Crown-Indigenous Relations and Northern Affairs Canada
Relations Couronne-Autochtones et Affaires du Nord Canada

Final Written Submission

Baffinland Iron Mines Corporation
Mary River Project Phase 2 Proposal

December 24, 2020

Canada

EXECUTIVE SUMMARY

Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) has undertaken a review of documents submitted by Baffinland Iron Mines Corporation (Baffinland) to the Nunavut Impact Review Board (NIRB) in support of its application for the Mary River Phase 2 Project Amendment (the Project). The review process included Information Requests (IRs) and a Technical Review submission, both of which received responses from Baffinland. This was followed by three Technical Meetings, a Community Roundtable and a Pre-hearing Conference, which resulted in Baffinland making a series of additional responses to address requests from CIRNAC and other parties.

During the IR and Technical Review phases for the Project, CIRNAC identified a number of potential concerns related to the Project's impacts on the biophysical environment and socio-economic matters. In most instances, these concerns have been sufficiently resolved for the purposes of the Environmental Assessment (EA). Based on the evidence considered to date, CIRNAC has concluded that, for aspects within CIRNAC's mandate, the proposed Project is not likely to cause significant adverse environmental effects with the exception of issues related to the thermal modeling and Acid Rock Drainage and Metal Leaching (ARD/ML), which required further assessment and Commitments for additional monitoring and mitigation as discussed in the present submission.

Geotechnical aspects and thermal modeling – For the purposes of the EA, CIRNAC is generally satisfied with the information provided in the Final Environmental Impact Statement (FEIS) Addendum and Baffinland's subsequent responses to CIRNAC concerns regarding assessments of permafrost areas, risk of excessive settlement of the railway embankment, thermal modelling of key infrastructure and analysis including climate change scenarios. In order to address CIRNAC's outstanding concerns related to these aspects, CIRNAC held a series of meetings with Baffinland which culminated in Baffinland committing to the following:

- Baffinland shall develop a detailed site wide program to monitor the thaw consolidation and strain prediction under the structures/embankments constructed as part of the Phase 2 Project. The monitoring results shall be compared with the FEIS Addendum predictions and appropriate mitigation measures shall be identified and incorporated into the adaptive management approach.
- Prior to the approval of the revised version of the Waste Rock Management Plan (or during the Water Licence Amendment process, subject to Nunavut Water Board requirements) Baffinland shall provide a heat balance and relationship of the heat generation associated with the exothermic reaction of potentially acid-generating (PAG) waste rock and soluble sulphates. Baffinland shall demonstrate that the current design of the waste rock facility (WRF) will maintain permafrost conditions in the long term.
- Baffinland shall perform an oxygen balance of the WRF and correlate it with soluble sulphates in order to demonstrate an understanding of the process of ARD generation and the performance of the WRF.

Potential Impacts of Acid Rock Drainage and Metal Leaching – CIRNAC has concerns regarding the assessment of the potential loadings of suspended solids and metals associated with rock materials from the rail road cut and associated quarries and the potential loadings of acidity and metals from waste rock associated with Deposit 1.

Baffinland has committed to identifying causes of ARD/ML and reassessing the Neutralization Potential Ratio (NPR) inputs and criteria used for classification of potentially ARD/ML generating rock and updating the Phase 1 Waste Rock Management Plan accordingly. Baffinland stated that they will complete correlations between NPR, total sulphur and ARD/ML behaviour based upon new and pre-exiting geochemical test data that is specific to the different types of rock within Deposit 1 and the rail road cut and associated quarries. In order to address CIRNAC's outstanding concerns related to these aspects, CIRNAC held a series of meetings with Baffinland, which culminated in Baffinland committing to the following:

- Baffinland shall undertake test work to confirm to the Nunavut Water Board the origin of elevated concentrations of aluminum, mercury and copper in Shake Flask Extraction for rock materials sourced from quarry and borrow pits for road / railway construction, and develop and implement an appropriate water quality monitoring and management strategy for railway corridor rock quarries as part of water licensing. The monitoring results shall be compared with the FEIS Addendum predictions and appropriate mitigation measures shall be identified and implemented.
- Baffinland shall develop reliable criteria for identification of PAG rock that clearly accounts for uncertainty in the 0.2% total sulphur threshold and the presence of acidic soluble sulphates upon projected life of mine tonnages of PAG and Non-Acid Generating (NAG) rock.
- Baffinland shall incorporate these criteria, clearly stated ranges in projected life of mine PAG and NAG rock tonnages and the resultant necessary contingencies and methods of validation that need to be incorporated into engineering design, environmental monitoring and management strategies for the Waste Rock Management Plan and Interim Closure and Reclamation Plan. These documents are to be submitted for review during the Water Licence Amendment process, subject to Nunavut Water Board requirements.
- Baffinland shall review the performance of these plans and provide evidence of the effectiveness of these plans by demonstrating compliance with the management measures and that the desired outcomes of mitigation are achieved on an annual basis.

Hazardous Materials and Waste Management - Implementation of the Phase 2 development triggers changes to the existing management plans, such as quantity increases as well as a new potential spill source from rail operation. The updated Hazardous Waste Management Plan provides details on quantity estimates for a future rail maintenance facility. The Snow Management Plan has been updated to include the North Railway and Milne Port areas and position of culverts as well as guidelines for snow management along the North Railway alignment. CIRNAC is satisfied with the documents and information presented by Baffinland for the purpose of the EA process.

Socio Economics - CIRNAC's technical comments on socio-economic matters were resolved following the April 2019 NIRB Technical Meeting. In response to submitted comments, Baffinland provided information on the adequacy of baseline data by Valued Socio-Economic Component (VSEC); how Inuit Qaujimajatuqangit (IQ) was used to develop impact predictions; and indicator information by VSEC. In addition, Baffinland provided a supplement to its Technical Supporting Document on Cumulative and Transboundary Effects (TSD 27) to make clear that the project's main alternative development scenarios were evaluated for potential cumulative impacts.

TABLE OF CONTENTS

LIST OF ACRONYMS

ARD	Acid Rock Drainage
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
EA	Environmental Assessment
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
FC	Final Comment
FEIS	Final Environmental Impact Statement
ICRP	Interim Closure and Reclamation Plan
IQ	Inuit Qaujimajatuqangit
IR	Information Request
ML	Metal Leaching
NAG	Non-Acid Generating rock
NIRB	Nunavut Impact Review Board
NPR	Neutralization Potential Ratio
NUPPAA	Nunavut Planning and Project Assessment Act
NWB	Nunavut Water Board
PAG	Potentially Acid Generating rock
SFE	Shake Flask Extraction
TRC	Technical Review Comment
TSD	Technical Support Document
VSEC	Valued Socio-Economic Component
WRMP	Waste Rock Management Plan
WRF	Waste Rock Facility
wt%	Weight percent

INTRODUCTION

Baffinland Iron Mines Corporation (Baffinland)'s "Mary River Phase 2 Project Amendment" (the Project) proposal is currently under review by the Nunavut Impact Review Board (NIRB File No. 08MN053). Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) has participated throughout the Environmental Assessment (EA) process and is pleased to submit this Final Written Submission for consideration by the NIRB. CIRNAC has a broad mandate for the co-management of land and water resources in Nunavut, as well as the management of Crown land under the following applicable acts and regulations:

- The *Department of Crown-Indigenous Relations and Northern Affairs Act*
- The *Nunavut Land Claims Agreement Act* and the Nunavut Agreement (NA);
- The *Nunavut Planning and Project Assessment Act* (NuPPAA);
- The *Arctic Waters Pollution Prevention Act* and Regulations;
- The *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and Regulations; and
- The *Territorial Lands Act* and Regulations.

As set out under NuPPAA, the Northern Affairs Minister, in concurrence with other responsible Ministers, will have a decision-making role on the proposed project's approval to proceed based on the NIRB's assessment. If the proposed Project is approved to proceed, CIRNAC will be responsible for inspecting and enforcing conditions contained within the Project Certificate and Water Licence associated with the Project.

As part of the NIRB's review, CIRNAC, along with other stakeholders, acts as an intervenor in the process, providing advice and expertise to NIRB by way of this submission. Based on CIRNAC's regulatory mandate and decision-making roles, CIRNAC is participating in the review by providing expertise in the following mandate areas related to Mary River Phase 2 Project Amendment proposal works, activities, and plans:

- Environmental impact assessment methodology and best practices, including cumulative effects assessment;
- Crown land contamination/degradation, particularly closure and reclamation planning;
- Surface water quality and quantity;
- Groundwater quality and quantity;
- Marine water quality only as affected from land;
- Permafrost;
- Waste management; and
- Socio-economic impact assessment and monitoring.

CIRNAC has completed its review of Baffinland's Final Environmental Impact Statement (FEIS) Addendum and supporting documentation to assess whether environmental and socio-economic impacts, cumulative impacts and alternative means to carry out the Project have been adequately identified and evaluated. CIRNAC has also reviewed any related management, mitigation and monitoring plans to ensure that they are appropriate at a conceptual level.

This submission summarizes CIRNAC's conclusions regarding whether the Project is likely to cause significant adverse environmental and socio-economic impacts.

BIO-PHYSICAL COMMENTS

Geotechnical aspects of the North Railway alignment

Review Comment Number	**CIRNAC- Final Comment #1**
Subject	**Seismic data for North Railway Alignment (Route 1)**
Reference	• NIRB Amended EIS Guidelines for the Mary River Phase 2 Development Proposal, Section 8.1.4 and Section 8.1.4.2 • Baffinland FEIS Addendum Mary River Project Phase 2 Proposal, Section 9.2 • Baffinland IR Responses, Response to CIRNAC-IR # 3 • Technical Supporting Document-08- Landforms, Soils, and Permafrost Assessment and TSD 13- Surface Water Assessment • Baffinland FEIS, 2012, Vol 6, Section 2.0 Landforms, Soils and Permafrost • Type A Water Licence Amendment Application – Attachments 6.1; 6.2; 6.3; 12.1 to 12.4 • Baffinland Response to CIRNAC Technical Comment # 01.
Summary	Seismic analysis/assessment of the North Railway alignment has not been presented as part of the submission. This assessment is required to evaluate potential risks to the Project infrastructure within the railway alignment.
Importance of issue to impact assessment	The potential risk of seismic events should be evaluated in order to assess how they may affect the integrity of the Project infrastructure within the North Railway alignment and to identify appropriate mitigation measures.
Detailed Review Comment	A regional seismic assessment was performed for the South Railway embankment, the Mine site, Steensby Port and Milne Port expansion; however a seismic assessment was not carried out for the North Railway alignment. A seismic assessment of the North Railway alignment was needed to evaluate the potential risks to the Project and the potential environmental impacts. CIRNAC recommended Baffinland perform a seismic analysis taking into consideration the major geological structures along the North Railway alignment and incorporate findings into the detailed facility engineering design. Baffinland obtained additional seismic parameters along the railway from the *National Building Code of Canada (2015)*. These seismic data were used for slope stability analyses of the North railway alignment, embankment cuts and fills. Stability analyses were completed using a pseudo-static seismic coefficient of 0.06, based on peak ground acceleration (PGA) of 0.090 g for 1:2500-year return period (2% probability of exceedance based on design life of 50 years).
Recommendation / Request	CIRNAC is satisfied with the provided response and does not have any additional comments at this stage.

Review Comment Number	**CIRNAC- Final Comment #2**
Subject	**North Railway Geotechnical Investigations (Route 1)**
Reference	• NIRB Amended EIS Guidelines for the Mary River Phase 2 Development Proposal, Section 8.1.4 and Section 8.1.4.2 • Baffinland FEIS Addendum Mary River Project Phase 2 Proposal, Section 9.2 • Baffinland IR Responses, Response to CIRNAC-IR # 3 • Technical Supporting Document-08- Landforms, Soils, and Permafrost Assessment and TSD 13- Surface Water Assessment • Baffinland FEIS, 2012, Vol 6, Section 2.0 Landforms, Soils and Permafrost • Type A Water Licence Amendment Application - Attachments 6.1; 6.2; 6.3; 12.1 to 12.4 • Hatch, April 26, 2019, Geotechnical Recommendations for Northern Railway. Reference # H353004-30000-229-230-0001, Rev.0.
Summary	Geotechnical investigations along the railway alignment have identified areas of concern related to terrain stability. A discussion of settlement monitoring and mitigation measures for those areas should be provided.
Importance of issue to impact assessment	The geotechnical characteristics of the local and regional area should be understood in detail to evaluate potential risks to the Project infrastructure due to instability of slopes, railway embankment and berms that may be caused by thaw sensitive materials, soil erosion, surface water runoff, drainage patterns, creep settlement and climate change effects on ice-rich permafrost**.**
Detailed Review Comment	Geotechnical characteristics of the Project area were not fully described in the FEIS Addendum and could present risks that have not been identified. Geotechnical investigations are required to be cold regions/permafrost specific and should include thaw consolidation/thaw strain assessments. CIRNAC requested Baffinland provide, as per the EIS guidelines, a detailed description of the geology and geomorphology aspects in the Project area and consideration of their effects on the major Project components. In response, Baffinland provided *Geotechnical recommendations for the Northern Railway, April 26, 2019*. The report includes creep and thaw settlement estimates and thermal analysis. This is additional information to the previously submitted reports (*Geotechnical Design Criteria, Hatch, March 2019 and Geotechnical investigations along the North railway alignment conducted from 2016 to 2018, Hatch October 5, 2018*). This document includes: sampling and laboratory test results supporting the permafrost forecast, geochemical results and borehole data, acid base accounting results of potential quarry locations.
Recommendation / Request	CIRNAC is satisfied with the provided response and does not have any additional comments at this stage.

Review Comment Number	**CIRNAC- Final Comment #3**
Subject	**North Railway Management Plan (Route 1)**
Reference	• NIRB Amended EIS Guidelines for the Mary River Phase 2 Development Proposal, Section 8.1.4 and Section 8.1.4.2 • Baffinland FEIS Addendum Mary River Project Phase 2 Proposal, Section 9.2 • Baffinland IR Responses, Response to CIRNAC-IR # 3 • Technical Supporting Document-08- Landforms, Soils, and Permafrost Assessment and TSD 13- Surface Water Assessment • FEIS, Baffinland, 2012, Vol 6, Section 2.0 Landforms, Soils and Permafrost • Type A Water License Amendment Application - Attachments 6.1; 6.2; 6.3; 12.1 to 12.4 • Baffinland, Draft Railway Operation and Maintenance Management Plan – Phase 2 Proposal Revisions, May 13, 2019.
Summary	Geotechnical investigations along the railway alignment have identified areas of concern related to terrain stability; however the North Railway Management Plan does not include monitoring of the areas and specific mitigation measures to address these concerns.
Importance of issue to impact assessment	A Railway Management Plan should be prepared to address potential stability risks to the Projects infrastructure, particularly in the three identified areas of concern. Baffinland shall indicate how it intends to monitor the areas to assess effects, select and implement mitigation measures.
Detailed Review Comment	The Railway Management Plan should describe how the mitigation measures will be carried out during construction of the rail embankment in the portions of the alignment where potential geotechnical issues have been identified. It was unclear from the review of the Railway Management Plan, how Baffinland intends to monitor any settlement issues that may be encountered. Geotechnical characteristics were not fully described which may present risks that have not been identified. CIRNAC requested Baffinland update the existing Railway Management Plan to include regular monitoring of potential settlement of the North Railway embankment. In response, Baffinland provided the draft document *North Railway Operation and Maintenance Management Plan, May 13, 2019*. The plan includes infrastructure inspection and maintenance strategy for the North Railway that considers the identified issues.
Recommendation / Request	CIRNAC is satisfied with the provided response and does not have any additional comments at this stage.

Review Comment Number	**CIRNAC- Final Comment #4**
Subject	**Risk of Excessive Settlement of Railway Embankment – Thaw Settlement Tests or Thaw Strain Assessment (Route 1)**
Reference	• TSD-06 Climate Change Assessment • TSD-08 Landforms, Soil and Permafrost • Amec Earth and Environment (AMEC), 2010a. Baffinland Mary River Project - Trucking Feasibility Study Tote Road Design Considerations-Rev 0. October 19. Ref. No. TC101510, Memo#15 • Hatch Ltd (Hatch), 2017a. Baffin Iron Mine Corporation - Mary River Expansion Study-Stage II - Preliminary Geotechnical Recommendation for Railway Embankment (Between Milne Inlet and Mine Site). January 10. Rev 2 • Hatch Ltd (Hatch), 2017b. Site Visit Report - September 7 to 14, 2016. April 21. Mississauga, Ontario, Reference No. H352034-1000-220-068-0001, Rev 0 • Hatch Ltd (Hatch), 2017c. Baffinland Iron Mine LP - Mary River Expansion Study-Stage 3 - Definitive Study Report. May 1. Ref. No. H353004-00000-100-146-0001-SE07, Rev 0 • Hatch Ltd (Hatch), 2018. Baffin Iron Mine Corporation - Mary River Expansion Study-Stage - 2016/2017 Rail Geotechnical Factual Data Report. May 22. Mississauga, Ontario, Reference No. H352034-10000-229-230-0005, Rev 0 • Hatch, April 26, 2019, Geotechnical Recommendations for Northern Railway. Reference # H353004-30000-229-230-0001, Rev.0
Summary	Information provided by Baffinland did not contain thaw consolidation tests or a thaw strain assessment. This information is required to assess the extent of settlement due to permafrost degradation associated both with construction related impacts and future potential climate change impacts.
Importance of issue to impact assessment	Comprehensive geotechnical investigations to predict if infrastructure designs will meet performance requirements, accounting for climate change, were required for a complete assessment of Baffinland's conclusions. Additional geotechnical assessments were needed to confirm the validity of design assumptions as they relate to ground settlement due to permafrost degradation either as a result of construction impacts or climate change effects.
Detailed Review Comment	As acknowledged by Baffinland, the potential for permafrost warming due to a warming climate increases the risk of permafrost degradation. Comprehensive geotechnical site investigations help identify areas where the risk associated with excessive settlement is the greatest. Geotechnical site investigations were completed along the North Railway alignment in 2010, 2016 and 2017 (*AMEC, 2010a, Hatch, 2017a, Hatch, 2017b, and Hatch, 2018*) and the North Railway embankment designs were established as part of a feasibility study completed for the Phase 2 Proposal (*Hatch, 2017c*). However, they did not include thaw settlement tests or thaw strain assessment. CIRNAC requested Baffinland to: 1) describe how they intend to deal with areas that are prone to excessive settlement that cannot be avoided and 2) commit to performing additional geotechnical assessments which will include thaw settlement tests or a thaw strain assessment.

	In response, Baffinland provided report titled *Geotechnical Recommendations for Northern Railway, Hatch, April 26, 2019*. The Report provides creep and thaw settlement estimates and a thermal analysis. The impacted depth with the railway development is shallow and thermal modelling has been carried out including climate change scenarios. Geotechnical data basis, including ice content and ground temperature measurements, have been updated. Ground temperatures below -8 ^{0}C and -10 ^{0}C at 10 m depth have been reported. Design measures and ongoing adaptive mitigation measures are identified to minimize any cumulative impacts of the Project on permafrost.
Recommendation / Request	CIRNAC is satisfied with the provided response and does not have any additional comments at this stage.

Review Comment Number	**CIRNAC- Final Comment #5 / CIRNAC 1A NEW / CIRNAC 1 NEW**
Subject	**Thermal Modelling of Key Infrastructure**
Reference	• TSD-06 Climate Change Assessment • TSD-08 Landforms, Soil and Permafrost • TSD-28 Management Plans, Appendix H-Phase 1 Waste Rock Management Plan • Baffinland IR Responses, Response to CIRNAC-IR #14 • Hatch, April 26, 2019, Geotechnical Recommendations for Northern Railway. Reference # H353004-30000-229-230-0001, Rev. 0 • Baffinland, Interim Closure and Reclamation Plan, Appendix D, updated May 1, 2019.
Summary	The thermal modelling was not originally included in the FEIS Addendum. Baffinland provided a summary of the results of the thermal analyses in several structure-specific geotechnical recommendations reports, including thermal modelling for port infrastructure. Baffinland also presented a site-wide program to monitor the performance of the structures/embankments constructed as part of the Project. Baffinland presented some modeling results for the Waste Rock Facility (WRF) to demonstrate that its design assumptions are appropriate, but the model does not include internal heat generation and oxygen balance associated with the exothermic reaction of waste rock and soluble sulphates.
Importance of issue to impact assessment	Considering that the site contains areas with continuous permafrost with massive ground ice, thermal modelling results are important for the environmental impact assessment in order to determine if permafrost conditions during and post-construction will affect the Project infrastructure. Management of WRF relies on freeze-back to mitigate acid rock drainage/metal leaching (ARD/ML) issues. Thermal modeling is required to demonstrate that the proposed management approach is appropriate.
Detailed Review Comment	The site has been described as continuous permafrost with massive ground ice. These soil conditions highlight thaw sensitivity as a concern that has to be addressed when constructing infrastructure, namely the North Railway, docks, railway embankments, bridges and other relevant components. However, no thaw consolidation data or thaw strain predictions were included under various infrastructure, thus it was unclear how Baffinland will avoid thaw strains to sensitive landforms. Moreover, no thermal modelling or monitoring of permafrost degradation due to infrastructure and climate change was presented in the FEIS Addendum. Considering that climate change impacts on permafrost are likely to alter hydrologic cycles, groundwater flow networks and surface water supplies, the ongoing refinement of models using site-specific information is essential. During the Technical Review, CIRNAC requested Baffinland to develop and implement a site-wide program to monitor the thaw consolidation and strain predictions under the structures/ embankments. In response, Baffinland provided the document titled: *Geotechnical Recommendations for Northern Railway, Hatch, April 26, 2019,* which addresses the concerns regarding the North Railway and associated infrastructure. The thermal modelling and analysis for the area of the WRF was not included in that document. In the *Interim Closure and Reclamation Plan, Appendix D*, updated May 1, 2019, Baffinland stated that a thermal model of the WRF will be

	completed once sufficient data have been collected for model calibration. The results of the available thermal modelling were included in the Waste Rock Management Plan submitted in December 2019. CIRNAC reviewed the results and provided new comments that were partially addressed by Baffinland during several conference calls and technical memoranda; however some of the comments remain outstanding and can be addressed as part of the water licensing process. On August 25, 2020 CIRNAC provided Baffinland a Memorandum proposing a commitment to address the outstanding issues as part of the water licensing process.
Recommendation / Request	CIRNAC recommended the following Terms and Conditions be included in the amended Project Certificate, should the Project be approved: • Baffinland shall develop a detailed site wide program to monitor the thaw consolidation and strain prediction under the structures/embankments constructed as part of the Phase 2 Project. The monitoring results shall be compared with the FEIS Addendum predictions and appropriate mitigation measures shall be identified and incorporated into the adaptive management approach. This recommendation has been discussed with Baffinland and in November 2019, Baffinland agreed to address this issue by accepting the proposed Terms and Conditions. CIRNAC recommended the following commitments be accepted by Baffinland, should the Project be approved: • Prior to the approval of the revised version of the Waste Rock Management Plan (or during the Water Licence Amendment process, subject to Nunavut Water Board requirements) Baffinland shall provide a heat balance and relationship of the heat generation associated with the exothermic reaction of PAG waste rock deposited and soluble sulphates. Baffinland shall demonstrate that the current design of the WRF will maintain permafrost conditions in the long term (closure and beyond). • Baffinland shall perform an oxygen balance of the waste rock facility and correlate it with soluble sulphates in order to demonstrate an understanding of the process of ARD generation and the performance of the WRF. This recommendation has been discussed with Baffinland and in September 2020, Baffinland agreed to address this issue by accepting proposed commitments.

Acid Rock Drainage and Metal Leaching

Review Comment Number	**CIRNAC- Final Comment #6**
Subject	**Mine Closure Strategies for Materials with Acid Rock Drainage and Metal Leaching (ARD/ML) Potential including the North Railway**
Reference	• TSD-28 Appendix H, Phase 1 Waste Rock Management Plan, Section 8 • TSD-28 Appendix I, Interim Waste Rock Management Plan • TSD-28 Appendix C - Interim Closure and Reclamation Plan • Baffinland, Draft Interim Closure and Reclamation Plan, Phase 2 Proposal Revisions, May 1, 2019.
Summary	The Northern Railway has to be considered in the Mine Closure Plan and the Waste Rock Management Plan has to be updated to reflect the proposed increase in ore production as a result of the Phase 2 Development. With increased production the generation rate of waste rock material will also rise, creating additional pressure on the management system currently employed. The early onset of ARD/ML issues compared to what was predicted at the original FEIS stage has resulted in a need for re-examination of the waste rock management strategy employed on the site. The mine closure strategy needs to be reassessed in light of the ARD/ML operational experience to date.
Importance of issue to impact assessment	Establishing the closure criteria and objectives to be pursued during the closure of the mine, the Northern Railway and the management of ARD/ML are important to prevent potential environmental effects in soils, surface- and groundwater quality. This is also important for planning of closure aspects of the Project and the methodology that will be employed to deal with residual adverse effects. As a result, mine and North Railway closure strategy needs to be reassessed in light of the operational experience to date.
Detailed Review Comment	CIRNAC noted that the mine closure plan and waste rock management plan have not been updated to reflect the proposed production increase and update on ARD/ML issues. Generation of ARD/ML associated with the WRF may affect water quality and soils in the Project area and should be considered in the mine closure strategy. CIRNAC requested Baffinland provide an update of the closure plan presented in the *TSD-28 Appendix C-ICRP, March 31, 2016* to include the Northern Railway and the Waste Rock Management Plan, as well as the environmental mitigation strategy. In response, Baffinland provided the updated *Interim Closure and Reclamation Plan (ICRP) – Draft, dated May 1, 2019*. The ICRP included all aspects of the North Railway and residual effects of the Project have been evaluated. In the ICRP, Baffinland states that a revised Waste Rock Management Plan to address WRF over the next five years, based on recent geochemistry results, is under preparation. The mine closure plan will be updated to take into consideration the revised Waste Rock Management Plan. Phase 2 Marginal Closure and Reclamation Financial Security Estimate were included in the updated *ICRP Appendix I, May 1, 2019*. In the *Water Licence - Management Plans_Concordance_20190502 - Concordance Table*, Baffinland states that they will submit a revised version of the ICRP within 60 days following approval of the requested water licence amendment, and in accordance with Part C of the Licence for the Annual Security Review process.

Recommendation / Request	CIRNAC is satisfied with the provided response for the purposes of the EA process. Please refer to the CIRNAC proposed commitments for Comment #8.

Review Comment Number	**CIRNAC- Final Comment #7 / CIRNAC 2 NEW**
Subject	**Acid Rock Drainage and Metal Leaching (ARD/ML) Potential of Railway Cut Material, Quarry and Pit Walls**

Reference	• NIRB Amended EIS Guidelines for the Mary River Phase 2 Development Proposal, Sections 8.1.7 and 9.4.12
	• TSD-02 Project Description
	• TSD-28 Management Plans, Appendix B - Borrow Pit and Quarry Management Plan
	• Mary River Project, 2018 Annual Report to NIRB, March 2019, Section 3.2.3
	• Baffinland IR Responses, Response to CIRNAC-IR # 8 and #10
	• Additional Information provided by Baffinland:
	  ○ Hatch 2017 Geotechnical Investigations - Acid Rock Drainage Assessment
	  ○ Baffinland Mary River Project - Trucking Feasibility Study Interim ML/ARD Assessment of Tote Road Quarry and Borrow Pit Samples Rev1 - Issued for FEIS (AMEC 2010) (Phase 1)]
	  ○ Hatch, April 26, 2019 Borrow Source Investigation Factual Data Report
	  ○ Baffinland, Memo Clarification related to Environment and Climate Change Canada (ECCC) 3.20, May 14, 2019
	  ○ Baffinland, Memo Statement on Waste Rock and ARD, July 3, 2019
	  ○ Hatch, July 24, 2019 Borrow Source Investigation Factual Data Report.

Summary	Baffinland earlier submitted Borrow Source Investigation Factual Data Report (April 26, 2019) to address potential ARD/ML issues for construction of the Northern Railway. During the technical review, CIRNAC noted that this report was substantially deficient in the rock sampling and representative test work in the southern section of the intended Northern Railway corridor, south-west of Deposit 4, which leads to uncertainty in assessment of the ARD/ML potential of the railway cut material, quarries and pit walls. To address this deficiency Baffinland submitted an *additional Borrow Source Investigation Factual Data Report (July 24, 2019)* and committed to avoidance, mitigation and monitoring of ARD/ML at all rail corridor quarries.
Importance of issue to impact assessment	Rail corridor rock surfaces and quarries in this area that come into regular contact with rainfall / snowmelt may become sources of adverse water quality due to ARD/ML. Assessment of the ARD/ML potential is required to better understand any potential adverse environmental impacts and develop appropriate mitigation measures. Adequate interpretation and investigation of ARD/ML material, particularly leachate results is an important part of predicting probable drainage water quality from rail quarries and construction materials.
Detailed Review Comment	CIRNAC noted that there was uncertainty in ARD/ML potential of the railway cut material, quarries and pit walls. CIRNAC requested Baffinland perform a representative sampling program and geochemistry test work program in the area of the Northern railway corridor south-west of Deposit 4.

	In response, Baffinland issued a Memo (July 3, 2019) committing to avoidance, mitigation and monitoring of ARD/ML at all rail corridor quarries. The detailed and specific mitigation measures were earlier presented in *Baffinland's Memo to ECCC (May 14, 2019)*. These include water monitoring for ARD/ML parameters, water diversion, covering potential acid generating (PAG) materials with crushed carbonate rock and / or engineered covers and contingency for passive / active water treatment prior to discharge. Baffinland also provided both the Phase 1 and Phase 2 ARD/ML test work program results, which is representative of the majority of potential quarry locations along the rail route. In light of completion of the Phase 2 ARD/ML test work program, sampling locations appear to be significantly more representative of rock types that will be encountered along the railway corridor than prior investigations (including the deviation between Tote Road and the rail route immediately south-west of the mine). Overall, the results suggest that rock materials sourced from quarry and borrow pits for road / rail construction represent a low risk in terms of ARD. These rock materials appear to have negligible potential for generating acidity as a result of low sulphur content and an abundance of carbonate minerals. However, Shake Flask Extraction (SFE) results suggested that some rock materials may leach certain metals at concentrations greater than the adopted Canadian Water Quality Guidelines for Aquatic Life, specifically aluminum, mercury and copper. The origin of these exceedances (dissolved phase vs suspended solids) and implications for drainage water quality is yet to be determined.
Recommendation / Request	CIRNAC is satisfied with the response for the purpose of the EA process for ARD issues related to the rail road cut and associated quarries conditional on adoption of the following commitments: • Baffinland shall undertake test work to confirm to the Nunavut Water Board the origin of elevated concentrations of aluminum, mercury and copper in SFE for rock materials sourced from quarry and borrow pits for road / railway construction, and develop and implement an appropriate water quality monitoring and management strategy for railway corridor rock quarries as part of water licensing. • The monitoring results shall be compared with the FEIS Addendum predictions and appropriate mitigation measures shall be identified and implemented. These recommendations have been discussed with Baffinland and in November 2019, Baffinland agreed to address this issue by accepting the proposed commitments.

Review Comment Number	**CIRNAC- Final Comment #8 / CIRNAC 3 NEW**
Subject	**ARD/ML Characterization within Ore and Waste Rock from Deposit 1**
Reference	• NIRB Amended EIS Guidelines for the Mary River Phase 2 Development Proposal, Section 6.5.3.1; 6.5.3.2; 6.5.3.3 and 6.5.13 • TSD-02 Project Description • TSD-28 Management Plans, Appendix H - Phase 1 Waste Rock Management Plan, Section 5.3 • TSD-28 Management Plans, Appendix I - Interim Waste Rock Management Plan • Mary River Project, 2018 Annual Report to NIRB, March 2019, Section 3.2.3 • Baffinland IR Responses, Responses to CIRNAC-IR # 9 • Baffinland, Memo Statement on Waste Rock and ARD, July 3, 2019 • Baffinland, Memo Outstanding questions related to ECCC 3.19, May 01, 2019 • Table 4-1 of Section 4-1 of Hatch, July 24, 2019 Borrow Source Investigation Factual Data Report (in relation to NPR threshold to identify non-PAG materials).
Summary	PAG waste rock stored within the WRF at the approved Mary River mine site currently generates ARD/ML that is collected and treated before discharge. Baffinland is conducting sampling and test work to better understand the nature of ARD/ML associated with the PAG waste rock. The current method of identifying PAG waste rock that may generate ARD/ML relies on measuring the total sulphur content. Baffinland considers rock with total sulphur content below 0.2 weight percent (wt %) to be not problematic in terms of generation of ARD/ML. The 0.2 wt % criteria is based upon a neutralization potential ratio (NPR) criteria of 2 which, according to the Mine Environment Neutral Drainage (MEND) program (MEND. 2009), can only be used where acid potential is associated with pyrite and there is readily available neutralization potential provided by Ca/Mg carbonate minerals (e.g. calcite and dolomite). CIRNAC is of the view that the lack of Ca/Mg carbonate minerals and presence of soluble sulphates, implies that an NPR value of 2 and associated 0.2 wt % total sulphur criteria may not be appropriate for identifying PAG waste rock at the mine site.
Importance of issue to impact assessment	Clear and adequate derivation of an appropriate set of PAG identification criteria is critical for effective management of waste rock at the mine site. If the NPR value and associated total sulphur wt % criteria are not suitably conservative (i.e. account for an absence of Ca/Mg carbonate minerals and the rapid release of ARD/ML as a result of soluble sulphate mineral content), Baffinland may substantially underestimate tonnages of PAG in the Block Model for Deposit 1. Greater than expected tonnages of PAG may result in the WRF design and water treatment sizing not being sufficiently adequate to prevent short and or longer term adverse impacts to the watershed in which the WRF is located.
Detailed Review Comment	Currently, waste rock is identified as PAG if it has greater than 0.2 wt % total sulphur and an associated NPR less than 2. PAG identification criteria are being reviewed by Baffinland.

	CIRNAC's review indicates the following key uncertainties related to the derivation of an appropriate set of PAG identification criteria (the total sulphur wt % and associated NPR value): • Consideration of the effect of an absence of Ca/Mg carbonate minerals; • Consideration of the effect of the presence of soluble sulphate minerals; and • Consideration of the variation and uncertainty in ARD/ML behaviour of the different types of waste rock at Deposit 1. Both *Appendix E.6 and E.7 Mary River Project 2018 QIA and NWB Annual Report for Operations, March 31, 2019*, clearly demonstrate lack of Ca/Mg carbonate mineral content in waste rock (including PAG waste rock). The bulk Neutralization Potential is relatively low and at least twice as great as Carbonate Neutralization Potential, suggesting a predominance of Neutralization Potential being provided by silicate minerals rather than Ca/Mg carbonate minerals. The implication is that if PAG rock releases ARD/ML, there will be no effective neutralisation capacity to maintain non-acidic conditions (i.e. above pH 6) and loadings of acidity and metals will readily seep from the WRF. The MEND program[1] clearly advocates adjustment of the NPR value to a suitable value greater than 2 to account for a lack of Ca/Mg carbonate minerals (noting the current 0.2 wt % total sulphur cut-off is based upon an NPR value of 2). On that basis, the current PAG identification criteria (NPR of less than 2 and more than 0.2 wt % total sulphur content) needs to be thoroughly reviewed and potentially adjusted in a manner that clearly demonstrates consideration of the effect of an absence of Ca/Mg carbonate minerals and presence of soluble sulphate minerals. If materials contain significant amount of soluble sulphate minerals, release of acidity and metals is expected to be very rapid. This was observed at the WRF in 2017 and suggested by SFE results for test work associated with the Interim Waste Rock Management Plan[2]. The overall kinetics of release of acidity and metals occurs much faster than what was suggested in the kinetic work undertaken to inform the Environmental Assessment, the Water Licence application and associated Waste Rock Management Plan. In their response to these concerns, Baffinland suggested that the behaviour of the soluble sulphate mineral content will be investigated by the following geochemical test work upon samples collected from the WRF and blast boreholes: whole rock and total metals analysis, acid-base accounting, net acid generation testing, SFE leach testing, X-ray diffraction, optical petrography, and scanning electron microscopy. CIRNAC notes that these tests all seem appropriate; however they will provide limited insight into the effects of an absence of Ca/Mg carbonate minerals and presence of soluble sulphate minerals. Additionally, it is recommended that Baffinland provide clear demonstration of uncertainty in ARD/ML behaviour of the different types of waste rock at Deposit 1. Baffinland has suggested that evaluation of correlations between NPR and total sulphur for different waste rock lithologies will be completed for the

[1] MEND. 2009. Page 14-11, Chapter 14, Prediction Manual for Drainage Chemistry from Sulphidic Materials. MEND Report 1.20.1. December 2009. Report prepared by William A. Price. CANMET – Mining and Mineral Sciences Laboratories. Smithers, British Columbia. V0J 2N0

[2] Interim Waste Rock Management Plan. Mary River Project. Baffinland Iron Mines Corporation. Rev 1790951 (DOC 034_Rev0). March 2019. Golder, Mississauga, Ontario, Canada.

	geochemistry test work dataset that is currently being developed as well as pre-existing datasets. In their *Memo of May 01, 2019* (reply to ECCC comment 3.19) Baffinland stated that "*Reassessment of the total sulphur content cut-off for PAG characterization will be completed, as appropriate, following an improved understanding of the concentration of soluble sulphates within the waste rock. If the 2019 geochemical investigation finds that soluble sulphates in waste rock with less than the 0.2% total sulphur content cut-off has the potential to produce poor seepage water quality, then additional geochemical testing will likely be required as part of the waste rock segregation practices to define PAG versus non-PAG during blasthole sampling. The additional geochemical testing requirements, if required, will be defined after reviewing the 2019 geochemical investigation results.*" In November 2019 Baffinland committed to develop effective criteria for identification of PAG rock following industry best practice. Baffinland committed to incorporating these criteria in an updated Waste Rock Management Plan and Interim Closure and Reclamation Plan, to be submitted for review during the Water Licence Amendment process, subject to Nunavut Water Board requirements. Since December 2019 Baffinland, has provided new information in their updated waste rock management plan, various memoranda, conference calls and emails and partially addressed some of the questions raised before. CINRAC is of the view that use of 0.2%Sulphur as a cut off value for PAG rocks is not sufficiently justified based on evidence presented so for. The Department recommends providing more lines of scientific evidence during the regulatory process.
Recommendation / Request	Should the Project be approved, CIRNAC suggests that Baffinland commits to the following: • Baffinland shall develop reliable criteria for identification of PAG rock that clearly accounts for uncertainty in the 0.2% total sulphur threshold and the presence of acidic soluble sulphates upon projected life of mine tonnages of PAG and Non-Acid Generating (NAG) rock. • Baffinland shall incorporate these criteria, clearly stated ranges in projected life of mine PAG and NAG rock tonnages and the resultant necessary contingencies and methods of validation that need to be incorporated into engineering design, environmental monitoring and management strategies for the Waste Rock Management Plan and Interim Closure and Reclamation Plan. These documents are to be submitted for review during the Water Licence Amendment process, subject to Nunavut Water Board requirements. • Baffinland shall review the performance of these plans and provide evidence of the effectiveness of these plans by demonstrating compliance with the management measures and that the desired outcomes of mitigation are achieved on an annual basis. These recommendations have been discussed with Baffinland earlier and in September 2020, Baffinland agreed to address this issue by accepting the proposed commitments.

Hazardous Material and Waste Management

Review Comment Number	**CIRNAC- Final Comment #9**
Subject	**Updates to Waste Management Plan, Hazardous Materials Management Plan, Spill Contingency Plan and Explosives Management Plan**

Reference	• Baffinland Mary River Project - Phase 2 Proposal, Addendum to the Final Environmental Impact Statement, August 2018 TSD-028 Management Plans
	  ○ Appendix F - Waste Management Plan
	  ○ Appendix G - Hazardous Materials and hazardous Waste Management Plan
	  ○ Appendix M - Spill Contingency Plan
	• Baffinland IR Responses, Responses to CIRNAC-IR # 6 and CIRNAC-IR # 16
	• Baffinland IR Responses. Responses to CIRNAC, Appendix 11
	• Guidelines for the Preparation of an Environmental Impact Statement for Baffinland Iron Mines Corporation's Mary River Project (NIRB File No. 08MN053), October 6, 2015 - Nunavut Impact Review Board
	• Baffinland, DRAFT Waste Management Plan, May 1, 2019
	• Baffinland, DRAFT Hazardous Materials and Hazardous Waste Management Plan, May 1, 2019
	• Baffinland, DRAFT Explosives Management Plan, May 13, 2019.

Summary	Implementation of the Phase 2 development triggers changes to existing management plans, such as quantity increases as well as a new potential spill source from rail operation. As part of the submission, Baffinland provided a description of the updates to the management plans in Appendix 11 in their response to information requests (CIRNAC-IR # 6, 11, and 16). The remaining gaps that have to be addressed in these updates are expected quantities of waste and materials.
Importance of issue to impact assessment	Considering the remote nature of the Project and the difficulty to access the disposal sites, special attention should be placed on quantities, storage and management of wastes and hazardous materials. Clarity is required with regards to the assessment of the increased quantities of materials that are to be managed and any additional mitigation that may be required.
Detailed Review Comment	Baffinland has gained site operations experience over the last number of years and this experience should be referenced. During the technical review of Baffinland's Phase 2 Application, CIRNAC requested that the following items be addressed in each plan: • Explosives Management Plan: Update to reflect new quantities of explosives, as well as other required updates to the storage and handling method; and spill response. • Waste Management Plan: Include an estimate of waste quantities that will be generated as a result of the Phase 2 proposal and how the waste reuse and recycling principles are implemented. • Hazardous Materials and Hazardous Waste Management Plan: The inventory of the types and volumes of hazardous waste generated or produced by Project Activities. • Spill Control Plan: Update required to reflect increased volumes of sewage generated during construction and operation of Phase 2, emergency response equipment needed to respond to spills due to increases in fuels and other

	hazardous materials used/generated throughout the Project as a result of the Phase 2 proposal. Furthermore, CIRNAC requested that Baffinland should demonstrate how they apply the adaptive management principle to manage these materials. In response, Baffinland provided the document titled: *DRAFT Hazardous Materials and Hazardous Waste Management Plan, May 1, 2019*, and updated the *Explosives Management Plan*. The plan includes a table outlining the maximum cumulative quantities of explosives and ammonium nitrate as well as the storage location and storage container requirements. The existing management requirements for storage and handling appear adequate. The updated *Draft Spill Contingency Plan* presents a new Spill Scenario 5, including spills from locomotive during Railway Operation. A new table of explosives and ammonium nitrate was also added.
Recommendation / Request	CIRNAC is satisfied with the provided response and does not have any additional comments at this stage.

Review Comment Number	**CIRNAC- Final Comment #10**
Subject	**Hazardous Materials and Waste Management at Milne Port**
Reference	• Baffinland FEIS Addendum Mary River Project Phase 2 Proposal, Technical Supporting Document 02: Project Description, Sections 1.2.4, 3.1, and Section 4.5 • Application to Amend Type A Water Licence, 2AM-MRY1325 • Guidelines for the Preparation of an Environmental Impact Statement for Baffinland Iron Mines Corporation's Mary River Project (NIRB File No. 08MN053), Section 9.4.9 • Baffinland, DRAFT Hazardous Materials and Hazardous Waste Management Plan, May 1, 2019.
Summary	The Project activities at railway maintenance facility/yard at Milne Port will potentially generate significant quantities of waste and hazardous materials which were not generated previously at this location. Given the scale of the facility and the types of maintenance activities that are being described therein and the fact that facilities were not assessed in the original FEIS, it was unclear how Baffinland reached the conclusion that there was no change to the quantities of hazardous waste materials and storage requirements associated with this facility.
Importance of issue to impact assessment	To demonstrate that adequate planning is in place for the management of waste and hazardous materials that will be generated as part of the Phase 2 Project, a sufficient assessment of expected quantities and types of waste is needed as they relate to the proposed changes to the Project. Baffinland should further demonstrate that it is using the adaptive management principles in its management planning by building its approach on existing project experience on waste generation.
Detailed Review Comment	A railway maintenance facility/yard at Milne Port Project is presented in the Project Description of the FEIS Addendum. Baffinland was requested to provide a description of forecasted changes in quantities, types of hazardous materials and waste that are expected to be generated under the Phase 2 Proposal. CIRNAC was referred to the Application to Amend Type A Water Licence, 2AM-MRY1325 for this information. A review of the licence application did not provide sufficient information to ascertain whether material and waste associated with this new facility has been considered in determining waste quantities related to Phase 2 and how this would be managed. CIRNAC requested Baffinland provide an inventory of waste types and quantities that would be generated by such a facility indicating additional material/wastes that would require management as a result of this new facility at Milne Port. In response, Baffinland provided the document titled: *DRAFT Hazardous Materials and Hazardous Waste Management Plan, # BAF-PH1-830-P16-0011, Revision: Issued for review purposes only, Issue Date: May 1, 2019.* The Plan includes information on hydrocarbon waste and hydrocarbon products such as engine oils and filters. Baffinland also provided estimated quantities of wastes and noted these were small in relation to all generated wastes. Table 4.2 of the Plan provides hazardous waste management methods that are appropriate for locomotive maintenance, including the proposed management options.
Recommendation /	CIRNAC is satisfied with the provided response and does not have any

Request	additional comments at this stage.

Review Comment Number	**CIRNAC- Final Comment #11**
Subject	**Comparison of the Approved Project to the Phase 2 Proposal with Respect to Hazardous Material and Waste Management**
Reference	• Baffinland FEIS Addendum Mary River Project Phase 2 Proposal, Section 1.1 • Baffinland IR Responses, Response to CIRNAC-IR # 16 • Baffinland Response to CIRNAC Technical Comment # 12.
Summary	The difference between the approved project and the Phase 2 Project Description with regards to hazardous materials and waste management is unclear. The Application to Amend Type A Water Licence, 2AM-MRY1325, presents quantities of solid waste, sewage effluent and hazardous waste to be generated from the Phase 2 Proposal, as well as the description of waste management capacity to accommodate the increased volume of materials and waste. However no comparison was provided to current volumes of waste under the existing project.
Importance of issue to impact assessment	Given the remote nature of the Project and the difficulties this presents to managing general waste as well as hazardous waste, it is important to understand what quantities are being produced and how they are managed.
Detailed Review Comment	The Application to Amend Type A Water Licence, 2AM-MRY1325, presents quantities of solid waste, sewage effluent and hazardous waste to be generated from the Phase 2 Proposal, as well as the description of waste management capacity to accommodate the increased volume of materials and waste. However no comparison was provided to current volumes of waste under the existing project. In response to the previously submitted on this issue Baffinland requested CIRNAC examine the Application to Amend the Type A Water Licence, specifically Section 4.7, Table 4.3, Attachments 11.2 and 11.4, as well as Figures B.1 and B.5. However, a review of these documents does not fully address the concern and a comparison of the original project and the Phase 2 with regards to these materials is not evident. Baffinland Response to CIRNAC Technical Comment # 12 provided a comparison of the current volumes of waste generated (2016, 2017 and 2018).
Recommendation / Request	CIRNAC is satisfied with the provided response and does not have any additional comments at this stage.

Review Comment Number	**CIRNAC- Final Comment #12**
Subject	**Snow Management and Capacity of Snow Stockpiles**
Reference	• TSD-28 Management Plans, Appendix E-Snow Management Plan • Baffinland IRs Response. Response to CIRNAC-IR # 13 • Baffinland, Draft Snow Management Plan, Phase 2 Proposal Revisions, May 13, 2019.
Summary	Baffinland has not presented the monitoring data or details on collected volumes of contaminated snow/ice from previous and current operations within the Snow Management Plan. Given Baffinland's operational experience, a discussion of the volume of contaminated snow and ice is required to assess the potential impact on soils and water and to identify appropriate mitigation measures with regards to planning for Phase 2 of the Project.
Importance of issue to impact assessment	Knowledge of the volume of contaminated snow is required to assess the potential impact on soils and water and to identify appropriate measures to prevent or mitigate these effects.
Detailed Review Comment	The proposed Snow Management Plan did not provide for estimates of hydrocarbon contaminated snow and ice that will be generated by Phase 2 activities and details on how these will be managed. It was expected that Baffinland should have details of volumes of contaminated snow and ice from its current operational experience. This experience should inform the assessment of current capacities of the snow management areas and any modifications required to meet the management needs for the proposed Phase 2 activities. Baffinland has updated the Snow Management Plan to include the North Railway, construction and operation phases. The Snow Management Plan indicates the snow piles location at Milne port, mine site and along the Tote Road / North Railway. The plan also includes the position of culverts and guidelines for snow management along the North Railway. However, the plan does not include volumes of contaminated snow and ice estimates for the Phase 2 Project development. In their March 2019 Responses to CIRNAC Technical Comment # 13, Baffinland noted that the volume of contaminated snow and ice managed at the Milne Port snow dump is reported in the Qikiqtani Inuit Association / Nunavut Water Board Annual Report for Operations, expressed as the volume of water treated from the facility. In 2017, Baffinland discharged approximately 187 m^3 of treated water from the snow dump facility. Projected quantities of contaminated snow and ice for the phase 2 of the Project are not available, as the primary source of contamination are unplanned spills. Additional containment for contaminated soils, snow and ice will be addressed on an on-going basis as required by the operation. Baffinland has identified the construction of an additional landfarm facility at the Mine Site in the 2019 Work Plan, which may include additional contaminated snow and ice storage.
Recommendation / Request	CIRNAC is satisfied with the provided response and does not have any additional comments at this stage.

Socio Economics

Review Comment Number	**CIRNAC- Final Comment #13**
Subject	**Adequacy of Baseline Data**
Reference	• NIRB Amended EIS Guidelines for the Mary River Phase 2 Development Proposal, Section 7.1: Baseline Information Collection, p. 35. October 2015. • Baffinland FEIS Addendum Mary River Project Phase 2 Proposal, Section 8.2.7 Socio-economic Environment, pp. 8.9 to 8.17. • Baffinland TSD 25 - Socio-economic Assessment, Sections 2 through 11, pp. 6 to 151, Appendix B, and Appendix C, pp. 384 of 535 – 418 of 535. • Baffinland FEIS Addendum Mary River Project Phase 2 Proposal, FEIS Addendum, Appendix I: Assessment Methodology. • Baffinland Responses to Technical Review Comments, p. 9 and Attachment 1: Table 1: Adequacy of Baseline Data Used for Each VSEC. March 25, 2019.
Summary	Section 7.1 of the Amended Environmental Impact Statement Guidelines (NIRB Guidelines) states, "[t]he Proponent shall explain methodologies for baseline data collection, evaluation of the adequacy of data, confidence levels associated with the baseline data, and identification of significant gaps in knowledge and understanding" [emphasis added]. However, neither the main FEIS Addendum document nor the Technical Supporting Document on Socio-economic Assessment (TSD 25) discuss the adequacy of, or degree of confidence in baseline data collected for any of the Valued Socio-Economic Components (VSEC); nor is adequacy of data mentioned in the FEIS' Assessment Methodology (Appendix I).
Importance of issue to impact assessment	Confidence in baseline data is necessary to determine the significance of impacts a proposed project may have on the environment (biophysical and socio-economic), as well as impacts the environment may have on the project.
Detailed Review Comment	Section 8.2.7 of the FEIS Addendum describes the socio-economic baseline conditions for eight of the project's ten VSECs but does not mention the adequacy of baseline data[3]. The presented VSECs are: 1. Education and Training; 2. Livelihood and Employment; 3. Economic Development and Self-reliance; 4. Benefits, Royalty, and Taxation; 5. Community Infrastructure and Public Services; 6. Contracting and Business Opportunities; 7. Population Demographics; and 8. Human Health and Well-being. The Technical Supporting Document on Socio-economic Assessment (TSD 25) briefly discusses baseline information in the assessment methodology subsections for all of the Project's VSECs. Most refer to Appendix C of TSD 25, Updated Socio-economic Baseline Information for further information, which presents data primarily sourced from Statistics Canada, the Nunavut Bureau of Statistics, and the Nunavut Housing Corporation. However, no discussion is provided on the reliability of data sources or confidence in the updated baseline data.

[3] The excluded VSECs are 'Culture, Resources and Land Use,' and 'Governance and Leadership.'

	In their March 25, 2019 written response to technical comments, Baffinland explained the adequacy of baseline data presented in support of the Project. A table was provided (Attachment 1: Table 1: Adequacy of Baseline Data Used for Each VSEC) that includes statements on the adequacy of baseline data used for each VSEC presented in TSD 25 and a rationale for their determination. The response provides reasonable descriptions of adequacy/overcoming limitations; identifies VSECs that have no baseline data (e.g., Royalties); and others that have no quantitative data (e.g., Governance).
Recommendation / Request	CIRNAC is satisfied with the provided response and does not have any additional comments at this stage.

Review Comment Number	**CIRNAC- Final Comment #14**
Subject	**Use of Inuit Qaujimajatuqangit/Traditional Knowledge/Community Concerns in Impact Predictions**
Reference	• NIRB Amended EIS Guidelines for the Mary River Phase 2 Development Proposal, Section 7.7: Impact Prediction, p. 39. October 2015. • Baffinland FEIS Addendum Mary River Project Phase 2 Proposal, Section 7: Consultation and IQ Studies. • Baffinland Responses to Technical Review Comments, pp. 9-10 and Appendix 13: Inuit Qaujimajatuqangit and the Mary River Project Phase 2 Proposal. March 25, 2019.
Summary	Section 7.7 of the Amended Environmental Impact Statement Guidelines (NIRB Guidelines) states impact predictions should "specify and reference sources for any contributions based on traditional knowledge (TK)." Section 7 of the FEIS Addendum outlines the methods Baffinland used to engage with Inuit communities, the public, and stakeholders from 2014 to 2018. Included in these engagement methods are five Inuit Knowledge Workshops that were held with representatives from the five North Baffin communities in 2015 and 2016. The Technical Supporting Document on Socio-economic Assessment (TSD 25) does not reference the collection of Inuit Qaujimajatuqangit (IQ) or TK from these workshops. As a result, it is difficult to determine whether or not IQ or TK was included in the impact prediction/assessment process.
Importance of issue to impact assessment	TK is considered to be a significant contributor to the environmental assessment process, as Section 2.5 (p. 7) of the EIS Guidelines states that TK is an "indispensable element both as baseline information and as an Inuit lens through which impact analyses can be better understood…" In the absence of explicit mention of IQ or TK terms in the assessment of specific VSECs and indicators, it is not possible to determine to what degree IQ or TK was gathered through engagement activities.
Detailed Review Comment	In their March 25, 2019 written response to technical comments, Baffinland explained the incorporation of IQ in TSD 25 and previous assessments conducted for the Approved Project. The response is supplemented by a report entitled *"Inuit Qaujimajatuqangit and the Mary River Project Phase 2 Proposal"* (Appendix 13). This report outlines Baffinland's approach to IQ, how IQ is incorporated into the Phase 2 Proposal, and future steps that will be followed (including additional IQ that will be collected, the use of IQ in monitoring programs, and adaptive management considerations).
Recommendation / Request	CIRNAC is satisfied that the Baffinland has provided references to sources and information related to IQ.

Review Comment Number	**CIRNAC- Final Comment #15**
Subject	**Socio-economic Impact Assessment – Addressing NIRB Guidelines**
Reference	• NIRB Amended EIS Guidelines for the Mary River Phase 2 Development Proposal, Section 8.2: Socio-economic Environment, pp. 59-68. October 2015. • Baffinland Responses to Technical Review Comments, p. 11 and CIRNAC 14 Attachment 1: Table 1: Adequacy of Baseline Data Used for Each VSEC March 25, 2019. • Baffinland TSD 25 - Socio-economic Assessment, Sections 9.7, 10.6, and 11.6.
Summary	Section 8.2 of the Amended Environmental Impact Statement Guidelines (NIRB Guidelines) identifies a number of indicators and interactions to be addressed by the socio-economic assessment, organized by VSEC. The Technical Supporting Document on Socio-economic Assessment (TSD 25) addresses most of these indicators and interactions through a series of "EIS Guideline Summary" tables. However, tables are not provided for three VSECs: 'Culture, Resources, and Land Use,' 'Benefits, Royalty and Taxation,' and 'Governance and Leadership.' In addition, the impact assessments of these VSECs (Sections 9.7, 10.6, and 11.6) do not address all the points identified in the NIRB Guidelines unlike what was performed for the other VSECs. As a consequence, several socio-economic indicators and interactions identified in the EIS Guidelines appear to have been unaddressed.
Importance of issue to impact assessment	Conformity with the EIS Guidelines is necessary to demonstrate that requested information has been provided. The use of tables structured to include the details presented in the guidelines allows reviewers to assess the adequacy of submitted information. For those VSECs that are not assigned tables it is more difficult to determine whether details provided in the guidelines have been considered. In the case of the VSECs for 'Culture, Resources, and Land Use,' 'Benefits, Royalty and Taxation,' and 'Governance and Leadership,' presented in TSD 25, some of the details identified in the EIS Guidelines appear to have not been addressed without explanation for their omission.
Detailed Review Comment	In their March 25, 2019 written response to technical comments, Baffinland provided summaries of interactions for the information requested under Section 8.2 of the EIS Guidelines for the 'Culture, Resources, and Land Use,' 'Benefits, Royalty, and Taxation,' and 'Governance and Leadership' VSECs (Appendix 1) at the same level of thoroughness as the summaries of interactions provided for other VSECs in TSD 25.
Recommendation / Request	CIRNAC is satisfied with the provided response and does not have any additional comments at this stage.

Review Comment Number	**CIRNAC- Final Comment #16**
Subject	**Cumulative Effects Assessment in Alternatives Assessment**
Reference	• NIRB Amended EIS Guidelines for the Mary River Phase 2 Development Proposal, Subsections 6.1 and 7.8. October 2015. • Baffinland TSD 01 - Alternatives Analysis. • Baffinland TSD 27 - Cumulative and Transboundary Effects Assessment. • Baffinland Supplement to TSD 27 Cumulative and Transboundary Effects, Section 5. August 23, 2019
Summary	Subsection 6.1 of the Amended Environmental Impact Statement Guidelines (EIS Guidelines) states the "associated cumulative effects of each option should be discussed, in accordance with the requirements of Subsection 7.8, particularly the potential for cumulative impacts on the marine ecosystem and Inuit harvesting activities." However, the Technical Supporting Documents on Alternatives Analysis (TSD 01) and Cumulative and Transboundary Effects Assessment (TSD 27) do not provide cumulative effects assessments for each Project alternative under consideration.
Importance of issue to impact assessment	In the North Baffin area, Inuit harvest various terrestrial and aquatic species for economic, social, and cultural purposes. As a result, the potential cumulative impact resulting from Phase 2 Project activities in addition to other projects/activities that may affect Nunavut Inuit's use of the land and resources should be assessed. The EIS Guidelines request information on the associated cumulative effects for each Project alternative discussed, specific to the marine ecosystem and Inuit harvesting activities.
Detailed Review Comment	In response to technical comments and a commitment made at the April 2019 Technical Meeting, Baffinland provided a supplement to the *Technical Supporting Document on Cumulative and Transboundary Effects* (TSD 27) (dated Aug. 23, 2019). The supplement describes how the Project's main alternative development scenarios (I. A future without the Phase 2 Proposal; II. A future with the Phase 2 Proposal; and III. Potential future development at the Mary River Project) have been evaluated in accordance with Subsections 6.1 and 7.8 of the EIS Guidelines. Baffinland's view is that the intent of these guidelines is focused on alternative development scenarios, not each individual project alternative. Baffinland also believes that completing a Cumulative Effects Assessment for individual project alternatives would result in several development scenarios that would not be practical or useful. CIRNAC agrees with the provided explanation.
Recommendation / Request	CIRNAC is satisfied with the provided response and does not have any additional comments at this stage.

SUMMARY

CIRNAC has undertaken a review of documents submitted by Baffinland to the NIRB in support of applications for the Project. The review process included IRs and a Technical Review submission, both of which received responses from Baffinland. This was followed by Technical Meetings, Community Roundtable and Pre-hearing Conference, which resulted in Baffinland responding to comments and making additional commitments to address requests from CIRNAC and other parties.

In general, the information and analysis contained in Baffinland's FEIS Addendum for the Mary River Project Phase 2 Proposal submissions was adequate for the purposes of the EA process. In most respects, potential impacts are well understood and/or are readily mitigated through active interventions. However, some aspects of the proposed activities require further assessment and commitments for additional monitoring and mitigation, as discussed in the present submission.

During the IR and Technical Review phases for the Project, CIRNAC identified a series of potential concerns related to the project's impacts on the biophysical environment and socio-economic matters. In most instances, those concerns have been sufficiently resolved for the purposes of the EA. Based on the evidence considered to date, CIRNAC has concluded that, for aspects within CIRNAC's mandate, the proposed Project is not likely to cause significant adverse environmental effects with exception of issues related to the ARD/ML characterization within ore and waste rock from Deposit 1 and thermal modeling of Waste Rock Facility. These concerns, however, can be addressed at the regulatory phase subject to implementation of proposed commitments and Terms and Conditions.

As indicated in the following table, most of those concerns have been sufficiently resolved for the purposes of the EA. This does not preclude CIRNAC from addressing the same concerns during the Water Licensing process.

CIRNAC Review Comments	Subject	CIRNAC Conclusion on EA Status
FC #1	Seismic data for North Railway alignment	Resolved
FC #2	North Railway geotechnical investigations	Resolved
FC #3	North Railway management plan	Resolved
FC #4	Risk of excessive settlement of Railway embankment – thaw settlement tests or thaw strain assessment	Resolved
FC #5	Thermal modelling of key infrastructure	Resolved. See FC #1 NEW and FC #1A NEW
FC #1 NEW	Thermal monitoring of the Waste Rock Facility	Resolved, contingent with recommended commitment
FC #1A NEW	Thermal modelling of Phase 2 Project key infrastructure	Resolved, contingent with recommended Terms and Conditions
FC #6	Mine closure strategies for materials with acid rock drainage and metal leaching potential	Resolved
FC #7 (FC #2 NEW)	Acid rock drainage and metal leaching potential of railway cut material, quarries and pit walls	Resolved, contingent with recommended commitment
FC #8 (FC #3 NEW)	ARD/ML characterization within ore and waste rock from Deposit 1	Resolved, contingent with recommended commitment
FC #9	Updates to Waste Management Plan, Hazardous Materials Management Plan, Spill Contingency	Resolved

CIRNAC Review Comments	Subject	CIRNAC Conclusion on EA Status
	Plan and Explosives Management Plan	
FC #10	Hazardous Materials and Waste Management at Milne Port	Resolved
FC #11	Comparison of the Approved Project to the Phase 2 Proposal with respect to Hazardous Material and Waste Management	Resolved
FC #12	Snow management and capacity of snow stockpiles	Resolved
FC #13	Adequacy of baseline data	Resolved
FC #14	Use of Inuit Qaujimajatuqangit/Traditional Knowledge/Community Concerns in impact predictions	Resolved
FC #15	Socio-economic Impact Assessment – Addressing NIRB Guidelines	Resolved
FC #16	Cumulative Effects Assessment in Alternatives Assessment	Resolved