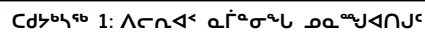


**Baffinland ▶ ኖፋሙንግታ 2019 ሐረጎች ▶ ምዕክር**

May15, 2020 | LΔ15, 2020



The Mary River iron ore deposits on North Baffin Island are considered to be one of the largest and highest quality iron ore open pit deposits in the world. No other mine features the same

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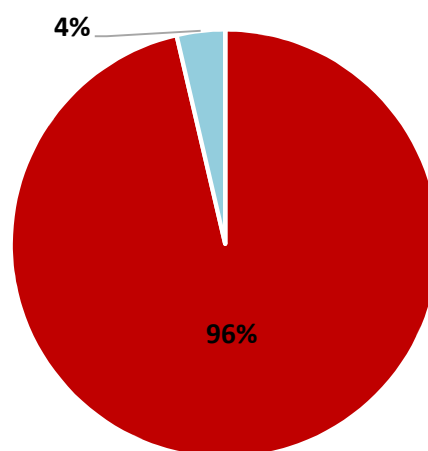
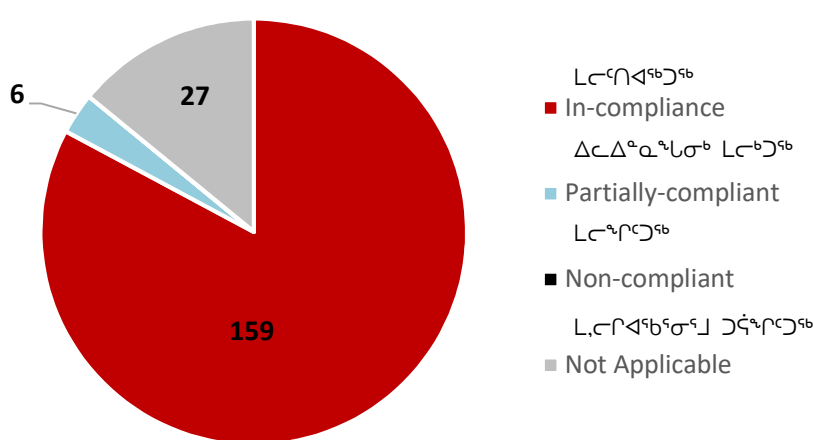
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In-Compliance	Condition requirements have been met	ፎካል ሚኒስቴር	የፎካል ሚኒስቴር ማረጋገጫ
Partially-Compliant	Condition requirements have been partially met. <i>*Demonstrable efforts towards meeting compliance requirements is evidenced.</i>	የፎካል ሚኒስቴር	የፎካል ሚኒስቴር ማረጋገጫ
Non-Compliant	Conditions requirements have not been met. <i>*Rationale for being unable to meet compliance requirements is provided.</i>	የፎካል ሚኒስቴር	የፎካል ሚኒስቴር ማረጋገጫ
Not Applicable	Condition is tied to a project phase or component that was not active during the reporting year, or the responsible party is not the Proponent.	የፎካል ሚኒስቴር	የፎካል ሚኒስቴር ማረጋገጫ

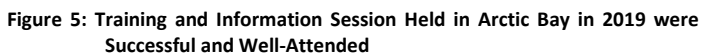
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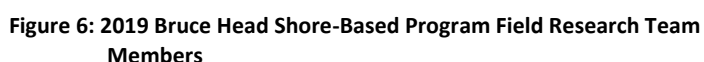
Project-related information about ongoing operations and future Project planning including the Phase 2 Proposal is shared during all community engagement events. Baffinland will continue to take a proactive approach to engagement with all parties through meetings, workshops, surveys and sharing of information and reports. This will ensure that the communities, QIA, regulators, government agencies and the public are informed in a timely and culturally appropriate manner of the Project's progress and the potential environmental and social impacts of ongoing and proposed operations.

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In 2019, a number of the Terrestrial Environment Monitoring Program components benefitted from the involvement of Inuit participants. Inuit supported key surveys such as Height of Land, exotic plant and vegetation abundance surveys, raptor monitoring and lemming trapping. A total of 9 positions were made available (cumulative 68 days or 680 hours) to Inuit to support the terrestrial work. In-field training on data collection methods was provided over the length of the programs.

Three Inuit researchers were hired for the summer field season to assist the Site Environment team in executing freshwater monitoring programs including fisheries surveys, the Aquatic Effects Monitoring Program, surface water quality monitoring on the Tote Road, as well as routine monitoring of discharges from the Project and executing regular compliance inspections. In addition, three Environmental Monitors on behalf of the QIA joined the Site Environment team in 2019, providing a crucial link between QIA and Baffinland for environmental monitoring and reporting purposes. While the Environmental Monitors are QIA staff members, they are integrated into the operation of the Site Environment team and participate in the implementation of the Environmental Management System of the Project.

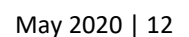
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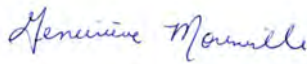


# Baffinland Iron Mines Corporation

## Mary River Project

2019 ANNUAL REPORT TO THE NUNAVUT IMPACT REVIEW BOARD

REV 0



2020-05-15	0			
		G. Morinville	C. Murray	L. Kamermans
Date	Rev.	Prepared By	Reviewed By	Approved By

**TABLE 0: REPORT SUBMISSION SUMMARY**

Year of Annual Report	2019
Annual Report Submission Date:	May 15, 2020
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## TABLE OF CONTENTS

<b>1 INTRODUCTION.....</b>	<b>14</b>
1.1 PROJECT OVERVIEW .....	14
1.2 REGULATORY CONTEXT .....	17
1.2.1 Project Certificate .....	17
1.2.2 Permits.....	18
1.2.3 Permitting of the Phase 2 Expansion Project Proposal.....	20
1.3 REPORT STRUCTURE .....	21
1.3.1 Report Content .....	21
1.3.2 Supporting Documents and Appendices .....	22
<b>2 ENGAGEMENT ACTIVITIES.....</b>	<b>23</b>
2.1 ENGAGEMENT APPROACH.....	23
2.2 ENGAGEMENT OBJECTIVES.....	23
2.3 ENGAGEMENT ACTIVITIES .....	24
2.3.1 Public Meetings & Events .....	25
2.3.2 Community Group Meetings .....	25
2.3.3 Community Sponsorships .....	27
2.4 ENGAGEMENT WITH THE QIA.....	28
2.4.1 Engagement on IIBA Implementation .....	28
2.4.2 Engagement on the Commercial Lease and Associated Agreements.....	29
2.5 ENGAGEMENT WITH WORKING GROUPS.....	29
2.5.1 Terrestrial and Marine Environment Working Groups .....	30
2.5.2 Mary River Socio-Economic Monitoring Working Group .....	32
2.6 LOOKING AHEAD.....	33
<b>3 OPERATIONS OVERVIEW.....</b>	<b>34</b>
3.1 SITE ACTIVITIES COMPLETED IN 2019.....	34
3.2 2019 HIGHLIGHTS AND CHALLENGES .....	35
3.2.1 Project Economics .....	35
3.2.2 IIBA Implementation Highlights.....	35
3.2.3 CIRNAC Directive - Waste Rock Facility .....	36
3.2.4 Inuit Employment and Contracting.....	37
3.3 LOOKING AHEAD.....	38
<b>4 PERFORMANCE ON PC CONDITIONS .....</b>	<b>40</b>
4.1 METHODOLOGY AND CRITERIA .....	40
4.2 APPROACH TO REPORTING ON PERFORMANCE.....	41
4.3 SUMMARY OF 2019 COMPLIANCE WITH CONDITIONS .....	42
4.4 PERFORMANCE ON GENERAL CONDITIONS .....	43
4.5 PERFORMANCE ON COMPLIANCE WITH REGULATORY INSTRUMENTS .....	45
4.5.1 Agency Inspections and Site Visits.....	45
4.5.2 Unauthorized Discharges and Spills.....	46



4.5.3	Water Licence Compliance (Type A 2AM-MRY1325 and Type B 2BE-MRY1421)	47
4.6	PERFORMANCE ON ECOSYSTEMIC CONDITIONS	48
4.6.1	Meteorology and Climate (PC Conditions 1 through 6)	48
4.6.2	Air Quality (PC Conditions 7 through 12)	63
4.6.3	Noise & Vibration (PC Conditions 13 through 15)	77
4.6.4	Hydrology and Hydrogeology (PC Conditions 16 through 19)	92
4.6.5	Groundwater & Surface Water (PC Conditions 20 through 30)	104
4.6.6	Vegetation (PC Conditions 31 through 40)	132
4.6.7	Freshwater Environment (PC Conditions 41 through 48a)	156
4.6.8	Terrestrial Environment (PC Conditions 49 through 64)	179
4.6.9	Birds (PC Conditions 65 through 75)	222
4.6.10	Marine Environment (PC Conditions 76 through 98)	251
4.6.11	Marine Wildlife (PC Conditions 99 through 128)	319
4.7	PERFORMANCE ON SOCIO-ECONOMIC CONDITIONS	442
4.7.1	Population Demographics (PC Conditions 129 through 134)	442
4.7.2	Education and Training (PC Conditions 135 through 141)	461
4.7.3	Livelihood & Employment (PC Conditions 142 through 147)	482
4.7.4	Economic Development, Self-Reliance, and, Contracting and Business Opportunities (PC Conditions No. 148 through 152)	492
4.7.5	Human Health & Wellbeing (PC Conditions 153 through 157)	503
4.7.6	Community Infrastructure and Public Services (PC Conditions 158 through 161)	519
4.7.7	Culture, Resources & Land Use (PC Conditions 162 through 166)	530
4.7.8	Benefits, Royalties and Taxation (PC Condition 167)	551
4.7.9	Governance & Leadership (PC Conditions 168 through 169)	553
4.8	PERFORMANCE ON OTHER CONDITIONS	560
4.8.1	Accidents & Malfunctions (PC Conditions 170 through 177)	560
4.8.2	Alternatives Analysis (PC Condition 178 through 184)	573
<b>5</b>	<b>NIRB CORRESPONDENCE</b>	<b>593</b>
5.1	NIRB SITE VISITS AND INSPECTIONS	593
5.2	COMMENTS ON THE 2018 ANNUAL REPORT TO THE NIRB	594
5.3	NIRB'S ANNUAL MONITORING REPORT AND BOARD RECOMMENDATIONS	601
<b>6</b>	<b>MANAGEMENT PLAN UPDATES</b>	<b>602</b>
<b>7</b>	<b>REFERENCES</b>	<b>604</b>

## LIST OF TABLES

Table 1.1:	Permit Registry	18
Table 2.1:	Public Meetings & Events in 2019	25
Table 2.2:	Community Group Meetings in 2019	26
Table 2.3:	JEC, EC and CC Meetings in 2019	28

Table 2.4:	Terrestrial Environment and Marine Environment Working Group Meetings in 2019 .....	30
Table 2.5:	Socio-economic Monitoring Working Group Meetings in 2019 .....	32
Table 4.1:	Status of Self-Assessment Compliance Terminology and Criteria.....	40
Table 4.2:	Layout of PC Condition Summary Sheets.....	41
Table 4.3:	List of Reported Spills and Unauthorized Discharges – 2019 .....	47
Table 4.4:	Climate Impact Evaluation .....	49
Table 4.5:	Calculated 2019 Project Gaseous Emissions .....	61
Table 4.6:	Air Quality Impact Evaluation .....	63
Table 4.7:	Calculated 2019 Project Greenhouse Gas Emissions .....	70
Table 4.8:	Noise and Vibration Impact Evaluation.....	77
Table 4.9:	Summary Statistics of 2019 Noise Monitoring Results .....	81
Table 4.10:	Summary Statistics of 2019 Vibration Monitoring Results .....	81
Table 4.11:	Underwater Noise Management Thresholds.....	84
Table 4.12:	Summary of Marine Mammal Observations within the 200 m Exclusion Zone.....	85
Table 4.13:	Community Group Meetings in 2019.....	89
Table 4.14:	Hydrology and Hydrogeology Impact Evaluation.....	93
Table 4.15:	Groundwater and Surface Water Impact Evaluation .....	105
Table 4.16:	2019 Community Group Meetings.....	123
Table 4.17:	2019 Submissions to Regulatory Agencies and Stakeholders .....	129
Table 4.18:	Vegetation Impact Evaluation.....	134
Table 4.19:	Freshwater Environment Impact Evaluation.....	158
Table 4.20:	Terrestrial Environment Impact Evaluation .....	180
Table 4.21:	Elevation points calculated to obtain low-level flight rationale in all areas, May 1 – September 30, 2019.....	212
Table 4.22:	2019 Meetings with Local HTOs.....	218
Table 4.23:	Birds Impact Evaluation .....	222
Table 4.24:	Elevation Points Calculated to Obtain Low-Level Flight Rationale in all Areas, May 1 – September 30, 2019.....	235
Table 4.25:	Elevation Points Calculated to Obtain Low-Level Flight Rationale in all Areas, May 1 – September 30, 2019.....	238
Table 4.26:	Summary Statistics for Raptor Survey Effort and Detections at Known Raptor Nesting Sites within the RMA (2011 to 2019).....	248
Table 4.27:	Marine Environment Impact Evaluation .....	252
Table 4.28:	2019 Ship Ballast Water Salinity Test Results Prior to Discharge in Milne Port.....	298
Table 4.29:	Ship Hull Biofouling Monitoring Effort in 2019 .....	306
Table 4.30:	Marine Mammals Impact Evaluation .....	320
Table 4.31:	Recorded Vessel Speeds of Project Vessels on Northern Shipping Route During 2019.....	347
Table 4.32:	Proportion of Travel Time in RSA Relative to Speed Restriction – 2019 Shipping Season.....	349
Table 4.33:	Proportion of Travel Time in RSA Relative to 9 knot Speed Restriction – 2018 v. 2019 Shipping Season .....	354
Table 4.34:	Baffinland’s Marine Mammal Monitoring Programs Undertaken for Northern Shipping Route (2006 to 2019).....	385

Table 4.35:	Population Demographics Impact Evaluation .....	442
Table 4.36:	2019 Monitoring of Indicators of Demographic Change.....	449
Table 4.37:	Changes in Inuit Employee and Contractor Residence and Community (2019 Inuit Employee Survey Results) .....	456
Table 4.38:	Current Inuit Employee and Contractor Housing Status (2019 Inuit Employee Survey Results) .....	457
Table 4.39:	Inuit Employee and Contractor Migration Intentions (2019 Inuit Employee Survey Results) .....	458
Table 4.40:	Education and Training Impact Evaluation.....	461
Table 4.41:	Apprentices at Baffinland in 2019.....	470
Table 4.42:	Education Status (2019 Inuit Employee Survey Results).....	477
Table 4.43:	Employment Status Prior to Project Employment (2019 Inuit Employee Survey Results) .....	478
Table 4.44:	Education Status Prior to Project Employment (2019 Inuit Employee Survey Results) .....	478
Table 4.45:	Livelihood and Employment Impact Evaluation.....	483
Table 4.46:	Hours Worked by Project Employees and Contractors by Ethnicity and Gender (2019) .....	489
Table 4.47:	Economic Development Impact Evaluation .....	492
Table 4.48:	Human Health and Well-being Impact Evaluation .....	504
Table 4.49:	Employee Health and Counselling Indicators and Trends in 2019.....	507
Table 4.50:	Socio-Economic Indicators and Trends for Potential Indirect Effects in 2019 .....	509
Table 4.51:	Employee Health and Counselling Indicators and Trends in 2019.....	518
Table 4.52:	Community Infrastructure and Public Services Impact Evaluation .....	519
Table 4.53:	Selected Human Health and Well-Being Indicators and Trends in 2019 .....	522
Table 4.54:	2019 Monitoring Results for Selected Community Infrastructure and Public Services Indicators .....	525
Table 4.55:	Culture, Resources and Land Use Impact Evaluation.....	530
Table 4.56:	Public Meetings & Events in 2019.....	533
Table 4.57:	Community Group Meetings.....	533
Table 4.58:	Public Meetings.....	537
Table 4.59:	Community Group Meetings.....	537
Table 4.60:	2019 Shipping Concerns and Comments Tracker.....	548
Table 4.61:	Benefits, Royalties and Taxation Impact Evaluation .....	551
Table 4.62:	2019 Monitoring Results and Trends for Selected Socio-Economic Indicators.....	555
Table 4.63:	Monthly and Annual Quantities of Ore Shipped by the Project in 2019.....	576
Table 4.64:	Monthly and Annual Quantities of Ore Generated and Transported Via the Tote Road in 2019.....	578
Table 5.1:	Summary of Agency Comments on Regulatory Performance.....	599
Table 6.1:	Current List Environmental Monitoring and Management Plans .....	602

## LIST OF FIGURES

Figure 1.1:	Baffinland Iron Mines Project Location.....	15
Figure 1.2:	Project Activities Overview .....	16
Figure 2.1:	Baffinland's Approach to Stakeholder Engagement .....	23
Figure 2.2:	Overview of Baffinland's Engagement Objectives .....	24
Figure 4.1:	Baffinland's Overall Performance against Project Certificate Conditions in 2019.....	42
Figure 4.2:	GHG Emissions Relative to Ore Production.....	56
Figure 4.3:	GHG Emissions Relative to Ore Production.....	62



Figure 4.4:	Total Ground Cover and Total Canopy Cover by Distance Class and Year .....	146
Figure 4.5:	Ground Cover and Canopy Cover by Plant Group and Year .....	146
Figure 4.6:	Snow Bank Height Compliance Monitoring Results from 2014 to 2019 on the Tote Road .....	192
Figure 4.7:	Caribou Observations from Height of Land Surveys from 2013 to 2019 .....	193
Figure 4.8:	Snow Tracking Survey Trends from 2014 to 2019.....	193
Figure 4.9:	Daily Vehicle Transits on the Tote Road in 2019.....	203
Figure 4.10:	Trends in Vehicle Transits on the Tote Road from 2015 to 2019.....	204
Figure 4.11:	Annual Dustfall and Ore Shipping Trends from 2014 to 2019 .....	208
Figure 4.12:	Percent (%) Compliance of Flights Inside the Goose Area during the Moulting Season and Within and Outside the Goose Area in All Months (2015 to 2019) .....	213
Figure 4.13:	Percent (%) Compliance of Flights Inside the Goose Area during the Moulting Season and Within and Outside the Goose Area in All Months (2015 to 2019) .....	236
Figure 4.14:	Percent (%) Compliance of Flights Inside the Goose Area during the Moulting Season and Within and Outside the Goose Area in All Months (2015 to 2019) .....	239
Figure 4.15:	Annual Estimates of Peregrine Falcon (PEFA) and Rough-legged Hawk (RLHA) Nesting Territory Occupancy (2012 to 2019) .....	247
Figure 4.16:	Project Related Vessel Transits – 2019 .....	341
Figure 4.17:	MSV Botnica Trackline on 4 to 5 August 2019 .....	342
Figure 4.18:	Proportional Ship Travel Speed for all Project-related Vessels - 2019 Shipping Season.....	349

## APPENDICES

Appendix A	Status of PC Conditions in 2019
Appendix B	2019 Community Engagement Records
Appendix C	2019 Working Group Meeting Records
Appendix C.1	MEWG Meeting Records
Appendix C.2	TEWG Meeting Records
Appendix C.3	SEMWG Meeting Records
Appendix C.4	Q-SEMC Meeting Records
Appendix D	2019 Photo Essay
Appendix E	Concordance to NIRB Recommendations
Appendix F	Status of Proponent Commitments in 2019
Appendix G	Supporting Studies and Reports
Appendix G.1	CREMP Report
Appendix G.2	Lake Sedimentation Monitoring Report
Appendix G.3	2019 SNP Hydrometric Monitoring Report
Appendix G.4	Freshet 2019 Monitoring Report
Appendix G.5	Groundwater 2019 Monitoring Program Report
Appendix G.6	DFO Tote Road Report
Appendix G.7	DFO Ore Dock Offset Report
Appendix G.8	Draft 2019 Marine Environmental Effects Monitoring Program and Aquatic Invasive Species Monitoring Program Report
Appendix G.9	2019 Passive Acoustic Monitoring Program Report

- Appendix G.10 Draft 2019 Bruce Head Shore-based Monitoring Program Report
- Appendix G.11 Draft 2019 Ship-based Observer Monitoring Program Report
- Appendix G.12 Draft 2019 Mary River Project Terrestrial Environmental Annual Monitoring Report
- Appendix G.13 Revegetation Study Reports
- Appendix G.14 2019 Geotechnical Inspection Reports
  - Appendix G.14.1 August 2019 Geotechnical Inspection Report
  - Appendix G.14.2 November 2019 Geotechnical Inspection Report
- Appendix G.15 Tetrattech 2019 Tote Road Inspection Report
- Appendix G.16 Borrow Source Action Plan
- Appendix G.17 Noise and Vibration Surveys – Accommodation Facilities (2019)
- Appendix G.18 Air Quality Memo
- Appendix G.19 2019 Daily Ship Tracks with Ice Imagery
- Appendix G.20 Environmental Monitoring Completion Report for the Milne Port Freight Dock
- Appendix G.21 2019 Socio-Economic Monitoring Report
- Appendix G.22 MHTO Letters of Support for 2019 Monitoring Programs
- Appendix G.23 2019 Source Testing
- Appendix G.24 Draft 2017–2018 Integrated Narwhal Tagging Study Technical Data Report
- Appendix G.25 Draft 2019 Marine Mammal Aerial Survey



## ABBREVIATIONS

AANDC .....	Aboriginal Affairs and Northern Development Canada
AAQS .....	Ambient Air Quality Standards
ABW .....	Atlantic Ballast Water
ADCP .....	Acoustic Doppler Current Profilers
AED .....	Automatic External Defibrillator
AEMP .....	Aquatic Effects Monitoring Plan
AIS .....	Aquatic Invasive Species
AIS .....	Automatic Identification System
AMBNS .....	Active Migratory Bird Nest Surveys
APRF .....	Annual Project Review Forum
ARD .....	Acid Rock Drainage
ARU .....	Autonomous Recording Units
ASR .....	Annual Security Review
B2B .....	Business to Business
Baffinland .....	Baffinland Iron Mines Corporation
BCLO .....	Baffinland Community Liaison Officer
BWM .....	Ballast Water Management
BWMP .....	Ballast Water Management Plan
CC .....	Contracting Committee
CCG .....	Canadian Coast Guard
CCME .....	Canadian Council of Ministers of the Environment
CDA .....	Canadian Dam Association
CEMP .....	Construction Environment Management Plan
CF .....	Crusher Facility
CGVD .....	Canadian Geodetic Vertical Datum
CHS .....	Canadian Hydrographic Service
CIRNAC .....	Crown Indigenous Relations and Northern Affairs Canada
CO .....	Carbon Monoxide
CO <sub>2</sub> .....	Carbon Dioxide
CO <sub>2</sub> eq .....	Carbon Dioxide Equivalent
CoPC .....	Contaminant of Potential Concern
CORI .....	Coastal and Ocean Resources Inc.
CPA .....	Closest Point of Approach
CPIT .....	Contracting and Procurement Information Tour
CPR .....	Cardiopulmonary Resuscitation
CPUE .....	Catch-Per-Unit-Effort
CRD .....	Collaborative Research and Development
CREMP .....	Core Receiving Environment Monitoring Program
CTD .....	Conductivity, Temperature, and Depth
CV .....	Coefficient of Variation

CWS .....	Canada-Wide Standards
dB.....	Decibels
dBA .....	A-weighted Decibels
DAF .....	Dissolved Air Flotation
DEM .....	Digital Elevation Model
DFO .....	Department of Fisheries and Oceans
DOR.....	Department of Environment
DPA .....	Development Partnership Agreement
DSMB .....	Dust Stop Municipal Blend
EC.....	Employment Committee
ECCC.....	Environment and Climate Change Canada
ECSAS .....	Eastern Canada Seabirds at Sea
EDC .....	Endocrine Disruption Chemicals
EDI.....	Environmental Dynamics Inc.
EEZ .....	Exclusive Economic Zone
EEM.....	Environmental Effects Monitoring
EFAP .....	Employee Family Assistance Program
EIS .....	Environmental Impact Statement
EPP .....	Environmental Protection Plan
ERP.....	Early Revenue Phase
ERL .....	Effects Range-Low
ERP.....	Emergency Response Plan
ETIS .....	Employment and Training Information Sessions
EWI .....	Early Warning Indicators
FAA.....	<i>Fisheries Act</i> Authorization
FCSAP .....	Federal Contaminated Sites Action Plan
FEIS .....	Final Environmental Impact Statement
FET .....	Full-Time Equivalents
FNBC .....	First Nations Bank of Canada
FSWMP .....	Fresh Water Supply, Sewage and Wastewater Management Plan
GDP .....	Gross Domestic Product
GHG .....	Greenhouse Gas
GN.....	Government of Nunavut
Golder.....	Golder Associates Ltd.
GPS.....	Global Positioning System
ha .....	hectars
HADD .....	Harmful Alteration, Disruption or Destruction (of Fish Habitat)
Hatch .....	Hatch Ltd.
HD .....	High Definition
HEO .....	Heavy Equipment Operator
HTO .....	Hunter and Trapper Organization
ICE.....	Inuit Cultural Engagement

ICRP.....	Interim Closure and Reclamation Plan
IEG.....	Inuit Employment Goals
IFC.....	Issued-for-Construction
IFO.....	Intermediate Fuel Oil
IHRs.....	Inuit Human Resources Strategy
IIBA .....	Inuit Impact and Benefit Agreement
ILBA.....	Inuit Labour Force Barriers Analysis
IMO.....	International Maritime Organization
INPK .....	Ilagiiktunut Nunalinnullu Pivalliajutisait Kiinaujat
IOL.....	Inuit-Owned Land
IOPPC.....	International Oil Pollution Prevention Certificate
IPCC.....	Intergovernmental Panel on Climate Change
IPCS.....	Inuit Procurement and Contracting Strategy
IQ .....	Inuit Qaujimajatuqangit
ISQG.....	Interim Sediment Quality Guidelines
JEC.....	Joint Executive Committee (Baffinland and the QIA)
JPCSL.....	Jason Prno Consulting Services Ltd.
KPI.....	Key Performance Indicators
kPa .....	Kilopascal
LMA.....	Labour Market Analysis
LRR.....	Listening Range Reduction
LSA .....	Local Study Area
magl.....	Meters Above Ground Level
masl.....	Meters Above Sea Level
MDL .....	Minimum Detection Limit
MDMER.....	Metal & Diamond Mining Effluent Regulations
MEEMP .....	Marine Environmental Effects Monitoring Program
MEWG.....	Marine Environment Working Group
MFO .....	Mixed Function Oxygenase
MHTO.....	Mittimatalik Hunters and Trappers Organization
MIEG .....	Minimum Inuit Employment Goal
Milne Inlet Tote Road .....	Tote Road
Mining Industry Human Resources Council.....	MIHR
mL .....	Millilitre
ML.....	Metal Leaching
MMER .....	Metal Mining Effluent Regulations
MMO.....	Marine Mammal Observers
MOU .....	Memorandum of Understanding
m/s <sup>2</sup> .....	Meter per Second Squared
MSC.....	Mine Site Complex
Mtpa .....	Million Tonnes Per Annum
MWO .....	Marine Wildlife Observer



NEMESIS .....	National Exotic Marine and Estuarine Species Information System
NHC .....	Nunavut Housing Corporation
NIRB .....	Nunavut Impact Review Board
NIS .....	Non-Indigenous Species
NLCA .....	Nunavut Land Claims Agreement
NO <sub>2</sub> .....	Nitrogen Dioxide
NO <sub>x</sub> .....	Nitrogen Oxide
NOAA .....	National Oceanic and Atmospheric Administration
NPC .....	Nunavut Planning Commission
NPRI .....	National Pollutant Release Inventory
NSERC .....	Natural Sciences and Engineering Research Council of Canada
NTI .....	Nunavut Tunngavik Incorporated
NT-NU .....	Northwest Territories-Nunavut
NWB .....	Nunavut Water Board
NWPA .....	Navigable Waters Protection Act
NWT .....	Northwest Territories
OETIO .....	Operating Engineers Training Institute of Ontario
OHS .....	Occupational Health & Safety
OPEP .....	Oil Pollution Emergency Plan
OPPP .....	Oil Pollution Prevention Plan
OSRL .....	Oil Spill Response Ltd.
OWTS .....	Oily Water Treatment System
PAI .....	Potential Acidic Input
PAH .....	Polycyclic Aromatic Hydrocarbons
PAM .....	Passive Acoustic Monitoring
PBR .....	Potential Biological Removal
PC .....	Project Certificate
PCA .....	Principal Component Analysis
PDA .....	Project Development Area
PEFA .....	Peregrine Falcon
PEL .....	Probable Effect Level
PLC .....	Programmable Logic Controller
PM .....	Particulate Matter
PSC .....	Port Site Complex
psi .....	Pounds per Square Inch
PTS .....	Permanent Threshold Shift
PWSP .....	Polishing and Waste Stabilization Pond
Q-STEP .....	Qikiqtani Skills and Training for Employment Partnership
QA/QC .....	Quality Assurance / Quality Control
QIA .....	Qikiqtani Inuit Association
QLMA .....	Qikiqtani Labour Market Analysis
QSEMC .....	Qikiqtaaluk Socio-Economic Monitoring Committee

RAD .....	Relative Abundance and Distribution
RBR .....	RBRconcerto CTD
RCMP .....	Royal Canadian Mounted Police
RLHA .....	Rough-Legged Hawk
RMA .....	Raptor Monitoring Area
rms .....	Root-Mean-Square
ROV .....	Remotely Operated Vehicle
RSA .....	Regional Study Area
RTK .....	Real Time Kinematic
SBO .....	Ship-Based Observer
SCA .....	Skills and Capacities Assessment
SD .....	Standard Deviation
SE .....	Standard Error
SECP .....	Sediment and Erosion Control Plan
SEL .....	Sound Exposure Level
SEP .....	Stakeholder Engagement Plan
SEMWG .....	Socio-economic Environment Working Group
SEM .....	Sikumiut Environmental Management Ltd.
SMWMP .....	Shipping and Marine Wildlife Management Plan
SITM .....	Standing Instructions to Masters
SMR .....	Soil Moisture Regime
SNP .....	Surveillance Network Program
SO <sub>2</sub> .....	Sulphur Dioxide
SOP .....	Standard Operating Procedure
SOPEP .....	Shipboard Oil Pollution Emergency Plan
SPL .....	Sound Pressure Level
SSA .....	Stratified Study Area
SSRP .....	Spill at Sea Response Plan
STP .....	Sewage Treatment Plants
SWAEMP .....	Surface Water and Aquatic Ecosystem Management Plan
TAH .....	Total Allowable Harvest
TEL .....	Threshold Effect Level
TEMMP .....	Terrestrial Environment Mitigation and Monitoring Plan
TEWG .....	Terrestrial Environment Working Group
the Communities .....	North Baffin communities
the Project .....	Mary River Project
the Report .....	2019 Annual Report
the Strategy .....	Climate Change Strategy
Tote Road .....	Milne Inlet Tote Road
TREEP .....	Tote Road Earthworks Execution Plan
TSD .....	Technical Support Document
TSP .....	Total Suspended Particulate

TSS .....	Total Suspended Solids
TTS .....	Temporary Hearing Shift
VSEC.....	Valued Socio-Economic Component
WHMIS.....	Workplace Hazardous Materials Information System
WQG .....	Water Quality Guidelines
WRF .....	Waste Rock Facility
WSCC .....	Workers' Safety and Compensation Commission
WTP .....	Water Treatment Plant
WWF .....	World Wildlife Fund
YOY .....	Young-of-Year
ZOI .....	Zone of Influence



## 1 INTRODUCTION

This 2019 Annual Report (the Report) to the Nunavut Impact Review Board (NIRB) is a requirement of Baffinland Iron Mines Corporation's (Baffinland's) Project Certificate (PC) No. 005 for the Mary River Project (the Project). The Annual Report summarizes:

- Project activities undertaken during the reporting year (January 1, 2019 to December 31, 2019);
- Baffinland's performance against the requirements of the Terms and Conditions in PC No. 005;
- An evaluation of the Project's effects in relation to those predicted in the Final Environmental Impact Statement (FEIS; Baffinland, 2012); the Addendum to the FEIS (FEIS Addendum; Baffinland, 2013a) for the Early Revenue Phase (ERP) which includes a temporary approval for production increase exclusive to 2018 and 2019; and
- Planned Project-work for the next reporting year (January 1, 2020 to December 31, 2020).

### 1.1 PROJECT OVERVIEW

The Project is an open pit iron ore mine located in the Qikiqtani Region of Nunavut on northern Baffin Island, approximately 160 Km south-southwest of the nearest community of Pond Inlet (Mittimatalik) and 1,000 Km north-northwest of the territorial capital of Iqaluit. (Figure 1.1).

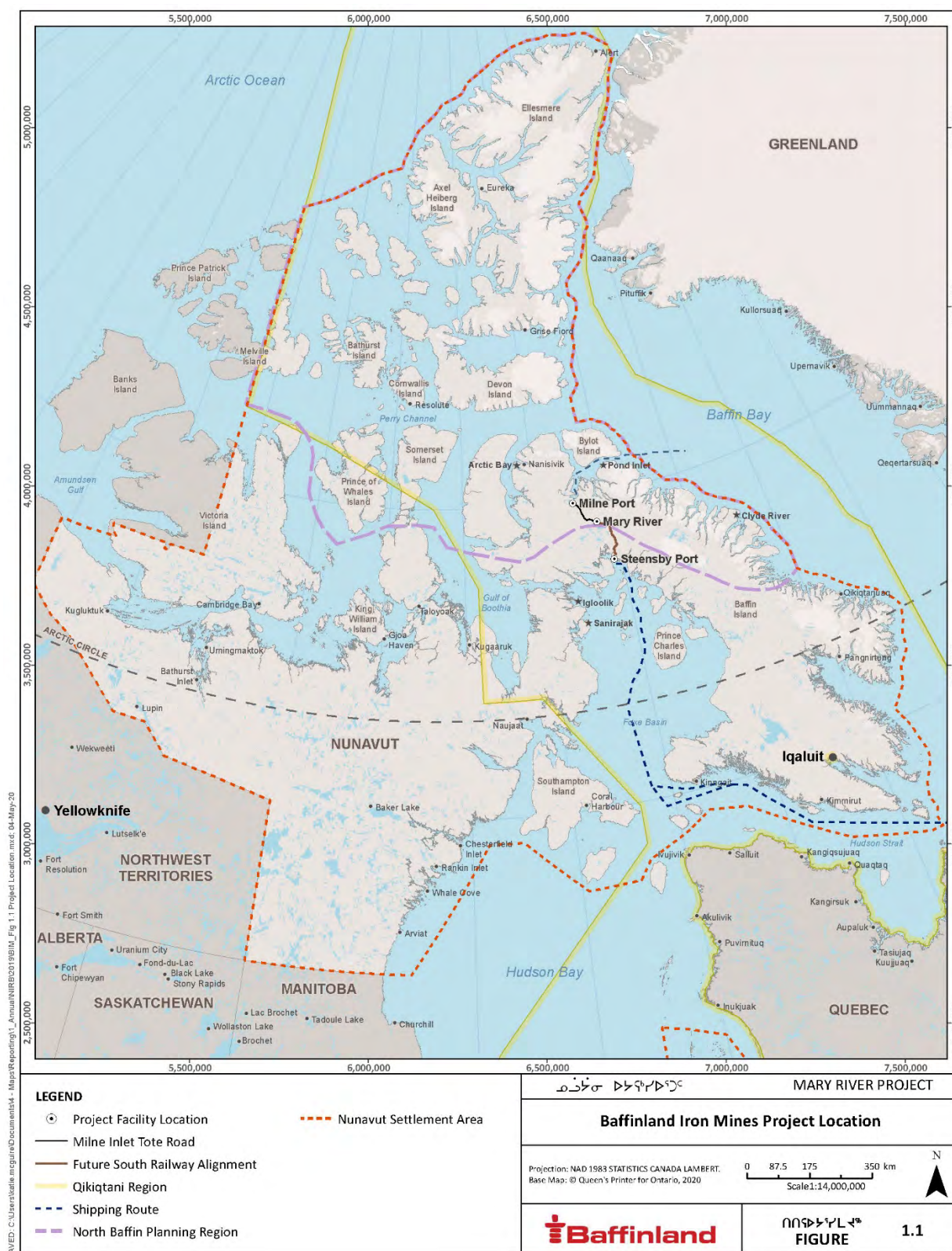
The Project is currently in the Early Revenue Phase (ERP), which consists of a mining rate of up to 4.2 million tonnes per annum (Mtpa) at Deposit No. 1. A temporary approval (for 2018 and 2019 exclusively) for a production increase to haul and ship 6.0 Mtpa from Milne Port was approved in September 2018 (NIRB, 2018a). For the purposes of this report, this is considered a temporary expansion of the ERP phase. The operation has the potential to last for generations; representing an important long-term opportunity for economic development in the North Baffin region.

During the ERP phase, the Project includes three (3) primary components (Figure 1.2):

- Mine Site;
- Milne Inlet Tote Road (Tote Road); and
- Milne Port.

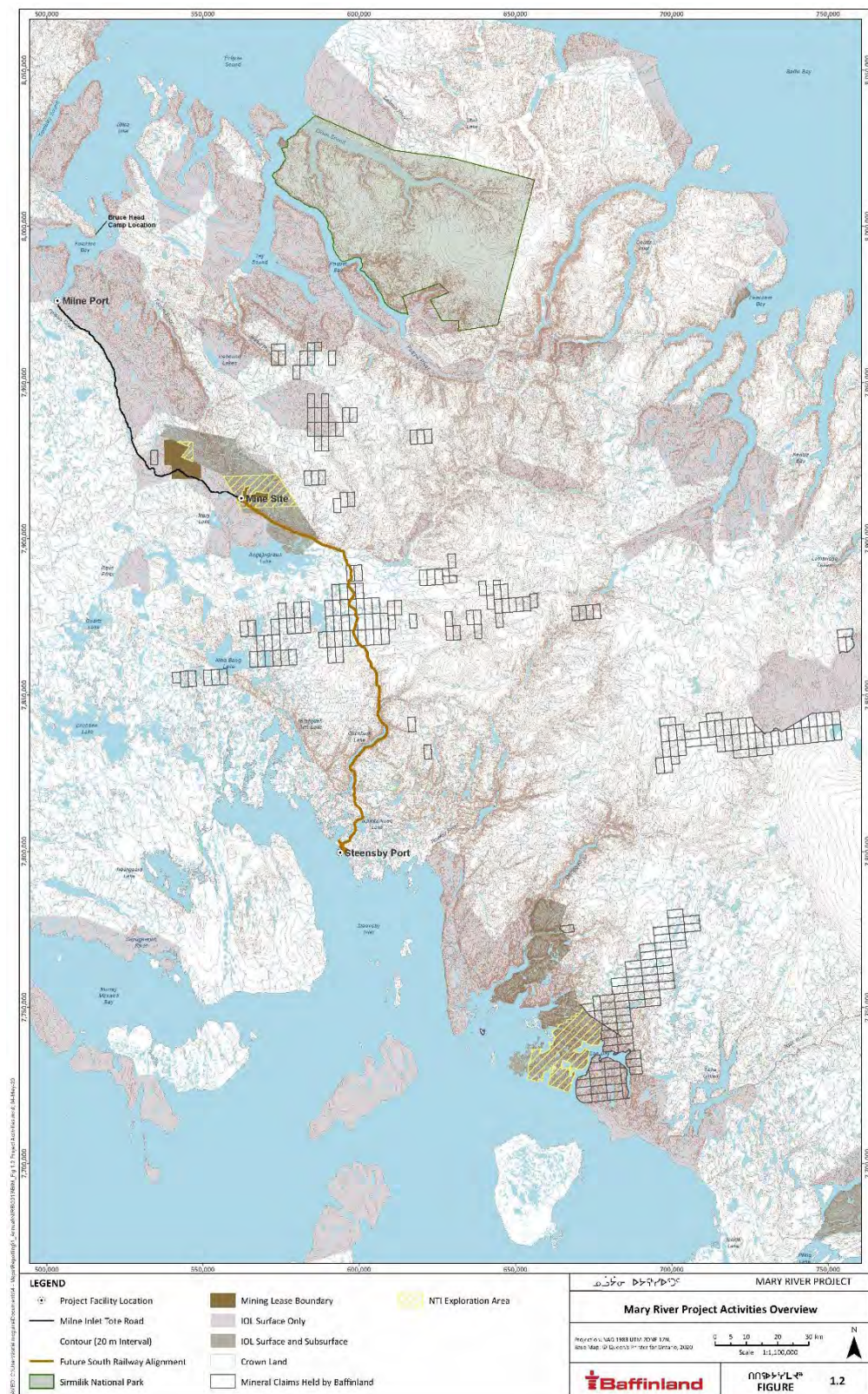
Operational activities include:

- Ore extraction;
- Ore processing via crushing;
- Transportation of the ore from the Mine site to Milne Port;
- Loading and shipping of ore from Milne Port;
- Stakeholder and Inuit community engagement; and
- Environmental monitoring and reporting.



**Figure 1.1: Baffinland Iron Mines Project Location**





**Figure 1.2: Project Activities Overview**



## 1.2 REGULATORY CONTEXT

### 1.2.1 Project Certificate

On December 28, 2012, the NIRB issued PC No. 005 for the Project to Baffinland (NIRB, 2012a) pursuant to Section 12.5.12 of Article 12 of the Nunavut Agreement (CIRNAC and Nunavut Tunngavik Inc., 2010). The basis for the Project Certificate is Baffinland's FEIS (Baffinland, 2012), which presented in-depth analyses and evaluation of potential environmental and socio-economic effects associated with mining the reserves of Deposit No. 1 at a nominal rate of 18 Mtpa.

In addition to the primary components of the ERP, the Approved Project includes construction, operation, closure and post-closure activities associated with the following proposed Project components:

- A 150 Km South Railway from the Mine Site to a new port facility at Steensby Inlet (Figure 1.1);
- Steensby Port, which will operate year-round; and
- Year-round shipping along the Southern Shipping Route (Foxye Basin - Hudson Strait).

The FEIS for the approved Mary River Project was prepared in adherence to Guidelines for the Preparation of an Environmental Impact Statement for Baffinland Iron Mines Corporation's Mary River Project (the Guidelines; NIRB, 2009); and NIRB's Preliminary Hearing Conference Decision (NIRB, 2011).

Two amendments to the PC have been issued to Baffinland, one of which was in 2018. Additionally, the Company is currently seeking a further reconsideration for its Phase 2 Proposal which, if granted, will result in a third amendment to the PC. This history is described below.

#### **Amendment No. 1 of Project Certificate No. 005 for the Early Revenue Phase**

Following the issuance of the PC, Baffinland requested an amendment to the PC to undertake the 4.2 Mtpa ERP, and an Addendum to the FEIS was submitted to the NIRB in June 2013 (Baffinland, 2013a). The Minister of Aboriginal Affairs and Northern Development Canada (AANDC; now Crown Indigenous Relations and Northern Affairs Canada - CIRNAC) approved the ERP on April 28, 2014 (Minister of Aboriginal Affairs and Northern Development, 2014), and NIRB subsequently issued an amended Project Certificate in May 2014 (NIRB, 2014).

#### **Amendment No. 2 of Project Certificate No. 005 for the Production Increase Project Proposal and Extension Request**

In 2018, Baffinland applied for and was granted a second amendment to its PC for the Production Increase Proposal.

In April 2018, Baffinland submitted a project proposal to the Nunavut Planning Commission (NPC) for an increase in production from the current 4.2 Mtpa to 6.0 Mtpa (Stantec Consulting Ltd., 2018). On May 18, 2018 the NPC referred the Production Increase Proposal to the NIRB for screening. In the Production Increase Proposal, Baffinland requested that NIRB reconsider Mary River Project Certificate No. 005 and amend Conditions 179(a) and 179(b) in order to accommodate the increase in the volume of ore transported and shipped out of Milne Port.

On June 11, 2018 the Board determined that the modifications proposed in the Production Increase Proposal require assessment through a formal reconsideration of the PC Terms and Conditions. On June 20, 2018 Baffinland filed additional information in support of the FEIS Addendum and on June 27, 2018, the NIRB issued correspondence formally accepting the FEIS Addendum, and inviting comment on the proposal from interested parties to be received on or before July 26, 2018. The NIRB held a public information session in Pond Inlet on July 12, 2018.

A public hearing was not held in support of the review and the NIRB issued its Reconsideration Report and Recommendations on August 31, 2018 that partially approved the infrastructure and activities included in the Production Increase Proposal (NIRB, 2018b). Notably, Baffinland was approved to move forward with the construction of its 380-person camp and additional 15 mL fuel tank at Milne Port, but was not approved to increase its annual limits for trucking and shipping ore to market. On September 30, 2018, following an appeal by the Qikiqtani Inuit Association (QIA) to the Minister responsible for the final determination of the NIRB's Report – the Minister of Intergovernmental Affairs, Northern Affairs and Internal Trade - Baffinland received an approval to increase its trucking and shipping limits for 2018 and 2019 (Minister of Intergovernmental and Northern Affairs and Internal Trade, 2018). On October 30, 2018, the NIRB issued PC Amendment No. 2 (NIRB, 2018a).

In early December 2019, Baffinland sent a notification of its intention to NIRB to request an additional extension to the production increase limits (i.e., extending the 6 Mtpa limit beyond 2019) and thereby consider further modifications of Conditions 179(a) and 179(b). On January 6, 2020, Baffinland submitted a formal Extension Request Package. Baffinland's intention to continue shipping 6 Mtpa in 2020 was widely supported by the five North Baffin region hamlets and regulators, with letters of support submitted to the NIRB. On March 4, 2020 the NIRB issued its "Reconsideration Report and Recommendations" indicating that they recommended the extension of the 6 Mtpa production increase until December 31, 2021. The Responsible Ministers are expected to make a final determination by June 2020.

### 1.2.2 Permits

Baffinland operates the ERP in accordance with the permits, licences, approvals, authorizations and agreements identified in Table 1.1. In addition, Baffinland's contractors and consultants undertake various activities on the Project under additional permits in the areas of scientific research, archaeology, and explosives manufacture, storage and use.

**Table 1.1: Permit Registry**

Approval	Project Activity and Update	Expiry
<b>Nunavut Impact Review Board</b> <b><i>Nunavut Agreement, and the Nunavut Planning and Project Assessment Act</i></b>		
Project Certificate No. 005 (Amendment No. 1)	Required under Article 12 of the <i>Nunavut Agreement</i> to obtain the requisite permits and approvals to proceed with the Project.	No Expiry
Project Certificate No. 005 (Amendment No. 2)	Required under Article 12 of the <i>Nunavut Agreement</i> to obtain the requisite permits and approvals to proceed with the Project	December 31, 2019
<b><i>Nunavut Agreement (Article 12) Qikiqtani Inuit Association (QIA)</i></b> <b><i>Agreements issued under Articles 6, 20 and 26 of the Nunavut Agreement</i></b>		
Inuit Impact and Benefits Agreement (IIBA)	Required under Article 26 of the <i>Nunavut Agreement</i> to proceed with Project - concluded September, 2013; Compliance with the agreement is outlined in the Annual IIBA Implementation Report submitted by March 31 <sup>st</sup> of each year.	No Expiry
Wildlife Compensation Agreement	Wildlife Compensation required under Article 6 of the <i>Nunavut Agreement</i> , with the regime set out in IIBA.	No Expiry

Approval	Project Activity and Update	Expiry
Quarry Concession Agreement	Required to extract specified substances (quarried rock and borrow sand and gravel) on Inuit Owned Land under the Commercial Lease	N/A
Water Compensation Agreement	Required under Article 20 of the Nunavut Agreement to provide compensation to Inuit for water use by the project or impact to water use.	June 10, 2025
Commercial Lease Q13C301	Mine development activities on Inuit Owned Land; Compliance with the lease is outlined in the <i>2019 QIA and NWB Annual Report for Operations</i> submitted April 30, 2020.	December 31, 2043
<b>Nunavut Water Board (NWB)</b> <b>Water Licences issued under the Nunavut Agreement (Article 13), the Nunavut Waters and Nunavut Surface Rights Tribunal Act, and the Northwest Territories Water Regulations</b>		
Type B Water licence 2BE-MRY1421	Regional exploration activities, including exploration drilling; In good standing; no amendments were issued by the NWB in 2019.	April 16, 2021
Type A Water Licence 2AM-MRY1325	Water use and waste disposal associated with the mine; In good standing; no amendments were issued by the NWB in 2019.	June 10, 2025
<b>Crown Indigenous Relations and Northern Affairs Canada</b> <b>Mineral Leases and Land Leases, Land Use Permits, and Quarry Permits on Crown Land, issued under the Territorial Lands Act and associated Canadian Mining Regulations and Territorial Land Use Regulations</b>		
Land Use Permit N2019C0009	New lease issued in 2019, replaces prior permit N2014C0013. Infrastructure and activities on Crown Land at Steensby Port.	June 29, 2024
Tote Road and Borrow Area Land Use Permit N2019Q0011	New lease issued in 2019, replaces prior permit N2014Q0016. Quarry permit renewal for the Tote Road is currently under review.	June 29, 2024
Land Use Permit N2019J0010	New lease issued in 2019, replaces prior permit N2014J0011. Summer marine monitoring camp at Bruce Head, in Milne Inlet	June 29, 2024
Mineral Leases #2483, #2484 and #2485	Rights to extract minerals; Lease #2484 covers Deposit No.1.	August 27, 2034
Foreshore Lease 47H/16-1-2	Supercedes historical Class A Land Use Permit N2014X0012; Use of foreshore area current Milne Port Ore Dock; In good standing. Amendment to the lease is currently under review.	June 30, 2035
<b>Department of Fisheries and Oceans (DFO)</b> <b>Authorizations and Letters of Advice issued under the Fisheries Act</b>		
Letters of Advice (various)	DFO issued Baffinland various letters of advice in regard to culvert extensions and replacements along the Tote Road	No Expiry
Fisheries Authorization NU-06-0084	Authorization to construct water crossings in fish habitat along the Tote Road; The authorization remains valid and has been amended over the years. A monitoring report for the water crossings was submitted to DFO on December 31, 2019.	August 30, 2008; monitoring ongoing
Fisheries Authorization 14-HCAA-00525	Authorization to construct the Milne Ore Dock in fish habitat; A monitoring report for the Milne Ore Dock was submitted to DFO on December 31, 2019.	December 31, 2020



Approval	Project Activity and Update	Expiry
Fisheries Authorization 18-HCAA-00160	Authorization to construct the Freight Dock in fish habitat	June 1, 2020
Letters of Advice (various)	DFO issued Baffinland various letters of advice in regard to Project crossings along Tote Road and at quarries, culvert extensions and replacements.	No Expiry
<b>Transport Canada</b> <b>Approvals of in-water works under the <i>Navigable Waters Protection Act</i> (NWP; now the <i>Canadian Navigable Waters Act</i>); and Marine Facility Approval under the Marine Transportation Security Act and Regulations</b>		
Approvals: 8200-07-10273, 8200-07-10267, 8200-07-10269, 8200-07-10268, 8200-07-10274, 8200-07-10272 8200-07-10266, 8200-07-10271	Approvals to interfere with navigation within navigable waters along the Tote Road at crossings: CV040, BG50, CV128, CV223, CV072, BG17, CV217, and CV099	No Expiry
Statement of Compliance of a Marine Facility # 001743	Approval for the Milne Inlet Marine Facility to conduct iron ore operations	June 24, 2020
<b>National Resources of Canada</b> <b>Licensing of Explosives Manufacture and Storage Facilities under the <i>Explosives Act</i></b>		
Factory Licence #F76068/E	Issued to Baffinland's explosives contractor to manufacture explosives for the mine	-

### 1.2.3 Permitting of the Phase 2 Expansion Project Proposal

The NIRB public technical review of the Phase 2 Proposal that was initiated in 2018 continued throughout 2019. Technical review comments from interveners were submitted March 7, 2019, with responses from Baffinland submitted March 29, 2019. Two technical meetings were held in person in Iqaluit from April 8 to 10, 2019 and June 17 to 19, 2019.

On July 4, 2019, Baffinland submitted a request to NIRB to reschedule the Public Hearing (the Hearing) to allow additional time to collaborate with interveners and for additional community engagement. On July 25, 2019, the NIRB issued correspondence rescheduling the Hearing to November 2 to 9, with technical sessions in Iqaluit, and a Community Roundtable in Pond Inlet. NIRB issued a Notice of Public Hearing for these dates on August 21, 2019. A tour of the Mary River project site was also held on September 21, 2019 for members of NIRB's board and interveners. Final written submissions were submitted to NIRB by interveners on September 27, 2019, with Baffinland's responses provided on October 15, 2019.

The Hearing was held from November 2 to 6, 2019 in Iqaluit. On November 6, 2019, Nunavut Tunngavik Incorporated (NTI) put forth a motion to suspend the Hearing for a period of 9-12 months. In response to this motion, NIRB temporarily adjourned the Hearing and cancelled the planned community roundtable. The NIRB also requested parties provide their views with respect to the required length of time for an adjournment of the Hearing.

Following receipt of responses from interveners and Baffinland on the proposed length of the adjournment, on December 16, 2019 NIRB issued procedural direction for next steps in the Phase 2 Proposal review process. A third technical meeting followed by a community roundtable and Pre-Hearing Conference were subsequently scheduled for March 2020.

In response to the COVID-19 pandemic, on March 13, 2020 the NIRB provided notice that the planned third technical meetings would not be held in-person, and would instead be replaced by a combination of teleconference sessions and written submissions. On March 17, 2020 the NIRB provided notification they will not be issuing a revised schedule for formal technical teleconferences until circumstances change or organizations have had sufficient time to adjust their operations to current conditions. On April 13, 2020, Baffinland provided correspondence to the NIRB requesting technical meetings be facilitated via teleconference in the weeks following to ensure the regulatory review process could continue to advance in a manner that respects public safety. In response, NIRB proposed a teleconference-based Technical Meeting option for April 28-May 7, 2020 but this was also cancelled due to logistics-related complications associated with COVID-19. Baffinland continues to proceed through the Phase 2 FEIS review and approvals process, which includes engagement with communities and regulators to address remaining concerns with the intent for developing joint recommendations for NIRB's consideration. Baffinland currently awaits final direction from NIRB for the rescheduling of the Technical Meetings and Pre-Hearing Conference, as well as a Public Hearing.

The Nunavut Water Board (NWB) review process for the amendment to Baffinland's Type 'A' Water License required for the Phase 2 Proposal continued through 2019, in parallel with the NIRB review process. Technical meetings scheduled for November 2019 immediately following the NIRB Public Hearing were postponed pending further resolution through the NIRB review.

Baffinland looks forward to completion of the regulatory review process for Phase 2 through 2020 with the aim of continuing to stabilize the Mary River Project for the continued benefit of all Nunavummiut.

## 1.3 REPORT STRUCTURE

### 1.3.1 Report Content

This report is structured as follows:

**Section 1:** provides an overview of the Project and the regulatory context in which this Report is being submitted.

**Section 2:** highlights key activities and consultation efforts conducted with stakeholders for the Project, including:

- The five (5) North Baffin communities (the Communities);
- The Qikiqtani Inuit Association (QIA);
- Relevant regulatory agencies; and
- PC mandated Project working groups (Marine Environment Working Group (MEWG), Terrestrial Environment Working Group (TEWG) and the Mary River Socio-economic Environment Working Group (SEMWG).

**Section 3:** describes the Project's operational context in 2019, provides an overview of operational successes, and discusses challenges Baffinland faced with respect to meeting PC Terms and Conditions in 2019.

**Section 4:** includes a 'summary sheet' detailing compliance for each of the PC Conditions. The summary sheets provide an overview of the work completed towards meeting the requirements of all the PC conditions, and a status of compliance is assigned. This section also describes the status and/or progress Baffinland has made towards fulfilling the commitments the Company made during the Final Public Hearing (NIRB, 2012b) for the Project and a high-level review of the Project's effects in comparison to the potential effects predicted in the FEIS and FEIS Addendum.

**Section 5:** outlines the correspondence Baffinland has had with NIRB during 2019 and comments provided by NIRB on Baffinland's 2018 Annual Report to NIRB.

**Section 6:** lists all updates made to environmental management plans as a result of monitoring programs and engagement activities throughout 2019.

### 1.3.2 Supporting Documents and Appendices

Where PC conditions specify that Baffinland provide supporting documentation to NIRB as part of the submission of this Report, these documents have been appended to the Report. Other appendices, such as reports or documentation that are likely to be of specific interest to NIRB as part of their review of this Report, and those that provide a pertinent context to the discussions are also included in this Report.

In the interest of sustainability, other Project documentation that may be of interest to NIRB and other interested parties has been posted to the Project Document Portal available on the Baffinland website: <https://www.baffinland.com/media-centre/document-portal/>. As described in Section 2.5 several reports are shared with the Working Groups and regulatory agencies throughout the year during various engagement activities.

## 2 ENGAGEMENT ACTIVITIES

### 2.1 ENGAGEMENT APPROACH

Meaningful stakeholder, Inuit, and community engagement is valued by Baffinland as a means of building and maintaining relationships and continuously optimizing community and Inuit benefits of the Project. Baffinland's approach to engagement emphasizes the importance of informing stakeholders and community members, establishing effective communication strategies, and collecting feedback on potential issues and concerns (Figure 2.1).



**Figure 2.1: Baffinland's Approach to Stakeholder Engagement**

### 2.2 ENGAGEMENT OBJECTIVES

Baffinland is committed to meaningful engagement with stakeholders potentially affected by the Project, including the five (5) North Baffin Inuit communities (Arctic Bay, Clyde River, Sanirajak, Igloodik and Pond Inlet), the QIA, applicable regulatory agencies and the general public. Baffinland's approach to meaningful stakeholder engagement is integrally related to its commitment to corporate responsibility and sustainable development.

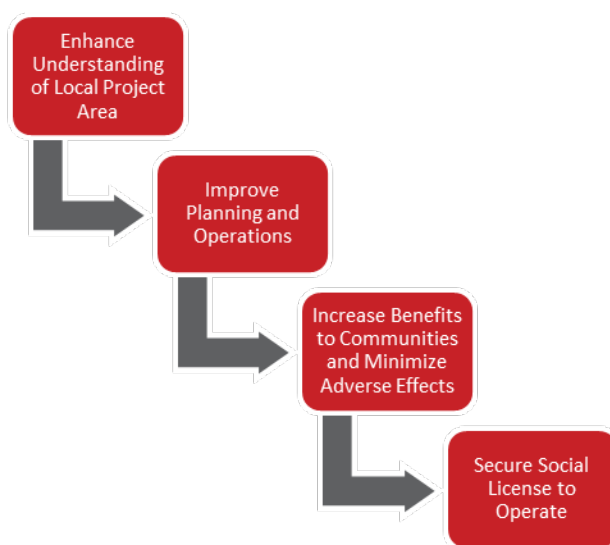
All engagement initiatives have been designed and implemented to achieve consistency with relevant corporate policies and regulatory authorizations, including the Inuit Impact and Benefit Agreement (QIA and Baffinland, 2018) as well as the conditions of PC No. 005 and other regulatory instruments relating to consultation.

Baffinland's approach to stakeholder, Inuit, and community engagement has informed the development and implementation of the Stakeholder Engagement Plan (SEP) for the Project (Baffinland, 2016a).

The objectives of Baffinland's engagement efforts are to:



- Provide stakeholders and Inuit communities with relevant Project information in a timely, accessible and culturally appropriate manner in order to enable stakeholders to identify issues and concerns and provide input into the development of appropriate mitigation measures;
- Ensure that stakeholders and Inuit communities have the opportunity to understand and meaningfully engage in the processes initiated by the Project;
- Build constructive and positive relationships with the Communities most likely to be affected by the Project;
- Consider traditional and local knowledge as well as scientific expertise in internal decision making processes;
- Facilitate effective implementation of and compliance with commitments contained in the IIBA;
- Focus priorities so that potential adverse effects are mitigated and Project benefits are enhanced; and
- Incorporate additional knowledge and expertise from potential partners (e.g. communities, academic researchers, government agencies).



**Figure 2.2: Overview of Baffinland's Engagement Objectives**

## 2.3 ENGAGEMENT ACTIVITIES

In support of the Baffinland's focus on continuous improvement and the engagement objectives defined for the Project (Section 2.2), Baffinland implements a variety of engagement mechanisms that are intended to ensure a broad and comprehensive approach to the identification of stakeholders and that the creation of enhanced opportunities for dialogue and input are executed. During 2019, Baffinland completed a number of engagement activities, which included:

- Providing regular and ongoing opportunities for the dissemination of Project-related information and receipt of stakeholder input through Baffinland Community Liaison Officers (BCLOs) stationed in each of the five (5) North Baffin communities;
- Newly implemented during the 2019 shipping season, providing regular and ongoing opportunities for the dissemination of Project-related shipping activities and receipt of stakeholder input through the creation of Baffinland Shipping Monitor roles stationed in Pond Inlet (in-person visits, posters throughout the community, radio shows, ongoing marine VHF radio communications about ongoing vessel traffic);
- Hosting public meetings and open houses;

- Conducting employee surveys;
- Participating in multi-stakeholder forums (e.g. Working Groups);
- Holding focus groups, workshops and meetings with community groups and hamlet Councils;
- Hosting site meetings for interested observers; and
- Distributing Project-related information through the corporate website, social media sites including Facebook, LinkedIn and Twitter, newsletters, advertisements, radio shows, and other means.

Baffinland will continue to implement a proactive approach to engagement with various stakeholders, through meetings, workshops, surveys and dissemination of information and reports. This will ensure that the communities, QIA, regulators and the public are informed in a timely and culturally sensitive manner of the Project's progress and the potential environmental and social impacts of the Project.

### 2.3.1 Public Meetings & Events

In 2019, Baffinland held public meetings within the five (5) North Baffin communities. These meetings provided an important opportunity for Baffinland to share information with the Communities related to current operations and avenues for Inuit to become more involved in the Project and/or a way to access the benefits of the Project. A list of select public meetings and events held in the communities is provided in Table 2.1.

**Table 2.1: Public Meetings & Events in 2019**

Community	Date(s) of Public Meeting	Information Shared
5 North Baffin Communities	January 7-11, 2019	Phase 2 Public Information Sessions
Annual Project Review Forum (Clyde River)	May 29-30, 2019	IIBA Annual Project Review Forum
5 North Baffin Communities and Resolute Bay	June 3-11 2019	Phase 2 Public Information Sessions
Public and High School Students, Pond Inlet	October 8-10, 2019	Career and Training Information as well as an update on the Phase 2 Regulatory Process
Public Meeting, Arctic Bay	November 13, 2019	Report on November NIRB Public Hearings and general Phase 2 discussion

Meeting details from public meetings and community group meetings held in 2019 are presented in Appendix B.

### 2.3.2 Community Group Meetings

Baffinland meets with various community groups on a regular basis to discuss aspects of the Project and ongoing issues, concerns or recommendations community representatives may have. Baffinland engaged with several community groups in 2019 including local community HTOs and Hamlet Councils, as presented in Table 2.2.

**Table 2.2: Community Group Meetings in 2019**

Date	Community Group	Location	Topic
January 14, 2019	Elder and HTO Representatives from Sanirajak, Arctic Bay, Clyde River and QIA	Mary River Mine Site	Community Risk Assessment Workshop Session 1
January 30, 2019	MHTO	Pond Inlet	Follow-up to August 30 site visit, IIBA Commitments
January 30, 2019	MHTO, QIA	Pond Inlet	IIBA Program Update, Mine and Milne Post MHTO Cabins relocation
February 11, 2019	Elder and HTO Representatives from Pond Inlet, Sanirajak, Arctic Bay, Clyde River and QIA	Trois- Rivières	Community Risk Assessment Workshop Session 2
February 27, 2019	MHTO, QIA	Pond Inlet	Narwhal Harvest Season, Community Based Monitoring
March 26, 2019	Hamlet of Pond Inlet	Teleconference	Training Centre Update
March 26, 2019	Clyde River HTO	Clyde River	Phase 2
April 30, 2019	MHTO, QIA, Hamlet of Pond Inlet	Pond Inlet	Community Based Monitoring
May 7, 2019	Elder and HTO Representatives from Pond Inlet, Sanirajak, Arctic Bay, Clyde River, and Igloolik	Mary River Mine Site	Community Risk Assessment Workshop Session 2
May 23, 2019	MHTO, Hamlet of Pond Inlet, QIA	Pond Inlet	Hunting Season Observations, Perceived interactions with project vessels, wildlife monitoring and mitigation
June 24, 2019	MHTO, Hamlet of Pond Inlet, QIA	Pond Inlet	Follow-up to Meeting of May 23 regarding harvesting
June 25, 2019	MHTO, Hamlet of Pond Inlet, QIA	Pond Inlet	2019 Pre Shipping Season Meeting and Follow-up to Meeting of May 23 regarding harvesting
July 2, 2019	North Baffin Mayors and HTOs, QIA	Mary River Mine Site	Discussion about Phase 2, direct project benefits and finding ways the Company and North Baffin Communities can work closer together.
August 21, 2019	Hamlet of Igloolik	Teleconference	Phase 2 Update
August 27, 2019	Hamlet and HTO	Arctic Bay	Phase 2 Update and Day Care Funding Announcement
September 2, 2019	Hamlet of Igloolik	Teleconference	Phase 2 Update
September 3, 2019	MHTO	Pond Inlet	Phase 2 Update, Rail Alignment
September 4, 2019	All North Baffin HTOs	Iqaluit	Phase 2 Update, Rail Alignment

Date	Community Group	Location	Topic
September 4, 2019	Elder and HTO Representatives from Pond Inlet, Sanirajak, Arctic Bay, Clyde River	Iqaluit	Community Risk Assessment, Results Verification Workshop
September 9, 2019	Hamlet of Igloolik	Igloolik	Phase 2 Update
September 10, 2019	Pond Inlet Phase 2 Committee & MHTO	Pond Inlet	Rail Alignment September 10-11, 2019
September 11, 2019	Hamlet Council	Pond Inlet	Phase 2 Update, Rail Alignment and Community Benefits
September 12, 2019	Hamlet & HTO	Clyde River	Community Benefit Opportunities & Phase 2 - September 12-13
September 13, 2019	Clyde River Council and HTO	Clyde River	Phase 2 Update and Direct Community Benefits
September 24, 2019	North Baffin Mayors and HTOs, QIA	Mary River	Discussion about Phase 2, direct project benefits and finding ways the Company and North Baffin Communities can work closer together.
November 26, 2019	Hamlet of Pond Inlet and MHTO	Pond Inlet	Discussion post Phase 2 Public Hearing and forward planning
November 29, 2019	Hamlet of Sanirajak	Teleconference	Discussion of Baffinland response to NIRB re: NTI Motion
November 29, 2019	Hamlet of Clyde River	Teleconference	Discussion of Baffinland response to NIRB re: NTI Motion
November 29, 2019	Hamlet of Arctic Bay	Teleconference	Discussion of Baffinland response to NIRB re: NTI Motion
December 11, 2019	Hamlet of Igloolik	Igloolik	Phase 2 Public hearing Follow-up and 2020 Work Planning

### 2.3.3 Community Sponsorships

Baffinland understands the importance of and is committed to proactively pursuing opportunities to support the North Baffin communities. Partly through support of the following activities, Baffinland is working to delivering long-term benefits to the communities. The following lists some of the community sponsorships provided in 2019:

- 54 Laptops to high school graduates in the North Baffin communities;
- Hockey exchange trip between Pond Inlet and Mimico, Ontario;
- Flights to enable Local Study Area (LSA) residents' participation in the Elder's gathering in Igloolik;
- Baffinland provided the Arctic Bay's Tununirusiq Daycare with funds toward for building renovations and the reopening of the centre;
- Made financial contributions to the Mittima Food Bank Society in Pond Inlet to support their ongoing operations;
- A variety of contributions to community sports and recreational initiatives, including community sporting teams and events throughout the North Baffin Region and Iqaluit; and



- A variety of contributions to cultural and wellness initiatives, including contributions to food centers and the Arctic Inspiration Prize.

## 2.4 ENGAGEMENT WITH THE QIA

Baffinland is committed to maintaining a positive relationship with the QIA through ongoing engagement and collaboration. Engagement with the QIA is generally focused on the implementation of the IIBA and on the Commercial Lease (Q13C301), associated Agreements and other regulatory authorizations.

### 2.4.1 Engagement on IIBA Implementation

Implementation of the IIBA is managed by a Joint Executive Committee (JEC), Employment Committee (EC) and Contracting Committee (CC). These committees consist of an equal number of representatives from Baffinland and QIA, and meet on a regular basis by phone or in-person.

At various points throughout the year, the JEC, EC and CC host teleconference calls to address ongoing issues related to IIBA implementation. In addition to these regular teleconference calls, Baffinland met with the JEC, EC and CC on several occasions throughout 2019, as presented in Table 2.3.

**Table 2.3: JEC, EC and CC Meetings in 2019**

Date	Location	Topics Discussed
Joint Executive Committee (JEC)		
February 20, 2019	Ottawa	<ul style="list-style-type: none"><li>IIBA Annual Work Plan</li><li>IIBA Implementation Budget</li><li>Employment and Training Fund Proposals</li></ul>
April 15, 2019	Teleconference	
June 11, 2019	Teleconference	
September 11, 2019	Montreal	
December 5, 2019	Ottawa	
Employment Committee (EC)		
July 19, 2019	Teleconference	<ul style="list-style-type: none"><li>Arnait Action Plan</li><li>Work Readiness Program</li><li>Workplace Conditions Review</li><li>Labour Market Analysis</li></ul>
August 14, 2019	Teleconference	
October 23, 2019	Teleconference	
November 19, 2019	Ottawa	
Contracting Committee (CC)		
August 6, 2019	Teleconference	<ul style="list-style-type: none"><li>Inuit Firm Survey</li><li>Pond Inlet Training Centre</li><li>Inuit Firm Spend</li></ul>
August 29, 2019	Teleconference	
October 2, 2019	Teleconference	
November 22, 2019	Ottawa	

QIA and Baffinland host an IIBA Annual Project Review Forum (APRF) where both parties provide Project updates and progress reports to representatives of the five (5) North Baffin communities. In 2019, the IIBA forum was held in Clyde River on May 29 and 30. During the forum, Baffinland and the QIA presented updates on the Project and activities related to IIBA Implementation. The Annual Project Review Forum provides a valuable opportunity to discuss and address Project-related issues of concern identified by community members and to develop

collaborative solutions. An IIBA Annual Implementation Report is also produced annually by Baffinland that describes implementation plans and priorities for the preceding calendar year.

Baffinland also undertook several community engagement initiatives geared towards recruiting members and providing information on business opportunities for Inuit contractors from the five (5) North Baffin communities.

In October 2019, Baffinland conducted the Contracting and Procurement Information Tour (CPIT), where information sessions were held in Clyde River, Sanirajak, Igloolik, and Pond Inlet. In total there were 95 individual participants and 31 Firms taking part in the information sessions. Kakivak Association also participated in the information sessions and presented on various funding opportunities for Inuit Firms. The purpose of this tour was to provide the opportunity for Inuit-owned businesses, aspiring entrepreneurs, and the public to learn more about the contracting provisions of the Mary River Project Inuit Impact and Benefit Agreement.

Baffinland held Employment and Training Information Sessions (ETIS) in Pond Inlet, Clyde River, Sanirajak, Igloolik, Arctic Bay and Iqaluit during the second, third and fourth quarter of 2019. Baffinland has transformed the style of the information sessions to increase engagement, with the focus of the sessions now being interactive and providing more opportunities for discussion and questions, hosting the events in school gyms and community halls. Baffinland saw participation grow at these sessions throughout 2019, with 147 total participants in the second quarter, 373 in the third quarter and 500 total participants in the fourth quarter.

#### 2.4.2 Engagement on the Commercial Lease and Associated Agreements

In addition to engagement related to the implementation of the IIBA, Baffinland and QIA also engage on a regular basis with respect to the Commercial Lease, associated Agreements and a range of management plans. Meetings in 2019 were primarily focused on discussing the Annual Work Plan, Annual Securities Review, the Water Compensation Agreement, and the Interim Closure and Reclamation Plan. Regular engagement with QIA on the commercial lease and associated agreements has been ongoing. In 2019, Baffinland continued to meet with QIA at the beginning of the year to set a schedule of activities for the year based on jointly agreed upon priorities, ensuring that the objectives of both the QIA and Baffinland could be achieved in reasonable and actionable timelines.

### 2.5 ENGAGEMENT WITH WORKING GROUPS

PC No. 005 Conditions require that Baffinland establish three (3) working groups for the Project, identified as the:

- Terrestrial Environment Working Group (TEWG);
- Marine Environment Working Group (MEWG); and
- Socio-Economic Monitoring Working Group (SEMWG).

The Working Groups provide a valuable forum for ongoing Project communication and reporting between Baffinland and interested parties. The Working Groups also serve as an advisory board to provide recommendations on monitoring and management approaches related to the Project.

The meetings are structured to enable participants to have the opportunity to provide input on monitoring program design and implementation, and follow-up at the conclusion of the field programs prior to finalization of the Annual Monitoring reports. The TEWG and MEWG receive presentations on the implementation of field programs and the subsequent results in order to prioritize monitoring plans and suggest measures for mitigation where required. The Working Groups provide a platform for the discussion of collaborative research opportunities between parties and

to identify monitoring programs suited for community-based monitoring and Inuit participation. The TEWG and MEWG includes both member-status and observer status participant organizations.

The SEMWG is typically structured to occur following the annual meeting of the Qikiqtaaluk Socio Economic Monitoring Committee. Baffinland provides a short presentation and overview of monitoring activities for the year, as well as project updates and any monitoring program updates. Comments and general discussion are then held with all working group members.

Updates on 2019 activities specific to each working group are provided below. A record of meeting minutes for all Working Group meetings held in 2019 are provided in Appendix C.

### 2.5.1 Terrestrial and Marine Environment Working Groups

Project Certificate Conditions No. 49 and 77 mandated the establishment of working groups related to the terrestrial and marine environments. Members for each group include the Government of Nunavut, the QIA, Environment and Climate Change Canada (ECCC), Mittimatalik Hunters and Trappers Organization and Baffinland. Fisheries and Oceans Canada (DFO), Parks Canada and Makivik Corporation are also members of the MEWG. World Wildlife Foundation - Canada participates as an observer on both groups, and Oceans North participates as an observer to the MEWG.

Generally, the Working Group meetings are structured in such a way to include:

- Baffinland to provide a Project update to the members (e.g., includes mining and shipping-related activities such as ore production, and vehicular and vessel traffic);
- Discussion of monitoring program planning including sampling approach (e.g., sampling variables, sites, and data collection methods) in advance of field programs to obtain feedback by MEWG members;
- Discussion of results of monitoring programs to obtain feedback by MEWG members; and
- Various research presentations (given by Baffinland, Baffinland technical consultants and other members).

A list of the meetings with the TEWG and MEWG in 2019 is provided in Table 2.4.

**Table 2.4: Terrestrial Environment and Marine Environment Working Group Meetings in 2019**

Date	Location	Topics Discussed
TEWG		
April 24, 2019	Teleconference	<ul style="list-style-type: none"> <li>• Baffinland Project Update and update on Phase 2 Expansion Project Proposal</li> <li>• Discussion of 2018 Terrestrial Environment Annual Monitoring Report Comments</li> <li>• 2019 Field Monitoring Programs Overview</li> </ul>
June 20, 2019	Iqaluit, NU	<ul style="list-style-type: none"> <li>• Baffinland Update <ul style="list-style-type: none"> <li>○ 2019 Production Targets</li> <li>○ Dust Stop® Trial - Update</li> <li>○ TEWG Mandate and Effectiveness</li> <li>○ Incorporation of Inuit Qaujimajatuqangit (IQ) in Monitoring Programs</li> </ul> </li> <li>• 2019 Terrestrial Monitoring Program Overview <ul style="list-style-type: none"> <li>○ 2019 Regional Monitoring Collaborations and Initiatives</li> </ul> </li> </ul>

Date	Location	Topics Discussed
		<ul style="list-style-type: none"> <li>○ 2019 Bird Monitoring</li> <li>○ Collaborations with ECCC</li> <li>○ 2019 Dustfall Monitoring</li> <li>○ 2019 Vegetation Monitoring</li> <li>○ Helicopter Overflights</li> <li>○ Snowbank Monitoring</li> <li>○ Snow Track Surveys</li> <li>○ Height of Land</li> <li>○ Alternative Wildlife Monitoring Methods/Innovative Research Techniques</li> </ul>
October 7, 2019	Teleconference	<ul style="list-style-type: none"> <li>● Baffinland Project Update <ul style="list-style-type: none"> <li>○ Summary of 2019 Production</li> <li>○ Dust Stop® Trial</li> </ul> </li> <li>● 2019 Terrestrial Environment Monitoring – Field Program Summary <ul style="list-style-type: none"> <li>○ Field Season Update</li> <li>○ Dust Fall</li> <li>○ 2019 Vegetation Surveys</li> <li>○ Mammals</li> <li>○ Birds</li> <li>○ Wildlife - General</li> </ul> </li> </ul>
MEWG		
April 23, 2019	Teleconference	<ul style="list-style-type: none"> <li>● Baffinland Project Update <ul style="list-style-type: none"> <li>○ 2019 Operations Overview</li> </ul> </li> <li>● Phase 2 Update</li> <li>● Floating Freight Dock Fisheries Authorization</li> <li>● 2019 Marine Monitoring Program Review <ul style="list-style-type: none"> <li>○ Bruce Head Shore-based Monitoring Program</li> <li>○ Acoustic Monitoring</li> <li>○ Aerial Surveys</li> <li>○ Marine Environmental Effects Monitoring Program (MEEMP), Physical Oceanography and Aquatic Invasive Species (AIS) Monitoring</li> <li>○ Ship-based Observer (SBO) Program</li> </ul> </li> </ul>
June 21, 2019	Iqaluit, NU	<ul style="list-style-type: none"> <li>● Baffinland Project Update <ul style="list-style-type: none"> <li>○ Overview of 2019 Shipping Season and Schedule</li> <li>○ Shipping Mitigation and Management Overview</li> <li>○ 2019 Communications Protocol</li> <li>○ Shipping Monitors</li> <li>○ Ongoing Feedback from the MEWG</li> <li>○ Incorporation of IQ in Monitoring Programs</li> </ul> </li> <li>● 2019 Marine Monitoring Programs Overview</li> </ul>



Date	Location	Topics Discussed
		<ul style="list-style-type: none"> <li>○ MEEMP</li> <li>○ AIS Program</li> <li>○ 2019 Marine Fish Habitat Offset Monitoring</li> <li>○ 2019 Physical Oceanography Data Collection Program</li> <li>○ 2017 Narwhal Tagging Program Report</li> <li>○ Aerial Survey Program</li> <li>○ Bruce Head Shore-based Monitoring</li> <li>○ Acoustic Monitoring</li> <li>● Early Warning Indicators</li> </ul>
October 7, 2019	Teleconference	<ul style="list-style-type: none"> <li>● Baffinland Project Update <ul style="list-style-type: none"> <li>○ Summary of 2019 Production</li> <li>○ Summary of 2019 Shipping Season Mitigation and Management Measures</li> </ul> </li> <li>● 2019 Marine Environment Monitoring - Field Program Summary <ul style="list-style-type: none"> <li>○ 2019 Marine Mammal Aerial Surveys</li> <li>○ Bruce Head Shore-based Monitoring</li> <li>○ Acoustic Monitoring</li> <li>○ Ship-based Observer Program</li> <li>○ Marine Environmental Effects Monitoring Program</li> <li>○ Physical Oceanography</li> <li>○ Marine Habitat Offset Monitoring</li> <li>○ Overall Program Summary</li> </ul> </li> </ul>

### 2.5.2 Mary River Socio-Economic Monitoring Working Group

Baffinland coordinates the Mary River Socio-Economic Monitoring Working Group (SEMWG) in fulfillment of Project Certificate Condition No. 129. The SEMWG is a sub-group of the Regional Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC), which meets annually. Baffinland also acts as a participant in the QSEMC. The SEMWG includes members from the Government of Nunavut (GN), the QIA, CIRNAC and Baffinland.

A list of 2019 meetings with the SEMWG and QSEMC is provided in Table 2.5.

**Table 2.5: Socio-economic Monitoring Working Group Meetings in 2019**

Date	Location	Topics Discussed
SEMWG		
February 28, 2020	Teleconference	<ul style="list-style-type: none"> <li>● Baffinland Project Update</li> <li>● Update on Phase 2</li> <li>● Update on Stratos Inc. to develop 2019 Socio-Economic Monitoring Report</li> <li>● Review of sample design change with changes to 2019 Socio-Economic Report</li> </ul>

Date	Location	Topics Discussed
		<ul style="list-style-type: none"> <li>Revisions to SEMWG Terms of Reference</li> </ul>
QSEMC		
May 14-16, 2019	Franco Centre, Iqaluit	<ul style="list-style-type: none"> <li>Site Visit and Tour</li> <li>Community Round Table</li> <li>Nunavut Bureau of Statistics presentation</li> <li>Baffinland presentation on education and training Valued Socio-economic Component(VSEC)</li> <li>Department of Education presentation</li> <li>Baffinland presentation on livelihood, employment, contracting, business opportunities</li> <li>Family Services presentation</li> <li>Baffinland presentation on <ul style="list-style-type: none"> <li>Health and well-being</li> <li>Community infrastructure and public services Data limitations</li> <li>Food security</li> </ul> </li> <li>De Beers- Chidliak presentation</li> <li>CIRNAC presentation</li> </ul>

## 2.6 LOOKING AHEAD

Baffinland will continue to implement a proactive approach to engagement with various stakeholders through meetings, workshops, surveys and dissemination of information through various communication modes including reports. This will ensure that the communities, QIA, regulators and the public are informed in a timely manner of the Project's progress and the potential environmental and social impacts of ongoing operations. In 2020, Baffinland will work towards continuing operations for the Early Revenue Phase of the Project, and where permitted prepare for anticipated expansion of the Project. Specific activities to support the Project that are proposed to be undertaken in 2020 include: ongoing improvements to the Tote Road and progressive reclamation of historic borrow sources, development and implementation of a water management strategy for Deposit 1 and the Mine Haul Road to reduce sedimentation and erosion, site grading and laydown construction to support future construction activities and remove ponding around current infrastructure, construction of new hazardous waste berms to streamline waste management, and the addition of a mine dry facility at the Sailiivik Camp.

Project environmental monitoring programs prescribed by the Project Certificate, water licences, authorizations, management plans and environmental effects monitoring plans will continue through 2020.

### 3 OPERATIONS OVERVIEW

#### 3.1 SITE ACTIVITIES COMPLETED IN 2019

Baffinland continued to focus on mine production from Deposit No. 1 in 2019. Key activities undertaken in 2019 occurred at the active Project component areas including Milne Port, the Milne Inlet Tote Road, and the Mine Site. No Project activities were undertaken related to the development of the South Railway or at Steensby Port in 2019.

Mining and hauling activities from the Mine Site to Milne Port continued throughout 2019, with 5.7 million tonnes of iron ore hauled using the Tote Road and stockpiled at Milne Port. This year also marked the fifth season of shipping with a total of 5.86 million tonnes of iron ore shipped between July 17 to October 30. Baffinland utilized an ice breaking vessel (the MSV Botnica) to escort ore carriers at the beginning and end of the shipping season, which served to facilitate safe passage through prevailing ice conditions. Eighty-one (81) voyages were executed, with vessels carrying an average of 72,360 tonnes of iron ore each. This surpasses Baffinland's previous record of 5.09 million tonnes shipped in 2018.

Operational activities in 2019 included:

- Development and operation of the mine, ore crushing and land transportation, stockpiling and marine shipment of ore;
- The continued development and construction of infrastructure required at Milne Port and the Mine Site, and along the Tote Road;
- Continued operation of Mine Site and Milne Port Camps to support ongoing operations and construction activities, which included the use of water and deposition of waste as authorized under existing permits. The Sailiivik Camp at the Mine Site was completed in 2019, and the Bruce Head camp was re-established in Milne Inlet to support seasonal monitoring activities;
- Ongoing operation of permitted quarry and borrow sources;
- Arrival of vessels carrying fuel, equipment and supplies for use at the Mine Site and Milne Port during shipping season (approximately between mid-July and mid-October 2019). Transportation of material, fuel and supplies required for operational and construction activities to the Mine Site year-round via the Tote Road;
- Ongoing environmental effects studies and baseline data collection to support the construction and operation of the Project as well as for future engineering requirements;
- Environmental monitoring in accordance with the approved PC, licences, authorizations, management plans and environmental effects monitoring plans;
- Ongoing exploration activities including drilling, mapping, prospecting, sampling and geophysics;
- Tote Road improvements to address fish passage, drainage and sedimentation and erosion concerns;
- Construction of additional fuel storage at the Mine Site consisting of a 15 mL tank in a new bulk fuel storage facility;
- Site grading and laydown construction for supplies and equipment to support future construction activities and remove ponding and permafrost degradation issues;
- Erection of additional maintenance facilities to safely service equipment; and
- Inspection and replacement of the geomembrane liner at the Waste Rock Facility pond to address seepage attributed to liner integrity issues.

Representative photographs showing major 2019 site activities are included in the Photo Essay (Appendix D).

### 3.2 2019 HIGHLIGHTS AND CHALLENGES

The Project has been in operation since September 2014 and the operational experience gained has proved that high volume, bulk commodity mining in the Canadian Arctic is feasible. Despite harsh environmental and economic conditions, Baffinland's investors continue to support the Project with the goal of increasing production to reach an economically sustainable operation.

2019 represented another successful year of operations for Baffinland. Production and shipping numbers continue to increase, supported by a positive decision from the Minister of Intergovernmental and Northern Affairs and Internal Trade to increase the amount of iron ore hauled and shipped to 6 million tonnes per year for 2018 and 2019.

#### 3.2.1 Project Economics

With the current ERP production rate of 4.2 Mtpa out of Milne Port and in consideration of the temporary expansion of 6.0 Mtpa until the end of 2021, the Project remains vulnerable to iron ore price fluctuations. As stated in Baffinland's request to the NIRB for the extension of the Production Increase submitted December 6, 2019, the 4.2 Mtpa operation is not financially viable for the Mary River Project in the long term. Further expansion of the Project is necessary for Baffinland to continue to operate and provide benefits to the North Baffin communities, governments, and other stakeholders.

Although the implementation of the 18 Mtpa South Railway and Steensby Port is authorized under Project Certificate No. 005, it is not economically feasible in the short-term, due to its high capital cost. However, the South Railway and Steensby Port remains an important part of Baffinland's long-term development plan for the Project, as Baffinland seeks to expand to 30 Mtpa to be competitive in the world's iron ore market.

Advancing the Phase 2 Proposal will allow Baffinland to increase production from 4.2 Mtpa (and temporary expansion increase of 6 Mtpa) to 12 Mtpa from Milne Port and achieve profitability in a shorter timeframe, while working incrementally towards the longer-term goal of reaching a production rate of 30 Mtpa. Continued pursuit of this phased approach will safeguard the Project from vulnerability to market fluctuations, which will subsequently help prevent temporary or early closure of the Project.

#### 3.2.2 IIBA Implementation Highlights

Implementation of the IIBA contributed to many new and notable highlights for the year 2019. These include, but are not limited to, the following:

- Enhanced training opportunities through a significantly expanded Inuit training budget (\$2.25 million per year from 2018 to 2021 and \$1.5 million on the delivery of training to Inuit from 2021 to 2031);
- Purchase of marine research vessel which was delivered to Milne Port in September 2019 through Article 17.9 Marine Research Equipment;
- New funds (starting at \$200,000 per year and continuing over a period of 10 years) directed towards a community-driven monitoring program in Pond Inlet through Article 17.8 Wildlife Monitoring Program;
- Targeted Education and Training funding through Article 20.4.2 (b) which supports initiatives aimed at enhancing capacity building;
- Awarding 7 scholarships to well-deserving students in pursuit of continuing education through Article 8.8 Achievement Awards and Scholarships; and



- Contribution of \$10 million towards the design and construction of a regional training centre in Pond Inlet through Article 8.7.5.
- Development of the Inuit Success Assurance team. This team ensures Inuit Success at Baffinland by directly interacting with all Inuit working at Baffinland. They encourage Inuit to access available training opportunities as well as ensure Baffinland continues to develop and retain our Inuit employees.
- As per Section 7.20 (Inuit Internship Program) of the IIBA, Baffinland shall offer a minimum of four (4) Inuit Internship positions each year. Baffinland exceeded this minimum requirement by employing 8 Inuit interns that work out of Baffinland's Oakville and Iqaluit offices and the Mary River Mine site.
- While not a direct requirement of the IIBA, since 2007 Baffinland has provided laptops to high school graduates in the North Baffin communities as an incentive to motivate local youth to complete their high school education and pursue post-secondary education. Baffinland provided 54 laptops to grade 12 Inuit graduates in 2019.

### 3.2.3 CIRNAC Directive - Waste Rock Facility

During the summer of 2017, the development of Acid Rock Drainage and Metal Leaching (ARD/ML) at the Mine Site Waste Rock Facility (WRF) in combination with the observation of seepage from the Waste Rock Facility surface water management pond (WRF Pond) suggesting that the liner had become compromised, resulted in non-compliant effluent discharges at the Waste Rock Facility.

In response to the concerns identified and non-compliant discharges in 2017, Baffinland developed and implemented several immediate corrective actions in 2017 and 2018 to ensure compliance regarding the management of waste rock and effluent at the Waste Rock Facility. These actions were summarized and provided to regulators in the Project's 2017 QIA & NWB Annual Report for Operations (Baffinland, 2018a) and 2018 QIA and NWB Annual Report for Operations (Baffinland, 2019a). During 2019, Baffinland continued to implement corrective actions to address ongoing concerns, including:

- The ongoing operation of a dedicated water treatment plant at the Waste Rock Facility to ensure effluent water quality compliance under the Metal & Diamond Mining Effluent Regulations (MDMER) and Type A Water Licence during controlled discharges;
- Remediation of the existing WRF Pond liner to mitigate seepage identified from the WRF Pond in 2017. The remediation work included the removal of the existing liner and subsequent repair of the pond subgrade. Installation of the replacement liner was carried out from September 2019 through January 2020;
- Monitoring of water quality, thermistors, oxygen sensors and piezometers to support modelling and studies to assess the geochemical and thermal condition of the waste rock placed in the WRF; and
- Continued optimization of the Project's near-term waste rock depositional and management strategies, culminating in the release of the revised Phase 1 Waste Rock Management Plan (Baffinland, 2019b) to address ARD/ML formation, and establish ongoing monitoring to be completed.

Baffinland continues to remain committed to addressing the identified concerns and maintaining compliance in the management of waste rock and effluent at the WRF. Industry best practices and procedures to be implemented at the WRF are detailed in the Project's most recent revision of the Phase 1 Waste Rock Management Plan (Baffinland, 2019b). Baffinland will continue to implement monitoring and Quality Assurance / Quality Control (QA/QC) procedures to evaluate the effectiveness of the management practices outlined in the revised Phase 1

Waste Rock Management Plan in mitigating ARD/ML formation and ensuring the closure objectives for the facility will ultimately be met.

Additional information regarding actions taken by Baffinland to address this Directive can be found in the QIA & NWB Annual Report for Operations (Baffinland, 2020a).

### 3.2.4 Inuit Employment and Contracting

In 2019, a total of 580,197 hours were worked by Inuit and 3,771,486 by non-Inuit. These hours include both Baffinland and Contractor employees. In total, Inuit employment hours were 15% of the total hours worked. Baffinland's Inuit employee payroll totaled \$15,441,391 which is an increase of over 3.4 million from 2018. These amounts include all Inuit employees who lived in and outside of Nunavut.

Since 2014, Baffinland (not inclusive of contractors) has provided \$60.6 million in payroll to Inuit. Wages paid to Inuit is an important measure of the Projects significant positive socio-economic impact on Nunavummiut. Through the provision of wages, Baffinland is providing Inuit with the opportunity to purchase goods and services in their communities creating positive benefits for local business, including Inuit owned firms.

Article 6 of the IIBA refers to procurement and contracting to ensure that all economic activity associated with the Project will be available to Inuit firms. Baffinland utilizes the registry of Inuit Firms maintained by Nunavut Tunngavik Incorporated (NTI) to identify Inuit Firms which may be eligible/qualified for various contracting opportunities. Additionally, Baffinland commenced development of the IIBA Contracting Database in 2019 as a tool to maintain a record of pre-qualified Inuit Firms, contracting opportunities and contract awards, and potential Inuit Firm assistance initiatives.

Procurement with Inuit-owned businesses and joint ventures in 2019 totaled approximately \$288.8 million when measured on a commitment basis. This includes eight new contracts awarded to Inuit-owned businesses and joint ventures, all of which were based in either the North Baffin communities or Iqaluit. Since Project development, a total of approximately \$1.01 billion worth of contracts have been awarded to Inuit-owned businesses and joint ventures.

Throughout 2019, Baffinland continued to take steps to ensure that maximum benefits of the Project, represented by employment and contracting opportunities, were accessible to Inuit. A discussion of some of these relevant initiatives is provided in the sections that follow.

#### 3.2.4.1 Training Initiatives

Baffinland and the QIA have partnered in the \$19 million Qikiqtani Skills and Training for Employment Partnership (Q-STEP) training program, with the objective of providing Inuit with skills and qualifications to meet the employment needs of the Mary River Project as well as other employment opportunities in the region. Q-STEP is a four-year initiative consisting of work readiness measures, as well as targeted training programs directed at apprenticeships, skills development, supervisor training, and formal certification in heavy equipment operation.

There are strong indications the Project has had a positive effect on training and skills acquisition amongst Inuit. In 2019, Baffinland continued to provide training and skills development opportunities for Inuit employees. Furthermore, Baffinland employees are regularly exposed to various 'informal' training and skills development opportunities through contact with more experienced coworkers and the process of everyday work. Several other

Baffinland programs and IIBA initiatives have also contributed to the development of a more experienced Inuit workforce.

The number of training hours completed by Project employees is a useful indicator of the magnitude of Baffinland's annual training efforts. In 2019, a total of 95,207 hours of training were completed at the Project site, of which 45,975 hours (or 48.2%) were provided to Inuit. There has been a total of 290,198 hours of training provided since Project development, of which 96,471 hours have been provided to Inuit.

Training programs with the highest levels of Inuit participation in 2019 included the Q-STEP Apprenticeship Program (20,703 hours), Q-STEP Morrisburg Heavy Equipment Operators Training Program (9,555 hours) and the Q-STEP Work Ready Off-Site Program (3,648 hours).

#### 3.2.4.2 Support for Local Businesses

Baffinland supports the development of local businesses through its annual contribution of \$275,000 through the IIBA's Business Capacity and Start Up Fund. The fund, which is administered by the QIA, is designed to assist existing Inuit Firms to develop capacity to participate in the bidding process and to encourage business start-ups in the communities. In addition, Baffinland has worked and will continue to work with local businesses on an ongoing basis to create contracting opportunities in the communities.

In 2019, Baffinland partnered with five local ground transportation service providers to transport Project employees from their homes to the airport and back each flight day. The ground transportation services are all Inuit-owned businesses, which Baffinland contracts with to perform this crucial service.

### 3.3 LOOKING AHEAD

The 2020 Work Plan was submitted to the NWB and the QIA on November 1, 2019 (Baffinland, 2019c). This submission is a requirement under Part J, Item 3 of Amendment No. 1 of Type A Water Licence 2AM-MRY1325 and under Section 6.1 of Commercial Lease No. Q13C301 agreed between Baffinland and the QIA (QIA and Baffinland, 2013).

A summary of the planned 2020 activities are as follows:

- Development and operation of the mine, ore crushing and land transportation, stockpiling and marine shipment of ore;
- The continued development and construction of infrastructure required at Milne Port and the Mary River Mine Site (Mine Site) and along the Tote Road for the Mary River Project;
- Continued operation of Mine Site and Milne Port Camps to support ongoing operations and construction activities which will include the use of water and deposition of waste as authorized under existing permits;
- On-going operation and expansion of permitted quarry and borrow sources;
- At Milne Port, vessels carrying fuel, equipment and supplies for use at the Mine Site and Milne Port will arrive during open water. Material, fuel and supplies required for operational and construction activities will be transported to the Mine Site year round via the Tote Road;
- Ongoing environmental effects studies and baseline data collection will continue to support the construction and operation of the Project as well as for future engineering requirements;
- Continued environmental monitoring in accordance with the approved Project Certificate, licenses, authorizations, management plans and environmental effects monitoring plans;

- On-going exploration activities including drilling, mapping, prospecting, sampling, and geophysics. Planning of the details of the summer drilling and/or trenching program is not yet finalized;
- Tote Road improvements to address safety concerns, freshet runoff issues and poor road conditions during the spring and summer periods;
- Continued construction of additional fuel storage at the project;
- Site grading and laydown construction for supplies and equipment to support future construction activities and remove ponding and permafrost degradation issues around current infrastructure; and
- Erection of additional maintenance facilities to safely service equipment.

No activities are planned to be undertaken along the south railway or at Steensby Port in 2020. The Project's Phase 2 Expansion Proposal continues to proceed through the review and approvals process facilitated by the NIRB and NWB. Project environmental monitoring programs prescribed by the Project Certificate, water licences, authorizations, management plans and environmental effects monitoring plans will continue through 2020. Due to the current precautions and measures taken in response to the COVID-19 global pandemic, some monitoring programs expected or required to be executed in 2020 may be impacted and require augmentation to proceed in a meaningful way. The health and safety of the North Baffin Communities, Baffinland staff, and contractors are paramount, and we will take all measures necessary to protect our communities and staff while ensuring the greatest possible implementation of our monitoring programs in 2020. Updates to monitoring programs will be recorded and communicated to the NIRB, regulators, working groups and other interested parties as they become available.



## 4 PERFORMANCE ON PC CONDITIONS

The following sections provide a discussion of Baffinland's self-assessed status of compliance and performance related to each of PC conditions for the Project in 2019.

The discussion of compliance with PC conditions has been disaggregated into the following categories:

- Performance on General Conditions;
- Performance on Compliance with Regulatory Instruments;
- Performance on Ecosystemic Terms and Conditions;
- Performance on Socio-Economic Terms and Conditions; and
- Performance on Other Terms and Conditions.

### 4.1 METHODOLOGY AND CRITERIA

Table 4.1 outlines the status of compliance levels and describes the criteria related to each of these options. Each PC condition has been assigned a status of compliance. Where a PC condition is designated as being only 'Partially compliant' or 'Non-compliant', a rationale explaining why 'In-compliance' was not achieved in 2019 and, where applicable, a strategy for moving towards full compliance for the 2020 reporting year has been provided.

**Table 4.1: Status of Self-Assessment Compliance Terminology and Criteria**

Status of Compliance	Criteria
In-Compliance	Condition requirements have been met
Partially-Compliant	Condition requirements have been partially met *Demonstrable efforts towards meeting compliance requirements is evidenced.
Non-Compliant	Conditions requirements have not been met *Rationale for being unable to meet compliance requirements is provided.
Not Applicable	Condition is tied to a project phase or component that was not active during the reporting year, or the responsible party is not the Proponent

Baffinland has taken a conservative approach for self-assessing the status of compliance with PC conditions for 2019. When determining a status of compliance for each of the PC conditions, the following process was implemented by Baffinland and its technical experts:

1. A review of the specific requirements outlined in each PC condition is conducted.
2. A review of all relevant work completed by Baffinland in the reporting year and/or previous reporting years (if applicable) relevant to the PC condition is conducted.
3. A gap analysis is completed to assess whether or not there is a delta between the requirements of the PC condition and the work completed by Baffinland to meet these requirements.
4. Stakeholder comments relevant to the PC condition are considered.
5. A status of compliance based on the results of the analysis is assigned.

Baffinland will continue to complete its self-assessment using the approach described above until such time that additional guidance is provided by the NIRB on its expectations for completing self-assessments and/or its methodology for assessing PC compliance is disclosed to proponents.

## 4.2 APPROACH TO REPORTING ON PERFORMANCE

An individual summary sheet for each of the ecosystemic, socio-economic and 'other' terms and conditions has been provided in Sections 4.6 to 4.8. The category and content of information provided in these summary sheets is outlined in Table 4.2.

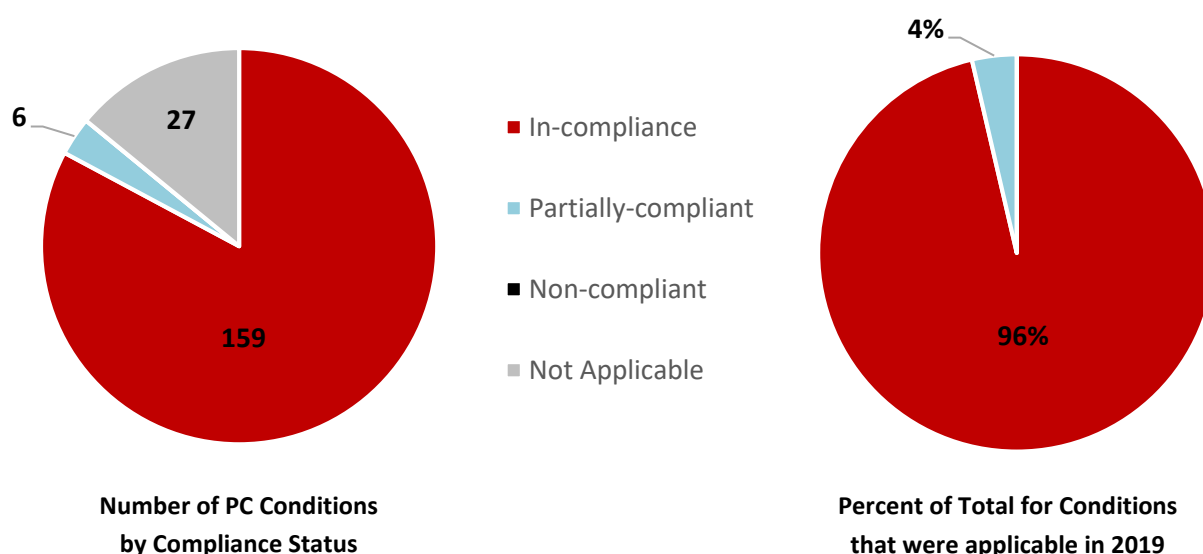
**Table 4.2: Layout of PC Condition Summary Sheets**

Item	Summary of Content
Category	<ul style="list-style-type: none"> <li>Category as defined in PC No. 005.</li> </ul>
Responsible Parties	<ul style="list-style-type: none"> <li>Responsible party as defined in PC No. 005.</li> </ul>
Project Phase(s)	<ul style="list-style-type: none"> <li>Phase(s) of the Project the PC Condition is applicable to: <ul style="list-style-type: none"> <li>Construction</li> <li>Operations</li> <li>Temporary Closure / Care and Maintenance</li> <li>Closure</li> <li>Post-Closure Monitoring (as outlined in PC No. 005)</li> </ul> </li> </ul>
Objective	<ul style="list-style-type: none"> <li>The objective as outlined in PC No. 005</li> </ul>
Term or Condition	<ul style="list-style-type: none"> <li>The term or condition as written in PC No. 005</li> </ul>
Relevant Project Commitment	<ul style="list-style-type: none"> <li>List of all corresponding Baffinland commitments outlined in the Final Hearing Report (NIRB, 2012b).</li> </ul>
Reporting Requirement	<ul style="list-style-type: none"> <li>The reporting requirement as outlined in PC No. 005.</li> </ul>
Status of Compliance	<ul style="list-style-type: none"> <li>A self-assessed status of compliance for the PC Condition: <ul style="list-style-type: none"> <li>In-Compliance</li> <li>Partially-Compliant</li> <li>Non-Compliant</li> <li>Not Applicable</li> </ul> </li> </ul>
Stakeholder Review	<ul style="list-style-type: none"> <li>Stakeholders and other interested parties that participate in discussions and reviews related to aspects and implementation of regulatory submission of actions or documents relevant to the PC condition.</li> </ul>
Reference	<ul style="list-style-type: none"> <li>Description / title of relevant documents where supporting information related to PC condition status of compliance is available for review.</li> <li>URL to web-portal where referenced documentation can be accessed, and/or Appendix where documentation can be found appended to the report.</li> </ul>
Methods	<ul style="list-style-type: none"> <li>The methods employed to complete work required to meet compliance to the PC condition.</li> <li>Summary of any adaptive management measures employed that year in support of achieving compliance to the PC condition.</li> </ul>

Item	Summary of Content
Results	<ul style="list-style-type: none"> <li>Summary of efforts or work that were completed in support of achieving PC condition compliance in 2019, and previous reporting years, where applicable.</li> </ul>
Trends	<ul style="list-style-type: none"> <li>Summary of notable trends from previous years.</li> </ul>
Recommendations / Lessons Learned	<ul style="list-style-type: none"> <li>Summary of any operational changes undertaken or recommended for the future to achieve compliance or to further enhance environmental performance.</li> <li>Assessment of effectiveness of monitoring program and whether any changes to the scope of monitoring are appropriate.</li> <li>Identification of any challenges related to implementing mitigation measures, undertaking monitoring, or obtaining data from other sources.</li> </ul>

### 4.3 SUMMARY OF 2019 COMPLIANCE WITH CONDITIONS

Baffinland's performance in fulfilling the PC conditions in 2019 is presented on Figure 4.1. A summary of each of the conditions and the Project status with respect to the conditions in 2019 is presented in Appendix A.



**Figure 4.1: Baffinland's Overall Performance against Project Certificate Conditions in 2019**

Overall, Baffinland is in-compliance with the required terms and conditions for the Project. Of the 165 PC conditions that were applicable to the Project in 2019, Baffinland is 96% in-compliance with these terms and conditions – an increase of 1% improvement over 2018 (95%). Baffinland further reduced the number of Partially Compliant conditions in 2019 (6) in comparison to 2018 (13), an improvement of 54%. In areas where improvement is still required, Baffinland will continue to make operational changes, implement adaptive management, and work with regulators and the communities to ensure the Project remains in compliance with Project Certificate No. 005.

#### 4.4 PERFORMANCE ON GENERAL CONDITIONS

The following presents the performance on general conditions set out in Section 4.1 of the Project Certificate, and Baffinland's comment on the condition performance. Items one to four in this section of the Project Certificate speak to the NIRB's monitoring responsibilities, and Sections five through 12 describe additional requirements for Baffinland. A 2019 status on these items is provided below.

*5. The Proponent must obtain all required federal and territorial permits and other approvals, and shall comply with the requirements of such regulatory instruments.*

Baffinland has received the necessary approvals from NIRB to construct and operate the 18 Mtpa (Steensby) rail project, the 4.2 Mtpa ERP, and for the temporary production increase to 6 Mtpa for 2018 and 2019 (NIRB, 2018a), as well as the permits necessary to operate the latter two projects (Table 1.1). Baffinland will obtain additional permits prior to initiating construction of the 18 Mtpa rail project.

These authorizations often include their own annual reporting requirements. Other major annual reports include the combined annual report for operations submitted to the NWB and the QIA, pursuant to Baffinland's Type A Water Licence and Commercial Lease. The Annual Report to the NWB and QIA is substantial and, in comparison to the NIRB Annual Report, includes much greater detail on water, waste management activities, as well as spill management and other topics related to water. These reports can be found on Baffinland's Document Portal at: <https://www.baffinland.com/media-centre/document-portal/>.

A separate annual report on the status of implementation of the IIBA in 2019 was issued to the QIA and Joint Executive Committee on March 31, 2019. The contents of the IIBA report address or partly address many components of socio-economic monitoring and management.

The Company's performance on compliance with its regulatory instruments is described in Section 4.5.

*6. The Proponent shall take prompt and appropriate action to remedy any occasion of non-compliance with environmental laws and regulations and/or regulatory instruments, and shall report any non-compliance as required by law immediately. A description of all instances of non-compliance and associated follow up is to be reported annually to the NIRB.*

The Company's performance on compliance with its regulatory instruments is described in Section 4.5.

*7. The Proponent shall meet with respective licensing authorities prior to the commencement of construction to discuss the posting of adequate performance bonding. Licensing authorities are encouraged to take every measure to require that sufficient security is posted before construction begins.*

Closure and reclamation costs and resulting corresponding bonding requirements for the Mary River Project are determined through the Annual Security Review (ASR) process conducted in accordance with Schedule C of the Type A Water License 2AM-MRY1325, Amendment No. 1, and the QIA Commercial Lease Q13C301. Under the ASR process, Baffinland, the respective landowners (the QIA & the Crown), the Nunavut Water Board, and other interested parties meet and confer to determine the estimated closure and reclamation costs for an upcoming year. Baffinland submitted the Marginal Closure and Reclamation Financial Security Estimate to the NWB and QIA with the Annual Work Plan on November 1, 2019, and a subsequent revised version was submitted on January 22, 2020. Publicly available ASR document submissions for a respective year, describing in detail annual estimated closure and reclamation costs, can be downloaded from the NWB FTP site at: <ftp.nwb-oen.ca>.



Items eight to twelve speak to conditions related to monitoring records. The conditions and Baffinland's responses are included below.

*8. All monitoring information collected pursuant to the Project Certificate and various regulatory requirements for the Project shall contain the following information:*

- a. The name of the person(s) who performed the sampling or took the measurements including any relevant accreditations;*
- b. The date, time and place of sampling or measurement, and weather conditions;*
- c. The date of analysis;*
- d. The name of the person(s) who performed the analysis including any relevant accreditations;*
- e. A description of the analytical methods or techniques used; and*
- f. A discussion of the results of any analysis.*

Baffinland ensures that the records for all monitoring programs includes the above information. Baffinland has included this requirement in all monitoring program outlines and notifies all external consultants of the requirements.

*9. The Proponent shall make its monitoring results available, to the fullest extent possible, in English and Inuktitut.*

From 2014 to 2019 Baffinland included a summary of all monitoring programs in the executive summary of the NIRB annual report which was translated into Inuktitut. Starting in 2019, Baffinland ensures that a popular / executive summary translated into Inuktitut is included for all final report versions of the Socio-economic, Terrestrial and Marine Annual Monitoring reports. Meeting minutes from the Terrestrial and Marine Environment Working Group meetings were also translated into Inuktitut.

*10. The Proponent shall keep and maintain the records, including results, of all Project-related monitoring data and analysis for the life of the Project, including closure and post-closure monitoring.*

Baffinland keeps and maintains all Project-related monitoring data and will continue to do so.

*11. The Proponent shall maintain the Final Environmental Impact Statement and the Environmental Effects Monitoring program developed for the Project, with predictions updated as new baseline data is collected.*

The Environmental Effects Monitoring programs are reviewed on a regular basis through discussions with the Terrestrial and Marine Environmental Working Groups. Monitoring programs that are not managed under one of the environmental working groups are reviewed with applicable regulatory agencies. A summary of the effects of the Project compared to those predicted in the FEIS is also provided in Sections 4.5 through 4.7.

*12. The Proponent shall establish a Project-specific web portal or web page as a means of making all non-confidential monitoring and reporting information associated with the Project available to the general public. This does not limit what the Proponent may be required to submit to the NIRB or other regulatory authorities to meet reporting requirements.*

In 2017, Baffinland launched a Project-specific Document Portal on its corporate website in order to provide monitoring and reporting information to the public (<https://www.baffinland.com/media-centre/document-portal/>). The web portal has been live as of March 31, 2017 and remained operational throughout 2019, however the website

address was updated when the Baffinland website was revised and re-launched in 2019. Where possible the web portal provides links to English and Inuktitut versions of the popular summary of most recent final reports as well as the main body of the report or document.

Baffinland will continue to provide all documentation required by regulatory agencies directly to the appropriate body.

#### 4.5 PERFORMANCE ON COMPLIANCE WITH REGULATORY INSTRUMENTS

General regulatory requirements under the PC requires Baffinland to take prompt and appropriate action to remedy any event of non-compliance, and to report all instances of non-compliance and associated follow-up annually to NIRB. Baffinland's compliance with applicable regulatory instruments in 2019 is discussed below.

##### 4.5.1 Agency Inspections and Site Visits

To validate compliance with the Project's various regulatory instruments, Baffinland hosted numerous regulatory inspections with representatives from CIRNAC, ECCC, QIA, DFO and the Workers' Safety and Compensation Commission (WSCC) during 2019. Where relevant, documentation and correspondence associated with these inspections are available in the 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a). The following subsections outline the inspections conducted by regulatory agencies and stakeholders at the Project in 2019. Details regarding NIRB's site visits are provided in Section 5.1.

###### 4.5.1.1 CIRNAC Inspections

During 2019, three (3) inspections were conducted by CIRNAC:

- January 23-24, 2019;
- May 22-23, 2019; and
- September 16-19, 2019.

Inspection results were conveyed during close-out meetings and are documented in Water Licence Inspection Reports subsequently distributed to Baffinland and the NWB. Baffinland responded to any concerns identified in the inspections to provide additional information and/or address the identified concerns. More details are available in the 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a).

###### 4.5.1.2 QIA Inspections

In 2019, three (3) inspections were conducted on the following dates by the QIA:

- May 20-21, 2019;
- July 16-17, 2019; and
- October 23, 2019.

The findings from the audit and inspections were conveyed during the close-out meetings between QIA personnel and Baffinland representatives as well as documented in subsequent reports and correspondence. Baffinland responded to the concerns identified in the inspections to provide additional information and/or address the identified concerns. More details are available in the 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a).

#### 4.5.1.3 ECCC Inspections

In 2019, one (1) inspection was conducted on the following date by ECCC:

- July 8-11, 2019.

Inspection results are conveyed during close-out meetings following each inspection and subsequent correspondence. Baffinland responded to the concerns identified in the inspections to provide additional information and/or address the identified concerns.

#### 4.5.1.4 DFO Site Visit

In 2019, one (1) site visit was conducted on the following date by DFO:

- June 24-27, 2019.

A close-out meeting with DFO and Site Environment was held before DFO departed the Mine Site. Topics of discussion included water crossings, sediment erosion, and Freight Dock construction.

#### 4.5.1.5 Workers' Safety and Compensation Commission (WSCC) Mine Inspections

During 2019, the WSCC conducted a total of eight (8) inspections at the Mine Site and Milne Port. WSCC inspections were held on the following dates:

- June 7, 2019;
- June 14 – 17, 2019;
- July 31 - August 1, 2019;
- August 27, 2019;
- October 23, 2019;
- November 20, 2019;
- December 2, 2019; and
- December 11, 2019.

The reports for these inspections were distributed to Baffinland management as well as Baffinland's Occupational Health & Safety (OHS) Committee.

#### 4.5.2 Unauthorized Discharges and Spills

During 2019, twenty-five (25) spills were reported to the Northwest Territories-Nunavut (NT-NU) Spill Line, CIRNAC and QIA by the Project. Overall, this represented a frequency decrease of 28% when compared to the frequency of reportable spills in 2018. In addition to the original spill report submitted within 24 hours of each spill event in 2019, a detailed follow-up report was submitted within thirty (30) days of each reported spill. Baffinland continued to investigate the basic causes of all spills that occurred on site in 2019 so that effective long-term corrective actions could be implemented to reduce the frequency of spills at Project sites. A summary of the 2019 spills reported by the Project are outlined in Table 4.3.

To further outline the corrective actions taken in 2019 and planned to address the sediment releases reported during freshet 2019, Baffinland provided the 2019 Freshet Monitoring Report to the NWB, CIRNAC, ECCC and the QIA in early 2020.

Copies of the 2019 initial and follow spill reports along with the 2019 Freshet Monitoring Report are provided in the appendices of the 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a).

**Table 4.3: List of Reported Spills and Unauthorized Discharges – 2019**

Date of Occurrence	Quantity (m3)	Material Spilled	Approximate Location (UTM; NAD83 Zone 17W)		Proximity to a Water Body?	Spill Line ID No.
			Easting	Northing		
3/Jan/19	0.2	Sewage (Untreated)	561334	7913430	>100 m	18-492
7/Jan/19	2	Sewage (Untreated)	558125	7914488	>100 m	19-007
2/Feb/19	0.4	Waste Oil	558314	7914493	>100 m	19-034
7/Feb/19	0.2	Fuel - Diesel	561773	7913009	>100 m	19-045
26/Feb/19	0.28	Sewage (Untreated)	561319	7913244	>100 m	19-079
2/Mar/19	3	Sewage (Untreated)	561384	7913401	>100 m	19-084
3/Apr/19	4.5	Sewage (Untreated)	561363	7913431	>100 m	19-151
19/Apr/19	0.5	Sewage (Untreated)	503962	7975985	>100 m	19-162
7/May/19	-	Sediment	-	-	<100 m	19-198
12/May/19	0.6	DEF Fluid	559499	7914030	>100 m	19-201
19/May/19	1	Grey Water	503529	7975705	>100 m	19-212
23/May/19	1	Sewage (Untreated)	558105	7914519	>100 m	19-219
30/May/19	-	Sediment	-	-	<100 m	19-226
18/Jun/19	0.25	Transmission Oil	503723	7974745	>100 m	19-246
10/Jul/19	-	Crusher Pad Water	561644	7912664	>100 m	19-279
18/Jul/19	1.5	Grey Water	503318	7975085	>100 m	19-292
9/Aug/19	1	Sewage (Untreated)	503789	7975985	>100 m	19-317
12/Aug/19	0.2	Sewage (Untreated)	503308	7975147	>100 m	19-323
16/Aug/19	-	Crusher Pad Water	561497	7912908	>100 m	19-326
11/Sep/19	2	Sewage (Untreated)	503298	7975054	>100 m	19-374
19/Sep/19	0.5	Grey Water	560740	7913351	>100 m	19-391
23/Sep/19	0.05	Hydrocarbons	504009	7976636	0 m	19-354
27/Sep/19	3	Sewage (Untreated)	503298	7975054	>100 m	19-404
28/Sep/19	-	Waste Rock Effluent	563212	7916801	>100 m	19-409
11/Nov/19	0.25	Sewage (Untreated)	561406	7913339	>100 m	19-460

#### 4.5.3 Water Licence Compliance (Type A 2AM-MRY1325 and Type B 2BE-MRY1421)

In 2019, Baffinland operated the Mary River Project under its Type A Water Licence (2AM-MRY1325 – Amendment No. 1) and a Type B Water Licence (2BE-MRY1421). The scope of the Type A Water Licence focuses on ERP operations while the scope of the Type B Water Licence focuses on geotechnical and exploration activities, including drilling operations and the establishment of satellite exploration camps. Both Water Licences include conditions on water use, wastewater management and water quality monitoring as well as the management of waste.

Compliance with the conditions and requirements outlined in the Type A Water Licence during 2019 is discussed in the 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a). Similarly, compliance with the conditions



and requirements outlined in the Type B Water Licence is discussed in the 2019 QIA & NWB Annual Report for Exploration and Geotechnical Activities (Baffinland, 2020b).

## 4.6 PERFORMANCE ON ECOSYSTEMIC CONDITIONS

### 4.6.1 Meteorology and Climate (PC Conditions 1 through 6)

The first six (6) PC conditions relate to the potential impacts of the Project on meteorology and the climate, including climate change.

#### **Stakeholder Feedback**

Baffinland's stakeholders have identified climate change as a key issue in Nunavut, with communities reporting observations of the changing climate. NIRB prescribed several conditions in Baffinland's Project Certificate related to climate change, requesting Baffinland to identify GHG emissions reduction opportunities and to share any research or observations of climate change with communities, agencies and researchers. Participants from the Mary River Inuit Knowledge Study (2007 to 2010; Baffinland, 2014a) shared observations related to climate change in the Arctic. Previously, Baffinland engaged the communities of Pond Inlet and Arctic Bay through workshops to discuss the Phase 2 Proposal in 2015 and 2016, and a limited amount of feedback was received regarding observations of climate change (JPCSL, 2017). Baffinland recorded questions from one community member during consultation events in 2017; the individual asked if the permafrost and the ocean was being monitored for climate change, if Baffinland was combining Inuit and scientific knowledge, and if rapid changes were being observed. Since then, climate change remains a topic during Phase 2 community meetings (Sanirajak, Igloodik and Mary River), and was also mentioned during Phase 2 Community Risk Assessment Workshops (ERM, 2019) where there was the recognition that all aspects of the environment (land, sea, people, wildlife) are changing because of climate change and that this should be considered in addition to mine impacts (Appendix B).

#### **Monitoring Activities**

Baffinland operates two meteorological stations, and this information is made publically available for Mary River and Milne Inlet through The Weather Network and on our website. A third station was located along the Tote Road but was severely damaged during a storm in 2019. Plans for rebuild are currently underway.

To date, no climate change impacts have been observed through Project monitoring. Baffinland continues to track and monitor Greenhouse Gas (GHG) emissions and report as per Environment and Climate Change Canada's GHG Emissions Reporting Program (ECCC, 2019) and National Pollutant Release Inventory (NPRI), which is included as part of the Air Quality and Noise Abatement Plan (Baffinland, 2020c). Baffinland submitted a Climate Change Strategy to NIRB on February 12, 2019 (Baffinland, 2019d). The Strategy included a description of the actions the Company will undertake to validate and update climate change impact predictions for the Project and the effects of the Project on climate change. Baffinland subsequently sought the external expertise of a third-party partner in June 2019 to help refine and elaborate the existing Strategy and approach for effective implementation. Refinement of the existing Strategy aims to describe priorities and approach to greenhouse gas emissions management, the anticipated impacts on climate change on the Project, and how Baffinland will work with Nunavummiut to adapt to climate changes in the North.

Table 4.4 provides a summary of climate effects monitoring completed in 2019, and an evaluation of impacts relative to the predictions presented in the FEIS and FEIS Addendum. The calculated gaseous emissions in 2019 (Table 4.4) are below the maximum annual GHG, SO<sub>2</sub> and NO<sub>2</sub> emissions predicted in the FEIS.

**Table 4.4: Climate Impact Evaluation**

Component	Effect	Monitoring Program	Impact Evaluation
Greenhouse Gases (GHGs)	Increased GHG emissions	GHG emissions calculated from fuel combustion: Emissions below FEIS forecast	Effect within FEIS predictions
SO <sub>2</sub> and NO <sub>2</sub> emissions at Milne Port	Increased SO <sub>2</sub> and NO <sub>2</sub> emissions	SO <sub>2</sub> and NO <sub>2</sub> emissions calculated from fuel combustion: Emissions below FEIS forecast	Effect within FEIS predictions
SO <sub>2</sub> and NO <sub>2</sub> emissions at Mine Site	Increased SO <sub>2</sub> and NO <sub>2</sub> emissions	SO <sub>2</sub> and NO <sub>2</sub> emissions calculated from fuel combustion: Emissions below FEIS forecast	Effect within FEIS predictions

### Path Forward

As Baffinland further refines the Climate Change Strategy, updates regarding the status of these activities will be provided as part of the annual reporting. The Climate Change Strategy, once fully refined, will be an important tool to guide and articulate Baffinland's efforts on PC conditions No. 2, 3 and 4. Baffinland will continue to conduct monitoring activities and develop initiatives to ensure any impacts that the Project may have on the climate are measured to the extent possible. Reporting on each PC condition is included in the pages that follow.

## Project Certificate Condition No. 1

Category	Meteorology and Climate
Responsible Parties	The Proponent
Project Phase(s)	All phases
Objective	To provide feedback on the impacts that climate change might be having on the port facilities.
Term or Condition	The Proponent shall use GPS monitoring or a similar means of monitoring at both Steensby Port and Milne Port, with tidal gauges to monitor the relative sea levels and storm surges at these sites.
Relevant Baffinland Commitment	N/A
Reporting Requirement	The Proponent shall summarize and supply these monitoring results to NIRB in the annual project report.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	Oceanographic Data Processing – Baffinland Ballast Water Study, Milne Inlet 2014-15 (ASL, 2015) Draft 2019 Milne Inlet Marine Environmental Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Monitoring Program (Golder, 2020a)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

## METHODS

### *Milne Port*

In order to monitor the relative sea levels and storm surges at Milne Port, tide data was collected using a tidal gauge installed at Milne Port in 2014 (ASL, 2015). Tide data retrieved at that time was used to support oceanography and ballast water dispersion modelling for the Project. Following completion of the modelling exercise, the gauge was removed and was not installed at Milne Port in 2015 or 2016. As such, no tidal data were collected or are available from Milne Port for the 2015 or 2016 reporting periods. Baffinland re-installed a tide gauge system at Milne Port and resumed tidal monitoring on-site during the 2017, 2018, and 2019 open-water season. The purpose of the tide gauge was to extend the tidal data set (starting in 2014) and provide insight to relative sea level and storm surges at the project site. Additionally, in 2019, multi-year data from the Milne Port tide gauge, in combination with a literature review of sea level rise and land uplift/subsidence rate in Nunavut, was conducted to assess the potential for sea level rise near Milne Port.

Tide monitoring instrumentation was installed at Milne Port from June 23 to October 30, 2019, and consisted of an RBRconcerto CTD (RBR) sensor programmed to continuously measure pressure, temperature, and conductivity. The instrument was mounted on a steel ladder located on the west end of the existing ore dock. The ladder provided a consistent mounting point (i.e. repeatable position and elevation from year to year) that can be installed as part of standard port operations. A steel plate at the top of the ladder was surveyed with a Real Time Kinematic Global Positioning System (RTK GPS) survey instrument. The elevation and position of the top plate of the ladder was

surveyed using five survey points and the average elevation of the five points has been used to reference the position of the tide gauge to the Canadian Geodetic Vertical Datum (CGVD).

#### ***Steensby Port***

Not Applicable - No tidal gauge systems were installed at Steensby Port in 2019, as this component of the Project is currently inactive.

### **RESULTS**

#### ***Milne Port***

The tide gauge system was deployed at Milne Port from June 23 to October 30, 2019 and the relative tide gauge position was surveyed at five points on the ore dock ladder top plate with an RTK GPS (Golder, 2020a). A continuous time-series of water level, temperature, and conductivity data was collected and is provided in the draft 2019 MEEMP and AIS Monitoring Program Report (Golder, 2020a). Water level data recorded at Milne Port indicated typical fluctuations resulting from tidal forcing. During the measurement period, a total of seven neap-spring tidal cycles were observed, indicating that the current approach for monitoring relative sea levels and storm surges is effective.

#### ***Steensby Port***

Not Applicable - No activities took place at Steensby Port during 2019.

### **TRENDS**

Based on the multi-year tide gauge dataset there has been no observable sea level rise at Milne Port (between 2017 and 2019). Additionally, in Nunavut it is expected that land uplift is occurring and will result in effectively a lowering of sea levels in Nunavut and near Milne Port between 64cm and 74cm by 2100.

### **RECOMMENDATIONS / LESSONS LEARNED**

#### ***Milne Port***

A tide gauge monitoring plan was developed in 2018 and 2019 (Golder, 2018a; Golder, 2019a) and provides guidelines for annual management and maintenance of the tide gauge station such that a long-term record of water levels at Milne Port during the open-water season can be developed, and will allow to detect potential impacts that climate change may have on Milne Port infrastructure. Given that three recent years of data have been collected (i.e., 2017 to 2019) and that there has been no recently observable sea level rise at Milne Port, tide gauge monitoring is not considered necessary for 2020. Baffinland will re-evaluate the frequency for gauge installation in future years at Milne Port as deemed necessary to build upon a multi-year dataset supporting future trends analyses.

#### ***Steensby Port***

The measurement of sea level and storm surges at Steensby Port will be re-evaluated when activities are renewed at Steensby Port.

## Project Certificate Condition No. 2

Category	Meteorology and Climate - Climate Change Validation and Studies
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To provide feedback on the impacts that climate change might be having on the Project.
Term or Condition	The Proponent shall provide the results of any new or revised assessments and studies done to validate and update climate change impact predictions for the Project and the effects of the Project on climate change in the Local Study Area and Regional Study Area as defined in the Proponent's Final Environmental Impact Statement.
Relevant Baffinland Commitment	58
Reporting Requirement	The Proponent shall provide new or revised assessments and studies to the NIRB, the affected communities, relevant regulatory authorities, and interested parties.
Status	Not Applicable
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	Climate Change Strategy (Baffinland, 2019d)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

No new or revised assessments or studies were required in 2019 to validate and/or update the climate change impact predictions for the Project. Baffinland submitted a Climate Change Strategy (the Strategy) to the NIRB on February 12, 2019 (Baffinland, 2019d). The Strategy describes the actions the Company will undertake to validate and update climate change impact predictions for the Project, and the effects of the Project on climate change. These include:

- Implementing comprehensive environmental monitoring and management programs that are based on a combination of scientific data and Inuit Qaujimajatuqangit to safeguard the environment.
- Modifying or replacing equipment with more efficient alternatives to reduce GHG emissions.
- Researching the potential for renewable energy sources, and where possible, implementing these sources to off-set fuel requirements and reduce GHG emissions.
- Conducting ongoing risk assessments to ensure that all aspects of the operations are able to withstand potential climate change related events
- Identifying opportunities for energy efficiency through Project design optimizations
- Ensuring that an effective closure strategy is in place at all stages of Project development that considers best available science for future climate scenarios
- Maintaining compliance with monitoring and regulatory reporting requirements

Baffinland subsequently sought the external expertise of a third-party partner in June 2019 to help refine and elaborate the existing Strategy and approach for effective implementation. Refinement of the existing Strategy aims



to describe priorities and approach to greenhouse gas emissions management, the anticipated impacts on climate change on the Project, and how Baffinland will work with Nunavummiut to adapt to climate changes in the North.

Since September 2019, Baffinland has been working actively with an environmental and sustainability consultancy to support the drafting of an amended strategy based on a two-staged approach as summarized below:

- Stage 1: Development of an amended Draft Strategy, informed by (i) an external scan for benchmarking across similar sectors and region; (ii) an internal scan to assess current and future state of operations which incorporated information across the organization; (iii) establishment of a current state assessment and options for positioning in consideration of internal and external scans; and (iv) development of a draft strategy document that defines Baffinland's goals, objectives and priority action areas and approaches, with specific options for consideration for implementation;
- Stage 2: Refinement of the amended Draft Strategy and Action Planning, based on the following considerations including; (i) external engagement; (ii) finalization of strategy based on external engagement and approval on path forward for establishment of short-term action areas; and (iii) development of plans for year 1 actions based on foundational elements.

Baffinland is currently in the process of moving through the various elements of Stage 1 and has completed the current state assessment, informed by the results of the external and internal scans. The external scan consisted of a review of publically available documents pertaining to the state of climate change action in the North and the mining sector. The internal scan consisted of a comprehensive review of 60 documents, covering Project-related information including existing climate change and sustainability strategies, GHG emissions, relevant PC conditions, and the Mary River IIBA. Information was collected through multiple interviews undertaken across multiple organization levels. Baffinland will continue working through the various elements of Stage 1 to further update the amended draft climate change strategy and subsequently share as part of Stage 2 external engagement efforts.

## **RESULTS**

Not applicable.

## **TRENDS**

Not applicable.

## **RECOMMENDATIONS / LESSONS LEARNED**

Updates regarding the status of these relevant activities will be provided in the Annual Report to the NIRB as they pertain to the existing strategy, in addition to any updates that Baffinland is able to share during the refinement process.

### Project Certificate Condition No. 3

Category	Meteorology and Climate - Green House Gas Emissions
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To confirm that the Proponent is exploring and implementing concrete steps to reduce greenhouse gases.
Term or Condition	The Proponent shall provide interested parties with evidence of continued initiatives undertaken to reduce greenhouse gas emissions.
Relevant Baffinland Commitment	N/A
Reporting Requirement	The Proponent shall include relevant information in the Annual Report submitted to the NIRB.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	N/A
Ref. Document Link	N/A

#### METHODS

As operations progress and production increases, Baffinland has increased its efforts for exploring and implementing concrete steps towards the reduction of greenhouse gas emissions through the implementation of various initiatives. These initiatives were implemented prior to the formal development of a strategic plan aimed at reducing emissions because Project operations were still in their infancy.

From 2013 to 2017 Baffinland used solar/wind power generators to supplement energy requirements at our remote environmental monitoring sites (e.g. Bruce Head Camp). Substantial damage possibly from extreme cold prevented its use as a main energy source at Bruce Head Camp 2019, however both radio and Automatic Information System relay systems were powered by solar.

Baffinland is also conducting ongoing investigations into operating alternative energy sources to supply supplementary renewable energy for the Project at a much larger scale. In 2017, Baffinland established an Idling Policy to reduce unnecessary vehicle and equipment idling. This was developed with the specific purpose of reducing air pollution generated as a result of Project activities. Since its inception, employees are required to follow the Idling Policy where manufacturer guidelines for warm-up periods are not readily available. Where specific manufacturing guidelines are not provided, idling times are restricted to a maximum of 10 minutes for light vehicles and 20 minutes for heavy vehicles and equipment in -20 degrees Celsius or below, and a maximum of 5 minutes for light vehicles and 10 minutes for heavy vehicles and equipment when the ambient temperature is between 0 to -20 degrees Celsius.

Baffinland submitted a Climate Change Strategy to the NIRB on February 12, 2019 (Baffinland, 2019d). The Strategy included a description of the actions the Company will undertake to validate and update climate change impact predictions for the Project and the effects of the Project on climate change. Baffinland subsequently sought the external expertise of a third-party partner in June 2019 to help refine and elaborate the existing Strategy and

approach for effective implementation. Refinement of the existing Strategy aims to describe priorities and approach to greenhouse gas emissions management, the anticipated impacts on climate change on the Project, and how Baffinland will work with Nunavummiut to adapt to climate changes in the North.

Baffinland subsequently sought the external expertise of a third-party partner in June 2019 to help refine and elaborate the existing Strategy and approach for effective implementation. Refinement of the existing Strategy aims to describe priorities and approach to greenhouse gas emissions management, the anticipated impacts on climate change on the Project, and how Baffinland will work with Nunavummiut to adapt to climate changes in the North.

## RESULTS

In 2019 Baffinland constructed the Mine Haul Road Cross Cut, which significantly reduced the distance travelled for mine haul trucks as well as reduced the cycle time between Deposit 1 and the ROM stockpile at the Crusher Facility. As a result, in 2019 alone it is estimated that Baffinland saved approximately 55,000 L of fuel from reduced haul distances. On an annual basis, it is estimated that Baffinland will save approximately 99,000 L per year of diesel fuel in comparison to the use of the previous haul road configuration.

Since September 2019, Baffinland has been working actively with an environmental and sustainability consultancy to support the drafting of an amended strategy based on a two-staged approach as summarized below:

- Stage 1: Development of an amended Draft Strategy, informed by (i) an external scan for benchmarking across similar sectors and region; (ii) an internal scan to assess current and future state of operations which incorporated information across the organization; (iii) establishment of a current state assessment and options for positioning in consideration of internal and external scans; and (iv) development of a draft strategy document that defines Baffinland's goals, objectives and priority action areas and approaches, with specific options for consideration for implementation;
- Stage 2: Refinement of the amended Draft Strategy and Action Planning, based on the following considerations including; (i) external engagement; (ii) finalization of strategy based on external engagement and approval on path forward for establishment of short-term action areas; and (iii) development of plans for year 1 actions based on foundational elements.

Baffinland is currently in the process of moving through the various elements of Stage 1 and has completed the current state assessment, informed by the results of the external and internal scans. The external scan consisted of a review of publically available documents pertaining to the state of climate change action in the North and the mining sector. The internal scan consisted of a comprehensive review of 60 documents, covering Project-related information including existing climate change and sustainability strategies, GHG emissions, relevant PC conditions, and the Mary River IIBA. Information was collected through multiple interviews undertaken across multiple organization levels. Baffinland will continue working through the various elements of Stage 1 to further update the amended draft climate change strategy and subsequently share as part of Stage 2 external engagement efforts.

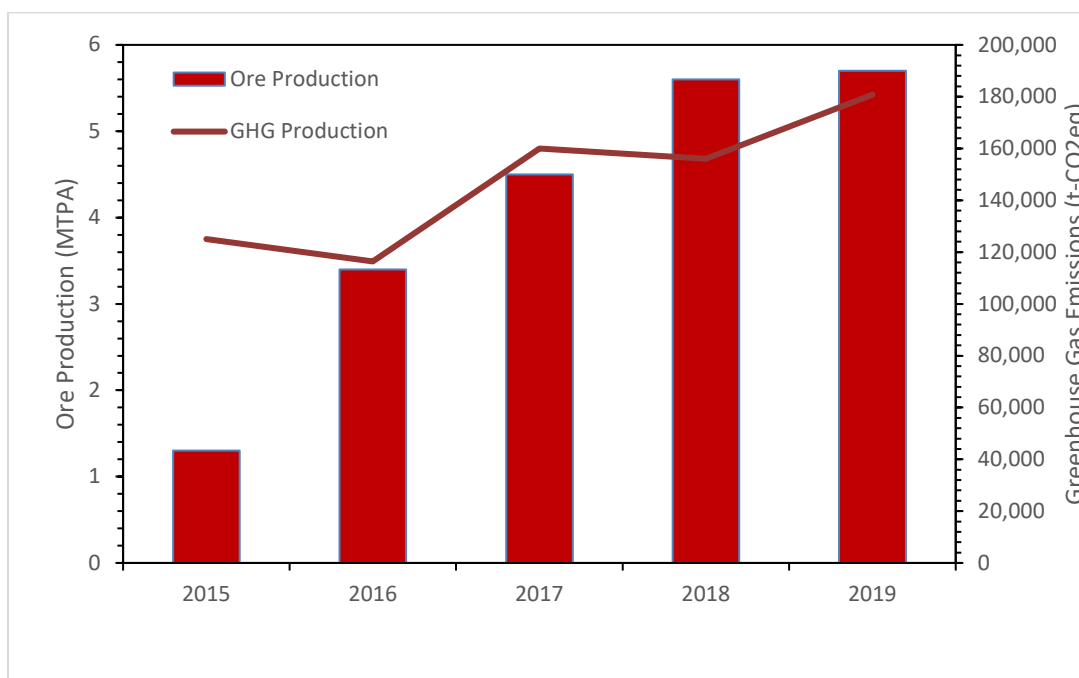
In parallel to the refinement of the climate change strategy, one of the key first steps to managing energy/fuel use consumption is implement processes that allow for tracking of energy use/fuel use by type of activity or infrastructure requirement. Accordingly, recognizing that Baffinland's operations depend heavily on fuel such as diesel and that emissions generated are tied directly to fuel consumption, a new Power Generation and Distribution Department was created. This department has the responsibility of overseeing power generation and distribution which comprises, in part, the tracking of key performance indicators (KPIs) on fuel/energy use, efficiencies, load

factor, etc. Tracking of energy consumption requires a good understanding of how much fuel is consumed by, for example, individual components of the heavy equipment fleet and how changes may lead to efficiencies (e.g., driving practices, regular maintenance), fuel required to run generators to heat individual buildings versus those connected on same power grid, or key infrastructure components such as ore loader, crusher, and how efficiencies may be achieved through better ore handling sequencing, etc.

Continuing from these efforts, Baffinland initiated the installation of two (2) new GE generators in the latter part of 2019, which are more fuel efficient to supplement the current high-speed generators. The GE generators are estimated to be 22% more energy efficient in their diesel consumption in comparison to the existing Cummins generators on Site. Baffinland will continue the installation and commissioning of the GE generators in 2020, and look for opportunities to continue upgrading the existing power generation facilities at the Project. Baffinland continues investigating the potential use of thermo-electric or fluid heat exchange heat recovery systems to recover energy from diesel generator exhaust and incinerator capture, although the feasibility of this is yet to be confirmed.

## TRENDS

Between 2015 to 2019, Baffinland increased the amount of iron ore hauled on the Tote Road by 338%, although GHG produced by the Project only increased by 44% (Figure 4.2).



**Figure 4.2: GHG Emissions Relative to Ore Production**

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland actively looks for continuous improvement opportunities to lower its fuel/energy use. Baffinland intends to continue to modify or replace equipment with more energy efficient alternatives, research and where possible implement renewable energy sources, (e.g., use of solar energy to power radio relay stations), and identify opportunities for energy efficiency through optimizations in the Project design, all in an effort to further reduce GHG

emissions. Additional initiatives identified through the update to the existing Climate Change Strategy will inform future opportunities for GHG emission reductions guided by an action plan with specific next steps.

Future updates regarding Baffinland's GHG emission production and initiatives being undertaken to optimize efficiencies in energy requirements will continue to be reported in Baffinland's Annual Report's to the NIRB, in addition to any updates to the existing Strategy as Baffinland works through the refinement process.

Third-party verification of GHGs is planned for 2020 which will contribute toward the setting of future GHG emissions target.

A key component of the proposed amendment to the Project under Phase 2 is the switch from road to rail. Phase 2 is expected to generate approximately 21.6 Mt CO<sub>2</sub>eq of GHG emissions, which represents a 10.3% reduction relative to the ERP.



## Project Certificate Condition No. 4

Category	Climate Change - Consultation on Climate
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To promote public awareness and engagement of affected groups.
Term or Condition	The Proponent shall endeavour to include the participation of Inuit from affected communities and other communities in Nunavut when undertaking climate-change related studies and research.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	Climate Change Strategy (Baffinland, 2019d)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Not Applicable in 2019. Baffinland submitted a Climate Change Strategy to the Nunavut Impact Review Board (NIRB) on February 12, 2019 (Baffinland, 2019d). The Strategy includes a description of activities the Company will undertake to validate and update climate change impact predictions for the Project and the effects of the Project on climate change. This includes, though is not limited to:

- Implementing comprehensive environmental monitoring and management programs that are based on a combination of scientific data and Inuit Qaujimajatuqangit to safeguard the environment.

Baffinland has since sought the external expertise of a third-party partner in June 2019 to help refine and elaborate the existing Strategy and approach for effective implementation. Refinement of the existing Strategy aims to describe priorities and approach to greenhouse gas emissions management, the anticipated impacts on climate change on the Project, and how Baffinland will work with Nunavummiut to adapt to climate changes in the North.

Since September 2019, Baffinland has been working actively with an environmental and sustainability consultancy to support the drafting of an amended strategy based on a two-staged approach as summarized below:

- Stage 1: Development of a Draft Strategy, informed by (i) an external scan for benchmarking across similar sectors and region; (ii) an internal scan to assess current and future state of operations which incorporated information across the organization; (iii) establishment of a current state assessment and options for positioning in consideration of internal and external scans; and (iv) development of a draft strategy document that defines Baffinland's goals, objectives and priority action areas and approaches, with specific options for consideration for implementation;
- Stage 2: Refinement of Draft Strategy and Action Planning, based on the following considerations including (i) external engagement; (ii) finalization of strategy based on external engagement and approval on path forward for establishment of short-term action areas; and (iii) development of plans for year 1 actions based on foundational elements. External engagement is expected to include focused engagement with all relevant

external stakeholders to better understand their interests and expectations, increase awareness and support for the strategy, and create the conditions for potential collaboration on strategy implementation, where appropriate. The “what we heard” would support final refinement of the strategy, and subsequently the identification and prioritization of next steps (action planning).

Baffinland is currently in the process of moving through the various elements of Stage 1 and has completed the current state assessment, informed by the results of the external and internal scans. The external scan consisted of a review of publically available documents pertaining to the state of climate change action in the North and the mining sector. The internal scan consisted of a comprehensive review of 60 documents, covering Project-related information including existing climate change and sustainability strategies, GHG emissions, relevant PC conditions, and the Mary River IIBA. Information was collected through multiple interviews undertaken across multiple organization levels. Baffinland will continue working through the various elements of Stage 1 to further update the Draft climate change strategy and subsequently share as part of Stage 2 external engagement efforts.

Results from these efforts will help to guide future participation of Inuit from affected communities and other communities in Nunavut when undertaking climate-change related studies and research as identified through the development of a Climate Change Strategy Action Plan.

#### **RESULTS**

Not applicable.

#### **TRENDS**

Not applicable.

#### **RECOMMENDATIONS / LESSONS LEARNED**

As Baffinland refines the existing Climate Change Strategy and implements new measures, updates regarding the status of these activities, including consultation with Inuit communities, will be provided in future relevant updates in the Annual Report to the NIRB.

## Project Certificate Condition No. 5

Category	Meteorology and Climate - Weather Monitoring Data
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To provide families of employees with up to date information.
Term or Condition	The Proponent shall endeavour to explore and implement reasonable measures to ensure that weather-related information for the various Project sites is readily accessible to the public on a continual basis throughout the life of the Project.
Relevant Baffinland Commitment	5
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	Baffinland Corporate Website
Ref. Document Link	<a href="https://www.baffinland.com/operation/mary-river-mine/">https://www.baffinland.com/operation/mary-river-mine/</a>

### METHODS

Baffinland ensures that weather-related information is publicly accessible for the Mary River Project Site by posting current weather information on the Baffinland website ([www.baffinland.com](http://www.baffinland.com)). Weather related information is also available to the public at [www.weathernetwork.com](http://www.weathernetwork.com) for two weather stations, Mary River and Milne Inlet.

### RESULTS

Weather related information for Project sites is publicly available.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to provide weather-related information on publicly available websites for all active Project sites.

## Project Certificate Condition No. 6

Category	Meteorology and Climate - Emissions
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To provide feedback on the Project's emissions.
Term or Condition	The Proponent shall provide the results of any emissions calculations conducted to determine the level of sulphur dioxide (SO <sub>2</sub> ) emissions, nitrogen oxide (NO <sub>x</sub> ) emissions and greenhouse gases generated by the Project using fuel consumption or other relevant criteria as a basis.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status	In-Compliance
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland used guidance documents provided by Environment and Climate Change Canada (ECCC, 2016; ECCC, 2017, ECCC, 2019) and the Intergovernmental Panel on Climate Change (IPCC, 2006) along with published emission factors to estimate the Project's annual GHG, SO<sub>2</sub> and NO<sub>x</sub> emissions. Annual emissions were calculated based on on-site fuel consumption and waste management at the Project.

Baffinland continues to report annual emissions to ECCC through the NPRI and GHG reporting programs.

### RESULTS

Baffinland's 2019 annual emissions for GHGs, SO<sub>2</sub> and NO<sub>x</sub> are presented in Table 4.5.

**Table 4.5: Calculated 2019 Project Gaseous Emissions**

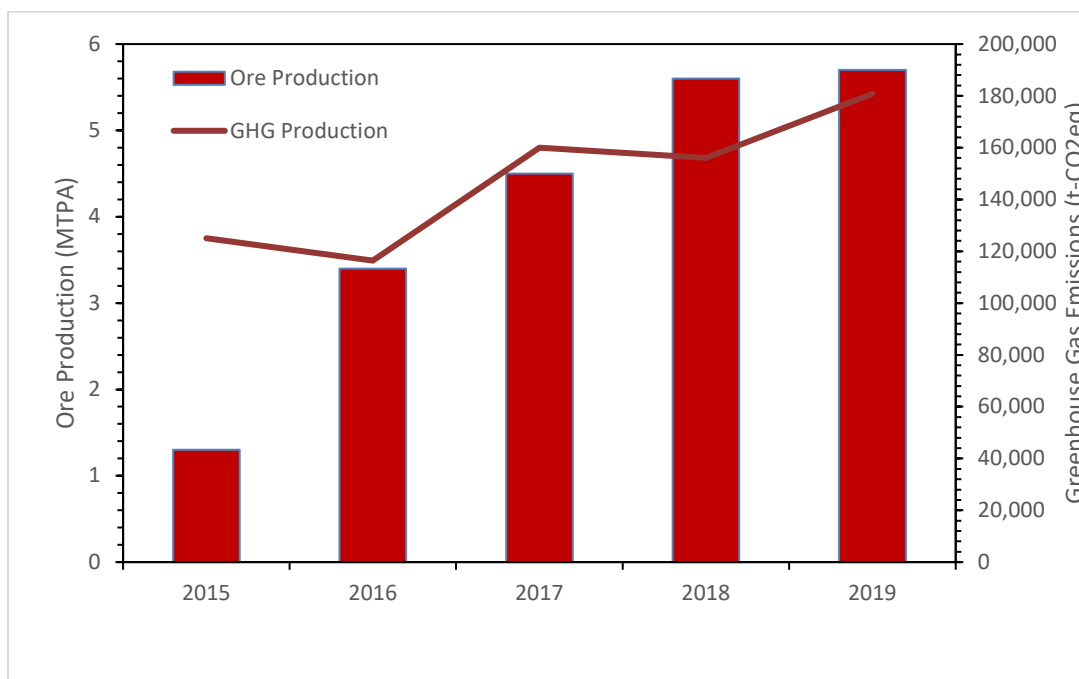
Gaseous Emission	Units	Calculated Emissions
GHG	t-CO <sub>2</sub> eq	180,794
SO <sub>2</sub>	t (SO <sub>2</sub> )	14
NO <sub>x</sub>	t (NO <sub>2</sub> )	4,083

### TRENDS

Between 2015 to 2019, Baffinland increased the amount of iron ore hauled on the Tote Road by 338%, although GHG produced by the Project only increased by 44% (Figure 4.2).

Although total gaseous emissions have increased from 156,000 tonnes in 2018 to 180,794 tonnes in 2019, when compared to FEIS predictions, Baffinland's 2019 total Scope 1 gaseous direct emissions from equipment owned or

controlled by the company are below FEIS predicted emissions estimates. The increase in emissions between 2018 and 2019, can be attributed to an increase in total fuel consumed on site for stationary and mobile combustion.



**Figure 4.3: GHG Emissions Relative to Ore Production**

## RECOMMENDATIONS / LESSONS LEARNED

Consistent with the existing Climate Change Strategy for the project, Baffinland will continue to modify or replace equipment with more energy efficient alternatives, research and where possible implement renewable energy sources, and identify opportunities for energy efficiency through optimizations in the Project design, all to further reduce emissions from the Project.



#### 4.6.2 Air Quality (PC Conditions 7 through 12)

Six (6) PC conditions relate to the potential impacts of the Project on air quality, including calculations of total Project emissions from fuel consumption and gaseous monitoring.

##### Stakeholder Feedback

During review of the FEIS and FEIS Addendum, communities and regulators alike focused on dust, including Dustfall and potential impacts to soil, vegetation and forage to caribou. The focus of stakeholder feedback on dustfall and potential impacts on soil, vegetation and wildlife, along with several years of exceedances of the predicted threshold levels for dustfall presented in the FEIS, has prompted Baffinland to implement additional dust mitigation measures described in the updates to PC Conditions 10 and 58c. Concern about dust was expressed several times during 2019 consultation activities, mostly in relation to the Phase 2 Expansion Project Proposal, but also in regard to current operations (Appendix B).

##### Monitoring Activities

Table 4.6 provides a summary of air quality effects, monitoring completed in 2019, and an evaluation of impacts relative to the predictions presented in the FEIS and FEIS Addendum.

**Table 4.6: Air Quality Impact Evaluation**

Component	Effect	Monitoring Program	Impact Evaluation
Incineration of combustible non-hazardous wastes	Release of air contaminants, including particulate matter (PM), carbon monoxide (CO), mercury, dioxins, furans	Incinerator stack testing was completed at commissioning. Stack testing completed in August 2019 indicated exceedances of dioxin/furan contaminant limits compared to the CCME Canada-Wide Standards (CWS).	Air quality limits should be met under normal operating conditions and appropriate use of incinerators. Corrective actions implemented include performance of maintenance work on the incinerators, and a review of the incinerator settings which resulted in minor process control changes at the PLC to optimize operation.
Release of air contaminants from mobile and stationary equipment due to fuel combustion	Increased concentrations of total suspended particulate (TSP), sulphur dioxide (SO <sub>2</sub> ), nitrogen dioxide (NO <sub>2</sub> ), CO and potential acidic input (PAI)	Continuous NO <sub>2</sub> and SO <sub>2</sub> monitoring was conducted at Milne Port and the Mine Site continuously through 2019.	2019 air quality monitoring was within Nunavut Ambient Air Quality Standards (AAQS) and FEIS predictions.

Component	Effect	Monitoring Program	Impact Evaluation
Earthworks, mining, hauling, stockpiling and transfer of ore	Ore handling and transport, including wheel entrainment from haulage of ore	Dustfall in 2019 was less than in 2018 at most year-round sampling locations Monitoring showed that in general total annual dustfall across the Project area decreased in 2019 in comparison with earlier years, demonstrating significant ongoing progress in effectively reducing dust generation from crushing and Tote Road traffic, despite increases in the production level at the Project and the volume of Tote Road traffic.	Monitoring showed that although dustfall exceeded FEIS predictions at select locations, in general total annual dustfall across the Project area decreased in 2019.
Haulage of ore and other traffic on the Tote Road	Particulate matter emissions and dustfall from wheel entrainment	Dustfall in 2019 was less than in 2018 at most year-round sampling locations. Along the Tote Road dustfall decreased at monitors at the north end of the road, but a slight increase was noted at monitors at the south end in comparison with 2018 dustfall. It should be noted that overall the dustfall decreased, despite the increase in traffic along the Tote Road in 2019.	Monitoring showed that although dustfall exceeded FEIS predictions at select locations, exceedances decreased in 2019 as compared to 2018.

Baffinland continues to investigate how to better mitigate dust onsite and submitted an updated Air Quality and Noise Management Plan (Baffinland, 2020c) with the QIA and NWB Type A Annual Report for 2019. Baffinland continues to evaluate and report on dustfall through its approved dust monitoring program at the Mine Site, Port Site and Tote Road, including additional monitoring stations deployed in 2019. Baffinland has worked diligently towards decreasing dust generated by wheel entrainment across the Project Sites, specifically reducing dust generation from ground surfaces by applying water and/or chemical suppressants such as calcium chloride to road surfaces and site layouts during summer conditions. In 2019, Baffinland implemented a trial application of a new dust suppressant technology, Dust Stop by Cypher Environmental. Based on the trial application, Baffinland will be rolling out a full scale application on the Tote Road in 2020. Baffinland's effort with respect to the application of dust suppressants on the Tote Road are documented in the Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2019a).

Measures implemented in 2018 to mitigate downwind dust of the Ore Pad at Milne Port continued to be implemented in 2019 by removing dust impacted snow from areas of accumulation, including snow drifts near waterbodies and the beach west of the ship loader. The Crushers at the Mine Site were installed with engineered dust shrouds on the main surge bins to reduce windblown dust as well as hoods at the outflow areas.

The measuring of dust on vegetation will be incorporated into vegetation and soil base metals monitoring, which is planned to be reinstated for the 2020 season. Baffinland continues to investigate new methods of transportation that will generate less dustfall.

**Path Forward**

In 2020, Baffinland will continue its monitoring programs of gaseous emissions and dustfall. The company will also continue to evaluate opportunities to further mitigate dustfall on the Project and implement adaptive management that considers feedback from communities, monitoring data, and available and novel mitigation measures. Reporting on each PC condition related to air quality is presented in the next several pages. Dustfall monitoring is described in more detail in Section 4.5.8 (PC Condition No. 58, Item c).

## Project Certificate Condition No. 7

Category	Air Quality - Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To provide feedback on the Project's emissions.
Term or Condition	The Proponent shall update its Air Quality and Noise Abatement Management Plan to provide for continuous monitoring at land-based monitoring stations designed to capture operations phase ship-generated SO <sub>2</sub> and NO <sub>2</sub> emissions at Steensby Port and Milne Port. Continuous monitoring is to be carried out through several shipping seasons at each port as required to determine that emissions are at acceptable levels.
Relevant Baffinland Commitment	57, 61, 62
Reporting Requirement	The updated plan shall be provided to the NIRB for review and comment at least 60 days prior to commencement of construction activities.
Status	In-Compliance
Stakeholder Review	N/A
Reference	Air Quality and Noise Abatement Management Plan (Baffinland, 2020c)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Continuous ambient air quality monitoring equipment was set up at Milne Port and the Mine Site to monitor sulphur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>) levels at Project sites in 2014. Continuous ambient air quality monitoring commenced in November 2014 and continued throughout 2015. Monitoring throughout 2015 concluded that all results were well below the Ambient Air Quality Standards (AAQS) set out by the Government of Nunavut (2011), resulting in the discontinuation of the monitoring program in 2016. To ensure compliance with Project Certificate Condition No. 7 and collect additional data over multiple shipping seasons, the monitoring program resumed at Milne Port in March 2017 and at the Mine Site in November 2017, and is currently ongoing.

The Air Quality and Noise Abatement Management Plan was updated in April 2020, and submitted with the QIA and NWB 2019 Annual Report for Operations. Updates to the management plan involved the addition of six (6) new dustfall collection stations as discussed in 2018 in direct consultation with the Mittimatalik Hunters and Trappers Organization (MHTO) and the QIA. These new locations were added to assess the geographic extent of fugitive dust within the Tote Road corridor.

### RESULTS

The 2019 air quality monitoring results can be summarized as follows:

- Overall, monitored SO<sub>2</sub> levels at both the Mary River and Milne Inlet sites were very low. The highest measured SO<sub>2</sub> concentration represented 6% or less of the applicable standard.
- Overall, monitored NO<sub>2</sub> levels at both the Mary River and Milne Inlet sites were moderate. The highest measured NO<sub>2</sub> concentration represented 76% or less of the applicable standard.

In summary, the results of the monitoring during 2019 at the Mary River site are as follows:

- The Mary River site had a minimum of 97.8% valid data for the 2019 sampling year. Sampling was conducted January 1st, 2019 to December 31st, 2019;
- NO<sub>2</sub> and SO<sub>2</sub> levels did not exceed the 1-hour, 24-hour or annual limits in 2019;
- NO<sub>2</sub> levels peaked during the colder months (October to April) and were significantly lower during the warmer months (May to September);
- The maximum 1-hour NO<sub>2</sub> concentration was 66% of the AAQS;
- The maximum 24-hour NO<sub>2</sub> concentration was 76% of the AAQS;
- The annual NO<sub>2</sub> arithmetic mean was 60% of the AAQS;
- The maximum 1-hour SO<sub>2</sub> concentration was 5% of the AAQS;
- The maximum 24-hour SO<sub>2</sub> concentration was 5% of the AAQS;
- The annual SO<sub>2</sub> arithmetic mean was 6% of the AAQS.

In summary, the results of the monitoring during 2019 at the Milne Inlet site are as follows:

- The Milne Inlet site had a minimum of 97.8% valid data for the 2019 sampling year. Sampling was conducted January 1st, 2019 to December 31st, 2019;
- NO<sub>2</sub> and SO<sub>2</sub> levels did not exceed the 1-hour, 24-hour or annual limits in 2019;
- NO<sub>2</sub> levels peaked during the colder months (October to April) and were significantly lower during the warmer months (May to September);
- The maximum 1-hour NO<sub>2</sub> concentration was 61% of the AAQS;
- The maximum 24-hour NO<sub>2</sub> concentration was 56% of the AAQS;
- The annual NO<sub>2</sub> arithmetic mean was 46% of the AAQS;
- The maximum 1-hour SO<sub>2</sub> concentration was 3% of the AAQS;
- The maximum 24-hour SO<sub>2</sub> concentration was 3% of the AAQS;
- The annual SO<sub>2</sub> arithmetic mean was 4% of the AAQS.

## TRENDS

Monitoring results to date indicate that SO<sub>2</sub> levels at both Milne Port and the Mine Site remain below the AAQS. Monitored NO<sub>2</sub> levels at both the Mary River and Milne Inlet sites were generally moderate, where NO<sub>2</sub> levels at the Milne Inlet Site remain below the AAQS. NO<sub>2</sub> and SO<sub>2</sub> levels did not exceed the 1-hour, 24-hour or annual limits in 2019.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to monitor SO<sub>2</sub> and NO<sub>2</sub> levels at Milne Port and the Mine Site during 2020 to ensure that maximum values remain below the AAQS. Air quality monitoring at Steensby Port will be implemented when the Port is developed and shipping activities commence.



## Project Certificate Condition No. 8

Category	Air Quality - Greenhouse Gas Emissions
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To provide feedback on the Project's emissions.
Term or Condition	The Proponent shall demonstrate through monitoring of air quality at the mine site and at the Steensby Inlet and Milne Inlet port sites that SO <sub>2</sub> and NO <sub>2</sub> emissions remain within predicted levels and, where applicable, within limits established by all applicable guidelines and regulations. In cases where exceedances are manifested, the Proponent shall provide an explanation for the exceedance, a description of planned mitigation, and shall conduct additional monitoring to evaluate the effectiveness of mitigative measures.
Relevant Baffinland Commitment	61
Reporting Requirement	To be included in the Proponent's annual reporting to the NIRB.
Status	In-Compliance
Stakeholder Review	None
Reference	Air Quality and Noise Abatement Management Plan (Baffinland, 2020c) Summary of AQ Monitoring Results (RWDI, 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

Continuous ambient air quality monitoring equipment was set up at Milne Port and the Mine Site to monitor sulphur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>) levels at Project sites in 2014. Continuous ambient air quality monitoring commenced in November 2014 and continued throughout 2015. Monitoring throughout 2015 concluded that all results were well below the Ambient Air Quality Standards (AAQS) set out by the Government of Nunavut (2011), resulting in the discontinuation of the monitoring program in 2016. To ensure compliance with Project Certificate Condition No. 7 and collect additional data over multiple shipping seasons, the monitoring program resumed at Milne Port in March 2017 and at the Mine Site in November 2017, and is currently ongoing.

The Air Quality and Noise Abatement Management Plan was updated in March 2020, and submitted with the QIA and NWB 2019 Annual Report for Operations.

### RESULTS

The 2019 air quality monitoring results can be summarized as follows:

- Overall, monitored SO<sub>2</sub> levels at both the Mary River and Milne Inlet sites were very low. The highest measured SO<sub>2</sub> concentration represented 6% or less of the applicable standard.
- Overall, monitored NO<sub>2</sub> levels at both the Mary River and Milne Inlet sites were moderate. The highest measured NO<sub>2</sub> concentration represented 76% or less of the applicable standard.

In summary, the results of the monitoring during 2019 at the Mary River site are as follows:

- The Mary River site had a minimum of 97.8% valid data for the 2019 sampling year. Sampling was conducted January 1st, 2019 to December 31st, 2019;
- NO<sub>2</sub> and SO<sub>2</sub> levels did not exceed the 1-hour, 24-hour or annual limits in 2019;
- NO<sub>2</sub> levels peaked during the colder months (October to April) and were significantly lower during the warmer months (May to September);
- The maximum 1-hour NO<sub>2</sub> concentration was 66% of the AAQS;
- The maximum 24-hour NO<sub>2</sub> concentration was 76% of the AAQS;
- The annual NO<sub>2</sub> arithmetic mean was 60% of the AAQS;
- The maximum 1-hour SO<sub>2</sub> concentration was 5% of the AAQS;
- The maximum 24-hour SO<sub>2</sub> concentration was 5% of the AAQS;
- The annual SO<sub>2</sub> arithmetic mean was 6% of the AAQS.

In summary, the results of the monitoring during 2019 at the Milne Inlet site are as follows:

- The Milne Inlet site had a minimum of 97.8% valid data for the 2019 sampling year. Sampling was conducted January 1st, 2019 to December 31st, 2019;
- NO<sub>2</sub> and SO<sub>2</sub> levels did not exceed the 1-hour, 24-hour or annual limits in 2019;
- NO<sub>2</sub> levels peaked during the colder months (October to April) and were significantly lower during the warmer months (May to September);
- The maximum 1-hour NO<sub>2</sub> concentration was 61% of the AAQS;
- The maximum 24-hour NO<sub>2</sub> concentration was 56% of the AAQS;
- The annual NO<sub>2</sub> arithmetic mean was 46% of the AAQS;
- The maximum 1-hour SO<sub>2</sub> concentration was 3% of the AAQS;
- The maximum 24-hour SO<sub>2</sub> concentration was 3% of the AAQS;
- The annual SO<sub>2</sub> arithmetic mean was 4% of the AAQS.

## TRENDS

Monitoring results to date indicate that SO<sub>2</sub> levels at both Milne Port and the Mine Site remain below the AAQS. Monitored NO<sub>2</sub> levels at both the Mary River and Milne Inlet sites were generally moderate, where NO<sub>2</sub> levels at the Milne Inlet Site remain below the AAQS. NO<sub>2</sub> and SO<sub>2</sub> levels did not exceed the 1-hour, 24-hour or annual limits in 2019.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to monitor SO<sub>2</sub> and NO<sub>2</sub> levels at Milne Port and the Mine Site during 2020 to ensure that maximum values remain below the AAQS. Air quality monitoring at Steensby Port will be implemented when the Port is developed and shipping activities commence.

## Project Certificate Condition No. 9

Category	Air Quality - Greenhouse Gas Emissions
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To provide feedback on the Project's emissions.
Term or Condition	The Proponent shall provide calculations of greenhouse gas emissions generated by activities at the Steensby Inlet and Milne Inlet port sites and other Project sources including aircraft associated with the Project. Calculations shall take into consideration, fuel consumption as measured by Baffinland's purchase and use as well as the fuel use of its contractors and sub-contractors.
Relevant Baffinland Commitment	57
Reporting Requirement	To be included in the Proponent's annual reporting to the NIRB.
Status	In-Compliance
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland used guidance documents provided by Environment and Climate Change Canada (ECCC, 2016; ECCC, 2017, ECCC, 2019) and the Intergovernmental Panel on Climate Change (IPCC, 2006) along with published emission factors to estimate the Project's annual GHG emissions. Annual emissions were calculated based on on-site fuel consumption and waste management at the Project.

Baffinland continues to report annual emissions to ECCC through the National Pollutant Release Inventory (NPRI) and GHG reporting programs. Baffinland's 2019 annual emissions for GHGs are presented in Table 4.7.

**Table 4.7: Calculated 2019 Project Greenhouse Gas Emissions**

Gaseous Emission	Units	Calculated Emissions
GHG	t-CO <sub>2</sub> eq	180,794

### TRENDS

Total gaseous emissions have increased from 156,000 tonnes of CO<sub>2</sub> equivalents in 2018 to 180,794 tonnes of CO<sub>2</sub> equivalents in 2019, therefore indicating a general upward trend. The observed increase in emissions is attributed to an overall increase in total fuel consumption for both stationary and mobile fuel combustion at Milne Port and Mary River, associated with the overall increase in mine production in 2019.

### RECOMMENDATIONS / LESSONS LEARNED

Consistent with the Climate Change Strategy for the project, Baffinland will continue to modify or replace equipment with more energy efficient alternatives, research and where possible implement renewable energy sources, and identify opportunities for energy efficiency through optimizations in the Project design, all in an effort to further

reduce GHG emissions. Future updates regarding Baffinland's GHG emission production and initiatives being undertaken to optimize efficiencies in energy requirements will continue to be reported in Baffinland's Annual Report's to NIRB.

## Project Certificate Condition No. 10

Category	Air Quality - Dust Management and Monitoring Plan
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent impacts to air quality from dust dispersion.
Term or Condition	<p>The Proponent shall update its Dust Management and Monitoring Plan to address and/or include the following additional items:</p> <ul style="list-style-type: none"> <li>a) Outline the specific plans for monitoring dust along the first few kilometres of the rail corridor leaving the Mary River mine site.</li> <li>b) Identify the specific adaptive management measures to be considered should monitoring indicate that dust deposition from trains transporting along the rail route is greater than initially predicted.</li> <li>c) Outline specific plans for monitoring dustfall at intervals along and in the vicinity of the Milne Inlet Tote Road to determine the amount and extent of dustfall.</li> <li>d) Identify the specific adaptive management measures to be considered if monitoring indicates that dust deposition from traffic on the Milne Inlet Tote Road is greater than initially predicted.</li> <li>e) The Proponent shall implement its Dust Management and Monitoring Plan, report all monitoring data to the NIRB annually, and take all adaptive management measures described in its Dust Management and Monitoring Plan if monitoring indicates that dust in the ambient air or dust deposition from the increased traffic associated with the increased volume of ore being shipped is greater than initially predicted.</li> </ul>
Relevant Baffinland Commitment	2, 57
Reporting Requirement	To be provided to the NIRB for review and comment at least 60 days prior to commencement of construction activities.
Status	In-Compliance
Stakeholder Review	Nunavut Water Board, Nunavut Impact Review Board, Qikiqtani Inuit Association, Indigenous and Northern Affairs Canada, Environment and Climate Change Canada
Reference	<p>Air Quality and Noise Abatement Management Plan (Baffinland, 2020c)</p> <p>Roads Management Plan (Baffinland, 2020d)</p> <p>Dust Mitigation Action Plan (Golder, 2016a)</p>
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Dust Management and Monitoring was incorporated into the Air Quality and Noise Abatement Management Plan (Attachment 7, Dust Management Protocol) and the Roads Management Plan prior to the start of construction. Dust monitoring and mitigation measures continued to be implemented in 2019 at the Mine site, Port Site, and along the Tote Road. In consultation with the QIA and the Pond Inlet Hunter and Trapper Organization (HTO), six (6) additional remote dustfall sites were installed in the Tote Road corridor between the Mine Site and Milne Port, to further delineate the extent of dustfall and assess the effectiveness of mitigation measures.

A Dust Mitigation Action Plan (Plan) was developed in 2016 to identify specific measures to be implemented to reduce dust emissions (Golder, 2016a). Implementation of the Plan continued in 2019 including completing installation of new crusher shrouding and enclosed chutes, road resurfacing, limiting speed and volume of vehicles on all roads, application of water and dust suppression substances, continued implementation of redesigned stockpile activities and layout at the Port, retrofitting existing dust suppressant equipment, and the removal of dust impacted snow at strategic locations at the Project.

Section 5.2.1 of the Air Quality and Noise Abatement Management Plan outline the performance indicators and corrective actions to be employed by the Project for air quality parameters, including dustfall. In 2019 Baffinland implemented a trial of a GN approved new dust suppressant; Dust Stop, produced by Cypher Environmental. This action was a direct result of adaptive management to mitigate observed exceedences of dustfall thresholds. Dust Stop is environmentally friendly, and is expected to have a longer lasting durability for both traffic and rainfall impact, as it promotes a hard, competent water repellant surface when properly applied. Baffinland commenced a trial application of the DSMB (Dust Stop Municipal Blend) dust suppression product in 2019. Improved dust suppression was observed throughout the application zones and the product also showed signs of water shedding during rain events supporting improved road sealant and application lifespan.

## **RESULTS**

Monitoring showed that although dustfall exceeded FEIS predictions at select locations, in general total annual dustfall across the Project area decreased in 2019 in comparison with earlier years, demonstrating significant ongoing progress in effectively reducing dust generation from crushing and Tote Road traffic, despite increases in the production level at the Project and the volume of Tote Road traffic.

## **TRENDS**

Overall, dustfall continues to remain relatively constant or decrease at most year-round sampling locations throughout the project area. In general, total annual dustfall across the Project area decreased in 2019 in comparison with earlier years. At the Mine Site, the magnitude of annual dustfall was comparable to 2018. However, in 2019 dustfall was highest near the ore haul road while dustfall near the airstrip and the crusher decreased in 2019 in comparison with 2018. There was a modest decrease in total annual dustfall at Milne Port when compared with data from 2018. The decreases observed are attributed to an increase in mitigations employed in 2019 including shroud covers, optimal ore stockpiling with fines, and continuous monitoring of conveyor drop height.

## **RECOMMENDATIONS / LESSONS LEARNED**

The Roads Management Plan and Air Quality and Noise Abatement Management Plan were updated in 2020 to provide further clarity on the adaptive management measures to be considered if elevated dustfall deposition is observed at the Project.

In 2020 Baffinland will be expanding and implementing the use of Dust Stop, starting with two initial applications of the product along the entire Tote Road (24 hrs apart), followed by routine application to maintain the coating on the roads every two weeks. Based on the trial application in 2019, the use of Dust Stop in combination with regular use of water as dust suppression on Project roadways is anticipated to reduce dust generation below levels using current mitigation measures.



## Project Certificate Condition No. 11

Category	Air Quality - Incineration Management Plan
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts to air quality from incineration activities.
Term or Condition	The Proponent shall develop and implement an Incineration Management Plan that takes into consideration the recommendations provided in Environment Canada's Technical Document for Batch Waste Incineration (2010).
Relevant Baffinland Commitment	57
Reporting Requirement	Updated Incineration Management Plan to be provided to the NIRB at least 60 days prior to the commencement of construction activities.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board
Reference	Air Quality and Noise Abatement Management Plan (Baffinland, 2020c) Waste Management Plan (Baffinland, 2020e) Incinerator Operation Procedure (see Waste Management Plan)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

An Incineration Management Plan is presented in Section 3.5 of the Waste Management Plan. Environment Canada's Technical Document for Batch Waste Incineration (EC, 2010) was considered during the development of the Incineration Management Plan, and meets the recommendations outlined by ECCC.

### RESULTS

Baffinland adheres to the six-step process for batch waste incineration as outlined in the Environment Canada's Technical Document (EC, 2010), including conducting periodic waste stream audits and waste sorting for the dual chamber incinerators, which are installed at both the Mine Site and Milne Port.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 12

Category	Air Quality – Incineration
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To mitigate impacts to air quality from incineration activities.
Term or Condition	Prior to commencing any incineration of on-site Project wastes, the Proponent shall conduct at least one stack test immediately following the commissioning of each temporary and permanent incinerator.
Relevant Baffinland Commitment	N/A
Reporting Requirement	Stack test results to be reported to the NIRB and Environment Canada annually as required.
Status	In-Compliance
Stakeholder Review	Environment and Climate Change Canada, Nunavut Impact Review Board
Reference	Air Quality and Noise Abatement Management Plan (Baffinland, 2020c) Waste Management Plan (Baffinland, 2020d) 2019 Source Testing (Wood, 2019a)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

Stack testing was conducted on the Mine Site and Milne Port incinerators when commissioned in 2013, as required by PC Condition No. 12. As part of ongoing operations, Baffinland conducts periodic monitoring of the dual chamber incinerator operation data. This data can be utilised to determine if the incinerators are operating to original specifications. Data includes operational temperature data, burn cycle times, and bottom residual ash composition results. In addition, Baffinland will conduct routine stack tests for dioxins, furans and mercury every five years following commissioning to confirm the above monitoring, in accordance with commitments made to the NIRB following recommendations on the 2018 Annual Report to the NIRB. As a result of this commitment, stack testing was completed in August 2019 on the existing Mine Site and Milne Port incineration units.

In 2019, Baffinland installed one (1) new incinerator to support the 380-Person Camp infrastructure at Milne Port. Prior to operating the unit, the incinerator was subject to stack testing in 2019 to confirm emissions standards were being met immediately following commissioning of the unit. While stack testing was performed on the 380-Person Camp incinerator, it was not put into operation in 2019 pending results of the stack testing.

### RESULTS

Stack testing completed on the Mine Site Incinerator and Milne Port Incinerator units was completed in 2013 upon commissioning of the units, and demonstrated compliance with the applicable emissions standards.

Stack testing completed in August 2019 on the Mine Site Incinerator and Milne Port Incinerator units indicated mercury concentrations below the applicable Canadian Council of Ministers of the Environment (CCME) Canada-Wide Standards (CWS) at both locations, however both incinerators demonstrated exceedances of dioxin/furan parameter standards compared to the CCME CWS. Corrective actions implemented following the receipt of stack

testing results included performance of maintenance work on the incinerators, and a review of the incinerator settings which resulted in minor process control changes at the programmable logic controller (PLC) to optimize operation. Additionally, specific guidelines were posted at incinerator chambers as visual reminders of waste load designs and suitable incineration materials and a review of the Incinerator Operation Procedure was completed by all operators. Further stack testing is planned for 2020 to demonstrate these corrective actions were effective and confirm emissions standards continue to be met.

Preliminary stack testing at the 380-person camp incinerator indicated exceedances of dioxin/furan parameter standards compared to the CCME CWS. As a result, Baffinland has not put the 380-person camp Incineration Unit into operation, and will complete confirmatory stack testing to ensure emissions standards are being met, as required by PC Condition No. 12, prior to operation.

### **TRENDS**

Baffinland has noted that the residual bottom ash generated by the dual chamber incineration process rarely exceeds the guidelines outlined in the Environmental Guideline for Industrial Waste Discharges into Municipal Solid Waste Facilities (GN, 2011). Any exceedances are reported in the 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a). These results suggest that the Incinerator is generally operating as commissioned.

It is noted that the results of stack testing completed in 2019 demonstrated exceedances of the in-stack standards for dioxin/furan parameters, while commissioning of the units in 2013 demonstrated compliance with the applicable standards. Additional testing is required to demonstrate corrective actions put into place have been effective.

### **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will conduct additional confirmatory stack testing in 2020 and report results to demonstrate corrective actions were effective and confirm emissions standards are met. Baffinland will also continue to monitor the incinerator operational and residual bottom ash data to identify changes in operational effectiveness.

### 4.6.3 Noise & Vibration (PC Conditions 13 through 15)

Five (5) PC conditions (including 13, 14, 14a, 14b and 15) relate to the potential impacts of the Project on noise and vibration.

#### Stakeholder Feedback

Stakeholders have expressed concerns regarding noise and vibration focused on effects to fish, inclusive of underwater noise and vibration impacts to fish and marine mammals. Impacts of noise and vibration have not been a focus of external stakeholder concern. Concern over noise and vibration levels have been expressed by some workers at the Project site historically in the context of sleeping at the accommodation facilities. Accordingly, Baffinland made several enhancements to improve noise levels near the accommodation facilities in 2018; a new 800-person camp (Sailiivik Camp) was established at a different location, between the mine infrastructure area and Sheardown Lake. Noise and vibration-related topics such as ground transportation and workplace noise were noted, albeit infrequently during 2019 consultation activities associated with Phase 2 community consultations (Igloodik, Arctic Bay, Clyde River), and youth radio show in Pond Inlet (Appendix B), and as well as during the Phase 2 Community Risk Assessment Workshops with respect to the unfamiliarity of animals to noise of trains or as mitigation to avoid collisions (ERM, 2019). Noise related to shipping is discussed under Section 4.16.11

#### Monitoring Activities

In 2018 Baffinland engaged an external noise and vibration expert consultant, RWDI, to develop and implement a testing program at the Project Site and to provide training to Baffinland staff on new equipment. Monitoring of noise and vibration was conducted in 2019 within the accommodation building at each Project site during the summer and winter according to mine health and safety regulations (PC Condition No. 14).

Table 4.8 provides a summary of noise effects monitored in 2019, and an evaluation of impacts relative to the predictions presented in the FEIS and FEIS Addendum.

**Table 4.8: Noise and Vibration Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Ambient Noise and Vibration	Disturbance of sleeping workers, affecting worker health and safety	Indoor noise and vibration levels were measured in the summer and winter of 2019. Occupational noise and vibration at Baffinland was assessed according to the Mine Health and Safety Act, Consolidation of Mine Health and Safety Regulation, R-125-95, Part IX and Schedule 5. The overall average noise levels recorded at the Mine Site in 2019 were consistent with those recorded in 2018, but greater than previous 3 years. Noise levels at Milne Port have been variable over the years; 2019 values were lower on average than years 2018 and 2016, but higher than 2017 and 2015. Vibration levels were higher in 2019 than 2018.	Effect within FEIS predictions
Underwater Vibration Levels	Increased vibration levels affecting fish in nearby watercourses	Noise monitoring during Freight Dock construction in Milne Port was undertaken in 2019; no explosives used within setback distances of watercourses in 2019.	Results consistent with FEIS predictions

**Path Forward**

Baffinland will continue to implement noise and vibration monitoring in relation to human health and safety twice per year, at each receptor location (Milne Port and Mine Site). Should results identify a need for noise or vibration reduction efforts, a plan will be formulated to address these concerns in consultation with stakeholders.

In 2020, Baffinland expects to complete in-water works associated with offsetting habitat associated with the construction of the Freight Dock at Milne Port as part of DFO Fisheries Authorization No. 18-HCAA-00160. The Fisheries Authorization describes the measures Baffinland must take to protect fish and fish habitat during construction, and monitoring required to be conducted during construction. The use of explosives (i.e. blasting) will not be required to complete the work.

Reporting on each PC condition is provided in the pages that follow.

## Project Certificate Condition No. 13

Category	Noise and Vibration - Use of Explosives
Responsible Parties	The Proponent, Fisheries and Oceans Canada
Project Phase(s)	Construction
Objective	To determine appropriate protection of fish and aquatic life in the Arctic.
Term or Condition	The Proponent is encouraged to work with Fisheries and Oceans Canada at the regulatory phase and to take a precautionary approach when selecting the overpressure threshold to be applied to explosives use for the protection of fish and aquatic life.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Fisheries and Oceans Canada, Nunavut Water Board, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board, Qikiqtani Inuit Association
Reference	Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2020f) Environmental Protection Plan (Baffinland, 2016b) Quarry Blasting Operations Management Plan (Baffinland, 2013b)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Baffinland's Surface Water and Aquatic Ecosystem Management Plan (SWAEMP) states that work requiring the use of explosives (blasting) in or near water bodies shall be carried-out in accordance with Fisheries and Oceans Canada guidance (Wright and Hopky, 1998), in order to mitigate possible effects on fish habitat and fish health. Blasting at the Project is conducted in accordance with Baffinland's Quarry Blasting Operations Management Plan and Environmental Protection Plan (EPP).

The aforementioned plans described above mitigate the possibility of an explosive to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous pressure change (i.e., overpressure) greater than 100 kPa (14.5 psi) in the swim bladder of a fish.

### RESULTS

Not applicable. No blasting occurred in 2019 within the required setback distances detailed in the DFO guidance document (Wright and Hopky, 1998).

### TRENDS

Not applicable. No blasting has occurred at the Project within the required setback distances of fish habitat, as stipulated by the aforementioned DFO guidance document.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.



## Project Certificate Condition No. 14

Category	Noise and Vibration - Noise and Vibration Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate noise and vibration at Project sites, especially living areas.
Term or Condition	The Proponent shall conduct noise and vibration monitoring at Project accommodations sites located at the Mary River mine site, Steensby Inlet Port site, and Milne Inlet Port site. Sampling shall be undertaken during the summer and winter months during all phases of Project development.
Relevant Baffinland Commitment	32
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	Consolidation of Mine Health and Safety Regulation, R-125-95 Noise and Vibration Surveys (HDS, 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/Appendix G">https://www.baffinland.com/media-centre/document-portal/Appendix G</a>

### METHODS

Noise and vibration monitoring at the Mine Site and Milne Port accommodations is scheduled annually by Baffinland Health and Safety staff. Monitoring uses a sound meter with microphone and a vibration pad with meter set-up in different rooms and wings of accommodation buildings at both sites. Monitoring is conducted in the summer and winter seasons. Noise or vibration concerns brought forth by employees are taken seriously and addressed on an as-needed basis. Occupational noise and vibration at Baffinland is assessed according to the *Mine Health and Safety Act, Consolidation of Mine Health and Safety Regulation, R-125-95, Part IX and Schedule 5*.

The numerical thresholds from which protection is required include 8-hour equivalent sound exposures equal to or greater than 85 dBA, based on the expectation that a worker has a sound environment of 75 dBA or less for the remainder of the day. The noise monitoring equipment is calibrated before and after use as well as between the periods.

Since the *Mine Health and Safety Act* does not provide specific numerical limits, 8-hour equivalent vibration criteria are taken from the European Physical Agents Vibration Directive – 2002/44/EC. For whole body vibration, the directive provides an exposure action value of 0.5 m/s<sup>2</sup>, and an exposure limit of 1.15 m/s<sup>2</sup>. The action value provides the threshold for increased vigilance to prevent reaching the exposure limit.

### RESULTS

In 2019, adaptive management continued to be employed to reduce noise and vibration near accommodation complexes:

- Quiet work hours continued to be implemented;
- Operation of equipment was limited in the vicinity of accommodation complexes, where practicable; and
- The Mine Site helicopter landing zone was relocated further away from the accommodations complexes during the morning and evening hours of the day.

Between June and December 2019, accommodations at the Mine Site Complex (MSC), Weatherhaven Camp, and Port Site Complex (PSC) were tested for noise and vibration.

Sleeping accommodation sound level measurements demonstrate levels that are well below the 75 dBA level for off-work hours that is associated with the 8-hour exposure criterion. Summary statistics of average noise measurements collected within sleeping accommodations are presented in Table 4.9.

Vibration measurements were below the applicable criteria, and are presented in Table 4.10.

**Table 4.9: Summary Statistics of 2019 Noise Monitoring Results**

Sampling Period	Average Noise Level (dBA)
Summer Monitoring	
Mine Site	44
Port Site	47
Winter Monitoring	
Mine Site	41
Port Site	44

**Table 4.10: Summary Statistics of 2019 Vibration Monitoring Results**

Sampling Period	Max Vibration Exposure ( $\text{m/s}^2$ )
Summer Monitoring	0.18
Winter Monitoring	0.085

## TRENDS

Overall average noise levels at the Mine Site in 2019 (43 dBA) were consistent with average recorded noise levels in 2018 (45 dBA). The 2019 average noise levels experienced an increase over average recorded noise levels in years prior to 2018 (28 dBA in 2017, 30.6 dBA in 2016, and 34.8 in 2015); however, values remained below 75 dBA exposure criteria. The gradual increase in noise levels may have been the result of additional construction activities that occurred in 2018 and 2019 in comparison to 2017. Overall, average noise recorded at Milne Port in 2019 (46 dBA) was lower than average noise recorded in 2018 (48 dBA), greater than average noise recorded in 2017 (43 dBA), and lower than average noise recorded in 2016 (50 dBA).

Vibration levels measured in 2019 (0.003 to 0.18  $\text{m/s}^2$ ) were higher than vibration levels measured in 2018 (0.001 to 0.008  $\text{m/s}^2$ ) but significantly less than vibration measured in 2017 (0.49  $\text{m/s}^2$ ).

## RECOMMENDATIONS / LESSONS LEARNED

To ensure that noise and vibrations at the accommodations within the Project Sites are not adversely affecting our employees and contractors, Baffinland will continue to monitor noise levels in relation to human health and safety.

Should the data identify a need for noise or vibration reduction efforts, a plan will be formulated to address these concerns in consultation with stakeholders.

### Project Certificate Condition No. 14 (a)

Erin Category	Noise and Vibration - Noise and Vibration Adaptive Management
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To mitigate potential impacts of noise to marine wildlife during project construction.
Term or Condition	The Proponent, through coordination with the MEWG as may be appropriate, shall demonstrate appropriate adaptive management for construction activities at Milne Inlet that have the potential to disrupt marine mammal species, including pile driving and ore dock construction, are undertaken.
Relevant Baffinland Commitment	32
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	Milne Ore Dock Construction Environmental Method Statement (PND Engineers, 2014) Environmental Protection Plan (EPP) (Baffinland, 2016b) Fisheries Act Authorization File No. 18-HCAA-00160 (DFO, 2019) Environmental Monitoring Completion Report, Milne Port Freight Dock Construction Project (Golder, 2020b) Sediment and Erosion Control Plan (SECP) (Golder, 2019b) Construction Environmental Management Plan (CEMP) (Golder, 2019c) Environmental Monitoring Completion Report for the Milne Port Freight Dock (Golder, 2019b)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

## METHODS

In 2019, Baffinland constructed a Freight Dock at Milne Port to support the import of containerised supplies, break-bulk, and special cargo during the 2019 shipping season and beyond. Installation of the Freight Dock involved nearshore and in-water construction activities in the marine environment between April and August 2019. Construction activities included impact and vibratory pile driving, rock fill placement and backfilling, and surficial sediment removal via dredging. In addition to the construction of the Freight Dock, the existing barge landing was expanded by 10 m width and 15 m in length (approximately 1,700 m<sup>3</sup> of fill). Removal of 1,700 m<sup>2</sup> of sea ice in the immediate infill area was required to complete expansion works. The expansion of the barge landing involved nearshore and in-water construction activities in the marine environment between May and August 2019.

In support of the above works, Golder prepared a SECP (Golder, 2019b) and a CEMP (Golder, 2019c). The SECP and CEMP outlined required mitigation, performance-based environmental monitoring objectives, and environmental protection measures to be implemented during construction of the freight dock and the extension of the barge landing at Milne Port (hereafter referred to as the 'Works'), to achieve compliance with Baffinland's overall EPP for the Project, applicable environmental legislation, and the *Fisheries Act* Authorization (FAA) (File No: 18-HCAA-00160, dated 21 March 2019) issued by Fisheries and Oceans Canada (DFO) for the proposed Works.

The FAA issued by DFO for the proposed Works included the following conditions related to mitigating potential adverse effects on marine mammals from underwater noise and vibration:

- While conducting vibratory pile driving, dredging and infilling, a marine mammal exclusion zone of 200 m radius shall be established. The marine mammal exclusion zone will be monitored for marine mammal presence starting 30 minutes prior to the commencement of vibratory pile driving, dredging or infilling activities. All activities shall cease if marine mammals are observed within the exclusion zone and shall not recommence until 30 minutes after the marine mammal was last observed or 30 minutes after the marine mammal is seen leaving the exclusion zone.
- Field measurements shall be undertaken to verify that underwater sound pressure and noise levels at the edge of the exclusion zone shall not exceed 100 dB re 1  $\mu$ Pa root-mean-square (rms) sound pressure level (SPL) to prevent auditory injury to marine mammals during construction. If measured underwater noise levels exceed the 100 dB threshold, the following contingency measures shall be implemented: expansion of the marine mammal exclusion zone and the installation of bubble curtains.
- In-air sound levels during the iced-season shall not exceed the in-air acoustic threshold of 100 dB re 20  $\mu$ Pa rms when pinnipeds are observed on the ice during construction activities.

Previous studies conducted in Milne Inlet have shown that ambient noise levels are naturally above 100 dB, which meant that using 100 dB as an acoustic threshold was untenable (ERM, 2015). An email was sent from Baffinland to DFO on 2 April, 2019, recommending the use of established acoustic injury thresholds for marine mammals as the basis for the exclusion zone boundary (in lieu of the 100 dB threshold stated in the FAA), and supporting this with underwater noise compliance monitoring at the edge of the exclusion zone during in-water works that had the potential to generate underwater noise (pile driving, dredging, etc.).

Underwater noise monitoring was performed during in-water activities that were considered to have potential for injury to marine mammals and fish. Potential noise sources during construction included continuous noise sources from dredging, drilling, vibratory pile driving, and rock infilling, as well as impulsive noise from impact pile driving. Injury management thresholds applied during environmental monitoring of construction activities on the Freight Dock are described in Table 4.11.

**Table 4.11: Underwater Noise Management Thresholds**

Noise Type	Indicator Group		
	Cetaceans (whales)	Pinnipeds (seals)	Fish
Continuous	180 dB rms re 1 $\mu$ Pa	190 dB rms re 1 $\mu$ Pa	207 dB peak re 1 $\mu$ Pa
Impulsive	212 dB peak re 1 $\mu$ Pa	212 dB peak re 1 $\mu$ Pa	207 dB peak re 1 $\mu$ Pa
	180 dB rms re 1 $\mu$ Pa	190 dB rms re 1 $\mu$ Pa	-

**Notes:** rms = root mean square; dB = decibels relative to 1  $\mu$ Pa.

Injury thresholds from the National Marine Fisheries Services were updated in 2016 to 202 dB and 218 dB for high-frequency cetaceans and pinnipeds exposed to impulsive noise sources. Golder conservatively retained the generic National Oceanic and Atmospheric Administration thresholds of 180 and 190 dB as a management threshold for this program.

During ice-cover conditions, noise levels were measured from the sea ice, by drilling a hole in the sea ice and deploying a hydrophone through the hole to obtain in-situ acoustic measurements (in addition to water quality

measurements). During open water conditions, underwater noise levels were measured from a vessel platform at the 200 m marine mammal exclusion zone boundary using a hydrophone deployed from the vessel. When access to the marine mammal exclusion boundary was not possible due to sea ice or weather restrictions, in-situ measurements were made where possible from the existing barge landing or from the end of the freight dock (as it was constructed) at a safe setback distance from construction activities.

Due to the potential for potential acoustic injury to marine mammals from certain construction activities, monitoring was performed for 30 minutes prior to the start of vibratory pile driving, dredging or infilling activities, as per the FAA. If there was any observation of a marine mammal within the 200 m marine mammal exclusion zone, all in-water works were immediately ceased. The activity of the marine mammal was monitored until it left the exclusion zone or 30 min had elapsed since the last time it was sighted within the exclusion zone. In-water works were allowed to resume 30 min following the observed exit (or last sighting) of the marine mammal from within the exclusion zone.

## RESULTS

Construction activities occurring in-water and/or nearshore were staggered during the April to August construction period, therefore acoustic compliance and marine mammal monitoring activities were not continuous during this period. Underwater noise levels of the proposed works were measured during their initial implementation to confirm sound levels were within the established acoustic thresholds at the edge of the exclusion zone. Once it was confirmed that the activities performed were compliant with the performance objectives and were not anticipated to result in any exceedances of the thresholds, acoustic monitoring was then implemented periodically throughout the construction program to verify the initial findings. During late May and early June, sea ice conditions became unstable and safety concerns were raised with respect to using the sea ice as a platform to collect in-situ measurements at the 200-m marine mammal exclusion zone boundary. During this period, measurements were made where possible from the edges of the freight dock or the existing landing barge. Despite the proximity to the in-water works, no exceedances of injury thresholds occurred. All measurements were below acoustic injury thresholds, and no exceedances occurred during any monitoring event.

During the early stage of the construction program, ringed seal were frequently observed hauled out on the sea ice in Assomption Harbour. None of these events occurred closer than 900 m from the proposed Works, and therefore, no “stop works” orders were required. Following ice break-out, ring seal were infrequently observed within the 200 m marine mammal exclusion zone and in the work area; these observations and the specific adaptive management responses are summarized in Table 4.12 During this period, other ringed seal were observed in the vicinity but outside of the exclusion zone. The locations of these seals were actively monitored to confirm they did not enter the work area.

**Table 4.12: Summary of Marine Mammal Observations within the 200 m Exclusion Zone**

Date	Species	Observations and Response
3 July 2019	Ringed seal	Swimming inside and outside of the silt curtain, diving within the dredge area and along the silt curtain edge during a break in dredging activities, In-water works resumed 30 min following the last observation of the seal within the exclusion zone.
14 July 2019	Ringed seal	Two seals were observed outside of the exclusion zone, one seal entered the 200 m boundary and the work area. The placement of scour material was halted following



Date	Species	Observations and Response
		the seal entering the exclusion zone. Work resumed 30 min following the last observation.
17 July 2019	Ringed seal	Observed within the 200 m exclusion zone, diving and surfacing inside and around the silt curtain. No in-water works was occurring at the time and work did not resume that day.
20 July 2019	Ringed seal	Observed diving and surfacing within the work area. No in-water works was occurring at the time of observation, and in-water works did not commence until two hours following the observation.
24 July 2019	Ringed seal	Observed within the exclusion zone, swimming along the silt curtain during rock placement activities in the dredge area. In-water works was stopped, resuming 30 min following the last observation of the seal.
31 July 2019	Ringed seal	Observed within the exclusion zone, swimming within the silt curtain. No in-water works was occurring at the time of observation. In-water works did not commence until 30 min following the last sighting within the exclusion zone.

#### TRENDS

Not applicable.

#### RECOMMENDATIONS / LESSONS LEARNED

Throughout the in-water construction works completed in 2019, Baffinland was able to successfully implement monitoring, mitigation and adaptive management to mitigate disruption to marine mammals. Baffinland will continue to comply with all aspects of Fisheries Act Authorizations for future in water works, and implement updated mitigation and adaptive management measures to protect marine mammals during in-water and nearshore construction works including pile driving, infilling, dredging and other dock construction activities.

## Project Certificate Condition No. 14 (b)

Category	Noise and Vibration- Noise and Vibration Adaptive Management
Responsible Parties	The Proponent
Project Phase(s)	Operations
Objective	To mitigate potential impacts of noise to wildlife and people during project operations.
Term or Condition	The Proponent, through coordination with the TEWG as may be appropriate, shall demonstrate appropriate adaptive management for project activities during operations which have the potential to produce noise and sensory disturbance to wildlife and other users of project areas.
Relevant Baffinland Commitment	32
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Air Quality and Noise Abatement Management Plan (Baffinland, 2020c)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Baffinland has procedures to minimize the impact of noise to people including regular maintenance of equipment to reduce unnecessary noise levels and the implementation of noise reduction rules in and around living quarters. As described in the Air Quality and Noise Abatement Management Plan, Baffinland is committed to ensuring that all mobile equipment is equipped with mufflers and that equipment is well-maintained.

Monitoring and adaptive management measures for Project activities to reduce noise and sensory disturbance to wildlife remains an open discussion with the TEWG allowing to receiving further feedback and recommendations.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to engage the TEWG regarding initiatives to reduce noise and sensory disturbance to wildlife. Baffinland, with support of a third-party consultant, intends on running a Zone of Influence (ZOI) Noise Monitoring Pilot Study (Pilot Study) in 2020. This is a pro-active action that Baffinland is making to ensure that it is fully characterizing the potential noise disturbance footprint and that it correlates to the theoretical ZOI. The primary objectives of the Pilot Study will be to characterize the noise produced by the Project near its main areas of activity (Mine Site, Tote Road, and Milne Port) and assess how this changes between sites and with distance from the Project Development Area (PDA). Baffinland intends to share the proposed approach and subsequent results with the TEWG as part of annual monitoring planning and reporting efforts. Baffinland also intends on updating its Air Quality and Noise Abatement Management Plan in 2020 by hiring a third-party consultant.

## Project Certificate Condition No. 15

Category	Noise and Vibration - Noise and Vibration Monitoring
Responsible Parties	The Proponent, Qikiqtani Inuit Association, local Hamlet organizations
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To enhance public safety when travelling around the Project area.
Term or Condition	The Proponent shall collaborate to the extent possible with the Qikiqtani Inuit Association and local Hamlet organizations when undertaking consultation with all affected communities regarding railway, tote road and marine shipping operations. During these consultations, it is recommended that the Proponent provide information including video, audio, and photographic representation as well as any other aids (i.e. models) that may enhance the general public's understanding of railway, tote road and marine shipping operations, as well as all safety considerations for members of the public who may be travelling around the project area.
Relevant Baffinland Commitment	32
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland continues to work with local Hamlet organizations and the Qikiqtani Inuit Association (QIA) regarding safety considerations for travel and interaction with the Project for those travelling in the area. In support of this, the QIA established the Mary River Community Group (which includes representatives from Baffinland, the Mittimatalik Hunters and Trappers Organization (MHTO) and the local Hamlet). In addition, the QIA and the MHTO are members of the Marine and Terrestrial Environment Working Groups.

During the June 21, 2019 MEWG meeting Baffinland reviewed the plans for the 2019 shipping schedule, mitigation and management, and communications protocol to be implemented during the 2019 shipping season. In addition, Baffinland hosted a pre-shipping season meeting in Pond Inlet with the Hamlet, MHTO, and QIA, and later developed a Shipping and Marine Monitoring Fact Sheet and a large map showing the Northern Shipping Route for distribution throughout Pond Inlet (e.g., Hamlet of Pond Inlet, museum, co-op). To improve communications regarding shipping, Baffinland created two (2) full-time Shipping Monitor roles based out of the Pond Inlet office located in the MHTO building to act as a liaison between community members, hunters and Baffinland. Daily vessel transit updates at various intervals throughout the day were provided to the community of Pond Inlet and land users using a variety of communication methods including announcements on local Pond Inlet radio, marine VHF radio (for hunters on the water) and via social media (Facebook). Baffinland hosted a shipping-related radio show during the fall to provide residents an opportunity to learn further about its shipping operations.

In order to support visual tracking of its vessels transiting to Milne Port, Baffinland contracted exactEarth® a global vessel monitoring and tracking service to track and report on vessel movements using Automatic Identification

System (AIS) technology. The ship tracks are accessible to residents of Pond Inlet at the Baffinland office on a large wall-mounted monitor and individual viewing computer station and, more generally, also publicly accessible through the Baffinland website during the shipping season.

The computer station set-up in Baffinland's Pond Inlet office also allowed visitors to view Baffinland reports, management plans, and general company information found on the online Document Portal of its corporate website. Baffinland continues to provide information related to the Project on the Baffinland corporate website including:

- Images of operational activities; and
- Ship tracks.

During Public Community Tours, Baffinland makes available posters showing Project components (Mine Site, Tote Road and Milne Port), and has a three-dimensional model showing the entire Project Area.

In addition to regular engagement with the QIA, including through IIBA Annual Project Review Forum, Baffinland held several meetings with local community organizations during 2019. These meetings are listed in Table 4.13.

Baffinland also hosted a site visit with MHTO in August 2018. The site visit included a discussion and mapping exercise of important travel areas in and near the Project area. Since then, Baffinland welcomes feedback from hunters on most appropriate areas to cross the Tote Road.

**Table 4.13: Community Group Meetings in 2019**

Date	Community Group	Location	Topic
January 7-11, 2019	5 North Baffin Communities	Sanirajak, Igloolik, Arctic Bay, Pond Inlet, Clyde River	Phase 2 Public Information Sessions
January 14, 2019	Elder and HTO Representatives from Sanirajak, Arctic Bay, Clyde River and QIA	Mary River Mine Site	Community Risk Assessment Workshop Session 1
January 30, 2019	MHTO	Pond Inlet	Follow-up to August 30 site visit, IIBA Commitments
January 30, 2019	MHTO, QIA	Pond Inlet	IIBA Program Update, Mine and Milne Post MHTO Cabins relocation
February 11, 2019	Elder and HTO Representatives from Pond Inlet, Sanirajak, Arctic Bay, Clyde River and QIA	Trois- Rivières	Community Risk Assessment Workshop Session 2
February 27, 2019	MHTO, QIA	Pond Inlet	Narwhal Harvest Season, Community Based Monitoring
March 26, 2019	Hamlet of Pond Inlet	Teleconference	Training Centre Update
March 26, 2019	Clyde River HTO	Clyde River	Phase 2
April 30, 2019	MHTO, QIA, Hamlet of Pond Inlet	Pond Inlet	Community Based Monitoring

Date	Community Group	Location	Topic
May 7, 2019	Elder and HTO Representatives from Pond Inlet, Sanirajak, Arctic Bay, Clyde River, and Igloolik	Mary River Mine Site	Community Risk Assessment Workshop Session 2
May 23, 2019	MHTO, Hamlet of Pond Inlet, QIA	Pond Inlet	Hunting Season Observations, Perceived interactions with project vessels, wildlife monitoring and mitigation
June 3-11, 2019	5 North Baffin Communities and Resolute Bay	Pond Inlet, Arctic Bay, Igloolik, Sanirajak, Clyde River, Resolute Bay	Public consultation meeting for Phase 2 proposal.
June 24, 2019	MHTO, Hamlet of Pond Inlet, QIA	Pond Inlet	Follow-up to Meeting of May 23 regarding harvesting
June 25, 2019	MHTO, Hamlet of Pond Inlet, QIA	Pond Inlet	2019 Pre Shipping Season Meeting and Follow-up to Meeting of May 23 regarding harvesting
July 2, 2019	North Baffin Mayors and HTOs, QIA	Mary River Mine Site	Discussion about Phase 2, direct project benefits and finding ways the Company and North Baffin Communities can work closer together.
August 21, 2019	Hamlet of Igloolik	Teleconference	Phase 2 Update
August 27, 2019	Hamlet and HTO	Arctic Bay	Phase 2 Update and Day Care Funding Announcement
September 2, 2019	Hamlet of Igloolik	Teleconference	Phase 2 Update
September 3, 2019	MHTO	Pond Inlet	Phase 2 Update, Rail Alignment
September 4, 2019	All North Baffin HTOs	Iqaluit	Phase 2 Update, Rail Alignment
September 4, 2019	Elder and HTO Representatives from Pond Inlet, Sanirajak, Arctic Bay, Clyde River	Iqaluit	Community Risk Assessment, Results Verification Workshop
September 9, 2019	Hamlet of Igloolik	Igloolik	Phase 2 Update
September 10, 2019	Pond Inlet Phase 2 Committee & MHTO	Pond Inlet	Rail Alignment September 10-11, 2019
September 11, 2019	Hamlet Council	Pond Inlet	Phase 2 Update, Rail Alignment and Community Benefits
September 12, 2019	Hamlet & HTO	Clyde River	Community Benefit Opportunities & Phase 2 - September 12-13
September 13, 2019	Clyde River Council and HTO	Clyde River	Phase 2 Update and Direct Community Benefits

Date	Community Group	Location	Topic
September 24, 2019	North Baffin Mayors and HTOs, QIA	Mary River	Discussion about Phase 2, direct project benefits and finding ways the Company and North Baffin Communities can work closer together.
November 13, 2019	Community	Arctic Bay	Public Meeting: Report on November NIRB Public Hearings and general Phase 2 discussion
November 26, 2019	Hamlet of Pond Inlet and MHTO	Pond Inlet	Discussion post Phase 2 Public Hearing and forward planning
November 29, 2019	Hamlet of Sanirajak	Teleconference	Discussion of Baffinland response to NIRB re: NTI Motion
November 29, 2019	Hamlet of Clyde River	Teleconference	Discussion of Baffinland response to NIRB re: NTI Motion
November 29, 2019	Hamlet of Arctic Bay	Teleconference	Discussion of Baffinland response to NIRB re: NTI Motion
December 11, 2019	Hamlet of Igloolik	Igloolik	Phase 2 Public hearing Followup and 2020 Work Planning

## RESULTS

Not applicable.

## TRENDS

Not applicable.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to work with the QIA, HTO representatives and local Hamlet organizations through the working groups and/or other venues to enhance the general public's understanding of the Project.



#### 4.6.4 Hydrology and Hydrogeology (PC Conditions 16 through 19)

Four (4) PC conditions relate to the potential effects of the Project on hydrology and hydrogeology. These conditions relate to aspects of the project that are regulated under Baffinland's Type A Water Licence (for mining) and Type B Water Licence (for mineral exploration).

##### **Stakeholder Feedback**

The NWB is the primary stakeholder regulating water use and waste disposal through its issuance of water licences. The QIA is also a key stakeholder, and has a Water Compensation Agreement in place with Baffinland, pursuant to Article 20 of the Nunavut Agreement (CIRNAC and Nunavut Tunngavik, 2010). Water diversions have the potential to impact fish and fish habitat, and DFO administers the fish and fish habitat sections of the Fisheries Act. Effects to water quantity have not been raised in 2019 consultation activities (Appendix B).

##### **Monitoring Activities**

Hydrology monitoring is undertaken by recording water use and reporting this information to the NWB under the water licence, and by operating six long-term seasonal hydrometric stations. Visual monitoring is conducted of water conveyance structures, including bridges and culverts.

The mining footprint remains small relative to the fully developed project, and hence water diversions associated with the project footprint are minor in scale.

The Type A Water Licence specifies water withdrawal limits. Under the authorization of the Type A Water Licence, freshwater was withdrawn during 2019 to sustain three key activities at the Project: potable water supply (domestic), dust suppression, and for miscellaneous (industrial) uses. During 2019, daily water volume withdrawal limits, stipulated in the Type A Water Licence, for domestic, industrial and dust suppression purposes were not exceeded at approved Project water sources, with the following exceptions:

- Although the total daily water withdrawal limit for Camp Lake (355.4 m<sup>3</sup>/day) was not exceeded in 2019, there were twelve (12) incidents where the daily water volume withdrawn for domestic purposes exceeded Camp Lake's domestic daily water withdrawal limit (203.8 m<sup>3</sup>/day). These twelve (12) incidents, detailed in the 2019 QIA and NWB Type A Water Licence Report, are believed to be a result of the mis-categorization of water volumes withdrawn for industrial purposes and operator error due to raw water capacity constraints. To prevent similar incidents from re-occurring, Baffinland plans to improve the documentation and categorization of water volumes withdrawn to support Project activities.
- There was one (1) incident where the daily water volume withdrawn for industrial purposes exceeded the KM 32 Lake daily water withdrawal limit (67.5 m<sup>3</sup>/day). The incident was the result of higher water use for temporary ice crossing construction on that day.
- During June, July, August and September several exceedances of source specific daily water withdrawal limits, outlined in the Type 'A' Water Licence, occurred at three (3) approved dust suppression water sources along the Tote Road (BG50, CV217 and CV233). All exceedances were based on the source specific daily water withdrawal limits, with annual withdrawal volumes being within the source specific withdrawal water limits stipulated in the Type 'A' Water Licence. Baffinland will continue to work on improving the enforcement of the source specific daily water withdrawal limits at approved water sources along the Tote Road.

Further discussion on the water withdrawals at the Project, including all supporting daily and monthly volumes, are provided in the 2019 QIA & NWB Annual Report for Operations.

Table 4.14 provides an evaluation of the Project's impacts on hydrology and hydrogeology based on monitoring activities completed in 2019, relative to predictions presented in the FEIS and FEIS Addendum.

**Table 4.14: Hydrology and Hydrogeology Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Water Usage	Water usage exceeding thresholds and affecting the aquatic environment	Measure/monitor and report water usage in accordance with water licence limits	Water usage generally within water licence limits. Effect within FEIS predictions
Water Diversions	Reductions or increases in water flow due to diversions	None; this is primarily a function of the growing Project footprint, particularly the open pit and waste rock stockpile	Minor; within FEIS predictions

#### Path Forward

Baffinland will continue to implement its Tote Road Earthworks Execution Plan (TREEP) and Hatch 2013 design in 2020, will continue to operate its long-term hydrometric network, and will monitor and report water use to the NWB under the company's water licences. Baffinland plans to improve the documentation and categorization of water volumes withdrawn to support Project activities and enforcement of the source specific daily water withdrawal limits at approved water sources.

## Project Certificate Condition No. 16

Category	Hydrology and Hydrogeology - Water Infrastructure
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To provide assurance that the potential impacts to flow and quantity of water in the Project area are minimized.
Term or Condition	The Proponent shall ensure that the water related infrastructure or facilities that are designed and constructed, including the modification of culverts, diversion of watercourses, and diversion of runoff into watercourses along the railway, access roads, port sites, the Milne Inlet Tote Road, and other areas of the Project site, are consistent with those proposed in the FEIS and FEIS Addendum in terms of type, location, and scope and that the requirements of all relevant regulatory authorities are satisfied advance of constructing those facilities.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), Environment and Climate Change Canada (ECCC), Fisheries and Oceans Canada (DFO), Nunavut Impact Review Board (NIRB), Nunavut Water Board (NWB), Qikiqtani Inuit Association (QIA)
Reference	Final Environmental Impact Statement (FEIS; Baffinland, 2012) FEIS Addendum - Early Revenue Phase (Baffinland, 2013a)
Ref. Document Link	N/A

### METHODS

Baffinland ensures that the water related infrastructure and facilities constructed at the Project are consistent with those proposed in the FEIS (Baffinland, 2012) and FEIS Addendum (Baffinland, 2013a).

### RESULTS

During 2019, the following work was completed on water related infrastructure and facilities at the Project:

- Continued assembly and installation of the sewage and potable water treatment plants associated with the Sailiivik Camp at the Mine Site and 380 person Site Accommodations at Milne Port;
- Assembly and commissioning of a pipeline to allow for the direct discharge of treated sewage effluent from the sewage treatment plant servicing the new Sailiivik Camp to the existing discharge location near Mary River;
- Maintenance and repair of the perimeter ditches associated with the Mine Site Crusher Facility;
- Continued operation of a dedicated wastewater treatment plant to treat effluent generated by the Waste Rock Facility and replacement and expansion of the geotextile liner of the Waste Rock Facility pond;
- Routine maintenance of surface water management infrastructure along the Milne Inlet Tote Road (i.e. culvert replacements and repair, etc.);
- Construction of berms, swales and ditches to improve surface water management at Milne Port, as outlined in the Milne Port Water Management Plan; and

- Initial construction works for the expansion of the Milne Port Ore Stockpile Facility and associated surface water management ponds.

Prior to the commencement of construction, the applicable regulatory approvals were obtained by Baffinland for the works listed above.

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Water related infrastructure and facilities constructed to date are generally consistent with those proposed in the FEIS (Baffinland, 2012) and FEIS Addendum (Baffinland, 2013a) in terms of type, location, and scope.

## Project Certificate Condition No. 17

Category	Hydrology and Hydrogeology - Effluent Management
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to water bodies from effluent.
Term or Condition	The Proponent shall develop and implement effective measures to ensure that effluent from project-related facilities and/or activities, including sewage treatment plants, ore stockpiles, and mine pit, satisfies all discharge criteria requirement established by the relevant regulatory agencies prior to being discharged into the receiving environment.
Relevant Baffinland Commitment	6
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Partial-Compliance
Stakeholder Review	Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), Environment and Climate Change Canada (ECCC), Nunavut Impact Review Board (NIRB), Nunavut Water Board (NWB), Qikiqtani Inuit Association (QIA)
Reference	Fresh Water Supply, Sewage and Wastewater Management Plan (FSWMP; Baffinland, 2020g) Metals & Diamond Mining Effluent Regulations (MDMER; Minister of Justice, 2018) Metals and Diamond Mining Effluent Regulations Emergency Response Plan (MDMER ERP; Baffinland, 2019e) Sampling Program - Quality Assurance and Quality Control Plan (Baffinland, 2020h) 2019 MDMER Annual Report (Baffinland, 2020i) 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Wastewater/effluent management practices and procedures are outlined in the Project's Fresh Water Supply, Sewage and Wastewater Management Plan (FSWMP; Baffinland, 2020g) and the Metals and Diamond Mining Effluent Regulations Emergency Response Plan (MDMER ERP; Baffinland, 2019e).

Water quality discharge criteria (discharge criteria) for effluent generated by the Project are stipulated in the Type A Water Licence issued by the NWB, and Schedules 4 and 5 of the MDMER (Minister of Justice, 2018).

Prior to discharge, wastewater (e.g. treated sewage, treated contact water, oily water, etc.) is sampled to ensure the wastewater's water quality meets the applicable discharge criteria. Wastewater that meets the applicable discharge criteria is discharged to the receiving environment. Water samples are routinely taken prior to and during wastewater discharges to ensure the water quality remains in compliance with the applicable discharge criteria. In the event that water quality sampling during a discharge indicates that the water quality has changed and is no longer in compliance with the applicable discharge criteria, the discharge of the non-compliant wastewater is halted.

Wastewater that does not meet the applicable discharge criteria is treated on-site using approved treatment methods (e.g. sewage treatment plants, mobile oily water treatment systems, WRF treatment plant, etc.) and is not

discharged to the receiving environment until it has been confirmed by water quality analysis that the treated wastewater meets the applicable discharge criteria.

All water sampling at the Project is conducted in accordance with the Project's Sampling Program - Quality Assurance and Quality Control Plan (Baffinland; 2020h).

As required by the Type A Water Licence, volumes and water quality analysis of all wastewater discharged to the receiving environment are reported to regulators (CIRNAC, NWB) on a monthly and annual basis. As a requirement of MDMER, volume and water quality results for discharges from the surface water management ponds associated with the Crusher Facility and Waste Rock Facility (WRF) at the Mine Site are reported to ECCC on a quarterly and annual basis.

## RESULTS

Effluents generated and managed by the Project in 2019 included sewage, contact water retained in surface water management ponds associated with ore and waste rock facilities and oily water retained in containment areas, such as bulk fuel facilities. Effluent treatment systems operated at the Project in 2019, included:

- Sewage Treatment Plants (STPs) at Milne Port (MP-01, MP-01B) and the Mine Site (MS-01, MS-01B);
- Dissolved Air Flotation (DAF) Treatment System at Milne Port to treat and discharge wastewater stored in Milne Port PWSP (MP-01A);
- Mobile Oily Water Treatment System (OWTS), at the Mine Site and Milne Port; and the,
- Waste Rock Facility Wastewater Treatment Plant (WRF WTP) at the Waste Rock Facility (MS-08), installed in 2018.

Five (5) discharges of effluent at the Project in 2019 did not comply with the applicable discharge criteria. These were single isolated events at each of the Mine Site STP (MS-01B), the WWTP at the WRF (MS-08) and the mobile OWTS at the Milne Port Contaminated Snow Containment Berm (MP-04A). These events are outlined as follows;

- On May 1, 2019, a treated sewage effluent sample collected from the Mine Site STP (MS-01B) servicing the Sailiivik Camp exceeded the applicable discharge criteria for total ammonia of 4 mg/L. The elevated ammonia concentration (9.45 mg/L) is believed to be the result of sampling error. The subsequent sampling event of the treated sewage effluent confirmed that total ammonia had returned to concentrations below the applicable discharge criteria.
- On November 12, 2019, a treated sewage effluent sample from the Mine Site STP (MS-01B) also exceeded the applicable discharge criteria for total ammonia (4 mg/L). The elevated ammonia concentration (47.0 mg/L) is believed to have been caused by temporary upset conditions at the Mine Site STP. The subsequent sampling event of the treated sewage effluent confirmed that total ammonia had returned to concentrations below the applicable discharge criteria. No other water quality exceedances involving treated sewage effluent at the Project were observed in 2019.
- During 2019, operation of the WRF WTP continued to prove to be effective at addressing the water quality concerns observed at the WRF in 2017. Beginning in June 2019, controlled discharges of treated effluent from the WRF Pond were conducted and resulted in no exceedances of the water license water quality discharge criteria in 2019 observed in samples collected under Schedule I of the Type 'A' Water Licence.



Additional effluent discharge sampling was completed to satisfy the requirements of the MDMER. Within those sampling events, there was one (1) exceedance of the MDMER maximum authorized monthly mean concentration for TSS of 15 mg/L and one (1) non-compliant discharge event of the MDMER grab sample criterion for TSS of 30 mg/L in 2019. The results of sampling completed to satisfy MDMER requirements are detailed in Baffinland's 2019 MDMER Annual Report (Baffinland, 2020i).

- On September 8, 2019, a treated effluent sample collected from the mobile OWTS, while stationed at the Contaminated Snow Containment Berm (MP-04A) which is part of the Milne Port Landfarm Facility (MP-04), had an elevated total lead concentration of 0.00117 mg/L; exceeding the applicable discharge criteria for total lead of 0.001 mg/L. Discharge of treated effluent from the mobile OWTS was halted on September 11, 2019, prior to receipt of the elevated total lead result from the analytical lab, and was not resumed in 2019. Due to the close proximity to freeze-up at the Project, subsequent sampling was not undertaken following receipt of the elevated total lead result. Potential causes of the exceedance include lab error, due to the close proximity of the discharge criterion to the analytical minimum detection limit (MDL), and the media used by the mobile OWTS being spent. No other water quality exceedances involving treated oily water effluent from the mobile OWTS were observed in 2019.

Periodic controlled discharges of the treated effluent from the Crusher Facility (CF) Pond occurred during August and September 2019. Controlled effluent discharges from the Crusher Facility in 2019 involved pumping retained surface water runoff from the CF Pond through a direct-discharge pipeline shared with the Mine Site STPs and releasing the effluent at an approved discharge point near the Mary River. During periods of discharge, water quality monitoring was conducted to ensure compliance with the applicable water quality discharge criteria outlined in the MDMER and the Type 'A' Water Licence. No exceedances of the applicable water quality discharge criteria were observed during the 2019 Crusher Facility effluent discharges.

2019 water quality exceedances for effluents monitored under the Type A Water Licence were reported to CIRNAC, the NWB and the QIA in the monthly monitoring reports prescribed by the Type A Water Licence. Water quality exceedances of the MDMER criterion were reported to ECCC and included in the annual MDMER report submission. A full discussion of the Project's 2019 monitoring results under the Type A Water Licence is provided in the 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a) and a description of the monitoring results under the MDMER is provided in the 2019 MDMER Annual Report (Baffinland, 2020i).

## TRENDS

Overall, the frequency of incidents involving the discharge of effluents to the receiving environment that exceed the applicable discharge criteria have remained low and incidental since the start of operations in 2014.

## RECOMMENDATIONS / LESSONS LEARNED

To ensure the accuracy of future water quality sampling results, Baffinland will continue to train all personnel involved with sampling effluents at the Project in the proper sampling practices and procedures, as outlined in the Project's Sampling Program - Quality Assurance and Quality Control Plan (Baffinland, 2020h).

To address the total ammonia exceedance observed at the STP servicing the Sailiivik Camp, the Standard Operating Procedure for the STP operation was updated. Baffinland will also continue to adjust process controls as necessary to optimize effluent treatment.

Baffinland plans to continue to operate the WRF WTP to treat contact water generated at the WRF as required in 2020. Since the commissioning and operation of the WRF WTP, Baffinland has increased the frequency and rigor of testing and sampling of WRF Pond effluent to optimize dosing requirements and reduce variances in Total Suspended Solids (TSS). Upgrades to the WRF WTP in 2020 include the addition of a second geotube settling pond to facilitate future maintenance requirements.

To address the total lead exceedance observed at the mobile OWTS in 2019, the media will be replaced prior to operation of the mobile OWTS in 2020. In addition, all operators of the mobile OWTS will be thoroughly trained in the system's operation to ensure the media continues to be replaced at the frequency recommended by the media's manufacturer.

Overall, the low frequency of non-compliant discharges involving effluents generated and managed by the Project are evidence of the effectiveness of the Project's wastewater/effluent management practices and procedures. Baffinland will continue to update the Project's management practices and procedures and implement new mitigation measures as required to ensure effluent discharges to the receiving environment are in compliance with applicable water quality discharge criteria.

## Project Certificate Condition No. 18

Category	Hydrology and Hydrogeology - Pit Lake Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To enhance predictions for mine site closure conditions.
Term or Condition	The Proponent shall carry out continued analyses over time to confirm and update, accordingly, the approximate fill time for the mine pit lake identified in the FEIS.
Relevant Baffinland Commitment	42
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), Nunavut Impact Review Board (NIRB), Nunavut Water Board (NWB), Qikiqtani Inuit Association (QIA)
Reference	Interim Closure and Reclamation Plan (Baffinland, 2018b)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

The latest revision of the Interim Closure and Reclamation Plan (ICRP; Baffinland, 2018b) discusses the estimated fill time for the mine pit lake.

### RESULTS

Current mining activities have not yet created a pit at Deposit No. 1. No additional information is available at this time to update the estimated fill time of the mine pit lake. A reclamation research program to evaluate the Open Pit flooding timeline is outlined in Appendix D.2 of the ICRP.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will update the estimated mine pit lake fill time in the ICRP as additional information becomes available through monitoring and implementation of the reclamation research program for Open Pit flooding.

## Project Certificate Condition No. 19

Category	Hydrology and Hydrogeology - Water Infrastructure Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts to natural water flow.
Term or Condition	The Proponent shall ensure that it develops and implements adequate monitoring and maintenance procedures to ensure that the culverts and other conduits that may be prone to blockage do not significantly hinder or alter the natural flow of water from areas associated with the proposed mine. In addition, the Proponent shall monitor, document and report the withdrawal rates for water removed and utilized for all domestic and industrial purposes.
Relevant Baffinland Commitment	57
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), Fisheries and Oceans Canada (DFO), Nunavut Water Board (NWB), Qikiqtani Inuit Association (QIA)
Reference	Environmental Protection Plan (EPP; Baffinland, 2016b) Fish Habitat Monitoring - 2019 Annual Report - Early Revenue Phase - Tote Road Upgrades (Baffinland, 2019f) Fisheries Authorization No. NU-06-0084 (For Tote Road Crossings; DFO, 2007) Roads Management Plan (Baffinland, 2020d) Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2020f) 2019 QIA & NWB Annual Report for Exploration and Geotechnical Drilling Activities (Baffinland, 2020b) 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Routine inspections of water crossings (i.e. culverts, bridges) at the Project are conducted throughout the year by road maintenance and environmental monitoring personnel to ensure water crossings are not obstructed and are working as designed. Monitoring and routine maintenance activities completed for Project water crossings are outlined in the Project's Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2020f), Roads Management Plan (Baffinland, 2020d) and Environmental Protection Plan (EPP; Baffinland, 2016b).

As a requirement of Baffinland's *Fisheries Act* Authorization for the Milne Inlet Tote Road (NU-06-0084; DFO, 2007), fish bearing water crossings at the Project are, at a minimum, assessed annually by a third-party Professional Fisheries Biologist. The assessment focuses on ensuring that surface water flows and fish passage is not being hindered or altered at Project fish bearing water crossings. The annual assessment is documented and summarized in an annual report (Baffinland, 2019f) submitted to Fisheries and Oceans Canada (DFO) each year. Baffinland's DFO Tote Road Report is included in Appendix G. Concerns identified by the annual assessment (i.e. perched culvert) are communicated to the Project's Road Maintenance Department for corrective action and promptly addressed.

As stipulated by the Project's Type A and B Water Licences, the Project is required to monitor, document and report the Project's water withdrawal rates from approved water sources. This information is submitted to the CIRNAC, the NWB and the QIA on a monthly basis for the Type A Water Licence, and compiled and presented annually in the 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a), as well as the water withdrawal under the Type B Water Licence in the 2019 QIA & NWB Annual Report for Exploration and Geotechnical Drilling (Baffinland, 2020b).

## RESULTS

During 2019, Baffinland continued to monitor Project water crossings to ensure surface water flows were not being hindered or altered. Routine preventative maintenance conducted at Project water crossing in 2019 included the clearing of snow and ice at the ends of culverts prior to and during freshet. No significant blockages that had the potential of hindering or altering surface water flow volumes downstream of Project water crossings were observed in 2019.

Water withdrawal rates in 2019 for approved water sources under the Type A and B Water Licences are presented in the 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a) and the 2019 QIA & NWB Annual Report for Exploration and Geotechnical Drilling Activities (Baffinland, 2020b), respectively.

Under Table 3 of the Type A Water Licence, source specific water withdrawal limits are specified for both domestic and industrial purposes for each approved water source. During 2019, daily water volume withdrawal limits, stipulated in the Type A Water Licence, for domestic, industrial and dust suppression purposes were not exceeded at approved Project water sources, with the following exceptions:

Although the total daily water withdrawal limit for Camp Lake (355.4 m<sup>3</sup>/day) was not exceeded in 2019, there were twelve (12) incidents where the daily water volume withdrawn for domestic purposes exceeded Camp Lake's domestic daily water withdrawal limit (203.8 m<sup>3</sup>/day). These twelve (12) incidents, detailed in Table 4.1, are believed to be a result of the mis-categorization of water volumes withdrawn for industrial purposes and operator error due to raw water capacity constraints. To prevent similar incidents from re-occurring, Baffinland plans to improve the documentation and categorization of water volumes withdrawn to support Project activities.

There was one (1) incident where the daily water volume withdrawn for industrial purposes exceeded the KM 32 Lake daily water withdrawal limit (67.5 m<sup>3</sup>/day). The incident was the result of higher water use for temporary ice crossing construction on that day.

During June, July, August and September several exceedances of source specific daily water withdrawal limits, outlined in the Type 'A' Water Licence, occurred at three (3) approved dust suppression water sources along the Tote Road (BG50, CV217 and CV233). All exceedances were based on the source specific daily water withdrawal limits, with annual withdrawal volumes being within the source specific withdrawal water limits stipulated in the Type 'A' Water Licence. Baffinland will continue to work on improving the enforcement of the source specific daily water withdrawal limits at approved water sources along the Tote Road.

Further discussion on the water withdrawals at the Project, including all supporting daily and monthly volumes, are provided in the 2019 QIA & NWB Annual Report for Operations.

## TRENDS

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to monitor Project water crossings and conduits to ensure that surface water flows are not being significantly hindered or altered.

As required by the Type A and B Water Licences, Baffinland will continue to monitor, document and report water withdrawal rates from approved water sources to the appropriate agencies.

Baffinland plans to improve the documentation and categorization of water volumes withdrawn to support Project activities. Baffinland will continue to work on improving the enforcement of the source specific daily water withdrawal limits at approved water sources.



#### 4.6.5 Groundwater & Surface Water (PC Conditions 20 through 30)

Eleven (11) PC conditions relate to the potential impacts of the Project on groundwater and surface water. There is overlap in the scope of these PC conditions with PC Conditions 16 to 19 for hydrology and hydrogeology. Several of the conditions require the development of management plans. These conditions also overlap with aspects of the Project that are regulated under Baffinland's Type A Water Licence (for mining) and Type B Water Licence (for mineral exploration). PC Conditions 29 and 30 require Baffinland to submit construction designs, as-built drawings and site-specific management plans to the relevant regulatory agency, as required under Part D of the Type A Water Licence.

##### **Stakeholder Feedback**

As described in Section 4.6.3 (Hydrology and Hydrogeology), the NWB is the primary stakeholder regulating water use and waste disposal through its issuance of water licences. The QIA is also a key stakeholder; the QIA and Baffinland have a Water Compensation Agreement should the Project substantially affect the quality, quantity or flow of water through IOL. ECCC is a key regulator administering the section of the *Fisheries Act* regarding the prohibition on the release of deleterious substances to fish-bearing waters. Groundwater is limited to minor seepage through the active layer during the brief snow-free period. Surface water quality, however, is a key resource to Inuit and to regulatory agencies, and it is among the most closely regulated aspects of the environment through effluent monitoring and an aquatic effects monitoring program under the Project's water licences. In 2019, community members have expressed concern regarding the potential for dust to impact water quality in local streams (Appendix B).

##### **Monitoring Activities**

Throughout 2019, Baffinland continued to implement the Surveillance Network Program (SNP) outlined in Schedule I of the Type 'A' Water Licence, analyzing effluents (i.e. treated sewage, treated oily stormwater) discharged to the receiving environment and monitoring surface water quality within specific Project areas (i.e. surface water runoff downstream of Project areas). Based on a review of 2019 SNP results reported to the NWB, CIRNAC and the QIA, exceedances of applicable discharge criteria in 2019 involved mainly surface water runoff and effluents with elevated total suspended solids (TSS) levels. In each case, appropriate control measures were implemented to restore TSS levels below applicable discharge criteria. Baffinland continues to assess and implement the appropriate corrective and mitigation measures to address ongoing sedimentation concerns at the Project.

In 2019, Baffinland implemented the Tote Road Monitoring Program to assess Project-related impacts to surface water resulting from sedimentation and erosion events. The program evaluates upstream and downstream concentrations of total suspended solids in surface water proximal to the Tote Road at select crossings considered representative of the respective catchment areas, where fisheries crossings have been identified, and other sources of sedimentation such as snow stockpiles and historic borrow sources. The monitoring conducted in 2019 did not identify any project-related impacts to surface water quality throughout the freshet season and the remainder of the summer season.

In addition to the above monitoring programs, Baffinland implements ongoing environmental monitoring and effects studies, including the Project's Aquatic Effects Monitoring Plan (AEMP), in accordance with the Type A Water Licence and PC terms and conditions.

Table 4.15 provides an evaluation of the Project's impacts on groundwater and surface water, based on monitoring activities completed in 2019, relative to predictions presented in the FEIS and FEIS Addendum.

**Table 4.15: Groundwater and Surface Water Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Groundwater Quality	Adverse seepage from project areas (landfill, landfarm, waste rock stockpile) affecting groundwater quality	A groundwater monitoring program was continued at the landfill in 2019. There are no established groundwater quality criteria in Nunavut. Future monitoring will seek to establish trends.	N/A
Surface Water Quality	Releases of TSS or other changes in water quality due to point-source discharges (i.e., stormwater and sewage effluents)	Effluents are monitored prior to discharge under the SNP; the receiving aquatic environment is monitored in accordance with the AEMP.	Elevated TSS concentrations detected downstream of Project infrastructure and water crossings during freshet; within FEIS predictions.  Discharges of effluent at the Project met the applicable discharge criteria, with the exception of three (3) events involving minor water quality exceedances of discharge criteria outlined in the Type A Water Licence, with no exceedances of MDMER discharge criteria occurring in 2018.
	Releases of TSS or other changes in water quality due to non-point source releases (i.e., erosion and sedimentation)	Runoff from ground disturbance areas (construction areas, quarries) are monitored for TSS; site is inspected visually for evidence of erosion and sedimentation, with follow-up sampling if required.	TSS exceedances occurred at the Mine.  No project-related releases of TSS identified along the Tote Road corridor.  ECCC issued a Direction under the <i>Fisheries Act</i> , which Baffinland implemented satisfactorily. Erosion and sedimentation impacts were within FEIS predictions.
	Releases of TSS or other changes in water quality due to airborne emissions	Site is inspected visually for evidence of erosion and sedimentation, with follow-up sampling if required. Lake sedimentation monitored under the AEMP.	Ore dust runoff did not exceed FEIS predictions

**Path Forward**

Baffinland will continue to implement the TREEP and other sedimentation and erosion mitigation measures in 2020, will continue to operate its long-term hydrometric network, and will monitor effluents and receiving waters in accordance with Type A Water Licence and AEMP.

Baffinland plans to continue the groundwater monitoring program in 2020, and plans to implement an expansion to the program to gain a better understanding of natural groundwater chemistry at the Project site. Due to challenges associated with sampling methodologies for groundwater data collection in a permafrost environment and the challenges in interpreting this data, however, long-term trends will likely not be identified even with an expanded dataset. Despite these operational challenges, Baffinland is committed to retaining groundwater consultants that are knowledgeable in Arctic environments, to further assess the current program and provide recommendations in 2020. Following 2020, Baffinland will provide further recommendations to the NWB and other relevant parties.

## Project Certificate Condition No. 20

Category	Groundwater/Surface Waters - Explosives
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure that the effects associated with the manufacturing, storage, transportation and use of explosives do not negatively impact the areas surrounding the Project.
Term or Condition	The Proponent shall monitor the effects of explosives residue and related by-products from Project-related blasting activities as well as develop and implement effective preventative and/or mitigation measures, including treatment, if necessary, to ensure that the effects associated with the manufacturing, storage, transportation and use of explosives do not negatively impact the Project and surrounding areas.
Relevant Baffinland Commitment	57, 65
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), Nunavut Water Board (NWB), Qikiqtani Inuit Association (QIA)
Reference	Aquatic Effects Monitoring Plan (Baffinland, 2015a) Canadian Water Quality Guidelines for the Protection of Aquatic Life - Nitrate Ion (CCME, 2012) Canadian Water Quality Guidelines for the Protection of Aquatic Life - Ammonia (CCME, 2010) Sampling Program - Quality Assurance and Quality Control Plan (Baffinland, 2020h) 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Surface water runoff downstream of Project mining areas and quarries is monitored as prescribed by the Type A Water Licence, with water quality results reported to CIRNAC, the NWB and the QIA on a monthly and annual basis. Water samples are collected using the practices and procedures described in Baffinland's Sampling Program - Quality Assurance and Quality Control Plan (QA/QC Plan; Baffinland, 2020h), which is an approved plan under the Type A Water Licence.

In addition, the Aquatic Effects Monitoring Plan (AEMP; Baffinland, 2015a), a follow-up monitoring program identified in Baffinland's FEIS and prescribed by the Baffinland's Type A Water Licence, monitors the receiving aquatic environment downstream of Project activities at the Mine Site.

### RESULTS

During 2019, surface water runoff downstream of active quarries and mining areas were monitored for the water quality parameters outlined by the Type A Water Licence, including parameters related to explosives residue, such as ammonia and nitrate. Although select water samples collected downstream of active quarries and mining areas showed elevated ammonia and nitrate levels in comparison to baseline concentrations, the majority of grab samples

were below the established Canadian Council of Ministers of the Environment (CCME) water quality guidelines for ammonia and nitrate (CCME, 2010; CCME, 2012). All acute toxicity water samples collected in 2019 downstream of Project quarries and mining areas were demonstrated to be acutely non-lethal. A complete discussion of the 2019 water quality monitoring results collected under the Type A Water Licence is provided in the 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a).

Monitoring under the AEMP in 2019 included the Core Receiving Environment Monitoring Program (CREMP), a key component of the AEMP used to detect Project-related changes in water quality, sediment quality, phytoplankton (chlorophyll a), benthic invertebrate community metrics, and arctic char (*Salvelinus alpinus*) populations in lakes and streams near the Mine Site. Evidence of Project-related change was observed in Camp Lake and Sheardown Lake systems as well as the Mary River. Within these systems, elevated levels of nitrate and/or ammonia were observed in 2019 when compared to baseline and/or reference conditions, however no adverse effects to phytoplankton, benthic invertebrates or arctic char were indicated. The 2019 AEMP reports, including a complete analysis and discussion of the 2019 CREMP results, are provided in the 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020b).

### **TRENDS**

Overall, 2019 monitoring results for surface water runoff and aquatic environments downstream of Project mining areas and quarries were generally consistent with monitoring results observed in 2018.

### **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to monitor surface water runoff and aquatic environments downstream of Project mining areas and quarries as outlined in the Type A Water Licence and the Project's AEMP (Baffinland, 2015a).

## Project Certificate Condition No. 21

Category	Groundwater/Surface Waters - Aquatic Effects Monitoring Plan and Dustfall Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations
Objective	To mitigate potential impacts to surface and ground waters.
Term or Condition	<p>The Proponent shall ensure that the scope of the Aquatic Effects Monitoring Plan (AEMP) includes, at a minimum:</p> <ul style="list-style-type: none"> <li>a. Monitoring of non-point sources of discharge, selection of appropriate reference sites, measures to ensure the collection of adequate baseline data and the mechanisms proposed to monitor and treat runoff, and sample sediments</li> <li>b. Measures for dustfall monitoring designed as follows: <ul style="list-style-type: none"> <li>i. To establish a pre-trucking baseline and collect data during Project operation for comparison</li> <li>ii. To facilitate comparison with existing guidelines and potentially with thresholds to be established using studies of Arctic char egg survival and/or other studies recommended by the Terrestrial Environment Working Group (TEWG)</li> <li>iii. To assess the seasonal deposition (rates, quantities) and chemical composition of dust entering aquatic systems along representative distance transects at right angles to the Tote Road and radiating outward from Milne Port and the Mine Site.</li> </ul> </li> </ul>
Relevant Baffinland Commitment	2
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Crown-Indigenous and Northern Affairs Canada (CIRNAC), Nunavut Impact Review Board (NIRB), Nunavut Water Board (NWB), Qikiqtani Inuit Association (QIA)
Reference	<p>Aquatic Effects Monitoring Plan (Baffinland, 2015a)</p> <p>Final Environmental Impact Statement (FEIS; Baffinland, 2012)</p> <p>Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)</p> <p>2019 QIA &amp; NWB Annual Report for Operations (Baffinland, 2020a)</p>
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/Appendix G">https://www.baffinland.com/media-centre/document-portal/Appendix G</a>

### METHODS

The Aquatic Effects Monitoring Plan (AEMP) was submitted to the NWB on June 27, 2014, as required by the Type A Water Licence, and was subsequently approved by the NWB. On October 31, 2015, Revision 1 of the AEMP was submitted to the NWB and subsequently approved. Revision 1 of the AEMP focused on updating the Plan to reflect Amendment No. 1 of the Type A Water Licence.

The AEMP has been structured to serve as an overarching ‘umbrella’ that conceptually provides an opportunity to integrate results of individual but related aquatic monitoring programs including water and sediment quality, dustfall monitoring and freshwater biota and fish health. Key component studies of the AEMP that were conducted in 2019,



included the Core Receiving Environment Monitoring Program (CREMP), Lake Sedimentation Monitoring Program and the Dustfall Monitoring Program.

The CREMP evaluates potential mine-related influences on water quality, sediment quality, and/or biota (including phytoplankton, benthic invertebrates and fish) within aquatic environments near the Mine Site. Under the CREMP, receiving aquatic environments near the Mine Site are monitored during several periods throughout the year and include the Camp Lake, Sheardown Lake and Mary Lake Systems, as well as Reference Lake 3 and several reference tributaries. The AEMP includes benchmarks and an action framework to evaluate monitoring data and determine next steps and/or corrective actions, if required.

The Lake Sedimentation Monitoring Program monitors dust and sediment deposition rates in Sheardown Lake NW in an effort to better understand and evaluate potential mine-related influences on biota (e.g. fish larvae hatching success). Currently, the Lake Sedimentation Monitoring Program is conducted annually and involves the deployment and retrieval of submerged sediment traps to determine sediment deposition rates, density and thickness during ice-cover and open water periods.

Annual monitoring reports for both the CREMP and Lake Sedimentation Monitoring Program provide further discussion of the methods used and annual monitoring results, and are provided as appendices to the 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a).

The Dustfall Monitoring Program is performed annually with sampling stations established at the Mine Site, Milne Port, along the Milne Inlet Tote Road and at reference sites located at various distances from Project operations.

The three (3) main objectives of the Dustfall Monitoring Program are as follows:

1. To quantify the extent, magnitude and composition of dustfall generated by Project activities;
2. To determine seasonal variations in dustfall; and
3. To assess annual changes in dustfall at sampling locations relative to thresholds associated with the models and assessments performed in the Final Environmental Impact Statement (FEIS; Baffinland, 2012).

Results collected under the dustfall monitoring program are provided on an annual basis to NIRB and other relevant regulatory agencies and stakeholders in the Terrestrial Environment Annual Monitoring Report.

## RESULTS

Reports discussing the 2019 results for the CREMP and Lake Sedimentation Monitoring Program are provided in Appendix G and as appendices to the 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a). The 2019 results of the Dustfall Monitoring Program are presented in Appendix G in the Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020).

The current revision of the Project's AEMP (Rev. 1; Baffinland, 2015a) meets the requirements and intended scope outlined in PC Condition 21 and has been approved by the NWB.

## TRENDS

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to work with appropriate stakeholders and regulatory agencies to identify required revisions to the AEMP and associated environmental monitoring programs. Baffinland submitted Revision 2 of the AEMP in April 2016 to the NWB and continues to work with the appropriate stakeholders and regulatory agencies to finalize the revision. In November 2017, Baffinland chaired a freshwater workshop in Iqaluit, Nunavut to further discuss and justify the proposed changes to the CREMP outlined in Revision 2 of AEMP. Attending participants of the freshwater workshop included the NWB, QIA, CIRNAC, GN and ECCC.

An updated Revision 2 of the AEMP incorporating points of discussion from the freshwater workshop was submitted as part of the supporting documentation for the water licence amendment application for the Phase 2 Proposal. Pending the review and approval of the Phase 2 Proposal, Baffinland will implement the Revision 2 of the AEMP following further stakeholder feedback.

## Project Certificate Condition No. 22

Category	Groundwater/Surface Waters - Sediment and Erosion Management Plan
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To develop appropriate sediment and erosion controls to prevent impacts to surface waters.
Term or Condition	The Proponent shall develop a detailed Sediment and Erosion Management Plan to prevent and/or mitigate sediment loading into surface water within the Project area.
Relevant Baffinland Commitment	57
Reporting Requirement	Plan to be provided to the NIRB for review and comment at least 60 days prior to commencement of construction activities.
Status	In-Compliance
Stakeholder Review	Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), Nunavut Impact Review Board (NIRB), Nunavut Water Board (NWB), Qikiqtani Inuit Association (QIA)
Reference	Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2020f)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

A comprehensive sediment and erosion management plan is incorporated into Baffinland's Surface Water and Aquatic Ecosystem Management Plan (SWAEMP; Baffinland, 2020f). An earlier revision of the SWAEMP was submitted to and approved by the NWB prior to the commencement of Early Revenue Phase construction.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 23

Category	Groundwater / Surface Waters - Groundwater Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent impacts to groundwater quality.
Term or Condition	The Proponent shall develop and implement a Groundwater Monitoring and Management Plan to monitor, prevent and/or mitigate the potential effects of the Project on groundwater within the Project area.
Relevant Baffinland Commitment	57
Reporting Requirement	Plan to be provided to the NIRB for review and comment at least 60 days prior to commencement of construction activities.
Status	In-Compliance
Stakeholder Review	Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), Nunavut Impact Review Board (NIRB), Nunavut Water Board (NWB), Qikiqtani Inuit Association (QIA)
Reference	Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2020f) 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a) 2019 Groundwater Monitoring Report (Baffinland, 2020j)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

A groundwater monitoring program, involving the installation of shallow groundwater wells downstream of Project infrastructure, is discussed in Baffinland's Surface Water and Aquatic Ecosystem Management Plan (SWAEMP; Baffinland, 2020f).

Baffinland continued to implement the groundwater monitoring program, as outlined in the 2019 Groundwater Monitoring Report in Appendix G. In September 2019, Baffinland installed shallow groundwater wells up-gradient and down-gradient of the Mine Site Non-Hazardous Waste Landfill Facility (Landfill Facility) using drive-point piezometers. Groundwater wells were established to the depth of permafrost (approx. 1.1 to 1.8 meters) and water samples were collected near the depth of the active layer. The methodology for the 2019 groundwater monitoring program is detailed in the 2019 QIA and NWB Annual Report for Operations (Baffinland, 2020a).

### RESULTS

During the 2019 program, groundwater was sampled at three (3) monitoring wells down-gradient and two (2) monitoring wells up-gradient of the Landfill Facility. Water quality results for groundwater samples collected during the 2019 program did not demonstrate any significant trends that would allow for evaluation of potential water quality changes associated with the Landfill Facility. Due to the limited data set collected to date for groundwater chemistry, further groundwater monitoring and assessment of the stratigraphy is required to gain a better understanding of the natural groundwater chemistry and hydrogeology at the Project Site.

### TRENDS

As additional monitoring is conducted in future years, Baffinland will be able to better characterize natural groundwater chemistry at the Project and identify any trends, including potential impacts from Project activities or

infrastructure. Due to challenges associated with sampling methodologies for groundwater data collection in a permafrost environment and the challenges in interpreting this data, however, long-term trends will likely not be identified even with an expanded dataset.

#### **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland plans to continue the groundwater monitoring program in 2020, and plans to implement an expansion to the program to gain a better understanding of natural groundwater chemistry at the Project site. Due to challenges associated with sampling methodologies for groundwater data collection in a permafrost environment and the challenges in interpreting this data, however, long-term trends will likely not be identified even with an expanded dataset. Despite these operational challenges, Baffinland is committed to retaining groundwater consultants that are specialized in Arctic environments, to further assess the current program and provide recommendations in 2020. Following the 2020 year, Baffinland will provide further recommendations.

## Project Certificate Condition No. 24

Category	Groundwater/Surface Waters - Effluent Management
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts to groundwater and surface waters from effluent discharge.
Term or Condition	The Proponent shall monitor as required the relevant parameters of the effluent generated from Project activities and facilities and shall carry out treatment if necessary to ensure that discharge conditions are met at all times.
Relevant Baffinland Commitment	6
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Partially-Compliant
Stakeholder Review	Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), Environment and Climate Change Canada (ECCC), Nunavut Impact Review Board (NIRB), Nunavut Water Board (NWB), Qikiqtani Inuit Association (QIA)
Reference	Fresh Water Supply, Sewage and Wastewater Management Plan (FSWMP; Baffinland, 2020g) Metals & Diamond Mining Effluent Regulations (MDMER; Minister of Justice, 2018) Metals and Diamond Mining Effluent Regulations Emergency Response Plan (MDMER ERP; Baffinland, 2019e) Sampling Program - Quality Assurance and Quality Control Plan (Baffinland, 2020h) 2019 MDMER Annual Report (Baffinland, 2020i) 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Wastewater/effluent management practices and procedures are outlined in the Project's Fresh Water Supply, Sewage and Wastewater Management Plan (FSWMP; Baffinland, 2020g) and the Metals & Diamond Mining Effluent Regulations Emergency Response Plan (MDMER ERP; Baffinland, 2019e).

Water quality discharge criteria (discharge criteria) for effluent generated by the Project are stipulated in the Type A Water Licence issued by the NWB, and Schedules 4 and 5 of the Metals and Diamond Mining Effluent Regulations (MDMER, 2018).

Prior to discharge, wastewater (e.g. treated sewage, treated contact water, oily water, etc.) is sampled to ensure the wastewater's water quality meets the applicable discharge criteria. Wastewater that meets the applicable discharge criteria is discharged to the receiving environment. Water samples are routinely taken during wastewater discharges to ensure the water quality remains in compliance with the applicable discharge criteria. In the event that water quality sampling during a discharge indicates that the water quality has changed and is no longer in compliance with the applicable discharge criteria, the discharge of the non-compliant wastewater is halted.

Wastewater that does not meet the applicable discharge criteria is treated on-site using approved treatment methods (e.g. sewage treatment plants, mobile oily water treatment systems, WRF WTP, etc.) and is not discharged

to the receiving environment until it has been confirmed by water quality analysis that the treated wastewater meets the applicable discharge criteria.

All water sampling at the Project is conducted in accordance with the Project's Sampling Program - Quality Assurance and Quality Control Plan (Baffinland; 2020h).

As required by the Type A Water Licence, volumes and water quality analysis of wastewater discharged to the receiving environment are reported to regulators (CIRNAC, NWB) on a monthly and annual basis. As a requirement of the MDMER, volume and water quality results for discharges from the surface water management ponds associated with the Crusher Facility (CF) and Waste Rock Facility (WRF) at the Mine Site are reported to ECCC on a quarterly and annual basis.

## RESULTS

Effluents generated and managed by the Project in 2019 included sewage, contact water retained in surface water management ponds associated with ore and waste rock facilities and oily water retained in containment areas, such as bulk fuel facilities. Effluent treatment systems operated at the Project in 2019, included:

- Sewage Treatment Plants (STPs) at Milne Port (MP-01, MP-01B) and the Mine Site (MS-01, MS-01B);
- Dissolved Air Flotation (DAF) Treatment System at Milne Port to treat and discharge wastewater stored in Milne Port PWSP (MP-01A);
- Mobile Oily Water Treatment System (OWTS), at the Mine Site and Milne Port; and the,
- Waste Rock Facility Wastewater Treatment Plant (WRF WTP) at the Waste Rock Facility (MS-08), installed in 2018.

Five (5) discharges of effluent at the Project in 2019 did not comply with the applicable discharge criteria. These were single isolated events at each of the Mine Site STP (MS-01B), the WWTP at the WRF (MS-08) and the mobile OWTS at the Milne Port Contaminated Snow Containment Berm (MP-04A).

- On May 1, 2019, a treated sewage effluent sample collected from the Mine Site STP (MS-01B) servicing the Sailiivik Camp exceeded the applicable discharge criteria for total ammonia of 4 mg/L. The elevated ammonia concentration (9.45 mg/L) is believed to be the result of sampling error. The subsequent sampling event of the treated sewage effluent confirmed that total ammonia had returned to concentrations below the applicable discharge criteria.
- On November 12, 2019, a treated sewage effluent sample from the Mine Site STP (MS-01B) also exceeded the applicable discharge criteria for total ammonia (4 mg/L). The elevated ammonia concentration (47.0 mg/L) is believed to have been caused by temporary upset conditions at the Mine Site STP. The subsequent sampling event of the treated sewage effluent confirmed that total ammonia had returned to concentrations below the applicable discharge criteria. No other water quality exceedances involving treated sewage effluent at the Project were observed in 2019.
- During 2019, operation of the WRF WTP continued to prove to be effective at addressing the water quality concerns observed at the WRF in 2017. Beginning in June 2019, controlled discharges of treated effluent from the WRF Pond were conducted and resulted in no exceedances of the water license water quality discharge criteria in 2019 observed in samples collected under Schedule I of the Type 'A' Water Licence. Additional effluent discharge sampling was completed to satisfy the requirements of the MDMER. Within



those sampling events, there was one (1) exceedance of the MDMER maximum authorized monthly mean concentration for TSS of 15 mg/L and one (1) non-compliant discharge event of the MDMER grab sample criterion for TSS of 30 mg/L in 2019. The results of sampling completed to satisfy MDMER requirements are detailed in Baffinland's 2019 MDMER Annual Report (Baffinland, 2020i).

- On September 8, 2019, a treated effluent sample collected from the mobile OWTS, while stationed at the Contaminated Snow Containment Berm (MP-04A) which is part of the Milne Port Landfarm Facility (MP-04), had an elevated total lead concentration of 0.00117 mg/L; exceeding the applicable discharge criteria for total lead of 0.001 mg/L. Discharge of treated effluent from the mobile OWTS was halted on September 11, 2019, prior to receipt of the elevated total lead result from the analytical lab, and was not resumed in 2019. Due to the close proximity to freeze-up at the Project, subsequent sampling was not undertaken following receipt of the elevated total lead result. Potential causes of the exceedance include lab error, due to the close proximity of the discharge criterion to the analytical Minimum Detection Limit (MDL), and the media used by the mobile OWTS being spent. No other water quality exceedances involving treated oily water effluent from the mobile OWTS were observed in 2019.

Periodic controlled discharges of the treated effluent from the Crusher Facility (CF) Pond occurred during August and September 2019. Controlled effluent discharges from the Crusher Facility in 2019 involved pumping retained surface water runoff from the CF Pond through a direct-discharge pipeline shared with the Mine Site STPs and releasing the effluent at an approved discharge point near the Mary River. During periods of discharge, water quality monitoring was conducted to ensure compliance with the applicable water quality discharge criteria outlined in the MDMER and the Type 'A' Water Licence. No exceedances of the applicable water quality discharge criteria were observed during the 2019 Crusher Facility effluent discharges.

2019 water quality exceedances for effluents monitored under the Type A Water Licence were reported to CIRNAC, the NWB and the QIA in the monthly monitoring reports prescribed by the Type A Water Licence. Water quality exceedances of the MDMER criterion were reported to ECCC and included in the annual MDMER report submission. A full discussion of the Project's 2019 monitoring results under the Type A Water Licence is provided in the 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a) and a description of the monitoring results under the MDMER is provided in the 2019 MDMER Annual Report (Baffinland, 2020i).

## TRENDS

Overall, the frequency of incidents involving the discharge of effluents to the receiving environment that exceed the applicable discharge criteria have remained low and incidental since the start of operations in 2014.

## RECOMMENDATIONS / LESSONS LEARNED

To ensure the accuracy of future water quality sampling results, Baffinland will continue to train all personnel involved with sampling effluents at the Project in the proper sampling practices and procedures, as outlined in the Project's Sampling Program - Quality Assurance and Quality Control Plan (Baffinland, 2020h).

To address the total ammonia exceedance observed at the STP servicing the Sailiivik Camp, the Standard Operating Procedure for the STP operation was updated. Baffinland will also continue to adjust process controls as necessary to optimize effluent treatment.

In response to effluent water quality concerns identified at the WRF in 2017, Baffinland installed and commissioned a water treatment plant (WTP) at the WRF. The WTP proved to be very effective at addressing the effluent water

quality concerns identified in 2017. As a result, Baffinland plans to continue to operate the WTP to treat contact water generated at the WRF as required. Since the commissioning and operation of the WTP, Baffinland has increased the frequency and rigor of testing and sampling of WRF Pond effluent to optimize dosing requirements and reduce variances in TSS.

To address the total lead exceedance observed at the mobile OWTS in 2019, the media will be replaced prior to operation of the mobile OWTS in 2020. In addition, all operators of the mobile OWTS will be thoroughly trained in the system's operation to ensure the media continues to be replaced at the frequency recommended by the media's manufacturer.

Overall, the low frequency of non-compliant discharges involving effluents generated and managed by the Project are evidence of the effectiveness of the Project's wastewater/effluent management practices and procedures. Baffinland will continue to update the Project's management practices and procedures and implement new mitigation measures as required to ensure effluent discharges to the receiving environment are in compliance with applicable water quality discharge criteria.

## Project Certificate Condition No. 25

Category	Landforms - Additional Geotechnical Investigations
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To mitigate impacts to sensitive landforms.
Term or Condition	The Proponent shall undertake additional geotechnical investigations to identify sensitive landforms, modify engineering design for Project infrastructure, develop and implement preventative and/or mitigation and monitoring measures to minimize the impacts of the Project's activities and infrastructure on sensitive landforms.
Relevant Baffinland Commitment	N/A
Reporting Requirement	Plan to be provided to the NIRB for review and comment at least 60 days prior to commencement of construction activities.
Status	In-Compliance
Stakeholder Review	Nunavut Water Board, Indigenous and Northern Affairs Canada, Qikiqtani Inuit Association
Reference	Annual Geotechnical Inspections (Wood, 2019b) 2019 Inspection of the Milne Inlet Tote Road and Associated Borrow Sources (Tetra Tech, 2019) Borrow Source Management Plan - Kilometre 97 (Baffinland, 2014b) 2019 QIA & NWB Annual Report for Exploration and Geotechnical Drilling Activities (Baffinland, 2020b) 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

In 2019, Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited (Wood), completed two (2) geotechnical inspections of the following Project facilities and infrastructure:

- Bulk Fuel and Waste Storage Facilities;
- Water Management Ponds and associated Surface Water Drainage Infrastructure;
- Polishing and Waste Stabilization Ponds (PWSPs); and
- Select Water Crossings and Areas along the Tote Road.

The inspections took place from June 27 to July 2, 2019 and from September 23 to September 26, 2019. The inspections were carried out in accordance with the guidelines set out in the Canadian Dam Association's Dam Safety Guidelines 2007 (CDA, 2013).

The inspections primarily focused on the following aspects:

- The structures were inspected for conformance with the design basis as presented in "as constructed" and "as-built" drawings (provided in the first and subsequent reports);
- The structures were specifically inspected for settlement, cracking, and seepage through the berms;
- The areas around the structures were examined for evidence of seepage;

- New structures under construction were reviewed for conformity with design drawings; and
- The berms of the containment structures were examined with respect to possible tears in liner membranes.

Geotechnical investigations continued to be conducted at Project sites and proposed infrastructure contained within the Phase 2 Proposal, to support engineering studies for future Project infrastructure. Additionally, in 2019 Baffinland retained Tetra Tech to complete an evaluation of the stability and condition of the Milne Inlet Tote Road and the historic borrow sources within the Tote Road corridor (Tetra Tech, 2020). Geotechnical investigations completed by Wood and Tetra Tech can be found in Appendix G.

## RESULTS

Results from the geotechnical inspections at the Mine Site indicate there has been little to no erosion from wind or rain and the dykes constructed of the sand/gravel soil for fuel and waste storage facilities have remained stable at slopes of 3:1 and 4:1. As noted in previous years, there are minor signs of settlement appearing at PSWP's 1, 2 and 3. The settlements are not differential settlements of the dykes but are minor overall settlements of the total structures with respect to the surrounding area. These settlements appear within the one (1) metre ( $\pm$ ) active layer above the permafrost and are of little concern as the PWSP's are temporary structures and the settlements have no effect on the dyke stability. The 2019 bi-annual geotechnical inspections confirmed that these berms have stable foundations, which is supported by the fact that there are no indications of differential settlements, sinkholes, or sloughing at the perimeter berms. Minor repairs and actions were recommended at PWSP's 2 and 3 and at Hazardous Waste Berm 6 to remove timbers and other miscellaneous items to ensure liner integrity and at the generator fuel berm to correct minor disturbance by foot traffic. These are scheduled to be addressed prior to July 2020.

Minor water seepage at the Mine Site Crusher Facility is currently being assessed and reviewed by a third party consultant. Baffinland implemented earthworks remediation recommended by a third party consultant in September 2019. Testing of this initial earthworks remediation confirmed that the ditch is still compromised. Additional remedial works are planned when ground conditions and resources permit in 2020. A contingency plan is in place for water management until the ditch is confirmed functional for conveyance of water to the pond. This will involve monitoring contact water and active pumping of contact water directly to the pond.

At Milne Port, minor repairs and actions were recommended at the Hazardous Waste Storage facility, the Polishing Waste Stabilization Pond, the landfarm containment area, and at a drainage ditch and an upstream area leading to the culverts near the Rock Quarry. These are scheduled to be addressed prior to July 2020.

As identified in previous years, Project activities have led to localized permafrost degradation along the Tote Road. Baffinland has developed an Execution Plan to address locations identified as high-priority. Implementation of the Execution Plan was initiated in 2019 with the majority of the work scheduled to be completed in 2020. The 2019 geotechnical inspections reports, along with Baffinland's plans to address any identified concerns, are included in Appendix G.

Details of the geotechnical investigations (e.g. drilling) completed in 2019 are discussed in the 2019 QIA & NWB Annual Report for Exploration and Geotechnical Drilling Activities (Baffinland, 2020b).

## TRENDS

All water retention structures have continued to remain stable with minor settling.

Tetra Tech has assessed the Tote Road and associated borrow sources in 2009, 2014 and most recently in 2019. The observations have established that there are clear links between some borrow pit locations adjacent to the road and thaw settlement observed on the road embankment.

#### **RECOMMENDATIONS / LESSONS LEARNED**

Results from geotechnical investigations conducted in 2019 will be used to support the design of future Project infrastructure.

Recommendations outlined in the Geotechnical Inspections reports will be completed prior to July 2020 to address outstanding issues at Milne Port and Mary River.

Baffinland has developed an Execution Plan to address locations identified as high-priority in the Tetra Tech assessment of the Tote Road and associated borrow sources. Implementation of the Execution Plan was initiated in 2019 with the majority of the work scheduled to be completed in 2020. An action plan was submitted to the NWB and QIA to address these priority locations, and is provided in Appendix G.

In 2019, Baffinland continued to address permafrost degradation at the KM 97 Borrow Source by executing significant dewatering of the KM 97 borrow areas to reduce permafrost degradation. Baffinland plans to continue implementing the borrow source's progressive reclamation and rehabilitation plan outlined in Appendix B of the borrow source's approved management plan titled Borrow Source Management Plan - Kilometre 97 (Baffinland, 2014b).

## Project Certificate Condition No. 26

Category	Landforms and Soils - Erosion Management Plan
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To develop appropriate measures for preventing destabilization and erosion.
Term or Condition	The Proponent shall develop and implement a comprehensive erosion management plan to prevent or minimize the effects of destabilization and erosion that may occur due to the Project's construction and operation.
Relevant Baffinland Commitment	57
Reporting Requirement	Plan to be provided to the NIRB for review and comment at least 60 days prior to commencement of construction activities.
Status	In-Compliance
Stakeholder Review	Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), Nunavut Water Board (NWB), Qikiqtani Inuit Association (QIA)
Reference	Environmental Protection Plan (Baffinland, 2016b) Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2020f)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

A comprehensive erosion management plan is included in the Project's Surface Water and Aquatic Ecosystem Management Plan (SWAEMP; Baffinland, 2020f). An earlier revision of the SWAEMP was approved by the NWB prior to the commencement of Early Revenue Phase construction.

Activity specific sediment and erosion control measures and procedures used at the Project are also discussed within the Project's Roads Management Plan (Section 3.4.5) and Environmental Protection Plan (Baffinland, 2016b):

- Section 2.3 Land Disturbance;
- Section 2.9 Sediment and Erosion Control;
- Section 2.17 Road Construction and Borrow Development;
- Section 2.18 Tote Road Watercourse Crossing Installation;
- Section 2.25 Quarry and Borrow Pit Operation; and
- Section 2.27 Excavations and Foundations.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 27

Category	Landforms, Geology and Geomorphology - Natural Aesthetics
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts to natural aesthetics.
Term or Condition	The Proponent shall include within its public consultation report information related to the sentiments expressed by affected communities about the impacts that changes to the topography and landscape have had on the aesthetic value of the Project area.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	The Communities of: Arctic Bay, Clyde River, Sanirajak, Igloolik and Pond Inlet
Reference	2019 Community Meeting Notes
Ref. Document Link	Appendix B

### METHODS

Throughout 2019, Baffinland held several community group meetings within the five (5) North Baffin communities and at Mary River. These meetings provide an important opportunity for Baffinland to share information with the Communities related to current operations, the results of ongoing environmental monitoring programs and future planning to support the development of the Project. Community Group meetings held in 2019 are presented in Table 4.16.

**Table 4.16: 2019 Community Group Meetings**

Date	Community Group	Location	Topic
January 7-11, 2019	5 North Baffin Communities	Sanirajak, Igloolik, Arctic Bay, Pond Inlet, Clyde River	Phase 2 Public Information Sessions
January 14, 2019	Elder and HTO Representatives from Sanirajak, Arctic Bay, Clyde River and QIA	Mary River Mine Site	Community Risk Assessment Workshop Session 1
January 30, 2019	MHTO	Pond Inlet	Follow-up to August 30 site visit, IIBA Commitments
January 30, 2019	MHTO, QIA	Pond Inlet	IIBA Program Update, Mine and Milne Post MHTO Cabins relocation
February 11, 2019	Elder and HTO Representatives from Pond Inlet, Sanirajak, Arctic Bay, Clyde River and QIA	Trois- Rivières	Community Risk Assessment Workshop Session 2



Date	Community Group	Location	Topic
February 27, 2019	MHTO, QIA	Pond Inlet	Narwhal Harvest Season, Community Based Monitoring
March 26, 2019	Hamlet of Pond Inlet	Teleconference	Training Centre Update
March 26, 2019	Clyde River HTO	Clyde River	Phase 2
April 30, 2019	MHTO, QIA, Hamlet of Pond Inlet	Pond Inlet	Community Based Monitoring
May 7, 2019	Elder and HTO Representatives from Pond Inlet, Sanirajak, Arctic Bay, Clyde River, and Igloolik	Mary River Mine Site	Community Risk Assessment Workshop Session 3
May 23, 2019	MHTO, Hamlet of Pond Inlet, QIA	Pond Inlet	Hunting Season Observations, Perceived interactions with project vessels, wildlife monitoring and mitigation
June 3-11, 2019	5 North Baffin Communities and Resolute Bay	Pond Inlet, Arctic Bay, Igloolik, Sanirajak, Clyde River, Resolute Bay	Public consultation meeting for Phase 2 proposal.
June 24, 2019	MHTO, Hamlet of Pond Inlet, QIA	Pond Inlet	Follow-up to Meeting of May 23 regarding harvesting
June 25, 2019	MHTO, Hamlet of Pond Inlet, QIA	Pond Inlet	2019 Pre Shipping Season Meeting and Follow-up to Meeting of May 23 regarding harvesting
July 2, 2019	North Baffin Mayors and HTOs, QIA	Mary River Mine Site	Discussion about Phase 2, direct project benefits and finding ways the Company and North Baffin Communities can work closer together.
August 21, 2019	Hamlet of Igloolik	Teleconference	Phase 2 Update
August 27, 2019	Hamlet and HTO	Arctic Bay	Phase 2 Update and Day Care Funding Announcement
September 2, 2019	Hamlet of Igloolik	Teleconference	Phase 2 Update
September 3, 2019	MHTO	Pond Inlet	Phase 2 Update, Rail Alignment
September 4, 2019	All North Baffin HTOs	Iqaluit	Phase 2 Update, Rail Alignment
September 4, 2019	Elder and HTO Representatives from Pond Inlet, Sanirajak, Arctic Bay, Clyde River	Iqaluit	Community Risk Assessment, Results Verification Workshop
September 9, 2019	Hamlet of Igloolik	Igloolik	Phase 2 Update
September 10, 2019	Pond Inlet Phase 2 Committee & MHTO	Pond Inlet	Rail Alignment September 10-11, 2019
September 11, 2019	Hamlet Council	Pond Inlet	Phase 2 Update, Rail Alignment and Community Benefits

Date	Community Group	Location	Topic
September 12, 2019	Hamlet & HTO	Clyde River	Community Benefit Opportunities & Phase 2 - September 12-13
September 13, 2019	Clyde River Council and HTO	Clyde River	Phase 2 Update and Direct Community Benefits
September 24, 2019	North Baffin Mayors and HTOs, QIA	Mary River	Discussion about Phase 2, direct project benefits and finding ways the Company and North Baffin Communities can work closer together.
November 13, 2019	Community	Arctic Bay	Public Meeting: Report on November NIRB Public Hearings and general Phase 2 discussion
November 26, 2019	Hamlet of Pond Inlet and MHTO	Pond Inlet	Discussion post Phase 2 Public Hearing and forward planning
November 29, 2019	Hamlet of Sanirajak	Teleconference	Discussion of Baffinland response to NIRB re: NTI Motion
November 29, 2019	Hamlet of Clyde River	Teleconference	Discussion of Baffinland response to NIRB re: NTI Motion
November 29, 2019	Hamlet of Arctic Bay	Teleconference	Discussion of Baffinland response to NIRB re: NTI Motion
December 11, 2019	Hamlet of Igloolik	Igloolik	Phase 2 Public hearing Follow-up and 2020 Work Planning

These meetings provide an opportunity for community representatives to discuss ongoing concerns, interests in participating in the benefits related to the Project and any changes they may have seen in the landscape as a result of the Project.

## RESULTS

Public consultation did not reveal any significant concerns from affected communities about the impacts that changes to the topography and landscape have had on the aesthetic value of the Project area. Other comments about changes to the land and sea were focused on ensuring the effects of the Project were being monitored and mitigated, and concerns with potential Project related effects on land use (hunting and harvesting). A mention of visual disruption was noted during Phase 2 Community Public Meeting held in Igloolik, as were comments on dust, which may be visible on the landscape depending on distance from Project (Appendix B).

Discussions on aesthetic values as they relate to mine closure and the final state of the mine following reclamation were initiated by Baffinland during the May 7, 2019 Community Risk Workshop at the Mary River Mine Site. While limited direct feedback on aesthetic values was gained during the workshop discussion, Baffinland will continue to engage with Inuit to identify closure objectives and criteria that respect the aesthetic values and end land use, while incorporating and respecting Inuit Qaujimajatuqangit.

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to track and report on comments made regarding the aesthetic value of the Project area.

## Project Certificate Condition No. 28

Category	Landforms, Geology and Geomorphology - Permafrost
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure that permafrost integrity is maintained.
Term or Condition	The Proponent shall monitor the effects of the Project on the permafrost along the railway and all other Project affected areas and must implement effective preventative measures to ensure that the integrity of the permafrost is maintained.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Partially-Complaint
Stakeholder Review	Environment Climate Change Canada, Qikiqtani Inuit Association, Nunavut Water Board, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board.
Reference	Annual Geotechnical Inspections (Wood, 2019b) 2019 Inspection of the Milne Inlet Tote Road and Associated Borrow Sources (Tetra Tech, 2019) Environmental Protection Plan (Baffinland, 2016b)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Bi-annual geotechnical inspections were completed by Wood Environment & Infrastructure Solutions in 2019, as required by the NWB Type A Water Licence No. 2AM-MRY1325, for the following on-site engineered facilities at the Mine and Port:

- Bulk Fuel and Waste Storage Facilities;
- Water Management Ponds and associated Surface Water Drainage Infrastructure;
- Polishing and Waste Stabilization Ponds (PWSPs); and
- Select Water Crossings and Areas along the Tote Road.

Inspections in 2019 took place between June 27 to July 2, 2019 and from September 23 to September 26, 2019. The inspection reports are provided to regulators for review and comment. Inspections are carried out in accordance with the Canadian Dam Association (CDA) *Dam Safety Guidelines* (CDA, 2013).

The inspections primarily focused on the following aspects:

- The structures were inspected for conformance with the design basis as presented in "as constructed" and "as-built" drawings (provided in the first and subsequent reports);
- The structures were specifically inspected for settlement, cracking, and seepage through the berms;
- The areas around the structures were examined for evidence of seepage; and
- New structures under construction were reviewed for conformity with design drawings.

Geotechnical investigations continued to be conducted at Project sites and proposed infrastructure contained within the Phase 2 Proposal, to support engineering studies for future Project infrastructure. Additionally, in 2019

Baffinland retained Tetra Tech to complete an evaluation of the stability and condition of the Milne Inlet Tote Road and the historic borrow sources within the Tote Road corridor (Tetra Tech, 2020). Geotechnical investigations completed by Wood and Tetra Tech can be found in Appendix G.

## **RESULTS**

As identified in previous years, Project activities have led to localized permafrost degradation issues along the Tote Road and Mine Haul Road.

Previous bi-annual geotechnical inspections indicated that the Mary River Polishing/Waste Stabilization Ponds (PWSPs) 1, 2 and 3 were noted to be experiencing minor overall settlements of the structures with respect to the surrounding area. The minor settlement was restricted to the berms. The 2019 bi-annual geotechnical inspections confirmed that these berms have stable foundations, which is supported by the fact that there are no indications of differential settlements, sinkholes, or sloughing at the perimeter berms.

## **TRENDS**

Baffinland continues to monitor, research strategies and remediate identified locations as required. Tetra Tech has assessed the Tote Road and associated borrow sources in 2009, 2014 and most recently in 2019. The observations have established that there are clear links between some borrow pit locations adjacent to the road and thaw settlement observed on the road embankment.

## **RECOMMENDATIONS / LESSONS LEARNED**

Project designs and the placement of infrastructure consider sensitive landforms and permafrost. Baffinland continues to have a third-party conduct bi-annual geotechnical inspections.

To improve historical permafrost degradation issues along the Tote Road, Baffinland will continue to develop and prioritize preventative and mitigation measures to minimize the impacts of the Project's activities and infrastructure on landforms along the Tote Road. To address recommendations from the Tetra Tech inspection, Baffinland has developed an Execution Plan for locations identified as high-priority. Implementation of the Execution Plan was initiated in 2019 with the majority of the work scheduled to be completed in 2020.

## Project Certificate Condition No. 29

Category	Landforms, Geology and Geomorphology - Design Plans
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations
Objective	To confirm constructed components meet design as assessed.
Term or Condition	The Proponent shall provide to the respective regulatory authorities, for review and acceptance, for-construction engineering design and drawings, specifications and engineering analysis to support design in advance for constructing those facilities. Once project facilities are constructed, the Proponent shall provide copies of the as-built drawings and design to the appropriate regulatory authorities.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), Fisheries and Oceans Canada (DFO), Nunavut Impact Review Board (NIRB), Nunavut Water Board (NWB), Qikiqtani Inuit Association (QIA)
Reference	N/A
Ref. Document Link	<a href="ftp://ftp.nwb-oen.ca/registry/2%20MINING%20MILLING/2A/2AM%20-%20Mining/2AM-MRY1325%20BIMC/3%20TECH/5%20CONSTRUCTION%20(D)/">ftp://ftp.nwb-oen.ca/registry/2%20MINING%20MILLING/2A/2AM%20-%20Mining/2AM-MRY1325%20BIMC/3%20TECH/5%20CONSTRUCTION%20(D)/</a>

### METHODS

Not applicable.

### RESULTS

As required by the Project's Type A Water Licence and Commercial Lease with QIA, several engineering submissions were provided to regulatory agencies and stakeholders throughout 2019, including Issued-for-Construction (IFC) Drawings, As-Built Drawings and Construction Summary Reports. A summary of the relevant submissions is provided in Table 4.17.

**Table 4.17: 2019 Submissions to Regulatory Agencies and Stakeholders**

Date of Submission	Regulatory Agencies and Stakeholders	Content
January 25, 2019	NWB, CIRNAC, QIA	IFC Drawings - NWB Type A Water Licence Notification - Fuel Storage Facility and 15ML Tank at Mine Site
February 12, 2019	NWB, CIRNAC, QIA	IFC Drawings and Design Specifications - Mine Haul Road Plan and Profile
February 15, 2019	DFO	Letter of Advice - Expansion of Existing Barge Landing at Milne Port (Pushout)
February 27, 2019	Transport Canada	Layout Drawings - Transport Canada Navigation Protection Act Notice of Works - Expansion of Existing Barge Landing at Milne Port (Pushout)

Date of Submission	Regulatory Agencies and Stakeholders	Content
Feb 28, 2019	NIRB, NWB, CIRNAC, QIA	IFC Drawings and Design Specifications - Installation of an Incineration Unit at Milne Port's 380-Person Camp
March 31, 2019	NWB, CIRNAC, QIA	Crusher Facility Footprint – As-Built Drawing
March 31, 2019	NWB, CIRNAC, QIA	Culvert Repairs and Replacements – As-Built Drawings
April 1, 2019	NWB, CIRNAC, QIA	As-Built Drawings for Construction of Milne Port Ore Stockpile Facility Expansion Pond 1a.
May 3, 2019	NIRB, NWB, CIRNAC, QIA, DFO	IFC Drawings and Design Specifications - Milne Port Ore Stockpile #1 and Water Management Expansion
June 24, 2019	NIRB, NWB, CIRNAC, QIA	IFC Drawings, Revised Run of Mine Stockpile and Sedimentation Pond

In addition, a number of Construction Summary Reports, containing relevant as-built documentation, were submitted with the 2019 QIA & NWB Annual Report, for infrastructure completed in 2019. These include the following pieces of infrastructure;

- Mary River Mine Truck Shop (H353004-10000-430-066-0001)
- Mary River Tank Farm (H353004-10000-430-066-0002)
- Sailiivik Camp Effluent Line (H353004-10000-430-066-0003)
- Mary River Tank Piping and Electrical (H353004-10000-430-066-0004)
- Sailiivik Camp (H353004-10000-430-066-0005)
- Milne Port Tank Farm Addition (H353004-40000-121-066-0002)
- Milne Port Ore Stockpile Pond 1A (H353004-40000-430-066-0001)
- Milne Port Ore Stockpile Expansion (H353004-40000-430-066-0002)
- Milne Port Water Management Structures (H353004-40000-430-066-0004)
- Milne Port 380 Person Camp (H353004-40000-430-066-0005)

## TRENDS

Not applicable.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to provide the appropriate regulatory agencies and stakeholders, for review and acceptance, design and engineering documentation, drawings and construction reports for Project infrastructure.



## Project Certificate Condition No. 30

Category	Landforms, Geology and Geomorphology - Quarries
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To provide oversight on quarry design and management.
Term or Condition	The Proponent shall develop site-specific quarry operation and management plans in advance of the development of any potential quarry site or borrow pit.
Relevant Baffinland Commitment	65
Reporting Requirement	Plans to be provided to the NIRB for review and comment at least 30 days prior to commencement of construction activities.
Status	In-Compliance
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

To date, site-specific management plans for quarries and borrow sources have been developed and provided to the relevant agencies prior to development, for active quarry sources. No new quarry sources were sought in 2019, and as a result no new management plans were submitted to the NIRB for review and comment.

### RESULTS

Baffinland continued to utilize quarry material from Q1 and QMR2 Quarries. Newly proposed quarries have not been developed, are pending submission and/or review of Quarry Management Plans.

### TRENDS

None.

### RECOMMENDATIONS / LESSONS LEARNED

Site-specific management plans for new quarries and borrow sources will be developed and provided to the relevant agencies prior to development.

#### 4.6.6 Vegetation (PC Conditions 31 through 40)

Ten (10) PC conditions relate to the potential impacts of the Project on vegetation. Several of the conditions require the development of vegetation monitoring plans within the Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016c).

##### Stakeholder Feedback

Key stakeholders that have expressed concern regarding vegetation have included the QIA, ECCC and the Government of Nunavut (GN). Issues related to vegetation have included a desire to minimize the overall footprint of the Project, concerns over potential introduction of invasive terrestrial vegetation species and the potential for ore dust deposited on vegetation and soil to be taken up by plants, potentially affecting foraging wildlife such as caribou. Additionally, despite the climatic challenges to revegetation at closure, stakeholders have expressed an interest in revegetation being incorporated into reclamation plans. Responses to these issues are reflected in PC Conditions No. 31 through 40. Reclamation and revegetation was discussed as part of Phase 2 community consultation activities (Phase 2 Community Tour in Igloolik, Community group meeting held at Mary River) in 2019 (Appendix B). In addition, concern about long-term impacts of dust on vegetation and the importance of dust control and vegetation (including lichen) monitoring through measures of growth and metals in soils was voiced during the Phase 2 Community Risk Assessment Workshops (ERM, 2019), consistent with previous feedback. This included concern that caribou, birds and other animals will get sick from eating dust that is on vegetation (ERM, 2019).

##### Monitoring Activities

Baffinland's vegetation monitoring programs include the following

- Vegetation abundance monitoring;
- Vegetation and soil base metals sampling;
- Exotic invasive plant species monitoring program; and
- Dustfall monitoring.

Not all of these programs involve annual sampling, and trends may become apparent only after many years of monitoring.

The 2019 vegetation abundance monitoring program included 15 transects, 75 sites, and 179 plots. Fifteen control (Reference) sites were established within the regional study area (RSA), approximately 20 Km from the Project footprint. Of these 15 Reference sites, nine were newly added in 2019. In addition, measurement methods for the vegetation abundance monitoring program were evaluated. The evaluation of vegetation abundance monitoring methods demonstrated that the method used to measure vegetation is highly objective and repeatable, confirming that it is appropriate for addressing the objectives of the vegetation abundance monitoring program. Direct loss of plant habitat remains limited to developed areas of the PDA. Outside of this, there were no distinguishable Project-related effects on vegetation ground cover, canopy cover, or plant group composition. These results are consistent with the FEIS prediction of no significant impact.

Baseline metal concentrations across all 2012 to 2014 and 2016 vegetation and soil base metals monitoring sites were below Project-specific thresholds. The year 2019 marked the first year of post-construction sampling for the continuation of metals sampling. Samples were collected in the three Project areas (Milne Port, Tote Road, Mine Site) at varying distances from the Project Development Area (PDA). A subset of total metals referred to as contaminants of potential concern (CoPCs) were selected for analysis: arsenic, cadmium, copper, lead, selenium and

zinc. These six CoPCs were compared to available Canadian Council of Ministers of the Environment (CCME) agricultural soil quality guidelines for the protection of environmental and human health, and available toxicity indicator values for lichen. The CoPC metal concentrations in soil in 2019 remained low or undetectable. Predictions outlined in the Final Environmental Impact Statement (FEIS) stated that some soil metal levels would exceed criteria guidelines by the end of the project life (arsenic, manganese, cobalt, chromium, copper, nickel, and selenium), and that sensitive vegetation classes may be affected by metal uptake. However, changes to vegetation were predicted to be indistinguishable from natural variation, limited to within and near the PDA, and not be significant at the scale of the RSA.

Metal concentrations in lichen in 2019 increased from baseline conditions for some metals within 100 m of the PDA. The amount of these increases from the 'Before' to the 'After' period were comparable among sites at the Mine Site, Tote Road, and Milne Port. Despite some increases compared to baseline conditions, all lichen samples were below indicator values for all metals analyzed except for lead, which was within the range of indicator values (5 to 15 mg/kg dry weight). No effects on vegetation health were observed, and overall metal concentrations in lichen remain either below or within the range of associated indicator values.

One exotic species, garden tomato was recorded at the sewage/effluent discharge pipe. However, none of the 20 individual plants were acting invasive (i.e., all in a vegetative state, no flowering or fruiting).

A revegetation research program was initiated in 2019, beginning with a desktop study of available practices and recent advances from Arctic mine reclamation in Canada's northern territories and Alaska, USA. The next step following the desktop review was to implement a field program to assess current conditions and establish test plots. The pilot study was implemented in summer 2019, and was designed to document the status of select post-disturbance areas of the Site, initiate preliminary reclamation trials to assess methods and approaches considered appropriate for the challenges of the Arctic environment, and identify future research opportunities. Following a survey of existing disturbance sites, the pilot program involved the establishment of reclamation plots to assess methodologies for surface preparation.

Table 4.18 provides an evaluation of the Project's impacts on vegetation.

**Table 4.18: Vegetation Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Vegetation Health	Ore dust emissions result in an increase in concentrations of contaminants of potential concern in soils and vegetation	Vegetation and soil base metals sampling was completed in 2019.	Soil metals were below CCME guidelines and consistent with FEIS guidelines, with the exception of 1 sample.1 sample. Foliar update of metals appears to be limited in lichen; no evidence of metal toxicity was observed; Results consistent with FEIS predictions.
Vegetation Abundance	Dustfall results in changes in species composition and vegetation abundance	Vegetation abundance monitoring was completed in 2019.	No Project-related effects on vegetation ground cover, canopy cover or plant group composition. Results within FEIS predictions
Invasive Species	Invasive species introduction to North Baffin Island	Exotic invasive plant species monitoring was undertaken in 2019.	One exotic species (garden tomato) was observed at Mine Site below the sewage/effluent discharge pipe (thus within PDA), though none of the 20 individual plans were acting invasive. Results within FEIS predictions.

### Path Forward

Soil and vegetation monitoring will be undertaken in 2020, focusing on an additional year of vegetation and soil base metals as well as the target removal of exotic invasive vegetation found at the sewage/effluent discharge pipe at the Mine Site in 2019; vegetation abundance monitoring is not being recommended for 2020. In 2020 Baffinland will be organizing a Mine Closure Working Group to evaluate the implementation and results of reclamation research programs and progressive reclamation projects at Mary River. Baffinland will discuss the findings of the 2019 revegetation studies with the Mine Closure Working Group, to assess and evaluate the current study design, seek input on the integration of IQ into the study design, and establish a path forward for the expanded implementation of the research program.

## Project Certificate Condition No. 31

Category	Vegetation - Construction and Operations
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations
Objective	To minimize impacts to vegetation.
Term or Condition	The Proponent shall ensure that Project activities are planned and conducted in such a way as to minimize the Project footprint.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board
Reference	Environmental Protection Plan (Baffinland, 2016b) Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016c) Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

Baffinland's Project design philosophy focuses on minimizing earthworks, re-using existing facilities, and using pre-assembled infrastructures to minimize construction activities in the Project area. Design activities undertaken to minimize the Project footprint include:

- Using pre-cast concrete where feasible including the use of integrated module foundations;
- Using pre-assembled material packages, such as building wall and roof panels, ground conveyors, elevated conveyors, conveyor bents, fuel tanks etc.;
- Using complete multi discipline modules such as screen building modules, crushing building modules, powerhouse modules, transfer stations, etc.;
- Purchasing fully-assembled yard and mobile mining equipment offsite such as the stacker, reclaimer, ship loader, loader, mine haul truck, etc.;
- Conducting Environmental Protection Plan training, which outlines the importance of minimizing disturbed land at the Project and the process that must be followed prior to construction on non-disturbed land;
- Ensuring appropriate approvals are met with applicable stakeholders and land lease agreement; and
- Documenting and tracking land disturbance approvals associated with the Project.

### RESULTS

To-date, Baffinland has completed all required construction activities for the Project within the Project Development Area (PDA). Baffinland also restricts any overland movement of equipment or personnel that are required to operate to existing site roads and laydowns. Any unauthorized land disturbance or deviation from the PDA is reported as an incident and is investigated. Overburden that is removed from an area to be disturbed is

stockpiled for the remediation of the area. No unauthorised land disturbance occurred in 2019 and all disturbed land is reported in the 2019 Annual Terrestrial Report (EDI, 2020).

#### **TRENDS**

Baffinland has completed all construction to date within the PDA. During construction activities, direct habitat loss occurred primarily due to surface disturbance including compaction, burial, and removal. During the operations phase, vegetation loss occurs mainly as ore extraction expands within Deposit No. 1, laydowns are constructed for material storage and infrastructure development, and as quarries expand to support ongoing maintenance. Terrestrial vegetation studies supported little to no impact in the Regional Study Area on vegetation abundance and diversity in 2019.

#### **RECOMMENDATIONS / LESSONS LEARNED**

Long-term vegetation surveys will continue to be monitored and used for analysis to determine if vegetation is being impacted outside of the PDA. Project footprint will continue to be minimized wherever possible to limit the impact of the project.

## Project Certificate Condition No. 32

Category	Vegetation - Construction and Operations
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent introduction of invasive species.
Term or Condition	The Proponent shall ensure that equipment and supplies brought to the Project sites are clean and free of soils that could contain plant seeds not naturally occurring in the area. Vehicle tires and treads in particular must be inspected prior to initial use in Project areas.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association, Nunavut Water Board, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board
Reference	Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

All equipment and supplies are to be inspected by Supplier's prior to being offloaded at Baffinland's Milne Port. Service agreements and contracts sent to suppliers were updated in the beginning of 2018 to include a clause "All equipment delivered to site must be free and clear of soils that may contain seeds of invasive species."

Baffinland continues to monitor and regulate employees seeking to bring plants (e.g. office plants) to Mary River.

### RESULTS

An exotic species (garden tomato plant) was observed growing at the Mine Site below the sewage/effluent discharge pipe. The 20 observed plants were in a vegetative state, and none were flowering or fruiting. Due to the short growing season and the growth requirements of tomatoes, the plants were not capable of producing flower or fruit and were not acting invasive. For additional information, refer to Condition No. 37 for additional information.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.



## Project Certificate Condition No. 33

Category	Vegetation – Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To facilitate monitoring.
Term or Condition	The Proponent shall include relevant Monitoring and Management Plans within its Environmental Management System, Terrestrial Environment Management and Monitoring Plan (TEMMP).
Relevant Baffinland Commitments	57
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016c) 2019 TEWG Meeting Records
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C

### METHODS

The Terrestrial Environment Mitigation and Monitoring Plan (TEMMP) includes vegetation monitoring consisting of the following components: vegetation abundance and composition, vegetation health, culturally-valued vegetation, exotic invasive vegetation and natural revegetation and dustfall. The TEMMP is updated on a regular basis to reflect adjustments to programs and analytical results, statistical power analysis, and input provided on programs by the TEWG and annual review by the Nunavut Impact Review Board.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Regularly updating mitigation and monitoring plans to reflect regulator and TEWG feedback has been invaluable in addressing regular analytical results, evolving methods, and adapting to further understanding of potential Project-related effects.

## Project Certificate Condition No. 34

Category	Vegetation – Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations
Objective	Monitor metals concentrations in both soils and vegetation, particularly caribou forage (i.e., lichen) at varying distances from the PDA to compare metal concentrations in soil and vegetation between near (impacted) and far (control) sites. Determine if metal concentrations in soil and vegetation exceed CCME and relevant available threshold levels provided in the literature.
Term or Condition	The Proponent shall conduct soil sampling to determine metal levels of soils in areas with berry-producing plants near any of the project development areas, prior to commencing operations.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Mary River Project Final Environmental Impact Statement: Volume 6 — Terrestrial Environment (Baffinland, 2012) Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016c) Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020) 2019 TEWG Meeting Records
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

The vegetation and soil base metals monitoring program includes samples of soil and vegetation collected during the 'Before' development period (i.e., baseline sampling) and the 'After' development period (i.e., post-baseline sampling). According to the TEMMP, soil and vegetation (i.e., lichen) samples are to be collected every three to five years (typically between late July to early August). Specifically, baseline sampling included collections from 2012 to 2014, and 2016, while post-construction sampling began in 2019 and marks the first year of post-baseline sampling for the vegetation and soil base metals monitoring program.

The study design for the vegetation and soil base metals monitoring program considered three Project areas (Milne Port, Tote Road, Mine Site) at varying distances from the Project Development Area (PDA) (Near: 0 to 100 m; Far: 101 to 1,000 m; Reference: >1,000 m). Samples were analyzed for total metal concentrations to assess the relationship of metals in soil and lichen with distance from the PDA. A subset of total metals referred to as contaminants of potential concern (CoPCs) were selected for analysis: arsenic, cadmium, copper, lead, selenium and zinc. These six CoPCs were compared to available Canadian Council of Ministers of the Environment (CCME) agricultural soil quality guidelines for the protection of environmental and human health, and available toxicity indicator values for lichen. In the absence of established thresholds suitable to determine metal toxicity in lichen for

the Project, indicator values from peer-reviewed literature of metal toxicity for similar species and geographic region were used to assess potential Project effects to vegetation health.

The relationship of CoPC metal concentrations in soil and lichen with distance from the PDA between the 'Before' and the 'After' period were analyzed statistically. In 2019, following an inquiry from the TEWG, metal uptake in lichen tissues, as opposed to metal accumulation on the surface of the plant, was also evaluated to better understand metals contributed by dustfall.

In addition to assessing the accumulation of CoPC metals at varying distances from the PDA, the association between metal accumulation in soil and vegetation and metals in dustfall deposition was also quantified. This investigation paired dustfall collector sites and nearby soil and lichen sampling sites to determine whether increased dustfall led to measurably higher metal concentrations in lichen tissue and soil samples. Statistical analyses were conducted to determine the direction and strength of the relationship between dustfall deposition, distance to PDA, and accumulated metal concentrations.

## RESULTS

The CoPC metal concentrations in soil in 2019 remained low or undetectable. Although some increases in metal concentrations were observed compared to baseline conditions, all soil samples were below CCME soil quality guidelines. The only exception was a single sample with a copper concentration that exceeded CCME soil quality guidelines near the Mine Site. There were no observed changes in soil metal concentrations at any sample sites near that anomalous sample site; therefore, it is suspected that the exceedance may be due to a sampling or laboratory error.

Metal concentrations in lichen in 2019 increased from baseline conditions for some metals within 100 m of the PDA. The amount of these increases from the 'Before' to the 'After' period were comparable among sites at the Mine Site, Tote Road, and Milne Port. Few increases were observed at Far (101 to 1,000 m) sites; most of these were due to lead in lichen samples along the Tote Road up to 251 m from the PDA. Despite some increases compared to baseline conditions, all lichen samples were below indicator values for all metals analyzed except for lead, which was within the range of indicator values (5 to 15 mg/kg dry weight). Lead in lichen generally exceeded the lower end of the indicator value by 1 to 2 mg/kg dry weight at Near sites along the Tote Road, and only one of these samples approached the upper end of the indicator value. No effects on vegetation health were observed, and overall metal concentrations in lichen remain either below or within the range of associated indicator values.

Dust-deposited metals on lichen compared to in lichen tissues did not differ among Project areas for any of the CoPCs except for copper. Statistical evidence suggested that dust-deposited copper on lichen differed among Project areas and that some of the copper in samples near the Tote Road and Mine Site may be attributed to dust on lichen surfaces rather than solely in lichen tissues.

The relationship between dustfall and metal concentrations differed between samples of lichen versus samples of soil. Statistical support for a positive relationship between dustfall deposition and accumulated concentrations of metal in lichen was evident for only arsenic, copper, and lead. However, when accounting for the effects of distance, copper, lead, and zinc in lichen yielded a positive relationship with dustfall deposition at distances Near and Far from the PDA, whereas Reference sites yielded a negative relationship. These results suggest that increased dustfall deposition leads to greater accumulation of certain metals in lichen at sites within 1,000 m of the PDA, while increased dustfall at Reference sites farther than 1,000 m is not associated with an increase in metal accumulation.

There was no statistical support for a relationship between dustfall deposition and accumulated concentrations of metals in soil for any CoPC metal except arsenic, for which there was evidence of a negative relationship.

Predictions outlined in the Final Environmental Impact Statement (FEIS) stated that some soil metal levels would exceed criteria guidelines by the end of the project life (arsenic, manganese, cobalt, chromium, copper, nickel, and selenium), and that sensitive vegetation classes may be affected by metal uptake. However, changes to vegetation were predicted to be indistinguishable from natural variation, limited to within and near the PDA, and not be significant at the scale of the RSA.

Aside from the sample in which a sampling or laboratory error was suspected, all soil metal levels were below CCME guidelines and thus consistent with FEIS predictions. Foliar uptake of metals/metalloids appears to be limited; all lichen samples were below or, in the case of lead, within the range of indicator values for all metals. No evidence of metal toxicity was observed. Foliar uptake of metals in plants was, therefore, consistent with impact predictions.

#### **TRENDS**

Not applicable, the vegetation and soil base metals monitoring program require another year of data collection in the sampling cycle to assess initial trends among years.

#### **RECOMMENDATIONS / LESSONS LEARNED**

Vegetation abundance results do not support the need for sampling in 2020. However, Baffinland will conduct an extra year of vegetation and soil base metals monitoring in 2020 to determine initial trends and the extent of increased metal concentrations observed in lichen at varying distances from the PDA.

## Project Certificate Condition No. 35

Category	Vegetation - Monitoring
Responsible Parties	The Proponent, local Hunters and Trappers Organizations
Project Phase(s)	Construction and Operations
Objective	To determine baseline metal levels in foraging caribou.
Term or Condition	The Proponent shall undertake monitoring of baseline metal levels in organ tissue from caribou harvested within the local study area, prior to commencing operations. The Proponent is strongly encouraged to coordinate with local Hunters and Trappers Organizations regarding procurement of harvested caribou organs.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	Not Applicable
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	2019 TEWG Meeting Records Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Not applicable.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

The North Baffin caribou herd is at low numbers, and limited harvesting has been occurring. At the November 17, 2015 TEWG Meeting No. 7, Baffinland asked if the Government of Nunavut (GN) would like Baffinland to distribute sample kits to hunters coming through the site. The GN's response was that no kits were available to send to the site. There were several hunting parties travelling through the Mary River Mine Site in 2019, but tissue sampling protocols and coordination have not been finalized between TEWG parties yet.

As described in previous Annual Reports to the NIRB, PC Condition No. 35 has been discussed with the TEWG several times; however, a clear plan for collaboration has yet to be established among TEWG members. Baffinland insists that collaboration with other stakeholders and interested parties (e.g., the GN and MHTO) is critical for the successful implementation of a caribou tissue monitoring program.

To further advance efforts, Baffinland met with the Primary Investigator for The Northern Contaminants Program in December 2019. Baffinland believes that collaboration with a planned regional-level collection program is the most

beneficial way to address the requirements of PC Condition No. 35. Tissues would be analyzed by a third party on a regional scale and would contribute data to an Arctic-wide monitoring program.

A proposed timeline for coordination of tissue sampling protocols, subject to agreement and participation of external parties, was developed as follows:

- January to March 2020: Establish an agreement between Gamberg Consulting, Baffinland, the GN and the Mittimatalik Hunters and Trappers Organization (MHTO) for the collection and analysis of organ tissue for North Baffin caribou in 2020 through The Northern Contaminants Program.
- March to June 2020: Schedule an in-person meeting between Gamberg Consulting and the MHTO to provide an overview of the research conducted through The Northern Contaminants Program and to discuss and plan for the collection of organ tissue samples by local hunters.
- TBD: Hunters wishing to participate collect and submit organ samples as instructed when caribou is harvested.
- TBD: Samples analyzed in the lab and results reported as a section in the Terrestrial Environment Annual Monitoring Report.

Further updates of work undertaken in 2020 related to PC Condition No. 35 will be included in the 2020 Annual Report to the NIRB.

## Project Certificate Condition No. 36

Category	Vegetation – Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations
Objective	Measure percent plant cover and plant group composition of available caribou forage within the RSA to track potential changes at varying distances from the edge of the PDA through long-term monitoring.
Term or Condition	The Proponent shall establish an ongoing monitoring program for vegetation species used as caribou forage (such as lichens) near Project development areas, prior to commencing operations.
Relevant Baffinland Commitments	67
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Mary River Project Final Environmental Impact Statement: Volume 6 — Terrestrial Environment (Baffinland, 2012) Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020) 2019 TEWG Meeting Records
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

The vegetation abundance monitoring program considers the abundance and composition of caribou forage at sites of varying distances from the Mine Site, Milne Port and the Tote Road. Lichen (caribou forage) monitoring is included in the broader vegetation abundance program.

The 2019 vegetation abundance monitoring program included 15 transects, 75 sites, and 179 plots. Six (6) transects radiate out from the Mine Site, five (5) transects from the Tote Road, and four (4) transects from Milne Port, with four (4) sample sites each. Fifteen (15) control (Reference) sites were established within the regional study area (RSA), approximately 20 Km from the Project footprint. Of these fifteen (15) Reference sites, nine (9) were added in 2019 at the request of the TEWG during the December 11, 2018 meeting to reduce variability expressed by wider confidence intervals at Reference sites. Along each transect, sample sites were located at 30, 100, 750, and 1,200 m from the PDA. Each sample site consisted of one to two open plots and one plot enclosed by a wire cage to control for herbivory. Vegetation within each plot was sampled for percent cover by plant group using the point quadrat method. The plant groups selected for the study included deciduous shrubs, evergreen shrubs, forbs, moss, lichen, and standing dead litter (including graminoids). Data were analyzed for total percent ground cover, total percent canopy cover, and percent cover by plant group to determine relationships with distance from the PDA. Vegetation abundance monitoring in 2019 and marked the third year that data were analyzed among years; a trend analysis was conducted using a full sample size for years 2017, 2018 and 2019 and partial sample size for 2014 and 2016. The trends analysis assessed potential changes in percent plant cover and plant group composition with the relationship of distance to the PDA.



In response to a technical review comment (#3) by Environment and Climate Change Canada (ECCC) on the 2018 Mary River Project Terrestrial Environment Annual Monitoring Report, the 2019 vegetation abundance monitoring program also considered soil moisture regime (SMR) and drainage. Soils were assessed at vegetation abundance monitoring sites to determine whether differences exist in SMR and drainage between Near sites (i.e., 30 and 100 m) and Reference sites ( $\geq 20$  Km), which could influence plant cover and composition.

## RESULTS

Direct loss of plant habitat remains limited to developed areas of the PDA. Outside of this, there were no distinguishable Project-related effects on vegetation ground cover, canopy cover, or plant group composition. These results are consistent with the FEIS prediction of no significant impact.

Results of 2019 vegetation abundance monitoring in comparison to prior years are as follows:

### *Ground Cover*

There is a difference in percent ground cover among years ( $p = 0.06$ ; Figure 4.3); however, differences are small (total ground cover varied from 91 to 95% through sampling years) and consistent across all distance classes. Therefore, changes in ground cover among years are likely the result of regional-level inter-annual variation rather than Project-related effects. There remained no effect on total ground cover and distance from the PDA ( $p = 0.49$ ). In 2019, soil moisture analysis showed that the average ground cover was positively related to the soil moisture regime ( $p = 0.001$ ).

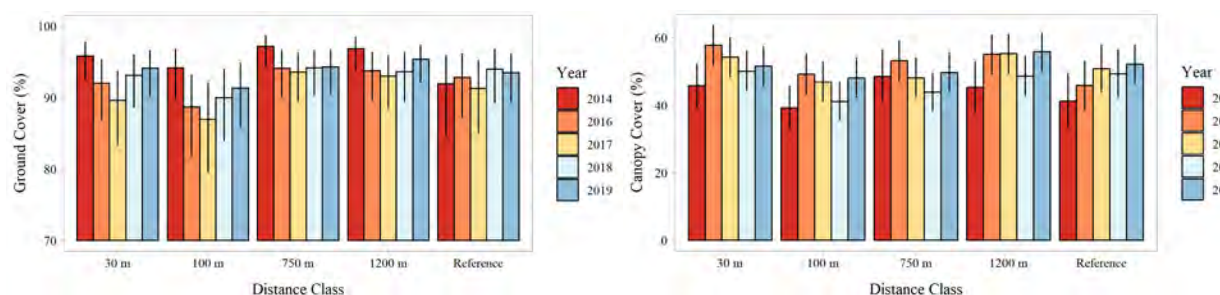
Plant cover was consistent across all distance classes in the Project area (Figure 4.3). Therefore, changes in plant group cover among years were likely the result of inter-annual variation rather than Project-related effects. For example, in the plant groups with highest ground cover:

- Ground litter cover in 2019 was 55.6%, within the range of the low of 50.8% in 2014 and the high of 63.1% in 2016.
- Moss cover in 2019 was 8.5%, within the range of the low of 6.1% in 2016 and the high of 13.1% in 2014. While changes in moss cover were consistent among distance classes, there was a statistical difference among years at the 30 and 100 m distance classes, but not at the farther distances classes at 750 m, 1,200 m, and Reference sites. This is likely due to greater variability in moss cover among sites at the farther sites. Sites with more ground litter cover tended to have lower moss cover. Moss cover was higher at sites with wetter soil moisture regimes ( $p < 0.001$ ).
- Evergreen shrub cover was significantly higher at 6.2% in 2019 (all  $p < 0.01$ ), greater than the range of the low of 4.0% in 2016 and 2017, and the previous high of 5.0% in 2018.
- Lichen cover was 2.4% in 2019, within the range of a low of 2.0% in 2017 and a high of 3.3% in 2014. Lichen cover in 2019 was higher than in 2016 ( $p = 0.05$ ) and in 2017 ( $p = 0.04$ ), with no difference between 2018 and 2019 ( $p = 0.93$ ).

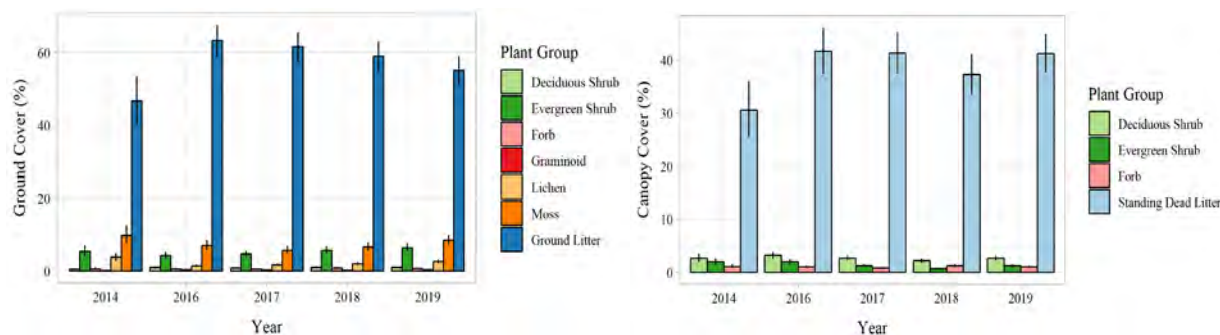
### *Canopy Cover*

Total canopy cover in 2019 was 51.5%, with the range of a low of 43.9% in 2014 to a high of 52.2% in 2016. There are differences in total percent canopy cover among years ( $p = 0.004$ ) and an interaction between year and distance class ( $p = 0.009$ ; Figure 4.4). Not all distance classes followed the overall trend and trends did not indicate a Project-related effect (Figure 4.4). Changes in canopy cover among years were likely the result of the inter-annual variation. For example, in the two plant groups with highest canopy cover:

- Standing dead litter was 41.2% in 2019. There is evidence of an interaction between distance class and year ( $p = 0.02$ ); however, trends among years are inconsistent. Standing dead litter cover was lowest in 2014 at 31.9% and higher in all other monitoring years (up to 41.8% in 2017) across all plots. Standing dead litter increased with soil moisture regime ( $p < 0.001$ ).
- Deciduous shrub cover was 2.8% in 2019. There is evidence of an interaction between distance from the PDA and year ( $p = 0.03$ ); however, trends among years are inconsistent. Deciduous shrub cover was lowest in 2.3% in 2018 and highest at 3.2% in 2014 across all plots.



**Figure 4.4: Total Ground Cover and Total Canopy Cover by Distance Class and Year**



**Figure 4.5: Ground Cover and Canopy Cover by Plant Group and Year**

## TRENDS

There was evidence of annual variation in total vegetation abundance in the Project area, but no evidence that these changes were due to a Project-related effect. Differences in total ground cover, total canopy cover among years were small in magnitude, consistent across all distance classes, or else a weak and inconsistent interaction between year and distance class. Differences in total vegetation abundance are attributed to natural variation between years rather than a Project-related effect.

There was evidence of annual variation in the cover of some plant groups in the Project area. These differences were either found across all distance classes, or else trends in the data were inconsistent between distance classes and years. Therefore, differences in plant group cover are indicative of natural variation rather than a Project-related effect.

**RECOMMENDATIONS / LESSONS LEARNED**

The vegetation monitoring program has evolved since its inception in 2012 based in large part on original input on culturally-valued vegetation during baseline inventories, an original study design concept by the GN, review by QIA biologists, suggested statistical approaches from ECCC, feedback garnered through engagement with the TEWG, and ultimately by the results of repeated field measurements, a statistical power analysis, and revisions to the program. Baffinland will continue with the scheduled vegetation abundance monitoring program and in accordance with the Terrestrial Environment Mitigation and Monitoring Plan.

## Project Certificate Condition No. 37

Category	Vegetation – Monitoring
Responsible Parties	The Proponent, Government of Nunavut Department of Environment
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent establishment of invasive species.
Term or Condition	The Proponent shall incorporate protocols for monitoring for the potential introduction of invasive vegetation species (e.g. surveys of plant populations in previously disturbed areas) into its Terrestrial Environment and Monitoring Plan. Any introductions of non-indigenous plant species must be promptly reported to the Government of Nunavut Department of Environment.
Relevant Baffinland Commitments	43, 68
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016c) 2019 TEWG Meeting Records (Baffinland, 2019g) Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Exotic invasive vegetation and natural re-vegetation monitoring was focused on surveying previously disturbed areas within and adjacent to the Project footprint. Presence/absence sampling was used to search for exotic invasive vegetation where invasive plants could be found (i.e., disturbance areas along buildings, infrastructure, road ditches and pullouts). Most areas were surveyed on foot, with some sections surveyed from a vehicle travelling at slow speeds along the Tote Road. Each of the three focal areas (Mine Site, Milne Inlet and Tote Road) were surveyed to the extent that was permitted to safely walk or drive in the Project footprint. Incidental findings of natural revegetation were also documented when observed in previously disturbed locations within or adjacent to the Project footprint.

As outlined in the TEMMP, exotic invasive vegetation and natural regeneration monitoring is scheduled every three to five years or as triggered by observations of exotic invasive plant species. Prior to 2019, exotic invasive vegetation was last conducted in 2014. No exotic invasive species were observed during the 2014 survey.

### RESULTS

One exotic species was found in the Project footprint during surveys from July 29 to 31, 2019. Garden tomato (*Solanum lycopersium*) was found growing at the Mine Site below the sewage/effluent discharge pipe. A total of 20 plants were scattered throughout the rock armory and down slope of the outlet pipe. All plants were in a vegetative state, and none were flowering or fruiting. Due to the short growing season and the growth requirements of tomatoes, the plants were not capable of producing flower or fruit and were not acting invasive.

**TRENDS**

The garden tomato plants noted in the 2019 surveys were the only exotic plant found during exotic invasive plant surveys to date for the project. No trends can be established at this time.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue exotic invasive vegetation monitoring in accordance with the TEMMP, and review the results of the 2019 survey with the TEWG to determine next steps based on the findings.

## Project Certificate Condition No. 38

Category	Vegetation - Adaptive Management
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts to vegetation abundance, diversity, and health.
Term or Condition	The Proponent shall review, on an annual basis, all monitoring information and the vegetation mitigation and management plans developed under its Environmental Management System, Terrestrial Environment and Monitoring Plan (TEMMP) and adjust such plans as may be required to effectively prevent or reduce the potential for significant adverse Project effects on vegetation abundance, diversity and health.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be included in the Annual Report submitted to the NIRB
Status of Compliance	In-Compliance
Stakeholder Review	Nunavut Impact Review Board, Terrestrial Environment Working Group (TEWG)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016c) 2019 TEWG Meeting Records Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

The vegetation monitoring program is reviewed annually by Baffinland via the Terrestrial Environment Annual Monitoring Reports, and thorough TEWG meetings. The TEMMP and the monitoring program itself are adjusted based on previous results and ongoing discussions with TEWG members. The vegetation monitoring program has evolved significantly over the years in response to advances in science and methodology, monitoring results, and TEWG member input. Changes to the program implemented in 2019 as a result of annual report review and TEWG feedback are outlined below. The details and results of the analyses are presented in the Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020).

### Vegetation Abundance

The 2019 vegetation abundance monitoring program included 15 transects, 75 sites, and 179 plots. Six (6) transects radiate out from the Mine Site, five (5) transects from the Tote Road, and four (4) transects from Milne Port, with four (4) sample sites each. Fifteen (15) control (Reference) sites were established within the regional study area (RSA), approximately 20 Km from the Project footprint. Of these 15 Reference sites, nine (9) were added in 2019 at the request of the TEWG during the December 11, 2018 meeting to reduce variability expressed by wider confidence intervals at Reference sites.

In response to a technical review comment (#3) by Environment and Climate Change Canada (ECCC) on the 2018 Mary River Project Terrestrial Environment Annual Monitoring Report, the 2019 vegetation abundance monitoring program also considered soil moisture regime (SMR) and drainage. Soils were assessed at vegetation abundance

monitoring sites to determine whether differences exist in SMR and drainage between Near sites (i.e., 30 and 100 m) and Reference sites ( $\geq 20$  Km), which could influence plant cover and composition.

### **Vegetation and Soil Base Metals**

The relationship of metal concentrations in soil and lichen with distance from the PDA between the 'Before' and the 'After' periods are analyzed statistically. 2019 was the first year of post-baseline sampling for CoPC metals. In 2019, following an inquiry from the TEWG, metal uptake in lichen tissues, as opposed to metal accumulation on the surface of the plant, was also evaluated to better understand metals contributed by dustfall.

Baffinland expanded the metals analysis in 2019 to relate metal uptake in vegetation and soil to metal deposition by dustfall. This analysis integrates the dustfall and vegetation monitoring programs to build a more holistic understanding of potential Project-related effects on the terrestrial environment.

### **RESULTS**

As a result of the annual review of the monitoring conducted by Baffinland via the Terrestrial Environment Annual Monitoring Reports, and thorough TEWG meetings, changes to the program were implemented in 2019 as outlined above. For detailed results, refer to a summary in PC Condition No. 36 and the Draft 2019 Terrestrial Environment Annual Monitoring Report.

### **TRENDS**

Not applicable.

### **RECOMMENDATIONS / LESSONS LEARNED**

The vegetation monitoring program has evolved since its inception in 2012 based in large part on original input on culturally-valued vegetation during baseline inventories, an original study design concept by the GN, review by QIA biologists, suggested statistical approaches from ECCC, review and feedback from the TEWG, and ultimately by the results of repeated field measurements, a statistical power analysis, and revisions to the program. Baffinland will continue with the scheduled vegetation abundance monitoring program and in accordance with the Terrestrial Environment Mitigation and Monitoring Plan.



## Project Certificate Condition No. 39

Category	Vegetation - Reclamation and Revegetation
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent erosion and promote progressive revegetation of disturbed areas.
Term or Condition	The Proponent shall develop a progressive revegetation program for disturbed areas that are no longer required for operations, such program to incorporate measures for the use of test plots, reseeding and replanting of native plants as necessary. It is further recommended that this program be directly associated with the management plans for erosion control established for the Project.
Relevant Baffinland Commitment	39
Reporting Requirement	To be provided to the NIRB for review and comment at least 60 days prior to commencement of construction activities.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board
Reference	Interim Closure and Reclamation Plan (Baffinland, 2018b) Revegetation Survey & Preliminary Reclamation Trail (EDI, 2020) Implications for Reclamation Practices & Trials at the Mary River Project (EDI, 2019a)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

As described in the ICRP, a Reclamation Research program was proposed to identify best practices for promoting natural revegetation that will inform the progressive revegetation program for disturbed areas that are no longer required for operations. Due to limited research conducted to date for mines in the Canadian Arctic, the research will focus on the development of methods to successfully achieve sustainable vegetation cover that meets the desired land use for the Project sites post-closure in the shortest duration possible. These sites include gravel roads, gravel pads, waste rock, stockpiles, and waste dumps. The objective of the Reclamation Research Program is to identify methods to successfully achieve a sustainable vegetation cover, and the ability of a vegetation cover to enhance physical stability and/or achieve the desired aesthetic conditions for the Project site at closure.

In early 2019, Baffinland retained EDI to complete a desktop review of available practices and recent advances from Arctic mine reclamation in Canada's northern territories and Alaska, USA (EDI, 2019a). Upon review of the available information, common themes are that the Arctic environment imposes significant limitations and constraints on plants/ecosystem development. The most critical issues identified refer to (a) the availability of organic topsoil, (b) the probability of moisture retention, and (c) the availability of suitable seed/plant sources. Consequently, primary preparation techniques (addressed by previous reclamation programs) focused on enhancing soil water and nutrient retention to then provide suitable micro-habitats conducive to early-establishment of vegetation.

The next step following the desktop review was to implement a field program to assess current conditions and establish test plots. EDI developed a pilot study designed to document the status of select post-disturbance areas of

the Site, initiate preliminary reclamation trials to assess methods and approaches considered appropriate for the challenges of the Arctic environment, and identify future research opportunities. Following a survey of existing disturbance sites, the pilot program involved the establishment of reclamation plots to assess methodologies for surface preparation. Two surface configurations were applied: (1) 'rough and loose' where the digging bucket of an excavator/loader is used to open small holes and generate mounds with the landscape, creating heterogeneity and micro-site conditions favourable to seed germination; and (2) 'track packing' which refers to the use of tracked equipment to create surface roughness and is typically used to reduce soil erosion potential by enhancing surface stability, as well as providing micro-site conditions for seed germination.

## RESULTS

The revegetation survey field program was conducted between July 17 to 24, 2019, and assessed two (2) areas in proximity to the Tote Road at KM 12 and KM 52. These areas were identified as having been previously disturbed (historical road alignment or area of disturbance from road construction) and were examined for the purpose of documenting opportunistic post-disturbance revegetation. Soils in both areas were defined by xeric or subxeric conditions and characterized by restrictive growth substrates and poor fertility. At KM 52, the high level of soil disturbance corresponded with low/scarcely cover vegetation consisting primarily of graminoids and perennial herbs and forbs, consistent with the notion that natural revegetation rates are low as this area was assessed to be 1-year post-disturbance. Observations at KM 16 indicated less soil/substrate disturbance, with only moderately low cover vegetation comprised of graminoids, perennial herbs and forbs, and some shrubs, bryophytes and lichen.

Following the survey of existing areas, a reclamation trial program was implemented to assess methodologies for surface preparation in a reclamation scenario that will promote revegetation. Following application of the surface preparation, ongoing monitoring will be required to determine the success of the techniques applied.

## TRENDS

Not applicable.

## RECOMMENDATIONS/LESSONS LEARNED

In 2020 Baffinland will be organizing a Mine Closure Working Group to evaluate the implementation and results of reclamation research programs and progressive reclamation projects at Mary River. Baffinland will discuss the findings of the 2019 revegetation studies with the Mine Closure Working Group, to assess and evaluate the current study design, seek input on the integration of IQ into the study design, and establish a path forward for the expanded implementation of the research program. Based on the work completed by EDI, long term recommendations for future studies include:

- Expand the number and location of revegetation survey sites to increase the sample size;
- Review the range of landscapes intersected by the Project and assess the reclamation strategies and surface configurations that could be applied to optimize revegetation outcomes; and
- Expand to medium or large scale trials, based on project features that could be decommissioned and/or reclaimed. Availability of these sites will be contingent on the Project lifecycle, but could include such areas as a laydown or access road.

## Project Certificate Condition No. 40

Category	Vegetation - Reclamation and Revegetation
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent erosion and promote progressive revegetation of disturbed areas.
Term or Condition	The Proponent shall include revegetation strategies in its Site Reclamation Plan that support progressive reclamation and that promote natural revegetation and recovery of disturbed areas compatible with the surrounding natural environment.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	QIA
Reference	Interim Closure and Reclamation Plan (Baffinland, 2018b) Revegetation Survey & Preliminary Reclamation Trail (EDI, 2020) Implications for Reclamation Practices & Trials at the Mary River Project (EDI, 2019a)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

As described in the ICRP, a Reclamation Research program was proposed to identify best practices for promoting natural revegetation that will inform the progressive revegetation program for disturbed areas that are no longer required for operations. Due to limited research conducted to date for mines in the Canadian Arctic, the research will focus on the development of methods to successfully achieve sustainable vegetation cover that meets the desired land use for the Project sites post-closure in the shortest duration possible. These sites include gravel roads, gravel pads, waste rock, stockpiles, and waste dumps. The objective of the Reclamation Research Program is to identify methods to successfully achieve a sustainable vegetation cover, and the ability of a vegetation cover to enhance physical stability and/or achieve the desired aesthetic conditions for the Project site at closure.

In early 2019, Baffinland retained EDI to complete a desktop review of available practices and recent advances from Arctic mine reclamation in Canada's northern territories and Alaska, USA (EDI, 2019a). Upon review of the available information, common themes are that the Arctic environment imposes significant limitations and constraints on plants/ecosystem development. The most critical issues identified refer to (a) the availability of organic topsoil, (b) the probability of moisture retention, and (c) the availability of suitable seed/plant sources. Consequently, primary preparation techniques (addressed by previous reclamation programs) focused on enhancing soil water and nutrient retention to then provide suitable micro-habitats conducive to early-establishment of vegetation.

The next step following the desktop review was to implement a field program to assess current conditions and establish test plots. EDI developed a pilot study designed to document the status of select post-disturbance areas of the Site, initiate preliminary reclamation trials to assess methods and approaches considered appropriate for the challenges of the Arctic environment, and identify future research opportunities. Following a survey of existing disturbance sites, the pilot program involved the establishment of reclamation plots to assess methodologies for

surface preparation. Two surface configurations were applied: (1) 'rough and loose' where the digging bucket of an excavator/loader is used to open small holes and generate mounds with the landscape, creating heterogeneity and micro-site conditions favourable to seed germination; and (2) 'track packing' which refers to the use of tracked equipment to create surface roughness and is typically used to reduce soil erosion potential by enhancing surface stability, as well as providing micro-site conditions for seed germination.

## RESULTS

The revegetation survey field program was conducted between July 17 to 24, 2019, and assessed two (2) areas in proximity to the Tote Road at KM 12 and KM 52. These areas were identified as having been previously disturbed (historical road alignment or area of disturbance from road construction) and were examined for the purpose of documenting opportunistic post-disturbance revegetation. Soils in both areas were defined by xeric or subxeric conditions and characterized by restrictive growth substrates and poor fertility. At KM 52, the high level of soil disturbance corresponded with low/sparse cover vegetation consisting primarily of graminoids and perennial herbs and forbs, consistent with the notion that natural revegetation rates are low as this area was assessed to be 1-year post-disturbance. Observations at KM 16 indicated less soil/substrate disturbance, with only moderately low cover vegetation comprised of graminoids, perennial herbs and forbs, and some shrubs, bryophytes and lichen.

Following the survey of existing areas, a reclamation trial program was implemented to assess methodologies for surface preparation in a reclamation scenario that will promote revegetation. Following application of the surface preparation, ongoing monitoring will be required to determine the success of the techniques applied.

## TRENDS

Not applicable for 2019.

## RECOMMENDATIONS / LESSONS LEARNED

In 2020 Baffinland will be organizing a Mine Closure Working Group to evaluate the implementation and results of reclamation research programs and progressive reclamation projects at Mary River. Baffinland will discuss the findings of the 2019 revegetation studies with the Mine Closure Working Group, to assess and evaluate the current study design, seek input on the integration of IQ into the study design, and establish a path forward for the expanded implementation of the research program. Based on the work completed by EDI, long term recommendations for future studies include:

- Expand the number and location of revegetation survey sites to increase the sample size;
- Review the range of landscapes intersected by the Project and assess the reclamation strategies and surface configurations that could be applied to optimize revegetation outcomes; and
- Expand to medium or large scale trials, based on project features that could be decommissioned and/or reclaimed. Availability of these sites will be contingent on the Project lifecycle, but could include such areas as a laydown or access road.

#### 4.6.7 Freshwater Environment (PC Conditions 41 through 48a)

Nine (9) PC conditions (includes No. 48 and 48a) relate to the potential impacts of the Project on the freshwater environment, focused on fish and other freshwater biota. Several of the conditions recommend environmental protection measures, such as setbacks from watercourses and meeting blasting thresholds, or relate to meeting discharge requirements for effluents and runoff (the latter is evaluated in Section 4.6.5).

##### **Stakeholder Feedback**

The Department of Fisheries and Oceans Canada (DFO) administers the fish and fish habitat sections of the *Fisheries Act* and is therefore the primary stakeholder with respect to freshwater biota. The Nunavut Water Board also regulates in-water structures such as bridges and culverts. The QIA in previous environmental reviews has also provided valuable feedback for freshwater biota. Freshwater biota has not been a key concern for local communities, as the Project does not interact with freshwater bodies containing anadromous (sea run) arctic char. For most stakeholders, the use of explosives near or in fish bearing waters was a key area of concern. Effects to fish and freshwater biota have not been raised in 2019 consultation activities (Appendix B).

Monitoring activities undertaken in relation to the freshwater environment include:

- Monitoring of fish habitat offsetting measures associated with the 2007 Authorization under the Fisheries Act for water crossings along the Tote Road (DFO, 2007);
- Monitoring of the freshwater environment (including sediment, phytoplankton, benthic invertebrates and fish) as part of the AEMP; and,
- Monitoring of sedimentation rates in Sheardown Lake NW to evaluate the potential effects of dust and site runoff on arctic char reproductive success.

##### **Tote Road Fish Use Assessments**

Related to the fish habitat offsetting measures associated with the Tote Road Authorization, the principal conclusions from the 2019 monitoring program were:

- All compensation works completed prior to 2019 remain successful (including fish use of the rustic fishway installed at BG-30);
- No in-stream construction work was completed in 2019 during periods of flow that required turbidity monitoring;
- Fish use assessments in 2019 were conducted at all fish bearing crossings along the Tote Road;
- There were no fish passage or habitat issues observed at 27 of the 36 fish bearing crossings assessed; and,
- Issues with fish passage and/or habitat were observed at nine (9) fish bearing water crossings. At water crossings BG-29 and BG-01, instream road aggregate/rip rap was removed from the channel and full accessibility was promptly restored in 2019. Perching of culverts was noted at seven (7) fish bearing water crossings (CV-106, CV-111, CV-114, CV-129, CV-216, CV-225, BG-50) resulting in limited access to upstream habitat. Perching was able to be addressed in 2019 at five (5) of these water crossings by installing step-pool rocky ramps. However, the installation of step-pool rocky ramps was not feasible at CV-111 and CV-225. Additional efforts are planned in 2020 to address the perching concerns at these two remaining crossings.

### Freshwater Biota Monitoring Under the AEMP

One component study of the AEMP is the Core Receiving Environment Monitoring Program (CREMP). This monitoring program involves water and sediment quality monitoring and aquatic biota monitoring (including phytoplankton, benthic invertebrates and fish) in lakes and streams near the Mine Site. The AEMP monitoring was undertaken in 2019 with support from Minnow Environmental Inc. (Minnow) and is reported in detail in the 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a).

The results of the 2019 CREMP indicated some mine-related influences on water and sediment quality of a few of the mine primary receiver systems, but no ecologically significant, adverse, mine-related effects to biota were identified in any of the Mine Site waterbodies based on comparisons to applicable reference conditions or baseline data. This includes: Camp Lake and tributaries, Sheardown Lake and tributaries; and Mary River and Mary Lake.

### Lake Sedimentation Monitoring

The principal conclusions of 2018 - 2019 lake sedimentation monitoring study in Sheardown Lake NW are as follows (Minnow, 2020a):

- At littoral (shallow) areas, including habitat likely to be used by Arctic char for spawning, sedimentation rates over the ice-cover and open-water periods in 2018 to 2019 were similar to those during the mine baseline period (2013 to 2014);
- At profundal (deep) areas, sedimentation rates during the ice-cover period in 2018 to 2019 were significantly higher than during the mine baseline period;
- At profundal (deep) areas, sedimentation rates during the open-water period in 2018 to 2019 were within the range observed during the mine baseline period.
- Current monitoring data does not indicate increasing sedimentation rates since the onset of commercial mine production in 2015 at Sheardown Lake NW. Despite higher annual sedimentation in 2018-2019 compared to baseline at profundal habitat, sedimentation rates at Sheardown Lake NW in 2018-2019 (as well as for all previous study years) were within the range observed among typical Canadian arctic lakes that have not been influenced by anthropogenic activities.
- Annual sediment accumulation thickness estimates for Sheardown Lake NW in 2018 to 2019 were comparable to or lower than annual estimates for arctic lakes of comparable size and/or depth. The sediment accumulation thickness estimated for the 2018 to 2019 arctic char egg incubation/larval pre-emergence period at Sheardown Lake NW was well below the threshold level of 1 mm of sediment deposition.

Overall, the 2018 to 2019 results indicated no effects on arctic char reproductive success were likely at Sheardown Lake NW as a result of sedimentation rates/accumulation over the 2018 - 2019 egg incubation/larval preemergence period.

Table 4.19 provides an evaluation of the Project's impacts on the freshwater environment, based on monitoring activities completed in 2019, relative to predictions presented in the FEIS and FEIS Addendum.

**Table 4.19: Freshwater Environment Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Freshwater Biota	Culvert replacements or extensions; sea container crossings were removed	Monitoring undertaken in accordance with the 2007 authorization under the <i>Fisheries Act</i> .	All compensation works are effective. Within FEIS predictions
	Culvert perching	Monitoring undertaken in accordance with the 2007 authorization under the <i>Fisheries Act</i> .	Perching of culverts was noted remaining at two (2) crossings. Effect within FEIS predictions
	Water withdrawals from lakes affecting nearshore fish habitat	Measure/monitor and report water usage in accordance with water licence limits	Water usage generally within water licence limits. Effect within FEIS predictions
	Fish impingements at camp and dust suppression water takes	No monitoring; appropriate screens are used on all intakes	Within FEIS predictions

### Path Forward

Baffinland plans to continue the implementation of improvements outlined in the TREEP and the Hatch 2013 design throughout 2020 to improve surface water drainage along the Tote Road and address outstanding fish passage concerns.



## Project Certificate Condition No. 41

Category	Freshwater Aquatic Environment - Setbacks
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts of runoff into freshwater aquatic habitat.
Term or Condition	Unless otherwise approved by regulatory authorities, the Proponent shall maintain a minimum 100-metre naturally-vegetated buffer between the high-water mark of any fish-bearing water bodies and any permanent quarries with potential for acid rock drainage or metal leaching.
Relevant Baffinland Commitment	64, 65
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association, Nunavut Water Board, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board
Reference	Borrow Pit and Quarry Management Plan (Baffinland, 2014c) Q1 Quarry Management Plan (Baffinland, 2020j) QMR2 Quarry Management Plan (Baffinland, 2017a) 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Baffinland maintains the 100 metre buffer from the high water mark to any fish bearing water bodies during the development and operation of the quarries at the Project. Baffinland continues to evaluate active quarries to assess the potential for generating Acid Rock Drainage (ARD) or Metal Leaching prior to and during development. Geochemical investigations have been carried out at the proposed sites, and ARD sources are avoided to the extent practicable. Additionally, Baffinland maintains specific quarry management plans that outline testing requirements to identify potential acid rock drainage material encountered during quarry operation and maintains appropriate buffers to fish bearing waters.

### RESULTS

No new quarries were developed in 2019. Existing quarries maintained the 100 metre buffer from the high water mark to any fish bearing water bodies. Construction activities increased in 2018 and 2019, resulting in the requirement to expand existing quarries at the Project. Analyses for ARD indicators of quarried material were performed as per specific approved quarry management plans to ensure no potential acid generating material was used during construction activities. A discussion of geochemistry sampling of quarry rock and surface water runoff monitoring downstream of Project areas and quarries is provided in Section 7.4 of the 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a).

### TRENDS

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

New quarry developments will continue to be tested for ARD and metal leaching using the Protocol for the Assessment for the Potential for Acid Rock Drainage (Borrow Pit and Quarry Management Plan, Appendix 2) and the 100 metre buffer from the high water mark to any fish bearing water bodies will be maintained.

## Project Certificate Condition No. 42

Category	Freshwater Aquatic Environment - Setbacks
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts of runoff into freshwater aquatic habitat.
Term or Condition	The Proponent shall maintain minimum a 30-metre naturally-vegetated buffer between the mining operation and adjacent water bodies.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In Compliance
Stakeholder Review	Qikiqtani Inuit Association, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board
Reference	Surface Water and Aquatic Ecosystems Management Plan (Baffinland, 2020f) Environmental Protection Plan (EPP; Baffinland, 2016b) Terrestrial Environmental Management and Monitoring Plan (TEMMP; Baffinland, 2016c) Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

Baffinland continues to perform regular inspections during construction activities to ensure all Project-related operations are at a distance greater than 31 metres from any water body, except where authorized under the Type A Water License and DFO Letters of Advice. If infractions are discovered, responsible departments for development areas are actioned to remove materials or infrastructure, and to reclaim the developed area. New proposed development areas must be approved by the Baffinland Site Environment Department to ensure the area has a setback of 31 metres from the high water mark of natural water bodies. Consultants preparing design drawings for new infrastructure are also made aware of the requirement. Baffinland conducts orientation training on the EPP for new contractors. The presentation provides an overview of key Project activities and the required natural vegetation buffers to any waterbodies.

### RESULTS

No permanent or temporary Project-related operations were sited within 30 m of a water body during 2019.

### TRENDS

Project operations have maintained the 31-m buffer between water bodies and the condition continues to be enforced.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland personnel continue to monitor all new Project developments to ensure the 31-m buffer condition is adhered to. Baffinland will ensure all requirements and mitigation measures are clearly communicated to Projects contractors.

## Project Certificate Condition No. 43

Category	Freshwater Aquatic Environment - Drainage
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To mitigate impacts of runoff into freshwater aquatic habitat.
Term or Condition	Prior to the start of construction, the Proponent must submit a Site Drainage and Silt Control Plan to the appropriate regulatory authorities for approval.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), Nunavut Impact Review Board (NIRB), Nunavut Water Board (NWB), Qikiqtani Inuit Association (QIA)
Reference	Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2020f)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Drainage plans for Project sites and silt/sediment control measures used at the Project are outlined in the Project's Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2020f). A modification to the Type A Water Licence for the implementation of the Milne Port Surface Water Management Plan was approved in 2018. This plan was developed to manage surface water at Milne Port and reduce the volume of surface water in contact with project infrastructure by diverting surface flow using berms, ditching and culverts around and through developed areas of the Project.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

The SWAEMP will continue to be followed and enforced at the Project.

## Project Certificate Condition No. 44

Category	Freshwater Aquatic Environment - Explosives
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts of explosives on freshwater aquatic habitat.
Term or Condition	The Proponent shall meet or exceed the guidelines set by Fisheries and Oceans Canada for blasting thresholds and implement practical and effective measures to ensure that residue and by-products of blasting do not negatively affect fish and fish habitat.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky, 1998)
Ref. Document Link	N/A

### METHODS

Not applicable.

### RESULTS

No blasting occurred in 2019 within the required setback distances detailed in the DFO guidance document titled *"Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters"* (Wright and Hopky, 1998).

### TRENDS

Not applicable. To date, no blasting has occurred within the required setback distances at the Project.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 45

Category	Freshwater Aquatic Environment - General
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts to freshwater aquatic habitat.
Term or Condition	The Proponent shall adhere to the No-Net-Loss principle at all phases of the Project to prevent or mitigate direct or indirect fish and fish habitat losses.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Fisheries and Oceans Canada (DFO)
Reference	<p>Fisheries Authorization No. NU-06-0084 (For Tote Road Water Crossings; DFO, 2007)</p> <p>Fisheries Authorization No. 14-HCAA-00525 (For Ore Dock; DFO, 2014)</p> <p>Fisheries Authorization No. 18-HCAA-00160 (For Freight Dock; DFO, 2019)</p> <p>No Net Loss and Monitoring Plan (Knight Piésold, 2007)</p> <p>Fish Habitat Monitoring - 2019 Annual Report - Early Revenue Phase - Tote Road Upgrades (Baffinland, 2019f)</p> <p>2019 Milne Ore Dock Fish Offset Monitoring Report (Golder, 2019d)</p> <p>Floating Freight Dock Project – Revised Effectiveness Monitoring Plan for Coarse Rock Offsetting Habitat (Golder, 2019e)</p> <p>2019 Environmental Monitoring Completion Report - Milne Port Freight Construction Project, Baffin Island, Nunavut (Golder, 2020b)</p>
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/Appendix G">https://www.baffinland.com/media-centre/document-portal/Appendix G</a>

## METHODS

The three (3) above-referenced *Fisheries Act* Authorizations (DFO, 2007; DFO, 2014; DFO, 2019) are the regulatory instruments by which Baffinland is required to demonstrate adherence to the No-Net-Loss Principle. Annual monitoring programs of habitat off-setting works associated with Project fish bearing water crossings (i.e. culverts, bridges) and the Milne Port Ore Dock were undertaken in 2019 as described below. During 2019, Baffinland constructed the Milne Port Freight Dock (Freight Dock) for which annual monitoring programs of habitat off-setting works for the Freight Dock will begin in 2020.

## RESULTS

### ***Milne Inlet Tote Road Water Crossings (Fisheries Act Authorization No. NU-06-0084)***

2019 assessments of Project fish bearing water crossings were completed by North/South Consultants fisheries biologists in late June and early July. The emphasis of the 2019 monitoring program was to assess the presence of fish, habitat quality, and fish passage success at Project fish bearing water crossings. The 2019 monitoring program also resurveyed water crossings that had previously been identified as non-fish bearing to confirm continued lack of fish use.



During the 2019 assessments, fish were captured and/or observed at all known fish bearing crossings, with the exception of water crossings CV-115 and CV-102 due to low flow conditions. No fish were observed at water crossings that had been categorized as non-fish bearing, confirming their previously determined status. It was also noted that compensation works completed prior to 2019 remained successful.

No fish passage or habitat issues were documented at 27 of the 36 fish bearing water crossings. Issues with fish passage and/or habitat were observed at nine (9) fish bearing water crossings. At water crossings BG-29 and BG-01, instream road aggregate/rip rap was removed from the channel and full accessibility was promptly restored in 2019. Perching of culverts was noted at seven (7) fish bearing water crossings (CV-106, CV-111, CV-114, CV-129, CV-216, CV-225, BG-50) resulting in limited access to upstream habitat. Perching was able to be addressed in 2019 at five (5) of these water crossings by installing step-pool rocky ramps. However, the installation of step-pool rocky ramps was not feasible at CV-111 and CV-225. Additional efforts are planned in 2020 to address the perching concerns at these two (2) remaining crossings.

#### ***Milne Port Ore Dock (Fisheries Act Authorization No. 14-HCAA-00525)***

Under the *Fisheries Act* Authorization issued for the Milne Port Ore Dock (Ore Dock), Baffinland is required to monitor and report on the structural stability and biological utilization of offsetting measures implemented at the Ore Dock during construction in 2014.

2019 was the fifth year in which monitoring of offsetting measures was conducted. The 2019 monitoring program involved:

- Underwater, georeferenced video surveys to monitor the integrity of the coarse rock substrate and identify any slumping or other deterioration of the offset habitat;
- Retrieval of natural substrate settlement baskets and artificial plates in the vicinity of the Ore Dock to evaluate colonization of benthic invertebrates (encrusting epifauna) and larval fish; and,
- Underwater video surveys of the offset habitat to demonstrate the association of fish with the coarse rock substrate.

During 2019, multiple underwater video surveys were conducted at various depths along three (3) transects on the west side of the Ore Dock and four (4) transects on the east side of the Ore Dock using a remotely operated vehicle (ROV). 2019 surveys followed methods used during the previous year.

Analysis of the underwater video showed no evidence of movement or slumping and demonstrated that the coarse rock was functioning as constructed with no loose or stray rocks present along the adjacent seafloor. Similar to observations in 2018, there was generally a large amount of algal growth and epifaunal colonization on the rocks along the east and west sides of the Ore Dock. Macroalgae was dominated by green and brown algae and included perennial species such as laminarian kelp. The presence of thick cover of macroalgae and perennial species further confirms the stability of the coarse rock habitat. In general, patterns of biological growth and sediment deposition associated with the coarse rock apron suggest that the offset habitat has been in a relatively stable position since its initial placement.

Analysis of the underwater video also demonstrated the presence of benthic invertebrates. Overall, 12 different taxa of invertebrates were identified with the most abundant taxa observed being opossum shrimp (Mysida) and amphipods (Amphipoda). Invertebrate observations were incidental to the program and no apparent differences were noted from the more detailed surveys in 2018.

To document the association of fish with the coarse rock substrate, underwater video surveys were analyzed and identified a total of 41 fish within close proximity to the Ore Dock's coarse rock substrate. Fish identified in the underwater video were comprised of three (3) families: cod (Gadidae), prickleback (Stichaeidae) and sculpin (Cottidae). Consistent with previous years, fish and fish larvae sampling was also undertaken in 2019 to identify fish presence in the offset habitat area. A total of 279 fish belonging to five Arctic species groups were captured during active fish sampling undertaken in 2019. As in previous survey years, Arctic char (*Salvelinus alpinus*) (n=106), fourhorn sculpin (*Myoxocephalus quadricornis*) (n=105) and shorthorn sculpin (*M. scorpius*) (n=66) were the most common species caught, comprising 99% of the total catch. A single northern sandlance (*Ammodytes dubius*) and a single ninespine stickleback (*Pungitius pungitius*) made up the remainder of identified species. Since 2010, 14 distinct fish species have been identified in surveys. Analysis of zooplankton samples collected near Milne Port also observed a single larval fish identified as an indeterminate cod.

As part of the 2019 monitoring program, three (3) settlement baskets and five (5) settlement plates were recovered from the east side of the Ore Dock after being deployed for 24 months and 12 months, respectively. Unfortunately, tethers for the settlement baskets and plates on the west side of the Ore Dock were severed during winter ice break-up and were not able to be recovered. Similar to 2018, due to the relatively low amount of epifaunal colonization of settlement baskets and plates, a composite sample of whole rocks and plates were preserved in 10% formalin and submitted for analysis. Analysis of the rocks and plates collected from the settlement baskets and plates identified a total of 2,317 encrusting epifauna from 22 distinct taxa. Epifauna counts in 2019 represented a 34% increase in total organisms and a 125% increase in unique taxa compared to 2018. The 2019 results indicated the offset habitat is functioning as intended and that colonization of the coarse rock has established and increased to the point where it is capable of seeding new populations of hard substrate associated epifauna.

2019 results indicate that the objectives of the Ore Dock's offset habitat measures are being achieved and contingency measures are not required at this time. A complete discussion of the 2019 monitoring program's methods and results is provided in the 2019 Milne Ore Dock Fish Offset Monitoring Report (Golder, 2019d).

#### ***Milne Port Freight Dock (Fisheries Act Authorization No. 18-HCAA-00160)***

Several environmental monitoring programs were completed during the construction of the Freight Dock in 2019, including routine environmental inspections and the monitoring of water quality, underwater noise, marine mammals and fish within the proximity of the Freight Dock. Annual monitoring programs of habitat off-setting works (e.g. coarse rock along the Freight Dock's perimeter) will begin in 2020 using similar methodologies as the Ore Dock. Details of the annual monitoring programs for the Freight Dock are provided in the Project's Floating Freight Dock Project – Revised Effectiveness Monitoring Plan (Golder, 2019e).

#### **TRENDS**

As noted in previous years, habitat compensation works completed along the Tote Road remain successful.

Submerged substrate associated with the Ore Dock continues to be colonized by marine biota, including vegetation, benthic invertebrates and fish, and considered successful.

#### **RECOMMENDATIONS / LESSONS LEARNED**

During 2019, Baffinland continued to repair and upgrade water crossings at the Project to improve fish passage and surface water drainage, including two (2) fish bearing water crossings. Baffinland continues to routinely inspect fish bearing water crossings at the Project and address identified concerns. Remedying fish passage concerns at water

crossings remains a top priority for Baffinland to ensure compliance with the Project's Tote Road Fisheries Act Authorization (NU-06-0084; DFO, 2007) and No Net Loss and Monitoring Plan (Knight Piésold, 2007). Assessments of fish bearing water crossings will be continued in 2020 as part of the Project's fish habitat monitoring program.

The 2019 monitoring results for the Ore Dock indicate that the offsetting habitat has been successful and that contingency measures are not required at this time. Based on monitoring results collected to date, the coarse rock substrate placed around the perimeter of the Ore Dock in Milne inlet is functioning as designed and in accordance to the conditions set out in *Fisheries Act* Authorization No. 14-HCAA-00525 (DFO, 2014).

Monitoring of the habitat off-setting works associated with the new Freight Dock are planned to begin in 2020 in accordance with the conditions set out in *Fisheries Act* Authorization No. 18-HCAA-00160 (DFO, 2019).

## Project Certificate Condition No. 46

Category	Freshwater Aquatic Environment - Drainage
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate impacts to freshwater aquatic habitat.
Term or Condition	The Proponent shall ensure that runoff from fuel storage and maintenance facility areas, sewage and wastewater other facilities responsible for generating liquid effluent and runoff meet discharge requirements.
Relevant Baffinland Commitment	64
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Partially-Compliant
Stakeholder Review	Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), Environment and Climate Change Canada (ECCC), Nunavut Impact Review Board (NIRB), Nunavut Water Board (NWB), Qikiqtani Inuit Association (QIA)
Reference	Dust Mitigation Action Plan (Golder, 2016a) Fresh Water Supply, Sewage and Wastewater Management Plan (FSWMP; Baffinland, 2020g) Metals & Diamond Mining Effluent Regulations (MDMER; Minister of Justice, 2018) Metal Mining Effluent Regulations Emergency Response Plan (MMER ERP; Baffinland, 2019e) Sampling Program - Quality Assurance and Quality Control Plan (Baffinland, 2020h) Sedimentation Mitigation Action Plan (Golder, 2016b) Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2020f) Tote Road Earthworks Execution Plan (TREET; Golder, 2017) 2019 Freshet Monitoring Report (Baffinland, 2020l) 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a) 2019 MDMER Annual Report (Baffinland, 2020i)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

## METHODS

Wastewater/effluent management practices and procedures are outlined in the Project's Fresh Water Supply, Sewage and Wastewater Management Plan (FSWMP; Baffinland, 2020g) and the Metals & Diamond Mining Effluent Regulations Emergency Response Plan (MDMER ERP; Baffinland, 2019e). Surface water monitoring, management practices and procedures are outlined in the Project's Surface Water and Aquatic Ecosystem Management Plan (SWAEMP; Baffinland, 2020f).

Water quality discharge criteria (discharge criteria) for effluent generated by the Project are stipulated in the Type A Water Licence issued by the Nunavut Water Board, and Schedules 4 and 5 of the Metals and Diamond Mining Effluent Regulations (MDMER; Minister of Justice, 2018).

Prior to discharge, wastewater (e.g. treated sewage, treated contact water, etc.) is sampled to ensure the wastewater's water quality meets the applicable discharge criteria. Wastewater that meets the applicable discharge criteria is discharged to the receiving environment. Water samples are routinely taken during wastewater discharges to ensure the water quality remains in compliance with the applicable discharge criteria. In the event that water quality sampling during a discharge indicates that the water quality has changed and is no longer in compliance with the applicable discharge criteria, the discharge of the non-compliant wastewater is halted.

Wastewater that does not meet the applicable discharge criteria is treated on-site using approved treatment methods (e.g. sewage treatment plants, mobile oily water treatment systems, etc.) and is not discharged to the receiving environment until it has been confirmed by water quality analysis that the treated wastewater meets the applicable discharge criteria.

All water sampling at the Project is conducted in accordance with the Project's Sampling Program - Quality Assurance and Quality Control Plan (Baffinland; 2020h).

As required by the Type A Water Licence, volumes and water quality analysis of wastewater discharged to the receiving environment are reported to regulators (CIRNAC, NWB) on a monthly and annual basis. As a requirement of MDMER, volume and water quality results for discharges from the surface water management ponds associated with the Crusher Facility and Waste Rock Facility (WRF) at the Mine Site are reported to ECCC on a quarterly and annual basis.

The Tote Road Monitoring Program (TRMP) was developed to monitor the water quality of surface water flows at select water crossings (culverts, bridges) along the Tote Road, with a focus on monitoring upstream and downstream TSS concentrations and addressing any sedimentation concerns identified during the monitoring events. Water crossings monitored under the TRMP were selected to give a geographically representative sample set of water crossings for each watershed intersected by the Tote Road. In selecting the water crossings, factors such as key depositional habitats located downstream of the Tote Road (e.g. fish habitat), and areas historically prone to sediment events, were considered. The program includes weekly visual inspections and water quality sampling at designated water crossings during freshet, and subsequently continues monthly until the freeze-up of flows.

## RESULTS

During freshet 2019 (approx. May 15 to June 30), Baffinland conducted water quality monitoring programs at the Mary River Mine Site and along the Milne Inlet Tote Road (Tote Road). The Mine Site freshet monitoring program is conducted each year to characterize the water quality of several Mine Site tributaries and drainages during the high flow period of freshet. The monitoring program begins each year upon the start of flows at the monitoring locations, which typically begins around mid-May. The four (4) monitoring locations (CLSP-OUT, CLT-OUT, SDLTOUT, LDFG-OUT) included in the 2019 program were monitored daily during freshet (typically May 15 to June 30) for total suspended solids (TSS), total dissolved solids (TDS), pH and turbidity.

Several TSS exceedances at locations monitored under the Type A Water Licence and unauthorized releases of sediment were reported to ECCC, CIRNAC, NWB and the NT-NU Spill Line, and are documented in NT-NU Spill Reports 19-198 and 19-226. Further analysis and discussion of the sediment releases and TSS exceedances reported by Baffinland during freshet 2019, including mitigate and corrective actions taken and planned to address sedimentation concerns at the Project, is provided in the 2019 Freshet Monitoring Report (Baffinland, 2020i) and 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a).

Sampling conducted for the Tote Road Monitoring Program identified only two (2) crossings with elevated (grab sample above 30 mg/L) downstream TSS concentrations on the Tote Road during freshet monitoring in 2019. However, upstream TSS concentrations at these crossings were also elevated and of similar concentrations, indicating that the elevated concentrations were naturally occurring and not the result of Project-related activities or infrastructure. Regardless, this is a significant reduction in sediment impacted fishery crossings as compared to previous years; in 2018, eight (8) crossings were found to be above grab sample limits during freshet monitoring and, in 2017, twenty-four (24) crossings were identified above grab sample limits. The TRMP is part of the Roads Management Plan and water quality monitoring are reported in the 2019 QIA & NWB Annual Report for Operations.

Effluents generated and managed by the Project in 2019 included sewage, contact water retained in surface water management ponds associated with ore and waste rock facilities and oily water retained in containment areas, such as bulk fuel facilities. Effluent treatment systems operated at the Project in 2019, included:

- Sewage Treatment Plants (STPs) at Milne Port (MP-01, MP-01B) and the Mine Site (MS-01, MS-01B);
- Dissolved Air Flotation (DAF) Treatment System at Milne Port to treat and discharge wastewater stored in Milne Port PWSP (MP-01A);
- Mobile Oily Water Treatment System (OWTS), at the Mine Site and Milne Port; and the,
- Waste Rock Facility Wastewater Treatment Plant (WRF WTP) at the Waste Rock Facility (MS-08), installed in 2018.

Five (5) discharges of effluent at the Project in 2019 did not comply with the applicable discharge criteria. These were single isolated events at each of the Mine Site STP (MS-01B), the WRF WTP at the WRF (MS-08) and the mobile OWTS at the Milne Port Contaminated Snow Containment Berm (MP-04A). These events are outlined as follows;

- On May 1, 2019, a treated sewage effluent sample collected from the Mine Site STP (MS-01B) servicing the Sallivik Camp exceeded the applicable discharge criteria for total ammonia of 4 mg/L. The elevated ammonia concentration (9.45 mg/L) is believed to be the result of sampling error. The subsequent sampling event of the treated sewage effluent confirmed that total ammonia had returned to concentrations below the applicable discharge criteria.
- On November 12, 2019, a treated sewage effluent sample from the Mine Site STP (MS-01B) also exceeded the applicable discharge criteria for total ammonia (4 mg/L). The elevated ammonia concentration (47.0 mg/L) is believed to have been caused by temporary upset conditions at the Mine Site STP. The subsequent sampling event of the treated sewage effluent confirmed that total ammonia had returned to concentrations below the applicable discharge criteria. No other water quality exceedances involving treated sewage effluent at the Project were observed in 2019.
- During 2019, operation of the WRF WTP continued to prove to be effective at addressing the water quality concerns observed at the WRF in 2017. Beginning in June 2019, controlled discharges of treated effluent from the WRF Pond were conducted and resulted in no exceedances of the water license water quality discharge criteria in 2019 observed in samples collected under Schedule I of the Type 'A' Water Licence. Additional effluent discharge sampling was completed to satisfy the requirements of the MDMER. Within those sampling events, there was one (1) exceedance of the MDMER maximum authorized monthly mean concentration for TSS of 15 mg/L and one (1) non-compliant discharge event of the MDMER grab sample criterion for TSS of 30 mg/L in 2019. The results of sampling completed to satisfy MDMER requirements are detailed in Baffinland's 2019 MDMER Annual Report (Baffinland, 2020i).

- On September 8, 2019, a treated effluent sample collected from the mobile OWTS, while stationed at the Contaminated Snow Containment Berm (MP-04A) which is part of the Milne Port Landfarm Facility (MP-04), had an elevated total lead concentration of 0.00117 mg/L; exceeding the applicable discharge criteria for total lead of 0.001 mg/L. Discharge of treated effluent from the mobile OWTS was halted on September 11, 2019, prior to receipt of the elevated total lead result from the analytical lab, and was not resumed in 2019. Due to the close proximity to freeze-up at the Project, subsequent sampling was not undertaken following receipt of the elevated total lead result. Potential causes of the exceedance include lab error, due to the close proximity of the discharge criterion to the analytical minimum detection limit (MDL), and the media used by the mobile OWTS being spent. No other water quality exceedances involving treated oily water effluent from the mobile OWTS were observed in 2019.

Periodic controlled discharges of the treated effluent from the Crusher Facility (CF) Pond occurred during August and September 2019. Controlled effluent discharges from the Crusher Facility in 2019 involved pumping retained surface water runoff from the CF Pond through a direct-discharge pipeline shared with the Mine Site STPs and releasing the effluent at an approved discharge point near the Mary River. During periods of discharge, water quality monitoring was conducted to ensure compliance with the applicable water quality discharge criteria outlined in the MDMER and the Type 'A' Water Licence. No exceedances of the applicable water quality discharge criteria were observed during the 2019 Crusher Facility effluent discharges.

2019 water quality exceedances for effluents monitored under the Type A Water Licence were reported to CIRNAC, the NWB and the QIA in the monthly monitoring reports prescribed by the Type A Water Licence. Water quality exceedances of the MDMER criterion were reported to ECCC and included in the annual MDMER report submission. A full discussion of the Project's 2019 monitoring results under the Type A Water Licence is provided in the 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a) and a description of the monitoring results under the MDMER is provided in the 2019 MDMER Annual Report (Baffinland, 2020i).

## TRENDS

Overall, the frequency of incidents involving the discharge of effluents to the receiving environment that exceed the applicable discharge criteria have remained low and incidental since the start of operations in 2014.

Continued upgrades to Tote Road water crossings and Project surface water infrastructure have significantly reduced the number and frequency of TSS exceedances and sediment releases observed and reported by Baffinland during 2019. Results from monitoring of the Tote Road water crossings in 2019 did not identify any Project-related sedimentation in surface water as a result of operation of the roadway or infrastructure.

## RECOMMENDATIONS / LESSONS LEARNED

To improve the water quality of surface water drainage at the Project during freshet, Baffinland continues to implement the corrective actions and improvements outlined in the Sedimentation and Dust Mitigation Action Plans and Tote Road Earthworks Execution Plan (Golder, 2016a, 2016b and 2017), as well as the Hatch 2013 design for the Tote Road. A number of corrective actions were undertaken to address the sediment releases associated with freshet 2019 Spill Reports 19-198 and 19-226. Consistent with Baffinland's Surface Water and Aquatic Ecosystem Management Plan, corrective and mitigation actions taken during freshet 2019 in response to reported sediment releases included one or more of the following:

- Silt fence and spring berm installation;



- Check dam and settling pond repairs, construction and operation;
- Gabion basket installation to reinforce check dams;
- Armouring of ditches, banks, and road embankments near waterbodies;
- Clearing of excess snow at culvert inlets and outlets; and
- Redirection of sediment/turbid waters away from fish habitat by means of ditches, swales, and active pumping.

To ensure the accuracy of future water quality sampling results, Baffinland will continue to train all personnel involved with sampling effluents at the Project in the proper sampling practices and procedures, as outlined in the Project's Sampling Program - Quality Assurance and Quality Control Plan (Baffinland, 2017h).

Baffinland plans to continue to operate the WRF WTP to treat contact water generated at the WRF as required in 2020. Since the commissioning and operation of the WRF WTP, Baffinland has increased the frequency and rigor of testing and sampling of WRF Pond effluent to optimize dosing requirements and reduce variances in TSS. Upgrades to the WRF WTP in 2020 include the addition of a second geotube settling pond to facilitate future maintenance requirements.

To address the total lead exceedance observed at the mobile OWTS in 2019, the media will be replaced prior to operation of the mobile OWTS in 2020. In addition, all operators of the mobile OWTS will be thoroughly trained in the system's operation to ensure the media continues to be replaced at the frequency recommended by the media's manufacturer.

Overall, the low frequency of non-compliant discharges involving effluents generated and managed by the Project are evidence of the effectiveness of the Project's wastewater/effluent management practices and procedures. Baffinland will continue to update the Project's management practices and procedures and implement new mitigation measures as required to ensure effluent discharges to the receiving environment are in compliance with applicable water quality discharge criteria.

## Project Certificate Condition No. 47

Category	Freshwater Aquatic Environment - Watercourses
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent blockages or restrictions to fish passage.
Term or Condition	The Proponent shall ensure that all Project infrastructure in watercourses are designed and constructed in such a manner that they do not unduly prevent and limit the movement of water in fish bearing streams and rivers.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In Compliance
Stakeholder Review	Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), Fisheries and Oceans Canada (DFO), Nunavut Water Board (NWB), Qikiqtani Inuit Association (QIA)
Reference	Fish Habitat No Net Loss and Monitoring Plan (Knight Piésold, 2007) Fish Habitat Monitoring - 2019 Annual Report - Early Revenue Phase - Tote Road Upgrades (Baffinland, 2019f) Fisheries Act Authorization No. NU-06-0084 (For Tote Road Crossings; DFO, 2007)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

A fish habitat monitoring plan was developed by Baffinland to ensure that all measures and works specified in the No Net Loss and Monitoring Plan (Knight Piésold, 2007), as well as the *Fisheries Act* Authorization (NU-06-0084; DFO, 2007) and amendments, are implemented and are functioning as intended. In 2019, monitoring was conducted at fish bearing water crossings at the Project. As an additional measure, crossings that had been previously categorized as non-fish bearing were resurveyed in 2019 to confirm continued lack of fish use. The emphasis of the 2019 monitoring program was to assess the presence of fish, habitat quality, and fish passage success at Project fish bearing water crossings.

### RESULTS

2019 assessments of Project fish bearing water crossings were completed by a third-party Professional Fisheries Biologist in late June and early July.

During the 2019 assessments, fish were captured and/or observed at all known fish bearing crossings, with the exception of water crossings CV-115 and CV-102 due to low flow conditions. No fish were observed at water crossings that had been categorized as non-fish bearing, confirming their previously determined status. It was also noted that compensation works completed prior to 2019 remained successful.

No fish passage or habitat issues were documented at 27 of the 36 fish bearing water crossings. At the 27 water crossings, no velocity or physical obstructions were identified. Issues with fish passage and/or habitat were observed at nine (9) fish bearing water crossings. At water crossings BG-29 and BG-01, instream road aggregate/rip rap was removed from the channel and full accessibility was promptly restored in 2019. Perching of culverts was noted at

seven (7) fish bearing water crossings (CV-106, CV-111, CV-114, CV-129, CV-216, CV-225, BG-50) resulting in limited access to upstream habitat. Perching was able to be addressed in 2019 at five (5) of these water crossings by installing step-pool rocky ramps. However, the installation of step-pool rocky ramps was not feasible at CV-111 and CV-225. Additional efforts are planned in 2020 to address the perching concerns at these two (2) remaining crossings.

#### **TRENDS**

Baffinland continues to address perched culverts at Project fish bearing water crossings, as they are identified. Current monitoring and assessment of project watercourses is sufficiently robust to identify fish passage issues, and Baffinland has consistently demonstrated the ability to remedy these issues in a timely and effective manner.

#### **RECOMMENDATIONS / LESSONS LEARNED**

During 2019, Baffinland continued to repair and upgrade water crossings at the Project to improve fish passage and surface water drainage, including two (2) fish bearing water crossings. Baffinland continues to routinely inspect fish bearing water crossings at the Project and address identified concerns. Additional works to address outstanding concerns (CV-111, CV-225) are planned for 2020. Remedying fish passage concerns at water crossings remains a top priority for Baffinland to ensure compliance with the Project's Tote Road Fisheries Act Authorization (NU-06-0084; DFO, 2007) and No Net Loss and Monitoring Plan (Knight Piésold, 2007). Assessments of fish bearing water crossings will be continued in 2020 as part of the Project's fish habitat monitoring program.

## Project Certificate Condition No. 48

Category	Freshwater Aquatic Environment - Explosives
Responsible Parties	The Proponent, Qikiqtani Inuit Association, Fisheries and Oceans Canada
Project Phase(s)	Construction, Operations
Objective	To mitigate impacts to freshwater aquatic habitat.
Term or Condition	The Proponent shall engage with Fisheries and Oceans Canada and the Qikiqtani Inuit Association in exploring possible Project specific thresholds for blasting that would exceed the requirements of Fisheries and Oceans Canada's Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky, 1998).
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky, 1998)
Ref. Document Link	N/A

### METHODS

To date there has been no requirement to undertake blasting in or near water, and as such, there has been no requirement to discuss blasting near water with Fisheries and Oceans Canada and the Qikiqtani Inuit Association.

### RESULTS

No blasting occurred in 2019 within the required setback distances detailed in the DFO guidance document titled "*Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters*" (Wright and Hopky, 1998).

### TRENDS

Not applicable. To date, no blasting has occurred within the required setback distances at the Project.

### RECOMMENDATIONS / LESSONS LEARNED

To date there has been no requirement to undertake blasting in or near water, and as such, there has been no requirement to discuss blasting near water with Fisheries and Oceans Canada and the Qikiqtani Inuit Association. Baffinland will discuss Project specific blasting thresholds with the appropriate parties if required in the future.

## Project Certificate Condition No. 48 (a)

Category	Freshwater Aquatic Environment - Arctic char
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations
Objective	To determine presence and health of Arctic char in freshwater aquatic habitat.
Term or Condition	The Proponent shall develop plans to conduct additional surveys for the presence of Arctic char in freshwater bodies and ongoing monitoring of arctic char health where applicable, within watersheds proximal to the mine, tote road and Milne Inlet Port project development areas, including but not limited to, Phillips Creek, Tugaat and Qurluktuk. The Proponent shall consult with the MHTO regarding the design, timing, and location of proposed surveys and ongoing monitoring.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC), Fisheries and Oceans Canada (DFO), Nunavut Impact Review Board (NIRB), Nunavut Water Board (NWB), Qikiqtani Inuit Association (QIA)
Reference	Fish Habitat Monitoring - 2019 Annual Report - Early Revenue Phase - Tote Road Upgrades (Baffinland, 2019f) 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

## METHODS

In addition to the annual fish use assessments completed near Project water crossings, as discussed in PC No. 47, Baffinland conducts annual fish population assessments for Arctic char in Camp Lake, Sheardown Lake, Mary Lake and Reference Lake 3 near the Mine Site as part of the Project's Core Receiving Environment Monitoring Program (CREMP). The CREMP is an aquatic monitoring program conducted annually that focuses on evaluating mine-related influences on water quality, sediment quality and/or biota, including Arctic char, within aquatic environments located near the Mine Site. Under the CREMP, condition of arctic char populations within monitored lakes are assessed using a non-lethal sampling program that involves capturing and assessing 100 Young-of-Year (YOY) Arctic char from nearshore lake habitat via electrofishing and 100 adult Arctic char from littoral/profundal lake habitat via gill netting in each monitored lake.

## RESULTS

As documented in the 2019 CREMP Monitoring Report, monitoring data collected to date suggest no adverse mine-related effects on arctic char populations within monitored lakes under the CREMP. The 2019 CREMP Monitoring Report, which provides a complete analysis and discussion of 2019 monitoring results, is provided as an appendix to the 2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a).

**TRENDS**

No adverse mine-related effects on arctic char populations within monitored lakes under the CREMP have been observed to date. Similar to previous years (2015, 2016, 2017, 2018), low numbers of Arctic char were captured in the littoral/profundal habitat of Reference Lake 3 in 2019 suggesting a lower fish abundance than the other monitored lakes (e.g. Mary Lake, Camp Lake, Sheardown Lake).

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland plans to continue the CREMP, described above, to assess the condition of arctic char populations within aquatic environments near the Mine Site. Engagement activities with the QIA and North Baffin communities are planned for 2020, such that Baffinland can provide an overview of the AEMP and results of monitoring to date.

#### 4.6.8 Terrestrial Environment (PC Conditions 49 through 64)

Sixteen (16) PC conditions relate to the potential impacts of the Project on the terrestrial environment, focusing primarily on caribou, carnivores, and terrestrial wildlife habitat. The importance of Baffinland support to regional wildlife monitoring and management initiatives was stressed by the NIRB, the GN and other parties.

##### **Stakeholder Feedback**

Caribou remains one of the primary focusses of stakeholder concern with respect to the terrestrial environment. The TEWG is a stakeholder body that Baffinland interacts with regarding caribou and other components of the terrestrial environment.

During the environmental review process for the FEIS and FEIS addendum, the potential for sensory disturbance on caribou resulting from the Project was a key issue. Concerns were related to potential sensory disturbance and the potential for mortalities due to collisions with trains on the south railway and truck traffic along the Milne Inlet Tote Road. Communities were initially very concerned that the railway would interrupt the typical northward movement of caribou into the North Baffin Region, though through the review process the feedback received from community members seemed to indicate that they had become more comfortable with the idea that the caribou would acclimatize to the railway over time. Another concern identified was the idea that caribou are particularly sensitive to disturbance at their current state of low abundance within their natural population cycle. Effects to terrestrial wildlife, and in particular key issues such as the current low numbers of caribou in the area, potential impacts to calving areas, movement and migration, as well as potential effects of caribou eating vegetation with dust, continue to be expressed in 2019 consultation activities (Appendix B).

##### **Monitoring**

Baffinland completes a number of monitoring programs on the terrestrial environment, some of which are conducted in collaboration with government agencies when feasible. Baffinland is increasing its focus on inclusion of community-based monitoring into all aspects of the programs. The TEWG members, consisting of government agencies, the QIA, technical experts and community representatives, provide recommendations and guidance on Baffinland's terrestrial monitoring programs. The TEWG provides review and comment on the Terrestrial Environment Annual Monitoring Report, and provides comments and recommendations for future updates and revisions to the monitoring program. Two (2) in-person meetings and two (2) teleconferences are held annually to review the trends and results of all programs and to solicit feedback regarding future monitoring. In 2019, only one (1) in-person and two (2) teleconferences were held with the TEWG due to the logistical challenges and conflicts of scheduling associated with the November 2019 Phase 2 Proposal hearing. Accordingly, the second typically-scheduled in person meeting was postponed and held in February 2020.

Table 4.20 provides an evaluation of the Project's impacts on the terrestrial environment, based on monitoring activities completed in 2019, relative to predictions presented in the FEIS and FEIS Addendum.



**Table 4.20: Terrestrial Environment Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Habitat Loss	Direct habitat loss due to the Project footprint, and indirect habitat loss due to sensory disturbances	Height of Land monitoring; snow track and snow bank monitoring; incidental observations.	Within FEIS predictions
Restriction of Movement	Project infrastructure and the tote road act as a barrier to the movement of caribou		
Mortality	Mortality resulting from vehicle collisions or project-induced hunting	Incidental observations; biologists and other staff on-site: no mortalities observed	Within FEIS predictions

Effects of the Project on the terrestrial environment are within FEIS predictions.

### Path Forward

Baffinland will remain vigilant about implementing the mitigation and monitoring activities that are in place to minimize and monitor any potential effects of the Project on the terrestrial environment and wildlife resources. Baffinland will continue to seek input and review monitoring results trends from technical members of the TEWG and with other interested stakeholders. Reporting on each PC condition follows.

## Project Certificate Condition No. 49

Category	Terrestrial Wildlife and Wildlife Habitat - Terrestrial Environment Working Group
Responsible Parties	The Proponent
Project Phase(s)	All phases
Objective	To provide environmental oversight.
Term or Condition	The Proponent shall establish a Terrestrial Environment Working Group (TEWG) which will act as an advisory group in connection with mitigation measures for the protection of the terrestrial environment and in connection with its Environmental Effects Monitoring Program, as it pertains to the terrestrial environment. Members may consider the draft terms of reference for the TEWG filed in the Final Hearing, but they are not bound by them. The role of the TEWG is not intended to either duplicate or to affect the exercise of regulatory authority by appropriate government agencies and departments.
Relevant Baffinland Commitment	46, 47, 49, 50
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	2019 TEWG Meeting Records Terrestrial Environment Effects Monitoring Plan (Baffinland, 2016c)
Ref. Document Link	Appendix C

### METHODS

Baffinland has fully met the condition through the establishment of the TEWG in 2013 and ongoing implementation of the TEWG process in 2019. Members of the TEWG include representatives from: Environment and Climate Change Canada, Qikiqtani Inuit Association, Government of Nunavut, Makivik Corporation and Baffinland with technical experts as required. The Mittimatalik Hunters and Trappers Organization joined the group in 2016. WWF-Canada also participates as an observer to the TEWG.

The meetings are structured to enable participants to have the opportunity to provide input on monitoring program implementation and follow-up at the conclusion of the field programs prior to finalization of reports. The group receives presentations on the implementation of field programs and the subsequent results in order to prioritize monitoring plans and suggest measures for mitigation where required. The groups are also established to provide a platform for the discussion of collaborative research opportunities between parties and to identify monitoring programs suited for community based monitoring and Inuit participation.

The group typically schedules two (2) yearly in-person meetings, in addition to hosting two (2) interim teleconferences per year.

Draft technical annual reports and other documentation are provided to the group in advance of meetings to the extent possible and on an on-going basis to allow for review, comment and advice to be provided by all members. Baffinland and their technical experts take into consideration comments received by the working group in the finalization of documents and planning of subsequent year monitoring programs. The Draft 2019 Terrestrial

Environment Annual Monitoring Report (EDI, 2020) was distributed to the TEWG for review and comment on April 15, 2020, following the 26 February 2020 in-person TEWG meeting (No. 21) where the report was discussed.

## RESULTS

In 2019, the TEWG met in-person in Iqaluit (20 June; Meeting 19) and over two (2) teleconferences (24 April and 7 October; Meetings 18 and 20, respectively). The TEWG provides a valuable forum for ongoing Project communication and reporting between Baffinland and other interested parties. The TEWG also serves as an advisory group to provide recommendations on appropriate management approaches related to the Project.

The TEWG has guided the development of the Terrestrial Environment Effects Monitoring Plan (TEEMP; Baffinland, 2016c) and also reviews and provides comments on other draft terrestrial environment annual monitoring reports. The program is reviewed annually and adjustments are made to the monitoring program as needed following guidance from the group.

The TEWG reviews the annual terrestrial environment annual monitoring report and provides comments to Baffinland for consideration in the final version. Baffinland reviews all comments received on draft reports, makes effort to provide meaningful responses to each comment, and in so doing, takes into consideration the suggestions for improvement of the report and advice provided by TEWG. This mechanism allows TEWG members to provide constructive feedback on annual reporting efforts. For example, based on reviews of 2018 annual monitoring reports, Working Group members provided approximately 300 comments on draft reports, each of which was meaningfully responded to by Baffinland. For 2019 and future final drafts of the Terrestrial Environment Annual Monitoring Report, Baffinland will include an appended table summarizing all comments/suggestions provided by TEWG members during their review, and any accompanying responses for consistency, as requested at the June 2019 MEWG meeting.

## TRENDS

Baffinland, through collaboration with the various members of the TEWG, has successfully developed a robust terrestrial monitoring program that is reviewed and adjusted on an annual basis as deemed relevant and necessary to the objectives of Project Certificate No. 005 terms and conditions.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to work with the TEWG to review and guide monitoring programs on an annual basis and develop mitigation measures or action plans as and when deemed necessary based on review of any emerging trends requiring further investigation.

Baffinland, with support from the QIA and other members of the TEWG, has put a strong emphasis on continuing existing community-based monitoring, as well as developing more diverse community-based monitoring initiatives.

## Project Certificate Condition No. 50

Category	Terrestrial Wildlife and Habitat - General
Responsible Parties	The Proponent and other Parties as appropriate
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure appropriate and responsive adaptive management.
Term or Condition	The Proponent shall continue to develop and implement Project-specific monitoring for the terrestrial environment, and will demonstrate appropriate refinements to design, incorporation of analytical methods and elaboration of methodologies. The monitoring plan shall contain clear thresholds to allow for the assessment of long-term trends and cumulative effects where Project interactions are identified. Coordination and cooperation will be required where data collection, analysis and interpretation, or responsibility for mitigation and management requires the efforts of multiple parties (e.g., government, Qikiqtani Inuit Association, communities).
Relevant Baffinland Commitments	40, 70
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016c) 2019 TEWG Meeting Records Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

The TEMMP outlines Baffinland's monitoring programs for terrestrial wildlife and habitat. The plan has been revised numerous times, though not formally since 2016, based on guidance and recommendations provided by the TEWG and NIRB over the past several years. Terrestrial environment monitoring programs are reviewed regularly during TEWG meetings to refine methodologies. Cumulative effects assessment is incorporated into various aspects of the monitoring programs outlined in the TEMMP. The TEMMP also includes applicable thresholds for the assessment of long-term trends.

The TEMMP is supplemented by Baffinland's contributions to information gathered from region-wide monitoring for caribou conducted by the Government of Nunavut, PRISM plot surveys and seabird research conducted by ECCC, and research on cliff-nesting raptor ecology by ArcticRaptors Inc.

### RESULTS

Terrestrial environment monitoring has been ongoing since 2012 following methods outlined in the TEMMP. The TEMMP has been revised numerous times since its creation to improve methodologies and address reviewer input. Though the most recent formal revision was released in 2016, several minor adjustments have since been added to reflect evolving methodologies and responses to reviewer comments.

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Updates to the TEMMP are developed on an as-needed basis, although minor adjustments are not always formally updated on a yearly basis. The updates are based on statistical analysis of data and adjustments necessary to improve robustness of survey design and methods. The TEMMP updates are based on annual monitoring data review, and discussion with technical experts who participate in the TEWG. The TEWG is engaged regularly to discuss annual monitoring programs for the terrestrial environment. Feedback received from TEWG members is incorporated into annual monitoring reports and updates to the TEMMP where relevant.

## Project Certificate Condition No. 51

Category	Terrestrial Wildlife and Habitat - General
Responsible Parties	The Proponent and/or TWEG
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To promote coordination of monitoring efforts.
Term or Condition	The Proponent, either directly or as part of the TEWG, shall consider and, where appropriate, cooperate with relevant regional and/or community-based monitoring initiatives that raise issues or produce information pertinent to mitigating Project-induced impacts. The Proponent shall give special consideration for supporting regional studies of population health and harvest programs for North Baffin caribou which help address areas of uncertainty for Project impact predictions.
Relevant Baffinland Commitments	58
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016c) 2019 TEWG Meeting Records Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Baffinland has provided financial and logistical support for the Government of Nunavut's (GN's) North Baffin Island caribou survey research on several occasions since 2009. Baffinland will continue to provide support for future GN caribou surveys, as relevant, to enhance Baffinland's understanding of potential Project-related effects and regional knowledge about wildlife distribution and abundance.

### RESULTS

Most recently, in 2018, Baffinland provided financial and logistical support for the North Baffin Island spring caribou population survey. There were no regional caribou population surveys executed by the GN in 2019.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

In 2016, the MHTO became a member of the TEWG, adding a regional and community perspective to decisions and discussions within the group. Baffinland will continue to support the GN's regional caribou surveys, as appropriate. Baffinland is currently in the process of finalizing an agreement for ongoing support of regional monitoring projects to be carried out by the GN, with relevance to the project. Baffinland and the GN have engaged in discussions with Mary Gamberg, Primary Investigator of an annual caribou tissue collection program funded through the Northern

Contaminants Program. Baffinland believes that collaboration with a planned regional-level collection program is the most effective way to collect caribou tissue metals data and that collaboration with other stakeholders and interested parties (e.g., GN and MHTO) is critical for the successful implementation of a caribou tissue monitoring program. A proposed timeline for coordination of tissue sampling protocols, subject to agreement and participation of external parties, was developed and presented to the TEWG in 2020.



## Project Certificate Condition No. 52

Category	Terrestrial Wildlife and Habitat - Caribou
Responsible Parties	The Proponent, TEWG
Project Phase(s)	Construction
Objective	To ensure best practices are used for caribou protection.
Term or Condition	Within 3 months of issuance of the Project Certificate, the Proponent shall initiate design, and develop the timeline to test and implement means of deterring caribou from pits and other hazardous areas. A review of best practices and techniques will be undertaken at other Northern mines where interactions with caribou occur. Considerations should include temporary ribbon placement, Inuksuks, or fencing and subsequent monitoring for effectiveness. These activities shall be reported back to the Terrestrial Environment Working Group.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister; results to be reported back to the Terrestrial Environment Working Group.
Status of Compliance	Not applicable
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016c) 2019 TEWG Meeting Records Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

The issues of caribou protection measures and caribou deterrents were discussed with the TEWG in December 2013, and several techniques were considered including Inuksuks, electric fences, wildlife fencing and berms. It was suggested within the TEWG that caribou deterrents be considered a “step-wise” mitigation to be addressed if conflict between caribou and pit or other hazardous area ever occurs, or is likely to occur based on regional caribou abundance. Given the low regional population numbers of the North Baffin caribou herd, there has not yet been a need to implement caribou deterrent measures from hazardous areas.

As a preventative caribou protection measure, Baffinland requires all employees to adhere to a stop work policy when wildlife is present within the PDA, which reduces hazardous conditions. Baffinland has created guidelines (the Caribou Decision Tree; Figure 3-2 in the TEMMP) for driver response to caribou near roads based on distance and behaviour to further reduce hazardous conditions.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Currently, caribou abundance is relatively low on Baffin Island, and only a few incidental sightings of caribou have been made (see Table 5-3 in Section 5.4 in the Draft 2019 Terrestrial Environment Annual Monitoring Report). Baffinland will continue to monitor for caribou within the Project sites and RSA, support regional caribou monitoring conducted by the GN, and, in conjunction with the TEWG, identify appropriate caribou deterrents from Deposit 1 and hazardous areas when required.

## Project Certificate Condition No. 53

Category	Terrestrial Wildlife and Habitat - Caribou
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To mitigate impacts to caribou from Project-related traffic.
Term or Condition	<p>The Proponent shall demonstrate consideration for the following:</p> <ol style="list-style-type: none"> <li>Steps taken to prevent caribou mortality and injury as a result of train and vehicular traffic, including operational measures meant to maximize the potential for safe traffic relative to operations on the railway, Milne Inlet Tote Road and associated access roads. <ol style="list-style-type: none"> <li>Specific measures intended to address the reduced effectiveness of visual protocols for the Milne Inlet Tote Road and access roads/trails during times of darkness and low visibility must be included.</li> </ol> </li> <li>Monitoring and mitigation measures at points where the railway, roads, trails and flight paths pass through caribou calving areas, particularly during caribou calving times. The details of these monitoring and mitigation measures shall be developed in conjunction with the Terrestrial Environment Working Group.</li> <li>Evaluation of the effectiveness of proposed caribou crossings over the railway, Milne Inlet Tote Road and access roads as well as the appropriate number.</li> <li>Development of a surveillance system along the railway corridor to identify the presence of caribou in proximity to the train tracks and operational protocols for the train to avoid collisions and enable caribou to cross the train tracks unimpeded.</li> </ol> <p>Protocols for documentation and reporting of all caribou collisions and mortalities, as well as mechanisms for adaptive management responses designed to prevent further such interactions.</p>
Relevant Baffinland Commitments	15, 71, 73
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	<p>Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016c)</p> <p>2019 TEWG Meeting Records</p> <p>Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)</p>
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

## METHODS

### *a. Prevention of Caribou Mortality and Injury as a Result of Vehicular Traffic*

- The Caribou Decision Tree presented in the TEMMP (Figure 3-2) directs driver responses when caribou are near or crossing the Tote Road;

- Snow bank heights and slopes were managed throughout the winter season to decrease potential barriers to caribou movement across the Tote Road, and compliance of snow management to a 1 m height limit was monitored approximately once per month during winter months by Baffinland Site Environment staff; and
- Snow track surveys were used to monitor caribou interaction with the Tote Road to determine if they cross the road or deflect their paths of movement away from the road, and are conducted at least twice in late winter.

Detailed methods are identified in the TEMMP (Sections 3.3.3 and 4.5.2, and Figure 3-2) and the Draft 2019 Terrestrial Environment Annual Monitoring Report (Sections 5.1.1 and 5.2.1).

#### ***b. Monitoring and Mitigation Measures***

In 2019, twenty-four (24) Height of Land survey stations were visited at least twice during the caribou calving period annually to monitor caribou distribution, abundance, and behaviour.

Each site was visited for a minimum of 20 minutes, and the landscape was scanned using binoculars and spotting scope to detect caribou presence and their proximity to Project infrastructure. If caribou were observed, a detailed survey would commence tracking caribou behaviour and interaction with Project infrastructure and vehicles. This monitoring data can then be used to inform mitigation measures.

Detailed methods are identified in the TEMMP (Section 4.5, Appendix 4-8) and the Draft 2019 Terrestrial Environment Annual Monitoring Report (Section 5.3.1).

#### ***c. Evaluation of Effectiveness of Caribou Crossings***

Snow track surveys were used to collect data on caribou response to Project activities based on patterns of movement. The surveys were conducted by driving slowly (30 Km/hr) from the Mine Site to Milne Port on the Tote Road in late winter. When wildlife tracks were observed, surveyors stopped and walked to the tracks to confirm species and then followed the tracks to observe behaviour, habitat use and possible divergence of travel paths. When tracks were near or intersected the Tote Road, surveyors recorded the location, species that produced the tracks, number of sets of tracks counted (i.e., group size), travel path in relation to the road (e.g., deflected, travelled along, or crossing the Tote Road) and the height of the snow bank measured at either the crossing point, or likely point of deflection.

Detailed methods are identified in the TEMMP (Sections 4.5.2, Appendix 4-9) and the Draft 2019 Terrestrial Environment Annual Monitoring Report (Section 5.1.1).

In 2019, the snow track survey was conducted once in April, once in May, and once in November by two Baffinland Site Environment employees, using the methods described above.

Due to low embankments and existing low profile road conditions, there are no caribou crossings required for the Tote Road. Monitoring to date has focused on managing snow bank heights to minimize barriers to movement.

#### ***d. Surveillance System***

Not applicable in 2019 as the railway has not yet been constructed. The TEMMP (Sections 3.3.1, 3.3.2, 3.3.3, and 4.5.2), which includes avoiding collisions with caribou, will include an updated surveillance system once the railway becomes a viable option.

***e. Documentation and Reporting***

The TEMMP (Sections 3.3.3 and 3.3.4) details the protocol for documenting and reporting caribou collisions and mortalities. Although caribou numbers are very low and the risks of having a vehicle-caribou collision are low, ongoing mitigation such as use of the Caribou Decision Tree are occurring to prevent caribou mortalities.

**RESULTS*****a. Prevention of Caribou Mortality and Injury as a Result of Vehicular Traffic***

- Caribou numbers remained low in 2019 and therefore interactions with the Tote Road and vehicles have not occurred;
  - When caribou have been observed from the Tote Road drivers have followed the Caribou Decision Tree to determine the most appropriate response – no collisions or mortalities have occurred to date.
  - One group of four (4) caribou was observed approximately 1 Km west of KM 13 of the Tote Road on September 22, 2019. These caribou were grazing and did not show signs of disturbance.
- A stop-work policy is implemented when wildlife in the area could be endangered by work being conducted, including truck driver responses when caribou are near or crossing the Tote Road using the Caribou Decision Tree;
- Continued snow bank height management in 2019 resulted in 97% compliance to the 1 m height limit, ensuring barrier-free movement of caribou; and
- Snow tracking surveys did not observe caribou tracks in 2019, reflecting low regional caribou numbers.

***b. Monitoring and Mitigation Measures***

- A total of 24 hours and 20 minutes of survey effort was conducted during the calving period in 2019;
- No caribou were detected on the landscape during 2019 snow track or Height of Land surveys; and
- Details of previous surveys dating back to 2013 are provided in the previous annual reports.

***c. Evaluation of Effectiveness of Caribou Crossings***

Results were inconclusive as of 2019, as caribou have only been incidentally and sporadically detected in or around the PDA since 2013 (see Section 5.4 in the Draft 2019 Terrestrial Environment Annual Monitoring Report); however, ongoing management of snowbank heights and providing escape routes, and monitoring wildlife responses continue.

***d. Surveillance System***

Not applicable in 2019 as the south railway was not constructed.

***e. Documentation and Reporting***

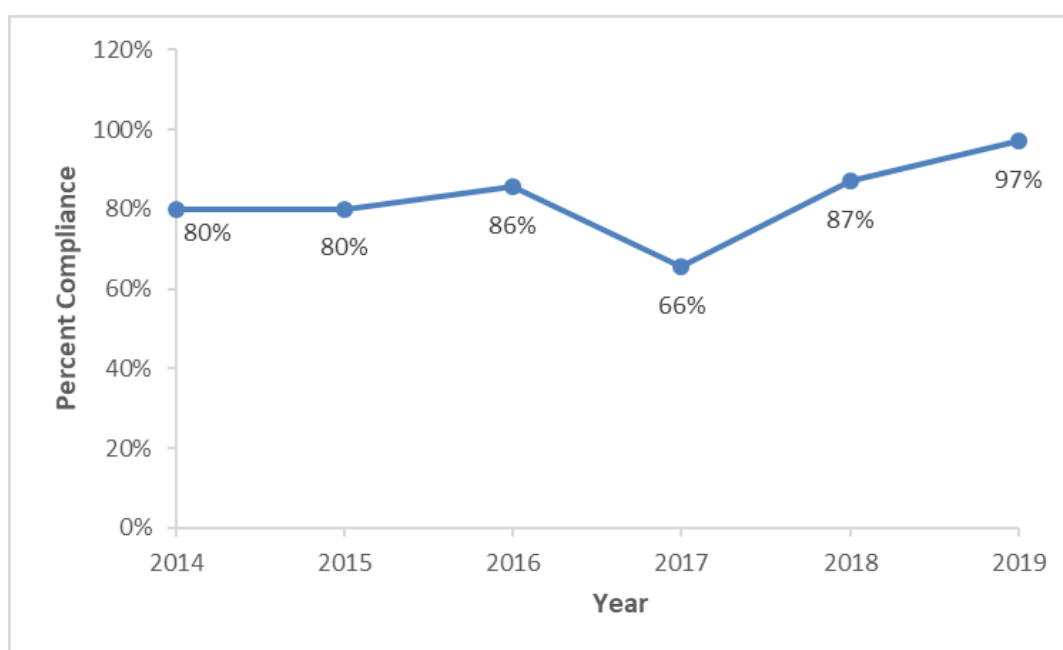
All documentation and reporting protocols have been developed. Baffinland maintains records of all wildlife interactions and mortalities via mandatory reporting protocols. Neither caribou collisions nor caribou mortalities occurred in 2019, nor any other year of Project operation.

## TRENDS

### *a. Prevention of Caribou Mortality and Injury as a Result of Vehicular Traffic*

Caribou interactions with the Tote Road and vehicles have not occurred; however, training on how to use the Caribou Decision Tree, snow bank height management, and snow tracking surveys continue. Four caribou were observed incidentally from the Tote Road in 2019; no interaction with the road nor vehicles occurred.

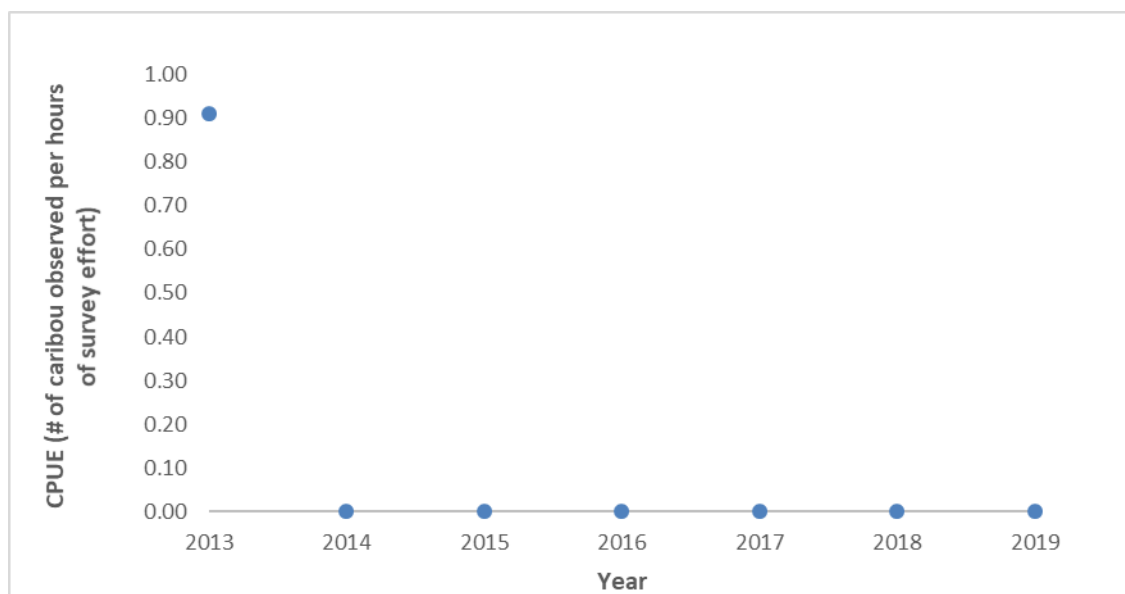
Annual monitoring of snow bank heights along the Tote Road since 2014 indicates a rate of compliance between 66% and 97% (Figure 4.6), with the highest level of compliance achieved in 2019.



**Figure 4.6: Snow Bank Height Compliance Monitoring Results from 2014 to 2019 on the Tote Road**

### *b. Monitoring and Mitigation Measures*

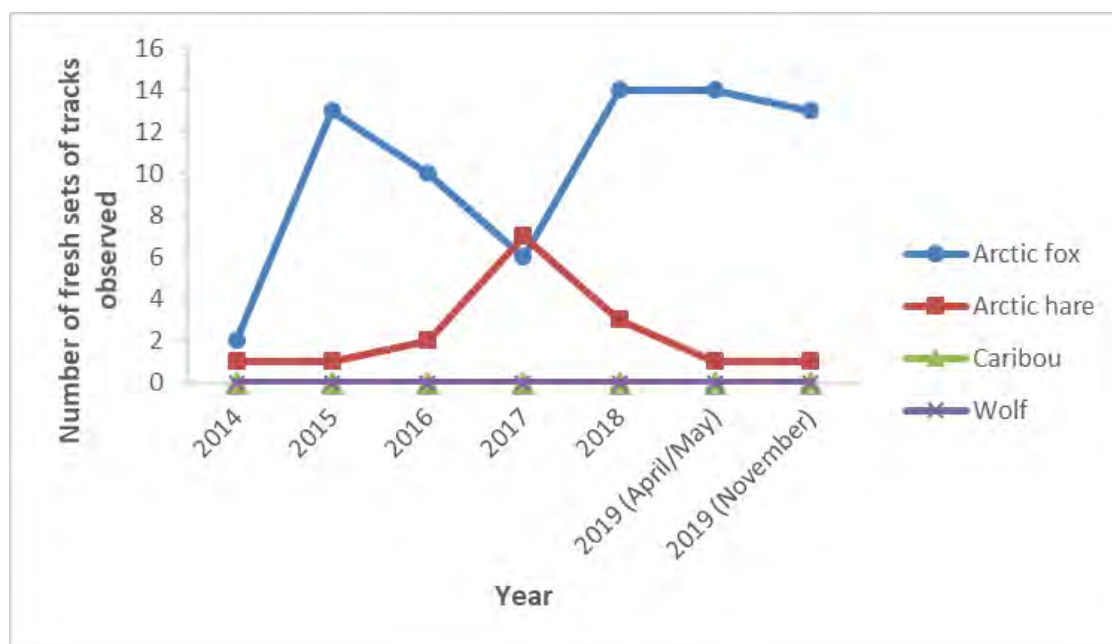
Based on caribou observed per hours of survey effort, there was a decrease in caribou observations from 2013, when the surveys began, to present (Figure 4.7). These data reflect the low regional caribou numbers of the North Baffin Island herd.



**Figure 4.7:** Caribou Observations from Height of Land Surveys from 2013 to 2019

### c. Evaluation of Effectiveness of Caribou Crossings

No caribou or wolf tracks have been detected during snow tracking surveys along the Tote Road between 2014 and 2019. However, Arctic fox and snowshoe hare tracks were observed during all survey years (Figure 4.8)



**Figure 4.8:** Snow Tracking Survey Trends from 2014 to 2019



**RECOMMENDATIONS / LESSONS LEARNED**

Snow bank height, Height of Land, and snow track surveys will continue annually. As caribou numbers in the region eventually start increasing and their presence is identified on or near the Tote Road, the Caribou Decision Tree will be reviewed; seasonal migrations of caribou and their interaction with the Tote Road will be considered; and snow track surveys will occur more often by on-site staff.

The TEWG is engaged regularly to discuss annual monitoring programs for the terrestrial environment. Feedback received from TEWG members is incorporated into annual monitoring reports and updates to the TEMMP where relevant.

## Project Certificate Condition No. 54

Category	Terrestrial Wildlife and Habitat - Caribou
Responsible Parties	The Proponent
Project Phase(s)	Construction - within six (6) months of issuance of Project Certificate
Objective	To Update the Terrestrial Environmental Management and Monitoring Plan.
Term or Condition	<p>The Proponent shall provide an updated Terrestrial Environmental Management and Monitoring Plan which shall include, but not be limited to the following:</p> <ul style="list-style-type: none"> <li>a. Details of the methods and rationale for conducting monitoring prior to the commencement of construction;</li> <li>b. Monitoring for caribou presence and behaviour during railway and Tote Road construction;</li> <li>c. Description and justification of statistical design or other means of determining effect and proposed analyses to support the conclusions drawn from monitoring impacts of the mine and related infrastructure on wildlife;</li> <li>d. Details of monitoring and mitigation activities, which should be established in collaboration with the Terrestrial Environment Working Group and are expected to include: <ul style="list-style-type: none"> <li>i. Dustfall (fugitive and Total Suspended Particulates), that addresses methods to reduce risk to caribou forage from dustfall;</li> <li>ii. Snow track surveys during construction and the use of video-surveillance to improve the predictability of caribou exposure to the railway and Tote Road. Using the result of this information, an early warning system for caribou on the railway and Tote Road shall be developed for operation.</li> </ul> </li> <li>e. Details of monitoring thresholds related to level of mitigation and management; and</li> <li>f. Details of a comprehensive hunter harvest survey to determine the effect on caribou populations and potential effects on caribou behaviour resulting from increased human access caused by upgrades to the Milne Inlet tote road (and any other roads if they are shifted from private to public use) and increase local knowledge of the mine site, including establishing pre-construction baseline harvesting data.</li> </ul>
Relevant Baffinland Commitments	N/A
Reporting Requirement	Plan to be submitted to the NIRB and the TEWG within 6 months of issuance of a Project Certificate.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG), Nunavut Impact Review Board
Reference	Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016c) 2019 TEWG Meeting Records
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C

### METHODS

The TEMMP directly addresses PC Condition No. 54. The TEMMP outlines detailed rationale and methodology for Baffinland's monitoring and mitigation programs. It is reviewed and updated as needed on a periodic basis, though

changes may be implemented in advance of formal updates as the need arises. Regarding No. 54c, the programs are revised based on statistical analyses of annual data, as reported in the annual reports.

**RESULTS**

Not applicable.

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Regarding PC Condition No. 54f, Baffinland continues to monitor human use of the Project site. There is no legal obligation for users to report harvest to on-site personnel. Due to previous responses of harvesters from reported caribou sightings on the Project site, Baffinland has changed reporting of caribou sightings as confidential to the Baffinland Site Environment staff. The challenges associated with Baffinland addressing PC Condition No. 54f, and no legal mandate to monitor harvest, have been discussed at various TEWG meetings. The caribou harvest is now managed on a quota/tag system, and harvest in the region is managed by the Government of Nunavut.

## Project Certificate Condition No. 55

Category	Terrestrial Wildlife and Habitat - Wolves
Responsible Parties	The Proponent, Government of Nunavut Department of Environment
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate potential impacts to wolves.
Term or Condition	<p>The Proponent shall develop an adaptive management plan applicable to wolves and wolf habitat in collaboration with the Government of Nunavut- Department of Environment (GN-DOE) to ensure compliance with the <i>Nunavut Wildlife Act</i>. Consideration must be given to the following:</p> <ul style="list-style-type: none"> <li>a. Monitoring for active wolf dens within a 10 Km radius from the mine site, under the direction and prior approval of the GN DOE, and reporting the results through NIRB's Annual Reports on terrestrial wildlife in the Project Development Area (PDA);</li> <li>b. Estimating the available (glacio-fluvial materials) esker habitat within the Regional Study Area/PDA and identifying such habitat as ecologically sensitive;</li> <li>c. Developing "wolf indices" for presence/abundance of wolves (by conducting studies) to set a baseline pre-construction baseline; and</li> <li>d. Ensuring that wolf monitoring is capable of determining the relative abundance and distribution of wolves in the PDA over time.</li> </ul>
Relevant Baffinland Commitments	57, 74
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	Not Applicable
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	<p>Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland 2016c)</p> <p>2019 TEWG Meeting Records (Baffinland, 2019g)</p> <p>Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)</p>
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Not Applicable.

### RESULTS

Not Applicable.

### TRENDS

Not Applicable.

### RECOMMENDATIONS / LESSONS LEARNED

As a result of low caribou numbers, wolf numbers in the region have also declined (i.e. total of five (5) wolves incidentally observed in or around the PDA throughout 2019). Wolf monitoring programs will be re-initiated when

wolves and/or caribou are observed near the Project area on a consistent basis (e.g. based on trends observed from the Height of Land monitoring data, or incidental monitoring data), or on observations of local harvesters and as reported to Baffinland or the TEWG. Monitoring of carnivore dens will continue to be discussed within the TEWG based on discussions within the group and when deemed necessary, Baffinland will re-initiate carnivore den monitoring.

## Project Certificate Condition No. 56

Category	Terrestrial Wildlife and Habitat - Wildlife Habitat
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure progressive reclamation of disturbed wildlife habitat.
Term or Condition	The Proponent shall develop a strategy for the recovery of terrestrial wildlife habitat in a progressive manner that is consistent with the <i>Nunavut Wildlife Act</i> . Overall, this will require the integration of a decision-making process and the identification of mitigation responses to cumulative impacts on caribou survival, breeding propensity, and population dynamics.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association, Nunavut Water Board, Indigenous and Northern Affairs Canada
Reference	Interim Closure and Reclamation Plan (Baffinland, 2018b) Revegetation Survey & Preliminary Reclamation Trail (EDI, 2020) Implications for Reclamation Practices & Trials at the Mary River Project (EDI, 2019a) 2019 TEWG Meeting Records (Baffinland, 2019g)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

As described in the ICRP, a Reclamation Research program was proposed to identify best practices for promoting natural revegetation that will inform the progressive revegetation program for disturbed areas that are no longer required for operations. Due to limited research conducted to date for mines in the Canadian Arctic, the research will focus on the development of methods to successfully achieve sustainable vegetation cover that meets the desired land use for the Project sites post-closure in the shortest duration possible. These sites include gravel roads, gravel pads, waste rock, stockpiles, and waste dumps. The objective of the Reclamation Research Program is to identify methods to successfully achieve a sustainable vegetation cover, and the ability of a vegetation cover to enhance physical stability and/or achieve the desired aesthetic conditions for the Project site at closure.

In early 2019, Baffinland retained EDI to complete a desktop review of available practices and recent advances from Arctic mine reclamation in Canada's northern territories and Alaska, USA (EDI, 2019a). Upon review of the available information, common themes are that the Arctic environment imposes significant limitations and constraints on plants/ecosystem development. The most critical issues identified refer to (a) the availability of organic topsoil, (b) the probability of moisture retention, and (c) the availability of suitable seed/plant sources. Consequently, primary preparation techniques (addressed by previous reclamation programs) focused on enhancing soil water and nutrient retention to then provide suitable micro-habitats conducive to early-establishment of vegetation.

The next step following the desktop review was to implement a field program to assess current conditions and establish test plots. EDI developed a pilot study designed to document the status of select post-disturbance areas of the Site, initiate preliminary reclamation trials to assess methods and approaches considered appropriate for the challenges of the Arctic environment, and identify future research opportunities. Following a survey of existing disturbance sites, the pilot program involved the establishment of reclamation plots to assess methodologies for surface preparation. Two surface configurations were applied: (1) 'rough and loose' where the digging bucket of an excavator/loader is used to open small holes and generate mounds with the landscape, creating heterogeneity and micro-site conditions favourable to seed germination; and (2) 'track packing' which refers to the use of tracked equipment to create surface roughness and is typically used to reduce soil erosion potential by enhancing surface stability, as well as providing micro-site conditions for seed germination.

## RESULTS

The revegetation survey field program was conducted between July 17 to 24, 2019, and assessed two (2) areas in proximity to the Tote Road at KM 12 and KM 52. These areas were identified as having been previously disturbed (historical road alignment or area of disturbance from road construction) and were examined for the purpose of documenting opportunistic post-disturbance revegetation. Soils in both areas were defined by xeric or subxeric conditions and characterized by restrictive growth substrates and poor fertility. At KM 52, the high level of soil disturbance corresponded with low/sparse cover vegetation consisting primarily of graminoids and perennial herbs and forbs, consistent with the notion that natural revegetation rates are low as this area was assessed to be 1-year post-disturbance. Observations at KM 16 indicated less soil/substrate disturbance, with only moderately low cover vegetation comprised of graminoids, perennial herbs and forbs, and some shrubs, bryophytes and lichen.

Following the survey of existing areas, a reclamation trial program was implemented to assess methodologies for surface preparation in a reclamation scenario that will promote revegetation. Following application of the surface preparation, ongoing monitoring will be required to determine the success of the techniques applied.

## TRENDS

Not applicable for 2019.

## RECOMMENDATIONS / LESSONS LEARNED

In 2020 Baffinland will be organizing a Mine Closure Working Group to evaluate the implementation and results of reclamation research programs and progressive reclamation projects at Mary River. Baffinland will discuss the findings of the 2019 revegetation studies with the Mine Closure Working Group, to assess and evaluate the current study design, seek input on the integration of IQ into the study design, and establish a path forward for the expanded implementation of the research program. Based on the work completed by EDI, long term recommendations for future studies include:

- Expand the number and location of revegetation survey sites to increase the sample size;
- Review the range of landscapes intersected by the Project and assess the reclamation strategies and surface configurations that could be applied to optimize revegetation outcomes; and
- Expand to medium or large scale trials, based on project features that could be decommissioned and/or reclaimed. Availability of these sites will be contingent on the Project lifecycle, but could include such areas as a laydown or access road.



## Project Certificate Condition No. 57

Category	Terrestrial Wildlife and Habitat - Reporting
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate and monitor for impacts to wildlife.
Term or Condition	<p>The Proponent shall report annually regarding its terrestrial environment monitoring efforts, with inclusion of the following information:</p> <ul style="list-style-type: none"> <li>a. Description of all updates to terrestrial ecosystem baseline data;</li> <li>b. A description of the involvement of Inuit in the monitoring program;</li> <li>c. An explanation of the annual results relative to the scale of the natural variability of Valued Ecosystem Components in the region, as described in the baseline report;</li> <li>d. A detailed presentation and analysis of the distribution relative to mine structures and activities for caribou and other terrestrial mammals observed during the surveys and incidental sightings;</li> <li>e. Results of the annual monitoring program, including field methodologies and statistical approaches used to support conclusions drawn;</li> <li>f. A summary of the chronology and level of mine activities (such as vehicle frequency and type);</li> <li>g. An assessment and presentation of annual environmental conditions including timing of snowmelt, green-up, as well as standard weather summaries;</li> <li>h. A discussion of any proposed changes to the monitoring survey methodologies, statistical approaches or proposed adaptive management stemming from the results of the monitoring program.</li> </ul>
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status of Compliance	In-Compliance
Stakeholder Review	Nunavut Impact Review Board, Terrestrial Environment Working Group (TEWG)
Reference	<p>Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016c)</p> <p>2019 TEWG Meeting Records (Baffinland, 2019g)</p> <p>Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)</p>
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS AND RESULTS

- a. Updates and descriptions of all baseline data are recorded annually in the terrestrial environment annual monitoring reports.
- b. Baffinland believes that consultation with Inuit and incorporation of Inuit in field monitoring programs is critically important. Inuit are involved in various components of the terrestrial environment monitoring program, including: hiring and training Inuit to work on terrestrial monitoring programs; supporting participation of the MHTO in the TEWG; funding for two full-time on-site Environmental Monitors that are appointed and solely

employed by QIA but fully integrated into the Site Environment team; and the implementation of a community-based monitoring program through the Mary River Inuit Impact and Benefit Agreement. Inuit are involved in all terrestrial environment annual monitoring programs conducted by Baffinland's consultant when possible. This has included participation in snow track surveys, Height of Land surveys, and vegetation monitoring. In 2019, one Inuit Baffinland Environmental Monitor participated in the raptor monitoring and vegetation abundance monitoring programs, and three Inuit Technicians participated in Height of Land surveys, vegetation abundance monitoring, and raptor monitoring programs.

- c. Where relevant, the terrestrial environment annual monitoring report discusses near-site wildlife observations in relation to available knowledge about regional populations. Bird monitoring survey data that derived density estimates was compared to regionally available density estimates. The lack of caribou and wolf observations near site reflect low numbers reported throughout the North Baffin Island region by the GN.

- d. Project Certificate Condition No. 57(d) is addressed in the terrestrial environment annual monitoring reports through reporting of results of Height of Land surveys, snow tracking surveys, incidental observation logs, wildlife mortalities log, and reference to regional conditions from other publications and documents.

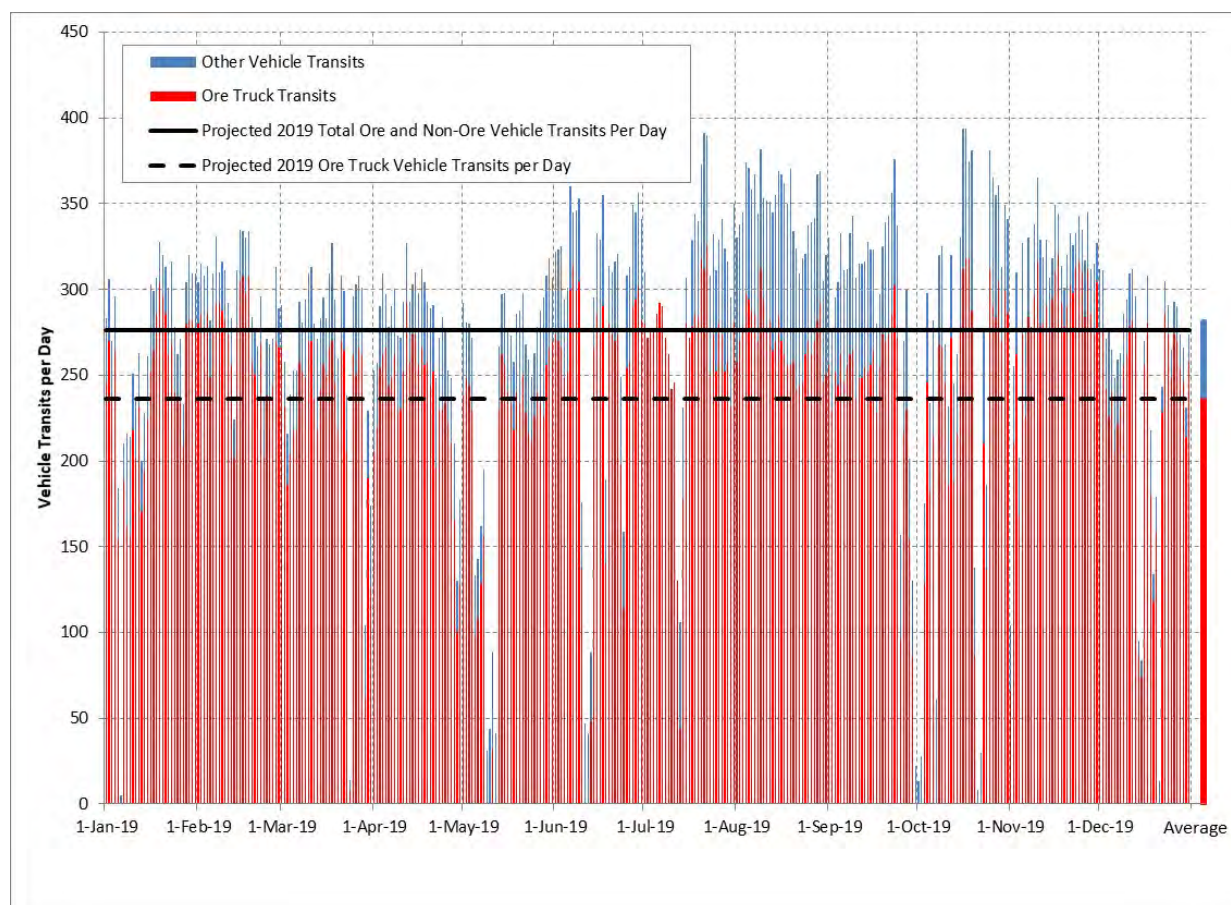
No caribou were observed during 2019 Height of Land surveys. Snow tracking surveys conducted in April, May, and November 2019 documented 22, 14, and 22 sets of arctic fox tracks, respectively. In total, three (3) sets of fox tracks were potential or confirmed deflections from the Tote Road; all others either crossed or ran parallel to the road. Other wildlife tracks observed included: six (6) sets of ptarmigan tracks were observed in April and two (2) in November; three (3) sets of ermine tracks in November; and two (2) Arctic hare tracks in May and seven (7) in November. Incidental observations within and outside of the PDA are described in detail in the Draft 2019 Terrestrial Environment Annual Monitoring Report, and included fifty-two (52) caribou, thirty (30) arctic foxes, thirty (30) arctic hares, three (3) lemmings, one (1) ermine, eight (8) wolves, eight (8) narwhals, fifteen (15) seals, nine (9) polar bears, nineteen (19) walruses, and one (1) beluga whale. These numbers represent total number of animals reported in the log, but may include multiple observations for the same individual(s) (e.g. multiple observations of the same arctic fox living near a camp). Four (4) of the reported caribou were observed from the Tote Road.

- e. All results of the monitoring programs, including methods and approaches to statistics, are included in the terrestrial environment annual monitoring reports.

- f. The Draft 2019 Terrestrial Environment Annual Monitoring Report summarizes mine traffic activity as it correlates to dustfall monitoring. All non-haul vehicle traffic on the Tote Road is recorded by Baffinland security. This type of vehicle traffic includes road maintenance mobile equipment, mechanical maintenance/fueling trucks, pick-up trucks, etc. The number of trucks hauling ore on the Tote Road each day is tracked by Mine Operations Dispatch.

The average number of ore haul transits per day in 2019 was 238.0 (Figure 4.9); this represents a slight increase in the average daily number of ore haul transits in 2019 compared with 2018 (219.5 ore haul transits per day). As seen in previous years, there were periodic full or partial closures of the Tote Road associated with adverse weather conditions (freeze/thaw, poor visibility, etc.). However, these closures and corresponding decreases in ore haul transits were short-lived and the average daily number of transits was steady through the 2019 calendar year. Other non-haul truck traffic had an annual average of 43.0 vehicle transits per day, which was only slightly higher than in 2018 (37.3 vehicle transits per day). The average daily total vehicle transits (haul and other) on the Tote Road in 2019 was 280.9 vehicle transits per day.

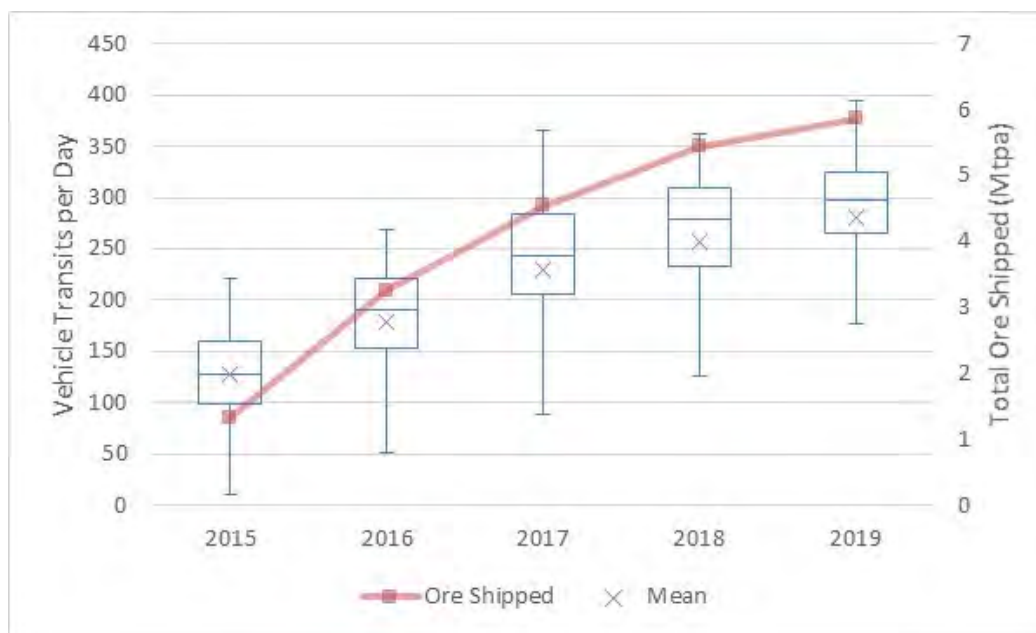
- g. At Mary River, there were more days of rainfall and more rainfall overall in 2019 relative to baseline conditions. The total amount of rainfall recorded at the Mary River weather station in 2019 was 152.5 mm. Wind direction in 2019 at Milne Inlet and Mary River was mostly consistent with 2018 and baseline wind direction data. In 2019 the range in minimum and maximum wind speeds was variable from calm to gusting winds on the upper end of the Beaufort scale. Wind data were not recorded at the Environment Canada Mary River meteorological station.
- In 2019, air temperatures at Milne Inlet rose consistently above 0°C on June 26 (approximately 2.5 weeks later than 2018) and remained above freezing until August 20 (approximately 2 weeks earlier than 2018). By September, temperatures at Milne Inlet were consistently below 0°C. At Mary River, air temperatures rose consistently above 0°C on May 28 (approximately one week earlier than 2018) and remained above freezing until September 8 (similar to 2018) when temperatures dipped below 0°C. Throughout September and October, temperatures fluctuated above/below freezing levels until November when temperatures dropped and remained consistently below 0°C.
- h. The TEMMP addresses Project Certificate Condition No. 57(h). All versions of the TEMMP have been included in the revision table contained within the document. Ongoing updates and changes to monitoring programs are also discussed in the terrestrial environment annual monitoring reports. This PC Condition is seemingly identical to PC Condition No. 58(e).



**Figure 4.9: Daily Vehicle Transits on the Tote Road in 2019**

## TRENDS

- No trends reported.
- No trends reported.
- No trends reported. Wolf and caribou observations on site follow the trends of regional observations; very low abundance. The low bird densities near site reflect low densities in the North Baffin Island region.
- No trends reported.
- No trends reported.
- The annual mean ore haul transits and non-haul transits per day increased between 2015 and 2019 (Figure 4.10).
- No trends reported.
- No trends reported.



**Figure 4.10: Trends in Vehicle Transits on the Tote Road from 2015 to 2019**

### Notes:

- Includes ore haul traffic and other traffic combined.
- The 'x' in the centre of each box marks the annual mean value, the box displays median, 25<sup>th</sup> and 75<sup>th</sup> quartiles, and the whiskers represent the minimum and maximum values.
- The red line indicates the total annual amount of ore shipped.

## RECOMMENDATIONS / LESSONS LEARNED

The TEWG is engaged regularly to discuss annual monitoring programs for the terrestrial environment. Feedback received from TEWG members is incorporated into annual monitoring reports and updates to the TEMMP where relevant.

## Project Certificate Condition No. 58

Category	Terrestrial Wildlife and Habitat - Reporting
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate and monitor for impacts to wildlife.
Term or Condition	<p>Within its annual report to the NIRB, the Proponent shall incorporate a review section which includes:</p> <ul style="list-style-type: none"> <li>a. An examination for trends in the measured natural variability of Valued Ecosystem Components in the region relative to the baseline reporting; <ul style="list-style-type: none"> <li>i. A detailed analysis of wildlife responses to operations with emphasis on calving and post-calving caribou behaviour and displacements (if any), and caribou responses to and crossing of the railway, the Milne Inlet Tote Road and associated access roads/trails;</li> <li>ii. A description of the extent of dustfall based on measured levels of dustfall (fugitive and finer particles such as TSP) on lichens and blueberries, and ash content of caribou fecal pellets;</li> <li>iii. A demonstration and description of how the monitoring results, including the railway, road traffic, air traffic and dustfall contribute to cumulative effects of the Project;</li> <li>iv. Any proposed changes to the monitoring survey methodologies, statistical approaches or proposed adaptive management stemming from the results of the monitoring program;</li> <li>v. Any updates to information regarding caribou migration trails. Maps of caribou migration trails, primarily obtained through any new collar and snow tracking data, shall be updated (at least annually) in consultation with the Qikiqtani Inuit Association and affected communities, and shall be circulated as new information becomes available.</li> </ul> </li> </ul>
Relevant Baffinland Commitments	60, 71
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status of Compliance	In-Compliance
Stakeholder Review	Nunavut Impact Review Board, Terrestrial Environment Working Group (TEWG)
Reference	<p>Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland 2016c)</p> <p>2019 TEWG Meeting Records (Baffinland, 2019g)</p> <p>Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)</p>
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS AND RESULTS

- a. Baffinland does not currently conduct any regional terrestrial environmental monitoring programs but does contribute to and support regional environmental monitoring programs conducted by the Government of

Nunavut and Environment and Climate Change Canada, the results of which are discussed at TEWG meetings. There are no known reports of regional trends that can be used to address Part (a).

- b. Part (b) is addressed in the terrestrial environment annual monitoring program annually through Height of Land surveys, snow bank height management and monitoring, and snow track surveys. However, caribou displacement has not yet been observed on-site. In 2019, no caribou were observed during Height of Land surveys, and no caribou tracks were observed during snow track surveys.
- c. Part (c) is addressed through dustfall sampling. At the start of 2019, there were a total of 33 dustfall sampling sites including: nine dustfall samplers located at the Mine Site; six dustfall samplers located at Milne Port; sixteen dustfall samplers divided between two sites along the Tote Road (the North site and South site); and two Reference dustfall samplers are located 14 Km southwest of the Tote Road; a further six samplers were added along the Tote Road, 1 Km distant, and one of the Milne Port samplers was moved to allow for adjustment of the footprint of the ore pad.

Dustfall sampling was conducted year-round; however, the winter sampling program was limited to a subset of the sampling sites (26 out of 39 in the 2019 season) because access to remote sites was restricted and unsafe during the winter months. Data analysis investigated differences between Near, Far and Reference sites, seasonal differences, and calculations of total annual deposition.

The magnitude of annual dustfall at the Mine Site sample locations was comparable with 2018. However, in 2019 dustfall was highest near the ore haul road, downwind of the ore deposit, while dustfall near the airstrip and the crusher decreased in 2019 in comparison with 2018. In all previous years the highest dustfall in the Mine area was associated with the airstrip.

Dustfall at Milne Port decreased at all sites in 2019 in comparison with 2018; however, this trend at DF-P-01 may be attributed to its relocation to DF-P-08; this site was relocated approximately 300 m to the boundary of the PDA to accommodate the expansion of the ore stockpile area at Milne Port. Dustfall at Milne Port was higher in summer than in winter; this relationship was driven by a modest increase in summer dustfall in 2019 in comparison with 2018, while winter dustfall remained consistent with 2018.

Along the Tote Road in 2019 dustfall decreased at monitors at the north end of the road, but a slight increase was noted at monitors at the south end in comparison with 2018 dustfall. In all areas dustfall was highest in the summer months and decreased significantly during the winter months. Calm conditions observed during August/September 2019 resulted in similar dustfall on both sides of the Tote Road, which has not been seen in previous years when prevailing winds have resulted in greatest dustfall south and west of the Tote Road.

The extent and effect of dustfall on lichen was assessed as part of the vegetation and soil base metals analysis. In 2019, following an inquiry from the TEWG, metal uptake in lichen tissues, as opposed to metal accumulation on the surface of the plant, was evaluated to better understand metals contributed by dustfall. Baffinland also expanded the metals analysis in 2019 to relate metal uptake in vegetation and soil to metal deposition by dustfall. This analysis integrates the dustfall and vegetation monitoring programs to build a more holistic understanding of potential Project-related effects on the terrestrial environment.

There was statistical support for a positive relationship between dustfall deposition and some metal concentrations in lichen. At Near (<100 m) and Far (101 to 1,000 m) sites from the PDA, increased dust deposition was positively related to increased copper, lead, and zinc concentration in lichen. Therefore,



increased dustfall deposition led to greater accumulation of metal in lichen only within 1,000 m of the PDA. In contrast, there was no statistical support for a positive relationship between metal dustfall deposition and accumulated concentrations of metal in soil for any metals. These results provided greater insight into the relationships between metal deposition (i.e. dustfall) and metal uptake by soil and lichen. For details, refer to PC Condition No. 34 and the Draft 2019 Terrestrial Environment Annual Monitoring Report.

Regional and Project-focused caribou abundance have been too low to obtain an adequate collection of caribou fecal pellets for ash content analysis.

- d. Part (d) is addressed through the annual reporting of the size of the Project footprint, dustfall, road traffic and helicopter overflights. The Project footprint was 403 ha in 2019, much smaller than the total PDA size of 7,618 ha.
- e. Part (e) is addressed by the TEMMP. Ongoing updates and changes to monitoring programs are also discussed in the terrestrial environment annual monitoring reports, and they are made in consideration of comments from TEWG members. This Project condition is seemingly identical to PC Condition No. 57(h).
- f. There is no new information on caribou migration trails since the data collection was summarized for the FEIS baseline report completed in 2012. By the end of 2019 there had been no collar data collected, and no new caribou tracks (including from snow track surveys) had been observed on-site. These results are reviewed with the TEWG, within which the QIA participates. Affected communities were consulted in November 2015 and April 2016 to gather contemporary knowledge about caribou movement in the Project area. Mapping of likely caribou movement areas adds to the growing local knowledge database that has been used to assess for and mitigate potential effects to caribou.

During 2019, four (4) caribou were observed incidentally from the Tote Road near Km 13 across Philips Creek. No caribou were identified during the Height of Land surveys. Caribou have not been observed directly in the PDA during Height of Land surveys between 2014 and 2019. This information has been correlated with traditional knowledge received at workshops held in November 2015 and April 2016. Caribou abundance surveys conducted in 2014 and 2018 by the Government of Nunavut also reported low abundance throughout Baffin Island.

## TRENDS

Trends related to wildlife response (as indicated by Height of Land surveys, snow bank height management and monitoring, and snow track surveys) are included in response to PC Condition No. 53.

In general, dustfall across the Project area increased from 2014 through 2016 as mine production increased. Dustfall between 2016 and 2019 showed a levelling off or decrease in most sites. Trends at each Project site are summarized below and are presented in Figure 4.11.

- Mine Site (DF-M Stations) — Mine area dustfall monitoring sites DF-M-01 and DF-M-02 saw a decrease in dustfall in 2019 compared with 2018, however there was a slight increase in dustfall at DF-M-03, which is nearest to the Ore Haul Road.
- Milne Port (DF-P Stations) — There was a modest decrease in dustfall at all Milne Port dustfall monitoring sites when compared with data from 2018.
- Tote Road North (DF-RN Stations) — Dustfall deposition measured at all monitoring stations in 2019 at the north road have held constant or decreased since 2017.

- Tote Road South (DF-RS Stations) — Dustfall deposition in 2019 increased at the sites closest to the Tote Road in 2019, likely associated with a drier summer season.

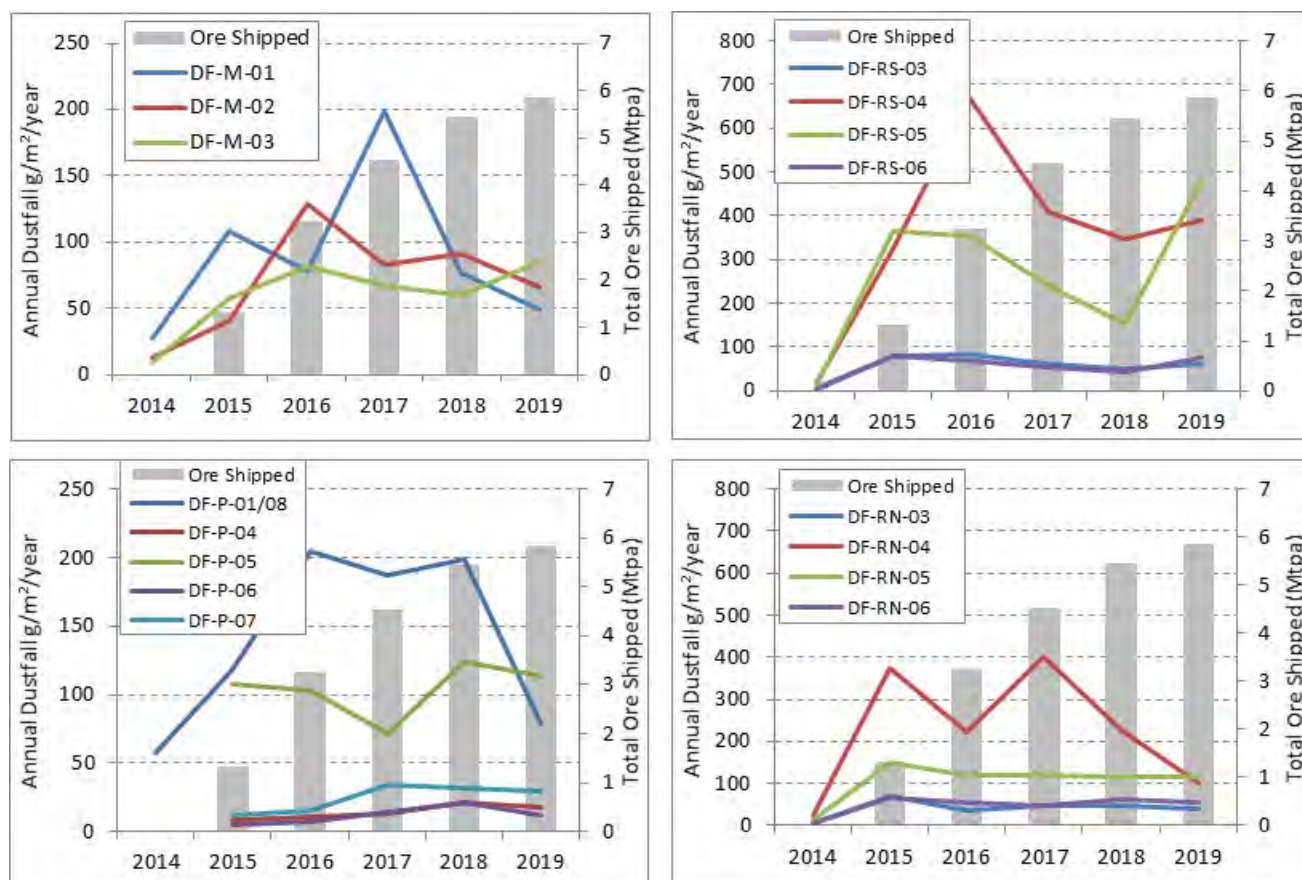


Figure 4.11: Annual Dustfall and Ore Shipping Trends from 2014 to 2019

## RECOMMENDATIONS / LESSONS LEARNED

Recommendations related to wildlife response are included in response to PC Condition No. 53.

The following recommendations relate to dustfall:

- Continue monitoring dustfall in 2020 in accordance with the TEMMP;
- Baffinland will undertake a dustfall extent remote sensing analysis in 2020 to assess the feasibility of using this data to support the existing dustfall monitoring program;
- Baffinland will continue monitoring vegetation and soil base metals every 3 to 5 years in accordance with the TEMMP;
- Baffinland will consider continuing its analysis on dust-deposited metals on lichen surfaces relative to metals in lichen tissues. For details, refer to PC Condition No. 34 and Section 4.2 in the Draft 2019 Terrestrial Environment Annual Monitoring Report;
- Baffinland will continue ongoing efforts to mitigate the generation of dust in all Project areas through dust suppression, shrouding and stockpile management. Following a successful trial application in 2019, in early



spring 2020 Baffinland will implement a full application of Dust Stop by Cypher Environmental across the entire length of the Tote Road, with regular re-application throughout the spring and summer season; and

- Baffinland will investigate new methods of transportation that will generate less dustfall.

## Project Certificate Condition No. 59

Category	Terrestrial Wildlife and Habitat – Aircraft Disturbances
Responsible Parties	The Proponent
Project Phase(s)	Construction, Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate aircraft disturbance to wildlife and Inuit harvesting.
Term or Condition	The Proponent shall ensure that aircraft maintain, whenever possible (except for specified operational purposes such as drill moves, take offs and landings), and subject to pilot discretion regarding aircraft and human safety, a cruising altitude of at least 610 metres during point to point travel when in areas likely to have migratory birds, and 1,000 metres vertical and 1,500 metres horizontal distance from observed concentrations of migratory birds (or as otherwise prescribed by the Terrestrial Environment Working Group) and use flight corridors to avoid areas of significant wildlife importance. The Proponent, in collaboration with the Terrestrial Environment Working Group shall develop a program or specific measures to ensure that employees and subcontractors providing aircraft services to the Project are respectful of wildlife and Inuit harvesting that may occur in and around Project areas.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland 2016c) 2019 TEWG Meeting Records (Baffinland, 2019g) Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

There is a discrepancy between Project Condition No. 59 and 71, Project Condition No. 59 suggesting that minimum flight height should be 610 magl in all areas, while Project Condition No. 71 prescribes a minimum flight height of 650 magl. Considering that most, if not all, areas where Baffinland operated in June through September were likely to have migratory birds, the default minimum altitude for helicopter overflights was the more conservative 650 magl (during point to point travel).

In consultation with the TEWG, Baffinland implemented a requirement for all helicopter pilots to complete a flight log to track flight data, reason for flight and explanation for lower flight altitudes, when required. Pilots are also given the spatial boundaries of any identified concentrations of migratory birds, which are buffered by the required 1,500 m horizontal avoidance distance. Pilots are then asked to avoid flying in these areas.

Canadian Helicopters provided flight log data and Baffinland provided compliance documentation using daily pilot timesheets (with flight details) from May to September, 2019 for analysis. This analysis includes all travel related to Baffinland, including Ege Bay exploration. Baffinland also provided pilots with GPS coordinates for flight height

allowance areas. Point data representing vertices along helicopter flight paths were provided and a Digital Elevation Model (DEM) was used to estimate ground level elevation values above sea level. The provided point elevation data was used to calculate the helicopter altitude above ground level. To find the actual elevation above ground level in metres, the metres above sea level (masl) from the DEM was subtracted from the masl from the helicopter data, resulting in a helicopter's approximate metres above ground level (magl) at each logged point.

Data were split into two categories: 1) those data within the snow goose area in July and August 2019 in relation to 1,100 magl elevation requirement and 2) those data within and outside the snow goose area in all months in relation to 650 magl. The data sets were then analyzed separately to assess specific flight height allowances using the different areas and elevation values. The flight height data was also cross-referenced with compliance data from daily pilot timesheets, and any flight data with justifications for flying at lower elevations than required was considered compliant. When no justification was provided, entries defaulted to non-compliant. For this reason, the proportion of compliant flights was considered conservative. Based on this analysis, flight data was organized into the following six categories:

1. Those data within the snow goose area in July and August, where the 1,100 magl elevation requirement was achieved (compliant);
2. Those data within the snow goose area in July and August where the 1,100 magl elevation requirement was not achieved, but lower elevation flying was justified by pilots (compliant);
3. Those data within the snow goose area in July and August where the 1,100 magl elevation requirement was not achieved and no justification for low level flying was given (non-compliant);
4. Those data within and outside the snow goose area in all months where the 650 magl elevation requirement was achieved (compliant);
5. Those data within and outside the snow goose area in all months where the 650 magl elevation requirement was not achieved, but lower elevation flying was justified by pilots (compliant); and
6. Those data within and outside the snow goose area in all months where the 650 magl elevation requirement was not achieved and no justification for low level flying was given (non-compliant).

Additional helicopter flight height analysis was requested by the TEWG in the February 2020 meeting. This data verification and analysis are still in progress, and so results presented for 2019 are preliminary and may change based on the updated analysis. Transit data and flight rationale data will be most affected, while general trends and compliance data will likely remain the same.

## RESULTS

There were no identified “observed concentrations of migratory birds” in 2019, nor areas specifically prescribed by the TEWG to avoid for migratory birds excluding the established Snow Goose area. After considering pilot rationale in 2019, compliance for transects flown within the Snow Goose area during the moulting season was 93%, and compliance within and outside the snow goose area in all months was 91%. No known public complaints occurred about helicopter overflights in 2019,

2019 was the third year that flight height data were cross-referenced with compliance data from daily pilot timesheets. For analytical purposes, flight height data points were designated “compliant” when elevation requirements were achieved, or where pilot’s discretionary rationale for deviating from flight heights was provided.

Data points were designated “non-compliant” if they did not meet elevation requirements and no explanation was given. This additional analysis resulted in an increase in helicopter flight height compliance when compared to previous years, as it provided explanations for transits flown lower than the elevation requirements. A summary of low-level flight rationale for 2019 is provided in Table 4.21.

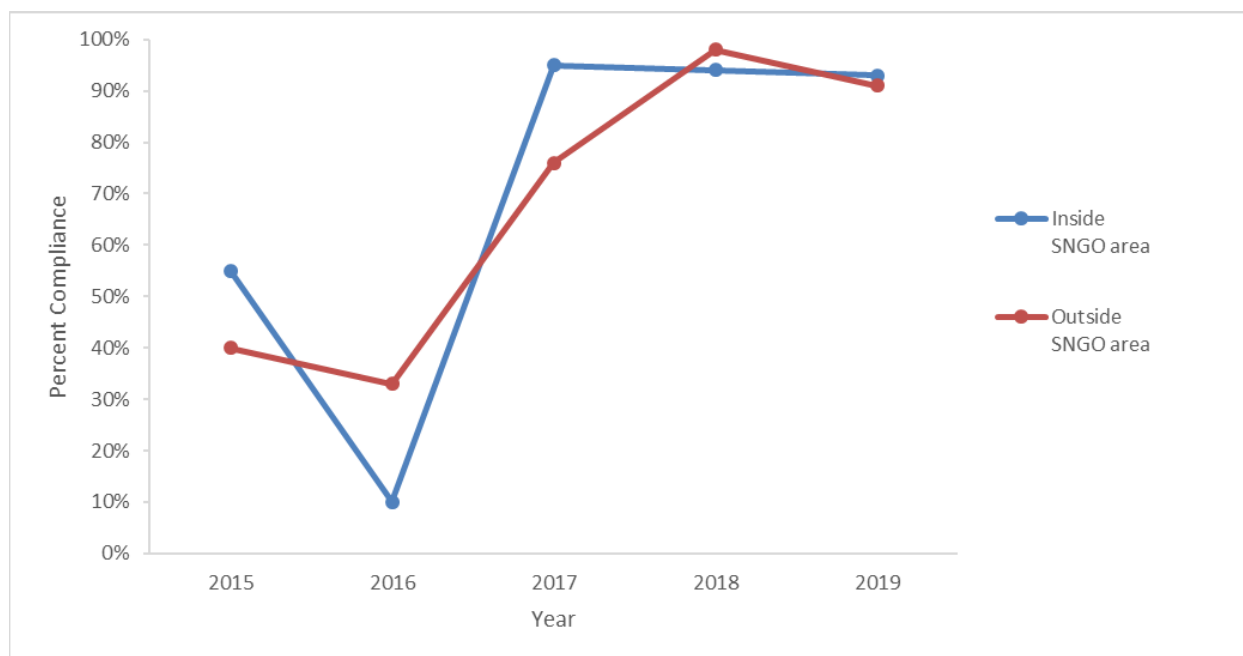
This additional analysis showed that when considering rationale provided by pilots for low-level flying, most low-level data points were compliant. For example, of all the compliant points within the snow goose area during the moulting season, only 31% were  $\geq 1,100$  magl, and the other 59% were  $< 1,100$  magl with reasons given by pilots. Similarly, when looking at all compliant points within and outside the snow goose area in all months, only 11% were  $\geq 650$  magl, and the other 89% were  $< 650$  magl with reasons given by pilots. The high percentage of low-level compliant flights in 2019 is similar to what was observed in 2017 and 2018, and will likely continue in future years as the majority of helicopter work conducted at Mary River either requires low-level flying for safety/operational reasons (e.g. slinging, surveys), or involves multiple short distance flights whereby helicopters are unable to reach the required elevations between take-off and landing sites (e.g. staking, sampling, drop offs/pickups). Most compliant transits that met the elevation requirements in 2019 tended to be long distance flights, where pilots were airborne long enough to reach and maintain the required elevations.

**Table 4.21: Elevation points calculated to obtain low-level flight rationale in all areas, May 1 – September 30, 2019**

Rationale	Total Elevation Points	% of Total Elevation Points
Drop off/pick up	16,535	33.1
Survey	11,486	23.0
Slinging	10,634	21.3
Weather	1,575	3.2
Sampling	1,161	2.3
Mobilization/demobilization	1,142	2.3
Other	1,012	2.0
Staking	656	1.3
Evacuation	37	0.1
<b>Total</b>	<b>44,238</b>	<b>88.5</b>

## TRENDS

Preliminary results showed that helicopter flight height compliance inside the goose area during moulting period was 93%, which was similar to 2017 (95%) and 2018 (84%), and considerably higher than 2015 (55%) and 2016 (10%) (Figure 4.12). This increase was largely due to an additional analysis performed in 2017, 2018, and 2019, which considered justifications provided by pilots for many of the transits flown below the elevation requirements. Helicopter flight height compliance within and outside the goose area in all months was higher in 2019 (91%) and 2018 (98%) than 2017 (76%), 2016 (33%) and 2015 (40%). The high level of compliance observed in 2019 is largely due to the additional analysis performed, as well as improved documentation of the rationale for low-level flights by pilots and Baffinland staff over the past few years (Figure 4.12).



**Figure 4.12: Percent (%) Compliance of Flights Inside the Goose Area during the Moulting Season and Within and Outside the Goose Area in All Months (2015 to 2019)**

#### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to work with their helicopter provider to improve flight height compliance by continuing to communicate elevation requirements and improving documentation of rationale for not meeting the requirements.

Additional details concerning helicopter flight purpose (e.g., environmental monitoring, exploration) and pilot rationale is further required to provide a comprehensive review of pilot justification during past years. To further address the need, the entire helicopter flight database must be re-analysed to maintain consistency and comparability between years. As this data verification and analysis are still in progress, results presented for 2019 are preliminary and may change based on the updated analysis. Any new updates stemming from the analysis of helicopter compliance results will be included as part of the final version of the 2020 Terrestrial Annual Report, following additional input received through TEWG review processes.

## Project Certificate Condition No. 60

Category	Terrestrial Wildlife and Habitat - Explosives
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To mitigate impacts to wildlife from explosives.
Term or Condition	Prior to construction, the Proponent shall develop a detailed blasting program to minimize the effects of blasting on terrestrial wildlife that includes, but is not limited to the restriction of blasting when migrating caribou, sensitive local carnivores or birds may be negatively affected.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	N/A
Reference	Quarry Blasting Operations Management Plan (Baffinland, 2013b) Borrow Pit and Quarry Management Plan (Baffinland, 2014b) Environmental Protection Plan (Baffinland, 2016b)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Baffinland submitted a Borrow Pit and Quarry Management Plan to the Nunavut Water Board in 2013. That plan accompanied a broader Environmental Protection Plan that included the requirement to scan for and report wildlife presence on a wildlife sightings log and that blasting not occur if wildlife is present and could be harmed by the activity.

### RESULTS

No wildlife has been knowingly harmed or disturbed by blasting activities during construction.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 61

Category	Terrestrial Wildlife and Habitat - Operations (General)
Responsible Parties	The Proponent, TEWG
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate Project impacts to wildlife.
Term or Condition	Whenever practical and not causing a human safety issue, a stop work policy shall be implemented when wildlife in the area may be endangered by the work being carried out. An operational definition of 'endangered' shall be provided by the Terrestrial Environment Working Group.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Environmental Protection Plan (Baffinland, 2016b) Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016c)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

The Environmental Protection Plan outlines the 'stop work' procedure when wildlife is in the area policy.

### RESULTS

Whenever practical and not presenting a risk to human safety, a stop work policy shall be implemented when wildlife in the area may be endangered (at risk of immediate injury or death) by work being conducted.

The term "endangered" was defined by the TEWG as: at risk of physical injury or death.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.



## Project Certificate Condition No. 62

Category	Terrestrial Wildlife and Habitat - Operations (General)
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent increased harvesting pressure on wildlife.
Term or Condition	The Proponent shall prohibit project employees from transporting firearms to site and from operating firearms in project areas for the purpose of wildlife harvesting.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	Weapons on Site Policy (Baffinland, 2019f) Hunting and Harvesting Policy (Baffinland, 2013c)
Ref. Document Link	N/A

### METHODS

In 2013 and newly amended in 2019, Baffinland implemented its Weapons on Site Policy (Baffinland, 2019g) which prohibits employees from transporting firearms to site. Site orientation includes cultural awareness and reviews the policies outlined in the Hunting and Fishing (Harvesting) Policy (Baffinland, 2013c). The policy states that no employee or contractor will be permitted to hunt or fish (harvest) on lands leased to Baffinland. Baffinland does not interfere with rights of public hunting or fishing near or within the Project Development Area. All visitors and visitor activities are tracked through a visitor access log, provided in the terrestrial annual monitoring reports.

### RESULTS

No incidences of Project personnel hunting or fishing within the Impact Area leased to Baffinland and/or PDA occurred in 2019.

In 2019, a total of 892 land use visitor person-days were recorded at Project sites, which is a 73% increase from 2018. Visitors frequenting the area were often passing through, dog sled racing, hunting, visiting, or stopping in to pick up or service snowmobiles. Baffinland provided food, beverages, transportation, tools, construction supplies, fuel and mechanical assistance to hunters and other visitors as requested.

### TRENDS

No Project personnel have participated in hunting or fishing on the Project Development Area unless approved by scientific permit and have not interfered with public rights to fish or hunt in or near the Project Development Area.

Baffinland continues to accommodate all hunting parties and other visitors that travel to the Project.

### RECOMMENDATIONS / LESSONS LEARNED

The Weapons on Site Policy has been successful in eliminating firearms from the workplace.

Baffinland continues to monitor and implement the policy banning all employees and contractors from hunting and fishing within the Project Development Area, and accommodating all hunting parties.

## Project Certificate Condition No. 63

Category	Terrestrial Wildlife and Habitat - Public Engagement
Responsible Parties	The Proponent, local Hunters and Trappers Organizations
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To keep communities up to date with Project operations.
Term or Condition	The Proponent shall liaise with local Hunters and Trappers Organizations in advance of carrying out terrestrial wildlife surveys. At a minimum, The Proponent shall also meet annually in person with Hunters and Trappers Organizations to discuss wildlife monitoring and mitigation plans and address community concerns regarding wildlife interactions. The Proponent may be required to facilitate these meetings through payment of honoraria and meeting costs.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG) and with local Hunter and Trappers Organizations (HTOs)
Reference	2019 Community Engagement Records 2019 TEWG Meeting Records
Ref. Document Link	Appendix B Appendix C

### METHODS

The Mittimatalik Inlet Hunters' and Trappers' Organization (MHTO) became a member of the TEWG in 2016. The TEWG meets twice in-person annually or more often as required via conference call. Baffinland facilitates these meetings through the provision of honoraria and meeting costs for MHTO members' participation.

In addition to the MHTO's participation in the Working Groups, Baffinland met with the MHTO on a number of occasions, as well as with other North Baffin HTOs throughout the year to provide an update on the Project and the Phase 2 Proposal. These meetings are listed in Table 4.22.

**Table 4.22: 2019 Meetings with Local HTOs**

Date	Hunters and Trappers Organization
January 14, 2019	Elder and HTO Representatives from Sanirajak, Arctic Bay, Clyde River and QIA
January 30, 2019	MHTO
January 30, 2019	MHTO, QIA
February 11, 2019	Elder and HTO Representatives from Pond Inlet, Sanirajak, Arctic Bay, Clyde River and QIA
February 27, 2019	MHTO, QIA
March 26, 2019	Clyde River HTO
April 30, 2019	MHTO, QIA, Hamlet of Pond Inlet

Date	Hunters and Trappers Organization
May 7, 2019	Elder and HTO Representatives from Pond Inlet, Sanirajak, Arctic Bay, Clyde River, and Igloolik
May 23, 2019	MHTO, Hamlet of Pond Inlet, QIA
June 24, 2019	MHTO, Hamlet of Pond Inlet, QIA
June 25, 2019	MHTO, Hamlet of Pond Inlet, QIA
July 2, 2019	North Baffin Mayors and HTOs, QIA
August 27, 2019	Hamlet and HTO
September 3, 2019	MHTO
September 4, 2019	All North Baffin HTOs
September 4, 2019	Elder and HTO Representatives from Pond Inlet, Sanirajak, Arctic Bay, Clyde River
September 10, 2019	Pond Inlet Phase 2 Committee & MHTO
September 12, 2019	Hamlet & HTO
September 13, 2019	Clyde River Council and HTO
September 24, 2019	North Baffin Mayors and HTOs, QIA
November 26, 2019	Hamlet of Pond Inlet and MHTO

## RESULTS

Wildlife monitoring and mitigation programs and wildlife surveys are reviewed at the TEWG meetings. In addition, draft annual monitoring reports are provided to TEWG members for review and comment prior to finalization and for input into the following years monitoring programs.

The 2019 monitoring for mammals included a number of surveys designed to enhance baseline data and monitor the effects of construction activities on caribou. Specific surveys included:

- Snow track surveys;
- Snow bank height monitoring;
- Height of Land caribou surveys; and
- Incidental observations and wildlife log.

The 2019 surveys were informed by input previously received from MHTO members who had participated in the Height of Land surveys.

## TRENDS

Not applicable.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to work with the MHTO at TEWG meetings and other meetings organized between Baffinland and the local HTOs.

## Project Certificate Condition No. 64

Category	Terrestrial Wildlife and Habitat - Waste Management
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent human-carnivore interactions.
Term or Condition	<p>The Proponent shall ensure that its Environment Protection Plan incorporates waste management provisions to prevent carnivores from being attracted to the Project site(s). Consideration must be given to the following measures:</p> <ul style="list-style-type: none"> <li>a. Installation of an incinerator beside the kitchen that will help to keep the food waste management process simple and will minimize the opportunity for human error (i.e. storage of garbage outside, hauling in a truck (odours remain in truck), hauling some distance to a landfill site, incomplete combustion at landfill, fencing of landfill, etc.); and</li> <li>b. Installation of solid carnivore-proof skirting on all kitchen and accommodation buildings (i.e., heavy-duty steel mesh that would drop down from the edge of the buildings/trailers and buried about a half meter into the ground to prevent animals from digging under the skirting).</li> </ul>
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Environment Climate Change Canada, Qikiqtani Inuit Association, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board.
Reference	<p>Environmental Protection Plan (Baffinland, 2016b)</p> <p>Waste Management Plan (Baffinland, 2020e)</p> <p>Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)</p>
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

Waste management buildings are situated at both the Mine and Port sites. The waste management buildings house a dual chamber incinerator designed for optimal incineration of approved specific wastes, including food wastes. Design constraints at the Project site limited the ability to situate the Waste Management Building(s) directly beside complex kitchens, however Baffinland employs procedures to minimize animal attractants and interaction of carnivores with food or food wastes as described in the Environmental Protection Plan (EPP) and the Waste Management Plan (which includes the Incinerator Operation Procedure as an appendix). Employees are trained on animal attractant policies upon arrival at Site.

The specific measures implemented to mitigate attractants and animal interactions include; double bagging food and food wastes, storage in closed top bins or sealed seacans, and prompt removal for incineration inside the enclosed Waste Management Building(s). Food wastes are incinerated under stipulated conditions, and ash is visually inspected and tested under applicable Nunavut guidelines for landfilling. Ash deposited in the designated landfill is promptly covered with a layer of material to mitigate animal attraction. Metal Skirting has also been

installed on kitchen and accommodation buildings on the Project site to prevent carnivores accessing under buildings. In 2018 Baffinland began construction of the new Sallivik camp accommodations complex at the Mine Site. Installation of metal skirting to comprehensively cover the complex was completed in 2019.

## **RESULTS**

Both the Environmental Protection Plan and Waste Management Plan incorporate carnivore interaction and attractant mitigation measures and policies, which continued to be implemented in 2019. Food and food wastes were stored as designated by the aforementioned plans, incinerated in the waste management buildings and ash promptly disposed of and covered in the designated landfill. The Mine Site Landfill Facility continued to only accept inert, non-hazardous waste materials in 2019, with all animal attractants (food scraps, wrappers, etc.) diverted to the incineration units. While landfill fencing was completed in 2019 and may result in some additional wildlife deterrence, the primary mitigation measure to reduce animal interactions at the landfill remains the diversion of all animal attractants from placement in the landfill.

Carnivore interactions have been minimized however still do occur with Arctic fox. Arctic fox site habituation has proven to be a challenge even while mitigating animal attractants on site. Animal interactions are documented and discussed in the Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020).

Metal Skirting on accommodation and kitchen complexes continued to be repaired and maintained in 2019 and metal skirting installation on the new Sallivik accommodations complex was completed.

## **TRENDS**

Carnivore and/or Arctic Fox interactions have gradually increased over the life of the Project as it grows in scale, however fewer interactions occurred in 2019 as compared to 2018 and 2017 validating the success of improved waste management practices implemented on site. Incineration, animal attractant mitigation measures and metal skirting installation continue to be implemented.

## **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland continues to mitigate wildlife interactions at the Project area by training, enforcing, and monitoring waste management practices and guidelines. Management attend mandatory Environment Protection Plan training, which is then passed on to all employees. Included in the EPP are wolf, polar bear, fox, and caribou protection measures and waste management guidelines that are continually updated and implemented. Incineration and proper waste sorting are the most prominent deterrents used. Wildlife attractants such as food scraps and human waste are sorted and sealed in animal proof containers and incinerated on site. Posted around each site are waste sorting guidelines that clearly define where food and other attractants should be placed. Another deterrent used is metal skirting to minimize wildlife entry under buildings. Wire skirting is used under the main camps at both sites to ensure no wildlife such as foxes or hares den underneath. Feeding of wildlife is strictly prohibited and non-compliance is dealt with accordingly.

#### 4.6.9 Birds (PC Conditions 65 through 75)

Eleven (11) PC conditions focus on potential impacts of the Project on birds. Most of these conditions relate to the implementation of mitigation measures within the TEMMP to protect birds in consultation with relevant organizations. Baffinland is also required to report on the amount of terrestrial habitat loss annually.

##### Stakeholder Feedback

The Canadian Wildlife Service of Environment and Climate Change Canada (CWS-ECCC), have legislated responsibility for migratory birds, under the Migratory Birds Convention Act and associated regulations. The Government of Nunavut (GN) is responsible for species at risk within Nunavut, pursuant to the Wildlife Act (GN, 2005). During the course of the Project reviews, the focus was understandably on bird species at risk. Both agencies participate in the TEWG, and as such, Baffinland engages with these agencies bi-annually on the mitigation and monitoring of Project effects on birds through the TEWG. Topics discussed during 2019 consultation activities, though infrequently, included potential effects to birds from oil spills and dust on their food source, in addition to associated effects monitoring (Appendix B).

##### Monitoring

Baffinland's bird monitoring program included the following in 2019, which contributes to the wide array of surveys completed to date:

- Pre-clearing nest surveys;
- Cliff-nesting raptor occupancy and productivity surveys;
- Active migratory bird nest surveys (AMBNS); and
- Red Knot surveys (collaboration with CWS-ECCC).

The CWS-ECCC has also conducted seabird monitoring programs that contributes to regional bird distribution data.

To the extent that Project impacts on the terrestrial environment can be evaluated, the effects of the Project appear to be within FEIS predictions. Table 4.23 provides a summary of the main activities in 2019 in relation to the birds, and an impact evaluation in comparison to the predictions outlines in the FEIS and FEIS Addendum.

**Table 4.23: Birds Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Bird Indicator Species/Species at Risk	Destruction of nests due to development in expanded project footprint	Pre-clearing nest surveys are completed at applicable locations. No nests were found in 2019. Surveys will continue to be required whenever clearing vegetation within the migratory bird nesting season.	Effect did not occur
	Habitat loss: direct habitat loss due to the Project footprint; and indirect habitat loss due to sensory disturbances	Cliff-nesting raptor occupancy and productivity survey; cliff-nesting raptor nest site management and effects monitoring. No effect on cliff-nesting raptor nest occupancy rates since 2011. Distance to disturbance analysis suggests there is no negative effect on monitored raptor nesting.	Effect negligible, within FEIS predictions

Component	Effects	Monitoring Program	Impact Evaluation
	Influences on health	Helicopter flight height compliance inside the goose area during moulting period (July to August) remained high (93%) in 2019, and also high over all months (May-September) of analysis (91%).	Consistent with FEIS predictions
	Mortality	Seven (7) bird mortalities were observed in 2019: American Pipit (3), Long-tailed Duck (1), Snow Bunting (1), Common Loon (1) and Rock Pigeon (1). Three (3) of these involved collisions with infrastructure (e.g., warehouse fan, shipping vessel) or vehicles (ore haul truck); remaining causes are unknown.	Seven (7) mortalities were observed, but within FEIS predictions

### Path Forward

Baffinland will remain vigilant about the mitigation and monitoring activities that are in place to protect birds including bird species at risk. Baffinland will continue to seek input and review monitoring results trends from technical members of the TEWG. Baffinland will continue to support regional monitoring of shorebirds, including species at risk in conjunction with CWS-ECCC as opportunities arise similar to the 2019 passive sound recorder deployment for detection of Red Knot vocalizations. Active migratory bird nest surveys will continue in future years prior to any proposed land disturbance and/or clearing during the breeding bird window, and raptor monitoring will continue to focus on multiple nesting territory visits in 2020. Baffinland will also be partnering on a three-year initiative with CWS-ECCC, and multiple universities (McGill, Windsor and Carleton) entitled “Using cutting-edge biologging and physiological tools to map environmental sensitivities in the Arctic: application to shipping associated with Baffinland Iron Mines” after a successful Natural Sciences and Engineering Research Council of Canada (NSERC) Collaborative Research and Development (CRD) grant application was awarded in December 2019. This initiative aims to develop innovative techniques to study the potential impacts of marine shipping on seabirds, and the effects of mining activities on terrestrial birds near the Project.



## Project Certificate Condition No. 65

Category	Birds - Awareness
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent disturbance to birds and bird habitat.
Term or Condition	The Proponent shall ensure all employees working at project sites receive awareness training regarding the importance of avoiding known nests and nesting areas and large concentrations of foraging and moulting birds.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association, Nunavut Impact Review Board, Terrestrial Environment Working Group (TEWG)
Reference	Environmental Protection Plan (EPP; Baffinland, 2016b) 2019 TEWG Meeting Records
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C

### METHODS

Section 2.13 (Bird Protection Measures) of the EPP is the relevant document that deals with Bird Awareness training delivered to employees.

In 2019, on-site training of pre-clearing Bird Nest Surveys was performed by EDI to the Baffinland Site Environment Department. Training included nest searching methods and identification of common species known in the area.

Baffinland endeavours to perform construction activities outside of the bird nesting season. If construction activity is required in undisturbed areas during bird nesting seasons (e.g. between May 31 and August 5), active migratory bird nest surveys are conducted in accordance with the *Migratory Birds Convention Act, 1994*. Construction has five (5) days to commence from the time that a migratory bird presence survey is conducted. A new survey is completed if construction does not commence in this five-day timeline. The results of these surveys are provided to the TEWG for review on a yearly basis.

### RESULTS

In 2019, Baffinland continued to monitor all new construction activities around development areas prior to conducting any ground disturbance. A total of 26.9 hectares were surveyed between June 2 and August 18, 2019. No disturbance or destruction of migratory bird nests or their young were recorded.

### TRENDS

Baffinland Site Environment Department employees have continued to receive annual training on performing bird surveys through its consultant, EDI. Baffinland Site Environment Department employees have also continued to raise

awareness of all Baffinland employees and contractors on the importance of preventing the disturbance of all wildlife and habitats at all Project sites through EPP training.

**RECOMMENDATIONS / LESSONS LEARNED**

Continue to minimize disturbance (clearing) or other industrial activities in previously undisturbed areas during the nesting season between May 31 and August 5.

## Project Certificate Condition No. 66

Category	Birds - Species at Risk
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to sensitive bird species.
Term or Condition	If Species at Risk or their nests and eggs are encountered during Project activities or monitoring programs, the primary mitigation measure must be avoidance. The Proponent shall establish clear zones of avoidance on the basis of the species-specific nest setback distances outlined in the Terrestrial Environment Management and Monitoring Plan.
Relevant Baffinland Commitments	75
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland, 2016c) 2019 TEWG Meeting Records
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C

### METHODS

Baffinland concentrates new ground disturbance outside of the breeding bird season and conducts active migratory bird nest surveys in areas that are disturbed in the breeding season, prior to disturbance. Surveys are conducted a maximum of five (5) days prior to clearing using the rope-drag method, as recommended by CWS-ECCC. Surveys are conducted with a minimum of three observers by walking slowly through the area with the rope drag, looking for nests and birds displaying nesting behaviour. When bird nests are found, Baffinland establishes clear zones of avoidance based on species-specific nest setback distances included in Table 3-1 in the TEMMP.

### RESULTS

No Species at Risk nests or eggs have been encountered during Project activities.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to avoid Species at Risk nests and eggs when encountered by conducting pre-clearing active migratory bird nest surveys and following established guidelines for setback distances.

## Project Certificate Condition No. 67

Category	Birds - Species at Risk
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to sensitive bird species.
Term or Condition	The Proponent shall ensure that the mitigation and monitoring strategies developed for Species at Risk are updated as necessary to maintain consistency with any applicable status reports, recovery strategies, action plans and management plans that may become available during the duration of the Project.
Relevant Baffinland Commitments	75
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG), Environment and Climate Change Canada (ECCC)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016c) 2019 TEWG Meeting Records Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Environment and Climate Change Canada (ECCC) provides input to the development of mitigation and monitoring strategies for Species at Risk via participation in the TEWG. Section 3 of the TEMMP identifies mitigation and monitoring strategies relevant to all wildlife that could interact with the Project, including Species at Risk.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to coordinate with ECCC through the TEWG to address mitigation and monitoring strategies related to Species at Risk.

In 2019, Baffinland deployed nine (9) passive Autonomous Recording Units (ARUs) to detect red knot vocalizations in collaboration with CWS-ECCC. Baffinland Environmental Staff monitored the recorders throughout the summer to ensure functionality and change out memory cards. Originally, CWS-ECCC recommended that the sound recorders be deployed for at least two breeding seasons. However, no Red Knot were detected during 2019. CWS-ECCC concluded that ARU monitoring is not necessary for 2020.

## Project Certificate Condition No. 68

Category	Birds - Project Infrastructure
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent potential injuries to birds.
Term or Condition	The Proponent shall ensure flashing red, red strobe or white strobe lights and guy-wire deterrents are used on communications towers established for the Project. Consideration should also be given to reducing lighting when possible in areas where it may serve as an attractant to birds or other wildlife.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status of Compliance	In-Compliance
Stakeholder Review	Environment and Climate Change Canada (ECCC), Terrestrial Environment Working Group (TEWG)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016c) 2019 TEWG Meeting Records Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Through discussions with ECCC in 2013, Baffinland installed reflectors on guy wires at the communication towers established for the Project and will continue to do so on any new infrastructure as required. It was determined that strobe lights were not a relevant mitigation measure as most birds are in the area during the summer when there is 24 hours of light. Consideration has been given to reducing lighting where possible if it does not present any risks to operating the Project safely.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Strobe lights were found to not be a relevant mitigation measure because birds are mostly present during the period when the Project experiences 24 hours of daylight. Baffinland will maintain the reflectors installed on the guy wires of the communication towers for the Project and will continue to use this method on any new infrastructure as required.

## Project Certificate Condition No. 69

Category	Birds - Construction/Clearing Activities
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent nesting by birds in active Project areas.
Term or Condition	Prior to bird migrations and commencement of nesting, the Proponent shall identify and install nesting deterrents (e.g. flagging) to discourage birds from nesting in areas likely to be disturbed by construction/clearing activities taking place during the nesting season.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016c) 2019 TEWG Meeting Records Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Baffinland prepared a bird deterrence review that was discussed at the TEWG meeting held on May 21, 2013. There was no feedback from the group on what would prove to be practical solutions prior to the 2014 construction season. Although active migratory bird nest surveys were completed, deterrents were not erected. Baffinland conducts clearing activities outside of the breeding bird season whenever possible to discourage birds from nesting in these areas and to minimize the potential for nests to be disturbed by clearing or construction.

### RESULTS

In 2019, there were no apparent nesting attempts by birds in the cleared areas. No deterrents were used. In 2019, approximately 650,962 m<sup>2</sup> of land was disturbed for Project infrastructure. Of the approximate areas cleared, 77% of the work was done outside of the breeding bird window. During the breeding bird window, approximately 148,438 m<sup>2</sup> of land was cleared while 269,362 m<sup>2</sup> was surveyed through active migratory bird nest surveys.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Given that the areas cleared during the breeding season are managed by active migratory bird nest surveys prior to disturbance, deterrents have not been required. Avoidance has been the primary method used to prevent

disturbances to nesting birds. No recommendations have been made by the TEWG that an alternative method would be more successful.

## Project Certificate Condition No. 70

Category	Birds - Construction/Clearing Activities
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to birds and nesting areas.
Term or Condition	The Proponent shall protect any nests found (or indicated nests) with a buffer zone determined by the setback distances outlined in its Terrestrial Environment Mitigation and Monitoring Plan, until the young have fledged. If it is determined that observance of these setbacks is not feasible, the Proponent will develop nest-specific guidelines and procedures to ensure bird's nests and their young are protected.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016c) 2019 TEWG Meeting Records Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Active migratory bird nest surveys are conducted in areas that are scheduled for clearing disturbance during the breeding bird season. Surveys are conducted a maximum of five days prior to clearing using the rope-drag method, as recommended by CWS-ECCC. Surveys are conducted with a minimum of three (3) observers by walking slowly through the area with the rope drag, looking for nests and birds displaying nesting behaviour. When bird nests are found, Baffinland establishes clear zones of avoidance on the basis of the species-specific nest setback distances are included in Table 3-1 of the TEMMP.

### RESULTS

Thirteen (13) pre-clearing surveys were conducted between May 31 and August 5, 2019, consisting of 12.9 person-hours and 269,361 m<sup>2</sup> (26.9 ha) surveyed at the Mine Site, Tote Road and Milne Port development areas. No nests were located during Active Migratory Bird Nest Surveys in 2019. While conducting surveys, environmental staff did note that songbirds were in the area, but no indications of nesting behavior were observed (e.g. carrying food, carrying nesting material). As no nests were located, no buffers or set-back distances were needed.

### TRENDS

Not applicable.



**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to avoid new ground disturbance during the nesting season where possible and continue to conduct Active Migratory Bird Nest Surveys throughout the breeding bird season in areas that need to be cleared.

## Project Certificate Condition No. 71

Category	Birds - Flight Altitude Requirements
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate aircraft disturbance to birds.
Term or Condition	<p>Subject to safety requirements, the Proponent shall require all Project related aircraft to maintain a cruising altitude of at least:</p> <ul style="list-style-type: none"> <li>• 650 m during point to point travel when in areas likely to have migratory birds;</li> <li>• 1,100 m vertical and 1500 m horizontal distance from observed concentrations of migratory birds; and</li> <li>• 1,100 m over the area identified as a key site for moulting snow geese during the moulting period (July-August), and if maintaining this altitude is not possible, maintain a lateral distance of at least at least 1,500 m from the boundary of this site.</li> </ul>
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	<p>Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016c)</p> <p>2019 TEWG Meeting Records</p> <p>Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)</p>
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

There is a discrepancy between Project Condition No. 59 and 71, Project Condition 59 suggesting that minimum flight height should be 610 magl in all areas, while Project Condition No. 71 prescribes a minimum flight height of 650 magl. Considering that most, if not all, areas where Baffinland operated in June through September were likely to have migratory birds, the default minimum altitude for helicopter overflights was the more conservative 650 magl (during point to point travel).

In consultation with the TEWG, Baffinland implemented a requirement for all helicopter pilots to complete a flight log to track flight data, reason for flight and explanation for lower flight altitudes, when required. Pilots are also given the spatial boundaries of any identified concentrations of migratory birds, which are buffered by the required 1,500 m horizontal avoidance distance. Pilots are then asked to avoid flying in these areas.

Canadian Helicopters provided flight log data and Baffinland provided compliance documentation using daily pilot timesheets (with flight details) from May to September, 2019 for analysis. This analysis includes all travel related to Baffinland, including Ege Bay Exploration. Baffinland also provided pilots with GPS coordinates for flight height allowance areas. Point data representing vertices along helicopter flight paths were provided and a Digital Elevation

Model (DEM) was used to estimate ground level elevation values above sea level. The provided point elevation data was used to calculate the helicopter altitude above ground level. To find the actual elevation above ground level in metres, the metres above sea level (masl) from the DEM was subtracted from the masl from the helicopter data, resulting in a helicopter's approximate metres above ground level (magl) at each logged point.

Data were split into two categories: 1) those data within the snow goose area in July and August 2019 in relation to 1,100 magl elevation requirement and 2) those data within and outside the snow goose area in all months in relation to 650 magl. The data sets were then analyzed separately to assess specific flight height allowances using the different areas and elevation values. The flight height data was also cross-referenced with compliance data from daily pilot timesheets, and any flight data with justifications for flying at lower elevations than required was considered compliant. When no justification was provided, entries defaulted to non-compliant. For this reason, the proportion of compliant flights was considered conservative. Based on this analysis, flight data was organized into the following six categories:

1. Those data within the snow goose area in July and August, where the 1,100 magl elevation requirement was achieved (compliant);
2. Those data within the snow goose area in July and August where the 1,100 magl elevation requirement was not achieved, but lower elevation flying was justified by pilots (compliant);
3. Those data within the snow goose area in July and August where the 1,100 magl elevation requirement was not achieved and no justification for low level flying was given (non-compliant);
4. Those data within and outside the snow goose area in all months where the 650 magl elevation requirement was achieved (compliant);
5. Those data within and outside the snow goose area in all months where the 650 magl elevation requirement was not achieved, but lower elevation flying was justified by pilots (compliant); and
6. Those data within and outside the snow goose area in all months where the 650 magl elevation requirement was not achieved and no justification for low level flying was given (non-compliant).

Additional helicopter flight height analysis was requested by the TEWG in the February 2020 meeting. This data verification and analysis are still in progress, and so results presented for 2019 are preliminary and may change based on the updated analysis. Transit data and flight rationale data will be most affected, while general trends and compliance data will likely remain the same.

## RESULTS

There were no identified “observed concentrations of migratory birds” in 2019, nor areas specifically prescribed by the TEWG to avoid for migratory birds excluding the established Snow Goose area. After considering pilot rationale in 2019, compliance for transects flown within the Snow Goose area during the moulting season was 93%, and compliance within and outside the snow goose area in all months was 91%. No known public complaints occurred about helicopter overflights in 2019,

2019 was the third year that flight height data were cross-referenced with compliance data from daily pilot timesheets. For analytical purposes, flight height data points were designated “compliant” when elevation requirements were achieved, or where pilot’s discretionary rationale for deviating from flight heights was provided. Data points were designated “non-compliant” if they did not meet elevation requirements and no explanation was

given. This additional analysis resulted in an increase in helicopter flight height compliance when compared to previous years, as it provided explanations for transits flown lower than the elevation requirements. A summary of low-level flight rationale for 2019 is provided in Table 4.24.

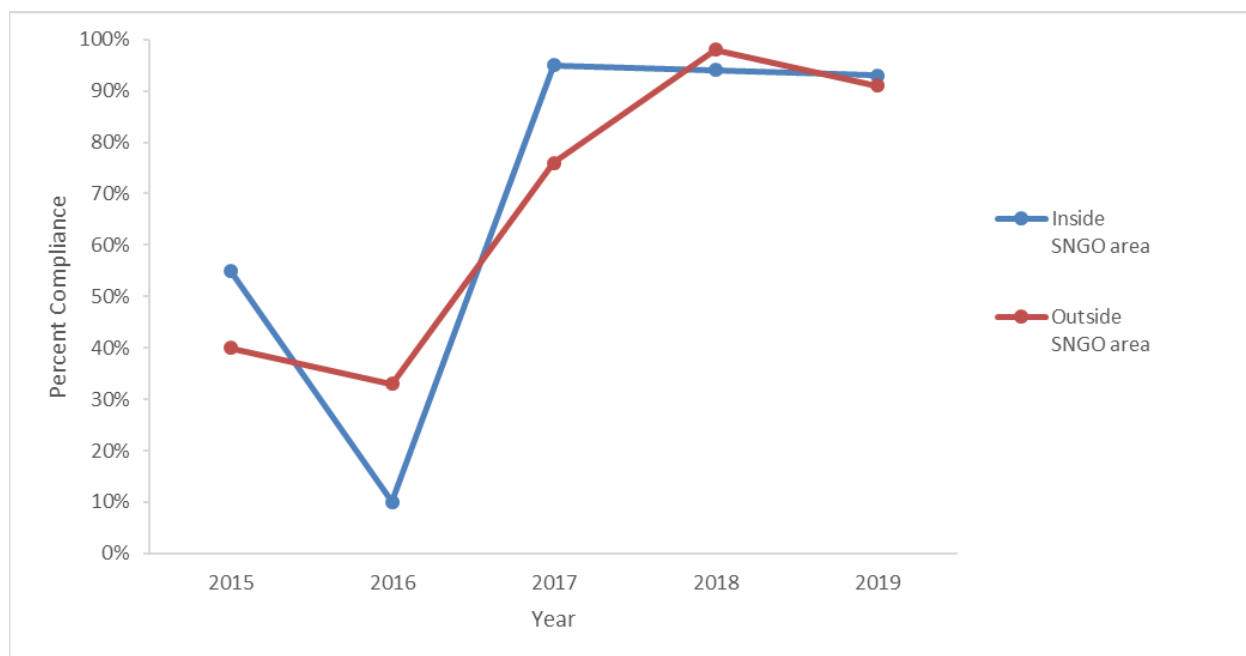
This additional analysis showed that when considering rationale provided by pilots for low-level flying, most low-level data points were compliant. For example, of all the compliant points within the snow goose area during the moulting season, only 31% were  $\geq 1,100$  magl, and the other 59% were  $< 1,100$  magl with reasons given by pilots. Similarly, when looking at all compliant points within and outside the snow goose area in all months, only 11% were  $\geq 650$  magl, and the other 89% were  $< 650$  magl with reasons given by pilots. The high percentage of low-level compliant flights in 2019 is similar to what was observed in 2017 and 2018, and will likely continue in future years as the majority of helicopter work conducted at Mary River either requires low-level flying for safety/operational reasons (e.g. slinging, surveys), or involves multiple short distance flights whereby helicopters are unable to reach the required elevations between take-off and landing sites (e.g. staking, sampling, drop offs/pickups). Most compliant transits that met the elevation requirements in 2019 tended to be long distance flights, where pilots were airborne long enough to reach and maintain the required elevations.

**Table 4.24: Elevation Points Calculated to Obtain Low-Level Flight Rationale in all Areas, May 1 – September 30, 2019**

Rationale	Total Elevation Points	% of Total Elevation Points
Drop off/pick up	16,535	33.1
Survey	11,486	23.0
Slinging	10,634	21.3
Weather	1,575	3.2
Sampling	1,161	2.3
Mobilization/demobilization	1,142	2.3
Other	1,012	2.0
Staking	656	1.3
Evacuation	37	0.1
<b>Total</b>	<b>44,238</b>	<b>88.5</b>

## TRENDS

Preliminary results showed that helicopter flight height compliance inside the goose area during moulting period was 93%, which was similar to 2017 (95%) and 2018 (84%), and considerably higher than 2015 (55%) and 2016 (10%) (Figure 4.13). This increase was largely due to an additional analysis performed in 2017, 2018, and 2019, which considered justifications provided by pilots for many of the transits flown below the elevation requirements. Helicopter flight height compliance within and outside the goose area in all months was higher in 2019 (91%) and 2018 (98%) than 2017 (76%), 2016 (33%) and 2015 (40%). The high level of compliance observed in 2019 is largely due to the additional analysis performed, as well as improved documentation of the rationale for low-level flights by pilots and Baffinland staff over the past few years (Figure 4.13).



**Figure 4.13: Percent (%) Compliance of Flights Inside the Goose Area during the Moulting Season and Within and Outside the Goose Area in All Months (2015 to 2019)**

#### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to work with their helicopter provider to improve flight height compliance by continuing to communicate elevation requirements and improving documentation of rationale for not meeting the requirements.

Additional details concerning helicopter flight purpose (e.g., environmental monitoring, exploration) and pilot rationale is further required to provide a comprehensive review of pilot justification during past years. To further address the need, the entire helicopter flight database must be re-analysed to maintain consistency and comparability between years. As this data verification and analysis are still in progress, results presented for 2019 are preliminary and may change based on the updated analysis. Any new updates stemming from the analysis of helicopter compliance results will be included as part of the final version of the 2020 Terrestrial Annual Report, following additional input received through TEWG review processes.

## Project Certificate Condition No. 72

Category	Birds - Flight Altitude Requirements
Responsible Parties	The Proponent, Transport Canada
Project Phase(s)	Construction, Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate aircraft disturbance to birds.
Term or Condition	The Proponent shall ensure that pilots are informed of minimum cruising altitude guidelines and that a daily log or record of flight paths and cruising altitudes of aircraft within all Project Areas is maintained and made available for regulatory authorities such as Transport Canada to monitor adherence and to follow up on complaints.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association, Nunavut Impact Review Board, Transport Canada, Terrestrial Environment Working Group (TEWG)
Reference	Environmental Protection Plan (Baffinland, 2016b) Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland 2016c) 2019 TEWG Meeting Records (Baffinland, 2019g) Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

In 2019, Baffinland Environment staff directed pilots to be aware of the potential disturbance to wildlife and the potential disturbance to local users (Inuit Hunters) moving through the Project Area as stated in Section 2.8 'Aircraft Flights' of the Environmental Protection Plan (EPP) and Section 3.2.4 'Aircraft' in the TEMMP. Flight height requirements are included in all aviation contracts and flight paths are recorded using the software Skytracker. To comply with horizontal guidelines, pilots are given the spatial boundaries of any identified concentrations of migratory birds, which are buffered by the required 1,500 m horizontal avoidance distance. Pilots are then asked to avoid flying in these areas. Pilots are made aware of flight height requirements in 'toolbox' talks given at the beginning of each season and daily toolbox talks are held within each department. In addition, flight height compliance was incorporated into the helicopter contract Baffinland holds with Canadian Helicopters. Random audits of flight-logs were also completed throughout the season to help ensure compliance with requirements.

### RESULTS

There were no identified "observed concentrations of migratory birds" in 2019, nor areas specifically prescribed by the TEWG to avoid for migratory birds excluding the established Snow Goose area. After considering pilot rationale in 2019, compliance for transects flown within the Snow Goose area during the moulting season was 93%, and compliance within and outside the snow goose area in all months was 91%. No known public complaints occurred about helicopter overflights in 2019.

2019 was the third year that flight height data were cross-referenced with compliance data from daily pilot timesheets. For analytical purposes, flight height data points were designated “compliant” when elevation requirements were achieved, or where pilot’s discretionary rationale for deviating from flight heights was provided. Data points were designated “non-compliant” if they did not meet elevation requirements and no explanation was given. This additional analysis resulted in an increase in helicopter flight height compliance when compared to previous years, as it provided explanations for transits flown lower than the elevation requirements. A summary of low-level flight rationale for 2019 is provided in Table 4.25.

This additional analysis showed that when considering rationale provided by pilots for low-level flying, most low-level data points were compliant. For example, of all the compliant points within the snow goose area during the moulting season, only 31% were  $\geq 1,100$  magl, and the other 59% were  $< 1,100$  magl with reasons given by pilots. Similarly, when looking at all compliant points within and outside the snow goose area in all months, only 11% were  $\geq 650$  magl, and the other 89% were  $< 650$  magl with reasons given by pilots. The high percentage of low-level compliant flights in 2019 is similar to what was observed in 2017 and 2018, and will likely continue in future years as the majority of helicopter work conducted at Mary River either requires low-level flying for safety/operational reasons (e.g. slinging, surveys), or involves multiple short distance flights whereby helicopters are unable to reach the required elevations between take-off and landing sites (e.g. staking, sampling, drop offs/pickups). Most compliant transits that met the elevation requirements in 2019 tended to be long distance flights, where pilots were airborne long enough to reach and maintain the required elevations.

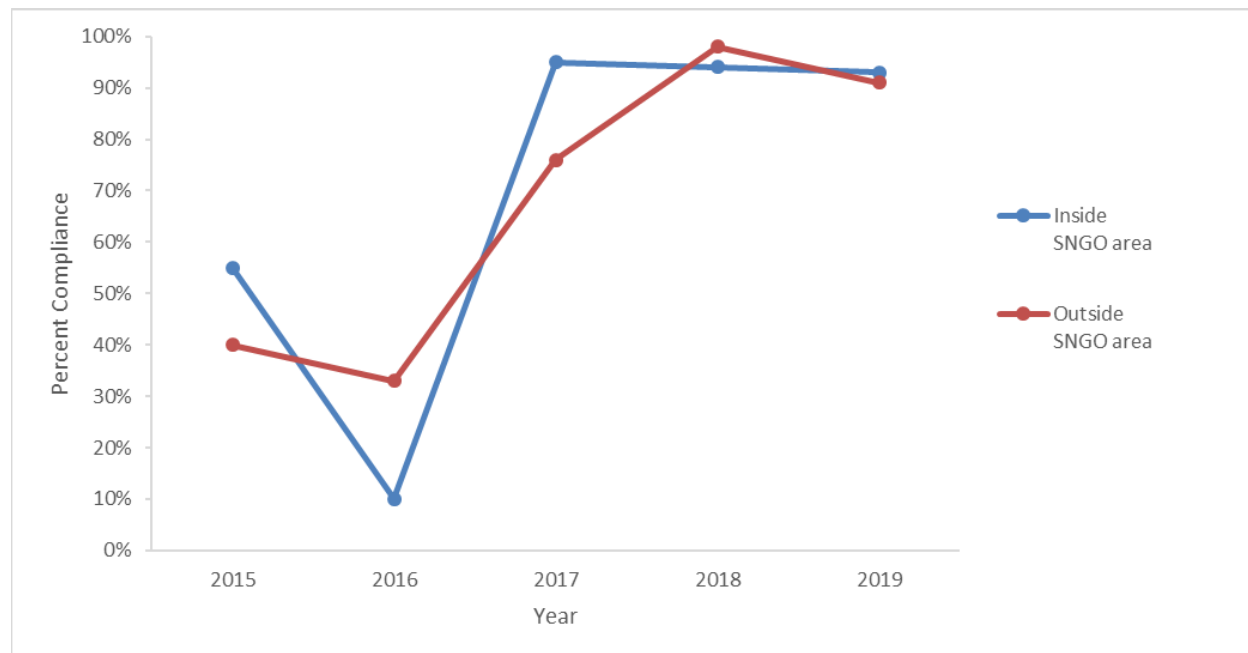
**Table 4.25: Elevation Points Calculated to Obtain Low-Level Flight Rationale in all Areas, May 1 – September 30, 2019**

Rationale	Total Elevation Points	% of Total Elevation Points
Drop off/pick up	16,535	33.1
Survey	11,486	23.0
Slinging	10,634	21.3
Weather	1,575	3.2
Sampling	1,161	2.3
Mobilization/demobilization	1,142	2.3
Other	1,012	2.0
Staking	656	1.3
Evacuation	37	0.1
<b>Total</b>	<b>44,238</b>	<b>88.5</b>

## TRENDS

Preliminary results showed that helicopter flight height compliance inside the goose area during moulting period was 93%, which was similar to 2017 (95%) and 2018 (84%), and considerably higher than 2015 (55%) and 2016 (10%) (Figure 4.14). This increase was largely due to an additional analysis performed in 2017, 2018, and 2019, which considered justifications provided by pilots for many of the transits flown below the elevation requirements. Helicopter flight height compliance within and outside the goose area in all months was higher in 2019 (91%) and 2018 (98%) than 2017 (76%), 2016 (33%) and 2015 (40%). The high level of compliance observed in 2019 is largely

due to the additional analysis performed, as well as improved documentation of the rationale for low-level flights by pilots and Baffinland staff over the past few years (Figure 4.14).



**Figure 4.14: Percent (%) Compliance of Flights Inside the Goose Area during the Moulting Season and Within and Outside the Goose Area in All Months (2015 to 2019)**

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to include flight height requirements and flight tracklog data in aviation contracts, ensure pilots are aware of flight height requirements and completing daily timesheets with flight details, and analyze flight height data for compliance. Baffinland will continue to work with their helicopter provider to improve flight height compliance by continuing to communicate elevation requirements and improving documentation of rationale for not meeting the requirements.

Additional details concerning helicopter flight purpose (e.g., environmental monitoring, exploration) and pilot rationale were requested during the February 2020 TEWG meeting. To address this request, the helicopter flight database must be re-analysed to maintain consistency and comparability between years. As this data verification and analysis are still in progress, results presented for 2019 are preliminary and may change based on the updated analysis. Updated helicopter compliance results will be included as part of the final version of the 2020 Terrestrial Annual Report.



## Project Certificate Condition No. 73

Category	Birds
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To monitor Project-related effects on migratory birds.
Term or Condition	The Proponent shall develop detailed and robust mitigation and monitoring plans for migratory birds, reflecting input from relevant agencies, the Qikiqtani Inuit Organization and communities as part of the Terrestrial Environment Working Group and to the extent applicable the Marine Environment Working Group.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG), Marine Environment Working Group (MEWG)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland 2016c) 2019 TEWG Meeting Records (Baffinland, 2019g) Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020) Draft 2019 Ship-based Observer (SBO) Monitoring Report (Golder, 2020f)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Since 2011, Baffinland has continued to monitor cliff nesting raptor site occupancy and productivity. This is an established monitoring program with the statistical power and robust design required to detect nesting raptor response to disturbances associated with the Project. That program has evolved since 2012 to accommodate statistical data requirements and is described in the TEMMP and terrestrial environment annual monitoring reports. In 2018 and 2019, small mammal monitoring was incorporated into the raptor monitoring program to address whether occupancy and reproductive success of rough-legged hawk cycles with small mammal abundance.

Since 2012, Baffinland has provided financial support to ECCC's breeding bird PRISM plot surveys and seabird research programs in the region. The last PRISM plot surveys were completed in 2018; they are next scheduled for 2023. Seabird research programs continued from the SBO program. The ongoing research results of the PRISM program are reported separately by ECCC's National Research Centre, and the results of the SBO program are reported by Golder Associates Ltd.

Since the start of the construction phase, Baffinland has conducted active migratory birds nest surveys for areas of planned disturbance. Pre-clearing nest surveys were conducted by Baffinland Environment staff over the 2019 nesting season. At the beginning of the migratory bird nesting season, Baffinland Environment staff were trained on methods to conduct nest searching surveys as well as in the identification of common species found in the area. In compliance with CWS input provided in 2015 at the TEWG meeting, Baffinland acquired two rope-drags (for Mary

River and Milne sites) to use during pre-clearing surveys to increase the likelihood of nest/nesting adult detection. Rope drags were constructed following the template provided by CWS (Rausch, 2015). More detail on the active migratory bird nest surveys can be found in the Draft 2019 Terrestrial Environment Annual Monitoring Report (Section 6.2).

In 2019, Baffinland deployed nine passive Autonomous Recording Units (ARUs) to detect red knot vocalizations in collaboration with ECCC and CWS. Baffinland Environmental Staff monitored the recorders throughout the summer to ensure functionality and change out memory cards.

Baffinland is also contributing to an industry NSERC, effective December 2019. Field work will begin in 2020 to support this initiative. This program will use biologging and physiological tools to map environmental sensitivities in the Arctic, applied to shipping associated with the Project. This is a collaboration with multiple researchers from various universities including McGill University, University of Windsor, Carleton University, and ECCC.

## **RESULTS**

Not applicable.

## **TRENDS**

Not applicable.

## **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue the monitoring programs as described in the TEMMP and will continue to collect opportunistic information when qualified biologists are on site. Updates to the TEMMP will continue to reflect input from relevant agencies, the QIA and communities as part of the Terrestrial Environment Working Group and to the extent applicable the Marine Environment Working Group.

## Project Certificate Condition No. 74

Category	Birds - Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To develop appropriate mitigation and monitoring of impacts to birds.
Term or Condition	The Proponent shall continue to develop and update relevant monitoring and management plans for migratory birds under the Proponent's Environmental Management System, Terrestrial Environment Mitigation and Monitoring Plan prior to construction. The key indicators for follow up monitoring under this plan will include peregrine falcon, gyrfalcon, common and king eider, red knot, seabird migration and wintering, and songbird and shorebird diversity.
Relevant Baffinland Commitments	57, 77
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (TEMMP; Baffinland 2016c) 2019 TEWG Meeting Records (Baffinland, 2019g) Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020) Draft 2019 Ship-based Observer (SBO) Monitoring Report (Golder 2020c)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Since 2011, Baffinland has continued to monitor cliff nesting raptor site occupancy and productivity. This is an established monitoring program with the statistical power and robust design required to detect nesting raptor response to disturbances associated with the Project. That program has evolved since 2012 to accommodate statistical data requirements and is described in the TEMMP and terrestrial environment annual monitoring reports. In 2018 and 2019, small mammal monitoring was incorporated into the raptor monitoring program to address whether occupancy and reproductive success of rough-legged hawk cycles with small mammal abundance.

Since 2012, Baffinland has provided financial support to ECCC's breeding bird PRISM plot surveys and seabird research programs in the region. The last PRISM plot surveys were completed in 2018; they are next scheduled for 2023. Seabird research programs continued from the SBO program. The ongoing research results of the PRISM program are reported separately by ECCC's National Research Centre, and the results of the SBO program are reported by Golder Associates Ltd.

Since the start of the construction phase, Baffinland has conducted active migratory birds nest surveys for areas of planned disturbance. Pre-clearing nest surveys were conducted by Baffinland Environment staff over the 2019 nesting season. At the beginning of the migratory bird nesting season, Baffinland Environment staff were trained on methods to conduct nest searching surveys as well as in the identification of common species found in the area. In compliance with CWS input provided in 2015 at the TEWG meeting, Baffinland acquired two rope-drags (for Mary

River and Milne sites) to use during pre-clearing surveys to increase the likelihood of nest/nesting adult detection. Rope drags were constructed following the template provided by CWS (Rausch 2015). More detail on the active migratory bird nest surveys can be found in the Draft 2019 Terrestrial Environment Annual Monitoring Report (Section 6.2).

In 2019, Baffinland deployed nine passive autonomous recording units (ARUs) to detect red knot vocalizations in collaboration with ECCC and CWS. Baffinland Environmental Staff monitored the recorders throughout the summer to ensure functionality and change out memory cards.

Baffinland is also contributing to an industry NSERC, effective December 2019. Field work will begin in 2020 to support this initiative. This program will use biologging and physiological tools to map environmental sensitivities in the Arctic, applied to shipping associated with the Project. This is a collaboration with multiple researchers from various universities including McGill University, University of Windsor, Carleton University, and ECCC.

Bird monitoring and survey programs are conducted as follows:

***Peregrine falcon, rough-legged hawk, and gyrfalcon (baseline studies and ongoing monitoring since 2011):***

- Known nest sites are surveyed annually. As part of these surveys, crews also attempt to locate new nest sites in suitable areas. All nesting sites are categorized into distance bins from Project infrastructure to assess the potential effects of disturbance.
- Spring occupancy surveys (indicates number of pairs that attempt to breed) and summer productivity surveys (to measure nesting success by counting the number of young that reach fledging age) are used to collect demographic information on raptor populations.

***Common and king eider as well as shorebird diversity:***

- Shoreline Surveys (2012 and 2013).
  - Shoreline surveys were conducted to detect which species were present in the area, locations of nests, and their proximity to shoreline to assess potential effects of ship wakes. Surveys consisted of beach sweeps scanning for birds, bird activity, and potential nest sites. All shore types were surveyed regardless of perceived shorebird and waterbird nesting potential.
  - In 2012, 104 kilometres of shoreline along Steensby Inlet were surveyed. Surveys were conducted north of the proposed Steensby Port area, the port area itself, and south of the port to the mainland area adjacent the islets at the mouth of Steensby Inlet.
  - In 2013, 135 kilometres of shoreline along Milne Inlet were surveyed.
- East Bay Island migratory bird research (2018).
- Regional studies conducted by ECCC on the influence of climate change and resource development on arctic marine birds, particularly eiders.

***Songbird and shorebird diversity:***

- Baseline bird surveys were conducted from 2006 to 2008, resulting in 32 species being identified in the area.
- PRISM Plot Surveys (2012, 2013 and 2018).
  - In 2012 and 2013, 80 and 13 (respectively), 300 m x 400 m PRISM plots were selected and surveyed. A total of 93 plots (11.2 Km<sup>2</sup>) were surveyed in the two years.

- In 2018, CWS conducted 14 PRISM plot surveys within a 100 Km radius of the Mary River Mine Site and another 24 plots in other areas of North Baffin Island.
- PRISM surveys were conducted using two or three crew members walking along north-south transects with a 25-meter spacing. Average survey intensity was 51 minutes per plot.
- Each plot was ground-truthed and classified as having either good, medium or poor suitability based on the classification methods used for PRISM plots. Good plots are those containing greater than 50% of wetland habitat types; poor plots were those containing greater than 50% of sparsely vegetated uplands, barren areas, and bare gravel; and medium plots were those habitats containing a mix of vegetated uplands, heaths, and drier grasslands.
- Bird Encounter Transects (2013).
  - Bird encounter transects were conducted to monitor Project effects on tundra breeding songbirds and shorebirds.
  - Conducted 45 transects extending 1.5 Km perpendicular from the PDA. Transects were divided into 100 m segments and all birds seen or heard along a segment were recorded.

***Red knot:***

- Red knot, a Species at Risk, were identified as a species that may be found on site and observers were aware of their potential presence during all surveys. Targeted red knot surveys were conducted in 2014 & 2015 along Phillips Creek and the shoreline around Milne Port.
- In May 2019, Baffinland collaborated with CWS to deploy nine passive ARUs in suitable Red Knot habitat to detect Red Knot vocalizations throughout the summer and fall seasons. Baffinland Environmental Staff monitored the ARUs throughout the summer to ensure functionality and change out memory cards.

***Seabird migration and wintering:***

- Staging Waterfowl and Waterbird Surveys at Milne Inlet (2015).
  - Staging surveys were conducted to determine species composition, abundance and use of river mouths by staging waterfowl and waterbirds.
  - Phillips Creek and Tugaat River are close to the shipping routes and were chosen as investigation sites, while Robertson River was selected as a control site since no shipping activity was proposed nearby.
  - Staging surveys involved three observers at each site using binoculars and spotting scopes to scan the water and nearby upland sites for birds and other wildlife.

***Seabird research on shipping routes:***

- Marine habitat use by thick-billed murres on Coates Island (2018).
  - ECCC sampling included: breeding timing, reproductive success, and diet to assess future impacts of planned shipping activity and climate change.
- East Bay Island migratory bird research (2018).
  - ECCC research included: investigating relationships between polar bears, eiders and diminishing sea ice; identifying key seabird marine habitats, particularly in shipping areas; physiological mechanisms linking

climate variability, reproduction and survival of arctic-breeders; and, investigating effects on changing sea ice regimes on eider reproduction and population dynamics.

- Ship-based Observer program (2013 to 2015, 2018 and 2019).
  - SBO research included collecting observational data on seabirds using the CWS Eastern Canada Seabirds at Sea protocols while aboard the MSV *Botnica* to document abundance and distribution.

## RESULTS

### ***Peregrine falcon, rough-legged hawk, and gyrfalcon:***

- Arctic Raptors Inc. conducted raptor surveys in 2011 and 2012 as part of the Project's terrestrial baseline surveys and have conducted annual raptor monitoring surveys since 2013. Results are reported in detail in the Annual Monitoring Reports.
- In 2019, site occupancy, brood size, and nest success were monitored for all known nest sites located within 10 Km from the PDA (the Raptor Monitoring Area). Areas with high nest-site suitability for cliff-nesting raptors located between known nest sites were also surveyed.
- A total of 169 nesting sites have been detected in the Raptor Monitoring Area; 165 nesting sites were monitored in 2019.
- Of these, 55 sites were occupied by raptors in 2019: 43 by peregrine falcon, 11 by rough-legged hawk, and one by gyrfalcon.
- In 2019, small mammal abundance monitoring was conducted to confirm the cyclical occupancy of rough-legged hawks in conjunction with the small mammal cycle. Only one collared lemming was captured over a total of 2,880 trap-nights over two, 6-night trapping sessions in 2019.

### ***Common and king eider as well as shorebird diversity:***

- Steensby Inlet Shoreline Surveys (2012).
  - A total of 40 nests were found, representing six species (Canada goose, semipalmated plover, herring gull, American pipit, lapland longspur, and snow bunting).
  - No colonies of waterfowl or other birds were observed during the surveys, on ferrying flights, or in transit between transects.
  - Numerous other bird species were documented but none displayed nesting behaviour within the shoreline study area.
- Milne Inlet Shoreline Surveys (2013).
  - Two nesting colonies - one glaucous gull, the other mixed glaucous and Thayer's gulls were located. Outside of the nesting colonies, nest densities were lower than those observed at Steensby Inlet in 2012. One site with two potential eider nests from the previous year was located. No active eider or other seabird nests were located.
  - A total of 1,016 birds, representing 23 different species were observed during the survey. The most common species included long-tailed duck, king eider, and glaucous gull.

### ***Songbird and shorebird diversity:***

- PRISM Plot Surveys:

- In 2012, 80 rapid PRISM plots were completed and a total of 507 individual birds from 13 different species were observed.
- In 2013, 13 rapid PRISM plots were completed in the northern sections of the RSA and a total of 90 individual birds from 7 different species were observed.
- Similar species composition and densities were detected in the 2012 and 2013 surveys.
- Shorebird densities were relatively low compared to those observed at other nearby study sites.
- In 2018, CWS conducted 14 PRISM plot surveys within a 100 Km radius of the Mary River Mine Site and another 24 plots in other areas of North Baffin Island, no new species were observed during the surveys that haven't been reported during other monitoring at Mary River. Some of the plots surveyed were considered good red knot habitat; however, no red knot were observed. Preliminary results provided by CWS indicated that 2018 was a low productivity year for shorebirds in the Mary River area and densities appeared lower than previous surveys in 2012/2013.
- Bird Encounter Transects:
  - Observed a total of 424 birds and a total of 18 species.
  - No evidence of a relationship between distance from the road/PDA and the number of birds was detected.
- Power analysis based on 2013 results indicated that songbird and shorebird densities were low and that any monitoring program would be unlikely to detect an effect of disturbance; discussion with the TEWG and CWS concluded that effects monitoring for tundra breeding birds could be discontinued but that Baffinland would commit to completing 20 PRISM plots every five years as a contribution to regional monitoring efforts.

***Red knot:***

- Red knot were observed incidentally by Wayne Renaud in 2007 at Camp Lake, Mary River.
- Red knot were not detected during targeted surveys in 2014 and 2015, but biologists and Baffinland Environment continue to be aware of their potential presence while on site.
- In 2019, Baffinland deployed nine (9) passive ARUs to detect red knot vocalizations in collaboration with CWS-ECCC. No Red Knot were detected during ARU monitoring in 2019 and based on available data, CWS-ECCC does not recommend additional years of data collection.

***Seabird migration and wintering:***

- Staging waterfowl surveys.
  - Fifteen staging waterfowl surveys were completed at three sites between June 10 and 15, 2015.
  - A total 411 individuals of 20 different bird species were observed.
  - All species observed had previously been documented within the RSA.
  - Species diversity and abundance were greatest at the Phillips Creek site with 15 species and lowest at the Tugaat River mouth with 11 species.

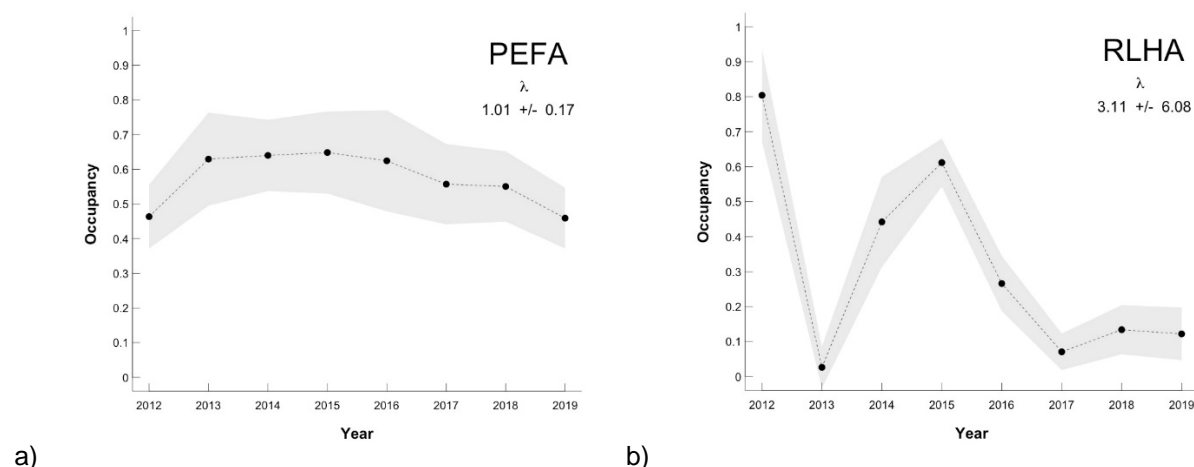
***Seabird research on shipping routes:***

- Marine habitat use by thick-billed murres (2018):
  - Since 2010, counts of thick-billed murres on Coates Island have been lower than the long-term average, suggesting a decline.
  - Shifts in prey species since the 1990's may be due to reduced summer ice cover.

- Data on distribution, habitat use, foraging behaviour, foraging range, and energetics were also collected.
- East Bay Island migratory bird research (2018):
  - Shifts in sea ice extent in Foxe Basin result in polar bears arriving at East Bay Island early, allowing bears to opportunistically forage on common eider eggs.
  - It is predicted that Endocrine Disruption Chemicals (EDCs) in eiders, combined with climate change may produce a decline in nest attentiveness, causing impacts to duckling health.
  - Eiders can use different foraging strategies, which may help eiders adapt to changing sea ice conditions, though further studies are needed.
  - Eider hens with key energetic hormones have larger clutches and higher duckling survival rates.
- Ship-based Observer program (2019) (Golder, 2020f)
  - Observations were completed in July and October 2019.
  - Six seabird species (127 individuals) were observed during summer surveys.
  - Nine seabird species (420 individuals) were observed during fall surveys.

## TRENDS

Annual variation in productivity for peregrine falcons and rough-legged hawks was apparent (Figure 4.15, Table 4.26) however, it was most likely representative of natural variability associated with variation in prey availability and weather rather than due to any influence of anthropogenic disturbance. For rough-legged hawks, occupancy appeared to be cyclical, and strongly suggests that occupancy is associated with presence of microtine rodents, which are known to cycle approximately every four years. Occupancy of potential nesting sites by gyrfalcons in the RMA have been too low to monitor annual trends. At the population level, on-going monitoring suggests that distance to disturbance and distance to nearest neighbour (individually and as an interaction) have no negative effect on occupancy or reproductive success for peregrine falcons and rough-legged hawks. Future monitoring will continue to focus on multiple nesting territory visits annually.



**Figure 4.15: Annual Estimates of Peregrine Falcon (PEFA) and Rough-legged Hawk (RLHA) Nesting Territory Occupancy (2012 to 2019)**

### Notes:

1. Annual Estimates include  $\pm$  standard errors.



**Table 4.26: Summary Statistics for Raptor Survey Effort and Detections at Known Raptor Nesting Sites within the RMA (2011 to 2019)**

Variable		Year								
		2011	2012	2013	2014	2015	2016	2017	2018	2019
Effort	Total nesting sites known annually	96	107	108	127	159	162	167	169	169
	New sites found annually	0	11	1	19	32	3	5	2	0
	Count of sites checked	87	107	90	125	147	142	166	166	165
	% known sites checked	91%	100%	83%	98%	92%	88%	99%	98%	98%
	Count of checked sites occupied	56	76	30	77	99	70	63	63	55
	% checked sites occupied	64%	71%	33%	62%	67%	49%	38%	38%	33%
	Count of sites checked twice annually	4	50	35	90	113	99	158	164	164 <sup>2</sup>
Detections <sup>1</sup>	Count of sites no raptors detected	31	31	60	48	48	72	103	103	110
	Count of sites PEFA detected	27	29	29	43	50	48	50	49	43
	Count of sites RLHA detected	26	45	1	31	47	18	5	12	11
	Count of sites GYRF detected	3	0	0	1	1	2	2	1	1
	Count of sites CORA detected	0	1	0	1	0	1	6	1	0
	Count of sites GLGU detected	0	1	0	0	1	1	0	0	0
	Count of sites SNOW detected	0	0	0	1	0	0	0	0	0

**Note:**

1. Peregrine falcon (PEFA), rough-legged hawk (RLHA), gyrfalcon (GYRF), common raven (CORA), glaucous gull (GLGU), snowy owl (SNOW). These sites were checked three times in 2019.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue the monitoring programs as described in the TEMMP and will continue to collect opportunistic information when qualified biologists are on site. Monitoring to date has found that bird densities of most species are not sufficient to monitor Project effects (i.e., songbirds, shorebirds, eiders, red knot, and gyrfalcon). To date, trend analysis has only been conducted for cliff-nesting raptors. In 2018, Baffinland contributed funds to

marine bird research on southern shipping routes. Baffinland will continue to support marine bird research (thick-billed murre, common eider) conducted by ECCC in the northern (Cape Graham Moore) and southern shipping routes (Digges Sound, East Bay, and Hudson Strait). PRISM plot surveys are next scheduled for 2023. Baffinland will also continue to support the industry NSERC program to map environmental sensitivities associated with the Project. As no Red Knot were detected in 2019, CWS has thus concluded that ARU monitoring is not necessary for 2020.

## Project Certificate Condition No. 75

Category	Birds - Monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To assess the extent of terrestrial habitat loss.
Term or Condition	The Proponent's monitoring program shall assess and report, on annual basis, the extent of terrestrial habitat loss due to the Project to verify impact predictions and provide updated estimates of the total Project footprint.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be provided within the Annual Report to the NIRB.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association, Nunavut Impact Review Board, Terrestrial Environment Working Group (TEWG)
Reference	Environmental Protection Plan (Baffinland, 2016b) Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

Prior to construction on undisturbed land, the appropriate approvals must be obtained, and construction plans must adhere to the Environment Protection Plan. Baffinland also restricts any overland movement of equipment or personnel which are required to operate to existing site roads and laydowns, to minimize the overall Project footprint; any unauthorized land disturbance or deviation from the PDA is reported as an incident and is investigated.

### RESULTS

Baffinland has limited its construction activities to within the PDA, and the current Project footprint (403 ha in 2019) is smaller than what was assessed in the FEIS (7,618 ha), which assumed the entire PDA would be disturbed.

### TRENDS

To-date, construction activities for the Project have remained within the PDA.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to monitor terrestrial habitat loss due to disturbance and maintain the limits of the Potential and restrict overland movement and traffic to existing roads, pads, and walkways.

#### 4.6.10 Marine Environment (PC Conditions 76 through 98)

Twenty-four (24) PC conditions relate to the potential impacts of the Project on the marine environment, excluding marine mammals (Section 4.6.11). These conditions encompass the development of a comprehensive environmental effects monitoring program and the establishment of the Marine Environment Working Group (MEWG).

##### Stakeholder Feedback

The marine environment has been a key focus of stakeholder interest and concern. This includes marine mammals (discussed in Section 4.6.11) as well as marine biota, the effects of ballast water discharge, and the risk of fuel spills (discussed below). A key community concern in both Pond Inlet and Igloolik during the Environmental review period of the FEIS and FEIS addendum was the potential for the Project to impact the fisheries resources at both Steensby Inlet and Milne Inlet. Key stakeholders focused on the marine environment include local communities, the MHTO, the QIA, and agencies with jurisdictional responsibility for the marine environment: DFO, ECCC, Transport Canada and the Canadian Coast Guard. Baffinland continues to engage these groups through the MEWG and by providing other reporting or Project updates, as necessary. NIRB also held a Marine Monitoring and Marine Mitigation Workshop in Pond Inlet from May 1 to 2, 2019 which provided an opportunity for participants to expand their understanding of the Project. Many elders and community members were able to actively participate in the workshop, and share their experiences and IQ with the NIRB staff and other workshop participants (NIRB 2019a). Numerous topics were discussed including effects from Project-related activities including, though not exhaustively, water quality, dust, shipping impacts to marine mammals (e.g., narwhal, bowhead, seals) and fish, and need for effective monitoring, ballast water and invasive species risk, and general vessel management; these key topics were also reflected during 2019 consultation activities (Appendix B).

##### Monitoring

Marine biota and the physical environment (water and sediment quality) is subject to a marine EEM program, which includes the following components:

- Benthic Habitat - Underwater videography to characterize benthic habitat substrate type/class and detect changes over time.
- Sediment - Sampling sediment for particle size analysis (to detect changes in sediment composition) the presence of hydrocarbons, and iron concentrations as a function of distance from the ore dock.
- Water Quality - Sampling measuring total suspended solids, salinity, temperature, pH, metals, nutrients and hydrocarbon concentrations over time.
- Epibenthic Community - Underwater videography to enumerate benthic epifauna and compare changes over time.
- Fish - Opportunistic sampling of contaminants in fish flesh of both sculpin species and Arctic char, and shellfish species.
- Aquatic Invasive Species (AIS) - Sampling for the presence/absence of aquatic organisms (zooplankton, benthic infauna, benthic infauna, macroflora, encrusting epifauna, fish).
- Ballast Water Monitoring - Monitoring of salinity levels in ballast water to verify exchange of ballast in accordance with Ballast Water Management Regulations.

Table 4.27 provides an evaluation of the Project's impacts on the marine environment, based on monitoring activities completed in 2019, relative to predictions presented in the FEIS and FEIS Addendum.

To the extent that Project impacts on the marine environment can be evaluated, the effects of the Project are within FEIS predictions.

**Table 4.27: Marine Environment Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Water and Sediment Quality	Changes in water and sediment quality due to prop wash, ballast water discharge, and ore dust deposition	The marine EEM program did not detect any meaningful changes in water quality. Metal concentrations in sediment samples collected in 2019 generally correlated with sediment physical composition.	Effect within FEIS predictions
	Changes in water and sediment quality due to sewage effluent discharge	Weekly monitoring of effluent as required by water licence. Monitoring results for discharge to the Marine environment complied with all water licence limits.	Effect within FEIS predictions
	Accidental fuel spill from marine shipping of fuel and other supplies	Inspections and visual monitoring during ship to land fuel transfers and sealift deliveries. No accidents or malfunctions occurred that had the potential for effects.	Effect did not occur
Marine Habitat	Disruption and loss of marine coastal habitat due to dock structure	There is considerable evidence of use of the offsetting area by all trophic levels	Effect within FEIS predictions
Marine Biota	Potential changes to marine biota from the introduction of aquatic invasive species due to shipping (ballast water discharges, etc.)	None of the macroflora, benthic epifauna, or fish taxa observed during the AIS surveys in 2019 were identified to be invasive, with the exception of a benthic infaunal species, <i>Marenzelleria viridis</i> . This species was verified through independent review to be a taxa flagged as potentially invasive. Further review is required to determine if presence in Milne Port is recent and/or whether species is established.	Effect within FEIS predictions

### Path Forward

Baffinland will remain vigilant about the mitigation and monitoring activities that are in place to protect the marine environment. Baffinland will continue to seek input and review monitoring results trends from technical members of the MEWG, in addition to gathering feedback through separate forums such as annual pre-shipping and post-shipping meetings led by Baffinland with representatives of relevant HTOs (e.g., MHTO) and communities (e.g. Pond Inlet). Reporting on each PC condition follows.

## Project Certificate Condition No. 76

Category	Marine Environment - General
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To mitigate potential impacts to the marine environment.
Term or Condition	The Proponent shall develop a comprehensive Environmental Effects Monitoring Program to address concerns and identify potential impacts of the Project on the marine environment.
Relevant Baffinland Commitment	40, 51, 84, 85, 79
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	Marine Biological and Environmental Baseline Surveys Milne Inlet 2014 (SEM, 2015a) Draft 2019 MEEMP and AIS Monitoring Report (Golder, 2020a) 2019 MEWG Meeting Records
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

#### MEEMP:

A Marine Environmental Effects Monitoring Program (MEEMP) was developed in 2015 following completion of marine biological baseline studies at Milne Port during 2010, 2013 and 2014. The MEEMP includes annual monitoring to detect potential Project-related effects on marine water and sediment quality, benthic invertebrates, marine vegetation, and fish and fish habitat. The MEEMP sampling design is based on EEM guidance from Environment Canada (2012) and includes statistical approaches to detecting potential Project-induced impacts on the marine environment. Detailed information on study design and sampling methodology is available in the annual monitoring reports for the MEEMP (SEM, 2016a; 2017a; Golder, 2018a; 2019a, 2020a).

In 2019, Baffinland undertook a sixth consecutive year of environmental effects monitoring (EEM) at Milne Port and in Milne Inlet. Vertical physical profiles measuring conductivity (i.e. salinity), temperature, and depth (CTD) along with turbidity, dissolved oxygen, and chlorophyll-a were conducted at fourteen (14) stations in August and eleven (11) stations in September along a transect between Milne Port and Ragged Island. Additional vertical physical profiles of CTD were conducted in Milne Inlet and near Milne Inlet Port. Physical oceanographic parameters were measured through three (3) subsurface tautline moorings deployed in Milne Inlet, one (1) at Bruce Head and two (2) near Milne Port, and a tide gauge deployed at Milne Port. The subsurface tautline moorings measured depth, current speed and direction, as well as conductivity, salinity and temperature at select depths. Discrete water quality samples were collected during six (6) sampling events at four (4) sampling stations near the effluent discharge point in Milne Port to monitor for potential changes in water quality due to site drainage and operational discharges (including iron ore stockpile run-off). Water samples were analyzed for general chemistry, nutrients, major ions,

total and dissolved metals, coliforms, and hydrocarbons. Sediment samples were collected at forty-four stations (44) along four (4) transects (West, East, Northwest and Northeast) as part of a radial gradient design that allowed for monitoring effects as a function of distance from the ore dock point source, in consideration of potential contaminant issues (e.g., ore dust, hydrocarbon deposition) and/or physical impacts (sediment re-suspension and transportation) in the marine environment. Sediment samples were analyzed for particle size composition, organic content, metals and hydrocarbons. Benthic infauna samples were collected at thirty-two (32) stations along the same four (4) transects, co-located with sediment sample stations, in consideration of the impact of potential contaminants and/or physical impacts on benthic infauna assemblages (i.e. abundance, density). Percent (%) cover of substrate, macroflora and benthic epifauna, as well as species assemblages within ten (10) permanent belt transects were monitored using a remotely operated vehicle (ROV) based underwater video system as part of a Before/After-Control/Impact design. Fish sampling was conducted throughout the Milne Port area using gill net, Fukui trap, fyke net, angling (trolling and jigging) and beach seine sampling methods. Captured fish were enumerated, identified to species and measured for length/weight before being released. Incidental fish mortalities were retained for sexing, aging, stomach content, tissue (body burden), toxicology and condition analyses. The bivalve *Hiatella arctica* was collected from benthic infauna sampling stations for measurements of age and tissue (body burden) analysis.

Several modifications to the MEEMP were introduced in 2019 in consultation with the MEWG during the June 21, 2019 MEWG meeting (Meeting No. 19) when the 2019 monitoring programs were discussed and following review of the 2018 MEEMP results (Golder, 2019a). Modifications to the MEEMP introduced in 2019 included:

- Expansion of the marine water quality monitoring program by adding more vertical CTD profile locations in Eclipse Sound (near Ragged Island) and Milne Inlet (near Milne Port).
- Background review of potential sea level rise in Nunavut to provide context to ongoing continuous monitoring of water levels at Milne Port Ore Dock in the open-water season.
- Background review of hydrology and geomorphology in Phillips Creek Estuary to assess the potential for natural sediment redistribution at the head of Milne Inlet.
- Completed power analysis to evaluate detection power for various MEEMP sampling parameters. Based on results of the power analysis, sampling effort was increased for benthic infauna and marine sediment (from 5 to 15 sampling stations per transect) to improve detection power for these parameters.
- A new transect (Northeast Transect) was added in 2019 that extended offshore from the eastern portion of the existing Ore Dock in a Northeast direction up to a distance of 2,100 m from the dock (corresponding to a water depth of approximately 120 m). Both the Northwest and Northeast transects included a distance and depth gradient for consideration in the EEM analyses, whereas the East, West and Coastal transects only include a distance gradient due to their positioning along the 15 m depth contour.
- Benthic infauna and sediment samples were collected using either a standard Ponar grab or a Van Veen grab (a petite Ponar was used in previous years), increasing the overall sample area and volume of sediment collected per grab. Due to the large volume of sediment yielded per station (composite of three grabs per station), the sample was split in the field (half sample retained for processing and laboratory analyses).
- Sculpin were added as new fish indicator species for tissue/body burden analysis. In previous years, Arctic char were the only fish species collected for tissue/body burden analysis.

- In lieu of collecting length and weight measurements in the field for shellfish indicator species (*H. arctica*) to inform corresponding tissue / body burden analysis, specimens were submitted to laboratory for age analysis in concert with tissue / body burden analysis.
- Ageing of shellfish (*H. arctica*) was undertaken to appropriately interpret changes in growth and metal uptake.
- Modifications to Fukui traps to increase catch rate.
- Addition of fyke nets to fish sampling program to explore using this method as an alternative to Fukui trap sampling which demonstrated low catch rates in previous years.
- Addition of bottom trawls to fish sampling program to target potentially missed species (e.g. Arctic cod).
- Increased jigging and gill net sampling effort to allow for more consistent and repeatable fish sampling.
- Improved ROV-based underwater video surveys by using higher resolution video equipment and improved lighting system.
- For all changes to study design, sampling continued at old sampling locations for minimum of 3 years to facilitate comparison of old and new methods / results.

#### *AIS/NIS Monitoring Program:*

Baffinland's Aquatic Invasive Species (AIS) monitoring program was developed in 2015 as part of the MEEMP to detect Non-Indigenous Species (NIS) potentially introduced to Milne Inlet via ballast water discharges or hull biofouling. AIS /NIS surveys targeted lower trophic levels, including zooplankton, benthic infauna, epifauna and fish. Biophysical surveys were initially conducted in 2014 to enhance baseline data (collected in 2008 and 2013) by supplementing existing species inventory datasets for marine flora and fauna prior to the start of shipping operations at Milne Port. AIS/NIS surveys in 2015 and 2016 (SEM, 2016a, 2016b, 2017a) focused on detection of marine organisms not previously identified in Milne Port as primary indicators of invasion (i.e., early warning of AIS introductions in the Project area). Surveys were based on a Before/After experimental design focusing on areas with the highest likelihood of marine invasion. Since ballast water releases only occur in Milne Port, data collection was focused on the marine areas surrounding the Milne Port infrastructure. In 2017, the AIS/NIS monitoring program was expanded to include sampling sites near Ragged Island to capture potential AIS or NIS at existing anchorage locations in this area. In 2019, AIS/NIS monitoring continued in Milne Port and at Ragged Island and included zooplankton sampling, benthic infauna sampling, video surveys for macroflora and benthic epifauna, video surveys and sampling for fish and mobile epifauna, settlement surveys for encrusting epifauna, and video surveys of ore carrier hulls for detection of biofouling organisms.

Identification of any newly detected taxa (taxa not identified in baseline or previous MEEMP and AIS/NIS surveys in Milne Port) identified during annual AIS/NIS monitoring efforts were thoroughly investigated to determine if the organism was non-indigenous or invasive. All taxa were compared against a global invasive species database (Molnar et al., 2008), the National Exotic Marine and Estuarine Species Information System (NEMESIS; Fofonoff et al., 2020), as well as a known invasive species list within the National Risk Assessment for Introduction of Aquatic Nonindigenous Species to Canada by Ballast Water (Casas-Monroy et al., 2014). In addition, a comprehensive literature review was conducted for each newly identified organism to assess what is known on their home range, distribution, life cycle processes, and habitat preferences. This information was used to determine if the newly identified species was considered non-indigenous to the Arctic region. Any taxa flagged as potential NIS or AIS were sent to Philippe Archambault's Benthic Ecology Lab (Université Laval, Quebec) for independent verification of the taxonomic identification. Results of the independent review are still pending for some flagged



specimens. Monitoring thresholds were implemented to establish protocols for evaluating taxonomic data to determine if mitigation measures need to be implemented. Depending on the species and the relative risk it poses to the native biological community, thresholds may consist of a single occurrence of an invasive species, or evidence that the species has become established in the area through reproduction and/or range expansion. Detailed information on the AIS program study design and sampling methodology is available in the 2019 MEEMP and AIS Monitoring Report (Golder, 2020a).

During Baffinland's in-person meeting with the MEWG in June 2019, the MEWG was provided with a summary of the 2018 AIS/NIS results and detailed information on the proposed 2019 monitoring programs (Golder, 2019a). During this meeting, Baffinland discussed proposed modifications to the AIS/NIS Monitoring Program for implementation in 2019. These program modifications included the following:

- Expanding the scope of the program to include monitoring for all NIS, and not only AIS.
- Use of an independent secondary taxonomic lab for taxonomic verification of potential AIS/NIS.
- Use of a higher resolution high definition (HD) video camera and improved lighting system on the ROV platform to improve taxonomic identification using underwater video methods.
- Deploying the settlement plates in sets so recovery could be staggered to allow for longer soak duration.
- Conducting an additional AIS towed video survey transect east of the new Freight Dock at Milne Port.

## RESULTS

Overall, MEEMP sampling results from 2019 do not suggest degradation or impairment of the marine physical or biological environment (i.e., water and sediment quality, marine fish and benthic communities, fish health) associated with the construction and operation of Milne Port, as detailed below for each MEEMP study component. Monitoring completed to date as part of the MEEMP reflects concordance with the applicable Terms and Conditions of Project Certificate No. 005, including Conditions No. 1, 76, 83, 83(a), 85, 87, 91, 99, 99(b), 113, 114 and 126. Based on MEEMP results collected to date, no additional adaptive management or mitigation measures are warranted at this time.

All relevant water quality parameters analyzed in 2019 (pH, TSS, turbidity, nitrates, arsenic, cadmium, chromium, mercury, silver and naphthalene) were below applicable CCME WQG<sup>1</sup>. Hydrocarbons and Polycyclic Aromatic Hydrocarbons (PAHs) were measured at concentrations less than analytical detection limits in 2019, consistent with results from previous MEEMP sampling years. Fecal coliform bacteria levels measured in 2019 were mostly below detection limits and did not exceed 2 CFU/100 mL. No CCME guidelines are available for iron in water; iron concentrations were within range of concentrations measured in previous years (2015 to 2018).

Collectively, marine water quality monitoring undertaken to date indicates that the construction and operation of Milne Port does not appear to have negatively affected water quality in Milne Inlet, as the reported analytical results for conventional water quality parameters measured in 2019 were generally within range of conditions observed in previous MEEMP and baseline surveys or below the analytical detection limits used in previous monitoring years (2014 to 2018).

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<sup>1</sup> Canadian Council of Ministers of the Environment (CCME) – Canadian Environmental Quality Guidelines (CCME, 2014)

Analysis of the physical and chemical composition of sediments determined that, in general, concentrations of metals, volatile organic compounds, hydrocarbons, and PAH were determined to be less than applicable sediment quality guidelines, with few exceptions.

Minor exceedances of CCME guidelines and BC Interim Sediment Quality Guidelines (ISQG) were noted for arsenic (ISQG: 7.24 mg/kg) at eleven (11) stations sampled along the two Northern Transects, but concentrations did not exceed the CCME Probable Effect Level (PEL) of 41.6 mg/kg in any sample. Arsenic concentrations also exceeded the  $T_{20}^2$  benchmark (7.4 mg/kg; Buchman, 2008) at ten (10) stations and exceeded Effects Range-Low (ERL) of 8.2 mg/kg (Buchman, 2008) at nine (9) stations. Nickel concentrations in 2019 exceeded the  $T_{20}$  benchmark (15 mg/kg) at eight (8) stations located along the Northern Transects. Seven (7) stations from the Northeast Transect also exceeded the NOAA Threshold Effect Level (TEL) of 15.9 mg/kg. CCME sediment quality guidelines are not currently available for nickel; however, measured concentrations were less than the lower (30 mg/kg) and upper (50 mg/kg) British Columbia (BC) Working Sediment Guidelines.

Observed exceedances for arsenic and nickel are not considered to be Project-related, as neither chemical element is associated with ore crushing, handling and hauling at Mary River (Baffinland, 2012) and both were recorded in similar high concentrations during baseline surveys (SEM, 2015a). It is presumed that elevated arsenic and nickel concentrations in these areas are likely naturally occurring. Statistical correlation analysis of spatial trends did not suggest that sediment metal concentrations were accumulating at elevated levels in closer proximity to the Ore Dock relative to other locations sampled within Milne Inlet. Similarly, exceedances were noted for a few organic constituents, but these were rare, small in magnitude (i.e., not considered to be at levels that would represent harm to the aquatic environment), and were not concentrated around the Ore Dock in a way that would suggest a significant point source.

Volatile organic compounds, extractable petroleum hydrocarbons, and PAHs were, with few exceptions, below detection limits in sediment samples. Concentrations of volatile organic compounds benzene and toluene were detected at five (5) and four (4) stations, respectively. Petroleum hydrocarbons were determined to be less than detection limits at all stations. PAHs were detected at five (5) stations. Concentrations of PAHs acenaphthylene and dibenz(a,h)anthracene exceeded CCME and BC ISQGs in one (1) and five (5) stations on the North transect, respectively. No other organic compound exceeded sediment quality guidelines and benchmarks during the 2019 sediment program. Notably, the FCSAP (Federal Contaminated Sites Action Plan) guidance for working harbours (FCSAP, 2018) recommends use of PEL over ISQG for screening primary contaminants of potential concern, as screening with ISQGs is considered overly conservative and does not always correlate well with observed effects under field conditions (FCSAP, 2018). Both sediment organic and inorganic parameters measured in 2019 were less than CCME PEL guidelines in each of the collected sediment samples.

The results of Spearman Rank Correlation analyses and Principal Component Analysis performed on 2019 sediment transect data suggested a strong relationship between metal concentrations and the proportion of fine-grained sediments (i.e., clay and silt sediment fractions), consistent with baseline observations in Milne Inlet (SEM, 2015a) and observations made in previous MEEMPs (2014 to 2018). Comparison of the percentage of fine sediment over time along the transects did not indicate statistically significant changes in fines content between 2014 and 2019.

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<sup>2</sup> Chemical concentrations corresponding to 20% probability of observing toxicity.

Marine sediment guidelines for iron are not currently available and, as such, the sediment data for iron were evaluated spatially and temporally along the transects using general linear modeling. Overall, increased iron content in sediments at concentrations greater than those observed during the 2014 baseline characterization program were rarely observed (i.e., only along the coastal East Transect at distances of 500 m and 1,000 m from the Ore Dock). Similar to the West Transect, iron concentrations year-over-year along the East Transect were determined to be more variable than the northern offshore transects.

Collectively, marine sediment quality monitoring undertaken to date suggests that the construction and operation of Milne Port does not appear to have negatively affected sediment quality in Milne Inlet, as measured concentrations were low and generally consistent with previous years (2014 to 2018).

Measurements of current speed and direction in Milne Inlet indicated flows were weak, primarily wind driven, and oriented along the channel, with a wind mixed upper water column. Other physical properties of the water column indicated seasonal differences in stratification. Phillips Creek and other freshwater inflows form a freshwater lens at the head of Milne Inlet in summer, which weakens in late August. This freshwater inflow is likely an important factor in establishing stratification<sup>3</sup> in Milne Inlet each year, persisting throughout the entire inlet, with the lower bound of the pycnocline (area of greatest temperature and salinity change) approximately 20 m deep. Below the pycnocline, the temperature was uniformly cold and water saline. Following the establishment of stratification, oscillations in temperature and salinity measurements at mid-water column near Milne Port suggest that winds play a large role in surface mixing. Observations indicated that the upper water column of Milne Inlet undergoes an annual mixing event in the late fall and that the lower salinity water measured near the surface in August becomes homogeneously mixed, resulting in a loss of stratification and a deepening of the pycnocline.

Chlorophyll-a concentrations were generally in the lower range for the Arctic Ocean (Ardyna et al., 2013), ranging from 0 to 0.9 mg/m<sup>3</sup>, showing evidence of primary productivity with little risk of eutrophication. Measured dissolved oxygen concentrations ranged from 6.6 mg/L to 12.2 mg/L, corresponding to saturations ranging from 57% to 104%, indicating that oxygen was generally available within ranges that support ecological productivity. Water in Milne Inlet was fairly clear throughout the water column, with elevated levels of turbidity at the surface (0.3 NTU to 1.2 NTU), likely due to freshwater input and surface run-off.

An analysis of multi-year tide gauge data indicated no discernible trend (positive or negative) in sea level rise in the three-year water level dataset for Milne Port Ore Dock tide gauge. Literature review of land uplift/subsidence rates in Nunavut indicates that the Milne Port area will undergo land uplift (glacial rebound) in the next 100 years, effectively lowering the sea levels by approximately 64 to 74 cm by 2100.

Benthic infauna sampling was introduced to the MEEMP in 2018 and therefore 2019 represents only the second year of sampling. Similar to 2018, the 2019 benthic communities were dominated by polychaetes, with percent relative abundance values ranging between 17% and 88%. Other dominant taxa included crustaceans of the Class Malacostraca (1% to 58%), bivalves (1% to 23%), and seed shrimp (ostracods) (0% to 21%).

Benthic invertebrate density and richness were typically greater along the 15 m contour transects (East and West Transects) relative to the results observed along the northern offshore transects (Northeast and Northwest). The

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<sup>3</sup> Stratification refers to the division of the water column into layers with different densities caused by differences in temperature or salinity, or both. Stratification is important because it inhibits vertical transfer of dissolved chemicals and particulates between layers and thus affects how, for example, nutrients are distributed between surface and bottom waters.

results of the linear regression analyses did not suggest that benthic invertebrate densities were lower closer to the Ore Dock, as densities were determined to either decrease with greater distance away from the Ore Dock (northern transects), or relationships were not determined to be significant (East and West Transects). Furthermore, statistically significant temporal changes in benthic invertebrate densities were not observed between the 2018 and 2019 sampling programs along the East, West or Northwest Transects.

Species richness along the coastal East Transect was determined to be significantly lower between 200 m and 300 m from the Ore Dock relative to other stations sampled along the Transect. However, this statistically significant effect appeared to have minor ecological relevance because richness was greater at these stations in 2019 relative to the 2018 results. Additionally, effects were not observed at these stations in other community indices assessed, suggesting that the pattern is unlikely to represent a meaningful ecological alteration related to Port activities.

Collectively, the results of the benthic infauna survey in 2019 did not indicate impairment of benthic communities related to the construction and operation of Milne Port.

2019 represented the second consecutive year belt transects were surveyed using an ROV-based underwater video system to monitor for potential Project effects on epibenthic communities (macroflora and epifauna). Only four (4) of the ten (10) belt transects installed in 2018 remained intact at the start of the 2019 MEEMP program, with the remainder presumably dragged out to sea or damaged by sea ice (i.e. bottom scour) during the spring break-out period. Results presented here are therefore based on a qualitative assessment of the four (4) remaining belt plots (as no density or abundance estimates were possible). Similar species were identified in the belt transects in both sampling years (2018 and 2019). More green algae (Chlorophyta) was observed in 2019 compared to 2018, but there were fewer recorded *Laminaria* sp. Clams were the dominant taxonomic group among all stations analyzed for relative abundance, while brittle stars (Ophiuridae) and unclassified bivalves (*Bivalvia* indet.) were present at every station. Observed differences between survey years are considered minor and are likely due to natural variability or within the range of error due to survey methodology. Qualitative observations provided no evidence of spatial or temporal trends that might be associated with the construction and operation of Milne Port.

Fish captures in 2019 (n=279), as in 2018, were higher relative to previous years which was attributed to the increased length of the sampling program, and thus higher effort. Relative taxonomic composition of fish captures did not materially change from previous sampling years, with Arctic char (*Salvelinus alpinus*), fourhorn sculpin (*Myoxocephalus quadricornis*) and shorthorn sculpin (*Myoxocephalus scorpius*) comprising over 99% of the total catch. Two other species were caught, a single sandlance (*Ammodytes* sp.) and a single ninespine stickleback (*Pungitius pungitius*), the latter representing the first occurrence of this species during MEEMP fish surveys.

A total of thirteen (13) fish taxa were captured or observed throughout all MEEMP and AIS surveys in 2019; eight (8) of these taxa were only observed incidentally during surveys of other components, indicating that dedicated fish survey methods are not fully characterizing the fish populations in Milne Port and highlighting the importance of employing a range of sampling techniques to fully characterize the species and age groups of fish in Milne Port.

Fyke nets were introduced in 2019 as a possible alternative passive fishing method to Fukui traps to address the low captures consistently observed in that method. Fyke nets captured a total of twelve (12) fish, representing three (3) species, including an Arctic char – representing the first time in MEEMP surveys this species was caught outside of gill net efforts. Catch Per Unit Effort (CPUE) for fyke nets was higher than Fukui traps, indicating this method may be a suitable replacement.

The length-weight relationship of captured fish were compared between 2017, 2018 and 2019 for Arctic char, fourhorn sculpin and shorthorn sculpin. No statistically significant differences were identified between any of the sample years. Fish of a certain size class were within a consistent weight class in each survey year, indicating there has been no observed change in fish condition over this time period.

A total of 47 incidental Arctic char and 35 sculpin mortalities were retained for sex, age, stomach content and body burden analysis. Ages of Arctic char incidental mortalities ranged from 4 to 19 years, with a mean of 12 years, comparable with ages in 2018, and with previous survey years. Due to degradation and damage to some fish during transportation, sex was not determinable for all fish, therefore a summary of characteristics based on age was not reflective of the full sample set. Mean age in fish identifiable as female (n=7) was 13.6 compared to 11.9 in males (n=10). A higher average age in females was also observed in 2018. No relationship between body length and age was observed, indicating body size is not a good predictor for Arctic char age in the Milne Port area, consistent with observations in 2018. The shellfish *H. arctica* was collected as a supplement to fish tissue collection for body burden. Shellfish ranged in age from 7 years to 69 years with an average age of 28.1 years – this is consistent with the documented age range published in the literature (Sejr et al., 2002).

Due to degradation and damage to some fish during transportation, sex was not determinable for all sculpin incidental mortalities, therefore summary of characteristics based on age are not reflective of the full sample set. Of the identifiable sculpin, 19 were female and 6 were male. Mean ages in fish identifiable as female was 6.5 compared to 6.2 in males. Sculpin incidental mortalities were not retained for analysis in previous years.

The similarities in observed species and relative abundance across years suggests the construction and operation of Milne Port has not triggered detectable changes in local fish communities to date; further, similarities in the weight to length relationships across years indicate that site operations have not compromised fish condition.

Concentrations of metals in Arctic char tissue analyzed for body burden in 2019 were consistent with those reported in previous years (2010 to 2018). Statistically significant elevations in tissue concentrations of some metals were noted for the clam *H. arctica* and, to a lesser extent, Arctic char, in 2019 relative to concentrations in 2018. However, relatively large variance in metal concentrations have been observed in Arctic char tissues since baseline years, and samples in 2019 were generally within range of measured values reported since 2010 and concentrations of copper and iron have shown a slight downward trend since 2010. Observed increases in metal concentrations in Arctic char tissues are not considered Project-related because the metals that were shown to be elevated are not materially associated with iron ore. As such, reported changes more likely reflect natural geologic sources or atmospheric deposition from further afield.

No samples exceeded the Health Canada guideline (0.5 mg/kg) for mercury in fish tissue for human consumption. Metals concentrations were consistently and notably greater in *H. arctica* relative to both fish species, occasionally by orders of magnitude. This is attributable to between species differences in habitat preferences, feeding modalities, and ability to metabolize/excrete pollutants. There is no indication that these concentrations of metals are affecting fish health.

In 2019, a total of forty-three (43) zooplankton species were identified during AIS/NIS sampling Milne Port and Ragged Island. Three (3) of these taxa were not recorded during baseline studies or during previous AIS monitoring campaigns. None of the newly observed zooplankton taxa in 2019 were listed in the identified invasive or non-indigenous species databases.

A total of 319 benthic invertebrate taxa were identified during AIS sampling in 2019 at Milne Port and Ragged Island. Forty-one (41) of these taxa were not recorded during baseline studies or during previous AIS monitoring campaigns. An analysis of the available literature and species databases indicated that most of the newly identified taxa had known ranges that include Arctic waters or had unknown northern limits with ranges reaching into the north Atlantic and Norwegian Sea. These taxa presumably could have ranges that extend to Arctic waters.

The AIS/NIS program is conducted at a surveillance level and designed to flag potential invasive or non-indigenous species. The following five examples serve as evidence that this program is functioning as intended:

- New taxa observations included a spionid polychaete identified as *Marenzelleria viridis*, confirmed via independent verification. This species is listed in the Global Database and the National Risk Assessment as a species of concern for Canadian and Arctic waters, with a primary invasion vector through ballast water (Molnar et al., 2008; Casas-Monroy et al., 2014). However, specimen collection records for *M. viridis*, and under the superseded name *Scolecoplepides viridis* indicate historical occurrences outside the documented natural range in the North Atlantic and Arctic Oceans, including the Canadian Arctic and Baffin Island (Cusson, 2018; GBIF, 2020; Miller et al., 2014). Further review of collection records around Baffin Island is needed to determine if this species is a recent invader in Milne Port.
- A sabellid polychaete worm was tentatively identified as *Pseudofabricia* sp. nr. *aberrans*. This taxon was also identified in 2018 and sent for independent review due to the defined range for this species being limited to the Mediterranean Sea (Giangrande and Cantone, 1990; WoRMS, 2020). *P. aberrans* is not considered an invasive species or a species of concern in Canadian or Arctic waters (Molnar et al., 2008; Casas-Monroy et al., 2014). A tentative alternative identification of *Manayunkia aesturiana* was assigned in 2018 (Golder, 2019a), although the identification was uncertain. Specimens from 2019 samples were again sent to Université Laval for independent verification. Université Laval identified the specimens as *Fabricia sabella*, an unaccepted name for *Fabricia stellaris*. Neither *F. sabella* nor *F. stellaris* have been identified in previous surveys at Milne Port, but both have documented distributions that include the Canadian Arctic, with specimen collections made at Baffin Island. This taxon was not considered invasive; though further review is required to determine NIS status.
- A terebellid polychaete worm was identified in 2019 samples that was similar to the description for *Sosane wireni*, a species with a taxonomic description limited to New England. Samples were classified as *Sosane* sp. nr. *wireni*, and are currently pending independent verification. *S. wireni* is not considered an invasive species or a species of concern in Canadian or Arctic waters (Molnar et al., 2008; Casas-Monroy et al., 2014) and specimen collection records exist for this species, and under the superseded name *Sosanopsis wireni*, in Scandinavian waters, Western Greenland and the Laptev Sea. This taxon was not considered AIS in Arctic waters, but further review is required to determine nonindigenous status.
- An unknown species of gammarid amphipod was identified from the *Monocorophium* genus in 2019 benthic infauna samples. No species within this genus have known distributions that include Arctic waters, and three species within this genus (*M. insidiosum*, *M. acherusicum* and *M. sextonae*) are considered invasive (Molnar et al., 2008). These specimens are currently pending independent verification. Independent verification of the genus, and resolving the identification to species level, are required to make a determination of NIS or AIS status.
- A bryozoan was identified as an indeterminate species from the genus *Oncousoecia*. There are no recent specimen collections in Arctic waters and species within this genus with described ranges that include Arctic



waters are limited to the European Arctic, the Barents Sea and Svalbard (WoRMS, 2020). No species within the genus *Oncousoecia* are listed on any of the available databases on invasive species or species of concern. These specimens are pending for independent verification. Independent verification of the genus and resolving of the identification to species level is required to make a determination of NIS or AIS status.

The macroflora and benthic epifauna component involved data collection via underwater video surveys along the length of each of the four previously established AIS/NIS transects, plus an additional transect established in 2019 to the east of the newly constructed Freight Dock. The addition of high definition (HD) video footage in 2019 helped facilitate the identification of two (2) new taxa of epifaunal invertebrates that had not been previously recorded during AIS underwater video surveys, but were not considered NIS or AIS. A total of six (6) distinct macroflora taxa were observed, all of which have been recorded in previous surveys.

In settlement basket surveys, a total of 2,317 encrusting epifauna from twenty-two (22) unique taxa were identified in 2019, the majority of which were bryozoans of the Order Cyclostomatida. Three (3) new encrusting epifauna taxa were identified during the 2019 AIS/NIS surveys, two identifiable to the species level - *Circeis armoricana*, a sabellid worm, and *Patinella verrucaria*, a colonial bryozoan - and one identifiable to the Cnidarian genus *Gonothyraea*. None of the newly observed encrusting epifauna taxa were identified as invasive species, with literature review confirming known Arctic distributions for each.

Thirteen (13) fish species were observed in 2019 across all MEEMP and AIS survey components. One new taxa was added to the AIS/NIS survey taxonomic record from ROV surveys, an unidentified eelpout (Zoarcidae indet.), although at least one genus in this Family has been recorded in previous MEEMP surveys. Additionally, a ninespine stickleback was captured during fish surveys as part of the MEEMP program. All fish taxa captured or observed in 2019 had known representative species with ranges that included the Canadian Arctic and none were considered NIS or AIS.

Underwater video surveys of five ore carriers indicated that the ship hulls were mostly free of biofouling (i.e., growth). Exceptions to this included limited areas of the stern on four of the five ships surveyed, where some colonization by aquatic organisms (predominantly barnacles) was observed. The taxonomic resolution of biofouling organisms did not adequately improve in 2019 (second consecutive year of hull monitoring) despite the inclusion of a higher resolution video camera and improved lighting system. Observed taxa were not able to be resolved to species-level using ROV video methods and physical sample collection was not logistically feasible.

## TRENDS

In general, the MEEMP study design and data collection methodology followed the same approach utilized in previous years, in addition to modifications made in 2019 as a result of discussions with the MEWG, to provide technical continuity and repeatability of the program and to allow for inter-annual comparisons of the multi-year dataset.

To date, construction and operation of Milne Port does not appear to have negatively affected water quality, physical oceanography, sediment quality, benthic infaunal communities, substrate, macroflora, benthic epifauna, and fish communities and health.

Five years of AIS monitoring has yielded a relatively large dataset of marine organisms residing in Milne Port and Milne Inlet. Further investigations into the status of several new species identified during the AIS program are in

progress in consultation with DFO and other external experts, with representative specimens sent to a second laboratory for confirmatory taxonomic analysis.

#### **RECOMMENDATIONS / LESSONS LEARNED**

Overall, MEEMP sampling results from 2019 do not suggest degradation or impairment of the marine physical or biological environment (i.e., water and sediment quality, marine fish and benthic communities, fish health) associated with the construction and operation of Milne Port, as detailed below for each MEEMP study component. Monitoring completed to date as part of the MEEMP reflects concordance with this Condition (No.76) of Project Certificate No. 005, in addition to the other following relevant Conditions: No. 1, 83, 83(a), 85, 87, 91, 99, 99(b), 113, 114 and 126. Based on MEEMP results collected to date, no additional adaptive management or mitigation measures are recommended at this time.

The MEEMP study design, data collection methodology and results are reviewed yearly with the MEWG. Recommendations from the MEWG assist in refinements to the program, enhancement of existing mitigation measures, and development of adaptive management measures (when and where applicable).

AIS and MEEMP results will continue to be presented to the MEWG on an annual basis, and recommended adjustments to the programs will be considered by Baffinland and implemented as deemed necessary and relevant for detecting potential Project-related impacts.



## Project Certificate Condition No. 77

Category	Marine Environment - Working Group
Responsible Parties	The Proponent, Environment Canada, Fisheries and Oceans Canada, the Government of Nunavut, the Qikiqtani Inuit Association and interested parties
Project Phase(s)	All Phases
Objective	The MEWG will consult with, and provide advice and recommendations to the Proponent in connection with mitigation measures for the protection of the marine environment, monitoring of effects on the marine environment and the consideration of adaptive management plans. The role of the MEWG is not intended to either duplicate or to affect the exercise of regulatory authority by appropriate government agencies and departments.
Term or Condition	A Marine Environment Working Group (MEWG) shall be established to serve as an advisory group in connection with mitigation measures for the protection of the marine environment, and in connection with the Project Environmental Effects Monitoring program, as it pertains to the marine environment. Membership on the MEWG will include the Proponent, Environment Canada, Fisheries and Oceans Canada, Parks Canada, the Government of Nunavut, the Qikiqtani Inuit Association, the Mittimatalik Hunters and Trappers Organization, and other agencies or interested parties as determined to be appropriate by these key members. Makivik Corporation shall also be entitled to membership on the MEWG at its election. The MEWG members may consider the draft terms of reference for the MEWG filed in the Final Hearing, but they are not bound by them.
Relevant Baffinland Commitment	46, 49, 51
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	2019 MEWG Meeting Records Marine Environmental Effects Monitoring Plan (Baffinland 2016d)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C

### METHODS

Baffinland established a MEWG in 2013. Members include representatives from: Environment and Climate Change Canada, Department of Fisheries and Oceans Canada, Qikiqtani Inuit Association, Government of Nunavut, Parks Canada, Makivik and Baffinland, with technical experts as required. The Mittimatalik Hunters and Trappers Organization joined the group in 2016. The World Wildlife Fund-Canada and Oceans North also participate as observers.

The meetings are structured to enable participants to have the opportunity to provide input on monitoring program implementation and follow-up at the conclusion of the field programs prior to finalization of reports. The group receives presentations on the implementation of field programs and the subsequent results in order to prioritize monitoring plans and suggest measures for mitigation where required. The groups are also established to provide a

platform for the discussion of collaborative research opportunities between parties and to identify monitoring programs suited for community based monitoring and Inuit participation.

The group typically schedules two (2) yearly in-person meetings, in addition to hosting two (2) interim teleconferences per year.

Draft technical annual reports and other documentation are provided to the group in advance of meetings to the extent possible and on an ongoing basis to allow for review, comment and advice to be provided by all members. Baffinland and their technical experts take into consideration comments received by the working group in the finalization of documents and planning of subsequent year monitoring programs. A number of 2019 program reports will be distributed to the MEWG in 2020. The Draft 2019 Ship-based Observer Monitoring Report (Golder, 2020f) was distributed to the MEWG for review and comment on April 1, 2020, five weeks following the 25 February 2020 in-person MEWG meeting (No. 21) where the 2019 program reports were discussed. A review period of 30 days was provided for comment.

## **RESULTS**

In 2019, the MEWG met during one in-person meeting in Iqaluit (21 June; Meeting 19) and over two teleconferences (23 April and 7 October; Meetings 18 and 20, respectively). The MEWG provides a valuable forum for ongoing Project communication and reporting between Baffinland and other interested parties. The MEWG also serves as an advisory group to provide recommendations on appropriate management approaches related to the Project.

The MEWG has guided the development of the Marine Environment Effects Monitoring Program (MEEMP; Baffinland 2016d) and also reviews and provides comments on other draft marine environment monitoring reports. The program is reviewed annually and adjustments are made to the monitoring program as needed following guidance from the group.

The MEWG reviews the various annual marine monitoring reports and provides comments to Baffinland for consideration in the final version. Baffinland reviews all comments received on draft reports, makes effort to provide meaningful responses to each comment, and in so doing, takes into consideration the suggestions for improvement of the report and advice provided by MEWG. This mechanism allows MEWG members to provide constructive feedback on annual reporting efforts. For 2019 and future final drafts of the Marine Environment Annual Monitoring Report, Baffinland will include an appended table summarizing all comments/suggestions provided by MEWG members during their review, and any accompanying responses, as requested at the June 2019 MEWG meeting.

## **TRENDS**

Baffinland, through collaboration with the various members of the MEWG, has successfully incorporated valued input into the development of numerous and diverse Baffinland annual marine monitoring programs, with adjustments being considered on an annual basis and implemented as deemed relevant and necessary to the objectives of Project Certificate No. 005 terms and conditions.

## **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to work with the MEWG to review and guide marine monitoring programs for the Project on an annual basis and develop mitigation measures or adaptive management action plans when deemed necessary based on review of any emerging trends requiring further investigation.

Baffinland, with support from the QIA and other members of the MEWG has put a strong emphasis on continuing existing programs and developing more diverse community-based monitoring programs.

## Project Certificate Condition No. 78

Category	Marine Environment - Ice Breaking and Shipping
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To obtain accurate and current ice information.
Term or Condition	The Proponent shall update the baseline information for land fast ice using a long-term dataset (28 years), and with information on inter-annual variation. The analysis for pack and landfast ice shall be updated annually using annual sea ice data (floe size, cover, concentration) and synthesized and reported in the most appropriate management plan.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	Ice Conditions and Ship Access to the Milne Inlet Port Site – Mary River Iron Ore Project - Final Report. Amended in 2015. (ENFOTEC, 2015). Ice Conditions and ship access to the Milne Inlet port site – Update (ENFOTEC, 2016), included in Technical Supporting Document (TSD) No. 16. – Ice Conditions Report
Ref. Document Link	N/A

### METHODS

A 2011 ice conditions study by ENFOTEC Technical Services Inc. (ENFOTEC) was included in Appendix 3G of the FEIS. This ice study report is updated periodically to incorporate new information on ice conditions along the Northern Shipping Route and ship access to Milne Inlet / Milne Port with a focus on planning for shipping by tracking dates of ice break-up and re-freeze. Updated ice conditions studies were prepared for the ERP in 2015 (ENFOTEC, 2015) and for the Phase 2 proposal (ENFOTEC, 2016).

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

The ice condition report for the Northern Shipping Route (Milne Port) will be updated periodically as new data becomes available. The ice condition study for the Southern Shipping Route (Steensby Inlet) will be updated prior to the construction and operation of the Steensby Port.

## Project Certificate Condition No. 79

Category	Marine Environment - Ice Breaking and Shipping
Responsible Parties	The Proponent, Canadian Hydrographic Services
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To assist in the development of nautical charts for Canadian waters.
Term or Condition	The Proponent shall provide the Canadian Hydrographic Services with bathymetric data and other relevant information collected in support of Project shipping where possible, to assist in the development of nautical charts for Canadian waters.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Canadian Hydrographic Service (CHS)
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland entered into a collaborative cost-sharing agreement with Canadian Hydrographic Service (CHS) for their nautical charting program. The CHS also collected additional detailed bathymetry around the Existing Ore Dock in 2016. No additional data has been collected since that time, as there have been no substantial deviations in the Northern Shipping Route.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 80

Category	Marine Environment - Ice Breaking and Shipping
Responsible Parties	The Proponent, Canadian Hydrographic Services
Project Phase(s)	Construction
Objective	To identify areas of risk along the shipping route.
Term or Condition	Prior to commercial shipping of iron ore, the Proponent shall conduct a detailed risk assessment for Project-related shipping accidents, noting areas along the ship tracks where vessels may be particularly vulnerable to environmental conditions such as sea ice, and any seasonal differences in risk. This assessment shall inform mitigation and adaptive management plans.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	Emergency Response Plan (ERP; Baffinland, 2018c) Oil Pollution Emergency Plan – Milne Inlet (OPEP; Baffinland, 2020m) Oil Pollution Prevention Plan – Milne Inlet (OPPP; Baffinland, 2020n) Shipping and Marine Wildlife Management Plan (Baffinland, 2016e) Spill at Sea Response Plan (SSRP; Baffinland, 2015b) Spill Contingency Plan (Baffinland, 2018d) Diesel Environmental Emergency (E2) Plan - Milne Port (Baffinland, 2020o)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Accidents and malfunctions were assessed for the ERP Phase of the Project, and a risk register for the Project was developed to identify potential risks, the likelihood of the accidental event occurring, the level of consequence associated with each accidental event, and applicable emergency response plans (Baffinland, 2013a). The risk register is an integral part of Baffinland's Environmental Management System, and various potential risks including Project-related shipping accidents are addressed in several management plans, including:

- Emergency Response Plan;
- Oil Pollution Emergency Plan (OPEP) - Milne Inlet;
- Oil Pollution Prevention Plan (OPPP);
- Shipping and Marine Wildlife Management Plan (SMWMP);
- Spill at Sea Response Plan (SSRP);
- Spill Contingency Plan; and
- Diesel Environmental Emergency (E2) Plan – Milne Port

In 2019, training of Baffinland staff on its OPEP was conducted by spill response consultant Navenco Marine between July 12 to 21, 2019. The training included both classroom and hands-on spill response techniques, with a mock exercise for potential port oil spills during ship-to-shore transfer. The training also included an audit inspection to confirm that Baffinland's spill response equipment and training requirements were in compliance with the OPEP and

Transport Canada regulations for Baffinland's Class 2 Oil Handling Facility. General land-based spill response training is periodically reviewed with the Mine Rescue Team; however, this does not apply to the OPEP. Baffinland also maintains a contract with Oil Spill Response Ltd. (OSRL) for emergency response in the event of a marine spill.

## **RESULTS**

OPEP training occurred in 2019. A mock spill exercise was performed to ensure spill readiness. Baffinland has invited communities of the North Baffin Region to participate and observe training. Required equipment for a Class 2 Oil Handling Facility was met. No spills occurred during fuel transfers in 2019.

## **TRENDS**

Baffinland is committed to conducting regular and annual spill response exercises and training in known and effective techniques for responding to spills and any other Project-related shipping accidents.

## **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to conduct routine training exercises and strategically procure resources and equipment to respond to any Project-related shipping accidents in the unlikely event that these occur.

Management plans, including the Spill at Sea Response Plan (Baffinland, 2015b) and the Emergency Response Plan (Baffinland, 2018c) are being updated as part of the Phase 2 EIS regulatory process to incorporate the updated fuel spill dispersion modelling that was completed in support of Phase 2 Proposal. Versions of the management plans that are currently operational will remain in effect until anticipated approval of the Phase 2 Proposal is received.

## Project Certificate Condition No. 81

Category	Marine Environment - Shoreline Effects and Sediment Redistribution
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To mitigate potential shoreline effects from shipping.
Term or Condition	The Proponent shall reassess the potential for ship wake impacts to cause coastal change following any further changes to the proposed shipping routes.
Relevant Baffinland Commitment	84
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	Mary River Project - FEIS (Baffinland, 2012) Mary River Project - Addendum to the FEIS. June 2013 (Baffinland, 2013a) TSD #17 - Marine Environment Effects Assessment. Mary River Project – Phase 2 Proposal. 10 August 2018. (Golder, 2018b) TDS #22 - Ship Wake and Propeller Wash Assessment. Mary River Project – Phase 2 Proposal. 21 June 2018. (Golder, 2018c)
Ref. Document Link	<a href="https://www.nirb.ca/project/123910">https://www.nirb.ca/project/123910</a>

### METHODS

Baffinland is in-compliance with the condition, as there have been no significant changes in 2019 to the proposed shipping routes assessed for ship wake effects in the FEIS. Ship wake effects on shorelines were assessed in the FEIS (Baffinland, 2012), the FEIS Addendum for the Early Revenue Phase (Baffinland, 2013a). Additional work to assess ship wake effects on shorelines was completed for the FEIS Addendum for the Phase 2 Proposal (Golder, 2018b; Golder, 2018c). These assessments concluded that ship wakes would result in negligible effects on the physical shoreline along the Northern Shipping Route in comparison to wind-generated waves (i.e., wave energy from wind-generated waves were estimated to exceed ship-generated wave energy during both average and peak wind conditions, and therefore ship wake impacts would be non-measurable relative to existing conditions).

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Should changes to the current shipping routes be proposed, Baffinland will undertake the required assessment.



## Project Certificate Condition No. 82

Category	Marine Environment - Shoreline Effects and Sediment Redistribution
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To mitigate potential shoreline effects from shipping.
Term or Condition	The Proponent is strongly encouraged to have its ore carriers subjected to sea trials to measure wake characteristics at various vessel speeds and distances from the vessel.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	Mary River Project – FEIS. February 2012 (Baffinland, 2012)
Ref. Document Link	<a href="https://www.nirb.ca/project/123910">https://www.nirb.ca/project/123910</a>

### METHODS

Baffinland understands that the intent of this condition was to address concerns related to potential erosional effects of ship wakes from purpose-built Baffinland ore carriers on shorelines along the Southern Shipping Route. In this case, the same carriers would be conducting repeated voyages and wake effects could be compared to modeling predictions made in the FEIS (Baffinland, 2012). During the Early Revenue Phase (ERP) of the Project, ore is shipped via the Northern Shipping Route out of Milne Port using commercially contracted ore carriers. Sea trials to measure wake characteristics of the commercial vessels were not conducted for the ERP because there is less concern related to the wake effects along the Northern Shipping Route.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will review the requirement for wake characteristics if and/or when ore carriers are commissioned for the Southern Shipping Route.

## Project Certificate Condition No. 83

Category	Marine Environment - Shoreline Effects and Sediment Redistribution
Responsible Parties	The Proponent
Project Phase(s)	All phases
Objective	To provide data on tide levels and storm surges.
Term or Condition	The Proponent shall install tidal gauges at Steensby and Milne Port to monitor sea levels and storm surges.
Relevant Baffinland Commitment	N/A
Reporting Requirement	The Proponent shall summarize and supply these monitoring results to NIRB in the annual Project report.
Status	In-Compliance for Milne Port Not Applicable for Steensby Port
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	Oceanographic Data Processing – Baffinland Ballast Water Study, Milne Inlet 2014-15 (ASL, 2015) Technical Memo – Tide Gauge Collection at Milne Port During 2017 Open-water Season (Golder, 2018d) 2018 Marine Environmental Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Monitoring Program Report (Golder, 2019a) Draft 2019 Marine Environmental Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Monitoring Program (Golder, 2020a)
Ref. Document Link	N/A

### METHODS

#### *Milne Port:*

In order to monitor the relative sea levels and storm surges at Milne Port, tide data was collected using a tidal gauge installed at Milne Port in 2014 (ASL, 2015). Tide data retrieved at that time was used to support oceanography and ballast water dispersion modelling for the Project. Following completion of the modelling exercise, the gauge was removed and was not installed at Milne Port in 2015 or 2016. As such, no tidal data were collected or are available from Milne Port for the 2015 or 2016 reporting periods. Baffinland re-installed a tide gauge system at Milne Port and resumed tidal monitoring on-site during the 2017, 2018, and 2019 open-water season. The purpose of the tide gauge was to extend the tidal data set (starting in 2014) and provide insight to relative sea level and storm surges at the project site. Additionally, in 2019, multi-year data from the Milne Port tide gauge, in combination with a literature review of sea level rise and land uplift/subsidence rate in Nunavut, was conducted to assess the potential for sea level rise near Milne Port.

Tide monitoring instrumentation was installed at Milne Port from June 23 to October 30, 2019, and consisted of an RBRconcerto CTD (RBR) sensor programmed to continuously measure pressure, temperature, and conductivity. The instrument was mounted on a steel ladder located on the west end of the existing ore dock. The ladder provided a consistent mounting point (i.e. repeatable position and elevation from year to year) that can be installed as part of standard port operations. A steel plate at the top of the ladder was surveyed with a Real Time Kinematic Global

Positioning System (RTK GPS) survey instrument. The elevation and position of the top plate of the ladder was surveyed using five survey points and the average elevation of the five points has been used to reference the position of the tide gauge to the Canadian Geodetic Vertical Datum (CGVD).

*Steensby Port:*

Not applicable in 2019. No tidal gauge systems were installed at Steensby Port in 2019, as that component of the Project is currently inactive.

## RESULTS

*Milne Port:*

The tide gauge system was re-deployed at Milne Port from June 23 to October 30, 2019 and the relative tide gauge position was surveyed at five points on the ore dock ladder top plate with an RTK GPS (Golder, 2020a). A continuous time-series of water level, temperature, and conductivity data was collected and is provided in the draft 2019 MEEMP and AIS Monitoring Program Report (Golder, 2020a). Water level data recorded at Milne Port indicated typical fluctuations resulting from tidal forcing. During the measurement period, a total of seven neap-spring tidal cycles were observed, indicating that the current approach for monitoring relative sea levels and storm surges is effective.

*Steensby Port:*

Not applicable in 2019. No activities took place at Steensby Port during 2019.

## TRENDS

Based on the multi-year tide gauge dataset there has been no observable sea level rise at Milne Port (between 2017 and 2019). Additionally, in Nunavut it is expected that land uplift is occurring and will result in effectively a lowering of sea levels in Nunavut and near Milne Port between 64 cm and 74 cm by 2100.

## RECOMMENDATIONS / LESSONS LEARNED

*Milne Port:*

A tide gauge monitoring plan was developed in 2018 and 2019 (Golder, 2018d; Golder, 2019a) and provides guidelines for annual management and maintenance of the tide gauge station such that a long-term record of water levels at Milne Port during the open-water season can be developed. Given that three recent years of data have been collected (i.e., 2017 to 2019) and that there has been no recently observable sea level rise at Milne Port, tide gauge monitoring is not considered necessary for 2020. Baffinland will re-evaluate the frequency for gauge installation in future years at Milne Port as deemed necessary to build upon a multi-year dataset supporting future trends analyses.

*Steensby Port:*

The measurement of sea level and storm surges at Steensby Port will be re-evaluated when activities are renewed at Steensby Port.

### Project Certificate Condition No. 83 (a)

Category	Marine Environment - Shoreline Effects and Sediment Redistribution
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations
Objective	To identify potential for and conduct monitoring to identify effects of sediment redistribution associated with construction and operation of the Milne Port.
Term or Condition	The Proponent shall conduct hydrodynamic modelling in the Milne Inlet Port area to determine the potential impacts arising from disturbance to sediments including re-suspension and subsequent transport and deposition of sediment. The modelling results shall be used to update the marine water and sediment quality monitoring and mitigation program to include activities associated with the construction and operation of the Milne Inlet Port. The monitoring program shall include an ongoing assessment of the potential introduction of metals that bio-accumulate in the marine food chain.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	Final Environmental Impact Statement (FEIS; Baffinland, 2012) Addendum to the FEIS (Baffinland, 2013a) TDS #20 - Hydrodynamic Modelling Report - Milne Port (Golder, 2018e) Draft 2019 Marine Environmental Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Monitoring Program (Golder, 2020a)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

In the FEIS (Baffinland, 2012) and the FEIS Addendum for the ERP (Baffinland, 2013a), it was predicted that installation of the ore dock will have minimal effect on local sediment transport and that Project operations were not likely to result in significant adverse effects on water or sediment quality. These impact predictions were used to inform the MEEMP sampling design (2014 through to 2019) including the selection of sample locations and analytical parameters. In order to meet the overall objective of assessing and monitoring for potential sediment redistribution associated with Milne Port-related activities, in addition to assessing the potential introduction of metals, Baffinland has implemented the following study components:

#### *Hydrodynamic Modelling:*

In 2018, Golder was contracted to perform hydrodynamic and sediment transport modelling at the head of Milne Inlet near Milne Port in support of the Phase 2 Proposal. The Hydrodynamic Modelling Report for Phase 2 operations is included as a Technical Support Document (TSD 20; Golder, 2018e) in Baffinland's FEIS Addendum for the Phase 2 Proposal (Baffinland, 2018e). A qualitative three-dimensional hydrodynamic and sediment transport model was developed in the Delft3D-4 suite to assess the sediment transport near Milne Port. The qualitative model consisted of a regional domain and a local domain informed with measured bathymetry and fit to local land boundaries. The potential sediment transport resulting from idealized northeast wind conditions were simulated for pre- (i.e.,

existing conditions relevant to current Port infrastructure) and post-Phase 2 construction scenarios. The results were qualitatively validated to satellite imagery of the head of Milne Inlet.

*Review of Hydrology and Geomorphology of Phillips Creek:*

In 2019, Golder conducted a background review of hydrology and geomorphology in Phillips Creek estuary to better understand observed fluvial processes and whether observed changes in sediment conditions along the West Transect stem from underlying natural or Project-related causes. This included a literature review of Arctic hydrology and sediment regime, analysis of historical air photographs of Phillips Creek estuary and delta, and a review of collected Milne Inlet sediment data from 2014 to 2017. Data from 2018 and 2019 sampling years was not considered, as the intent was to compare data to the available imagery, which at the time of this assessment was the 2017 year. The air photographs were used to assess the potential migration of Phillips Creek channel and delta pre- and post-development of Milne Port. The sediment review focused on data collected along the West Transect which extends closest to Phillips Creek mouth.

*MEEMP:*

Baffinland's monitoring efforts at Milne Port include an ongoing assessment of potential Project-related introductions of metals to the marine environment that would have the potential to bio-accumulate in the marine food chain. The 2019 MEEMP (Year 5 of the Program) included marine water and sediment quality sampling, as well as various levels of biological sampling including fish tissue collection for analysis of metals (body burden). Monitoring sites for marine water quality were located offshore of the effluent discharge in a radial design in three directions from the discharge point, consistent with locations sampled in previous years. The monitoring program was designed to monitor for potential changes to water quality due to site drainage discharge (including iron ore stockpile run-off) to the marine environment at Milne Port. Six distinct sampling events were completed between August and October 2019. Water quality samples were analyzed for a variety of parameters that included total and dissolved metals, screening against CCME Water Quality Guidelines (WQG) where applicable.

The sampling design for the 2019 sediment program was based on a radial gradient pattern originating at the Milne ore dock. The radial pattern is designed to detect potential Project-related effects based on a gradient of key components with numerical indicators (e.g., percent fines and metal concentrations in sediment) with increasing distance from the point source (ore dock and effluent discharge). From the point source, stations are established along the distance gradient which allows for changes to be assessed spatially.

Sediment samples were collected along four transects extending in a radial pattern from the Milne ore dock. Along the East and West transects, sediment sampling stations were located along the 15-m depth contour to a distance of approximately 1,000 m from the existing ore dock. Along the Northwest Transect, sampling stations extended to a distance of 1,300 m from the existing ore dock at depths ranging from 37 m to 91 m. A new transect was added in 2019 extending to from the ore dock to a distance of 1,500 m, ranging from 29 m to 121 m in depth. A composite sample of three grabs was collected from each sampling station. The sediment program expanded significantly from 2018, increasing from 5 stations per transect to a proposed 15. Due to logistical constraints, only 10 to 12 of the proposed stations per transect were sampled, still representing a significant increase from 2018.

Sediment samples were analyzed for a variety of parameters including grain size and extractable metals. Measured concentrations were screened against the CCME Interim Sediment Quality Guidelines (ISQGs) and Probable Effect Level (PEL) guidelines for sediment.

A Spearman Rank Correlation analysis was conducted to determine if there were statistically significant relationships ( $P < 0.05$ ) between sediment metal concentrations and the sampled distance from the Ore Dock along each Transect. Principal Component Analysis (PCA) was conducted on sediment physical and chemical variables of samples. PCA is an ordination technique that examines ecological distances (differences or similarities) between samples and allows plotting of high dimensional data in two or three-dimensional graphs, with the distances between the samples in the graphs representing the degree of similarity or difference in chemistry.

Fines content (i.e., sum of clay and silt fractions) was analyzed separately for the 2019 data and the combined 2014 to 2019 data to assess spatial and temporal gradients, respectively. Both analyses were conducted using general linear modelling. The model for the 2019 data included main effects of distance from transect origin, transect, and the possible interaction between the two variables. The model for the 2014 to 2019 data included main effects of distance from transect origin, year (as a categorical variable), transect, and all possible interactions among the three variables. The effect of distance was modeled as a second-degree orthogonal polynomial to account for the non-linearity in percent fines relative to distance from transect origin. Model residuals were examined to identify departures from linear regression assumptions—normality, homoscedasticity (equal variances), and linearity in predictors. No outliers were identified in the analyses; therefore, all applicable data were used in the models. Following the 2019 linear regression, multiple comparisons were performed to assess differences in fines content at consecutive distances along each transect individually. Following the multi-year linear regression, multiple comparisons were performed at the following covariate values: distances of 0 m, 500 m, 1,000 m, and 1,500 m. The model results were compared between years within each distance-transect combination. Tukey's honest significant difference (HSD) procedure was used in pairwise comparisons to correct for Family-wise error rate, and in 2019, Holm-Sidak method was used for P-value adjustments.

The analysis of iron concentrations in sediments was performed in a similar manner to the analysis of fines content. However, the model also included a main effect of percent fines. Fines and iron concentrations were transformed using natural logarithms, and the effect of distance was modeled as a second-degree orthogonal polynomial. One outlier value was removed during the 2019 analysis based on examination of residuals—the value was from the SE Transect (at 144 m). Three (3) outlier values were removed during the multi-year analysis based on examination of residuals—all values were from the East Transect, one in 2016 (120 m) and two in 2019 (144 m and 289 m). All outliers were shown on the plots depicting raw values and model predictions. Multiple comparisons were performed for observed fines content at each transect-distance combination (or combination of transect-distance-year for the multi-year comparison) for each of the models. The comparisons for 2019 assessed differences between consecutive distances along each individual transect based on the observed iron and fines values, whereas comparisons for the multi-year analysis assessed differences among years based on the observed fines values at each distance-transect combination. In the calculation of multiple comparisons based on observed fines content, all estimates were adjusted to mean natural log-transformed fines for each transect-distance combination.

In order to assess for the potential introduction of metals that bio-accumulate in the marine food chain, incidental fish mortalities (Arctic char and sculpin species) during the MEEMP surveys were retained for analysis of metal concentrations in tissue (body burden). Analysis of shellfish species *Hiattella arctica* tissue for body burden was introduced in 2018, and again added to the MEEMP in 2019 to assess for metal uptake of organisms from various trophic levels, in addition to water and sediment.

Descriptive statistics (i.e., sample size, mean, median, standard deviation [SD], standard error [SE], minimum, and maximum values) were calculated for 2019 metals concentrations in Arctic char, sculpin, and *H. arctica*. Descriptive

statistics were also calculated for historical samples of Arctic char from 2010, 2013 and 2015 to 2018, and from *H. arctica* from 2018. Comparisons were made between Arctic char and *H. arctica* data collected in 2019 relative to previous sample years. The lack of data from sculpin in 2018 prevented a similar comparison for sculpin.

For Arctic char and *H. arctica*, differences in mean metals concentrations between 2018 and 2019 were assessed using analysis of variance (ANOVA). When the assumptions of ANOVA were not met (i.e., the residuals of the data after being fit to the model were not normally distributed nor had equal variance between groups), the data were log-transformed, and the ANOVA was re-run. If, after being log-transformed, the assumptions of ANOVA were still not met, a non-parametric Kruskal-Wallis (K-W) test was used. Raw data were not compiled for years prior to 2018, nor were data available for all metals. Mean values were considered to assess consistency over time, but statistical comparisons were not performed for 2019 relative to historical data.

Mercury concentrations in fish and *H. arctica* muscle tissue were compared to the Canadian Food Inspection Agency (CFIA) commercial guideline of 0.5 milligrams per kilogram wet weight (mg/kg wwt).

## RESULTS

### *Hydrodynamic Modelling:*

Detailed results of the hydrodynamic and sediment transport modelling completed by Golder in 2018 are presented in TSD #20 (Golder, 2018e) in Baffinland's FEIS Addendum for the Phase 2 Proposal (Baffinland, 2018a).

### *Review of Hydrology and Geomorphology of Phillips Creek:*

Based on historical aerial photographs during the period 1982 to 2016, it is suggested that Phillips Creek Delta is a dynamic environment that migrates as a result of Phillips Creek sediment deposition and coastal processes. Further, it is expected that the amount and size of sediment that is deposited by Phillips Creek on the delta will change from year to year due to annual variability in sediment load, coastal forcing (i.e. waves and current-generated sediment transport), and other natural processes. Lastly, it is suggested that the position of the West Transect from Milne Port Ore Dock towards the Phillips Creek delta means the sediment data may demonstrate large spatial and temporal variabilities. This suggests the measured 2014 to 2017 samples along the West Transect are within the expected range of natural variability. Detailed results of the hydrology and geomorphology review in Phillips Creek Estuary is provided as Appendix M in the 2019 Draft Report for the 2019 MEEMP and Aquatic Invasive Species (AIS) Monitoring Program (Golder, 2020a). Overall, results suggest sediment data based on years where sediment sampling and satellite imagery were available (2014 to 2017) are within the expected range of natural variability.

### *MEEMP:*

Detailed results from marine water and sediment quality sampling and fish toxicological analyses are presented in the 2019 MEEMP and AIS Monitoring Report (Golder, 2020a), with a brief summary provided below.

All relevant water quality parameters analyzed in 2019 (arsenic, cadmium, chromium, mercury and silver) were below applicable CCME WQG<sup>4</sup>. No CCME guidelines are available for iron in water; although iron concentrations were shown to be within range of concentrations measured in previous years (2015 to 2018) with no evidence of degraded water quality as a result of iron ore deposition. Overall, water quality results are consistent with the

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<sup>4</sup> Canadian Council of Ministers of the Environment (CCME) – Canadian Environmental Quality Guidelines (CCME, 2014).



original FEIS predictions, which forecasted no significant residual effects on water quality but indicated the potential for minor localized increases in metal concentrations.

Sediment samples were analyzed for particle size composition and metals. The results of Spearman Rank Correlation analyses and PCA performed on 2019 sediment transect data suggested a strong relationship between metal concentrations and the proportion of fine-grained sediments (i.e., clay and silt sediment fractions), consistent with baseline observations in Milne Inlet and observations made in previous MEEMPs (2014 to 2018; SEM, 2015b; 2016a, 2017a; Golder, 2018f, 2019a). These analyses did not suggest that sediment metal concentrations were accumulating at elevated levels close to the Ore Dock relative to other locations sampled within Milne Port. Additionally, arsenic and nickel concentrations tended to increase with greater distance from the existing Ore Dock along the two northern transects, which is the opposite of what would be expected if the existing Ore Dock represented a significant point source of arsenic and nickel to the marine receiving environment in Milne Inlet.

Due to the observed relationship between sediment grain size, particularly the percentage of fines, and total metal concentrations, it was considered important to assess whether spatial and temporal changes in sediment percent fines content have occurred that might be related to Milne Port operations. The results of general linear modeling indicated that no statistically significant differences were observed between years (2014 to 2019) at any of the distances evaluated along the transects extending out from the existing Ore Dock, suggesting that sediment percent fines have not been significantly impacted by Milne Port operations relative to 2014 pre-Project conditions.

Marine sediment guidelines for iron are not currently available and, as such, the sediment data for iron were evaluated spatially and temporally along the transects using general linear modeling. Overall, increased iron content in sediments at concentrations greater than those observed during the 2014 baseline characterization program were rarely observed (i.e., only along the coastal East Transect at distances of 500 m and 1,000 m from the Ore Dock). Similar to the coastal West Transect, iron concentrations year-over-year along the coastal East Transect were determined to be more variable than the northern offshore transects. Monitoring of sediment quality within the study area will continue in 2020 to continue to evaluate the noted variability and the potential for Project-related effects.

In the analysis of metals concentrations in Arctic char tissue, significantly greater concentrations of arsenic, calcium, sodium, strontium, and titanium concentrations were observed in 2019 relative to 2018. However, relatively large variance in metal concentrations have been observed in Arctic char tissues since baseline years, and samples in 2019 were generally within range of measured values reported since 2010. Documented increases in these metals in Arctic char tissue is unlikely to be Project-related, since (i) these metals are either not associated with iron ore processing (i.e., strontium) or are present in the ore in very low concentrations (i.e., arsenic, calcium, sodium, titanium) compared to iron<sup>5</sup> (Baffinland, 2012) and (ii) the generally pristine nature of Milne Inlet water and sediment quality has been demonstrated by extensive data collection in baseline studies and over the course of the MEEMP (i.e., during the period of 2014 to 2019). Therefore, the observed metals concentrations are believed to be less a reflection of local anthropogenic inputs in Milne Inlet, and more likely a product of natural geologic sources (e.g., constituents mobilized from nearby watersheds, such as Phillips Creek) or atmospheric deposition, as has been demonstrated for metals and other contaminants. Notably, concentrations of copper and iron both showed a trend of slightly decreased mean concentrations since 2010.

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<sup>5</sup> The chemical composition of the ore dust is 65% iron, on average (Baffinland, 2012).



Sculpin metals concentrations could not be compared to previous years' data, as 2019 was the first year sculpin tissue chemistry was analyzed. Sculpin metals concentrations were generally similar, but slightly greater, than those measured in Arctic char in 2019.

For *H. arctica*, metals concentrations were significantly greater in 2019 compared to 2018 for all metals except barium, phosphorus, sodium, and strontium. Many metals exhibit strong associations with finer sediments (i.e., clay minerals), and would be expected to be enriched in areas with greater deposition of riverine silt-clays. The elevated metals concentrations in 2019 may also partially be explained by the reproductive status of the clams at the time of sampling. Biota that release a large portion of their body mass through reproductive output (i.e., spawning) can also reduce their body burdens of contaminants through a commensurate loss of contaminant mass. While this could account for observed interannual differences (i.e., if sampling occurred post-spawn in 2018, but pre-spawn in 2019), reproductive status of the clams is not known from the 2018 or 2019 sampling periods.

No samples (i.e., Arctic char, sculpin or *H. arctica*) collected in 2018 or 2019 exceeded the CFIA commercial consumption guideline of 0.5 mg/kg wwt mercury.

## TRENDS

### *Review of Hydrology and Geomorphology of Phillips Creek:*

Overall, results suggest sediment data based on years where sediment sampling and satellite imagery were available (2014 to 2017) are within the expected range of natural variability.

### *MEEMP:*

Collectively, marine water quality monitoring undertaken to date indicates that the construction and operation of Milne Port does not appear to have negatively affected water quality in Milne Inlet, as the reported analytical results for conventional water quality parameters measured in 2019 were generally within range of conditions observed in previous MEEMP and baseline surveys or below the analytical detection limits used in previous monitoring years (2014 to 2018).

For marine sediment, the inference made in Golder (2018a) identifying a significant increase in the percentage of fines observed along the West Transect as a potential result of the Project, is no longer valid as observed changes are within natural variability based on the background review of hydrology and geomorphology in Phillips Creek Estuary. No clear long-term trends have been established with respect to sediment accumulation or iron concentrations in the marine receiving environment. Additional years of monitoring at the planned level of increased sampling effort (from 5 to 15 sampling stations per transect) will contribute to ongoing trend analysis.

Relatively large variance in metal concentrations have been observed in Arctic char tissues since baseline years, and samples in 2019 were generally within range of measured values reported since 2010. For *H. arctica*, metal concentrations were significantly greater in 2019 compared to 2018 for most metals, there are no previous sample years or baseline data to compare to in order to determine if the increase is within the natural variance.

## RECOMMENDATIONS / LESSONS LEARNED

### *Hydrodynamic Modelling:*

Based on hydrodynamic and sediment transport modelling results from Phase 2, in concert with sediment data collected as part of the MEEMP program (2014 to 2019), no additional hydrodynamic modelling is considered required at this time.

### *MEEMP:*

All water quality samples collected in 2019 were below the applicable water quality guidelines for all tested parameters. Concentrations of iron and aluminum were above detection limits; however, these parameters do not have established limits in the CCME guidelines. Temporal and spatial variability were generally low among water samples collected throughout the water quality program. Water sampling should be repeated in 2020 following the same procedures outlined in the MEEMP Report (Golder, 2020a).

Overall, increased iron content in sediments at concentrations greater than those observed during the 2014 baseline characterization program were rarely observed (i.e., only along the coastal East Transect at distances of 500 m and 1,000 m from the Ore Dock). Similar to the coastal West Transect, iron concentrations year-over-year along the coastal East Transect were determined to be more variable than the northern offshore transects. It is recommended that the sediment sampling program conducted annually since 2014 continue in 2020 to further evaluate changes in sediment chemistry and composition. Based on a recently completed power analysis of the MEEMP program, the sampling effort for marine sediment will be increased (from 5 to 15 sampling stations per transect) in 2020 to increase detection power for this study component.

Body burden analysis is recommended to continue for incidental fish mortalities. Sculpin, Arctic char and *H. arctica* remain recommended species for body burden analysis.

As the MEEMP evolves and additional data become available for analyses, the design and approach to analyses can be continuously revisited to optimize the statistical power for interpreting change.

## Project Certificate Condition No. 84

Category	Marine Environment - Shoreline Effects and Sediment Redistribution
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To prevent sediment redistribution along the shipping route
Term or Condition	The Proponent shall update its sediment redistribution modeling once ship design has been completed and sampling should be undertaken to validate the model and to inform sampling sites and the monitoring plan.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	None
Reference	Final Environmental Impact Statement (FEIS; Baffinland, 2012) Addendum to the FEIS (Baffinland, 2013a) Addendum to the FEIS (Baffinland, 2018e) TSD 22 - Ship Wake and Propeller Wash Assessment (Golder, 2018c)
Ref. Document Link	N/A

### METHODS

This condition is considered not applicable as Baffinland has not introduced purpose-built vessels. Baffinland understands that the intent of this condition was to address concerns related to potential ship-induced sediment redistribution from propeller wash and ship wake effects for shipping operations using purpose-built vessels for use along the Southern Shipping Route and Steensby Port. No sediment dispersion (i.e., hydrodynamic) modelling was completed for Milne Port or along the Northern Shipping Route in support of the FEIS (Baffinland, 2012) or the FEIS Addendum for the Early Revenue Phase (ERP) (Baffinland, 2013a). Given that the Steensby phase of the Project is not active, and Baffinland has not constructed or utilized any built-for-purpose vessels, the designation is considered Not applicable to the Northern Shipping Route shipping operations.

In 2018, Golder was retained in good practice to perform a ship wake and propeller wash assessment update. The Ship Wake and Propeller Wash Modelling Report for the Phase 2 Proposal is included as a Technical Support Document (TSD) 22 (Golder, 2018c) in Baffinland's FEIS Addendum for the Phase 2 Proposal (Baffinland, 2018e).

### RESULTS

Ship wake modelling results for the Phase 2 Proposal (Golder, 2018c) indicated that ship generated waves (wakes) were expected to be minimal along the Northern Shipping Route with an estimated maximum wave height of 0.12 m near the sailing line and less than 0.05 m at distances greater than 1 Km from the sailing line. The wake height is primarily constrained by the vessel speed limit of 9 knots along the shipping route. Any significant wave heights from wind-generated waves are estimated to exceed ship generated wave heights during both average and peak wind conditions.

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

The Steensby phase of the Project is not active and no purpose-built vessels, proposed for use in the Southern Shipping Corridor, have been constructed to date. Until the Steensby phase is deemed active, no additional actions are required. Accordingly, Baffinland will only review the requirement for updating ship wake modelling along the Southern Shipping Route when activities associated with the future development of Steensby Port resume.

## Project Certificate Condition No. 85

Category	Marine Environment - Shoreline Effects and Sediment Redistribution
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To prevent sediment redistribution along the shipping route.
Term or Condition	The Proponent shall develop a monitoring plan to verify its impact predictions associated with sediment redistribution resulting from propeller wash in shallow water locations along the shipping route. If monitoring detects negative impacts from sediment redistribution, additional mitigation measures will need to be developed and implemented.
Relevant Baffinland Commitment	84
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	None
Reference	N/A
Ref. Document Link	N/A

### METHODS

Not applicable. Baffinland understands that the intent of this condition was to address concerns related to potential ship and/or tug propeller wash effects in shallow-water areas along the Southern Shipping Route.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will develop a monitoring plan to verify predictions of sediment redistribution resulting from propeller wash in shallow locations along the shipping route if and/or when ore carriers are commissioned for the Southern Shipping Route.

## Project Certificate Condition No. 86

Category	Marine Environment - Ballast Water
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To update ballast water discharge impact predictions.
Term or Condition	Prior to commercial shipping of iron ore, the Proponent shall use more detailed bathymetry collected from Steensby Inlet and Milne Inlet to model the anticipated ballast water discharges from ore carriers. The results from this modeling shall be used to update ballast water discharge impact predictions and should account for density dependent flow and annual timescales over the project life. Additional sampling should also be undertaken to validate the model and to inform sampling sites and the monitoring plan.
Relevant Baffinland Commitment	85
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	<p>Oceanographic Data Processing - Baffinland Ballast Water Study, Milne Inlet 2014-15 (ASL, 2015)</p> <p>Ocean Circulation and Ballast Water Dispersal in Milne Inlet, Baffin Island (CORI, 2014)</p> <p>Data Report for the 2015-2016 Observational Oceanography Program in Milne Inlet (CORI, 2016)</p> <p>Mary River Project - Addendum to the FEIS (Baffinland, 2018e)</p> <p>Tech Memo - Tide Gauge Collection at Milne Port During 2017 Open-water Season (Golder, 2018a)</p> <p>TDS 18 - Ballast Water Dispersion Modelling Report (Golder, 2018g)</p> <p>2015 MEEMP Report (SEM, 2016a)</p> <p>2016 MEEEMP and AIS Monitoring Report (SEM, 2017a)</p> <p>2017 MEEMP and AIS Monitoring Report (Golder, 2018f)</p> <p>Draft 2018 MEEMP and AIS Monitoring Report (Golder, 2019a)</p> <p>Ballast Water Model Validation Report (Golder 2019f)</p> <p>Response to DFO Ballast Water Modelling Concerns (DFO 3.10.1) (Golder 2020d)</p>
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Ballast water dispersion modelling was initially undertaken in 2014 by Coastal and Ocean Resources Inc. (CORI) on behalf of Baffinland prior to the start of commercial shipping of iron ore at Milne Port (CORI, 2014; 2016). Oceanographic data collected in the model region, including Conductivity-Temperature-Depth (CTD) data, ocean current data (via deployment of Acoustic Doppler Current Profilers or ADCPs), hydrology data, atmospheric data, and bathymetric data, were used to determine basic ocean conditions and to prepare gridded fields for the initial and boundary conditions for the model. The model was validated using ADCP and CTD data collected in Milne Inlet in 2014. Modelling results were used to inform sampling sites for Baffinland's AIS monitoring program in 2015 and 2016.

In 2018, Golder was retained to perform updated ballast water dispersion modelling in Milne Inlet. The Ballast Water Dispersion Modelling Report for the Phase 2 Proposal was included as a Technical Support Document (TSD) 18; Golder, 2018g) in Baffinland's FEIS Addendum for the Phase 2 Proposal (Baffinland, 2018e). A three-dimensional hydrodynamic model was developed in the MIKE3 suite to assess the discharge of ballast water in Milne Inlet. This included modelling of ballast water discharges under the present Project (Early Revenue Phase), as well as under Phase 2 operations. The model was calibrated and validated to oceanographic data collected in the model region in 2014 by CORI (CORI, 2014). This included Conductivity-Temperature-Depth (CTD) data, ocean current data (via deployment of Acoustic Doppler Current Profilers or ADCPs), hydrology data, atmospheric data, and bathymetric data. However, data near Milne Port was not available.

In 2019, in response to comments from NIRB, the QIA, DFO and Parks Canada, Golder undertook a validation exercise to assess the ballast water dispersion model in comparison to observed 2018 oceanographic data and updated the model with improved wind data, estimates of discharge from Phillips Creek, and more spatially resolved heat-flux inputs. This involved running the ballast water dispersion model for the 2018 open-water season with measured 2018 ballast water discharge volumes, temperature, and salinity. Golder also assessed the sensitivity of ballast water dispersion to variations in ballast water salinity and temperature through six (6) model sensitivity simulations. Additionally, Golder developed a box model analysis to assess the potential increase and/or decrease in temperature and salinity in distinct water masses due to ballast water discharge at the end of the 2018 open water season.

Additional oceanographic data were collected in Milne Inlet, specifically near Milne Port in 2018 and 2019 as follows:

- Oceanographic data (ocean currents and CTD measurements) were collected by Golder in 2018 and 2019 (Golder, 2019a; 2020a) for the purpose of providing ocean current, water level and CTD data needed to validate the improved ballast water model. Data was collected near Milne Port and Bruce Head.

In addition, the following oceanographic data have been collected to address other NIRB Conditions and assist with ballast water dispersion model validation:

- Water level data were collected at a tide gauge installed at the Milne Port ore dock by Golder between 2017 and 2019 (Golder, 2018a; 2019a; 2020a).
- CTD data has been collected annually as part of the MEEMP between 2014 and 2019 (SEM, 2016a; 2017a; Golder, 2018a; 2019a; 2020a).

## RESULTS

Detailed results of the 2018 updated ballast water dispersion modelling are presented in Technical Support Document (TSD) 18 (Golder, 2018g) in Baffinland's FEIS Addendum for the Phase 2 Proposal (Baffinland, 2018e). Detailed results of the 2019 ballast water dispersion model validation are presented in Golder (2019f, 2020d).

Validation of the 2018 updated ballast water dispersion model to 2018 observed oceanographic data shows the model is in good agreement with observed water levels and reasonable agreement with observed current speed and direction at Bruce Head and Milne Port. Results indicate that ballast water is diluted to negligible concentrations within 5 Km of the discharge location at the end of the 3-month simulation. Near the mouth of Phillips Creek, the simulated concentration of ballast water is diluted further as the freshwater inputs drive mixing processes. Ballast water sensitivity simulations indicated that ballast water dispersion in Milne Inlet is relatively insensitive to the temperature and salinity of onboard ballast water, and the box model analysis indicated that outside the direct

vicinity of an ore carrier, the potential increase and/or decrease in temperature and salinity of ambient water as a result of ballast water is negligible (Golder, 2019f; 2020d).

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland has achieved compliance with the active phase of the shipping operation in Milne Inlet. Prior to the development of the Steensby phase of the Project, Baffinland will complete the required modelling and validation exercises. Based on the above conclusions, Golder has concluded that re-running the Phase 2 Proposal modelling is not warranted as the anticipated Phase 2 Proposal conditions are not expected to alter the ballast water dispersion results. Similarly, no further ballast water modeling of current operations (ERP) is considered warranted given that the Phase 2 Proposal ballast water modelling results and conclusions are based on greater than two (2) times the volume of ballast water that is presently discharged under the existing Project.



## Project Certificate Condition No. 87

Category	Marine Environment - Ballast Water
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent invasive species introductions resulting from Project shipping.
Term or Condition	The Proponent shall develop a detailed monitoring program at a number of sites over the long term to evaluate changes to marine habitat and organisms and to monitor for non-native introductions resulting from Project-related shipping. This program needs to be able to detect changes that may have biological consequences and should be initiated several years prior to any ballast water discharge into Steensby Inlet and Milne Inlet to collect sufficient baseline data and should continue over the life of the Project.
Relevant Baffinland Commitment	85
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	2015 AIS Monitoring Report (SEM, 2016b) 2016 MEEEMP and AIS Monitoring Report (SEM, 2017a) 2016 Milne Ore Dock Fish Offset Monitoring Report (SEM, 2017b) 2018 MEEMP and AIS Monitoring Report (Golder, 2019a) Draft 2019 MEEMP and AIS Monitoring Report (Golder, 2020a)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Baffinland's AIS Monitoring Program was developed in 2015 as part of the MEEMP to detect non-native species potentially introduced to Milne Inlet via ballast water discharges or hull biofouling. AIS surveys targeted lower trophic levels, including zooplankton, benthic infauna, epifauna and fish. Biophysical surveys were initially conducted in 2014 to enhance baseline data by supplementing existing species inventory datasets for marine flora and fauna prior to the start of shipping operations at Milne Port. AIS surveys in 2015 and 2016 (SEM, 2016b; 2017a) focused on detection of marine organisms not previously identified in Milne Port as primary indicators of invasion (i.e., early warning of AIS introductions in the Project area). Surveys were based on a Before/After experimental design focusing on areas with the highest likelihood of marine invasion. Since ballast water releases only occur in Milne Port, data collection was focused on the marine areas surrounding the Milne Port infrastructure. Monitoring thresholds were implemented to establish protocols for evaluating taxonomic data to determine if additional mitigation measures need to be implemented. Depending on the species and the relative risk it poses to the native biological community, thresholds may consist of a single occurrence of an invasive species, or evidence that the species has become established in the area through reproduction and/or range expansion. In 2017, the AIS monitoring program was expanded to include sampling sites near Ragged Island to capture potential AIS at existing anchorage locations in this area.

In 2019, the monitoring program was altered slightly to highlight the emphasis on early identification of Non-Indigenous Species (NIS) and not just AIS. This included literature review of species descriptions and collection

records for all newly identified taxa to determine their documented and presumed ranges. Where taxa were not identifiable to the species level, a review was completed to confirm that at least one species within the higher taxonomic group had a known Canadian Arctic distribution. All taxa were compared against a global invasive species database (Molnar et al., 2008), the National Exotic Marine and Estuarine Species Information System (NEMESIS; Fofonoff et al., 2020), as well as a known invasive species list within the National Risk Assessment for Introduction of Aquatic Nonindigenous Species to Canada by Ballast Water (Casas-Monroy et al., 2014). Any taxa flagged as potential NIS or AIS were sent to Philippe Archambault's Benthic Ecology Lab (Université Laval, Quebec) for independent verification of the taxonomic identification. At the time of issuing this report, the independent review had not been fully completed for all flagged specimens in 2019, however any relevant findings will be incorporated in the final version of the report and shared with the MEWG.

In 2019, AIS and NIS monitoring continued in Milne Port and at Ragged Island and included zooplankton sampling, benthic infaunal sampling, underwater video surveys for macroflora and benthic epifauna, sampling for fish and mobile epifauna, settlement surveys for encrusting epifauna, and video surveys of ore carrier hulls for detection of biofouling organisms. Detailed information on the 2019 sampling methodology is available in the 2019 MEEMP and AIS Monitoring Report (Golder, 2020a).

## RESULTS

Detailed results of the 2019 AIS Monitoring Program are presented in the 2019 MEEMP and AIS Monitoring Report (Golder, 2020a), with a summary provided below.

In 2019, a total of forty-three (43) zooplankton species were identified during AIS/NIS sampling Milne Port and Ragged Island. Three (3) of these taxa were not recorded during baseline studies or during previous AIS monitoring campaigns. None of the newly observed zooplankton taxa in 2019 were listed in the identified invasive or non-indigenous species databases.

A total of 319 benthic invertebrate taxa were identified during AIS sampling in 2019 at Milne Port and Ragged Island. Forty-one (41) of these taxa were not recorded during baseline studies or during previous AIS monitoring campaigns. An analysis of the available literature and species databases indicated that most of the newly identified taxa had known ranges that include Arctic waters or had unknown northern limits with ranges reaching into the north Atlantic and Norwegian Sea. These taxa presumably could have ranges that extend to Arctic waters. Any taxa determined to be potential NIS or AIS were sent for independent verification of the taxonomic identification. At the time of issuing this report, the independent review had not been fully completed for all flagged specimens in 2019, however any relevant findings will be incorporated in the final version of the report and shared with the MEWG.

AIS/NIS monitoring is conducted at a surveillance level and designed to flag potential invasive or non-indigenous species. The following five examples serve as evidence that this program is functioning as intended:

- New taxa observations included a spionid polychaete identified as *Marenzelleria viridis*, confirmed via independent verification. This species is listed in the Global Database and the National Risk Assessment as a species of concern for Canadian and Arctic waters, with a primary invasion vector through ballast water (Molnar et al., 2008; Casas-Monroy et al., 2014). However, specimen collection records for *M. viridis*, and under the superseded name *Scolecoplepides viridis* indicate historical occurrences outside the documented natural range in the North Atlantic and Arctic Oceans, including the Canadian Arctic and Baffin Island (Cusson, 2018, GBIF, 2020, Miller et al., 2014). Further review of collection records around Baffin Island is needed to determine if this species is a recent invader in Milne Port.

- A sabellid polychaete worm was tentatively identified as *Pseudofabricia sp. nr. aberrans*. This taxon was also identified in 2018 and sent for independent review due to the defined range for this species being limited to the Mediterranean Sea (Giangrande and Cantone, 1990; WoRMS, 2020). *P. aberrans* is not considered an invasive species or a species of concern in Canadian or Arctic waters (Molnar et al., 2008; Casas-Monroy et al., 2014). A tentative alternative identification of *Manayunkia aesturiana* was assigned in 2018 (Golder 2019a), although the identification was uncertain. Specimens from 2019 samples were again sent to Université Laval for independent verification. Laval identified the specimens as *Fabricia sabella*, an unaccepted name for *Fabricia stellaris*. Neither *F. sabella* nor *F. stellaris* have been identified in previous surveys at Milne Port, but both have documented distributions that include the Canadian Arctic, with specimen collections made at Baffin Island. This taxon was not considered invasive though further review is required to determine NIS status.
- A terebellid polychaete worm was identified in 2019 samples that was similar to the description for *Sosane wireni*, a species with a taxonomic description limited to New England. Samples were classified as *Sosane sp. nr. wireni*, and are currently pending independent verification. *S. wireni* is not considered an invasive species or a species of concern in Canadian or Arctic waters (Molnar et al., 2008; Casas-Monroy et al., 2014) and specimen collection records exist for this species, and under the superseded name *Sosanopsis wireni*, in Scandinavian waters, Western Greenland and the Laptev Sea. This taxon was not considered invasive in Arctic waters, but further review is required to determine nonindigenous status.
- An unknown species of gammarid amphipod was identified from the *Monocorophium* genus in 2019 benthic infauna samples. No species within this genus have known distributions that include Arctic waters, and three species within this genus (*M. insidiosum*, *M. acherusicum* and *M. sextonae*) are considered invasive (Molnar et al., 2008). These specimens are currently pending independent verification. Independent verification of the genus, and resolving the identification to species level, are required to make a determination of NIS or AIS status.
- A bryozoan was identified as an indeterminate species from the genus *Oncousoecia*. There are no recent specimen collections in Arctic waters and species within this genus with described ranges that include Arctic waters are limited to the European Arctic, the Barents Sea and Svalbard (WoRMS, 2020). No species within the genus *Oncousoecia* are listed on any of the available databases on invasive species or species of concern. These specimens are pending for independent verification. Independent verification of the genus and resolving of the identification to species level is required to make a determination of NIS or AIS status.

The macroflora and benthic epifauna component involved data collection via underwater video surveys along the length of each of the four previously established AIS/NIS transects, plus an additional transect established in 2019 to the east of the newly constructed Freight Dock. The addition of high definition (HD) video footage in 2019 helped facilitate the identification of two (2) new taxa of epifaunal invertebrates that had not been previously recorded during AIS underwater video surveys, but were not considered NIS or AIS. A total of six (6) distinct macroflora taxa were observed, all of which have been recorded in previous surveys.

In settlement basket surveys, a total of 2,317 encrusting epifauna from twenty-two (22) unique taxa were identified in 2019, the majority of which were bryozoans of the Order Cyclostomatida. Three (3) new encrusting epifauna taxa were identified during the 2019 AIS/NIS surveys, two identifiable to the species level - *Circeis armoricana*, a sabellid worm, and *Patinella verrucaria*, a colonial bryozoan - and one identifiable to the Cnidarian genus *Gonothyraea*. None

of the newly observed encrusting epifauna taxa were identified as invasive species, with literature review confirming known Arctic distributions for each.

Thirteen (13) fish species were observed in 2019 across all MEEMP and AIS/NIS survey components. One new taxa was added to the AIS/NIS survey taxonomic record from ROV surveys, an unidentified eelpout (Zoarcidae indet.), although at least one genus in this Family has been recorded in previous MEEMP surveys. Additionally, a ninespine stickleback was captured during fish surveys as part of the MEEMP program. All fish taxa captured or observed in 2019 had known representative species with ranges that included the Canadian Arctic and none were considered NIS or AIS.

Underwater video surveys of five ore carriers indicated that the ship hulls were mostly free of biofouling (i.e., growth). Exceptions were small areas of the sterns of four ships, where some amounts of colonization by aquatic organisms – predominantly barnacles - were found. The taxonomic resolution of biofouling organisms did not improve in the second year of monitoring, despite the inclusion of a high-resolution camera. Many taxa were not resolved to species level due to the difficulty of identification without a specimen.

Detailed results of the 2019 AIS Monitoring Program are presented in Golder (2020a).

#### **TRENDS**

Five years of monitoring has yielded a relatively large dataset of marine organisms residing in Milne Port and Milne Inlet. Further investigations into the status of several new species identified during the AIS program are in progress in consultation with DFO and other external experts, with representative specimens sent to a second laboratory for confirmatory taxonomic analysis. Additional years of monitoring will provide for a more comprehensive AIS/NIS database to serve as a basis for determining whether changes are occurring as a result of Project-related activities.

#### **RECOMMENDATIONS / LESSONS LEARNED**

AIS/NIS results will continue to be presented to the MEWG on an annual basis, and adjustments to the programs will be made as needed.

## Project Certificate Condition No. 88

Category	Marine Environment - Ballast Water
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent invasive species introductions resulting from Project shipping.
Term or Condition	<p>Prior to commercial shipping of iron ore and in conjunction with the Marine Environment Working Group, the Proponent shall provide an updated risk analysis regarding ballast water discharge to assess the adequacy of treatment and implications on the receiving environment. This risk analysis shall consider, but not be limited to:</p> <ul style="list-style-type: none"> <li>a. Invasive species</li> <li>b. Seasonal oceanography</li> <li>c. Ballast water quality and quantity</li> <li>d. Receiving water quality;</li> <li>e. Residual physical, chemical, and/or biological effects; and</li> <li>f. Any risk assessment analysis regarding ballast water exchange and treatment efficacy in arctic waters</li> </ul>
Relevant Baffinland Commitment	85, 86
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environment Work Group (MEWG)
Reference	<p>Mary River Project - Addendum to the FEIS. June 2013 (Baffinland, 2013a)</p> <p>Mary River Project - Addendum to the FEIS Baffinland. September 2018 (Baffinland, 2018e)</p> <p>Risk Assessment for Potential Introduction of Aquatic Nonindigenous Species through Ballast Water Discharge at Milne Port (SEM, 2013)</p> <p>TSD 17 - Marine Environment Effects Assessment (Golder, 2018b)</p> <p>TSD 21 - Risk Assessment for Introduction of AIS from Ballast Water (Golder, 2018h)</p> <p>International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (Convention; IMO, 2017)</p> <p>Ballast Water Control and Management Regulations (SOR/2011-237) (Transport Canada, 2020)</p> <p>Ballast Water Management Plan (Baffinland, 2019h)</p> <p>2019 MEWG Meeting Record</p>
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

As described in the annual update for PC Conditions No. 76 and 87, AIS surveys were conducted at Milne Port from 2014 to 2019, with expansion of the AIS monitoring program in 2017 and 2018 to include additional sampling locations near established anchorages at Ragged Island and ships' hull monitoring for potential biofouling. In 2019, the monitoring program was also altered slightly to highlight the emphasis on early identification of Non-Indigenous Species (NIS) and not just AIS.

Oceanographic measurements of salinity, temperature, dissolved oxygen, turbidity, and chlorophyll-a were taken between Milne Port and Ragged Island from 2016 to 2019 to better characterize the receiving environment. This

involved using a conductivity (i.e. salinity), temperature, and depth (CTD) profiler to measure through water column physiochemical properties.

A risk assessment for the potential introduction of aquatic nonindigenous species through ballast water discharges at Milne Port was completed in 2013 prior to the start of commercial shipping of iron ore at Milne Port. Detailed methodology for the semi-quantitative risk assessment is presented in SEM (2013), presented as Appendix 8B-4 of the FEIS Addendum (Baffinland, 2013a). An additional risk assessment for introduction of AIS from ballast water was completed in 2018 in support of the FEIS for the Phase 2 Proposal (Golder, 2018i). The methodology that was applied in both risk assessments closely followed methods described by Chan et al. (2012, 2013) and Casas-Monroy et al. (2014) which allowed for a comparison of invasion risks between Milne Port and other Canadian Arctic ports servicing international merchant vessels.

All bulk (ore) carriers servicing Milne Port, including those for the 2019 shipping season, conduct mid-ocean ballast water exchange as required by federal Ballast Water Control and Management Regulations (SOR/2011-237; Transport Canada, 2020) through the Canada Shipping Act (S.C. 2001, c. 26). In addition to federally-mandated ballast water regulations, Baffinland, as part of its Ballast Water Management Plan (Golder, 2019f) exceeds federal ballast water regulatory requirements by voluntarily conducting ballast water compliance monitoring in at least one (1) randomly sampled ballast tank on all ore carriers arriving at Milne Port prior to ballast water discharge as a part of its compulsory ship inspections to verify their compliance with the Ballast Water Control and Management Regulations and IMO's D-1 standards.

## RESULTS

The risk assessment undertaken in support of the ERP (SEM, 2013) determined that shipping operations under the ERP of the Project were unlikely to significantly increase the potential for AIS introductions as a consequence of ballast water discharges or ship hull fouling at Milne Port.

The risk assessment undertaken in support of the Phase 2 Proposal (Golder, 2018h) determined that the level of risk of AIS invasion from ballast water releases under Phase 2 operations was high if ships were to implement the D-1 standard only (ballast water exchange). However, all Project ore carriers will be required to comply with IMO's D-2 performance standards (IMO, 2017) prior to the start of Phase 2 shipping operations in 2024, which requires all ships to install an on-board IMO-approved ballast water treatment system to eliminate unwanted organisms in their ballast tanks prior to release. Further to this, Baffinland has committed to requiring all ore carrier vessels to engage in both exchange and treatment protocols prior to releasing. The proposed mitigation, which is beyond federal ballast water regulatory requirements as well as beyond measures applied by any other marine port in Canadian waters, is considered to be effective at mitigating for potential introductions of NIS/AIS in the marine environment from ballast water releases at Milne Port.

AIS and NIS monitoring in 2019 identified five (5) taxa flagged for further review as potentially AIS or NIS. Independent verification confirmed the identification of *Marenzelleria viridis*, a spionid polychaete. This species is listed in the Global Database and the National Risk Assessment as a species of concern for Canadian and Arctic waters, with a primary invasion vector through ballast water. There are indications that this species was present in Arctic waters prior to Project-related operations. Further review is ongoing to determine AIS/NIS status for this species and the other taxa flagged in 2019. More information is presented in the response to PC Condition No. 87, and in the 2019 MEEMP and AIS Monitoring report (Golder, 2020a).

**TRENDS**

See update to Conditions No. 76 and 87 for detailed results from the 2019 NIS/AIS Monitoring Program undertaken at Milne Port. Five years of AIS monitoring has yielded a relatively large dataset of marine organisms residing in Milne Port and Milne Inlet. Further investigations into the status of several new species identified during the 2019 AIS program are in progress in consultation with DFO and other external experts, with representative specimens sent to a second laboratory for confirmatory taxonomic analysis.

**RECOMMENDATIONS / LESSONS LEARNED**

Ongoing annual AIS monitoring will add to the current AIS dataset for determining whether changes are occurring as a result of Project-related activities that could have biological consequences on marine ecosystem health in Milne Inlet. AIS results will continue to be presented to the MEWG on an annual basis, and adjustments to the programs will be made as deemed necessary.

## Project Certificate Condition No. 89

Category	Marine Environment - Ballast Water
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to marine water quality resulting from ballast water exchange.
Term or Condition	The Proponent shall develop and implement an effective ballast water management program that may include the treatment and monitoring of ballast water discharges in a manner consistent with applicable regulations and/or exceed those regulations if they are determined to be ineffective for providing the desired and predicted results. The ballast water management program shall include, without limitation, a provision that requires ship owners to test their ballast water to confirm that it meets the salinity requirements of the applicable regulations prior to discharge at the Milne Port, and a requirement noting that the Proponent, in choosing shipping contractors will, whenever feasible, give preference to contractors that use ballast water treatment in addition to ballast water exchange.
Relevant Baffinland Commitment	57,87
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Transport Canada, Marine Environmental Working Group (MEWG)
Reference	Ballast Water Management Plan (Baffinland, 2019h) International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM). (IMO, 2017) Discussion paper: Canadian implementation of the ballast water convention. (Transport Canada, 2012)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> <a href="http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships'-Ballast-Water-and-Sediments-(BWM).aspx">http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships'-Ballast-Water-and-Sediments-(BWM).aspx</a>

### METHODS

Baffinland has developed a comprehensive, stand-alone Ballast Water Management Plan (BWMP) that is reflective of its current (ERP) and future shipping operations under the Phase 2 Proposal (Baffinland, 2019h). The BWMP includes information on applicable legislation, BWMP program objectives, monitoring responsibilities, sampling equipment specifications, detailed technical procedures for sampling and analyses, comprehensive QA/QC procedures, and adaptive management measures for implementation during non-compliance events. The BWMP identifies procedures to manage and monitor ship ballast water in a manner consistent with applicable regulations, guidelines, and terms and conditions of the Project Certificate. The BWMP includes a Standard Operating Procedure (SOP) which provides detailed instructions for salinity testing of ballast water tank on carriers calling at Milne Port, including directives for accessing on-board ballast tanks, selecting ballast tanks for testing, equipment set-up and deployment, detailed sampling and data entry procedures, guidance on instrument calibration, maintenance and storage, and reporting requirements.



In response to the threat of the introduction and spread on non-native species through ballast water, the International Maritime Organization (IMO) adopted the International Convention for the Control and Management of Ships' Ballast Water and Sediments (i.e., the Ballast Water Management (BWM) Convention). The BWM Convention was ratified and entered into force on 8 September 2017. Under the BWM Convention, all ships are required to have an International Ballast Water Management Certificate, their own Ballast Water Management Plan (BWMP), and a comprehensive record of ballast water exchange and monitoring results recorded in an on-board ballast water record book (with a detailed record of when ballast water is taken on board, when it is circulated or treated for BWM purposes, and when it is discharged into the ocean). Ships also need to record accidental or other exceptional discharges of ballast water to the marine environment.

The BWM Convention includes two performance standards for the discharge of ballast water: D-1 and D-2. The D-1 standard concerns ballast water exchange, which must be undertaken within open ocean areas, defined as waters >200 nautical miles from land and in seas >2,000 m deep. The D-2 standard covers approved ballast water treatment systems. All ships entering Canadian waters must currently meet the D-1 standard. The D-2 standard will come into force over a phased time period depending on each ship's date of construction and the timing of its International Oil Pollution Prevention (IOPP) certificate renewal survey, which is required every five years. All new build ships must meet the D-2 (treatment) standard after entry into force (8 September 2017). For existing ships, the BWM Convention requires that either the D-1 (exchange) or D-2 (treatment) standard is met after entry into force (September 8, 2017). However, as ballast water exchange (D-1) is not considered an ideal method of ballast water management, the BWM Convention requires compliance with D-2 (treatment) upon a ship's first IOPP Certificate renewal survey occurring after September 8, 2017.

The D-2 standard (treatment) specifies a maximum number of organisms and indicator microbes that are allowed to be discharged to the receiving marine environment according to the schedule set by the IMO. At this point in time, sampling and analysis methodologies to test for compliance with the D-2 standard have not been fully developed by the IMO yet. It is acknowledged in the IMO guidelines that although significant technical advances and refinements have been made in this area since the adoption of the Convention, there are still numerous issues to be resolved. Administrations are still undertaking research to define the most appropriate methods to test for compliance, and the best way to collect, handle and analyze samples. However, it is expected that in due course, appropriate guidance will become available once full compliance testing regimes are developed and the applicable regulators have had time to gain experience and develop best practice in ballast water sampling and analyses.

In 2019, nine (9) of the forty-one (41) ore carriers that serviced Milne Port had IMO-approved D-2 ballast water treatment systems installed onboard. This included the Nordic Olympic, Nordic Oshima, Nordic Odin, NS Energy, NS Yakutia, Golden Strength, Golden Opal, Golden Ruby and Arkadia. As most of these vessels conducted repeat voyages to Milne Port during the 2019 shipping season, this resulted in 23 of the 82 ore carrier voyages having completed both ballast water exchange and treatment methods prior to releasing their ballast water in the RSA (i.e., representing 28% of all ore carriers that called to Port in 2019).

All bulk carriers servicing Milne Port, including those during the 2019 shipping season, conducted mid-ocean ballast water exchange as required by federal Ballast Water Control and Management Regulations (D-1 standard), with the exception of the Golden Ruby that only completed a ballast water treatment (D-2 standard) prior to release of ballast water on its first trip to Milne Port. All other vessels with D-2 treatment systems completed both a ballast water exchange and treatment prior to releasing ballast waters, and the Golden Ruby on its second trip also completed both an exchange and treatment. As a matter of due diligence, Baffinland, as stipulated in its Ballast Water

Management Plan (Baffinland, 2019a), conducts voluntary ballast water sampling in one randomly selected ballast water tank on all ore carriers arriving at Milne Port prior to ballast water discharge to verify their compliance with the Regulations and the IMO's D-1 standard.

In 2019, all bulk carriers that called at Milne Port during the shipping season were boarded by a Baffinland environmental representative that conducted salinity testing of the ship's ballast water before it was approved for release in Milne Port and before loading of the carrier could begin. In these instances, a single ballast tank on the vessel was tested for salinity concentration using a calibrated water quality meter (i.e. YSI Pro 30) to confirm that ballast water salinity levels were above 30 ‰ (parts per thousand), prior to being authorized by the port captain to discharge in Milne Port. Salinity levels were consistent with mid-ocean exchange requirements for vessels conducting a transoceanic voyage (salinity of mid-Atlantic seawater, where open-water exchange takes place, is typically in the range of 34-35‰).

It is important to note that the ship operators/owners are the responsible party for ensuring their ships are compliant with federal ballast water regulations and the BWM Convention. To facilitate the administration of ballast water management and treatment procedures on board each bulk carrier, a responsible officer is designated to ensure the maintenance of appropriate records and to ensure that ballast water management and/or treatment procedures are followed, recorded, and reported in accordance with the regulations. There are no specific legal obligations on the part of port and harbour authorities in relation to overseeing ballast water management or treatment procedures on behalf of the ship owner/operators, including for testing of ballast water or reporting ballast water readings to the federal authority. Baffinland's voluntary measure of testing a ballast water tank on each bulk carrier to confirm that salinity is at least 30 ‰ prior to discharge in the RSA, represents a level of monitoring that exceeds all federal (Transport Canada) and international (IMO) regulatory requirements related to ballast water management, and surpasses management practices currently implemented at any marine port in Canada.

## RESULTS

Ballast water salinity was measured in all ore carriers (n=82) that called at Milne Port in 2019. Results are presented in Table 4.28. Salinity measurements for most carriers ranged between 30.0‰ to 38.2‰, which was compliant with federal Ballast Water Regulations. One exception occurred on August 27, 2019 where ballast water tested on the Bulk Destiny measured 29.3‰. Baffinland confirmed that this vessel had exchanged ballast water for freshwater in Bécancour, Quebec, Canada and that the freshwater could be discharged in Milne Port as the vessel was coming directly from another Canadian Port located within the Canadian Exclusive Economic Zone (EEZ) (i.e., it did not arrive at Milne Port directly from international waters).

In 2019, it was noted that many ships had ballast water salinities close to 30‰. On August 1, 2019, ballast water from the Golden Pearl consistently measured below 30‰ in multiple ballast tanks, measured with redundant calibrated instruments in accordance with the Ballast Water Management Plan (Baffinland, 2019h). The Master of the Golden Pearl was informed by the Milne Port Captain of the failure of the salinity tests and ballast water exchange records were reviewed and it was confirmed that an exchange had occurred in accordance with the D-1 standard of the BWM Convention. The Baffinland Shipping Department followed procedures in Section 4 of the Ballast Water Management Plan (Baffinland, 2019h) and, in consultation with vessel Master, deferred to NORDREG and Transport Canada Marine Safety and Security – Atlantic Ballast Water (ABW). ABW provided approval to re-exchange ballast water in the vicinity of 073W UTM prior to discharge at Milne Port. Accordingly, Golden Pearl was instructed to leave Milne Port and complete re-exchange before returning to Milne Port. Golden Pearl completed

ballast water exchange on August 3, 2019 and was given permission by the Port Captain to return to Milne Port. Ballast water in the Golden Pearl was tested upon its return to Port, and salinities once again were consistently below 30‰. Following aeration of the tanks to allow recirculation of ballast water in tanks that may have settled, salinities were measured above 30‰. After review of the Canadian Ballast Water Reporting Form provided by the Vessel Master, ABW approved deballasting in Milne Port.

In mid- and late August, both the Nordic Odin and the Nordic Oshima had similar circumstances where salinities were consistently measured below 30‰ in multiple tanks with redundant instrumentation. Following review of the ballast water exchange records it was confirmed that exchanges had occurred in accordance with the D-1 standard for both vessels. Following directions from Fednav, ballast water was remeasured following aeration of the tanks and salinities were confirmed to be above 30‰ and vessels were allowed to discharge in Milne Port.

Due to the three (3) occasions of the ships measuring below 30‰ despite being compliant with the D-1 standard (though two of these also had D-2 ballast water treatment systems), as well as low values measured in other vessels, a review was performed to determine the potential cause. It was subsequently determined that instrument error was unlikely at fault due to the frequent calibrations and daily test readings performed as well as consistently similar values being measured across multiple instruments. It was determined possible that the low salinity readings were related to the locations where ballast water exchange occurred prior to the ships entering Canadian waters. Ballast exchange frequently occurred in waters south of Greenland, where in 2019, an unprecedentedly large-scale melting of the ice sheet occurred during a heatwave, peaking during late-July and early August (DMI et al., 2018), which resulted in appreciably high levels of freshwater runoff to the surrounding ocean and likely leading to notably lower salinity levels in surface waters in this area. A review of the ore carriers' ballast water records indicated that vessels completed their exchange in waters likely influenced by the ice sheet melting and where salinities in the range of 29‰ were documented (Ocean Navigator, 2020). It was also determined possible that stratification may have occurred within the ballast tanks, particularly for vessels subject to longer hold times in Baffin Bay prior to entering the RSA, thus mixing of ballast water in the tanks through aeration methods was recommended prior to salinity sampling. In response, Baffinland's Shipping Department issued a recommendation to vessel masters to perform ballast water exchange south of 60°North to minimize any potential influence of freshwater run-off from Greenland, and to aerate and recirculate water in the ship's ballast tanks to ensure uniformity in the ballast water tank.

**Table 4.28: 2019 Ship Ballast Water Salinity Test Results Prior to Discharge in Milne Port**

Vessel	Date	Salinity (‰)	Tank Tested
Nordic Odin Voy 1 <sup>D-2</sup>	July 18, 2019	33.6	Cargo Hold no. 4
Nordic Oasis Voy 1	July 18, 2019	33.8	Cargo Hold no. 4
NS Yakutia Voy 1 <sup>D-2</sup>	July 21, 2019	34.2	Cargo Hold no. 4
NS Energy Voy 1 <sup>D-2</sup>	July 21, 2019	33.2	Cargo Hold no. 4
Sagar Samrat Voy 1	July 23, 2019	34.2	Cargo Hold no. 4
Nordic Oshima Voy 1 <sup>D-2</sup>	July 23, 2019	34.0	Cargo Hold no. 4
Nordic Odyssey Voy 1	July 23, 2019	34.5	Cargo Hold no. 4
Nordic Olympic Voy 1 <sup>D-2</sup>	July 25, 2019	30.9	Cargo Hold no. 4
Golden Strength Voy 1 <sup>D-2</sup>	July 24, 2019	31.4	4 Port Side
Golden Ruby Voy 1 <sup>D-2</sup>	July 26, 2019	31.2	3 Port Side
Bulk Destiny Voy 1	July 28, 2019	29.3 *	Cargo Hold no.3

Vessel	Date	Salinity (‰)	Tank Tested
Nordic Orion Voy 1	July 29, 2019	31.7	Cargo Hold no. 4
MS Arkadia Voy 1 <sup>D-2</sup>	July 30, 2019	30.4	4 Port Side
Elena Ve Voy 1	July 31, 2019	30.4	1 Port Side
Gebe Oldendorff Voy 1	August 2, 2019	32.8	Starboard Manhole no. 2
Golden Amber Voy 1	August 2, 2019	34.5	Port Side Manhole no.3
Despina V Voy 1	August 4, 2019	33.4	Port Side Manhole no.4
Golden Suek Voy 1	August 4, 2019	33.0	Port Side Manhole no.4
Golden Pearl Voy 1	August 6, 2019	30.1**	Starboard Side Manhole no.2
Golden Brilliant Voy 1	August 6, 2019	32.0	Port Side Manhole no.2
Pabur Voy 1	August 7, 2019	37.1	Starboard Manhole no.4
Flag Mette Voy 1	August 8, 2019	34.2	Starboard Side Manhole no.2
Patricia V Voy 1	August 9, 2019	38.2	Port Side Manhole no.3
Golden Saguenay Voy 1	August 10, 2010	34.2	Starboard Side Manhole no.3
Georg Oldendorff Voy 1	August 11, 2019	34.3	Port Side Manhole no.2
Golden Opal Voy 1 <sup>D-2</sup>	August 12, 2019	34.6	Port Side Manhole no.4
Golden Diamond Voy 1	August 13, 2019	32.1	Starboard Side Manhole no.4
Golden Opportunity Voy 1	August 13, 2019	32.9	Starboard Side Manhole no.2
Golden Ice Voy 1	August 15, 2019	31.2	Port Side Manhole no.4
NS Energy Voy 2 <sup>D-2</sup>	August 15, 2019	31.1	Starboard Side Manhole no.4
Nordic Odin Voy 2 <sup>D-2</sup>	August 16, 2019	30.4**	Port Side Manhole no.1
Bulk Endurance Voy 1	August 16, 2019	30.7	Port Side Sounding Pipe no.4
Gisela Oldendorff Voy 1	August 17, 2019	31.5	Cargo Hold no.4
Kumpula Voy 1	August 18, 2019	30.0	Starboard Side Manhole no.2
Nordic Oasis Voy 2	August 20, 2019	33.5	Starboard Side Manhole no.2
Golden Enterprise Voy 1	August 21, 2019	32.4	Port Side Manhole no.4
NS Yakutia Voy 2 <sup>D-2</sup>	August 22, 2019	31.8	Starboard Side Manhole no.4
Golden Bull Voy 1	August 24, 2019	31.8	Port Side Manhole no.4
Sagar Samrat Voy 2	August 25, 2019	31.0	Cargo Hold no.4
AM Buchanan Voy 1	August 25, 2019	31.1	2 Port Side
Sea Neptune Voy 1	August 26, 2019	30.4	Port Side Manhole no.4
Nordic Oshima Voy 2 <sup>D-2</sup>	August 28, 2019	33.2**	Port Side Manhole no.2
Nordic Odyssey Voy 2	August 28, 2019	34.3	Port Side Cargo Hold no.4
Nordic Olympic Voy 2 <sup>D-2</sup>	August 29, 2019	34.3	Port Side Manhole no.5/6
Gebe Oldendorff Voy 2	August 30, 2019	34.2	Starboard Side Manhole no.2
Golden Ruby Voy 2 <sup>D-2</sup>	August 31, 2019	34.0	Port Side Manhole no.5
Pabal Voy 1	September 1, 2019	34.4	Port Side Manhole no.2
Nordic Orion Voy 2	September 2, 2019	33.2	Starboard Side Manhole no.4
AM Buchanan Voy 2	September 3, 2019	33.2	Port Side Cargo Hold no.5

Vessel	Date	Salinity (‰)	Tank Tested
Bulk Destiny Voy 2	September 4, 2019	32.6	Port Side Manhole no.1
Golden Strength Voy 2 <sup>D-2</sup>	September 5, 2019	30.7	Starboard Side Manhole no.5
MS Arkadia Voy 2 <sup>D-2</sup>	September 6, 2019	30.7	Starboard Side Manhole no.5
Elena Ve Voy 2	September 7, 2019	35.1	Port Side Manhole no.2
Golden Amber Voy 2	September 8, 2019	34.2	Port Side Manhole no.4
AM Hamburg Voy 1	September 9, 2019	34.4	Port Side Manhole no.4
Despina V Voy 2	September 10, 2019	34.2	Starboard Side Manhole no.4
Patricia V Voy 2	September 11, 2019	35.5	Port Side Manhole no.4
Golden Pearl Voy 2	September 12, 2019	32.5	Starboard Side Manhole no.4
Kai Oldendorff Voy 1	September 16, 2019	31.6	Starboard Side Manhole no.4
Sea Orpheus Voy 1	September 17, 2019	32.1	Starboard Side Manhole no.4
Gisela Oldendorff Voy 2	September 19, 2019	32.8	Cargo Hold no.4
Golden Suek Voy 2	September 21, 2019	32.5	4 Port Side
Golden Brilliant Voy 2	September 22, 2019	31.9	4 Port Side
Flag Mette Voy 2	September 23, 2019	31.1	4 Port Side
Golden Saguenay Voy 2	September 24, 2019	30.6	WBST#4
Golden Opal Voy 2 <sup>D-2</sup>	September 25, 2019	33.0	WBST#4
Golden Diamond Voy 2	September 27, 2019	33.8	WBST#4
Bulk Endurance Voy 2	September 28, 2019	35.4	WBT No.4 Port
Kumpula Voy 2	September 29, 2019	33.7	WBT No. 4 STBD
Golden Opportunity Voy 2	October 1, 2019	30.6	WBT No.3 Port
Golden Ice Voy 2	October 2, 2019	33.4	WBT No. 3 STBD
Golden Bull Voy 2	October 3, 2019	31.3	WBT No.3 Port
NS Yakutia Voy 3 <sup>D-2</sup>	October 4, 2019	31.4	WBT No. 4 Port
Nordic Oshima Voy 3 <sup>D-2</sup>	October 5, 2019	33.1	WBT No. 3 STBD
NS Energy Voy 3 <sup>D-2</sup>	October 6, 2019	32.9	WBT No.3 Port
Sagar Samrat Voy 3	October 7, 2019	33.6	WBT No. 7 STBD
Nordic Odin Voy 3 <sup>D-2</sup>	October 8, 2019	30.5	WBT No. 2/3 Port
Nordic Oasis Voy 3	October 9, 2019	30.6	Cargo Hold no.4
MS Arkadia Voy 3 <sup>D-2</sup>	October 10, 2019	31.4	WBST#3
Nordic Orion Voy 3	October 13, 2019	30.8	Cargo Hold no.4
Nordic Odyssey Voy 3	October 16, 2019	33.5	Cargo Hold no.4
Nordic Olympic Voy 3 <sup>D-2</sup>	October 17, 2019	32.2	5 Port Side

\* Bulk Destiny originated from a port within Canadian waters and was not required to exchange prior to arrival at Milne Port under the D-1 standard

\*\* Golden Pearl, Nordic Odin and Nordic Oshima initially had measurements below 30‰, all records of ballast water exchange were reviewed by the Port Captain and exchange was confirmed to have occurred in compliance with the D-1 standard. The latter two vessels also treated water prior to discharge. Compliant measurements were attained following mixing through aeration of the ballast tanks.

<sup>D-2</sup> Vessels that called to Milne Port that had an IMO-approved ballast water treatment system installed, and that undertook both ballast water exchange and treatment in the RSA prior to releasing ballast water with the exception of the Golden Ruby on its first call to Milne Port (26 July 2019) in which only treatment was conducted (noting this vessel conducted both exchange and treatment on its second call to Milne Port on 31 August 2019).

## TRENDS

All ships arriving at Milne Port in 2019 were compliant with the D-1 standard of the BWM Convention. Lower salinity levels measured in the ballast tanks may have been related to the exchange location outside of Canadian waters and associated influence of freshwater input from the melting ice sheet in Greenland, and/or reflective of water stratification occurring in ballast tanks following an extended drifting period in Baffin Bay following exchange (as vessels wait to enter RSA).

Actions implemented to date based on compliance monitoring data indicate that the current ballast water management measures, as outlined in Baffinland's Ballast Water Management Plan, are shown to be effective in protecting the marine environment.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to implement and, as necessary, update the Ballast Water Management Plan (BWMP) to maintain compliance with Canadian and international ballast water regulations. With Canada's ratification of the International Convention for the Control and Management of Ships' Ballast Water and Sediments (IMO, 2017) that entered into force on September 8, 2017 (IMO, 2017), ships are now required to incorporate an on-board ballast water treatment system to meet D-2 performance standards and further reduce the potential for invasive species introductions. Newly built ships must now meet the D-2 standard, while the requirements for existing ships will be implemented over a phased period up to 2024 in coordination with the renewal of each ship's International Oil Pollution Prevention Certificate (IOPPC). Until then, all ore carriers will continue ballast water exchange outside the Canadian Exclusive Economic Zone (EEZ). Baffinland has updated its BWMP to reflect this new legislation. Importantly, nine of the vessels calling to Milne Port in 2019 (representing 21 of the 82 carrier voyages that year) had approved D-2 treatment systems installed onboard. All of these vessels completed both exchange and treatment prior to discharge with the exception of one vessel voyage (Golder Ruby, 26 July 2019) where only treatment was completed prior to release of ballast water.

It is recommended that recent ice melt activity in Greenland and its influence on local/regional ocean salinity be considered when selecting ballast exchange locations, interpreting ballast water compliance data, and determining responsive actions following non compliance events - specifically when salinity testing results at Milne Port are inconsistent with the ship's ballast water management and monitoring records. It is also recommended that vessels exchange ballast, when possible, south of 60° North to avoid potential influences of significant Greenland ice melt on ballast water salinity and that ballast tanks be mixed through aeration prior to sampling. Baffinland will also be requesting that all ore carriers calling to Milne Port perform both ballast water exchange (D-1 standard) and treatment (D-2 standard) when their IMO-approved treatment systems are installed.

## Project Certificate Condition No. 90

Category	Marine Environment - Ballast Water
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent impacts to marine water quality resulting from ballast water exchange.
Term or Condition	The Proponent shall incorporate into its Shipping and Marine Mammal Management Plan provisions to achieve compliance with the requirements under the International Convention for the Control and Management of Ship's Ballast Water and Sediment (2004) or its replacement and as implemented by the Canadian Ballast Water and Control Regulations as may be amended from time to time.
Relevant Baffinland Commitment	57
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Transport Canada, Marine Environment Working Group (MEWG)
Reference	Ballast Water Management Plan (Baffinland, 2019h) Shipping and Marine Wildlife Management Plan (Baffinland, 2016e) Ballast Water Control and Management Regulations (SOR/2011-237). Government of Canada. Last amended in 2017-02-13 (Transport Canada 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Baffinland's stand-alone Ballast Water Management Plan (BWMP; Baffinland, 2019h), which is one component of Baffinland's overall Shipping and Marine Wildlife Management Plan (Baffinland, 2016e) describes Baffinland's commitment and steps taken to verify that vessels calling at Milne Port meet the legal requirements around ballast water management, including IMO Ballast Water Convention Regulation D-1, and Section 6(1) of the Canadian Ballast Water Control and Management Regulations under the *Canada Shipping Act* (SOR/2011-237; Transport Canada, 2020). The Milne Port BWMP includes voluntary on-board inspection of ship logs by a Baffinland representative to re-confirm mid-ocean ballast water exchange has occurred, and on-board testing of ballast water in a single random tank for each ship calling at Milne Port to verify that it meets the regulation for salinity (at least 30 ppt) prior to discharge Baffinland has implemented these procedures, which exceed federally-mandated regulations, to further mitigate potential impacts from Project-related activities.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to implement and, as necessary, update the BWMP to maintain compliance with Canadian and international regulations. With Canada's ratification of the International Convention for the Control and



Management of Ships' Ballast Water and Sediments (IMO, 2017) that entered into force on September 8, 2017, ships are now required to incorporate on-board ballast water treatment to meet D-2 performance standards. Newly built ships must immediately meet the D-2 standard, while requirements for existing ships will be phased over a period up to 2024 in coordination with the renewal of each ship's IOPPC. Until then, all ships will continue ballast water exchange outside the Canadian EEZ.

In 2019, nine (9) of the forty-one (41) ore carriers that serviced Milne Port had IMO-approved D-2 ballast water treatment systems installed onboard. This included the Nordic Olympic, Nordic Oshima, Nordic Odin, NS Energy, NS Yakutia, Golden Strength, Golden Opal, Golden Ruby and Arkadia. As most of these vessels conducted repeat voyages to Milne Port during the 2019 shipping season, this resulted in 23 of the 82 ore carrier voyages having completed both ballast water exchange and treatment methods prior to releasing their ballast water in the RSA (i.e., representing 28% of all ore carriers that called to Port in 2019).



## Project Certificate Condition No. 91

Category	Marine Environment - Ballast Water
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent impacts to marine water quality in Steensby Inlet and Milne Inlet.
Term or Condition	The Proponent shall develop a detailed monitoring plan for Steensby Inlet and Milne Inlet for fouling that complies with all applicable regulatory requirements and guidelines as issued by Transport Canada, and includes sampling areas on ships where antifouling treatment is not applied such as the areas where non-native species are most likely to occur.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Transport Canada, Marine Environmental Working Group (MEWG)
Reference	Draft 2019 MEEMP and AIS Monitoring Report (Golder, 2020a) Shipping and Marine Wildlife Management Plan (SMWMP; Baffinland, 2016e)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Baffinland has implemented a monitoring program and mitigation measures that meet, and exceed, regulatory requirements issued by Transport Canada. Mitigation for hull fouling is implemented for all vessels calling on Milne Inlet and for all international vessels. As outlined in the SMWMP (Baffinland, 2016e), in order to reduce or eliminate the risk of invasive aquatic species and pathogens being introduced into Canadian waters as a result of ship hull biofouling, an anti-fouling coating will be applied to the hulls of all Project vessels that will arrive and depart from Milne Port. The anti-fouling coating used 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 commissioned for operations will exceed 400 gross tonnes and will be undertaking international voyages, these vessels will require an international anti-fouling system certification. Baffinland is committed to ensuring all vessels procured for the Project meet 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.

To specifically address the monitoring requirement outlined in PC Condition No. 91, Baffinland developed a detailed ship full biofouling monitoring plan in 2018 as part of its MEEMP and AIS Monitoring Program (Golder, 2020a). 2019 represented the second consecutive year of biofouling monitoring at Milne Port. The program consists of conducting underwater video surveys of the hulls of a subset of ore carriers berthed at the ore dock using an ROV-based underwater video system. In 2018, the underwater video system consisted of a standard resolution camera (NTSC standard definition with 3x optical zoom) mounted on a lightweight Seamor Chinook 300F industrial-grade inspection ROV equipped with spotlights, integrated pressure/depth sensor and magnetic compass. In 2019, to address previous limitations in identifying species from video footage, the video camera was replaced with a high-resolution video camera (1080p.) and improved lighting system. The video cameras on the ROV were connected via umbilical cable to a video monitor set-up on the deck of the field vessel, where video data was recorded on an external hard drive. The ROV was operated by a trained, subcontracted ROV technician using manual and automatic thruster, tilt, pitch and heading controls built into a top-side deck-mounted control box.

Surveys were conducted along the hulls of the ore carriers, interspaced to cover a representative range of depths along the submerged hulls. Much of the effort was focused on areas of the hull where biofouling was most likely to occur (e.g., chain lockers, bulbous bow and stem, sea-chain grating, stern tube, rope guard, propeller nose cone and blades, rudder side, bottom, leading and trailing edges). The collected video recordings were later examined by qualified marine biologists to identify potential biofouling species to the lowest practical taxonomic level.

As outlined in the update for PC Conditions No. 76 and 87, in addition to ship hull monitoring, multi-trophic AIS monitoring (zooplankton, macroflora, benthic epifauna and infauna, fish and encrusting epifauna) has been conducted every summer in Milne Port and at Ragged Island (2019 inclusive) since 2014. AIS surveys conducted as part of the MEEMP are designed to detect potential AIS introductions primarily from ship ballast water releases but also from ship fouling.

## RESULTS

As shown in Table 4.29, a total of six (6) ROV surveys were conducted alongside five (5) ore carriers docked in Milne Port between August 22 and 26, 2019 (this included the *NS Yakutia*, *Golder Enterprise*, *Sagar Samrat*, *Golder Bull* and the *Nordic Oasis*). A total of 113 minutes of video footage was collected of these ship hulls. Survey lengths were shorter in 2019 compared to 2018 and were primarily concentrated on the stern sections of the vessels focussing on areas where biofouling had been observed in previous surveys. The video was subsequently analyzed by an experienced marine biologist to assess the presence or absence of AIS on the ship hulls, and provide taxonomic identification when possible.

*NS Yakutia* had no visible signs of biofouling along the bow and stern sections surveyed. Other surveyed vessels showed some degree of biofouling in certain locations of the ship. The *Nordic Oasis* had a limited (<2 m<sup>2</sup>) patch of biofouling barnacles on its stern hull at -4.9 m depth. The encrusting barnacles could only be identified to the Suborder Balanomorpha. The *Golden Bull* had small traces of encrusting barnacles on its rudder at -8.3 m. The *Golden Enterprise* had several large patches of encrusting barnacles (Balanomorpha indet.) on its rudder and hull at -1.2 m to -3.2 m depth. Another biofouling organism was observed at -1.2 m deep but could not be positively identified.

The *Sagar Samrat* had encrusting barnacles in its water intake port and on its stern at -0.9 m to -1.2 m depth. This vessel also contained some small unidentifiable debris in a hole located on the stern of the ship at -1.3 m depth.

Overall, the taxonomic resolution of biofouling organisms did not improve in the second year of monitoring, despite the inclusion of a high-resolution camera and better lighting system. Many taxa were not resolved to species level due to the difficulty of identification of encrusting taxa without a specimen. Due to the location of the ship where biofouling was observed, specimen collection was not possible.

**Table 4.29: Ship Hull Biofouling Monitoring Effort in 2019**

Date	Carrier	Location of Survey	Maximum Depth (m)	Survey Effort (min:sec)	Evidence of Biofouling
22 August	<i>Nordic Oasis</i>	Stern section	-13.6	12:09	Barnacles observed on dock side of hull
22 August	<i>Golden Enterprise</i>	Stern section	-6.5	24:35	Barnacles observed on rudder and hull; Unidentified biofouling organism observed on hull
24 August	<i>NS Yakutia</i>	Bow section	-5.3	13:24	No signs of biofouling
		Stern section	-5.6	22:54	No signs of biofouling
25 August	<i>Golden Bull</i>	Stern section	-10.1	27:10	Barnacles observed on hull
26 August	<i>Sagar Samrat</i>	Stern section	-2.7	13:14	Barnacles observed in the water intake port

No non-indigenous or invasive zooplankton, benthic epifauna, macroflora or fish taxa were identified during the 2019 AIS Monitoring Program. The status of five (5) of the newly identified benthic infauna species is presently being evaluated. Based on a review of the literature, the initial identification indicated the taxa were either flagged as invasive species to Canadian Arctic waters or did not have described ranges that included the Canadian Arctic. These specimens were all sent for independent verification at Philippe Archambault's Benthic Ecology Lab (Université Laval, Quebec).

A summary of the flagged taxa and the status of the independent verifications is as follows:

- New taxa observations included a spionid polychaete identified as *Marenzelleria viridis*, confirmed via independent verification. This species is listed in the Global Database and the National Risk Assessment as a species of concern for Canadian and Arctic waters, with a primary invasion vector through ballast water (Molnar et al., 2008; Casas-Monroy et al., 2014). However, specimen collection records for *M. viridis*, and under the superseded name *Scolecoplepides viridis* indicate historical occurrences outside the documented natural range in the North Atlantic and Arctic Oceans, including the Canadian Arctic and Baffin Island (Cusson, 2018; GBIF, 2020; Miller et al., 2014). Further review of collection records around Baffin Island is needed to determine if this species is a recent invader in Milne Port.

- A sabellid polychaete worm was tentatively identified as *Pseudofabricia* sp. nr. *aberrans*. This taxon was also identified in 2018 and sent for independent review due to the defined range for this species being limited to the Mediterranean Sea (Giangrande and Cantone, 1990; WoRMS, 2020). *P. aberrans* is not considered an invasive species or a species of concern in Canadian or Arctic waters (Molnar et al., 2008; Casas-Monroy et al., 2014). A tentative alternative identification of *Manayunkia aesturiana* was assigned in 2018 (Golder, 2019a), although the identification was uncertain. Specimens from 2019 samples were again sent to Laval for independent verification. Laval identified the specimens as *Fabricia sabella*, an unaccepted name for *Fabricia stellaris*. Neither *F. sabella* nor *F. stellaris* have been identified in previous surveys at Milne Port, but both have documented distributions that include the Canadian Arctic, with specimen collections made at Baffin Island. This taxon was not considered AIS, further review is required to determine NIS status.
- A terebellid polychaete worm was identified in 2019 samples that was similar to the description for *Sosane wireni*, a species with a taxonomic description limited to New England. Samples were classified as *Sosane* sp. nr. *wireni*, and are currently pending independent verification. *S. wireni* is not considered an invasive species or a species of concern in Canadian or Arctic waters (Molnar et al., 2008; Casas-Monroy et al., 2014) and specimen collection records exist for this species, and under the superseded name *Sosanopsis wireni*, in Scandinavian waters, Western Greenland and the Laptev Sea. This taxon was not considered AIS in Arctic waters, but further review is required to determine NIS status.
- An unknown species of gammarid amphipod was identified from the *Monocorophium* genus in 2019 benthic infauna samples. No species within this genus have known distributions that include Arctic waters, and three species within this genus (*M. insidiosum*, *M. acherusicum* and *M. sextonae*) are considered invasive (Molnar et al., 2008). These specimens are currently pending independent verification. Independent verification of the genus, and resolving the identification to species level, are required to make a determination of NIS or AIS status.
- A bryozoan was identified as an indeterminate species from the genus *Oncousoecia*. There are no recent specimen collections in Arctic waters and species within this genus with described ranges that include Arctic waters are limited to the European Arctic, the Barents Sea and Svalbard (WoRMS, 2020). No species within the genus *Oncousoecia* are listed on any of the available databases on invasive species or species of concern. These specimens are pending for independent verification. Independent verification of the genus and resolving of the identification to species level is required to make a determination of NIS or AIS status.

## TRENDS

Consistent with hull surveys conducted in 2018, the underwater video ship hull surveys of the five ore carriers showed that most of the hull areas inspected were free of biofouling with the exception of some areas on the sterns where some level of colonization by aquatic organisms was present. Biofouling taxa included barnacles (unidentifiable to species) and an indeterminate biofouling taxa.

Five years of AIS monitoring has yielded a relatively large dataset of marine organisms residing in Milne Port and Milne Inlet. Based on the level of AIS monitoring completed to date, several organisms have been flagged as potential NIS/AIS organisms in Milne Port, demonstrating that the AIS Monitoring Program is working well as a surveillance-based monitoring program for early detection of NIS/AIS. Further investigations into the status of these newly identified species are in progress in consultation with DFO, with representative specimens sent to a second laboratory for confirmatory taxonomic analysis. Additional years of AIS monitoring will provide for a more

comprehensive AIS database to serve as a basis for determining whether changes are occurring as a result of Project-related activities.

#### **RECOMMENDATIONS / LESSONS LEARNED**

Consistent with the intent of Condition No. 91 for developing and implementing a detailed monitoring plan for Milne Inlet for biofouling, Baffinland has implemented as part of its annual MEEMP and AIS Program a sampling component that seeks to identify the potential presence of non-native species on ship hulls based on concerns of where fouling is most likely to occur. In 2019, Baffinland modified its biofouling monitoring plan based on some of the limitations identified through earlier implementation. Specifically, due to the limits of identification using solely the video footage, with no sample collection possible given the location and depth of the observed biofouling, identification to species or genus level was not possible. Based on MEWG recommendations provided during the fall of 2018, a higher definition video camera and improved lighting system was incorporated into the ROV-based program to aid in taxonomic identification of biofouling taxa. However, due to cryptic identifying features in many taxa, resolution of taxonomic identifications to the species level was not possible without collection of a physical specimen. Despite the notable improvement in video quality in 2019, further resolution of the biofouling taxa was not achieved. If identifications are to be made to the species level, physical specimens must be collected and sent for identification. Due to the locations and depths of observed biofouling, as well as safety considerations in an active port, physical collection is not currently possible.

Baffinland will thus continue to monitor potential risks associated with ship biofouling with the use of a ROV with a high definition camera and will seek to obtain the best available technology on a yearly basis.

Baffinland wishes to emphasize that current ship hull biofouling monitoring by Baffinland remains a voluntary measure that exceeds federal (Transport Canada) and international (IMO) guidelines for the control and management of biofouling. To our best knowledge, Milne Port is the only marine port in Canadian Waters that currently undertakes annual ship hull biofouling monitoring as part of its operations. Baffinland remains committed to conducting ship hull biofouling monitoring surveys on a yearly basis using the best available technology for remote data collection. The projected number of ore carriers that will be sampled annually will be determined in consultation with the MEWG.

## Project Certificate Condition No. 92

Category	Marine Environment - Spill Prevention
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure adequate spill response capacity.
Term or Condition	The Proponent shall ensure that it maintains the necessary equipment and trained personnel to respond to all sizes of potential spills associated with the Project in a self-sufficient manner.
Relevant Baffinland Commitment	10, 108, 110
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	Emergency Response Plan (Baffinland, 2018c) Spill Contingency Plan (Baffinland, 2018d) Oil Pollution Emergency Plan – Milne Inlet (Baffinland, 2020m) Spill at Sea Response Plan (Baffinland, 2015b)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Baffinland has developed and maintained appropriate contingency plans to respond to spills on land, at the port, and at sea. The plans outline the equipment to be used in the event of a spill, as well as the roles and responsibilities and training necessary to maintain appropriately trained personnel. Oil Pollution Emergency Response training and spill response exercises are conducted annually. Timing of the training corresponds with ship-to-shore fuel transfer events at Milne Port. In 2019, training of Baffinland staff on its Oil Pollution Emergency Plan (OPEP) was conducted by spill response consultant Navenco Marine between July 12 to 21, 2019. The training encompassed classroom and hands-on spill response techniques including a mock exercise for potential port oil spills during ship-to-shore transfer. The training also included an audit inspection to confirm that Baffinland's spill response equipment and training requirements were in compliance with the OPEP and Transport Canada regulations for Baffinland's Class 2 Oil Handling Facility. General land-based spill response training is periodically reviewed with the Mine Rescue Team; however, this does not apply to the OPEP. Baffinland also maintains a contract with Oil Spill Response Ltd. (OSRL) for emergency response in the event of a marine spill.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Annual spill response training will be continued prior to the arrival of fuel vessels and unloading of fuels.

## Project Certificate Condition No. 93

Category	Marine Environment - Spill Prevention
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent impacts to the marine environment at Steensby Inlet.
Term or Condition	Prior to construction, based on vessel selection and if so required, the Proponent shall reassess the risk analysis of using vessel-based fuel storage, including the potential environmental impacts of containment failure under a range of winter ice conditions, how a spill might spread and the impact of fuel if it does not volatilize to the atmosphere.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Not Applicable. The use of vessel-based fuel storage is not currently proposed.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 94

Category	Marine Environment - Spill Prevention
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To promote public awareness of Project activities.
Term or Condition	The Proponent shall consult directly with affected communities regarding its plans for over-wintering of fuel in Steensby Inlet, with discussion topics to include descriptions of the duration of proposed activities, vessel type, spill preparedness and emergency response protocols, environmental impact predictions and answers to community member questions.
Relevant Baffinland Commitment	106
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	Communities of Sanirajak and Igloodik
Reference	N/A
Ref. Document Link	N/A

### METHODS

Not Applicable in 2019. Overwintering of fuel in Steensby Inlet is not currently proposed.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

This condition will be re-visited if overwintering of fuel at Steensby Inlet is proposed.



## Project Certificate Condition No. 95

Category	Marine Environment - Spill Prevention
Responsible Parties	The Proponent, Transport Canada
Project Phase(s)	Construction
Objective	To prevent impacts to the marine environment at Steensby Inlet.
Term or Condition	The Proponent shall meet or exceed all regulatory regulations and requirements as apply to the practice of overwintering a fuel vessel at Steensby Inlet, with reporting to the NIRB and Transport Canada.
Relevant Baffinland Commitment	8
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Not Applicable in 2019. Overwintering of fuel in Steensby Inlet is not currently proposed.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

This condition will be re-visited if overwintering of fuel in Steensby Inlet is proposed.

## Project Certificate Condition No. 96

Category	Marine Environment - Spill Prevention
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To ensure adequate oversight of Project activities is occurring.
Term or Condition	The Proponent will update the NIRB on the results of all compliance monitoring and site inspections undertaken by government agencies for the overwintering of a fuel vessel in Steensby Inlet.
Relevant Baffinland Commitment	8
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Not applicable in 2019. Overwintering of fuel in Steensby Inlet is not currently proposed.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

This condition will be revisited if overwintering of fuel in Steensby Inlet is proposed.

## Project Certificate Condition No. 97

Category	Marine Environment - Spill Prevention
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent impacts to the marine environment along the shipping route.
Term or Condition	<p>Prior to the commercial shipping of iron ore, the Proponent shall conduct fuel spill dispersion modeling that will, at a minimum, consider:</p> <ul style="list-style-type: none"> <li>a. Modeling of oil spills for both the Northern and Southern Shipping Routes, in representative locations, identified by the Proponent, in consultation with the Marine Environment Working Group along both Shipping Routes, and including: <ul style="list-style-type: none"> <li>i. Pinch points;</li> <li>ii. The approaches into Steensby Inlet and Milne Inlet;</li> <li>iii. Shallow water and shorelines; and,</li> <li>iv. Areas that have been identified as having high flows and/or high concentrations of marine mammals, marine fish or seabirds.</li> </ul> </li> <li>b. Open water and, where applicable, ice-covered conditions</li> <li>c. Spill volumes up to and including loss of a full tanker cargo</li> <li>d. Differences in the quantity and properties of each type of bulk fuel transported by vessels when they are at, or in transit to, the ports at Steensby Inlet and Milne Inlet</li> </ul>
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Transport Canada Marine Safety. Canadian Coast Guard
Reference	<p>Milne Inlet Spill Modelling Report Fuel Spill Modelling: Northern Shipping Route Open Water Season – Milne Inlet, Eclipse Sound, Pond Inlet (AMEC Foster Wheeler, 2015)</p> <p>Spill at Sea Response Plan (Baffinland, 2015b)</p> <p>Emergency Response Plan (ERP; Baffinland, 2018c)</p>
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Revised oil spill modelling was conducted for shipping from Milne Port in 2015. Leading up to this modelling, a fuel spill preparedness workshop was held in April 2014 with Transport Canada and the Canadian Coast Guard. This workshop established the following credible spill scenarios for modelling:

- For arctic diesel - two (2) compartments of a double-hull, multi-compartment fuel tanker, which amounts to 4,000 m<sup>3</sup> (4 mL). The expected maximum size of the fuel tanker is 15 mL.
- For IFO - half of the IFO fuel remaining in the ship when sailing into Milne Inlet which amounts to 2,000 m<sup>3</sup> (2 mL) of IFO.

The spill assessment considered the open water season, and the month of September was selected as representative in terms of meteorological and oceanographic conditions. Five potential spill locations along the shipping route were selected considering community recommendations.

Two (2) scenarios were modelled at each of the five (5) locations using the software OST, which computes spill probability distributions to indicate geographical regions (e.g., Pond Inlet, Eclipse Sound, Navy Board Inlet and Milne Inlet) which might be affected as a result of a spill, how frequently and how soon.

In addition, ten (10) (two fuel types x five locations) simulations were run with a September 'P50' wind condition defined as the average wind speed conditions and the associated most frequent wind direction. Finally, a sensitivity run considering a full fuel tanker loss of 15 mL arctic diesel cargo at a location in Eclipse Sound was also prepared. For these scenarios, RPS ASA's OILMAP (RPS, 2014) was used to provide additional estimation of spill weathering and fate. This includes slick characteristics, estimate of fuel concentrations in the surface layer, amounts evaporated and that have reached shore, and remaining amounts of fuel, and fuel and water (mousse) volume. The spill modelling completed in this study assumes no intervention, response or containment and that the slick is assumed to freely discharge (during a very short duration) from the damaged vessel.

The OILMAP oil spill model and response system introduced above was used to provide additional estimates of spilled fuel fate, in particular, slick characteristics and weathering. OILMAP calculates the evaporation, dispersion and remaining percentage for a given spill scenario where the user defines a fuel product type, weather conditions, properties of the receiving water, and the amount of fuel released.

The fate or weathering processes considered were; evaporation, the conversion of liquid fuel into gaseous component; and natural dispersion, the breakup of a fuel slick into small droplets that are mixed into the sea by wave action. These are two important weathering processes that typically occur over the first five days following a spill and act to remove fuel from the sea surface. Fuel will also be brought to shore depending on the prevailing currents and winds at the time as well as the type and amount of fuel, and type of shoreline. Consideration of the amounts lost due to these processes yields an estimate of the remaining amount of fuel on the surface at any time. These are the key fates modeled and tracked by OILMAP. No containment or recovery of spilled fuel was assumed in the simulations.

## RESULTS

The modelling results from the 2015 report were presented in a series of figures showing expected spill trajectories after 1 day and 5 days. The spill model informed the development of Baffinland's Spill at Sea Response Plan (Baffinland, 2015b).

## TRENDS

Not applicable.

## RECOMMENDATIONS / LESSONS LEARNED

The spill modelling results highlight the importance of spill prevention, the Oil Pollution Prevention Plan and the Spill at Sea Response Plan preparedness to minimize any adverse effects in the unlikely event of a fuel release of any size during vessel traffic into Milne Inlet.

Management plans, including the Spill at Sea Response Plan (Baffinland, 2015b) and the Emergency Response Plan (Baffinland, 2018c) are being updated as part of the Phase 2 Proposal EIS regulatory process to incorporate the updated fuel spill dispersion modelling that was completed in support of the Phase 2 Proposal. Versions of the aforementioned management plans that are currently operational will remain in effect until anticipated approval of

the Phase 2 Proposal is received. The Oil Pollution Prevention Plan and Oil Pollution Emergency Plan (OPEP) for ship to shore fuel transfers at Milne Port are updated on an annual basis and approved by Transport Canada.

## Project Certificate Condition No. 98

Category	Marine Environment - Spill Prevention
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent impacts to the marine environment along the shipping route.
Term or Condition	The Proponent shall incorporate the results of revised fuel spill dispersion modeling into its impact predictions for the marine environment and its spill response and emergency preparedness plans.
Relevant Baffinland Commitment	11, 106
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Transport Canada Marine Safety, Canadian Coast Guard
Reference	Milne Inlet Spill Modelling Report Fuel Spill Modelling: Northern Shipping Route Open Water Season – Milne Inlet, Eclipse Sound, Pond Inlet (AMEC Foster Wheeler, 2015) Spill at Sea Response Plan (Baffinland, 2015b) Emergency Response Plan (ERP; Baffinland, 2018c)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Revised oil spill modelling was conducted for shipping from Milne Port in 2015. Leading up to this modelling, a fuel spill preparedness workshop was held in April 2014 with Transport Canada and the Canadian Coast Guard. This workshop established the following credible spill scenarios for modelling:

- For arctic diesel - two (2) compartments of a double-hull, multi-compartment fuel tanker, which amounts to 4,000 m<sup>3</sup> (4 mL). The expected maximum size of the fuel tanker is 15 mL.
- For IFO - half of the IFO fuel remaining in the ship when sailing into Milne Inlet which amounts to 2,000 m<sup>3</sup> (2 mL) of IFO.

The spill assessment considered the open water season, and the month of September was selected as representative in terms of meteorological and oceanographic conditions. Five potential spill locations along the shipping route were selected considering community recommendations.

Two (2) scenarios were modelled at each of the five (5) locations using the software OST, which computes spill probability distributions to indicate geographical regions (e.g., Pond Inlet, Eclipse Sound, Navy Board Inlet and Milne Inlet) which might be affected as a result of a spill, how frequently and how soon.

In addition, ten (10) (two fuel types x five locations) simulations were run with a September 'P50' wind condition defined as the average wind speed conditions and the associated most frequent wind direction. Finally, a sensitivity run considering a full fuel tanker loss of 15 mL arctic diesel cargo at a location in Eclipse Sound was also prepared. For these scenarios, RPS ASA's OILMAP (RPS, 2014) was used to provide additional estimation of spill weathering and fate. This includes slick characteristics, estimate of fuel concentrations in the surface layer, amounts evaporated and that have reached shore, and remaining amounts of fuel, and fuel and water (mousse) volume. The spill

modelling completed in this study assumes no intervention, response or containment and that the slick is assumed to freely discharge (during a very short duration) from the damaged vessel.

The OILMAP oil spill model and response system introduced above was used to provide additional estimates of spilled fuel fate, in particular, slick characteristics and weathering. OILMAP calculates the evaporation, dispersion and remaining percentage for a given spill scenario where the user defines a fuel product type, weather conditions, properties of the receiving water, and the amount of fuel released.

The fate or weathering processes considered were evaporation, the conversion of liquid fuel into gaseous component, and natural dispersion, the breakup of a fuel slick into small droplets that are mixed into the sea by wave action. These are two important weathering processes that typically occur over the first five days following a spill and act to remove fuel from the sea surface. Fuel will also be brought to shore depending on the prevailing currents and winds at the time as well as the type and amount of fuel, and type of shoreline. Consideration of the amounts lost due to these processes yields an estimate of the remaining amount of fuel on the surface at any time. These are the key fates modeled and tracked by OILMAP. No containment or recovery of spilled fuel was assumed in the simulations.

## RESULTS

The modelling results from the 2015 report were presented in a series of figures showing expected spill trajectories after 1 day and 5 days. The spill model informed the development of Baffinland's Spill at Sea Response Plan (Baffinland, 2015b).

## TRENDS

Not applicable.

## RECOMMENDATIONS / LESSONS LEARNED

The spill modelling results highlight the importance of spill prevention, the Oil Pollution Prevention Plan and the Spill at Sea Response Plan preparedness to minimize any adverse effects in the unlikely event of a fuel release of any size during vessel traffic into Milne Inlet.

Management plans, including the Spill at Sea Response Plan (Baffinland, 2015b) and the Emergency Response Plan (Baffinland, 2018c) are being updated as part of the Phase 2 EIS regulatory process to incorporate the updated fuel spill dispersion modelling that was completed in support of the Phase 2 Proposal. Versions of the aforementioned management plans that are currently operational will remain in effect until anticipated approval of the Phase 2 Proposal is received. The Oil Pollution Prevention Plan and Oil Pollution Emergency Plan (OPEP) for ship to shore fuel transfers at Milne Port are updated on an annual basis and approved by Transport Canada.

#### 4.6.11 Marine Wildlife (PC Conditions 99 through 128)

Thirty-one (31) PC conditions (including 125 and 125a) relate to the potential effects of the Project on marine wildlife. These conditions require the collection of supplemental baseline data prior to the shipping of ore, provide direction on mitigation and monitoring programs to be included in Baffinland's Shipping and Marine Wildlife Management Plan (SMWMP; Baffinland 2016e), and identify shipping information to be communicated to potentially affected communities regarding shipping activities.

##### **Stakeholder Feedback**

Marine mammals have been and continue to be a key environmental issue with Baffinland's stakeholders. Stakeholders focused on the Project's potential effects to marine mammals includes local communities, the QIA, and agencies with jurisdictional responsibility for the marine environment: DFO, ECCC, Transport Canada and the Canadian Coast Guard. Baffinland continues to engage these groups through the MEWG and/or other regulatory reporting, as necessary. The communities expressed concerns during the FEIS and FEIS addendum environmental review process about potential impacts to marine mammals, mainly narwhal in Pond Inlet and walrus in Igloolik; community awareness of shipping activities; and the potential for the Project to impact potential fisheries resources in Steensby and Milne Inlets. Nunavik, represented by the Makivik Corporation, expressed concern over potential impacts of shipping on marine mammal populations in Hudson Strait.

The potential effects of increased shipping on marine mammals (particularly narwhal, seal, bowhead) continues to be vocalized during the various consultation activities completed in 2019 (Appendix B), including during the Marine Monitoring and Marine Mitigation Workshop organized by NIRB in May 2019 (NIRB, 2019a). Underwater noise from shipping and its potential impact on marine mammal migration and other disturbances (e.g., impacts to calving grounds, traditional shipping activities) has been consistently raised as key concerns during community consultation meetings and the community risk workshops completed as part of Phase 2 consultation efforts (ERM, 2019). Risks from oil spills and increasing presence of killer whales has also been mentioned. Limited concern was expressed for vessel strike impacts since these were considered unlikely given that marine mammals (narwhal) tend to move away when vessels transit through.

##### **Monitoring**

Baffinland implements a number of marine mammal monitoring programs. In 2019, marine environment monitoring programs undertaken by Baffinland included the following:

- Ship-based Observer Monitoring Program;
- Marine Mammal Aerial Surveys (Eclipse Sound and Admiralty Inlet);
- Bruce Head Shore-based Monitoring Program;
- Passive Acoustic Monitoring Program;
- Marine Environmental Effects Monitoring Program (water, sediment, invertebrates and fish) around the ore dock;
- Aquatic invasive species (AIS) Monitoring Program;
- Ore Dock Marine Fisheries Habitat Offset Monitoring Program; and
- Freight Dock Construction Environmental Monitoring

Three (3) underwater acoustic monitoring stations were deployed near Bruce Head in 2019 to document ambient underwater noise levels along the shipping corridor, monitor marine mammal presence, and to compare measured



(actual) ship noise levels to estimated ship noise levels determined through underwater noise modelling during open-water conditions. An additional two (2) stations were installed near Ragged Island and Bylot Island along the shipping corridor to assess underwater noise while icebreaking was carried out during early shoulder season conditions. Acoustic monitoring data collected throughout 2019 were within impact predictions from the FEIS (i.e., impacts from ship noise are limited to temporary and localized disturbance effects). Ship noise measures at all five recorder locations never exceeded the acoustic injury thresholds for marine mammals, for either permanent or temporary hearing threshold shift. Acoustic monitoring results suggested that shipping activities in 2019 had minimal influence, where the disturbance threshold of 120 db was rarely exceeded (i.e., less than 2% of the total recording period during the shoulder season, and no more than 3% during the open-water season). Acoustic monitoring results indicated that ambient noise (e.g., wind, waves) affected the listening range of narwhal at similar severity levels as vessel noise, and for similar or greater proportions of time as vessel noise.

Table 4.30 provides an evaluation of the Project's impacts on the marine environment, based on monitoring activities completed in 2019, relative to predictions presented in the FEIS and FEIS Addendum.

To the extent that Project impacts on marine mammals can be evaluated, the effects of the Project are within FEIS predictions.

**Table 4.30: Marine Mammals Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Ringed Seals, Bearded Seals, Walrus, Beluga Whales, Narwhal, Bowhead Whales, Polar Bear	Habitat change resulting from icebreaking and/or ice management of landfast ice	No project interactions to monitor in 2019	N/A
	Hearing impairment and/or damage caused by sound from construction activities	In-water construction in 2019	Effects within FEIS predictions
	Disturbance caused by airborne and/or underwater sound from construction, shipping and aircraft	Three (5) underwater acoustic monitoring stations deployed near Bruce Head in 2019, and an additional two (2) stations near Ragged Island and Bylot Island along the shipping corridor. Acoustic monitoring results demonstrated minimal impact on narwhal.	Effects within FEIS predictions
Narwhal	Masking of environmental sounds caused by vessel and construction sound	Five (5) underwater acoustic monitoring stations deployed near Bruce Head, Ragged Island and Bylot Island in 2019. Acoustic monitoring results demonstrated minimal impact on narwhal	Effects within FEIS predictions
Bowhead Whales	Mortality from collisions with vessels and blasting during construction	No collisions were noted by ship crew	Effects within FEIS predictions
Polar Bears	Mortality from human-bear interactions	Polar bear monitors look for polar bears entering camps and remote work areas. No polar bear incidents occurred in 2019.	Effects within FEIS predictions

**Path Forward**

Baffinland will remain vigilant about the mitigation and monitoring activities that are in place to protect marine mammals. Baffinland will continue to seek input and review monitoring results trends with all members of the MEWG. Reporting on each PC condition follows.

## Project Certificate Condition No. 99

Category	Marine Environment - Supplemental Baseline Assessments
Responsible Parties	The Proponent, Marine Environment Working Group
Project Phase(s)	Construction
Objective	To supplement baseline information and improve predictions for potential impacts to marine wildlife.
Term or Condition	<p>The Proponent, working with the Marine Environment Working Group, shall consider and identify priorities for conducting the following supplemental baseline assessments:</p> <ul style="list-style-type: none"> <li>a. Establish shipping season, inter-annual baseline in Steensby Inlet and Milne Inlet that enables effective monitoring of physical and chemical effects of ballast water releases, sewage outfall, and bottom scour by ship props, particularly downslope and downstream from the docks. This shall include the selection and identification of physical, chemical, and biological community/indicator components. The biological indicators shall include both pelagic and benthic species but with emphasis on relatively sedentary benthic species (e.g., sculpins).</li> <li>b. The collection of additional baseline data: <ul style="list-style-type: none"> <li>i. In Steensby Inlet on walrus, beluga, bearded seal anadromous Arctic Char abundance, distribution ecology and habitat use.</li> <li>ii. In Milne Inlet on narwhal, bowhead and anadromous Arctic Char abundance, distribution ecology and habitat use.</li> </ul> </li> <li>c. Enhance baseline data on marine wildlife (fish, invertebrates, birds, mammals, etc.) and to provide more details on species abundance and distribution found in the Project area. This shall include, but not be limited to the following: <ul style="list-style-type: none"> <li>i. Aerial surveys for basking ringed seals throughout the landfast ice of Steensby Inlet and at an appropriate control location</li> <li>ii. Shore-based observations of pre-Project narwhal and bowhead whale behavior in Milne Inlet that continues at an appropriate frequency throughout the Early Revenue Phase and for not less than three consecutive years</li> </ul> </li> <li>d. Enhance the baseline for affected freshwater systems, which includes control sites to detect Project-related changes before they cause significant harm.</li> </ul>
Relevant Baffinland Commitment	81
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	Marine Environmental Effects Monitoring Plan (MEEMP; Baffinland, 2016d)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

PC Condition No. 99 applies to the construction phase of the Project and completion of supplemental baseline assessments. The Project is currently in the Early Revenue Phase and supplemental baseline assessments are now complete (pre-2018) for Milne Inlet. Current efforts as part of post-construction monitoring (i.e., Operations phase) are focused on Environmental Effects Monitoring (EEM) using a number of different EEM programs that focus on

detection of potential Project effects on marine mammals and the marine environment. Detailed information on EEM study design and sampling methodology are available in Baffinland (2016d).

**RESULTS**

Not applicable.

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Planning for any supplemental baseline data collection in Steensby Inlet area will resume in advance of future construction activities. Baffinland will work with the Marine Environment Working Group and will seek advice for identifying priorities for completing supplemental baseline assessments that are specific to Steensby Inlet area and relevant to subsequent potential Project-related effects monitoring.

## Project Certificate Condition No. 100

Category	Marine Environment - Supplemental Baseline Assessments
Responsible Parties	The Proponent, Marine Environment Working Group
Project Phase(s)	Construction
Objective	To supplement baseline information and improve predictions for potential impacts to marine wildlife.
Term or Condition	The Proponent shall update its Shipping and Marine Wildlife Management Plan, to include avoidance of polynyas and mitigation measures designed for potential fuel spills along the shipping lane during the winter months, with consideration for the impact of spilled fuel on marine mammals when they might be less mobile or able to avoid contact with spilt fuel or fumes.
Relevant Baffinland Commitment	57
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	Shipping and Marine Wildlife Management Plan (Baffinland, 2016e)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Not applicable in 2019 as this pertains to Construction phase. Furthermore, there is currently no winter shipping occurring as part of the Mary River Project so there is no need to address fuel spills during winter months in the Shipping and Marine Wildlife Management Plan.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable in 2019. Baffinland will update the Shipping and Marine Wildlife Management Plan prior to any winter shipping. Furthermore, this condition is relevant only to the Construction phases of the project.

## Project Certificate Condition No. 101

Category	Marine Environment - Monitoring
Responsible Parties	The Proponent, Marine Environment Working Group
Project Phase(s)	Construction and Operations
Objective	To monitor for potential impacts to marine wildlife and marine habitat.
Term or Condition	<p>The Proponent shall incorporate into the appropriate monitoring plans the following items:</p> <ul style="list-style-type: none"> <li>a. A monitoring program that focuses on walrus use of Steensby Inlet and their reaction to disturbance from construction activities, aircraft, and vessels;</li> <li>b. Efforts to involve Inuit in monitoring studies at all levels;</li> <li>c. Monitoring protocols that are responsive to Inuit concerns;</li> <li>d. Marine monitoring protocols are to consider the use of additional detecting devices to ensure adequate monitoring through changing seasonal conditions and daylight;</li> <li>e. Schedule for periodic aerial surveys as recommended by the Marine Environment Working Group;</li> <li>f. Periodic aerial surveys for basking ringed seals throughout the landfast ice of Steensby Inlet, and a suitable control location. Surveys shall be conducted at an appropriate frequency to detect change inter-annual variability;</li> <li>g. Shore-based observations of pre-Project narwhal behavior in Milne Inlet, that continues at an appropriate frequency throughout the Early Revenue Phase (not less than three years); and</li> <li>h. Conduct landfast ice monitoring for the duration of the Project Operations phase, which will include: <ul style="list-style-type: none"> <li>i. The number of ship transits that are able to use the same track; and,</li> <li>ii. The area of landfast ice disrupted annually by ship traffic.</li> <li>iii. Monitoring strategy focused on assessing and mitigating interaction between humans and wildlife at the port site(s).</li> </ul> </li> </ul>
Relevant Baffinland Commitment	Not Applicable
Reporting Requirement	To be provided in the Annual Report to the NIRB.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG), Nunavut Impact Review Board
Reference	<p>2019 Milne Ore Dock Fish Offset Monitoring Report (Golder, 2019g)</p> <p>2019 Marine Environment Monitoring — Field Program Summary (Golder, 2019h)</p> <p>Draft 2019 MEEMP and AIS Monitoring Report (Golder, 2020a)</p> <p>Technical Memorandum: 2019 Marine Mammal Monitoring Programs — Updated Preliminary Results (Golder, 2020e)</p> <p>Draft 2019 Ship-based Observer (SBO) Monitoring Report (Golder, 2020f)</p> <p>Draft 2019 Marine Mammal Aerial Survey Report (Golder, 2020g)</p> <p>Draft 2017–2018 Integrated Narwhal Tagging Study Report (Golder, 2020h)</p> <p>Draft Bruce Head Shore-based Monitoring Report (Golder, 2020c)</p> <p>Draft 2019 Passive Acoustic Monitoring Report (Frouin-Mouy et al., 2020)</p> <p>2019 MEWG Meeting Records</p> <p>MHTO Letters of Support for 2019 Monitoring Programs</p>
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

## METHODS

- a. No activity took place at Steensby Port in 2019. This phase of the project is currently inactive.
- b. Inuit were actively involved in the planning and/or execution of the 2019 monitoring programs (2019 MEEMP and AIS Monitoring Program, 2019 Habitat Offset Monitoring Program at Milne Port, 2019 Bruce Head Shore-based Monitoring Program, 2019 Passive Acoustic Monitoring (PAM) Program, 2019 Ship-Based Observer (SBO) Program and the 2019 Marine Mammal Aerial Survey Program). As part of annual planning and review of upcoming field programs, Baffinland provides its annual monitoring results to MEWG members (which include Inuit representation through the Mittimatalik Hunters and Trappers Organization [MHTO] and QIA) for comment, and also presents plans for monitoring for upcoming year during MEWG meetings. In 2019, Baffinland and with support of its consultant, Golder, presented the various programs it intended to complete during the 21 June 2019 in-person MEWG meeting allowing for MEWG members to provide input. Baffinland (with support of Golder) also held a meeting with the MHTO on 30 April 2019 in Pond Inlet to discuss upcoming 2019 marine monitoring programs (additional details are provided below). Subsequent to this meeting, Letters of Support from the MHTO were received indicating that the MHTO had been adequately consulted in order to obtain input on the design/sampling of proposed Baffinland programs and supported hiring of Inuit study team members. In order to build a pool of qualified candidates for the SBO Program, marine safety training was provided to ten (10) Inuit from Pond Inlet in Dartmouth, Nova Scotia. Additional program-specific training workshops were provided in Pond Inlet and Mary River in July 2019 for all Inuit researchers involved in the 2019 monitoring programs. Practical technical training was also provided on-site for those participants successfully employed on the 2019 monitoring programs.
- c. Baffinland's ongoing development and refinement of monitoring programs and protocols considers input from local community members (e.g., concerns that are communicated through community workshops) as well as discussions with the MEWG, in which Inuit organizations actively participate. For example, the QIA has been a member of MEWG since its inception and the MHTO joined the MEWG in 2016. Furthermore, as described above, Baffinland requests letters of support on an annual basis from the MHTO prior to program implementation. Prior to the start of the 2019 monitoring programs, a meeting was held with the MHTO and QIA in Pond Inlet on April 30, 2019 to discuss the 2019 monitoring programs. Additional discussions were held with the MHTO at their office in Pond Inlet on May 2, 2019. As a follow-up to the 2019 shipping season, Baffinland conducted a face-to-face meeting in Pond Inlet with the MHTO in January 2020, and provided a high level summary of programs completed in 2019. The 2019 Inuit program team members participated in end of program interviews to review and discuss preliminary monitoring results, and provide feedback on program design and program planning for the 2020 Monitoring Programs. Baffinland's monitoring programs strive to actively involve local participation and take into account community concerns as well as discussions with the MEWG, in which Inuit organizations actively participate. Input on the design of the 2019 monitoring programs was also provided by Inuit participants of the MEWG during the in-person meeting in Iqaluit on June 21, 2019. Monitoring results are reviewed annually by MEWG members, including Inuit participants through in-person meetings.

- d. From 2017–2019, several new monitoring tools (i.e., detecting devices) were incorporated into a new narwhal monitoring program that allowed for adequate monitoring of narwhal through changing seasonal and daylight conditions, as well as during periods when narwhal are not readily visible (because they are underwater).

The 2017–2018 Narwhal Tagging Program involved deploying remote sensing tags on the backs of narwhal to effectively track the animal's three-dimensional movements, vocal behaviour and surrounding acoustic environment over an extended time-series as the animals naturally moved through their summer foraging range in the North Baffin Island region. This provided insight into the animal's behaviour over a continuous 24 h period, throughout changing environmental conditions and across a broad geographic range. The deployment of satellite-based location/dive tags on individual narwhal allowed for the tracking of narwhal spatial movement (horizontal and vertical) in relation to shipping events. The deployment of Acousonde (passive acoustic recorder) tags on individual narwhals allows for the evaluation of potential changes in narwhal behaviour in relation to received levels of shipping noise, in comparison to their movements and behaviour when no shipping is present. Passive acoustic tags allow for a better understanding of what the whale is hearing (received sound levels) in its natural environment, while simultaneously recording information on three-dimensional movement and vocal behaviour of the tagged animal. The 2017–2018 Narwhal Tagging Program was a collaborative study with DFO, and the results from the program continued to be analyzed in 2019. Detailed methodology on data collection and analytical procedures for the 2017–2018 Narwhal Tagging Program are presented in Golder (2020h).

In 2019, as part of JASCO Applied Sciences' (JASCO) PAM Program, acoustic recorders (Autonomous Multichannel Acoustic Recorders, AMARs) were deployed at five representative locations along the Northern Shipping Route in Eclipse Sound and Milne Inlet. The objective of the program was to document ambient and anthropogenic underwater noise levels in the RSA during the open-water and shipping shoulder season periods, to monitor marine mammal presence along the shipping corridor near Bruce Head and in Koluktoo Bay, to evaluate Project shipping noise levels in relation to established marine mammal acoustic thresholds for injury and disturbance and to compare measured sound levels from shipping activities during the shoulder season to modelled estimates used for environmental effects assessment. Three AMARs were deployed in Milne Inlet South over a two-month period (4 August to 29 September) to collect acoustic data during the open water season, concurrently with visual observer data collected as part of the 2019 Bruce Head Shore-based Monitoring Program (specific program details are provided in Golder, 2020c). An additional two AMARs were deployed along the nominal shipping route in Eclipse Sound, near Ragged Island and south of Bylot Island in May 2019 to record icebreaker and ore carrier noise during vessel transits in Eclipse Sound. The recorder near Bylot Island was only deployed for the spring shoulder season (28 days); the recorder near Ragged Island remained in place throughout the 2019 open water season (85 days total). Both of these recorders were redeployed at the end of the open water season to record sounds during the Fall 2019 and Spring 2020 shoulder seasons. Frequency-weighted daily Sound Exposure Level (SEL) values were calculated for the five marine mammal functional hearing groups and compared to established acoustic injury thresholds based on criteria and guidance established by the National Oceanic and Atmospheric Administration (NOAA) for assessing acoustic impacts on marine mammals. Non-weighted Sound Pressure Levels (SPL) were measured and compared to acoustic disturbance thresholds for marine mammals based on established NOAA guidance/criteria. Given there are presently no established regulatory thresholds to aid in determination of acoustic masking effects on marine mammals, in order to better understand this potential effect from shipping noise on narwhal, JASCO evaluated the proportion of lost listening space a narwhal may experience from ship noise relevant to ambient conditions. This was done using acoustic monitoring data collected in 2019 which provides a more accurate and reliable estimate of



the level of reduced listening range that would occur for narwhal (compared to modeled estimates). Listening Range Reduction (LRR) is defined as the fractional decrease in the available listening range (the distance over which sources of sound can be detected) experienced by an animal when they are exposed to ambient and/or anthropogenic noise source. Acoustic data were analyzed from the five AMAR recorder stations in Eclipse Sound and Milne Inlet to quantify the proportion of the recording period in which a >50% and >90% LRR would occur for narwhal during the early shoulder and open-water seasons. For the LRR assessment, JASCO looked at three different frequencies which were representative of the three main call types used by narwhal: clicks (25 kHz), whistles (5 kHz) and bubble pulses (1 kHz). Detailed methodology on data collection and analytical procedures for the 2019 Passive Acoustic Monitoring Program are presented in Frouin-Mouy et al. (2020).

In 2019, marine mammal aerial surveys were conducted in the North Baffin area during the early shoulder season (July) and the peak open-water season (August), with the support of Inuit researchers from Pond Inlet and Arctic Bay. The 2019 aerial survey program was approved by the MHTO. DFO and other MEWG members were actively consulted on the study design and data collection methods during the 21 June 2019 MEWG meeting (Appendix C2). Input and recommendations provided by these parties were incorporated into the program. The objectives of the surveys were to determine the relative abundance and distribution of narwhal near the Pond Inlet floe edge prior to and during initial shipping and icebreaking operations, and to undertake systematic aerial transect surveys to obtain abundance and density estimates of the Eclipse Sound and Admiralty Inlet narwhal summer stocks during the open-water season. The aerial survey data collection methodology combined distance-based line transect methods (double platform design using four Marine Mammal Observers (MMOs) stationed at front and rear bubble windows on the aircraft) and high-resolution photography methods (two DSLR cameras mounted in the belly hatch of the aircraft and programmed to collect oblique digital imagery of the survey area). Data collection was based exclusively on photographic surveys for areas associated with high narwhal concentrations. Detailed methodology and analytical procedures are presented in Golder (2020h).

- e. No activity took place at Steensby Inlet in 2019. This phase of the project is currently inactive.

Baffinland undertook a shore-based narwhal monitoring program at Bruce Head from 2013–2017 and again in 2019. The objective of the Bruce Head shore-based monitoring study was to investigate narwhal response to shipping activities along the Northern Shipping Route in Milne Inlet. During the open-water season of 2019, visual survey data were collected from a cliff-based observation platform at Bruce Head overlooking the nominal shipping route. Data was collected systematically on Relative Abundance and Distribution (RAD) and group composition of narwhal. Additional data were collected on environmental conditions and anthropogenic activities (e.g., shipping and hunting activities) to distinguish between the potential effects of Project-related shipping activities and confounding factors that may also affect narwhal behaviour. Detailed methodology and analytical procedures are presented in Golder (2020h).

- f. Baffinland understands that the intent of this condition (101-h) was to address concerns related to icebreaking of land-fast ice in support of shipping operations along the Southern Shipping Route and in Steensby Port. This phase of the project is currently inactive. Baffinland has not undertaken icebreaking of land-fast ice along the Northern Shipping Route. Baffinland's current shipping operations are limited to when the floe edge is no longer being used by Pond Inlet land users. To ensure the implementation of this, prior to the start of the shipping season, Baffinland receives formal written confirmation from MHTO that the floe edge has been closed to harvesting activities and that hunters are no longer using the sea ice.

## RESULTS

- a. Not applicable in 2019.
- b. A total of twenty-three (23) Inuit researcher team members (20 from Pond Inlet, two from Arctic Bay and one from Igloolik) were employed for the 2019 monitoring programs. Inuit researchers were hired through three (3) Inuit-owned outfitting companies based in Pond Inlet. The total amount of work hours for Inuit staff on the 2019 monitoring programs was 6,500 hours. The work positions filled by Inuit researchers in 2019 included: marine mammal observers, polar bear monitors, field technicians, boat operators, boat assistants and data analysts.

Four (4) Inuit researchers supported the deployment of PAM equipment through the sea ice on 20 to 21 May 2019. Ten (10) Inuit trainees from Pond Inlet participated in a Transport Canada approved offshore safety training course in Halifax, NS, from 11–15 May 2019 for the 2019 SBO Program; four (4) Inuit researchers were selected from this pool of trainees to participate in the 2019 SBO Program. Five Inuit researchers (four from Pond Inlet and one from Arctic Bay) participated in the 2019 MEEMP and AIS Monitoring Program and 2019 Habitat Offset Monitoring Program. Twelve (12) Inuit researchers (nine (9) from Pond Inlet, two (2) from Arctic Bay and one (1) from Igloolik) participated in the 2019 Bruce Head Shore-based Monitoring Program. Nine (9) Inuit researchers (seven (2) from Pond Inlet and two (2) from Arctic Bay) participated in the 2019 Marine Mammal Aerial Survey Program. One (1) of the Inuit participants from Pond Inlet spent 27 days in Calgary, AB, and Victoria, BC, training in aerial photography analysis and supporting the reporting of the 2019 marine mammal monitoring programs in early 2020.

- c. The Bruce Head marine mammal monitoring program, which has been conducted each year since 2013 (noting that the program was implemented as a vessel-based version of the program in 2018), originated from a proposal by the QIA to develop a community-based monitoring protocol and has been operated with a team of Inuit marine mammal observers and polar bear monitors each year. Following feedback from Inuit researchers and the MHTO, the Bruce Head monitoring program returned as a shore-based monitoring program in 2019 following a vessel-based pilot version of the program trialed in 2018.

The 2019 marine mammal aerial survey program included coverage of the floe edge prior to the start of the shipping season to determine the relative abundance and distribution of narwhal near the Pond Inlet floe edge prior to and during initial shipping and icebreaking operations. It also included coverage of Admiralty Inlet. The early shoulder season aerial survey was driven by Inuit feedback provided in 2018 regarding the low number of narwhals reported by hunters in the RSA that year.

- d. Detailed results of the 2017–2018 Narwhal Tagging Program are presented in Golder (2020h) with a brief summary presented below. Narwhal positional data from 2017 and 2018 demonstrated that tagged narwhal occurred in all strata in the RSA throughout the summer shipping season but were more common in certain areas of the RSA, namely Milne Inlet South, Koluktoo Bay, Milne Inlet North and Tremblay Sound. High use areas in the RSA included the central portion of Tremblay Sound, the western shore of Milne Inlet North, and most of Koluktoo Bay and Milne Inlet South, particularly in areas south of Bruce Head (i.e., entrance to Koluktoo Bay) and in Assomption Harbour (i.e., Milne Port site). These results were consistent with previously reported areas of high narwhal concentrations identified during baseline aerial surveys conducted in the RSA during the open-water seasons of 2007, 2008, 2013 and 2014 (Elliott et al., 2015; Thomas et al., 2015) prior to the commencement of iron ore shipping along the Northern Shipping Route.

With respect to interactions between tagged narwhal and existing shipping in the RSA, the majority of the GPS data collected during 2017 and 2018 occurred when narwhal were >10 Km from medium- and large-sized vessels (Project and non-Project related). Vessel exposure events (<10 Km) occurred throughout the RSA but were more common in the Milne Inlet South and Koluktoo Bay strata due to the confined nature of the channel along this part of the Northern Shipping Route. Satellite tag data from 2017 indicated that several of the tagged narwhal moved between Eclipse Sound and Admiralty Inlet during their deployment period. These results supported the notion that some degree of mixing occurs between the Eclipse Sound and Admiralty Inlet stocks during the open-water and late shoulder seasons. Narwhal dive behavioural responses that were shown to be significantly influenced by ship noise and/or close ship encounters included surface time, dive duration, and bottom dives; the latter only during periods when narwhal were engaged in bottom diving at the initial time of vessel exposure. No significant effects were observed for the following dive behavioural responses: dive rate, time at depth, descent speed, or bottom dives (during periods when narwhal were not actively diving to the bottom at the initial time of exposure). The distance at which significant changes were observed in dive behavior ranged from 1 to 5 Km dependent on the response variable. This corresponded with an exposure period ranging from 7 to 36 min per vessel transit (based on a 9 knot travel speed), with animals returning to their pre-response behaviour following the exposure period (temporary effect). The frequency of this effect was considered intermittent given that vessels were within 5 Km of a tagged narwhal for <1% of the GPS datapoints collected in the RSA during 2017 and 2018. Narwhal surface movement responses that were shown to be significantly influenced by ship-generated noise included turning angle, and orientation relative to vessel (low level severity responses). No significant effects were observed for travel speed. The distance at which significant changes were observed in surface movement behavior ranged from 4 to 10 Km dependent on the response variable. This corresponded with an exposure period ranging from 29 to 54 min per vessel transit (based on a 9 knot travel speed), with animals returning to their pre-response behaviour following the exposure period (temporary effect). The frequency of this effect was considered intermittent given that vessels were within 10 Km of a tagged narwhal for <7% of the GPS datapoints collected in the RSA during 2017 and 2018. Overall, the 2017 and 2018 tagging results supported predictions made in the Final Environmental Impact Statement (FEIS) for the Early Revenue Phase (ERP), in that ship noise effects on narwhal will be limited to temporary, short-term avoidance behaviour, consistent with low to moderate severity responses (Finneran et al. 2012; 2015). No evidence was observed of large-scale avoidance behaviour, displacement effects, or abandonment of the summering grounds (high severity responses), which might in turn result in a population or stock-level consequence (consistent with the definition of non-significant effects used in the FEIS).

Detailed results of the 2019 Passive Acoustic Monitoring Program are provided in Frouin-Mouy et al. (2020) with a brief summary presented below. During the open-water and shoulder season periods, sound exposure levels (SEL) at all five recording stations never exceeded marine mammal acoustic injury thresholds, for either permanent or temporary hearing threshold shift (PTS and TTS), based on NOAA criteria for assessing acoustic impacts on marine mammals. Sound Pressure Levels (SPL) also rarely exceeded the 120 dB marine mammal disturbance threshold at any of the recorder stations. During the shoulder season, the disturbance threshold was exceeded for 1.9% of the total recording period (28 days) at AMAR-RI (located on shipping lane near Ragged Island) and for 1.4% of the total recording period (28 days) at AMAR-BI (located in Eclipse Sound south of Bylot Island). During the open-water season, the

disturbance threshold was exceeded for 3% of the total recording period (55 days) at AMAR-1 (located on shipping lane in Milne Inlet South) and for 0.8% of the total recording period (55 days) at AMAR-2 (located inside Koluktoo Bay away from the shipping lane). Vocalizations from three (3) different marine mammal species were identified in the acoustic data. Narwhal vocalizations were present at all stations mainly from early August to late September. Several bowhead whale vocalizations were detected (and manually validated) during August and September at two (2) of the three (3) stations in Milne Inlet South. Several killer whale vocalizations were detected during August and September at all stations. Listening range reduction (LRR), the fractional decrease in the available listening range for marine animals, was calculated for narwhal based on acoustic data collected at the five AMAR recorder locations in Milne Inlet and Eclipse Sound. Acoustic monitoring results indicated that LRR is influenced by both ambient and vessel noise sources, at different contributing levels depending on the call type of interest. LRRs were highest for click vocalizations and lowest for burst pulses. For both clicks and whistle vocalizations, vessel-related contributions to LRR were similar to levels narwhal already experience from ambient noise sources (e.g. wind, waves, rain). A small seasonal effect is present for both call types, with icebreaker noise slightly more influential than ambient noise sources during the early shoulder season (particularly at Ragged Island), and ambient noise sources slightly more influential than vessel noise during the open-water season. The third call type (burst pulses), was shown to be the least susceptible call type to LRR. During the early shoulder season, a >90%LRR occurred  $\leq 1\%$  of the time when vessels were detected on the recordings (which was  $\leq 37\%$  of the total recording period). During the open-water season, a >90% LRR occurred  $\leq 2.1\%$  of the time when vessels were detected on the recordings (which was  $\leq 29\%$  of the total recording period). Ambient noise did not result in any appreciable level of LRR for burst pulses because the hearing threshold for narwhal at 1 kHz is higher than the median ambient sound level at this frequency. Collectively, these results indicate that ambient noise (e.g., wind, waves) affects the listening range of narwhal at similar severity levels as vessel noise, and for similar or greater proportions of time as vessel noise.

- e. Baffinland has completed periodic aerial surveys in the RSA, as prescribed by this Condition (101-e) and as recommended by members of the MEWG. This included aerial surveys undertaken in 2006, 2007, 2008, 2013, 2014, 2015 and 2019. DFO also completed independent aerial surveys in the RSA in 2004, 2013 and 2016 to generate abundance estimates of the Eclipse Sound narwhal stock (and adjacent summer stocks); with this information subsequently used to update Potential Biological Removal (PBR) estimates used by DFO for narwhal stock management.

Detailed results of Baffinland's 2019 Marine Mammal Aerial Survey Program are presented in Golder (2020d) with a brief summary presented below. A total of eight (8) different species of marine mammals were observed during the 2019 aerial surveys: narwhal, bowhead whale, beluga whale, killer whale, ringed seal, harp seal, bearded seal and polar bear. The fully corrected abundance estimate for the Eclipse Sound summer stock in 2019 was 9,931 animals (Coefficient of Variation (CV) = 0.05, 95% confidence interval (CI) = 9,009 to 10,946) based on aerial surveys completed on 21-22 and 25-27 August 2019 (Golder, 2020g). This estimate falls within the range calculated by DFO for the Eclipse Sound stock in 2016 (12,093 animals, CV = 0.23, 95% CI = 7,768 to 18,660; Marcoux et al. 2019), 2013 (10,489 animals, CV = 0.24, 95% CI = 6,342 to 17,347; Doniol-Valcroze et al., 2015) and 2004 (20,225 animals, CV = 0.36, 95% CI = 9,471 to 37,096; Richard et al., 2010). The combined 2019 abundance estimate for the Eclipse Sound and Admiralty Inlet summer stocks was 38,771 animals (CV = 0.12, 95% CI = 30,667-49,016) based on aerial surveys completed on 21-22 and 25-27 August 2019 (Golder 2020d). This estimate fell within the range calculated by DFO

survey for the combined stock in 2013 (45,532 animals, CV = 0.33, 95% CI = 22,440–92,384; Doniol-Valcroze et al. 2015).

- f. Not applicable in 2019.
  - g. As part of the Bruce Head Shore-based Monitoring Program, Baffinland completed shore-based observations of pre-Project narwhal behavior in Milne Inlet that continued at an appropriate frequency throughout the ERP (not less than three years), as prescribed by this Condition (101-g) and as recommended by members of the MEWG. This included shore-based monitoring in 2013, 2014, 2015, 2016, 2017 and 2019. Detailed results of the 2019 Bruce Head Shore-based Monitoring Program are presented in Golder (2020i) with a brief summary presented below. A total of 226 RAD surveys were completed over the course of 26 days between 6 August and 1 September 2019. Similar to previous years, narwhal were the most common species recorded at Bruce Head in 2019, followed by ringed seal and bearded seal. Less common species sightings recorded during 2019 included killer whale (multiple sightings), bowhead whale ( $n=1$ ), beluga ( $n=2$ ), and polar bear ( $n=2$ , observed on opposite shore).
- Relative abundance and distribution (RAD):
    - The overall relative abundance of narwhal in the SSA, inferred from sighting rate (no. of narwhal per hour - corrected for effort), has remained relatively constant between 2014 and 2019 despite a gradual increase in iron ore shipping along the Northern Shipping Route during this period. Narwhal numbers in the RSA were shown to be comparable to baseline levels documented during the 2014 Bruce Head Monitoring Program, which took place prior to the start of iron ore shipping in the RSA, noting however that some level of shipping activity still occurred in the RSA during 2014 (e.g. eight Project support vessels and 48 non-Project-related vessels; Thomas et al., 2015). These findings are consistent with results from Baffinland's other narwhal monitoring programs demonstrating that the Bruce Head area continues to support high narwhal densities and proportionately higher habitat use by narwhal compared to other areas in the RSA (Elliott et al., 2015; Thomas et al., 2015; Golder, 2020a; Golder, 2020e).
    - Within each study year, a likely but uncertain effect of vessel exposure on narwhal relative abundance in the study area (SSA) was observed. Specifically, vessel exposure was shown to result in a significant decrease in narwhal sightings in the SSA compared to when no vessels were present, but only when narwhal were exposed to vessels travelling north and away from the study area, and only at close exposure distances of 2 to 3 km. These results suggest that the relative abundance of narwhal is influenced by vessel traffic at close distances, although the exact spatial extent of this effect could not be determined due to high data variability.
  - Group composition and behaviour:
    - Group Size: None of the effects of shipping (distance from vessel, vessel direction, vessel orientation relative to the Behavioural Study Area or BSA) on narwhal group size were shown to be statistically significant ( $P>0.2$  for all effects). These results suggest that narwhal neither congregate into larger groups nor fragment into smaller groups in response to vessel exposure.
    - Group Composition:
      - All narwhal life stage categories (adult females, adult males, yearlings/juveniles and calves) were recorded in the BSA throughout the five sampling years. The daily proportion of calves/yearlings recorded in the BSA (relative to the total number of narwhal observed per day) was higher in 2019

(annual mean of 11.2%) than all previous years (2014=10.7%, 2016=9.7%, 2017=7.7%), with the exception of 2015 (14%). This suggests that calving success at Bruce Head in 2019 is consistent with pre-shipping levels, despite year-over-year increases in shipping in the BSA.

- Vessel traffic was shown to have a significant effect on group composition relative to the probability of calf/yearling presence (i.e., a significant interaction was observed between ‘vessel distance’, ‘vessel direction’ and ‘vessel orientation relative to BSA’). Results suggest that the proportion of groups with calves/yearlings was similar between all four vessel traffic scenarios (i.e., vessel transiting toward/away BSA, vessel transiting southbound/northbound), but generally increased during close vessel encounters.
- Collectively, these results suggest that narwhal group composition did not significantly change between study years despite an increase in shipping activity during this period, but the proportion of groups with calves/yearlings was generally higher during close vessel encounters (although it is unknown whether this specific effect was significant).
- Group Spread: Narwhal groups were more often observed in tight associations compared to loose associations under both vessel presence and vessel absence scenarios. In general, group spread did not significantly change during vessel-exposure events. However, loosely spread groups were less common when vessels headed away from the BSA (32% for northbound vessels and 30% for southbound vessels) than when vessels were heading toward the BSA (38% for northbound vessels and 32% for southbound vessels). These results suggest that narwhal group spread did not significantly change during vessel exposure events.
- Group Formation: Narwhal groups were most often observed in parallel formation under both vessel presence and vessel absence scenarios. A possible but uncertain effect of vessel distance on narwhal group formation was evident that depended on vessel direction, with the most consistent effect suggested for southbound vessels moving away from the BSA. However, none of the shipping-related variables were statistically significant. These results suggest that narwhal group formation did not significantly change in the BSA during vessel exposure events; however, the detection power for this response variable was low.
- Group Direction: Vessel traffic was shown to have a significant effect on travel of narwhal groups in the BSA (i.e., a significant interaction was observed between ‘vessel distance’, ‘vessel direction’ and ‘vessel orientation relative to BSA’ although the effect on travel direction was shown to be variable). Narwhal groups were predominantly observed traveling south through the BSA. Southbound travel was least common when southbound vessels were headed away from the BSA, and most common when northbound vessels were headed away from the BSA. These findings suggest that narwhal groups may experience some level of avoidance behaviour in the wake of vessels transiting through Milne Inlet (i.e., narwhal groups appear to avoid “following” vessels) but that travel direction by narwhal groups is relatively less affected during the approach of vessels.
- Travel Speed: The majority of the observed narwhal groups travelled at a medium speed, regardless of vessel exposure conditions. A lack of statistical significance of any of the vessel-related variables suggests that vessel traffic did not have an effect on narwhal groups decreasing their travel speed. The nature of the data for fast-travelling groups was not adequate to test for the effect of vessel exposure on increased travel speed in the BSA. These results suggest that narwhal did not decrease their travel speed or demonstrate a ‘freeze’ response during vessel exposure events.



- Distance from Bruce Head Shore: Narwhal groups were observed more often within 300 m of the Bruce Head shore under both vessel presence and vessel absence scenarios. Offshore groups (>300 m) were detected less frequently with increasing Beaufort scale values, suggesting a decreased detection ability at distance with deteriorating sea state. Furthermore, vessel traffic was shown to result in a significant decrease in 'distance from shore' (i.e., significant interaction was between 'vessel distance', 'vessel direction' and 'vessel orientation'). This effect appeared to be largely attributed to vessel traffic moving toward the BSA. The results suggest that narwhal swim closer to shore when in close proximity to vessels moving toward the BSA.
- h. Not applicable in 2019.

## TRENDS

- a. Not applicable in 2019.
- b. Inuit have been involved in monitoring studies at all levels since the inception of the program. The addition of the MHTO as members of the MEWG in 2016 and the hiring of Inuit participants from Inuit outfitting companies based in Pond Inlet has increased the participation of Inuit in this process. Inuit participation in Baffinland's monitoring programs increased in 2019 compared to 2017 and 2018 (from 2,265 hours / 12 participants in 2017 and 1,610 hours / 9 participants in 2018 to 6,500 hours / 23 participants in 2019). In 2019, an Inuit participant from Pond Inlet was also involved in the analysis and reporting of the 2019 marine mammal monitoring program. In 2020, Inuit participants from the 2019 monitoring programs will also be involved in communicating the results of the 2019 monitoring programs to Inuit community members.
- c. Engagement with Inuit community members on the design and results of the marine monitoring programs continued to increased in 2019 compared to previous years. End of program interviews were newly implemented to review and discuss preliminary monitoring results, and to solicit input on program design and program planning for Baffinland to consider during subsequent year monitoring activities.
- d. Through the implementation of a spatially and temporally expanded program, acoustic monitoring results collected to date are consistent with marine mammal impact predictions made in the FEIS Addendum for the ERP, in that ship noise will not result in acoustic injury to marine mammals and acoustic impacts will be limited to temporary disturbance effects.
- e. The 2019 abundance estimate calculated for the Eclipse Sound narwhal summer stock is within the range of all three previous DFO survey estimates for this stock, and is consistent with impact predictions made in the FEIS Addendum for the ERP that the Project is unlikely to result in significant residual adverse effects on narwhal in the RSA (defined as effects that would compromise the integrity of the population either through mortality or via large-scale displacement or abandonment of the RSA).
- f. Not applicable in 2019.
- g. Overall, results from this five-year shore-based monitoring study support impact predictions made in the Final Environmental Impact Statement (FEIS) for the Early Revenue Phase (ERP), in that ship noise effects on narwhal will be limited to localized avoidance behaviour, consistent with low to moderate severity responses (Southall et al., 2007; Finneran et al., 2017). No evidence was observed of large-scale avoidance behaviour, displacement effects, or abandonment of the summering grounds (high severity responses),

which might in turn result in a population or stock-level consequence (consistent with the definition of a non-significant effect used in the FEIS).

- h. Not applicable in 2019.

#### RECOMMENDATIONS / LESSONS LEARNED

- a. Not applicable in 2019.
- b. Marine monitoring programs will be reviewed with the MEWG and MHTO in 2020 in consideration of increasing Inuit involvement, if possible.
- c. Marine monitoring programs will be reviewed with the MEWG and MHTO in 2020, with the intention of increasing responsiveness to Inuit concerns, if possible.
- d. Marine monitoring programs will be reviewed in 2020, and discussed with the MEWG and the MHTO, and will consider the use of additional detecting devices. A passive acoustic monitoring program is, again, being considered for 2020.
- e. Baffinland is not currently planning to conduct a marine mammal aerial surveys along the Northern Shipping Route during summer of 2020 as DFO is currently planning a marine mammal aerial survey during summer of 2020 that would include the Northern Shipping Route.
- f. Not applicable in 2019.
- g. Shore-based monitoring at Bruce Head has been shown to be an effective method for monitoring of narwhal in relation to shipping activities. For 2019, the following recommendations are being considered for the proposed 2020 shore-based monitoring program:
  - Data collection:
    - Consideration is being made to supplement visual observations with UAV (i.e. drone)-based video and photographic data collection. This would provide a means to verify observation counts, confirm group dynamics, and correct for observation bias under conditions of low visibility or increased distance. In addition, UAV imagery will be helpful for filling in information gaps on narwhal behaviour and group composition in the BSA, where observers are not able to record certain aspects of group behaviour due to reduced sightability. This was attempted in 2019 but technical limitations of the UAV system prevented achieving the desired program objectives. Baffinland has initiated communications with an alternative UAV provider in an attempt to bridge the technological limitations gaps encountered in 2019.
  - Analysis:
    - Continued integration of acoustic monitoring results with shore-based observer data to assess potential changes in narwhal acoustic behaviour in response to vessel transits and vessel noise.
- h. Not applicable in 2019.



## Project Certificate Condition No. 102

Category	Marine Environment - Traffic Log and Shipping Information
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To promote public awareness of Project shipping activities for the general public.
Term or Condition	The Proponent shall ensure that routing of Project vessels is tracked and recorded for both the southern and northern shipping routes, with data made accessible in real time to communities in Nunavut and Nunavik.
Relevant Baffinland Commitment	30, 36
Reporting Requirement	To be provided in the Annual Report to the NIRB.
Status	In-Compliance
Stakeholder Review	N/A
Reference	Baffinland Corporate Website – Operation – Shipping and Monitoring
Ref. Document Link	<a href="https://www.baffinland.com/operation/shipping-and-monitoring/">https://www.baffinland.com/operation/shipping-and-monitoring/</a>

### METHODS

Baffinland has contracted exactEarth®, a global vessel monitoring and tracking service based on AiS (Automatic Identification System) data from polar orbiting satellites to track and report on vessel movements. The vessel tracking information is available on Baffinland’s website to allow communities to check on vessel coordinates, which direction the vessel is moving, and its destination.

The vessel locations plotted on the online map are not “real-time” on a minute by minute basis, but do provide regularly updated snap shot of vessel movement in the North Baffin region approximately every 30 minutes.

To improve communications, Baffinland implemented Pond Inlet “guardian program” (Shipping Monitors) which consisted of employing a minimum of two full-time Shipping Monitors from the community of Pond Inlet to actively track daily Project vessel movements in the RSA in real-time, and in relation to reported marine mammal aggregations (as shared by the community and the monitoring teams). The Shipping Monitors provided liaison between the community of Pond Inlet, hunters and Baffinland. This was a new approach introduced in 2019 in response to feedback from the MHTO that better communications on Baffinland shipping operations were needed. Shipping Monitors provided updates on Baffinland shipping activity to residents of Pond Inlet via local public radio, marine VHF radio (for hunters on the water) and through social media (e.g., Facebook posts).

### RESULTS

Baffinland has made vessel routing accessible to the public via the Baffinland website. Baffinland also installed an Automatic Information System tracker system in Baffinland’s Shipping Monitor office located in the second floor of the MHTO building on a dedicated laptop and wall mounted monitor. This provided live continuous monitoring of vessels active in the Northern Shipping Route to all office visitors during office hours (8am to 5pm).

### TRENDS

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland has found the use of exactEarth® to be beneficial in providing information related to ship routing to the public. Baffinland will continue to use this service. Furthermore, it is Baffinland's intent to continue providing live viewing of vessel tracks through the Pond Inlet Office in 2020.

## Project Certificate Condition No. 103

Category	Marine Environment - Traffic Log and Shipping Information
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To monitor effectiveness of mitigation of shipping impacts to marine wildlife.
Term or Condition	<p>The Proponent shall report annually to the NIRB regarding project-related ship track and sea ice information, including:</p> <ul style="list-style-type: none"> <li>a. A record of all ship tracks taken along both shipping routes covering the entire shipping season;</li> <li>b. When employing ice-breaking, an overlay of ship tracks onto ice imagery to determine whether ships are effectively avoiding shore leads and polynyas;</li> <li>c. A comparison of recorded ship tracks to the expected nominal shipping route, and probable (if any) extent of year-round shipping during periods of ice cover and open-water;</li> <li>d. An assessment of the level of adherence to the nominal shipping route and the spatial extent of the shipping zone of influence; and</li> <li>e. When employing ice-breaking, marine bird and mammal species and number of individuals attracted to ship tracks in ice.</li> </ul>
Relevant Baffinland Commitment	Not applicable
Reporting Requirement	To be provided in the Annual Report to the NIRB.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board
Reference	<p>Daily Ice Charts (Canadian Ice Service, 2020)</p> <p>Draft 2019 Ship-based Observer Program (Golder, 2020f)</p> <p>Draft 2019 Marine Mammal Aerial Survey (Golder, 2020g)</p> <p>2019 Daily ship tracks with ice imagery</p>
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

- a. Project-related ship tracks and ship speeds along the Northern Shipping Route were recorded throughout the 2019 shipping season using an automatic ship tracking system (Automatic Identification System; AIS), which tracks the movement of each ship using an onboard AIS transceiver with integrated Global Positioning System (GPS). Vessels fitted with AIS transceivers are tracked in the Project area by an AIS base stations set up at Pond Inlet and Bruce Head; and when out of range of the base stations, through satellites with AIS receiving capability. Information provided by AIS equipment includes the vessel's unique identification number, position, course, and speed. Baffinland has contracted exactEarth®, a global vessel monitoring and tracking service based on AIS data from polar orbiting satellites to track and report on vessel movements. Vessel ship tracks are publicly accessible through the Baffinland website during the shipping season and at the Baffinland office located in the MHTO building on a large wall-mounted monitor. A map is created yearly

to aid in visualization of ship tracks along the Northern Shipping Route covering the full duration of the shipping season.

- b. Baffinland procured an icebreaking vessel, the MSV *Botnica*, in 2019 to facilitate the safe passage of vessels through prevailing ice conditions (i.e., both the start and end of the shipping season). For the 2019 shipping season, daily maps were prepared showing Project vessel ship tracks (including the MSV *Botnica* and vessels under escort) on all days when ice concentrations were 1/10 or greater. These ship track maps include an overlay of daily sea ice concentration (i.e., coverage) provided by the Canadian Ice Service (2020) showing vessels transiting in open water whenever possible while avoiding shore leads and polynyas.
- c. See update to (a) and (b) above.
- d. See update to (a) and (b) above.
- e. Marine wildlife observers (MWOs) were present on the MSV *Botnica* during the shoulder shipping seasons from 19 to 29 July 2019 (Leg 1) and again from 5 to 28 October 2019 (Leg 2) as part of Baffinland's 2019 Ship-based Observer (SBO) Program to monitor for potential ship strikes on marine mammals and seabirds in the Regional Study Area (RSA), and to collect data on the presence, relative abundance and distribution of marine mammals and seabirds within the boundaries of the RSA. Prevalent ice conditions along with seabird and marine mammal sightings made during this time, are presented in the 2019 Ship-based Observer Program Report (Golder, 2020f).

Marine mammal observers (MMOs) stationed on a survey aircraft also actively monitored the RSA during the early and late shoulder seasons as part of the 2019 Marine Mammal Aerial Survey Program. Marine mammal aerial surveys were conducted out of Pond Inlet from 12 to 26 July 2019 (Leg 1) to determine the relative abundance and distribution of marine mammals near the Pond Inlet floe edge and within the RSA during the ice break-out period of the early shoulder season, prior to the start of 2019 shipping and icebreaker escort operations in the RSA (Golder, 2020g). During the fall shoulder season, an end of shipping season marine mammal aerial reconnaissance survey was also flown out of Pond Inlet on 30 to 31 October 2019. This survey covered the Northern Shipping Route to assess for the presence of marine mammals still remaining in the RSA and potentially using ship tracks in ice and the risk for potential entrapment of marine mammals in the RSA following the departure of the last Project vessel out of the RSA (October 30, 2019).

## RESULTS

- a. Recorded 2019 Project-related ship tracks are plotted in Figure 4.16.
- b. Figures showing an overlay of daily ship tracks onto ice imagery from 13 to 26 July and 4 to 31 October 2019 indicating that ships are effectively avoiding shore leads and polynyas are presented in Appendix G.
- c. There were no major deviations from the nominal shipping route in 2019 by Project vessels (see Figure 4.16), with the exception of the following occurrences:
  - o Four vessels drifted briefly in the western portion of Eclipse Sound, south of the shipping lane. On 31 July, the Golden Pearl could not anchor at the Ragged Island location because of the presence of ice at the anchorage and drifted in Eclipse Sound for approximately 10 hours.

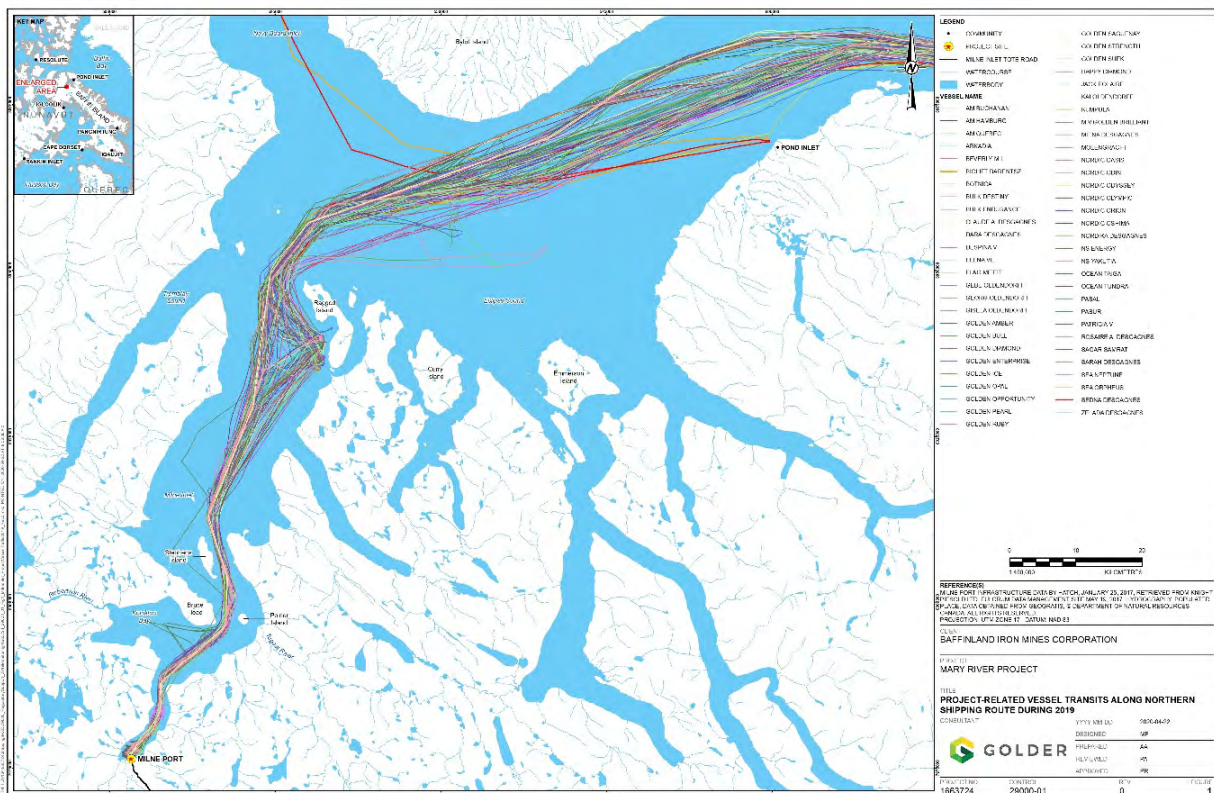
- On 23 to 24 August, the Golden Bull, Sagar Samrat and NS Yakutia were forced to leave anchorage at Milne Port due to strong winds. The vessels drifted briefly in Eclipse Sound and returned to Milne Port when conditions improved.
- Figure 4.16 depicts track lines of two freight vessels (Sedna Desgagnés and BigLift Barentsz) transiting north into Navy Board Inlet during the open-water season. Both freight vessels initially serviced Milne Port before calling to Pond Inlet under a separate shipping contract, effectively ending their service for Baffinland at Pond Inlet. Following their departure from Pond Inlet, both vessels transited north through Navy Board Inlet to continue their northern service operations.
- The MSV *Botnica* icebreaker deviated from the nominal shipping route in Milne Inlet during early August (4 to 5 August 2019) to undertake scientific work in support of the 2019 MEEMP and AIS Monitoring Program and the 2019 Passive Acoustic Monitoring Program. This vessel was used to deploy acoustic recorders (AMARs) and oceanographic moorings at three locations near Bruce Head and one location in Koluktoo Bay, and to collect a series of CTD (Conductivity, Temperature, and Depth) profiles throughout Milne Inlet including in areas west of the nominal shipping route (Figure 4.17).
- d. See update to (c) above
- e. Ship-based MWOs on the MSV *Botnica* did not observe narwhal using old tracks following the MSV *Botnica* in 2019 (Golder, 2020f). MMOs on the aerial surveys indicated that they observed narwhal following the MSV *Botnica* when it was transiting through the ice during the early shoulder season, when 2019 shipping operations first commenced in the RSA.

## TRENDS

No major deviations from the nominal Northern Shipping Route have occurred by Project vessels in the RSA during the first five years of iron ore shipping in this area (2015 to 2019).

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to monitor ship tracks using the shore-based AIS stations at Pond Inlet and Bruce Head, and satellite-based ship tracking using the exactEarth® AIS archive. Baffinland will also continue to communicate expectations to Vessel Masters with regards to avoiding deviations from the nominal Northern Shipping Route when vessels are under contract to Baffinland, and will maintain active tracking through use of notification alerts.



**Figure 4.16: Project Related Vessel Transits – 2019**





**Figure 4.17: MSV Botnica Trackline on 4 to 5 August 2019**

**Note:**

Blue = JASCO AMAR; Yellow = CTD

## Project Certificate Condition No. 104

Category	Marine Environment - Traffic Log and Shipping Information
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations
Objective	To prevent impacts to marine wildlife from Project shipping activities.
Term or Condition	<p>Subject to safety considerations and the potential for conditions as determined by the crew of transiting vessels, to result in route deviations:</p> <ol style="list-style-type: none"> <li>The Proponent shall require, for shipping to/from Steensby Port, project vessels to maintain a route to the south of Mill Island to prevent disturbance to walrus and walrus habitat on the northern shore of Mill Island. Where project vessels are required to transit to the north of Mill Island owing to environmental or other conditions, an incident report is to be provided to the Marine Environment Working Group and the NIRB within 30 days, noting all wildlife sightings and interactions as recorded by shipboard monitors.</li> <li>The Proponent shall summarize all incidences of significant deviations from the nominal shipping routes for traffic to/from Milne Port and Steensby Port as presented in the FEIS and FEIS Addendum to the NIRB annually, with corresponding discussion regarding justification for deviations and any observed environmental impacts.</li> </ol>
Relevant Baffinland Commitment	Not applicable
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

- Not applicable in 2019. Shipping from Steensby Port is not currently an active part of the Project.
- Project-related ship tracks and ship speeds along the Northern Shipping Route were recorded throughout the 2019 shipping season using an automatic ship tracking system (Automatic Identification System; AIS), which tracks the movement of each ship using an onboard AIS transceiver with integrated Global Positioning System (GPS). Vessels fitted with AIS transceivers are tracked in the Project area by an AIS base stations set up at Pond Inlet and Bruce Head; and when out of range of the base stations, through satellites with AIS receiving capability. Information provided by AIS equipment includes the vessel's unique identification number, position, course, and speed. Baffinland has contracted exactEarth®, a global vessel monitoring and tracking service based on AIS data from polar orbiting satellites to track and report on vessel movements. Vessel ship tracks are publicly accessible through the Baffinland website during the shipping season and at the Baffinland office located in the MHTO building on a large wall-mounted monitor. A map is prepared yearly to aid in visualization of ship tracks along the Northern Shipping Route covering the full duration of the shipping season.



## RESULTS

- a. Not applicable in 2019.
- b. There were no major deviations from the nominal shipping route in 2019 by Project vessels (see Figure 4.16), with the exception of the following occurrences:
  - o Four (4) vessels drifted briefly in the western portion of Eclipse Sound, south of the shipping lane. On 31 July, the Golden Pearl could not anchor at the Ragged Island location because of the presence of ice at the anchorage and drifted in Eclipse Sound for approximately 10 hours.
  - o On 23 to 24 August, the Golden Bull, Sagar Samrat and NS Yakutia were forced to leave anchorage at Milne Port due to strong winds. The vessels drifted briefly in Eclipse Sound and returned to Milne Port when conditions improved.
  - o Figure 4.16 depicts track lines of two freight vessels (Sedna Desgagnés and BigLift Barentsz) transiting north into Navy Board Inlet during the open-water season. Both freight vessels initially serviced Milne Port before calling to Pond Inlet under a separate shipping contract, effectively ending their service for Baffinland at Pond Inlet. Following their departure from Pond Inlet, both vessels transited north through Navy Board Inlet to continue their northern service operations.
  - o The MSV *Botnica* icebreaker deviated from the nominal shipping route in Milne Inlet during early August (4 to 5 August 2019) to undertake scientific work in support of the 2019 MEEMP and AIS Monitoring Program and the 2019 Passive Acoustic Monitoring Program. This vessel was used to deploy acoustic recorders (AMARs) and oceanographic moorings at three locations near Bruce Head and one location in Koluktoo Bay, and to collect a series of CTD (Conductivity, Temperature, and Depth) profiles throughout Milne Inlet including in areas west of the nominal shipping route (Figure 4.17).

## TRENDS

- a. Not applicable in 2019.
- b. No major deviations from the nominal Northern Shipping Route have occurred by Project vessels in the RSA during the first five years of iron ore shipping in this area (2015 to 2019).

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to monitor ship tracks using the shore-based AIS station at Pond Inlet and Bruce Head, and satellite-based ship tracking using the exactEarth® service. Baffinland will also continue to communicate expectations to Vessel Masters with regards to avoiding deviations from the nominal Northern Shipping Route when vessels are under contract to Baffinland, and will maintain active tracking through use of notification alerts.

## Project Certificate Condition No. 105

Category	Marine Environment - Traffic Log and Shipping Information
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To prevent impacts to marine wildlife from Project shipping activities.
Term or Condition	<p>The Proponent shall ensure that measures to reduce the potential for interaction with marine mammals, particularly in Hudson Strait and Milne Inlet, are identified and implemented prior to commencement of shipping operations. These measures could include, but are not limited to:</p> <ol style="list-style-type: none"> <li>Changes in the frequency and timing (including periodic suspensions) of shipping during winter months in Hudson Strait and during the open water season in Milne Inlet, i.e., when interactions with marine mammals are likely to be the most problematic.</li> <li>Reduced shipping speeds where ship-marine mammal interactions are most likely.</li> <li>Identification of alternate shipping routes through Hudson Strait for use when conflicts between the proposed routes and marine mammals could arise. Repeated winter aerial survey results showing marine mammal distribution and densities in Hudson Strait would greatly assist in this task.</li> </ol>
Relevant Baffinland Commitment	Not applicable
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	<p>Standard Instructions and General Information for Masters of Vessels Loading at Milne Inlet Port (Fednav, 2019a)</p> <p>Standard Instructions and General Information for Masters of Vessels Loading at Milne Inlet Port (Fednav, 2019b)</p> <p>Draft 2019 Ship-based Observer Program (Golder, 2020f)</p> <p>Draft 2017–2018 Integrated Narwhal Tagging Study (Golder, 2020h)</p> <p>Draft Bruce Head Shore-based Monitoring Program — 2019 Integrated Report (Golder, 2020c)</p> <p>Draft 2019 Passive Acoustic Monitoring Program (Frouin-Mouy et al., 2020)</p> <p>2019 MEWG Meeting Records</p>
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

- Shipping from Steensby Port is not currently an active part of the Project.

Prior to the beginning of the shipping season in Milne Inlet and as part of annual planning procedures, Baffinland reviews and takes into consideration the previous year's monitoring results, observations and feedback provided by local Inuit, and/or input acquired through MEWG members during the annual teleconference and face-to-face meetings. This information is then used to inform operational planning

initiatives for the following year, including adaptive management actions should these be required, such as modifications to existing mitigation or addition of new protective measures. Any resulting operational changes are communicated to stakeholders during the pre-season shipping season meeting held in Pond Inlet and to MEWG members during the next available scheduled meeting.

Interactions between marine mammals and Project vessels along the Northern Shipping Route are routinely evaluated as part of the ongoing marine mammal monitoring programs. In 2019, monitoring programs included the 2019 Bruce Head Shore-based Monitoring Program (Golder, 2020c), the 2019 Ship-based Observer (SBO) Program (Golder, 2020f), the 2019 Passive Acoustic Monitoring Program (Frouin-Mouy et al., 2020) and the 2019 Marine Mammal Aerial Survey Program (Golder, 2020e). Other relevant programs included the Narwhal Tagging Program undertaken in 2016 and 2017 (Golder, 2020h).

- b. Baffinland's Standing Instructions to Masters (SITM) (Fednav, 2019a; 2019b) identifies a "maximum vessel speed limit of 9 knots over ground beginning at the entrance to Pond Inlet (at 74 degrees longitude) through Eclipse Sound and throughout Milne Inlet". Project vessel speeds are tracked in real-time using the satellite-based Automatic Identification System (AIS), supported by two shore-based AIS base stations installed along the Northern Shipping Route (at Bruce Head and Pond Inlet).
- c. Not applicable in 2019.

## RESULTS

- a. Data collected to date as part of the existing marine mammal monitoring programs demonstrate that additional mitigation measures during the open-water season are not warranted at this time, including any changes to the frequency or timing of shipping. However, two notable measures were implemented in 2019 to reduce the potential for disturbance of marine mammals from Project vessel noise during the early shoulder season, particularly for animals travelling in the RSA during the ice break-up period or for animals potentially staging at the floe edge and/or waiting to enter Eclipse Sound. This included 1) setting restrictions on the maximum number of Project vessel transits allowed in the RSA within a 24-h period based on daily ice conditions along the Northern Shipping Route, effectively reducing daily noise exposure periods; and (2) implementing a 40 km buffer zone (i.e., vessel set-back area) at the entrance of the RSA that extended 40 Km to the east of the Nunavut Settlement Boundary (east of 73 degrees longitude). Project-related vessels were required to hold position outside the buffer zone until instructed by the Port Captain at Milne Port to proceed with their transit to Milne Port. The 40 km boundary was selected based on acoustic modelling results indicating that this would represent an appropriate acoustic buffer zone for animals at or near the floe edge (i.e. noise levels at the floe edge would be outside marine mammal audible range or below levels known to elicit adverse behavioral responses such as displacement or avoidance).

Detailed results of the 2019 Integrated Bruce Head Shore-based Monitoring Program are presented in Golder (2020i). Detailed results of the 2019 Ship-based Observer Program are presented in Golder (2020f). Detailed results of the 2019 Passive Acoustic Monitoring Program are presented in Frouin-Mouy et al. (2020). Detailed results of the 2019 Marine Mammal Aerial Survey Program are presented in Golder (2020e). Data from the 2017–2018 Integrated Narwhal Tagging Program are presented in Golder (2020h).

- b. Table 4.31 presents vessel speed information for all Project-related vessels calling at Milne Port in 2019. A total of 82 ore carrier voyages (comprising 41 ore carrier vessels), 20 freights ships/tanker voyages (comprising 13 vessels), four tugs, and one icebreaker called to Milne Port during the 2019 shipping season.

Project vessels traveled below the 9 knot speed limit for the majority (97.8%) of their transit period in the RSA (Table 4.31). The maximum recorded travel speed for an ore carrier in 2019 was 11.4 knots. The maximum recorded speed for a freight / fuel tanker in 2019 was 17.1 knots. The proportional breakdown of vessel travel speed in the RSA during the 2019 shipping season is presented for all vessels combined (ore carriers and cargo/fuel vessels) in Figure 4.18.

c. Not applicable in 2019.

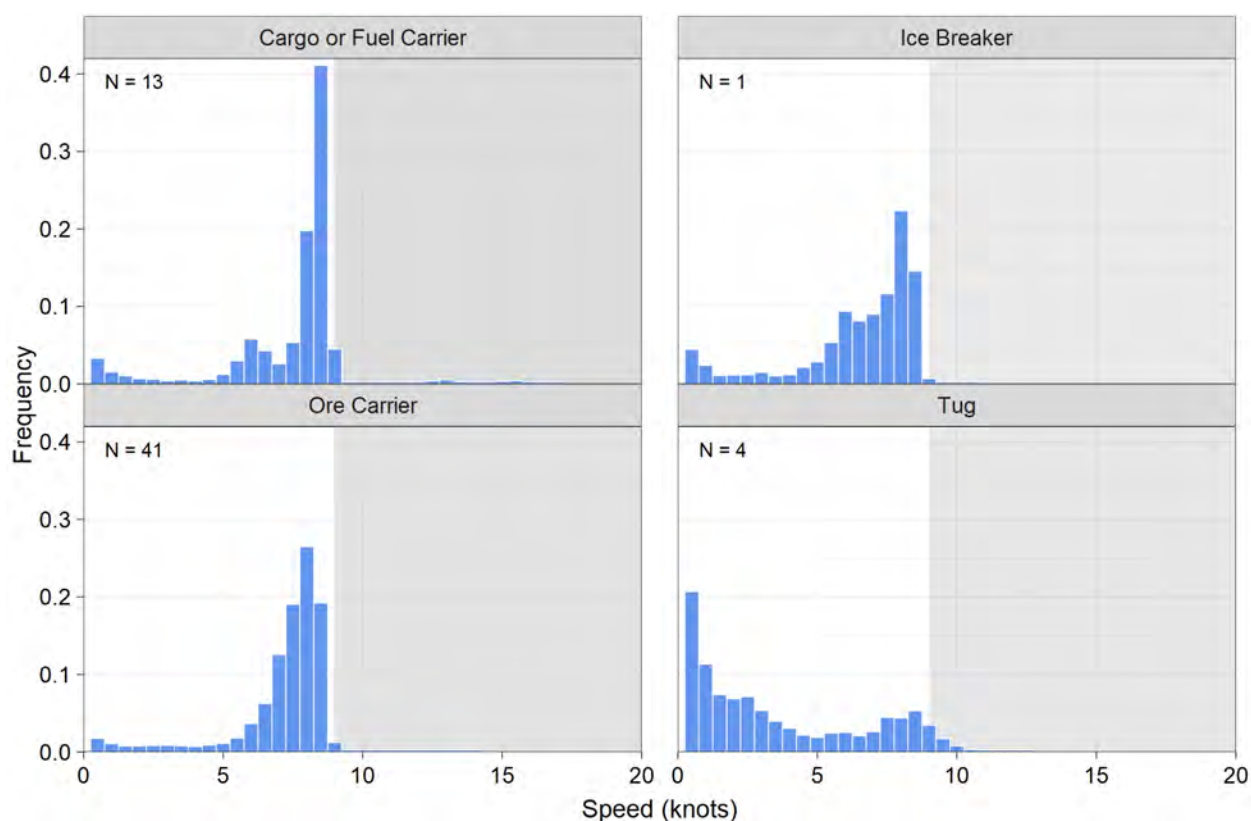
**Table 4.31: Recorded Vessel Speeds of Project Vessels on Northern Shipping Route During 2019**

Vessel Name	No. of Round Trips	Vessel Type	Max Speed	Median Speed	% of travel >9knots	% of travel >10 knots
AM BUCHANAN	1	Ore Carrier	9	8.1	0	0
AM HAMBURG	1	Ore Carrier	9.9	7.8	1.14	0
AM QUEBEC	1	Ore Carrier	9	7.7	0	0
ARKADIA	3	Ore Carrier	9.4	8	0.61	0
BULK DESTINY	2	Ore Carrier	9.2	7.6	0.41	0
BULK ENDURANCE	2	Ore Carrier	9.7	7.4	0.69	0
DESPINA V	2	Ore Carrier	9.5	8.2	0.21	0
ELENA VE	2	Ore Carrier	10	7.7	1.56	0
FLAG METTE	2	Ore Carrier	10	8	0.05	0
GEBE OLDENDORFF	2	Ore Carrier	9.3	8.3	0.22	0
GEORG OLDENDORFF	1	Ore Carrier	9.2	8.3	1.02	0
GISELA OLDENDORFF	2	Ore Carrier	9.7	8.2	1.93	0
GOLDEN AMBER	2	Ore Carrier	9	8.2	0	0
GOLDEN BRILLIANT	2	Ore Carrier	10.2	7.8	0.55	0.08
GOLDEN BULL	2	Ore Carrier	11.4	6.8	0.45	0.20
GOLDEN DIAMOND	2	Ore Carrier	8.9	7.4	0	0
GOLDEN ENTERPRISE	1	Ore Carrier	8.9	7.3	0	0
GOLDEN ICE	2	Ore Carrier	9.1	8	0.02	0
GOLDEN OPAL	2	Ore Carrier	14	7.9	1.30	1.06
GOLDEN OPPORTUNITY	2	Ore Carrier	8.4	7.6	0	0
GOLDEN PEARL	2	Ore Carrier	9.1	8.2	0	0
GOLDEN RUBY	2	Ore Carrier	10.2	6.6	4.05	0.05
GOLDEN SAGUENAY	2	Ore Carrier	9.4	7.9	0.51	0
GOLDEN STRENGTH	2	Ore Carrier	13	8.3	2.11	1.46
GOLDEN SUEK	2	Ore Carrier	8.9	7.2	0	0
KAI OLDENDORFF	1	Ore Carrier	9	8.4	0	0
KUMPULA	2	Ore Carrier	8.9	8.3	0	0
NORDIC OASIS	3	Ore Carrier	9	8.1	0	0
NORDIC ODIN	3	Ore Carrier	9.1	8.2	0.36	0

Vessel Name	No. of Round Trips	Vessel Type	Max Speed	Median Speed	% of travel >9knots	% of travel >10 knots
NORDIC ODYSSEY	3	Ore Carrier	9	8	0	0
NORDIC OLYMPIC	3	Ore Carrier	9.1	8.3	0.01	0
NORDIC ORION	3	Ore Carrier	9.1	8	0.03	0
NORDIC OSHIMA	3	Ore Carrier	9	7.8	0	0
NS ENERGY	3	Ore Carrier	9.1	7.2	0.23	0
NS YAKUTIA	3	Ore Carrier	11.1	7.6	1.46	0.17
PABAL	1	Ore Carrier	8.8	7	0	0
PABUR	1	Ore Carrier	10.8	8.6	7.32	0.10
PATRICIA V	2	Ore Carrier	10.5	8.4	0.90	0.02
SAGAR SAMRAT	3	Ore Carrier	11.8	7.7	1.73	1.59
SEA NEPTUNE	1	Ore Carrier	9.2	7.3	0.20	0
SEA ORPHEUS	1	Ore Carrier	10.5	8.4	1.53	0.10
ATLANTIC OSPREY	1	Cargo/Fuel	13.4	8.4	19.79	1.59
BIGLIFT BARENTSZ	1	Cargo/Fuel	9.3	8.5	1.52	0
CLAUDE A. DESGAGNES	3	Cargo/Fuel	16.7	8.4	12.92	9.56
DARA DESGAGNES	1	Cargo/Fuel	9	8.3	0	0
HAPPY DIAMOND	1	Cargo/Fuel	9.6	8.6	3.25	0
HORIZON STAR	1	Cargo/Fuel	9.8	8.5	5.97	0
MIENA DESGAGNES	2	Cargo/Fuel	14.6	8.5	2.57	1.16
MOLENGRACHT	1	Cargo/Fuel	14.7	8.6	7.03	3.96
NORDIKA DESGAGNES	2	Cargo/Fuel	14.1	6.4	2.21	1.08
ROSAIRE A. DESGAGNES	1	Cargo/Fuel	13.8	8.6	3.67	3.36
SARAH DESGAGNES	4	Cargo/Fuel	12.9	8.5	2.34	0.83
SEDNA DESGAGNES	1	Cargo/Fuel	17.1	8.6	26.06	20.65
ZELADA DESGAGNES	1	Cargo/Fuel	9.5	8.5	0.36	0
MSV BOTNICA	Escort vessel	Icebreaker	10.7	7.4	0.35	0.02
BEVERLY M I	1	Tug	9.5	3.1	0.19	0
JACK POLAIRE	7	Tug	10	2.4	0.06	0
OCEAN TAIGA	1	Tug	12.8	2.3	8.35	1.91
OCEAN TUNDRA	1	Tug	12.3	2.6	4.03	0.21

**Table 4.32: Proportion of Travel Time in RSA Relative to Speed Restriction – 2019 Shipping Season**

Project Vessel Type	% of travel in the RSA <9 knots	% of travel in the RSA <10 knots
Ore carriers	99.3	99.9
Cargo / freight vessels	93.6	99.3
Fuel tankers	98.2	99.4
Tugs	94.5	99.0
MSV Botnica icebreaker	99.7	99.9
<b>TOTAL</b>	<b>97.8</b>	<b>99.2</b>


**Figure 4.18: Proportional Ship Travel Speed for all Project-related Vessels - 2019 Shipping Season**
**Notes:**

1. All vessel speeds <0.5 knots were excluded from the analysis as it was assumed vessels were moored/anchored at this time.

**TRENDS**

- Results of the 2019 marine mammal monitoring programs suggest that existing mitigation measures (e.g. 9 knot maximum speed limit in RSA, restricted shipping areas in Milne Inlet and Koluktoo Bay, maximum of three ships in shipping corridor or at Ragged Island anchorages at a time) and new adaptive management measures introduced during the early 2019 shoulder season to further modify the frequency and timing of

shipping in the RSA (e.g. limiting the daily number of transits in the RSA when ice concentrations were 3/10 or higher, implementation of the 40-km vessel buffer area east of the floe edge) are effective at minimizing adverse impacts on marine mammals related to Project vessel noise and interactions with Project vessels. This is demonstrated through multiple lines of evidence, as summarized by the relevant monitoring program results below. Based on these results, no further mitigation measures are considered necessary at this time.

***Bruce Head Shore-based Monitoring Program:***

Overall, results from this five-year shore-based monitoring study support impact predictions made in the Final Environmental Impact Statement (FEIS) for the Early Revenue Phase (ERP), in that ship noise effects on narwhal will be limited to localized avoidance behaviour, consistent with low to moderate severity responses (Southall et al., 2007; Finneran et al., 2017). No evidence was observed of large-scale avoidance behaviour, displacement effects, or abandonment of the summering grounds (high severity responses), which might in turn result in a population or stock-level consequence (consistent with the definition of a non-significant effect used in the FEIS).

***Narwhal Tagging Program:***

Results of the narwhal tagging study undertaken in 2017 and 2018 demonstrate that tagged narwhal occurred in all strata in the RSA throughout the summer shipping season but were more common in certain areas of the RSA, namely Milne Inlet South, Koluktoo Bay, Milne Inlet North and Tremblay Sound. Narwhal high-use areas in the RSA included the central portion of Tremblay Sound, the western shore of Milne Inlet North, and most of Koluktoo Bay and Milne Inlet South, particularly in areas south of Bruce Head (i.e., entrance to Koluktoo Bay) and in Assomption Harbour (i.e., Milne Port site). These results were consistent with previously reported areas of high narwhal concentrations identified during baseline aerial surveys conducted in the RSA during the open-water seasons of 2007, 2008, 2013 and 2014 (Elliott et al., 2015; Thomas et al., 2015) prior to the commencement of iron ore shipping along the Northern Shipping Route. With respect to interactions between tagged narwhal and existing shipping in the RSA, the majority of the GPS data collected during 2017 and 2018 occurred when narwhal were >10 Km from medium- and large-sized vessels (Project and non-Project related). Vessel exposure events (<10 Km) occurred throughout the RSA but were more common in the Milne Inlet South and Koluktoo Bay strata due to the confined nature of the channel along this part of the Northern Shipping Route. Narwhal dive behavioural responses that were shown to be significantly influenced by ship noise and/or close ship encounters included surface time, dive duration, and bottom dives; the latter only during periods when narwhal were engaged in bottom diving at the initial time of vessel exposure. No significant effects were observed for the following dive behavioural responses: dive rate, time at depth, descent speed, or bottom dives (during periods when narwhal were not actively diving to the bottom at the initial time of exposure). The distance at which significant changes were observed in dive behavior ranged from 1 to 5 Km dependent on the response variable. This corresponded with an exposure period ranging from 7 to 36 min per vessel transit (based on a 9 knot travel speed), with animals returning to their pre-response behaviour following the exposure period (temporary effect). The frequency of this effect was considered intermittent given that vessels were within 5 Km of a tagged narwhal for <1% of the GPS datapoints collected in the RSA during 2017 and 2018. Narwhal surface movement responses that were shown to be significantly influenced by ship-generated noise included turning angle, and orientation relative to vessel (low level severity responses). No significant



effects were observed for travel speed. The distance at which significant changes were observed in surface movement behavior ranged from 4 to 10 Km dependent on the response variable. This corresponded with an exposure period ranging from 29 to 54 min per vessel transit (based on a 9-knot travel speed), with animals returning to their pre-response behaviour following the exposure period (temporary effect). The frequency of this effect was considered intermittent given that vessels were within 10 Km of a tagged narwhal for <7% of the GPS datapoints collected in the RSA during 2017 and 2018. Narwhal positional data indicated an absence of narwhal within approximately 0.5 Km of a vessel's port and starboard, and within 1 Km of a vessel's bow and stern. These results also support the prediction that narwhals are expected to exhibit localized avoidance of Project vessels along the shipping route.

Overall, the 2017 and 2018 tagging results supported predictions made in the Final Environmental Impact Statement (FEIS) for the Early Revenue Phase (ERP), in that ship noise effects on narwhal will be limited to temporary, short-term avoidance behaviour, consistent with low to moderate severity responses (Finneran et al. 2012; 2015). No evidence was observed of large-scale avoidance behaviour, displacement effects, or abandonment of the summering grounds (high severity responses), which might in turn result in a population or stock-level consequence (consistent with the definition of non-significant effects used in the FEIS). Detailed results of the 2017–2018 Narwhal Tagging Program are presented in Golder (2020h).

#### ***Passive Acoustic Monitoring Program:***

Acoustic monitoring data collected during the 2019 shoulder and open-water seasons support impact predictions from the FEIS (i.e., impacts from ship noise will be limited to temporary and localized disturbance effects). Ship noise measured at all five recorder locations never exceeded the acoustic injury thresholds for marine mammals, for either permanent or temporary hearing threshold shift (PTS and TTS), based on NOAA criteria for assessing acoustic impacts on marine mammals. Measured Sound Pressure Levels (SPL) rarely exceeded the 120 dB disturbance threshold for marine mammals at any of the recorder locations. During the shoulder season, the disturbance threshold was exceeded for 1.9% of the total recording period (28 days) at AMAR-RI (located on shipping lane near Ragged Island) and for 1.4% of the total recording period (28 days) at AMAR-BI (located in Eclipse Sound south of Bylot Island). During the open-water season, the disturbance threshold was exceeded for 3% of the total recording period (55 days) at AMAR-1 (located on shipping lane in Milne Inlet South) and for 0.8% of the total recording period (55 days) at AMAR-2 (located inside Koluktoo Bay away from the shipping lane). Listening Range Reduction (LRR), the fractional decrease in the available listening range for marine animals, was calculated for narwhal based on acoustic data collected at the five AMAR recorder locations in Milne Inlet and Eclipse Sound. Acoustic monitoring results indicated that ambient noise (e.g., wind, waves) affected the listening range of narwhal at similar severity levels as vessel noise, and for similar or greater proportions of time as vessel noise. Detailed results of the 2019 Passive Acoustic Monitoring Program are provided in Frouin-Mouy et al. (2020).

#### ***Marine mammal aerial surveys:***

Marine mammal aerial surveys were flown during the 2019 early shoulder season to characterize narwhal presence and distribution in the RSA prior to the start of shipping and to determine their relative numbers during the staging period when narwhal await ice break-out prior to their entry into Eclipse Sound and Milne Inlet. When surveys were first initiated on 12 July, the floe edge had already largely broken up with most



of the remnant fragmented ice situated west of Pond Inlet in Eclipse Sound and Milne Inlet North. A reconnaissance survey was flown in Baffin Bay and throughout the RSA, with narwhal, seal and bowhead observed throughout the RSA, with some narwhal already as far south as Bruce Head. The focus of the survey therefore shifted to completing a systematic abundance survey in the RSA prior to and during icebreaking activities. To our knowledge, narwhal aerial surveys have never previously been undertaken this early in the season for the Eclipse Sound summer stock area. The first Project vessel to enter the RSA in 2019 was the MSV Botnica on 17 July. The first full survey was completed on 15 to 16 July (Survey #2), prior to any Project shipping in the RSA. Narwhal were observed throughout the RSA during this survey, largely distributed near Pond Inlet, in Eclipse Sound West, Eclipse Sound East and Milne Inlet (near Bruce Head). The abundance estimate from this survey was 5,793 narwhals (CV=0.23, 95% = 3,744-8,964). The second survey was completed on 21 to 22 July (Survey #4), after the MSV Botnica had entered the RSA and transited to Milne Port while escorting two (2) ore carriers and two (2) tugs. Narwhal were present throughout the RSA during this survey, again largely distributed near Pond Inlet, Eclipse Sound West, Eclipse Sound East and Milne Inlet. The abundance estimate for this survey was 15,591 narwhals (CV=0.19, 95% CI = 10,856 to 22,391).

Bowhead whale were also present in the RSA in relatively high numbers during the early shoulder season. During Survey #2 (15 to 16 July), bowhead whale abundance was estimated at 176 animals (CV=0.64, 95% CI = 56 to 553) in the RSA. During Survey #4 (21 to 22 July), bowhead whale abundance was estimated at 1,291 animals (CV=0.29, 95% CI = 735 to 2,267) in the RSA. Survey #4 reported the highest number of bowhead whale ever documented in the Eclipse Sound grid based on aerial surveys completed by Baffinland. When talking to local residents in Pond Inlet about the number of bowhead whales seen in 2019, they mentioned that it was more than they had seen in recent years, but they had observed similar high numbers approximately eight years previously (est. 2011).

Marine mammal aerial surveys were flown during the 2019 open-water season to determine the abundance of the Eclipse Sound and Admiralty Inlet narwhal summer stocks. The fully corrected abundance estimate for the Eclipse Sound summer stock in 2019 was 9,931 animals (Coefficient of Variation (CV) = 0.05, 95% confidence interval (CI) = 9,009 to 10,946) based on aerial surveys completed on 21-22 and 25 to 27 August 2019 (Golder, 2020d). This estimate falls within the range calculated by DFO for the Eclipse Sound stock in 2016 (12,093 animals, CV = 0.23, 95% CI = 7,768 to 18,660; Marcoux et al., 2019), 2013 (10,489 animals, CV = 0.24, 95% CI = 6,342 to 17,347; Doniol-Valcroze et al., 2015) and 2004 (20,225 animals, CV = 0.36, 95% CI = 9,471 to 37,096; Richard et al. 2010). The combined 2019 abundance estimate for the Eclipse Sound and Admiralty Inlet summer stocks was 38,771 animals (CV = 0.12, 95% CI = 30,667 to 49,016) based on aerial surveys completed on 21-22 and 25 to 27 August 2019 (Golder 2020g). This estimate fell within the range calculated by DFO survey for the combined stock in 2013 (45,532 animals, CV = 0.33, 95% CI = 22,440 to 92,384; Doniol-Valcroze et al. 2015).

Bowhead whale sightings declined substantially during the open-water surveys, suggesting that most bowhead observed during the early shoulder season had since migrated out of the RSA. This is consistent with available data with respect to seasonal timing of bowhead whale migration (JPCS 2017/TSD 03). Four (4) bowhead were observed in the RSA on 17 August 2019. During previous aerial surveys flown in August, six (6) bowhead were observed during the 2014 survey (Thomas et al 2015) and none were observed in either 2013 or 2015 surveys (Elliott et al. 2015; Thomas et al. 2015). Based on this, the lower number of

bowhead sightings recorded in August 2019 is consistent with baseline conditions and is not reflective of displacement behaviour by bowhead due to shipping noise.

Overall, the 2019 marine mammal aerial survey results are consistent with impact predictions made in the FEIS Addendum for the Early Revenue Phase (ERP) in that the Project is unlikely to result in significant residual adverse effects on narwhal in the RSA (defined as effects that would compromise the integrity of the population either through mortality or via large-scale displacement or abandonment of the RSA). Narwhal occurred in the RSA in similar numbers during the early shoulder season as the open-water season, suggesting that mitigation measures implemented during icebreaking were effective in managing any potential large-scale avoidance or displacement behaviour by marine mammals in the RSA. As the 2019 abundance estimate for the Eclipse Sound stock falls within the range reported in previous DFO abundance estimates for this stock, this suggests that existing mitigation measures are showing to be similarly effective at avoiding any adverse effects at the population and/or stock level. Detailed results of the 2019 Marine Mammal Aerial Survey Program are provided in Golder (2020e).

***Ship-Based Observer Program:***

No ship strikes on marine mammals have been recorded over five years of SBO monitoring. Similarly, no ship strikes on marine mammals have been reported by ship operators since the start of the Project, including ore carriers, fuel tankers, freight ships, support tugs and an icebreaker. The 2019 Ship-based Observer (SBO) Program (Golder, 2020f) did not report any ship strikes. This is in agreement with impact predictions made in the FEIS. It is also in agreement with Inuit expectations of vessel interactions as reported in the Community Risk Assessment Workshops Report (ERM, 2019). The first report of a seabird strike over five years of monitoring occurred during the 2019 SBO Program.

The relative abundance of marine mammals in the RSA, expressed as the animal detection rate (no. of animals relative to survey effort in Km), was similar in 2019 (0.90 individuals / Km) as that recorded in 2018 (0.88 individuals / Km), while the number of sightings was marginally lower in 2019 (0.10 sightings / Km) than 2018 (0.18 sightings / Km). Species observed in greater relative abundance in 2019 than 2018 included narwhal, beluga, and bowhead whale. Less ringed seal and harp seal were observed in 2019 compared to 2018, although this is likely associated with the large number of unidentified seal species in 2019 (n=1,225) compared to 2018 (n=760). When considering all seal categories, a similar number of seal sightings was observed in both years. This was the first year that bowhead whales were observed during the SBO Program, with a total of 22 bowhead sightings comprising 24 individuals recorded in the RSA during 2019. All of the sightings occurred during the early shoulder season, with the exception of one solitary bowhead observed during the late shoulder season north of Ragged Island. During the early shoulder season, bowhead sightings were primarily concentrated in Eclipse Sound with several bowhead also observed in Milne Inlet South and Milne Inlet North near Ragged Island. All sightings consisted of solitary animals with the exception of two separate sightings of a pair of bowheads recorded during July.

Possible explanations for the observed increased in relative abundance of certain species in 2019 (e.g., narwhal, bowhead) include better survey conditions, difference in ice conditions, effectiveness of new mitigation measures introduced in 2019 (i.e., limited number of vessel transits in ice concentrations of 3/10 or higher; 40-km vessel buffer at entrance of RSA), and/or potential habituation of animals to icebreaking or shipping activity in general. According to one of the MWOs, the higher number of narwhal observed in

2019 likely reflects more narwhal in the RSA compared to 2018, when the community observed a low abundance of narwhal locally and very low catches that year. While in 2019, anecdotal evidence from hunters found the opposite to be true with narwhal observed throughout the RSA and in very large groups.

Overall, SBO results suggest that marine mammals in the RSA are not demonstrating large-scale displacement or abandonment from the RSA during or following icebreaking operations, and that mitigation measures implemented during the 2019 early shoulder season (e.g., limited number of transits, 40-km buffer area) are demonstrating to be effective. Detailed results of the 2019 SBO Program are provided in Golder (2020f).

- b. There has been a marked improvement by Project vessel operators over the last two years in terms of adherence to the 9 knot speed restriction in the RSA. This has been largely the result of better communication between the Port Master/Baffinland Shipping and the vessel owners/operators, substantial updates made to the Standing Instructions to Masters (SITM) regarding updated mitigation measures required by all Project vessels, the use of a real-time AIS-based alert system that immediately informs the Port Master and Baffinland Shipping personnel of a non-compliance event such as a speed exceedance so that the issue can be quickly resolved, and the use of ship monitors in Pond Inlet that actively track Project vessel movements in the RSA in real-time, and in relation to reported marine mammal aggregations (as shared by the community and the monitoring teams). This information can be used for adaptive management actions, including notices from the Port Authority to Vessel Masters operating in the RSA to exercise due caution in order to minimize the likelihood of interaction with the mammals. In such events, Masters will be authorized to adjust speed or alter course within safe and prudent navigational constraints to avoid to the extent possible interactions with high density marine mammal areas.

Table 4.33 provided the proportion of time Project vessels transited under 9 knots in the RSA for both 2018 and 2019 shipping seasons. In 2018, ore carriers traveled below 9 knots for 93.7% of their total travel time in the RSA and freight/tankers traveled below 9 knots for 79% of their total travel time in the RSA. In 2019, ore carriers traveled below 9 knots for 99.3% of their total travel time in the RSA, freight vessels traveled below 9 knots for 93.6 % of their total travel time in the RSA, and fuel tankers traveled below 9 knots for 98.2% of their total travel time in the RSA.

**Table 4.33: Proportion of Travel Time in RSA Relative to 9 knot Speed Restriction – 2018 v. 2019 Shipping Season**

Project Vessel Type	2018	2019
Ore carriers	93.7	99.3
Cargo / freight vessels	79.0	93.6
Fuel tankers	79.0	98.2
Tugs	85.7	94.5
MSV Botnica icebreaker	92.5	99.7
TOTAL	92.2	97.8

- c. Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

- a. In 2019, Baffinland, with support from the MEWG and Inuit participants, made modifications to the Bruce Head field camp to implement the shore-based study in 2019. Baffinland plans to continue operating the Shore-based Monitoring Program from Bruce Head in 2020.

New mitigation introduced in 2019 during the early shoulder season (i.e., limited number of daily vessel transits in RSA when ice concentrations are 3/10 or higher, use of the 40-km vessel setback area at the entrance of the RSA) will be re-implemented in 2020.

- b. In 2020, all Project vessels will continue to be provided with standing instructions to travel along the Northern Shipping Route at speeds not exceeding 9 knots. Baffinland will continue to monitor ship tracks and ship speeds using shore-based AIS stations installed at Pond Inlet and Bruce Head, and satellite-based ship tracking using the exactEarth® archive and alerts will be sent to vessels exceeding speed limits. An information package will be prepared by Baffinland and provided to all vessels prior to the start of the 2020 shipping season highlighting the speed limit commitments made by Baffinland for the Project and the reason for these commitments as it relates to mitigating potential wildlife interactions.
- c. None.

## Project Certificate Condition No. 106

Category	Marine Environment - Shipboard Observers
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure that interactions with marine mammals and Project shipping activities are effectively monitored.
Term or Condition	The Proponent shall ensure that shipboard observers are employed during seasons where shipping occurs and provided with the means to effectively carry out assigned duties. The role of shipboard observers in shipping operations should be taken into consideration during the design of any ore carriers purpose-built for the Project, with climate controlled stations and shipboard lighting incorporated to permit visual sightings by shipboard observers during all seasons and conditions. Any shipboard lighting incorporated should be in accordance with the Canada Shipping Act, 2001's Collision Regulations, and should not interfere with safe navigation of the vessel.
Relevant Baffinland Commitment	N/A
Reporting Requirement	As-needed.
Status	In Compliance
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	Draft 2019 Ship-based Observer (SBO) Monitoring Report (Golder, 2020f)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

In order to ensure that interactions with marine mammals and Project shipping activities are effectively monitored, Baffinland developed the SBO Program to monitor for potential ship strikes on marine mammals and seabirds in the RSA and to collect observational data on the presence, relative abundance and distribution of marine mammals and seabirds within the boundaries of the RSA relative to Project vessel operations. The SBO Program was first run in 2013 to 2015 and was subsequently resumed in 2018 and 2019. The 2013 to 2015 SBO Program took place during the construction phase at Milne Port (2013 and 2014) and during Year 1 of shipping operations (2015). Baffinland has not designed or constructed purpose-built ore carriers as originally envisioned, therefore Baffinland relied on placing the observers aboard market vessels in order to conduct the monitoring. Fuel tanker and sealift vessel traffic in and out of Milne Port served as the SBO observation platform during the 2013 to 2015 program. Observers boarded the ship in Pond Inlet, disembarked at Milne Port and returned to Pond Inlet via community charter flight for the subsequent vessel boarding. The SBO Program was put on hold in 2016 due to concerns regarding safe onboarding of the observers on the vessels in Pond Inlet (as boarding occurred at sea).

In 2018–2019, the survey platform for the SBO Program was the MSV *Botnica*, an icebreaker that was commissioned by Baffinland to serve as an escort vessel to ore carriers at the beginning and end of the shipping season. The MSV *Botnica* provided a safe climate-controlled viewing platform 20 m above sea level, where Marine Wildlife Observers (MWOs) could comfortably and more effectively observe marine wildlife and environmental conditions (compared to onboard the industry platforms used in 2013 to 2015). Marine mammal surveys were conducted while the vessel

was in transit (averaging approx. 8.3 knots). Seabirds were monitored using the Canadian Wildlife Service (CWS)'s Eastern Canada Seabirds at Sea (ECSAS) protocol.

Boarding of the MSV Botnica occurred at Milne Port with the observers remaining on the live-aboard vessel for the full multi-week monitoring period, eventually disembarking at Milne Port once ice escort services were complete. Marine mammal surveys typically lasted throughout daylight hours with scheduled breaks to avoid observer fatigue. The 2019 SBO Program took place from 19 to 29 July (Leg 1) and again from 5 to 28 October (Leg 2).

The MWOs were responsible for recording marine wildlife sightings from the bridge of the MSV Botnica during dedicated watch periods. Systematic data on marine wildlife sightings and environmental conditions were recorded by the MWOs and entered into an electronic database. Surveying was performed with the naked eye and using 10x42 and 7x50 binoculars. The MWOs were also responsible for photo-documentation of wildlife sightings and reporting observed ship strikes on marine mammals or seabirds, including near misses. The MWOs also informed the Vessel Master and ship officers of any notable wildlife sightings (i.e. species of higher concern such as polar bear, walrus and bowhead whales) and areas associated with high animal densities. Details on these sightings (including sighting locations) were then relayed to the Port Authority during daily communications between the MSV Botnica Master and Baffinland's shipping department. This information was then used for adaptive management actions (when and where required), including notices from the Port Authority to Vessel Masters operating in the RSA to exercise due caution in order to minimize the likelihood of interaction with the marine mammals identified. In such events, Vessel Masters are authorized to adjust speed or alter course within safe and prudent navigational constraints to avoid to the extent possible interactions with high density marine mammal areas or with species of higher concern.

Marine mammal sightings were recorded over a daily monitoring period extending up to 16 h on Leg 1 (from 10:00 to 02:00 EST) and up to 10 h on Leg 2 (from 08:00 to 18:00 EST) depending on available daylight hours. While the vessel was in transit, the focus of the survey was forward of the vessel, with the MWOs visually surveying from 240° to 120° relative to the centre or track line of the vessel (0°). When the vessel was stationary, the MWOs attempted to visually survey on all sides (360°) of the vessel, although the design of the bridge made this somewhat impractical. The vessel was rarely stationary, representing only 3% of total survey effort on Leg 1 (2 h and 46 min) and 1% of total survey effort on Leg 2 (52 min).

At the beginning of each watch period, a Global Positioning System (GPS) track file was initiated to record the path and speed of the survey vessel and to record sighting locations. Observational effort was calculated relative to survey distance in linear kilometres using trackline GPS data extracting segments of effort using start and end times recorded during each MWO shift. The same start and end times were used to determine temporal survey effort. All data analyses were completed based on spatial survey effort (Km) as not temporal effort. During each recorded marine mammal sighting, the distance between the detected marine mammal and the ship was estimated. The initial distance at which a marine mammal was observed by the MWO was noted and if the animal was subsequently observed again at a closer distance to the ship, the Closest Point of Approach (CPA) was updated.

Various environmental variables were systematically recorded during the active survey watch periods as these can influence an observer's ability to detect and identify marine mammals, in addition to potentially altering animal behaviour and distribution. Environmental variables were recorded at the beginning of each watch and whenever conditions noticeably changed during a watch. Environmental variables considered in the study included Near Field Ice Cover (ice cover within 100 m of the vessel, estimated by MWOs), Far Field Ice Cover (ice cover  $\geq$  100 m from vessel but within line of sight of the MWO), Beaufort Sea State (based on the Beaufort scale), Beaufort Wind Force,

Weather (e.g., precipitation and cloud cover), Visibility, Sun Glare and Sightability (combination of Weather, Sun Glare, and Beaufort Sea State). Relative representations of environmental conditions (e.g., Near Field and Far Field Ice Cover, Weather, Beaufort Sea State, Visibility and Sightability) were calculated as percentages of observational effort and were entered into the sightings e-database.

Detailed methodology on data collection and analytical procedures for the 2019 SBO Program is presented in Golder (2020f).

## RESULTS

The revised SBO Program has been successfully implemented from the MSV Botnica over the last two years and has included local Inuit participation. In 2019, total monitoring effort over both survey legs consisted of 268.7 hours covering 3,089 Km. Total monitoring effort during Leg 1 was 100.4 hours covering 1,119 Km. Total monitoring effort during Leg 2 was 168.3 hours traveling 1,970 Km. Although there were nearly twice as many observation days in Leg 2 compared to Leg 1 (24 vs. 11 days), this was not reflected in overall survey effort given the longer daylight hours during Leg 1 (mean daily effort= 11 h) compared to Leg 2 (mean daily effort = 7 h).

Seven different species of marine mammals were observed during the 2019 SBO Program: ringed seal, harp seal, narwhal, bowhead whale, beluga, bearded seal and polar bear. A total of 304 marine mammal sightings comprising 2,785 individuals were recorded. Killer whale and walrus were not recorded in the RSA during either survey leg in 2019; however, both species are known to occur in the region. Consistent with previous years (2013 to 2015 and 2018), no ship strikes on marine mammals were recorded in 2019.

During early summer (Leg 1), a total of 152 sightings comprising 2,453 individuals were recorded. Species identified included ringed seal (61 sightings of 722 individuals), narwhal (27 sightings of 385 individuals), harp seal (24 sightings of 136 individuals), bowhead whale (22 sightings of 24 individuals), bearded seal (four sightings of four individuals), polar bear (two sightings of two individuals) and beluga (one sighting of one individual). There were also nine sightings of unconfirmed pinniped species (comprising 1,176 individuals) and two sightings of unconfirmed cetacean species (comprising three individuals).

During fall (Leg 2), a total of 152 sightings comprising 332 individuals were recorded. Species identified included ringed seal (53 sightings of 58 individuals), narwhal (27 sightings of 103 individuals), harp seal (25 sightings of 117 individuals), bearded seal (one sighting of one individual) and bowhead whale (one sighting of one individual). There were also 44 sightings of unconfirmed pinniped species (49 individuals) and one sighting of an unconfirmed cetacean species (comprising three individuals).

A total of 54 narwhal sightings comprising 488 individuals were recorded in the RSA in 2019, with a higher number of animals observed during summer (n=385) than fall (n=103). Narwhal were observed as early as 19 July and as late as 30 October. During summer, sightings were concentrated in eastern Eclipse Sound near Pond Inlet and near Bruce Head in southern Milne Inlet. During fall, sightings were concentrated in Eclipse Sound near the southwest tip of Bylot Island and in Milne Inlet North near Ragged Island. Mean narwhal group size in 2019 was nine (ranging from 1 to 100 animals). No calves were recorded during the 2019 SBO Program.

This was the first year that bowhead whales were observed during the SBO Program, with a total of 22 bowhead sightings comprising 24 individuals recorded in the RSA during 2019. All of the sightings occurred during the early shoulder season, with the exception of one solitary bowhead observed during the late shoulder season north of Ragged Island. During summer, sightings were primarily concentrated in Eclipse Sound with several bowhead whales



also observed in Milne Inlet South and Milne Inlet North near Ragged Island. All sightings consisted of solitary animals with the exception of two separate sightings of a pair of bowheads recorded during early summer.

Only two polar bear sightings were recorded in the RSA in 2019, both on the same day (20 July), with each sighting consisting of a solitary polar bear walking on the sea ice in Milne Inlet North. The first polar bear was observed approximately 1 Km from the vessel. The second polar bear was observed 12 minutes later, approximately 3 Km from the vessel.

The CPA for cetacean species recorded during the 2019 SBO Program ranged from 200 to 5,000 m. The CPA for pinniped (i.e., seal) species recorded in 2019 ranged from 30 to 1,500 m. The 2019 CPA results support impact predictions that animals demonstrate localized avoidance of the ship. This provides further confidence that a vessel strike on a marine mammal is unlikely to occur based on current vessel speeds in the RSA (9 knot speed restriction).

Total monitoring effort for seabirds in 2019 was 103.2 h (Leg 1 and 2 combined), consisting of 231 5-min surveys during Leg 1 and 1,008 5-min surveys during Leg 2. A total of eleven species were identified during Leg 1 (157 confirmed sightings comprising 265 individuals), with fulmar and thick-billed murre being the most common species. A total of nine species were identified during Leg 2 (97 sightings comprising 396 individuals), with glaucous gull and northern fulmar being the most common species. Four ivory gulls, a federally Endangered species on Schedule 1 of the Species at Risk Act were observed during Leg 2; this species was not observed during the Leg 1 survey period, nor during the 2018 SBO Program.

One seabird strike, the first since start of ship-based monitoring, was recorded during Leg 2 of the 2019 SBO Program. At 22:00 on 11 October, a long-tailed duck flew into a helideck support post. The strike occurred in eastern Eclipse Sound near Pond Inlet while the vessel was holding station for the night. Conditions at the time were low visibility (dark, heavy snow), low wind and calm sea state. The specimen was a definitive basic (adult winter plumage) male. The specimen suffered a broken neck and died shortly thereafter. The bird strike event was reported to ECCC-CWS, QIA and the MHTO.

Detailed results for the 2019 SBO Program are presented in Golder (2020f).

## TRENDS

No ship strikes on marine mammals were recorded over the five years of SBO monitoring. Similarly, no ship strikes on marine mammals have been reported by ship operators since the start of the Project, including ore carriers, fuel/cargo ships and support tugs. The first report of a seabird strike over five years of monitoring occurred during the 2019 SBO Program. No additional seabird strikes have been reported by ship operators in 2019, including ore carriers, fuel/cargo ships and support tugs.

The relative abundance of marine mammals in the RSA, expressed as the animal detection rate (no. of animals relative to survey effort in Km), was similar in 2019 (0.90 individuals per Km) as that recorded in 2018 (0.88 individuals per Km), while the number of sightings was marginally lower in 2019 (0.10 sightings per Km) than 2018 (0.18 sightings / Km). Species observed in greater relative abundance in 2019 than 2018 included narwhal, beluga, and bowhead whale. The observed increase in 2019 is mostly reflective of early summer sightings (similar numbers were seen during fall in both years). Less ringed seal and harp seal were observed in 2019 compared to 2018, although this is likely associated with the large number of unidentified seal species in 2019 (n=1,225) compared to 2018 (n=760). When considering all seal categories, a similar number of seal sightings was observed in both years.



Possible explanations for the observed increased in relative abundance of certain species in 2019 (e.g., narwhal, bowhead) include better survey conditions, difference in ice conditions, effectiveness of new mitigation measures introduced in 2019 (i.e., limited number of vessel transits in ice concentrations of 3/10 or higher; 40-km vessel buffer at entrance of RSA), and/or potential habituation of animals to icebreaking or shipping activity in general. According to one of the MWOs, the higher number of narwhal observed in 2019 likely reflects more narwhal in the RSA compared to 2018, when the community observed a low abundance of narwhal locally and very low catches that year. While in 2019, hunters found the opposite to be true with narwhal observed throughout the RSA and in very large groups.

Overall, results suggest that marine mammals in the RSA are not demonstrating large-scale displacement or abandonment from the RSA during or following icebreaking operations, and that mitigation measures implemented during the 2019 early shoulder season (e.g., limited number of transits, 40 km buffer area) are effective.

### **RECOMMENDATIONS / LESSONS LEARNED**

Safety concerns that were raised regarding the initial SBO program (that led to the postponement of the program in 2016) were mitigated through the use of the MSV *Botnica* as the survey platform and boarding the vessel in Milne Port in 2018 and 2019. This included on-board accommodation for Inuit observers to allow for regular wildlife surveys over consecutive days. In doing so, the need to conduct at-sea boarding of observers on different survey vessels was no longer necessary.

Given the success of the recently modified SBO program, a similar program as completed in 2018 to 2019 remains under consideration for future implementation. Alternative methods for marine wildlife incidental reporting are being considered for 2020.

## Project Certificate Condition No. 107

Category	Marine Environment - Shipboard Observers
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations
Objective	To determine the presence of, and ensure that interactions with marine mammals, seabirds and seaducks are effectively monitored for, along the northern and southern shipping routes, as applicable.
Term or Condition	The Proponent shall revise the proposed “surveillance monitoring” to improve the likelihood of detecting strong marine mammal, seabird or seaduck responses occurring too far ahead of the ship to be detectable by observers aboard the ore carriers. A baseline study early in the shipping operations could employ additional surveillance to detect potential changes in distribution patterns and behavior. At an ambitious scope, this might be achieved using unmanned aircraft flown ahead of ships, or over known areas of importance for seabirds or haul-out sites in the case of walruses, in accordance with the requirements of their Special Flight Operations Certificate.
Relevant Baffinland Commitment	Not applicable
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	Draft 2019 Ship-based Observer Program (Golder, 2020f) 2019 MEWG Meeting Records
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

## METHODS

In order to ensure that interactions with marine wildlife and Project shipping activities are effectively monitored, Baffinland developed the SBO Program to monitor for potential ship strikes on marine mammals and seabirds in the RSA and to collect observational data on the presence, relative abundance and distribution of marine mammals and seabirds within the boundaries of the RSA relative to Project vessel operations. The SBO Program was first run in 2013 to 2015 and was subsequently resumed in 2018 and 2019. The 2013 to 2015 SBO Program took place during the construction phase at Milne Port (2013 and 2014) and during Year 1 of shipping operations (2015). As Baffinland had not designed or constructed purpose-built ore carriers as originally planned, there was reliance on placing the observers aboard market vessels in order to conduct the monitoring. Fuel tanker and sealift vessel traffic in and out of Milne Port served as the SBO observation platform during the 2013 to 2015 program. Observers boarded the ship in Pond Inlet, disembarked at Milne Port and returned to Pond Inlet via community charter flight for the subsequent vessel boarding. The SBO Program was put on hold in 2016 due to concerns regarding safe onboarding of the observers on the vessels in Pond Inlet (as boarding occurred at sea).

In 2018 to 2019, the survey platform for the SBO Program was the MSV *Botnica*, an icebreaker that was commissioned by Baffinland to serve as an escort vessel to ore carriers at the beginning and end of the shipping season. The MSV *Botnica* provided a safe climate-controlled viewing platform 20 m above sea level, where Marine

Wildlife Observers (MWOs) could comfortably and more effectively (compared to onboard the industry platforms used in 2013 to 2015) observe marine wildlife and environmental conditions. Marine mammal surveys were conducted while the vessel was in transit (averaging approx. 8.3 knots). Seabirds were monitored using the Canadian Wildlife Service (CWS)'s Eastern Canada Seabirds at Sea (ECSAS) protocol.

Boarding of the MSV Botnica occurred at Milne Port with the observers remaining on the live-aboard vessel for the full multi-week monitoring period, eventually disembarking at Milne Port once ice escort services were complete. Marine mammal surveys typically lasted throughout daylight hours with scheduled breaks to avoid observer fatigue. The 2019 SBO Program took place from 19 to 29 July (Leg 1) and again from 5 to 28 October (Leg 2).

The MWOs were responsible for recording marine wildlife sightings from the bridge of the MSV Botnica during dedicated watch periods. Systematic data on marine wildlife sightings and environmental conditions were recorded by the MWOs and entered into an electronic database. Surveying was performed with the naked eye and using 10x42 and 7x50 binoculars. The MWOs were also responsible for photo-documentation of wildlife sightings and reporting observed ship strikes on marine mammals or seabirds, including near misses. The MWOs also informed the Vessel Master and ship officers of any notable wildlife sightings (i.e. species of higher concern such as polar bear, walrus and bowhead whales) and areas associated with high animal densities. Details on these sightings (including sighting locations) were then relayed to the Port Authority during daily communications between the MSV Botnica Master and Baffinland's shipping department. This information was then used for adaptive management actions (when and where required), including notices from the Port Authority to Vessel Masters operating in the RSA to exercise due caution in order to minimize the likelihood of interaction with the marine mammals identified. In such events, Vessel Masters are authorized to adjust speed or alter course within safe and prudent navigational constraints to avoid to the extent possible interactions with high density marine mammal areas or with species of higher concern.

Marine mammal sightings were recorded over a daily monitoring period extending up to 16 h on Leg 1 (from 10:00 to 02:00 EST) and up to 10 h on Leg 2 (from 08:00 to 18:00 EST) depending on available daylight hours. While the vessel was in transit, the focus of the survey was forward of the vessel, with the MWOs visually surveying from 240° to 120° relative to the centre or track line of the vessel (0°). When the vessel was stationary, the MWOs attempted to visually survey on all sides (360°) of the vessel, although the design of the bridge made this somewhat impractical. The vessel was rarely stationary, representing only 3% of total survey effort on Leg 1 (2 h and 46 min) and 1% of total survey effort on Leg 2 (52 min).

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Various environmental variables were systematically recorded during the active survey watch periods as these can influence an observer's ability to detect and identify marine mammals, in addition to potentially altering animal behaviour and distribution. Environmental variables were recorded at the beginning of each watch and whenever conditions noticeably changed during a watch. Environmental variables considered in the study included Near Field

Ice Cover (ice cover within 100 m of the vessel, estimated by MWOs), Far Field Ice Cover (ice cover  $\geq 100$  m from vessel but within line of sight of the MWO), Beaufort Sea State (based on the Beaufort scale), Beaufort Wind Force, Weather (e.g., precipitation and cloud cover), Visibility, Sun Glare and Sightability (combination of Weather, Sun Glare, and Beaufort Sea State). Relative representations of environmental conditions (e.g., Near Field and Far Field Ice Cover, Weather, Beaufort Sea State, Visibility and Sightability) were calculated as percentages of observational effort and were entered into the sightings e-database.

Detailed methodology on data collection and analytical procedures for the 2019 SBO Program is presented in Golder (2020f).

## RESULTS

The revised SBO Program has been successfully implemented from the MSV Botnica over the last two years and has included local Inuit participation. In 2019, total monitoring effort over both survey legs consisted of 268.7 hours covering 3,089 Km. Total monitoring effort during Leg 1 was 100.4 hours covering 1,119 Km. Total monitoring effort during Leg 2 was 168.3 hours traveling 1,970 Km. Although there were nearly twice as many observation days in Leg 2 compared to Leg 1 (24 vs. 11 days), this was not reflected in overall survey effort given the longer daylight hours during Leg 1 (mean daily effort= 11 h) compared to Leg 2 (mean daily effort = 7 h).

Seven (7) different species of marine mammals were observed during the 2019 SBO Program: ringed seal, harp seal, narwhal, bowhead whale, beluga, bearded seal and polar bear. A total of 304 marine mammal sightings comprising 2,785 individuals were recorded. Killer whale and walrus were not recorded in the RSA during either survey leg in 2019; however, both species are known to occur in the region. Consistent with previous years (2013 to 2015 and 2018), no ship strikes on marine mammals were recorded in 2019.

During early summer (Leg 1), a total of 152 sightings comprising 2,453 individuals were recorded. Species identified included ringed seal (61 sightings of 722 individuals), narwhal (27 sightings of 385 individuals), harp seal (24 sightings of 136 individuals), bowhead whale (22 sightings of 24 individuals), bearded seal (four sightings of four individuals), polar bear (two sightings of two individuals) and beluga (one sighting of one individual). There were also nine sightings of unconfirmed pinniped species (comprising 1,176 individuals) and two sightings of unconfirmed cetacean species (comprising three individuals).

During fall (Leg 2), a total of 152 sightings comprising 332 individuals were recorded. Species identified included ringed seal (53 sightings of 58 individuals), narwhal (27 sightings of 103 individuals), harp seal (25 sightings of 117 individuals), bearded seal (one sighting of one individual) and bowhead whale (one sighting of one individual). There were also 44 sightings of unconfirmed pinniped species (49 individuals) and one sighting of an unconfirmed cetacean species (comprising three individuals).

A total of 54 narwhal sightings comprising 488 individuals were recorded in the RSA in 2019, with a higher number of animals observed during summer ( $n=385$ ) than fall ( $n=103$ ). Narwhal were observed as early as 19 July and as late as 30 October. During summer, sightings were concentrated in eastern Eclipse Sound near Pond Inlet and near Bruce Head in southern Milne Inlet. During fall, sightings were concentrated in Eclipse Sound near the southwest tip of Bylot Island and in Milne Inlet North near Ragged Island. Mean narwhal group size in 2019 was nine (ranging from 1 to 100 animals). No calves were recorded during the 2019 SBO Program.

This was the first year that bowhead whales were observed during the SBO Program, with a total of 22 bowhead sightings comprising 24 individuals recorded in the RSA during 2019. All of the sightings occurred during the early

shoulder season, with the exception of one solitary bowhead observed during the late shoulder season north of Ragged Island. During summer, sightings were primarily concentrated in Eclipse Sound with several bowhead also observed in Milne Inlet South and Milne Inlet North near Ragged Island. All sightings consisted of solitary animals with the exception of two separate sightings of a pair of bowheads recorded during early summer.

Only two polar bear sightings were recorded in the RSA in 2019, both on the same day (20 July), with each sighting consisting of a solitary polar bear walking on the sea ice in Milne Inlet North. The first polar bear was observed approximately 1 Km from the vessel. The second polar bear was observed 12 minutes later, approximately 3 Km from the vessel.

The CPA for cetacean species recorded during the 2019 SBO Program ranged from 200 to 5,000 m. The CPA for pinniped (i.e., seal) species recorded in 2019 ranged from 30 to 1,500 m. The 2019 CPA results support impact predictions that animals demonstrate localized avoidance of the ship. This provides further confidence that a vessel strike on a marine mammal is unlikely to occur based on current vessel speeds in the RSA (9 knot speed restriction).

Total monitoring effort for seabirds in 2019 was 103.2 h (Leg 1 and 2 combined), consisting of 231 5-min surveys during Leg 1 and 1,008 5-min surveys during Leg 2. A total of eleven species were identified during Leg 1 (157 confirmed sightings comprising 265 individuals), with fulmar and thick-billed murre being the most common species. A total of nine species were identified during Leg 2 (97 sightings comprising 396 individuals), with glaucous gull and northern fulmar being the most common species. Four ivory gulls, a federally Endangered species on Schedule 1 of the Species at Risk Act were observed during Leg 2; this species was not observed during the Leg 1 survey period, nor during the 2018 SBO Program.

One seabird strike, the first since start of ship-based monitoring, was recorded during Leg 2 of the 2019 SBO Program. At 22:00 on 11 October, a long-tailed duck flew into a helideck support post. The strike occurred in eastern Eclipse Sound near Pond Inlet while the vessel was holding station for the night. Conditions at the time were low visibility (dark, heavy snow), low wind and calm sea state. The specimen was a definitive basic (adult winter plumage) male. The specimen suffered a broken neck and died shortly thereafter. The bird strike event was reported to ECCC-CWS, QIA and the MHTO.

Detailed results for the 2019 SBO Program are presented in Golder (2020f).

## TRENDS

No ship strikes on marine mammals were recorded over the five years of SBO monitoring. Similarly, no ship strikes on marine mammals have been reported by ship operators since the start of the Project, including ore carriers, fuel/cargo ships and support tugs. The first report of a seabird strike over five years of monitoring occurred during the 2019 SBO Program. No additional seabird strikes have been reported by ship operators in 2019, including ore carriers, fuel/cargo ships and support tugs.

The relative abundance of marine mammals in the RSA, expressed as the animal detection rate (no. of animals relative to survey effort in Km), was similar in 2019 (0.90 individuals per Km) as that recorded in 2018 (0.88 individuals per Km), while the number of sightings was marginally lower in 2019 (0.10 sightings per Km) than 2018 (0.18 sightings / Km). Species observed in greater relative abundance in 2019 than 2018 included narwhal, beluga, and bowhead whale. The observed increase in 2019 is mostly reflective of early summer sightings (similar numbers were seen during fall in both years). Less ringed seal and harp seal were observed in 2019 compared to 2018, although this is likely associated with the large number of unidentified seal species in 2019 (n=1,225).

compared to 2018 (n=760). When considering all seal categories, a similar number of seal sightings was observed in both years.

Possible explanations for the observed increased in relative abundance of certain species in 2019 (e.g., narwhal, bowhead) include better survey conditions, difference in ice conditions, effectiveness of new mitigation measures introduced in 2019 (i.e., limited number of vessel transits in ice concentrations of 3/10 or higher; 40-km vessel buffer at entrance of RSA), and/or potential habituation of animals to icebreaking or shipping activity in general. According to one of the MWOs, the higher number of narwhal observed in 2019 likely reflects more narwhal in the RSA compared to 2018, when the community observed a low abundance of narwhal locally and very low catches that year. While in 2019, hunters found the opposite to be true with narwhal observed throughout the RSA and in very large groups.

Overall, results suggest that marine mammals in the RSA are not demonstrating large-scale displacement or abandonment from the RSA during or following icebreaking operations, and that mitigation measures implemented during the 2019 early shoulder season (e.g., limited number of transits, 40-km buffer area) are effective.

#### **RECOMMENDATIONS / LESSONS LEARNED**

Safety concerns that were raised regarding the initial SBO program (that led to the postponement of the program in 2016) were mitigated through the use of the MSV *Botnica* as the survey platform and boarding the vessel in Milne Port in 2018 and 2019. This included on-board accommodation for Inuit observers to allow for regular wildlife surveys over consecutive days. In doing so, the need to conduct at-sea boarding of observers on different survey vessels was no longer necessary. Given the success of the recently modified SBO program, a similar program as completed in 2018 to 2019 remains under consideration for future implementation. Alternative methods for marine wildlife incidental reporting are being considered for 2020.

## Project Certificate Condition No. 108

Category	Marine Environment - Shipboard Observers
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations
Objective	To ensure that interactions with marine mammals, seabirds, and seaducks are effectively monitored for along the southern and northern shipping routes, as applicable.
Term or Condition	The Proponent shall ensure that data produced by the surveillance monitoring program is analysed rigorously by experienced analysts (in addition to being discussed as proposed in the FEIS) to maximize their effectiveness in providing baseline information, and for detecting potential effects of the project on marine mammals, seabirds and seaducks in the Regional Study Area. It is expected that data from the long-term monitoring program be treated with the same rigor.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	Draft 2019 Ship-based Observer Program (Golder, 2020f) 2019 MEWG Meeting Records
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

In order to ensure that interactions with marine mammals and Project shipping activities are effectively monitored, Baffinland developed the SBO Program to monitor for potential ship strikes on marine mammals and seabirds in the RSA and to collect observational data on the presence, relative abundance and distribution of marine mammals and seabirds within the boundaries of the RSA relative to Project vessel operations. The SBO Program was first run in 2013 to 2015 and was subsequently resumed in 2018 and 2019. The 2013 to 2015 SBO Program took place during the construction phase at Milne Port (2013 and 2014) and during Year 1 of shipping operations (2015). As Baffinland had not designed or constructed purpose-built ore carriers as originally planned, there was reliance on placing the observers aboard market vessels in order to conduct the monitoring. Fuel tanker and sealift vessel traffic in and out of Milne Port served as the SBO observation platform during the 2013 to 2015 program. Observers boarded the ship in Pond Inlet, disembarked at Milne Port and returned to Pond Inlet via community charter flight for the subsequent vessel boarding. The SBO Program was put on hold in 2016 due to concerns regarding safe onboarding of the observers on the vessels in Pond Inlet (as boarding occurred at sea).

In 2018 to 2019, the survey platform for the SBO Program was the MSV *Botnica*, an icebreaker that was commissioned by Baffinland to serve as an escort vessel to ore carriers at the beginning and end of the shipping season. The MSV *Botnica* provided a safe climate-controlled viewing platform 20 m above sea level, where Marine Wildlife Observers (MWOs) could comfortably and more effectively (compared to onboard the industry platforms used in 2013 to 2015) observe marine wildlife and environmental conditions. Marine mammal surveys were



conducted while the vessel was in transit (averaging approx. 8.3 knots). Seabirds were monitored using the Canadian Wildlife Service (CWS)'s Eastern Canada Seabirds at Sea (ECSAS) protocol.

Boarding of the MSV Botnica occurred at Milne Port with the observers remaining on the live-aboard vessel for the full multi-week monitoring period, eventually disembarking at Milne Port once ice escort services were complete. Marine mammal surveys typically lasted throughout daylight hours with scheduled breaks to avoid observer fatigue. The 2019 SBO Program took place from 19 to 29 July (Leg 1) and again from 5 to 28 October (Leg 2).

The MWOs were responsible for recording marine wildlife sightings from the bridge of the MSV Botnica during dedicated watch periods. Systematic data on marine wildlife sightings and environmental conditions were recorded by the MWOs and entered into an electronic database. Surveying was performed with the naked eye and using 10x42 and 7x50 binoculars. The MWOs were also responsible for photo-documentation of wildlife sightings and reporting observed ship strikes on marine mammals or seabirds, including near misses. The MWOs also informed the Vessel Master and ship officers of any notable wildlife sightings (i.e. species of higher concern such as polar bear, walrus and bowhead whales) and areas associated with high animal densities. Details on these sightings (including sighting locations) were then relayed to the Port Authority during daily communications between the MSV Botnica Master and Baffinland's shipping department. This information was then used for adaptive management actions (when and where required), including notices from the Port Authority to Vessel Masters operating in the RSA to exercise due caution in order to minimize the likelihood of interaction with the marine mammals identified. In such events, Vessel Masters are authorized to adjust speed or alter course within safe and prudent navigational constraints to avoid to the extent possible interactions with high density marine mammal areas or with species of higher concern.

Marine mammal sightings were recorded over a daily monitoring period extending up to 16 h on Leg 1 (from 10:00 to 02:00 EST) and up to 10 h on Leg 2 (from 08:00 to 18:00 EST) depending on available daylight hours. While the vessel was in transit, the focus of the survey was forward of the vessel, with the MWOs visually surveying from 240° to 120° relative to the centre or track line of the vessel (0°). When the vessel was stationary, the MWOs attempted to visually survey on all sides (360°) of the vessel, although the design of the bridge made this somewhat impractical. The vessel was rarely stationary, representing only 3% of total survey effort on Leg 1 (2 h and 46 min) and 1% of total survey effort on Leg 2 (52 min).

At the beginning of each watch period, a Global Positioning System (GPS) track file was initiated to record the path and speed of the survey vessel and to record sighting locations. Observational effort was calculated relative to survey distance in linear kilometres using trackline GPS data extracting segments of effort using start and end times recorded during each MWO shift. The same start and end times were used to determine temporal survey effort. All data analyses were completed based on spatial survey effort (Km) as not temporal effort. During each recorded marine mammal sighting, the distance between the detected marine mammal and the ship was estimated. The initial distance at which a marine mammal was observed by the MWO was noted and if the animal was subsequently observed again at a closer distance to the ship, the Closest Point of Approach (CPA) was updated.

Various environmental variables were systematically recorded during the active survey watch periods as these can influence an observer's ability to detect and identify marine mammals, in addition to potentially altering animal behaviour and distribution. Environmental variables were recorded at the beginning of each watch and whenever conditions noticeably changed during a watch. Environmental variables considered in the study included Near Field Ice Cover (ice cover within 100 m of the vessel, estimated by MWOs), Far Field Ice Cover (ice cover  $\geq$  100 m from vessel but within line of sight of the MWO), Beaufort Sea State (based on the Beaufort scale), Beaufort Wind Force,



Weather (e.g., precipitation and cloud cover), Visibility, Sun Glare and Sightability (combination of Weather, Sun Glare, and Beaufort Sea State). Relative representations of environmental conditions (e.g., Near Field and Far Field Ice Cover, Weather, Beaufort Sea State, Visibility and Sightability) were calculated as percentages of observational effort and were entered into the sightings e-database.

Detailed methodology on data collection and analytical procedures for the 2019 SBO Program is presented in Golder (2020f).

## RESULTS

The revised SBO Program has been successfully implemented from the MSV Botnica over the last two years and has included local Inuit participation. In 2019, total monitoring effort over both survey legs consisted of 268.7 hours covering 3,089 Km. Total monitoring effort during Leg 1 was 100.4 hours covering 1,119 Km. Total monitoring effort during Leg 2 was 168.3 hours traveling 1,970 Km. Although there were nearly twice as many observation days in Leg 2 compared to Leg 1 (24 vs. 11 days), this was not reflected in overall survey effort given the longer daylight hours during Leg 1 (mean daily effort= 11 h) compared to Leg 2 (mean daily effort = 7 h).

Seven different species of marine mammals were observed during the 2019 SBO Program: ringed seal, harp seal, narwhal, bowhead whale, beluga, bearded seal and polar bear. A total of 304 marine mammal sightings comprising 2,785 individuals were recorded. Killer whale and walrus were not recorded in the RSA during either survey leg in 2019; however, both species are known to occur in the region. Consistent with previous years (2013 to 2015 and 2018), no ship strikes on marine mammals were recorded in 2019.

During early summer (Leg 1), a total of 152 sightings comprising 2,453 individuals were recorded. Species identified included ringed seal (61 sightings of 722 individuals), narwhal (27 sightings of 385 individuals), harp seal (24 sightings of 136 individuals), bowhead whale (22 sightings of 24 individuals), bearded seal (four sightings of four individuals), polar bear (two sightings of two individuals) and beluga (one sighting of one individual). There were also nine sightings of unconfirmed pinniped species (comprising 1,176 individuals) and two sightings of unconfirmed cetacean species (comprising three individuals).

During fall (Leg 2), a total of 152 sightings comprising 332 individuals were recorded. Species identified included ringed seal (53 sightings of 58 individuals), narwhal (27 sightings of 103 individuals), harp seal (25 sightings of 117 individuals), bearded seal (one sighting of one individual) and bowhead whale (one sighting of one individual). There were also 44 sightings of unconfirmed pinniped species (49 individuals) and one sighting of an unconfirmed cetacean species (comprising three individuals).

A total of 54 narwhal sightings comprising 488 individuals were recorded in the RSA in 2019, with a higher number of animals observed during summer (n=385) than fall (n=103). Narwhal were observed as early as 19 July and as late as 30 October. During summer, sightings were concentrated in eastern Eclipse Sound near Pond Inlet and near Bruce Head in southern Milne Inlet. During fall, sightings were concentrated in Eclipse Sound near the southwest tip of Bylot Island and in Milne Inlet North near Ragged Island. Mean narwhal group size in 2019 was nine (ranging from 1 to 100 animals). No calves were recorded during the 2019 SBO Program.

This was the first year that bowhead whales were observed during the SBO Program, with a total of 22 bowhead sightings comprising 24 individuals recorded in the RSA during 2019. All of the sightings occurred during the early shoulder season, with the exception of one solitary bowhead observed during the late shoulder season north of Ragged Island. During summer, sightings were primarily concentrated in Eclipse Sound with several bowhead also

observed in Milne Inlet South and Milne Inlet North near Ragged Island. All sightings consisted of solitary animals with the exception of two separate sightings of a pair of bowheads recorded during early summer.

Only (2) two polar bear sightings were recorded in the RSA in 2019, both on the same day (20 July), with each sighting consisting of a solitary polar bear walking on the sea ice in Milne Inlet North. The first polar bear was observed approximately 1 Km from the vessel. The second polar bear was observed 12 minutes later, approximately 3 Km from the vessel.

The CPA for cetacean species recorded during the 2019 SBO Program ranged from 200 to 5,000 m. The CPA for pinniped (i.e., seal) species recorded in 2019 ranged from 30 to 1,500 m. The 2019 CPA results support impact predictions that animals demonstrate localized avoidance of the ship. This provides further confidence that a vessel strike on a marine mammal is unlikely to occur based on current vessel speeds in the RSA (9 knot speed restriction).

Total monitoring effort for seabirds in 2019 was 103.2 h (Leg 1 and 2 combined), consisting of 231 5-min surveys during Leg 1 and 1,008 5-min surveys during Leg 2. A total of eleven species were identified during Leg 1 (157 confirmed sightings comprising 265 individuals), with fulmar and thick-billed murre being the most common species. A total of nine species were identified during Leg 2 (97 sightings comprising 396 individuals), with glaucous gull and northern fulmar being the most common species. Four ivory gulls, a federally Endangered species on Schedule 1 of the Species at Risk Act were observed during Leg 2; this species was not observed during the Leg 1 survey period, nor during the 2018 SBO Program.

One seabird strike, the first since start of ship-based monitoring, was recorded during Leg 2 of the 2019 SBO Program. At 22:00 on 11 October, a long-tailed duck flew into a helideck support post. The strike occurred in eastern Eclipse Sound near Pond Inlet while the vessel was holding station for the night. Conditions at the time were low visibility (dark, heavy snow), low wind and calm sea state. The specimen was a definitive basic (adult winter plumage) male. The specimen suffered a broken neck and died shortly thereafter. The bird strike event was reported to ECCC-CWS, QIA and the MHTO.

Detailed results for the 2019 SBO Program are presented in Golder (2020f).

## TRENDS

No ship strikes on marine mammals were recorded over the five years of SBO monitoring. Similarly, no ship strikes on marine mammals have been reported by ship operators since the start of the Project, including ore carriers, fuel/cargo ships and support tugs. The first report of a seabird strike over five years of monitoring occurred during the 2019 SBO Program. No additional seabird strikes have been reported by ship operators in 2019, including ore carriers, fuel/cargo ships and support tugs.

The relative abundance of marine mammals in the RSA, expressed as the animal detection rate (no. of animals relative to survey effort in Km), was similar in 2019 (0.90 individuals per Km) as that recorded in 2018 (0.88 individuals per Km), while the number of sightings was marginally lower in 2019 (0.10 sightings per Km) than 2018 (0.18 sightings / Km). Species observed in greater relative abundance in 2019 than 2018 included narwhal, beluga, and bowhead whale. The observed increase in 2019 is mostly reflective of early summer sightings (similar numbers were seen during fall in both years). Less ringed seal and harp seal were observed in 2019 compared to 2018, although this is likely associated with the large number of unidentified seal species in 2019 (n=1,225) compared to 2018 (n=760). When considering all seal categories, a similar number of seal sightings was observed in both years.

Possible explanations for the observed increased in relative abundance of certain species in 2019 (e.g., narwhal, bowhead) include better survey conditions, difference in ice conditions, effectiveness of new mitigation measures introduced in 2019 (i.e., limited number of vessel transits in ice concentrations of 3/10 or higher; 40 km vessel buffer at entrance of RSA), and/or potential habituation of animals to icebreaking or shipping activity in general. According to one of the MWOs, the higher number of narwhal observed in 2019 likely reflects more narwhal in the RSA compared to 2018, when the community observed a low abundance of narwhal locally and very low catches that year. While in 2019, hunters found the opposite to be true with narwhal observed throughout the RSA and in very large groups.

Overall, results suggest that marine mammals in the RSA are not demonstrating large-scale displacement or abandonment from the RSA during or following icebreaking operations, and that mitigation measures implemented during the 2019 early shoulder season (e.g., limited number of transits, 40 km buffer area) are demonstrating to be effective.

#### **RECOMMENDATIONS / LESSONS LEARNED**

Safety concerns that were raised regarding the initial SBO program (that led to the postponement of the program in 2016) were mitigated through the use of the MSV *Botnica* as the survey platform and boarding the vessel in Milne Port in 2018 and 2019. This included on-board accommodation for Inuit observers to allow for regular wildlife surveys over consecutive days. In doing so, the need to conduct at-sea boarding of observers on different survey vessels was no longer necessary. Given the success of the recently modified SBO program, a similar program as completed in 2018 to 2019 remains under consideration for future implementation. Alternative methods for marine wildlife incidental reporting are being considered for 2020.

## Project Certificate Condition No. 109

Category	Marine Environment - Ship Noise
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To prevent impacts to marine mammals from Project shipping activities.
Term or Condition	The Proponent shall conduct a monitoring program to confirm the predictions in the FEIS with respect to disturbance effects from ships noise on the distribution and occurrence of marine mammals. The survey shall be designed to address effects during the shipping seasons, and include locations in Hudson Strait and Foxe Basin, Milne Inlet, Eclipse Sound and Pond Inlet. The survey shall continue over a sufficiently lengthy period to determine the extent to which habituation occurs for narwhal, beluga, bowhead and walrus.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	2019 Marine Environment Monitoring — Field Program Summary (Golder, 2019h) 2019 Marine Mammal Monitoring Programs — Updated Preliminary Results (Golder, 2020e) Draft Marine Mammal Aerial Survey (Golder, 2020g) Draft 2017–2018 Integrated Narwhal Tagging Study (Golder, 2020h) Draft Bruce Head Shore-based Monitoring Program (Golder, 2020c) Draft 2019 Passive Acoustic Monitoring Program (Frouin-Mouy et al., 2020) 2019 MEWG Meeting Records
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

No studies were conducted in Hudson Strait or Foxe Basin, as the Steensby phase of the Project is currently inactive.

Monitoring programs conducted along the Northern Shipping Route and corresponding analyses undertaken in 2019 used a ‘multiple lines of evidence’ approach to confirm predictions in the FEIS with respect to disturbance effects from ships noise on the distribution and occurrence of marine mammals along the Northern Shipping Route. These predictions indicate that the response of marine mammals to ship noise will be limited to temporary, short-term avoidance behaviour, consistent with low to moderate severity responses. No large-scale avoidance behaviour, displacement effects, or abandonment of the summering grounds (high severity responses) are predicted to occur. In 2019, monitoring programs used visual, acoustic and remote sensing techniques to assess changes in marine mammal distribution and abundance within the RSA, and behavioural responses of narwhal and other marine mammals to ship noise. The 2019 monitoring programs included the 2019 Bruce Head Shore-based Monitoring Program, the 2019 Marine Mammal Aerial Survey Program, the 2019 Passive Acoustic Monitoring Program, the 2017–2018 Narwhal Tagging Program (integrated report prepared in 2019/2020) and the 2019 SBO Program.

Collectively, these multi-year monitoring programs provide for a comprehensive evaluation of potential ship noise effects on marine mammals during the entire shipping period and throughout the life of the Project.

***Bruce Head Shore-based Monitoring Program:***

Baffinland undertook a shore-based narwhal monitoring program at Bruce Head from 2013–2017 and again in 2019. The objective of the Bruce Head Shore-based Monitoring Program was to investigate narwhal response to shipping activities along the Northern Shipping Route in Milne Inlet. During the open water season of 2019, visual survey data were collected from a cliff-based observation platform that enabled observing narwhal along a confined section of the shipping route, in a calving area where narwhal are known to occur in high density and are subject to exposure to incoming and outgoing Project vessel traffic. Data were collected on relative abundance and distribution (RAD) and group composition of narwhal. Additional data were collected on environmental conditions and anthropogenic activities (e.g., shipping and hunting activities) to distinguish between the potential effects of Project-related shipping activities and confounding factors that may also affect narwhal behaviour. Detailed methodology on data collection and analytical procedures for the 2019 Bruce Head Shore-based Monitoring Program are presented in Golder (2020i).

***Marine Mammal Aerial Survey Program:***

In 2019, marine mammal aerial surveys were conducted in the North Baffin area during the early shoulder season (July) and the peak open-water season (August), with the support of Inuit researchers from Pond Inlet and Arlic Bay. The 2019 aerial survey program was approved by the MHTO. DFO and other MEWG members were actively consulted on the study design and data collection methods during the 21 June 2019 MEWG meeting (Appendix C.1). Input and recommendations provided by these parties were incorporated into the program. The objectives of the surveys were to determine the relative abundance and distribution of narwhal near the Pond Inlet floe edge prior to and during initial shipping and icebreaking operations, and to undertake systematic aerial transect surveys to obtain abundance and density estimates of the Eclipse Sound and Admiralty Inlet narwhal summer stocks during the open-water season. The aerial survey data collection methodology combined distance-based line transect methods (double platform design using four Marine Mammal Observers (MMOs) stationed at front and rear bubble windows on the aircraft) and high-resolution photography methods (two DSLR cameras mounted in the belly hatch of the aircraft and programmed to collect oblique digital imagery of the survey area). Data collection was based exclusively on photographic surveys for areas associated with high narwhal concentrations. Detailed methodology and analytical procedures are presented in Golder (2020g).

***Passive Acoustic Monitoring Program:***

In 2019, as part of JASCO Applied Sciences' (JASCO) Passive Acoustic Monitoring (PAM) Program acoustic recorders (Autonomous Multichannel Acoustic Recorders, AMARs) were deployed at five representative locations along the Northern Shipping Route in Eclipse Sound and Milne Inlet. The objective of the program was to document ambient and anthropogenic underwater noise levels in the RSA during the open-water and shipping shoulder season periods, to monitor marine mammal presence along the shipping corridor near Bruce Head and in Koluktoo Bay, to evaluate Project shipping noise levels in relation to established marine mammal acoustic thresholds for injury and disturbance and to compare measured sound levels from shipping activities during the shoulder season to modelled estimates used for environmental effects assessment. Three AMARs were deployed in Milne Inlet South over a two-month period (4 August to 29 September) to collect acoustic data during the open water season, concurrently with visual observer data collected as part of the 2019 Bruce Head Shore-based Monitoring Program (specific program details

are provided in Golder, 2020c). An additional two AMARS were deployed along the nominal shipping route in Eclipse Sound, near Ragged Island and south of Bylot Island in May 2019 to record icebreaker and ore carrier noise during vessel transits in Eclipse Sound. The recorder near Bylot Island was only deployed for the spring shoulder season (28 days); the recorder near Ragged Island remained in place throughout the 2019 open water season (85 days total). Both of these recorders were redeployed at the end of the open water season to record sounds during the Fall 2019 and Spring 2020 shoulder seasons. Frequency-weighted daily sound exposure level (SEL) values were calculated for the five marine mammal functional hearing groups and compared to established acoustic injury thresholds based on criteria and guidance established by the National Oceanic and Atmospheric Administration (NOAA) for assessing acoustic impacts on marine mammals. Non-weighted sound pressure levels (SPL) were measured and compared to acoustic disturbance thresholds for marine mammals based on established NOAA guidance/criteria. Given there are presently no established regulatory thresholds to aid in determination of acoustic masking effects on marine mammals, in order to better understand this potential effect from shipping noise on narwhal, JASCO evaluated the proportion of lost listening space a narwhal may experience from ship noise relevant to ambient conditions. This was done using acoustic monitoring data collected in 2019 which provides a more accurate and reliable estimate of the level of reduced listening range that would occur for narwhal (compared to modeled estimates). Listening range reduction (LRR) is defined as the fractional decrease in the available listening range (the distance over which sources of sound can be detected) experienced by an animal when they are exposed to ambient and/or anthropogenic noise source. Acoustic data were analyzed from the five AMAR recorder stations in Eclipse Sound and Milne Inlet to quantify the proportion of the recording period in which a >50% and >90% LRR would occur for narwhal during the early shoulder and open-water seasons. For the LRR assessment, JASCO looked at three different frequencies which were representative of the three main call types used by narwhal: clicks (25 kHz), whistles (5 kHz) and bubble pulses (1 kHz). Detailed methodology on data collection and analytical procedures for the 2019 Passive Acoustic Monitoring Program are presented in Frouin-Mouy et al. (2020).

#### ***2017–2018 Narwhal Tagging Program:***

The 2017–2018 Narwhal Tagging Program involved deploying remote sensing tags on the backs of narwhal to effectively track the animal's three-dimensional movements, vocal behaviour and surrounding acoustic environment over an extended time-series as the animals naturally moved through their summer foraging range in the North Baffin Island region. This provided insight into the animal's behaviour over a continuous 24-h period, throughout changing environmental conditions and across a broad geographic range. The deployment of satellite-based location/dive tags on individual narwhal allowed for the tracking of narwhal spatial movement (horizontal and vertical) in relation to shipping events. The deployment of Acousonde (passive acoustic recorder) tags on individual narwhals allows for the evaluation of potential changes in narwhal behaviour in relation to received levels of shipping noise, in comparison to their movements and behaviour when no shipping is present. Passive acoustic tags allow for a better understanding of what the whale is hearing (received sound levels) in its natural environment, while simultaneously recording information on three-dimensional movement and vocal behaviour of the tagged animal. The 2017–2018 Narwhal Tagging Program was a collaborative study with DFO, and the results from the program continued to be analyzed in 2019. Detailed methodology on data collection and analytical procedures for the 2017-2018 Narwhal Tagging Program are presented in Golder (2020h).

#### ***2019 Ship-based Observer (SBO) Program:***

In order to ensure that interactions with marine mammals and Project shipping activities are effectively monitored, Baffinland developed the SBO Program to monitor for potential ship strikes on marine mammals in the RSA and to

collect observational data on the presence, relative abundance and distribution of marine mammals within the boundaries of the RSA relative to Project vessel operations. The SBO Program was first run in 2013–2015 and was subsequently resumed in 2018 and 2019. The 2013 to 2015 SBO Program took place during the construction phase at Milne Port (2013 and 2014) and during Year 1 of shipping operations (2015). As Baffinland had not designed or constructed purpose-built ore carriers as originally planned, there was reliance on placing the observers aboard market vessels in order to conduct the monitoring. Fuel tanker and sealift vessel traffic in and out of Milne Port served as the SBO observation platform during the 2013 to 2015 program. Observers boarded the ship in Pond Inlet, disembarked at Milne Port and returned to Pond Inlet via community charter flight for the subsequent vessel boarding. The SBO Program was put on hold in 2016 due to concerns regarding safe onboarding of the observers on the vessels in Pond Inlet (as boarding occurred at sea).

In 2018 to 2019, the survey platform for the SBO Program was the MSV Botnica, an icebreaker that was commissioned by Baffinland to serve as an escort vessel to ore carriers at the beginning and end of the shipping season. The MSV Botnica provided a safe climate-controlled viewing platform 20 m above sea level, where Marine Wildlife Observers (MWOs) could comfortably and more effectively (compared to onboard the industry platforms used in 2013 to 2015) observe marine wildlife and environmental conditions. Marine mammal surveys were conducted while the vessel was in transit (averaging approx. 8.3 knots).

Boarding of the MSV Botnica occurred at Milne Port with the observers remaining on the live-aboard vessel for the full multi-week monitoring period, eventually disembarking at Milne Port once ice escort services were complete. Marine mammal surveys typically lasted throughout daylight hours with scheduled breaks to avoid observer fatigue. The 2019 SBO Program took place from 19 to 29 July (Leg 1) and again from 5 to 28 October (Leg 2).

The MWOs were responsible for recording marine wildlife sightings from the bridge of the MSV Botnica during dedicated watch periods. Systematic data on marine wildlife sightings and environmental conditions were recorded by the MWOs and entered into an electronic database. Surveying was performed with the naked eye and using 10x42 and 7x50 binoculars. The MWOs were also responsible for photo-documentation of wildlife sightings and reporting observed ship strikes on marine mammals, including near misses. The MWOs also informed the Vessel Master and ship officers of any notable wildlife sightings (i.e. species of higher concern such as polar bear, walrus and bowhead whales) and areas associated with high animal densities. Details on these sightings (including sighting locations) were then relayed to the Port Authority during daily communications between the MSV Botnica Master and Baffinland's shipping department. This information was then used for adaptive management actions (when and where required), including notices from the Port Authority to Vessel Masters operating in the RSA to exercise due caution in order to minimize the likelihood of interaction with the marine mammals identified. In such events, Vessel Masters are authorized to adjust speed or alter course within safe and prudent navigational constraints to avoid to the extent possible interactions with high density marine mammal areas or with species of higher concern.

Marine mammal sightings were recorded over a daily monitoring period extending up to 16 h on Leg 1 (from 10:00 to 02:00 EST) and up to 10 h on Leg 2 (from 08:00 to 18:00 EST) depending on available daylight hours. While the vessel was in transit, the focus of the survey was forward of the vessel, with the MWOs visually surveying from 240° to 120° relative to the centre or track line of the vessel (0°). When the vessel was stationary, the MWOs attempted to visually survey on all sides (360°) of the vessel, although the design of the bridge made this somewhat impractical. The vessel was rarely stationary, representing only 3% of total survey effort on Leg 1 (2 h and 46 min) and 1% of total survey effort on Leg 2 (52 min).



At the beginning of each watch period, a Global Positioning System (GPS) track file was initiated to record the path and speed of the survey vessel and to record sighting locations. Observational effort was calculated relative to survey distance in linear kilometres using trackline GPS data extracting segments of effort using start and end times recorded during each MWO shift. The same start and end times were used to determine temporal survey effort. All data analyses were completed based on spatial survey effort (Km) as not temporal effort. During each recorded marine mammal sighting, the distance between the detected marine mammal and the ship was estimated. The initial distance at which a marine mammal was observed by the MWO was noted and if the animal was subsequently observed again at a closer distance to the ship, the Closest Point of Approach (CPA) was updated.

Detailed methodology on data collection and analytical procedures for the 2019 SBO Program is presented in Golder (2020f).

## RESULTS

Overall, marine mammal monitoring programs and data from multiple lines of evidence demonstrate effects below predictions made in the FEIS for the ERP, in that ship noise effects on marine mammals will be limited to temporary, short-term avoidance behaviour, consistent with low to moderate severity responses. No evidence was observed of large-scale avoidance behaviour, displacement effects, or abandonment of the summering grounds (high severity responses), which might in turn result in a population or stock-level consequence (consistent with the definition of non-significant effects used in the FEIS).

### ***Bruce Head Shore-based Monitoring Program:***

Detailed results of the 2019 Bruce Head Shore-based Monitoring Program are presented in Golder (2020f) with a brief summary presented below.

Relative abundance and distribution (RAD):

- The overall relative abundance of narwhal in the SSA, inferred from sighting rate (no. of narwhal per hour - corrected for effort), has remained relatively constant between 2014 and 2019 despite a gradual increase in iron ore shipping along the Northern Shipping Route during this period. Narwhal numbers in the RSA were shown to be comparable to baseline levels documented during the 2014 Bruce Head Monitoring Program, which took place prior to the start of iron ore shipping in the RSA, noting however that some level of shipping activity still occurred in the RSA during 2014 (e.g. eight Project support vessels and 48 non-Project-related vessels; Thomas et al., 2015). These findings are consistent with results from Baffinland's other narwhal monitoring programs demonstrating that the Bruce Head area continues to support high narwhal densities and proportionately higher habitat use by narwhal compared to other areas in the RSA (Elliott et al., 2015; Thomas et al., 2015; Golder, 2020a; Golder, 2020e).
- Within each study year, a likely but uncertain effect of vessel exposure on narwhal relative abundance in the study area (SSA) was observed. Specifically, vessel exposure was shown to result in a significant decrease in narwhal sightings in the SSA compared to when no vessels were present, but only when narwhal were exposed to vessels travelling north and away from the study area, and only at close exposure distances of 2-3 km. These results suggest that the relative abundance of narwhal is influenced by vessel traffic at close distances, although the exact spatial extent of this effect could not be determined due to high data variability.



#### Group composition and behaviour:

- **Group Size:** None of the effects of shipping (distance from vessel, vessel direction, vessel orientation relative to the Behavioural Study Area or BSA) on narwhal group size were shown to be statistically significant ( $P > 0.2$  for all effects). These results suggest that narwhal neither congregate into larger groups nor fragment into smaller groups in response to vessel exposure.
- **Group Composition:**
  - All narwhal life stage categories (adult females, adult males, yearlings/juveniles and calves) were recorded in the BSA throughout the five sampling years. The daily proportion of calves/yearlings recorded in the BSA (relative to the total number of narwhal observed per day) was higher in 2019 (annual mean of 11.2%) than all previous years (2014=10.7%, 2016=9.7%, 2017=7.7%), with the exception of 2015 (14%). This suggests that calving success at Bruce Head in 2019 is consistent with pre-shipping levels, despite year-over-year increases in shipping in the BSA.
  - Vessel traffic was shown to have a significant effect on group composition relative to the probability of calf/yearling presence (i.e., a significant interaction was observed between 'vessel distance', 'vessel direction' and 'vessel orientation relative to BSA'). Results suggest that the proportion of groups with calves/yearlings was similar between all four vessel traffic scenarios (i.e., vessel transiting toward/away BSA, vessel transiting southbound/northbound), but generally increased during close vessel encounters.
  - Collectively, these results suggest that narwhal group composition did not significantly change between study years despite an increase in shipping activity during this period, but the proportion of groups with calves/yearlings was generally higher during close vessel encounters (although it is unknown whether this specific effect was significant).
- **Group Spread:** Narwhal groups were more often observed in tight associations compared to loose associations under both vessel presence and vessel absence scenarios. In general, group spread did not significantly change during vessel-exposure events. However, loosely spread groups were less common when vessels headed away from the BSA (32% for northbound vessels and 30% for southbound vessels) than when vessels were heading toward the BSA (38% for northbound vessels and 32% for southbound vessels). These results suggest that narwhal group spread did not significantly change during vessel exposure events.
- **Group Formation:** Narwhal groups were most often observed in parallel formation under both vessel presence and vessel absence scenarios. A possible but uncertain effect of vessel distance on narwhal group formation was evident that depended on vessel direction, with the most consistent effect suggested for southbound vessels moving away from the BSA. However, none of the shipping-related variables were statistically significant. These results suggest that narwhal group formation did not significantly change in the BSA during vessel exposure events; however, the detection power for this response variable was low.
- **Group Direction:** Vessel traffic was shown to have a significant effect on travel of narwhal groups in the BSA (i.e., a significant interaction was observed between 'vessel distance', 'vessel direction' and 'vessel orientation relative to BSA' although the effect on travel direction was shown to be variable). Narwhal groups were predominantly observed traveling south through the BSA. Southbound travel was least common when southbound vessels were headed away from the BSA, and most common when northbound vessels were headed away from the BSA. These findings suggest that narwhal groups may experience some level of avoidance behaviour in the wake of vessels transiting through Milne Inlet (i.e., narwhal groups appear to

avoid “following” vessels) but that travel direction by narwhal groups is relatively less affected during the approach of vessels.

- **Travel Speed:** The majority of the observed narwhal groups travelled at a medium speed, regardless of vessel exposure conditions. A lack of statistical significance of any of the vessel-related variables suggests that vessel traffic did not have an effect on narwhal groups decreasing their travel speed. The nature of the data for fast-travelling groups was not adequate to test for the effect of vessel exposure on increased travel speed in the BSA. These results suggest that narwhal did not decrease their travel speed or demonstrate a ‘freeze’ response during vessel exposure events.
- **Distance from Bruce Head Shore:** Narwhal groups were observed more often within 300 m of the Bruce Head shore under both vessel presence and vessel absence scenarios. Offshore groups (>300 m) were detected less frequently with increasing Beaufort scale values, suggesting a decreased detection ability at distance with deteriorating sea state. Furthermore, vessel traffic was shown to result in a significant decrease in ‘distance from shore’ (i.e., significant interaction was between ‘vessel distance’, ‘vessel direction’ and ‘vessel orientation’). This effect appeared to be largely attributed to vessel traffic moving toward the BSA. The results suggest that narwhal swim closer to shore when in close proximity to vessels moving toward the BSA.

#### ***Marine Mammal Aerial Survey Program:***

Detailed results of Baffinland’s 2019 Marine Mammal Aerial Survey Program are presented in Golder (2020g) with a brief summary presented below. A total of eight different species of marine mammals were observed during the 2019 aerial surveys: narwhal, bowhead whale, beluga whale, killer whale, ringed seal, harp seal, bearded seal and polar bear. The fully corrected abundance estimate for the Eclipse Sound summer stock in 2019 was 9,931 animals (Coefficient of Variation (CV) = 0.05, 95% confidence interval (CI) = 9,009 to 10,946) based on aerial surveys completed on 21 to 22 and 25 to 27 August 2019 (Golder, 2020d). This estimate falls within the range calculated by DFO for the Eclipse Sound stock in 2016 (12,093 animals, CV = 0.23, 95% CI = 7,768 to 18,660; Marcoux et al., 2019), 2013 (10,489 animals, CV = 0.24, 95% CI = 6,342 to 17,347; Doniol-Valcroze et al., 2015) and 2004 (20,225 animals, CV = 0.36, 95% CI = 9,471-37,096; Richard et al., 2010). The combined 2019 abundance estimate for the Eclipse Sound and Admiralty Inlet summer stocks was 38,771 animals (CV = 0.12, 95% CI = 30,667 to 49,016) based on aerial surveys completed on 21 to 22 and 25 to 27 August 2019 (Golder 2020g). This estimate fell within the range calculated by DFO survey for the combined stock in 2013 (45,532 animals, CV = 0.33, 95% CI = 22,440 to 92,384; Doniol-Valcroze et al., 2015).

#### ***2017–2018 Narwhal Tagging Program:***

Detailed results of the 2017–2018 Narwhal Tagging Program are presented in Golder (2020h) with a brief summary presented below.

- Narwhal positional data from 2017 and 2018 demonstrated that tagged narwhal occurred in all strata in the RSA throughout the summer shipping season but were more common in certain areas of the RSA, namely Milne Inlet South, Koluktoo Bay, Milne Inlet North and Tremblay Sound. High use areas in the RSA included the central portion of Tremblay Sound, the western shore of Milne Inlet North, and most of Koluktoo Bay and Milne Inlet South, particularly in areas south of Bruce Head (i.e., entrance to Koluktoo Bay) and in Assomption Harbour (i.e., Milne Port site). These results were consistent with previously reported areas of high narwhal concentrations identified during baseline aerial surveys conducted in the RSA during the open-

water seasons of 2007, 2008, 2013 and 2014 (Elliott et al., 2015; Thomas et al., 2015) prior to the commencement of iron ore shipping along the Northern Shipping Route.

- With respect to interactions between tagged narwhal and existing shipping in the RSA, the majority of the GPS data collected during 2017 and 2018 occurred when narwhal were >10 Km from medium- and large-sized vessels (Project and non-Project related). Vessel exposure events (<10 Km) occurred throughout the RSA but were more common in the Milne Inlet South and Koluktoo Bay strata due to the confined nature of the channel along this part of the Northern Shipping Route.
- Satellite tag data from 2017 indicated that several of the tagged narwhal moved between Eclipse Sound and Admiralty Inlet during their deployment period. These results supported the notion that some degree of mixing occurs between the Eclipse Sound and Admiralty Inlet stocks during the open-water and late shoulder seasons.
- Narwhal dive behavioural responses that were shown to be significantly influenced by ship noise and/or close ship encounters included surface time, dive duration, and bottom dives; the latter only during periods when narwhal were engaged in bottom diving at the initial time of vessel exposure. No significant effects were observed for the following dive behavioural responses: dive rate, time at depth, descent speed, or bottom dives (during periods when narwhal were not actively diving to the bottom at the initial time of exposure). The distance at which significant changes were observed in dive behavior ranged from 1 to 5 Km dependent on the response variable. This corresponded with an exposure period ranging from 7 to 36 min per vessel transit (based on a 9 knot travel speed), with animals returning to their pre-response behaviour following the exposure period (temporary effect). The frequency of this effect was considered intermittent given that vessels were within 5 Km of a tagged narwhal for <1% of the GPS data points collected in the RSA during 2017 and 2018.
- Narwhal surface movement responses that were shown to be significantly influenced by ship-generated noise included turning angle, and orientation relative to vessel (low level severity responses). No significant effects were observed for travel speed. The distance at which significant changes were observed in surface movement behavior ranged from 4 to 10 Km dependent on the response variable. This corresponded with an exposure period ranging from 29 to 54 min per vessel transit (based on a 9 knot travel speed), with animals returning to their pre-response behaviour following the exposure period (temporary effect). The frequency of this effect was considered intermittent given that vessels were within 10 Km of a tagged narwhal for <7% of the GPS data points collected in the RSA during 2017 and 2018.
- Overall, the 2017 and 2018 tagging results supported predictions made in the Final Environmental Impact Statement (FEIS) for the Early Revenue Phase (ERP), in that ship noise effects on narwhal will be limited to temporary, short-term avoidance behaviour, consistent with low to moderate severity responses (Finneran et al. 2012; 2015). No evidence was observed of large-scale avoidance behaviour, displacement effects, or abandonment of the summering grounds (high severity responses), which might in turn result in a population or stock-level consequence (consistent with the definition of non-significant effects used in the FEIS).

#### ***Passive Acoustic Monitoring Program:***

Detailed results of the 2019 Passive Acoustic Monitoring Program are provided in Frouin-Mouy et al. (2020) with a brief summary presented below.

- Sounds from three marine mammal species were identified in the acoustic data. Narwhal vocalizations were present at all stations mainly from early August to late September. Several bowhead whale vocalizations were detected (and manually validated) during August and September at two of the three stations in Milne Inlet South. Several killer whale vocalizations were detected during August and September at all stations.
- During the open-water and shoulder season periods, Sound Exposure Levels (SEL) at all five recording stations never exceeded marine mammal acoustic injury thresholds, for either permanent or temporary hearing threshold shift (PTS and TTS), based on NOAA criteria for assessing acoustic impacts on marine mammals.
- Sound Pressure Levels (SPL) also rarely exceeded the 120 dB marine mammal disturbance threshold at any of the recorder stations. During the shoulder season, the disturbance threshold was exceeded for 1.9% of the total recording period (28 days) at AMAR-RI (located on shipping lane near Ragged Island) and for 1.4% of the total recording period (28 days) at AMAR-BI (located in Eclipse Sound south of Bylot Island). During the open-water season, the disturbance threshold was exceeded for 3% of the total recording period (55 days) at AMAR-1 (located on shipping lane in Milne Inlet South) and for 0.8% of the total recording period (55 days) at AMAR-2 (located inside Koluktoo Bay away from the shipping lane).
- Listening range reduction (LRR), the fractional decrease in the available listening range for marine animals, was calculated for narwhal based on acoustic data collected at the five AMAR recorder locations in Milne Inlet and Eclipse Sound. Acoustic monitoring results indicated that LRR is influenced by both ambient and vessel noise sources, at different contributing levels depending on the call type of interest. LRRs were highest for click vocalizations and lowest for burst pulses. For both clicks and whistle vocalizations, vessel-related contributions to LRR were similar to levels narwhal already experience from ambient noise sources (e.g. wind, waves, rain). A small seasonal effect is present for both call types, with icebreaker noise slightly more influential than ambient noise sources during the early shoulder season (particularly at Ragged Island), and ambient noise sources slightly more influential than vessel noise during the open-water season. The third call type (burst pulses), was shown to be the least susceptible call type to LRR. During the early shoulder season, a >90%LRR occurred  $\leq 1\%$  of the time when vessels were detected on the recordings (which was  $\leq 37\%$  of the total recording period). During the open-water season, a >90%LRR occurred  $\leq 2.1\%$  of the time when vessels were detected on the recordings (which was  $\leq 29\%$  of the total recording period). Ambient noise did not result in any appreciable level of LRR for burst pulses because the hearing threshold for narwhal at 1 kHz is higher than the median ambient sound level at this frequency. Collectively, these results indicate that ambient noise (e.g., wind, waves) affects the listening range of narwhal at similar severity levels as vessel noise, and for similar or greater proportions of time as vessel noise.

**2019 Ship-based Observer (SBO) Program:**

Detailed results of the 2019 SBO Program are provided in Golder (2020f) with a brief summary presented below.

- The revised SBO Program has been successfully implemented from the MSV Botnica over the last two (2) years and has included local Inuit participation. In 2019, total monitoring effort over both survey legs consisted of 268.7 hours covering 3,089 Km. Total monitoring effort during Leg 1 was 100.4 hours covering 1,119 Km. Total monitoring effort during Leg 2 was 168.3 hours traveling 1,970 Km. Although there were nearly twice as many observation days in Leg 2 compared to Leg 1 (24 vs. 11 days), this was not reflected in overall survey effort given the longer daylight hours during Leg 1 (mean daily effort= 11 h) compared to Leg 2 (mean daily effort = 7 h).

- Seven (7) different species of marine mammals were observed during the 2019 SBO Program: ringed seal, harp seal, narwhal, bowhead whale, beluga, bearded seal and polar bear. A total of 304 marine mammal sightings comprising 2,785 individuals were recorded. Killer whale and walrus were not recorded in the RSA during either survey leg in 2019; however, both species are known to occur in the region. Consistent with previous years (2013-2015 and 2018), no ship strikes on marine mammals were recorded in 2019.
- During early summer (Leg 1), a total of 152 sightings comprising 2,453 individuals were recorded. Species identified included ringed seal (61 sightings of 722 individuals), narwhal (27 sightings of 385 individuals), harp seal (24 sightings of 136 individuals), bowhead whale (22 sightings of 24 individuals), bearded seal (four sightings of four individuals), polar bear (two sightings of two individuals) and beluga (one sighting of one individual). There were also nine sightings of unconfirmed pinniped species (comprising 1,176 individuals) and two sightings of unconfirmed cetacean species (comprising three individuals).
- During fall (Leg 2), a total of 152 sightings comprising 332 individuals were recorded. Species identified included ringed seal (53 sightings of 58 individuals), narwhal (27 sightings of 103 individuals), harp seal (25 sightings of 117 individuals), bearded seal (one sighting of one individual) and bowhead whale (one sighting of one individual). There were also 44 sightings of unconfirmed pinniped species (49 individuals) and one sighting of an unconfirmed cetacean species (comprising three individuals).
- A total of 54 narwhal sightings comprising 488 individuals were recorded in the RSA in 2019, with a higher number of animals observed during summer (n=385) than fall (n=103). Narwhal were observed as early as 19 July and as late as 30 October. During summer, sightings were concentrated in eastern Eclipse Sound near Pond Inlet and near Bruce Head in southern Milne Inlet. During fall, sightings were concentrated in Eclipse Sound near the southwest tip of Bylot Island and in Milne Inlet North near Ragged Island. Mean narwhal group size in 2019 was nine (ranging from 1 to 100 animals). No calves were recorded during the 2019 SBO Program.
- This was the first year that bowhead whales were observed during the SBO Program, with a total of 22 bowhead sightings comprising 24 individuals recorded in the RSA during 2019. All of the sightings occurred during the early shoulder season, with the exception of one solitary bowhead observed during the late shoulder season north of Ragged Island. During summer, sightings were primarily concentrated in Eclipse Sound with several bowhead also observed in Milne Inlet South and Milne Inlet North near Ragged Island. All sightings consisted of solitary animals with the exception of two separate sightings of a pair of bowheads recorded during early summer.
- Only two polar bear sightings were recorded in the RSA in 2019, both on the same day (20 July), with each sighting consisting of a solitary polar bear walking on the sea ice in Milne Inlet North. The first polar bear was observed approximately 1 Km from the vessel. The second polar bear was observed 12 minutes later, approximately 3 Km from the vessel.
- The CPA for cetacean species recorded during the 2019 SBO Program ranged from 200 to 5,000 m. The CPA for pinniped (i.e., seal) species recorded in 2019 ranged from 30 to 1,500 m. The 2019 CPA results support impact predictions that animals demonstrate localized avoidance of the ship. This provides further confidence that a vessel strike on a marine mammal is unlikely to occur based on current vessel speeds in the RSA (9 knot speed restriction).

## TRENDS

Overall, marine mammal monitoring programs and data from multiple lines of evidence continue to demonstrate effects below the impact predictions made in the FEIS for the ERP, in that ship noise effects on marine mammals will be limited to temporary, short-term avoidance behaviour, consistent with low to moderate severity responses. No evidence was observed of large-scale avoidance behaviour, displacement effects, or abandonment of the summering grounds (high severity responses), which might in turn result in a population or stock-level consequence (consistent with the definition of non-significant effects used in the FEIS).

### ***Bruce Head Shore-based Monitoring Program:***

Overall, results from this five-year shore-based monitoring study support impact predictions made in the Final Environmental Impact Statement (FEIS) for the Early Revenue Phase (ERP), in that ship noise effects on narwhal will be limited to localized avoidance behaviour, consistent with low to moderate severity responses (Southall et al., 2007; Finneran et al., 2017). No evidence was observed of large-scale avoidance behaviour, displacement effects, or abandonment of the summering grounds (high severity responses), which might in turn result in a population or stock-level consequence (consistent with the definition of a non-significant effect used in the FEIS).

### ***Marine Mammal Aerial Survey Program:***

The narwhal abundance estimate calculated from the 2019 Marine Mammal Aerial Survey Program is within the range calculated during previous DFO surveys and consistent with impact predictions made in the FEIS Addendum for the Early Revenue Phase (ERP) that the Project is unlikely to result in significant residual adverse effects on narwhal in the RSA (defined as effects that would compromise the integrity of the population either through mortality or via large-scale displacement or abandonment of the RSA).

### ***Narwhal Tagging Program:***

Overall, the 2017 and 2018 tagging results support predictions made in the Final Environmental Impact Statement (FEIS) for the Early Revenue Phase (ERP), in that ship noise effects on narwhal will be limited to temporary, short-term avoidance behaviour, consistent with low to moderate severity responses. No evidence was observed of large-scale avoidance behaviour, displacement effects, or abandonment of the summering grounds (high severity responses), which might in turn result in a population or stock-level consequence (consistent with the definition of a non-significant effect used in the FEIS).

### ***Passive Acoustic Monitoring Program:***

The 2019 PAM Program expanded spatially with additional recorders installed on the shipping lane near Bylot Island and Ragged Island), as well as temporally with acoustic coverage of the early and late shoulder seasons in addition to the open-water season. Acoustic monitoring results are consistent with marine mammal impact predictions made in the FEIS Addendum for the ERP, in that ship noise will not result in acoustic injury and acoustic impacts will be limited to temporary disturbance effects.

### ***Ship-based Observer Program:***

No ship strikes on marine mammals were recorded over the five years of SBO monitoring. Similarly, no ship strikes on marine mammals have been reported by ship operators since the start of the Project, including ore carriers, fuel/cargo ships and support tugs. The relative abundance of marine mammals in the RSA, expressed as the animal



detection rate (no. of animals relative to survey effort in Km), was similar in 2019 (0.90 individuals per Km) as that recorded in 2018 (0.88 individuals per Km), while the number of sightings was marginally lower in 2019 (0.10 sightings per Km) than 2018 (0.18 sightings / Km). Species observed in greater relative abundance in 2019 than 2018 included narwhal, beluga, and bowhead whale. The observed increase in 2019 is mostly reflective of early summer sightings (similar numbers were seen during fall in both years). Less ringed seal and harp seal were observed in 2019 compared to 2018, although this is likely associated with the large number of unidentified seal species in 2019 (n=1,225) compared to 2018 (n=760). When considering all seal categories, a similar number of seal sightings was observed in both years. Possible explanations for the observed increase in relative abundance of certain species in 2019 (e.g., narwhal, bowhead) include better survey conditions, difference in ice conditions, effectiveness of new mitigation measures introduced in 2019 (i.e., limited number of vessel transits in ice concentrations of 3/10 or higher; 40-km vessel buffer at entrance of RSA), and/or potential habituation of animals to icebreaking or shipping activity in general. According to one of the MWOs, the higher number of narwhal observed in 2019 likely reflects more narwhal in the RSA compared to 2018, when the community observed a low abundance of narwhal locally and very low catches that year. While in 2019, hunters found the opposite to be true with narwhal observed throughout the RSA and in very large groups.

Overall, results suggest that marine mammals in the RSA are not demonstrating large-scale displacement or abandonment from the RSA during or following icebreaking operations, and that mitigation measures implemented during the 2019 early shoulder season (e.g., limited number of transits, 40-km buffer area) are demonstrating to be effective.

## **RECOMMENDATIONS / LESSONS LEARNED**

### ***Bruce Head Shore-based Monitoring Program:***

Shore-based monitoring at Bruce Head has been shown to be an effective method for monitoring of narwhal in relation to shipping activities. Based on 2019 results, the following recommendations are being considered for the proposed 2020 shore-based monitoring program:

- Data collection:
  - Consideration is being made to supplement visual observation with UAV (i.e. drone)-based video and photographic data collection. This would provide a means to verify observation counts, confirm group dynamics, and correct for observation bias under conditions of low visibility or increased distance. In addition, UAV imagery will be helpful for filling in information gaps on narwhal behaviour and group composition in the BSA, where observers are not able to record certain aspects of group behaviour due to reduced sightability. This was attempted in 2019 but technical limitations of the UAV system prevented achieving the desired program objectives. Baffinland has initiated communications with an alternative UAV provider in an attempt to bridge the technological limitations gaps encountered in 2019.
- Analysis:
  - Continued integration of acoustic monitoring results with shore-based observer data to assess potential changes in narwhal acoustic behaviour in response to vessel transits and vessel noise.

***Marine Mammal Aerial Survey Program:***

Baffinland is not currently planning to conduct marine mammal aerial surveys along the Northern Shipping Route during summer of 2020 as DFO is currently planning a marine mammal aerial survey in this region that would include the Northern Shipping Route.

***2017–2018 Narwhal Tagging Program:***

The narwhal tagging program is an effective tool to monitoring the effects of ship noise on narwhal movements, distribution and behaviour. An increase in the sample size of tagged animals would increase the power of the study. Future opportunities to collaborate on marine mammal tagging programs will continue to be assessed on a yearly basis based on the availability of tagging permits and ability to collaborate with DFO, the tagging program lead.

***Passive Acoustic Monitoring Program:***

A large acoustic dataset was collected in 2019 through the successfully implemented spatially-expanded program comprising additional recorders as well as temporarily with acoustic coverage of the early and late shoulder seasons in addition to the open-water season. Given that acoustic monitoring results are consistent with marine mammal impact predictions made in the FEIS Addendum for the ERP, in that ship noise will not result in acoustic injury and acoustic impacts will be limited to temporary disturbance effects, acoustic monitoring is not deemed necessary in 2020 for the open-water season. However, early shoulder season acoustic data will be collected in spring 2020 using the AMARs deployed in fall 2019.

***Ship-based Observer (SBO) Program:***

Given the success of the recently modified SBO program, a similar program as completed in 2018 to 2019 remains under consideration for implementation in 2020. Alternative methods for marine wildlife incidental reporting are being considered for 2020.



## Project Certificate Condition No. 110

Category	Marine Environment - Ship Noise
Responsible Parties	The Proponent, Marine Environment Working Group
Project Phase(s)	Construction and Operations
Objective	To prevent impacts to marine mammals from Project shipping activities.
Term or Condition	The Proponent shall immediately develop a monitoring protocol that includes, but is not limited to, acoustical monitoring, to facilitate assessment of the potential short term, long term, and cumulative effects of vessel noise on marine mammals and marine mammal populations. The Proponent is expected to work with the Marine Environment Working Group to determine appropriate early warning indicator(s) that will ensure rapid identification of negative impacts along the southern and northern shipping routes.
Relevant Baffinland Commitment	84
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Partial-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	Draft 2019 Passive Acoustic Monitoring Program (Frouin-Mouy et al., 2020) 2019 Marine Environment Monitoring — Field Program Summary (Golder, 2019h) 2019 Marine Mammal Monitoring Programs — Updated Preliminary Results (Golder, 2020e) Draft 2017–2018 Integrated Narwhal Tagging Study (Golder, 2020h) 2019 MEWG Meeting Records
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

## METHODS

### *Monitoring Protocol:*

In order to better understand potential short-term, long-term and cumulative effects of vessel noise on marine mammals, Baffinland has implemented since 2014 a number of marine mammal monitoring programs aimed at evaluating the potential effects on vessel noise on marine mammals and marine mammal populations (e.g., Bruce Head Shore-based Monitoring Program, Marine Mammal Aerial Survey Program, Narwhal Tagging Study, Ship-based Observer (SBO) Program). An overview of all the marine mammal monitoring programs completed by Baffinland to date for the Northern Shipping Route is provided in Table 4.34 below:

**Table 4.34: Baffinland's Marine Mammal Monitoring Programs Undertaken for Northern Shipping Route (2006 to 2019)**

Marine Mammal Monitoring Program	Baseline						ERP (4.2 Mpta)			ERP (6 Mpta)	
	2006	2007	2008	2010	2013	2014 <sup>1</sup>	2015 <sup>1</sup>	2016	2017	2018	2019
Bruce Head Shore-based Monitoring	-	-	-	-	X	X	X	X	X	-	X
Passive Acoustic Monitoring	-	-	-	-	-	X	X	-	-	X	X
Ship-based Observer (SBO) Program	-	-	-	-	X	X	X	-	-	X	X
Aerial Surveys – cetaceans	X	X	X	-	X	X	X	X <sup>2</sup>	-	-	X
Aerial Surveys - pinnipeds	X	X	X	-	-	X	-	-	-	-	-
Narwhal Tagging Study	-	-	-	-	-	-	-	-	X	X	-

<sup>1</sup> 2014 included baseline data collection and initial evaluation of EEM protocols, 2015 was first full year of EEM implementation, post- Milne Port ore dock construction (ERP Phase).

<sup>2</sup> DFO 2016 aerial survey data analyzed by Baffinland

#### ***Passive Acoustic Monitoring Program:***

In 2019, JASCO Applied Sciences (JASCO) expanded on its 2018 Passive Acoustic Monitoring (PAM) Program by deploying acoustic recorders (AMARs) in additional representative areas of the RSA to better understand ambient and shipping noise levels in those areas. In addition to the three recorders installed in Milne Inlet South, one recorder was installed in Eclipse Sound (south of Bylot Island) and another in Milne Inlet North (near Ragged Island). The objective of the program was to document ambient and anthropogenic underwater noise levels in the RSA during the open-water and shipping shoulder season periods, to monitor marine mammal presence along the shipping corridor near Bruce Head and in Koluktoo Bay, to evaluate Project shipping noise levels in relation to established marine mammal acoustic thresholds for injury and disturbance and to compare measured sound levels from shipping activities during the shoulder season to modelled estimates used for environmental effects assessment.

Three AMARs were deployed in Milne Inlet South over a two-month period (4 August to 29 September) to collect acoustic data during the open water season, concurrently with visual observer data collected as part of the 2019 Bruce Head Shore-based Monitoring Program (specific program details are provided in Golder, 2020c). An additional two AMARs were deployed along the nominal shipping route in Eclipse Sound, near Ragged Island and south of Bylot Island in May 2019 to record icebreaker and ore carrier noise during vessel transits in Eclipse Sound. The recorder near Bylot Island was only deployed for the spring shoulder season (28 days); the recorder near Ragged Island remained in place throughout the 2019 open water season (85 days total). Both of these recorders were redeployed at the end of the open water season to record sounds during the Fall 2019 and Spring 2020 shoulder seasons.

Frequency-weighted daily sound exposure level (SEL) values were calculated for the five marine mammal functional hearing groups and compared to established acoustic injury thresholds based on criteria and guidance established by the National Oceanic and Atmospheric Administration (NOAA) for assessing acoustic impacts on marine mammals. Non-weighted sound pressure levels (SPL) were measured and compared to acoustic disturbance thresholds for marine mammals based on established NOAA guidance/criteria.

Given there are presently no established regulatory thresholds to aid in determination of acoustic masking effects on marine mammals, in order to better understand this potential effect from shipping noise on narwhal, JASCO evaluated the proportion of lost listening space a narwhal may experience from ship noise relevant to ambient conditions. This was done using acoustic monitoring data collected in 2019 which provides a more accurate and reliable estimate of the level of reduced listening range that would occur for narwhal (compared to modeled estimates). Listening range reduction (LRR) is defined as the fractional decrease in the available listening range (the distance over which sources of sound can be detected) experienced by an animal when they are exposed to ambient and/or anthropogenic noise source. Acoustic data were analyzed from the five AMAR recorder stations in Eclipse Sound and Milne Inlet to quantify the proportion of the recording period in which a >50% and >90% LRR would occur for narwhal during the early shoulder and open-water seasons. For the LRR assessment, JASCO looked at three different frequencies which were representative of the three main call types used by narwhal: clicks (25 kHz), whistles (5 kHz) and bubble pulses (1 kHz). Detailed methodology on data collection and analytical procedures for the 2019 Passive Acoustic Monitoring Program are presented in Frouin-Mouy et al. (2020).

#### ***Other Marine Mammal Monitoring Programs:***

See update to Condition No. 109 for a comprehensive summary of all of Baffinland's marine mammal monitoring programs that have been designed to better understand potential short-term, long-term and cumulative effects of vessel noise on marine mammals, including Baffinland's Bruce Head Shore-based Monitoring Program, the Marine Mammal Aerial Survey Program, the 2017-2018 Integrated Narwhal Tagging Study and the Ship-based Observer (SBO) Program. Collectively, these multi-year monitoring programs provide for a comprehensive evaluation of potential shipping noise effects on marine mammals during the entire shipping period and throughout the life of the Project.

#### ***Establishment of Early Warning Indicators***

Through these various studies initiated as early as 2014, Baffinland has been collecting data on a number of response variables (e.g., changes in animal abundance, relative abundance and distribution, group composition, calving rate, behavioural responses) that may be suitable to serve as early warning indicators (EWIs). Baffinland has been working with the MEWG for the selection of early warning indicators (EWIs) capable of detecting potential impacts to marine mammals and with potential relevance to vessel noise are currently in the progress of being developed with the MEWG. A framework was distributed to all MEWG members and observer groups in September 2018. This framework provided an opportunity for MEWG members and observer groups to participate in the identification of EWIs and, eventually, identify thresholds. Feedback received from the MEWG in 2018 regarding the identification of EWIs was limited to suggestions from DFO and the MHTO (through an in-person meeting on 28–29 November 2018 in Pond Inlet). The MEWG was provided an opportunity to provide feedback on the identification thresholds for the suggested EWIs in Q1 2019 with the goal finalizing the EWI process in time for the 2019 shipping season. In the absence of formalized EWIs for the 2019 shipping season, Baffinland relied on data collected from all of its ongoing

marine mammal monitoring programs, as well as feedback from Inuit community members, to apply adaptive management to its operations and enhance mitigations, as required.

## RESULTS

### *Monitoring Protocol*

#### *Passive Acoustic Monitoring Program:*

Detailed results of the 2019 Passive Acoustic Monitoring Program are provided in Frouin-Mouy et al. (2020) with a brief summary presented below.

Vocalizations from three different marine mammal species were identified in the acoustic data. Narwhal vocalizations were present at all stations mainly from early August to late September. Several bowhead whale vocalizations were detected (and manually validated) during August and September at two of the three stations in Milne Inlet South. Several killer whale vocalizations were detected during August and September at all stations.

During the open-water and shoulder season periods, sound exposure levels (SEL) at all five recording stations never exceeded marine mammal acoustic injury thresholds, for either permanent or temporary hearing threshold shift (PTS and TTS), based on NOAA criteria for assessing acoustic impacts on marine mammals.

Sound pressure levels (SPL) also rarely exceeded the 120 dB marine mammal disturbance threshold at any of the recorder stations. During the shoulder season, the disturbance threshold was exceeded for 1.9% of the total recording period (28 days) at AMAR-RI (located on shipping lane near Ragged Island) and for 1.4% of the total recording period (28 days) at AMAR-BI (located in Eclipse Sound south of Bylot Island). During the open-water season, the disturbance threshold was exceeded for 3% of the total recording period (55 days) at AMAR-1 (located on shipping lane in Milne Inlet South) and for 0.8% of the total recording period (55 days) at AMAR-2 (located inside Koluktoo Bay away from the shipping lane).

Listening range reduction (LRR), the fractional decrease in the available listening range for marine animals, was calculated for narwhal based on acoustic data collected at the five AMAR recorder locations in Milne Inlet and Eclipse Sound. Acoustic monitoring results indicated that LRR is influenced by both ambient and vessel noise sources, at different contributing levels depending on the call type of interest. LRRs were highest for click vocalizations and lowest for burst pulses. For both clicks and whistle vocalizations, vessel-related contributions to LRR were similar to levels narwhal already experience from ambient noise sources (e.g. wind, waves, rain). A small seasonal effect is present for both call types, with icebreaker noise slightly more influential than ambient noise sources during the early shoulder season (particularly at Ragged Island), and ambient noise sources slightly more influential than vessel noise during the open-water season. The third call type (burst pulses), was shown to be the least susceptible call type to LRR. During the early shoulder season, a >90%LRR occurred  $\leq 1\%$  of the time when vessels were detected on the recordings (which was  $\leq 37\%$  of the total recording period). During the open-water season, a >90%LRR occurred  $\leq 2.1\%$  of the time when vessels were detected on the recordings (which was  $\leq 29\%$  of the total recording period). Ambient noise did not result in any appreciable level of LRR for burst pulses because the hearing threshold for narwhal at 1 kHz is higher than the median ambient sound level at this frequency. Collectively, these results indicate that ambient noise (e.g., wind, waves) affects the listening range of narwhal at similar severity levels as vessel noise, and for similar or greater proportions of time as vessel noise.

*Other Marine Mammal Monitoring Programs:*

See update to Condition No. 109 for a comprehensive summary of all of Baffinland's marine mammal monitoring programs that have been designed to better understand potential short-term, long-term and cumulative effects of vessel noise on marine mammals, including Baffinland's Bruce Head Shore-based Monitoring Program, the Marine Mammal Aerial Survey Program, the 2017-2018 Integrated Narwhal Tagging Study and the Ship-based Observer (SBO) Program. Collectively, results from these multi-year monitoring programs provide for a comprehensive evaluation of potential shipping noise effects on marine mammals during the entire shipping period and throughout the life of the Project.

***Establishment of Early Warning Indicators***

The MEWG was requested to provide proposed thresholds for candidate indicators by 31 March 2019. Only the QIA provided feedback relevant to the EWIs on 31 March 2019. The feedback provided by the QIA did not provide thresholds suggestions, but rather indicated the challenges in provided such thresholds as "Thresholds need to be biologically appropriate and logistically feasible" and that the QIA "cannot suggest thresholds without additional information". As a result, the process of finalizing a framework for EWIs, and their associated thresholds, could not be completed by the start of the 2019 shipping season. While the framework and timeline initially proposed was not completed, Baffinland has been using the data collected through its monitoring programs and the input provided by the community of Pond Inlet to respond to reported changes observed in marine mammal numbers and distribution in the RSA. For instance, Pond Inlet hunters and community members indicated to Baffinland that narwhal numbers observed in 2018 were much lower than those observed in previous years. This was supported by the relatively few narwhal observed during the 2018 Bruce Head vessel-based monitoring program (one-week pilot study) and during the 2018 Narwhal Tagging Program at Tremblay Sound. While EWIs had not been formally established at the time, Baffinland nonetheless responded to the provided feedback by applying adaptive management actions for implementation during the 2019 shipping season (Fednav, 2019a; 2019b, Baffinland, 2019i). This included development of the following new and enhanced mitigation measures:

- During the early shoulder season, restrictions were set on the maximum number of Project vessel transits allowed in the RSA within a 24-h period based on daily ice conditions along the Northern Shipping Route, effectively reducing daily noise exposure periods.
- During the early shoulder season, a 40-km vessel buffer zone (i.e., vessel set-back area) was implemented at the entrance of the RSA that extended 40 Km to the east of the Nunavut Settlement Boundary (east of 73 degrees longitude). Project-related vessels were required to hold position outside the buffer zone until instructed by the Port Authority at Milne Port to proceed with their transit to Milne Port. The 40 km boundary was selected based on acoustic modelling results indicating that this would represent an appropriate acoustic buffer zone for animals at or near the floe edge (i.e. noise levels at the floe edge would be outside marine mammal audible range or below levels known to elicit adverse behavioral responses such as displacement or avoidance).
- Collection of permanent video recordings onboard the icebreaker to record ice conditions during all icebreaker/escort transits in the RSA during both shoulder seasons.
- An ice analyst was deployed on the icebreaker on all transits undertaken in the RSA during the early and late shipping shoulder seasons. The ice analyst recorded daily ice conditions and liaised daily with the Port Authority and Baffinland's shipping department to coordinate daily transits allowable in RSA based on ice conditions.

- Continued use of a real-time AIS-based alert system that immediately informed the Port Authority and Baffinland's shipping department of any non-compliance events (e.g. speed exceedances in the RSA) so that the issue could be quickly resolved.
- MWOs stationed on the icebreaker actively informed the Vessel Master and ship officers of any notable wildlife sightings (i.e. species of higher concern such as polar bear, walrus and bowhead whales) and areas associated with high animal densities. Details on these sightings (including sighting locations) were then relayed to the Port Authority during daily communications between the MSV Botnica Master and Baffinland's shipping department. This information was then used for adaptive management actions (when and where required), including notices from the Port Authority to Vessel Masters operating in the RSA to exercise due caution in order to minimize the likelihood of interactions with the marine mammals identified. In such circumstances, Vessel Masters are authorized to adjust speed or alter course within safe and prudent navigational constraints to avoid to the extent possible interactions with high density marine mammal areas or with species of higher concern.
- Community consultation prior to start of icebreaker escort and shipping operations
- Maximum of three ships transiting at a time in the RSA or anchored at Ragged Island.

Similarly, based on feedback from the community and the MEWG in 2018 and early 2019, the following new components were incorporated into Baffinland's 2019 marine mammal monitoring programs:

- Implementation of the Pond Inlet "guardian program" (Shipping Monitors) which consisted of employing a minimum of two full-time Shipping Monitors from the community of Pond Inlet to actively track daily Project vessel movements in the RSA in real-time, and in relation to reported marine mammal aggregations (as shared by the community and the monitoring teams). The Shipping Monitors provided liaison between the community of Pond Inlet, hunters and Baffinland. This was a new approach introduced in 2019 in response to feedback from the MHTO that better communications on Baffinland shipping operations were needed. Shipping Monitors provided updates on Baffinland shipping activity to residents of Pond Inlet via local public radio, marine VHF radio (for hunters on the water) and through social media.
- Start of season aerial surveys were completed during the early shoulder season to determine the relative abundance and distribution of marine mammals near the Pond Inlet floe edge prior to and during initial shipping and icebreaking operations, and to undertake systematic aerial transect surveys to obtain abundance and density estimates of the Eclipse Sound narwhal summer stock during this period.
- During the open-water season, Baffinland completed simultaneous aerial surveys of the Eclipse Sound and Arctic Bay narwhal summer stock areas to determine abundance and density estimates for both stocks during peak summer, and to account for potential exchange between these respective stocks.
- An aerial-based clearance survey was undertaken at the end of the shipping season to monitor for potential narwhal entrapment events in the RSA.
- Baffinland integrated recommendations from DFO/QIA into aerial survey study design and data collection methodology.
- Deployed acoustic recorders in additional representative areas of the RSA to better understand ambient and shipping noise levels in those areas. In addition to the three recorders installed in Milne Inlet South, one recorder was installed in Eclipse Sound (south of Bylot Island) and another in Milne Inlet North (near Ragged Island).

- Complied with request to include daily ice charts in 2018 and 2019 SBO Program reports to compare wildlife sightings data with prevalent ice conditions.

## **TRENDS**

The 2019 Passive Acoustic Monitoring Program expanded spatially with additional recorders installed on the shipping lane near Bylot Island and Ragged Island, as well as temporally with acoustic coverage of the early and late shoulder seasons in addition to the open-water season. Through the implementation of a spatially and temporally expanded program, acoustic monitoring results collected to date are consistent with marine mammal impact predictions made in the FEIS Addendum for the ERP, in that ship noise will not result in acoustic injury to marine mammals and acoustic impacts will be limited to temporary disturbance effects.

Based on community feedback during the summer of 2018, Baffinland initiated meaningful and comprehensive adaptive management actions to investigate and mitigate potential acoustic effects from Project shipping on narwhal. This was undertaken in the absence of formally defined EWIs and corresponding thresholds to drive the adaptive management process. Baffinland acknowledged concerns from local communities regarding vessel noise and marine mammals and accordingly responded by implementing additional monitoring and mitigation measures, using adaptive management practices derived directly from consultation with community members and the MEWG. Preliminary data suggest these mitigation measures were effective in reducing vessel noise along the Northern Shipping Route. Long-term monitoring of response to existing and enhanced mitigation measures is required to further understand marine mammal response to ship noise.

## **RECOMMENDATIONS / LESSONS LEARNED**

Based on the data collected to date as part of Baffinland's integrated marine mammal monitoring programs, the observed effects are in line with predictions of the FEIS for the ERP - effects will be limited to temporary, short-term avoidance behaviour, consistent with low to moderate severity responses (Finneran et al., 2012; 2015). No evidence has been observed of large-scale avoidance behaviour, displacement effects, or abandonment of the summering grounds (high severity responses), which might in turn result in a population or stock-level consequence (consistent with the definition of non-significant effects used in the FEIS).

Based on monitoring results collected to date, no additional mitigation or management measures are recommended at this time for 2020. Baffinland will continue to work with the MEWG, DFO and Inuit stakeholders on an annual basis to inform and refine the existing monitoring programs and develop new or enhanced mitigation measures or management actions should these be required in the future.

As a result of its consultation with the MEWG in 2018 and 2019, Baffinland will finalize its EWI framework and identify an appropriate threshold for its selected EWI(s). This threshold will be linked to existing monitoring programs to ensure that the EWI framework will provide a tool to rapidly detect adverse impacts from ship noise on marine mammals. Baffinland will continue to use all data collected through its monitoring programs and input provided by the community of Pond Inlet to respond to changes observed in marine mammal populations and integrate adaptive management, as required.



## Project Certificate Condition No. 111

Category	Marine Environment - Ship Noise
Responsible Parties	The Proponent, Marine Environment Working Group
Project Phase(s)	Construction and Operations
Objective	To prevent impacts to marine mammals from Project shipping activities.
Term or Condition	<p>The Proponent shall develop clear thresholds for determining if negative impacts as a result of vessel noise are occurring. Mitigation and adaptive management practices shall be developed to restrict negative impacts as a result of vessel noise. This shall include, but not be limited to:</p> <ul style="list-style-type: none"> <li>c. Identifications of zones where cumulative noise could be mitigated due to biophysical features (e.g., water depth, distance from migration routes, distance from overwintering areas etc.)</li> <li>d. Vessel transit planning, for all seasons, to determine the degree to which cumulative sound impacts can be mitigated through the seasonal use of different zones</li> </ul>
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	<p>Draft 2019 Passive Acoustic Monitoring Program (Frouin-Mouy et al., 2020)</p> <p>2019 Marine Environment Monitoring — Field Program Summary (Golder, 2019h)</p> <p>2019 Marine Mammal Monitoring Programs — Updated Preliminary Results (Golder, 2020e)</p> <p>Draft 2017–2018 Integrated Narwhal Tagging Study (Golder, 2020h)</p> <p>2019 MEWG Meeting Records</p>
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

## METHODS

### *Passive Acoustic Monitoring Program:*

In 2019, JASCO Applied Sciences (JASCO) expanded on its 2018 Passive Acoustic Monitoring (PAM) Program by deploying acoustic recorders (AMARs) in additional representative areas of the RSA to better understand ambient and shipping noise levels in those areas. In addition to the three recorders installed in Milne Inlet South, one recorder was installed in Eclipse Sound (south of Bylot Island) and another in Milne Inlet North (near Ragged Island). The objective of the program was to document ambient and anthropogenic underwater noise levels in the RSA during the open-water and shipping shoulder season periods, to monitor marine mammal presence along the shipping corridor near Bruce Head and in Koluktoo Bay, to evaluate Project shipping noise levels in relation to established marine mammal acoustic thresholds for injury and disturbance and to compare measured sound levels from shipping activities during the shoulder season to modelled estimates used for environmental effects assessment.



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Given there are presently no established regulatory thresholds to aid in determination of acoustic masking effects on marine mammals, in order to better understand this potential effect from shipping noise on narwhal, JASCO evaluated the proportion of lost listening space a narwhal may experience from ship noise relevant to ambient conditions. This was done using acoustic monitoring data collected in 2019 which provides a more accurate and reliable estimate of the level of reduced listening range that would occur for narwhal (compared to modeled estimates). Listening range reduction (LRR) is defined as the fractional decrease in the available listening range (the distance over which sources of sound can be detected) experienced by an animal when they are exposed to ambient and/or anthropogenic noise source. Acoustic data were analyzed from the five AMAR recorder stations in Eclipse Sound and Milne Inlet to quantify the proportion of the recording period in which a >50% and >90% LRR would occur for narwhal during the early shoulder and open-water seasons. For the LRR assessment, JASCO looked at three different frequencies which were representative of the three main call types used by narwhal: clicks (25 kHz), whistles (5 kHz) and bubble pulses (1 kHz). Detailed methodology on data collection and analytical procedures for the 2019 Passive Acoustic Monitoring Program are presented in Frouin-Mouy et al. (2020).

#### ***Other Marine Mammal Monitoring Programs:***

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#### ***Establishment of Early Warning Indicators***

Through these various studies initiated as early as 2014, Baffinland has been collecting data on a number of response variables (e.g., changes in animal abundance, relative abundance and distribution, group composition, calving rate, behavioural responses) that may be suitable to serve as Early Warning Indicators (EWIs). Baffinland has been working with the MEWG for the selection of EWIs capable of detecting potential impacts to marine mammals and with potential relevance to vessel noise are currently in the progress of being developed with the MEWG. A framework was distributed to all MEWG members and observer groups in September 2018. This framework provided an

opportunity for MEWG members and observer groups to participate in the identification of EWIs and, eventually, identify thresholds. Feedback received from the MEWG in 2018 regarding the identification of EWIs was limited to suggestions from DFO and the MHTO (through an in-person meeting on 28 to 29 November 2018 in Pond Inlet). The MEWG was provided an opportunity to provide feedback on the identification thresholds for the suggested EWIs in Q1 2019 with the goal finalizing the EWI process in time for the 2019 shipping season. In the absence of formalized EWIs for the 2019 shipping season, Baffinland relied on data collected from all of its ongoing marine mammal monitoring programs, as well as feedback from Inuit community members, to apply adaptive management to its operations and enhance mitigations, as required.

## RESULTS

### *Passive Acoustic Monitoring Program:*

Detailed results of the 2019 Passive Acoustic Monitoring Program are provided in Frouin-Mouy et al. (2020) with a brief summary presented below.

Vocalizations from three different marine mammal species were identified in the acoustic data. Narwhal vocalizations were present at all stations mainly from early August to late September. Several bowhead whale vocalizations were detected (and manually validated) during August and September at two of the three stations in Milne Inlet South. Several killer whale vocalizations were detected during August and September at all stations.

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that ambient noise (e.g., wind, waves) affects the listening range of narwhal at similar severity levels as vessel noise, and for similar or greater proportions of time as vessel noise.

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relayed to the Port Authority during daily communications between the MSV Botnica Master and Baffinland's shipping department. This information was then used for adaptive management actions (when and where required), including notices from the Port Authority to Vessel Masters operating in the RSA to exercise due caution in order to minimize the likelihood of interactions with the marine mammals identified. In such circumstances, Vessel Masters are authorized to adjust speed or alter course within safe and prudent navigational constraints to avoid to the extent possible interactions with high density marine mammal areas or with species of higher concern.

- Community consultation prior to start of icebreaker escort and shipping operations.
- Maximum of three ships transiting at a time in the RSA or anchored at Ragged Island.

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- During the open-water season, Baffinland completed simultaneous aerial surveys of the Eclipse Sound and Arctic Bay narwhal summer stock areas to determine abundance and density estimates for both stocks during peak summer, and to account for potential exchange between these respective stocks.
- An aerial-based clearance survey was undertaken at the end of the shipping season to monitor for potential narwhal entrapment events in the RSA.
- Baffinland integrated recommendations from DFO/QIA into aerial survey study design and data collection methodology.
- Deployed acoustic recorders in additional representative areas of the RSA to better understand ambient and shipping noise levels in those areas. In addition to the three recorders installed in Milne Inlet South, one recorder was installed in Eclipse Sound (south of Bylot Island) and another in Milne Inlet North (near Ragged Island).
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## TRENDS

The 2019 Passive Acoustic Monitoring Program expanded spatially with additional recorders installed on the shipping lane near Bylot Island and Ragged Island, as well as temporally with acoustic coverage of the early and late shoulder seasons in addition to the open-water season. Through the implementation of a spatially and temporally expanded

program, acoustic monitoring results collected to date are consistent with marine mammal impact predictions made in the FEIS Addendum for the ERP, in that ship noise will not result in acoustic injury to marine mammals and acoustic impacts will be limited to temporary disturbance effects.

Based on community feedback during the summer of 2018, Baffinland initiated meaningful and comprehensive adaptive management actions to further mitigate potential acoustic effects from Project shipping on narwhal. This was undertaken in the absence of formally defined EWIs and corresponding thresholds to drive the adaptive management process. Baffinland acknowledged concerns from local communities regarding vessel noise and marine mammals and accordingly responded by implementing additional monitoring and mitigation measures, using adaptive management practices derived directly from consultation with community members and the MEWG. Preliminary data suggest these mitigation measures were effective in reducing vessel noise along the Northern Shipping Route. Long-term monitoring of response to existing and enhanced mitigation measures is required to further understand marine mammal response to ship noise.

### **RECOMMENDATIONS/LESSONS LEARNED**

Based on the data collected to date as part of Baffinland's integrated marine mammal monitoring programs, the observed effects are in line with predictions of the FEIS for the ERP - effects will be limited to temporary, short-term avoidance behaviour, consistent with low to moderate severity responses (Finneran et al. 2012; 2015). No evidence has been observed of large-scale avoidance behaviour, displacement effects, or abandonment of the summering grounds (high severity responses), which might in turn result in a population or stock-level consequence (consistent with the definition of non-significant effects used in the FEIS).

Based on monitoring results collected to date, no additional mitigation or management measures are recommended at this time. Baffinland will continue to work with the MEWG, DFO and Inuit stakeholders on an annual basis to inform and refine the existing monitoring programs and develop new or enhanced mitigation measures or management actions should these be required in the future.

As a result of its consultation with the MEWG in 2018 and 2019, Baffinland will finalize its EWI framework and identify an appropriate threshold for its selected EWI(s). This threshold will be linked to existing monitoring programs to ensure that the EWI framework will provide a tool to rapidly detect adverse impacts from ship noise on marine mammals. Baffinland will continue to use all data collected through its monitoring programs and input provided by the community of Pond Inlet to respond to changes observed in marine mammal populations and integrate adaptive management, as required.

## Project Certificate Condition No. 112

Category	Marine Environment - Ship Noise
Responsible Parties	The Proponent, Marine Environment Working Group
Project Phase(s)	Construction and Operations
Objective	To prevent impacts to marine mammals from Project shipping activities.
Term or Condition	<p>Prior to commercial shipping of iron ore, the Proponent, in conjunction with the Marine Environment Working Group, shall develop a monitoring protocol that includes, but is not limited to, acoustical monitoring that provides an assessment of the negative effects (short and long term cumulative) of vessel noise on marine mammals. Monitoring protocols will need to carefully consider the early warning indicator(s) that will be best examined to ensure rapid identification of negative impacts. Thresholds shall be developed to determine if negative impacts as a result of vessel noise are occurring. Mitigation and adaptive management practices shall be developed to restrict negative impacts as a result of vessel noise. This shall include, but not be limited to:</p> <ul style="list-style-type: none"> <li>e. Identification of zones where noise could be mitigated due to biophysical features (e.g., water depth, distance from migration routes, distance from overwintering areas etc.).</li> <li>f. Vessel transit planning, for all seasons.</li> <li>g. A monitoring and mitigation plan is to be developed, and approved by Fisheries and Oceans Canada prior to the commencement of blasting in marine areas.</li> </ul>
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Partial-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	<p>Draft 2018 Passive Acoustic Monitoring Program (Frouin-Mouy and Maxner, 2019)</p> <p>Draft 2019 Passive Acoustic Monitoring Program (Frouin-Mouy et al., 2020)</p> <p>2019 Marine Environment Monitoring — Field Program Summary (Golder, 2019h)</p> <p>2019 Marine Mammal Monitoring Programs — Updated Preliminary Results (Golder, 2020e)</p> <p>Draft 2017–2018 Integrated Narwhal Tagging Study (Golder, 2020h)</p> <p>2019 MEWG Meeting Records</p>
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

- a. See update to Condition No. 110.
- b. See update to Condition No. 110.
- c. No blasting activities occurred in 2019 and none planned in the marine environment (or near-shore environment) in 2020. Not applicable in 2019/2020.

## RESULTS

### *Passive Acoustic Monitoring Program:*

Detailed results of the 2019 Passive Acoustic Monitoring Program are provided in Frouin-Mouy et al. (2020) with a brief summary presented below.

Vocalizations from three (3) different marine mammal species were identified in the acoustic data. Narwhal vocalizations were present at all stations mainly from early August to late September. Several bowhead whale vocalizations were detected (and manually validated) during August and September at two of the three stations in Milne Inlet South. Several killer whale vocalizations were detected during August and September at all stations.

During the open-water and shoulder season periods, sound exposure levels (SEL) at all five recording stations never exceeded marine mammal acoustic injury thresholds, for either permanent or temporary hearing threshold shift (PTS and TTS), based on NOAA criteria for assessing acoustic impacts on marine mammals.

Sound pressure levels (SPL) also rarely exceeded the 120 dB marine mammal disturbance threshold at any of the recorder stations. During the shoulder season, the disturbance threshold was exceeded for 1.9% of the total recording period (28 days) at AMAR-RI (located on shipping lane near Ragged Island) and for 1.4% of the total recording period (28 days) at AMAR-BI (located in Eclipse Sound south of Bylot Island). During the open-water season, the disturbance threshold was exceeded for 3% of the total recording period (55 days) at AMAR-1 (located on shipping lane in Milne Inlet South) and for 0.8% of the total recording period (55 days) at AMAR-2 (located inside Koluktoo Bay away from the shipping lane).

Listening range reduction (LRR), the fractional decrease in the available listening range for marine animals, was calculated for narwhal based on acoustic data collected at the five AMAR recorder locations in Milne Inlet and Eclipse Sound. Acoustic monitoring results indicated that LRR is influenced by both ambient and vessel noise sources, at different contributing levels depending on the call type of interest. LRRs were highest for click vocalizations and lowest for burst pulses. For both clicks and whistle vocalizations, vessel-related contributions to LRR were similar to levels narwhal already experience from ambient noise sources (e.g. wind, waves, rain). A small seasonal effect is present for both call types, with icebreaker noise slightly more influential than ambient noise sources during the early shoulder season (particularly at Ragged Island), and ambient noise sources slightly more influential than vessel noise during the open-water season. The third call type (burst pulses), was shown to be the least susceptible call type to LRR. During the early shoulder season, a >90%LRR occurred  $\leq 1\%$  of the time when vessels were detected on the recordings (which was  $\leq 37\%$  of the total recording period). During the open-water season, a >90%LRR occurred  $\leq 2.1\%$  of the time when vessels were detected on the recordings (which was  $\leq 29\%$  of the total recording period). Ambient noise did not result in any appreciable level of LRR for burst pulses because the hearing threshold for narwhal at 1 kHz is higher than the median ambient sound level at this frequency. Collectively, these results indicate that ambient noise (e.g., wind, waves) affects the listening range of narwhal at similar severity levels as vessel noise, and for similar or greater proportions of time as vessel noise.

### *Establishment of Early Warning Indicators*

The MEWG was requested to provide proposed thresholds for candidate indicators by 31 March 2019. Only the QIA provided feedback relevant to the EWIs on 31 March 2019. The feedback provided by the QIA did not provide thresholds suggestions, but rather indicated the challenges in provided such thresholds as “Thresholds need to be biologically appropriate and logistically feasible” and that the QIA “cannot suggest thresholds without additional



information". As a result, the process of finalizing a framework for EWIs, and their associated thresholds, could not be completed by the start of the 2019 shipping season. While the framework and timeline initially proposed was not completed, Baffinland has been using the data collected through its monitoring programs and the input provided by the community of Pond Inlet to respond to reported changes observed in marine mammal numbers and distribution in the RSA. For instance, Pond Inlet hunters and community members indicated to Baffinland that narwhal numbers observed in 2018 were much lower than those observed in previous years. This was supported by the relatively few narwhal observed during the 2018 Bruce Head vessel-based monitoring program (one-week pilot study) and during the 2018 Narwhal Tagging Program at Tremblay Sound. While EWIs had not been formally established at the time, Baffinland nonetheless responded to the provided feedback by applying adaptive management actions for implementation during the 2019 shipping season (Fednav, 2019a,b; Baffinland, 2019i). This included development of the following new and enhanced mitigation measures:

- During the early shoulder season, restrictions were set on the maximum number of Project vessel transits allowed in the RSA within a 24-h period based on daily ice conditions along the Northern Shipping Route, effectively reducing daily noise exposure periods.
- During the early shoulder season, a 40-km vessel buffer zone (i.e., vessel set-back area) was implemented at the entrance of the RSA that extended 40 Km to the east of the Nunavut Settlement Boundary (east of 73 degrees longitude). Project-related vessels were required to hold position outside the buffer zone until instructed by the Port Authority at Milne Port to proceed with their transit to Milne Port. The 40 Km boundary was selected based on acoustic modelling results indicating that this would represent an appropriate acoustic buffer zone for animals at or near the floe edge (i.e. noise levels at the floe edge would be outside marine mammal audible range or below levels known to elicit adverse behavioral responses such as displacement or avoidance).
- Collection of permanent video recordings onboard the icebreaker to record ice conditions during all icebreaker/escort transits in the RSA during both shoulder seasons.
- An ice analyst was deployed on the icebreaker on all transits undertaken in the RSA during the early and late shipping shoulder seasons. The ice analyst recorded daily ice conditions and liaised daily with the Port Authority and Baffinland's shipping department to coordinate daily transits allowable in RSA based on ice conditions.
- Continued use of a real-time AIS-based alert system that immediately informed the Port Authority and Baffinland's shipping department of any non-compliance events (e.g. speed exceedances in the RSA) so that the issue could be quickly resolved.
- MWOs stationed on the icebreaker actively informed the Vessel Master and ship officers of any notable wildlife sightings (i.e. species of higher concern such as polar bear, walrus and bowhead whales) and areas associated with high animal densities. Details on these sightings (including sighting locations) were then relayed to the Port Authority during daily communications between the MSV Botnica Master and Baffinland's shipping department. This information was then used for adaptive management actions (when and where required), including notices from the Port Authority to Vessel Masters operating in the RSA to exercise due caution in order to minimize the likelihood of interactions with the marine mammals identified. In such circumstances, Vessel Masters are authorized to adjust speed or alter course within safe and prudent navigational constraints to avoid to the extent possible interactions with high density marine mammal areas or with species of higher concern.
- Community consultation prior to start of icebreaker escort and shipping operations



- Maximum of three ships transiting at a time in the RSA or anchored at Ragged Island.

Similarly, based on feedback from the community and the MEWG in 2018 and early 2019, the following new components were incorporated into Baffinland's 2019 marine mammal monitoring programs:

- Implementation of the Pond Inlet "guardian program" (Shipping Monitors) which consisted of employing a minimum of two full-time Shipping Monitors from the community of Pond Inlet to actively track daily Project vessel movements in the RSA in real-time, and in relation to reported marine mammal aggregations (as shared by the community and the monitoring teams). The Shipping Monitors provided liaison between the community of Pond Inlet, hunters and Baffinland. This was a new approach introduced in 2019 in response to feedback from the MHTO that better communications on Baffinland shipping operations were needed. Shipping Monitors provided updates on Baffinland shipping activity to residents of Pond Inlet via local public radio, marine VHF radio (for hunters on the water) and through social media.
- Start of season aerial surveys were completed during the early shoulder season to determine the relative abundance and distribution of marine mammals near the Pond Inlet floe edge prior to and during initial shipping and icebreaking operations, and to undertake systematic aerial transect surveys to obtain abundance and density estimates of the Eclipse Sound narwhal summer stock during this period.
- During the open-water season, Baffinland completed simultaneous aerial surveys of the Eclipse Sound and Arctic Bay narwhal summer stock areas to determine abundance and density estimates for both stocks during peak summer, and to account for potential exchange between these respective stocks.
- An aerial-based clearance survey was undertaken at the end of the shipping season to monitor for potential narwhal entrapment events in the RSA.
- Baffinland integrated recommendations from DFO/QIA into aerial survey study design and data collection methodology.
- Deployed acoustic recorders in additional representative areas of the RSA to better understand ambient and shipping noise levels in those areas. In addition to the three recorders installed in Milne Inlet South, one recorder was installed in Eclipse Sound (south of Bylot Island) and another in Milne Inlet North (near Ragged Island).
- Complied with request to include daily ice charts in 2018 and 2019 SBO Program reports to compare wildlife sightings data with prevalent ice conditions.

## TRENDS

The 2019 Passive Acoustic Monitoring Program expanded spatially with additional recorders installed on the shipping lane near Bylot Island and Ragged Island, as well as temporally with acoustic coverage of the early and late shoulder seasons in addition to the open-water season. Through the implementation of a spatially and temporally expanded program, acoustic monitoring results collected to date are consistent with marine mammal impact predictions made in the FEIS Addendum for the ERP, in that ship noise will not result in acoustic injury to marine mammals and acoustic impacts will be limited to temporary disturbance effects.

Based on community feedback during the summer of 2018, Baffinland initiated meaningful and comprehensive adaptive management actions to further mitigate potential acoustic effects from Project shipping on narwhal. This was undertaken in the absence of formally defined EWIs and corresponding thresholds to drive the adaptive management process. Baffinland acknowledged concerns from local communities regarding vessel noise and marine mammals and accordingly responded by implementing additional monitoring and mitigation measures, using

adaptive management practices derived directly from consultation with community members and the MEWG. Preliminary data suggest these mitigation measures were effective in reducing vessel noise along the Northern Shipping Route. Long-term monitoring of response to existing and enhanced mitigation measures is required to further understand marine mammal response to ship noise.

#### **RECOMMENDATIONS/LESSONS LEARNED**

Based on the data collected to date as part of Baffinland's integrated marine mammal monitoring programs, the observed effects are in line with predictions of the FEIS for the ERP - effects will be limited to temporary, short-term avoidance behaviour, consistent with low to moderate severity responses (Finneran et al., 2012; 2015). No evidence has been observed of large-scale avoidance behaviour, displacement effects, or abandonment of the summering grounds (high severity responses), which might in turn result in a population or stock-level consequence (consistent with the definition of non-significant effects used in the FEIS).

Based on monitoring results collected to date, no additional mitigation or management measures are recommended at this time. Baffinland will continue to work with the MEWG, DFO and Inuit stakeholders on an annual basis to inform and refine the existing monitoring programs and develop new or enhanced mitigation measures or management actions should these be required in the future.

As a result of its consultation with the MEWG in 2018 and 2019, Baffinland will finalize its EWI framework and identify an appropriate threshold for its selected EWI(s). This threshold will be linked to existing monitoring programs to ensure that the EWI framework will provide a tool to rapidly detection adverse impacts from ship noise on marine mammals. Baffinland will continue to use all data collected through its monitoring programs and input provided by the community of Pond Inlet to respond to changes observed in marine mammal populations and integrate adaptive management, as required.

## Project Certificate Condition No. 113

Category	Marine Environment - Arctic Char
Responsible Parties	The Proponent, Marine Environment Working Group
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to marine fish in Steensby Inlet and Milne Inlet
Term or Condition	The Proponent shall conduct monitoring of marine fish and fish habitat, which includes but is not limited to, monitoring for Arctic Char stock size and health condition in Steensby Inlet and Milne Inlet, as recommended by the Marine Environment Working Group
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	Draft 2019 MEEMP and AIS Monitoring Program (Golder, 2020a) 2019 MEWG Meeting Records
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Marine fish and fish habitat in the Milne Port area was initially surveyed in 2010 and then monitored annually from 2013 to 2019. The marine fish study component of the MEEMP was conducted to provide a general characterization of the fish community, including Arctic char, and was initially developed based on traditional fishing areas (i.e., IQ) and sites adjacent to the Milne Port facility. Marine fish data collected from the field were analyzed to include:

- Relative abundance and distribution of species;
- Catch per unit of effort (CPUE);
- Length/weight distribution of each fish species; and
- Age distribution, body burden, and diet of incidental fish mortalities.

Modifications incorporated into the marine fish study component of Baffinland's 2019 MEEMP Program in response to recommendations and feedback provided by the MEWG, DFO, and Inuit stakeholders included the following:

MEEMP and AIS Program:

- Modifications to Fukui traps to increase catch rate.
- Addition of hoop/fyke nets to fish sampling program to compensate for low catch in Fukui traps.
- Added bottom trawls to fish sampling program to target potentially missed species (e.g. Arctic cod).
- Increased jigging and gill net sampling effort to allow for more consistent and repeatable fish sampling.
- For any potential changes to study design, continue sampling at old locations for minimum of three years to facilitate comparison of old and new methods / results.
- Added species (sculpin and shellfish) other than char for tissue/body burden analysis.

- Ageing of char using appropriate otolith experts.
- Ageing was conducted for shellfish (*H. arctica*) as they are known to be potentially long-lived such to appropriately interpret changes in growth and metal uptake.

In 2019, fish sampling was conducted in the Milne Port area from 26 July to 3 September using both active (gill netting, angling, beach seine) and passive (Fukui traps, fyke nets) capture methods. Fish sampling locations and methods were, in general, consistent with those in previous years, with the addition of fyke nets in 2019. The effort was spread over five weeks to capture as much of the open-water season as possible.

Angling (jigging and trolling) was conducted over a total of six days between 26 July and 27 August to characterize bottom and demersal fish communities in the LSA with a total effort of 3 hours and 42 minutes. The duration of sampling was activity-dependent; with a single trolling event occurring for 36 minutes, and jigging occurring between 10 and 46 minutes (n=6). Jigging occurred from a stationary position with one or two rods and lines deployed from the field vessel. Baited hooks or spoon lures (flashers) were allowed to hit the bottom, then flicked upward to attract bottom fish. Trolling occurred along a pre-determined depth contour where lines with flashers were cast over the side of the field vessel and spooled in towards the field vessel at a known depth to attract pelagic fish.

Standardized monofilament floating gill nets were used to sample shallow (i.e., up to 15 m deep) subtidal areas for characterization of pelagic fish communities present in the Milne Port area. A total of 20 gill net sets occurred from 27 July to 29 August 2019. Each gill net consisted of six panels with each panel measuring 15.2 m in length and 2.4 m in width, with mesh sizes of each panel consisting of 2.5 cm, 3.8 cm, 5.1 cm, 6.4 cm, 7.6 cm and 10.2 cm. The gill nets were deployed in a shore-perpendicular orientation (smallest mesh size closest to shore) and suspended just below the water surface and were checked every two hours for fish presence over the duration of deployment. Total soak durations ranged from 2 hours to 9 hours and 59 minutes with an average soak duration of 5 hours and 27 minutes. Exceptions included gill net sets GN05 and GN07, which were deployed for 28 hours and 58 minutes and 24 hours and 40 minutes, respectively. Total sampling effort for gill net sampling was 151 hours and 54 minutes.

Seine nets were used to sample fish in near shore habitat in Milne Port on 30 August 2019 in three sampling events. Sampling was conducted using a 1.5 m by 9 m seine net with a 5 mm mesh. Sampling effort took a total of 16 minutes to sample areas ranging from 315 m<sup>2</sup> to 630 m<sup>2</sup> at an approximate average depth of 1 m.

Fukui traps were used to sample demersal fish in the Milne Port area from 22 August 2019 to 3 September 2019. Sampling was conducted with sets consisting of three traps connected with a line, each trap measuring 61 cm x 46 cm x 20 cm, with 1.25 cm stretch mesh, and equipped with a bait container. Traps were baited with Arctic char and deployed for several days at each station. Deployment time ranged from 46 hours and 27 minutes to 164 hours and 20 minutes, with a mean deployment time of 94 hours and 6 minutes. Traps were periodically checked (normally every day) and, upon retrieval, bait containers were refilled if necessary, prior to redeployment. There were 18 Fukui trap stations in total.

In 2019, fyke net sampling was added to the fish sampling program to test the effectiveness of this method compared to Fukui traps, as the latter sampling technique obtained consistently low catch rates during previous survey years. Fyke nets were used to sample fish in near shore habitat in Milne Port from 28 August to 2 September 2019 (two sampling events in total). Total sampling effort was 233 hours and 15 minutes. Sampling was conducted using a 4 m two-chamber fyke net consisting of 40 mm mesh. The net was placed so the 0.9 m diameter mouth was perpendicular to the shore and the 9 m length wing panels were oriented in a wide V-shape extending outwards from the net opening. Fyke nets were set in nearshore habitat in the subtidal area west of the Ore Dock during low

tide with the wing panels running from a minimum water depth of 0.2 m to a maximum of 1.5 m. Nets were checked daily during low tide.

All fish collected were transferred to buckets with seawater prior to processing. Representative photographs were taken for each species. Fish were identified to species, or lowest practical taxonomic level, measured for length and weight, and directly released or returned to buckets to allow for recovery if visibly stressed prior to release to the approximate area of capture.

Incidental mortalities were retained for tissue (body burden), stomach content, condition, and age analysis. Mortalities were individually wrapped in aluminum foil, labelled and frozen. Frozen fish were shipped to Biologica for further analysis. A total of 47 Arctic char and 35 sculpin (i.e., *Myoxocephalus sp.*) incidental mortalities were collected from six different gill nets and one fyke net. Due to fish condition upon arrival at the lab, species were not able to be determined for sculpin, therefore, all sculpin incidental mortalities were grouped as *Myoxocephalus sp.*

Prior to tissue collection for analysis, fish were sexed and examined for lesions and tumors. Internal organs were removed and stored in formalin for stomach content analysis, heads were removed for removal of otoliths, and the body set aside for tissue collection.

During stomach content analysis the stomach was separated from the intestines anterior of the pyloric caecae and the intestines discarded. A longitudinal incision was made with a scalpel, avoiding damage to the contents, revealing the food bolus. Prior to dissection of the bolus, percent fullness and percent digestion were assessed. At this time, stomach fullness was estimated by considering two factors: the degree of distention of the stomach, and the weight of the bolus relative to the size of the fish. The bolus was dissected, working anterior-posterior, and its identifiable components weighed to the nearest 0.0001 g. Prey items were identified to the lowest practicable taxonomic level (species when possible). Digested and unidentifiable material were categorized (e.g., unidentified parts, digested tissue, non-food, etc.). Each identifiable unit (taxon or category) was placed in small drops of water on a petri dish to prevent desiccation during the identification process. All prey categories (taxa and unidentifiable categories) were blotted and weighed to the nearest 0.01 mg of wet weight.

For fish aging, the sagittal otoliths were removed from each fish head, cleaned and stored in water. Whole otoliths were mounted and polished, if necessary. Aging was performed by counting the number of annuli on each otolith visible under compound microscope.

Tissue samples for Arctic char were collected by removing a portion of muscle and skin with a clean knife (which was rinsed between samples) and wrapping the samples in new food-grade aluminum foil to be placed in clean labeled bags. Muscle tissue samples for sculpin were collected using a tissue punch to collect a muscle tissue plug. Muscle tissue samples from both Arctic char and sculpin were wrapped in aluminum foil and frozen as soon as possible and delivered in a cooler with ice packs to Bureau Veritas Labs (BV Labs) in Burnaby, BC for metals in tissue (body burden) analysis. BV Labs then removed the skin from the samples and analyzed the muscle tissue samples for moisture content and metals concentrations (wet weight) by atomic spectroscopy by ICP-MS.

A total of 80 *Hiattella arctica* (wrinkled rock borer) were collected as a supplement to fish health monitoring from 19 sediment and benthic invertebrate sampling stations. Data for shellfish condition was collected from the same stations as sediment and benthic invertebrate samples as part of the MEEMP. The first five to ten shellfish specimens found in benthic infauna sample grabs were collected for analysis. Specimens were wrapped in damp cloth and aluminum foil, frozen, and sent to Biologica where they were shucked, and shells were retained for age analysis. For aging analysis, shells were sectioned through the umbo rim and polished using progressively finer grit sandpaper.

Polished shells were etched in a 1% hydrochloric acid for 1 min, rinsed and dried. An acetate peel was made of the polished umbo surface. Peels were examined using a dissecting microscope to count continuous growth lines to determine the age of the shell.

A tissue punch was used to collect tissue plugs from each *H. arctica* specimen, which were then sent to BV Labs for metals analysis. Similar to the process outlined for finfish, BV Labs analyzed the tissue samples for moisture content and metals concentrations (wet weight) by atomic spectroscopy.

Detailed information on the fish sampling program study design and sampling methodology is available in the 2019 MEEMP and AIS Monitoring Report (Golder, 2020a).

## RESULTS

A total of 279 fish belonging to five Arctic species groups were captured during active fish sampling undertaken in 2019. As in previous survey years, Arctic char (*Salvelinus alpinus*, 37.6%), fourhorn sculpin (*Myoxocephalus quadricornis*, 38.0%) and shorthorn sculpin (*M. Scorpius*, 23.7%) were among the most abundant fish species caught, comprising 99.3% of the total catch in 2019. A single northern sandlance (*Ammodytes dubius*) and a single ninespine stickleback (*Pungitius pungitius*) made up the remainder of identified species with each with a relative abundance of 0.36% each.

As in previous years, the highest total captures were realized using gill nets: 252 fish, representing 90% of the total catch. CPUE in gill net sampling was lower than in 2018 ( $1.47 \pm 1.58$  fish/h compared to  $1.57 \pm 2.19$  fish/h), but comparable to previous years.

Similar to previous years, beach seines were the most effective method of capture in terms of CPUE ( $15.86 \pm 7.75$  fish/h); however, this method is limited by the necessity for sampling to occur in nearshore areas and in only a few locations in Milne Port, targeting small and juvenile fish. Short deployment times and limited sampling locations for beach seining led to considerably smaller total yields, despite a high CPUE, compared to other survey methods and excluded larger species that are present in Milne Port. Repeatedly surveying the suitable locations would potentially lead to multiple recaptures of the same individuals, subsequently misrepresenting the population in the nearshore area.

Fukui traps remain the least effective method, in terms of fish caught per hour ( $0.0074 \pm 0.0147$  fish/h), although CPUE and total catch increased since 2018 ( $0.0026 \pm 0.0045$  fish/h). Fyke nets were introduced in 2019 as a possible alternative passive fishing method to Fukui traps to address the low captures observed in that method. Fyke nets captured a total of 12 fish, representing three species, including an Arctic char, the first time in MEEMP surveys this species was caught outside of gill net efforts. CPUE for fyke nets ( $0.0515 \pm 0.0246$  fish/h) was considerably higher than Fukui traps, indicating this method may be a suitable replacement.

A total of eleven (11) fish taxa were observed in other components of the MEEMP and AIS/NIS surveys in 2019, many of which not identifiable to the species level due to limitations of the ROV or lack of distinguishing features. Eight of these taxa were only observed incidentally in components of the MEEMP and AIS/NIS surveys other than fishing efforts, indicating that dedicated fish survey methods are not fully characterizing the fish populations in Milne Port. Arctic char and ninespine sculpin were captured in fish collection surveys but were not captured or observed in any other method. Incidental captures in benthic infauna and zooplankton samples included larval and juvenile fish, age groups that are largely lacking in other fish survey methods. These differences between methodologies indicate the importance in a range of sampling techniques to fully characterize the species and age groups of fish in Milne Port.

ROV methods had the greatest number of fish taxa observations, including four (4) taxa not observed in any other method. However, these fish were often not resolved to species level due to poor camera angle, camera motion, visibility in the water column and fish behavior limiting the ability to observe the fish in detail.

The length to weight relationships were compared between 2017, 2018 and 2019 for the three most abundant fish species, Arctic char, fourhorn sculpin and shorthorn sculpin. No significant differences in the length-to-weight relationships were found between any of the sample years. Fish of a certain size class are within a consistent weight class in each survey year, indicating there has been no change in fish condition over this time period. Project effects are not impacting fish health through a notable change in body condition.

The shellfish *H. arctica* was collected as a supplement to fish tissue collection. Shellfish ranged in age from 7 years to 69 years with an average age of 28.1 years. *H. arctica* is a relatively long-lived bivalve species, and specimens have been collected with ages estimated at over 125 years (Sejr et al., 2002). The ages of *H. arctica* collected at Milne Port in 2019 represented a range of ages that fit within the expected range.

In the analysis of metals concentrations in Arctic char tissues significantly greater concentrations of arsenic, calcium, sodium, strontium, and titanium concentrations were observed in 2019 relative to 2018. However, relatively large variance in metal concentrations have been observed in Arctic char tissues since baseline years, and samples in 2019 were generally within range of measured values reported since 2010. Documented increases in these metals in char tissue is unlikely to be Project-related, since (i) these metals are either not associated with iron ore processing (i.e., strontium) or present in the ore in very low concentrations (i.e., arsenic, calcium, sodium, titanium) compared to iron<sup>6</sup> (Baffinland, 2012) and (ii) the generally pristine nature of Milne Inlet water and sediment quality has been demonstrated by extensive data collection in baseline studies and over the course of the MEEMP (i.e., during the period of 2014 to 2019). Therefore, the observed metals concentrations are believed to be less a reflection of local anthropogenic inputs in Milne Inlet, and more likely a product of natural geologic sources (e.g., contaminants mobilized from nearby watersheds, such as Phillips Creek) or atmospheric deposition, as has been demonstrated for metals and other contaminants. Notably, concentrations of copper and iron both showed a trend of slightly decreased mean concentrations since 2010.

Sculpin metals concentrations could not be compared to previous years' data, as 2019 was the first year sculpin tissue chemistry was analyzed. Sculpin metals concentrations were generally similar, but slightly greater, than those measured in Arctic char in 2019.

For *H. arctica*, metals concentrations were significantly greater in 2019 compared to 2018 for all metals except barium, phosphorus, sodium, and strontium. Many metals exhibit strong associations with finer sediments (i.e., clay minerals), and would be expected to be enriched in areas with greater deposition of riverine silt-clays. The elevated metals concentrations in 2019 may also partially be explained by the reproductive status of the clams at the time of sampling. Biota that release a large portion of their body mass through reproductive output (i.e., spawning) can also reduce their body burdens of contaminants through a commensurate loss of contaminant mass. While this could account for observed interannual differences (i.e., if sampling occurred post-spawn in 2018, but pre-spawn in 2019), reproductive status of the clams is not known from the 2018 or 2019 sampling periods.

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<sup>6</sup> The chemical composition of the ore dust is 65% iron, on average (Baffinland, 2012).



Tissue metals concentrations in *H. arctica* were consistently greater than concentrations measured in either Arctic char or sculpin; numerous metals were measured at concentrations at least one order of magnitude greater in *H. arctica* relative to both fish species. Iron was measured at concentrations approximately two orders of magnitude greater in clams than fish. *H. arctica* is a filter-feeding infaunal species and is closely associated with bottom sediments; therefore, these organisms filter large quantities of water, making *H. arctica* more prone to exposure and accumulation of a variety of natural and anthropogenic contaminants relative to pelagic species such as Arctic char.

In as much as species are capable of bioaccumulating various contaminants from the environment, they are also capable and physiologically adapted to eliminate contaminants from their bodies (i.e., through excretion, before or after metabolic modification). While fish are capable of metabolizing several classes of contaminants through the Mixed Function Oxygenase (MFO) system (e.g., McMaster et al., 1991) or biochemical equivalent, many bivalves have a limited ability to metabolically modify and eliminate contaminants. This may, in whole or in part, explain observed differences in the measured concentrations of metals between species.

No samples (i.e., Arctic char, sculpin or *H. arctica*) collected in 2018 or 2019 exceeded the CFIA commercial consumption guideline of 0.5 mg/kg wwmt mercury.

Fish sampling efforts and ROV surveys completed in 2019 showed comparable presence and composition of species within the Milne Port area compared to previous years, including baseline sampling. This suggests that there has not been a notable change in fish communities associated with the construction and operation of Milne Port. Fish survey results were consistent with FEIS predictions of no significant adverse residual effects on marine fish habitat and populations of Arctic char in Milne Inlet from Project construction and operation. Tissue chemistry monitoring results remain well within original FEIS predictions, which indicated the potential for non-significant, low magnitude effects on char health and condition.

## TRENDS

In 2019, total fish catch was less than 2018, but greater than all previous survey years, with 279 fish captured, representing five (5) species. Throughout the 2010 to 2019 surveys, fourteen different fish species have been identified, including ninespine stickleback, observed for the first time in 2019. In 2019, in addition to the fish captured through active fish sampling, incidental observations of other fish species were made during other MEEMP sampling efforts. A total of eleven (11) marine fish taxa were identified using non-active fish sampling methods, eight (8) of which were not collected through active fish sampling, indicating fish capture surveys may not be fully characterizing fish populations in Milne Port.

Arctic char was the most abundant fish captured in 2019 surveys, similar to previous years. As in previous survey years, sculpin species were the most abundant fish caught aside from Arctic char. Relative abundance among the sculpin species varies between survey years, however shorthorn sculpin and fourhorn sculpin consistently are the two most abundant sculpin species.

## RECOMMENDATIONS / LESSONS LEARNED

In 2020, Baffinland will continue marine fish sampling to provide a general characterization of the marine fish community, including Arctic char, in the Milne Port area. Fish community monitoring results will include:

- Relative abundance and distribution of species;
- Catch per unit of effort (CPUE);



- Length/weight distribution of each fish species; and
- Age distribution, body burden and diet of incidental fish mortalities.

It is recommended that fish sampling continue in 2020 with the following modifications:

- increased trolling effort to target pelagic species observed by ROV.
- replace Fukui nets with fyke nets to improve sampling efficiency.
- It is recommended that a biologist with local Arctic fauna knowledge be present with the ROV operator when videos are collected to direct the operator to focus on specimens of interest and perform in-situ taxonomic identifications of fish species.

It is recommended that the fish tissue sampling program continue in 2020 with the following modifications:

- qualitative documentation of reproductive status of *H. arctica*, such as presence of roe or spawn residue, to contextualize body burden results.
- rather than relying on incidental mortalities, adjust sampling to target minimum sample sizes of sentinel species (i.e., *H. arctica* and sculpin). Arctic char would be retained as an opportunistically sampled species.

## Project Certificate Condition No. 114

Category	Marine Environment - Arctic Char
Responsible Parties	The Proponent, Marine Environment Working Group
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to marine fish in Steensby Inlet and Milne Inlet.
Term or Condition	In the event of the development of a commercial fishery in the Steensby Inlet area or Milne Inlet-Eclipse Sound areas, the Proponent, in conjunction with the Marine Environment Working Group, shall update its monitoring program for marine fish and fish habitat to ensure that the ability to identify Arctic char stock(s) potentially affected by Project activities and monitor for changes in stock size and structure of affected stocks and fish health (condition, taste) is maintained to address any additional monitoring issues identified by the MEWG relating to the commercial fishery.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister
Status	Not Applicable
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

No commercial fishery / Schedule V waterbody operated in the vicinity of Milne Port or Steensby Port during 2019.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will adapt its monitoring programs accordingly in the event a commercial fishery is developed in the Steensby Inlet area or Milne Inlet-Eclipse Sound areas.

## Project Certificate Condition No. 115

Category	Marine Environment - Arctic Char
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To prevent impacts to marine fish in Steensby Inlet and Milne Inlet.
Term or Condition	The Proponent is encouraged to continue to explore off-setting options in both the freshwater and marine environment to offset the serious harm to fish which will result from the construction and infrastructure associated with the Project.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Fisheries and Oceans Canada (DFO), Marine Environment Working Group (MEWG)
Reference	2019 Milne Ore Dock Fish Offset Monitoring Report (Golder, 2019g) Construction Summary Report: Milne Port Freight Dock (Hatch, 2019a) Environmental Monitoring Completion Report for the Milne Port Freight Dock (Golder, 2019a) TSD 23: Conceptual-level Marine Offsetting Plan (Golder, 2018i)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

Baffinland has engaged and conducted comprehensive consultation on the Project as a whole with the five North Baffin communities (Arctic Bay, Clyde River, Sanirajak, Igloolik, and Pond Inlet) prior to, during, and following the environmental reviews of the Project by the NIRB. Specific to fisheries offsetting in the marine environment, Baffinland (with DFO participation) consulted with the community of Pond Inlet in regard to the Ore Dock proposed at Steensby Port and the habitat off-set design for the existing Ore dock and Freight dock at Milne Port for the Early Revenue Phase of the Project (ERP). Early engagement was initiated during the consultation process on the ERP when Baffinland met with members of the MHTO and other community members to discuss the design, offsetting measures, and proposed monitoring with respect to construction of the Ore Dock at Milne Port. Since then, consultation efforts have focused largely on offsetting habitat effectiveness monitoring associated with in-water marine infrastructure.

Baffinland was issued a Fisheries Authorization (Ref No. 14-HCAA-00525) from DFO in 2014 for construction of the Ore Dock at Milne Port. A fish habitat offsetting plan was included with Baffinland's application for an authorization under the *Fisheries Act*. This included fish habitat enhancement measures constructed around the Ore Dock.

Similarly, Baffinland was issued a Fisheries Authorization (Ref No. 18-HCAA-00160) on March 21, 2019 for construction of the Freight Dock at Milne Port. A separate offsetting plan for the Freight Dock was developed which included the addition of coarse rock substrates as offsetting materials.

With regards to future expansion plans such as the proposed Phase 2 proposal, Baffinland continues to explore potential offsetting options in both freshwater and marine environments to address potential losses in fish habitat associated with permanent habitat alteration or destruction of fish habitat.

## RESULTS

The Ore Dock at Milne Port was constructed in 2014, and the offsetting plan was implemented. The 2019 Milne Ore Dock Fish Offset Monitoring Report (Golder, 2019g) was submitted to DFO on December 31, 2019. Results were shared with the MEWG on February 12, 2020. The annual report demonstrates that the habitat offsets are supporting biological activity at all trophic levels as expected.

Construction of the new Freight Dock at Milne Port was initiated in 2019. Baffinland is currently seeking an extension to the applicable Fisheries Authorization Application to complete installation of the habitat offsetting measures beyond June 2020. The first year of post-construction monitoring is scheduled to occur in 2020, regardless.

A number of potential offsetting options were identified for the marine environment as part of Phase 2 conceptual offsetting planning (Golder, 2018e). Numerous potential freshwater offsetting options located in both lake (e.g., rearing habitat creation and/or improvements to existing) and stream (e.g., rearing habitat creation, removal of natural barriers, improvements to upstream passage) habitats were also identified and further investigated during summer field programs in 2019.

## TRENDS

Results from Milne Port Ore Dock offsetting monitoring have been shown effective in supporting biological activity, providing support for the addition of coarse substrates as an effective approach for successful offsetting.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to monitor the success of fish habitat offsetting measures associated with the construction of the existing Ore Dock and the recently constructed Freight Dock. Baffinland will also continue to provide the results of the annual monitoring program to DFO, the MEWG and other interested parties, as requested. Baffinland remains committed to exploring potential offsetting options in both freshwater and marine environments to address potential losses in fish habitat associated with permanent habitat alteration or destruction of fish habitat.

## Project Certificate Condition No. 116

Category	Marine Environment - Blasting
Responsible Parties	The Proponent, Fisheries and Oceans Canada
Project Phase(s)	Construction
Objective	To prevent impacts to marine fish and fish habitat from explosives.
Term or Condition	Prior to construction, the Proponent shall develop mitigation measures to minimize the effects of blasting on marine fish and fish habitat, marine water quality and wildlife that includes, but is not limited to compliance with the Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters (Wright and Hopky 1998) as modified by Fisheries and Oceans Canada for use in the North and as revised from time to time.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	N/A
Reference	Quarry Blasting Operations Management Plan (Baffinland, 2013b)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Not applicable in 2019. Blasting in the marine environment has not occurred on site to date. In the event it is required, Baffinland will provide operational control procedures in consultation with the MEWG that prescribe the requirements for the use of explosives in or near marine water bodies to ensure the activity is carried-out in accordance with Fisheries and Oceans Canada (DFO) guidance and best practice, including the requirement that blasting in, and near, marine water shall only occur during periods of open water.

### RESULTS

Blasting in the marine environment has not occurred on site to date.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 117

Category	Marine Environment - Blasting
Responsible Parties	The Proponent, Fisheries and Oceans Canada
Project Phase(s)	Construction
Objective	To prevent impacts to marine fish and fish habitat from explosives.
Term or Condition	The Proponent shall ensure that blasting in, and near, marine water shall only occur during periods of open water. Blasting in, and near, fish-bearing freshwaters shall, to the greatest degree possible, only occur in open water. If blasting is required during ice-covered periods, it must meet requirements established by Fisheries and Oceans Canada.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	Fisheries and Oceans Canada (DFO), Marine Environment Working Group (MEWG)
Reference	Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2020f) Quarry Blasting Operations Management Plan (Baffinland, 2013b)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Not Applicable in 2019. Blasting in the marine environment has not occurred on site to date. In the event it is required, Baffinland will provide operational control procedures in consultation with the MEWG that prescribe the requirements for the use of explosives in or near marine water bodies to ensure the activity is carried-out in accordance with Fisheries and Oceans Canada (DFO) guidance and best practice, including the requirement that blasting in, and near, marine water shall only occur during periods of open water.

For freshwaters, Baffinland's Surface Water and Aquatic Ecosystem Management Plan (SWAEMP) and Quarry Blasting Operations Management Plan have been developed to include the requirements for the use of explosives (blasting) in or near freshwater bodies. The requirements were developed in accordance with Fisheries and Oceans Canada (DFO) guidance, including the *Guidelines for Use of Explosives In or Near Canadian Fisheries Water, 1998* (Wright and Hopky, 1998), in order to mitigate possible effects on fish habitat and fish health.

### RESULTS

Blasting in the marine environment has not occurred on site to date.

### TRENDS

To date, no blasting has occurred within the required setback distances at the Project.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 118

Category	Marine Environment - Blasting
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To prevent impacts to marine fish and fish habitat from explosives.
Term or Condition	The Proponent shall incorporate into the appropriate mitigation plan prior to construction, thresholds for the use of specific mitigation measures meant to prevent or limit marine wildlife disturbance, such as bubble curtains for blasting, and nitrate removal.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	Surface Water and Aquatic Ecosystem Management Plan (Baffinland, 2020f) Quarry Blasting Operations Management Plan (Baffinland, 2013b)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Not applicable in 2019. Blasting in the marine environment has not occurred on site to date, including during the recent construction activities undertaken in 2019 in support of the freight dock construction program and barge landing expansion.

In the event it is required, Baffinland will provide operational control procedures in consultation with the MEWG that prescribe the requirements for the use of explosives in or near marine water bodies to ensure the activity is carried-out in accordance with Fisheries and Oceans Canada (DFO) guidance and best practice, including the requirement that blasting in, and near, marine water shall only occur during periods of open water.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 119

Category	Marine Environment - Ringed Seals
Responsible Parties	The Proponent, Marine Environment Working Group
Project Phase(s)	Construction
Objective	To prevent impacts to ringed seals from icebreaking associated with Project shipping.
Term or Condition	The Proponent shall, in conjunction with the Marine Environment Working Group, monitor ringed seal birth lair abundance and distribution for at least two years prior to the start of icebreaking to develop a baseline, with continued monitoring over the life of the Project as necessary to test the accuracy of the impact predictions and determine if mitigation is needed. Monitoring shall also include a control site outside of the Project's zone of influence.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	N/A
Ref. Document Link	N/A

### METHODS

Not applicable in 2019. Winter shipping has not been required in the Early Revenue Phase of the Project. Baffinland's shipping-related management and mitigation measures takes into consideration key sensitive periods of ringed seal. Specifically, shipping and icebreaking will be conducted outside of key sensitive periods including pupping, nursing and mating periods (i.e., January to May, thus no temporal overlap with Project-related shipping). In so doing, ringed seal hotspots and pupping grounds will have dissolved as ice conditions deteriorate and thus by the time shipping begins in mid- to late July. The foraging period following key sensitive periods extends from July to early December when ringed seals disperse as solitary animals or small groups throughout open-water areas or to coastal areas to forage.

### RESULTS

Not applicable in 2019.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable in 2019. Shipping through landfast ice during winter months is not part of Baffinland's shipping operations through Eclipse Sound.



## Project Certificate Condition No. 120

Category	Marine Environment - Marine Mammal Interactions
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to marine mammals associated with Project shipping.
Term or Condition	<p>The Proponent shall ensure that, subject to vessel and human safety considerations, all project shipping adhere to the following mitigation procedures while in the vicinity of marine mammals:</p> <ul style="list-style-type: none"> <li>a. Wildlife will be given right of way. <ul style="list-style-type: none"> <li>i. Ships will when possible, maintain a straight course and constant speed, avoiding erratic behavior.</li> <li>ii. When marine mammals appear to be trapped or disturbed by vessel movements, the vessel will implement appropriate measures to mitigate disturbance, including stoppage of movement until wildlife have moved away from the immediate area.</li> </ul> </li> </ul>
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environmental Working Group (MEWG)
Reference	<p>Shipping and Marine Wildlife Management Plan – Rev 06 – March 2016</p> <p>Standing Instructions and General Information for Masters of Vessels Loading at Milne Inlet Port (Fednav, 2019a)</p> <p>Standing Instructions and General Information for Masters of Vessels Sailing to Milne Inlet Port (Fednav, 2019b)</p> <p>Draft 2019 Ship-based Observer Program (Golder, 2020f)</p> <p>2019 MEWG Meeting Records</p>
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

The primary mitigation procedure used to avoid and/or minimize disturbance to marine wildlife from shipping operations include has been for Project vessels to adhere to a maximum speed of 9 knots when transiting within the boundaries of the RSA, and to maintain a straight course and constant speed in the RSA as safe navigation allows. The Shipping and Marine Wildlife Management Plan (SMWMP; Baffinland, 2016e) and the Standing Instructions to Masters (Fednav, 2019a; 2019b) provide specific guidance on ship speeds and the nominal shipping route in the RSA that vessels are required to follow. These requirements are provided to all vessels procured by Baffinland prior to their entry into the RSA.

Project-related ship tracks and ship speeds along the Northern Shipping Route were recorded throughout the 2019 shipping season using the satellite-based Automatic Identification System (AIS), an automatic vessel tracking system that uses transponders on ships to track movement of each ship in the Project area. Satellite-based AIS data was

supplemented by two AIS shore-based receiver stations installed in the Project area, one at Bruce Head and the other at Baffinland's Pond Inlet office located in the MHTO office building. Information communicated by the AIS system includes the vessel's unique identification number, position, course, and speed. Baffinland has contracted exactEarth® a global vessel monitoring and tracking service based on AIS data from polar orbiting satellites to track and report on vessel movements. The ship tracks are accessible to residents of Pond Inlet at the Baffinland office in Pond Inlet on a large wall-mounted monitor and individual viewing computer station and, more generally, publicly accessible through the Baffinland website during the shipping season.

## RESULTS

Mitigation measures outlined in the SMWMP (Baffinland, 2016e) and the Standing Instructions to Masters (Fednav, 2019a; 2019b) which aim to avoid and/or minimize disturbance to marine wildlife from shipping operations include:

- All Project vessels will reduce speeds to a maximum of nine knots when transiting along the established shipping corridor.
- Project vessels will maintain constant speed and course, subject to vessel and human safety considerations.
- When marine mammals appear to be trapped or disturbed by Project vessel movements, the vessel will implement appropriate measures to mitigate disturbance, including stoppage of movement until wildlife move away from the immediate area (as safe navigation allows).
- All Project vessels will be provided with standard instructions to not approach within 300 m of a walrus or polar bear observed on sea ice.
- All Project vessels will be provided with standard instructions to operate their vessel in a manner that avoids separating an individual member(s) of a group of marine mammals from other members of the group.
- Between the period of 01 July and 30 July, a maximum of one icebreaker transit (with escorted vessels) will occur per day (24-h period) where ice concentrations of 6/10 or greater cannot be avoided along the shipping route. Between the period of 01 July and 30 July, a maximum of two icebreaker transits (with escorted vessels) will occur per day (24-h period) where ice concentrations less than 6/10 but greater than 3/10 cannot be avoided along the shipping route. When a continuous sailing route of uninterrupted ice concentrations of 3/10 or less is available between the entrance of Pond Inlet and Milne Port, then icebreaker transits in the RSA will proceed according to the normal shipping schedule.
- All icebreaking, ice management and ice escort activities will be conducted outside of the period of ringed parturition, nursing, and breeding periods.
- Baffinland will place MWOs on icebreaking vessels during the shoulder seasons that will be responsible for recording relative abundance along the Northern Shipping Route. MWOs will also be responsible for recording any incidences of marine mammal strikes or near misses with Project vessels, including icebreaker vessels.

In addition to mitigation listed above, Baffinland also incorporated the following additional mitigation measures during the 2019 shipping season (the majority of these measures were introduced through adaptive management decisions made following release of the 2019 SITM):

- During the early shoulder season, a 40-km vessel set-back or buffer zone (i.e., vessel set-back area) was implemented at the entrance of the RSA that extended 40 Km to the east of the Nunavut Settlement Boundary (east of 73 degrees longitude). Project-related vessels were required to hold position outside the

buffer zone until instructed by the Port Authority at Milne Port to proceed with their transit to Milne Port. The 40-km boundary was selected based on acoustic modelling results indicating that this would represent an appropriate acoustic buffer zone for animals at or near the floe edge (i.e. noise levels at the floe edge would be outside marine mammal audible range or below levels known to elicit adverse behavioral responses such as displacement or avoidance).

- Collection of permanent video recordings onboard the icebreaker to record ice conditions during all icebreaker/escort transits in the RSA during both shoulder seasons.
- An ice navigator / analyst was deployed on the icebreaker on all transits undertaken in the RSA during the early and late shipping shoulder seasons. The ice analyst recorded daily ice conditions and liaised daily with the Port Authority and Baffinland's shipping department to coordinate daily transits allowable in RSA based on ice conditions.
- Daily (morning) teleconferences during early shoulder season involving Fednav team, Baffinland's Shipping and Sustainable Development teams, the Port Authority, and Golder marine monitoring lead, to review daily projected ice conditions, number of transits allowed for the 24-hour period, community hunting activities and concerns, and marine mammal presence in the RSA.
- MWOs stationed on the icebreaker actively informed the Vessel Master and ship officers of any notable wildlife sightings (i.e. species of higher concern such as polar bear, walrus and bowhead whales) and areas associated with high animal densities. Details on these sightings (including sighting locations) were then relayed to the Port Authority during daily communications between the MSV Botnica Master and Baffinland's shipping department. This information was then used for adaptive management actions (when and where required), including notices from the Port Authority to Vessel Masters operating in the RSA to exercise due caution in order to minimize the likelihood of interaction with the marine mammals identified. In such events, Vessel Masters are authorized to adjust speed or alter course within safe and prudent navigational constraints to avoid to the extent possible interactions with high density marine mammal areas or with species of higher concern.
- Avoidance of shipping in areas near Pond Inlet bowhead hunt to avoid disturbance during the hunt.
- Limiting number of vessels anchored or drifting at Ragged Island to 3 Project vessels.
- Continued use of a real-time AIS-based alert system that immediately informed the Port Authority and Baffinland's shipping department of a non-compliance event such as a speed exceedance in the RSA so that the issue could be quickly resolved.

Project vessel tracks from 2019 are plotted in Figure 4.14 (see update to Condition No. 103). There were no major deviations from the nominal shipping route in 2019 by Project vessels, with the exception of the following occurrences:

- Four vessels drifted briefly in the western portion of Eclipse Sound, south of the shipping lane. On 31 July, the Golden Pearl could not anchor at the Ragged Island location because of the presence of ice at the anchorage and drifted in Eclipse Sound for approximately 10 hours.
- On 23 to 24 August, the Golden Bull, Sagar Samrat and NS Yakutia were forced to leave anchorage at Milne Port due to strong winds. The vessels drifted briefly in Eclipse Sound and returned to Milne Port when conditions improved.
- Figure 4.14 depicts track lines of two freight vessels (Sedna Desgagnés and BigLift Barentsz) transiting north into Navy Board Inlet during the open-water season. Both freight vessels initially serviced Milne Port before

calling to Pond Inlet under a separate shipping contract, effectively ending their service for Baffinland at Pond Inlet. Following their departure from Pond Inlet, both vessels transited north through Navy Board Inlet to continue their northern service operations.

- The MSV Botnica icebreaker deviated from the nominal shipping route in Milne Inlet during early August (4 to 5 August 2019) to undertake scientific work in support of the 2019 MEEMP and AIS Monitoring Program and the 2019 Passive Acoustic Monitoring Program. This vessel was used to deploy acoustic recorders (AMARs) and oceanographic moorings at three locations near Bruce Head and one location in Koluktoo Bay, and to collect a series of CTD (Conductivity, Temperature, and Depth) profiles throughout Milne Inlet including in areas west of the nominal shipping route (Figure 4.15).

Table 4.26 presents vessel speed information for all Project-related vessels calling at Milne Port in 2019 (see update to Condition No. 105). Project vessels traveled below the 9-knot speed limit for the majority (97.8%) of their transit period in the RSA (Table 4.27 - see update to Condition No. 105). The maximum recorded travel speed for an ore carrier in 2019 was 11.4 knots. The maximum recorded speed for a freight / fuel tanker in 2019 was 17.1 knots. The proportional breakdown of vessel travel speed in the RSA during the 2019 shipping season is presented for all vessels combined (ore carriers and cargo/fuel vessels) in Figure 4.16 (see update to Condition No. 105).

## TRENDS

No significant deviations from the nominal shipping route have occurred in the first five years of iron ore shipping (2015 to 2019). In general, most Project vessels have adhered to the 9-knot vessel speed restriction along the Northern Shipping Route, with performance improving with every year since the start of Project operations. Baffinland will continue to work with all vessel owner / operators to communicate vessel speeds and nominal shipping route to avoid non-adherence events in the future.

No ship strikes on marine mammals or seabirds were recorded from the 2019 Ship-based Observer Program (Golder, 2020f). Similarly, no ship strikes on marine mammals or seabirds (with the exception of one seabird strike to the stationary MSV Botnica in 2019) have been reported by ship operators since the start of the Project, including ore carriers, fuel/cargo ships and support tugs.

## RECOMMENDATIONS / LESSONS LEARNED

To ensure adherence to the SMWMP, Baffinland will continue to monitor ship tracks and ship speeds using shore-based AIS stations at Pond Inlet and Bruce Head, and satellite-based ship tracking using the exactEarth® archive.

In 2020, all Project vessels (ore carriers, fuel tankers, cargo ships, tugs, icebreaker) will be subject to the mitigation measures outlined above (as part of the annually updated SITM) when under contract to Baffinland, including standing instructions to travel through Eclipse Sound and Milne Inlet at speeds of no greater than 9 knots and to avoid deviating from the nominal Northern Shipping Route. Baffinland will continue to maintain active ship tracking using AIS notification alerts and subsequent timely follow-up with vessel captains should exceedances be observed.

## Project Certificate Condition No. 121

Category	Marine Environment - Marine Mammal Interactions
Responsible Parties	The Proponent, Fisheries and Oceans Canada, Environment Canada
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to marine mammals and seabird colonies associated with Project shipping.
Term or Condition	<p>The Proponent shall immediately report any accidental contact by project vessels with marine mammals or seabird colonies to Fisheries and Oceans Canada and Environment Canada, respectively, by notifying the appropriate regional office of the:</p> <ul style="list-style-type: none"> <li>• Date, time and location of the incident;</li> <li>• Species of marine mammal or seabird involved;</li> <li>• Circumstances of the incident;</li> <li>• Weather and sea conditions at the time;</li> <li>• Observed state of the marine mammal or sea bird colony after the incident; and,</li> <li>• Direction of travel of the marine mammal after the incident, to the extent that it can be determined.</li> </ul>
Relevant Baffinland Commitment	80, 83
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG), Fisheries and Oceans Canada (DFO), Environment and Climate Change Canada (ECCC)
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland's Shipping and Marine Wildlife Management Plan mandates the recording of any contact that occurs between Project vessels and marine mammals or seabird colonies.

In order to ensure that interactions with marine wildlife and Project shipping activities are effectively monitored, Baffinland developed the SBO Program to monitor for potential ship strikes on marine mammals and seabirds in the RSA.

In 2018 to 2019, the survey platform for the SBO Program was the MSV *Botnica*, an icebreaker that was commissioned by Baffinland to serve as an escort vessel to ore carriers at the beginning and end of the shipping season. The MSV *Botnica* provided a safe climate-controlled viewing platform 20 m above sea level, where Marine Wildlife Observers (MWOs) could comfortably and more effectively (compared to onboard the industry platforms used in 2013 to 2015) observe marine wildlife and environmental conditions. Marine mammal surveys were conducted while the vessel was in transit (averaging approx. 8.3 knots). Seabirds were monitored using the Canadian Wildlife Service (CWS)'s Eastern Canada Seabirds at Sea (ECSAS) protocol.

Various environmental variables were systematically recorded during the active survey watch periods as these can influence an observer's ability to detect and identify marine wildlife. Environmental variables were recorded at the beginning of each watch and whenever conditions noticeably changed during a watch. Environmental variables considered in the study included Near Field Ice Cover (ice cover within 100 m of the vessel, estimated by MWOs), Far Field Ice Cover (ice cover  $\geq 100$  m from vessel but within line of sight of the MWO), Beaufort Sea State (based on the Beaufort scale), Beaufort Wind Force, Weather (e.g., precipitation and cloud cover), Visibility, Sun Glare and Sightability (combination of Weather, Sun Glare, and Beaufort Sea State). Relative representations of environmental conditions (e.g., Near Field and Far Field Ice Cover, Weather, Beaufort Sea State, Visibility and Sightability) were calculated as percentages of observational effort and were entered into the sightings e-database.

Detailed methodology on data collection and analytical procedures for the 2019 SBO Program is presented in Golder (2020f).

## RESULTS

There were no marine mammals strikes in 2019, and therefore no notification required. However, one seabird strike notification (the first since start of ship-based monitoring) occurred during Leg 2 of the SBO Program on October 11, 2019. A long-tailed duck (*Clangula hyemalis*) flew into the superstructure (support post) beneath the ship's helideck, while the MSV Botnica was holding station for the night in eastern Eclipse Sound near Pond Inlet. Conditions at the time of the strike consisted of low visibility (dark, heavy snow), low wind and calm sea state. The specimen was a definitive basic (adult winter plumage) male. The specimen suffered a broken neck and died shortly thereafter. The bird strike event was reported to ECCC-CWS, QIA and MHTO.

## TRENDS

From 2013 through 2019, no notifications of accidental contact were required for marine mammals and seabirds with the exception of one seabird strike in October 2019 with the stationary icebreaker MSV Botnica.

## RECOMMENDATIONS / LESSONS LEARNED

Given that only one (1) seabird strike has been recorded to date, no additional mitigation measures are deemed necessary based on the very low frequency. Additional recommendations will be considered should this be observed on a recurring basis.

Given the success of the recently modified SBO program, a similar program as completed in 2018–2019 remains under consideration for future implementation. Alternative methods for marine wildlife incidental reporting are being considered for 2020.

## Project Certificate Condition No. 122

Category	Marine Environment - Marine Mammal Interactions
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to marine mammals and seabird colonies associated with Project shipping.
Term or Condition	The Proponent shall summarize and report annually to the NIRB regarding accidental contact by project vessels with marine mammals or seabird colonies through the applicable monitoring report.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be provided in the Annual Report to the NIRB.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	Shipping and Marine Wildlife Management Plan (Baffinland, 2016e) 2019 Ship-based Observer Program (Golder, 2020f)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

In order to ensure that interactions with marine wildlife and Project shipping activities are effectively monitored, Baffinland developed the SBO Program to monitor for potential ship strikes on marine mammals and seabirds in the RSA.

In 2018–2019, the survey platform for the SBO Program was the MSV *Botnica*, an icebreaker that was commissioned by Baffinland to serve as an escort vessel to ore carriers at the beginning and end of the shipping season. The MSV *Botnica* provided a safe climate-controlled viewing platform 20 m above sea level, where Marine Wildlife Observers (MWOs) could comfortably and more effectively (compared to onboard the industry platforms used in 2013 to 2015) observe marine wildlife and environmental conditions. Marine mammal surveys were conducted while the vessel was in transit (averaging approx. 8.3 knots). Seabirds were monitored using the Canadian Wildlife Service (CWS)'s Eastern Canada Seabirds at Sea (ECSAS) protocol.

Various environmental variables were systematically recorded during the active survey watch periods as these can influence an observer's ability to detect and identify marine wildlife. Environmental variables were recorded at the beginning of each watch and whenever conditions noticeably changed during a watch. Environmental variables considered in the study included Near Field Ice Cover (ice cover within 100 m of the vessel, estimated by MWOs), Far Field Ice Cover (ice cover  $\geq$  100 m from vessel but within line of sight of the MWO), Beaufort Sea State (based on the Beaufort scale), Beaufort Wind Force, Weather (e.g., precipitation and cloud cover), Visibility, Sun Glare and Sightability (combination of Weather, Sun Glare, and Beaufort Sea State). Relative representations of environmental conditions (e.g., Near Field and Far Field Ice Cover, Weather, Beaufort Sea State, Visibility and Sightability) were calculated as percentages of observational effort and were entered into the sightings e-database.

Detailed methodology on data collection and analytical procedures for the 2019 SBO Program is presented in Golder (2020f).

## RESULTS

There were no notifications of marine mammals strikes in 2019. However, one seabird strike notification occurred during Leg 2 of the SBO Program on October 11, 2019. A long-tailed duck (*Clangula hyemalis*) flew into the superstructure (support post) beneath the ship's helideck, while the MSV Botnica was holding station for the night. Conditions at the time of the strike consisted of low visibility (dark, heavy snow), low wind and calm sea state. The specimen was a definitive basic (adult winter plumage) male. The specimen suffered a broken neck and died shortly thereafter.

There were no marine mammals strikes in 2019, and therefore no notification required. However, one seabird strike notification (the first since start of ship-based monitoring) occurred during Leg 2 of the SBO Program on October 11, 2019. A long-tailed duck (*Clangula hyemalis*) flew into the superstructure (support post) beneath the ship's helideck, while the MSV Botnica was holding station for the night in eastern Eclipse Sound near Pond Inlet. Conditions at the time of the strike consisted of low visibility (dark, heavy snow), low wind and calm sea state. The specimen was a definitive basic (adult winter plumage) male. The specimen suffered a broken neck and died shortly thereafter. The bird strike event was reported to ECCC-CWS, QIA and MHTO.

## TRENDS

From 2013 through 2019, no notifications of accidental contact with marine mammals or seabirds were required, with the exception of the recent seabird strike that occurred in October 2019. Given that this is the first seabird strike to occur since 2013, data is insufficient for concluding any possible trends.

## RECOMMENDATIONS / LESSONS LEARNED

Given the success of the recently modified SBO program for monitoring marine mammal and seabird strikes, a similar program as completed in 2018–2019 remains under consideration for future implementation. Alternative methods for marine wildlife incidental reporting are being considered for 2020.



## Project Certificate Condition No. 123

Category	Marine Environment - Marine Mammal Interactions
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to marine mammals and seabird colonies associated with Project shipping.
Term or Condition	The Proponent shall provide sufficient marine mammal observer coverage on project vessels to ensure that collisions with marine mammals and seabird colonies are observed and reported through the life of the Project. The marine wildlife observer protocol shall include, but not be limited to, protocols for marine mammals, seabirds, and environmental conditions and immediate reporting of significant observations to the ship masters of other vessels along the shipping route, as part of the adaptive management program to address any items that require immediate action.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	Draft 2019 Ship-based Observer Program (Golder, 2020f)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

In order to ensure that interactions with marine mammals and Project shipping activities are effectively monitored, Baffinland developed the SBO Program to monitor for potential ship strikes on marine mammals and seabirds in the RSA and to collect observational data on the presence, relative abundance and distribution of marine mammals and seabirds within the boundaries of the RSA relative to Project vessel operations. The SBO Program was first run in 2013 to 2015 and was subsequently resumed in 2018 and 2019. The 2013 to 2015 SBO Program took place during the construction phase at Milne Port (2013 and 2014) and during Year 1 of shipping operations (2015). As Baffinland had not designed or constructed purpose-built ore carriers as originally planned, there was reliance on placing the observers aboard market vessels in order to conduct the monitoring. Fuel tanker and sealift vessel traffic in and out of Milne Port served as the SBO observation platform during the 2013 to 2015 program. Observers boarded the ship in Pond Inlet, disembarked at Milne Port and returned to Pond Inlet via community charter flight for the subsequent vessel boarding. The SBO Program was put on hold in 2016 due to concerns regarding safe onboarding of the observers on the vessels in Pond Inlet (as boarding occurred at sea).

In 2018 to 2019, the survey platform for the SBO Program was the MSV *Botnica*, an icebreaker that was commissioned by Baffinland to serve as an escort vessel to ore carriers at the beginning and end of the shipping season. A team of experienced Marine Wildlife Observers (MWOs) were stationed on the bridge of MSV Botnica as this was the highest accessible and protected vantage point on the vessel. The bridge provided a safe climate-controlled viewing platform 20 m above sea level, where the MWOs could comfortably and more effectively (compared to onboard the freight ship platforms used in 2013 to 2015) observe marine wildlife and environmental

conditions. Marine mammal surveys were conducted while the vessel was in transit (averaging approx. 8.3 knots). Seabirds were monitored using the Canadian Wildlife Service (CWS)'s Eastern Canada Seabirds at Sea (ECSA) protocol.

Boarding of the MSV Botnica occurred at Milne Port with the observers remaining on the live-aboard vessel for the full multi-week monitoring period, eventually disembarking at Milne Port once ice escort services were complete. Marine mammal surveys typically lasted throughout daylight hours with scheduled breaks to avoid observer fatigue. The 2019 SBO Program took place from 19 to 29 July (Leg 1) and again from 5 to 28 October (Leg 2).

The MWOs were responsible for recording marine wildlife sightings from the bridge of the MSV Botnica during dedicated watch periods. Systematic data on marine wildlife sightings and environmental conditions were recorded by the MWOs and entered into an electronic database. Surveying was performed with the naked eye and using 10x42 and 7x50 binoculars. The MWOs were also responsible for photo-documentation of wildlife sightings and reporting observed ship strikes on marine mammals or seabirds, including near misses. The MWOs also informed the Vessel Master and ship officers of any notable wildlife sightings (i.e. species of higher concern such as polar bear, walrus and bowhead whales) and areas associated with high animal densities. Details on these sightings (including sighting locations) were then relayed to the Port Authority during daily communications between the MSV Botnica Master and Baffinland's shipping department. This information was then used for adaptive management actions (when and where required), including notices from the Port Authority to Vessel Masters operating in the RSA to exercise due caution in order to minimize the likelihood of interaction with the marine mammals identified. In such events, Vessel Masters are authorized to adjust speed or alter course within safe and prudent navigational constraints to avoid to the extent possible interactions with high density marine mammal areas or with species of higher concern.

Marine mammal sightings were recorded over a daily monitoring period extending up to 16 hours on Leg 1 (from 10:00 to 02:00 EST) and up to 10 hours on Leg 2 (from 08:00 to 18:00 EST) depending on available daylight hours. While the vessel was in transit, the focus of the survey was forward of the vessel, with the MWOs visually surveying from 240° to 120° relative to the centre or track line of the vessel (0°). When the vessel was stationary, the MWOs attempted to visually survey on all sides (360°) of the vessel, although the design of the bridge made this somewhat impractical. The vessel was rarely stationary, representing only 3% of total survey effort on Leg 1 (2 h and 46 min) and 1% of total survey effort on Leg 2 (52 min).

At the beginning of each watch period, a Global Positioning System (GPS) track file was initiated to record the path and speed of the survey vessel and to record sighting locations. Observational effort was calculated relative to survey distance in linear kilometres using trackline GPS data extracting segments of effort using start and end times recorded during each MWO shift. The same start and end times were used to determine temporal survey effort. All data analyses were completed based on spatial survey effort (km) as not temporal effort. During each recorded marine mammal sighting, the distance between the detected marine mammal and the ship was estimated. The initial distance at which a marine mammal was observed by the MWO was noted and if the animal was subsequently observed again at a closer distance to the ship, the Closest Point of Approach (CPA) was updated.

Various environmental variables were systematically recorded during the active survey watch periods as these can influence an observer's ability to detect and identify marine mammals, in addition to potentially altering animal behaviour and distribution. Environmental variables were recorded at the beginning of each watch and whenever conditions noticeably changed during a watch. Environmental variables considered in the study included Near Field Ice Cover (ice cover within 100 m of the vessel, estimated by MWOs), Far Field Ice Cover (ice cover  $\geq$  100 m from

vessel but within line of sight of the MWO), Beaufort Sea State (based on the Beaufort scale), Beaufort Wind Force, Weather (e.g., precipitation and cloud cover), Visibility, Sun Glare and Sightability (combination of Weather, Sun Glare, and Beaufort Sea State). Relative representations of environmental conditions (e.g., Near Field and Far Field Ice Cover, Weather, Beaufort Sea State, Visibility and Sightability) were calculated as percentages of observational effort and were entered into the sightings e-database.

Detailed methodology on data collection and analytical procedures for the 2019 SBO Program is presented in Golder (2020f).

## RESULTS

The revised SBO Program has been successfully implemented from the MSV Botnica over the last two years and has included local Inuit participation. In 2019, total monitoring effort over both survey legs consisted of 268.7 hours covering 3,089 Km. Total monitoring effort during Leg 1 was 100.4 hours covering 1,119 Km. Total monitoring effort during Leg 2 was 168.3 hours traveling 1,970 Km. Although there were nearly twice as many observation days in Leg 2 compared to Leg 1 (24 vs. 11 days), this was not reflected in overall survey effort given the longer daylight hours during Leg 1 (mean daily effort= 11 h) compared to Leg 2 (mean daily effort = 7 h).

Seven (7) different species of marine mammals were observed during the 2019 SBO Program: ringed seal, harp seal, narwhal, bowhead whale, beluga, bearded seal and polar bear. A total of 304 marine mammal sightings comprising 2,785 individuals were recorded. Killer whale and walrus were not recorded in the RSA during either survey leg in 2019; however both species are known to occur in the region. Consistent with previous years (2013 to 2015 and 2018), no ship strikes on marine mammals were recorded in 2019.

During early summer (Leg 1), a total of 152 sightings comprising 2,453 individuals were recorded. Species identified included ringed seal (61 sightings of 722 individuals), narwhal (27 sightings of 385 individuals), harp seal (24 sightings of 136 individuals), bowhead whale (22 sightings of 24 individuals), bearded seal (four sightings of four individuals), polar bear (two sightings of two individuals) and beluga (one sighting of one individual). There were also nine sightings of unconfirmed pinniped species (comprising 1,176 individuals) and two sightings of unconfirmed cetacean species (comprising three individuals).

During fall (Leg 2), a total of 152 sightings comprising 332 individuals were recorded. Species identified included ringed seal (53 sightings of 58 individuals), narwhal (27 sightings of 103 individuals), harp seal (25 sightings of 117 individuals), bearded seal (one sighting of one individual) and bowhead whale (one sighting of one individual). There were also 44 sightings of unconfirmed pinniped species (49 individuals) and one sighting of an unconfirmed cetacean species (comprising three individuals).

A total of 54 narwhal sightings comprising 488 individuals were recorded in the RSA in 2019, with a higher number of animals observed during summer (n=385) than fall (n=103). Narwhal were observed as early as 19 July and as late as 30 October. During summer, sightings were concentrated in eastern Eclipse Sound near Pond Inlet and near Bruce Head in southern Milne Inlet. During fall, sightings were concentrated in Eclipse Sound near the southwest tip of Bylot Island and in Milne Inlet North near Ragged Island. Mean narwhal group size in 2019 was nine (ranging from 1 to 100 animals). No calves were recorded during the 2019 SBO Program.

This was the first year that bowhead whales were observed during the SBO Program, with a total of 22 bowhead sightings comprising 24 individuals recorded in the RSA during 2019. All of the sightings occurred during the early shoulder season, with the exception of one solitary bowhead observed during the late shoulder season north of

Ragged Island. During summer, sightings were primarily concentrated in Eclipse Sound with several bowhead also observed in Milne Inlet South and Milne Inlet North near Ragged Island. All sightings consisted of solitary animals with the exception of two separate sightings of a pair of bowheads recorded during early summer.

Only two polar bear sightings were recorded in the RSA in 2019, both on the same day (20 July), with each sighting consisting of a solitary polar bear walking on the sea ice in Milne Inlet North. The first polar bear was observed approximately 1 Km from the vessel. The second polar bear was observed 12 minutes later, approximately 3 Km from the vessel.

The CPA for cetacean species recorded during the 2019 SBO Program ranged from 200 to 5,000 m. The CPA for pinniped (i.e., seal) species recorded in 2019 ranged from 30 to 1,500 m. The 2019 CPA results support impact predictions that animals demonstrate localized avoidance of the ship. This provides further confidence that a vessel strike on a marine mammal is unlikely to occur based on current vessel speeds in the RSA (9 knot speed restriction).

Total monitoring effort for seabirds in 2019 was 103.2 h (Leg 1 and 2 combined), consisting of 231 5-min surveys during Leg 1 and 1,008 5-min surveys during Leg 2. A total of eleven species were identified during Leg 1 (157 confirmed sightings comprising 265 individuals), with fulmar and thick-billed murre being the most common species. A total of nine species were identified during Leg 2 (97 sightings comprising 396 individuals), with glaucous gull and northern fulmar being the most common species. Four ivory gulls, a federally Endangered species on Schedule 1 of the Species at Risk Act were observed during Leg 2; this species was not observed during the Leg 1 survey period, nor during the 2018 SBO Program.

One seabird strike, the first since start of ship-based monitoring, was recorded during Leg 2 of the 2019 SBO Program. At 22:00 on 11 October, a long-tailed duck flew into a helideck support post. The strike occurred in eastern Eclipse Sound near Pond Inlet while the vessel was holding station for the night. Conditions at the time were low visibility (dark, heavy snow), low wind and calm sea state. The specimen was a definitive basic (adult winter plumage) male. The specimen suffered a broken neck and died shortly thereafter. The bird strike event was reported to ECCC-CWS, QIA and MHTO.

Detailed results for the 2019 SBO Program are presented in Golder (2020f).

## TRENDS

No ship strikes on marine mammals were recorded over the five years of SBO monitoring. Similarly, no ship strikes on marine mammals have been reported by ship operators since the start of the Project, including ore carriers, fuel/cargo ships and support tugs. The first report of a seabird strike over five years of monitoring occurred during the 2019 SBO Program. No additional seabird strikes have been reported by ship operators in 2019, including ore carriers, fuel/cargo ships and support tugs.

The relative abundance of marine mammals in the RSA, expressed as the animal detection rate (no. of animals relative to survey effort in Km), was similar in 2019 (0.90 individuals per Km) as that recorded in 2018 (0.88 individuals per Km), while the number of sightings was marginally lower in 2019 (0.10 sightings per Km) than 2018 (0.18 sightings / Km). Species observed in greater relative abundance in 2019 than 2018 included narwhal, beluga, and bowhead whale. The observed increase in 2019 is mostly reflective of early summer sightings (similar numbers were seen during fall in both years). Less ringed seal and harp seal were observed in 2019 compared to 2018, although this is likely associated with the large number of unidentified seal species in 2019 (n=1,225).

compared to 2018 (n=760). When considering all seal categories, a similar number of seal sightings was observed in both years.

Possible explanations for the observed increased in relative abundance of certain species in 2019 (e.g., narwhal, bowhead) include better survey conditions, difference in ice conditions, effectiveness of new mitigation measures introduced in 2019 (i.e., limited number of vessel transits in ice concentrations of 3/10 or higher; 40-km vessel buffer at entrance of RSA), and/or potential habituation of animals to icebreaking or shipping activity in general. According to one of the MWOs, the higher number of narwhal observed in 2019 likely reflects more narwhal in the RSA compared to 2018, when the community observed a low abundance of narwhal locally and very low catches that year. While in 2019, hunters found the opposite to be true with narwhal observed throughout the RSA and in very large groups.

Overall, results suggest that marine mammals in the RSA are not demonstrating large-scale displacement or abandonment from the RSA during or following icebreaking operations, and that mitigation measures implemented during the 2019 early shoulder season (e.g., limited number of transits, 40-km buffer area) are demonstrating to be effective. The annual SBO Monitoring Program provides sufficient observer coverage in the RSA to ensure that collisions with marine mammals are appropriately monitored and reported through the shipping shoulder seasons. During the open-water shipping season, Baffinland has other monitoring activities in place to monitor for potential ship strikes, including marine mammal aerial surveys and shore-based monitoring at Bruce Head. Collectively, these multi-year monitoring programs provide for a comprehensive evaluation of potential vessel interactions with marine mammals during the entire shipping period and throughout the life of the Project.

#### **RECOMMENDATIONS / LESSONS LEARNED**

Safety concerns that were raised regarding the initial SBO program (that led to the postponement of the program in 2016) were mitigated through the use of the MSV *Botnica* as the survey platform and boarding the vessel in Milne Port in 2018 and 2019. This included on-board accommodation for Inuit observers to allow for regular wildlife surveys over consecutive days. In doing so, the need to conduct at-sea boarding of observers on different survey vessels was no longer necessary. Given the success of the recently modified SBO program, a similar program as completed in 2018–2019 remains under consideration for future implementation. Alternative methods for marine wildlife incidental reporting are being considered for 2020.

## Project Certificate Condition No. 124

Category	Marine Environment - Marine Mammal Interactions
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To prevent impacts to marine mammals and marine fish populations from increased harvesting pressures in Project areas.
Term or Condition	The Proponent shall prohibit project employees from recreational boating, fishing, and harvesting of marine wildlife in project areas, including Steensby Inlet and Milne Inlet. The Proponent is not directed to interfere with harvesting by the public in or near project areas, however, enforcement of a general prohibition on harvesting in project areas by project employees during periods of active employment (i.e. while on site and between work shifts) is required.
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Fisheries and Oceans Canada (DFO), Crown Indigenous Relations and Northern Affairs Canada (CIRNAC), Qikiqtani Inuit Association (QIA), Terrestrial Environment Working Group (TEWG)
Reference	Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020) Hunting and Harvesting Policy (Baffinland, 2013c) Environmental Protection Plan (Baffinland, 2016b)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

As part of the Site orientation and training on the Environmental Protection Plan (EPP) individuals coming onto site participate in cultural awareness training and are provided with an overview of the policies outlined in the Hunting and Fishing (Harvesting) Policy. The policy states that no employee or contractor will be permitted to hunt or fish (harvest) on lands leased to Baffinland. Baffinland does not interfere with rights of public hunting or fishing near or on the Project Development Area. All visitors and visitor activities are tracked through a visitor access log.

Upon approval from DFO, fishing activities and fish population health surveys occur annually for the collection of environmental data and fish population health metrics by trained contracted professionals for aquatic effects assessment. Required scientific permits are applied for and received before sampling or fish population health programs occur. Results are published under various annual reports. Scientific collection permits are intended for non-lethal programs.

### RESULTS

No incidences of Project personnel hunting or fishing within Impact Area lands leased to Baffinland and/or the PDA occurred in 2019.

Consulting groups Minnow Environmental Inc., North South Consultants and Golder Associates Inc. completed various fish surveys over the course of 2019 to collect environmental data and fish population health metrics. The purpose was to gather information on distribution, relative abundance, size distribution and other biological

characteristics to evaluate potential mine related effects as required under *Fisheries Act* Authorizations, licences and applicable management plans.

In 2019, a total of 892 land use visitor person-days were recorded at Project sites, which is a 73% increase from 2018. Visitors frequenting the area were often passing through, dog sled racing, hunting, visiting, or stopping in to pick up or service snowmobiles. Baffinland provided food, beverages, transportation, tools, construction supplies, fuel and mechanical assistance to hunters and other visitors as requested.

#### **TRENDS**

No Project personnel have participated in hunting or fishing on the Project Development Area unless approved by scientific permit and have not interfered with public rights to fish or hunt in or near the Project Development Area.

Baffinland continues to accommodate all hunting parties and other visitors that travel to the Project.

#### **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland continues to monitor and implement the policy banning all employees and contractors from hunting and fishing within the Project Development Area and accommodating all hunting parties.

## Project Certificate Condition No. 125

Category	Marine Environment - Public Engagement
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To assess acceptability of acoustic deterrent devices for the general public.
Term or Condition	Prior to use of acoustic deterrent devices, the Proponent shall carry out consultations with communities along the shipping routes and nearest to Steensby Inlet and Milne Inlet ports to assess the acceptability of these devices. Feedback received from community consultations shall be incorporated into the appropriate mitigation plan.
Relevant Baffinland Commitment	41
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Not applicable. No acoustic deterrents have been required and therefore considered for use on the Project to date.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.



## Project Certificate Condition No. 125 (a)

Category	Marine Environment - Public Engagement
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure public acceptability of project vessel anchor sites and reduce potential conflicts between project marine shipping and local harvesting.
Term or Condition	The Proponent shall consult with potentially-affected communities and groups, particularly Hunters' and Trappers' Organizations regarding the identification of project vessel anchor sites and potential areas of temporary refuge for project vessels along the shipping routes within the Nunavut Settlement Area. Feedback received from community consultations shall be incorporated into the most appropriate mitigation or management plans.
Relevant Baffinland Commitment	35
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Mittimatalik Hunters and Trappers Organization (MHTO)
Reference	Shipping and Marine Wildlife Management Plan – Rev 06 – March 2016 Standing Instructions and General Information for Masters of Vessels Loading at Milne Inlet Port (Fednav, 2019a) Standing Instructions and General Information for Masters of Vessels Sailing to Milne Inlet Port (Fednav, 2019b) 2019 Community Engagement Records 2019 MEWG Meeting Records
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

## METHODS

Baffinland continues to interact with the Hamlet of Pond Inlet and the MHTO to better understand potential concerns associated with its shipping operations. In 2019, Baffinland conducted extensive and ongoing consultation with the MHTO regarding a variety of topics including existing anchorage and vessel drifting locations, and associated vessel management practices.

As indicated in Baffinland's submission to the NIRB on July 16 in response to NIRB recommendations following the NIRB-facilitated Marine Monitoring and Marine Mitigation Workshop (Baffinland, 2019j), Baffinland has been working with the MHTO on the identification of drifting zones since July 2018, when the issue of vessel drifting interfering with hunters was first raised to Baffinland. Since then, drifting zones have been discussed with the MHTO at the MHTO Mary River Site Visit held August 30 to 31, 2018, at the End of Season Shipping Meeting November 28 to 29, 2018 as part of the NIRB-facilitated Marine Monitoring and Marine Mitigation Workshop on May 1 to -2 2019 and during the pre-shipping season meeting held in Pond Inlet on June 25, 2019.

In 2018, it was brought forward to Baffinland that vessels could often be located at various locations throughout Eclipse Sound while waiting to be called to Milne Port. At the time of these meetings with the MHTO, it was determined that establishing a drifting area would be a suitable solution to ensure that community members would be aware of where to expect vessels waiting which would decrease interference with hunters in the area. In consultation with the MHTO a location just north of the entrance to Milne Inlet was selected (termed the 'drifting area'). This was then communicated to the community through the distribution of a community fact sheet before the shipping season began. During the 2018 shipping season the MHTO contacted Baffinland and requested that the drifting location be discussed at the planned site visit in August of 2018. During those meetings the Pond Inlet community representatives present expressed that there were too many vessels waiting in this location and that it was no longer a suitable location from the community perspective for the community. Both parties discussed other potential areas that could be used for drifting while waiting to come to Port. Baffinland reviewed the proposed locations in conjunction with vessel operators and the Baffinland shipping team to determine if the proposed locations would provide safe operations in terms of water depth and the extent of open area that would be deemed safe to drift in. None of the proposed locations were found to be suitable for drifting, so in response Baffinland instituted an operational change where no more than three (3) vessels would anchored at Ragged Island or drifting in the original proposed location. All other vessels would be instructed to wait outside the Regional Study Area before entering Eclipse Sound. This practice was found to be suitable at the time and put in place near the end of the 2018 shipping season. Baffinland committed to continuing this practice moving forward, and the community found this to be acceptable in feedback received during the November 2018 end of shipping season meeting.

At the NIRB Marine Monitoring and Marine Mitigation workshop in May of 2019 as well as at the June 25, 2019 pre-Shipping season meeting, concerns were raised about the anchorage location at Ragged Island and the drifting area. During the June 25, 2019 meeting the MHTO asked Baffinland if it would consider moving the anchorage location as well as the drifting area away from the entrance to Milne Inlet, as this area is frequented by hunters and other recreational users. Again, Baffinland and community representatives discussed possible alternatives that were not previously considered. An option to use an area near the entrance of Eclipse Sound (Erik Harbour and Guy's Bite) was put forward for Baffinland to consider. Baffinland has since considered the use of these areas and has determined that Erik Harbour is not a viable option due to its rocky outcrops and steep bathymetry which is not adequate for safe navigation. To the west, Guy's Bight could be considered further but required detailed charts. At the time of discussions, Guy's Bight showed better properties (100 m contour line about a mile off the beach) than Erik Harbour, but required further study including further consideration of the behaviour of ice movements in the area.

Following this discussion, Baffinland indicated that if this new proposed location was not deemed suitable, it would continue to utilize the existing anchorage and drifting zone with the limitation of no more than three (3) vessels present until an acceptable alternative could be identified in consultation with the MHTO. It was also suggested by the MHTO that to help community members out on the water, Baffinland and the MHTO should provide more information to the community on the shipping route and operational practices so that community members would be more aware of what to expect from Baffinland contracted vessels.

As a member of the MEWG, the MHTO also hears about Baffinland's annual plans on the shipping schedule, mitigation and management, and communication protocols for upcoming shipping seasons, which in 2019, including during the April 23, 2019 teleconference and in-person June 21, 2019 MEWG meetings.

## RESULTS

There were notable outcomes as a result of these engagement activities, which demonstrated Baffinland's responsiveness towards feedback and subsequent changes. Specifically, due to community concerns expressed about the anchorage location including the number of vessels waiting at Ragged Island and drifting in Eclipse Sound during the 2018 season, Baffinland committed to limiting the number of ships anchored at Ragged Island or drifting in Eclipse Sound to a maximum of three (3) Project-related vessels. Baffinland also committed to restricting vessels drifting to the extent possible in Eclipse Sound (unless warranted for safety reasons) over the entire 2019 shipping season.

Baffinland also received comments from community members regarding the location of where vessels should be drifting near Ragged Island, and what areas should be avoided. The established drifting zone, though only to be used when deemed necessary, was finalized in concert with the MHTO during 2019.

In order to operationalize the above measures, Project-related vessels held position outside of a buffer zone (the 40-km vessel set-back) at the entrance of the RSA that extended 40 Km to the east of the Nunavut Settlement Area in Baffin Bay and only entered the RSA once instructed by the Port Authority at Milne Port to proceed with their transit to Milne Port. This measure was implemented at the start of the shipping season, based in part on the acoustic modeling results indicating that this would represent an appropriate acoustic buffer zone for animals at or near the floe edge (i.e. noise levels at the floe edge would be outside marine mammal audible range or below levels known to elicit adverse behavioral responses such as displacement or avoidance). All of these new mitigation measures, which were in addition to those outlined in the Shipping and Marine Wildlife Management Plan (Baffinland, 2016e) were implemented through the application of the Standing Instructions to Masters (Fednav, 2019a; 2019b) and through direct correspondence between Port Authority and vessel Masters.

## TRENDS

Not applicable.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to consult with the MHTO and other key stakeholders throughout the life of the Project to mitigate Project effects on local communities and other resource users to the fullest extent practicable. With regards to anchorage locations, Baffinland continued to engage in discussions with the MHTO, including during the end of 2019 season shipping season meeting that occurred in January 2020. Baffinland will provide updates as warranted through future annual reporting efforts.

## Project Certificate Condition No. 126

Category	Marine Environment - Public Engagement
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To incorporate local input into monitoring data collection.
Term or Condition	The Proponent shall design monitoring programs to ensure that local users of the marine area in communities along the shipping route have opportunity to be engaged throughout the life of the Project in assisting with monitoring and evaluating potential project-induced impacts and changes in marine mammal distributions.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	Draft 2019 MEEMP and AIS Monitoring Program (Golder, 2020a) Draft 2019 Ship-based Observer Program (Golder, 2020f) Draft Marine Mammal Aerial Survey Program (Golder, 2020g) Draft Bruce Head Shore-based Monitoring Program (Golder, 2020c) 2019 MEWG Meeting Records Previous year (2018) MEWG Meeting Records MHTO Letters of Support for 2019 Monitoring Programs
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Baffinland's ongoing development and refinement of monitoring programs and protocols considers input from local community members (e.g., concerns that are communicated through community workshops) as well as discussions with the MEWG, in which Inuit organizations actively participate. For example, the Qikiqtani Inuit Association (QIA) has been a member of MEWG since its inception and the Mittimatalik Hunter and Trapper Organization (MHTO) joined the MEWG in 2016.

Prior to the start of the 2019 monitoring programs, a meeting was held with the MHTO and QIA in Pond Inlet on April 30, 2019 to discuss the 2019 monitoring programs. Additional discussions were held with the MHTO at their office in Pond Inlet on May 2, 2019. Letters of support were subsequently provided by the MHTO for the various marine monitoring programs to be implemented. Baffinland's monitoring programs strive to actively involve local participation and take into account community concerns as well as discussions with the MEWG, in which Inuit organizations actively participate. Input on the design of the 2019 monitoring programs was also sought from participants of the MEWG during the in-person meeting in Iqaluit on June 21, 2019. Monitoring results are reviewed annually by MEWG members, including Inuit participants through in-person meetings.

Inuit were actively involved in the planning and execution of the 2019 monitoring programs (2019 MEEMP and AIS Monitoring Program, 2019 Habitat Offset Monitoring Program at Milne Port, 2019 Bruce Head Shore-based

Monitoring Program, 2019 Passive Acoustic Monitoring (PAM) Program, 2019 Ship-Based Observer (SBO) Program and the 2019 Marine Mammal Aerial Survey Program). Program-specific training workshops were provided in Pond Inlet and Mary River in July 2019 for all Inuit researchers involved in the 2019 monitoring programs. Additional practical technical training was also provided on-site for those participants successfully employed on the 2019 monitoring programs. The 2019 Inuit researcher team members participated in end of program interviews to review and discuss preliminary monitoring results, and to solicit input on program design and program planning for the 2020 Monitoring Programs.

## RESULTS

A total of twenty-three (23) Inuit researchers (twenty (20) from Pond Inlet, two (2) from Arctic Bay and one (1) from Igloolik) were employed for the 2019 monitoring programs. Inuit researchers were hired through three (3) Inuit-owned outfitting companies based in Pond Inlet. The total amount of work hours for Inuit staff on the 2019 monitoring programs was 6,500 hours. The work positions filled by Inuit researchers in 2019 included: marine mammal observers, polar bear monitors, field technicians, boat operators, boat assistants and data analysts. Inuit were thus directly involved in data collection efforts across numerous marine monitoring programs.

Four (4) Inuit researchers supported the deployment of PAM equipment through the sea ice on 20 to 21 May 2019. Nine (9) Inuit trainees from Pond Inlet participated in a Transport Canada approved offshore safety training course in Halifax, NS, from 11 to 15 May 2019 for the 2019 SBO Program; four Inuit researchers were selected from this pool of trainees to participate in the 2019 SBO Program. Five Inuit researchers (four from Pond Inlet and one from Arctic Bay) participated in the 2019 MEEMP and AIS Monitoring Program and 2019 Habitat Offset Monitoring Program. Twelve (12) Inuit researchers (nine (9) from Pond Inlet, two (2) from Arctic Bay and one (1) from Igloolik) participated in the 2019 Bruce Head Shore-based Monitoring Program. Nine (9) Inuit researchers (seven (7) from Pond Inlet and two (2) from Arctic Bay) participated in the 2019 Marine Mammal Aerial Survey Program. One (1) of the Inuit participants from Pond Inlet spent 27 days in early 2020 in Calgary, AB, and Victoria, BC, training in aerial photography analysis and supporting the reporting of the 2019 marine mammal monitoring programs during early 2020. Inuit researchers provided feedback and comments on the 2019 marine monitoring programs through in-person end of program interviews. The results of these interviews are provided in the annual monitoring program reports (Golder, 2020a,f,g,i).

The inclusion of local Inuit land users in the marine monitoring programs has proven to be a successful example of community-based environmental monitoring providing tangible results that contribute to Baffinland's overall marine environment monitoring efforts. The MHTO has also provided invaluable advice regarding marine mammal behaviour through in-person meetings in Pond Inlet and the MEWG.

## TRENDS

Inuit have been involved in marine monitoring studies at all levels since the inception of the program. The addition of the MHTO as members of the MEWG in 2016 and the hiring of Inuit participants from Inuit outfitting companies based in Pond Inlet has increased the participation of Inuit in this process. Inuit participation in Baffinland's monitoring programs increased in 2019 compared to 2017 and 2018 (from 2,265 hours / 12 participants in 2017 and 1,610 hours / 9 participants in 2018 to 6,500 hours / 23 participants in 2019). In 2019, an Inuit participant from Pond Inlet was also involved in the analysis and reporting of the 2019 marine mammal monitoring program. In 2020, Inuit participants from the 2019 monitoring programs will also be involved in communicating the results of the 2019 monitoring programs to Inuit community members.

**RECOMMENDATIONS / LESSONS LEARNED**

Marine monitoring programs will be reviewed with the MEWG and MHTO in 2020 in consideration of increasing Inuit involvement if possible. Comments and feedback provided by 2019 Inuit participants through in-person end of program interviews will be considered during the design phase of the 2020 monitoring programs.

## Project Certificate Condition No. 127

Category	Marine Environment – Public Engagement
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To promote public awareness and engagement with Project shipping activities.
Term or Condition	The Proponent shall ensure that communities and groups in Nunavik are kept informed of Project shipping activities and are provided with opportunity to participate in the continued development and refinement of shipping related monitoring and mitigation plans.
Relevant Baffinland Commitment	27,28
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Mittimatilik Hunter and Trappers Organization, Marine Environment Working Group (MEWG)
Reference	Baffinland website
Ref. Document Link	<a href="https://www.baffinland.com/operation/shipping-and-monitoring/">https://www.baffinland.com/operation/shipping-and-monitoring/</a>

### METHODS

To ensure that the public is made aware of shipping related activities, Baffinland has enlisted exactEarth®, a global vessel monitoring and tracking service based on AiS (Automatic Identification System) data from polar orbiting satellites to track and report on vessel movements. The information is readily available on the Baffinland website.

Information on ships such as last reported coordinates of the vessel, whether the vessel is moving, the direction of vessel movement and destination of the vessel are provided.

The vessel locations plotted on the online map provide regularly updated snap shot of vessel movement in the North Baffin region approximately every 30 minutes. Baffinland encourages all land and water users to continue to practice safe boating, hunting, and other travel activities, and be aware of your surroundings at all times.

Further, Makivik is a member of the Marine Environment Working Group where any proposed changes to shipping activities would be discussed.

### RESULTS

Baffinland has made vessel routing accessible to the public via the Baffinland website. Baffinland also installed an Automatic Information System tracker system in Baffinland's Shipping Monitor office located on the second floor of the MHTO building on a dedicated laptop and wall mounted monitor. This provided live continuous monitoring of vessels active in the Northern Shipping Route to all office visitors during office hours (8am to 5pm).

Baffinland implemented the Pond Inlet "guardian program" (Shipping Monitors) which consisted of employing a minimum of two (2) full-time Shipping Monitors from the community of Pond Inlet to actively track daily Project vessel movements in the RSA in real-time, and in relation to reported marine mammal aggregations (as shared by the community and the monitoring teams). The Shipping Monitors liaised between the community of Pond Inlet,

hunters and Baffinland. This was a new approach introduced in 2019 in response to feedback from the MHTO that better communications on Baffinland shipping operations were needed. Shipping Monitors provided updates on Baffinland shipping activity to residents of Pond Inlet via local public radio, marine VHF radio (for hunters on the water) and through social media.

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland has found the use of exactEarth® to be beneficial in providing information related to ship routing to the public. Baffinland will continue to use this service. Furthermore, it is Baffinland's intent to continue providing live viewing of vessel tracks through the Pond Inlet Office in 2020. Information on project shipping activities will be continue to be shared with the MEWG and MHTO.



## Project Certificate Condition No. 128

Category	Marine Environment - Public Engagement
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure habitat compensation is acceptable to local communities.
Term or Condition	The Proponent shall consult with local communities as fish habitat off-setting options are being considered and demonstrate its incorporation of input received into the design of the Fish Habitat Off-Setting Plan required to offset the Harmful Alteration, Disruption or Destruction of Fish and Fish Habitat (HADD).
Relevant Baffinland Commitment	27, 28
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Fisheries and Oceans Canada, Mittimatalik Hunter and Trapper Organization, Pisiksik Working Group
Reference	TSD 23: Conceptual-level Marine Offsetting Plan (Golder, 2018i) Mary River Project - Addendum to the FEIS Baffinland. September 2018 (Baffinland, 2018e) 2017 MEWG Meeting Records
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Baffinland has engaged and conducted comprehensive consultation on the Project as a whole with the five North Baffin communities (Arctic Bay, Clyde River, Sanirajak, Igloolik, and Pond Inlet) prior to, during, and following the environmental reviews of the Project by the NIRB. Specific to fisheries offsetting in the marine environment, Baffinland (with DFO participation) consulted with the community of Pond Inlet in regard to the Ore Dock proposed at Steensby Port and the habitat off-set design for the existing Ore dock and Freight dock at Milne Port for the Early Revenue Phase of the Project (ERP). Early engagement was initiated during the consultation process on the ERP when Baffinland met with members of the MHTO and other community members to discuss the design, offsetting measures, and proposed monitoring with respect to construction of the Ore Dock at Milne Port. Since then, consultation efforts have focused largely on offsetting habitat effectiveness monitoring associated with in-water marine infrastructure.

On June 7, 2018 Baffinland provided MHTO members with a presentation on the specific design of the floating freight dock and also discussed this during the June 2018 MEWG meetings with MHTO representatives. Baffinland was issued a Fisheries Authorization (Ref No. 18-HCAA-00160) on March 21, 2019 for construction of the Freight Dock at Milne Port. An offsetting plan for the Freight Dock was developed which included the addition of coarse rock substrates as offsetting materials.

With regards to future expansion plans such as the proposed Phase 2 proposal, Baffinland continues to explore potential offsetting options in both freshwater and marine environments to address potential losses in fish habitat associated with permanent habitat alteration or destruction of fish habitat.

## **RESULTS**

Overall, the consultation activities described above did not identify any objectives to the undertaking or the habitat offset measures implemented during construction of either Ore Dock or Freight Dock. From the extent of consultation Baffinland has conducted with community members on the habitat offset design during the pre-construction phase of the ERP, and that ongoing engagement with these stakeholders throughout the ERP on monitoring programs related to the habitat offset for the Ore Dock, Baffinland is confident that it has a strong understanding of community member's concerns relative to the design, mitigations and offset plans and monitoring that is proposed for the Freight Dock.

A number of potential offsetting options were identified for the marine environment as part of Phase 2 conceptual offsetting planning (Golder, 2018i). Numerous potential freshwater offsetting options located in both lake (e.g., rearing habitat creation and/or improvements to existing) and stream (e.g., rearing habitat creation, removal of natural barriers, improvements to upstream passage) habitats were also identified and further investigated during summer field programs in 2019.

## **TRENDS**

Not applicable.

## **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland approaches community consultation as an ongoing and iterative process. Accordingly, Baffinland has established a program for continuous engagement opportunities on an annual basis with community members. Subsequently, Baffinland is committed to discussing concerns related to construction and monitoring of offset for any existing or proposed in-water infrastructure, including those associated with the Phase 2 Proposal, should they arise during future consultation opportunities, whether relevant to freshwater or marine offsetting. As indicated in is conceptual-level marine offsetting plan, Baffinland plans to undertake additional consultation with local community representatives to inform the development of future offsetting plans in support of Fisheries Authorization applications.

## 4.7 PERFORMANCE ON SOCIO-ECONOMIC CONDITIONS

### 4.7.1 Population Demographics (PC Conditions 129 through 134)

Six (6) PC conditions are listed under the heading of Population Demographics in the Project Certificate. Three (3) of these describe the NIRB's expectations with respect to working with the Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and establishing a Project-specific working group. Three PC conditions relate to mitigating the potential for demographic changes or monitoring and reporting of demographic change within the communities due to Project employment.

#### Stakeholder Feedback

Key stakeholders that provide input related to the socio-economic monitoring program for the Project include the communities, the QIA, various departments of the GN, and CIRNAC. These agencies are active members of the Mary River Socio-economic Monitoring Working Group (SEMWG). While the potential for in-migration of non-Inuit into the North Baffin communities and out-migration of Inuit from the North Baffin were raised as concerns by the GN and by communities during the environmental assessment, it hasn't been raised as a concern in recent engagement activities in 2019.

#### Monitoring

Baffinland conducts monitoring of population demographics in the Local Study Area - the five (5) North Baffin communities (LSA) by reviewing government population statistics, tracking employee origin information, and tracking worker changes in address. Table 4.35 provides an evaluation of the Project's impacts on population demographics, based on monitoring activities completed in 2019, relative to predictions presented in the FEIS and FEIS Addendum.

**Table 4.35: Population Demographics Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Mine Employment	Migration of non-Inuit Project employees into the North Baffin LSA	Baffinland's 2019 Socio-economic Monitoring Report, which includes a review of population statistics, BCLO tracking of worker changes in home community, and results from the Employee Information Survey.  The percentage of Inuit vs. non-Inuit residents in the North Baffin LSA has remained relatively constant. Based on annual information received from BCLOs, a net of one known non-Inuit employees/contractors have in-migrated to the North Baffin LSA, and a net of thirteen known Inuit employees/contractors have out-migrated from the North Baffin LSA since 2015. Results from the 2019 Employee Information Survey (71 surveys received) indicated 2 respondents had moved to a different community in the past 12 months, both of which moved within the North Baffin LSA, from outside of North Baffin LSA.	Effects may be occurring
	Out-migration from North Baffin		

**Path Forward**

Baffinland will continue to monitor this aspect of the socio-economic environment, and will discuss monitoring results with the SEMWG and QSEMC. Reporting on each PC condition follows.

## Project Certificate Condition No. 129

Category	Population Demographics - Qikiqtaaluk Socio-Economic Monitoring Committee
Responsible Parties	The Proponent, members of the QSEMC
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	Description of the general monitoring framework to be developed in consultation with the Qikiqtaaluk Socio-Economic Monitoring Committee.
Term or Condition	The Proponent is strongly encouraged to engage in the work of the Qikiqtaaluk Socio-Economic Monitoring Committee along with other agencies and affected communities, and it should endeavour to identify areas of mutual interest and priorities for inclusion into a collaborative monitoring framework that includes socio-economic priorities related to the Project, communities, and the North Baffin region as a whole.
Relevant Baffinland Commitment	41, 43, 45, 46
Reporting Requirement	To be determined following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2019 Socio-Economic Monitoring Report (Baffinland, 2020p) 2019 QSEMC and SEMWG Meeting Records Socio-Economic Monitoring Plan (Baffinland, 2019k).
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

## METHODS

Baffinland continues to engage with the Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and the Mary River Socio Economic Monitoring Working Group (SEMWG), a sub-set of the QSEMC whose members include Baffinland, the Government of Nunavut, the Government of Canada, and the QIA. A Terms of Reference for the SEMWG (which identifies socio-economic monitoring priorities and objectives for the Project) has been developed and is provided in the Socio-Economic Monitoring Plan (Baffinland, 2019k). Baffinland has also incorporated feedback from SEMWG members while developing the Project's socio-economic monitoring program and continues to welcome feedback on the program from the SEMWG and QSEMC.

## RESULTS

Baffinland's Socio-Economic Monitoring Report assesses the socio-economic performance of the Project on an annual basis. Performance of the Project is assessed using socio-economic indicators for Valued Socio-Economic Components (VSECs) considered in the FEIS (Baffinland, 2012). The report has identified various positive effects of the Project and presents information that is consistent with several FEIS predictions. In other cases, monitoring data have revealed unclear, inconsistent, or otherwise negative trends (but not necessarily due to the Project). Long-term monitoring will be necessary to track Project outcomes more fully over time and may contribute to an improved understanding of observed trends and causality. Baffinland's compliance with various Project Certificate Terms and Conditions pertaining to socio-economic monitoring are also discussed throughout the report.

## TRENDS

Where appropriate, trends have been described for the indicators assessed in the Socio-Economic Monitoring Report. These trends (i.e. pre-development, post-development, and since the previous year) demonstrate whether an indicator has exhibited change and describes the direction of that change. Black arrows indicate:

- ↑ - an upward or increasing trend
- ↓ A downward or decreasing trend
- A stable trend.

Where there are insufficient data or other issues preventing a trend analysis, N/A (not applicable), ND (no data) or / (no discernable trend) are used. Pre-dev (Pre-development trend) refers to the five-year period preceding Project construction (i.e. 2008 to 2012). In some cases, averaged data from this period have been compared against averaged data from previous years (i.e. 2003 to 2007, where available) to determine a trend. Post-dev (Post-development trend) refers to the period after Project construction commenced (i.e. 2013 onwards). Averaged data from this period may have also been compared against averaged data from the pre-development period to determine a trend and LY (trend since last year) refers to the two most recent years in which indicator data are available. Trend analyses can be useful for assessing potential Project influences on an indicator.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland has a Socio-Economic Monitoring Plan in place and continues to engage with the QSEMC and SEMWG on the Project's monitoring program, which confirms compliance with this Term and Condition. No need has been identified to update any FEIS predictions or to substantially modify Baffinland's existing management/mitigation approach at this time. However, Inuit employment and Inuit employee turnover are areas Baffinland will continue to address. This will occur in part through implementation of the Mary River Inuit Impact and benefit Agreement (IIBA), Inuit Human Resources Strategy (IHRS) and Inuit Procurement and Contracting Strategy (IPCS). Baffinland's Apprenticeship Program, Morrisburg Heavy Equipment Operator Training Program, Work Ready Program, Q STEP program (in conjunction with QIA), and other actions to meet the IIBA's Minimum Inuit Employment Goals (MIEGs) may also assist with increasing Inuit employment over time. Continued monitoring of Inuit employment hours, the causes of employee turnover, and other aspects of the initiatives described above will be necessary to track outcomes over time. Opportunities for potential performance improvements in these areas will also be continually investigated.

More generally, successful socio-economic monitoring for the Project will require appropriate long-term data, the regular input of Project stakeholders, and a focus on continual improvement. Baffinland has also committed to using adaptive management as a tool to identify and make necessary improvements to the Project's socio-economic performance in the future.

## Project Certificate Condition No. 130

Category	Population Demographics - Project-specific monitoring
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	Recognizing that some Project-specific socio-economic monitoring initiatives may be best addressed in smaller more focused working groups, this is encouraged where possible.
Term or Condition	The Proponent should consider establishing and coordinating with smaller socio-economic working groups to meet Project specific monitoring requirements throughout the life of the Project.
Relevant Baffinland Commitment	41, 43, 46
Reporting Requirement	To be determined following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2019 Socio-Economic Monitoring Report (Baffinland, 2020p) 2019 QSEMC and SEMWG Meeting Records Socio-Economic Monitoring Plan (Baffinland, 2019k)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Baffinland continues to engage with the QSEMC and the SEMWG on the Project's socio-economic monitoring program. In addition, Baffinland regularly engages North Baffin community members through its community engagement program, and other committees that operate under provisions of the Inuit Impact and Benefit Agreement (IIBA), on various socio-economic topics.

### RESULTS

Baffinland continues to engage with the QSEMC and SEMWG, a sub-set of the QSEMC whose members include Baffinland, the Government of Nunavut, the Government of Canada, and the QIA. A Terms of Reference for the SEMWG (which identifies socio-economic monitoring priorities and objectives for the Project) has been developed and is provided in the Socio-Economic Monitoring Plan (Baffinland, 2019k). However, the SEMWG is currently revising its Terms of Reference to better reflect its current activities. Baffinland has also incorporated feedback from SEMWG members while developing the Project's socio-economic monitoring program and continues to welcome feedback on the program from the SEMWG and QSEMC.

- Baffinland's recent meetings with the SEMWG and QSEMC have been recorded in meeting notes presented in Appendix A of the Socio-Economic Monitoring Report and include:
- March 6, 2019 SEMWG 2018 SEMR Update and 2019 Meeting Planning
- May 14, 2020 QSEMC Mary River Site Visit and Tour

- May 15-16, 2019 in-person meeting with the QSEMC in Iqaluit, Nunavut
- May 15, 2019 in person meeting of the SEMWG in Iqaluit, Nunavut

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to engage with the QSEMC and SEMWG on the Project's monitoring program and will consider establishing smaller, focused socio-economic working groups to address specific community issues or Project challenges if deemed appropriate.



## Project Certificate Condition No. 131

Category	Population Demographics - Monitoring demographic changes
Responsible Parties	The Proponent, members of the QSEMC
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To monitor demographic changes affecting the North Baffin communities and the territory as a whole in order to understand changes and to evaluate the Proponent's predictions as related to population demographics.
Term or Condition	The Qikiqtaaluk Socio-Economic Monitoring Committee is encouraged to engage in the monitoring of demographic changes including the movement of people into and out of the North Baffin communities and the territory as a whole. This information may be used in conjunction with monitoring data obtained by the Proponent from recent hires and/or out-going employees in order to assess the potential effect the Project has on migration.
Relevant Baffinland Commitment	45
Reporting Requirement	To be determined following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2019 Socio-Economic Monitoring Report (Baffinland, 2020p) 2019 QSEMC and SEMWG Meeting Records Socio-Economic Monitoring Plan (Baffinland, 2019k)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Baffinland has provided demographic change information in the Socio-Economic Monitoring Report. This includes data on population estimates, known in-migrations of non-Inuit Project employees and contractors, known out-migrations of Inuit Project employees and contractors, percentage of Inuit vs. non-Inuit residents in the North Baffin Local Study Area (LSA), and Nunavut annual net migration. Baffinland also regularly administers an Inuit Employee Survey, which collects information related to employee changes of address, housing status, and migration intentions.

### RESULTS

Demographic change indicator trends are provided in Table 4.36. Detailed results are presented in the Socio-Economic Monitoring Report.

### TRENDS

Where appropriate, trends have been described for the indicators assessed in the Socio-Economic Monitoring Report. Demographic change indicator trends are provided in Table 4.36. Black arrows indicate:

- ↑ A upward or increasing trend
- ↓ A downward or decreasing trend

→ A stable trend.

Where there are insufficient data or other issues preventing a trend analysis, N/A (not applicable), ND (no data) or / (no discernable trend) are used.

**Table 4.36: 2019 Monitoring of Indicators of Demographic Change**

Indicator / Topic	Pre Dev't Trend	Post Dev't Trend	Trend Since Prev. Year	Scale	Summary
Known in-migrations of non-Inuit Project employees and contractors	N/A	↑	→	LSA	One non-Inuit migrated into the LSA in 2018, no change in 2019.
In-migration of non-Inuit to the North Baffin LSA	N/A	ND	→	LSA	While LSA-level migration data is not available, the proportion of Inuit to non-Inuit in LSA communities has remained relatively similar to pre-development levels.
Known out-migrations of Inuit Project employees and contractors	→	/	↑	LSA	Nine Inuit employees/contractors were known to have moved out of the North Baffin LSA in 2019.
Out-migration of Inuit from the North Baffin LSA	ND	↓	ND	LSA	While LSA-level migration data is not available, the proportion of Inuit to non-Inuit in LSA communities has remained relatively similar to pre-development levels.
Population estimates	↑ ↑	↑ ↑	↑ ↑	LSA Territory	During the six years comprising 2013 to 2018, the North Baffin LSA communities grew from a population of 5,941 to 6,716 (or 13.0%). Post-development growth rates are similar to those pre-development.
Nunavut net migration	↑	/	↑	Territory	The past 3 years have seen a large increase in net-migration across the territory from a low of -163 in 2016 to +179 in 2018.
Employee and contractor changes of address, housing status, and migration intentions	N/A	N/A	/	LSA	In 2019, 12 survey respondents (16.9%) planned to move residences in the next 12 months while 46 did not (almost 65%). Due to a survey administration error in 2019, no data was collected on housing status for this reporting year.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland continues to provide demographic change information in its Socio-Economic Monitoring Report. However, only limited government data are currently available for the indicators 'in-migration of non-Inuit to the North Baffin LSA' and 'out migration of Inuit from the North Baffin LSA'. For this reason, Baffinland continues to present data from various non government sources (e.g. Inuit Employee Survey, Baffinland Community Liaison Officer (BCLO) survey) to help better understand this topic.

## Project Certificate Condition No. 132

Category	Population Demographics - Training programs
Responsible Parties	The Proponent, North Baffin Hamlets, Municipal Training Organization, Government of Nunavut
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To develop training programs in ways which contribute to limiting the potential for migration to occur as North Baffin residents seek training and employment opportunities in the larger centre of Iqaluit.
Term or Condition	The Proponent is encouraged to partner with other agencies such as Hamlet organizations in the North Baffin region, the Municipal Training Organization, and the Government of Nunavut in order to adapt pre-existing, or to develop new programs which encourage Inuit to continue living in their home communities while seeking ongoing and progressive training and development. Programs may include driver training programs offered within Hamlets, providing upgraded equipment to communities for use in municipal works, providing incentives for small businesses to remain operating out of their community of origin, or supplementing existing recreational facilities and programming in North Baffin communities.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2019 Socio-Economic Monitoring Report (Baffinland, 2020p) 2019 QSEMC and SEMWG Meeting Records Socio-Economic Monitoring Plan (Baffinland, 2019k)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

## METHODS

In 2019 Baffinland partnered with local and regional governmental agencies and educational institutions to support local communities and develop training programs for residents while limiting the potential for out-migration. Baffinland's priority in training is to train people to work at the mining operation. Training provided can benefit local communities should an employee chose to change jobs and return to work in the community. The skill sets learned at Baffinland is transferrable for life long benefit of the individual and their home communities.

In September 2019, the Government of Nunavut announced that they will set up a mine training centre in Rankin Inlet. Baffinland has an interest in partnering with this training in some capacity.

Baffinland also serves as a partner with the NWT/Nunavut Chamber of Mines Mine Education working group which began meeting in Q4 of 2019. Good things could come from this including training, and exposure of mining to youth.

**Q-STEP**

Baffinland and the Qikiqtani Inuit Association (QIA) have partnered in the \$19 million Qikiqtani Skills and Training for Employment Partnership (Q-STEP) training program, the objective of which is to provide Inuit with skills and qualifications to meet the employment needs of the Mary River Project as well as other employment opportunities in the region. Q-STEP is a four-year initiative consisting of work readiness measures as well as targeted training programs directed at apprenticeships, skills development, supervisor training, and formal certification in heavy equipment operation.

***Community Based Work Readiness Training***

Baffinland continues to offer the Community Based Work Readiness Training Program. The Community Based Work Readiness Training Program is a five-day training program facilitated in the communities and addresses the following areas: Self Awareness, An Introduction to Mining, Essential Skills for the Workplace, Money Management and Preparing for Fly-In, Fly-Out. For 2019 in line with the IIBA commitments the Work Readiness Program was delivered in all five of the North Baffin impacted communities as well as Iqaluit. In 2019, Baffinland held 15 off-site Work Ready Program sessions. There were a total of 99 graduates of this program during the year.

***On-Site Work Readiness Training***

The on-site Work Readiness program allows a maximum of 6 selected participants at a time to complete 60 hours of job shadowing at the Mary River site. The participants rotate within 5 entry-level jobs identified by the Inuit Success Assurance department. Upon completion of the on-site Work Readiness each participant is given the opportunity to provide feedback on their experience and area of interest such that Baffinland will find placement in a training program or an employment opportunity for the participant. In 2019 Baffinland had a total of 16 graduates of the on-site Work Readiness Training program.

***Apprenticeships and Other Opportunities***

Baffinland has identified apprenticeship opportunities in the following areas: Housing Maintainer, Oil Burner Mechanic, Electrician, Heavy Duty/Truck, Welder and Heavy Equipment Mechanic, Automotive Service Technician/Mechanic, Heavy Truck and Trailer Service Technician/Mechanic, Heat Systems Technician/Oil Burner Mechanic, Millwright, Parts Technician and Machinist.

Upon successful completion of a six-month term as Trades Assistants and a Trades Entrance Exam, candidates will become fulltime, permanent apprentices at Baffinland.

At the end of 2019, there were 16 Inuit apprentices (14 males and 2 females). All current apprentices at Baffinland shall be attending technical training school for their specific trade and apprenticeship level in 2020. Baffinland is coordinating the training with the Nunavut Apprenticeship Department.

***Heavy Equipment Training***

In partnership with the Qikiqtani Skills and Training for Employment Partnership (Q-STEP), Baffinland offers North Baffin Inuit opportunities to participate in the Heavy Equipment Operating Training delivered by the OETIO in Morrisburg, Ontario. In 2019 36 Inuit attended training as HEO trainees at Baffinland. Upon successful completion of the Heavy Equipment Operator (HEO) training program all Inuit participants are offered full time permanent roles at Baffinland as Operator Trainees in various departments.

***Support for Local Businesses***

In addition to provisions respecting the participation of Inuit Firms in Project contracting opportunities as detailed in Article 6 of the Inuit Impact and Benefit Agreement (IIBA) and the Inuit Procurement and Contracting Strategy, Baffinland supports the development of local businesses through its annual contribution of \$250,000 through the IIBA's Business Capacity and Start Up Fund. The fund, which is administered by the QIA, is designed to assist existing Inuit Firms to develop capacity to participate in the bidding process and to encourage business start-ups in the communities.

In addition, Baffinland has worked and will continue to work with local businesses on an ongoing basis to create contracting opportunities in the communities.

***Support for Local Communities***

Baffinland also supports a number of community investment programs. Pursuant to Article 12 of the IIBA, Baffinland and QIA each contribute \$375,000 annually to the Ilagiiktunut Nunalinnullu Pivalliajutsait Kiinaujat fund. The fund, which is administered by QIA is designed to meet the following objectives:

- Creation of opportunities for community capacity building;
- The fair distribution of impacts and benefits between communities and across generations;
- Maintenance of consistency with community development objectives; and
- Promotion of mutual understanding and learning.

The Fund is intended to support a wide range of activities including participation in community projects, youth and Elder programs, hunter support activities, cultural learning and revitalization, social support programs for families and individuals and counseling and healing programs.

In addition, through its community sponsorship program, Baffinland supports a wide range of social, recreational and cultural activities in the communities.

**RESULTS**

The types of training currently provided or proposed by Baffinland reveal the full scope of learning opportunities available at the Project, either provided directly by Baffinland or jointly with a partner such as the QIA. Most training opportunities continue to be offered on-site. In 2019, Inuit training hours totalled 45,975 hours which is 48.3% of the total training provided by Baffinland. Baffinland is also working to develop new training programs that would be offered both in the community and at the Mine site. Baffinland is also working with contractors to explore new skills development initiatives. Training programs are expected to continue to evolve at the Project as operations advance, employment increases, and feedback from Inuit employees is implemented.

In 2019 the Q-STEP partnership achieved the following:

- 36 Certified Heavy Equipment Trainee;
- 16 apprenticeships;
- 124 Community Based Work Readiness Graduates; and
- 16 On-Site Work Readiness Graduates.

**TRENDS**

On an annual basis, Baffinland has and continues to seek multiple avenues for offering training and education and employment opportunities to local Inuit, and to further explore new partnerships with local Hamlets and training institutes and strengthen existing programs or partnerships, where these already exist.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to work with its partners, such as Arctic College, to encourage Inuit to continue living in their home communities while seeking ongoing and progressive training and development.

Baffinland will also continue to identify new opportunities to encourage the development of local businesses and is committed to ongoing support for local community programs, initiatives and events.

## Project Certificate Condition No. 133

Category	Population Demographics - Monitoring demographic changes
Responsible Parties	The Proponent, members of QSEMC, Government of Nunavut, Nunavut Housing Corporation
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	Training programs may be developed with the goal of limiting the potential for migration to occur as North Baffin residents may choose to seek employment and therefore move from smaller North Baffin communities to the larger centre of Iqaluit.
Term or Condition	The Proponent is encouraged to work with the Qikiqtaaluk Socio-Economic Monitoring Committee and in collaboration with the Government of Nunavut's Department of Health and Social Services, the Nunavut Housing Corporation and other relevant stakeholders, design and implement a voluntary survey to be completed by its employees on an annual basis in order to identify changes of address, housing status (i.e. public/social, privately owned/rented, government, etc.), and migration intentions while respecting confidentiality of all persons involved. The survey should be designed in collaboration with the Government of Nunavut's Department of Health and Social Services, the Nunavut Housing Corporation and other relevant stakeholders. Non-confidential results of the survey are to be reported to the Government of Nunavut and the NIRB.
Relevant Baffinland Commitment	43, 45
Reporting Requirement	To be determined following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2019 Socio-Economic Monitoring Report (Baffinland, 2020p) 2019 QSEMC and SEMWG Meeting Records Socio-Economic Monitoring Plan (Baffinland, 2019k)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

## METHODS

Baffinland regularly administers a voluntary Inuit Employee Survey, which collects information on employee changes of address, housing status, and migration intentions. Baffinland has discussed its surveys with the SEMWG (which includes GN, QIA, and CIRNAC representatives) and QSEMC and will continue to engage both groups on the Project's socio-economic monitoring program. The most recent survey was administered by Baffinland in January/February 2019. Results from the Inuit Employee Survey are summarized, where relevant, in the Project's Socio-Economic Monitoring Reports.

Baffinland also added two new questions to its Inuit Employee Survey in 2019 on home ownership and financial literacy training, at the request of Nunavut Housing Corporation (NHC) staff. These questions ask survey participants if they have ever considered purchasing a home in their community, and if they would be interested in attending an



informational course about managing their personal finances, setting up monthly bill payments, and establishing savings goals if it was offered through their employer or local housing association.

## RESULTS

A total of 71 surveys were completed by Inuit employees and contractors. Table 4.37 summarizes results pertaining to changes in employee and contractor residence and community ( $n=71$ ). 4.2% of respondents indicated their housing situation had changed in the past 12 months, 74.6% indicated their housing situation had not changed in the past 12 months, and results were unknown for 21.1% of respondents. When 'unknown' results are removed, 5.4% of respondents indicated their housing situation had changed in the past 12 months and 94.6% indicated it had not. Respondents who had changed residences and moved to a different community ( $n=2$ ) were then asked which community they had moved from; this result was compared against information provided on their current community of residence. Of these respondents, 100.0% had moved into the North Baffin LSA (or 2.8% of all survey responses).

**Table 4.37: Changes in Inuit Employee and Contractor Residence and Community  
(2019 Inuit Employee Survey Results)**

Type of Change	Number of Respondents	Percentage of Respondents
All survey respondents ( $n=71$ )		
Residence changed in the past 12 months, within existing community	1	1.4%
Residence changed in the past 12 months, moved to new community	2	2.8%
Residence did not change in the past 12 months	53	74.6%
Unknown	15	21.1%
<b>Total</b>	<b>71</b>	<b>99.9%</b>
Residence changed in the past 12 months, moved to a new community ( $n=2$ )		
Moved from North Baffin LSA to outside of North Baffin LSA	N/A	N/A
Moved from outside of North Baffin LSA to North Baffin LSA	2	100.0%
Moved within the North Baffin LSA	0	0.0%
Other	N/A	N/A
Unknown	0	0.0%
<b>Total</b>	<b>2</b>	<b>100.0%</b>

### Notes:

Source: 2019 Inuit Employee Survey

Total percentages may not equal 100.0% due to rounding. Because the 2019 survey was administered only in North Baffin LSA communities, Inuit residing outside of these communities (e.g. in Iqaluit or non-Nunavut communities) were not included. North Baffin LSA out-migrants were thus not captured in the results, nor were residence changes that occurred outside the North Baffin LSA.

Table 4.38 pertains to current Inuit employee and contractor housing status. Due to a survey administration error in 2019, data on the type of housing respondents lived in were unable to be collected and are not included in the table

below.<sup>7</sup> The most recent data on this topic are presented in JPCSL (2018). This section of the table has been retained as a placeholder for future reports. Regarding homeownership ( $n=71$ ), 31.0% of respondents said they have considered purchasing a home in their community, 47.9% had not considered purchasing a home in their community, 4.2% already owned their own home, and results were unknown for 16.9% of respondents. When ‘unknown’ results are removed, 37.3% of respondents had considered purchasing a home in their community and 5.1% already owned their own home.

**Table 4.38: Current Inuit Employee and Contractor Housing Status (2019 Inuit Employee Survey Results)**

Current Housing Status	Number of Respondents	Percentage of Respondents
What type of housing do you currently live in? ( $n=N/A$ )		
Privately owned – Owned by you	–	–
Privately owned – Owned by another individual	–	–
Renting from a private company	–	–
Public housing	–	–
Government of Nunavut staff housing	–	–
Other staff housing	–	–
Other	–	–
Unknown	–	–
<b>Total</b>	–	–
Have you ever considered purchasing a home in your community? ( $n=71$ )		
Yes	22	31.0%
No	34	47.9%
I already own my own home	3	4.2%
Unknown	12	16.9%
<b>Total</b>	<b>71</b>	<b>100.0%</b>

Notes:

Source: 2019 Inuit Employee Survey.

Table 4.39 summarizes results pertaining to Inuit employee and contractor migration intentions ( $n=71$ ). 16.9% of respondents planned to move residences in the next 12 months while 64.8% did not. Migration intentions were unknown for 18.3% of respondents. When ‘unknown’ results are removed, 20.7% of respondents planned to move residences in the next 12 months and 79.3% did not. Respondents who planned to both change residences and move to a different community in the next 12 months ( $n=8$ ) were then asked which community they planned to move to; this result was compared against information provided on their current community of residence. Of these respondents, 50.0% (or 6.9% of known survey responses) planned to move out of the North Baffin LSA and 25.0% (or 3.4% of known responses) planned to move within the North Baffin LSA. The planned type of move was unknown for 25.0% (or 3.4% of known responses).

<sup>7</sup> A programming issue associated with a new survey administration technique in 2019 (i.e. tablet administration) resulted in responses to this survey question inadvertently defaulting to the first response option provided. This issue was not identified until after the data collection phase was complete. The issue will be rectified for future surveys conducted by this method.

**Table 4.39: Inuit Employee and Contractor Migration Intentions (2019 Inuit Employee Survey Results)**

Migration Intentions	Number of Respondents	Percentage of Respondents
All survey respondents (n=71)		
Plan to move residences in the next 12 months, within existing community	4	5.6%
Plan to move residences in the next 12 months, to a new community	8	11.3%
Do not plan to move residences in the next 12 months	46	64.8%
Unknown	13	18.3%
<b>Total</b>	<b>71</b>	<b>100.0%</b>
Plan to move residences in the next 12 months, to a new community (n=8)		
Plan to move from North Baffin LSA to outside of North Baffin LSA	4	50.0%
Plan to move from outside of North Baffin LSA to North Baffin LSA	N/A	N/A
Plan to move within North Baffin LSA	2	25.0%
Other	N/A	N/A
Unknown	2	25.0%
<b>Total</b>	<b>8</b>	<b>100.0%</b>

**Notes:**

Source: 2019 Inuit Employee Survey.

Total percentages may not equal 100.0% due to rounding. Because the 2019 survey was administered only in North Baffin LSA communities, Inuit residing outside of these communities (e.g. in Iqaluit or non-Nunavut communities) were not included. Those who were planning to immigrate to the North Baffin LSA were thus not captured in the results, nor were those who planned to move between residences outside the North Baffin LSA.

**TRENDS**

Like previous surveys, some respondents to the 2019 Inuit Employee Survey indicated they had moved to a different community in the past 12 months (3.6% in 2019, 9.9% in 2018, and 7.0% in 2017) or planned to move to a different community in the next 12 months (13.8% in 2019, 17.6% in 2018, and 16.3% in 2017). Due to a survey administration error in 2019, data on the type of housing respondents lived in were unable to be collected and compared to previous survey results (60.7% lived in public housing in 2018 and 66.7% lived in public housing in 2017). Baffinland will continue to track employee changes of address, housing status, and migration intentions through an Inuit Employee Survey to see if future trends emerge.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to administer this survey on a regular basis. Baffinland will also continue to welcome feedback on the survey from SEMWG and QSEMC members.

## Project Certificate Condition No. 134

Category	Population Demographics - Employee origin
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	Project-specific information regarding employee origin is important to comparing predictions of labour availability and employment opportunities with actual levels of employment from various demographic segments over different geographic areas.
Term or Condition	<p>The Proponent shall include with its annual reporting to the NIRB a summation of employee origin information as follows:</p> <ul style="list-style-type: none"> <li>a. The number of Inuit and non-Inuit employees hired from each of the North Baffin communities, specifying the number from each</li> <li>b. The number of Inuit and non-Inuit employees hired from each of the Kitikmeot and Kivalliq regions, specifying the number from each</li> <li>c. The number of Inuit and non-Inuit employees hired from a southern location or other province/territory outside of Nunavut, specifying the locations and the number from each</li> <li>d. The number of non-Canadian foreign employees hired, specifying the locations and number from each foreign point of hire.</li> </ul>
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be determined following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2019 Socio-Economic Monitoring Report (Baffinland, 2020p) Socio-Economic Monitoring Plan (Baffinland, 2019k)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

Data on the origin, number, and ethnicity of employees and contractors who worked on the Project are presented in the Socio-Economic Monitoring Report. This information was obtained from internal Baffinland records.

### RESULTS

Baffinland and contractor Inuit employees were primarily based in LSA communities (366 people), with Iqaluit hosting the highest average number of Baffinland and contractor Inuit employees (85 people). Igloodik had the lowest (47 people) within the North Baffin LSA, while the other four (4) communities had between 55 to 60 Baffinland and contractor Inuit employees. A small number of Baffinland and contractor Inuit employees; nine (9) originated from other Qikiqtani communities, one (1) from Kivalliq communities, and nine (9) from other unknown locations. An additional 32 Baffinland and contractor Inuit employees are known to have resided outside of Nunavut.

**TRENDS**

The Project has been successful at attracting LSA-based Inuit employees and contractors; approximately 16.4% of the LSA workforce who are old enough and have a high-school education (or equivalent) worked at Mary River in 2019. The large number of Baffinland and contractor employees from outside of Nunavut is in part attributed to a skills gap within the territory as individuals with advanced mining and/or technical skill sets are known to be in limited supply (Gregoire, 2014; Conference Board of Canada, 2016; Impact Economics, 2018; MIHR, 2016). The Inuit workforce from LSA communities will likely continue to grow as the Project's activities and labour demands increase, efforts to achieve and surpass MIEGs, and as awareness of employment opportunities and benefits from the Project continues to increase. However, while the Mary River mine requires a range of technical and non-technical skill sets, the Project's labour demand is anticipated to continue to exceed LSA Inuit labour supply over the entire life of the Project (Impact Economics, 2018). Baffinland will continue efforts to increase Inuit employment from LSA communities and monitor associated results.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to provide information regarding employee origin in future Socio-Economic Monitoring Reports.

#### 4.7.2 Education and Training (PC Conditions 135 through 141)

Seven (7) PC conditions relate to education and training, mostly encouraging Baffinland to maximize education and training benefits to Nunavummiut in the local communities. This includes the development of recognizable and transferable skills that can be used outside of the mining industry. The NIRB required Baffinland to conduct a labour market analysis, which was updated for the Early Revenue Phase.

##### Stakeholder Feedback

As noted in Section 4.7.1, the key stakeholders focused on the socio-economic environment include the communities, the QIA, various departments of the GN, and CIRNAC. There is an inherent relationship between the education and training initiatives and objectives implemented by Baffinland and the Government of Nunavut, which is responsible for delivering most education and training programs in Nunavut. Commitments for Baffinland to provide education and training opportunities are contained in the IIBA. The SEMWG and QSEMC also regularly discuss this element of the Project. Aside from employment (discussed in Section 4.7.3), Baffinland's stakeholders have viewed education and training opportunities as a key benefit of the Project (Appendix B).

##### Monitoring

Baffinland tracks and reports on the amount of training delivered each year (including the amount of training delivered to Inuit workers), government educational attainment statistics, and results from an Employee Information Survey. Table 4.40 provides an evaluation of the Project's impacts on education and training, based on monitoring activities completed in 2019, relative to predictions presented in the FEIS and FEIS Addendum.

**Table 4.40: Education and Training Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Life Skills	Training of workers and contractors, resulting in improved life skills amongst LSA residents. Training in 2018 is described in PC Condition No 137. The elder-in-residence counsels Inuit workers as requested.	All Inuit training hours for Baffinland staff are tracked and reported quarterly and annually to the QIA. Baffinland reports on its training programs annually in its socio-economic monitoring report	Positive effects consistent with FEIS predictions
Education and Skills	Training programs as described above; incentives related to school attendance and success (i.e., laptop program, scholarships); opportunities to gain skills on the job	In 2019, Inuit training hours totalled 45,975 hours which is 48.3% of the total training provided by Baffinland	Positive effects consistent with FEIS predictions

Positive effects with respect to life skills and to education and work skills have occurred as a result of the Project.

##### Path Forward

Baffinland will continue to implement and refine its training programs, in consultation with the SEMWG, QSEMC, and the Project's workforce. Reporting on each PC condition follows.

## Project Certificate Condition No. 135

Category	Education and Training - Employee work/study programs
Responsible Parties	The Proponent, Qikiqtani Inuit Association
Project Phase(s)	Construction and Operations
Objective	Recognizing the 12-hour work days inherent with work at the Project site, it is not clear how employees would successfully engage in a work/study program offered by the Proponent.
Term or Condition	The Proponent is encouraged to consider offering additional options for work/study programs available to Project employees (in addition to study programs at project sites that would be offered to employees when off-shift).
Relevant Baffinland Commitment	93
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Mary River Socio-Economic Monitoring Working Group
Reference	2019 SEMWG Meeting Records
Ref. Document Link	Appendix C

### METHODS

Baffinland utilizes CogniBox as a compliance and learning management system. Various opportunities for training exist for employees through CogniBox. These include: Workplace Hazardous Materials Information System (WHMIS) 2015, Respectful Workplace, Fall Protection, Confined Space, Zero Energy State, and Forklift Safety. All of this training is available to Nunavummiut and is beneficial as they expand their skills and knowledge.

Additionally, Baffinland offers a full suite of Leadership Training at site which is required for all supervisory and management employees, both Inuit and non-Inuit. Inuit employees who show supervisory potential have been selected to take this training. The supervisory training will help Nunavummiut advance within their set careers.

Training for coaches is also available to allow Nunavummiut to become coaches to help train other employees.

In 2019 a Financial Literacy training program was developed which built on information delivered during the community based work ready program. Additions to the program included home ownership, and home ownership programs available through the Government of Nunavut. In November 2019 members of the Inuit Success Assurance team completed training for the Community Based Work Ready Program and these Inuit team members will assist in delivering this training to employees. This program will assist all Inuit employees in the management of their finances to the benefit of employee, family and community.

### Online Training

Online training is available through CogniBox whereby employees can complete training prior to arriving at site. Baffinland jointly with QIA have discussed expanding access to this delivery of training.

### Q-STEP

Baffinland and the Qikiqtani Inuit Association (QIA) have partnered in the \$19 million Qikiqtani Skills and Training for Employment Partnership (Q-STEP) training program, the objective of which is to provide Inuit with skills and

qualifications to meet the employment needs of the Mary River Project as well as other employment opportunities in the region. Q-STEP is a four-year initiative consisting of work readiness measures as well as targeted training programs directed at apprenticeships, skills development, supervisor training, and formal certification in heavy equipment operation.

## **RESULTS**

The Baffinland Inuit Employment and Training Specialist works with the Mary River Inuit Impact and Benefit Agreement (IIBA) Joint Management Committee to discuss training opportunities at both the mine site and in communities. These discussions are of an ongoing and iterative nature and will continue to occur in 2020.

QIA and Baffinland are also engaged in implementation of the Q-STEP program and associated training initiatives.

## **TRENDS**

Given the remote location of Baffinland's Point of Hire Communities as well as the lack of comprehensive post secondary educational infrastructure in these communities, offering work/ study programs continues to be a challenge.

## **RECOMMENDATIONS/ LESSONS LEARNED**

Baffinland will continue to examine programs offered in other jurisdictions, including those offered by other mining companies operating in similar conditions, to determine their potential suitability for offer at the Mary River Project.

Review and expansion of online learning will be examined in order to expand this delivery option for employees while not at work.



## Project Certificate Condition No. 136

Category	Education and Training - Transferable skills and training
Responsible Parties	The Proponent, Qikiqtani Inuit Association, Government of Nunavut, Municipal Training Organization
Project Phase(s)	Construction and Operations
Objective	Offering training which results in certifications that are valid for employment at more than one site or in different fields provides an investment in the long-term employability of Nunavummiut.
Term or Condition	The Proponent is encouraged to work with training organizations and/or government departments offering mine-related or other training in order to provide additional opportunities for employees to gain meaningful and transferable skills, credentials and certifications especially where such training of employees offered by the Proponent remains valid only at the Mary River Project sites.
Relevant Baffinland Commitment	92, 94
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Mary River Socio-Economic Monitoring Working Group
Reference	2019 SEMWG Meeting Records
Ref. Document Link	Appendix C

### METHODS

Baffinland works in partnership with the Government of Nunavut, Department of Family Services to conduct an apprenticeship program. This allows Nunavummiut to train to become journeypersons in skilled trades. Prior to entering the apprenticeship program Baffinland offers eligible employees Pre-Trades training. This introduces Nunavummiut to the trades and prepares them to write their trades entrance exams.

Baffinland has identified apprenticeship opportunities in the following areas: Housing Maintainer, Oil Burner Mechanic, Electrician, Heavy Duty/Truck, Welder and Heavy Equipment Mechanic, Automotive Service Technician/Mechanic, Heavy Truck and Trailer Service Technician/Mechanic, Heat Systems Technician/Oil Burner Mechanic, Millwright, Parts Technician and Machinist. At the end of 2019, there were 16 Inuit apprentices (14 males and 2 females). All current apprentices at Baffinland shall be attending technical training school for their specific trade and apprenticeship level in 2020. Baffinland is coordinating the training with the Nunavut Apprenticeship Department.

In 2019 Baffinland worked with the Nunavut Literacy Council to plan an on-site workplace literacy needs assessment. Baffinland also developed a Financial Literacy training program which built on the information delivered during the community based work ready program. 5 Inuit team members completed a train the trainer program to be able to deliver this training at site. This program will provide many skills in budgeting, money management, and understanding finance and will be advantageous for Inuit team members.

Throughout 2019 Baffinland worked closely with the Operating Engineers Training Institute of Ontario (OETIO) to pre-train potential Inuit employees to operate heavy equipment found at the project.

Baffinland has trained a number of Inuit employees in Mine Rescue. This training involves advanced first aid and Cardiopulmonary Resuscitation (CPR), ladder and fire tool training, pumper truck operations, self-contained breathing apparatus, rope and confined space rescue and basic and advanced firefighting techniques. Internal and external instructors have been engaged to ensure the highest standard is being achieved.

In 2019 Baffinland continued to partner with the Qikiqtani Skills and Training for Employment Partnership (Q-STEP) program to train Inuit candidates from Arctic Bay, Clyde River, Sanirajak, Igloolik, Pond Inlet and Iqaluit as Heavy Equipment Operators, training delivered by the *OETIO* in Morrisburg, Ontario. The trainees learned the foundations of heavy equipment operation and built the skills to be able to operate various pieces of heavy equipment confidently and safely.

## **RESULTS**

In 2019 the Q-STEP partnership achieved the following:

- 36 Certified Heavy Equipment Trainees;
- 16 apprenticeships;
- 124 Community Based Work Readiness Graduates; and
- 16 On-Site Work Readiness Graduates.

These Inuit participants can use the training obtained for employment with Baffinland or in other careers in their home communities.

## **TRENDS**

Not applicable.

## **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland views offering training programs as a fundamental component of expanding the Inuit workforce for the Project.

Baffinland will continue to develop and implement new initiatives that will support education and capacity-building for the North Baffin region. This will ensure that Inuit, particularly those from the North Baffin, continue to develop new skillsets for advancement at the Project.

Baffinland will work with the Nunavut Literacy Council to develop an effective Adult Basic Education Program which can start to be delivered in 2020.

## Project Certificate Condition No. 137

Category	Education and Training - Transferable skills and training
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	Offering training which results in certifications that are valid for employment at more than one site or in different fields provides an investment in the long-term employability of Nunavummiut.
Term or Condition	Prior to construction, the Proponent shall develop an easily referenced listing of formal certificates and licences that may be acquired via on-site training or training during employment at Mary River, such listing to indicate which of these certifications and licences would be transferable to a similar job site within Nunavut. This listing should be updated on an annual basis, and is to be provided to the NIRB upon completion and whenever it is revised.
Relevant Baffinland Commitment	92
Reporting Requirement	The initial listing should be provided to the NIRB at least 60 days prior to the start of construction, an annually thereafter or as may otherwise be required.
Status	In-Compliance
Stakeholder Review	Mary River Socio-Economic Monitoring Working Group
Reference	2019 SEMWG Meeting Records
Ref. Document Link	Appendix C

### METHODS

There are a number of qualifications that employees can obtain which would aid them for their work and their personal lives. These include:

- First Aid & CPR Certification
- Mine Rescue and Fire Fighting Skills
- Forklift Certification
- Confined Space Certification
- Fall Arrest Certification
- WHMIS certification

Baffinland delivers training that is job specific. The above listing, although not exhaustive, is subject to operational need. It is noteworthy that due to poor internet connections in some communities, employees who reside in the North Baffin Communities upon hire complete the full suite of training once they arrive on site for their first employment rotation.

### RESULTS

In 2019, Inuit training hours totalled 45,975 hours which is 48.3% of the total training provided by Baffinland. Baffinland is also working to develop new training programs that would be offered both in the community and at the Mine site. Baffinland is also working with contractors to explore new skills development initiatives. Training

programs are expected to continue to evolve at the Project as operations advance, employment increases, and feedback from Inuit employees is implemented.

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to monitor and evaluate training programs to ensure that training is effective and offers employees the opportunities to advance in their chosen careers and to develop transferable skills. New initiatives and programs are being considered to enhance the subject matter of training (i.e. Mental Health and First Aid Programs, Inuktitut as a Second Language) as well as enhance the support that is offered by Baffinland Management to Project employees.

Baffinland will also continue to work with contractors to ensure Inuit content in the form of training opportunities and to explore new skills development initiatives. Training programs are expected to continue to evolve at the Project as operations advance, employment increases, and feedback from Inuit employees is considered.

## Project Certificate Condition No. 138

Category	Education and Training - Inuit employee training
Responsible Parties	The Proponent, Qikiqtani Inuit Association (QIA)
Project Phase(s)	Construction
Objective	Working together with the QIA to prepare effective training programs developed specifically for Inuit will assist in employee preparedness and may improve employee retention.
Term or Condition	The Proponent is encouraged to work with the QIA to ensure the timely development of effective Inuit training and work-ready programs.
Relevant Baffinland Commitment	92
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Mary River Socio-Economic Monitoring Working Group
Reference	2019 SEMWG Meeting Records
Ref. Document Link	Appendix C

### METHODS

Baffinland continued working in collaboration with QIA, to identify candidates for training opportunities for Inuit to gain skills and competencies to secure employment with Baffinland. This collaboration included further improvements in implementation of the Qikiqtani Skills and Training Partnership (Q-STEP) program in 2019.

This program is designed to prepare Inuit for employment both at the Project and to gain employment skills for future employment in the region through a number of training-to-employment initiatives. This program has continually enhanced skills development across the Qikiqtani Region, with a focus on training related to essential skills, heavy equipment and overall preparedness for being in the workforce, for a four-year period ending in March 2021.

### RESULTS

#### Q-STEP

Baffinland and the Qikiqtani Inuit Association (QIA) have partnered in a \$19 million Qikiqtani Skills and Training for Employment Partnership (Q-STEP) training program, with the goal of developing Inuit with skills and qualifications to gain basis skills for employment at the Mary River Project site as well or other potential employment opportunities in the region. Q-STEP is a four-year initiative which consists of work readiness measures as well as targeted training programs in skilled trades for apprenticeships, skills development, supervisor training, and trainee certification in heavy equipment operation.

#### *Community Based Work Readiness*

Baffinland continues to offer the Community Based Work Readiness Training Program. The community Based Work Readiness Training Program is a five-day training program conducted in Arctic Bay, Clyde River, Igloolik, Pond Inlet, Sanirajak and Iqaluit, which addresses the following areas: Self Awareness, An Introduction to Mining, Essential Skills for the Workplace, Money Management and Preparing for Fly-In, Fly-Out. For 2019, the Work Readiness Program

was delivered through 15 off-site Work Readiness Program sessions. There were a total of 99 graduates of this program during the year.

### ***On-Site Work Readiness Training***

Upon completion of the Community based work readiness program graduates from each class are offered the opportunity to gain on-the job experience through sixty (50) hours of job shadowing at the Mary River site. The participants get the opportunity to job-shadow 5 entry-level jobs at the mine site, to first hand see and experience what it is like to work at a mine and in an area of interest. Upon completion of the on-site Work Readiness each participant provides feedback on their experience and area of interest such that Baffinland can facilitate placement for a potential opportunity in a training program or an employment opportunity for the participant. In 2019, there were a total of sixteen (16) graduates that completed the On-Site Work Readiness Training program.

### ***Apprenticeships and Other Opportunities***

Apprenticeship opportunities in skilled trades are open to Inuit each year in the following trades:

- Housing Maintainer;
- Oil Burner Mechanic;
- Electrician, Heavy Duty/Truck;
- Welder and Heavy Equipment Mechanic;
- Automotive Service Technician/Mechanic;
- Heavy Truck and Trailer Service Technician;
- Mechanic, Heat Systems Technician/Oil Burner Mechanic;
- Millwrights;
- Parts Technician; and
- Machinist.

Baffinland and QIA, accept expressions of interest in the apprenticeship program from Inuit and conduct community based interviews and selection for participants to join an apprenticeship program. The career path for apprenticeship training is as follows:

1. Expression of Interest
2. Pre-Screen Interview and Discussion
3. Formal Interview
4. Selection & Offer
5. Job Shadowing in area of apprenticeship to understand the business and role
6. Participation in six month pre-trades training program
7. Writing Trades Entrance Exam
8. Indentured as Apprentice, completion of Year 1,2, and 3 Apprenticeship Training followed by completion of Block 1,2 and 3 Training delivered at a post-secondary institution including block exams.
9. For roles such as Housing Maintainer which have a 3-year apprenticeship, successful completion of the 3<sup>rd</sup> year would see the apprentice certified as a journeyperson.

10. For other roles completion of Year 4 apprenticeship training, followed by block 4 training, and block 4 exams are required.

11. On successful completion of block 4, apprentices can be certified as journeypersons.

At the end of 2019, there were 16 Inuit apprentices (14 males and 2 females). All current apprentices at Baffinland shall be attending technical training school for their specific trade and apprenticeship level in 2020. Baffinland is coordinating the training with the Nunavut Apprenticeship Department.

**Table 4.41: Apprentices at Baffinland in 2019**

Number of Apprentices	Level of Training	Occupation
8	Trades Assistants	<ul style="list-style-type: none"> <li>• Welder</li> <li>• Electrician</li> <li>• Millwright</li> <li>• Carpenter</li> <li>• Heavy Equipment Service Mechanic</li> <li>• Housing Maintainer</li> </ul>
6	Block 1 Apprentices	<ul style="list-style-type: none"> <li>• Electrician</li> <li>• Automotive Service Mechanic</li> <li>• Heavy Equipment Service Mechanic</li> <li>• Millwright</li> <li>• Welder</li> </ul>
1	Block 2 Apprentice	<ul style="list-style-type: none"> <li>• Heavy Equipment Service Mechanic</li> </ul>
1	Block 3 Apprentice	<ul style="list-style-type: none"> <li>• Electrician</li> </ul>

### Heavy Equipment Training

Heavy Equipment Operator (HEO) training is delivered by Operating Engineers Training Institute of Ontario (OETIO), in Morrisburg, Ontario. In 2019, a total of thirty-six (36) Inuit participants, from various communities and Iqaluit, graduated HEO training program. Upon successful completion of the HEO training program the participants are offered a full time permanent role at Baffinland as Operator Trainees in various areas in operations departments.

In 2019, the Q-STEP partnership program achieved successful completion as follows:

- 36 Certified Heavy Equipment Graduates
- 16 Apprentices
- 124 Community Based Work Readiness Graduates
- 16 On-Site Work Readiness Graduates

### TRENDS

Not Applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland and QIA continue to collaborate and implement education and training provisions of Mary River Project IIBA, with a goal of creating employment as an outcome of all respective programs. Baffinland and QIA monitor

training initiatives, develop and plan for new potential opportunities, and jointly review proposed activities to improve education and training programs each year.



## Project Certificate Condition No. 139

Category	Education and Training - Hiring southern Canadians and foreign employees
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	With the unknown availability of labour from the North Baffin region and Nunavut as a whole to provide employment to the Project, the need to employ southern Canadians or foreign workers may implicate the Proponent's on-site language, cross-cultural awareness, and other programming. Having information available regarding the sourcing of labour for the Project is important to ensuring the Proponent and others are prepared for any influx of southern or foreign employees.
Term or Condition	Prior to commencing construction, the Proponent is requested to undertake and provide the results of a detailed labour market analysis which provides quantitative predictions of the number of employees that may reasonably need to be sourced from southern Canada and from foreign markets, identifying where applicable, the country of origin for the foreign labour. Within 90 days of the issuance of the Project Certificate, the Proponent is required to submit an updated Labour Market Analysis which considers requirements of the ERP as well as hiring points within Nunavut and outside of the North Baffin region and RSA.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association, Mary River Socio-Economic Monitoring Working Group
Reference	Qikiqtani Labour Market Analysis (FHW Consulting, 2013)
Ref. Document Link	NIRB Registry Document No. 291437

### METHODS

Baffinland completed and presented a labour market analysis in the 2014 Annual Report to the NIRB to satisfy this condition.

In 2019, Mining Industry Human Resources Council (MIHR) was engaged to conduct a Qikiqtani Labour Market Analysis in the region, for both Baffinland and QIA. The Labour Market Analysis is intended to estimate and assess the availability of Inuit labour for Baffinland operations in the Qikiqtani region of Nunavut and to help identify the factors that may influence that availability.

There are challenges in recruiting Inuit effectively given the Qikiqtani labour supply. Limited numbers of semi-skilled and skilled qualified workers currently seeking work are available. Because of this unknown availability of labour from the North Baffin region, and Nunavut as a whole, Baffinland is required to employ southern Canadian workers at site to ensure production continues.

When employing a workforce with significant southern Canadian representation it is important to ensure on site language, cross cultural awareness, and other programming is available. Taking steps to ensure these are in place will increase communications and good working relations.

Baffinland ensures priority hiring is available for Inuit within the 5 impacted communities as well as the Qikiqtani region. All Inuit employees who express interest are contacted, and their qualifications and skills are assessed against any open roles. Inuit who are qualified for roles are interviewed and if successful are offered career positions at Baffinland.

## RESULTS

The Qikiqtani Labour Market Analysis report is organized around 2 key sections:

- **Section 1:** The Labour Market Analysis (LMA) examines the labour market conditions in the Qikiqtani region of Nunavut, from both a labour demand and labour supply perspective; and the Skills and Capacities Assessment (SCA) profiles the skills and capacities of the labour force, including a look at how people distribute by skill level among Qikiqtani's labour supply;
- **Section 2:** Inuit Labour Force Barriers Analysis (ILBA) explores barriers to full employment for Inuit people and identify potential strategies to support/improve the ability of Inuit people to attain and maintain employment at Baffinland operations.

At its core, the Qikiqtani Labour Market Analysis (QLMA) aims to understand and inform expectations of labour supply in Qikiqtani, such that project partners can develop strategies to maximize the potential of their community members. As well, the QLMA covers labour demand factors that may tighten the labour market for different occupations and categories of skill level.

This report provides an analytical framework that is simple to understand and reproduce and can lead to informed decisions about Baffinland's Inuit Employment Goals (IEGs) and targets as set out in the Inuit Impact Benefit Agreement.

This study also develops a Skills and Capacity Analysis (SCA) for Qikiqtani. The SCA will profile the skills and capacities of the labour force, including a look at how people distribute by skill level and how specific skills are utilized among the labour supply. Understanding the skill profile of the labour force can help identify where particular skill gaps in a region may exist and ultimately point to potential opportunities to better align the skills of the labour force with those in demand.

## TRENDS

Not applicable.

## RECOMMENDATIONS / LESSONS LEARNED

There are challenges in attracting workers in the Qikiqtani's unique and complex labour market. The main attractors to working full-time are financial and personal motivations such as supporting family members or purchasing snowmobiles that will help with hunting. However, these attractors are challenged by factors such as earnings-based rent increases and the family impacts of a rotational work schedule. Findings from the Qikiqtani Labour Market Analysis indicate that there is limited detailed understanding of what mining work involves and what employment opportunities there may be.

Many of the barriers to Inuit employment stem from a weak social infrastructure, notably lack of affordable child care, housing shortages, limited educational (elementary, secondary and post-secondary) levels and work-related training opportunities, welfare dependency through rent related to income, lack of equitable health services to

address complex mental health and addiction issues, and barriers to obtaining a driver's licence (often a requirement for employment).

Skills gaps and cultural norms concerning career advancement can create barriers, suggesting that Inuit employees may need more encouragement to apply for advancement, particularly for supervisory positions. The timeframes and steps required to advance from an entry-level position upward can also pose challenges.

Recognizing the importance of ensuring that language and cross cultural awareness is provided to the total workforce, Baffinland has ensured this is addressed. 100% of employees who arrive at the Baffinland site are required to complete an extensive site orientation on their first day at site. One hour of this orientation provides cultural awareness training, provided to all employees on their first day of work.

### ***Inuit Cultural Engagement Workshop***

This workshop was initially delivered in June of 2019 to the senior management team and at site. In late November of 2019 Baffinland used Legacy Training and Development to deliver an Inuit Cultural Engagement (ICE) Train the Trainer program to five new Inuit employees from the Inuit Success Assurance team with the intention of them becoming the trainers to deliver this workshop. During this session the ICE training presentation itself was updated to reflect the experiences and knowledge of the five Inuit employees who would be delivering the program to all site employees.

### ***Country Kitchens***

Country kitchens are available in three separate areas of the site. These kitchens allow both Inuit and non-Inuit employees to gather for cultural activities such as bannock making, and also to enjoy country food.

### ***Baffinland on-site Cultural Workshops***

Each quarter at the Mary River mine site and Milne Port site, Baffinland organizes cultural workshops for both Inuit and non-Inuit employees to participate in. In 2019 Baffinland held a variety of workshops, including; drum making, drum dancing and seal skin mitt making. Access to an area to sew, as well as material and supplies is available at all times.

### ***Inuit Societal Days***

Nunavut Day celebrates the official division of Nunavut from the Northwest Territories and the official recognition of Nunavut as an independent territory. In 2019, Baffinland celebrated the 25th anniversary of the signing of the Nunavut Land Claims Agreement with a week of celebration of Inuit culture. Baffinland hosted a country food feast for all employees and the Baffinland social committee organized Inuit games. We also welcomed special guest, Angela Amarualik from Igloodik, Nunavut, to perform her music that won her the Indigenous Music Award for Best Inuit, Indigenous Language, or Francophone Album.

On November 8th Baffinland held a series of events to celebrate International Inuit day on site. Reesie Churchill, one of Baffinlands Cultural Advisors, lead a seal skin mitt making workshop at both Port and Mine site locations. She began each workshop with a lighting of the Qulliq and the four workshops that were held had significant turnout of both Inuit and non-Inuit employees. In addition to these workshops, Baffinlands social committee held a games night where the string game was played in the Sailiivik Games.

***Cultural Advisors On Site***

Formally known as “Elders”, the role of Cultural Advisors is to act as Inuit career and cultural advisors and to provide guidance and assistance to all employees on issues involving Inuit culture. Cultural Advisors also develop, identify, encourage and facilitate cross-cultural activities on site. On-Site Cultural Advisors provide the following support:

- Personal counselling for Inuit;
- Work-related counselling for Inuit;
- Cultural advisement to Inuit and Non-Inuit;
- On-site interpretation/translation services (both written and verbal translation/ interpretation) as required by site personnel;
- Assistance to Baffinland’s Human Resources department with administrative and onboarding activities related to Inuit employees;
- Assistance with training facilitation required for Inuit employees; and
- Advise the Baffinland on-site Social Committee on the organization of on-site cross-cultural activities.

Facilitation of sessions on Inuit culture and culturally relevant topics to increase non-Inuit understanding.

## Project Certificate Condition No. 140

Category	Education and Training - Survey of Nunavummiut employees
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	Monitoring the number of employees who leave previous employment in their home communities or who leave some type of formal education in pursuit of employment with the Project is important to evaluate predictions made and the potential impacts to North Baffin communities and education rates.
Term or Condition	The Proponent is encouraged to survey Nunavummiut employees as they are hired and specifically note the level of education obtained and whether the incoming employee resigned from a previous job placement or educational institution in order to take up employment with the Project.
Relevant Baffinland Commitment	Not applicable
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2018 Socio-Economic Monitoring Report (JPCSL, 2019) Socio-Economic Monitoring Plan (Baffinland, 2019k)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

Baffinland regularly administers a voluntary Inuit Employee Survey, which collects information on employee level of education obtained and whether the employee resigned from a previous job placement or educational institution in order to take up employment with the Project. Baffinland has discussed its surveys with the SEMWG (which includes GN, QIA, and CIRNAC representatives) and QSEMC and will continue to engage both groups on the Project's socio-economic monitoring program. The most recent survey was administered by Baffinland in January/February 2019. Results from the Inuit Employee Survey are summarized, where relevant, in the Project's Socio-Economic Monitoring Reports.

### RESULTS

A total of 71 surveys were completed by Inuit employees and contractors. Table 4.42 summarizes results on the highest level of education obtained by survey respondents ( $n=71$ ). 49.3% of respondents had less than a high school education. 16.9% had a high school diploma or equivalent, 4.2% had an apprenticeship or trades certificate or diploma, and 15.5% had a college or other non-university certificate or diploma. 0.0% had any type of university certificate or diploma and 14.1% of respondents had unknown educational levels. When 'unknown' results are removed, 57.4% had less than a high school education, 19.7% had a high school diploma or equivalent, and 23.0% had higher than a high school diploma or equivalent.

Furthermore, 64.8% of respondents said they would attend an informational course about managing personal finances, setting up monthly bill payments, and establishing savings goals if it was offered through their employer

or local housing association; 25.4% would not; and results were unknown for 9.9% of respondents. When 'unknown' results are removed, 71.9% of respondents said they would attend such a course.

**Table 4.42: Education Status (2019 Inuit Employee Survey Results)**

Highest Level of Education	Number of Respondents	Percentage of Respondents
What is the highest education level you have obtained? (n=71)		
Less than high school	35	49.3%
High school diploma or equivalent	12	16.9%
Apprenticeship or trades certificate or diploma	3	4.2%
College or other non-university certificate or diploma	11	15.5%
University certificate or diploma	0	0.0%
Unknown	10	14.1%
<b>Total</b>	<b>71</b>	<b>100.0%</b>
Would you attend an informational course about managing your personal finances, setting up monthly bill payments, and establishing savings goals if it was offered through your employer or local housing association? (n=71)		
Yes	46	64.8%
No	18	25.4%
Unknown	7	9.9%
<b>Total</b>	<b>71</b>	<b>100.1%</b>

**Notes:**

1. Source: 2019 Inuit Employee Survey.
2. Total percentage may not equal 100.0% due to rounding.

Table 4.43 summarizes results on the employment status of survey respondents prior to Project employment (n=71). 23.9% of respondents resigned from a previous job in order to take up employment with the Project, while 66.2% did not. Results were unknown for 9.9% of respondents. When 'unknown' results are removed, 26.6% resigned from a previous job in order to take up employment with the Project while 73.4% did not. Of those respondents that resigned from a previous job in order to take up employment with the Project (n=17), 35.3% (or 9.4% of known survey responses) had casual employment status, 17.6% (or 4.7% of known responses) had part-time employment status, and 41.2% (or 10.9% of known responses) had full-time employment status.

**Table 4.43: Employment Status Prior to Project Employment (2019 Inuit Employee Survey Results)**

Pre-Employment Status	Number of Respondents	Percentage of Respondents
Did you resign from a previous job in order to take up employment with the Mary River Project? (n=71)		
Yes	17	23.9%
No	47	66.2%
Unknown	7	9.9%
<b>Total</b>	<b>71</b>	<b>100.0%</b>
If yes, what was your previous employment status? (n=17)		
Casual	6	35.3%
Part-time	3	17.6%
Full-time	7	41.2%
Unknown	1	5.9%
<b>Total</b>	<b>17</b>	<b>100.0%</b>

**Notes:**

1. Source: 2019 Inuit Employee Survey.
2. Total percentage may not equal 100.0% due to rounding.

Table 4.44 summarizes results on the education status of survey respondents prior to Project employment (n=71). 7.0% of respondents were enrolled in an academic or vocational program at the time of their hire at the Project, while 77.5% were not. Results were unknown for 15.5% of respondents. When 'unknown' results are removed, 8.3% of respondents were enrolled in an academic or vocational program at the time of their hire at the Project while 91.7% were not. Of those respondents that were enrolled in an academic or vocational program at the time of their hire at the Project (n=5), 0.0% (or 0.0% of known survey responses) suspended or discontinued their education because they were hired to work at the Project.

**Table 4.44: Education Status Prior to Project Employment (2019 Inuit Employee Survey Results)**

Pre-Employment Status	Number of Respondents	Percentage of Respondents
Were you enrolled in an academic or vocational program at the time of your hire at the Mary River Project? (n=71)		
Yes	5	7.0%
No	55	77.5%
Unknown	11	15.5%
<b>Total</b>	<b>71</b>	<b>100.0%</b>
If yes, did you suspend or discontinue your education because you were hired to work at the Mary River Project? (n=5)		
Yes	0	0.0%
No	5	100.0%
Unknown	0	0.0%
<b>Total</b>	<b>5</b>	<b>100.0%</b>

**Notes:**

1. Source: 2019 Inuit Employee Survey.
2. Total percentage may not equal 100.0% due to rounding.

## TRENDS

Like previous surveys, the individuals who completed Baffinland's Inuit Employee Survey in 2019 had varied educational and pre-employment backgrounds. 57.4% had less than a high school education, 19.7% had a high school diploma or equivalent, and 23.0% had higher than a high school diploma or equivalent. By comparison, data from the 2016 Census indicate the proportion of the North Baffin LSA's population (aged 25 to 64 years) with no certificate, diploma or degree was 50.8%; with a secondary school diploma or equivalency certificate was 14.4%; and with a postsecondary certificate, diploma, or degree was 36.0%. Likewise, the proportion of Nunavut's population (aged 25 to 64 years) with no certificate, diploma or degree was 40.9%; with a secondary school diploma or equivalency certificate was 14.6%; and with a postsecondary certificate, diploma, or degree was 44.4% (Statistics Canada 2017a, b, c, d, e, f, g).

Like previous surveys, some respondents to the 2019 Inuit Employee Survey also indicated they resigned from a previous job in order to take up employment with the Project (26.6% in 2019, 31.4% in 2018, and 20.9% in 2017). For greater reference, Nunavut's Inuit population participation rate, employment rate, and unemployment rate in December 2018 were 58.1%, 46.0%, and 20.8% respectively (Nunavut Bureau of Statistics 2019). Likewise, few or no respondents continue to indicate they suspended or discontinued their education because they were hired to work at the Project (0.0% in 2019, 3.1% in 2018, and 0.0% in 2017). Baffinland will continue to track employee education and pre-employment status through an Inuit Employee Survey to see if additional trends emerge.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to administer this survey on a regular basis. Baffinland will also continue to welcome feedback on the survey from SEMWG and QSEMC members.



## Project Certificate Condition No. 141

Category	Education and Training - Training of Inuit
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To ensure that effective training is available in a timely manner.
Term or Condition	The Proponent is encouraged to work with the Qikiqtani Inuit Association prior to construction in order to prioritize the provision of training of Inuit to serve as employees in monitoring or other such capacities.
Relevant Baffinland Commitment	92
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association (QIA)
Reference	N/A
Ref. Document Link	N/A

### METHODS

This Term and Condition is focused on Baffinland working cooperatively with the Qikiqtani Inuit Association (QIA) to prepare the local workforce for mine construction. Mine construction was last undertaken in 2013 and 2014 but a new construction phase is anticipated subject to regulatory approval of the Phase 2 Proposal.

Baffinland continues to work collaboratively with the QIA to promote Inuit training, education, and employment initiatives, consistent with provisions of the Inuit Impact and Benefit Agreement (IIBA), which was successfully re-negotiated in 2018. This work occurs through IIBA committees such as:

- Joint Executive Committee; and
- Employment Committee.

Inuit training and employment initiatives addressed through the IIBA include:

- Inuit Human Resources Strategy;
- Apprenticeship Program (not mentioned specifically in the IIBA, but apprenticeship training is identified as a potential program);
- Morrisburg Heavy Equipment Operator training program (not mentioned specifically in the IIBA, but HEO training is identified as a potential program);
- Work Ready Program;
- Summer Student Employment;
- Inuit Internship Program;
- Achievement Awards and Scholarships; and
- Baffinland Inuit Training Centre.

Furthermore, Baffinland and the QIA are partners in the \$19 million Qikiqtani Skills and Training for Employment Partnership (Q-STEP) program, which has been designed to provide Inuit with skills and qualifications to meet the employment needs of the Mary River Project as well as other employment opportunities in the region. Q-STEP is a

four-year initiative consisting of both work readiness measures as well as targeted training programs directed at apprenticeships, skills development, supervisor training, and formal certification in heavy equipment operation. The program will be implemented through the joint efforts of Baffinland and QIA.

In 2019, Inuit Environmental Monitors hired by QIA joined the Site Environment team at both the Mine Site and Milne Port. The Environmental Monitors participate in the implementation of the Environmental Management System and are integrated into the on-site Environment team, and provide a crucial link between QIA and Baffinland for environmental monitoring and reporting purposes.

**RESULTS**

Not applicable.

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland recognizes the need to institute training programs at early stages to ensure Inuit are equipped with the necessary skills to take advantage of employment opportunities at the Mary River Project. The Mary River IIBA and Inuit Human Resources Strategy outline several initiatives Baffinland is undertaking to advance Inuit training and employment. The success of Inuit training and employment initiatives will continue to be tracked through Baffinland's Socio-Economic Monitoring Reports and IIBA Implementation Reports provided to QIA.

#### 4.7.3 Livelihood & Employment (PC Conditions 142 through 147)

The Project provides direct and indirect employment opportunities to residents of the five (5) North Baffin communities and other Nunavummiut.

Six (6) PC conditions relate to potential impacts of the Project on livelihood and employment. The conditions identify actions that Baffinland and other parties (the GN, QIA and the Nunavut Housing Corporation) should undertake to remove barriers to employment of Inuit, including those barriers faced by Nunavummiut with limited or no previous wage employment experience; women; those living in social housing (the majority of Nunavummiut); and unilingual candidates.

The IIBA outlines the commitments Baffinland has made to ensuring the North Baffin communities benefit from employment opportunities of the Project. Baffinland and QIA also establish annual Minimum Inuit Employment Goals (MIEGs) to set a target for Inuit employment and to outline the actions that need to be taken to meet it.

Baffinland and QIA initiated the development of an Inuit Human Resources Strategy (IHRS) in 2016. The IHRS was finalized with QIA in 2017. In 2019, Baffinland developed the Inuit Success Assurance team. This team ensures Inuit Success at Baffinland by directly interacting with all Inuit working at Baffinland. The team encourages Inuit to access available training opportunities as well as ensure Baffinland continues to develop and retain our Inuit employees.

##### **Stakeholder Feedback**

Discussions around livelihood and Project-related employment opportunities continue to be a key focus of the comments provided by community members and other stakeholders during public meetings. The SEMWG and QSEMC also regularly discuss this element of the Project (Appendices C.3 and C.4).

##### **Monitoring**

Baffinland tracks and reports on Inuit employment levels reached each year. This information is presented in quarterly and annual IIBA reports to the QIA, and annually in the socio-economic monitoring report. Furthermore, Baffinland has provided information on potential barriers to employment for women in the 2019 Socio-Economic Monitoring Report for the Mary River Project. This includes indicator data on hours worked by female employees and contractors, and information on childcare availability and costs. Table 4.45 provides an evaluation of the Project's impacts on employment, relative to predictions presented in the FEIS.

The number of FTEs from the North Baffin Local Study Area (LSA) grew to 187 Full-Time Equivalents (FTEs), representing 377,956 hours worked in 2019. This represents an increase of 35 FTEs (or 90,916 hours) over 2018 levels. These LSA employment opportunities likely reflect both the increase in labour demand from the growth in Project activities, as well as commitments Baffinland has made to Inuit employment through the IIBA.

##### **Path Forward**

Baffinland continues to refine its Inuit human resources programs and remains committed to meeting Inuit employment targets. The new Baffinland Apprenticeship Program, the development of a labour pool of multi-skilled Inuit Heavy Equipment Operators, implementation of the Q-STEP training program (in conjunction with QIA and Governments) and other actions to meet the MIEG should also assist with increasing employment in the North Baffin communities. Baffinland will continue to monitor Inuit employment levels at the Project for future trends. Reporting on each PC condition follows.

**Table 4.45: Livelihood and Employment Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Wage Employment	Employment of LSA residents	In 2019, a total of 500,337 hours was worked by LSA residents on the Project. 379,604 hours were worked by North Baffin LSA residents and 120,733 hours were worked by Iqaluit residents. The 2019 LSA employment numbers exceeded expectations in the North Baffin LSA, while in Iqaluit they are largely consistent with Environmental Impact Statement (EIS) predictions. Baffinland has committed to improving its Inuit employment levels over time. This is expected to occur through ongoing implementation of IIBA provisions on Inuit employment and retention. Likewise, Baffinland's Apprenticeship Program, Morrisburg HEO Training Program, Inuit Internship Program, Work Ready Program, and other initiatives are anticipated to improve Inuit employment levels over time. Ongoing monitoring of employment levels against EIS predictions and the IIBA's MIEGs will provide a means of tracking the success of Baffinland's efforts in this area.	Positive effects consistent with FEIS predictions
	Creation of indirect jobs within the LSA	Spending on Inuit businesses is an indicator of potential indirect employment: In 2019, contracts worth approximately \$289 million were awarded to Inuit-owned businesses and joint ventures, which is \$147.9 million higher than in 2018. Prior to 2018, reporting was focused on 'value of procurement with Inuit-owned businesses and joint ventures'. This reporting focus was changed in 2018 to 'value of contracting with Inuit Firms' to better align with IIBA reporting methods. Total contracting (with Inuit and non-Inuit firms) in 2019 totaled \$760.7 million. Since Project development, a total of \$1.2 billion worth of contracts have been awarded to Inuit-owned businesses and joint ventures.	Positive effects consistent with FEIS predictions
Job Progression and Career Advancement	Expanded employment and career development options	A total of 8 Inuit workers received promotions in 2019.	Positive effects consistent with FEIS predictions

## Project Certificate Condition No. 142

Category	Livelihood and Employment - Employee Cohesion
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To promote cohesion between employees on site, and between employees and their families.
Term or Condition	The Proponent is encouraged to address the potential direct and indirect effects that may result from Project employees' on-site use of various Inuktitut dialects as well as other spoken languages, specifically paying attention to the potential alienation of some employees that may occur as a result of language or other cultural barriers.
Relevant Baffinland Commitment	105
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association (QIA)
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland's Inuktitut in the Workplace Policy outlines the Company's position respecting support for the use of Inuktitut at all Project sites in Nunavut and ensures that a lack of proficiency in English will not be a barrier to Inuit employment, subject to considerations of health and safety. The Inuktitut in the Workplace Policy has been shared with the QIA at the Executive Committee level and was last updated in 2017. Article 11.4 of the IIBA also specifically addresses the topic of Inuktitut in the workplace.

Although the working language at the Project is English, the Company supports the principle of increased use of Inuktitut in the workplace over the lifetime of the Project. Baffinland is looking to further reduce barriers associated with language through increased use of bilingual signs and documents, and the use of graphics and symbols where possible. While on-site training is delivered in English, site-based Cultural Advisors are available to provide ongoing support for Inuit employees and to provide translation and interpretation services when required as outlined in the Inuktitut in the Workplace Policy.

Pursuant to the IIBA, Baffinland provides Inuit employees with access to professional career counselling and professional counselling for personal issues on an as-needed basis. Services are available from Inuktitut speaking counsellors. Through the amended IIBA, Baffinland will be rolling out an in-community counselling program in 2019 to further support the residents of the North Baffin communities. These services will also be available in Inuktitut. Baffinland also updates the company website with news articles and other information related to the Project. It is intended that the website will eventually be bilingual (English and Inuktitut).

### RESULTS

Not applicable.

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Not applicable.

## Project Certificate Condition No. 143

Category	Livelihood and Employment - Employee family contact
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To enable and foster connection and contact between employees and family members.
Term or Condition	The Proponent is encouraged to consider the use of both existing and innovative technologies (e.g. community radio station call-in shows, cell phones, video-conferencing, Skype, etc.) as a way to ensure Project employees are able to keep in contact with family and friends and to ward off the potential for feelings of homesickness and distance to impact on employee retention and family stability.
Relevant Baffinland Commitment	N/A
Reporting Requirement	As needed
Status	In-Compliance
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Internet and telephone access is available free of charge to employees in the accommodations rooms at site, and in some common areas. Bandwidth and utilization levels may limit the use of some applications.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 144

Category	Livelihood and Employment - Requirements for employment
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To ensure that the prerequisites and requirements for employment are clear and well known in work readiness programs.
Term or Condition	The Proponent is encouraged to make requirements for employment clear in its work-readiness and other public information programs and documentation, including but not limited to: education levels, criminal records checks, policies relating to drug and alcohol use and testing, and language abilities.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland Community Liaison Officers (BCLOs) communicate these requirements to individuals who drop off their résumés to Baffinland. Job postings also identify many of these requirements. Employment requirements are made clear to potential employees during pre-screening for Work Ready training. They are also reviewed during pre-screening for new hiring. These requirements (background check, criminal record check and medical) are included in the employment agreement that new employees receive and sign.

From September 10-14, 2018, Baffinland hosted an Employment and Training Information Tour in the five (5) North Baffin communities. An important component of the information presented during this tour related to sharing description of the various pre-employment and work-readiness requirements to interested community members.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland is continuously seeking ways to increase Inuit employment in the Project and to provide relevant and meaningful training opportunities for local community members.



## Project Certificate Condition No. 145

Category	Livelihood and Employment - Barriers to employment for women
Responsible Parties	The Proponent, Government of Nunavut, members of QSEMC
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To monitor and understand the existence of barriers to employment for women specifically relating to childcare availability and costs.
Term or Condition	The Proponent is encouraged to work with the Government of Nunavut and the Qikiqtaaluk Socio-Economic Monitoring Committee to monitor the barriers to employment for women, specifically with respect to childcare availability and costs.
Relevant Baffinland Commitment	43, 45
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2019 Socio-Economic Monitoring Report (Baffinland, 2020p) 2019 QSEMC and SEMWG Meeting Records Socio-Economic Monitoring Plan (Baffinland, 2019k)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Baffinland has provided information on potential barriers to employment for women in the Socio-Economic Monitoring Report. This includes indicator data on hours worked by female employees and contractors, and some information on childcare availability and costs. Furthermore, specific reference is made in the Mary River Project IIBA to Inuit women's access to employment (Article 7.17) and affirmative steps for attracting female employees (Article 11.5; which acknowledges Inuit women entering non-traditional occupations can face barriers related to skill levels and discrimination). Actions identified in Article 11.5 include:

- The Company shall develop an affirmative action plan that sets out measurable goals and procedures to monitor compliance with government employment equity legislation and any harassment policies.
- The Company and a designated Inuit organization shall develop and locate training programs developed specifically to attract women who may want to work at the Project.
- The Company and a designated Inuit organization shall develop and implement gender sensitivity training programs.
- The Company shall provide for appropriate accommodations and facilities for female Inuit employees.

### RESULTS

Table 4.46 presents the hours (and percentage of hours) worked by women and men on the Project in 2019. 424,479 hours (or 9.8% of total hours worked on the Project) were worked by women, which is 198,399 hours more than documented for 2018. As a percentage of the workforce, Inuit women represented 28% of the Inuit workforce (which

is consistent with the proportion in 2018), and non-Inuit women represented 7.5% of the non-Inuit workforce (up from 3.4% in 2018). However, the percentage of hours worked by Inuit women compared to Inuit men on the Project (approximately 27.8% of this total) was much higher than non-Inuit women compared to non-Inuit men (approximately 6.9% of this total) in 2019.

**Table 4.46: Hours Worked by Project Employees and Contractors by Ethnicity and Gender (2019)**

Hours Worked by Project Employees and Contractors, by Ethnicity and Gender (2019)			
Employee Ethnicity and Gender		Hours Worked	% of Total (3,081,740)
Inuit	Male	418,190	9.6%
	Female	161,635	3.7%
Non-Inuit	Male	3,508,642	80.6%
	Female	262,844	6.1%
Total		4,351,683	100.0%

Appropriate community-level indicator data are currently unavailable for the topic of childcare availability and costs. As such, this topic continues to be tracked through the QSEMC process and community engagement conducted for the Project (results are reported on in the Socio-Economic Monitoring Report). Employment levels can be influenced by many factors, including the existence of barriers faced by certain demographic groups. Inadequate access to childcare in the Local Study Area (LSA) may be creating some barriers to increased employment of women at the Project. However, the new employment opportunities being created for women in the LSA because of the Project should be acknowledged. Baffinland has also developed, or has committed to developing, several measures that encourage Inuit female employment and retention at the Project. Goals and priorities in this area were finalized with the QIA in the IHRS and through renegotiation of the IIBA in 2018. The success of IIBA and IHRS initiatives will continue to be tracked by Baffinland.

Baffinland completed the Arnait Action Plan in 2019. This plan has identified potential areas that can be addressed over the long term to increase the number of Inuit women working at the project. Baffinland will also continue to strive for the inclusion of Inuit women in its annual training programs.

## TRENDS

While Baffinland has continued to encourage the employment of women at the Project, women have worked considerably fewer hours on the Project than their male counterparts. Baffinland will continue to track this issue in future Socio-Economic Monitoring Reports.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland continues to provide information related to potential barriers to employment for women through its Socio-Economic Monitoring Reports. However, appropriate community-level indicator data are currently unavailable for the topic of childcare availability and costs. As such, this topic continues to be tracked through the QSEMC process and community engagement conducted for the Project.

Baffinland engages with the GN on employment topics through the SEMWG and QSEMC as well as the Memorandum of Understanding signed in 2019. Baffinland remains open to discussing these issues with the GN further as part of its engagement with these groups. Baffinland also remains open to discussing how improved monitoring data may be obtained.

## Project Certificate Condition No. 146

Category	Livelihood and Employment - Availability of childcare for Project Employees
Responsible Parties	Government of Nunavut and Qikiqtani Inuit Association
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To lessen the barriers to employment as relating to the availability of childcare.
Term or Condition	The Government of Nunavut and the Qikiqtani Inuit Association are strongly encouraged to investigate the possibility for Project revenue streams to support initiatives or programs, which offset or subsidize childcare for Project employees.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	N/A
Ref. Document Link	N/A

### METHODS

This PC Condition is not directed at Baffinland. See PC Condition No. 145 for Baffinland's work with the SEMWG in this area.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 147

Category	Livelihood and Employment - Affordability of housing
Responsible Parties	The Proponent, Government of Nunavut and Nunavut Housing Corporation
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To lessen the barriers to maintaining employment as relating to the availability and costs of housing.
Term or Condition	The Proponent is encouraged to work with the Government of Nunavut and the Nunavut Housing Corporation to investigate options and incentives which might enable and provide incentive for employees living in social housing to maintain employment as well as to negotiate for and obtain manageable rental rates.
Relevant Baffinland Commitment	43
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Government of Nunavut (Nunavut Housing Corporation; Community and Government Services; Economic Development and Transportation); Mary River Socio-Economic Monitoring Working Group (SEMWG); Qikiqtani Socio-economic Monitoring Committee (QSEMC)
Reference	2019 SEMWG Meeting Records 2019 QSEMC Meeting Records
Ref. Document Link	Appendix C

### METHODS

Baffinland discusses housing related issues with the SEMWG, of which the Government of Nunavut (including Nunavut Housing Corporation) are active participants.

At the May 15 to 16, 2019 QSEMC meeting, concerns related to public housing were discussed by the participants.

### RESULTS

Not applicable

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Housing in Nunavut is the responsibility of the Government of Nunavut and the Nunavut Housing Corporation (NHC). Baffinland will continue to participate with these parties on related housing issue discussions and as requested and can advocate for more work-friendly social housing policies for its workers. Baffinland and the GN signed a Memorandum of Understanding in 2019 to work on issues of mutual concern. Baffinland would welcome discussions on housing related issues through this forum.

#### 4.7.4 Economic Development, Self-Reliance, and, Contracting and Business Opportunities (PC Conditions No. 148 through 152)

Five (5) PC conditions relate to the potential impacts of the Project on economic development and self-reliance, and contracting and business opportunities. The objectives of the conditions are to: encourage Baffinland to investigate what measures the Proponent could take to encourage home ownership; promote the contracting of Inuit firms by contracting with smaller work packages; undertake collaborative monitoring with regional agencies to evaluate the Project's interactions with harvesting and food security; outline measures to minimize impacts on park users; and to complete an assessment of the risk presented by temporary mine closure on local employment and economic development.

##### Stakeholder Feedback

With respect to economic development, local communities, the QIA, the GN, and the federal government are all key stakeholders. As with employment, these stakeholders are interested to see the Project deliver and induce economic development in the region. Conversely, concerns were expressed regarding the potential negative effects or challenges associated with temporary or early closure of the Project. Commitments and contracting guidelines are contained in the IIBA to encourage contracting of Inuit. Procurement and Contracting Workshops were held in all five of North Baffin communities in 2019 (Appendix B) consistent with the IIBA.

##### Monitoring

Baffinland tracks and reports on the amount spent on contracting with Inuit firms each year and on LSA payroll amounts. Baffinland has also presented information on Project harvesting interactions and food security, household income and food security, and land user - Project interactions in the 2019 Socio-Economic Monitoring Report. Table 4.47 provides an evaluation of the Project's impacts on economic development and self-reliance, and contracting and business opportunities based on monitoring activities completed in 2019, relative to predictions presented in the FEIS and FEIS Addendum.

Positive effects with respect to aspects of the economy in the North Baffin communities have accrued as a result of Project employment.

##### Path Forward

Baffinland and QIA signed an amended IIBA in 2018. Both continue to work collaboratively to improve Inuit business opportunities at the Mary River Project. Baffinland will continue to monitor and report on Project-related economic-development effects in future years. Reporting on each PC condition follows.

**Table 4.47: Economic Development Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Land	Mine operation and ongoing construction activities causing increased industrial utilization of land, may affect harvesting and travel, or result in changes to how people engage in the land-based economy	Effects are difficult to monitor and assess. However, 892 land use visitor person-days were recorded at Project sites in 2019, which is 353 person-days greater than in 2018. The majority (594) of the visitors stopped at Milne Port.	N/A

Component	Effects	Monitoring Program	Impact Evaluation
People	Employment, training and contracting resulting in increased human capacity and well-being; opportunities for youth, improved education and training; and increased wealth and well-being	Baffinland's 2019 Socio-economic Monitoring Report presents 2019 employment and contracting statistics. GN (2015) also reported positive feedback from Igloolik and Pond Inlet regarding Project employment bringing observable benefits to the communities, and GN (2016) reported positive benefits accruing to the LSA as a whole.	Positive effects consistent with FEIS predictions
Community Economy	Employment of North Baffin residents resulting in an improved ability to achieve strategic community development objectives; increased wealth in community; increased local business opportunities	Employment monitoring and results are described in Section 4.7.3. In 2019, contracts worth approximately \$289 million were awarded to Inuit-owned businesses and joint ventures, which is \$147.9 million higher than in 2018. Prior to 2018, reporting was focused on 'value of procurement with Inuit-owned businesses and joint ventures'. This reporting focus was changed in 2018 to 'value of contracting with Inuit Firms' to better align with IIBA reporting methods. Total contracting (with Inuit and non-Inuit firms) in 2019 totaled \$760.7 million. Since Project development, a total of \$1.25 billion worth of contracts have been awarded to Inuit-owned businesses and joint ventures. Furthermore, Project LSA employee payroll expenditures (in Canadian dollars, including both Inuit and non-Inuit employees) totaled \$20.3 million in 2019.	Positive effects consistent with FEIS predictions
Territorial Economy	Employment of Nunavut residents causing growth in the territorial economy. Expanded economic activity (Gross Domestic Product; GDP) Increased diversity of territorial economy.	Impacts to the territorial economy consist of employment (Section 4.7.3) and contracting within Nunavut (see above), as well as corporate and payroll taxes, mineral royalties (once they begin), and IIBA payments.	Positive effects consistent with FEIS predictions

## Project Certificate Condition No. 148

Category	Economic Development and Self-Reliance, and Contracting and Business Opportunities – Food security
Responsible Parties	The Proponent, Members of the QSEMC
Project Phase(s)	Construction and Operations
Objective	To improve understanding of the interactions between the Project and Inuit harvesting and how this relates to food security for residents of the North Baffin.
Term or Condition	The Proponent is encouraged to undertake collaborative monitoring in conjunction with the Qikiqtaaluk Socio-Economic Monitoring Committee's monitoring program which addresses Project harvesting interactions and food security and which includes broad indicators of dietary habits.
Relevant Baffinland Commitment	45
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2019 Socio-Economic Monitoring Report (Baffinland, 2020p) 2019 QSEMC and SEMWG Meeting Records Socio-Economic Monitoring Plan (Baffinland, 2019k)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Baffinland has provided some information on Project harvesting interactions and food security in the Socio-Economic Monitoring Report.

### RESULTS

Appropriate community-level indicator data are currently unavailable for this topic. As such, this topic continues to be tracked through the QSEMC process, community engagement conducted for the Project, and related information (results are reported on in the Socio-Economic Monitoring Report). Some territorial (but not community-scale) government data are available on harvesting and food security in Nunavut and are presented in the Socio-Economic Monitoring Report. Data related to this topic are also presented in the report and include: Proportion of taxfilers with employment income, median employment income, percentage of population receiving social assistance, number of recorded land use visitor person-days at Project sites, and number of Wildlife Compensation Fund claims.

Harvesting and consumption of country food remains a valued and important part of the Inuit culture and diet. Monitoring data presented in the Socio-Economic Monitoring Report suggest Inuit land use activities coexist to some degree with the Project, as local land users have continued to access Project sites since construction. Inuit employee harvesting is also permitted at the Project (subject to certain restrictions) although Baffinland's January 2019 Inuit Employee Survey indicates only minimal harvesting is currently being conducted.

Stakeholder concerns expressed about Project effects on harvesting and wildlife are acknowledged. Concerns have also been expressed elsewhere about declining rates of country food consumption and the lack of food security in Nunavut, generally. Various mitigation measures have been established by Baffinland to address effects on Inuit travel, camps, and harvesting. For example, Baffinland has contributed \$750,000 to a Wildlife Compensation Fund (administered by the QIA under the terms of the IIBA) to address the potential for wildlife-related impacts from the Project. Monitoring data indicate this Fund has been accessed by local Inuit. Baffinland has also established a Harvesters Enabling Program in Pond Inlet through the IIBA, whereby Baffinland will contribute \$400,000 per year for 10 years for a gas program to enhance travel for Inuit in the area.

There are positive indications the Project makes contributions to improved household income and food security in the Local Study Area (LSA). This has occurred by providing LSA residents with meaningful employment opportunities and through related contributions and initiatives. Employment income facilitates the purchase of food and other family goods, while also providing a means to participate in harvesting if desired. Baffinland also contributes to various community wellbeing initiatives directly (e.g. through the IIBA's INPK Fund, school lunch program, seasonal country food exchange program, community food bank donations) and indirectly (e.g. through the QIA Legacy Fund and QIA Benefits Fund), which may assist individuals not directly benefiting from Project employment.

The Nunavut Food Security Coalition (2014) has outlined four components of food security (i.e. availability, accessibility, quality, and use) and factors affecting each component. Baffinland has acknowledged it can play a role in each of these food security components. However, the Nunavut Food Security Coalition (2014: 2) also highlights food security components "are influenced by many complex factors" and notes "this critical and complex issue is larger than the mandate of any one organization. A collaborative approach is essential." Baffinland continues to make contributions to the components of food security through initiatives commensurate with its role as a regional mineral developer; Baffinland's role in each of the four food security components identified by the Nunavut Food Security Coalition (2014) is described in the Socio-Economic Monitoring Report.

## **TRENDS**

Baffinland acknowledges stakeholder concerns have been raised on this topic. However, relevant mitigation is in place (e.g. Wildlife Compensation Fund, Harvesters Enabling Program) and Baffinland continues to make contributions to the components of food security through initiatives commensurate with its role as a regional mineral developer. In addition, potential effects on wildlife resources continue to be tracked through Baffinland's environmental monitoring programs and the TEWG/MEWG processes. Relevant sections of Baffinland's Annual Report to the NIRB should be consulted for monitoring results and information specific to these topics.

## **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to monitor the topic of Project harvesting interactions and food security in its Socio-Economic Monitoring Report. However, appropriate community-level indicator data are currently unavailable for this topic. As such, this topic continues to be tracked through the QSEMC process, community engagement conducted for the Project, and related information. Baffinland is open to discussing with the SEMWG and QSEMC how improved monitoring data may be obtained.



## Project Certificate Condition No. 149

Category	Economic Development and Self-Reliance, and Contracting and Business Opportunities – Impacts of temporary closure
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To further the understanding of how a temporary closure may impact on the well-being of the residents and businesses of the North Baffin region.
Term or Condition	Prior to the commencement of operations, the Proponent is required to undertake an analysis of the risk of temporary mine closure, giving consideration to how communities in the North Baffin region may be affected by temporary and permanent closure of the mine, including economic, social and cultural effects and taking into consideration the potential drop in employment between the construction and operations phases of the Project.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	Potential Effects of a Mine Closure (FHW Consulting, 2014)
Ref. Document Link	N/A

### METHODS

The report '*Potential Effects of a Mine Closure*' (FHW Consulting, 2014) was completed in 2014 and submitted to the NIRB.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

When the Project is approaching closure, Baffinland will work with government and community stakeholders to implement programs to support employee transition. Many Baffinland employees will be able to demonstrate a meaningful work record and a variety of on-the-job and formal training experiences, which may assist them in their transition to new endeavours.

Baffinland is working with the QIA to develop a Mine Closure Working Group that will include members from local communities and will address biophysical and socio-economic issues related to temporary and permanent site closure.

## Project Certificate Condition No. 150

Category	Economic Development and Self-Reliance, and Contracting and Business Opportunities – Impacts to visitors of Sirmilik National Park
Responsible Parties	The Proponent, Parks Canada
Project Phase(s)	Construction and Operations
Objective	To limit potential of Project impacts upon visitors, researchers and/or beneficiary users of the Sirmilik National Park.
Term or Condition	<p>The Proponent will ensure the following:</p> <ul style="list-style-type: none"> <li>a. The Proponent will maintain, where possible, a minimum flying altitude of 2,000 feet over the park, except for approaches to land, take-off or for safety reasons</li> <li>b. The Proponent will ensure that certification of noise compliance is current, where compliance is applicable</li> <li>c. For the purpose of briefing Park visitors, the Proponent will provide Parks Canada (1) prior to commencing the shipping season, with planned daily shipping schedules, and (2) annually, with air traffic information, and (3) to provide updates when significant variations from these are expected</li> <li>d. The Proponent is strongly encouraged to provide due consideration to wilderness experience during its operations in the open water season, especially during the month of August which is typically a time of high use by sea kayakers.</li> </ul>
Relevant Baffinland Commitment	34
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not applicable
Stakeholder Review	Parks Canada, Environment Climate Change Canada, Qikiqtani Inuit Association, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board, Parks Canada
Reference	Environmental Protection Plan (Baffinland, 2016b) Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020) MEWG Meeting Records
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Not applicable in 2019. Pilots are made aware of the minimum flying altitude over the park and this condition is written into aviation contracts. Flight Height compliance was monitored in 2019 and is reported on in the Draft 2019 Terrestrial Environment Annual Monitoring Report. No flights over Sirmilik Park occurred in 2019 and therefore no noise implications are relevant.

Parks Canada is made aware of the shipping schedules for each upcoming shipping season through their participation in the MEWG and any planned variations from the schedule.

In 2014, Baffinland worked directly with Parks Canada to develop a brochure on kayaking safely around large ships. The brochure was published in French, English and Inuktitut and installed in the Pond Inlet Parks office.

Baffinland has contracted exactEarth®, a global vessel monitoring and tracking service based on AIS (Automatic Identification System) data from polar orbiting satellites to track and report on vessel movements. The vessel tracking information is available on Baffinland's web site to allow communities to check on vessel coordinates, which direction the vessel is moving, and its destination.

#### **RESULTS**

No flights over Sirmilik Park occurred in 2019. Parks Canada continues to be appraised of shipping seasons through publicly accessible information.

#### **TRENDS**

Not applicable.

#### **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to include the minimum flying altitude in aviation contracts and notify pilots of the condition.

Baffinland remains open to discussion with Parks Canada if updates to the brochure or other additional information is requested.

Baffinland has found the use of exactEarth® to be beneficial in providing information related to ship routing to the public. Baffinland will continue to use this service. Furthermore, it is Baffinland's intent to continue providing live viewing of vessel tracks through the Pond Inlet Office in 2020.

Baffinland will continue to provide information about its shipping season through MEWG correspondence and/or relevant MEWG meetings.

## Project Certificate Condition No. 151

Category	Economic Development and Self-Reliance, and Contracting and Business Opportunities - Access to housing
Responsible Parties	The Proponent
Project Phase(s)	Construction and Operations
Objective	To investigate ways that economic development and self-reliance may improve access to housing by employees.
Term or Condition	The Proponent is encouraged to investigate measures and programs designed to assist Project employees with homeownership or access to affordable housing options.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	N/A
Ref. Document Link	N/A

### METHODS

Access to affordable housing in Nunavut is the responsibility of the Government of Nunavut and the Nunavut Housing Corporation (NHC). However, with the introduction of paid employment at the Project, some Nunavut-based employees may be introduced to banking activities and programs, including savings and investment accounts and possible access to mortgages and similar opportunities, all of which may help employees with eventual home ownership.

Baffinland also regularly administers an Inuit Employee Survey, which collects data on employee housing status and other topics. Survey results are presented in the Socio-Economic Monitoring Report.

### RESULTS

Currently, there is not a clear and direct relationship between Project employment and any measures or programs undertaken by Baffinland or others and home ownership. However, Project employment should eventually act to increase the purchasing power of local residents and decrease the number of individuals receiving income support. This is expected to occur primarily through increases in local wealth generated by Project-related employment and other economic opportunities. While the manner in which Project employees spend their incomes will ultimately be a personal choice, access to adequate housing (including private ownership) may be a goal for some individuals. Incomes generated by the Project may help individuals accomplish this goal should they wish.

Baffinland provided financial literacy training at both Project locations (i.e. Mary River and Milne Port) in 2019. The individual providing the training also had several informal discussions related to financial planning with Baffinland employees while at site in 2019. Baffinland has engaged with the Nunavut Literacy Council to complete a Workplace Needs Assessment at Mary River in 2019, with other sites planned for 2020, to enable the effective delivery of these and other programs. Outcomes of these efforts will be reported as they are available. Baffinland will continue to offer financial literacy training to its employees, on an as-needed basis, in the future.

Baffinland also added two new questions to its Inuit Employee Survey in 2019 on home ownership and financial literacy training, at the request of Nunavut Housing Corporation (NHC) staff. These questions ask survey participants if they have ever considered purchasing a home in their community, and if they would be interested in attending an informational course about managing their personal finances, setting up monthly bill payments, and establishing savings goals if it was offered through their employer or local housing association. Results from the Inuit Employee Survey are summarized where relevant in the Project's Socio-Economic Monitoring Reports.

Baffinland and the GN signed a Memorandum of Understanding in 2019 to work on issues of mutual concern. Baffinland would welcome discussions on housing related issues through this forum.

The First Nations Bank of Canada (FNBC) established a branch in Pond Inlet in 2014. The FNBC also has a branch in Iqaluit, and one in Baker Lake. Though FNBC has established these branches independent of any action by Baffinland, it is likely that the establishment of the Pond Inlet branch was induced at least partly by the Project, in the same way that the branch in Baker Lake was likely induced at least partly by the Meadowbank Mine.

Furthermore, the NHC continues to make investments in new housing units across the territory and has several existing programs, which support improved access to housing for Nunavut residents. These programs include recent changes made to the Public Housing Rent Scale (in 2014) to reduce disincentives to work and encourage savings (e.g. by assessing only the incomes of the two primary tenants rather than non-primary tenants, placing limits on rent increases due to income increases every year until the rent assessed total is eventually reached). The NHC also offers home purchase assistance programs (e.g. the Nunavut Downpayment Assistance Program; Tenant to Owner Program) and home renovation and repair programs to Nunavut residents (NHC, 2016). Together, these programs and investments are expected to lead to improved housing circumstances for individuals, help reduce overcrowding, and address public housing deficits in the territory.

#### **TRENDS**

Not applicable.

#### **RECOMMENDATIONS / LESSONS LEARNED**

Not applicable.

## Project Certificate Condition No. 152

Category	Economic Development and Self-Reliance, and Contracting and Business Opportunities – IIBA contract requirements
Responsible Parties	The Proponent, Qikiqtani Inuit Association
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To improve ability of small businesses to access Project contract and sub-contract opportunities.
Term or Condition	The Qikiqtani Inuit Association is encouraged to provide the Board and the Qikiqtaaluk Socio-Economic Monitoring Committee with information regarding the effectiveness of any provisions within the Inuit Impact and Benefit Agreement which may require that larger contracts be broken down into smaller size in order that they are reasonably managed by smaller businesses in the North Baffin region, while respecting any confidential or privileged information.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not applicable
Stakeholder Review	Qikiqtani Inuit Association, Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2019 SEMWG Meeting Records
Ref. Document Link	Appendix C

### METHODS

Responsibility for implementation of this PC Condition is primarily directed towards the QIA.

In 2019, as part of IIBA implementation Baffinland and QIA finalized the IIBA Implementation Guide, which provides detailed processes and procedures to operationalize the IIBA. This includes contracting procedures designed to maximize opportunities for Inuit Firm participation in smaller and larger contracts. Implementation is regularly monitored by the IIBA Contracting Committee, and Baffinland provides quarterly reports to QIA on the number and value of contracts awarded to Inuit Firms.

Contracting and Procurement Information Tour (CPIT) information sessions were held in Clyde River, Sanirajak, Igloodik, and Pond Inlet during the second half of October 2019, with 95 individual participants and 31 Firms taking part in the information sessions in total. Kakivak Association also participated in the information sessions and presented on various funding opportunities for Inuit Firms. The purpose of this tour was to provide the opportunity for Inuit-owned businesses, aspiring entrepreneurs, and the public to learn more about the contracting provisions of the Mary River Project Inuit Impact and Benefit Agreement.

Baffinland also contributed \$275,000 to a Business Capacity and Start Up Fund in 2019 which was a continuation of previous years' contributions. The fund, which is administered by QIA, is intended to develop business capacity and enhance the ability of Inuit Firms to participate in the Project bidding process through the provision of advice and assistance related to start-up capital and financing, management development, ongoing business management, financial management, contracts and procurement or human resources management. Baffinland is currently in the

process of implementing a Contracting Database which will track Inuit firm pre-qualification status and reasons for unsuccessful pre-qualification and/or unsuccessful bids. This information will then be utilized to identify how the Business Capacity and Start Up Fund can be best utilized to maximize benefit to Inuit Firms.

Baffinland also participates in both the Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and the Mary River Socio-Economic Monitoring Working Group (SEMWG). These Working Groups provide a discussion forum and information sharing hub that supports impacted communities and interested stakeholders to take part in monitoring efforts to Project-specific economic monitoring.

Finally, in 2019 Baffinland QIA commenced planning to deliver several bid simulation workshops for Inuit Firms in 2020. During these workshops, Procurement representatives from Baffinland will provide a demonstration of Baffinlands Procurement process, and review examples of typical contract documents with attendees in detail. The objective is for smaller Inuit Firms to gain a better understanding of contracts and contracting processes, thereby facilitating their participation in economic opportunities from the Mary River Project.

Further Inuit Firm business development efforts will be informed by the Inuit Firm Survey, which was developed in 2019 and released to all Inuit Firms registered with Nunavut Tunngavik Incorporated (NTI). The survey allows Inuit Firms to identify areas in which they require the most business development support, thereby directing Baffinland and QIA efforts, as well informing the utilization of the Business Capacity and Start-Up Fund.

## **RESULTS**

Procurement with Inuit-owned businesses and joint ventures in 2019 totaled approximately \$288.8 million when measured on a commitment basis. This includes eight new contracts awarded to Inuit-owned businesses and joint ventures, all of which were based in either the North Baffin communities or Iqaluit. Since Project development, a total of approximately \$1.01 billion worth of contracts have been awarded to Inuit-owned businesses and joint ventures.

Additionally, as a direct outcome of the aforementioned CPIT information sessions, Baffinland met with aspiring entrepreneurs in North Baffin communities and executed agreements for various entrepreneurs to provide ground transportation services in their communities. This service provides ground transportation between employee homes and local aerodromes, thereby facilitating rotational travel to the Mary River site. This service has also reduced employee absenteeism at the site due to a secure method of transport. As of the end of 2019, this service is available in Arctic Bay, Clyde River, Sanirajak, Igloodik, Iqaluit, and Pond Inlet.

## **TRENDS**

Not applicable.

## **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland continues to work with the QIA through the Contracting Committee and the Joint Executive Committees to maximize Project-related benefits to Inuit Firms.

#### 4.7.5 Human Health & Wellbeing (PC Conditions 153 through 157)

Five (5) PC conditions relate to the potential impacts of the Project on human health and well-being. These conditions focus on the implementation of measures to support Inuit employed by the Project, including: the provision of employee assistance programs, addressing potential cultural conflicts at site, the provision of services or programs to benefit families in potentially affected communities to mitigate the impact of employees' absence from home, and monitoring of potential indirect effects of the Project on human health and well-being. Commitments to the provision of employee assistance and counselling are contained in the IIBA.

##### **Stakeholder Feedback**

As noted in Section 4.7.1, the key stakeholders focused on the socio-economic environment include the communities, the QIA, various departments of the GN, and the federal government. There is an inherent relationship between the Project and the Government of Nunavut for managing socio-economic effects from the Project as the GN is responsible for delivering most health and social services programs in Nunavut. Key concerns expressed by stakeholders relate to the effects of fly-in/fly-out employment on workers and their families. These concerns were raised during the environmental assessment, and also in recent consultation (Appendix B). The SEMWG and QSEMC also regularly discuss this element of the Project (Appendix C).

##### **Monitoring**

Baffinland tracks and reports on several indicators of human health and well-being. This includes reporting on the number of instances that illegal substances or alcohol are identified during security searches at the Project sites, and occupational health and safety statistics. Baffinland has also presented information on the prevalence of substance abuse, gambling issues, family violence, marital problems, rates of sexually transmitted infections and other communicable diseases, rates of teenage pregnancy, high school completion rates, proportion of tax filers with employment income and median employment income, percentage of population receiving social assistance, and other topics (e.g. crime rates) in the 2019 socio-economic monitoring report. Table 4.48 provides an evaluation of the Project's impacts on human health and well-being, based on monitoring activities completed in 2019, relative to predictions presented in the FEIS and FEIS Addendum.

Changes in human health and well-being are often more apparent over a longer term, and attributing cause can be challenging. As Project construction only began in 2013, there is a minimal amount of post-Project data currently available. Human health and well-being can also be influenced by many different socio-economic factors, including those which are external to the Project. Direct correlations between the Project and human health and well-being will only come to light with the analysis of additional annual data. However, there is currently no indication the FEIS predictions are not being met and it is expected that the Project is improving the health and well-being of some individuals and families in the LSA who participate in the Project. There were no significant injuries and no fatalities at the Project sites in 2019.

##### **Path Forward**

Baffinland will continue to deliver and refine its training and employee assistance programs, and monitor indicators of human health and well-being, in consultation with the SEMWG, the QSEMC, and the Project's workforce. Reporting on each PC condition follows.



**Table 4.48: Human Health and Well-being Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Substance Abuse	Increased substance abuse due to the transportation of substances through Project sites	Security searches of employees arriving and departing site and site searches with drug dog and trained staff.  In 2019, 24 drug and alcohol related contraband infractions occurred at Project sites amongst employees and contractors. This was a reduction from 2018. While all contraband infractions are of concern and taken seriously by Baffinland, the 24 infractions that occurred in 2019 represent only a small number of individuals from the Project workforce. All individuals who do not comply with Baffinland's no drugs/no alcohol policy are immediately removed from site and disciplinary action (up to and including termination) is commenced. Baffinland also notifies the RCMP, where appropriate, of search results.	Relevant monitoring activities for human health and well-being are longer term and conclusions will be drawn in future years
	Increased substance abuse because Project employment makes substances more affordable		
	The Company's focus on health and safety, and employee assistance and counselling programs will increase awareness of employees, reducing substance abuse	There has been an increasing trend in the number of impaired driving violation and in the number of drug violations in the North Baffin LSA in the post-development period, which was also evident prior to Project development. Conversely. There have been decreasing trends in Iqaluit and Nunavut in the post development period, which was not evident prior to Project development. Reason for lack of a similar trend reversals in the North Baffin LSA are currently unknown. As Project construction only began in 2013, there is minimal post-development data currently available. However, the area positive indications the Project continues to improve attitudes toward substances and additions in the LSA, by providing LSA residents with meaningful employment opportunities within a drug and alcohol-free environment.	
Increased Well-being and Community Social Stability	Project employment resulting in increased well-being of children, and increased community social stability	There are positive indications the Project is contributing to the enhanced well-being of children, by providing LSA residents (and parents) with opportunities to obtain meaningful employment and incomes. These opportunities can help reduce the various family stresses and uncertainties associated with un- and under-employment. Baffinland has also implemented an Employee and Family Assistance Program for workers and their family members who may require family-related or other forms of personal assistance. There are also positive indications the Project continues to improve household income and food security in the LSA. This has occurred	Relevant monitoring activities for human health and well-being are longer term and conclusions will be drawn in future years

Component	Effects	Monitoring Program	Impact Evaluation
		<p>through contributions to community wellness initiatives and by providing LSA residents with meaningful employment opportunities. Increased employment income facilitates the purchase of store-bought food and other family goods, while also providing an improved means to participate in harvesting.</p> <p>As Project construction only began in 2013, there is a minimal amount of post-Project data currently available. Correlations between the Project the various indicators being tracked (e.g. youth crime, employment income, social assistance rates), if any, will only come to light with the analysis of additional annual data.</p>	

## Project Certificate Condition No. 153

Category	Human Health and Well-Being - Employee and family health and well-being
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Closure and Post-Closure Monitoring
Objective	To provide adequate medical services on site, including those that contribute to the mental health and well-being of all employees.
Term or Condition	The Proponent is encouraged to employ a mental health professional to provide counselling to Inuit and non-Inuit employees in order to positively contribute toward employee health and well-being.
Relevant Baffinland Commitment	96
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	2019 Socio-Economic Monitoring Report (Baffinland, 2020p)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

Baffinland's benefit plan includes an Employee and Family Assistance Program (EFAP), which offers all permanent employees and their dependents professional short-term counselling on an as-needed basis. In addition, on-site Inuit Cultural Advisors are available for the Project's Inuit employees to meet with and Baffinland provides all employees with regular access to an on-site Project physician assistant. Furthermore, Section 11.7 of the IIBA commits Baffinland to the development and operation of a Community Counsellors Program in the communities of Arctic Bay, Clyde River, Sanirajak, Igloolik, and Pond Inlet.

The Community Counsellor Program was developed in 2019 in collaboration with Clyde River's Ilisaqsiq Society. Full time counsellors are employed as of report writing in Sanirajak, Igloolik, and Clyde River. Sustained efforts are underway to identify candidates interested and qualified to function as counsellors in Pond Inlet and Arctic Bay.

### RESULTS

In 2019 there were a total of 60 EFAP cases. This is 19 cases more than in 2018. Employees and their families who reside in Nunavut accounted for 30.4% of annual EFAP use. Furthermore, there were 6,436 recorded visits to the on-site Project site physician's assistant in 2019, an increase of 135 visits from 2018.

### TRENDS

A summary of monitoring results and trends is provided in Table 4.49. Detailed results are presented in the Socio-Economic Monitoring Report.

**Table 4.49: Employee Health and Counselling Indicators and Trends in 2019**

Indicator / Topic	Pre Dev't Trend	Post Dev't Trend	Trend Since Prev. Year	Scale	Summary
Number of times the Project EFAP is accessed	Not applicable	↑	↑	Project	The EFAP was accessed 60 times in 2019; 14 of these were by Nunavummiut
Number of visits to Project site physician assistant	Not applicable	↑	↑	Project	There were 6,436 visits to the Project site physician assistant in 2019; 1,648 of these were by Inuit

**Notes:**

1. Black arrows (↑↓) indicate the direction of change that has occurred. Where there is no discernable or significant change 'No change' is used. Where there are insufficient data or other issues preventing a trend analysis, 'Not available' or 'Not applicable' are used.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland has received informal positive feedback about the presence of Inuit Cultural Advisors (previously called on-site Elders) on site to work with and mentor Baffinland employees. Baffinland will maintain the employment of Inuit Cultural Advisors on site, per IIBA Article 11.8. Baffinland has also received direct positive feedback on the deployment of the Community Counsellors Program and would like to take this opportunity to thank the Ilisaqsivik Society for their ongoing work and effort to support this program. Baffinland will also continue to explore other options and opportunities to provide support to its Inuit employees.

## Project Certificate Condition No. 154

Category	Human Health and Well-being - Indirect impacts to health and well-being
Responsible Parties	The Proponent, Government of Nunavut, members of the QSEMC
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To understand the indirect impacts of the Project upon health and well-being.
Term or Condition	The Proponent shall work with the Government of Nunavut and the Qikiqtaaluk Socio-Economic Monitoring Committee to monitor potential indirect effects of the Project, including indicators such as the prevalence of substance abuse, gambling issues, family violence, marital problems, rates of sexually transmitted infections and other communicable diseases, rates of teenage pregnancy, high school completion rates, and others as deemed appropriate.
Relevant Baffinland Commitment	43, 45
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2019 Socio-Economic Monitoring Report (Baffinland, 2020p) 2019 QSEMC and SEMWG Meeting Records Socio-Economic Monitoring Plan (Baffinland, 2019k)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Baffinland has provided information on potential indirect effects of the Project in the Socio-Economic Monitoring Report. This includes information (where available) on the prevalence of substance abuse, gambling issues, family violence, marital problems, rates of sexually transmitted infections and other communicable diseases, rates of teenage pregnancy, high school completion rates, and other topics (e.g. crime rates).

### RESULTS

See 'Trends' below for summarized results. Detailed results are presented in the Socio-Economic Monitoring Report.

### TRENDS

A summary of monitoring results and trends is provided in Table 4.50. Detailed results are presented in the Socio-Economic Monitoring Report.

**Table 4.50: Socio-Economic Indicators and Trends for Potential Indirect Effects in 2019**

Indicator / Topic	Pre Dev't Trend	Post Dev't Trend	Trend Since Prev. Year	Scale	Summary
Number of drug and alcohol related contraband infractions at Project sites	Not applicable	↑	↓	Project	There were 24 drug and alcohol related contraband infractions at Project sites in 2019.
Number of impaired driving violations	↑ ↑	↑ ↓	↑ ↑	N. Baffin LSA Iqaluit	An increasing post-development trend in the number of impaired driving violations is apparent in the North Baffin LSA and was evident prior to the Project. A decreasing trend is apparent in Iqaluit, which was not evident prior to the Project.
Number of drug violations	↑ ↑	↓ ↓	↓ ↓	N. Baffin LSA Iqaluit	A decreasing post-development trend in the number of drug violations is apparent in the LSA, which was not evident prior to the Project.
Prevalence of gambling issues	Not available	Not available	Not available	Project	These topics continue to be tracked through the QSEMC process and community engagement conducted for the Project.
Prevalence of family violence					
Prevalence of marital problems					
Rates of teenage pregnancy					
Percent of health centre visits related to infectious diseases	↓ ↓	↑ ↓	↑ ↑	N. Baffin LSA Iqaluit	An increasing post-development trend in the percent of health centre visits related to infectious diseases is apparent in the North Baffin LSA, which was not evident prior to the Project. A decreasing post-development trend is apparent in Iqaluit and was evident prior to the Project.
Number of secondary school graduates	↑ ↑	↓ ↓	↑ ↓	N. Baffin LSA Iqaluit	A decreasing post-development trend in graduation numbers is apparent in the LSA, which was not evident prior to the Project.
Secondary school graduation rate	↑	↓	↑	Region	A decreasing post-development trend in graduation rates is apparent in the region, which was not evident prior to the Project.

Indicator / Topic	Pre Dev't Trend	Post Dev't Trend	Trend Since Prev. Year	Scale	Summary
Crime rate	↑ ↑	↑ ↓	↑ ↓	N. Baffin LSA Iqaluit	An increasing post-development trend in crime rates is apparent in the North Baffin LSA and was evident prior to the Project. A decreasing trend is apparent in Iqaluit, which was not evident prior to the Project.

**Note:**

1. Black arrows (↑↓) indicate the direction of change that has occurred. Where there is no discernable or significant change 'No change' is used. Where there are insufficient data or other issues preventing a trend analysis, 'Not applicable' or 'Not available' are used.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland continues to provide information on potential indirect effects of the Project through its Socio-Economic Monitoring Reports and complies with this Term and Condition. In instances where appropriate community-level indicator data are currently unavailable (e.g. for the topics of prevalence of gambling issues, prevalence of family violence, prevalence of marital problems, and rates of teenage pregnancy), these topics continue to be tracked through the QSEMC process and community engagement conducted for the Project.

Baffinland is working to increase its engagement of Community Services Providers (i.e. educators, RCMP, Health Care providers) in an effort to better understand these potential indirect effects and to discuss ways in which the Company can partner with Inuit Associations, and Governments to come up with solutions to them.

Further, Baffinland is investigating the establishment of alcohol and narcotics anonymous programs at Site as an additional support to employees.

Baffinland is also open to discussing with the SEMWG and QSEMC how improved monitoring data may be obtained.

## Project Certificate Condition No. 155

Category	Human Health and Well-being - Employee cohesion
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To encourage the on-site cohesion of employees through cultural-awareness and social programs.
Term or Condition	The Proponent is strongly encouraged to provide the NIRB with an updated report on its development of mitigation measures and plans to deal with potential cultural conflicts which may occur at site as these may become needed.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be provided at least 60 days prior to the commencement of any construction activities.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland is committed to promoting employee cohesion through cultural awareness and social programs. In 2019, Baffinland continued to provide cultural recognition programs such as cultural awareness, promotion of Inuktitut in the workplace and Inuit Cultural Advisors (formerly referred to as on-site Elder's) support for Inuit employees.

Baffinland takes every opportunity as an organization to celebrate Inuit Societal Days with all employees and contractors. Nunavut Day celebrates the official division of Nunavut from the Northwest Territories and the official recognition of Nunavut as an independent territory. In 2019, Baffinland celebrated the 25th anniversary of the signing of the Nunavut Land Claims Agreement with a week of celebration of Inuit culture. Baffinland hosted a country food feast for all employees and the Baffinland social committee organized Inuit games. We also welcomed special guest, Angela Amarualik from Igloolik, Nunavut, to perform her music that won her the Indigenous Music Award for Best Inuit, Indigenous Language, or Francophone Album.

On November 8<sup>th</sup>, 2019 Baffinland held a series of events to celebrate International Inuit day on site. Reesie Churchill, one of Baffinlands Cultural Advisors, lead a seal skin mitt making workshop at both Port and Mine site locations. She began each workshop with a lighting of the Qulliq and the four workshops that were held had significant turnout of both Inuit and non-Inuit employees. In addition to these workshops, Baffinlands social committee held a games night where the string game was played in the Sailiivik Games.

Consistent with the provisions of the IIBA, Baffinland has also instituted measures to reduce and address potential cultural conflicts at site, including:

- Mandatory cultural awareness training provided to all new employees and contractors;
- Providing culturally appropriate working conditions, including the use of Inuktitut in the workplace;
- Maintaining up to four (4) on-site Inuit Cultural Advisors to provide counselling services;
- Maintaining up to four (4) on-site Human Resources Advisor - Inuit Relations;



- In 2019 hiring two (2) Inuit Success Assurance Facilitators;
- In 2019 ensuring one (1) Inuit Engagement Coordinator was in place;
- In 2019 ensuring one (1) IIBA Employment and Training Specialist was in place;
- Updates to the Inuktitut in the Workplace Policy which was updated in Q4 2019;
- Continuing access to the country food kitchen provided for the consumption and sharing of traditional country food and activities; and
- Ongoing translation of signage and policies on site to ensure effective communications to and for the safety of all employees.

In the 4<sup>th</sup> quarter of 2019, Baffinland initiated a 3<sup>rd</sup> party confidential phone line to report any complaints or concerns. This allows the employee to be confident that their complaint will be heard and that there will be no retaliation or negative impact from bringing concerns forward.

Baffinland is committed to continuing to deliver the Inuit Cultural Engagement Workshop to all employees at site. This workshop exposes non-Inuit to the cultures and traditions of the Inuit and provides for a much greater level of understanding.

The Inuit Success Assurance team was created in the 4<sup>th</sup> quarter of 2019 and is now available to work with all employees, Inuit and Non-Inuit to increase engagement and improve communications. This team has been actively involved with reaching out to Inuit employees, discussing concerns, and assisting them to speak with their supervisors or managers.

Baffinland makes the Employee Family Assistance Program available to all employees who may wish to talk to someone or to get help dealing with any concerns. This is available in both English and Inuktitut.

## RESULTS

The Inuit Success Assurance team is showing early signs of success which can be built upon. In November 2019 this group came together to attend training and development. The Inuit Success Assurance Team reviewed and updated the Inuit Cultural Engagement Workshop, and by using shared experience and knowledge significantly improved this program. At that time the team also completed a train the trainer workshop that prepared them to deliver both the Inuit Cultural Engagement Workshop as well as the Community Work Ready Training Program to team members and within the communities. Both of these programs are now being delivered on a regular basis by the Inuit Success Assurance Team.

Significant work has been completed on Career Paths, which is an opportunity to have an individual focused conversation with each Inuit employee in regards to their current role, future ambitions, and best path to achieve future goals. Career Path conversations began in the first quarter of 2020 after significant work in 2019 to develop and plan for the implementation of this new development resource.

In addition to 4 quarterly Cultural activities which in 2019 included events such as drum making, seal skin mitt making etc., the Cultural Advisors at site often do smaller events such as Bannock Making or sewing with both Inuit and Non-Inuit together, which helps to build comradeship and a better understanding and awareness amongst the team.

## TRENDS

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland is committed to supporting Inuit employees at site and continuing to build cultural awareness and understanding amongst the entire Baffinland team. A number of initiatives are planned for 2020 to increase cultural awareness and reduce conflict including:

- Measures to promote the use of Inuktitut (ongoing efforts to translate signs / manuals – will continue in 2020);
- Investigate providing language lessons on site for interested employees;
- Continued review and enhancement of cross-cultural training programs and on-boarding orientation programs; and
- Delivery of presentations (on-site and at corporate head office) relating to Inuit culture and the IIBA.

## Project Certificate Condition No. 156

Category	Human Health and Well-Being - Support Initiatives
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To assist with fostering well-being within point-of-hire communities.
Term or Condition	The Proponent is encouraged to assist with the provision and/or support of recreation programs and opportunities within the potentially affected communities in order to mitigate potential impacts of employees' absences from home and community life
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	N/A
Ref. Document Link	N/A

### METHODS

An Ilagiiktunut Nunalinnullu Pivalliajutisait Kiinaujat Fund (the Fund) has been established under Article 12 of the IIBA (Support for Communities). The objectives of the fund include:

- Creation of opportunities for community capacity building;
- The fair distribution of impacts and benefits between communities and across generations;
- Maintenance of consistency with community development objectives; and
- Promotion of mutual understanding and learning.

The Fund is intended to support a wide range of activities including participation in community projects, youth and Elder programs, hunter support activities, cultural learning and revitalization, social support programs for families and individuals and counseling and healing programs. Baffinland and QIA each contributed \$375,000 annually to the fund which is administered by QIA from 2013 to 2020. Through successful IIBA renegotiations in 2018, the Company and QIA further agreed that commencing in 2019, maximum annual matching contributions to the Fund by the Company will be increased but shall not exceed \$550,000 annually. Baffinland also supported numerous community centered events and activities in 2019. This includes, but is not limited to, community snowmobile races, fishing derbies, square dances, community feasts, as well as various sports team travel and sponsorship. These activities directly supported participation in recreation programming, specifically the participation of Inuit youth.

As a responsible corporate citizen, Baffinland is committed to assisting the North Baffin Communities with sponsorship requests. A few additional initiatives which were supported in 2019 include:

- Baffinland was a key sponsor of the Experiences Canada Cultural Exchange Program between the Mittimatalik (Pond Inlet) Minor Hockey Association and the Mimico Canadians Minor Hockey Association during the first quarter of 2019. Experiences Canada funds youth exchanges between Indigenous and non-Indigenous communities as well as Indigenous groups to other Indigenous groups. These culturally enriching exchanges provide youth with an opportunity to share their culture, language and traditions while enhancing

their pride and respect for their community. From March 22-29, 16 youth from Pond Inlet travelled to Ontario to participate in this program. This exchange was also showcased on Hockey Night in Canada.

- Baffinland was proud to be a Platinum Sponsor for the Nunavut Trade Show & Conference. This event is Northern Canada's largest annual business to business (B2B) event, bringing together all levels of government, Inuit Organizations, Nunavut and southern businesses, investors, entrepreneurs for three days of powerful networking.
- Baffinland supported the Recreation and Parks Association summer camp program that is held in Arctic Bay, Pond Inlet, Sanirajak, Igloodik and Clyde River.
- Baffinland supported the Arctic Inspiration Prize. This prize recognizes excellence and encourages teamwork among diverse groups in order to use or expand Arctic knowledge and bring it into action for the decisive benefit of the Canadian Arctic, its inhabitants and Canada as a whole.
- Baffinland supported the Saavittut Program in 2019. This is a pre-expedition program for students and staff at Nunavut Sivuniksavut and focuses on supporting Inuit youth.
- Qajuqturvik Food Centre donation of \$15,258.42 for the great career training they do for community members in Iqaluit and daily preparation of healthy meals and takeaway lunches.
- Baffinland donated \$50,000 to the Municipality of Arctic Bay in Nunavut in support of reopening the Tununirusiq Daycare for preschool children.

Baffinland acknowledges that the mental health of all its employees (both Inuit and Non-Inuit) is just as important as their physical health. Adequate mental health is necessary to complete work-related tasks safely and effectively in addition to maintaining a positive work-life balance.

Pursuant to IIBA Article 11.6, Baffinland provides employees with access to professional career and personal counselling on an as-needed basis. Baffinland offers five types of counselling and support services:

- Employee and Family Assistance Program (EFAP);
- Site Cultural Advisors;
- Human Resource Advisor- Inuit Relations;
- On-Site physician's assistants;
- Community Counsellors Program.

The Community Counsellors Program, which operates in Arctic Bay, Clyde River, Sanirajak, Igloodik and Pond Inlet, provides in-person counselling support for all individuals living in all Point of Hire communities. Counsellors are trained professionals with expertise and experience in addressing trauma and related mental health care issues and concerns in a culturally appropriate way. Baffinland and the Qikiqtani Inuit Association (QIA) have been working closely with the Ilisaqsvik Society to design and support this Community Counselor Program.

Baffinland committed in 2019 to develop and begin implementation of the Arnait Action Plan. This Action Plan identifies barriers to employment, and then develops methods of reducing or eliminating those barriers. In 2019 two separate focus groups were conducted. The first was conducted in Arctic Bay with a group who did not currently work at Baffinland. The second focus group was conducted at the Mary River site and involved a group of current employees. In October 2019, Baffinland brought together a group of government, and non-government organizations along with a facilitator to conduct an Arnait Action Plan Round Table working group. At that time, all identified barriers from the two previous focus groups were explored, and potential solutions were discussed. Following this, a report was produced by the facilitator and all participants of the Round Table Working Group helped

to prepare a three year Arnait Action Plan. This Action Plan will begin to be implemented in 2020 and will continue until 2023.

## **RESULTS**

Baffinland realized great success with the Cultural Awareness activities that were undertaken. These activities helped to build cultural awareness and also brought the entire team together to participate in celebrations. For our Inuit employees these societal day celebrations showed that Baffinland recognizes the importance of these milestones, and wants to help in celebrating these important dates. For Non-Inuit team members, having the opportunity to participate in celebrations of Inuit Societal Days, builds their awareness and understanding of their fellow team members, and a greater understanding and respect for Nunavut.

Baffinland is proud to be able to support numerous community projects and activities. Providing support to these types of events and activities gives Baffinland a greater sense of being involved in each of our North Baffin Communities. Supporting youth activities, and community social well being activities is something that Baffinland is both honoured and glad to be able to be a part of.

Baffinland continues to review our various health and well being initiatives and activities to ensure they are meeting the needs of our employees and their families. Continuing training and development strengthens all of these resources, and provides a greater opportunity to meet the needs of our employees and their families as well as the communities.

Awareness of barriers for both our employees and potential employees, and having a plan to help reduce or eliminate some of these barriers is an effective way of ensuring a ready, able and willing labour force. The greater our ability to reduce or eliminate barriers, the larger number of available employees from the communities will be available to work with Baffinland. This will be a great benefit to both our communities, our employees, and Baffinland.

## **TRENDS**

Not applicable.

## **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to plan and implement cross cultural awareness activities for all employees. In addition, Baffinland will continue to develop and implement continued support and training for key staff who can in turn greatly impact the satisfaction of our employees with their employment, and their employer. Building a greater understanding of our communities will help to ensure we understand the needs, and are available to help with support and guidance where possible. Implementation of the Arnait Action Plan will have lasting impacts for both our current and future workforce, and Baffinland is committed to being successful with this endeavour.

## Project Certificate Condition No. 157

Category	Human Health and Well-Being - Counseling and treatment programs
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To make available, necessary treatment and counseling services for employee and family well-being.
Term or Condition	The Proponent should consider providing counseling and access to treatment programs for substance and gambling addictions as well as which address domestic, parenting, and marital issues that affect employees and/or their families.
Relevant Baffinland Commitment	96
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	2019 Socio-Economic Monitoring Report (Baffinland, 2020p)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

Baffinland's benefit plan includes an Employee and Family Assistance Program (EFAP), which offers all permanent employees and their dependents professional short-term counselling on an as-needed basis. In addition, on-site Inuit Cultural Advisors are available for the Project's Inuit employees to meet with, and Baffinland provides all employees with regular access to an on-site Project site physician's assistant. Furthermore, Section 11.7 of the IIBA commits Baffinland to the development and operation of a Community Counsellors Program in the communities of Arctic Bay, Clyde River, Sanirajak, Igloolik, and Pond Inlet.

### RESULTS

In 2019 there were a total of 60 EFAP cases. This is 19 cases more than in 2018. Employees and their families who reside in Nunavut accounted for 30.4% of annual EFAP use. Furthermore, there were 6,436 recorded visits to the on-site Project site physician's assistant in 2019, an increase of 135 visits from 2018.

### TRENDS

A summary of monitoring results and trends is provided in Table 4.51. Detailed results are presented in the Socio-Economic Monitoring Report.

**Table 4.51: Employee Health and Counselling Indicators and Trends in 2019**

Indicator / Topic	Pre Dev't Trend	Post Dev't Trend	Trend Since Prev. Year	Scale	Summary
Number of times the Project EFAP is accessed	Not applicable	↑	↑	Project	The EFAP was accessed 60 times in 2019; 14 of these were by Nunavummiut
Number of visits to Project site physician assistant	Not applicable	↑	↓	Project	There were 6,436 visits to the Project site physician's assistant in 2019; 1,648 of these were by Inuit

Note:

1. Black arrows (↑↓) indicate the direction of change that has occurred. Where there is no discernable or significant change 'No change' is used. Where there are insufficient data or other issues preventing a trend analysis, 'Not available' or 'Not applicable' are used.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to provide employee access to an EFAP, on-site Cultural Advisors, and a Project-site physician assistant, and is committed to the development and operation of a Community Counsellors Program. Baffinland also encourages its employees and stakeholders to provide feedback on how its various programs and initiatives can be improved in the future. For example, Baffinland's Workplace Conditions Review process (required under the IIBA) has previously reviewed aspects of the counselling and support services available to Project employees.

Baffinland is working to increase its engagement of Community Services Providers (i.e. educators, RCMP, Health Care providers) in an effort to better understand these potential indirect effects and to discuss ways in which the Company can partner with Inuit Associations, and Governments to come up with solutions to them.

Further, Baffinland is investigating the establishment of alcohol and narcotics anonymous programs at Site as an additional support to employees.

#### 4.7.6 Community Infrastructure and Public Services (PC Conditions 158 through 161)

Four (4) PC conditions relate to the potential impacts of the Project on community infrastructure and public services. All four conditions name the GN as the responsible party for implementation of these conditions. NIRB encourages Baffinland to work with the GN to address public service issues, particularly those that may be adversely affected by the Project.

##### Stakeholder Feedback

Key stakeholders focused on community infrastructure and public services include community members, Hamlet administrations, the QIA, the GN, and CIRNAC. The GN is the primary stakeholder, since it is responsible for the delivery of many public services. Hamlets expressed concern that skilled workers may leave their workforce to work for the Project, resulting in a skills gap, at least temporarily. Some Project employees and contractors have left positions in their communities to pursue employment at the Project. However, the recent Mary River Experience – The First Three Years report (BDSI, 2016) describes a lack of full-time hamlet work in many communities and the important role the Project plays in filling this gap. Potential opportunities for the community to realize new community infrastructure as a result of the Project continue to be expressed. This has included receiving retired heavy equipment from the Project, or about Baffinland purchasing, renovating, and renting buildings in the community (Appendix B).

##### Monitoring

Baffinland has conducted Employee Information Surveys in 2017, 2018 and 2019. Results are provided in the annual socio-economic monitoring reports. Baffinland also reports on indicators pertaining to competition for skilled workers, labour force capacity, pressures on existing health and social services provided by the GN that may be impacted by Project-related in-migration of employees, and on Project-related pressures on community infrastructure. Table 4.52 provides an evaluation of the Project's impacts on community infrastructure and public services, based on monitoring activities completed in 2019, relative to predictions presented in the FEIS and FEIS Addendum.

**Table 4.52: Community Infrastructure and Public Services Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Recruitment and Retention of Hamlet Employees	Competition for skilled workers may lead to temporary effects on municipal services	Based on the 2019 Employee Information Survey (71 surveys received), 17 Project employees (or 26.6%) indicated they had left positions in their communities to pursue employment at the Project. Of these, 9 were casual/part-time positions, while 7 were full-time positions.	Effect within FEIS predictions
Education and Skills	Long term improvement in labour force capacity	Since 2013, the Project has cumulatively generated 194,991 hours of training for Project employees, 34,629 hours (or 48.1%) of which were completed by Inuit employees (this does not include the additional training and experience gained by Project contractors). Likewise, 11,919,376 hours of labour have been cumulatively performed in Nunavut as a result of the Project since 2013, 1,919,267 hours (or 16.1%) of which were performed by Inuit employees and contractors.	Long-term effect to be realized over time



It is also expected that ongoing training and experience generated by the Project, in addition to regular employee turnover, will continue to increase the pool of skilled workers in the local labour force and negate any short-term, negative Project effects. Effects to community infrastructure and public services as a result of Project employment are consistent with FEIS predictions. An overall improvement in the capacity of the local labour force will occur and become apparent with time.

**Path Forward**

Baffinland will continue to monitor this aspect of the socio-economic environment, and will discuss monitoring results with the SEMWG. Reporting on each PC condition follows.

## Project Certificate Condition No. 158

Category	Community Infrastructure and Public Services – Impacts to health services
Responsible Parties	The Proponent, Government of Nunavut
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To monitor indirect Project impacts to health and social services provided by the Government of Nunavut.
Term or Condition	The Proponent is encouraged to work with the Government of Nunavut and other parties as deemed relevant in order to develop a Human Health Working Group which addresses and establishes monitoring functions relating to pressures upon existing services and costs to the health and social services provided by the Government of Nunavut as such may be impacted by Project-related in-migration of employees, to both the North Baffin region in general, and to the City of Iqaluit in particular.
Relevant Baffinland Commitment	43
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2019 Socio-Economic Monitoring Report (Baffinland, 2020p) 2019 QSEMC and SEMWG Meeting Records Socio-Economic Monitoring Plan (Baffinland, 2019k)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Baffinland continues to engage the QSEMC and SEMWG on its socio-economic monitoring program; the Government of Nunavut (GN) actively participates in both these groups. Baffinland also signed an updated Memorandum of Understanding (MOU) with the GN Department of Health in 2017 regarding site health services and medevac procedures. More specifically, this MOU describes the health care staff and services Baffinland will provide on-site, including procedures Baffinland will follow during medevac situations, for pre-employment medical examinations, and for the reporting and management of communicable diseases, amongst other topics. The MOU also describes how Baffinland will pay for and/or reimburse the GN Department of Health for costs associated with the medical transportation of employees and for conducting pre-employment medical exams.

Baffinland has provided information on potential socio-economic effects of the Project in its Socio-Economic Monitoring Report. This includes indicator data related to pressures on existing health and social services provided by the GN that may be impacted by Project-related in-migration of employees (e.g. percentage of the population receiving social assistance, percent of health centre visits related to infectious diseases, total and per capita number of health centre visits, number of visits to Project site physician assistant).

## RESULTS

Summary results and trends in socio-economic monitoring data are presented in Table 4.53. Detailed results are presented in the Socio-Economic Monitoring Report.

In-migration of workers is one way the Project could negatively affect health and social service provision in the LSA. Company monitoring data suggest North Baffin Local Study Area (LSA) in-migration is not occurring in any significant manner (see Sections 3.1.2 and 3.1.3 of the Socio-Economic Monitoring Report). Company monitoring data for Iqaluit are more limited, but a net of +1 individuals are known to have moved from the North Baffin LSA into Iqaluit since 2015 (data obtained from annual BCLO survey discussed in Section 3.1.2 of the Socio-Economic Monitoring Report). More generally, Section 3.1.5 of the Socio-Economic Monitoring Report indicates an average of 85 Inuit and 2 non-Inuit employees / contractors with known origins lived in Iqaluit in 2019. Appropriate government-sourced migration data for the LSA are otherwise unavailable. However, the Project may also be contributing positively to LSA health service provision, by providing employees with regular access to an on-site Project physician assistant and by providing various counselling and support services (e.g. EFAP, on-site Cultural Advisors, commitment to establish a Community Counsellor Program).

**Table 4.53: Selected Human Health and Well-Being Indicators and Trends in 2019**

Indicator / Topic	Pre Dev't Trend	Post Dev't Trend	Trend Since Prev. Year	Scale	Summary
Percentage of population receiving social assistance	↓ ↓	↓ ↓	↑ ↑	N. Baffin LSA Iqaluit	A decreasing post-development trend in the percentage of the population receiving social assistance is apparent in the LSA and was evident prior to the Project.
Percent of health centre visits related to infectious diseases	↓ ↓	↑ ↓	↑ ↑	N. Baffin LSA Iqaluit	An increasing post-development trend in the percent of health centre visits related to infectious diseases is apparent in the North Baffin LSA, which was not evident prior to the Project. A decreasing post-development trend is apparent in Iqaluit and was evident prior to the Project.
Number of health centre visits (total)	↑ ↑	↑ ↑	↓ ↓	N. Baffin LSA Iqaluit	An increasing post-development trend in the total number of health centre visits is apparent in the LSA and was evident prior to the Project.
Number of health centre visits (per capita)	↑ ↑	↑ ↑	↓ ↓	N. Baffin LSA Iqaluit	An increasing post-development trend in the per capita number of health centre visits is apparent in

Indicator / Topic	Pre Dev't Trend	Post Dev't Trend	Trend Since Prev. Year	Scale	Summary
					the LSA and was evident prior to the Project.
Number of visits to Project physician assistant	Not applicable	↑	↑	Project	There were 6,436 visits to the Project site physician's assistant in 2019; 1,648 of these were by Inuit.

Note:

1. Black arrows (↑↓) indicate the direction of change that has occurred. Where there is no discernable or significant change 'No change' is used. Where there are insufficient data or other issues preventing a trend analysis, 'Not available' or 'Not applicable' are used.

## TRENDS

Trends are presented in Table 4.53.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to provide information related to pressures on existing health and social services provided by the GN that may be impacted by Project-related in-migration of employees. Baffinland will also continue to engage the SEMWG and QSEMC on its socio-economic monitoring program.

In 2019, Baffinland employed the services of a private physician to conduct certain pre medical clearance services for Baffinland in the North Baffin Communities. Two (2) pilot sessions were conducted in 2019. Baffinland is evaluating the feasibility of continuing this service into the future as an additional measure to avoid potential impacts on community health services.

## Project Certificate Condition No. 159

Category	Community Infrastructure and Public Services – Impacts to infrastructure
Responsible Parties	The Proponent, Government of Nunavut
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To monitor Project-related impacts to infrastructure within the Local Study Area communities.
Term or Condition	The Proponent is encouraged to work with the Government of Nunavut to develop an effects monitoring program that captures increased Project- related pressures to community infrastructure in the Local Study Area communities, and to airport infrastructure in all point-of-hire communities and in Iqaluit.
Relevant Baffinland Commitment	43
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2019 Socio-Economic Monitoring Report (Baffinland, 2020p) 2019 QSEMC and SEMWG Meeting Records Socio-Economic Monitoring Plan (Baffinland, 2019k)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Baffinland continues to engage the QSEMC and the SEMWG on its socio-economic monitoring program and the Government of Nunavut (GN) actively participates in both these groups. Baffinland also provides information on potential socio-economic effects of the Project in the Socio-Economic Monitoring Report. This includes indicator data related to increased Project-related pressures to community and airport infrastructure in the Local Study Area (LSA) communities (i.e. Arctic Bay, Clyde River, Sanirajak, Igloolik, Pond Inlet, and Iqaluit).

### RESULTS

Like previous years, Baffinland has continued to use some LSA community infrastructure to support ongoing Project development. This use is small in comparison to other ongoing community uses but does add some incremental pressure on LSA facilities. However, Baffinland’s rental of office spaces in the LSA is generally limited to small facilities (i.e. to support individual BCLOs and Northern Affairs staff), and the use of local meeting rooms and accommodations is often intermittent and short-term in nature (e.g. community meetings only occur a limited number of times per year). Furthermore, the use of these spaces is a positive economic contribution of the Project to local economies (e.g. through payments of rental fees, purchase of related goods and services).

LSA community airports also regularly accommodate various non-Project passenger, cargo, and other aircraft (both scheduled and charter). Project-related aircraft movements add some incremental pressure on these facilities. For example, in 2018 (the most recent year data were available) there were a total of 26,699 aircraft movements within

the LSA. This includes 7,540 aircraft movements at North Baffin LSA airports (Statistics Canada, a) and 19,159 aircraft movements at the Iqaluit airport (Statistics Canada, b). Project-related aircraft movements at LSA community airports in 2018 represent a small portion (8.4%) of this total. 2019 monitoring results are summarized in Table 4.54.

**Table 4.54: 2019 Monitoring Results for Selected Community Infrastructure and Public Services Indicators**

Indicator / Topic	Pre Dev't Trend	Post Dev't Trend	Trend Since Prev. Year	Scale	Summary
Baffinland use of LSA community infrastructure	Not applicable	↑	No change	Project	Baffinland continued to use some LSA community infrastructure to support ongoing Project development in 2019
Number of Project aircraft movements at LSA community airports	Not applicable	↑	↑	Project	There were 2,253 Project aircraft movements at LSA airports in 2019

**Note:**

Black arrows (↑↓) indicate the direction of change that has occurred. Where there is no discernable or significant change 'No change' is used. Where there are insufficient data or other issues preventing a trend analysis, 'Not available' or 'Not applicable' are used.

## TRENDS

Trends are presented in Table 4.54.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to provide information related to increased Project-related pressures to community infrastructure in the LSA communities, and to airport infrastructure in all point-of-hire communities and in Iqaluit, in the Socio-Economic Monitoring Report. Baffinland will also continue to engage the SEMWG and QSEMC on the Project's socio-economic monitoring program.

## Project Certificate Condition No. 160

Category	Community Infrastructure and Public Services – Distribution of benefits
Responsible Parties	The Proponent, Qikiqtani Inuit Association, Government of Nunavut
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure the distribution of benefits is done in a way that off-sets Project-related impacts to infrastructure or services.
Term or Condition	The Government of Nunavut and the Qikiqtani Inuit Association are encouraged to cooperate to ensure in a broad sense, that Project benefits are distributed across impacted communities and across various demographic groups within these communities in a manner that best offsets any Project-related impacts to infrastructure or services.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association (QIA) and Government of Nunavut (GN)
Reference	The Mary River Project Inuit Impact and Benefit Agreement Between Qikiqtani Inuit Association and Baffinland Iron Mines Corporation (QIA and Baffinland, 2018) 2019 Socio-Economic Monitoring Report (Baffinland, 2020p)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

While Baffinland cannot influence how the QIA and GN cooperate with one another, the Proponent regularly engages with both organizations to help ensure Project benefits are distributed appropriately and Project-related impacts are addressed.

Baffinland produces an annual Socio-Economic Monitoring Report and regularly engages the QSEMC and SEMWG to discuss socio-economic impacts and benefits of the Project. GN and QIA representatives are members of both the QSEMC and SEMWG. Furthermore, Baffinland regularly communicates with the QIA on various matters related to the Mary River Project Inuit Impact and Benefit Agreement (IIBA; QIA and Baffinland 2018).

### RESULTS

The Socio-Economic Monitoring Report identifies positive effects the Project has had. 4.35 million hours of Project labour were performed by Baffinland employees and contractors in 2019, equal to approximately 2,159 FTEs. Of this total, 580,197 hours were worked by Inuit, representing approximately 288 FTEs. A total of 16.2 million hours of Project labour have been performed since Project development, of which 2.5 million hours have been performed by Inuit. In addition, \$20.23 million in payroll was provided to Project Inuit employees in 2019 and, since 2014, Baffinland has provided \$65.5 million in payroll to its Inuit employees. Likewise, \$288.8 million was spent on contracting with Inuit Firms in 2019. A total of \$1.25 billion has been awarded to Inuit Firms since Project development.

Various programs under the IIBA also continue to operate, such as the Ilagiiktunut Nunalinnullu Pivalliajutsait Kiinaujat (INPK) Fund (which provides up to \$1.1 million/year for community wellness-focused projects in the North Baffin) and the Business Capacity and Start-Up Fund (which provides up to \$275,000/year to Inuit Firms to assist with locating start-up capital and financing, management development, ongoing business management, financial management, contracts and procurement, and human resources management). Several other Project-related initiatives are also addressed directly in the IIBA.

**TRENDS**

Not Applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to engage the QIA and GN, where appropriate, to help ensure that Project benefits are distributed across impacted communities and across various demographic groups within these communities, and to help offset any Project-related impacts to infrastructure or services in the communities. Baffinland and the GN signed a Memorandum of Understanding (MOU) in 2019 to address areas of mutual interest.



## Project Certificate Condition No. 161

Category	Community Infrastructure and Public Services – Policing
Responsible Parties	The Proponent, Government of Nunavut, Royal Canadian Mounted Police
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure the territorial government and its policing service are adequately prepared to handle any Project-related increases to the need for service and associated impacts.
Term or Condition	The Government of Nunavut should be prepared for any potential increased need for policing, and ensure that the Royal Canadian Mounted Police is prepared to handle ongoing Project-related demographic changes and subsequent crime prevention that may be needed as a result of the development, operation, and closure of the Project.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Government of Nunavut (GN)
Reference	2019 Socio-Economic Monitoring Report (Baffinland, 2020p) 2019 QSEMC and SEMWG Meeting Records Socio-Economic Monitoring Plan (Baffinland, 2019k)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Baffinland regularly engages the GN on the Project's socio-economic monitoring program. For example, Baffinland produces an annual Socio-Economic Monitoring Report (which includes demographic and crime-related information) and regularly engages the QSEMC and SEMWG to discuss socio-economic impacts and benefits of the Project. GN representatives are active members of both the QSEMC and the SEMWG. Information obtained by the GN during these meetings and through review of Baffinland's annual Socio-Economic Monitoring Reports may be used to prepare for any potential increased need for policing and crime prevention activities.

The Company has also directly engaged local RCMP detachments in the North Baffin communities to discuss socio-economic impacts and benefits of the Project

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland continues to cooperate with the GN regarding Project-related socio-economic monitoring (including monitoring of demographic and crime-related information). Baffinland will continue to engage the GN through the

QSEMC and SEMWG, moving forward. Baffinland will also continue to engage directly with the RCMP on an as-needed basis.

#### 4.7.7 Culture, Resources & Land Use (PC Conditions 162 through 166)

Five (5) PC conditions relate to the potential impacts of the Project on culture, resources and land use. The conditions request Baffinland notify communities regarding Project activities and particularly shipping and that Baffinland engage communities in monitoring programs and the establishment of mitigation measures to ensure that both consider traditional activities.

##### Stakeholder Feedback

Key stakeholders focused on culture, resources and land use include the communities, the QIA, the GN Department of Culture and Heritage, and the Inuit Heritage Trust. The latter two organizations are responsible for the management of cultural heritage including archaeological sites. The potential for the Project to affect current land uses and the availability of wildlife resources were key concerns of the communities and the QIA. The GN departments expressed concern regarding the potential for adverse effects to archaeological sites and ensuring proper planning and procedures took place. Concerns regarding potential impacts to resources and land use continue to be a theme of community engagement (Appendix B).

##### Monitoring

Baffinland conducts annual monitoring and when required mitigation work under an Archaeological Permit issued by the GN. Baffinland also monitors the number of land use visitor person-days at Project sites, and the number of Wildlife Compensation Fund claims recorded annually. Table 4.55 provides an evaluation of the Project's impacts on culture, resources and land use, based on monitoring activities completed in 2019, relative to predictions presented in the FEIS and FEIS Addendum.

**Table 4.55: Culture, Resources and Land Use Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Archaeological Sites	Unauthorized removal of artifacts from known archaeological sites	Worker site orientation training includes rules regarding archaeological sites, with dismissal a consequence of offence. Baffinland's consulting archaeologist visits sites most years. Sites are successfully mitigated or protected, as applicable.	Effects did not occur
	Disturbance to archaeological sites due to ground disturbance activities without mitigation		
	Potential for chance finds	Reporting of chance finds as per Cultural and Heritage Resource Protection Plan: no chance finds located in 2019.	Effects did not occur
Inuit Harvesting of Wildlife	Mine operations affecting the harvesting of caribou, marine mammals and fish	Land user visits to the Mine Site and Milne Port were recorded. The QIA reported \$66,410 spent on the Wildlife Compensation Fund in 2018-19, though no data was available on number of claims.	Effect within FEIS predictions
Travel and Camps	Potential for reduced safety travelling around Eclipse Sound and Pond Inlet and through	Site observations suggest Inuit land use coexists with the Project's activities. In 2019, a total of 892 land	Effect within FEIS predictions

Component	Effects	Monitoring Program	Impact Evaluation
	Milne Port. Emissions and noise disruption during travel and/or camping	use visitor person-days were recorded at Project sites, which is 353 person-days greater than in 2018. The majority of the visitors (594) stopped at Milne Port.	
	Sensory disturbance and safety along Milne Inlet Tote Road	Fewer hunters using cabins due to the limited Total Allowable Harvest (TAH) of 250 set for caribou on Baffin Island.	Effect within FEIS predictions
	Detour around Mine Site		
	HTO cabin closure	HTO cabin at the Mine Site was relocated, and the Milne Port cabin was relocated and reconstructed.	Effect within FEIS predictions

Meaningful effects to culture, resources and land use as a result of the Project have not occurred, based on monitoring and site observations. In fact, monitoring data suggests Inuit land use and harvesting coexists with the Project to some degree. Local land users continued to access Project sites in 2019, and the number of land use visitor person-days have increased every year since record-keeping was commenced, except for 2017, which saw a decrease in land use visitor person-days.

Baffinland acknowledges the potential for future wildlife-related impacts from the Project and has contributed \$750,000.00 to a Wildlife Compensation Fund (administered by the QIA under the terms of the IIBA) to address this issue.

Baffinland worked closely with the MHTO to relocate and renovate an MHTO Cabin near the Mary River Mine Site as well as the construction of a new MHTO Cabin at Milne Port. We would like to thank all MHTO members who worked with Baffinland on these initiatives. Baffinland will continue to provide minor maintenance services to the MHTO Cabins in the Project Area when requested by the MHTO.

#### Path Forward

Baffinland will continue to monitor this aspect of the socio-economic environment, and will discuss monitoring results with the MRSMWG and QSEMC. Reporting on each PC condition follows.

## Project Certificate Condition No. 162

Category	Culture, Resources and Land Use - Public consultation
Responsible Parties	The Proponent, Elders and community members of the North Baffin communities
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure the ongoing and consistent involvement of Elders and community members in developing and revising monitoring and mitigation plans.
Term or Condition	The Proponent should make all reasonable efforts to engage Elders and community members of the North Baffin communities in order to have community level input into its monitoring programs and mitigative measures, to ensure that these programs and measures have been informed by traditional activities, cultural resources, and land use as such may be implicated or impacted by ongoing Project activities.
Relevant Baffinland Commitment	97
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association (QIA), North Baffin Communities
Reference	2019 MEWG Meeting Records
Ref. Document Link	Appendix C

### METHODS

Baffinland is committed to engaging and conducting comprehensive consultation on various Project-related aspects on an ongoing basis, with particularly focus on Pond Inlet and the other four North Baffin communities (Arctic Bay, Clyde River, Sanirajak, and Igloolik). While engagement efforts in 2019 were highly focused on the sharing of information and seeking feedback on the Phase 2 Proposal, a wide range of topics were discussed applicable to both current and proposed future operations.

Baffinland meets with various community groups on a regular basis to discuss aspects of the Project and ongoing issues, concerns or recommendations these Community representatives may have. The MHTO is also a participating member of the Terrestrial and Marine Environment Working Group (TEWG and MEWG) meetings, where annual monitoring program design and results are discussed. The MHTO participated in the in-person meetings held on June 21, 2019 in Iqaluit. During this meeting, Baffinland shared its plans on its anticipated shipping schedule, mitigation and management measures, and communications protocol to be implemented during the 2019 shipping season. In addition, Baffinland hosted a pre-shipping season meeting in Pond Inlet with representatives (including Elders) from the Hamlet, MHTO, and QIA.

Baffinland strives to maintain ongoing participation of community members including Elders from North Baffin Communities, particularly Pond Inlet, in the marine monitoring programs. This includes training and employment opportunities in marine vessel safety and field data collection techniques such as marine wildlife observations (marine mammals and seabirds), and physical and biological sampling (e.g., collection of water, sediment, benthos and fish samples). In 2019, Golder on behalf of Baffinland completed numerous monitoring programs that included various levels of Inuit participation. Eleven (11) individuals from Pond Inlet and two (2) from Arctic Bay received training to assist in conducting Marine Mammal Aerial Surveys, Ship-based Observer monitoring, Bruce Head Shore-

based Monitoring, and Marine Environmental Effects Monitoring/Aquatic Invasive Species programs, representing a total of 710 hours of training, a four-fold increase from 2018 (160 hours). A total of eleven (32) positions were available for Inuit employees in the 2019 marine programs, resulting in 6,500 hours of employment for these programs, also a four-fold increase from 2018 (1,610 hours). A total of twenty-three (23) Inuit staff who lived in Pond Inlet (20), Arctic Bay (2) and Igloolik (1) supported roles of Inuit researchers (e.g., marine wildlife/mammal observers), boat captain and assistant(s)/field sampling technicians, and polar bear monitors. The 2019 marine monitoring programs were staffed by engaged and knowledgeable individuals whose insights and contributions continue to strengthen the efficacy of the design and execution of the marine monitoring programs. End of season interviews with Inuit participants to obtain their feedback.

## RESULTS

Community members and other stakeholders continue to provide valuable input that guide the development of monitoring programs and mitigation measures as, needed.

A list of meetings held with the public (including with elders) and with community groups in 2019 are listed in Tables 4.56 and 4.57, respectively.

**Table 4.56: Public Meetings & Events in 2019**

Community	Date(s) of Public Meeting	Information Shared
5 North Baffin Communities	January 7-11, 2019	Phase 2 Public Information Sessions
Annual Project Review Forum (Clyde River)	May 29-30, 2019	IIBA Annual Project Review Forum
5 North Baffin Communities and Resolute Bay	June 3-11 2019	Phase 2 Public Information Sessions
Public and High School Students, Pond Inlet	October 8-10, 2019	Career and Training Information as well as an update on the Phase 2 Regulatory Process
Public Meeting, Arctic Bay	November 13, 2019	Report on November NIRB Public Hearings and general Phase 2 discussion

**Table 4.57: Community Group Meetings**

Date	Community Group	Location	Topic
January 14, 2019	Elder and HTO Representatives from Sanirajak, Arctic Bay, Clyde River and QIA	Mar River Mine Site	Community Risk Assessment Workshop Session 1
January 30, 2019	MHTO	Pond Inlet	Follow-up to August 30 site visit, IIBA Commitments
January 30, 2019	MHTO, QIA	Pond Inlet	IIBA Program Update, Mine and Milne Post MHTO Cabins relocation

Date	Community Group	Location	Topic
February 11, 2019	Elder and HTO Representatives from Pond Inlet, Sanirajak, Arctic Bay, Clyde River and QIA	Trois- Rivières	Community Risk Assessment Workshop Session 2
February 27, 2019	MHTO, QIA	Pond Inlet	Narwhal Harvest Season, Community Based Monitoring
March 26, 2019	Hamlet of Pond Inlet	Teleconference	Training Centre Update
March 26, 2019	Clyde River HTO	Clyde River	Phase 2
April 30, 2019	MHTO, QIA, Hamlet of Pond Inlet	Pond Inlet	Community Based Monitoring
May 7, 2019	Elder and HTO Representatives from Pond Inlet, Sanirajak, Arctic Bay, Clyde River, and Igloolik	Mary River Mine Site	Community Risk Assessment Workshop Session 2
May 23, 2019	MHTO, Hamlet of Pond Inlet, QIA	Pond Inlet	Hunting Season Observations, Perceived interactions with project vessels, wildlife monitoring and mitigation
June 24, 2019	MHTO, Hamlet of Pond Inlet, QIA	Pond Inlet	Follow-up to Meeting of May 23 regarding harvesting
June 25, 2019	MHTO, Hamlet of Pond Inlet, QIA	Pond Inlet	2019 Pre-Shipping Season Meeting and Follow-up to Meeting of May 23 regarding harvesting
July 2, 2019	North Baffin Mayors and HTOs, QIA	Mary River Mine Site (July 2-5)	Discussion about Phase 2, direct project benefits and finding ways the Company and North Baffin Communities can work closer together.
August 21, 2019	Hamlet of Igloolik	Teleconference	Phase 2 Update
August 27, 2019	Hamlet and HTO	Arctic Bay	Phase 2 Update and Day Care Funding Announcement
September 2, 2019	Hamlet of Igloolik	Teleconference	Phase 2 Update
September 3, 2019	MHTO	Pond Inlet	Phase 2 Update, Rail Alignment
September 4, 2019	All North Baffin HTOs	Iqaluit	Phase 2 Update, Rail Alignment
September 4, 2019	Elder and HTO Representatives from Pond Inlet, Sanirajak, Arctic Bay, Clyde River	Iqaluit (Sept 4-5)	Community Risk Assessment, Results Verification Workshop
September 9, 2019	Hamlet of Igloolik	Igloolik	Phase 2 Update
September 10, 2019	Pond Inlet Phase 2 Committee & MHTO	Pond Inlet	Rail Alignment September 10-11, 2019

Date	Community Group	Location	Topic
September 11, 2019	Hamlet Council	Pond Inlet	Phase 2 Update, Rail Alignment and Community Benefits
September 12, 2019	Hamlet & HTO	Clyde River	Community Benefit Opportunities & Phase 2 - Sept 12-13
September 13, 2019	Clyde River Council and HTO	Clyde River	Phase 2 Update and Direct Community Benefits
September 24, 2019	North Baffin Mayors and HTOs, QIA	Mary River	Discussion about Phase 2, direct project benefits and finding ways the Company and North Baffin Communities can work closer together.
November 26, 2019	Hamlet of Pond Inlet and MHTO	Pond Inlet	Discussion post Phase 2 Public Hearing and forward planning
November 29, 2019	Hamlet of Sanirajak	Teleconference	Discussion of Baffinland response to NIRB re: NTI Motion
November 29, 2019	Hamlet of Clyde River	Teleconference	Discussion of Baffinland response to NIRB re: NTI Motion
November 29, 2019	Hamlet of Arctic Bay	Teleconference	Discussion of Baffinland response to NIRB re: NTI Motion
December 11, 2019	Hamlet of Igloolik	Igloolik	Phase 2 Public hearing Follow-up and 2020 Work Planning

## TRENDS

Not applicable.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to provide the results of the key monitoring programs of interest to the communities. Baffinland will continue to seek feedback from the MHTO through their involvement as a Member of both the Marine Environment and Terrestrial Environment Working Groups.

Baffinland intends to continue training and employing Inuit participants in marine monitoring programs. Additional Inuit participation in the terrestrial environment monitoring programs is also planned during all future monitoring efforts.



## Project Certificate Condition No. 163

Category	Culture, Resources and Land Use - Public consultation
Responsible Parties	The Proponent, North Baffin communities
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To involve communities in the development and evolution of management and monitoring plans.
Term or Condition	The Proponent shall continue to engage and consult with the communities of the North Baffin region in order to ensure that Nunavummiut are kept informed about the Project activities, and more importantly, in order that the Proponent's management and monitoring plans continue to evolve in an informed manner.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	North Baffin Communities
Reference	2019 Community Meeting Records
Ref. Document Link	Appendix B

### METHODS

Baffinland is committed to meaningful engagement with individuals and organizations potentially affected by the Project, including the five (5) North Baffin Communities (Arctic Bay, Clyde River, Sanirajak, Igloodik and Pond Inlet).

In support of the Company's focus on continuous improvement and the engagement objectives defined for the Project (Section 2.2), Baffinland implements a variety of engagement mechanisms that are intended to ensure that a broad and comprehensive approach to the identification of interested parties and that the creation of enhanced opportunities for dialogue and input are executed. During 2019, Baffinland completed a number of engagement activities, which included:

- Providing regular and ongoing opportunities for the dissemination of Project-related information and receipt of stakeholder input through Baffinland Community Liaison Officers stationed in each of the five (5) North Baffin communities;
- Hosting public meetings;
- Conducting employee surveys;
- Participating in multi-stakeholder forums (e.g. Working Groups);
- Holding workshops and meetings with individual community groups and Hamlet Councils;
- Hosting site based meetings for MHTO members and representatives from the Hamlet of Pond Inlet and all North Baffin Communities and the QIA; and
- Distributing Project-related information through websites, newsletters, radio shows, social media, advertisements and other means.

Throughout 2019 Baffinland held meetings with representatives of the five (5) North Baffin communities and QIA at the Mine Site. These meetings provided an important opportunity for Baffinland to share information with

community representatives related to current operations, the results of ongoing environmental monitoring programs and future planning to support the phased development of the Project.

**Table 4.58: Public Meetings**

Community	Date(s) of Public Meeting	Information Shared
5 North Baffin Communities	January 7-11, 2019	Phase 2 Public Information Sessions
Annual Project Review Forum (Clyde River)	May 29-30	IIBA Annual Project Review Forum
Public and High School Students, Pond Inlet	October 8-10, 2019	Career and Training Information as well as an update on the Phase 2 Regulatory Process
Public Meeting, Arctic Bay	November 13, 2019	Report on November NIRB Public Hearings and general Phase 2 discussion

As North Baffin Community representatives, the Company also actively engages Hamlet Mayors and Councillors, as well as Hunter and Trapper Organization (HTO) Board Members. These organizations have a direct interest in Project activities and have provided valuable feedback to the company which has aided in more successful Project planning.

**Table 4.59: Community Group Meetings**

Date	Community Group	Location	Topic
January 14, 2019	Elder and HTO Representatives from Sanirajak, Arctic Bay, Clyde River and QIA	Mary River Mine Site	Community Risk Assessment Workshop Session 1
January 30, 2019	MHTO	Pond Inlet	Follow-up to August 30 site visit, IIBA Commitments
January 30, 2019	MHTO, QIA	Pond Inlet	IIBA Program Update, Mine and Milne Post MHTO Cabins relocation
February 11, 2019	Elder and HTO Representatives from Pond Inlet, Sanirajak, Arctic Bay, Clyde River and QIA	Trois- Rivières	Community Risk Assessment Workshop Session 2
February 27, 2019	MHTO, QIA	Pond Inlet	Narwhal Harvest Season, Community Based Monitoring
March 26, 2019	Hamlet of Pond Inlet	Teleconference	Training Centre Update
March 26, 2019	Clyde River HTO	Clyde River	Phase 2
April 30, 2019	MHTO, QIA, Hamlet of Pond Inlet	Pond Inlet	Community Based Monitoring
May 7, 2019	Elder and HTO Representatives from Pond Inlet, Sanirajak, Arctic Bay, Clyde River, and Igloolik	Mary River Mine Site	Community Risk Assessment Workshop Session 2

Date	Community Group	Location	Topic
May 23, 2019	MHTO, Hamlet of Pond Inlet, QIA	Pond Inlet	Hunting Season Observations, Perceived interactions with project vessels, wildlife monitoring and mitigation
June 24, 2019	MHTO, Hamlet of Pond Inlet, QIA	Pond Inlet	Follow-up to Meeting of May 23 regarding harvesting
June 25, 2019	MHTO, Hamlet of Pond Inlet, QIA	Pond Inlet	2019 Pre-Shipping Season Meeting and Follow-up to Meeting of May 23 regarding harvesting
July 2, 2019	North Baffin Mayors and HTOs, QIA	Mary River Mine Site (July 2-5)	Discussion about Phase 2, direct project benefits and finding ways the Company and North Baffin Communities can work closer together.
August 21, 2019	Hamlet of Igloolik	Teleconference	Phase 2 Update
August 27, 2019	Hamlet and HTO	Arctic Bay	Phase 2 Update and Day Care Funding Announcement
September 2, 2019	Hamlet of Igloolik	Teleconference	Phase 2 Update
September 3, 2019	MHTO	Pond Inlet	Phase 2 Update, Rail Alignment
September 4, 2019	All North Baffin HTOs	Iqaluit	Phase 2 Update, Rail Alignment
September 4, 2019	Elder and HTO Representatives from Pond Inlet, Sanirajak, Arctic Bay, Clyde River	Iqaluit (Sept 4-5)	Community Risk Assessment, Results Verification Workshop
September 9, 2019	Hamlet of Igloolik	Igloolik	Phase 2 Update
September 10, 2019	Pond Inlet Phase 2 Committee & MHTO	Pond Inlet	Rail Alignment September 10-11, 2019
September 11, 2019	Hamlet Council	Pond Inlet	Phase 2 Update, Rail Alignment and Community Benefits
September 12, 2019	Hamlet & HTO	Clyde River	Community Benefit Opportunities & Phase 2 - Sept 12-13
September 13, 2019	Clyde River Council and HTO	Clyde River	Phase 2 Update and Direct Community Benefits
September 24, 2019	North Baffin Mayors and HTOs, QIA	Mary River	Discussion about Phase 2, direct project benefits and finding ways the Company and North Baffin Communities can work closer together.
November 26, 2019	Hamlet of Pond Inlet and MHTO	Pond Inlet	Discussion post Phase 2 Public Hearing and forward planning
November 29, 2019	Hamlet of Sanirajak	Teleconference	Discussion of Baffinland response to NIRB re: NTI Motion
November 29, 2019	Hamlet of Cyde River	Teleconference	Discussion of Baffinland response to NIRB re: NTI Motion

Date	Community Group	Location	Topic
November 29, 2019	Hamlet of Arctic Bay	Teleconference	Discussion of Baffinland response to NIRB re: NTI Motion
December 11, 2019	Hamlet of Igloolik	Igloolik	Phase 2 Public hearing Followup and 2020 Work Planning

In addition to the above, through the establishment and operation of offices within each of the five (5) North Baffin Communities the Company ensures that Nunavummiut are kept informed about Project activities by having a full time presence available to answer questions, and provides update to the public on a consistent basis.

Baffinland implemented the Pond Inlet “guardian program” (Shipping Monitors) which consisted of employing a minimum of two (2) full-time Shipping Monitors from the community of Pond Inlet to actively track daily Project vessel movements in the RSA in real-time, and in relation to reported marine mammal aggregations (as shared by the community and the monitoring teams). The Shipping Monitors liaised between the community of Pond Inlet, hunters and Baffinland. This was a new approach introduced in 2019 in response to feedback from the MHTO that better communications on Baffinland shipping operations were needed. Shipping Monitors provided updates on Baffinland shipping activity to residents of Pond Inlet via local public radio, marine VHF radio (for hunters on the water) and through social media

## RESULTS

During the public, Hamlet, and HTO meetings a number of comments were raised by participants. The feedback received was a mix of comments that were both supportive of the Project and comments related to concerns or issues the community members perceived or were experiencing. Most of the comments raised at the meetings were similar to those raised previously, and were related to:

- Employment and Income;
- Direct Project Benefits;
- Expenditure of IIBA funds;
- Environmental Assessment Process;
- Education and Training Opportunities;
- Marine Environment;
- Terrestrial Environment;
- Potential effects on Land Use and Harvesting Practices;
- Potential effects of the Project on Climate Change; and
- Dust and Air Quality.

Comments received are considered by Baffinland and incorporated into management and monitoring plans, as relevant.

Comments specific to employment, training, and other matters related to the IIBA are incorporated into discussions between the QIA and Baffinland through established IIBA Committees as appropriate.

## TRENDS

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to implement a proactive approach to engagement with various stakeholders, through meetings, workshops, surveys and dissemination of information and reports. This will ensure that the communities, QIA, regulators and the public are informed in a timely and culturally sensitive manner of the Project's progress and the potential environmental and social impacts of ongoing operations.

In addition, through the amended IIBA, Baffinland will be increasing its direct community engagement as it relates to employment, training, and business opportunities provided by the Project. This can be seen in the commitments and obligations in IIBA Articles 7.8, 8.6, 14.3, 14.15, among others.

## Project Certificate Condition No. 164

Category	Socio-Economic Impacts – Shipping notification
Responsible Parties	The Proponent, Elders and community members of the North Baffin communities
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	In order to inform members of North Baffin communities of planned Project shipping transits such that community members' planned travel routing may be adjusted to avoid interaction with Project ships and/or ship tracks.
Term or Condition	The Proponent is required to provide notification to communities regarding scheduled ship transits throughout the regional study area including Eclipse Sound and Milne Inlet, real-time data regarding ships in transit and any changes to the proposed shipping schedule to the MEWG and agencies within Pond Inlet on a weekly basis during open water shipping, and to the RSA communities on a monthly basis.
Relevant Baffinland Commitment	30, 34
Reporting Requirement	The information required shall be provided on a monthly basis at a minimum or more often as the Proponent determines necessary and is to be provided to the Proponent's community liaison officers and those of the Qikiqtani Inuit Association as well as the Hunters and Trappers Organizations and Hamlet organizations of the North Baffin communities, Coral Harbour, and the NIRB's Monitoring Officer. Where deviations from the proposed schedule or routing are required, this information shall be provided as soon as possible.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG) and Mittimatalik Hunter and Trappers Organization (MHTO)
Reference	Baffinland Website
Ref. Document Link	<a href="https://www.baffinland.com/operation/shipping-and-monitoring/">https://www.baffinland.com/operation/shipping-and-monitoring/</a>

### METHODS

Baffinland has contracted exactEarth®, a global vessel monitoring and tracking service based on AIS (Automatic Identification System) data from polar orbiting satellites to track and report on vessel movements. The vessel tracking information is available on Baffinland's web site to allow communities to check on vessel coordinates, which direction the vessel is moving, and its destination. Baffinland also installed an AIS tracker system in Baffinland's Shipping Monitor office located on the second floor of the MHTO building on a dedicated laptop and wall mounted monitor. This provided live continuous monitoring of vessels active in the Northern Shipping Route to all office visitors during office hours (8am to 5pm).

In 2019, Baffinland implemented the Pond Inlet "guardian program" (Shipping Monitors) which consisted of employing a minimum of two (2) full-time Shipping Monitors from the community of Pond Inlet to actively track daily Project vessel movements in the RSA in real-time, and in relation to reported marine mammal aggregations (as shared by the community and the monitoring teams). The Shipping Monitors liaised between the community of Pond Inlet, hunters and Baffinland. This was a new approach introduced in 2019 in response to feedback from the MHTO that better communications on Baffinland shipping operations were needed. Shipping Monitors provided

updates on Baffinland shipping activity to residents of Pond Inlet via local public radio, marine VHF radio (for hunters on the water) and through social media.

Throughout 2019, Baffinland also conducted extensive consultation with the MHTO regarding Baffinland's plans for the 2019 shipping season (Appendix B). Relevant engagement events are as follows:

- January 14-17, 2019 - Risk Workshop Session 1;
- April 30, 2019 - Marine monitoring program overview and community-based monitoring;
- May 7-9, 2019 - Risk Workshop Session 2;
- May 23, 2019 - Hunting Season Observations, Perceived interactions with project vessels, wildlife monitoring and mitigation;
- June 25, 2019 - Pre-shipping Season meeting in Pond Inlet with the MHTO, Hamlet of Pond Inlet and QIA representatives; and
- September 4, 2019 - Risk Verification Workshop.

Throughout these meetings Baffinland noted that there were also ongoing challenges associated with the vessel traffic management, particularly with regards to vessel anchorage at Ragged Island, drifting in Eclipse Sound and general concern of underwater noise and associated impacts to marine mammals.

## RESULTS

Baffinland has made vessel routing accessible to the public via the Baffinland website. Baffinland also installed an AIS tracker system in Baffinland's Shipping Monitor office located in the second floor of the MHTO building on a dedicate laptop and wall mounted monitor. This provided live continuous monitoring of vessels active in the Northern Shipping Route to all office visitors during core drop-in hours (8am to 5pm).

Ongoing consultation with the MHTO and representatives of the Hamlet of Pond Inlet in 2019, in addition to the NIRB-facilitated Marine Monitoring and Marine Mitigation Workshop held in May 2019 (NIRB, 2019a) and Baffinland-led Phase 2 Risk Workshops resulted in Baffinland committing to several new optimized vessel traffic management practices, noting that these are additions to all other changes implemented from prior years (e.g., 9 knot vessel travel speeds):

- Between the period of 01 July and 30 July, a maximum of one icebreaker transit (with escorted vessels) will occur per day (24-h period) where ice concentrations of 6/10 or greater cannot be avoided along the shipping route. Between the period of 01 July and 30 July, a maximum of two icebreaker transits (with escorted vessels) will occur per day (24-h period) where ice concentrations less than 6/10 but greater than 3/10 greater cannot be avoided along the shipping route. When a continuous sailing route of uninterrupted ice concentrations of 3/10 or less is available between the entrance of Pond Inlet and Milne Port, then icebreaker transits in the RSA will proceed according to the normal shipping schedule.
- During the early shoulder season, a 40 km vessel set-back or buffer zone (i.e., vessel set-back area) was implemented at the entrance of the RSA that extended 40 Km to the east of the Nunavut Settlement Boundary (east of 73 degrees longitude). Project-related vessels were required to hold position outside the buffer zone until instructed by the Port Authority at Milne Port to proceed with their transit to Milne Port. The 40 km boundary was selected based on acoustic modelling results indicating that this would represent an appropriate acoustic buffer zone for animals at or near the floe edge (i.e. noise levels at the floe edge

would be outside marine mammal audible range or below levels known to elicit adverse behavioral responses such as displacement or avoidance).

- An ice navigator / analyst was deployed on the icebreaker on all transits undertaken in the Regional Study Area (RSA) during the early and late shipping shoulder seasons. The ice analyst recorded daily ice conditions and liaised daily with the Port Authority and Baffinland's shipping department to coordinate daily transits allowable in RSA based on ice conditions.
- Daily (morning) teleconferences during early shoulder season involving Fednav team, Baffinland's Shipping and Sustainable Development teams, the Port Authority, and Golder marine monitoring lead, to review daily projected ice conditions, number of transits allowed for the 24-hour period, community hunting activities and concerns, and marine mammal presence in the RSA.
- Avoidance of shipping in areas near Pond Inlet bowhead hunt to avoid disturbance during the hunt.
- Established communications protocol and designated contact information to respond to community concerns.
- Limiting the number of ships waiting at Ragged Island to a maximum of 3 Project-related vessels and avoiding drifting to the extent possible in Eclipse Sound.
- All other vessels will be instructed to wait in Baffin Bay at least 40 Km the east of the RSA.
- Implementation of the Pond Inlet "guardian program" (Shipping Monitors) which consisted of employing a minimum of two full-time Shipping Monitors from the community of Pond Inlet to actively track daily Project vessel movements in the RSA in real-time, and in relation to reported marine mammal aggregations (as shared by the community and the monitoring teams). The Shipping Monitors liaised between the community of Pond Inlet, hunters and Baffinland. This was a new approach introduced in 2019 in response to feedback from the MHTO that better communications on Baffinland shipping operations were needed. Shipping Monitors provided updates on Baffinland shipping activity to residents of Pond Inlet via local public radio, marine VHF radio (for hunters on the water) and through social media.
- Increase response time to correct vessel movement or speed in the event of non-adherence to vessel management protocols by continued use of a real-time AIS-based alert system that immediately informed the Port Authority and Baffinland's shipping department of a non-compliance event such as a speed exceedance in the RSA so that the issue could be quickly resolved.

## TRENDS

Not applicable

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland has found the use of exactEarth® to be beneficial in providing information related to ship routing to the public. Baffinland will continue its use of this service. Baffinland will continue to communicate changes to the proposed shipping schedule to the Marine Environment Working Group where the Mittimatalik Hunters and Trappers Organization is a member. Furthermore, Baffinland will continue to hire Shipping Monitors based out of Baffinland's office in Pond Inlet in order to provide updates on the presence of vessels along the the Northern Shipping Route over the duration of the shipping season and to provide a direct liaison with the community of Pond Inlet.



## Project Certificate Condition No. 165

Category	Socio-Economic Impacts - Emergency shelters
Responsible Parties	The Proponent, Elders and community members of the North Baffin communities
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	In order to provide for human safety precautions in the event of adverse weather or other emergency situations along segments of linear transportation infrastructure.
Term or Condition	The Proponent is strongly encouraged to provide buildings along the rail line and Milne Inlet Tote Road for emergency shelter purposes, and shall make these available for all employees and any land users travelling through the Project area. In the event that these buildings cannot, for safety or other reasons be open to the public, the Proponent is encouraged to set up another form of emergency shelters (e.g. seacans outfitted for survival purposes) every 1 kilometre along the rail line and Milne Inlet Tote Road. These shelters must be placed along Tote Road and rail routing prior to operation of either piece of infrastructure, and must be maintained for the duration of project activities, including the closure phase.
Relevant Baffinland Commitment	14
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtani Inuit Association, Nunavut Water Board, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board
Reference	Emergency Response Plan (Baffinland, 2020q) Roads Management Plan (Baffinland, 2020d)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Baffinland has constructed four (4) refuge stations at Km 33, 40, 60 and 69 along the Tote Road. Each station is heated and outfitted with beds and bedding, water, an Automatic External Defibrillator (AED), food and a digital radio that provides direct contact with Baffinland security or dispatch. In addition to the four (4) refuge stations, there are 11 heated seacans located at communication towers along the Tote Road, equipped with a fire extinguisher and first aid kits. The communication tower seacans are intended for emergency and temporary use only and do not house radios, food or water.

Baffinland has a trained emergency response team at both ends of the Tote Road with emergency vehicles to rapidly respond to any concerns. The emergency response team also has access to snowmobiles, and a side by side that is capable of moving through snowdrifts and effecting a rescue as required. Baffinland continued to expand rescue capabilities in 2019 with the purchase of a Sno-Cat® for long distance remote rescue requirements. The Tote Road Travel Procedure is publicly available and outlines the emergency response procedure.

Ensuring the health and safety of local hunters on-site is of utmost importance to Baffinland. In the summer months, local hunters have been advised to report to security and request a transport for their equipment and personnel. In the winter, they are to check in with security and are given instructions on where to safely travel around both sites. In 2018 Baffinland hosted a site visit with Pond Inlet hamlet and HTO representatives and worked with the MHTO to

improve hunter and visitor access on site, further defining Project site visitor communication protocols and improving snowmobile crossings on the tote road and incorporating them into snow management practices. Snowmobile crossing signs were erected for the safety of all. In 2019, Baffinland continued to work with the MHTO and QIA to improve the traditional hunter and visitor passage on the Project site with several improvements including establishing a new snowmobile access route to the Sailiivik accommodations complex, ongoing trail maintenance, and new cabin construction and maintenance. Additional equipment for hunter/visitor transportation between Milne Port and the Mine Site is being purchased and is expected to be available for use in Q3 2020.

The Steensby rail line project has been deferred at this time.

## RESULTS

A total of 936 individuals stopped and checked in at the Project site in 2019 to hunt near the Project area or for other reasons such as visiting or passing through. Baffinland accommodated all individuals, providing support when required for breakdowns and maintenance issues.

This was a significant increase from 2018 in which 354 individuals checked in at the Project, and from 2017 in which only 154 individuals were recorded as having visited the Project. No project related safety related incidents occurred in 2019 for visiting hunters and all emergency shelters were available for use.

## TRENDS

Emergency shelters continue to be available for use and no project related health and safety incidents with hunters and visitors occurred in 2019.

## RECOMMENDATIONS / LESSONS LEARNED

PC Condition No. 165 was originally developed for the development of the southern railway to Steensby Inlet. For the ERP, use of the Tote Road means that there are multiple types of vehicles readily available to access a person in need of assistance. Therefore, construction of emergency shelters along every 1 Km of the Tote Road is not warranted at this time. Construction of emergency shelters along the railway to Steensby Port will be considered when this phase of the Project becomes active. Baffinland commits that buildings placed along the rail line for signal and switch requirements will also be intended for use as emergency shelters for Railway personnel and visitors.

## Project Certificate Condition No. 166

Category	Socio-Economic Impacts - Public Consultation
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To ensure members of the public are able to access shipping information on an as-required basis in order to inform potential users of the scheduled Project activities, which could require deviations to land users' schedules or routing.
Term or Condition	The Proponent should ensure through its consultation efforts and public awareness campaigns that the public have access to shipping operations personnel for transits into and out of both Steensby Inlet port and Milne Inlet port either via telephone or internet contact, in order that any questions regarding ice conditions or ship movements that could assist ice users in preparing for travel may be answered by Project staff in a timely fashion.
Relevant Baffinland Commitment	30
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	N/A
Reference	Hunter and Visitor Site Access Procedure (Baffinland, 2015c)
Ref. Document Link	<a href="https://www.baffinland.com/operation/shipping-and-monitoring/">https://www.baffinland.com/operation/shipping-and-monitoring/</a>

### METHODS

Baffinland has developed a Hunter and Visitor Site Access Procedure (Baffinland, 2015c) for visitors wanting to access the Project area, made available to local communities. All policies related to visitor's access to the Project Area are developed with rights of Nunavut Land Claims Agreement (NLCA) beneficiaries and conditions of the IIBA in mind.

Ensuring the health and safety of local hunters on-site is of utmost importance to Baffinland. In the summer months, local hunters have been advised to report to security and request a transport for their equipment and personnel. In the winter, they are to check in with security and are given instructions on where to safely travel around both sites. In 2018 Baffinland hosted a site visit with Pond Inlet hamlet and HTO representatives and worked with the MHTO to improve hunter and visitor access on site, further defining Project site visitor communication protocols and improving snowmobile crossings on the tote road and incorporating them into snow management practices. Snowmobile crossing signs were erected for the safety of all. In 2019, Baffinland continued to work with the MHTO and QIA to improve the traditional hunter and visitor passage on the Project site with several improvements including establishing a new snowmobile access route to the Sailiivik accommodations complex, ongoing trail maintenance, and new cabin construction and maintenance. Additional equipment for hunter/visitor transportation between Milne Port and the Mine Site is being purchased and is expected to be available for use in Q3 2020.

Baffinland also implemented a new communications protocol with the community of Pond Inlet. Information regarding the communications protocol was shared during meetings with the MHTO during the pre-shipping season meeting on June 25, 2019, as well as during the June 21, 2019 MEWG meeting. Baffinland also made available a

Shipping and Marine Monitoring Program Fact Sheet, which contained relevant Baffinland staff contact information should community members have any concerns throughout the season.

## **RESULTS**

The public have access to shipping operations personnel via telephone (corporate direct land-line and cell-based, and local cell phone number), and internet contact via a dedicated shipping email address, in addition to having in-person access to Pond Inlet-based Shipping monitors during daily office hours from a dedicated Baffinland office.

Thirteen (13) comments/suggestions concerns were received either in-person, via marine VHF radio, email, and/or during radio show and recorded by Shipping Monitors in 2019. A summary of these records are provided in Table 4.60.

## **TRENDS**

Not applicable.

## **RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to promote the use of the Hunter and Visitor Site Access Procedure and the ship transit web tracking service available on the Baffinland website. Shipping and Marine Monitoring Fact sheets and large maps showing the Northern Shipping Route will continue to be posted throughout Pond Inlet, and will include staff contact information should community members have any concerns throughout the shipping season.

The communications protocol proved to be an effective method for addressing ongoing community concerns related to shipping throughout the season. Baffinland will continue to make community members aware of the protocol and implement this in 2019. This includes the hiring of two full-time Shipping Monitors to act as the liaison between community members, hunters and Baffinland and tracking of comments and concerns over the shipping season.

Table 4.60: 2019 Shipping Concerns and Comments Tracker

No.	Date	Communication Method	Type of Concern/ Comment	Concern/Comment	Vessel	Location of Concern	Response
1	22 July	Shipping Monitor Office	Giving heads up	Concerned about an individual who was on the local radio blaming Baffinland about the sea water turning green causing global warming.	N/A	N/A	No specific follow-up action required
2	29 July	VHF Radio	Private Vessel Activity	Concerned about the Pleasure craft sailing too close to camp	Pleasure Craft	Lavoie point	Response by Shipping monitor through VHF Radio
3	30 July	VHF Radio	Private Vessel Activity	Concerned about the Pleasure craft sailing too close to camp and going too fast.	Pleasure Craft	Milne Inlet	Response by Shipping monitor through VHF Radio
4	4 August	VHF Radio	Vessel too close	Concerned about vessel getting too close to hunting grounds	Golden Pearl	Milne Inlet/Saviit	Response by Shipping monitor through VHF Radio; Follow-up with Shipping Dept. and Port Captain
5	24 August	Email	Drafting Vessels	Concerned about the 3 moored vessels at Ragged Island and 2 drifters at the Eclipse Sound	5 Vessels	Ragged Island and Eclipse Sound	Response by SD team via email: drifting was required to ensure safety of the vessels during high-wind storm event
6	5 September	In person at Pond Inlet airport	Vessel too close	Stating a vessel is passing by Pond Inlet too close to shore on it ways out. Wants to confirm if it's on the shipping route	Elena V	Pond Inlet	Follow-up with Shipping Dept., Shipping Agent and Port Captain; additional waypoints included for vessel steering in SITM and additional direction by Port Captain to vessel captains
7	8 October	Baffinland Radio Show on Shipping	Praise for Baffinland	Pleased with the work of the ship monitors and thus praising for job well done	N/A	General	Comment is noted

No.	Date	Communication Method	Type of Concern/ Comment	Concern/Comment	Vessel	Location of Concern	Response
8	8 October	Baffinland Radio Show on Shipping	Effects from shipping on wildlife and fish	Seals and fish have been negatively affected by shipping	N/A	General	Comment is noted; various marine environmental effects and marine mammal monitoring programs have been implemented to study potential effects associated with shipping.
9	8 October	Baffinland Radio Show on Shipping	Vessel too close	Concern that vessels are not following the shipping route	N/A	General	Baffinland has an established shipping route with defined waypoints that result in notifications when vessels travel outside of established route. Vessels may sail off course when safety considerations require them to do so. Baffinland has followed up with vessel operators to emphasize importance of following the established shipping route.
10	8 October	Baffinland Radio Show on Shipping	Vessel speed	Inbound vessel speeds ok but outbound vessels going too fast.	N/A	General	Baffinland has an internal protocol to inform vessel captains when speeds are noted to exceed 9 knots and requests follow-up on reasons for exceedance when they occur.
11	8 October	Baffinland Radio Show on Shipping	Vessel condition	Some ships look rusty. Are invasive species more likely to stick to a rusty surface at ship bottoms than a nicely painted ship?	N/A	General	Comment is noted; Baffinland will consult with shipping agent. Ships are inspected twice every 5 years with a mandatory dry docking on second inspection, which includes application of an anti-fouling coating approved under the Pest Management Regulatory Agency of Canada and Regulations for the Prevention of Pollution from Ships and for Dangerous Chemicals (2007-86).

No.	Date	Communication Method	Type of Concern/ Comment	Concern/Comment	Vessel	Location of Concern	Response
12	8 October	Baffinland Radio Show on Shipping	Effects from shipping on fish	Fish abundance along the shore near Pond Inlet have been negatively affected by shipping	N/A	Pond Inlet	Comment is noted; various environmental effects and marine mammal monitoring programs have been implemented to study potential effects associated with shipping.
13	8 October	Baffinland Radio Show on Shipping	Communications	More communications on shipping is needed during the busiest mid-summer season, including activities such as the phone-in radio show.	N/A	General	Comment is noted for next year.

#### 4.7.8 Benefits, Royalties and Taxation (PC Condition 167)

One PC condition relates to the potential impacts of the Project on benefits, royalties and taxation: that Baffinland negotiate a Development Partnership Agreement with the GN. The GN, however, no longer negotiates such agreements.

##### Stakeholder Feedback

Key stakeholders focused on the benefits, royalties and taxation include the following:

- QIA - Receives IIBA benefits, as well as rent payment for the lease of Inuit Owned Land (IOL), royalties on aggregate from IOL, and tipping fees for waste deposited on IOL;
- NTI - recipient of mineral royalties first payable to the Government of Canada, since Inuit hold sub-surface rights to Deposit No. 1 covered by a grandfathered federal mining lease;
- GN - Recipient of territorial taxes (corporate, property and payroll taxes);
- Qikiqtani Inuit - Beneficiaries of benefits and royalties that accrue to the QIA, as well as a portion of mineral royalties paid to NTI and then dispensed to the QIA and other regional Inuit organizations; and
- Other Nunavummiut - Beneficiaries of mineral royalties' payable to NTI.

Communities continue to express a desire to maximize benefits of the Project (Appendix B).

##### Monitoring

Baffinland tracks payments made as benefits, royalties and taxes, and this information is presented in annual monitoring reports. Table 4.61 provides an evaluation of the Project's impacts on benefits, royalties and taxes, based on monitoring activities completed in 2019, relative to predictions presented in the FEIS and FEIS Addendum.

**Table 4.61: Benefits, Royalties and Taxation Impact Evaluation**

Component	Effects	Monitoring Program	Impact Evaluation
Benefits and Royalty Payments to Inuit Organizations	Increased revenues that can be dispensed to Inuit beneficiaries	Monitoring is not required.	Within FEIS predictions
Territorial Own-source Revenues	Increased taxes and revenues; Payments of payroll and corporate taxes to territorial government	Monitoring is not required to validate if taxation occurs	Within FEIS predictions

Significant positive benefits have been realized by the stakeholders listed above, as a result of benefits, royalties and taxes paid by the Project in 2019.

##### Path Forward

Baffinland will continue to meet its commitments with respect to benefits, royalties and taxes. Reporting on PC Condition No. 167 follows.



## Project Certificate Condition No. 167

Category	Benefits, Royalty and Taxation – Partnership Agreements
Responsible Parties	The Proponent, Government of Nunavut
Project Phase(s)	Construction
Objective	The Proponent and the Government of Nunavut develop a formalized partnership agreement.
Term or Condition	The Proponent and the Government of Nunavut are strongly encouraged to, as soon as practical following the issuance of the Project Certificate, enter into discussions to negotiate a Development Partnership Agreement.
Relevant Baffinland Commitment	43
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	Not applicable
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Baffinland issued an invitation letter to the Government of Nunavut (GN) in September 2013 regarding the negotiation of a Development Partnership Agreement (DPA). However, a DPA between the GN and Baffinland has not yet been formalized. It has come to Baffinland's attention the DPA program for new mines is currently on hold, while the GN's Department of Economic Development and Transportation and Department of Finance work to develop a replacement (Gregoire, 2016). For added context, the GN website (i.e. GN, 2019) contains a DPA Policy that is noted to have expired on March 31, 2016.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to engage with the GN on this topic once a current policy has been issued by the GN.

#### 4.7.9 Governance & Leadership (PC Conditions 168 through 169)

Two (2) PC conditions relate to the potential impacts of the Project on governance and leadership, both of which relate to the collection of socio-economic data and annual reporting to NIRB.

##### **Stakeholder Feedback**

Members of the SEMWG include Baffinland, the QIA, the GN, and CIRNAC. Each organization has an interest and a role in improving socio-economic conditions within the Qikiqtani Region and Nunavut as a whole. Baffinland has actively engaged the group over the past several years. In 2015 and early 2016, Baffinland revised its socio-economic monitoring program based on feedback from this group. Baffinland is also actively involved in the Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and regularly participates in its meetings.

##### **Monitoring**

Baffinland completes a socio-economic monitoring report annually, which presents monitoring results for aspects of the socio-economic environment that interacts with the Project. No negative regional or cumulative economic effects associated with the Project were identified in 2019. As such, no mitigation measures have been proposed to manage negative effects. The socio-economic monitoring program has been developed in consultation with the SEMWG, and monitoring results are also reviewed by this group and QSEMC annually.

##### **Path Forward**

Baffinland will continue to undertake the collection of socio-economic monitoring data in consultation with the SEMWG and QSEMC, and report this monitoring data annually through its Socio-Economic Monitoring Report. Reporting on each PC condition follows.

## Project Certificate Condition No. 168

Category	Governance and Leadership - Monitoring program
Responsible Parties	The Proponent, members of the QSEMC
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	Outline variables that are relevant to the Project and which should be adopted by the QSEMC's monitoring program.
Term or Condition	The specific socioeconomic variables as set out in Section 8 of the Board's Report, including data regarding population movement into and out of the North Baffin Communities and Nunavut as a whole, barriers to employment for women, project harvesting interactions and food security, and indirect Project effects such as substance abuse, gambling, rates of domestic violence, and education rates that are relevant to the Project, be included in the monitoring program adopted by the Qikiqtani Socio-Economic Monitoring Committee.
Relevant Baffinland Commitment	45
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2019 Socio-Economic Monitoring Report (Baffinland, 2020p) Socio-Economic Monitoring Plan (Baffinland, 2019k)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

Socio-economic data collection and analysis methods are described in the Socio-Economic Monitoring Plan (Baffinland, 2019k) and annual Socio-Economic Monitoring Report. Government data are collected from the Nunavut Bureau of Statistics and Statistics Canada. Change of address information is collected by Baffinland's Community Liaison Officers and through voluntary employee surveys. Other Project-specific information is also presented by Baffinland, as appropriate.

### RESULTS

Summary results and trends for relevant socio-economic monitoring data are presented in Table 4.62. Detailed results are presented in the annual Socio-Economic Monitoring Report, including additional information where appropriate community-level indicator data are currently unavailable (e.g. for the topics of childcare availability and costs, Project harvesting interactions and food security, prevalence of gambling issues, prevalence of family violence).

**Table 4.62: 2019 Monitoring Results and Trends for Selected Socio-Economic Indicators**

Indicator / Topic	Pre Dev't Trend	Post Dev't Trend	Trend Since Prev. Year	Scale	Summary
Known in-migrations of non-Inuit Project employees and contractors	Not applicable	↑	↑	N. Baffin LSA	Since 2015, a net of one known non-Inuit employee/contractor has in-migrated to the North Baffin LSA.
In-migration of non-Inuit to the North Baffin LSA	Not available	Not available	Not available	N. Baffin LSA	Limited government data are currently available. However, the percentage of Inuit vs. non-Inuit residents in the North Baffin LSA has remained relatively constant.
Known out-migrations of Inuit Project employees and contractors	Not applicable	↑	↑	N. Baffin LSA	Since 2015, a net of 20 known Inuit employees/contractors have out-migrated from the North Baffin LSA.
Out-migration of Inuit from the North Baffin LSA	Not available	Not available	Not available	N. Baffin LSA	Limited government data are currently available. However, the percentage of Inuit vs. non-Inuit residents in the North Baffin LSA has remained relatively constant.
Nunavut annual net migration	↑	↓	↑	Territory	A decreasing post-development trend in Nunavut annual net migration is currently occurring.
Employee and contractor changes of address, housing status, and migration intentions	Not applicable	Not applicable	Not applicable	Project	5.4% of respondents to the 2019 Inuit Employee Survey changed residences in the past 12 months. 3.6% moved to a different community and 1.8% moved within their existing community. 13.8% planned to move to a different community in the next 12 months. 6.9% planned to move away from the North Baffin LSA. Data on the housing status of respondents were not collected in 2019 due to a survey administration error.
Hours worked by female employees and contractors	Not applicable	↑	↑	Project	424,479 hours were worked by female employees and contractors in 2019 (9.8% of total), 161,635 hours of which were worked by Inuit females (3.7% of total).
Childcare availability and costs	Not available	Not available	Not available	Project	This topic continues to be tracked through the QSEMC process and community engagement conducted for the Project.

Indicator / Topic	Pre Dev't Trend	Post Dev't Trend	Trend Since Prev. Year	Scale	Summary
Project harvesting interactions and food security	Not available	Not available	Not available	Project	This topic continues to be tracked through the QSEMC process, community engagement conducted for the Project, and related information.
Number of drug and alcohol related contraband infractions at Project sites	Not applicable	↑	↓	Project	There were 24 drug and alcohol-related contraband infractions at Project sites in 2019.
Number of impaired driving violations	↑ ↑	↑ ↓	↑ ↑	N. Baffin LSA Iqaluit	An increasing post-development trend in the number of impaired driving violations is apparent in the North Baffin LSA and was evident prior to the Project. A decreasing trend is apparent in Iqaluit, which was not evident prior to the Project.
Number of drug violations	↑ ↑	↓ ↓	↓↓	N. Baffin LSA Iqaluit	A decreasing post-development trend in the number of drug violations is apparent in the LSA, which was not evident prior to the Project.
Prevalence of gambling issues	Not available	Not available	Not available	Project	These topics continue to be tracked through the QSEMC process and community engagement conducted for the Project.
Prevalence of family violence					
Number of secondary school graduates	↑ ↑	↓ ↓	↑ ↑	N. Baffin LSA Iqaluit	A decreasing post-development trend in graduation numbers is apparent in the LSA, which was not evident prior to the Project.
Secondary school graduation rate	↑	↓	↑	Region	A decreasing post-development trend in graduation rates is apparent in the region, which was not evident prior to the Project.

**Note:**

Black arrows (↑↓) indicate the direction of change that has occurred. Where there is no discernable or significant change 'No change' is used. Where there are insufficient data or other issues preventing a trend analysis, 'Not available' or 'Not applicable' are used.

**TRENDS**

Trends in the monitoring data relative to the previous year and pre-development period (and during the pre-development period itself in some instances) are presented in Table 4.62.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland continues to provide information on socio-economic effects of the Project through its Socio-Economic Monitoring Report. In instances where appropriate community-level indicator data are currently unavailable (e.g. for the topics of childcare availability and costs, Project harvesting interactions and food security, prevalence of gambling issues, prevalence of family violence), these topics continue to be tracked through the QSEMC process and community engagement conducted for the Project. Baffinland is open to discussing with the SEMWG and QSEMC how improved monitoring data may be obtained.

## Project Certificate Condition No. 169

Category	Governance and Leadership – Monitoring economic effects
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure / Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To maintain transparency inform communities in relation to economic benefits associated with the Project.
Term or Condition	The Proponent provide an annual monitoring summary to the NIRB on the monitoring data related to the regional and cumulative economic effects (positive and negative) associated with the Project and any proposed mitigation measures being considered necessary to mitigate the negative effects identified.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and Mary River Socio-Economic Monitoring Working Group (SEMWG)
Reference	2019 Socio-Economic Monitoring Report (Baffinland, 2020p) 2019 QSEMC and SEMWG Meeting Records
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

Baffinland has provided a summary of monitoring data related to regional and cumulative economic effects associated with the Project in its annual Socio-Economic Monitoring Report (Baffinland, 2020p).

### RESULTS

The Project continues to make positive contributions to the Nunavut economy. 4.35 million hours of Project labour were performed by Baffinland employees and contractors in 2019, equal to approximately 2,159 FTEs. Of this total, 580,197 hours were worked by Inuit, representing approximately 288 FTEs. A total of 16.2 million hours of Project labour have been performed since Project development, of which 2.5 million hours have been performed by Inuit. In addition, \$20.23 million in payroll was provided to Baffinland Inuit employees in 2019 and, since 2014, Baffinland has provided \$65.5 million in payroll to its Inuit employees. Likewise, \$288.8 million was spent on contracting with Inuit Firms in 2019. A total of \$1.25 billion has been awarded to Inuit Firms since Project development.

When compared to annual economic outputs for Nunavut as a whole, these values are notable. In 2018 (the most recent year estimates were available), for example, there were a total of 16,655 jobs held in Nunavut and 29,179,000 total hours worked with average weekly earnings of \$1,375.30 per employee. By comparison, hours worked by Baffinland's employees and contractors in 2018 (i.e. 3,081,740) represent 10.6% of the Nunavut total.<sup>8</sup>

<sup>8</sup> This is a general estimate only, as not all Project hours were necessarily worked in Nunavut.

Average weekly earnings of Baffinland's Inuit employees in 2018 were also higher than the Nunavut average, at \$1,719.17.

Mining remains an important contributor to the Nunavut economy. Nunavut's real Gross Domestic Product (GDP) for all industries in 2018 was \$2,995.0 million.<sup>9</sup> Of this amount, '*mining, quarrying, and oil and gas extraction*' was responsible for contributing \$680.7 million (or 22.7%). Mining may also make economic contributions to supporting industries such as '*construction*' (\$647.8 million contribution to the Nunavut economy in 2018), '*transportation and warehousing*' (\$66.8 million contribution to the Nunavut economy in 2018), and '*accommodation and food services*' (\$30.0 million contribution to the Nunavut economy in 2018), amongst others. The Mary River Project has likely been an important contributor to these amounts, as has Agnico Eagle Mines Limited's Meadowbank, Meliadine and Whale Tail Projects and TMAC Resources Hope Bay Project (Nunavut's only other operating mines in 2019), and several other Nunavut-based mining projects that were in various stages of development in 2018. Mining in Canada, generally, contributed \$57.6 billion to the country's GDP, or 3.4% of total Canadian GDP (in 2016). The industry also directly employs more than 403,000 individuals and remains the largest proportional private sector employer of Indigenous peoples in the country (Mining Association of Canada, 2018).

## TRENDS

The Project continues to provide positive regional and cumulative economic effects.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland continues to provide information on regional and cumulative economic effects of the Project through its Socio-Economic Monitoring Report. No negative regional or cumulative economic effects associated with the Project were identified in 2019. As such, no mitigation measures have been proposed to manage negative effects.

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<sup>9</sup> The Bank of Canada (2016) notes real GDP is "the most common way to measure the economy... GDP is the total value of everything - goods and services - produced in our economy. The word "real" means that the total has been adjusted to remove the effects of inflation." The real GDP amounts by industry presented by the Nunavut Bureau of Statistics (2018a) are in chained 2007 dollars.



#### 4.8 PERFORMANCE ON OTHER CONDITIONS

##### 4.8.1 Accidents & Malfunctions (PC Conditions 170 through 177)

Eight (8) PC conditions relate to accidents and malfunctions. Two (2) of these conditions relate to the TEMMP, four (4) relate to spill response planning, one (1) relates to implementing adaptive management measures for hunter safety around ice tracks, and one (1) relates to the use of foreign flagged vessels. Baffinland's updates to these PC conditions are provided in the pages that follow.

## Project Certificate Condition No. 170

Category	Accidents and Malfunctions - Terrestrial Wildlife Management and Monitoring Plan
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	Updates to plan in order to better understand the potential for, and to minimize possible caribou-railway interactions.
Term or Condition	The Proponent shall include in an updated Terrestrial Wildlife Management and Monitoring Plan, plans for increased caribou monitoring efforts including weekly winter track surveying and summer and fall surveys undertaken on foot twice per month.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status of Compliance	Not Applicable
Stakeholder Review	Terrestrial Environment Working Group (TEWG), Nunavut Impact Review Board
Reference	Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016c)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Not applicable in 2019. No Railway has been constructed to date thus there is no potential for caribou-railway interactions to exist.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable in 2019. Project Certificate Condition No. 170 refers to better understanding and minimizing caribou interactions with the Railway. The Railway has not been built, and therefore these monitoring activities have not been triggered. This will be re-evaluated once plans resume for Railway construction and operation.

## Project Certificate Condition No. 171

Category	Accidents and Malfunctions - Terrestrial Wildlife Management and Monitoring Plan
Responsible Parties	The Proponent
Project Phase(s)	Pre-Construction
Objective	Updates to plan in order to minimize potential for caribou-railway interactions.
Term or Condition	The Proponent shall include within its updated Terrestrial Wildlife Management and Monitoring Plan, a commitment to establish deterrents along the railway and Tote Road embankments at any areas where it is determined that caribou are utilizing the embankments or transportation corridors to facilitate movement and where such movement presents a likelihood of caribou mortality to occur.
Relevant Baffinland Commitments	N/A
Reporting Requirement	To be included in the Annual Report submitted to the NIRB.
Status of Compliance	In-Compliance
Stakeholder Review	Terrestrial Environment Working Group (TEWG)
Reference	Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016c) Draft 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix G

### METHODS

Areas along the Tote Road may be used for caribou movement were identified in the FEIS Terrestrial Wildlife Baseline Report (EDI, 2012). Successive Height of Land surveys and driver observations have continued to provide information on potential areas of use by caribou along the Tote Road.

Section 3.3.3 and 3.3.4 of the Terrestrial Environment Mitigation and Monitoring Plan (Baffinland, 2016c) outline specific mitigation and management measures with respect to caribou movement and mitigating mortalities. Snow bank heights along the Tote Road are limited to 1 m in height to allow for caribou movement across the length of the road corridor. Any identified trail crossings will be identified and reviewed with QIA-identified Elders and hunters, such that any adjustments to the embankments facilitate the desired wildlife movement. Refer to the TEMMP for further discussion on management measures and adaptive management.

### RESULTS

During 2019, four (4) caribou were observed incidentally from the Tote Road near KM 13 across Philips Creek, and a total of 48 caribou were incidentally observed outside the PDA as 23 separate observations (this may include the same individuals observed on separate days and/or by separate observers). No caribou were identified during the Height of Land surveys. Caribou have not been observed directly in the PDA during Height of Land surveys between 2014 and 2019. This information, in combination with Inuit Qaujimajatuqangit received at workshops held in November 2015 and April 2016 confirm that there is currently low caribou abundance. Caribou abundance surveys conducted in 2014 and 2018 by the Government of Nunavut also reported low abundance throughout Baffin Island (Ringrose, 2018).

**TRENDS**

Not applicable.

**RECOMMENDATIONS / LESSONS LEARNED**

To date, the implementation of deterrents along the Tote Road has not been required given the relatively low abundance of caribou. Existing mitigation and monitoring as outlined in the TEMMP is considered effective to meet the terms of the Project Certificate condition.

## Project Certificate Condition No. 172

Category	Accidents and Malfunctions – Overwintered fuel vessel
Responsible Parties	The Proponent
Project Phase(s)	Construction
Objective	To provide evidence that vessel to be used is fit and insured for proposed use.
Term or Condition	The Proponent is encouraged to provide the Government of Nunavut with evidence that the vessel that it intends to use for the overwintering of fuel has been designed and certified for use under the conditions which it is expected to operate, and that it be required to provide copies of the vessel owners' insurance policies.
Relevant Baffinland Commitment	8
Reporting Requirement	The required information is to be provided to the Government of Nunavut as soon as possible, and at a minimum, at least 60 days prior to the commencement of any construction related shipping.
Status	Not Applicable
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Not applicable in 2019.

### RESULTS

None.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable in 2019. Baffinland did not require the overwintering of fuel via vessel in 2019. If overwintering of fuel is required, Baffinland will provide the Government of Nunavut with the requested information.

## Project Certificate Condition No. 173

Category	Accidents and Malfunctions - Use of best practices
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Closure
Objective	To provide additional spill contingency measures for spills in marine areas.
Term or Condition	The Proponent shall employ best practices and meet all regulatory requirements during all ship-to-shore and other marine-based fuel transfer events.
Relevant Baffinland Commitment	9
Reporting Requirement	To be determined following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Environment and Climate Change Canada, Qikiqtani Inuit Association, Nunavut Water Board, Indigenous and Northern Affairs Canada, Nunavut Impact Review Board.
Reference	Oil Pollution Emergency Plan – Milne Inlet (OPEP; Baffinland, 2020m) Oil Pollution Prevention Plan – Milne Inlet (OPPP; Baffinland, 2020n) Shipping and Marine Wildlife Management Plan (Baffinland, 2016e) Spill at Sea Response Plan (SSRP; Baffinland, 2015b)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Baffinland maintains a Transport Canada approved OPEP for ship to shore fuel transfers at Milne Port, which is currently a Class 2 Oil Handling Facility. The OPEP was updated in May 2020. Training of Baffinland staff on the Milne Inlet OPEP was conducted by a qualified marine spill response contractor (Navenco Marine) between July 12 to 21, 2019. Baffinland is committed to undertaking fuel transfer from vessels under good weather conditions. Baffinland also maintains a Transport Canada approved OPPP (Baffinland, 2020n), which is specifically designed to prevent the discharge of oil during bulk fuel transfers at Milne Port.

Baffinland also maintains the SSRP that outlines procedures for dealing with the unlikely event of a spill during ship to ship fuel transfers. Each vessel under contract to Baffinland also maintains its own Shipboard Oil Pollution Emergency Plan (SOPEP), which outlines the vessels protocol for dealing with a spill event, and includes an inventory of spill response equipment onboard the vessel.

### RESULTS

OPEP training occurred in 2019. A mock spill exercise was performed to ensure spill readiness. Required equipment for a Class 2 Oil Handling Facility was met. No spills occurred during fuel transfers.

### TRENDS

As in previous years, Transportation Canada's Guidelines for Baffinland's Class 2 (previously Class 1) Oil Handling Facility were adhered to.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to conduct routine training exercises and strategically place resources and equipment on site for spill response during ship-to-shore fuel transfer events.

## Project Certificate Condition No. 174

Category	Accidents and Malfunctions - Community level spill response
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Closure
Objective	To improve community ability to assist in spill response
Term or Condition	The Proponent and the Canadian Coast Guard are required to provide spill response equipment and annual training to Nunavut communities along the shipping route to potentially improve response times in the event of a spill.
Relevant Baffinland Commitment	108,110
Reporting Requirement	To be determined following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Environment Climate Change Canada (ECCC), Qikiqtani Inuit Association (QIA), Nunavut Water Board (NWB), Indigenous and Northern Affairs Canada, Nunavut Impact Review Board (NIRB).
Reference	Oil Pollution Emergency Plan – Milne Inlet (OPEP; Baffinland, 2020m) Oil Pollution Prevention Plan – Milne Inlet (Baffinland, 2020n) Shipping and Marine Wildlife Management Plan (Baffinland, 2016e) Spill at Sea Response Plan (Baffinland, 2015b)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

In a January 29, 2015 letter from the Canadian Coast Guard (CCG) to NIRB, the CCG noted that the provision of spill response equipment and training to communities was the responsibility of CCG.

Training of Baffinland staff on the Milne Inlet OPEP was conducted by a qualified marine spill response contractor between July 12 to 21, 2019. This ensured that Baffinland is ready to respond to potential spills along the shipping route within the Inlet. Oil Spill Response Ltd. has continued to be retained to respond to significant spills that occur. Baffinland continued to improve marine spill response ability at the Port in 2019, procuring a spare outboard engine for the rescue boat and additional anchor kits, anchor buoys and other materials. Baffinland is committed to ensuring that adequate resources are allocated to the development and deployment of emergency and spill response capabilities within the Project.

### RESULTS

OPEP training occurred in 2019. A mock spill exercise was performed to ensure spill readiness. Baffinland has invited communities of the North Baffin Region to participate and observe training. Required equipment for a Class 2 Oil Handling Facility was met. No spills occurred during fuel transfers.

A minor release of an unknown hydrocarbon was observed on the ocean's surface in the local area of the Freight Dock on September 23, 2019 during routine marine monitoring in Milne Port. Notification was provided to ECCC, CIRNAC and QIA. Spill response procedures were initiated and an oil absorbent boom was deployed around the east face of the Freight Dock to contain the sheen. An investigation revealed that approximately 5 L of hydrocarbon had been released. No free product or point source was identified and the sheen was observed rapidly dissipating from

wave action. No sheen was observed during subsequent monitoring the following morning in Milne Inlet or within the containment booms. A follow-up spill report was issued to ECCC, CIRNAC and QIA on October 23, 2019.

**TRENDS**

Baffinland is committed, during operations, to conducting regular and annual spill response exercises and training in known and effective techniques for responding to spills

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to conduct routine training exercises and strategically place resources and equipment on site for spill response during ship-to-shore fuel transfer events.



## Project Certificate Condition No. 175

Category	Accidents and Malfunctions – Ship track markers in ice cover
Responsible Parties	The Proponent, Qikiqtani Inuit Association, Hunters and Trappers Organizations of the North Baffin region and Coral Harbour
Project Phase(s)	Construction, Operations, Closure and Post-Closure Monitoring
Objective	To ensure that measures taken to mark the shipping track(s) during periods of ice cover are effective in advising ice-based travelers, and that, where necessary, revisions to this practice can be made to ensure public safety.
Term or Condition	The Proponent shall, in coordination and consultation with the Qikiqtani Inuit Association and the Hunters and Trappers Organizations of the North Baffin communities and Coral Harbour, provide updates to its Shipping and Marine Mammals Management Plan to include adaptive management measures it proposes to take should the placement of reflective markers along the ship track in winter months not prove to be a feasible method of marking the track to ensure the safety of ice-based travelers.
Relevant Baffinland Commitment	34, 57
Reporting Requirement	To be determined following approval of the Project by the Minister.
Status	Not Applicable
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Not applicable in 2019. There is no winter shipping associated with the current phase of the Project. Furthermore, action on this PC Condition is deferred until the Steensby Port is developed and transits through ice are scheduled.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 176

Category	Accidents and Malfunctions - Revised spill modeling
Responsible Parties	The Proponent
Project Phase(s)	Pre-Construction, Construction Operations, Closure
Objective	To improve community ability to assist in spill response.
Term or Condition	The Proponent is required to revise its spill planning to include additional trajectory modeling for areas of Hudson Strait, such as Mill Island, where walrus concentrate, as well as for mid-Hudson Strait during winter conditions as well as for the northern shipping route, including Milne Inlet, Eclipse Sound and Pond Inlet.
Relevant Baffinland Commitment	N/A
Reporting Requirement	The updated modeling shall be provided to the NIRB, Fisheries and Oceans Canada, and Environment Canada for review at least 3 months prior shipment of bulk fuel to Steensby Inlet or Milne Inlet.
Status	In Compliance (Milne Inlet)
Stakeholder Review	Transport Canada, Canadian Coast Guard, Fisheries and Oceans Canada, Environment and Climate Change Canada
Reference	Milne Inlet Spill Modelling Report Fuel Spill Modelling: Northern Shipping Route Open Water Season - Milne Inlet, Eclipse Sound, Pond Inlet (AMEC Foster Wheeler, 2015) Oil Pollution Emergency Plan - Milne Inlet (Baffinland, 2017b) Emergency Response Plan (Baffinland, 2018c) Oil Pollution Emergency Plan – Milne Inlet (Baffinland, 2020m) Oil Pollution Prevention Plan – Milne Inlet (Baffinland, 2020n) Shipping and Marine Wildlife Management Plan (Baffinland, 2016e) Spill at Sea Response Plan (Baffinland, 2015b) Spill Contingency Plan (Baffinland, 2018d) Diesel Environmental Emergency (E2) Plan – Mine Site (Baffinland, 2020r). Diesel Environmental Emergency (E2) Plan - Milne Port (Baffinland, 2020o). Exploration Spill Contingency Plan (Baffinland, 2014d)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

### METHODS

Not applicable to Steensby Port and the southern shipping route in 2019. Revised oil spill modelling was conducted for shipping from Milne Port in 2015 that satisfies this condition. Leading up to this modelling, a fuel spill preparedness workshop was held in April 2014 with Transport Canada and the Canadian Coast Guard. This workshop established the following credible spill scenarios for modelling:

- For arctic diesel - two (2) compartments of a double-hull, multi-compartment fuel tanker, which amounts to 4,000 m<sup>3</sup> (4 mL). The expected maximum size of the fuel tanker is 15 mL.
- For Intermediate Fuel Oil (IFO) - half of the IFO fuel remaining in the ship when sailing into Milne Inlet which amounts to 2,000 m<sup>3</sup> (2 mL) of IFO.

The spill assessment considered the open-water season, and the month of September was selected as representative in terms of meteorological and oceanographic conditions. Five potential spill locations along the shipping route were selected considering community recommendations.

Two (2) scenarios were modelled at each of the five (5) locations using the software OST, which computes spill probability distributions to indicate geographical regions (e.g., Pond Inlet, Eclipse Sound, Navy Board Inlet and Milne Inlet) which might be affected as a result of a spill, how frequently and how soon.

In addition, ten (10) (two fuel types x five locations) simulations were run with a September 'P50' wind condition defined as the average wind speed conditions and the associated most frequent wind direction. Finally, a sensitivity run considering a full fuel tanker loss of 15 mL arctic diesel cargo at a location in Eclipse Sound was also prepared. For these scenarios, RPS ASA's OILMAP (RPS, 2014) was used to provide additional estimation of spill weathering and fate. This includes slick characteristics, estimate of fuel concentrations in the surface layer, amounts evaporated and that have reached shore, and remaining amounts of fuel, and fuel and water (mousse) volume. The spill modelling completed in this study assumes no intervention, response or containment and that the slick is assumed to freely discharge (during a very short duration) from the damaged vessel.

The OILMAP oil spill model and response system introduced above was used to provide additional estimates of spilled fuel fate, in particular, slick characteristics and weathering. OILMAP calculates the evaporation, dispersion and remaining percentage for a given spill scenario where the user defines a fuel product type, weather conditions, properties of the receiving water, and the amount of fuel released.

The fate or weathering processes considered were evaporation, the conversion of liquid fuel into gaseous component, and natural dispersion, the breakup of a fuel slick into small droplets that are mixed into the sea by wave action. These are two important weathering processes that typically occur over the first five days following a spill and act to remove fuel from the sea surface. Fuel will also be brought to shore depending on the prevailing currents and winds at the time as well as the type and amount of fuel, and type of shoreline. Consideration of the amounts lost due to these processes yields an estimate of the remaining amount of fuel on the surface at any time. These are the key fates modeled and tracked by OILMAP. No containment or recovery of spilled fuel was assumed in the simulations.

## RESULTS

The modelling results from the 2015 report were presented in a series of figures showing expected spill trajectories after 1 day and 5 days. The spill model informed the development of Baffinland's Spill at Sea Response Plan.

The spill modelling results highlight the importance of spill prevention and the Spill at Sea Response Plan preparedness to minimize any adverse effects in the unlikely event of a fuel release of any size during vessel traffic into Milne Inlet.

## TRENDS

Not applicable.

## RECOMMENDATIONS / LESSONS LEARNED

Management plans, including the Spill at Sea Response Plan (Baffinland, 2015b) and the Emergency Response Plan (Baffinland, 2018c) are being updated as part of the Phase 2 Proposal regulatory process to incorporate the updated fuel spill dispersion modelling that was completed in support of the Phase 2 Proposal. Versions of the

aforementioned management plans that are currently operational will remain in effect until anticipated approval of the Phase 2 Proposal is received.

## Project Certificate Condition No. 177

Category	Accidents and Malfunctions - Foreign flagged vessels
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Closure and Post-Closure Monitoring
Objective	To ensure foreign flagged ships operating in Canadian waters are held to the same standard as domestic ships with regard to emergency response planning.
Term or Condition	The Proponent shall enroll any foreign flagged vessels commissioned for Project-related shipping within Canadian waters into the relevant foreign program equivalent to Transport Canada's Marine Safety Delegated Statutory Inspection Program.
Relevant Baffinland Commitment	13, 37
Reporting Requirement	To be determined following approval of the Project by the Minister.
Status	In-Compliance
Stakeholder Review	Transport Canada
Reference	N/A
Ref. Document Link	N/A

### METHODS

Ship owners / operators are responsible for enrolling their foreign flagged vessel with the appropriate program. Baffinland incorporates this requirement into contract terms and conditions with all vessels contracted directly by Baffinland.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

#### 4.8.2 Alternatives Analysis (PC Condition 178 through 184)

Ten (10) PC conditions relate to alternatives analysis. Four (4) of these conditions relate to shipping activities, two (2) relate to the membership of the MEWG, one (1) relates volumes of ore to be hauled on the Tote Road, one (1) relates to the implementation of mitigation measures in the marine environment, and two (2) relate to the assessment of Baffinland's performance against commitments and terms and conditions of the Project Certificate. Of note, condition No. 179 (a), (b) and (c) relate to Baffinland's production increase proposal to allow for shipment of 6 Mtpa of ore through Milne Inlet. Baffinland's updates to these PC conditions are provided in the pages that follow.

## Project Certificate Condition No. 178

Category	Alternatives Analysis - Mill Island shipping route consideration
Responsible Parties	The Proponent, Qikiqtani Inuit Association, Nunavut Impact Review Board, Marine Environment Working Group
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance
Objective	To prevent disturbance to walrus and walrus habitat on the northern shore of Mill Island.
Term or Condition	Subject to safety considerations and the potential for conditions, as determined by the crew of transiting vessels, to result in route deviations, the Proponent shall require project vessels to maintain a route to the south of Mill Island to prevent disturbance to walrus and walrus habitat on the northern shore of Mill Island.
Relevant Baffinland Commitment	N/A
Reporting Requirement	Where project vessels are required to transit to the north of Mill Island owing to environmental or other conditions, an incident report is to be provided to the Marine Environment Working Group and the NIRB within 30 days, noting all wildlife sightings and interactions as recorded by shipboard monitors. The Proponent shall summarize all incidences of deviations from the nominal shipping route as presented in the FEIS to the NIRB annually, with corresponding discussion regarding justification for deviations and any observed environmental impacts.
Status	Not Applicable
Stakeholder Review	N/A
Reference	N/A
Ref. Document Link	N/A

### METHODS

Not Applicable in 2019. Shipping through Steensby Inlet is not currently part of the Project's operations.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.

## Project Certificate Condition No. 179

Category	Operational Variability
Responsible Parties	The Proponent
Project Phase(s)	Operations
Objective	To apply the precautionary principle in respect of potential effects on marine wildlife and marine habitat from changes to shipping frequency that may result from a significant increase in mine production for an extended period of time.
Term or Condition	Baffinland shall not exceed 20 ore carrier transits to Steensby Port per month during the open water season and 242 transits per year in total.
Relevant Baffinland Commitment	4
Reporting Requirement	To be developed following approval by the Minister.
Status	Not Applicable
Stakeholder Review	N/A
Reference	NA
Ref. Document Link	N/A

### METHODS

Not Applicable in 2019. Shipping through Steensby Inlet is not currently part of the Project's operations.

### RESULTS

Not applicable.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Not applicable.



## Project Certificate Condition No. 179 (a)

Category	Operational Variability/Flexibility
Responsible Parties	The Proponent
Project Phase(s)	Operations
Objective	To ensure that there are appropriate limits on the Milne Inlet marine shipping component in order to limit and manage likely project effects, while balancing the need for operational flexibility.
Term or Condition	Until December 31, 2019, the total volume of ore shipped via Milne Inlet may exceed 4.2 million tonnes per year, but must not exceed 6.0 million tonnes in any calendar year. After December 31, 2019 the maximum total volume of ore shipped via Milne Inlet in a calendar year returns to 4.2 million tonnes per year, unless this condition has been further modified under s. 112 of <i>Nunavut Planning and Project Assessment Act</i> , S.C. 2013, c. 14, s.2.
Relevant Baffinland Commitment	4
Reporting Requirement	For each year after the Proponent commences shipping ore via Milne Inlet under the Early Revenue Phase Proposal, the Proponent shall include in the Annual Report to the NIRB, a summary of the total amount of ore shipped via Milne Inlet for the previous calendar year.
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

## METHODS

The total volume of ore shipped via Milne Inlet is tracked annually by Baffinland.

## RESULTS

Baffinland shipped a total a total of 5.86 million tonnes of iron ore during the 2019 shipping season, as outlined in Table 4.63.

**Table 4.63: Monthly and Annual Quantities of Ore Shipped by the Project in 2019**

Month	Lump Shipped (Wet Metric Tonnes)		Fines Shipped (Wet Metric Tonnes)		Total Shipped (Wet Metric Tonnes)	
	Milne Inlet	Steensby Inlet	Milne Inlet	Steensby Inlet	Milne Inlet	Steensby Inlet
January	0	0	0	0	0	0
February	0	0	0	0	0	0
March	0	0	0	0	0	0
April	0	0	0	0	0	0
May	0	0	0	0	0	0
June	0	0	0	0	0	0

Month	Lump Shipped (Wet Metric Tonnes)		Fines Shipped (Wet Metric Tonnes)		Total Shipped (Wet Metric Tonnes)	
	Milne Inlet	Steensby Inlet	Milne Inlet	Steensby Inlet	Milne Inlet	Steensby Inlet
July	870,807	0	0	0	870,807	0
August	484,156	0	1,854,760	0	2,338,916	0
September	596,161	0	1,091,429	0	1,687,590	0
October	690,923	0	273,042	0	963,965	0
November	0	0	0	0	0	0
December	0	0	0	0	0	0
<b>SUB-TOTAL</b>	<b>2,642,047</b>	<b>0</b>	<b>3,219,231</b>	<b>0</b>	<b>5,861,278</b>	<b>0</b>
<b>TOTAL</b>	<b>2,642,047</b>		<b>3,219,231</b>		<b>5,861,278</b>	

## TRENDS

The total volume of ore shipped via Milne Inlet in 2017 was 4.05 million tonnes, 5.094 million tonnes in 2018 and 5.86 million tonnes in 2019. The volume of ore shipped each year has increased since the start of operations.

Baffinland continues to operate within the existing allowance for shipping limits outlined in PC Condition No. 179(a).

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to track ore volumes shipped on a yearly basis.

Baffinland in early December 2019 sent a notification of its intention to NIRB to request an additional extension to the production increase limits (i.e., extending the 6 Mtpa limit beyond 2019) and thereby consider further modifications of Conditions No. 179(a) and 179(b). In January 2020, Baffinland submitted a formal Extension Request Package. Baffinland's intention to continue shipping 6 Mtpa in 2020 was widely supported by the five North Baffin region hamlets and regulators, with letters of support submitted to the NIRB. On March 4, 2020 the NIRB issued its "Reconsideration Report and Recommendations" indicating that they recommended the extension of the 6 Mtpa production increase until December 31, 2021. The Responsible Ministers are expected to make a final determination by June 2020.

The Phase 2 application proposes to increase the volume of ore transported to Milne Port to 12 Mtpa by rail, and to cease the transport of ore via truck along the Milne Inlet Tote Road. Baffinland will continue to work through the regulatory process to obtain approval.

## Project Certificate Condition No. 179 (b)

Category	Operational Variability/Flexibility
Responsible Parties	The Proponent
Project Phase(s)	Operations
Objective	To ensure that there are appropriate limits on the Milne Inlet Tote Road land transportation component in order to limit and manage likely project effects, while balancing the need for operation flexibility.
Term or Condition	Until December 31, 2019, the total volume of ore transported by truck on the Milne Inlet Tote Road may not exceed 4.2 million tonnes per year, but must not exceed 6.0 million tonnes in any calendar year. After December 31, 2019, the maximum total volume of ore transported by truck on the Milne Inlet Tote Road in a calendar year returns to 4.2 million tonnes per year, unless this condition has been further modified under s. 112 of the <i>Nunavut Planning and Project Assessment Act</i> , S.C. 2013, c. 14, s. 2.
Reporting Requirement	For each year after the Proponent commences shipping ore via Milne Inlet under the Early Revenue Phase Proposal, the Proponent shall include in the Annual Report to the NIRB, a summary of the total amount of ore shipped via Milne Inlet for the previous calendar year.
Relevant Baffinland Commitment	4
Status	In-Compliance
Stakeholder Review	Nunavut Impact Review Board (NIRB)
Reference	2019 QIA & NWB Annual Report for Operations (Baffinland, 2020a)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>

## METHODS

The total volume of ore transported by truck on the Milne Inlet Tote Road is tracked annually by Baffinland.

## RESULTS

In 2019 a total of 5.7 Mt of iron ore was transported by truck on the Milne Inlet Tote Road, as outlined in Table 4.64.

**Table 4.64: Monthly and Annual Quantities of Ore Generated and Transported Via the Tote Road in 2019**

Month	Quantity of Ore Generated (Wet Metric Tonnes)	
	Lump	Fines
January	252,246	244,393
February	260,319	228,350
March	125,017	361,428
April	213,064	249,257
May	176,754	203,777
June	251,443	223,588
July	97,738	415,666
August	184,540	368,267

Month	Quantity of Ore Generated (Wet Metric Tonnes)	
	Lump	Fines
September	204,320	242,055
October	171,325	233,210
November	91,609	452,845
December	55,107	397,370
<b>SUB-TOTAL</b>	<b>2,083,482</b>	<b>3,620,206</b>
<b>TOTAL</b>	<b>5,703,688</b>	

## TRENDS

In 2017 and 2018, a total of 4.54 Mt and 5.44 Mt were transported by truck on the Milne Inlet Tote Road, respectively. The volume of ore hauled along the Tote Road each year has thus increased since the start of operations.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to track ore volumes transported by truck on the Milne Inlet Tote Road.

Baffinland in early December 2019 sent a notification of its intention to NIRB to request an additional extension to the production increase limits (i.e., extending the 6 Mtpa limit beyond 2019) and thereby consider further modifications of Conditions No. 179(a) and 179(b). In January 2020, Baffinland submitted a formal Extension Request Package. Baffinland's intention to continue shipping 6 Mtpa in 2020 was widely supported by the five North Baffin region hamlets and regulators, with letters of support submitted to the NIRB. On March 4, 2020 the NIRB issued its "Reconsideration Report and Recommendations" indicating that they recommended the extension of the 6 Mtpa production increase until December 31, 2021. The Responsible Ministers are expected to make a final determination by June 2020.

The Phase 2 application proposes to increase the volume of ore transported to Milne Port to 12 million tonnes per annum by rail, and to cease the transport of ore via truck along the Milne Inlet Tote Road. Baffinland will continue to work through the regulatory process to obtain approval.

### Project Certificate Condition No. 179 (c)

Category	Operational Variability/Flexibility
Responsible Parties	The Proponent
Project Phase(s)	Operations
Objective	To ensure commitments made by the Proponent with respect to the 2018 production increase and delivery of benefits to Inuit are adhered to, and can be determined through a body of evidence.
Term or Condition	The Proponent shall be required to resource and support a third party to conduct performance audits of commitments made by the Proponent in relation to both the IIBA and every Proponent commitment and every terms or condition of the Project Certificate relating to environmental management of the Tote Road component or environmental management related to shipping.
Relevant Baffinland Commitment	N/A
Reporting Requirement	On a bi-annual basis, the Proponent shall file a Performance Audit Report with the NIRB. This report shall include the findings of the third-party auditor, and Baffinland's commitment to addressing findings of the auditor. This term and condition will remain in force for the duration of the Mary River Project, unless it is modified under the <i>Nunavut Planning and Project Assessment Act</i> .
Status	In -Compliance
Stakeholder Review	N/A
Reference	Specified Auditing Procedures on the Commitments Audit Protocol report to the Nunavut Impact Review Board For the period ending June 30, 2019 (BDO, 2019) Specified Auditing Procedures on the Commitments Audit Protocol report to the Nunavut Impact Review Board For the period ending December 31, 2019 BDO, 2020.
Ref. Document Link	NIRB Public Registry

## METHODS

In 2018 Baffinland retained a consultant to design an audit template that would meet the specific objectives of the terms and conditions of Project Certificate Condition No. 179 (c). The audit template was shared with the Qikiqtani Inuit Association (QIA) to confirm the scope prior to initiating the audit. A contract was established with BDO Canada LLP (BDO) to conduct two (2) audits in relation to both the IIBA, project Commitments, and the Terms and Conditions of the Project Certificate relating to the operation of the Tote Road and shipping activities.

## RESULTS

The first Performance Audit Report was submitted to the NIRB in October 2019, for the period between January 1, 2019 and June 30, 2019 (BDO, 2019). For the IIBA section of the audit report, Baffinland had an 86% completion rate. For the PC No. 005 Terms and Conditions section, Baffinland had a 92% completion rate.

The second Performance Audit Report was filed to the NIRB on March 31, 2020, covering the period between June 30, 2019 up to December 31, 2019 (BDO, 2020). For the IIBA section of the audit report, Baffinland had an 91% completion rate. For the PC No. 005 Terms and Conditions section, Baffinland had a 95% completion rate.

**TRENDS**

In its first year of reporting, Baffinland demonstrated an improvement in performance between the two audit reporting periods.

**RECOMMENDATIONS / LESSONS LEARNED**

Baffinland will continue to execute the bi-annual audits required under Project Certificate Condition No. 179(c) in 2020.

## Project Certificate Condition No. 180

Category	Transboundary Effects - Makivik Corporation involvement in the Marine Environment Working Group (MEWG)
Responsible Parties	The Proponent, members of the Marine Environment Working Group
Project Phase(s)	Construction, Operations, Temporary Closure/Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To enable Makivik Corporation and Nunavik communities near shipping lanes to remain informed and involved in those shipping activities which could affect the marine environment and marine mammals.
Term or Condition	The Marine Environment Working Group established for this Project shall invite a representative from Makivik Corporation to be a member of the Group.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	2019 MEWG Meeting Records
Ref. Document Link	Appendix C

### METHODS

Makivik is a member of the MEWG established in 2013. Meeting minutes of working group meetings are distributed to all parties. If a representative of Makivik is unable to attend a meeting, they are informed of Project plans through the sharing of meeting presentation slides [Inuktitut and English] and meeting minutes (draft and final versions [Inuktitut and English]) via email.

### RESULTS

Makivik received MEWG meeting presentation slides and meeting minutes for all scheduled meetings, in addition to other technical information (e.g., latest drafts of annual monitoring reports) in 2019.

### TRENDS

Not applicable

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to update Makivik on Project activities through the MEWG meetings and distribution of technical documentation.

## Project Certificate Condition No. 181

Category	Transboundary Effects - Marine Environment Working Group (MEWG) reporting
Responsible Parties	The Proponent, members of Marine Environment Working Group
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To enable Makivik Corporation and Nunavik communities near shipping lanes to remain informed and involved in those shipping activities which could affect the marine environment and marine mammals.
Term or Condition	Regardless of whether Makivik Corporation participates as a member of the Marine Environment Working Group, the Marine Environment Working Group will provide Makivik Corporation with regular updates regarding the activities of the Marine Environment Working Group throughout the Project life cycle.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	2019 MEWG Meeting Records
Ref. Document Link	Appendix C

### METHODS

Makivik is a member of the MEWG established in 2013. Meeting minutes of the MEWG meetings are distributed to all parties. If a representative of Makivik is unable to attend a meeting, they are informed of Project plans through the sharing of meeting presentation slides [Inuktitut and English] and meeting minutes (draft and final versions [Inuktitut and English]) via email

### RESULTS

Makivik received MEWG meeting presentation slides for all scheduled meetings, meeting minutes and other technical information (e.g., latest drafts of annual monitoring reports) in 2019 including draft reports.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to update Makivik on Project activities through the MEWG meetings and distribution of technical documentation via email.



## Project Certificate Condition No. 182

Category	Transboundary Effects - Reporting to Marine Environment Working Group (MEWG)
Responsible Parties	The Proponent, Makivik Corporation
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To enable Makivik Corporation and Nunavik communities near shipping lanes to remain informed and involved in those shipping activities which could affect the marine environment and marine mammals.
Term or Condition	Baffinland shall make available to Makivik Corporation any ship route deviation reports provided to the NIRB in accordance with the terms and conditions set out in Section 4.12.4 of the Final Hearing Report.
Relevant Baffinland Commitment	N/A
Reporting Requirement	To be developed following approval by the Minister.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG)
Reference	N/A
Ref. Document Link	<a href="https://www.baffinland.com/operation/shipping-and-monitoring/">https://www.baffinland.com/operation/shipping-and-monitoring/</a>

### METHODS

Vessel transit information for all vessels (non-Baffinland and Baffinland-procured vessels) with Automatic Identification System (AIS) tracking data and travelling within the RSA along the active Northern Shipping Route is publicly available on a 24-hour basis on the Baffinland website over the entire shipping season. Accordingly, online tracking is available prior to start of shipping and remains until after shipping has ended (typically set to provide data from July to October, inclusively). Baffinland will provide ship route deviation reports to Makivik when required. This condition is focused on shipping through the shared waters of Hudson Strait from Steensby Port. The Project has not utilized the southern shipping route to transport ore to date.

### RESULTS

There were no changes to the ship route in 2019.

### TRENDS

Not applicable.

### RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to make ship route information publicly available through its online website and will provide Makivik with any ship route deviation reports.

## Project Certificate Condition No. 183

Category	Project monitoring of impacts to marine mammals
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To address concerns associated with the potential for impacts to marine mammals, and compliance and enforcement of terms and conditions in Project Certificate No. 005 relating to ship-based observer programs, noise exposure assessment, and the identification of other mitigation measures that have the potential to further reduce potential impacts to marine mammals.
Term or Condition	The Proponent shall collaborate with the Marine Environment Working Group to develop impact avoidance or mitigation strategies for the protection of the marine environment. The Proponent shall implement any direction from the Department of Fisheries and Oceans for any avoidance or mitigation measures, including cessation of any activity, for the protection of the marine environment.
Relevant Baffinland Commitment	N/A
Reporting Requirement	Results of the observer program shall be provided in the Annual Report to the Board. Further, Baffinland shall report all data it generates from the implementation of monitoring of marine impacts it is required to implement pursuant to the Terms and Conditions of the Project Certificate.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG), Department of Fisheries and Oceans (DFO)
Reference	Marine Environmental Effects Monitoring Plan (Baffinland, 2016d) Standing Instructions and General Information for Masters of Vessels Loading at Milne Inlet Port (Fednav, 2019a) Standing Instructions and General Information for Masters of Vessels Sailing to Milne Inlet Port (Fednav, 2019b) 2019 MEWG Meeting Records Draft 2019 Ship-based Observer (SBO) Monitoring Report (Golder, 2020f) Draft 2019 MEEMP and AIS Monitoring Report (Golder, 2020a) Draft 2019 Marine Mammal Aerial Survey Report (Golder, 2020g) Draft 2017–2018 Integrated Narwhal Tagging Study Report (Golder, 2020h)
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Baffinland has regularly consulted with the MEWG, DFO and Inuit stakeholders when developing or enhancing impact avoidance and mitigation strategies for the protection of the marine environment.

Any new or modified/enhanced mitigation measures related to shipping or port operations are documented in the annually revised Standing Instructions to Masters (SITM) (Fednav, 2019a; 2019b). This document is distributed to all Project Vessel owners / operators prior to the start of the shipping season. This document provides specific reporting

and navigational guidance to Vessel Masters calling to Milne Port, and is applicable to ore carriers, freight vessels, fuel tankers and Project support vessels (i.e., icebreaker, tugs) during their travel in the RSA and Baffin Bay.

## RESULTS

The MEWG provides a valuable forum for ongoing Project communication and reporting between Baffinland and other interested parties. The MEWG also serves as an advisory group to provide recommendations on appropriate management approaches and actions related to the Project.

In 2019, the MEWG held meetings on 23 April (teleconference), 21 June (in-person - Iqaluit), and 7 October (teleconference). In 2019, the MEWG held meetings on 23 April (teleconference), 21 June (in-person - Iqaluit), and 7 October (teleconference). New and enhanced mitigation measures incorporated by Baffinland in 2019 in response to recommendations and feedback provided by the MEWG, DFO, and Inuit stakeholders (Appendix C.2) included the following:

- During the early shoulder season, restrictions were set on the maximum number of Project vessel transits allowed in the RSA within a 24-h period based on daily ice conditions along the Northern Shipping Route, effectively reducing daily noise exposure periods.
- During the early shoulder season, a 40-km vessel buffer zone (i.e., vessel set-back area) was implemented at the entrance of the RSA that extended 40 Km to the east of the Nunavut Settlement Boundary (east of 73 degrees longitude). Project-related vessels were required to hold position outside the buffer zone until instructed by the Port Authority at Milne Port to proceed with their transit to Milne Port. The 40-km boundary was selected based on acoustic modelling results indicating that this would represent an appropriate acoustic buffer zone for animals at or near the floe edge (i.e. noise levels at the floe edge would be outside marine mammal audible range or below levels known to elicit adverse behavioral responses such as displacement or avoidance).
- Collection of permanent video recordings onboard the icebreaker to record ice conditions during all icebreaker/escort transits in the RSA during both shoulder seasons.
- An ice analyst was deployed on the icebreaker on all transits undertaken in the RSA during the early and late shipping shoulder seasons. The ice analyst recorded daily ice conditions and liaised daily with the Port Authority and Baffinland's shipping department to coordinate daily transits allowable in RSA based on ice conditions.
- Continued use of a real-time AIS-based alert system that immediately informed the Port Authority and Baffinland's shipping department of any non-compliance events (e.g. speed exceedances in the RSA) so that the issue could be quickly resolved.
- MWOs stationed on the icebreaker actively informed the Vessel Master and ship officers of any notable wildlife sightings (i.e. species of higher concern such as polar bear, walrus and bowhead whales) and areas associated with high animal densities. Details on these sightings (including sighting locations) were then relayed to the Port Authority during daily communications between the MSV Botnica Master and Baffinland's shipping department. This information was then used for adaptive management actions (when and where required), including notices from the Port Authority to Vessel Masters operating in the RSA to exercise due caution in order to minimize the likelihood of interactions with the marine mammals identified. In such circumstances, Vessel Masters are authorized to adjust speed or alter course within safe and prudent navigational constraints to avoid to the extent possible interactions with high density marine mammal areas or with species of higher concern.

- Community consultation prior to start of icebreaker escort and shipping operations
- Maximum of three ships transiting at a time in the RSA or anchored at Ragged Island.

Modifications incorporated into Baffinland's 2019 monitoring programs in response to recommendations and feedback provided by the MEWG, DFO, and Inuit stakeholders included the following:

*MEEMP and AIS Program:*

- Completed power analysis to inform sampling design. Based on results, increased sampling effort for benthic infauna and sediment study components (from 5 to 15 sampling stations per transect) to increase power of detection.
- Addition of benthic infauna as indicator species.
- Addition of new transect extending northeast off freight dock.
- Establishment of permanent belt transects for evaluating potential Project effects on epifauna/epiflora.
- Modifications to Fukui traps to increase catch rate.
- Addition of hoop/fyke nets to fish sampling program to compensate for low catch in Fukui traps.
- Added bottom trawls to fish sampling program to target potentially missed species (e.g. Arctic cod).
- Increased jigging and gill net sampling effort to allow for more consistent and repeatable fish sampling.
- For any potential changes to study design, continue sampling at old locations for minimum of three years to facilitate comparison of old and new methods / results.
- Added species (sculpin and shellfish) other than char for tissue/body burden analysis.
- Ageing of char using appropriate otolith experts.
- Ageing was conducted for shellfish (*H. arctica*) as they are known to be potentially long-lived such to appropriately interpret changes in growth and metal uptake.
- Improved ROV-based video surveys by using higher resolution video equipment for ship hull monitoring.
- Geographical expansion of the AIS monitoring program near Ragged Island.
- Use of an independent secondary taxonomic lab for taxonomic verification of potential NIS/AIS.
- Deployment of AIS settlement plates in sets so their recovery can be staggered to allow for longer soak duration.
- Undertook literature review of Phillips Creek Geomorphology to determine influence of Phillips Creek on MEEMP results.
- Expanded ballast water salinity compliance sampling to all ore carriers calling to Milne Port.
- Installation of additional oceanographic moorings in RSA and CTD depth profiling to better understand physical oceanographic conditions in Milne Inlet.
- Additional work on ballast water dispersion model including a sensitivity analysis.

*Marine Mammal Monitoring Programs:*

- Implementation of the Pond Inlet "guardian program" (Shipping Monitors) which consisted of employing a minimum of two full-time Shipping Monitors from the community of Pond Inlet to actively track daily Project vessel movements in the RSA in real-time, and in relation to reported marine mammal aggregations (as shared by the community and the monitoring teams). The Shipping Monitors provided liaison between the community of Pond Inlet, hunters and Baffinland. This was a new approach introduced in 2019 in response to feedback from the MHTO that better communications on Baffinland shipping operations were needed.

Shipping Monitors provided updates on Baffinland shipping activity to residents of Pond Inlet via local public radio, marine VHF radio (for hunters on the water) and through social media.

- Start of season aerial surveys were completed during the early shoulder season to determine the relative abundance and distribution of marine mammals near the Pond Inlet floe edge prior to and during initial shipping and icebreaking operations, and to undertake systematic aerial transect surveys to obtain abundance and density estimates of the Eclipse Sound narwhal summer stock during this period.
- During the open-water season, Baffinland completed simultaneous aerial surveys of the Eclipse Sound and Arctic Bay narwhal summer stock areas to determine abundance and density estimates for both stocks during peak summer, and to account for potential exchange between these respective stocks.
- An aerial-based clearance survey was undertaken at the end of the shipping season to monitor for potential narwhal entrapment events in the RSA.
- Baffinland integrated recommendations from DFO/QIA into aerial survey study design and data collection methodology.
- Installed a physical oceanography mooring at Bruce Head to tide /current level data with narwhal abundance, distribution and behavioral data collected as part of shore-based study.
- Incorporated a UAV/drone study component to Bruce Head shore-based monitoring design to better assess detection ability in furthest offshore strata.
- For Bruce Head shore-based monitoring program, expanded daily survey effort to capture more ship transit events and increase overall samples size.
- Deployed acoustic recorders in additional representative areas of the RSA to better understand ambient and shipping noise levels in those areas. In addition to the three recorders installed in Milne Inlet South, one recorder was installed in Eclipse Sound (south of Bylot Island) and another in Milne Inlet North (near Ragged Island).
- Developed enhanced training algorithms to improve automated animal vocalization detector to better refine calls from different species (e.g. orca vs. narwhal).
- Complied with request to include daily ice charts in 2018 and 2019 SBO Program reports to compare wildlife sightings data with prevalent ice conditions.
- General feedback incorporated into finalization of Early Warning Indicators and adaptive management measures.

## TRENDS

The MEWG has successfully provided valued input into the Baffinland annual marine monitoring programs.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to work with the MEWG to review and guide marine monitoring programs for the Project on an annual basis and develop mitigation measures or action plans as and when needed.

Baffinland, with support from DFO and other members of the MEWG, has put a strong emphasis on continuing existing programs and developing more diverse monitoring programs that incorporate participation from local Inuit communities (e.g., Pond Inlet, Arctic Bay).

## Project Certificate Condition No. 184

Category	Project monitoring of impacts to marine mammals
Responsible Parties	The Proponent
Project Phase(s)	Construction, Operations, Temporary Closure /Care and Maintenance, Closure and Post-Closure Monitoring
Objective	To address concerns associated with the potential for impacts to marine mammals, and compliance and enforcement of terms and conditions in Project Certificate No. 005 relating to ship-based observer programs, noise exposure assessments, and the identification of other mitigation methods that have the potential to further reduce potential impacts to marine mammals.
Term or Condition	The Proponent shall collaborate with the Marine Environment Working Group to review the status of compliance with, and implementation of, all of the Terms and Conditions in Project Certificate No. 005 related to marine environmental protection.
Relevant Baffinland Commitment	N/A
Reporting Requirement	Results of the observer program shall be provided in the Annual Report to the Board. Further, Baffinland shall report annually all data it generates from the implementation of monitoring of marine impacts it is required to implement pursuant to the Terms and Conditions of the Project Certificate.
Status	In-Compliance
Stakeholder Review	Marine Environment Working Group (MEWG), Department of Fisheries and Oceans (DFO)
Reference	Draft 2019 MEEMP and AIS Monitoring Report (Golder, 2020a) Technical Memorandum: 2019 Marine Mammal Monitoring Programs — Updated Preliminary Results (Golder, 2020e) Draft 2019 Ship-based Observer (SBO) Monitoring Report (Golder, 2020f) Draft 2019 Marine Mammal Aerial Survey Report (Golder, 2020g) Draft 2017–2018 Integrated Narwhal Tagging Study Report (Golder, 2020h) Draft Bruce Head Shore-based Monitoring Report (Golder, 2020c) Draft 2019 Passive Acoustic Monitoring Report (Frouin-Mouy et al., 2020) 2019 MEWG Meeting Records
Ref. Document Link	<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a> Appendix C Appendix G

### METHODS

Baffinland will collaborate with the MEWG to review the status of compliance with, and implementation of, all of the Terms and Conditions in Project Certificate No. 005 related to marine environmental protection.

The MEWG provides a valuable forum for ongoing Project communication and reporting between Baffinland and other interested parties. The MEWG also serves as an advisory group to provide recommendations on appropriate management approaches related to the Project.

The MEWG has guided the development of the Marine Environmental Effects Monitoring Program (MEEMP) and also reviews and provides input and recommendations regarding Baffinland's other marine-based monitoring programs and associated annual monitoring reports that are specific to marine wildlife.

In 2019, the MEWG held meetings on 23 April (teleconference), 21 June (in-person - Iqaluit), and 7 October (teleconference). In 2019, the MEWG held meetings on 23 April (teleconference), 21 June (in-person - Iqaluit), and 7 October (teleconference). New and enhanced mitigation measures incorporated by Baffinland in 2019 in response to recommendations and feedback provided by the MEWG, DFO, and Inuit stakeholders (Appendix C.2) included the following:

- During the early shoulder season, restrictions were set on the maximum number of Project vessel transits allowed in the RSA within a 24-h period based on daily ice conditions along the Northern Shipping Route, effectively reducing daily noise exposure periods.
- During the early shoulder season, a 40-km vessel buffer zone (i.e., vessel set-back area) was implemented at the entrance of the RSA that extended 40 Km to the east of the Nunavut Settlement Boundary (east of 73 degrees longitude). Project-related vessels were required to hold position outside the buffer zone until instructed by the Port Authority at Milne Port to proceed with their transit to Milne Port. The 40-km boundary was selected based on acoustic modelling results indicating that this would represent an appropriate acoustic buffer zone for animals at or near the floe edge (i.e. noise levels at the floe edge would be outside marine mammal audible range or below levels known to elicit adverse behavioral responses such as displacement or avoidance).
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- Continued use of a real-time AIS-based alert system that immediately informed the Port Authority and Baffinland's shipping department of any non-compliance events (e.g. speed exceedances in the RSA) so that the issue could be quickly resolved.
- MWOs stationed on the icebreaker actively informed the Vessel Master and ship officers of any notable wildlife sightings (i.e. species of higher concern such as polar bear, walrus and bowhead whales) and areas associated with high animal densities. Details on these sightings (including sighting locations) were then relayed to the Port Authority during daily communications between the MSV Botnica Master and Baffinland's shipping department. This information was then used for adaptive management actions (when and where required), including notices from the Port Authority to Vessel Masters operating in the RSA to exercise due caution in order to minimize the likelihood of interactions with the marine mammals identified. In such circumstances, Vessel Masters are authorized to adjust speed or alter course within safe and prudent navigational constraints to avoid to the extent possible interactions with high density marine mammal areas or with species of higher concern.
- Community consultation prior to start of icebreaker escort and shipping operations
- Maximum of three ships transiting at a time in the RSA or anchored at Ragged Island.

Modifications incorporated into Baffinland's 2019 monitoring programs in response to recommendations and feedback provided by the MEWG, DFO, and Inuit stakeholders included the following:

*MEEMP and AIS Program:*

- Completed power analysis to inform sampling design. Based on results, increased sampling effort for benthic infauna and sediment study components (from 5 to 15 sampling stations per transect) to increase power of detection.
- Addition of benthic infauna as indicator species.
- Addition of new transect extending northeast off freight dock.
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- Increased jigging and gill net sampling effort to allow for more consistent and repeatable fish sampling.
- For any potential changes to study design, continue sampling at old locations for minimum of three years to facilitate comparison of old and new methods / results.
- Added species (sculpin and shellfish) other than char for tissue/body burden analysis.
- Ageing of char using appropriate otolith experts.
- Ageing was conducted for shellfish (*H. arctica*) as they are known to be potentially long-lived such to appropriately interpret changes in growth and metal uptake.
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- Geographical expansion of the AIS monitoring program near Ragged Island.
- Use of an independent secondary taxonomic lab for taxonomic verification of potential NIS/AIS.
- Deployment of AIS settlement plates in sets so their recovery can be staggered to allow for longer soak duration.
- Undertook literature review of Phillips Creek Geomorphology to determine influence of Phillips Creek on MEEMP results.
- Expanded ballast water salinity compliance sampling to all ore carriers calling to Milne Port.
- Installation of additional oceanographic moorings in RSA and CTD depth profiling to better understand physical oceanographic conditions in Milne Inlet.
- Additional work on ballast water dispersion model including a sensitivity analysis.

*Marine Mammal Monitoring Programs:*

- Implementation of the Pond Inlet “guardian program” (Shipping Monitors) which consisted of employing a minimum of two (2) full-time Shipping Monitors from the community of Pond Inlet to actively track daily Project vessel movements in the RSA in real-time, and in relation to reported marine mammal aggregations (as shared by the community and the monitoring teams). The Shipping Monitors provided liaison between the community of Pond Inlet, hunters and Baffinland. This was a new approach introduced in 2019 in response to feedback from the MHTO that better communications on Baffinland shipping operations were needed. Shipping Monitors provided updates on Baffinland shipping activity to residents of Pond Inlet via local public radio, marine VHF radio (for hunters on the water) and through social media.



- Start of season aerial surveys were completed during the early shoulder season to determine the relative abundance and distribution of marine mammals near the Pond Inlet floe edge prior to and during initial shipping and icebreaking operations, and to undertake systematic aerial transect surveys to obtain abundance and density estimates of the Eclipse Sound narwhal summer stock during this period.
- During the open-water season, Baffinland completed simultaneous aerial surveys of the Eclipse Sound and Arctic Bay narwhal summer stock areas to determine abundance and density estimates for both stocks during peak summer, and to account for potential exchange between these respective stocks.
- An aerial-based clearance survey was undertaken at the end of the shipping season to monitor for potential narwhal entrapment events in the RSA.
- Baffinland integrated recommendations from DFO/QIA into aerial survey study design and data collection methodology.
- Installed a physical oceanography mooring at Bruce Head to tide /current level data with narwhal abundance, distribution and behavioral data collected as part of shore-based study.
- Incorporated a UAV/drone study component to Bruce Head shore-based monitoring design to better assess detection ability in furthest offshore strata.
- For Bruce Head shore-based monitoring program, expanded daily survey effort to capture more ship transit events and increase overall samples size.
- Deployed acoustic recorders in additional representative areas of the RSA to better understand ambient and shipping noise levels in those areas. In addition to the three recorders installed in Milne Inlet South, one recorder was installed in Eclipse Sound (south of Bylot Island) and another in Milne Inlet North (near Ragged Island).
- Developed enhanced training algorithms to improve automated animal vocalization detector to better refine calls from different species (e.g. orca vs. narwhal).
- Complied with request to include daily ice charts in 2018 and 2019 SBO Program reports to compare wildlife sightings data with prevalent ice conditions.
- General feedback incorporated into finalization of Early Warning Indicators and adaptive management measures.

## RESULTS

Not applicable.

## TRENDS

The MEWG has successfully provided valued input into the Baffinland annual marine monitoring programs.

## RECOMMENDATIONS / LESSONS LEARNED

Baffinland will continue to work with the MEWG to review and guide marine monitoring programs for the Project on an annual basis and develop mitigation measures or action plans as and when needed.

Baffinland, with support from DFO and other members of the MEWG has put a strong emphasis on continuing existing programs and developing more diverse community-based monitoring programs.

## 5 NIRB CORRESPONDENCE

Throughout 2019, formal correspondence and exchange of information regarding current operations took place between Baffinland and NIRB, and included the following:

- Meetings and Workshops
  - Baffinland participated in the NIRB-facilitated Marine Monitoring and Marine Mitigation Workshop held in Pond Inlet on May 1 to 2, 2019. NIRB released a summary report on June 6, 2019 (NIRB, 2019a) and provided some key recommendations. Baffinland responded to NIRB's recommendations on July 16, 2019 (Baffinland, 2019j).
  - NIRB is an Observer Organization for the MEWG and TEWG which meets annually either in-person (one in-person in June 2019 or via teleconference (two teleconference meetings in April and October 2019). All meeting minutes and presentation slides presented during these meetings are distributed to the NIRB, in addition to copies of draft monitoring programs when they are distributed to working group members for comment.
- Site Visits and Inspections
  - NIRB conducted two site visits on March 26 to 28 and August 6 to 9, 2019.
  - Baffinland prepared responses to comments and items identified during the 2019 site visits. The responses were provided to NIRB on September 27, 2019.
- Annual Reporting
  - Baffinland provided responses to reviewer comments received on the 2018 Annual Report to the Nunavut Impact Review Board (Baffinland, 2019i).
  - Baffinland provided responses to the NIRB's 2018-2019 Annual Monitoring Report for the Mary River Project (NIRB, 2019b) and Board's Recommendations (NIRB, 2019c).

The following sections further summarize engagement and correspondence with NIRB throughout 2019.

### 5.1 NIRB SITE VISITS AND INSPECTIONS

The objective of the NIRB's site visits to the Mary River and Milne Port sites is to determine whether, and to what extent, the land or resource use in question is being carried out within the predetermined Terms and Conditions as set out in the amended Project Certificate issued for the Mary River Project, in accordance with Section 12.7.2(b) of the *Nunavut Agreement*. As described by NIRB, the observations resulting from the site visits shall, wherever possible, be incorporated into the measurement of the relevant effects of the Project, provide the information necessary for agencies to enforce terms and conditions of land or resource use approvals, and will be further used to assess the accuracy of the predictions contained in the project impact statements in accordance with Section 12.7.2 of the *Nunavut Agreement*, and s. 135 (3) of the *NuPPAA* (NIRB, 2019d).

Upon completion of the site visit, NIRB staff met with Baffinland staff to discuss observations noted during the site visit. These meetings allowed for Baffinland operations staff to directly engage with NIRB staff, and for NIRB staff to provide an overview of their findings, including specific areas of the Project where improvement could be made, or adjustments to environmental mitigation measures could be implemented. Baffinland's senior management team was present for these meetings, such that any concerns identified could be addressed and corrected with the appropriate department in a timely and effective manner.

In alignment with previous years, in 2019 NIRB conducted two (2) site inspections at both the Mary River Mine Site and Milne Port. Inspections took place on the following days:

- March 26 to 28 2019 (winter visit); and
- August 6 to 9, 2019 (summer visit).

Baffinland provided responses to NIRB on both winter and summer site visits on September 27, 2019. Baffinland's responses to the findings include details, where applicable, on progress made to date and future plans to address any concerns identified by NIRB. It was noted by NIRB staff that during the winter 2019 site visit, *"Based on the observations made during this winter site visit, all Mary River Project facilities in operation appear to be generally well maintained with adequate environmental protection measures and procedures in place"* (NIRB, 2019d). Several improvements were also noted by NIRB staff across the project area during the winter and summer visits including:

- Addition of the Water Treatment Plant at the Waste Rock Facility;
- Management of the Landfarm facility;
- Management of tires;
- Maintenance of the Tote Road;
- Signage for snowmobile travellers; and
- Dust emission from the crusher facility and ship loading.

NIRB staff also highlighted that there were deficiencies with some monitoring items related to the following environmental measures. NIRB staff noted the following specific observations during the 2019 site visits:

- Terrain stability Issues on the Tote Road and sewage outfall area;
- Steensby Camp condition;
- Dust emissions from roadways; and
- Waste Management, specifically incomplete installation of fencing at the landfill facility.

The identification of these issues was addressed to Baffinland in the 2019 Winter Site Visit Report (NIRB, 2019d) and the August 2019 Site Visit Report (NIRB, 2019e), in addition to a summary provided in the Board Recommendations Report (NIRB, 2019c); described further below.

## 5.2 COMMENTS ON THE 2018 ANNUAL REPORT TO THE NIRB

Baffinland submitted its 2018 Annual Monitoring Report (the 2018 Annual Report) to the NIRB on March 31, 2019. The NIRB subsequently sent a notification to its Mary River Distribution List on April 10, 2019 indicating that the report was now accessible on NIRB's online public registry and requested comments from all interested parties with respect to their jurisdiction and/or area of expertise by May 10, 2019, and consider the following:

1. Effects monitoring
  - a. Whether the conclusions reached by Baffinland in the 2018 Annual Report are valid; and
  - b. Any areas of significance requiring further supporting information or any changes to the monitoring program which may be required.
2. Compliance monitoring:

- c. Provide a summary of any compliance monitoring and/or site inspections undertaken in association with the Project, including specifically:
  - i. Identify the terms and conditions from the amended Project Certificate which have been incorporated into any permits, certificates, licenses or other approvals issued for the Project, where applicable;
  - ii. A summary of any inspections conducted during the 2018 reporting period, and the result of these inspections; and
  - iii. A summary of Baffinland's compliance status with regards to authorizations that have been issued for the Project.

The NIRB provided Baffinland with regulatory agency comments to its 2018 Annual Report on June 14, 2019 based on comments received on or by June 7, 2019 by the QIA, GN, CIRNAC, DFO, Health Canada, Parks Canada and World Wildlife Fund (WWF; NIRB, 2019f). ECCC notified the NIRB that it would submit comments at a later date (June 24, 2019) and would forward the comments to Baffinland. NIRB requested that Baffinland provide a response to comments in a letter to the NIRB by July 12, 2019. A summary and response to the feedback received is provided below.

#### **Baffinland's Performance on Compliance with Licenses, Permits, Authorizations and Approvals**

As part of its July 12, 2019 submission, Baffinland noted that it had received a number of comments on the NIRB Annual Report that echoed comments and concerns submitted by interveners on the Phase 2 Proposal review process. Accordingly, Baffinland provided additional information on how these had been addressed by Baffinland throughout 2019, both through engagement with reviewers, the community of Pond Inlet, and QIA on the currently approved Project, and through the Phase 2 Proposal regulatory process. Specifically, Baffinland provided the NIRB an overview of efforts in response to five (5) general topics. These included:

- Enhanced Integration of IQ into Baffinland's current environmental programs;
- Development of community-based monitoring programs;
- Collection of baseline data for the Southern portion of the Project;
- Increased monitoring for potential effects of the Project on caribou and deeper collaboration with the HC and MHTO on regional monitoring; and
- Monitoring for ice escort activities.

Specific details on these topics are provided in Baffinland's response to the NIRB, available on the NIRB Public Registry.

Comments received from reviewers on the 2018 Annual Report generally aim to provide suggestions for achieving operational excellence in terms of both effects and compliance monitoring, and in the process maximize compliance status to the extent possible. In so doing, there is the acknowledgement that components of the Project have not yet been fully realized (e.g., development of Steensby Port) and accordingly, some terms and conditions are not applicable to the current Early Revenue Phase of the Project.

In 2018 Baffinland was successful in meeting the majority of its requirements applicable to the current Project phase, however NIRB has identified that additional efforts are required to demonstrate progress towards achieving full compliance with specific terms and conditions, specifically Project Certificate Conditions No. 17, 23, 24, 35, 46, 47,

48, 48(a), 52, 64, 179(c) and 184. NIRB identified these conditions as “Not in Compliance”, contrasting Baffinland’s self-assessment.

Baffinland continues to seek greater clarity from NIRB on its decision making process and associated considerations when assigning a status, particularly for those conditions for which there was mutual agreement on prior compliance status conclusions. Discussions with NIRB staff in 2019 confirmed that NIRB methodologies for assessing status of compliance for all Proponents had diverged from prior years, however no guidance was provided to clarify the revised methodology NIRB utilizes to assess compliance status with Project Certificate Conditions. Baffinland will continue to complete its self-assessment using the approach described in Section 4.1 until such time that additional guidance is provided by the NIRB on its assessment methodology and expectations for completing self-assessments.

Baffinland remains committed to improving compliance status, which includes prioritizing a reduction in the number and extent of non-compliances and accidents. Accordingly, Baffinland made progress towards achieving compliance on a number of terms and conditions and/or seeks greater acknowledgement from the NIRB in support of Baffinland’s compliance status self-assessment. Notable mentions are summarized below, as separated into six (6) key topic areas:

1. Effluent discharges:

- PC Condition No. 17 and 24 – In 2019, effluents generated and managed by the Project included sewage, contact water retained in surface water management ponds associated with ore and waste rock facilities, and oily water retained in containment areas. The frequency of incidents involving the discharge of effluents to the receiving environment that exceed the applicable discharge criteria have remained low (i.e., 5 occurrences). To address the total ammonia exceedance observed at the STP servicing the Sallivik Camp, the Standard Operating Procedure for the STP operation was updated and training provided to staff. Baffinland plans to continue to operate the WRF WTP to treat contact water generated at the WRF as required in 2020, in addition to planning future upgrades (e.g., addition of second geotube settling pond). Baffinland will continue its efforts at ensuring that all operators of the mobile OWTS is thoroughly trained in the system’s operation to ensure adequate maintenance of the system is maintained.
- PC Condition No. 23 – A groundwater monitoring program, involving the installation of shallow groundwater wells downstream of Project infrastructure, is discussed in Baffinland’s Surface Water and Aquatic Ecosystem Plan (Baffinland, 2020f), and as such a standalone Monitoring Plan is not required to address groundwater monitoring. The Groundwater Monitoring Program continued to be implemented in 2019, however water quality data did not reveal any significant trends that would allow for evaluation of potential water quality changes from Project operations. In 2020, Baffinland will retain external consultants specialized in groundwater monitoring in arctic environments to evaluate, and if required, expand the current groundwater program.
- PC Condition No. 46: Overall, the frequency of incidents involving the discharge of effluents to the receiving environment that exceed the applicable discharge criteria have remained low and incidental since the start of operations in 2014. Continued upgrades to Tote Road water crossings and Project water infrastructure have significantly reduced the frequency of TSS exceedances and sediment releases observed and reported by Baffinland in 2019, with no Project-related impacts to water quality identified during the 2019 Tote Road Monitoring Program. A number of corrective actions were undertaken to address the sediment releases associated with freshet 2019 Spill Reports. Furthermore, a number of

corrective and mitigation actions were implemented during freshet 2019. Baffinland will continue to identify operational improvement opportunities on a yearly basis.

## 2. Caribou and Wildlife Considerations

- PC Condition No. 35 – The North Baffin caribou herd is at low numbers, and limited harvesting has been occurring. At the November 17, 2015 TEWG Meeting No. 7, Baffinland asked if the Government of Nunavut (GN) would like Baffinland to distribute sample kits to hunters coming through the site. The GN's response was that no kits were available to send to the site. There were several hunting parties travelling through the Mary River Mine Site in 2019, but tissue sampling protocols and co-ordination have not been finalized between TEWG parties yet. Baffinland has insisted that collaboration with other stakeholders and interested parties (e.g., the GN and MHTO) is critical for the successful implementation of a caribou tissue monitoring program, however no clear plan for collaboration has been established. To further advance efforts, Baffinland met with the Primary Investigator of the Northern Contaminants Program on caribou contaminant monitoring in December 2019 to discuss a potential collaboration on regional-level collection programs, along with the GN. A proposed timeline was proposed for coordination of tissue sampling protocols. Pending a successful grant application (of which Baffinland committed to contributing funds), the timeline included a path forward for establishing an agreement between Gamberg Consulting, Baffinland, the GN and the MHTO.
- PC Condition No. 52 – Given the low regional population numbers of the North Baffin caribou herd, there has not yet been a need to implement caribou deterrent measures from hazardous areas. Accordingly, the low numbers preclude the potential to initiate and develop a timeline to test and implement deterrence mechanisms. Baffinland has instead implemented a stricter approach to avoiding potential negative interactions with wildlife and reduce hazardous conditions by enforcing a “stop work policy” and clear response frameworks should a caribou be observed by drivers in the vicinity of roads (the Caribou Decision Tree).

## 3. Freshwater Environment:

- PC Condition No. 47 - Baffinland continues to repair and upgrade water crossings at the Project to improve fish passage. A number of fish bearing water crossings were visited to assess potential for fish passage or habitat issues; 27 of 36 crosses had no identified issues. Perching issues were rectified at five (5) (CV-106, CV-114, CV-129, CV-216, BG-50) of seven (7) locations by installing step-pool rocky ramps, with additional efforts being planned in 2020 for the two (2) remaining crossings (CV-111, CV-225). Remediating fish passage concerns at water crossings remains a top priority for Baffinland to ensure compliance with the Project's Tote Road Fisheries Act Authorization.
- PC Condition No. 48 – No blasting occurred in 2019 within the required setback distances as prescribed in Wright and Hopky (1998). Accordingly, because there has been no requirement to undertake blasting in or near water, engagement with DFO and QIA has not been deemed necessary. Baffinland will engage with appropriate parties should Project specific blasting be identified that may prevent adherence to DFO blasting guidelines.
- PC Condition No. 48(a) – Baffinland continues to conduct annual fish population assessments in various lakes as part of the Project's CREMP. This includes the sampling of YOY arctic char from nearshore lake habitat. As documented in the 2019 CREMP Monitoring Report, data collected to date suggests no adverse mine-related effects to arctic char populations. Baffinland plans to continue the CREMP, described above,

to assess the condition of arctic char populations within aquatic environments near the Mine Site. Engagement activities with the MHTO, QIA and North Baffin communities are planned for 2020, such that Baffinland can provide an overview of the AEMP and monitoring results to date.

4. Waste Management:

- PC Condition No. 64 – Both the Environmental Protection Plan and Waste Management Plan incorporate carnivore interaction and attractant mitigation measures and policies, which continued to be implemented in 2019. The Mine Site Landfill Facility continued to only accept inert, non-hazardous waste materials in 2019, with all animal attractants (food scraps, wrappers, etc.) diverted to the incineration units. While landfill fencing was completed in 2019 and may result in some incidental effects to deter wildlife from the landfill facility, the primary mitigation measure to reduce animal interactions at the landfill is the diversion of all animal attractants from placement in the landfill in the first place, and the landfill fence was not - nor will ever be - designed to mitigate wildlife ingress.

5. Auditing:

- PC Condition No. 179c – Baffinland completed the two (2) required audits in 2019, covering periods ending June 30, 2019 and December 31, 2019. Typical reporting timelines of audit results and subsequent submission to the NIRB may be up to 4 months after the reporting period ends in order to provide adequate sharing of data to support auditing efforts. Baffinland will continue to file a Performance Audit Report with the NIRB on a bi-annual basis, with the next filing being due during Q3 of 2020 in order to cover reporting period up to June 30, 2020.

6. Working Groups:

- PC Condition No. 184 – Baffinland continues to collaborate with the MEWG on an annual basis, to receive input on the various annual monitoring programs implemented by Baffinland. New and enhanced mitigation measures were incorporated by Baffinland in 2019 in response to recommendations and feedback provided by the MEWG, DFO, and Inuit stakeholders

### **Baffinland Overview of Enhanced Stakeholder Engagement Efforts**

In Baffinland's July 12, 2019 response to NIRB, it was noted that significant efforts in 2019 were made to further enhance consultation with the North Baffin communities, and in particular with the community of Pond Inlet and the QIA. Baffinland also discussed specific engagement efforts made with the MEWG and TEWG to discuss reviewer comments that were provided on the 2018 Annual Report.

Based on the input received during consultation events held in 2018, Baffinland developed and implemented additional adaptive mitigations and monitoring activities for 2019. This included installing additional dust fall monitoring stations, continuing to increase water quality sampling at the Project and along the Tote Road, installing additional dust mitigations at the Crusher, constructing additional fencing around the landfill, making modifications to the Standing Instructions to Masters to ensure speed limits are followed, providing more detailed instructions to ship captains to avoid areas of potential interference with local hunting practices, and continuing to revise Baffinland's monitoring programs and management plans to reflect operational improvements through feedback from communities, regulators and subject matter experts. Baffinland believes that the aforementioned measures that were implemented will continue to further enhance and improve Project operations moving forward.



Throughout current operations and the Phase 2 Proposal, Baffinland has remained committed to engaging Inuit throughout the North Baffin Region as the Mary River project advances. Respecting comments shared by community representatives both publically and directly to Baffinland, in 2019 Baffinland hosted more informal engagements targeted at providing information to the largest number of community representatives possible. In 2019, this included a number of public radio shows and less formal presentations and the dissemination of large amounts of written materials. Baffinland believes that conducting engagements in this manner allowed for a more conversational style of public engagement that led to discussions on issues of concern and substance to Inuit throughout the North Baffin Communities. Baffinland remains committed to this approach and is confident that this continued approach will lead all parties to mutual successes.

### Baffinland Response to NIRB's List of Comments

In Baffinland's response to the NIRB regarding comments received on the 2018 Annual Report, Baffinland provided itemized responses to the comments received, where applicable, from QIA, GN, CIRNAC, ECCC, DFO, Parks Canada, Health Canada and WWF in the Company's letter to NIRB on July 12, 2019. A summary of the main comments by reviewing agency is provided in Table 5.1.

A complete version of the itemized responses is available on the NIRB Public Registry.

**Table 5.1: Summary of Agency Comments on Regulatory Performance**

Agency	Summary of Comments on 2019 Regulatory Performance and Compliance
Qikiqtani Inuit Association (QIA)	<ul style="list-style-type: none"> <li>Insufficient responsiveness to the Marine, Terrestrial and Socio-economic working group recommendations;</li> <li>A variety of exceedances in traffic levels on the Tote Road, dust deposition, water quality and quantity, vessel speeds and degradation of permafrost;</li> <li>Proponent self-assessment results;</li> <li>Insufficient integrations of Inuit in Project Monitoring;</li> <li>Gaps in the current monitoring programs;</li> <li>Confirmation of Project predictions in relation to the human environment;</li> <li>Uncertainty around which monitoring triggers action by Baffinland;</li> <li>Continued concerns regarding the failures of the sedimentation pond at the Waste Rock Facility;</li> <li>Despite the re-negotiated IIBA in October 2018, Baffinland is yet to achieve its commitment for Inuit employment on site.</li> </ul>
Government of Nunavut (GN)	<ul style="list-style-type: none"> <li>Questioned the effectiveness of vegetation monitoring programs;</li> <li>Lack of confidence in the dustfall monitoring report;</li> <li>Noted consistent deviations from the nominal shipping route;</li> <li>Insufficient monitoring of caribou on the Project Site;</li> <li>Underestimating jet fuel requirements.</li> </ul>
Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)	<ul style="list-style-type: none"> <li>Ineffective dust suppressions measures;</li> <li>Recommended that effluent monitoring be improved during freshet;</li> <li>Requested Baffinland to provide groundwater monitoring data from the landfill at the Mine site;</li> <li>Improvements to the Waste Rock source tracking and placement information;</li> </ul>



Agency	Summary of Comments on 2019 Regulatory Performance and Compliance
	<ul style="list-style-type: none"> <li>Improvements to the Permafrost Protection and Monitoring Plan as well as Erosion Management plan;</li> <li>Recommended that Baffinland consider actively reclaiming the problematic borrow sources;</li> <li>Recommended that Baffinland supply information regarding the equipment and methods regarding protection from invasive species in the marine environment;</li> <li>Suggested Baffinland implement their rapid response mitigation measures to mitigate future freshet related TSS exceedances along the Tote Road and Mine site;</li> <li>Suggested Baffinland implement ideas to further reduce interactions between the Project and wildlife;</li> <li>Recommended that Baffinland summarize its efforts to engage and consult with the North Baffin communities on project monitoring.</li> </ul>
Environment and Climate Change Canada (ECCC)	<ul style="list-style-type: none"> <li>Requested figures and tables containing the ambient air quality data being compared to the Nunavut and Canada wide Ambient Air Quality Standards;</li> <li>Requested that the Proponent provide a discussion around the causes of the large number of untreated sewage spills on site in 2018;</li> <li>Recommended that the groundwater monitoring report provide both analysis and interpretation of the results;</li> <li>Requested further identification of the taxa included in the metal-sensitive Chironomids group during the Benthic Invertebrate Community Data analysis;</li> <li>Recommended that the Proponent discuss any changes in mining activity in the Sheardown Watershed that would explain the increase in sulphate and manganese;</li> <li>Recommended that the Proponent consider whether increased frequency of benthic invertebrate surveys in the effluent-exposed upper reaches of Tributary-F might provide additional information on potential mine-related effects in the environment.</li> </ul>
Fisheries and Oceans Canada (DFO)	<ul style="list-style-type: none"> <li>Noted that although Baffinland did produce the Ship-based Observer Program in 2018, that the program was not conducted throughout the entire shipping season, potentially creating information gaps for periods of the season;</li> <li>Requested explanations regarding the ship-track deviations, specifically the ship that travelled through Navy Board Inlet. DFO also noted that this was not included in Baffinland's conclusions;</li> <li>Required further efforts to identify the species found during the aquatic invasive species sampling;</li> <li>Recommended that all crossings with fish passage concerns should be targeted for repair in 2019;</li> <li>Recommended that Baffinland develop a response plan for absent juvenile Arctic Char and propose additional measures to ensure that juveniles return and can use the downstream of crossing culvert BG-50.</li> </ul>
Parks Canada	<ul style="list-style-type: none"> <li>Recommended that Baffinland replace the term "Ice-management vessel" with the proper classification of "Ice-Breaking" when discussing the MSV Botnica;</li> </ul>

Agency	Summary of Comments on 2019 Regulatory Performance and Compliance
	<ul style="list-style-type: none"> <li>Expressed concerns regarding the lack of consistency regarding the marine monitoring programs. Parks Canada would like to see more robust, repetitive and well-designed monitoring programs applied to the project to allow for better understanding of potential project effects;</li> <li>Requested further explanations for instances where ships exceeded the 9-knot speed limit;</li> <li>Requested explanation for how observational data was corrected for the difference in observation dates performed over multiple years of the Ship-based Observer Program. Parks Canada does not see this as a reliable source of monitoring given the challenges comparing data on different dates each year regarding temporally sensitive marine mammals.</li> </ul>
Health Canada (HC)	<ul style="list-style-type: none"> <li>No comments available from Health Canada due to the lack of quantitative data available for examination within the report.</li> </ul>
World Wildlife Fund (WWF)	<ul style="list-style-type: none"> <li>Noted the lack of adaptive management including development of indicators and thresholds for the marine environment;</li> <li>Lack of comprehensive science relating to marine mammals monitoring program;</li> <li>Insufficient incorporation of community feedback on potential project related effects to marine mammals;</li> <li>Requested for updated on the Monitoring Framework for the Mary River Project and the list of outstanding issues not addressed in Annual Reports.</li> </ul>

### 5.3 NIRB'S ANNUAL MONITORING REPORT AND BOARD RECOMMENDATIONS

On October 25, 2019 the NIRB issued its 2018-2019 Annual Monitoring Report (the Monitoring Report) for Baffinland Iron Mines Corporation's Mary River Project and the Board's Recommendation (NIRB, 2019c) which included comments subsequent to NIRB's Winter and Summer 2019 Site Visits. NIRB motioned to issue eight (8) additional recommendations to Baffinland as part of the Monitoring Report. Recommendations are based on seven (7) key topic areas, as follows:

1. Dust;
2. Fish Passage and Sampling, pursuant to Terms and Condition No. 47, 48(a);
3. Fish Passage and Sampling, pursuant to Terms and Condition No. 47, 48(a);
4. Marine Mammal Monitoring Protocol, pursuant to Terms and Conditions Nos. 110, 111;
5. Survey of Baseline Metal Levels in Foraging Caribou, pursuant to Term and Condition No. 35;
6. Groundwater Management, pursuant to Terms and Conditions Nos. 17, 20 and 23;
7. Waste Management, pursuant to Term and Condition No. 64; and
8. Cross-cultural Training.

Baffinland's responses to the NIRB Board's recommendations provided on November 25, 2019, including further updates requested by NIRB for inclusion in the 2019 Annual Report, can be found in Appendix E.

## 6 MANAGEMENT PLAN UPDATES

Table 6.1 provides an extensive list of all the Management Plans for the Project.

**Table 6.1: Current List Environmental Monitoring and Management Plans**

Document Number	Plan Name	Current Revision Date
BAF-PH1-300-P16-0002	Snow Management Plan	Mar-19
BAF-PH1-830-P16-0001	Surface Water Sampling Program - Quality Assurance and Quality Control Plan	Mar-20
BAF-PH1-830-P16-0002	Air Quality and Noise Abatement Management Plan	Mar-20
BAF-PH1-830-P16-0004	Borrow Pit and Quarry Management Plan	Mar-14
BAF-PH1-830-P16-0006	Cultural Heritage Resource Protection Plan	Mar-16
BAF-PH1-830-P16-0008	Environmental Protection Plan	Aug-16
BAF-PH1-830-P16-0010	Fresh Water Supply, Sewage and Wastewater Management Plan	Mar-20
BAF-PH1-830-P16-0011	Hazardous Materials and Hazardous Waste Management Plan	Mar-17
BAF-PH1-830-P16-0012	Interim Closure and Reclamation Plan	Oct-18
BAF-PH1-830-P16-0013	Oil Pollution Emergency Plan - Milne Inlet (OPEP)	Sep-18
BAF-PH1-830-P16-0017	Q1 Quarry Management Plan	May-19
BAF-PH1-830-P16-0023	Roads Management Plan	Feb-20
BAF-PH1-830-P16-0024	Shipping and Marine Wildlife Management Plan	Mar-16
BAF-PH1-830-P16-0025	Stakeholder Engagement Plan	Mar-16
BAF-PH1-830-P16-0026	Surface Water and Aquatic Ecosystems Management Plan	Mar-20
BAF-PH1-830-P16-0027	Terrestrial Environmental Management and Monitoring Plan	Mar-16
BAF-PH1-830-P16-0028	Waste Management Plan	Mar-20
BAF-PH1-830-P16-0029	Phase 1 Waste Rock Management Plan	Dec-19
BAF-PH1-830-P16-0030	Borrow Source Management Plan – Kilometre 2	Oct-14
BAF-PH1-830-P16-0031	Life of Mine Waste Rock Management Plan	Apr-14
BAF-PH1-830-P16-0032	Borrow Source Management Plan - Kilometre 97	Oct-14
BAF-PH1-830-P16-0035	Borrow Source Management Plan - Kilometre 104	Mar-14
BAF-PH1-830-P16-0036	Spill Contingency Plan	Sep-18
BAF-PH1-830-P16-0037	Exploration Spill Contingency Plan	Jun-14
BAF-PH1-830-P16-0038	Exploration Closure and Reclamation Plan	Jul-14
BAF-PH1-830-P16-0039	Aquatic Effects Monitoring Plan	Oct-15
BAF-PH1-830-P16-0040	QMR2 Quarry Management Plan	Jul-17
BAF-PH1-830-P16-0041	Polar Bear Safety Plan	Mar-16
BAF-PH1-830-P16-0042	Spill at Sea Response Plan	Aug-15
BAF-PH1-830-P16-0046	Marine Environmental Effects Monitoring Plan	Mar-16
BAF-PH1-830-P16-0047	MDMER Emergency Response Plan	Feb-19

Document Number	Plan Name	Current Revision Date
BAF-PH1-840-P16-0002	Emergency Response Plan	Sep-18
H349000-3000-07-245-0001	Q7 Quarry Management Plan	Oct-13
H349000-3000-07-245-0002	Q11 Quarry Management Plan	Oct-13
H349000-3000-07-245-0003	Q19 Quarry Management Plan	Oct-13
H349000-4200-07-245-0001	D1Q1 Quarry Management Plan	Oct-13
H349000-4200-07-245-0002	D1Q2 Quarry Management Plan	Oct-13
BAF-PH1-830-P16-0050	Ballast Water Management Plan	Mar-19

A copy of Baffinland's Environmental Management Plans are available on the document web portal:  
<https://www.baffinland.com/media-centre/document-portal/>.

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- Baffinland Iron Mines Corporation (Baffinland), 2015c. Hunter and Visitor Site Access Procedure. Ref. No. BAF-PH1-830-PRO-0002, Rev 1. February 13, 2015.
- Baffinland Iron Mines Corporation (Baffinland), 2016a. Stakeholder Engagement Plan. Doc. No. BAF-PH1-830-P16-0025, Rev. 1, March 14, 2016.
- Baffinland Iron Mines Corporation (Baffinland), 2016b. Environmental Protection Plan. Ref. No. BAF-PH1-830-P16-0008. Rev 1. August 30, 2016.
- Baffinland Iron Mines Corporation (Baffinland), 2016c. Terrestrial Environment Mitigation and Monitoring Plan. Ref. No. BAF-PH1-830-P16-0027, Rev 1. March 14, 2016.
- Baffinland Iron Mines Corporation (Baffinland), 2016d. Marine Environmental Effects Monitoring Plan. Ref. No. BAF-PH1-830-P16-0046, Rev. 0. March 17, 2016.
- Baffinland Iron Mines Corporation (Baffinland), 2016e. Shipping and Marine Wildlife Management Plan. Ref. No. BAF-PH1-830-P16-0024, Rev 6. March 18, 2016.

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