



September 4, 2020

Solomon Amuno  
Technical Advisor II  
Nunavut Impact Review Board  
29 Mitik Street, PO Box 1360  
Cambridge Bay, NU, X0B 0C0  
*Sent via email: info@nirb.ca*

**Re: Baffinland Response to Reviewer Comments on the 2019 NIRB Annual Report  
Mary River Project, Project Certificate No. 005**

Dear Solomon,

Baffinland Iron Mines Corporation (Baffinland) is pleased to provide responses to comments received by the Nunavut Impact Review Board (NIRB) on the 2019 Annual Report for the Mary River Project. Specifically, Baffinland is responding to the NIRB letter inviting response to comments, and outlining the associated comments received from the following interested parties:

- Qikiqtani Inuit Association (QIA)
- Government of Nunavut (GN)
- Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)
- Environment and Climate Change Canada (ECCC)
- Fisheries and Oceans Canada (DFO)
- Parks Canada (PC)
- Transport Canada (TC)
- Oceans North (ON)
- World Wildlife Fund (WWF)

Responses to comments from the above intervenors can be found in Attachment 1. Based on the review of intervenor comments, Baffinland notes the following;

- Responses to TC comments were not required based on the nature of the comments.
- The submission from DFO and PC contained a number of comments that were initially submitted through the Marine Environment Working Group (MEWG) review of the draft marine monitoring reports. Responses to these comments will be submitted with the final versions of the marine monitoring reports, but are included in this submission for completeness.

- The submission from ECCC contained a number of comments that were also submitted on the 2019 QIA & NWB Annual Report submitted to the Nunavut Water Board (NWB). These comments have been addressed herein, and will be issued with the responses to the NWB for completeness. In an effort to streamline the comment and response process, all intervenors are encouraged to submit comments through a single review process to avoid duplication.
- In the NIRB correspondence it was indicated that the Mittimatalik Hunters and Trappers Organization (MHTO) was unable to meet the July 27, 2020 deadline, and would provide comments on or before August 14, 2020. To date, Baffinland has not been issued a notification of submission from the NIRB and is not aware of comments submitted from the MHTO on the 2019 Annual Report. Baffinland would be glad to respond to comments from the MHTO in a timely manner should they be issued.

Baffinland appreciates the meaningful comments submitted by reviewers on the 2019 Annual Report to NIRB and wishes to thank everyone for their ongoing engagement in the success of the Mary River Project.

Should you have any questions, please do not hesitate to contact the undersigned.

Regards,



Christopher Murray  
Environmental & Regulatory Compliance Manager

Cc: Kelli Gillard, Cory Barker (NIRB)  
Megan Lord-Hoyle, Lou Kamermans, Genevieve Morinville, Amanda McKenzie, Emma Malcolm,  
Timothy Sewell (Baffinland)

#### **Attachments**

Attachment 1 - Baffinland Response to Reviewer Comments by Agency

Attachment 2 – 2019 Helicopter Flight Paths

Attachment 3 – 2019 – 2020 Ice Conditions

Attachment 4 – Early Warning Indicators for Marine Mammals Memo – August 20, 2020

Attachment 5 – Term and Condition No. 134 Correction

Attachment 6 – Summary of Results for the 2019 Marine Mammal Monitoring Programs Memo –  
May 25, 2020

## **Attachment 1**

Baffinland Response to Reviewer Comments by Agency

**Table 1 - Response to QIA Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
<b>General</b>					
1	QIA 2019 AMR GC #1	"A total of 32 positions (87 weeks) were available for Inuit to participate as employees in the 2019 Marine Environment Monitoring programs. A total of 23 Inuit staff ... supported roles of Inuit researchers". Were the other available position (9) filled by non-Inuit? Or unfilled?	QIA requests that the Proponent report on who filled the other available positions that could have gone to Inuit, if any.	Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: Popular Summary Page: 8	All of the positions were filled by Inuit staff, but some of the Inuit had multiple positions (i.e, some Inuit worked on several different monitoring programs in the same given year). This explains the discrepancy between total number of positions (n=32), and total number of Inuit staff (n=23).
2	QIA 2019 AMR GC #2	The two community-based shipping monitors played an important role in community communication in 2019. Are they being hired again in 2020?	QIA requests that the Proponent clarify their hiring plans for shipping monitors for the 2020 shipping season.	Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: 2.3 Engagement Activities Page: 24	In advance of the start of the 2020 shipping season, two (2) shipping monitors were hired to work out of the Baffinland Pond Inlet office in early July. Of these two individuals, one was a returning full-time shipping monitor from 2019, and the other was a returning Baffinland 2019 summer student, though new to the role (previously assisted the Baffinland Community Liaison Officer [BCLO]). Both of these individuals participated during the 2020 Pre-Shipping Season meetings (July 8 and 15, 2020), along with representatives of the Mittimatalik Hunters and Trappers Organization, the Hamlet of Pond Inlet and the QIA. Following the hiring of these two individuals, an additional two (2) individuals were hired, one of these also a returning full-time shipping monitor from 2019, and the other a returning Baffinland summer student who had also worked as a shipping monitor in 2019. As of the end of August 2020, an additional two (2) shipping monitors have been hired to replace the summer students returning to school. Additional candidates may be trained in the role to develop a roster pool for 2020 and future years. One (1) of the 2019 shipping monitors continued to work for Baffinland in a new role as Assistant BCLO and has since advanced to the role of BCLO in Pond Inlet.
3	QIA 2019 AMR GC #3	The Proponent has not provided detailed evidence of tracking the comments, concerns, feedback and recommendations of community members and members of the public as evidence of the strength of its engagement process. Appendix B does list the topics raised but does not provide the context in which it was raised or how it was addressed by BIMC.	QIA requests that the Proponent provide further evidence of the strength of its community engagement process by providing a tracking table indicating key issues, feedback and concerns raised by community members and members of the public, where these issues were raised and how BIMC has addressed them.	Document Name: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E Section: Section 2.3.1 and 2.3.2 - Public Meetings and Events and Community Group Meetings Page: 25	<p>Evidence for the strength of Baffinland's engagement program has been and will continue to be provided in a variety of ways. Because Baffinland has both formal and informal engagements within the community the level of response by the Company can be varied according to the particular circumstances. Baffinland disagrees that provision of a single table outlining community feedback and the responses provided would indeed provide evidence for the strength of its engagement program. However, as an example of how issues have been tracked and responded to has been provided in the recent submission, "Baffinland Iron Mines 2020 Marine Shipping and Vessel Management Report to the Nunavut Impact Review Board". This report provides an example of how feedback received has been addressed by the Company, as applicable.</p> <p>A few of the mechanisms for receiving and responding to community comments include Baffinland Community Liaison Officers as a first point of contact for employees, members of the public, elected officials, and other interested bodies in the communities of Arctic Bay, Clyde River, Igloolik, Pond Inlet, Sanirajak, and Iqaluit. These team members receive feedback and ensure follow-up is conducted through their team lead who in turn ensures that responses to feedback are provided when required. This can often be done verbally and may not have a formal tracking mechanism.</p> <p>Baffinland also uses the "StakeTracker" software system to input comments, concerns, and feedback from more formal engagements like public meetings. Through this system the Company can also track necessary actions and responses as and when required. To ensure a greater access for members of the public, specifically those who reside in Nunavut, to provide feedback to Baffinland we have introduced new community-focused email addresses which are monitored by staff across departments. For example, our communityquestions@baffinland.com email inbox is monitored by members of the Sustainable Development, IIBA and HR departments.</p> <p>In addition, Baffinland relies on the Qikiqtani Inuit Association as the Designated Regional Inuit Organization to provide valuable feedback to the Company and to work with the Company to provide an adequate response.</p> <p>Baffinland's approach to addressing concerns and feedback is a dynamic one based on circumstance and the channels through which feedback has been received. As such, a tracking table as requested would not be comprehensive or representative of all the actions taken by the Company and alone would not suffice to determine the strength of our engagement program.</p> <p><b>Reference: 200717-08MN053-Baffinland Shipping Report-IA1E.pdf, Public Registry Identification: 330789, 190513-08MN053 BIMC Draft Mgmt plans- Community Stakeholder Engmt Plan, Public Registry Identification: 324938</b></p>

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
4	QIA 2019 AMR GC #4	The [Working Group] meetings are structured to enable participants to have the opportunity to provide input on monitoring program design and implementation...". This is not always effective, depending on timing of submission of draft monitoring reports and meeting materials. If materials are not provided with enough advance notice, parties are unable to prepare in advance, which limits the opportunity to provide effective input at the meetings. QIA notes that on-going efforts to revise the Working Group Terms of Reference (ToR) may help address these concerns.	QIA requests that the Proponent commit to a schedule whereby meeting materials are provided with enough advance time to allow participants to be adequately prepared to discuss monitoring and mitigation activities. QIA further requests that the Proponent provide an update to the NIRB and other parties on the status of the Terms of Reference revisions.	Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: 2.5 Engagement with Working Groups Page: 29	Baffinland notes this request from QIA and other reviewers, such as DFO, to provide presentations or other meeting materials at least 14 days in advance of any scheduled MEWG meetings. Baffinland notes however, that in order for this to be accomplished, less timely information will be available to MEWG members. For context, it takes approximately 14 days for all MEWG meeting materials to undergo translation. Subsequently, meeting materials prepared by Baffinland and its consultants would need to be completed 4 weeks in advance of a meeting. This may result in less information being available to MEWG members on monitoring program design (i.e. as details of each program may not be determined) or analysis of results. However, Baffinland is open to further discussing preferences for timing of scheduled meetings with the MEWG and the sharing of associated meeting materials. It is noted that the provision of draft technical monitoring reports to the MEWG is an entirely voluntary measure that Baffinland has adopted in an effort to better integrate MEWG feedback into the reports.  Baffinland also wishes to clarify to QIA that there is an established review and reporting schedule managed by the NIRB. This includes the submission of Baffinland's Annual Monitoring Report to the NIRB on March 31 of each year. (Note, 2020 represents this first year Baffinland did not meet this target, due to issues associated with COVID-19). This report provides information on results of monitoring from the previous year, on which intervenors are invited to review and comment. Typically this process occurs between March and August of each year. Following a review of all relevant annual monitoring documents, the Board provides Baffinland with subsequent recommendations to be implemented the following year.
5	QIA 2019 AMR GC #5	The Proponent notes that "Stakeholder comments relevant to the condition are considered" but it is not clear how this was undertaken or if comments from the former FEIS process was relied upon.	QIA requests that the Proponent describe the methods used to collect Stakeholder comments to inform this annual review and how they were considered.	Document Name: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E Section: Section 4.1 Methodology and Criteria Page: 40	As provided in the 2019 Annual Report Appendix B "Community Engagement Records", Baffinland lists the topics that were raised during various engagement sessions throughout the year. These topics correspond to meeting records, minutes, and/or notes taken during these events.  As report authors draft specific sections of the annual report, meeting records, minutes and/or notes may be reviewed. Further, conversations between report authors and Baffinland participants at meetings where specific comments of relevance to a report author were raised take place to ensure that comments are understood in the context of the annual report.
6	QIA 2019 AMR GC #6	Table 4.2 provides the Proponent's approach to reporting on conditions. Trends are described as "summary of notable trends from previous years" (p.41). It is unclear how the Proponent decides which trends are notable. In the spirit of transparency all trends should be reported on including qualitative indicators, for example, Inuit perspective on improvements in communication and engagement.	QIA requests that the Proponent provide methodology for reporting on trends. In all future reporting NIRB should require the Proponent to report on all trends and change over-time.	Document Name: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E Section: Section 4.2 Approach to Reporting on Performance Page: 41	Baffinland's approach to reporting on performance includes detailed PC condition summary sheets. The condition summary sheets include an evaluation of trends over time for the applicable ecosystemic, socio-economic and other terms and conditions as outlined in Sections 4.6 to 4.8.  The category and content of 'trends' information provided in these summary sheets is developed based on the following process as implemented by Baffinland and its technical experts: 1. 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. 2. An assessment is completed to determine whether or not there is a delta between the requirements of the PC condition, previous years data and the work completed by Baffinland to meet these requirements in the reporting year. If the data is quantitative, an evaluation of trends and statistical analysis is completed (i.e. graphs and metrics presented). Several examples included in the 2019 NIRB Annual Report include Project Certificate Condition No. 6, Greenhouse Gas Emissions, Project Certificate Condition No. 14, Noise and Vibration Monitoring, Project Certificate Condition No. 59 - Terrestrial Wildlife and Habitat, Project Certificate Condition No. 133- Population Demographics and Project Certificate Condition No. 140 - Education and Training. Quantitative, statistical trends are presented numerically and in graphs based on the previous data collected.  For qualitative indicators, an evaluation of applicable reports, engagement sessions and meeting records applicable to topic are evaluated to develop content for the 'trends' information presented. This includes the 2019 Annual Report Appendix B "Community Engagement Records", where Baffinland lists the topics that were raised during various engagement sessions throughout the year. These topics correspond to meeting records, minutes, and/or notes taken during these events. An example included in the 2019 NIRB Annual Report included Project Certificate Condition No. 129 - Qikiqtaaluk Socio-Economic Monitoring Committee.
7	QIA 2019 AMR GC #7	General Condition 8 requires that "[all] monitoring information collected pursuant to the Project Certificate and various regulatory requirements for the Project shall contain... [t]he name of the person(s) who performed the sampling or took the measurements including any relevant accreditations" ... and "the name of the person(s) who performed the analysis including any relevant accreditations...". Marine monitoring reports generally do not list all persons responsible for performing the sampling and analyses. For example, in Appendix G.25 (aerial survey report), the Closure section (p. 91) lists three Golder Associates Ltd. employees, presumably the report authors (and analysts?). But there is no list of all staff (and Inuit contractors, etc.) who collected the data. In s. 2.1 (Study Team and Training, p. 8), the report states that "[t]he study team consisted of two Golder and five contracted marine biologists with previous marine mammal survey experience, and four Inuit researchers trained as Marine Mammal Observers (MMOs)." The number of researchers collecting these data are provided, but not a complete list of who did so.	QIA requests that the Proponent provide the details required for this Condition. QIA further requests that the NIRB determine whether the requirements of this condition have been met, and whether it should be considered Partially Compliant given the missing information.	Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: 4.4 Performance on General Conditions (also various Appendices including the marine monitoring study reports) Page: 44	Term and Condition No. 8 does not require that the publishing of the information listed, only that monitoring information contains the details listed. Accordingly, Baffinland does not share the names of all staff and contractors that participate in monitoring programs, and will not be revising this practice for future reports. As stated in section 4.4, Baffinland ensures that internal record keeping for all monitoring programs tracks and records all personnel (including contractors) that travel to and from Mary River Mine Site and contributing to the monitoring programs.

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
8	QIA 2019 AMR GC #8	<p>".. 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)."</p> <p>"Baffinland operates two meteorological stations, and this information is made publicly available for Mary River and Milne Inlet through The Weather Network and on our website... To date, no climate change impacts have been observed through Project monitoring."</p> <p>How do the meteorological stations contribute to climate change monitoring? What is being monitored, and how does it contribute to addressing community concerns around changes being observed in "all aspects of the environment (land, sea, people, wildlife)"? "these data are provided, but not a complete list of who did so.</p>	<p>If meteorological stations are not measuring the various changes that Inuit are observing, additions to the data being collected should be considered, given that climate change is in fact occurring. QIA requests that the Proponent provide additional details on how their current monitoring activities contribute to climate change monitoring and address Inuit concerns regarding the need to consider climate change in Project monitoring.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: 4.6.1 Meteorology and Climate (PC Conditions 1 through 6) Page: 48</p>	<p>The operation of the meteorological stations at the Mary River Project are critical to evaluating the long term climate record for the project area. Over the long term, should there be interest to investigate long-term trends using data generated from Baffinland meteorological stations and subsequently determine whether climate changes are discernable for the Project Area, data will be available to further investigate potentially climate-related emerging trends. Weather data collected in 2019 include air temperature, wind direction, wind speed and precipitation as rainfall. This data will be used in concert with monitoring of changes in the marine, terrestrial and freshwater ecosystems over time to assess and discern impacts relative to mine-related activities, natural variation and climate change impacts.</p> <p>Baffinland's overall approach to monitoring the potential for Project-related changes through time provides the basis for discerning potentially emerging climate-related changes, however this requires a multi-year dataset such that long-term datasets may be generated. Baffinland implements numerous monitoring programs on an annual basis which aim to track potential temporal changes in freshwater, terrestrial and marine environments, which align with Inuit's concerns regarding potential climate change impacts on all aspects of the environment (e.g., land, sea and wildlife). Some specific topics that were highlighted as reported by ERM (2019) include potential impacts of climate change on marine mammals (e.g., narwhal moving west, introduction of new species in the area). Appearance of new species in the area (e.g., bowhead whale) may have impact on narwhal presence and travel. These concerns may be addressed through the running of Bruce Head Shore-based Monitoring Program, the Marine Mammal Aerial Surveys and the Aquatic Invasive Species Program. The implementation of programs involving multiple aspects over subsequent years should provide the opportunity to elucidate Project-related changes from natural variability, including potential changes stemming from climate change. In so doing, climate-change related impacts and natural variability may be evaluated following multiple years of data collection.</p> <p>Baffinland's Climate Change Strategy aims to integrate Inuit perspectives on climate change. 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. Given that the QIA is the regional voice for Qikiqtani Inuit, Baffinland looks forward to hearing further from the QIA about Inuit perspectives on this topic during future engagement activities.</p> <p><u>References:</u> Environmental Resources Management (ERM), 2019. Mary River Phase 2 Proposal – Community Risk Assessment Workshops: Final Report. September 30, 2019.</p>
9	QIA 2019 AMR GC #9	<p>Table 4.4 provides a summary of climate effects monitoring completed in 2019...". This is emissions monitoring only, how does it contribute to an overall understanding of climate change impacts on the Project, and for Project-related impacts on climate change?</p>	<p>QIA requests that the Proponent provide additional information explaining how the current monitoring contributes to an overall understanding of climate change impacts on the Project, and for Project-related impacts on climate change.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: 4.6.1 Meteorology and Climate (PC Conditions 1 through 6) Page: 49</p>	<p>As indicated in response to QIA-3, Baffinland's overall approach to monitoring the potential for Project-related changes through time provides the basis for discerning potentially emerging climate-related changes, however this requires a multi-year dataset such that long-term datasets may be generated. Baffinland implements numerous monitoring programs on an annual basis which aim to track potential temporal changes in freshwater, terrestrial and marine environments, which align with Inuit's concerns regarding potential climate change impacts on all aspects of the environment (i.e., land, sea and wildlife). The implementation of programs involving multiple aspects over subsequent years should provide the opportunity to elucidate Project-related changes from natural variability, including potential changes stemming from climate change. In so doing, climate-change related impacts (natural variability) may be detected following multiple years of data collection.</p>
10	QIA 2019 AMR GC #10	<p>Actions in the Climate Change Strategy document include "[i]mplementing comprehensive environmental monitoring and management programs that are based on a combination of scientific data and Inuit Qaujimatjuqangit to safeguard the environment."</p> <p>How do existing monitoring and management programs consider climate change impacts from and on the Project, and how has Inuit Qaujimatjuqangit on climate change been incorporated into these programs?</p>	<p>QIA requests that the Proponent provide additional information detailing how climate change impacts have been considered in existing monitoring programs. QIA requests that the Proponent provide additional information on how Inuit Qaujimatjuqangit on climate change been incorporated into existing monitoring programs. QIA requests that the Proponent identify all plans it has to increase the gathering of IQ on climate change.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: 4.6.1 Meteorology and Climate (PC Conditions 1 through 6) (Project Certificate Condition No. 2; Project Certificate Condition No. 4) Page: 52-53, 58-59</p>	<p>Baffinland's overall approach to monitoring the potential for Project-related changes through time provides the basis for discerning potentially emerging climate-related changes, however this requires a multi-year dataset such that long-term datasets may be generated. Baffinland implements numerous monitoring programs on an annual basis which aim to track potential temporal changes in freshwater, terrestrial and marine environments, which align with Inuit's concerns regarding potential climate change impacts on all aspects of the environment (i.e., land, sea and wildlife). The implementation of programs involving multiple aspects over subsequent years should provide the opportunity to elucidate Project-related changes from natural variability, including potential changes stemming from climate change. In so doing, climate-change related impacts (natural variability) may be detected following multiple years of data collection.</p> <p>Baffinland's Climate Change Strategy aims to integrate Inuit perspectives on climate change. 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. Given that the QIA is the regional representative for Qikiqtani Inuit, Baffinland looks forward to hearing further from the QIA about Inuit perspectives on this topic during</p>
11	QIA 2019 AMR GC #11	<p>The action items in the Climate Change Strategy also include "[c]onducting ongoing risk assessments to ensure that all aspects of the operations are able to withstand potential climate change related events".</p> <p>What work has been done here with respect to ore haulage and marine shipping? Are risk assessments currently ongoing? Where are the results of risk assessments reported?</p>	<p>QIA requests that the Proponent clarify the status of ongoing risk assessments and report the results of these risk assessments as they relate to potential risks from climate change.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: 4.6.1 Meteorology and Climate (PC Conditions 1 through 6) (Project Certificate Condition No. 2) Page: 52-53</p>	<p>The most recent risk assessment was completed and submitted as part of Phase 2-related processes (Baffinland 2018). Baffinland will undertake additional reviews in the future when major designs are undertaken and there is more up-to-date climate change information available from the Intergovernmental Panel on Climate Change (IPCC) or other credible sources, or if a risk assessment is identified as a necessary next step through the elaboration of Baffinland's Climate Change Strategy.</p> <p><u>Reference:</u> Baffinland Iron Mines Corporation (Baffinland), 2018e. Addendum to the Final Environmental Impact Statement - Mary River Project – Phase 2 Proposal. Technical Supporting Document No. 6 Climate Change Assessment. Revised, September 2018. NIRB File No. 08MN053.</p>

**Table 1 - Response to QIA Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
12	QIA 2019 AMR GC #12	<p>"Since September 2019, Baffinland has been working actively with an environmental and sustainability consultancy to support the drafting of an amended [climate change] strategy based on a two-staged approach..."</p> <p>"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."</p> <p>The draft Climate Change Strategy was submitted ca. 15 months ago. What are the anticipated timelines for completion of Stage 1 and initiation of Stage 2? When will the Proponent share the results of the external and internal scans with the NIRB and other parties?</p>	<p>QIA requests that the Proponent provide a detailed timeline for the completion of these activities and commit to sharing the results to date with the Board and other review parties.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf]</p> <p>Section: 4.6.1 Meteorology and Climate (PC Conditions 1 through 6) (Project Certificate Condition No. 2)</p> <p>Page: 52-53</p>	<p>During Q1, Baffinland was progressing through the various tasks as proposed by the external consultancy and had completed the internal/external scans and identified potential options for positioning which were essential for informing the subsequent development of a refined Draft Climate Change Strategy (the Draft Strategy). Accordingly, Baffinland had plans to complete a Draft Strategy that would be ready to discuss as part of external engagement activities by end of April/early May 2020. Unfortunately, progress on the Draft Strategy initiative came to an abrupt halt due to the COVID-19 pandemic. Because progress on the development of the Draft Strategy required the input of individuals across the organization including operations and corporate-level teams, it was no longer feasible to move forward over the short term due to the present challenges associated with managing the COVID-19 crisis. As Baffinland habituates to the "new COVID-19 normal", it is ready to resume its activities related to the Climate Change Strategy initiative.</p> <p>Baffinland's current timeline is to complete all tasks of stage 1 by end of Q4 2020, and then to begin planning and implementation of stage 2 tasks, with the objective of completing all tasks required to finalize a Climate Change Strategy and implementation action plan by end of Q2 2021. Baffinland has requested from its environmental and sustainability consultancy a revised plan for implementation of next steps in consideration of COVID-19 and potential restrictions associated with physical distancing and travel, particularly since the second stage of activities depends heavily on external engagement with various parties.</p>
13	QIA 2019 AMR GC #13	<p>"Third-party verification of GHGs is planned for 2020 which will contribute toward the setting of future GHG emissions target."</p> <p>Is this still the case, or has the coronavirus pandemic led to delays?</p>	<p>QIA requests that the Proponent provide an update on how the coronavirus pandemic has affected these activities and timelines for 2020.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf]</p> <p>Section: 4.6.1 Meteorology and Climate (PC Conditions 1 through 6) (Project Certificate Condition No. 2)</p> <p>Page: 54-57</p>	<p>In July 2019, the Output-Based Pricing System Regulations (OBPS) made under the Greenhouse Gas Pollution Pricing Act (GGPPA) came into effect in Nunavut. A reporting requirement under OBPS, includes an annual third party verification of emissions.</p> <p>On May 31, 2020, amendments to the Output-Based Pricing System Regulations came into force that postpone the deadline to submit annual reports and associated verification reports for the 2019 compliance period from June 1, 2020 to October 1, 2020. This change was made due to Covid-19.</p> <p>Baffinland's emissions data will be third party verified prior to the reporting due date of October 1, 2020, in alignment with the amendment to the OBPS Regulations posted by Environment Canada in April, 2020.</p>
14	QIA 2019 AMR GC #14	<p>The Proponent acknowledges that Inuit community concerns have been raised relating to noise and vibration in 2019. However, how these concerns have been addressed has not been discussed in the section overview or dealt with in reporting on Noise and Vibration related PCs. Noise and vibration can impact culture and land use and need to be investigated if there are Inuit concerns.</p>	<p>QIA requests that the Proponent provide a list of specific Inuit concerns related to Noise and Vibration and how they have been addressed, and whether and how Inuit have verified the effectiveness of any measures to reduce concerns.</p>	<p>Document Name: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E</p> <p>Section: Section 4.6.3 Noise &amp; Vibration (PC Conditions 13 through 15)</p> <p>Page: 77</p>	<p>Section 4.6.3 highlights the most commonly reported noise issues including impacts to fish and marine mammals, although the conditions falling under Section 4.6.3 (13 to 15) relate mostly to underwater noise and vibration related to construction activities (Ts &amp; Cs Nos.13, 14(a)), accommodation areas (all phases, T&amp;C No. 14), people and wildlife (T&amp;C No. 14(b) and public safety (T&amp;C No. 15). Terms and conditions related to marine mammals are further summarized in Section 4.6.11 (e.g., T&amp;C 101, 109-112).</p> <p>Baffinland, with support of a third-party consultant, is 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 its activities and results with the TEWG as part of annual monitoring reporting efforts, including during TEWG meetings.</p> <p>Based on the consideration of key concerns, a number of programs have been developed to address specific concerns related to vessel noise and marine mammals. A number of studies have been developed and implemented including tagging study collaboration with Fisheries and Oceans Canada (DFO), Bruce Head Shore-based Monitoring Program, Ship-based Observation Program, and Marine Mammal Aerial Surveys. Results from these programs are summarized as part of the 2019 Annual Report to the NIRB (e.g., under conditions 101, 109-112).</p> <p>Monitoring and adaptive management measures for Project activities to reduce noise and sensory disturbance to wildlife remains an open discussion with the TEWG and MEWG, of which QIA is a member, allowing an opportunity for gathering feedback and potential recommendations for reducing noise and sensory disturbance to wildlife. Baffinland looks forward to hearing further from the QIA about Inuit perspectives on this topic during future engagement activities including during TEWG meetings.</p>
15	QIA 2019 AMR GC #15	<p>The Proponent has concluded that they are in compliance with the communication requirements of Condition 15 but have not reported on Stakeholder input on the effectiveness of communication and engagement methods, nor have trends in meeting this Condition been addressed. It is unclear how Inuit perceive these methods and how they have improved or worsened over time.</p>	<p>QIA requests that the Proponent describe and/or provide any available Stakeholder feedback on communication/engagement methods and how this has changed over-time.</p>	<p>Document Name: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E</p> <p>Section: Section 4.6.3 Noise &amp; Vibration PC Conditions 15</p> <p>Page: 88</p>	<p>As described throughout the 2019 Annual Report to the NIRB, there are numerous opportunities for Inuit to provide input through Baffinland-led engagement activities and this has led to changes in communications protocols over time. For example, based on feedback received through pre-shipment season and end of season shipping meetings held in 2018 and 2019, it was recommended that full-time shipping monitor roles based in Pond Inlet be created. As a direct result, shipping monitors have been hired by Baffinland since 2019 to serve as the local liaison between community members, hunters, the Mittimatalik Hunters and Trappers Organization (MHTO); shipping monitors are based in the same building as the MHTO office), the Hamlet of Pond Inlet and Baffinland for communicating shipping-related information using a variety of communication methods (e.g., local radio, marine VHF radio, social media). Baffinland also provides contact information so that shipping monitors may be reached directly through a dedicated email address, cell phone and Facebook. Visitor hours are also maintained (though not yet possible in 2020 due to restrictions related to COVID-19 pandemic). The use of marine VHF radio to communicate incoming and outgoing Baffinland-related vessels was a recommendation made during the 2019 Pre-Shipping Season meeting and accordingly integrated into the Shipping Monitors daily vessel monitoring activities. Baffinland has also created full-time Baffinland Community Liaison Officer (BCLO) roles in each of the five North Baffin communities including Pond Inlet. Any concerns raised with the BCLO are dealt with on a case-by-case basis.</p>

**Table 1 - Response to QIA Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
16	QIA 2019 AMR GC #16	The Proponent indicates that a new communications protocol was developed to respond to community shipping concerns. Further details on the protocol are not provided.	QIA requests that the Proponent provide a copy of the most recently developed communications protocol, especially re: community shipping concerns.	Document Name: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E Section: Section 4.7.7 Culture, Resources & Land Use - PC Condition 164 Page: 543	<p>The draft Shipping Communications Protocol was included as part of the Baffinland Iron Mines 2020 Marine Shipping and Vessel Management Report to the Nunavut Impact Review Board (Baffinland Shipping Report) submitted to the NIRB on July 17, 2020, available through the NIRB Public Registry (<a href="http://www.nirb.ca/project/123910">www.nirb.ca/project/123910</a>).</p> <p>Baffinland notes that this protocol is considered a living document as amendments may be needed in the same shipping season (e.g. change of contact numbers). The main elements have been shared with representatives of the MHTO, the Hamlet of Pond Inlet and the QIA during the pre-shipping season and end of shipping season meetings held in 2019 and 2020, and opportunities for improvement are discussed.</p> <p>As indicated in the draft Shipping Communications Protocol in Section 4.2 During Shipping, a summary of tasks completed by Shipping Monitors is provided. Tracking of concerns/comments/questions is maintained by the Shipping Monitors, and follow-up actions, as needed. As summarized in Section 4.3 Post-season Communications, Baffinland provides a summary of feedback received over the shipping season as tracked through the Shipping Monitors (as indicated in Table 4.60 in the 2019 Annual Report to the NIRB).</p>
17	QIA 2019 AMR GC #17	<p>The Proponent notes the hiring of shipboard monitors to improve shipping communications with Inuit Communities, "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)." (p. 541).</p> <p>The Proponent has commented that this has been effective for sharing shipping concerns with communities but has not provided details on how community inputs have informed changes in shipping. This is relevant as the Proponent acknowledges that in community 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."(p. 542).</p> <p>The Draft Shipboard Observer Report does not outline how Monitors are to collect community concerns and report to the Proponent.</p> <p>The Proponent also states in Condition 166 that, "...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." (p. 547) In addition, Table 4.60 does not provide an example of Shipping Monitors as a communication method.</p> <p>Overall it is unclear how Shipping Monitors can have a two-way liaison role and what supports are in place to facilitate this.</p>	QIA requests that the Proponent describe any reporting protocols or opportunities for shipboard monitors to share community concerns and marine mammals sightings. The Proponent is also requested to describe any future steps for developing/improving ways for Shipping Monitors to facilitate communication from Inuit Communities to the Proponent.	Document Name: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E & Appendix G11 Draft 2019 Shipboard Observer Program Report (200521-08MN053- App G11-Draft 2019 SBO Report-IA1E) Section: Section 4.7.7 Culture, Resources & Land Use - PC Condition 164; Appendix G11 Draft 2019 Shipboard Observer Program Report; and Section 4.7.7 Culture, Resources & Land Use - PC Condition 166 Page: 541-543 & 546 - 550	<p>Baffinland would like to clarify to the QIA that the Shipping Monitors hired in Pond Inlet are community-based roles, and accordingly work in the Baffinland office located on the second floor of the Mittimatalik Hunters and Trappers (MHTO) building; they are not ship-based positions. The ship-based positions are relevant only to the Ship-based Observer (SBO) Monitoring Program which runs when the icebreaker MSV Botnica is escorting vessels during the spring and fall shoulder seasons.</p> <p>Specific tasks of the shipping monitors are highlighted in the draft Shipping Communications Protocol, available through the NIRB Public Registry (<a href="http://www.nirb.ca/project/123910">www.nirb.ca/project/123910</a>). Shipping Monitors are in active contact with their direct manager, Manager - Environmental, Social and Governance, and concerns are communicated should immediate action be required by either Baffinland Sustainable Development or Shipping department personnel. Otherwise, shipping monitors communicate daily through marine VHF radio on a daily basis. Table 4.60 is not meant to tabulate every radio announcement that the Shipping Monitors make on a daily basis. Rather, Table 4.60 provides a summary of all comments and concerns received (and the communication method by which the comment was received such as marine VHF radio, email, etc.) as tracked by Shipping Monitors over the 2019 shipping season and the responses provided/actions implemented by Baffinland. This in itself demonstrates two-way interactions where shipping monitors are contacted by community members, and subsequently provide follow-up as needed on specific topics. For example, Comment no. 5 in Table 4.60 summarizes a concern related to a vessel passing by Pond Inlet that is too close to its shoreline. Follow-up actions included the addition of additional GPS waypoints in the Standing Instructions to Masters (SITMs) that are provided to each incoming and outgoing Baffinland-contracted vessels. To monitor for potential deviations from the centreline of the shipping route as defined by GPS waypoints, an additional notification alert has been set for 2020 so that a notification is sent every time a vessel travels outside of 1 nautical mile on either side of the shipping route in the area near Pond Inlet.</p> <p>As indicated in the response to QIA 2019 AMR GC #16, these comments were shared as part of the End of Season Shipping Meeting held in January 2020, and Pre-Shipping Season meeting held in July 2020 with representatives of the MHTO, Hamlet of Pond Inlet and QIA. Baffinland welcomes the QIA's communications-related input during future End of Season and Pre-Shipping Season meetings held by Baffinland.</p>
18	QIA 2019 AMR GC #18	The Proponent notes that "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" The Proponent includes the 2015 Hunter and Visitor Site Access Procedure as a reference. It is unclear if revised communication protocols will be reflected in an updated Hunter and Visitor Site Access Procedure.	QIA requests that the Proponent provide a revised Hunter and Visitor Site Access Procedure including updated communication protocols.	Document Name: Section 4.7.7 Culture, Resources & Land Use - PC Condition 166 Section: Section 4.6.3 Noise & Vibration PC Conditions 15 Page: 546	Baffinland has attached the Revision 2 of the Hunter and Visitor Site Access Procedure that incorporates feedback from land users and the current Covid-19 pandemic protocols.

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
19	QIA 2019 AMR GC #19	<p>Draft monitoring reports (various Appendices in Annual Report) that were reviewed through the MEWG and TEWG, with comments submitted to the group distribution list via email, include the following:</p> <ul style="list-style-type: none"> <li>- Appendix G.8 - Draft 2019 Marine Environmental Effects Monitoring Program and Aquatic Invasive Species Monitoring Program Report</li> <li>- Appendix G.9 2019 Passive Acoustic Monitoring Program Report</li> <li>- Appendix G.10 Draft 2019 Bruce Head Shore-based Monitoring Program Report</li> <li>- Appendix G.11 Draft 2019 Ship-based Observer Monitoring Program Report</li> <li>- Appendix G.12 Draft 2019 Mary River Project Terrestrial Environmental Annual Monitoring Report</li> <li>- Appendix G.24 Draft 2017–2018 Integrated Narwhal Tagging Study Technical Data Report</li> <li>- Appendix G.25 Draft 2019 Marine Mammal Aerial Survey</li> </ul> <p>These comments are sent to NIRB technical staff, via the MEWG and TEWG distribution lists, and are relevant to the Annual Report. QIA has not provided an extensive review of these draft monitoring reports as part of our Annual Report review. It is QIA's understanding, as per a July 2020 MEWG conference call, that the Proponent will provide responses to these written submissions and final versions of the monitoring reports in mid-August. The extensive comments provided by QIA and other review parties are not reflected in the draft reports appended to the Annual Report, or in the Annual Report. The disconnect between the timing of submission of MEWG and TEWG comments and submission of the Annual Report leads to limitations in the information provided in the Annual Reporting to NIRB.</p>	<p>No specific request, comment provided for the Board's information.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: General (Appendices) Page: general</p>	<p>No response required by Baffinland as the comment is directed to the NIRB.</p>
<b>Terrestrial</b>					
1	QIA 2019 AMR TE #1	<p>Project certificate condition 10 states that the Proponent shall update its Dust Management and Monitoring Plan. This update shall include items such as plans for monitoring the first few kilometers of the rail corridor leaving the mine site, monitoring dustfall at intervals along Milne Inlet Tote Road, and taking 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.</p>	<p>QIA requests that the Proponent update the monitoring plan to include monitoring dust throughout the length of the rail corridor. QIA further requests that the proponent explore other methods for monitoring dustfall in the environment (e.g., satellite imagery), as has been discussed at meetings of the Terrestrial Environment Working Group. Extensive recommendations for modifications to the dustfall monitoring program have been put forward through the TEWG, and QIA is requesting that BIMC follow through with these recommendations, which include: a) re-examining dustfall locations based on where dustfall is predicted to be highest; b) pairing dustfall and vegetation monitoring; c) monitoring dustfall on vegetation; d) included some monitoring stations at the 1 m height (paired with stations at the 2 m height) to determine how much dustfall is being missed. A trend over time analysis of dustfall should be conducted for the next report. QIA has requested that Baffinland develop daily triggers for dust mitigation measures, using clear thresholds for when mitigation measures will be used. This request was also made in Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) Annual Monitoring Report (2018). QIA is requesting and has previously recommended that Baffinland develop a community-based monitoring program for impacts of dust to key values, including establishing culturally relevant thresholds for dustfall. QIA has put forward similar requests at</p>	<p>Document Name &amp; Page: 1. Mary River Project 2019 Annual Report (200521-08MN053- Mary River Project 2019 Annual Report-IA1E.pdf), Section 4.6.2 Air Quality, pg. 72 2. Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) 2018 Annual Monitoring Report (190607-08MN053-QIA Comments- IA1E.pdf), QIA Comments and Recommendations Table, pg. 12</p>	<p>No rail corridor existed at the Project during 2019, and accordingly dustfall associated with rail transportation is not currently evaluated. The dustfall monitoring program will be amended as appropriate to address the rail corridor for Phase 2, however it is noted that the existing network of monitoring proximal to the Tote Road addresses a significant portion of the proposed corridor.</p> <p>The dustfall monitoring program is continuously reviewed for potential improvements, and during 2020/2021 this work may be done in collaboration with Natural Resources Canada (NRCAN). BIM has engaged with NRCAN to discuss the use of satellite imagery to monitor dustfall extent. The use of imagery will potentially allow for a better comparison with vegetation data. Progress on those discussions will be shared with the Terrestrial Environment Working Group when relevant updates become available. Dustfall monitoring locations were established based on where dustfall was predicted, and are paired with numerous vegetation monitoring sites to assess potential impacts of dustfall on vegetation through the vegetation abundance and trace metals programs. The use of a non-standard 1 m high dustfall monitors is being considered. However, Baffinland is following the International ASTM Standard Test Method for Collection and Measurement of Dustfall (Settleable Particulate Matter, ASTM International 2010). To vary from that standard would require substantial justification, and all research completed to date indicates that sampling at that height will not provide more useful information when compared with data collected using the standardized method. Trend analysis over time will be completed in the 2020 terrestrial environment annual report.</p> <p>The concept of developing daily triggers for dust mitigation was discussed within the TEWG first in April 2014, prior to the QIA's more recent comments provided on the 2018 annual report. Daily triggers will not be developed using this sampling program. Sampling is completed on 30-day cycles with more days required for lab analysis and distribution and results. In 2014, the QIA's representative had committed to investigating at other sites (e.g., Ekati) what "daily triggers" exist and how monitored. No daily triggers were found, and it was acknowledged in discussions that dust suppression was a daily operational consideration and applied as required, not based on "clear thresholds." Baffinland clarified that while the dustfall monitoring program does not trigger dust suppression per se, it does inform on requirements for longer-term adjustments to the mitigation program.</p> <p>Through the Mary River Impact and Benefit Agreement Article 17.8 Wildlife Monitoring Program, Baffinland has committed to providing an annual budget of \$200,000 (2018 dollars) for the next 10 years towards the implementation of community-based monitoring programs. The objective of the Wildlife Monitoring Program is to enhance monitoring and mitigation of impacts of the Mary River Project as deemed important by Inuit. According to Article 18.8.5, the community is responsible for developing a Wildlife Monitoring Work Plan (Work Plan) to be presented to the Joint Executive Committee composed of both Baffinland and QIA representatives. Given that these initiatives are to be community-driven, Baffinland recommends that the QIA further discuss its proposed dust impact-related</p>

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
			<p>meetings of the Terrestrial Environment Working Group and in Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) Annual Monitoring Report (2018). QIA recognizes that this request may be addressed through ongoing revisions to the monitoring and adaptive management programs, should the Mary River Phase 2 project be approved; however, those revisions have yet to be finalized.</p>		<p>program with the community of Pond Inlet to determine what best aligns with their priorities and accordingly upon confirmation, welcomes the subsequent development and submission of a relevant Work Plan to the Joint Executive Committee to access funding to implement the community-based monitoring program. As of yet, no proposals have been submitted to access funds in 2020.</p> <p>ASTM International. 2010. Standard Test Method for Collection and Measurement of Dustfall (Settleable Particulate Matter); Designations D1739-98 (reapproved 2010). American Society for Testing and Materials (ASTM), Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. United States.</p>
2	QIA 2019 AMR TE #2	<p>Project certificate condition 14 (b) states that the proponent shall mitigate potential impacts of noise to wildlife and people during project operations. The mitigation measures for this condition do not address all major sources of noise beyond the use of mufflers.</p> <p>Project certificate condition 60 states that the proponent shall mitigate impacts to wildlife from explosions. The methods for this mitigation involve scanning the area for wildlife and if wildlife is present and could be harmed by the activity, blasting will not occur. It is unclear how the blast will impact nesting birds, which would be difficult to detect visually.</p> <p>The Air Quality and Noise Abatement Management Plan does not have information about sensitive timing windows for animals. Sensitive time windows are important to many animals including caribou and snow geese. The season that caribou give birth and are take care of their young is a sensitive time that should be respected. Bird nesting times should also be considered as a sensitive timing window . The Air Quality and Noise Abatement Management Plan does not provide adequate detail regarding how noise levels will be monitored to ensure compliance.</p> <p>QIA has put forward this request at meetings of the Terrestrial Environment Working Group and in Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) Annual Monitoring Report (2018) regarding the need for the establishment of Early Warning Indicators and thresholds for noise. These comments have not been addressed to date.</p>	<p>QIA requests detail regarding EWI indicators and specific thresholds for noise particularly during sensitive timing windows for culturally important animals such as caribou and birds (snow geese). QIA requests that blasting also consider sensitive timing windows and not be undertaken if the noise will disrupt or harm wildlife particularly during sensitive timing windows (e.g., bird nesting). Blasting activities should report any birds flushed during blasting.</p> <p>QIA requests that a noise monitoring plan be developed to ensure mitigation measures are working effectively. This monitoring plan should include reporting peak noise events and frequency of high noise events (not averages). Details of this plan should be updated in the Air Quality and Noise Abatement Management Plan.</p>	<p>Document Name &amp; Page:</p> <ol style="list-style-type: none"> <li>1. Mary River Project 2019 Annual Report (200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf), Section 4.6.3 Noise &amp; Vibration - Project Certificate Condition No.14 (b), and No.60, pgs. 87; 214</li> <li>2. Air Quality and Noise Abatement Management Plan (BAF-PH1-830-P16-0002-r7-Air-Quality-and-Noise-Abatement-Management-Plan), Section 3.4 Noise, pg. 20</li> <li>3. Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) 2018 Annual Monitoring Report (190607-08MN053-QIA Comments-IA1E.pdf), QIA Comments and Recommendations Table, pg. 13</li> </ol>	<p>No thresholds for noise for birds or caribou have been contemplated for the Project.</p> <p>Noise associated with the mine and mine activity occurs year-round. Blasting, the noisiest activity, occurs a few times each month. Blasting is limited to point sources at the mine and during construction at quarries. Through Project approval, it was determined that noise generated from the Project would not result in an unacceptable level of disturbance.</p> <p>If wildlife are observed within the proximity of a blast, the blast will not occur until wildlife have moved away. It is unlikely that birds are nesting in the continually active mining area. Caribou have not been observed by mine staff at the operating mine deposit since the start of the Project.</p> <p>A terrestrial wildlife noise monitoring pilot study was initiated in 2020 and will be discussed at future Terrestrial Environment Working Group (TWE) meetings and in the 2020 terrestrial environment annual monitoring report.</p>
3	QIA 2019 AMR TE #3	<p>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.</p> <p>The Tote Road has never been built to the presented designs as approved in the FEIS Addendum.</p>	<p>Baffinland build the Tote Road as designed.</p>	<p>Document Name: Baffinland Iron Mines 2018 Annual Report to the Nunavut Impact Review Board [200521-08MN053-Mary River Project 2019 Annual Report-IA1E] Section: Section 4.6.4, PC Condition 16 Page: 94</p>	<p>Since 2013, there have been ongoing upgrades to sections of the Tote Road as part of the construction and operation of the Early Revenue Phase (ERP) for the Project and in an effort to mitigate sedimentation and erosion concerns, and to safely transport iron ore from the Mine Site to Milne Port. This has included widening, straightening and re-alignment of the Tote Road at certain locations for road safety, and to minimize erosion and sedimentation issues. Additional armouring has also been added at road embankments for erosion mitigation measures. To maintain fish passage, Baffinland has obtained the required approvals for the installation, movement and/or extension of culverts at identified stream crossings to improve transportation safety and minimize impacts to fish. Any proposed changes to the Tote Road design as outlined in the FEIS Addendum, were completed to maintain the safety of personnel working along the Tote Road, and to protect sensitive environmental receptors.</p> <p>In terms of water quality, since initiation of the Tote Road Monitoring Program, there have been no project related impacts to water quality identified. The Tote Road has been constructed in alignment with what was proposed in the FEIS and is operating as intended.</p> <p>Baffinland obtained all required approvals by the relevant regulatory authorities prior to culvert work, and undertakes annual assessments of water crossing infrastructure along the Tote Road with the objective of maintaining connectivity for fish at water crossings, and ensuring that all existing culverts are functional. Results from these assessments and associated works are reported annually to DFO at the end of each calendar year. Additionally, consultation with DFO on best practices and recommendations for design occurs throughout the year on site-specific issues as needed.</p> <p>Baffinland will continue to seek advice from DFO as part of their regular maintenance activities at crossing locations to prevent and remove any fish passage barriers in fish-bearing streams. Continued maintenance of the Tote Road will be required to maintain safe, and environmentally responsible operations. Baffinland will continue to obtain all relevant regulatory authorizations prior to construction along the Tote Road.</p>

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
4	QIA 2019 AMR TE #4	<p>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. QIA disagrees with Baffinland's assessment of partial compliance as discharge criteria have been exceeded on five occasions. Baffinland has exceeded water quality criteria at locations MS-01B on two occasions, MS-08, and MP-04A. The November 12, 2019 exceedance at MS-08 is particularly of concern as the total ammonia was over ten times the applicable discharge criteria. Baffinland does not indicate what may have caused the temporary upset conditions and there was no indication if duplicate tests were performed.</p>	<p>Compliance with PC Condition 17 be considered non-compliant as discharge conditions have been exceeded. It is requested that a procedure for adaptive management be provided by Baffinland for the operation of water treatment plants, including thresholds based on monitoring data that if exceeded would trigger mitigative actions to ensure effluent is below required discharge criteria. Adaptive management should have monitored thresholds, that if exceeded have specific triggers to result in predetermined actions.</p>	<p>Document Name: Baffinland Iron Mines 2018 Annual Report to the Nunavut Impact Review Board [200521-08MN053-Mary River Project 2019 Annual Report-IA1E] Section: Section 4.6.4, PC Condition 17 Page: 96</p>	<p>Baffinland will continue to monitor required parameters at frequencies that are compliant with MDMER and the terms and conditions of the Type A Water Licence. Circumstances around the exceedances documented in 2019 are fully discussed in the 2019 QIA &amp; NWB Annual Report for Operations, submitted to the QIA, NWB and CIRNAC on April 30, 2020. 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 continues 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. It is important to note that while non-compliant discharges are to be avoided at all times, the predictions in the FEIS assumed impacts at levels greater than regulatory thresholds. To date, Baffinland remains within the FEIS predications and continues to monitor for impacts in the receiving environment.</p> <p>QIA commented that the November 12, 2019 ammonia exceedance took place at MS-08, however this exceedance took place at the Mine Site Sewage Treatment Plant (STP) sample (MS-01B). The exceedance was attributed to a failing membrane on one of the treatment trains at the sewage treatment plant. Details pertaining to the cause of the exceedance and follow up sample results were included in the November 2019 Monthly Water Licence Report.</p> <p>Prior to receipt of the external laboratory results for the sample collected on November 12, 2019, Baffinland's internal sampling identified an exceedance of the ammonia discharge criteria on November 16, 2019, and effluent discharge to the receiving environment was stopped immediately. Influent flows were transferred to other sewage treatment plants onsite to limit the volume of off-spec effluent diverted to the Polishing Waste Stabilization Pond (PWSP). Process controls were adjusted to drop the ammonia level within the process. Following internal sampling to confirm the effluent met the applicable discharge criteria, discharge to the receiving environment resumed on November 20, 2019. Results of a follow-up sample collected on November 30, 2019 for external analysis confirmed a compliant ammonia concentration of 0.181 mg/L. These results were included in Table 2 of the November 2019 Monthly Water Licence Report.</p> <p>Baffinland is in the process of finalizing the Adaptive Management Plan, focusing on implementing management actions based on the current understanding. A critical aspect of the Baffinland's Adaptive Management Plan is to develop a systematic approach to responding to results of monitoring programs. As part of the Phase 2 review process, Baffinland is currently working with QIA to integrate and apply the principles set forth in Baffinland's Adaptive Management Plan (AMP) into several management plan updates. Through updates to the management plans for Phase 2, Baffinland has been assessing the indicators, monitoring requirements, thresholds and responses required to implement a more robust adaptive management framework. Where reasonable, Baffinland will incorporate the actions, triggers and responses identified in the applicable management plans for Phase 2, into current operations.</p> <p>Baffinland is in the process of authoring specific, measurable thresholds for water use onsite as part of these management plan updates. These action levels will be established to prevent unacceptable adverse effects from occurring. Low level actions are focused on improving the understanding of the situation that is causing the noted changes and to plan for more substantive responses (i.e., moderate or high-level actions) if/as required.</p> <p>Baffinland looks forward to continuing to work with QIA on the updates to the various management plans for Phase 2 and integration of the adaptive management framework into current operations.</p>
5	QIA 2019 AMR TE #5	<p>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. QIA has observed a partial, temporary pit during previous inspection. QIA cannot determine compliance with this condition as it is unknown for what duration or extent the Mine Site had a pit.</p>	<p>Compliance with Condition 18 be considered non-compliant until analyses from the temporary pit are provided to reviewers.</p>	<p>Document Name: Baffinland Iron Mines 2018 Annual Report to the Nunavut Impact Review Board [200521-08MN053-Mary River Project 2019 Annual Report-IA1E] Section: Section 4.6.4, PC Condition 18 Page: 100</p>	<p>Baffinland is in compliance with Condition 18, as data is currently being collected regarding water quality and reclamation research to be implemented in 2020 that will address the predictions around pit lake water quality and fill time.</p> <p>Baffinland notes that while there have been localized depressions in the current mining area of Deposit 1 that have resulted in ponded water, the presence of these small sumps does not constitute the development of the open pit at Deposit 1. The active mining area remains a hilltop outcrop that is generally free draining to the surrounding environment.</p> <p>Baffinland plans to initiate the Open Pit Runoff Water Quality Research Program through discussions with the Mine Closure Working Group in 2020. At this time, the collection of water quality from the small depressions and sumps in the active mining area would not be appropriate for comparison to the predictions outlined in the FEIS, as the data would be highly subjective and relevant only to the immediate drainage area. The intent of the reclamation research outlined in Appendix D.1 is to assess the water quality observations relative to the predictions in the FEIS, and this can only be assessed following the formation of the pit and the capture of water across the entire active mining drainage area.</p>

**Table 1 - Response to QIA Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
6	QIA 2019 AMR TE #6	<p>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.</p> <p>Baffinland indicates they exceeded water withdrawal limits at numerous locations including domestic potable water from Camp Lake as well as several dust suppression sources along the Tote Road. Baffinland indicates these exceedances may be due to documentation errors and will continue to work to improve yet has not provided verifiable actions.</p>	<p>QIA requests the Department of Fisheries and Ocean report from Baffinland 2018d.</p>	<p>Document Name: Baffinland Iron Mines 2018 Annual Report to the Nunavut Impact Review Board [200521-08MN053-Mary River Project 2019 Annual Report-IA1E] Section: Section 4.6.4, PC Condition 19 Page: 101</p>	<p>Baffinland has continued routine inspections of water crossings (i.e. culverts, bridges) at the Project to ensure water crossings are not obstructed and are working as designed. 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.</p> <p>QIA had referenced Baffinland 2018d, however this does not correspond to the DFO 2019 Tote Road Report, this references the Spill Contingency Plan. The annual assessment is documented and summarized in an annual report submitted to Fisheries and Oceans Canada (DFO) each year (Baffinland, 2019f). Baffinland's DFO Tote Road Report was included as Appendix G in the 2019 NIRB Annual Report.</p> <p>During 2019, water was withdrawn from approved sources and used at Milne Port, the Mine Site and along the Tote Road for Project activities under the authorization of the Type 'A' Licence. To address the exceedances of daily water limits in 2019 and to prevent future events, Baffinland is committed to improving current operating practices to reduce the risk of reoccurrence. Immediate actions have been implemented onsite to address the daily water limit exceedances from 2019. This included installation of alarms at the Saliivik Camp water treatment plant. Baffinland is also looking to install an additional tank at the Saliivik Camp to have better raw water storage so that the plant has better control on incoming water. Along the Tote Road, a new Tote Road Water Collection Log has been established for Road Maintenance. Road Maintenance has also placed signage at the approved dust suppression withdrawal locations indicating the site name and number of daily loads which can be taken from the location.</p> <p>In addition to the above mitigations, Baffinland plans to take an adaptive management approach to prevent future daily water withdrawal exceedances as detailed in correspondence with QIA on July 10, 2020. This approach is an alignment with Baffinland's Incident Investigation and HSEC Management Standards.</p>
7	QIA 2019 AMR TE #7	<p>Section 4.6.6 states that, "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)" (p. 132). The Proponent notes that a revegetation pilot program was initiated in 2019 but does not describe Inuit involvement or if IQ has informed this program.</p>	<p>Please describe in detail how Inuit have been engaged in revegetation projects and if and how IQ has informed those programs. Please outline how Inuit will be involved in all future revegetation projects.</p>	<p>Document Name: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E Section: 4.6.6 Vegetation (PC Conditions 31 through 40) Page: 132-133</p>	<p>Baffinland initiated the revegetation research program as a pilot study to assess the methodologies and challenges associated with implementing these studies in a high arctic environment and in an active mining area. Baffinland intends to present the findings of the first year of study to the Mine Closure Working Group to solicit feedback on the study design, including the incorporation of IQ.</p> <p>Baffinland looks forward to working with QIA to integrate IQ and Inuit perspectives into closure and reclamation research, and working with QIA through the Culture Resource and Land Use and Adaptive Management working groups. Baffinland has committed to working with, and supporting financially, QIA to develop Inuit designed objectives, triggers, indicators, and responses for a ranges of topics, including Culture Resource and Land Use through an Inuit Stewardship Plan. Perspectives on current and end land use, revegetation and aesthetics of the mine area at closure will be integral to ensuring meaningful closure objectives and criteria on these topics are developed and evolve over the life of the mine.</p>
8	QIA 2019 AMR TE #8	<p>The objective of project certificate condition 32 is for the Proponent to prevent the introduction of invasive species. The Proponent's method of mitigating the introduction of invasive plants is to have suppliers inspect supplies and equipment before offloading at Baffinland's Milne Port. The QIA has previously stated that only relying on suppliers is not enough to prevent invasive plants and the QIA has previously requested a third-party auditor.</p>	<p>The QIA requests that a third party auditor be required to periodically inspect suppliers for compliance in inspecting supplies and equipment.</p>	<p>Document Name: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E Section: 4.6.6 Vegetation PC Condition 32 Page: 137</p>	<p>Baffinland's current practice is to monitor equipment and supplies being brought via sealift to the Mary River Project. As discussed in Baffinland's Environmental Protection Plan, new equipment entering the site is examined for invasive species to prevent the introduction of invasive plants. Although climate conditions within the RSA are expected to be a substantial barrier to the survival of exotic invasive plant species, equipment brought to the Project site is cleaned of other soils to help prevent the introduction of exotic invasive plant species. If exotic invasive plant species are found within the Project area, they will be removed and destroyed, and, if possible, efforts will be made to determine the path of entry to prevent further spread of exotic invasive plant species.</p> <p>Baffinland will continue to conduct inspections during equipment loading and mandate that all suppliers inspect supplies and equipment before offloading at Baffinland's Milne Port. Baffinland will consider employing a third party auditor in the event of sustained non-compliance or incident investigations identify the need to expand on existing inspection procedures.</p>

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
9	QIA 2019 AMR TE #9	<p>Project certificate condition 33 states that the Proponent shall include relevant monitoring and management plans within its environmental management system and the terrestrial environment management and monitoring plan. This section describes the Terrestrial Environment Mitigation and Monitoring Plan and the components including vegetation abundance and composition, vegetation health, culturally-valued vegetation, exotic invasive vegetation, and natural revegetation and dustfall. The reference document link includes the website <a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>, which does not have an updated Terrestrial Environment Mitigation and Monitoring Plan. The only available version of this plan is from 2016 and does not include monitoring plans for culturally-valued vegetation.</p>	<p>QIA requests the proponent to provide an updated Terrestrial Environment Mitigation and Monitoring Plan that describes how lessons learned have been incorporated into adaptive management to inform monitoring.</p> <p>A component of the Terrestrial Environment Mitigation and Monitoring Plan was to include monitoring of culturally-valued vegetation; however, there is little information about how this monitoring will take place. QIA requests the proponent to include in the Terrestrial Environment Mitigation and Monitoring Plan details for monitoring culturally-valued vegetation. QIA has put forward this request at meetings of the Terrestrial Environment Working Group and in comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) Annual Monitoring Report (2018). QIA recognizes that this request may be addressed through ongoing revisions to the monitoring and adaptive management programs, should the Mary River Phase 2 project be approved; however at this time Proponent commitments and Inuit Certainty Agreement provisions have yet to be applied.</p>	<p>Document Name &amp; Page:</p> <ol style="list-style-type: none"> <li>Mary River Project 2019 Annual Report (200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf), Section 4.6.6 Vegetation PC Condition 33, pg. 138</li> <li>Terrestrial Environment Mitigation and Monitoring Plan Rev 1 (baf-ph1-830- p16-0027-r1---terrestrial-environment-mitigation-and-monitoring-_2017-01- 25-05.pdf), Section 4.3 Vegetation Monitoring, pg. 61</li> <li>Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) 2018 Annual Monitoring Report (190607-08MN053-QIA Comments- IA1E.pdf), QIA Comments and Recommendations Table, pg. 14</li> </ol>	<p>Vegetation baseline surveys incorporated traditional plant use studies in the summer of 2007 in consultation with elders in Pond Inlet. The study included interviews and field trips with elders to discuss plants of traditional use. Twenty plant species/plant groups were identified around Pond Inlet and the traditional uses of the plants were documented, of which 17 species are known to occur in the northern portion of the Project area. For a complete list of all plants included in the traditional knowledge study see Appendix G in the Vegetation Baseline Report, Appendix 6C, FEIS (Burt 2010).</p> <p>Blueberry was used as an indicator species since its distribution could be modeled. The change in abundance of blueberry plants within the RSA was quantitatively assessed by comparing blueberry abundance before and after Project development using the same methods and assumptions used to assess changes to vegetation abundance. Additional baseline sampling for blueberry was attempted in 2014 to improve statistical inference; however, low availability on the landscape leads us to propose that blueberry be removed from the analysis due to inherently low sample size. Based on information collected to date, blueberry abundance within the RSA is very low since approximately 95% of the RSA is classed as having low blueberry cover (0–20%).</p> <p>The QIA is requesting that Baffinland work with affected communities to review, update and implement the EPP and the Terrestrial Environment Mitigation and Monitoring Plan (TEMMP) to include Culturally Important Vegetation monitoring. Baffinland understands that this request is predicated on the assumption that there has been no monitoring of Culturally Valued Vegetation for the Mary River Project. To clarify, while the TEMMP does not include a specific “Culturally Valued Vegetation Monitoring Program”, this should not be equated to a lack of monitoring for Culturally Valued Vegetation. In fact, the TEMMP includes several monitoring programs which provide information relevant to Project effects on Culturally Valued Vegetation. These include:</p> <ul style="list-style-type: none"> <li><b>Direct Habitat Loss Monitoring (Table 4-14 of the TEMMP)</b> — The assessment of Project effects on Culturally Valued Vegetation (described within the FEIS and updated for Phase 2) assessed effects to Culturally Valued Vegetation based on the direct loss of blueberry cover due to the clearing of the Project footprint. By conducting an annual survey quantifying direct habitat loss within the Project footprint Baffinland is conducting confirmation monitoring to demonstrate that the effects of direct habitat loss on various Valued Ecosystem Components and Key Indicators, including Culturally Valued Vegetation, do not exceed those predicted in the effects assessment.</li> <li><b>Dust Fall Monitoring (Table 4-4 of the TEMMP) and Vegetation Health Monitoring (Table 4-3 of the TEMMP)</b> — As noted by the QIA in their Supporting Rationale for TRC 09, one of the concerns raised by Inuit has been regarding the effect of dust fall and other Project emissions on the health of caribou forage and other vegetation, including Culturally Valued Vegetation. Dust fall monitoring quantifies the extent and magnitude of dust fall on vegetation both within the Project development area, and the adjacent habitats. Additionally, vegetation health monitoring quantifies metals concentrations in soil and vegetation over time. As described in Appendix 4-2 of the TEMMP, the selection of representative species for monitoring of metals levels in vegetation included consideration of Culturally Valued Vegetation. Blueberry was initially selected as a representative species due to it being a Culturally Valued species. It has since been dropped from the program due to limited availability on the landscape resulting in an insufficient quantity and distribution to inform Project effects. However, even without blueberry, continued monitoring of metals levels in soils and other vegetation (i.e., lichen), in combination with dust fall monitoring, provides valuable information relevant to the health of vegetation species, including Culturally Valued Vegetation, in the Project area.</li> </ul> <p>Lastly, it is noted that accordance with IIBA Article 17.8, should the community of Pond Inlet wish to pursue a community-based monitoring program focused on culturally-important vegetation, funding is available through this program to achieve this objective. So far no application has been received by the Joint Executive Committee of QIA and Baffinland to approve funding for the 2020 year.</p>

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
10	QIA 2019 AMR TE #10	<p>Project Certificate Condition No. 35 requires that the Proponent undertake monitoring of baseline metal levels in organ tissue from caribou harvested within the LSA. In practice, no monitoring of metals in organ tissue from caribou harvested within the LSA has been conducted to date.</p> <p>In the Annual Report the Proponent has stated that the best course for the Program is through participation in a Regional Program, however, in the Baffinland Response to NIRB Letter Re 2020 Monitoring it is noted that, "Funding decision through the Northern Contaminants Program which includes collaboration with multiple parties including the GN, Baffinland and Lead Investigator has been stalled..." (BIMC, Letter June 24, 2020). The Annual Report also mentions that the Proponent met with the Primary Investigator for the Northern Contaminants Program in December 2019, but does not provide details or notes from that meeting.</p> <p>The Annual Report and the June 24, 2020 letter indicate that an organ tissue program may not commence until late 2020 or even 2021. The June 24, 2020 letter states, "Training may potentially be conducted by a local GN wildlife biologist provided small gatherings (5 or less) can continue to occur in Pond Inlet over the coming months and that the GN is provided approval to resume research given their important role in this collaboration. Further discussion with all parties including the MHTO is required and the consideration for delaying activities until late 2020 or early 2021 pending outcome of above." (BIMC, Letter June 24, 2020, p.2). It is also unclear if the proposed steps for establishing the program provided in the Annual Report (see p. 143) has been approved by the TEWG.</p>	<p>Consistent with QIA's comment on the 2018 report, the status of this condition should be revised to non-compliant. Coordinating the acquisition of organ material with improved community-based monitoring of caribou within the PDA, LSA, and RSA is highly recommended.</p> <p>QIA requests that the Proponent share any meeting notes and or updates on the possible coordination with the Northern Contaminants Program. As this is a required condition, QIA seeks a description of how the Proponent will proceed with initiating the program if partnership with a Regional Program is not possible.</p> <p>QIA requests that the Proponent confirm whether the TEWG agrees with the steps described in the Annual Report, whether the TEWG is supportive of participation in a Regional Program, and if the steps have not been verified with the TEWG, describe the next steps for seeking agreement on the Program.</p>	<p>Document Name &amp; Page:</p> <ol style="list-style-type: none"> <li>Mary River Project 2019 Annual Report (200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf), Section 4.6.6 Vegetation PC Condition 35, pgs. 142-3</li> <li>BIMC, June 24, 2020. Baffinland Response to NIRB Letter RE Monitoring 2020 (200624-08MN053-Baffinland Response to NIRB Letter Re 2020 Monitoring-Final-IMTE.pdf, pg. 2</li> <li>Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) 2018 Annual Monitoring Report (190607-08MN053-QIA Comments-IA1E.pdf), pg. 14</li> </ol>	<p>Baffinland's efforts to collect organ tissues from caribou harvested in the Project Area prior to commencing operations were hampered by an initial attempt to coordinate tissue collection with a previous GN regional biologist (sample kits were not distributed), by limited availability of caribou harvested in the area, and eventually by a moratorium on caribou harvest on Baffin Island (Government of Nunavut, Department of Environment 2014). Since the moratorium, there has been limited harvest of caribou under a harvest quota put in place by the GN. Regardless, Baffinland has been attempting to address Project Term and Condition 31 (organ tissue collection) and 51 (support regional studies of population health), and it is our perspective that we are meeting the intent of the Project Term and Condition.</p> <p>To facilitate regional health monitoring, Baffinland held informal meetings in 2019 and 2020 that included participants from Baffinland, the GN's regional biologist and a contract biologist for the Northern Contaminants program to continue discussions on combined efforts to collect caribou organ tissue. Combined efforts are in the best regional interest given the limited quota harvest, and the interest and plans of all parties to collect tissue samples for essentially the same reasons — to monitor caribou health. There are no additional meeting notes to provide from meetings held prior to the June 24, 2020 letter submission to the NIRB.</p> <p>The issue of combined efforts on sample collection was discussed at several TEWG meetings. During the October 2013 TEWG meeting, the QIA, GN and BIM all agreed that a hunter harvest study should involve collaboration from all parties to be most effective and that the initiative of a caribou hunter harvest study needs to be led by the GN. It was acknowledged by parties that this will require, at a minimum, collaboration with external programs. Otherwise, efforts and data will not be effective (TEWG meeting minutes, October 13 meeting at Intergovernmental Affairs Building, Iqaluit). Based on this feedback and the desire to facilitate a regional program, efforts have been directed to helping to make that partnership work before a Baffinland-only option is considered. Baffinland will continue those efforts and encourages QIA's support of a regional-level collection to address interests of all parties using a limited number of samples in respect of the current caribou harvest quota.</p> <p>Despite some challenges related to COVID-19 as described in the June 24, 2020 letter to the NIRB, some good progress has been made on regional collaboration. On August 11, 2020, the contract biologist with NCP received confirmation from the Northern Contaminants Program that the Baffin Island caribou portion of the application would be awarded funding for year 2020 provided that it received a letter of support from the local hunters and trappers organization before end of August 2020 to the Northern Contaminants Program Secretariat. Subsequently, the GN obtained a letter of support from the Mittimatalik Hunters and Trappers Organization (MHTO) on August 12, 2020 to proceed with caribou sample collection in collaboration with the MHTO and local hunters. The GN will be responsible for developing the sample kits that will be distributed to hunters in the community. Currently the harvest season is open and will continue until the end of June 2021, unless quotas are reached prior to season closure. Given that the potential to hold in-person engagement activities are limited due to the COVID-19 pandemic, the GN will be responsible for engaging with the MHTO and training individuals in sample collection. Baffinland, along with the contract biologist, Environment and Climate Change Canada (ECCC), and the GN will work towards a data sharing agreement so that all the results obtained from the caribou sample collection and analysis may be shared among all parties.</p> <p>Currently the following is proposed to be collected: Collect samples from up to 34 caribou with support of local hunters, conservation officer and MHTO; Samples collected from each caribou will include: teeth (aging), kidney (metals analysis consisting of minimum 34 elements), liver (brominated and fluorinated compounds), muscle and hair; biological data will include sex. Muscle samples (0.5 g) will be stored in 1 ml of lysis buffer and sent to ECCC for use in the Caribou Genomics Project. These samples will assist in the definition of evolutionary and conservation units for caribou; Liver and muscle samples will be archived for potential future analysis.</p> <p>Originally, the NCP application included a contribution of \$20,000 from Baffinland towards consultation efforts with the MHTO prior to program implementation, in addition to the communication of results when available. Baffinland is currently considering how this will work since travel to Pond Inlet is restricted during the COVID-19 pandemic. Any relevant update will be provided to the TEWG as progress is made.</p> <p>In accordance with Project Term and Condition 51, Baffinland is giving "...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." Further, Project Condition 35 states... "The Proponent is strongly encouraged to coordinate with local Hunters and Trappers Organizations regarding procurement of harvested caribou organs." To that end, Baffinland is pursuing a coordinated effort on organ tissue collection at a regional and collaborative scale. It is unclear to Baffinland why we would seek TEWG agreement on support of participation in a regional program, when that group is established to advise on addressing Project Certificate Terms and Conditions.</p> <p>The TEWG has been kept informed of the steps being taken to work in collaboration on a regional-level organ tissue collection program.</p>

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
11	QIA 2019 AMR TE #11	Project certificate condition 39 states that the Proponent will prevent erosion and promote progressive revegetation of disturbed areas. The Proponent has started a revegetation study that aims to address the lack of research regarding the revegetation of disturbed areas in the far North. This study began in 2019 and has two study components including a post-disturbance revegetation survey and a reclamation trial. The Reclamation Pilot Study document states, "Expansion of reclamation trials at the Project will be necessary to improve data capture and support more in-depth analysis." The proposed expansions of this study involve increasing the number of reclamation trial sites and planning for medium and large-scale reclamation trials once mine features start to become decommissioned.	QIA has concerns that targets to meet progressive revegetation will not be met due to the slow nature of northern growing conditions. QIA requests that the Proponent provide documentation that supports the assertion that progressive revegetation is likely to succeed particularly for developing lichen mats in density that is adequate to support caribou forage. As the Proponent expands the current revegetation studies, the following questions should be considered and reported on: What is the timeline for successful establishment of progressive revegetation and how will that timeline be met? Will the proposed manual seeding promote lichen regeneration? Are there other approaches that will support lichen establishment? How will lichen regeneration be affected by slope and soil stabilization (soil compaction)? What is the lag time for re-establishing lichen forage?	Document Name & Page: 1. Mary River Project 2019 Annual Report (200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf), Section 4.6.6 Vegetation PC Condition 39, pg. 153 2. 2019 Revegetation Study (2019_RevegetationStudyReports.pdf), Section 3.2 Monitoring Commitment and Project Expansion, pg. 26	The purpose of the reclamation research review and reclamation trial initiatives was to (1) appropriately frame the context for reclamation in relation to end-land use objectives, (2) identify potential obstacles to reclamation in northern/arctic climates, and (3) establish a mechanism to document and create dialogue surrounding progressive reclamation efforts that will benefit/support the final mine closure and reclamation plan.  At present, the reclamation trials are focused on more fundamental aspects of land reclamation. For example, what are appropriate reclamation endpoints for project features? What are appropriate indicators for their development (e.g., rates of natural revegetation and succession patterns)? The reclamation trials then seek to address logistical/operational aspects of reclamation — especially given the inherent challenges imposed by/in northern/arctic environments. For example, how to best execute heavy earthworks in permafrost? What is the feasibility of extrinsic seeding/planting? What is an appropriate timeframe for assessment of post-reclamation site stability?  The authors of the reclamation trials acknowledge the QIA's questions and concerns and have taken note to integrate (where possible) these aspects into future/ongoing investigations. However, it should be recognized that more thorough/foundational investigations are necessary prior to addressing these concerns. The Mine Closure Working Group would be an appropriate forum/context to establish common understanding of reclamation challenges and timelines, to share dialogue on these issues, and to prioritize investigative initiatives.
12	QIA 2019 AMR TE #12	Project Certificate condition 37 states that the proponent is required to prevent establishment of invasive species. Current exotic invasive vegetation surveying is conducted within disturbed areas within and adjacent to the project footprint. Scheduled surveys take place every 3 to 5 years or as triggered by observations of exotic invasive plant species. Current detection method includes driving the road to observe invasive from a vehicle. QIA is concerned that this method may only lead to detection once plants are occurring in higher densities.	QIA requests that the proponent conduct invasive plant surveys more frequently than every 3 to 5 years. To increase the likelihood that invasive plants will be detected, the proponent is requested to increase survey effort, including conducting additional walking transects along roadways and disturbed areas to detect the occurrence of invasives at low densities. To ensure that the approach of relying on observations of exotic invasive plant species to trigger additional surveying is rigorous, QIA is again requesting additional training for all contractors and operators on site in identification and documentation of invasive plants. QIA has put forward this request in Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) Annual Monitoring Report (2018). For greater clarity, QIA is requesting that Baffinland support Inuit to be trained in the identification of invasive plants and in conducting these surveys, as well as conducting inspections of contractor vehicles and equipment as needed.	Document Name: Mary River Project 2019 Annual Report (200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf) Section: 4.6.6 Vegetation PC Condition 37 Page: 148	The primary method of exotic invasive species control for the Mary River Project is prevention. As the Project is on an island, and the majority of equipment remains on site for the duration of its operational period, the only methods of terrestrial exotic species introduction are on new equipment coming in via sea lifts, or on personnel and equipment via flights. All equipment and containers are thoroughly inspected once they arrive on site to ensure they are clean. The limited growing conditions on North Baffin Island are restrictive to exotic species establishment and success, which further reduces risk of exotic species invasion.  Although walking is the preferred method of exotic invasive plant survey, slow-moving vehicles were used to survey roadsides along the Tote Road in areas where it was unsafe and time-prohibitive to park or walk. This method has been used for roadside invasive plant surveys throughout Canada including in the territories (e.g., Oldham and Delisle-Oldham 2017; Bennet et al. 2016). Walking alongside the Tote Road with ore haul trucks and other heavy equipment traffic for extended periods would not be safe nor feasible for surveyors.  Due to the low risk of exotic species invasion and slow growth rate on North Baffin Island, a 3–5 year survey schedule is appropriate for detecting and controlling exotic species before they become widespread. The next scheduled exotic invasive species survey will increase survey effort by incorporating Bruce Head camp to the survey route.  <u>References:</u> Bennett, B., B. Pagecz, A. Suarez-Esteban, and M.J. Oldham. 2016. 2016 Invasive Plant Roadside Survey Methodology, Yukon Territory. Yukon Invasive Species Council. Oldham, M.J. and M. Delisle-Oldham. 2017. Report on the 2016 Survey of Exotic Plants along Northwest Territories Highways. Report to Department of Energy and Natural Resources, Government of Northwest Territories. Available at: <a href="https://www.enr.gov.nt.ca/sites/enr/files/resources/report_on_the_2016_survey_of_exotic_plants_along_northwest_territories_h.pdf">https://www.enr.gov.nt.ca/sites/enr/files/resources/report_on_the_2016_survey_of_exotic_plants_along_northwest_territories_h.pdf</a> Accessed August 2020.
13	QIA 2019 AMR TE #13	The report states that the communities have become more comfortable with the idea that caribou would acclimatize to the railway over time. QIA continues to be concerned about the potential displacement of caribou due to the Project components and activities including the road and rail traffic.	As noted in Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) Annual Monitoring Report (2018), the initial statement at left is misleading and affects the tone of the entire section. QIA requests removal of this statement. If Baffinland feels this is an accurate reflection of what they have heard from community engagement, please provide all references pointing to where this statement is substantiated, and all references to any contradictory inputs by Inuit. QIA requests that it be noted on the record that we have concerns about displacement of caribou particularly in migration and movement corridors and calving areas, and do not agree that there is compelling evidence that caribou will acclimatize.	Document Name & Page: 1. Mary River Project 2019 Annual Report (200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf), Section 4.6.8 Terrestrial Environment, pg. 179 2. Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) 2018 Annual Monitoring Report (190607-08MN053-QIA Comments- IA1E.pdf), QIA Comments and Recommendations Table, pg. 15	The QIA's comments and concerns are noted.  Note that Annual Reports to the NIRB are not reissued. Rather, the comment responses provided are to be used in combination with the review of the annual reports.

**Table 1 - Response to QIA Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
14	QIA 2019 AMR TE #14	<p>This condition includes a requirement that the Proponent "will demonstrate appropriate refinements to design, incorporation of analytical methods and elaboration of methodologies".</p> <p>QIA has not seen appropriate response to nil results for caribou monitoring and small mammal monitoring in adapting the monitoring approach.</p>	<p>The Proponent should provide documentation regarding how adaptive management processes are applied to monitoring for wildlife particularly where Project results are not providing adequate data to test null hypotheses (for example that caribou migration and movement patterns will not be affected by the road and rail infrastructure). Studies should be re-designed to better address potential Project effects and historical baseline IQ information. These recommendations have been put forward numerous times at meetings of the Terrestrial Environment Working Group and in Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) Annual Monitoring Report (2018). QIA recognizes that this request may be addressed through ongoing revisions to the monitoring and adaptive management programs, should the Mary River Phase 2 project be approved; however, those provisions have yet to be finalized and enshrined in Project requirements.</p>	<p>Document Name &amp; Page:</p> <ol style="list-style-type: none"> <li>Mary River Project 2019 Annual Report (200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf), Section 4.6.8 Terrestrial Environment - Project Certificate Condition No. 50, pg. 183</li> <li>Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) 2018 Annual Monitoring Report (190607-08MN053-QIA Comments- IA1E.pdf), QIA Comments and Recommendations Table, pg. 15</li> </ol>	<p>The existing monitoring studies were designed and adapted with input from the QIA and other parties in the Terrestrial Environment Working Group (TEWG). The evolution of the Terrestrial Environment Mitigation and Monitoring Plan (TEMMP) reflects changes made to monitoring plans because of TEWG feedback and in response to NIRB comments on annual reports since 2012. Baffinland anticipates that the TEMMP will continue to evolve as new information is acquired. Baffinland is currently exploring other monitoring options for caribou that can be initiated once a certain number of caribou start to interact with the Project. The number of caribou needed to interact with the Project is work ongoing, and was first presented for feedback from the TEWG at the June 2020 meetings. As work on this study progresses, additional feedback will be requested by members of the TEWG, the MHTO and QIA.</p> <p>Regardless of sampling methods, a null hypothesis cannot be tested when there is a low number of samples that could be used to measure effects (i.e., caribou interacting with the Project). While the QIA is suggesting that studies should be re-designed, it is not clear to Baffinland what a re-design could include when caribou numbers and interactions are so low that any results will be inconclusive and provide little to no information on which to base operational decisions.</p> <p>There is no small mammal monitoring associated with Project effects monitoring.</p>
15	QIA 2019 AMR TE #15	<p>Monitoring and Mitigation Measures - concerns were raised in QIA's comments on the 2018 Annual Monitoring Report, noting gaps and deficiencies in monitoring survey efforts. These gaps have not been addressed and concerns remain regarding:</p> <ul style="list-style-type: none"> <li>- Timing of surveys is limited and not informed by IQ</li> <li>- Threshold for understanding project effects on caribou movements are not clearly stated</li> <li>- The height to land surveys and tracking surveys have yielded nil results - considering the low abundance due to the cyclical nature of the population this methodology should be re-considered and a more appropriate approach for determining the effect of Project components should be explored. Note that HOL and road tracking transects both have poor validity where wildlife are in low density. 2019 incidental observations recorded 52 caribou in the PDA - this points to a disconnect with Project caribou monitoring methodology.</li> </ul>	<p>As noted in Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) Annual Monitoring Report (2018), current survey approaches are not considered by QIA to be effective at detecting caribou at low densities. The study approach for assessing Project effects (particularly road and rail) on caribou movement, calving, migration, etc. should be redesigned in accordance with previous recommendations on the record, including an effective landscape scale monitoring program (collars and/or marked-recapture pellet transects); an effective local scale monitoring program including improved use of incidental observations; and a separate monitoring program based on IQ, to be designed in collaboration with HTO members. QIA notes that these recommendations have been put forward numerous times at meetings of the Terrestrial Environment Working Group and in comments on Baffinland's annual terrestrial monitoring report without formal adoption to date. QIA further recognizes that these requests may be addressed through ongoing revisions to the monitoring and adaptive management programs, should the Mary River Phase 2 project be approved; however, these provisions have yet to be finalized and enshrined in Project conditions and agreements.</p> <p>Additional questions and concerns on PCC 53 include: Page 191 states that "[o]ne group of four (4) caribou was observed approximately 1 Km west of KM 13 of the Tote Road on September 22, 2019." Is this the only observation from the Tote Road? Page 193 (PCC 53) - presenting haul truck, exploration team, hunters passing through, etc. sightings corrected for effort would be both easy and useful. QIA requests that BIMC document survey effort associated with incidental observations to improve the usability of these data.</p>	<p>Document Name &amp; Page:</p> <ol style="list-style-type: none"> <li>Mary River Project 2019 Annual Report (200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf), 4.6.8 Terrestrial Environment - Project Certificate Condition No. 53, pg. 189</li> <li>Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) 2018 Annual Monitoring Report (190607-08MN053-QIA Comments-IA1E.pdf), QIA Comments and Recommendations Table, pg. 15</li> </ol>	<p>Baffinland acknowledges the QIA's suggestions for alternative caribou surveys. Many of those suggestions either have been, or are currently being, considered by Baffinland for both practicality and usefulness in addressing Project Terms and Conditions, or for improving mitigation for reducing disturbance to wildlife from the Project. While numerous changes to survey methodology have been adopted to date based on TEWG comments, not all have been adopted as it has not been made to clear to Baffinland how these particular suggestions would improve caribou detection at low densities.</p> <p>As requested by QIA in this comment, and as noted by Baffinland in response to GN's comment # 3 on the 2019 annual monitoring report, Baffinland has conducted and contributed to a number of "landscape scale" programs, namely project-specific aerial surveys, the GN's 2008-2011 collaring program, and intermittent Baffin Island caribou surveys. Additionally, Baffinland has been willing, through a Memorandum of Understanding with the GN, to contribute to a broader and strategic north Baffin Island caribou research program.</p> <p>The TEWG suggested that Baffinland may be interested in observers summarizing their search effort for incidental observations so that findings could be summarized as a "catch per unit effort" format. Baffinland is exploring the potential for doing this, but there are added challenges to record keeping and data management. As incidental observations are just that (incidental), and not necessarily related to a specific project term or condition, refinement to methods may be considered once all other Project Term and Condition requirements are addressed to the satisfaction of the TEWG and the NIRB.</p> <p>The QIA suggests a separate monitoring program based on IQ, and that program be designed in collaboration with the Mittimatalik Hunters and Trappers Organization (MHTO) members. Baffinland looks forward to continued collaboration with the MHTO and the QIA in facilitating community-based monitoring should that be the desire of the MHTO. Accordingly, through the Mary River Impact and Benefit Agreement Article 17.8 Wildlife Monitoring Program, Baffinland has committed to providing an annual budget of \$200,000 (2018 dollars) for the next 10 years towards the implementation of community-based monitoring programs. The objective of the Wildlife Monitoring Program is to enhance monitoring and mitigation of impacts of the Mary River Project as deemed important by Inuit. According to Article 18.8.5, the community is responsible for developing a Wildlife Monitoring Work Plan (Work Plan) to be presented to the Joint Executive Committee composed of both Baffinland and QIA representatives. Funding required to develop the Wildlife Monitoring Program Work Plan shall be provided as an additional cost by the Company with the understanding that such resources are over and above the annual Wildlife Monitoring Program contribution. Given that these initiatives are to be led by the community, Baffinland recommends that the QIA further discuss its proposed ideas with the community of Pond Inlet to determine what best aligns with their priorities and accordingly upon confirmation, welcomes the subsequent development and submission of a relevant Work Plan to the Joint Executive Committee to access funding in order to implement the community-based monitoring program. As of yet, no proposals have been submitted to access funds in 2020.</p> <p>Aside from the group of four caribou at km 13 on the Tote Road observed in 2019, all incidental caribou observation were in remote areas outside of the PDA.</p>

**Table 1 - Response to QIA Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
16	QIA 2019 AMR TE #16	c. Evaluation of Effectiveness of Caribou Crossings - This condition includes requirement for: "Evaluation of the effectiveness of proposed caribou crossings over the railway, Milne Inlet Tote Road and access roads as well as the appropriate number". Due to low density of caribou at this time crossing effectiveness cannot be established.	QIA requests that a community-based monitoring program be established where IQ can be used to inform appropriate locations for road and rail crossings and appropriate methods for monitoring effectiveness such that infrastructure does not preclude future caribou occupation of habitat that is currently vacant. This could include incidental sightings from hunters and employees as is done for wolf sightings. QIA does agree that the Proponent is in compliance regarding this condition at this time. QIA recognizes that this recommendation has been put forward numerous times at meetings of the Terrestrial Environment Working Group and in Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) Annual Monitoring Report (2018). QIA further recognizes that Baffinland has committed to working with IQ holders to identify crossing locations and monitoring approaches. However, it is important that the approach used to identify these locations allows for effective and meaningful participation of IQ holders.	Document Name & Page: 1. Mary River Project 2019 Annual Report (200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf), 4.6.8 Terrestrial Environment - Project Certificate Condition No. 53 and 54, pgs. 189, 195 2. Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) 2018 Annual Monitoring Report (190607-08MN053-QIA Comments-IA1E.pdf), QIA Comments and Recommendations Table, 15	The QIA's comments and suggestions are noted. Baffinland looks forward to continued collaboration with the QIA in facilitating further work on IQ-led information on caribou crossing and crossing monitoring.  Furthermore, Baffinland would like to reiterate to the QIA that funding for community-based monitoring programs is accessible through the Mary River Impact and Benefit Agreement Article 17.8 Wildlife Monitoring Program. As part of Article 17.8, Baffinland has committed to providing an annual budget of \$200,000 (2018 dollars) for the next 10 years towards the implementation of community-based monitoring programs. The objective of the Wildlife Monitoring Program is to enhance monitoring and mitigation of impacts of the Mary River Project as deemed important by Inuit. According to Article 18.8.5, the community is responsible for developing a Wildlife Monitoring Work Plan (Work Plan) to be presented to the Joint Executive Committee composed of both Baffinland and QIA representatives. Funding required to develop the Wildlife Monitoring Program Work Plan shall be provided as an additional cost by the Company with the understanding that such resources are over and above the annual Wildlife Monitoring Program contribution. Given that these initiatives are to be led by the community, Baffinland recommends that the QIA further discuss its proposed ideas with the community of Pond Inlet to determine what best aligns with their priorities and accordingly upon confirmation, welcomes the subsequent development and submission of a relevant Work Plan to the Joint Executive Committee to access funding in order to implement a proposed community-based monitoring program. As of yet, no proposals have been submitted to access funds in 2020.
17	QIA 2019 AMR TE #17	Terrestrial Wildlife and Habitat - Wildlife Habitat The Proponent is required to develop a strategy for the recovery of terrestrial wildlife habitat in a progressive manner that is consistent with the Nunavut Wildlife Act including the integration of a decision-making process and the identification of mitigation responses to cumulative impacts on caribou survival, breeding propensity, and population dynamics	As identified in Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) Annual Monitoring Report (2018), the Proponent has been asked to provide more detail on how the ICRP provides a detailed strategy for the recovery of terrestrial wildlife habitat in a progressive manner that is consistent with the Nunavut Wildlife Act. QIA would like to see documentation of how end land use objectives for wildlife habitat were determined and how IQ was incorporated into setting those specific strategic and tactical objectives. This has been previously noted in the document Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) Annual Monitoring Report (2018). If this cannot be shown specifically QIA considers PCC to be out of compliance.	Document Name & Page: 1. Mary River Project 2019 Annual Report (200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf), 4.6.8 Terrestrial Environment - Project Certificate Condition No. 56, pg. 199 2. Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) 2018 Annual Monitoring Report (190607-08MN053-QIA Comments-IA1E.pdf), QIA Comments and Recommendations Table	As described in response to QIA 2019 AMR TE Comment #11, the results of the desktop review and reclamation pilot project are intended as a starting point and first step to informing and guiding a comprehensive progressive reclamation strategy at the Mary River Mine Site. At present, the reclamation trials are focused on investigating fundamental aspects of land reclamation including identifying appropriate reclamation endpoints for project features. Ultimately, these initiatives will seek to identify and address strategies that will support recovery of disturbed terrestrial wildlife habitat.  Baffinland has committed to the development of a Mine Closure Working Group (MCWG) to review/evaluate study design and the outcomes from these initiatives and find common ground on the recovery of terrestrial wildlife habitat in relation to end-land use objectives. Baffinland are currently scoping a suitable timeline to action this commitment. The MCWG will provide a beneficial forum for local communities, QIA, and other interested parties to discuss questions/concerns pertaining to land reclamation and associated closure objectives.
18	QIA 2019 AMR TE #18	The Proponent states that "incorporation of Inuit in field monitoring programs is critically important." While environmental monitors are included in baseline data collection, participation is low and incorporation of IQ in a meaningful way in adaptive management is not evident. Barriers to Inuit participation and to meaningful incorporation of IQ are not described.	QIA requests the development of a parallel community-based monitoring program that builds opportunities for IQ knowledge transfer and integrates the harvester, tissue sampling and wildlife monitoring. QIA recognizes that Baffinland has committed to working with IQ holders to identify crossing locations and monitoring approaches. QIA further recognizes that this request may be addressed through ongoing revisions to the monitoring and adaptive management programs, should the Mary River Phase 2 Project be approved; however, these provisions have yet to be finalized and enshrined in Project conditions and agreements.	Document Name: Mary River Project 2019 Annual Report (200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf) Section: 4.6.8 Terrestrial Environment - Project Certificate Condition No. 57 Page: 201	As outlined in Article 17.8 of the IIBA, Baffinland has committed to the funding of an annual Wildlife Monitoring Program. Per Article 17.8.4, to ensure the Wildlife Monitoring Program addresses topics of primary concern to Inuit, communities whose regular harvesting practices are directly impacted by the Project will develop, in their discretion, the scope and design of the Wildlife Monitoring Program. The objective of the Wildlife Monitoring Program is to enhance monitoring and mitigation of impacts of the Mary River Project as deemed important by Inuit.  As part of the Inuit Certainty Agreement (ICA) which was signed by Baffinland and the QIA in July 2020, the topic of Wildlife Compensation and Culture, Resource and Land Use figures prominently. Baffinland looks forward to the continued collaboration with QIA on the implementation of this Agreement, specifically through the Culture Resource and Land Use and Adaptive Management working groups. Baffinland has committed to working with, and supporting financially, QIA to develop Inuit designed objectives, triggers, indicators, and responses for a ranges of topics, including Culture Resource and Land Use through an Inuit Stewardship Plan.

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
19	QIA 2019 AMR TE #19	It is clear that documentation of the interaction of dustfall on caribou fecal pellets in the vicinity of the Project is not possible due to low density of caribou at this phase of their population cycle. Another metric for this impact should be identified. Lichen distribution in vegetation plots tends to be low and project effects could be masked due to larger number of samples with low exposure to dustfall and low lichen density. The methodology used for dustfall interactions with lichen relies on paired vegetation and dust plots. Additional sampling should be done to overlay dustfall distribution patterns with lichen distribution to identify areas of higher lichen density that are vulnerable to dustfall increase particularly as traffic is anticipated to continue to increase in phase II. Studies of lichen response to dustfall should focus on most sensitive areas (heavier deposition areas and higher density lichen that overlaps with high caribou potential).	QIA requests Baffinland develop a strategic sampling approach targeting known or potential caribou forage areas with higher abundance of lichen and risk of increased dustfall for focused studies on potential effects on lichen quality, abundance and uptake of metals.	Document Name: Mary River Project 2019 Annual Report (200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf) Section: 4.6.8 Terrestrial Environment - Project Certificate Condition No. 58 Page: 205	The trace metals sampling design is based on sampling soil and lichen at varying distance classes from each project area: Mine Site, Tote Road, and Milne Port. Within the distance classes and project area spatial boundaries, lichen abundance and proximity to dustfall monitoring stations are two of the primary factors determining site selection. Thus, the trace metals sampling sites are already located in areas of high caribou forage potential and are already associated with measured dustfall deposition wherever possible.  The trace metals sampling design is already weighted to include more sample sites within 100 m of the PDA, where dustfall deposition is predicted to be greatest, to gain a confident analysis of how dustfall may be impacting caribou forage quality.
20	QIA 2019 AMR TE #20	Re: waste management provisions to prevent carnivores from being attracted to the Project: the Proponent states that "[c]arnivore 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."	QIA requests that the Proponent provide trend data to support claims concerning carnivores/Arctic Fox interactions.	Document Name: Mary River Project 2019 Annual Report (200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf) Section: 4.6.8 Terrestrial Environment - Project Certificate Condition No. 64 Page: 221	Baffinland will endeavour to further provide the trend data in 2020 annual reporting. All wildlife interactions and occurrences are tracked through Baffinland's Incident Reporting System. Interactions that occur during the reporting year are documented and trends discussed in the 2019 Terrestrial Environment Annual Monitoring Report (EDI, 2020) provided as Appendix G.12. In the 2019 NIRB Report, Baffinland indicated that carnivore interactions have been minimized.  Direct wildlife mortality from Project-related activities was predicted to be low to nil for raptors, birds, caribou, and other wildlife. Any mortalities that do occur were predicted to represent a small fraction of overall populations. Wildlife mortalities in 2019 were all individual losses, and never exceeded four individuals of any one species. Thus, wildlife mortalities were low overall and represented a very small proportion of overall populations, consistent with impact predictions. Baffinland continues to mitigate wildlife interactions in the Project area by training, enforcing, and monitoring waste management practices and guidelines. Wildlife interaction and mortality monitoring will continue in 2020.
21	QIA 2019 AMR TE #21	Condition 59 is intended to mitigate aircraft disturbance to wildlife and Inuit harvesting and Condition 71 is related to impacts on snow geese. Data are reported as percentages of logged points. These data do not provide a clear metric for impact to wildlife.	QIA requests that the Proponent provide data on the number of minutes flown below the minimum flight threshold particularly during sensitive timing windows for snow geese and caribou and over areas known to be sensitive habitat for snow geese and caribou (e.g., caribou calving and post-calving locations). Specific requests for modifications of the reporting and mitigation approaches have been put forward by QIA and other parties at the Terrestrial Environment Working Group and in comments on Baffinland's annual terrestrial monitoring report. These recommendations include exploring approaches for increased height-based compliance through consultation with pilots. Further effort is needed to report out on flight data to determine whether Baffinland is in compliance with this Project Certificate Condition.	Document Name: Mary River Project 2019 Annual Report (200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf) Section: 4.6.8 Terrestrial Environment - Project Certificate Condition No. 59; 4.6.9 Birds - Project Certificate Condition No.71 Pages: 220;233	An enhanced helicopter overflight analysis is in progress in response to recent Terrestrial Environment Working Group (TEWG) requests. This analysis will include flight duration and detailed compliance based on flying height and the provided flight rationale. The time flown below the minimum flight thresholds during sensitive timing windows and over sensitive areas will be determined. The results of the helicopter analysis will be included in the 2020 annual report.  Flying height requirements are incorporated into the contract with helicopter contractors, and are currently communicated to pilots at the beginning of the season/shift. Height-based compliance has been increasing over the years, due in part to improved communication/consultation.  The North Baffin Island caribou herd does not have characteristic calving grounds that they return to every year; rather, calving locations vary by individual caribou within their year-round range. Thus, it is not feasible to avoid individual caribou's calving locations as they are scattered and not predictable. However, the minimum flying height of 650 m throughout the project area mitigates disturbance to any caribou near the flight paths.
22	QIA 2019 AMR TE #22	The Proponent endeavors to undertake construction activities outside of bird nesting season. Where construction is required active migratory bird nest surveys are completed for previously undisturbed areas. It is unclear the extent of activities during sensitive timing windows. The area disturbed is reported in Condition 68, but not frequency and duration of disturbance.	QIA requests that the Proponent provide additional information regarding how many occurrences of construction and duration of occurrences during these sensitive timing windows for birds.	Document Name: Mary River Project 2019 Annual Report (200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf) Section: 4.6.9 Birds - Project Certificate Condition No.65 and 68 Page: 224;228	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.

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
23	QIA 2019 AMR TE #23	<p>Shoreline bird surveys have not been updated since 2013 while Seabird waterfowl staging and waterbird surveys in Milne Inlet have not updated since 2015. It is noted that bird densities are too low for monitoring to determine Project effects. Trend data has not been provided for seabirds at Milne Inlet. Power analysis indicates data not adequate to test null hypothesis. Consideration should be given to whether:</p> <ul style="list-style-type: none"> <li>- Other metrics are available to support a sensitivity analysis regarding factors contributing to changes in bird nesting or migration.</li> <li>- IQ could better support understanding of monitoring project effects.</li> </ul>	<p>QIA strongly requests that the Proponent return to/ start implementing the following:</p> <ul style="list-style-type: none"> <li>- Annual Shoreline surveys (including the Milne Inlet area which has not been completed since 2013)</li> <li>- Annual Staging Waterfowl and Waterbird surveys for monitoring seabird migration and wintering (not completed since 2015 at Milne Inlet)</li> <li>- Collection and analysis of trend data for marine birds in Milne Inlet. QIA notes that this request has been put forward in Comments on Baffinland Iron Mines Corp.'s Mary River Project (08MN053) Annual Monitoring Report (2018).</li> <li>- additional support for Inuit community monitoring programs including IQ on bird migration and nesting patterns.</li> </ul> <p>Without results that are valid for monitoring Project effects, the Proponent can only be considered to be partially in compliance for Condition 74.</p>	<p>Document Name: Mary River Project 2019 Annual Report (200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf)            Section: 4.6.9 Birds - Project Certificate Condition No.74            Page: 242</p>	<p>Baffinland acknowledges that this has been the first comment in seven years since the shoreline surveys for birds were discontinued in 2013.</p> <p>Shoreline surveys were conducted to address Project Condition 73:            "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."            ...and 74:            "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."</p> <p>The shoreline surveys were designed after discussing the purpose and methods at TEWG meetings prior to beginning 2012 monitoring work. Shoreline surveys were conducted over two years as an investigation into the potential effects of ship wakes on shoreline nesting birds, and as a baseline assessment of likely nesting birds along the respective shorelines. The surveys were conducted along 104 km of shoreline in Steensby Inlet in 2012, and along 135 km of shoreline in Milne Inlet in 2013. Those surveys were conducted as baseline data requirements for the Early Revenue Phase proposal, and preliminary surveys to address Project Conditions 73 and 74.</p> <p>The 2012 survey and analysis report (EDI Environmental Dynamics Inc. 2013) concluded that bird densities were too low along Steensby Inlet to provide relevant or robust monitoring for determining potential project effects or directing mitigation for nesting birds in that area. The 2013 analysis and report (EDI Environmental Dynamics Inc. 2014) determined similar results... "Shoreline nesting birds along Milne Inlet are at too low a density to warrant further surveys or monitoring during construction or operation. The wake effects of the vessels are unlikely to affect more than individual nests. Monitoring effects on individual nests of species that are not considered at risk will not trigger any project adaptive management activities, so further monitoring is not recommended for Milne Inlet shorelines." (pg. 105, EDI Environmental Dynamics Inc. 2014).</p> <p>The results of those surveys were discussed at follow-up TEWG meetings in March, May and October 2013, October 2014, and April 2014 – most of which meetings were attended by the QIA. The suggestion to discontinue the shoreline surveys did not generate any documented discussion during the meeting or as reflected in the meeting minutes.</p> <p>Although the shoreline surveys were discontinued, Baffinland continues to collaborate with the Canadian Wildlife Service (CWS) - Environment and Climate Change Canada' (ECCC) seabird research initiatives, including research initiatives completed on Bylot Island and Hudson Strait which is expected to inform on potential shipping effects. That collaborative work is often reported on in the Marine Environment Working Group (MEWG) meetings. Additional to that, Baffinland has supported ECCC's shorebird PRISM plot monitoring (in 2018) and placement of automated recording units to document presence/absence of Red Knot in the Project area (2019). Baffinland has contributed towards one of the most comprehensive seabird tracking database in the world (Grant Gilchrist, personal communication, July 22, 2020). Through these efforts, the dataset contains GPS tracking data from 1021 deployments on 729 individual Thick-billed Murres, collected at five different colonies between 2010 and 2019; translating to 1,429,085 individual GPS locations of murres at sea. Furthermore, Baffinland is 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. Baffinland made its first direct contribution to a 3-year commitment towards this initiative in July 2020.</p> <p>The QIA mentions "Other metrics are available to support a sensitivity analysis regarding factors contributing to changes in bird nesting or migration" and that "IQ could better support understanding of monitoring project effects." Although Baffinland considered metrics relevant to addressing Project Conditions 73 and 74 and had discussed the results of bird monitoring in follow-up engagement sessions and technical meetings for the ERP, there was no further IQ made available to Baffinland in regards to shoreline nesting birds. Given that the QIA represents Inuit of the Qikiqtani region, and is a member of the Terrestrial Environment Working Group which provides the opportunity for the QIA to share its knowledge including any available IQ on relevant topics being discussed or presented as part of annual monitoring reporting, Baffinland looks forward to the QIA providing relevant IQ input.</p> <p>Furthermore, Baffinland would like to reiterate to the QIA that funding for community-based monitoring programs is accessible through the Mary River Impact and Benefit Agreement Article 17.8 Wildlife Monitoring Program. Given that these initiatives are to be led by the community, Baffinland recommends that the QIA further discuss its proposed ideas with the community of Pond Inlet to determine</p>

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
					<p>what best aligns with their priorities and accordingly upon confirmation, welcomes the subsequent development and submission of a relevant Work Plan to the Joint Executive Committee to access funding in order to implement a proposed community-based monitoring program. As of yet, no proposals have been submitted to access funds in 2020.</p> <p>Baffinland stands by the conclusions made in the 2012 and 2013 annual reports about the discontinuation of the shoreline surveys. In conjunction with ongoing work and research collaboration with Arctic Raptors Inc. on cliff nesting raptors, and with ECC's seabird research on Bylot Island and Hudson Strait, it is appropriate to conclude that Project Conditions 73 and 74 are addressed.</p>
<b>Marine</b>					
1	QIA 2019 AMR M&AE #1	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. Baffinland indicated that select water samples collected downstream of active quarries and mining areas showed elevated ammonia and nitrate levels in comparison to baseline concentrations; however, no mitigative measures were taken.	Baffinland provide the triggers for Adaptive Management for elevated amounts of ammonia and/or nitrate levels and indicate preventative measure and/or mitigative measures taken.	Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: Section 4.6.5, PC Condition 20 Page: 107	Activity at the QMR2 quarry has been low this past year and in response, nitrate concentrations at CLT1 Station L2-03 were well below the CCME guideline of 3 mg/L in spring and summer of 2020. Benthic invertebrate community sampling conducted within CLT1 near Station L2-03 in 2016 indicated that rather than adverse impacts, higher density and diversity of benthic invertebrates occurred within this tributary compared to baseline and reference conditions (Minnow 2017). These results were consistent with a slight enrichment influence characteristic of effects associated with nutrient inputs to aquatic systems. Regardless of the absence of any adverse impacts related to nitrate concentrations, Baffinland will develop triggers for Adaptive Management and include potential preventative/mitigative measures related to avoiding adverse impacts due to nitrate concentrations.
2	QIA 2019 AMR M&AE #2	The Proponent shall ensure that the scope of the Aquatic Effects Monitoring Plan (AEMP) includes, at a minimum: <ul style="list-style-type: none"> <li>- 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>- Measures for dustfall monitoring designed as follows: <ul style="list-style-type: none"> <li>o To establish a pre-trucking baseline and collect data during Project operation for comparison.</li> <li>o 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>o 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> The Core Receiving Environment Monitoring Program (CREMP), Lake Sedimentation Monitoring Program and Dustfall Monitoring Program do not report mechanisms to monitor and treat runoff. Adaptive management, which would detail additional mechanisms to monitor and treat runoff, is being developed in consultation with QIA. Compliance for this will be re-assessed after this work; however, it remains non-compliant at this time. Though one of the objectives for the Dustfall Monitoring Program is to quantify the composition of dustfall generated by Project activities, an assessment of the chemical composition of dust was not provided. This is a non-compliance with item b) iii. of the Project Condition.	QIA considers Condition 21 non-compliant until Baffinland provides mechanisms proposed to monitor and treat runoff and sample sediments and the chemical composition of dust entering aquatic systems along representative distance transects. This should include an assessment of the composition, which goes beyond provision of the compositional monitoring data.	Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: Section 4.6.5, PC Condition 21 Page: 109	Monitoring and mitigation of impacts for non-point source runoff is outlined in the Surface Water and Aquatic Ecosystem Management Plan, while monitoring and mitigation of impacts associated with point source discharges is outlined in the Freshwater Supply, Sewage and Waste Water Management Plan. Baffinland monitors lake sediment annually, and stream sediment on a three-year basis. The lake sediment monitoring conducted annually is used to evaluate changes in sediment quality compared to the baseline period, and to evaluate differences compared to reference conditions (Reference Lake 3). Stream sediment sampling conducted in 2017 and just recently, in 2020, is used to monitor the quality of sediment that potentially enters the aquatic systems near the mine taking reference area conditions into account. Thus, the data from the combined lake and stream sediment monitoring provides a mechanism by which changes in sediment quality due to runoff and dust are effectively tracked (relative to baseline) and gauged (relative to reference conditions and Sediment Quality Guidelines) within the lakes adjacent to the mine.
3	QIA 2019 AMR M&AE #3	Under Project Certificate Condition 21, measures for dustfall monitoring were to be designed 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 Environmental Working Group (TEWG). The effects threshold used by the Proponent for sediment on char eggs is not based on char eggs or on local sediment. The sensitivity of Arctic char eggs to elevated sedimentation from Project-related dust and sediment, remains uncertain. Better information is needed on the effects of local sediment deposition on survival of Arctic char eggs and larvae.	QIA requests that the Proponent conduct laboratory or in situ studies to establish a meaningful sedimentation threshold based on mortality rates of Arctic char eggs exposed to Project-generated dust sediment.	Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: Section 4.6.5, PC Condition 21 Page: 109-111	Sediment accumulation over the arctic charr egg incubation period at Sheardown Lake since 2015 have been considerably lower (i.e., maximum of 0.12 mm) than the 1 mm threshold predicted to affect egg survival in other fish species. In addition, the annual sediment accumulation shown at Sheardown Lake is comparable to natural accumulation amounts reported at other Arctic lakes. Therefore, the amount of sediment accumulation occurring over the arctic charr incubation period at Sheardown Lake to date appears to be similar to other arctic waterbodies, suggesting that egg survival rates at Sheardown Lake are likely within the range of natural variability for the arctic. Relative numbers of young-of-the-year (YOY) arctic charr captured at Sheardown Lake through shoreline electrofishing have been considerably higher than at Reference Lake 3, and comparable to all other mine-exposed lakes, suggesting no adverse impacts on arctic charr egg survival. Based on this line of evidence, no effects on arctic charr recruitment due to sedimentation likely occur at Sheardown Lake.

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4	QIA 2019 AMR M&AE #4	<p>One of the requirements under PCC 21 is "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." In 2019, monitoring at Milne Port and along the Tote Road showed that annual dustfall continued to exceed FEIS predictions at 20 of 23 sampling sites situated up to 1000 m from the tote road (Table 3-5, p. 43; see also EDI 2020, Table 3-5, p. 35). Dustfall in the Milne Port area was predicted to be high and it was. In 2020 the Proponent plans to expand its dust suppression efforts using 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", for an unspecified period (PCC 10, pg. 73). Data are needed on how the combination of elevated dustfall, other Project-related sediment additions (e.g., from roadbed erosion), and regular applications of dust suppressant may affect the ecology of waterbodies along the Tote Road, including Phillips Creek which drains into Milne Inlet. Adaptive management measures for monitoring effects of increased dustfall, as required under PCC 10, have not been identified for these affected aquatic environments, many of which provide important summer rearing habitat for juvenile Arctic char.</p>	<p>QIA requests that pursuant to NIRB 2018 Monitoring Recommendation 2, the Proponent "implement long-term monitoring programs for dustfall and specifically assess potential sediment deposition, impacts on water quality, [and] impacts to biota at fish-bearing streams and lakes along the tote road (including at Phillips Creek)..."</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: Section 4.6.5, PC Condition 21 &amp; 10 Page: 109-111, 72-73</p>	<p>In 2018, QIA and Baffinland implemented a monitoring program to evaluate season dust deposition entering the aquatic environment along the Tote Road. This consists of water quality and sediment sampling at strategic locations along the Tote Road which also have dustfall and vegetation monitoring sites in proximity for potential comparison and correlation. In addition, the Tote Road Monitoring Program (TRMP) developed in consultation with the QIA was developed to address concerns around the referenced Project-related sediment additions, and to evaluate if there is a potential Project related effect from the operation and maintenance of the Tote Road. Since the implementation of this program, monitoring has not indicated any project-related increases in sediment as a result of the operation and maintenance of the Tote Road, with results falling well within the range of natural variability. DustStop, the current dust suppression used along the Tote Road, is an approved product for use on unpaved roads in the Arctic by the Government of Nunavut which involves confirmation that the product is non-acutely toxic.</p>
5	QIA 2019 AMR M&AE #5	<p>The Core Receiving Environment Monitoring Program (CREMP) involves water and sediment quality monitoring (PCC No. 20 and 21, s. 4.6.4) and aquatic biota monitoring (including phytoplankton, benthic invertebrates, and fish) in Mine Sites lakes and streams, particularly Arctic char (PCC 48a, 4.6.4). The results of the 2019 CREMP indicated some mine-related influences on water and sediment quality of a few of the mine's primary receiver systems but no ecologically significant, adverse, mine-related effects to biota were identified in the Mine Site waterbodies based on comparisons to applicable reference conditions or baseline data (Appendix G.1 CREMP report). In 2019 phytoplankton samples were collected and archived for potential future use (Appendix G.1, s.2.4.1, pg. 19). This sample archive is potentially an important resource for understanding any Project-related effects and should be maintained for the duration of the Project. The large drops in gillnetting catch-per-unit-effort (CPUE) of char in Camp Lake in 2017 and 2019 compared to 2016 and 2018 (Appendix G.1, s.3.3.5.1, pg. 74) could indicate a change in abundance or in some other factor that affects catchability, or be related to limited sampling effort and widely different sample sizes (pg. 76). If this variability is Project-related that is a concern, otherwise it limits the sensitivity of the sampling to detect Project-related changes. The "crack and burn" method of reading otoliths (Appendix G.1, s.2.4.3.3, pg. 27) may not be optimal for landlocked Arctic char, which tend to grow slower and live longer than anadromous char. Elevated concentrations of nitrate reported in the headwater primary receiving streams (L2-03 = 3.13 mg/L, pg. 35; FO-01 = 13 mg/L, pg. 142) could affect the development of juvenile char downstream if the nitrate concentrations are not sufficiently diluted and persist (Hickey and Martin 2009). As in 2018, the CREMP report recommends several changes to the AEMP sediment quality benchmarks to reflect not only baseline data, but also reference lake data; and harmonize the lake sediment quality and benthic invertebrate monitoring stations, focusing only on littoral habitat, to improve the ability of the program to evaluate mine related effects to biota and potentially allow linkages to be assessed between sediment metal concentrations and benthic endpoints (Appendix G.1, s. 6).</p>	<p>QIA requests that the archiving of phytoplankton samples be continued for the duration of this Project, in case they are needed to assess changes observed in the aquatic ecology. QIA requests the Proponent assess the power of the fish sampling program to detect Project-related change and consider methods that reduce interannual variability in the fish sampling results (s.4.2.5.2, pg. 117). QIA requests the Proponent seek verification of a subset of otoliths that covers the range ages by a reader familiar with landlocked char otoliths (e.g., DFO Central and Arctic). QIA requests that the Proponent clarify how changes recommended in Appendix G1 might affect the assessment benchmarks and interpretation of impacts.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: 4.6.5 (PCC 20, 21 see also 48a); Appendix G.1 Page: 108--111 (see also 177-178)</p>	<p>Phytoplankton samples will continue to be collected and archived for potential future use in assessing biological changes over time. Statistical power analyses have consistently been applied as part of the CREMP to determine the adequacy of the current program to evaluate differences in arctic charr condition between baseline and annual studies for individual lakes, and between the reference lake and mine-exposed lakes for individual years. These results have consistently indicated that the sample sizes in the current CREMP (i.e., 100 fish from each lake) are much greater than what is required (i.e., generally 25 to 30 fish from each lake) to evaluate temporal changes or spatial differences in arctic charr condition. As a result, a smaller sample size of 50 fish from each lake was previously tabled by Baffinland (see AEMP Revision 2) to minimize potential fish mortalities while still achieving adequate power to detect changes/differences in fish health over time and/or between lakes. Similarly, to reduce interannual variability in fish sampling results, the number of mesh sizes used to collect fish has been reduced from five during baseline to three currently. Previous recommendations put forth by Baffinland suggested using even fewer different mesh sizes provided that sample sizes for fish at each lake were also reduced. Otolith samples used for aging as part of the CREMP have been archived, and thus are available for assessment by an alternative laboratory. Should QIA have a specific individual contact to which samples could be forwarded to, QIA should provide a formal request with the details of the analysis to be completed. North Shore Environmental Services (NSES), the group which has conducted arctic charr aging analysis for the CREMP since 2015, has been conducting fish aging analyses for over 30 years. If QIA would like further credentials regarding NSES, Baffinland would be happy to provide contact details. Arsenic, copper, and iron concentrations were elevated above respective AEMP sediment quality benchmarks within Reference Lake 3 littoral and/or profundal station sediment. In turn, this suggested that the AEMP benchmarks for these metals may be overly conservative. Because reference lake information had not been available at the time of AEMP benchmark development, it is recommended that reference sediment quality data be factored into the derivation of AEMP benchmarks for arsenic, copper and iron to improve the applicability of these benchmarks as a tool for evaluating potential mine effects for the Mary River Project CREMP. Benthic invertebrate density, richness and relative abundance of dominant groups, including metal-sensitive taxa, consistently differed significantly between littoral (shallow) and profundal (deep) stations of the reference lake, which is consistent with general distribution patterns of benthic invertebrates with depth in lakes. Thus, the sampling of benthic invertebrates at profundal depths limits the ability to evaluate the occurrence and/or magnitude, of mine-related effects on biota due to natural factors being more important drivers of community structure than mine-related contaminants of concern at these depths (e.g., naturally lower oxygen and food resources with depth). Therefore, it was recommended that benthic sampling at mine-exposed lakes focus solely on littoral sampling depth to definitively assess mine-related effects. Currently, sediment chemistry data is not collected at all benthic invertebrate community sampling stations, limiting the ability to establish linkages between sediment metal concentrations and potential effects on benthic invertebrates. Therefore, it was recommended that sediment samples be collected at all benthic invertebrate community stations and analyzed for particle size, total organic carbon (TOC), and total metals concentrations as part of the CREMP. These changes will improve the ability of the CREMP to determine whether any differences in benthic invertebrate community traits between the reference lake and mine-exposed lake are mine-related, allowing for better interpretation of impacts.</p>

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6	QIA 2019 AMR M&AE #6	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. Baffinland indicated that the sampling data set was limited and a trend of groundwater chemistry at the Landfill Facility was unable to be determined.	Condition 23 be considered non-compliant due to lack of progress on applying next steps. The Proponent is requested to provide further reasoning for why sampling was limited and trends unable to be identified. Further, the Proponent is requested to provide a description of the planned expansion of the groundwater monitoring program.	Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: Section 4.6.5, PC Condition 23 Page: 113	Baffinland is further evaluating the groundwater monitoring program in 2020, Baffinland has retained groundwater consultants knowledgeable in Arctic environments to further assess the current program and provide recommendations in 2020. Baffinland plans to evaluate the groundwater 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. Tetra-tech has been hired to evaluate and provide recommendations for the potential expansion of the monitoring locations, as well as the implementation of the 2020 field season. Once assessed, Baffinland will provide further recommendations to CIRNAC, NWB and other relevant parties.
7	QIA 2019 AMR M&AE #7	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. QIA disagrees with Baffinland's assessment of partial compliance as discharge criteria have been exceeded on five occasions. Baffinland has exceeded water quality criteria at locations MS-01B on two occasions, MS-08, and MP-04A. The November 12, 2019 exceedance at MS-08 is particularly of concern as the total ammonia was over ten times the applicable discharge criteria. Baffinland does not indicate what may have caused the temporary upset conditions and there was no indication if duplicate tests were performed.	PC Condition 24 be considered non-compliant as discharge conditions have been exceeded. It is requested that a procedure for adaptive management be provided by Baffinland for the operation of water treatment plants, including thresholds based on monitoring data that if exceeded would trigger mitigative actions to ensure effluent is below required discharge criteria. Adaptive management should have monitored thresholds, that if exceeded have specific triggers to result in predetermined actions.	Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: Section 4.6.5, PC Condition 24 Page: 115	Baffinland will continue to monitor required parameters at frequencies that are compliant with MDMER and the terms and conditions of the Type A Water Licence. Circumstances around the exceedances documented in 2019 are fully discussed in the 2019 QIA & NWB Annual Report for Operations, submitted to the QIA, NWB and CIRNAC on April 30, 2020. 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 continues 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. It is important to note that while non-compliant discharges are to be avoided at all times, the predictions in the FEIS assumed impacts at levels greater than regulatory thresholds. To date, Baffinland remains within the FEIS predications and continues to monitor for impacts in the receiving environment.  QIA commented that the November 12, 2019 ammonia exceedance took place at MS-08, however this exceedance took place at the Mine Site Sewage Treatment Plant (STP) sample (MS-01B). The exceedance was attributed to a failing membrane on one of the treatment trains at the sewage treatment plant. Details pertaining to the cause of the exceedance and follow up sample results were included in the November 2019 Monthly Water Licence Report to QIA.  Prior to receipt of the external laboratory results for the sample collected on November 12, 2019, Baffinland's internal sampling identified an exceedance of the ammonia discharge criteria on November 16, 2019, and effluent discharge to the receiving environment was stopped immediately. Influent flows were transferred to other sewage treatment plants onsite to limit the volume of off-spec effluent diverted to the Polishing Waste Stabilization Pond (PWSP). Process controls were adjusted to drop the ammonia level within the process. Following internal sampling to confirm the effluent met the applicable discharge criteria, discharge to the receiving environment resumed on November 20, 2019. Results of a follow-up sample collected on November 30, 2019 for external analysis confirmed a compliant ammonia concentration of 0.181 mg/L. These results were included in Table 2 of the November Monthly Water Licence Report.  Baffinland is in the process of finalizing the Adaptive Management Plan, focusing on implementing management actions based on the current understanding. A critical aspect of the Baffinland's Adaptive Management Plan is to develop a systematic approach to responding to results of monitoring programs. As part of the Phase 2 review process, Baffinland is currently working with QIA to integrate and apply the principles set forth in Baffinland's Adaptive Management Plan (AMP) into several management plan updates. Through updates to the management plans for Phase 2, Baffinland has been assessing the indicators, monitoring requirements, thresholds and responses required to implement a more robust adaptive management framework. Where reasonable, Baffinland will incorporate the actions, triggers and responses identified in the applicable management plans for Phase 2, into current operations.  Baffinland is in the process of authoring specific, measurable thresholds for water use onsite as part of these management plan updates. These action levels will be established to prevent unacceptable adverse effects from occurring. Low level actions are focused on improving the understanding of the situation that is causing the noted changes and to plan for more substantive responses (i.e., moderate or high-level actions) if/as required.  Baffinland looks forward to continuing to work with QIA on the updates to the various management plans for Phase 2 and integration of
8	QIA 2019 AMR M&AE #8	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. QIA disagrees with Baffinland's assessment of in compliance as the Tote Road has not been built to design and concerns on the state of the Tote Road are ongoing. The 2019 Tetra Tech Report confirms most concerns along the Tote Road from the 2014 Tetra Tech Report have not been addressed, with mitigative and monitoring measures not identified.	PC Condition 25 be considered non-compliant until Baffinland builds the Tote Road as designed or provide a satisfactory effects assessment of operating the road in its current state. Tetra Tech recommends monitoring at three locations: KM Post 36.5 L&R, 35.7R and 49 which should be implemented and reported on in the 2020 NIRB Annual Report.	Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: Section 4.6.5, PC Condition 25 Page: 119	Since 2013, there have been ongoing upgrades to sections of the Tote Road as part of the construction and operation of the Early Revenue Phase (ERP) for the Project and in an effort to mitigate sedimentation and erosion concerns, and to safely transport iron ore from the Mine Site to Milne Port. Any changes in design or proposed deviations from those proposed in the FEIS and FEIS Addendum have been approved by all relevant regulatory authorities prior to construction, and were completed to minimize any adverse impacts to the environment. This has included widening, straightening and re-alignment of the Tote Road at certain locations for road safety, and to minimize erosion and sedimentation issues. Additional armouring has also been added at road embankments for erosion mitigation measures. To maintain fish passage, Baffinland has obtained the required approvals for the installation, movement and/or extension of culverts at identified stream crossings to improve transportation safety and minimize impacts to fish. Any proposed changes to the Tote Road design as outlined in the FEIS Addendum, were completed to maintain the safety of personnel working along the Tote Road, and to protect sensitive environmental receptors.

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
9	QIA 2019 AMR M&AE #9	<p>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.</p> <p>QIA disagrees with Baffinland's assessment of in compliance for PC Condition 26. At the time of submission, the updated erosion management plan considered to be the Surface Water and Aquatic Ecosystem Management Plan does not include adaptive management that would be required to be "comprehensive", as required by the PC condition. At the time of the 2019 Annual Report, the erosion management plan had not yet been reviewed and thus status unknown.</p>	<p>PC Condition 26 should be considered non-compliant due to the lack of detail in the triggers provided. For example, specific observations should be listed which would trigger a response, not just general observation.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: Section 4.6.5, PC Condition 26 Page: 122</p>	<p>Since submission of the April 2020 Surface Water and Aquatic Ecosystem Management Plan, Baffinland has been working with QIA to refine Baffinland's adaptive management framework. As part of the Phase 2 review process, Baffinland is currently working with QIA to integrate and apply the principles set forth in Baffinland's Adaptive Management Plan (AMP) into several management plan updates including the Surface Water and Aquatic Ecosystem Plan. Through updates to the management plans for Phase 2, Baffinland has been assessing the indicators, monitoring requirements, thresholds and responses required to implement a more robust adaptive management framework. The 'Trigger Action Response Plan' template has since been refined to ensure "triggers" are clear, descriptive, and related directly to an observation or event that would trigger action.</p> <p>Baffinland is in the process of authoring specific, measurable thresholds for water use onsite as part of these management plan updates. These action levels will be established to prevent unacceptable adverse effects from occurring. Low level actions are focused on improving the understanding of the situation that is causing the noted changes and to plan for more substantive responses (i.e., moderate or high-level actions) if/as required.</p>
10	QIA 2019 AMR M&AE #10	<p>Once project facilities are constructed, the Proponent shall provide copies of the as-built drawings and design to the appropriate regulatory authorities.</p> <p>QIA disagrees with Baffinland's assessment of in compliance. Though Baffinland has made many positive advances to this condition in 2019, there remains concerns. First, QIA was provided a list of for construction and as-builts from Baffinland which includes several for construction designs without as-builts, or without a date of submission. Second, as-builts are required to assess impact to Inuit Owned Land by infrastructure built by Baffinland and directly impact QIA's ability to properly assess reclamation security required. Neither of these concerns have been adequately confirmed by Baffinland's submission. Lastly, QIA is aware of a water's inspector direction to develop an as-built for the Camp Lake Water structure, which has not yet been shared.</p>	<p>Compliance with the PC Condition 29 should be considered non-compliant until such a time that QIA and Baffinland confirm reclamation security based on a review of each as-built constructed on Inuit owned land and the as-built for the water management structure near camp lake is received.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: Section 4.6.5, PC Condition 29 Page: 129</p>	<p>Compliance with this PC condition is not contingent on the allocation of appropriate reclamation security. Baffinland has fulfilled the condition by continually providing issued for construction and as-built documentation for project infrastructure since the issuance of PC No. 005 and the Type A Water Licence 2AM-MRY1325.</p> <p>Construction Summary Reports, containing relevant as-built documentation, were submitted with the 2019 QIA &amp; NWB Annual Report, for infrastructure completed in 2019. These include the following pieces of infrastructure;</p> <ul style="list-style-type: none"> <li>• Mary River Mine Truck Shop (H353004-10000-430-066-0001)</li> <li>• Mary River Tank Farm (H353004-10000-430-066-0002)</li> <li>• Saliivik Camp Effluent Line (H353004-10000-430-066-0003)</li> <li>• Mary River Tank Piping and Electrical (H353004-10000-430-066-0004)</li> <li>• Saliivik Camp (H353004-10000-430-066-0005)</li> <li>• Milne Port Tank Farm Addition (H353004-40000-121-066-0002)</li> <li>• Milne Port Ore Stockpile Pond 1A (H353004-40000-430-066-0001)</li> <li>• Milne Port Ore Stockpile Expansion (H353004-40000-430-066-0002)</li> <li>• Milne Port Water Management Structures (H353004-40000-430-066-0004)</li> <li>• Milne Port 380 Person Camp (H353004-40000-430-066-0005)</li> </ul> <p>Baffinland also prepared a historical list of Issued for Construction Designs and Corresponding As-Builts, in response to QIA's concerns regarding current Issued For Construction and or/As-Built drawings. This list was provided as Attachment 2 in Appendix E.15 of the 2019 QIA &amp; NWB Annual Report.</p> <p>At the direction of the Water Resources Officer, Baffinland prepared as-built documentation for the Camp Lake structures to verify construction. On February 14, 2020 Baffinland submitted as-built documentation for the Camp Lake Sediment and Erosion Control Measures to CIRNAC, NWB and QIA. Through discussions with NWB, it is understood that the conditions of the licence 2AM-MRY1325 set out in Part D, Items 2 and 17, applies only to engineered structures, and not to ad hoc construction of mitigation measures such as check dams.</p> <p>The Camp Lake Sediment and Erosion Control Measures were implemented to address sedimentation observed in the vicinity of the Camp Lake water jetty. This structure was constructed consistent with the approved Surface Water and Aquatic Ecosystems Management Plan (SWAEMP) as an emergency mitigation measure in response to an observed sedimentation event and subsequent sedimentation events at this location. Due to the nature of the construction and urgency of implementation, no Issued for Construction drawings were submitted to the Nunavut Water Board (NWB), nor were they deemed required to be submitted. These structures have been added to the bi-annual Geotechnical Report submitted to the NWB, which confirms the integrity of the structure. Baffinland notes that due to the nature of the construction as an emergency measure, Baffinland will not provide as-built documentation for sediment and erosion control measures implemented under the SWAEMP, unless directed to do so by the NWB or CIRNAC.</p>

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
11	QIA 2019 AMR M&AE #11	The objective of Project Certificate Condition 45 (see also 47) is to mitigate impacts to freshwater aquatic habitats. The Proponent is required to adhere to the No-Net- Loss principle. To meet this requirement it has upgraded Tote Road crossings, and is required to conduct annual monitoring to ensure fish passage at the Tote Road crossing is not impeded (see also Appendix E, NIRB Recommendation 2). Issues with fish passage and/or habitat were observed at nine (9) fish bearing water crossings during fish use assessments along the tote road in late June-early July 2019 (Appendix G.6) and one (1) in the area of the Freight Dock (stream M11-1; Appendix G.20, Photos 44 and 49, pg. 62 and 66 of 74). These issues were caused by physical obstructions such as instream road aggregate/rip rap (BG-29, BG-01, M11-1) or by perching of culverts that limited upstream access (CV-106, CV-111, CV-114, CV-129, CV-216, CV-225, BG-50). The obstructions were removed soon after assessment, and perching was corrected in 2019 for five (5) of the culverts. Installation of step-pool rocky ramps was not feasible at CV-111 and CV-225, which will be revisited for remediation in 2020. QIA recognizes that the Proponent is working to remove barriers to fish passage but is concerned by the number of culverts each year that are perched, obstructed, or damaged.	QIA requests that the Proponent continue to correct fish passage problems and take an increasingly proactive approach to preventing culvert damage, blockages, and undercutting that obstruct fish passage.	Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: 4.6.7 (PCC 45 and 47); Appendices G.6 and G.20 Page: 165-168 (see also 174-175)	Baffinland has continued routine inspections of water crossings (i.e. culverts, bridges) at the Project to ensure water crossings are not obstructed and are working as designed. 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 submitted to Fisheries and Oceans Canada (DFO) each year (Baffinland, 2019f). Baffinland's DFO Tote Road Report was included as Appendix G in the 2019 NIRB Annual Report.  As demonstrated by Baffinland's continued efforts over the years, Baffinland remains committed to addressing fish passage concerns as part of its annual monitoring requirements. Baffinland will continue to seek advice from DFO as part of their regular maintenance activities at crossing locations to prevent and remove any fish passage barriers in fish-bearing streams. Baffinland will continue to address outstanding or new fish passage concerns identified during the annual water crossing assessments and/or via additional direction provided by DFO.  It is noted that QIA has restricted efforts by Baffinland to remediate fish passage issues on the Tote Road by failing to approve the Tote Road Adjustment Notice (TRAN) procedure, preventing the required changes to the roadway to facilitate culvert repair. While this issue has been raised with QIA multiple times since the TRAN procedure was proposed in 2017, QIA has not acted in good faith to further this process. Baffinland encourages the land owner to approve the TRAN process such that these critical works can be completed.
12	QIA 2019 AMR M&AE #12	Despite its freshwater objective, monitoring of habitat offsetting works in the marine environment related the Milne Port Ore Dock (Appendix G.7) and the Freight Dock (Appendix G.8) were also discussed with PCC 45. The habitat offsetting structure at the Ore Dock appear to be functioning as intended. However, settlement baskets and plates used to monitor epifauna establishment on the west side of the dock were lost, probably to shifting sea ice, and only 8 of the 28 taxa on the east side were identified to species. Of 18 taxa observed on ROV video transect surveys, only 2 could be identified to species. Loss of these samples and inability to identify taxa to species weakens this monitoring program and also weakens monitoring for invasive species, particularly those carried on ships hulls that may be settling on the plates.	QIA requests that the Proponent increase the number of plates and baskets so that there is greater redundancy in case of losses to ice, and increase the soak time so the epifauna are older and easier to identify.	Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: 4.6.7 (PCC 45 and 47); Appendices G.7 Page: 165-168	Comment acknowledged. Baffinland has planned to increase the number of plates and baskets so that there is greater redundancy in case of losses to ice, and increase the soak time so the epifauna are older and easier to identify. This will be implemented in the 2020 MEEMP Program. For example, settlement baskets lost to sea ice in 2019 will be replaced in 2020 and additional baskets will be deployed along the Freight Dock and at other locations in Milne Port. The deployments will include extra baskets that will be left for periods of time ranging from 1 to 10 years as part of offset monitoring and for 1-3 years for Aquatic Invasive Species (AIS) monitoring. These longer deployments are anticipated to help resolve identification of species that were previously only observed in juvenile stages.
13	QIA 2019 AMR M&AE #13	Under Project Certificate Condition 46 (see also Hydrology and Geology PCC 17 and Ground and Surface Water PCC 24), the Proponent is required to ensure that runoff from its facilities meets discharge requirements. In 2019, despite testing prior to release, exceedances of applicable discharge criteria occurred during a releases of treated sewage (ammonia), a release of treated effluent from the Waste Rock Water Treatment Plant (WR WTP) (total suspended solids), and a release of treated effluent from the Oily Water Treatment System (OWTS)(lead). Testing prior to release is intended to prevent the release of water effluent that exceeds discharge guidelines, but it did not.	QIA requests that the Proponent adjust its testing and release protocols to prevent similar exceedances in 2020.	Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: 4.6.7 (PCC 46, also see 17, 24) Page: 169-173 (see also 96-99, and 115-118)	Baffinland will continue to monitor required parameters at frequencies that are compliant with MDMER and the terms and conditions of the Type A Water Licence. Circumstances around exceedances in 2019 are fully discussed in the 2019 QIA & NWB Annual Report for Operations, submitted to the QIA, NWB and CIRNAC.
14	QIA 2019 AMR M&AE #14	For Project Certificate Condition No. 48a, the need to conduct additional surveys for the presence of Arctic char in freshwater bodies and ongoing monitoring of Arctic char health in watersheds near the mine, Tote Road, and Milne Inlet Port has been identified. Many of the Tote Road streams provide important summer rearing habitat for Arctic char (Appendix G.6). These streams currently receive sediment from dustfall that lands in their catchment area and from roadbed erosion. The amount of sediment they receive annually and its effects on the stream ecology are unknown. To access habitats upstream of the road the small fish in many of these streams must pass through long culverts. Monitoring data on fish health in streams crossed by the tote road have not been found.	QIA requests that the Proponent develop and use non-lethal metrics to monitor Arctic char health over the long term at these stream crossings. QIA further requests that observations related to fish abundance/quality/health, etc. from the fledgling CRLU Monitoring Program are weighed appropriately when the Proponent draws future conclusions from this program.	Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: 4.6.7 (PCC 48a); Appendix G.6 Page: 177-178	Baffinland will continue to work with QIA in the ongoing development and evaluation of the Tote Road Monitoring Program. The program to date as not established any project-related impacts to suspended sediment concentrations, with all results well within the range of natural variability. Basic metrics on fish health (fish presence, catch per unit effort, fish length and fork length) are collected from 60 crossing sites along the Tote Road and this information was presented in the 2019 annual report to DFO for the tote road FAA (Appendix G.6 of the 2019 NIRB Annual Report). Baffinland will continue to seek advice from DFO as part of their regular maintenance activities at crossing locations to prevent and remove any fish passage barriers in fish-bearing streams. Baffinland will continue to address outstanding or new fish passage concerns identified during the annual water crossing assessments and/or via additional direction provided by DFO.

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
15	QIA 2019 AMR M&AE #15	<p>These Project Certificate Conditions relate to aircraft disturbances and helicopter flight heights. These conditions are in place to reduce disturbance to terrestrial wildlife, but overflights at low altitudes can also potentially disturb marine mammals that haul out on terrestrial surfaces or sea ice. One species of concern is the Atlantic walrus. Walrus haul out at terrestrial sites (uglit) when sea ice is not available. At the June 2019 TEWG/MEWG meetings it was noted that helicopter-based exploration activities in Foxe Basin might disturb hauled-out walrus during the open-water season. QIA provided BIMC and their consultants with the locations (latitude-longitude) of known haulouts in northern Foxe Basin, so that these sensitive locations could be incorporated into mitigation planning. DFO subsequently provided the MEWG with their Science Response document regarding buffer zones to prevent disturbance of walrus (by both boats and aircraft) (DFO 2019b).</p> <p>Baffinland has shared the GPS coordinates of known haulout sites with their exploration team, including with helicopter pilots, so that flight paths remain at least 5 km away from known haulout locations were possible. Baffinland also prepared a map showing uglit locations relative to the helicopter tracks and confirmed that exploration to date has typically avoided the locations identified. QIA appreciates the Proponent's efforts to address this emerging issue in a timely manner, provide additional information, and incorporate the avoidance of uglit into its mitigation planning.</p> <p>As the avoidance of walrus uglit will be important in subsequent years, the location of helicopter flight paths in relation to uglit should be reported on an annual basis, similar to what is currently done with the Snow Goose Moulting Area. Despite being a marine mammal, the results of compliance monitoring for this subject are likely best reported in the helicopter overflight section of the TEEMP annual report, along with the other relevant data on flight heights and wildlife avoidance.</p>	<p>QIA requests that the Proponent commit to reporting on helicopter overflights in relation to walrus uglit on an annual basis. The results of compliance monitoring for this subject are likely best reported in the helicopter overflight section of the TEEMP annual report, along with the other relevant data on flight heights and wildlife avoidance.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf]            Section: 4.6.8 (PCC 49 - 64) (PCC No. 59); 4.6.9 (PCC 65 through 75) (PCC No. 71)            (also see comments 45 and 65 in QIA's review of the draft TEEMP report)            Page: 210-213, 233-236</p>	<p>Currently, there is no reporting requirement for helicopter overflights in relation to walrus uglit (haulout) in either the Terrestrial Environment Annual Monitoring Report or the Annual Report to the Nunavut Impact Review Board (NIRB). However, as the QIA has mentioned, Baffinland has provided helicopter pilots and exploration teams with coordinates for walrus uglit and instructed these teams to maintain a 5 km buffer distance to minimize any disturbance. A map of 2020 helicopter overflights in relation to walrus uglit in Foxe Basin is included for reference in response to this comment (<b>See Attachment 2</b>). Baffinland will regularly include helicopter overflights in relation to walrus uglit in annual reports once Steensby Port is operational.</p>
16	QIA 2019 AMR M&AE #16	<p>The objective of Project Certificate Condition 76 is to mitigate potential impacts to the marine environment (see also PCC 99 and 113). To meet this condition the Proponent has developed a marine environmental effects monitoring program (MEEMP) to evaluate changes to marine habitat and organisms. The Proponent has provided a list of changes to the MEEMP in 2019. Notable among these are the addition of a Northeast sampling transect and increase in the number of sampling sites, which will strengthen the program's ability to detect Project-related changes in bottom sediment and benthic biota. As in 2018, these changes are generally positive and reflect monitoring advice. Appendix G.8 described a substantial portion of the total iron concentration in the water as "present in particulate form, and likely less bioavailable for uptake by aquatic biota." (s.4.1.1.4 Metals, pg. 54). This statement was not supported. Recent studies suggest inputs of biologically available iron can facilitate phytoplankton productivity and thereby alter light penetration and carbon availability (Cwiertny et al. 2008; Lambert et al. 2015; Shoenfelt et al. 2017, 2018; Conway et al. 2019, Khatiwala et al. 2019; Underwood 2020). Photos during construction of the freight dock show patches of ore dust blanketing the surface of Milne Port during the spring ice melt (Appendix G.20, Photos 22 and 37, pgs. 52 and 60 of 74). What fraction of Project-generated iron deposition that enters Milne Inlet is biologically available, and are these iron inputs affecting phytoplankton composition and production, and the availability of carbon to other marine biota? Changes in tissue metals in Arctic char and <i>Hiatella arctica</i> between 2018 and 2019 were not considered Project-related as "the metals that were elevated are not materially associated with iron ore" and "more likely reflect natural geologic sources or atmospheric deposition from further afield" (Appendix G.8, s.6.0, pg. 166; see also Exec. Sum., pg. vii; s. 4.1.7.4, p. 119; s.4.1.8, Tables 4-32 and 4-36 (pgs. 120 and 126); s.5.1.8, pg. 157). If that is the case, what changes have occurred in the monitoring program (locations, timing, catch composition, sample size, analytical methodology, etc.) that would explain the sampled population's high variability or change in exposure to different geological or atmospheric contaminants between years? This is very important to sort out to ensure that the long-term monitoring is directly comparable from year to year. Has Inuit knowledge of Arctic char movements and stock structure in the area been sought out to inform sampling design?</p>	<p>QIA requests that the Proponent and MEWG consider: 1) the potential effects of iron deposition on marine phytoplankton; 2) alternative field methods that would improve the rates of taxonomic identifications to species (e.g., longer soak time for settlement plates); and 3) methods of improving the power of tissue sampling to detect any Project-related effects.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf]            Section: 4.6.10 (PCC 76 see also 99, 113); Appendices G.8 and G.20            Page: 253-263 (see also 322-323, 402-408)</p>	<p>1) For iron to be biologically-available, it generally needs to be in a dissolved form so that it can effectively cross biological membranes. Mineral iron associated with iron ore particulates that would be stored at the Site, would be expected to be fairly inert biologically; however, the proportion of iron that could be released from these particulates into marine waters is dependent on environmental conditions in the receiving environment. Factors such as pH, dissolved oxygen concentrations and redox potential can influence the proportion of biologically available iron that can be released from particulates into surrounding waters. According to Millero (1998) and Lis et al. (2015), in circumneutral pH and well oxygenated environments, similar to those observed in Milne Inlet, iron tends to be poorly soluble. As a result, many open ocean waters and some freshwater systems are characterized by low dissolved iron concentrations (Johnson et al., 1997; McKay et al., 2004). Accordingly, the analysis of surface water samples collected close to the Milne Port, measured total iron concentrations up to 20 µg/L, but only &lt;10 µg/L was present in dissolved forms in each of the samples. 2) Baffinland has planned to increase the number of plates and baskets so that there is greater redundancy in case of losses to ice, and increase the soak time so the epifauna are older and easier to identify. This will be implemented in the 2020 MEEMP Program. 3) Formal analysis of Fulton's Condition Factor (K) will be undertaken as part of the 2020 MEEMP Program. This analysis considers fish weight relative to length based on a defined equation, as considered under the Federal Metal and Diamond Mining Effluent Regulations (MDMER) Environmental Effects Monitoring (EEM) Program (note that MDMER is not currently applicable to Milne Port). A power analysis (power to detect change in condition, K) will be included in the 2020 MEEMP Report.</p> <p><u>References:</u>            Johnson KS, Gordon RM, Coale KH. (1997). What controls dissolved iron concentrations in the world ocean? <i>Mar Chem</i> 57: 137-161.            Lis H, Saked Y, Kranzler C, Keren N, Morel FMM. (2015). Iron bioavailability to phytoplankton: an empirical approach. <i>ISME J.</i> 9(4): 1003-1013.            McKay RML, Bullerjahn GS, Porta D, Brown ET, Sherrell RM, Smutka TM et al. (2004). Consideration of the bioavailability of iron in the North American Great Lakes: development of novel approaches toward understanding iron biogeochemistry. <i>Aquat Ecosyst Health</i> 7: 475-490.            Millero FJ. (1998). Solubility of Fe (III) in seawater. <i>Earth Planet Sci Lett</i> 154: 323-329.</p>

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
		QIA is encouraged that the Proponent is sending biological samples to experts for confirmation or identification; however, we remain concerned by the number of taxa collected in 2019 that were not identified to species.			
17	QIA 2019 AMR M&AE #17	This Project Certificate Condition requires that the "analysis for pack and landfast ice... be updated annually using annual sea ice data (floe size, cover, concentration)", which is not being done. The Proponent indicates that trend data are "not applicable", but trends in sea ice conditions are important to monitor given their role as a trigger for shipping activity and mitigation and their importance to pagophilic wildlife and Inuit harvesting. QIA also notes that updates to the sea ice dataset will also contribute to climate change monitoring, which is also a requirement under the Project Certificate	QIA requests that the Board determine whether the Proponent can be "In Compliance" with this Condition when the requested updates have not been completed. QIA also request that the Proponent consider how this required sea ice monitoring can contribute to the climate change monitoring activities required under the Project Certificate.	Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: 4.6.10 (PCC 76 through 98) (PCC No. 78) Page: 267	Thank you for your comment. Table 2.1 in the Assessment of Icebreaking Operations during Shipping Shoulder Seasons (Golder 2019) presented a 22-year dataset for the purpose of evaluating when shipping operations may potentially start based on the presence of historical landfast ice break-up. Baffinland does not start shipping along the Northern Shipping Route until it is confirmed that there is no presence of landfast ice, thus regardless of the long-term trend depicted in Table 2.1, Baffinland will continue to assess ice conditions prior to start of shipping season on a yearly basis.  Baffinland's ice analysts assess ice conditions yearly prior to the start of the shipping season by using a combination of data including Canadian Ice Service and weather charts available through Environment and Climate Change Canada, in addition to satellite imagery (e.g., Sentinel, RADARSAT, MODIS).  Baffinland has included in <b>Attachment 3</b> an updated table that includes 2019 and latest 2020 information. Baffinland's ice analysts will continue to collect this data so that it may be presented in future annual reports when it is relevant to update the long-term dataset, though not necessarily including the table on a yearly basis, given that the daily ice coverage, as captured through Canadian Ice Service Charts, is already being included as part of annual reporting efforts. Baffinland recognizes that this sea ice dataset may over the long-term contribute additional information towards climate change monitoring.
18	QIA 2019 AMR M&AE #18	The objective of Project Certificate Condition 86 is to update ballast water discharge impact predictions. As part of this condition NIRB recommended that additional sampling be undertaken to validate the model and to inform sampling sites and the monitoring plan. "...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." (2019 Annual Report to NIRB, pg. 287; 304 of 631). DFO (2020) has recommended the Proponent rerun the ballast water dispersion model incorporating particle dispersion and using new oceanographical data and data on the number of individuals of non-indigenous species released with ballast water (propagule pressure), based on biological sampling of Project vessel ballast water, to update and refine the ballast water risk assessment. The Proponent currently expects that any Project ore vessels capable of treating their ballast water will use both treatment and exchange to reduce the risk of introducing invasive species. If Project vessels begin switching to treatment alone, the model should be rerun to assess how this change affects ballast water dispersal and the quality of water being released into Milne Port (anchorages and dock(s)), in particular the temperature, salinity, and presence of contaminants (e.g., treatment residuals, persistent pollutants).	QIA requests that the Proponent rerun the ballast water dispersion models incorporating particle dispersion and using new data from oceanographical studies (e.g., currents) and from ballast water sampling of Project vessels (physical, chemical, and biological) to update and refine the ballast water risk assessment. QIA considers the Proponent to be Partially-Compliant with PCC 86.	Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: 4.6.10 (PCC No. 86) Page: 285-287	Ballast water dispersion modelling conducted in TSD #18 'Ballast Water Dispersion Modelling' submitted for the Phase 2 Proposal and the 2019 Ballast Water Model Validation report simulated the potential dispersion of ballast water in Milne Inlet under present operations and proposed Phase 2 operations. This included assessing the sensitivity of ballast water dispersion over a large range of ballast water salinity and temperature conditions. It was found that regardless of the ballast water temperature and salinity there was little to no impact on the temperature and salinity of ambient waters and the effect on dispersion was negligible. Additionally, the ballast water model was re-run for the 2018 shipping season and validated to direct oceanographic measurements taken in 2018 at Milne Port and Bruce Head. This was the first-time oceanographic data in Milne Port was available, near the ballast water release location, and used to verify the ballast water dispersion model (Golder 2019). It is not expected that incorporating particle dispersion will change the physical parameters of the ballast water or ambient water in the modelled simulations, and therefore it is not expected that ballast water dispersion results would change under either present operations or Phase 2 operations with particle dispersion. Additionally, new oceanographic data has been used to validate the existing ballast water dispersion model. It is not expected that water being released into Milne Port following treatment will experience salinity and temperature changes outside the range of modelled sensitivity values.

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
19	QIA 2019 AMR M&AE #19	<p>The objective of Project Certificate Condition 87 (see also PCC 88) is to prevent invasive species introductions resulting from shipping. To meet this condition the Proponent has developed a monitoring program to evaluate changes to marine habitat and organisms and the presence of non-native species. These studies do not prevent species introductions, they provide evidence that efforts at prevention have failed. Once invasive species become established they can be impossible to eradicate and cause serious environmental damage and expense. Gathering the information needed to properly assess the risk of species introduction, and adopting a proactive approach to preventing species introductions is very important.</p> <p>QIA welcomes the increasing effort and collaborative approach to improve non-indigenous species (NIS) and aquatic invasive species (AIS) identification. Despite these efforts numerous taxa were not identified to species (Appendix G.8). This information should be included in the annual report to NIRB as it is important for understanding the uncertainty surrounding risk of species introductions, and to put the assertion that no species have been confirmed as invasive (e.g., 2019 Annual Report, pg. 306; Appendix G.8, pg. ix-xi) in proper context. For example, of the 52 taxa collected or observed by the AIS/NIS surveys of macroflora and benthic epifauna in 2019 (Table 4-43, pg. 141), 21 were identified to species, 2 to genus, and 29 were not identified to genus or species. Only 8 of 28 encrusting epifauna taxa were identified to species (Appendix G.8, 4.2.4, Table 4.4.4, p. 146). Taxonomic resolution that is limited to Phylum, or identifies all algae along a benthic belt transect as "unidentifiable algae" (e.g., s.4.1.6, Figures 4-25 and 4-26, pgs. 100-101), limit the value of these studies for monitoring introductions and change.</p>	<p>QIA requests that the Proponent monitor species' presence and abundance in the ballast water tanks of incoming Project vessels to determine whether they have exchanged and/or treated the ballast water to remove potentially invasive species (compliance) and to learn the efficacy of those measures for removing non-indigenous species, particularly those that are potentially invasive.</p> <p>QIA requests the Proponent and MEWG work to solve the problems of how to: 1) collect epifauna from fouled ship's hulls, 2) identify taxa on the belt transects in poor visibility, and 3) obtain mature encrusting species to fill the species identification gaps. Alternative approaches such as real-time taxonomic assessment of the videos by Arctic marine taxonomists who can direct the camera operator to key features, periodic diver surveys, or the use of DNA or RNA techniques should be considered.</p> <p>Monitoring for the presence of non-indigenous species in the marine environment is ongoing and meets the requirement to monitor for non-indigenous species that have been introduced to Milne Inlet. However, it does not meet the PCC objective of preventing invasive species introductions.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: 4.6.10 (PCC 87 and 88); Appendix G.8 Page: 288-294</p>	<p>Baffinland and DFO have come to a resolution on this matter, which involves DFO's expert ballast water team undertaking this work at Milne Port (Project-specific ballast tank biological sampling conducted on a subset of vessels calling to Milne Port). The sampling to be conducted will support building a body of knowledge for D-2 treatment systems. Understanding that the rationale for this program is tied to a learning curve associated with the use of ballast water treatment systems, the compliance sampling program and risk-based methodology will be adapted as deemed necessary based on the results of DFO's ballast water sampling program. 1) RE: collecting samples from fouled ship hulls...Identification of marine taxa requires physical collection of sample due to defining features only being visible through dissection or under a microscope. Further resolution of taxa will require collection of specimens that can be sent to a lab for identification. Due to safety concerns around diving on a vessel undergoing active loading, and the difficult access to areas where biofouling has been observed, collection of samples for identification is not feasible. Under WCB's Health and Safety regulations for diving, divers will not be allowed to dive on ore carriers unless this is completed by surface supply divers and a complete vessel lock-out procedure is implemented (which is not operationally feasible during the open-water loading period). A remotely-operated vehicle (ROV) fitted with a collection apparatus for sampling is not feasible either as the collection mechanism is unlikely to be able to reach the areas where biofouling may be observed and is likely to damage the specimen to a point where identification of the species will not be possible. 2) belt transects have been replaced with metal 1 m x 1 m quadrats which will be permanently installed on the seafloor and will be surveyed by divers and ROV video surveys. 3) see response to #1. Marine biologists skilled in species identification are actively running the program and perform the video review. However, having an Arctic marine taxonomist actively review the footage will do little to improve taxonomic resolution between closely-related taxa. Many of these species are identified definitively using characteristics that may require lethal sampling (such as counting fin rays or gill structures in fish) or examining the specimen in a laboratory setting with access to a taxonomic database. Divers may improve the ability for sample collection in some cases. In 2020, survey plans include a dedicated marine scientist to direct the ROV operator to potentially allow for better camera angles to aid in resolving some identifications. However, without collection of specimens, many taxa will not be resolved to the species level.</p>
20	QIA 2019 AMR M&AE #20	<p>The objective of Project Certificate Condition 88 is also to prevent invasive species introductions resulting from Project shipping. To meet this condition the Proponent conducted a risk analysis in 2013, and has been monitoring the Milne Port and Ragged Island areas for aquatic invasive species. "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" (2019 Annual Report to NIRB, pg. 293). That risk assessment was flawed and underestimated the potential risk posed by release of ballast water into Milne Inlet by Project shipping (DFO 2014, p. 24).</p> <p>Since 2013 many risk factors have changed. Ore markets have expanded to include ports in Asia, South America, and many areas of Europe, which will change the variety of species arriving at Milne Port. New oceanographic data are available for updating of ballast water dispersion modeling (see comment on PCC 86). Real data now exist for volumes and frequencies of ballast water discharges at Milne Port. And, the Ballast Water Management Convention has come into force, requiring ships to transition from mid-ocean exchange to treatment or treatment plus exchange of ballast water. These factors argue the need to reassess risks associated with non-indigenous species introductions. To do so, data are needed on the presence and abundance of species arriving in ballast at Milne Port.</p> <p>In its Risk Assessment for Introduction of Aquatic Invasive Species from Ballast Water, Golder calculated the probability of aquatic invasive species arriving in Milne Inlet to be HIGH, surviving once they arrived to be VERY HIGH and, based on these, that the probability was VERY HIGH that foreign species would be successfully introduced (Baffinland 2018d, TSD 21, s. 4.0, p. 12; p. 20 of 24). Given the number of potentially harmful aquatic invasive species (166) in a subset of source ports the magnitude of the consequences was ranked as VERY HIGH. Based on the probability of introduction and magnitude of consequences the invasion risk was ranked HIGH, with MODERATE uncertainty. Golder noted that using the actual number of species and abundance of AIS present in each ship's ballast water would have reduced uncertainty related to invasive species risk (Baffinland 2018d, TSD 21, s.3.1.1, p. 9; p. 17 of 24). Updating this analysis</p>	<p>QIA requests that the Proponent monitor ballast water of incoming Project vessels to determine the efficacy of exchange and treatment methods and use this, and other new information, to update the invasive species risk analysis and inform adaptive management designed to prevent invasive species introductions.</p> <p>QIA considers the Proponent to be Partially-Compliant with PCC 88.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: 4.6.10 PCC 88 Page: 292-294</p>	<p>Transport Canada appreciates the efforts by Baffinland to ensure current regulations are followed with respect to their plans for ballast water management. Given the learning curve associated with use of ballast water treatment systems, for Phase 2, Transport Canada (TC) in consultation with Fisheries and Oceans Canada (DFO), recommends, in conjunction with present sampling and testing protocols being proposed/adopted [NTD - will be summarized in complete package] by Baffinland, that Baffinland implement a ballast water compliance sampling plan based on a risk-based targeting methodology to be developed in consultation with DFO and TC.</p> <p>Such a risk-based methodology should be applied to evaluate the risk of all vessel ballast water management (D1, D2) with subsequent salinity and D-2 biological compliance sampling conducted on vessels identified as high or very high risk. The respective risk-based methodology and associated ballast water compliance sampling plan will be developed in consultation with DFO and TC following completion of DFO's Project-specific sampling conducted on a subset of vessels calling to Milne Port. The risk-based methodology and associated ballast water compliance sampling plan should include a consideration of other compliance initiatives or research being undertaken elsewhere by TC relative to implementation of the D-2 standard.</p> <p>Sampling conducted that supports building a body of knowledge for D-2 treatment systems, beyond biological compliance sampling conducted on high risk and very high risk tanks, should not compromise Baffinland's ability to transport annual ore quantities as approved under a modified Project Certificate No 005. Understanding that the rationale for this program is tied to a learning curve associated with the use of ballast water treatment systems, the compliance sampling program and risk-based methodology will be adapted as deemed necessary based on the results of the program.</p>

**Table 1 - Response to QIA Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
		<p>might not change the ranking, but it might change the scale itself and could provide important information for monitoring and adaptive management.</p> <p>Scientifically defensible sampling of ballast water tanks for salinity and biota is needed to properly assess exchange compliance and the efficacy of exchange and treatment by various methods for reducing risk posed by invasive species, and risk posed by chemical (including possible treatment residuals) and physical differences between the ballast water discharges and waters of Milne Inlet. This information is needed to recalculate the risk assessment analysis and inform adaptive management. "In 2019, the monitoring program was altered slightly to highlight the emphasis on early identification of Non-Indigenous Species (NIS) and not just AIS." (2019 Annual Report to NIRB, pg. 288). This change is important, since it is difficult to predict which non-indigenous species may be invasive in the Canadian Arctic and which species may not be invasive in Canadian Arctic waters.</p>			
21	QIA 2019 AMR M&AE #21	<p>The objective of Project Certificate Condition 89 (see also 90) is to prevent impacts to marine water quality from ballast water exchange. To meet this objective salinity is tested in a single ballast water tank of each arriving vessel to determine whether open-ocean exchange of ballast water has been conducted (i.e., test compliance) (2019 Annual Report to NIRB, pg. 297). The single salinity measurement does little to protect water quality or prevent the introduction of non-indigenous species (see also PCC 87). The quality of water in the tanks will be determined by whether ballast water obtained at foreign ports is exchanged mid-ocean, treated and exchanged, or simply treated before release into Milne Port. Consequently, its physical and chemical properties may vary widely, and may be altered somewhat by treatment. There is even greater uncertainty related to the efficacy of the exchange or treatment method used to reduce the presence of non-indigenous species, because the tanks are not sampled for biota. Consequently, the identity and abundance of species released into Milne Port and the risks they pose are unknown. If vessels have not fully exchanged their ballast water or treatment methods are ineffective the potential for introducing non-indigenous species is greatly increased. While the Proponent notes that "the ship operators/owners are the responsible party for ensuring their ships are compliant with Federal ballast water regulations and the BWM Convention" (pg. 297), it is the Proponent's responsibility under PCC 89 to protect water quality and prevent the introduction of invasive species. "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." (2019 Annual Report to NIRB, pg. 295). This is referring to D1 salinity testing of a single tank per vessel, which is of little value for assessing compliance with ballast water regulations, as there can be 20 or more separate ballast water tanks per vessel, or for assessing efficacy, as it does not provide information on potentially invasive live biota in these tanks. The draft Ballast Water Management Plan is missing many important features that are needed to assess regulatory compliance, and the efficacy of the various treatment methods under Project operating conditions (QIA Phase 2 FWS TC 45, pg. 148; DF0 2019a). This information is needed to understand invasive species risk and inform adaptive management.</p> <p>In 2019, 23 of the 82 ore carrier voyages were made by vessels equipped to treat ballast water (2019 Annual Report to NIRB, pg. 296). One of these vessels, the Golden Ruby conducted treatment only on its first voyage, so the quality of the water it released is unknown. The Proponent is in the position of being able to assess which treatment methods are best suited for Project operations. This is important since systems that meet D2 standards in temperate shipping environments may not do so when shipping to Project ports, and could be turned away without loading ore.</p>	<p>QIA requests that NIRB revisit the requirements of Project Certificate Condition 89 to ensure that this monitoring program provides:</p> <ul style="list-style-type: none"> <li>- Greater certainty regarding the efficacy of open-ocean exchange and treatment; and</li> <li>- The data needed to understand and mitigate risks from non-indigenous species transported in ballast water of Project vessels.</li> </ul> <p>QIA considers the Proponent to be Partially-Compliant with PCC 89.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf]</p> <p>Section: 4.6.10 PCC 89 &amp; 90</p> <p>Page: 295-303 (see also 288-291)</p>	<p>No response required by Baffinland as the comment is directed to the NIRB.</p>

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
22	QIA 2019 AMR M&AE #22	<p>Project Certificate Condition 90 requires the Proponent achieve compliance with provisions of The International Convention for the Control and Management of Ship's Ballast Water and Sediment (2004) (aka BW Convention), which came into force in 2017 (IMO 2017). Under the BW Convention newly built ships must immediately meet the D-2 standard, which specifies the maximum number of organisms that can be present in the ballast water when it is discharged. By 2024 all existing ships must be retrofitted with ballast water treatment systems. Biological testing is not conducted to verify whether Project vessels that treat their ballast water meet the D2 standards under Project operating conditions and which systems are most reliable, effective, and pose the least environmental risk to the Milne Inlet receiving environment.</p> <p>The draft Ballast Water Management Plan (190513-08MN053-BIMC Draft Mgmt Plans-Ballast Water Mgmt Plan-IA1E.pdf) does not discuss ballast water treatment or testing to verify the efficacy of exchange or treatment for reducing the risk of invasive species introductions. It is not clear how the Proponent will verify that D-2 standards have been met before ballast water is discharged into Milne Port or how, without such testing, it will inform adaptive management (e.g., identify optimal treatment systems) to reduce risk.</p>	<p>QIA requests that the Proponent revise and update its Ballast Water Management Plan to include testing of ballast water at a level designed to reduce uncertainty regarding compliance rates and conduct biological sampling to assess the efficacy of exchange, treatment, or both for reducing invasive species risk in Arctic waters.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: 4.6.10 PCC 90 Page: 302-303</p>	<p>Baffinland is committed to reducing the potential risk of invasive species introductions in Arctic waters. Accordingly, Baffinland is currently requesting that all vessels with onboard treatment systems perform a ballast water exchange (D-1 standard) and ballast water treatment (D-2 standard) prior to release, which goes beyond existing Canadian and international regulations. The remaining vessels without onboard treatment capacity are to exchange their ballast waters (D-1 standard) as prescribed by Canadian regulations prior to their entry into Canadian waters. The Ballast Water Management Plan (BWMP) remains valid in that the salinity compliance testing described therein continues to be implemented. Baffinland will continue to implement the measures described in the BWMP until a revised version is made when new updates are required based on any emerging regulations/guidance and/or once Phase 2 is approved and initiated. Additional relevant information is also provided in response to Comment QIA 2019 AMR M&amp;AE #19 and 20.</p>
23	QIA 2019 AMR M&AE #23	<p>The objective of PCC 91 is to prevent impacts to marine water quality in Milne Inlet. To meet this condition the Proponent must develop a detailed plan for monitoring biofouling species on Project vessels. In accordance with PCC 91, a SCUBA study of vessel hulls was attempted in 2017 but aborted due to safety concerns. In 2018 a remotely operated vehicle (ROV)-based underwater video was used to survey the hulls of three Project ore carriers. Despite using higher resolution video and better lighting on the ROV in 2019, most taxa still could not be identified to species (Appendix G.8, p. xi). Barnacles were observed fouling 4 of the 5 hulls examined (Appendix G.8, s.4.2, pg. 149). This is a concern as there are numerous invasive barnacle species (e.g., Amphibalanus amphitrite, A. eburneus, A. improvisus; Fofonoff et al. 2018). QIA recognizes that the Proponent is working to meet this condition but notes that the video resolution was insufficient to permit species identification and that specimens were not collected for identification. Inability to identify hull biofouling species is an important weakness of the hull fouling surveys.</p>	<p>QIA requests that the Proponent work with the MEWG to develop a scientifically defensible monitoring program capable of assessing the presence and abundance of non-indigenous biofouling species on the hulls of Project vessels to inform adaptive management and prevent introduction of invasive fouling species at Milne Port. The Shipping and Marine Wildlife Management Plan (SMWMP) should be revised accordingly. QIA considers the Proponent to be Non-Compliant with respect to PCC 91, as it has yet to conduct effective monitoring of biofouling species on vessel hulls.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: 4.6.10 (PCC 91); Appendix G.8 Page: 304-308</p>	<p>Identification of marine taxa requires physical collection of the sample due to defining features only being visible through dissection or under a microscope. Any further resolution of taxa for the hull fouling program will require collection of specimens that can be sent to a lab for identification. Due to safety concerns around diving on a vessel undergoing active loading, and the difficult access to areas where biofouling has been observed, collection of samples for identification is not feasible. Under WCB's Health and Safety regulations for diving, divers will not be allowed to dive on ore carriers unless this is completed by surface supply divers and it involves a complete vessel lock-out procedure on the vessel (which is not operationally feasible during the open-water loading period). A ROV fitted with a collection apparatus for sampling is not feasible either as the collection mechanism is unlikely to be able to reach the areas where biofouling may be observed and is likely to damage the specimen to a point where identification of the species will not be possible.</p> <p>Baffinland notes that the newest version of the Shipping and Marine Wildlife Management Plan (SMWMP), available on the NIRB Public Registry, was submitted to the NIRB on July 17, 2020.</p>
24	QIA 2019 AMR M&AE #24	<p>Objectives of the underwater acoustic monitoring program included comparing "measured (actual) ship noise levels to estimated ship noise levels determined through underwater noise modelling during open-water conditions". The draft PAM report (Appendix G.9) did not provide any details on how the noise signatures of individual Project vessels (ore carriers, sealift, tankers) compare with model estimates. Other parties (e.g., Oceans North) also identified this issue in their review comments submitted directly to the MEWG.</p>	<p>QIA requests that the Proponent provide a summary of modelled versus measured ranges for a representative sample of the different Project-related vessel types. The MEWG submission by Oceans North provides a good example of format, based on data collected through their independent passive acoustic monitoring program being conducted in the RSA.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: 4.6.11 (PCCs 99 through 128) (including section Introduction, PCC 101, PCC 109, PCC 110, PCC 111); also see Appendix G.9 Page: 319-320, 327, 372, 385, 391 (main report body)</p>	<p>Each individual vessel will have a distinct underwater sound signature. As the acoustic modelling is based on a representative sound signature, derived from a collection of empirical measurements, we expect variability of the actual vessel sound levels compared to the modeled sound source signature. It is not necessary to review the sound output from each individual vessel in order to compare the model and measurements. Instead, we analyze the total contribution of all vessels to the sound field. We compare modelled and measured estimates of the daily durations of sound exposure and the extent of Listening Range Reduction, as those are the metrics of importance for assessing potential impacts. Analysis of these data is ongoing and will include an assessment of the individual vessel sound signatures. These results will be provided as they become available, but they are not required for a comparison of modelled and measured results.</p>

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
25	QIA 2019 AMR M&AE #25	<p>"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."</p> <p>"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."</p> <p>How many of the Inuit marine monitoring employees participated in the interviews? Have the results been used to inform program design and program planning for the 2020 Monitoring Program?</p>	<p>QIA requests that the Proponent clarify how many Inuit program team members participated in the end of program interviews, and how these interviews informed 2020 planning.</p> <p>QIA requests that the Proponent clarify whether these interviews were conducted by an independent third-party or done internally.</p> <p>QIA requests that the Proponent provide additional details on the interview techniques, format, and questions.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf]</p> <p>Section: 4.6.11 (PCC 99 through 128) (PCC 101)</p> <p>Page: 325-335</p>	<p>All observers were invited to participate. This was conducted as a paid, but voluntary option for Marine Wildlife Observers (MWO). It is not a requirement of their employment with the program. For the 2019 Ship Board Observer (SBO) Program, 2 out of the 4 MWOs participated in the end of season interviews. For the 2019 Bruce Head Program, 6 out of 12 Marine Mammal Observers (MMOs) participated in the end of season interviews. For the 2019 Marine Mammal Aerial Survey Program, 2 out of 4 MMOs participated in the end of season interviews. For the 2019 Marine Environmental Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Program, 3 out of 3 Inuit staff participated in the end of season interviews. The interviews were completed by the Golder field lead. The interview format and questions are provided in the annual reports as an appendix.</p> <p>Generally, the feedback did not necessarily recommend specific changes to the programs, however there were many recommendations for improving knowledge sharing. For example, it was recommended that monitoring program results be available online. Baffinland makes available yearly monitoring program results on its online Document Portal (<a href="https://www.baffinland.com/media-centre/document-portal/">https://www.baffinland.com/media-centre/document-portal/</a>). Since 2019, Baffinland has also committed to providing hard copies of annual marine monitoring reports to the Mittimatalik Hunters and Trappers Organization. Other suggestions for improving knowledge sharing included the use of maps and figures to show results of aerial surveys, which was done in 2019 and will continue into 2020.</p> <p>As part of comments received on the Bruce Head Shore-based Monitoring Program, participants indicated that the location of the program was good since narwhal travel to Koluktoo Bay through the study area, and that the drone study should be longer. Accordingly, the drone study was expanded in 2020 based on lessons learned and feedback received. This included increasing the number of days over which drone surveys were completed (from 4 to 20 days of flying) and expanding the scope from one type of survey to four (used 9 drone types in 2020 versus 2 in 2019). A suggestion also was made with regards to the fish sampling methodology of the MEEMP where it was requested that tissue samples should be provided to local communities for consumption instead of sending whole samples to a laboratory for subsequent analysis. Accordingly, fish tissue plugs were taken rather than the whole fish being sent for analysis in 2020. Specific details on how information was considered and incorporated into planning. Implementation and reporting of 2020 programs will be provided in the 2020 Annual Report to the NIRB.</p>
26	QIA 2019 AMR M&AE #26	<p>The Proponent has made consistent improvements to vessel speed compliance as Project operations have advanced. Compliance for ore carriers is particularly high. Compliance for freight / fuel tankers has improved but it is still lower than for ore carriers. For example, over 25% of the Sedna Desgagnés' transit through the RSA was in excess of the speed limit in 2019 (Table 4.32, pp. 347-348). Continued improvements in speed limit compliance is possible and should be a goal for 2020.</p>	<p>QIA requests that the Proponent expand efforts to ensure compliance with vessel speed limits and focus as necessary on particular vessels that have lower compliance.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf]</p> <p>Section: 4.6.11 (PCC 99 through 128) (PCC 105; PCC 120)</p> <p>Page: 345-355, 416-419</p>	<p>Baffinland-contracted vessel performance has consistently improved year after year due to the ongoing vigilance and monitoring of all Project-related vessel traffic throughout the Regional Study Area (RSA). This is made possible with the installation of local Automatic Identification System (AIS) stations located at both Bruce Head and Pond Inlet allowing to have continual live vessel location tracking recording in the RSA. Furthermore, vessels are tracked using the exactEarth software which allows to set specific alert notifications should compliance expectations (e.g., no vessel speed exceedances, no entry in established no-go zones, no drifting, no shipping route deviations, etc.) not be met, and since 2019, the presence of Pond Inlet- based shipping monitors. This real-time tracking information allows Baffinland to respond rapidly when, for example, a vessel may travel over the speed restriction, even if temporary, and only slightly over the limit (i.e., speed alert will be triggered if vessel travels over 9 knots, including at 9.1 knots even for a fraction of time). Baffinland requests from all of its contracted vessels to follow its specific Standing Instructions to Masters (SITMs) for incoming and outgoing transits through the RSA. As observed by the QIA, ore carriers typically have highest compliance rates because both the incoming and outgoing transits are under contract to Baffinland. In contrast, fuel tankers and sealift vessels are typically only under contract to Baffinland for the incoming transits since once the deliveries are made, the vessels are moving onwards to deliver goods to their next customers and are thus no longer in contract to Baffinland, which means that they do not necessarily need to follow Baffinland-specific voluntary instructions since these are not applicable to other vessels (i.e., because there are no regulations on ship speed, or need to follow specific shipping route, etc.). The cargo and fuel tanker vessels used by Baffinland are often the same vessels being used to deliver goods to various Inuit communities. The short open-water season makes it particularly challenging and the vessels want to ensure that the goods are delivered in the same season.</p> <p>Baffinland will continue to message its expectations through Project-specific SITMs, and the daily incoming and outgoing vessel email exchanges between Baffinland's Port Captain and individual vessel masters. Because of the established communications, responses over the short-term may be actioned relatively quickly, which helps to further refine vessel compliance performance. Baffinland will continue to report on its performance during the 2020 Annual Report to the NIRB.</p>

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
27	QIA 2019 AMR M&AE #27	<p>The Shipboard Observer (SBO) Program has been running for two years on board the IMV Botnica, during the shoulder shipping seasons. Appendix G.11 (Draft 2019 Ship-based Observer Monitoring Program Report) was reviewed by QIA through the MEWG, and it was noted that behavioural observation data (i.e., the behavioural categories assigned to detected marine mammals) were not reported and analyzed. The Training Manual used to train SBOs (Appendix A of Appendix G.11) lists a variety of behaviours and indicates that primary and secondary behaviours should be recorded for each observation.</p> <p>Project Certificate Condition 107 speaks to the need for “detecting strong marine mammal, seabird or seaduck responses” and the need to “detect potential changes in distribution patterns and behavior”. QIA considers this to require the collection and reporting of behavioural data as part of the SBO Program.</p> <p>Were behavioural data, as outlined in the training manual, collected? If so, when will these data be analyzed and reported?</p>	<p>QIA requests that the Proponent clarify whether or not marine mammal behavioural data were collected as part of the 2019 SBO Program. If no, QIA requests that the Proponent clarify why these data were not collected. If yes, QIA requests the Proponent commit to analyzing these data and reporting results to the MEWG and NIRB.</p> <p>QIA further requests that the Proponent commit to collecting, analyzing, and reporting these data in future SBO Program reports (and we acknowledge that the 2020 program will not run as per previous years given issues caused by the coronavirus pandemic and associated public health requirements).</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf]</p> <p>Section: 4.6.11 (PCC 99 through 128) (PCC 105; PCC 106; PCC 107; PCC 108);</p> <p>Appendix G.11 Draft 2019 Ship-based Observer Monitoring Program Report Page: Main document - 345-355, 356-360, 361-365, 366-370</p>	<p>The primary objective of the SBO program is to monitor for potential ship strikes and, secondarily, to collect opportunistic data on occurrence and distribution of marine mammals in the RSA. The SBO program is not structured as a systematic behavioural effects study and is not designed for assessing the behaviour of marine mammals around project vessels before, during and after exposure as there is no control. Baffinland has other monitoring programs designed for this purpose, such as the narwhal tagging program and the Bruce Head shore-based monitoring program.</p>
28	QIA 2019 AMR M&AE #28	<p>The novel coronavirus pandemic and associated public health restrictions have had a significant influence on the planned activities of the Proponent and all other review parties, including Federal agencies that conduct research in Nunavut. Adapting to the current situation necessitates flexibility, and the Proponent has made considerable efforts to adjust monitoring plans as required. This is commendable, but also means that changing plans to adapt to a fluid situation has led to on-going adjustments that are not reflected in the Annual report.</p> <p>For example, under Project Certificate Condition No. 109 (pp. 371-383), the Proponent notes that they are “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.” This has changed, based on recent discussions with the MEWG. DFO has canceled their planned survey due to the pandemic, and the Proponent now plans to conduct an aerial survey as a result (which is laudable).</p> <p>Similarly, the Annual Report states that “acoustic monitoring is not deemed necessary in 2020 for the open-water season”. Monitoring plans have changed here as well (as per 2020 MEWG discussions), as an adaptation to current public health- imposed limitations. These changes will help ensure that important monitoring data are being collected in 2020, and a summary of how monitoring plans have changed from the time of Annual Report submission to the initiation of monitoring activities would be useful.</p>	<p>QIA requests that the Proponent provide an update on how monitoring plans have changed from the time of Annual Report submission to the initiation of 2020 monitoring activities.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf]</p> <p>Section: 4.6.11 (PCC 99 through 128) (PCC 109)</p> <p>Page: 371-383</p>	<p>On June 24, 2020 Baffinland provided an update to the NIRB regarding its plan for operations and monitoring for the 2020-2021 Annual Monitoring Year in light of changing conditions associated with COVID-19. This update made reference to changed plans associated with several PC Conditions, including:</p> <ol style="list-style-type: none"> <li>1) PC Condition No. 35: Baffinland intended to run a collaborative program with the GN, MHTO and NCP, which was later put on pause as a result of the GN putting all research on pause</li> <li>2) PC Condition No. 89: updates regarding procedures for ballast water testing to be conducted by Port Captain instead of Baffinland Environmental Monitors and a deferrel of the planned ballast water biological sampling program to 2021.</li> <li>3) PC Condition No. 101c and 126: Nunavummiut cannot be involved in any environmental monitoring being implemented at the Mary River Project at this time. Baffinland will continue to share information and seek feedback regarding environmental monitoring program design and results through other means, and continues to make funding available for community-based monitoring under Article 17.8 of the IIBA.</li> <li>4) PC Condition No. 106 and 123: Baffinland piloted implementation of an incidental marine mammal watching program in collaboration with some vessel owners through the Marine Mammal Observation Network (MMON).</li> </ol> <p>Additionally, and as noted by the QIA, following confirmation from DFO in early-June 2020 that they were not running aerial surveys, Baffinland committed to completing this work in 2020. Baffinland also re-evaluated the need for additional acoustic data collection near Bruce Head following recommendations from its technical experts to gather this information to allow for correlation of acoustic and visual sightings.</p>
29	QIA 2019 AMR M&AE #29	<p>Efforts to develop Early Warning Indicators and thresholds for noise impacts to marine mammals have progressed slowly but are ongoing. As such, the Proponent is in Partial Compliance for related Project Certificate Conditions. Recent (July 2020 conference call) discussions at the MEWG have advanced these discussions. A summary of recent progress, with proposed timelines for completion, should be provided as part of the Proponent's response to the Annual Report review.</p>	<p>QIA requests that the Proponent provide a summary of recent progress in the development of Early Warning Indicators and noise thresholds, with proposed timelines for completion, as part of their response to the Annual Report review.</p>	<p>Document Name: Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf]</p> <p>Section: 4.6.11 (PCC 99 through 128) (PCC 110; PCC 111; PCC 112)</p> <p>Page: 384-390, 391-396, 397-401</p>	<p>Submission of a technical memo summarizing the process for the development of, and final selection of an Early Warning Indicator (EWI) and associated threshold for marine mammals as required under PC 005 Term and Conditions No. 110 and 112 was provided to the NIRB on August 21 2020 (see Attachment 4).</p>

**Table 1 - Response to QIA Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
30	QIA 2019 AMR M&AE #30	<p>Daily maps showing Project vessel ship tracks (including the MSV Botnica and vessels under escort) on all days when ice concentrations were 1/10 or greater are shown in Appendix G.19.</p> <p>These maps use Canadian Ice Service (CIS) data, which include pack ice (with associated concentration, etc.) and landfast ice (all shown in black on CIS map products). The Proponent's maps just show ice by concentration class (&lt; 1/10, 1-3/10, 4-6/10, 7-8/10, 9-10/10, i.e., the same as used by CIS), without identifying which ice is landfast ice versus which is pack ice.</p> <p>For example, Figure 1 (page 2 of 43) in Appendix G.19 shows 9-10/10 concentration sea ice throughout Navy Board Inlet on 13 July 2019. As presented, anyone with familiarity with the CIS product (Daily Ice Charts, regional ice Charts) would logically conclude that all that ice is consolidated pack ice, when the CIS Daily Ice Chart for 13 July (Daily Ice Chart color WMO CT - Approaches to Resolute - WIS35CT - 2019/07/13) shows northern Navy Board Inlet to be covered in landfast ice.</p> <p>Granted, this landfast ice has no bearing on the Northern Shipping Route through Pond Inlet, Eclipse Sound, and Milne Inlet, but it is important that parties have accurate and realistic sea ice data throughout the Regional Study Area. These maps should include landfast ice as a separate category, given its importance to local Inuit and ecosystem functioning and its use as an environmental trigger for shoulder season shipping activity.</p>	QIA requests that the Proponent commit to showing ice type (landfast ice and pack ice) more clearly in future reporting.	<p>Document Name: Appendix G. 19 and Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf]</p> <p>Section: Appendix G.19 2019 Daily Ship Tracks with Ice Imagery (also see main report 4.6.11 (PCC 99 through 128), PCC 103 and PCC 110)</p> <p>Page: Appendix G.19 (all); Main report pages 338-342, 384-390</p>	Comment acknowledged. Baffinland will review the available ice imagery and data to determine if differentiation of landfast ice vs. pack ice is possible for future reporting. Baffinland notes that the CIS does include a "landfast" ice category, otherwise known as "Fast Ice", as part of their daily ice charts and this information, in combination with satellite imagery, is used by Baffinland's ice analysts (through Fednav) to assess ice conditions, including the confirmation that landfast ice no longer exists along the entire Northern Shipping Route.
<b>Socio-Economic</b>					
1	QIA 2019 AMR SE #1	<p>The Proponent shall include with its annual reporting to the NIRB a summary of employee origin information as follows:</p> <ul style="list-style-type: none"> <li>- The number of Inuit and non-Inuit employees hired from each of the North Baffin communities, specifying the number from each.</li> <li>- The number of Inuit and non-Inuit employees hired from each of the Kitikmeot and Kivalliq regions, specifying the number from each.</li> <li>- 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>- The number of non-Canadian foreign employees hired, specifying the locations and number from each foreign point of hire.</li> </ul> <p>QIA disagrees with Baffinland's assessment of in-compliance as the entirety of required information is not presented. Baffinland did not provide in the 2019 Social Monitoring Report:</p> <ul style="list-style-type: none"> <li>- The number of Inuit and non-Inuit hired from the Kitikmeot region.</li> <li>- The locations of employees from southern location or other province/territory.</li> <li>- The number of non-Canadian foreign employees hired.</li> </ul>	Compliance with PC Condition 134 be considered non-compliant until the Proponent provides all required statistics.	<p>Document Name: Appendix G. 19 and Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf]</p> <p>Section: Section 4.7.1, PC Condition 134</p> <p>Page: 459</p>	Baffinland acknowledges that an unintended error was made during the production of data tables for Term and Condition 134. This unintended error was identified and addressed at a meeting of the Mary River Socio-Economic Monitoring Working Group, which included the participation of the QIA, CINAC and the GN, on June 24, 2020. An updated data table to ensure compliance with Term and Condition 134 was provided to working group members via email on June 26, 2020. The table that was provided to address this unintended error can be seen in <b>Attachment 5</b> .
2	QIA 2019 AMR SE #2	<p>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.</p> <p>QIA disagrees with Baffinland's assessment of in compliance for PC Condition 141. Baffinland acknowledges that the possible commencement of Phase II would represent another Construction Phase of the Project. While Phase II has not been approved, Baffinland reporting had indicated new contracts relating to Phase II over the course of 2019 and had moved Phase 2 related equipment to Site. Meanwhile, a construction training program has yet to be initiated prior. The current Q-STEP efforts in itself are not appropriately comprehensive for a Project expansion related to Phase 2, as Baffinland still has not met skilled Inuit Employment Goals for the current Project.</p>	PC Condition 141 be considered non-compliant until a Construction Phase Training Program is implemented that factors the Labour supply and demand to determine appropriate training programs to maximize Inuit employment, particularly if approval for construction of the Northern Rail is granted.	<p>Document Name: Appendix G. 19 and Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf]</p> <p>Section: Section 4.7.2, PC Condition 141</p> <p>Page: 480</p>	<p>Mine construction for the approved Project was undertaken in 2013 and 2014. PC Condition 141 cannot be considered non-compliant in relation to a component of the Project that has not yet received regulatory approval i.e. Phase 2.</p> <p>Baffinland continues to implement numerous training programs and has provided close to 100,000 hours of training to Inuit since Project development. In 2019, a total of 93,367 hours of training were completed, of which 44,135 hours (or 47.3%) were completed by Inuit. This represents an increase of 9,506 Inuit training hours compared to 2018 which is a notable upward trend in the training being provided to Inuit by Baffinland.</p> <p>In addition to the work noted above, Baffinland has further committed to the development of an "Inuit Training Plan" as part of the Phase 2 review process. That commitment and associated reference are noted below:          "Baffinland will work with QIA to develop an updated Inuit Training Plan that covers the period between Phase 2 construction and the first three years of operations. This plan will provide updates on programs that will be offered and how Baffinland intends to maximize Inuit engagement with the Project. This updated plan will be developed within six months of issuance of the Project Certificate."          Reference: Baffinland Iron Mines Corporation 2019. Response to QIA Technical Comment #32 - 2018 Training Program Evaluation &amp; Response to QIA Technical Comments #33-26 – Phase 2 Construction Training Plan. Submitted to NIRB on July 12, 2019.</p>

**Table 1 - Response to QIA Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
3	QIA 2019 AMR SE #3	<p>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. QIA disagrees with Baffinland's assessment of in compliance for PC Condition 142. Baffinland has described what services/support are being offered to Inuit and the works being done to promote Inuktitut but it has not described what efforts are being made to address language or cultural barriers that may be caused by non-Inuit employees. Further, to QIA's knowledge, the amended Inuktitut in the Workplace Policy has not yet been implemented on Site.</p>	<p>PC Condition 142 be considered non-compliant. Baffinland is requested to confirm that the updated Inuktitut in the Workplace Policy, has been implemented on Site.</p>	<p>Document Name: Appendix G. 19 and Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: Section 4.7.3, PC Condition 142 Page: 484</p>	<p>Baffinland has had an Inuktitut in the Workplace Policy since 2013. In 2019 Baffinland worked collaboratively with QIA to update this policy which is currently implemented on Site. In addition to the Inuktitut in the Workplace Policy, in 2019 Baffinland hired a full time translator/interpreter to ensure that all applicable documents are translated and provided in Inuktitut.</p> <p>In any instance where language is a barrier for any employee, Baffinland is committed to using best efforts to provide translation in the dialect required to ensure that every employee is able to fully understand materials and documents.</p> <p>Baffinland is proactive in addressing any potential language or cultural barriers. This is evident through the various activities which increase the use and awareness of Inuktitut and Inuit culture at site. These activities include;</p> <ul style="list-style-type: none"> <li>• Inuit Cultural Engagement Workshops provided to all employees at the project which share Inuit History, Customs and Traditions.</li> <li>• Updated mandatory Cultural Awareness Employee Orientation Program currently under development which will provide an awareness and understanding to all Baffinland employees.</li> <li>• Cultural Workshops available to both Inuit and Non-Inuit employees at least once per quarter where participants learn about key elements of Inuit culture. Continual celebration of Inuit Societal Days on site. These include Nunavut Day and International Inuit Day. In 2019 Baffinland engaged in a full week of celebration for Nunavut Day.</li> <li>• Annual Workplace Conditions Survey which is administered by QIA and Baffinland jointly. This survey provides an opportunity for employees to report back on workplace conditions. This survey has for the first time in 2019 been administered to both Inuit and Non-Inuit employees.</li> </ul>
4	QIA 2019 AMR SE #4	<p>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. QIA disagrees with Baffinland's assessment of in compliance for PC Condition 147. Baffinland has not provided any indication of what issues were contained in the Memorandum of Understanding with the GN.</p>	<p>PC Condition 147 is considered non-compliant. It is requested that Baffinland expand on the Memorandum of Understanding with the GN and any other actions that led or may come out of this to help employees housing situations.</p>	<p>Document Name: Appendix G. 19 and Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: Section 4.7.3, PC Condition 147 Page: 491</p>	<p>The Government of Nunavut and Baffinland Memorandum of Understanding is a public document and can be found on the Nunavut Legislative Assembly Website (<a href="https://assembly.nu.ca/sites/default/files/TD-178-5(2)-EN-GN-Baffinland-MOU.pdf">https://assembly.nu.ca/sites/default/files/TD-178-5(2)-EN-GN-Baffinland-MOU.pdf</a>). During the negotiations of this MOU it is Baffinland's understanding that the QIA was invited to become a signatory to the agreement.</p> <p>Under section 1 (a) "Barriers to Employment", Baffinland and the GN, "agree to cooperate to reduce barriers to employment that may result from delays in pre-employment health care services and disincentives from employment due to rent control policies for those residing in public housing."</p> <p>Baffinland provides access to Nunavut Housing Corporation information on site on an ongoing basis. This information is made available to any and all Nunavummiut who may require it. Materials on site were developed by the Nunavut Housing Corporation and Baffinland complies with a request from the Nunavut Housing Corporation to have this information available to employees on site.</p> <p>During the COVID-19 pandemic, Baffinland initiated conversations with the Nunavut Housing Corporation to ensure that Nunavummiut employees affected by the pandemic could access rent control reductions in line with Nunavut Housing Corporation policies and processes. Information was provided to employees by Baffinland Community Liaison Officers who also facilitates introductions to local housing authorities as and when requested.</p> <p>Baffinland notes that since PC Condition 147 was issued in 2012 the NHC implemented a new Public Housing Rent Scale, with a rent-gear-to-income sliding scale designed to ensure that public housing rents remain fair and affordable, even when new gainful employment is acquired by members of a household. Details of the Nunavut's Public Housing Rent Scale are available on the NHC website (<a href="http://www.nunavuthousing.ca/publichousing">http://www.nunavuthousing.ca/publichousing</a>) and undoubtedly contribute to the intent of PC Condition 147.</p>
5	QIA 2019 AMR SE #5	<p>There continues to be no adequate measuring of Project harvesting interactions and food security. BIMC needs to be considerably more proactive in addressing its effects in this realm. While acknowledging that there is clearly an effect being felt in this regard by Inuit, BIMC continues to fail to monitor these effects or identify ways in which they can be appropriately monitored.</p>	<p>QIA requests the Proponent not wait to be provided with improved monitoring methods by SEMWG and QSEMC, but to rather actively engage with these groups and provide its plans for addressing its monitoring obligations. Proponent to provide a list of next steps for fulfilling monitoring objectives, including reference to the role it envisions the fledgling Inuit Stewardship Plan will play in this work.</p>	<p>Document Name: Appendix G. 19 and Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: Section 4.7.4 Economic Development, Self Reliance and Contracting and Small Business Opportunities - PC Condition 148 Page: 495</p>	<p>Baffinland has committed to provide the necessary funding and support to QIA to conduct a Pond Inlet Country Food Baseline Study, and implement CRLU and Socio-Economic monitoring programs under the Inuit Stewardship Plan for the life of the Project. This work will be Inuit-led. Baffinland looks forward to receiving defined Project plans in the near future and then engaging in discussions regarding the role expected of Baffinland. Should Phase 2 not be approved Baffinland will work with QIA and the NIRB to address alternative next steps to ensure existing PC Conditions are met.</p>

**Table 1 - Response to QIA Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
6	QIA 2019 AMR SE #6	PC Condition 165 indicates 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. QIA disagrees with Baffinland's assessment of in compliance for PC Condition 165. Emergency shelters are not stationed every 1 KM along the Milne Inlet Tote Road, nor is there evidence that they have been placed in adequate numbers in Inuit-preferred locations.	PC Condition 165 be considered non-compliant. Baffinland is requested to work with QIA and Inuit to install emergency shelters as per what we understand the spirit and intent of the Project Certificate to be – to increase the protection of Inuit from adverse conditions when traveling in the Project-affected area. This will require engaging with QIA and Inuit on Inuit preferred locations and intervals between them where appropriate emergency shelters will be located. It may not be limited to along the Tote Road, given that the Tote Road and Inuit travel routes are not always aligned.	Document Name: Appendix G. 19 and Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: Section 4.7.7 PC Condition 165 Page: 545	Baffinland has assessed the effectiveness and distribution of the current emergency shelters on the Milne Inlet Tote Road. The current distribution aligns with Emergency Response Procedures and effectively mitigates safety hazards on the road. Ongoing traffic on the road allows for continual communications. Baffinland does not feel that emergency shelters stationed every 1km on the tote road would increase safety around the Project.
7	QIA 2019 AMR SE #7	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. The objective of this condition is to ensure members of the public can access shipping information on an as-required basis to inform potential users of the scheduled Project activities, which could require deviations to land users' schedules or routing and to answer any questions concerning ice conditions. Currently, Baffinland has stated there is a new communications protocol with Pond Inlet but does not specify whether Inuit are able to contact Shipping Operations staff directly with any questions. Moreover, there is no indication of an effort to make the public aware of this protocol.	It is requested that Baffinland clarify whether this communications protocol includes direct communication between Shipping Operations and Inuit and whether and to what extent there has been a campaign to spread awareness of this protocol.	Document Name: Appendix G. 19 and Baffinland Iron Mines 2019 Annual Report to the Nunavut Impact Review Board [NIRB Registry: 200521-08MN053-Mary River Project 2019 Annual Report-IA1E.pdf ; Baffinland Document Portal: Mary River Project 2019 NIRB Annual Report (Body).pdf] Section: Section 4.7.7 PC Condition 166 Page: 432	Baffinland's Shipping Communications Protocol includes a number of activities implemented by Baffinland to meaningfully engage residents of Pond Inlet on its shipping activities before the season starts, during, and after the shipping season has ended. Representatives from Baffinland's Shipping Department actively participate in these community engagement activities throughout the year and have thus been able to integrate community concerns into annual planning for each shipping season.  Baffinland's Shipping Monitors also play a critical role in providing liaison between Inuit and Baffinland's Shipping Department and represent an important part of the collective Baffinland team responsible for managing shipping operations throughout the season. This role was originally proposed by the MHTO who identified a need for more frequent engagement with Baffinland staff.  A summary of the communications protocol's key elements were discussed as part of the Pre-shipping Season and End of Season meetings held in Pond Inlet in 2019 and 2020 with representatives from the MHTO, the Hamlet of Pond Inlet and the QIA. During these meetings, feedback on the protocol is sought, and updates are made accordingly. With respect to broader engagement on the protocol, Baffinland's efforts have focused on ensuring widespread awareness of the implementation of activities described within the document, rather than the document itself. These efforts are well documented in PC Condition No. 15, 102, 163 and 166.
8	QIA 2019 AMR SE #8	Conditions of approval from the MHTO indicate the possibility that BIMC/Golder's aerial survey method might have an effect on narwhal harvesting success - was this impact observed? What changes and adaptive measures were introduced to mitigate against this if impacts were observed?	QIA requests that adaptive management responses related to the effects of monitoring be more clearly visible in the Annual Report and be discussed both in the context of biological studies related to Marine Mammals as well as research into impacts to Inuit harvesting.	Document Name: 200521-08MN053-App G22-MHTO Ltrs of Support for 2019 Monitoring Programs-IA1M Section: Letter of 3 May 2019 from Golder to MHTO Page: 4	There was no evidence of the aerial surveys having an adverse effect on narwhal distribution or abundance in the RSA, and by extension, on narwhal harvesting success. As such, no adaptive management measures were required to manage this potential effect. If future aerial surveys are shown to result in effects on narwhal abundance or distribution in the RSA, BIM will work with the MHTO to establish suitable adaptive management measures for this purpose.
9	QIA 2019 AMR SE #9	What is meant by the discussion topic "community and social stability"? What is this term describing, and why does it not seem to appear elsewhere, for example in other documentation of socio-economic impacts and monitoring?	The Proponent is requested to define what is meant by "community and social stability" and identify examples in monitoring or other project literature where "community and social stability" is defined and where community concerns about this subject are meaningfully addressed.	Document Name: 200521-08MN053-App B-Community Engagement Record-IA1E Section: Appendix b - 2019 Community Engagement Records Page: 2	The meeting where "community and social stability" is referred to occurred in Igloolik on January 8, 2019. This was a public meeting where all community members were invited to participate in discussion with Baffinland about topics of interest.  The phrase and context around the topic were expressed by a meeting attendee during this public meeting. There is no set definition of the term referenced by QIA. The comment made by the meeting attendee is as follows, "Are concerned about our social wellbeing and environment. We live in a very expensive place. We will have more concerns in the future".

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Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
10	QIA 2019 AMR SE #10	Have notes or other records of discussions around IQ with HTO representatives been released or referenced in a meaningful and trackable way within project literature? The January 14, 2019 meeting clearly covered a significant number of topics. QIA is not aware of a meaningful record of this meeting, including any tracking of concerns or issues raised.	The Proponent is requested to provide notes and other records of meetings where communities or community reps are engaged, and shared on the public record in such a way as to provide clear evidence that when Inuit raise an issue or voice an opinion it is noted and evidence can subsequently be provided that it has been appropriately addressed.	Document Name: 200521-08MN053-App B-Community Engagement Record-IA1E Section: Appendix b - 2019 Community Engagement Records Page: 3	<p>Baffinland notes that the Project Certificate does not include a term and condition which requires Baffinland to provide notes of meetings through its Annual Report to the Board.</p> <p>Baffinland has committed to the development of Community Specific Engagement Guidelines should the Phase 2 Proposal be approved. Through the development of these guidelines with the North Baffin Communities, Baffinland shall seek the interest of community representatives on the sharing of meeting notes and minutes in a public format.</p> <p>The workshop referenced by QIA which occurred on January 14, 2019 was called "Impact and Mitigation Workshop #1". This workshop occurred at the Mary River Project Sites and was focused on project risks and mitigation measures associated with the Phase 2 Proposal. This meeting was a part of a series of three meetings on this topic. These workshops were conducted under Nunavut Research Institute License #02 001 19N-M. QIA was invited to participate in all workshops and did have a representatives attend the workshop which took place on January 14, 2019.</p> <p>The final bilingual workshop report was submitted on the public record as a part of the Phase 2 Assessment Process. This final workshop report provides an accurate summary of the main points of discussion during the workshops and issues and concerns raised. A draft of the final workshop report was provided to workshops participants for review and the content was verified in a dedicated verification workshop. It was submitted with Baffinland's responses to Final Written Submissions on October 16, 2019.</p> <p><b>Reference: Baffinland Iron Mines Corporation Response to Final Written Submissions. Nunavut Impact Review Board Public Registry Identification: 327146 and 327147. Submitted 2019-10-16.</b></p>
11	QIA 2019 AMR SE #11	There is limited correlation between the topics being monitored under the Resource and Land Use category and the indicators used. Visitor days and wildlife compensation claims are not appropriate, accurate or reliable indicators of the variety of avoidance behaviours which are indicated as topics being monitored. Sensory disturbance, harvester safety and routing choices are all qualitative questions which require different approaches to monitor.	BIMC is requested to work with QIA to identify more appropriate techniques to monitor changes in Resource and Land Use than those currently in use. These should involve Inuit-designed indicators of changing harvesting patterns and behaviours and should be designed to identify changes as well as reasons.	Document Name: 200521-08MN053-App G21-2019 Socio Economic Monitoring Report-IA1E Section: Socio-Economic Monitoring Indicators Page: 7	<p>As part of the Inuit Certainty Agreement (ICA) which was signed by Baffinland and the QIA in July 2020, the topic of Culture Resources and Land Use figures prominently.</p> <p>Baffinland looks forward to the continued collaboration with QIA on the implementation of this Agreement, specifically through the Culture Resource and Land Use and Adaptive Management working groups. Baffinland has committed to working with, and supporting financially, QIA to develop Inuit designed objectives, triggers, indicators, and responses for a range of topics, including Culture Resource and Land Use through an Inuit Stewardship Plan.</p> <p>Baffinland fully expects to report to the Board on the outcomes of this work and looks forward to updating its Socio-Economic Monitoring Plan in line with the development of Inuit designed indicators as appropriate and required.</p> <p>Should Phase 2 not proceed, Baffinland commits to working with the QIA to update its monitoring programs to include new techniques to monitor changes in Culture Resource and Land Use</p>
12	QIA 2019 AMR SE #12	Claims that project harvesting interactions are being tracked mean very little as Baffinland has completed no baseline study of preconstruction harvesting amounts, patterns or diets and existing food security research relied on within the Socio-economic monitoring work is high-level, not community specific and largely focused on store-bought rather than harvested country foods.	Baffinland must complete a baseline food study which meaningfully addresses diets, country food harvesting and the role that country food plays in food security. This study should subsequently inform analysis of effects pathways whereby project effects on harvesting are impacting community food security and access to country food. It is recognized by QIA that the Proponent is committed to a Country Food Baseline study with the community of Pond Inlet; however, details for this work have yet to be defined.	Document Name: 200521-08MN053-App G21-2019 Socio Economic Monitoring Report-IA1E Section: Socio-Economic Monitoring Indicators Page: 8	<p>Baffinland has committed to provide the necessary funding and support to QIA to conduct a Pond Inlet Country Food Baseline Study. This work will be Inuit-led. Baffinland looks forward to receiving from QIA a defined Project plan that contains the details sought under this monitoring comment.</p> <p>Baffinland will have the ability to review the design to ensure baseline information is consistent with monitoring requirements or to suggest where additional information could help to inform Baffinland's management systems and/or food security initiatives.</p> <p>As this work is completed, Baffinland looks forward to providing updates to the Board.</p>
13	QIA 2019 AMR SE #13	The statement "...the amount of country food harvested per level of effort is not anticipated to change meaningfully." is not being meaningfully addressed by existing monitoring techniques or indicators. No baseline study on harvesting effort has been conducted and there is no current effort to track change. There has been no documented attempt to test the veracity of this FEIS prediction, and it is a significant shortfall in BIMC monitoring efforts.	This statement should be retracted unless the Proponent can support it with additional evidence. In addition, the Proponent needs to work with QIA to identify more appropriate techniques to monitor changes in Resource and Land Use than those currently in use. These should involve Inuit-designed indicators of changing harvesting patterns, behaviours and harvesting effort and should be designed to identify changes in harvester behaviour as well as reasons. This should be designed to work in concert with ongoing tracking of food harvesting to provide meaningful monitoring of changing effort levels for the procurement of country food.	Document Name: 200521-08MN053-App G21-2019 Socio Economic Monitoring Report-IA1E Section: Section 8. Resource and Land Use: FEIS Predictions Page: 65	<p>Through the submission of the FEIS, Baffinland made many impact predications which are on the public record. It is through its monitoring programs that the Company monitors against predictions and implements adaptive management at the Project as needed should predictions be exceeded. Baffinland is not in a position to retract statements from the FEIS, nor does it see the value in doing so.</p> <p>As part of the Inuit Certainty Agreement (ICA) which was signed by Baffinland and the QIA in July 2020, the topic of Culture Resource and Land Use figures prominently.</p> <p>Baffinland looks forward to the continued collaboration with QIA on the implementation of this Agreement, specifically through the Culture Resource and Land Use and Adaptive Management working groups. Baffinland has committed to working with, and supporting financially, QIA to develop Inuit designed objectives, triggers, indicators, and responses for a ranges of topics, including Culture Resource and Land Use through an Inuit Stewardship Plan. Baffinland expects that the outcome of this work will achieve the objectives stated in the monitoring comment.</p> <p>Baffinland fully expects to report to the Board on the outcomes of this work and looks forward to updating its Socio-Economic Monitoring Plan in line with the development of Inuit designed indicators as appropriate and required.</p> <p>Should Phase 2 not proceed, Baffinland commits to working with the QIA to update its monitoring programs to include new techniques to monitor changes in Culture Resource and Land Use.</p>

**Table 1 - Response to QIA Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	QIA Cmt. #	Reviewer's Detailed Comment	QIA Recommendations	Reference Section	Baffinland's Response
14	QIA 2019 AMR SE #14	Visitor days and changes there-in are a virtually meaningless number unless presented alongside other related factors such as weather data, snow cover, group size, destination of groups etc. Currently no conclusions can be drawn from changes in the number of visitor days as to any project effects on harvesting patterns/behaviours in the Project area.	Additional data should be recorded alongside visitor days and should be considered in the analysis of visitor days to provide additional explanation of any changes.	Document Name: 200521-08MN053-App G21-2019 Socio Economic Monitoring Report-IA1E Section: Section 8. Resource and Land Use: Key Findings Page: 65,72	Baffinland notes that its visitor logs are voluntary and the Company cannot force any individual to provide information to the Company on their group size, destination, or purpose for travelling through the Project Area. As this is a voluntary log, it is important to note that data reported annually will not be consistent as individuals and parties may choose to provide varying levels of information.  Baffinland commits to reviewing its existing visitor log against the information presented in its Annual Socio-Economic Monitoring report to determine if additional information such as group size, destination of groups can be collected. Weather data and snow cover will not be associated with this log but reviewer can reference weather data in the Terrestrial Annual Report.
15	QIA 2019 AMR SE #15	The statement "(WCF) claims provides insight into land use and harvesting issues which may be arising because of the Project." is inaccurate on two fronts. The WCF claims provide a record of direct harvesting loss due to the Project - not "issues which may be arising". The insights that currently be accurately said to be provided by changes in claim amounts are that Inuit harvesting continues to be impacted by the Project - the WCF claims system is not designed to track indirect effects to harvesting or the land observed or experienced by hunters.	BIMC is requested to work with the MHTO and QIA to identify more meaningful ways to track data related to harvester-observed project effects. This should include an MHTO-led review of the WCF system and the information tracked by claims, as well as BIMC working with QIA to identify more appropriate techniques to monitor changes in Resource and Land Use than those currently in use. These should involve Inuit-designed indicators of changing harvesting patterns and behaviors and should be designed to identify changes as well as reasons.	Document Name: 200521-08MN053-App G21-2019 Socio Economic Monitoring Report-IA1E Section: Section 8.2 Wildlife compensation fund claims Page: 66	The Wildlife Compensation Fund as outlined in the Mary River Project Inuit Impact and Benefit Agreement (IIBA) is solely administered by the QIA as noted in IIBA Article 17.6.4 which states, "QIA has created, and will continue to manage and administer the Wildlife Compensation Fund." As such, Baffinland is not in a position to comment on the effectiveness of fund administration as it relates to a MHTO led review of the "WCF System and the information tracked by claims".  As part of the Inuit Certainty Agreement (ICA) which was signed by Baffinland and the QIA in July 2020, the topic of Wildlife Compensation and Culture, Resource and Land Use figures prominently.  Baffinland looks forward to the continued collaboration with QIA on the implementation of this Agreement, specifically through the Culture Resource and Land Use and Adaptive Management working groups. Baffinland has committed to working with, and supporting financially, QIA to develop Inuit designed objectives, triggers, indicators, and responses for a ranges of topics, including Culture Resource and Land Use through an Inuit Stewardship Plan. Baffinland is further in support of modification to the existing Wildlife Compensation Fund following requisite engagement between the QIA and MHTO.  Baffinland fully expects to report to the Board on the outcomes of this work and looks forward to updating its Socio-Economic Monitoring Plan in line with the development of Inuit designed indicators as appropriate and required.

**Table 2 - Response to GN's Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	Reviewer's Detailed Comment	GN Recommendations	Reference Section	Baffinland's Response
1	<p>The Proponent conducted snowbank height monitoring from November 2018 to April 2019 with one survey conducted in each of these months. The Proponent does not provide details regarding the timing of these monthly surveys relative to road maintenance activities in any of Appendix G.12 of the 2019 Annual Report (BIM 2020), or the 2019 Mary River Project Terrestrial Environment Annual Monitoring Report (EDI 2020). It is therefore, challenging to assess how representative the survey results are of the average snowbank height conditions present along the road.</p> <p>Excessively high or deep snowbanks may pose a risk to wildlife by several mechanisms. High banks may obstruct drivers' viewing range and increase risk of vehicle collisions with wildlife; wildlife on roads may be trapped within steep banked sections of road; and high/deep banks may deter wildlife from crossing roads. The snowbank height monitoring results reported in the draft report indicate that 97% of snowbanks were less than 1m high when measured. The general inference from this result is that compliance with snowbank height limits is high and snowbanks are therefore unlikely to pose a risk to wildlife. However, the methods section of the report does not provide details regarding the timing of monthly snowbank monitoring surveys relative to road maintenance activities; specifically snowplowing and snowbank management (EDI 2020, Section 5.2.1). It is thus unclear whether the timing of this monitoring activity is occurring independently of road management activities. Without this information, it is difficult to assess whether snowbank monitoring results provide an unbiased assessment of prevailing conditions along the Tote Road.</p>	<p>The GN requests that the Proponent, in the methods section, explain the how the timing of each monthly snowbank survey was determined. In the particular, the GN recommends that the following questions be answered:</p> <ul style="list-style-type: none"> <li>- Was the date within each month selected at random or the same day each month?</li> <li>- Was the survey within each month timed to coincide with certain weather or road maintenance events?</li> <li>- Prior to selecting the date and time of day for each survey, were survey staff aware of planned road maintenance activities during the selected date and time?</li> <li>- Similarly, were road maintenance staff aware of the timing of snowbank surveys before they occurred?</li> <li>- In other words, was snowbank monitoring independent of snow management activities and therefore unbiased?</li> </ul>	<ul style="list-style-type: none"> <li>- Baffinland Iron Mines (BIM). (2020). 2019 Annual Report to the Nunavut Impact Review Board.</li> <li>- Environmental Dynamics Inc. (EDI). (2020). 2019 Mary River Project Terrestrial Environment Annual Monitoring Report.</li> </ul>	<p>Snowbank compliance surveys are conducted randomly and opportunistically when the Tote Road is safe to drive and Site Environment staff are available to conduct the survey. Surveys are generally avoided during periods of heavy snowfall due to safety concerns associated with driving and reduced visibility. Snowbank compliance surveys are conducted independently of road maintenance activities, and survey dates are not communicated with road maintenance teams. However, road maintenance and snow clearing activities are on-going on a regular basis throughout the winter season and are increased following significant snowfall events as expected, and therefore the timing of snow bank surveys relative to snow clearing activities is not material. It is noted that QIA employed Environmental Monitors present on Site participate in this monitoring program, and regularly participate and provide oversight of various Baffinland-led monitoring activities at the Mary River Project. The methods will be reviewed and revised as necessary to address the GN's concern regarding perceived bias.</p>
2	<p>The routes used by the Project's marine shipping during 2019 cover an area considerably larger than the nominal shipping route used in the Project's final environmental impact statement (FEIS) to assess impacts on marine wildlife. The 2019 annual report does not discuss this deviation from the nominal shipping route and does not provide an assessment of the spatial extent of the shipping zone of influence, as required under Project certificate terms and conditions 103 and 104. The GN further notes that no definition is provided for the term "significant deviation" as used to describe ships that do not follow the nominal shipping route.</p> <p>In assessing the effects of Project shipping on marine mammals in the FEIS, the Proponent used a nominal shipping route to and from Milne Inlet (see Figure 1, below) and employed mitigation measures to minimize the spatial extent of disturbance such as the assumption that transiting vessels would adhere to the same route during round-trips (FEIS, Volume 8).</p>  <p>Figure 1. Nominal marine shipping route for Milne Inlet port (Source: Technical Service Document 24, Marine Mammal Effects Assessment, FEIS Addendum)</p> <p>Project certificate, term and condition #103 states that:          "The Proponent shall report annually to the NIRB regarding project-related ship track and sea ice information, including:          (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;          (d) An assessment of the level of adherence to the nominal shipping route and the spatial extent of the shipping zone of influence."</p> <p>Project certificate term and condition #104 part (b) states that:          "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."</p> <p>The GN is concerned that the 2019 annual report (BIM 2020) is not fully compliant with terms and conditions 103(c), (d) and 104(b). The Proponent provides a map of ship tracks (see Figure 2, below) in the annual report and concludes that there were no significant deviations from the nominal shipping route in 2019 and have been no significant deviations during the first 5 years (2015-2019) of shipping (BIM 2020, Section 4.6.11).</p>	<p>Similar to recommendations offered in response to the 2018 annual report, the GN offers the following recommendation to address these issues:</p> <ol style="list-style-type: none"> <li>1. That the NIRB provide a definition of the term 'significant deviation' as used to describe the tracks taken by Project shipping relative to the nominal shipping route used in the FEIS. In future annual reports, Project shipping activity should be reported under terms and conditions 103 and 104 using this definition. The need to provide this definition is made more important by the increase in shipping associated with proposed Phase 2 project.</li> <li>2. That the Proponent, in accordance with term and condition 104(b), summarize instances of deviation from the nominal shipping route (as depicted in maps presented in the FEIS, see Figure 1 above) that occurred in 2019 in accordance with the definition of 'significant deviation' provided by NIRB. That Baffinland also provide justification for significant deviations and the observed environmental impacts.</li> <li>3. That the Proponent, in accordance with term and condition 103(d), provide an assessment of the spatial extent of the shipping zone of influence in 2019. This assessment should be quantitative in nature using results from marine mammal behavioural monitoring that has revealed the range over which marine mammals such as narwhal respond to Project-related shipping. It is recommended that the assessment include estimates of the total area over which noise from Project shipping influences marine mammal behaviour, in particular for narwhal. Estimates should be expressed in absolute terms and as a proportion of the marine Local Study Area (LSA) and Regional Study Area (RSA). This area should also be mapped to illustrate the cumulative disturbance footprint of shipping in 2019.</li> </ol>	<p>Baffinland Iron Mines (BIM). (2012). Final Environmental Impact Statement (FEIS) for the Mary River Mine, volume 8, Marine Environment</p> <ul style="list-style-type: none"> <li>- Baffinland Iron Mines (BIM). (2020). 2019 Annual Report to the Nunavut Impact Review Board.</li> <li>- Baffinland Iron Mines (BIM). (2018). Final Environmental Impact Statement (FEIS) Addendum for the Mary River Phase 2 Project Proposal. Technical Service Document 24 – Marine Mammals</li> </ul>	<ol style="list-style-type: none"> <li>1) Baffinland acknowledges the GN's comment directed to the NIRB;</li> <li>2) This comment requires NIRB's response in order for Baffinland to respond. Baffinland acknowledges that in some cases, deviation from the nominal shipping route may occur (i.e. due to weather conditions, or for safety reasons such as to minimize interactions with community vessels). Baffinland does note however, that deviations from the nominal shipping route, remain within the LSA and RSA that has been assessed and monitored for. The following instances were summarized as part of PC 103 in the 2019 Annual Report to the NIRB:             <ul style="list-style-type: none"> <li>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;</li> <li>o On 23 to 24 August, the Golden Bull, Sagar Samrat and NS Yakutia were force 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;</li> <li>o Figure 4.16 in the 2019 Annual Report to the NIRB 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.</li> <li>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).</li> </ul> </li> <li>3) The spatial extent of the shipping Zone of Influence (ZOI) is equal to the full extent of the Marine Mammal Local Study Area (LSA), hence why monitoring for Project effects occurs within the full extent of the LSA and RSA identified for the Project. An assessment of effects within the LSA, and the potential for effects related to Project shipping have been well documented through the EA processes for this Project. Baffinland encourages the GN to review these materials to familiarize reviewers with the spatial boundaries of the effects assessment. It is unclear to Baffinland what component of this response remains outstanding from previous responses provided by Baffinland in response to reviewer comments on the 2018 Annual Report to the NIRB.</li> </ol>

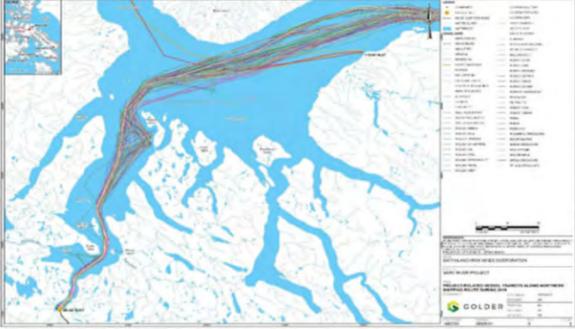
Cmt. #	Reviewer's Detailed Comment	GN Recommendations	Reference Section	Baffinland's Response																
	<p>The GN notes the following:</p> <ul style="list-style-type: none"> <li>- The annual report provides a map of ship tracks for 2019 but this map does not include the nominal shipping route for comparison, as required under term and condition 101 (c).</li> <li>- The Project Certificate does not define the term 'significant deviations' as used to describe shipping under term and condition 104(b). However, is the GN notes there are many individual ship tracks that appear to deviate from the nominal shipping route (see Figure 2, below). Moreover, the combined ship tracks for 2019 create a shipping 'lane' that is greater than 10km wide in some places (see Figure 2, below). This is clearly larger than the nominal shipping route used in the Project's effects assessment. This arguably constitutes a significant deviation. The Proponent should provide rationale in the report for this deviation and the associated environmental impacts, per term and condition 104(b).</li> <li>- The Proponent does not provide an assessment of the shipping zone of influence (ZOI) in the report, as required under term and condition 103(d). Clearly, the 2019 ZOI will be larger than estimates generated based on the assumption that ships will adhere to the nominal route presented in the FEIS. The Proponent could use data on marine mammal responses to shipping, such as that reported under term and condition 101(d) in the annual report, to estimate the spatial footprint of disturbance generated by Project's obvious shipping lane (BIM 2020, section 4.6.11) Figure 2. Ship tracks for the Mary River Project's 2018 operations. (Source: BIM (2020). Figure 4.16)</li> </ul> 																			
	<p>In section 4.6.8 of its Annual Report, the Proponent provides an overview of its 2019 monitoring activities to address terrestrial concerns, with note of particular emphasis on its caribou monitoring (BIM 2020). Table 4.20 of the annual report (see below) lists the possible Project effects on the terrestrial environment and the monitoring programs used to assess these effects.</p> <table border="1"> <thead> <tr> <th>Component</th> <th>Effects</th> <th>Monitoring Program</th> <th>Impact Evaluation</th> </tr> </thead> <tbody> <tr> <td>Habitat Loss</td> <td>Direct habitat loss due to the Project footprint, and indirect habitat loss due to sensory disturbances</td> <td>Height of Land monitoring; snow track and snow bank monitoring; incidental observations.</td> <td>Within FEIS predictions</td> </tr> <tr> <td>Restriction of Movement</td> <td>Project infrastructure and the tote road act as a barrier to the movement of caribou</td> <td></td> <td></td> </tr> <tr> <td>Mortality</td> <td>Mortality resulting from vehicle collisions or project-induced hunting</td> <td>Incidental observations; biologists and other staff on-site; no mortalities observed</td> <td>Within FEIS predictions</td> </tr> </tbody> </table> <p>Figure 3. Table 4.20 from BIM 2019 Annual Report.</p> <p>The Proponent concludes that the Project's effects on the distribution and movements of caribou are within FEIS predictions. This conclusion is based largely on the results of two monitoring programs; height-of-land (HOL) surveys and snow track surveys. The Proponent describes the methods and amount of time employed in conducting these surveys, and the results of the surveys. The Proponent states that in 2019 a total of 24 hours 20 minutes of HOL survey effort and 3 one-day snow track surveys were undertaken, and that no caribou were detected during either type of survey (see Terrestrial Monitoring Report (EDI 2019)). These surveys have failed to detect caribou since 2013.</p> <p>The GN also detailed these same concerns in comments on the Proponent' 2014, 2015, 2017, and 2018 annual reports. The Government of Nunavut (GN) has repeatedly expressed concern that these surveys continue to fail in meeting the objective of detecting caribou for the purposes of mitigating and monitoring project related effects on caribou. The fact that no caribou were observed during the last 6 years of these surveys could be a result of the following:</p> <ol style="list-style-type: none"> <li>1) Caribou were not detected because they are simply not present in the area during the survey, owing to low population density or low survey effort; or</li> <li>2) Caribou were not detected due to avoidance behaviour and/or deflection from Project infrastructure and activities.</li> </ol> <p>The GN is concerned that the current study design and level of survey effort does not offer the power to distinguish between these two possibilities. As such, the GN deems BIM to be non-compliant with Project terms and conditions 53 (b) and (c), and 58 (b). Project certificate term and condition 53 part (b) states that:</p>	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	<p>The GN again reiterates its previous requests made over the last 5 years that the Proponent monitor Project effects on caribou as required by the Terms and Conditions by:</p> <ul style="list-style-type: none"> <li>- Significantly increasing the HOL survey effort such that a large, statistically defensible portion of the year when caribou may be present along the road corridor is being observed (similar to what the Proponent does for monitoring narwhal at Bruce Head) Or, given the low densities of caribou in the PDA and the survey area, the Proponent could alternatively:</li> <li>- Invest the effort of an improved HOL survey into regional monitoring programs led by the GN, including aerial surveys and collaring programs, so as to increase effort in areas of the PDA where caribou may be present.</li> </ul> <p>Of these two options, the GN favors the latter based on technical considerations.</p> <p>The GN expects the Proponent to work closely with the GN and the Project's Terrestrial Ecosystem Working Group (TEWG) when developing and/or modifying mitigation and monitoring programs. The GN has worked via the TEWG to bring forward these concerns with support from other members. However, responsiveness on the part of the Proponent, in terms of revising monitoring plans, has been minimal.</p> <p>The GN requests that clear direction be provide by the NIRB to the Proponent on this matter.</p>	<ul style="list-style-type: none"> <li>- Baffinland Iron Mines (BIM). (2020). 2019 Annual Report to the Nunavut Impact Review Board.</li> <li>- Environmental Dynamics Inc. (EDI). (2020). 2019 Mary River Project Terrestrial Environment Annual Monitoring Report.</li> <li>- Government of Nunavut (GN). (2019). Comments on Baffinland Iron Mines 2018 Annual Report to the Nunavut Impact Review Board.</li> </ul>	<p>Baffinland has acknowledged the GN's concerns regarding caribou monitoring and, in principle, agrees over the life of the Project. The baseline survey work started with numerous aerial surveys, and a substantial contribution to the 2008–2011 GN-led caribou collaring program (e.g., (Jenkins 2008)). In addition to the Inuit traditional knowledge information collected on caribou abundance and population cycles, that information was used to formulate the baseline and provide a basis for monitoring program planning during operations — all of which the GN and the TEWG have been privy to.</p> <p>Baffinland has supported numerous GN regional-level surveys on north Baffin Island, beginning with their Island-wide surveys first conducted in 2014 (Campbell et al. 2015), and intermittently since then (e.g., (Pretzlaw 2016, Anderson 2016, Ringrose 2018), on a survey-by-survey request. In attempts to develop with the GN a longer-term strategic approach to north Baffin Island caribou monitoring, which would see consistent support from Baffinland formalized, Baffinland attempted to develop a memorandum of understanding (MOU) in November 2017. At the time, the GN was not prepared to make the commitment required for an MOU with Baffinland in regards to its regional efforts for caribou surveys.</p> <p>Given the efforts described above, and the current work in developing a research contribution agreement with the GN, it is incorrect for the GN to characterize Baffinland's responsiveness to revising monitoring plans as minimal. Further, as additional response to the previous requests by the GN to better quantify effects of the project on caribou distribution and movements, BIM initiated a study to design a statistically robust monitoring program that will have the power to detect changes. BIM presented options for study design and data acquisition at the 22 June 2020 TEWG meeting. The objective of the presentation was to communicate the options being considered and provide opportunity for TEWG members to give feedback and suggestions early in the task to help direct the study further. The GN did not provide feedback on the approach at that TEWG meeting or subsequently.</p> <p>Regional studies supported to date by Baffinland (in addition to Baffinland-led baseline surveys and current on-site monitoring):</p> <ul style="list-style-type: none"> <li>Ringrose, J. 2018. Baffin Island Caribou Composition Summary Report 2015–2018. Government of Nunavut Department of Environment, Pond Inlet, Nunavut. 18 pp.</li> <li>Anderson, M. 2016. North Baffin caribou fall demographic composition survey, September 2016. Status Report 2016-XX. Government of Nunavut, Department of Environment, Wildlife Research Section, Igloolik, Nunavut. 9 pp.</li> <li>Pretzlaw, T. 2016. 2015 Government of Nunavut North Baffin Island caribou fall composition/demographic survey. BIM Final Report. 5 pp.</li> <li>Campbell, M., Goorts, J., Lee, D.S., Boulanger, J., and Pretzlaw, T. 2015. Aerial abundance estimates, seasonal range use, and</li> </ul>
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																	

Table 2 - Response to GN's Comments on Baffinland's 2019 Annual Report to the NIRB

Cmt. #	Reviewer's Detailed Comment	GN Recommendations	Reference Section	Baffinland's Response
3	<p>"The Proponent shall demonstrate consideration for the following:</p> <p>b. 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."</p> <p>Term and condition 53(b) refers to monitoring and mitigation measures for caribou and appears to contemplate that one of the purposes of monitoring will be to trigger mitigation measures, such as road traffic or aircraft management, when caribou are detected near the Project. The 2019 annual report (BIM 2020) points to the results from height-of-land monitoring as evidence of compliance with this term and condition. For 2019, a total of 24 hours and 20 minutes of height-of-land surveys were conducted during which no caribou were observed (EDI 2020, Section 5.3.2). This level of monitoring represents 0.3% of the time when caribou could be present near the Project. For the remaining 99.8% of the time there was no dedicated monitoring program to detect caribou near the Project in 2019. As previously noted by the GN in response to the 2014, 2015, 2017 and 2018 annual reports, this level of monitoring is insufficient and does not appropriately "demonstrate consideration" as required under term and condition 53. Project certificate term and condition 53 part (c) states that:</p> <p>"The Proponent shall demonstrate consideration for the following:</p> <p>c. Evaluation of the effectiveness of proposed caribou crossings over the railway, Milne Inlet Tote Road and access roads as well as the appropriate number."</p> <p>As evidence of compliance with this term and condition, the 2019 report points to the results of higher than the current effort. The study designs rely on behavioural observations to indicate how caribou might be interacting with Project infrastructure and activities. This approach is only effective when caribou are frequently observed, such as in instances of high caribou population density.</p> <p>The requirement, under term and condition 58 (b), to conduct a detailed analysis of wildlife responses to operations cannot be fulfilled because BIM has not, since 2013, applied appropriate monitoring effort and/or an appropriate methodology to: (1) Collect the data necessary for this analysis; or (2) Prove, statistically, that such data cannot be collected due to lack of caribou interactions with the Project. The GN thus maintains that the Proponent is non-compliant with term and condition 58 (b).</p> <p>In summary, the caribou monitoring programs implemented by the Proponent since 2013 do not provide an adequate basis for detecting caribou for the purpose of implementing day-to-day mitigation measures nor do they provide a means for accurately and reliably monitoring Project effects on caribou in-order to facilitate adaptive management.</p>			<p>spatial affiliations of the barren-ground caribou (<i>Rangifer tarandus groenlandicus</i>) on Baffin Island — March 2014. Technical Report Series — No. 01-2015. Government of Nunavut Department of Environment, Iqaluit, Nunavut. 179 pp.</p> <p>Jenkins, D. 2008. North Baffin caribou collaring program — field summary report. Government of Nunavut Department of Environment. 10 pp.</p>

Cmt. #	Reviewer's Detailed Comment	GN Recommendations	Reference Section	Baffinland's Response																																								
4	<p>The Government of Nunavut (GN) has identified an inconsistency in the Proponent's reporting of data results from the 2019 Inuit Employee Survey for the migration changes of Inuit employees and contractor residence and community. The Proponent has provided tables of these results.</p> <p>Table 4.37: Changes in Inuit Employee and Contractor Residence and Community (2019 Inuit Employee Survey Results)</p> <table border="1"> <thead> <tr> <th>Type of Change</th> <th>Number of Respondents</th> <th>Percentage of Respondents</th> </tr> </thead> <tbody> <tr> <td>Residence changed in the past 12 months, within existing community</td> <td>1</td> <td>1.4%</td> </tr> <tr> <td>Residence changed in the past 12 months, moved to new community</td> <td>2</td> <td>2.8%</td> </tr> <tr> <td>Residence did not change in the past 12 months</td> <td>53</td> <td>74.6%</td> </tr> <tr> <td>Unknown</td> <td>15</td> <td>21.1%</td> </tr> <tr> <td>Total</td> <td>71</td> <td>99.9%</td> </tr> </tbody> </table> <p>Table 4.39: Inuit Employee and Contractor Migration Intentions (2019 Inuit Employee Survey Results)</p> <table border="1"> <thead> <tr> <th>Migration Intentions</th> <th>Number of Respondents</th> <th>Percentage of Respondents</th> </tr> </thead> <tbody> <tr> <td>Plan to move residences in the next 12 months, within existing community</td> <td>4</td> <td>5.6%</td> </tr> <tr> <td>Plan to move residences in the next 12 months, to a new Community</td> <td>8</td> <td>11.3%</td> </tr> <tr> <td>Do not plan to move residences in the next 12 months</td> <td>46</td> <td>64.8%</td> </tr> <tr> <td>Unknown</td> <td>13</td> <td>18.3%</td> </tr> <tr> <td>Total</td> <td>71</td> <td>100.0%</td> </tr> </tbody> </table> <p>In comparison, the corresponding results are summarized in Table 4.62.</p> <p>Table 4.62: 2019 Monitoring Results and Trends for Selected Socio-Economic Indicators</p> <table border="1"> <thead> <tr> <th>Indicator / Topic</th> <th>Summary</th> </tr> </thead> <tbody> <tr> <td>Employee and contractor changes of address, housing status, and migration intentions</td> <td>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.</td> </tr> </tbody> </table> <p>The GN has identified the data sources for Tables 4.37, Table 4.39, and Table 4.62 are from the same topics in the 2019 Inuit Employee Survey, however, the percentages are inconsistent where they should be equal.</p> <p>The GN recognizes the Proponent is compliant in their Project Certificate requirements to report on population movement data and the administration of a voluntary survey (Project Certificate No. 005 Amendment 3, Terms and Conditions No. 133 and 168). The migration of Inuit workers from Nunavut to other communities and to southern Canada is of high importance as it may impact communities permanently. Clarification of Inuit employee and contractor migration data for 2019 will ensure the efficacy of the Proponent's socio-economic monitoring program.</p> <p>A revision of the figures provided is recommended to ensure consistency and clarity. The percentages given in the largest box of page 555 differ from those found on pages 456 &amp; 458, although their definitions and sources appear identical. If these changes are not required, please add clarity on the origin of this data. From the information presented, the figures above seem to all come from a unique 2019 Inuit Employee Survey.</p>	Type of Change	Number of Respondents	Percentage of Respondents	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%	Total	71	99.9%	Migration Intentions	Number of Respondents	Percentage of Respondents	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%	Total	71	100.0%	Indicator / Topic	Summary	Employee and contractor changes of address, housing status, and migration intentions	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.	<p>The GN requests that the Proponent:</p> <ol style="list-style-type: none"> <li>1. Make revisions to the percentages outlined in Table 4.62 to reflect the results in Table 4.37.</li> <li>2. Provide clarity on the origin of the data relating to whether the recommended changes are not required.</li> </ol>	<p>200521-08MN053 Mary River Project 2019 NIRB Annual Report, May 2020 - Section No. 4 Performance on PC Conditions, pp. 456-458 Tables 4.37 and 4.39; p. 555 Table 4.62</p>	<p>The percentage figures outlined in the summary table (4.3.7) were calculated excluding 'unknown' results from the total number of surveys. Baffinland acknowledges that this was not clear in the Final Report. For clarity and consistency, Baffinland agrees to update these numbers to include the total number of participants (including those who responded 'unknown').</p> <p>REPLACE:</p> <p>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.</p> <p>WITH:</p> <p>4.2% of respondents to the 2019 Inuit Employee Survey changed residences in the past 12 months. 2.8% moved to a different community and 1.4% moved within their existing community. 11.3% planned to move to a different community in the next 12 months. 5.6% planned to move away from the North Baffin LSA. 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**Table 2 - Response to GN's Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	Reviewer's Detailed Comment	GN Recommendations	Reference Section	Baffinland's Response
5	<p>The Government of Nunavut (GN) acknowledges the Proponent's efforts to consult with the Department of Family Services regarding childcare availability, and the various initiatives and priorities addressed on the topic of childcare in the affected communities. Despite these efforts, the GN has identified a gap in the communication between the Proponent and the GN Department of Education (GN-EDU), Early Childhood Education division.</p> <p>The 2019 Annual Report for the Mary River Project states that "Appropriate community-level indicator data are currently unavailable for the topic of childcare availability and costs[...] Inadequate access to childcare in the Local Study Area (LSA) may be creating some barriers to increased employment of women at the Project."</p> <p>The Proponent is not adequately consulting with the GN-EDU, Early Childhood Education division to mitigate this issue.</p> <p>The GN-EDU, Early Childhood Education division is responsible for licensing childcare facilities, and offers funding to support start-up costs, operation and maintenance, and training. However, facilities are operated by communities and/or non-profit organizations in the territory.</p> <p>The GN-EDU, Early Childhood Education Division collects information that may further contribute to understanding childcare availability in communities. Through the Qikiqtaaluk Socio-Economic Monitoring Committee (QSEMC) and the Socio-Economic Monitoring Working Group (SEMWG), the GN-EDU, Early Childhood Education Division can provide this information to support the Proponent and other stakeholders with their child care initiatives in the Baffin LSA.</p> <p>In addition, given the foregoing, the GN-EDU, Early Childhood Education division has funding and training opportunities to assist in the successful operation of community child care facilities.</p> <p>To operate safely and effectively, childcare facilities in Nunavut must meet specific licensing criteria. As the licensing body for childcare facilities, the GN-EDU, Early Childhood Education division should be consulted prior to the allocation of funds towards the development of floor plans in an effort to meet these criteria. This will ensure all funding sources are applied efficiently, either to enhance existing child care facilities which require upgrades, or towards start up costs, training support, or operation and maintenance of a new facility.</p>	<p>The Proponent should more actively consult and collaborate with the GN-EDU Early Childhood Education division in respect of childcare facilities in the LSA. Such additional consultation and collaboration will allow the GN to adequately provide guidance and licensing requirements to the Proponent for child care facilities in the LSA.</p>	<p>- 2019 Annual Report for the Mary River Project, Section 4 (p. 489)</p>	<p>Baffinland organized and hosted the "Arnait Action Plan Roundtable" on October 24, 2019 in Iqaluit, which included the participation of Government of Nunavut (GN) staff from various departments. GN representatives included Kukik Karetak, Family Services, Career Development; Jonelle Lieng, Family Services, Career Development; and Susan Gardener, Human Resources. At this roundtable the topic of childcare was discussed and all parties shared their views and actions associated with childcare availability.</p> <p>As discussed at a teleconference of the GN-BIM Memorandum of Understanding (MOU) administrators on Thursday July 23, 2020, this should be a priority topic for joint MOU work on a go forward basis.</p> <p>Baffinland commits to more actively consult and collaborate with the GN-EDU Early Childhood Education division and requests that the GN provide at the earliest available opportunity to Baffinland the names and contact information of those staff members who should be engaged on this topic. Baffinland notes that as a mineral developer it may provide support to childcare initiatives but it will not own or operate a childcare facility in the LSA.</p>
6	<p>The Government of Nunavut (GN) has identified an opportunity for data collection through the Inuit Employee Survey. The Inuit Employee Survey was administered only to the Inuit residing in the North Baffin Local Study Area (LSA). The next versions of the Inuit Employee Survey should also be administered to Inuit residing in Iqaluit and non-Nunavut communities.</p> <p>The GN recognizes the Proponent is compliant in their Project Certificate requirements to report on population movement data and the administration of a voluntary survey (Project Certificate No. 005 Amendment 3, Terms and Conditions No. 133 and 168). The migration of Inuit workers from Nunavut to other communities and to southern Canada is of high importance as it may impact communities permanently. will ensure the efficacy of the Proponent's socio-economic monitoring program.</p> <p>Table 4.39 provides us with valuable information. In its footnotes, we find reference to Iqaluit and non-Nunavut communities. To increase the clarity and usefulness of this table, it would be desirable to be more specific with the destinations of the migrants. Presenting the number of respondents considering 'non-Nunavut communities' and 'Iqaluit' would give the reader a much better grasp of the situation. It would increase the precision of this table.</p>	<p>The GN recommends that the Proponent modify the Inuit Employee Survey to be administered to Inuit employees residing in "non-Nunavut communities" and "Iqaluit, and report on the number of respondents.</p>	<p>200521-08MN053 Mary River Project 2019 NIRB Annual Report, May 2020 - Section No. 4 Performance on PC Conditions, pp. 458 Table 4.39</p>	<p>Baffinland commits to examining the feasibility of administering the voluntary Inuit Employee Survey to Inuit employees residing in non-Nunavut communities and Iqaluit.</p>

**Table 3 - Response to ECCC's Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	Reviewer's Detailed Comment	ECCC Recommendations	Reference Section	Baffinland's Response
1	<p>The Surface Water and Aquatic Ecosystems Management Plan was updated in April 2020 and now includes a Trigger Action Response Plan (TARP) for erosion and sediment. Table 9-2 identifies four “triggers” related to erosion and sedimentation and subsequent response actions, including:</p> <ul style="list-style-type: none"> <li>- Observations identifying potential causes of erosion and sedimentation.</li> <li>- Severe weather periods in the forecast, per on-site weather stations and weather alerts</li> </ul> <p>- Exceedance of Water Licence Criteria for Total Suspended Solids</p> <p>- Regulatory Feedback</p> <p>Upon reading these triggers, it is not immediately clear what event needs to occur to instigate implementation of the TARP. For example, the trigger of, “TSS exceedance of Water Licence Criteria” insinuates that a sample has already been taken and an exceedance identified, but the response action discusses suspected exceedances and that water samples should be taken for testing. The Triggers should be simply worded and extremely clear such that actions can be taken quickly when a trigger event occurs.</p>	<p>ECCC recommends the Proponent review the TARP and ensure that “triggers” are clear, descriptive, and related directly to an observation or event that would trigger action.</p>	<ul style="list-style-type: none"> <li>□ NWB Appendix E.5.3 – Surface Water and Aquatic Ecosystems Management Plan</li> <li>○ Table 9-2</li> <li>○ Appendix G</li> </ul>	<p>Since submission of the April 2020 Surface Water and Aquatic Ecosystem Management Plan, Baffinland has been working with QIA to refine Baffinland's adaptive management framework. As part of the Phase 2 review process, Baffinland is currently working with QIA to integrate and apply the principles set forth in Baffinland's draft Adaptive Management Plan (AMP) into several management plan updates including the Surface Water and Aquatic Ecosystem Plan. Through updates to the management plans for Phase 2, Baffinland has been assessing the indicators, monitoring requirements, thresholds and responses required to clarify the implementation of a robust adaptive management framework. The 'Trigger Action Response Plan' template has since been refined to ensure “triggers” are clear, descriptive, and related directly to an observation or event that would trigger action.</p> <p>Baffinland is in the process of authoring specific, measurable thresholds for water use onsite as part of these management plan updates. These action levels will be established to prevent unacceptable adverse effects from occurring. Low level actions are focused on improving the understanding of the situation that is causing the noted changes and to plan for more substantive responses (i.e., moderate or high-level actions) if/as required.</p>
2	<p>The application for modification of SNP stations proposes to remove monitoring of MP-C-G at Milne Port, which is intended to capture surface discharge downstream of the construction area at Milne Site. The rationale provided is that this station, “no longer captures surface discharge downstream of construction due to the expansion of the Ore Pad at Milne Port. Thus removal of the station is proposed.” The rationale provided does not acknowledge whether surface runoff is still an issue at this location (implying that monitoring is no longer required), or whether the station simply no longer captures runoff due to mine site changes.</p>	<p>ECCC recommends the Proponent provide a discussion on whether monitoring in the vicinity of MP-C-G is still warranted, and whether the SNP Station should be relocated, rather than discontinued.</p>	<ul style="list-style-type: none"> <li>□ NWB Appendix E-13 – SNP Modification Application</li> </ul>	<p>In Appendix E-13 of the QIA-NWB Type A Annual Report for Operations, Baffinland proposed the removal of station MP-C-G at Milne Port, which originally captured surface discharge downstream of the construction area at Milne Port. In August 2019, Baffinland received approval for the Modification Request No. 12 Expansion of the Milne Port Ore Stockpile and Water Management, to optimize stockpiling and ship loading operations, resulting in an additional 140,000 m<sup>2</sup> of stockpile area and a new 15,000 m<sup>2</sup> lined sedimentation pond. Following approval, Baffinland proceeded with Stage 1 of the Ore Stockpile expansion, which resulted in the removal of Station MP-C-G. This station no longer captures surface discharge downstream of construction due to the expansion of the Ore Pad at Milne Port.</p> <p>As part of the package submitted and approved under Water Licence Modification No. 12, Baffinland prepared a Storm Water Management Plan for Stockpile No. 1, Stage 1 Expansion. This document details the Stage 1 earthworks and storm water drainage implemented for the expansion of Stockpile No 1 constructed in 2019. Effluent that would have originally been captured at MP-C-G, is now being directed in a newly constructed ditch and conveyed to Pond No. 3, where it can be collected and tested for compliance with Baffinland's Type A Water Licence. Thus, the removal and not relocation of station MP-C-G was proposed.</p>
3	<p>The groundwater monitoring report found elevated concentrations in the down-gradient wells relative to the up-gradient wells, and noted that further years of monitoring data is required to evaluate potential trends. However, although concentrations have been provided, there are no figures displaying the data for 2019 or any potential temporal trends in groundwater quality. Given that, by 2021 there will be four years of groundwater monitoring data available, figures would aid in interpretation of the data. Section 4 Conclusions and Recommendations states that: “Consideration will be given to the development of site-specific groundwater quality screening criteria based on background (reference) conditions (if available) and potentially utilizing groundwater quality guidelines from other jurisdictions...”</p> <p>ECCC supports developing site-specific groundwater quality objectives for the purpose of screening groundwater quality.</p>	<p>ECCC recommends that the Proponent present the groundwater data collected graphically in figures to depict differences in up-gradient and down-gradient concentrations in future reporting years, and to identify any temporal trends.</p> <p>ECCC recommends that appropriate screening groundwater quality objectives be identified for use in comparisons of groundwater quality data from the monitoring program.</p>	<ul style="list-style-type: none"> <li>□ NWB Appendix E-12; NIRB Appendix G5 – 2019 Groundwater Monitoring Report</li> </ul>	<p>Baffinland plans to continue and further evaluate the groundwater monitoring program in 2020. Due to challenges associated with sampling methodologies for groundwater data collection in a permafrost environment and the challenges in interpreting this data, long-term trends will likely not be identified even with an expanded dataset. Despite these operational challenges, Baffinland has retained groundwater consultants that are knowledgeable in Arctic environments, to further assess the current program and provide recommendations in 2020.</p> <p>In preparation of the 2020 groundwater report, Baffinland will consider the use of graphics to present the data collected. As part of the groundwater program expansion and with support from groundwater consultants, Baffinland will also be evaluating groundwater quality objectives for use in future monitoring.</p>
4	<p>Table 2.2 lists the water quality guidelines used for the Mary River project, the majority of which are based on the CCME Water Quality Guidelines for the Protection of Aquatic Life. Where no CCME guidelines exist for certain parameters, the Proponent has implemented the lowest of either the Ontario or BC Provincial Water Quality Guidelines. ECCC notes that neither the dissolved zinc nor manganese guidelines have been updated by the Proponent in accordance with the revised CCME criteria (released in 2018 and 2019, respectively). The equation for guideline derivation released by CCME is based on hardness and pH, and appears to result in a potentially lower water quality guideline than the 0.935 mg/L BC Water Quality Guideline and may be a more appropriate metric for use at Mary River.</p>	<p>ECCC recommends the Proponent:</p> <ul style="list-style-type: none"> <li>- Use the updated zinc CCME Water Quality Guideline for analysis in future monitoring years.</li> <li>- Discuss whether the newly released CCME Manganese Water Quality Guideline is more appropriate for use at the mine site than the BC Water Quality Guideline.</li> </ul>	<ul style="list-style-type: none"> <li>□ NWB Appendix E.9.1; NIRB Appendix G1 – 2019 CREMP Monitoring Report</li> <li>○ Table 2.2</li> </ul>	<p>Baffinland is further evaluating the groundwater monitoring program in 2020, Baffinland has retained groundwater consultants knowledgeable in Arctic environments to further assess the current program and provide recommendations in 2020. As part of this work, Baffinland and the supporting consultants will be reevaluating the updated zinc CCME Water Quality Guideline for analysis in future monitoring years. Baffinland will also evaluate the newly released CCME Manganese Water Quality Guideline and determine whether it is more appropriate for use at the mine site than the BC Water Quality Guideline. Once assessed Baffinland will provide further recommendations to CIRNAC, NWB and other relevant parties.</p>
5	<p>The nitrate guideline listed in Table 2.2 is 3 mg/L and stated to be reflective of the CCME Water Quality Guideline for Nitrate. Table 3.1 also identified the guideline as 3 mg/L as well as the AEMP Benchmark as 3 mg/L and identifies an exceedance at sampling station L2-3. However, in figure 3.2 the nitrate WQG depicted on the figure is 13 mg/L and therefore does not acknowledge the exceedance. ECCC notes that the Proponent appears to be using the nitrate guideline and nitrate-N guideline interchangeably, and that the appropriate comparison is to the 3 mg-N/L nitrate.</p>	<p>ECCC recommends that the Proponent consistently applies the 3 mg-N/L nitrate guidelines.</p>	<ul style="list-style-type: none"> <li>□ NWB Appendix E.9.1; NIRB Appendix G1 – 2019 CREMP Monitoring Report</li> </ul>	<p>For future reporting the CCME guideline of 3 mg-N/L will be used/displayed.</p>

**Table 3 - Response to ECCC's Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	Reviewer's Detailed Comment	ECCC Recommendations	Reference Section	Baffinland's Response
6	<p>Water quality guidelines for nitrate have been exceeded for the last two years at station L2-03 (CLT1 upper main stem) and concentrations of several metals have increased over time. This sampling location is in close proximity to QMR2 quarry and the proponent acknowledges that these increases are consistent with the deposition of explosive residues from the quarry. However, they go on to state that despite the elevated parameters at the upper CLT1 main stem, none were elevated above WQG or AEMP benchmarks at the lower stem prior to discharge into Camp Lake. This rationale minimizes the potential localized effects that could be occurring in the vicinity of station L2-03 and the QMR2 quarry, and no potential mitigations have been presented to minimize impacts from nitrogen compound use and dust creation from the quarry.</p>	<p>ECCC recommends the Proponent provide potential mitigation measures to reduce impacts from dust and nitrogen deposits into CLT1 from the QMR2 quarry.</p>	<p>□ NWB Appendix E.9.1; NIRB Appendix G1 – 2019 CREMP Monitoring Report            ○ Section 3.1.1 – Camp Lake System – CLT1 – Water Quality</p>	<p>Nitrate concentrations at CLT1 Station L2-03 were well below the CCME guideline of 3 mg/L in 2020.</p> <p>As discussed in the approved Quarry Management Plan for QMR2, Baffinland proactively controls the release of ammonia at the point source. Industry best practices have been adopted to maximize source control and to minimize the potential for AN dissolution to downstream waters. In addition to water quality monitoring downstream of the quarries, the following lists additional mitigation measures in place:</p> <ul style="list-style-type: none"> <li>- When handling, transporting or storing explosives, care will be taken to avoid any spillage.</li> <li>- Prior to loading explosives, blast holes will be inspected for the presence of water.</li> <li>-Stand time for explosives will be minimized and the lag time between load and blast will be kept to a minimum.</li> <li>-Holes will be loaded by experienced supervisors/blasters so that the blasting pattern optimizes complete detonation of explosives, and avoiding misfires which will also minimize the release of ammonia residue to the environment.</li> <li>-Overland flows that impinge on quarry operations and have the potential to contact downstream water will be diverted around the active pit area by means of berms, check dams, or minor diversions.</li> </ul> <p>The primary sources of dust at QMR2 include blasting, loading, crushing and screening of aggregates. Measures are in place to reduce impacts of dust from the quarries by minimizing the creation of dust at source (i.e. siting the crushing operation to take advantage of the local topography for shelter, enforcing speed limits to reduce dust, crushing locations take into account prevailing winds and proximity to surface water).</p>
7	<p>Water chemistry within the Mary River showed no distinct and/or consistent spatial gradients with progression downstream, with the exception of sulfate and nitrate, which were elevated at Mary River Tributary F. Based on the temporal analysis provided in Figure 5.2, elevated levels of nitrate and sulfate have not been observed in previous years and represent a large increase compared to previous sampling data. Although the concentrations presented do not exceed water quality guidelines, the sudden jump in concentration may be due to mine influences. The report does not provide any discussion or analysis of the sudden increases in nitrate and sulfate or examine any potential causes.</p>	<p>ECCC recommends the proponent provide a discussion of potential causes of the sudden increases in nitrate and sulfate at the confluence of Mary River Tributary F.</p>	<p>□ NWB Appendix E.9.1; NIRB Appendix G1 – 2019 CREMP Monitoring Report            ○ Section 5.1.1 – Mary River System – Water Quality</p>	<p>Nitrate and sulphate data collected at Mary River Tributary F in spring and summer of 2020 were in line (nitrate) or lower (sulphate) than concentrations observed in previous years, and thus do not suggest a notable, continued increase in concentrations of these parameters within the tributary. Therefore, higher concentrations of nitrate and sulphate that were suggested at Mary River Tributary F in fall 2019 compared to previous years may reflect anomalous results. Because seasonal changes in water quality are generally evident within watercourses near the Project, water quality monitoring information collected at Mary River Tributary F in fall 2020 will be used to assess whether an empirical elevation in nitrate and/or sulphate concentrations has occurred within this watercourse, or whether the fall 2019 results were anomalous. Discussion regarding potential causes of an increase in nitrate and/or sulphate in fall 2019 and fall 2020 or whether the fall 2019 data were anomalous will be provided in the 2020 Annual Report as per the results of the 2020 sampling program. Trends in parameter concentrations between years will continue to be evaluated, an analysis that will gain confidence as the monitoring record increases with time.</p>
8	<p>Section 2.2 describes the station SHAL1 as a silt-loam substrate, and notes that it is the closest of the stations to Sheardown Lake Tributary inflow. Section 3.1.1 describes the sedimentation rates and refers to SHAL1 as being the hard-bottomed substrate near the tributary, and SHAL2 as being the silt substrate.</p>	<p>ECCC requests clarification on the stations' substrates.</p>	<p>□ NWB Appendix E.9.2; NIRB Appendix G2 – Lake Sedimentation Monitoring Report            ○ Section 2.2 – Station Locations            ○ Section 3.1 – Sedimentation Rates</p>	<p>Station substrates in Section 3.1.1 should have described SHAL1 as the littoral area characterized by soft-bottomed (silt-loam) substrate, and SHAL2 as the littoral area characterized by hard-bottomed (cobble) substrate.</p>
9	<p>Project Certificate Condition Numbers 67, 73 and 74 reference the proponent's use of 9 passive Autonomous Recording Units (ARUs) in May 2019 to detect Red Knot vocalizations. This work was done in collaboration with ECCC.</p> <p>The results of the 2019 ARU monitoring survey did not detect the presence of Red Knots in the northern RSA. As indicated in PC No. 67, ECCC concluded that further ARU monitoring in 2020 in the northern RSA was not necessary. However, ECCC would like to provide clarification on remarks made under Project Certificate Condition No. 74, where the proponent states that, "based on available data, ECCC does not recommend additional years of collection". Although further monitoring in the northern RSA may not be necessary, similar Red Knot monitoring surveys should be conducted in the southern portion of the RSA prior to activities ramping up in those areas. Furthermore, if Red Knot activity is detected in future years within the northern RSA, the proponent should contact ECCC to determine if additional ARU monitoring will be required.</p>	<p>ECCC recommends similar ARU monitoring surveys for Red Knots be conducted in the southern RSA prior to the ramping up of activities in those regions. ECCC recommends that the proponent contact ECCC to determine if additional ARU monitoring will be required if Red Knot activity is detected in future years within the northern RSA.</p>	<p>□ 2019 NIRB Annual Report – Section 4</p>	<p>Upon recommendation by the QIA and ECCC, Baffinland is considering deploying ARUs along the south rail line and in the Steensby Port area in suitable Red Knot habitat prior to increasing activities in these areas. If Red Knot activity is detected in the northern portion of the RSA in future years, Baffinland will consult with ECCC to determine whether additional Red Knot monitoring is required.</p>
10	<p>Project Certificate Condition Numbers 59, 71, and 72 reference the proponent's flight height analysis results.</p> <p>In regards to the proponent's use of flight logs to validate compliance, ECCC requires a more thorough understanding of the justification provided by the pilots before we can determine if there are concerns with this approach. As noted by the proponent, additional analysis has been requested by the Terrestrial Environment Working Group during our February, and more recently at a June, 2020 meeting.</p>	<p>ECCC looks forward to reviewing the flight log data along with the additional analysis the proponent has committed to providing during the TEWG meetings and within the 2019 Annual Report.</p>	<p>□ 2019 NIRB Annual Report – Section 4</p>	<p>An enhanced helicopter overflight analysis is in progress in response to TEWG requests. This analysis will include flight duration and detailed compliance based on flying height and the provided flight rationale. The time flown below the minimum flight threshold during sensitive timing windows and over known sensitive areas will be determined. The results of the helicopter analysis will be included in the 2020 annual report.</p>

**Table 3 - Response to ECCC's Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	Reviewer's Detailed Comment	ECCC Recommendations	Reference Section	Baffinland's Response
11	<p>Project Certificate Condition Numbers 59, 71, and 72 references BIM's flight height analysis results.</p> <p>In their analysis, the proponent indicates compliance for transects flown within the Snow Goose area during the moulting season was 93%. However, only 31% of these flights were conducted above the required 1100m altitude set in the Project Certificate Conditions.</p> <p>ECCC understands that safety and operational restrictions may prevent helicopters from reaching the required altitudes, and that this may have been used as justification to validate lower altitude flights as complaint. However, the majority of these flights occur on the eastern edge of the Snow Goose area and pilots are not maintaining the minimum 1500m horizontal distance required during the moulting season.</p>	<p>ECCC recommends that if an altitude of 1100m through the Snow Goose area during moulting season cannot be maintained, pilots take a route around the Snow Goose area and maintain the required 1500m horizontal distance.</p>	<p>□ 2019 NIRB Annual Report – Section 4</p>	<p>Pilots maintain a 1,100 m vertical distance when flying over the Snow Goose moulting area whenever possible. If this flight height is not possible for safety and/or operational reasons, pilots maintain a 1,500 m horizontal distance if the flight path allows. However, this 1,500 m horizontal buffer is not always practical as it results in longer flight times, which causes more overall disturbance. As a compromise, pilots sometimes fly over the eastern edge of the Snow Goose moulting area. Baffinland understands that Snow Geese are typically concentrated in the core of the moulting area and are seldom present near the edges, and as a result, overall flight time and associated disturbance is reduced.</p>
12	<p>Project Certificate Condition Numbers 103, 105, 106, 107 108, 121, and 123 reference the 2019 Ship Based Observer (SBO) Program Report (Golder, 2020f).</p> <p>The proponent indicates that detailed methodology on data collection and analytical procedures as well as detailed results on the SBO program are presented in the Golder 2020F report.</p> <p>ECCC has been unable to locate this document in the referenced document portal or on the NIRB registry to review summarized seabird observations during the 2019 shipping season.</p>	<p>ECCC requests a copy of the Golder Associates LTD. (Golder), 2020f. Draft 2019 Ship-based Observer Program. Report submitted to Baffinland Iron mines Corporation. Report No. 1663724-185-R-RevB-31000. 26 March 2020.</p>	<p>□ 2019 NIRB Annual Report – Section 4</p>	<p>2019 draft report is available on the Document Portal (<a href="https://www.baffinland.com/_resources/2019_DraftShipboardObserverProgramReport.pdf">https://www.baffinland.com/_resources/2019_DraftShipboardObserverProgramReport.pdf</a>) in addition to the NIRB Public Registry.</p> <p>The final report is included as part of the submission of final versions of various marine environment monitoring programs, following review and comment through the MEWG.</p>

**Table 4 - Response to DFO's Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	Reviewer's Detailed Comment	DFO Recommendations	Reference Section	Baffinland's Response
<b>Effects Monitoring</b>				
i	<p>Icebreaking: In Table 4.30 on page 320 of the 2019 Annual Report, it is indicated that effects to marine mammals from “habitat changes resulting from icebreaking and/or ice management of landfast ice” were not monitored as there were “no project interactions to monitor in 2019”. DFO-FFHPP recognizes that “Baffinland has not undertaken icebreaking of land-fast ice along the Northern Shipping Route” (pg. 328, 2019 Annual Report). However, DFO-FFHPP notes that icebreaking of non-land-fast ice occurred in both 2018 and 2019. On page 339 of the Annual Report, it indicates that “Baffinland procured an icebreaking vessel, the MSV Botnica, in 2019 to facilitate the safe passage of vessels through prevailing ice conditions”. Further, on page 353 of the Annual Report, BIM indicates that “[n]arwhal 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 behavior by marine mammals in the RSA.”</p> <p>DFO-FFHPP notes that, under the current Project Certificate, BIM has no explicit approval to engage in icebreaking activities, regardless of if land-fast ice is impacted or not. DFO-FFHPP additionally notes that an assessment of potential impacts to marine mammals resulting from icebreaking was only conducted relevant to the Phase 2 Environmental Assessment (EA), not for this current Production Increase Extension Request phase, and is still being evaluated as part of that ongoing EA. DFO-FFHPP acknowledges the mitigation measures that Baffinland has applied to mitigate potential impacts to marine mammals and their habitats resulting from icebreaking activities, however notes that voluntary implementation of these measures does not supersede the requirement to fulsomely assess and evaluate potential impacts nor the requirement to obtain approval of those mitigation measures. DFO continues to express concerns with both the impact assessment relative to icebreaking and the associated mitigations, as documented in our comments on the 2019 draft monitoring reports (see attached).</p> <p>DFO-FFHPP notes that, on page 15 of their February 3, 2020 submission to the NIRB in regards to BIM’s Production Increase Proposal Extension Request, DFO recommended that the amended Project Certificate for the Mary River Project include the following Term and Condition: “Baffinland shall not conduct icebreaking activities at any point along the Northern Shipping Route until a full assessment of the additional impacts to marine mammals is provided, and the additional activities and associated mitigations are approved and supported by DFO”. On page 18 of Baffinland’s February 13, 2020 Response to Comments, BIM recommended modifications to Term and Condition 183 in lieu of a prohibition on icebreaking. DFO-FFHPP notes that on February 24, 2020, DFO sent a letter to NIRB indicating that “DFO will continue to work with Baffinland and the MEWG to ensure protection of marine mammals and the marine environment. DFO acknowledges that Condition 183 may provide a sufficient mechanism to do so in the interim.”</p>	<p>This letter does not constitute support or approval of icebreaking activities under the current Production Increase Proposal Extension. Additionally, support and approval of icebreaking and associated mitigations should also come from the Marine Environmental Working Group (MEWG) and the NIRB.</p>		<p>The Production Increase Proposal Extension Request included a description of Baffinland's icebreaking activities and associated mitigations. Following receipt of a positive recommendation from NIRB, approval of the Production Increase Proposal Extension Request was provided by the Responsible Ministers, including the Minister of Fisheries and Oceans and Canadian Coast Guard on May 19, 2020, inclusive of all activities as described in the proposal.</p> <p>Although suggested by DFO staff in their comment, it is clearly outlined in PC Condition No. 77, the role of the MEWG is not intended to either duplicate or to affect the exercise of regulatory authority by appropriate government agencies or departments.</p>
ii	<p>ii. Marine Mammals: Condition 3.4 of BIM’s Fisheries Act Authorization for the Milne Inlet Ore Dock under DFO File # 14-HCAA-00525, states “the Proponent shall provide sufficient marine mammal observer coverage on project vessels to monitor marine mammal interactions with project vessels.” Additionally, on page 356 of the Annual Report, Term and Condition 106 states “The Proponent shall ensure that shipboard observers are employed during seasons where shipping occurs...”. On page 339 of the 2019 Annual Report, it states “Marine wildlife observers[...]were present on the MSV Botnica during the shoulder shipping seasons from 19 to 29 July 29 (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...” DFO notes that while BIM conducted a marine mammal observation program in 2019, it was not conducted throughout the entire shipping season, only during the shoulder seasons. DFO notes that monitoring throughout the entire shipping season is important in order to inform the conclusions regarding potential effects and interactions of vessels with marine mammals, especially with respect to ship strikes.</p> <p>On page 335 of the 2019 Annual Report, Baffinland indicates that they are “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 during summer of 2020 that would include the Northern Shipping Route.” DFO-FFHPP notes that in email correspondence from June 16, 2020, DFO indicated to BIM that aerial surveys were postponed/cancelled for summer 2020.</p>	<p>DFO recommends that, if possible given the circumstances of the COVID-19 pandemic, BIM continue to conduct marine mammal aerial surveys during summer 2020.</p> <p>DFO-FFHPP notes that additional comments relative to marine mammal monitoring have been provided to BIM through the MEWG for all the 2019 draft monitoring reports in advance of this Annual Report. We have attached these comments for the NIRB’s records as they remain unresolved and are relevant to this Annual Report.</p>		<p>Baffinland is conducting marine mammal aerial abundance surveys during 2020, covering both Admiralty Inlet and Eclipse Sound narwhal stocks, as DFO was forced to cancel its surveys due to COVID-19.</p> <p>Copies of the final drafts of the various marine environment monitoring reports are included as part of the submission of comment responses, and in so doing, will be available on the NIRB Public Registry.</p>
iii	<p>iii. Ballast/AIS: DFO notes that on pages 260 and 261 of the Annual Report, it states “In 2019, 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” and “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.” On pages 262 to 263 of the Annual Report, BIM indicates that “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.” DFO notes that BIM states “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)” (pg. 289, 2019 Annual Report), but DFO further notes that potentially harmful species may not necessarily exist on these lists. DFO additionally notes that “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” (pg. 289, 2019 Annual Report).</p>	<p>DFO will continue to work with BIM to ensure the best preventative measures against the spread of aquatic invasive species, and looks forward to reviewing the results of the independent review.</p> <p>DFO-FFHPP notes that additional comments for the draft 2019 MEEMP and AIS Monitoring Program report were provided to BIM through the MEWG in advance of this Annual Report. We have attached these comments for the NIRB’s records as they remain unresolved and are relevant to this Annual Report</p>	<p>Condition 45, page 145</p>	<p>Baffinland will also continue to work with DFO and seek guidance on the best preventative measures against the spread of aquatic invasive species and will continue to follow relevant federal and international regulations.</p> <p>Final versions of the various marine environment monitoring reports will include comment responses and are also included as part of this comment response submission to the NIRB.</p>

**Table 4 - Response to DFO's Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	Reviewer's Detailed Comment	DFO Recommendations	Reference Section	Baffinland's Response
iv	<p>Freshwater: In table 4.15 on page 105 of the Annual Report, it is indicated that "ECCC issued a Direction under the Fisheries Act, which Baffinland implemented satisfactorily" in regards erosion and sedimentation. Although ECCC is the lead department responsible for enforcement of pollution prevention provision of the Fisheries Act, DFO has a vested interest in any matters that may impact fish habitat, such as sedimentation.</p> <p>DFO-FFHPP additionally notes that currently there is no dedicated forum to discuss ongoing freshwater environment impacts and monitoring programs, particularly in regards to the existing Tote Road. On page 8 of the June 20, 2019 TEWG Meeting Minutes in Appendix C of the 2019 Annual Report, a representative from the Government of Nunavut asked BIM if there will be "a freshwater Working Group moving forward" in relation to a request regarding fish abundance monitoring along the Tote Road. In response, BIM indicated that they "have been thinking about how to better incorporate freshwater discussions into the TEWG or how to separate these out".</p>	<p>DFO-FFHPP requests that future erosion and sedimentation events be additionally reported to DFO in a timely matter, such that DFO is aware of the situation should any subsequent impacts that may constitute harmful alteration, disruption, or destruction (HADD) of fish habitat occur. DFO-FFHPP notes that DFO is not currently a member of the TEWG, but recommends that freshwater discussions and monitoring be incorporated into the TEWG and that DFO becomes a member of the TEWG to ensure that ongoing impacts and concerns related to the freshwater environment are fulsomely considered and addressed.</p>	Table 4.15	<p>Roads and water crossings are inspected regularly for signs of degradation, maintenance requirements and potential impacts to fish habitat. Visual inspections are conducted on the Project road network by trained personnel and occur at regular intervals and after heavy precipitation events to inspect for signs of erosion and sedimentation. In 2019, no Project-related releases of total suspended solids were identified along the Tote Road corridor. In the event that a sedimentation event led to subsequent impacts that may constitute harmful alteration, disruption, or destruction (HADD) of fish habitat, DFO would be immediately notified as per Section 38, 4.1 of the Fisheries Act.</p> <p>Baffinland will continue to report all spills/releases in accordance with Baffinland's Spill Contingency Plan. Thus, once a potential spill is identified, a spill report will be submitted within 24 hours of each spill event to the Northwest Territories-Nunavut (NT-NU) Spill Line, CIRNAC and QIA.</p> <p>Baffinland continues to explore potential options for presenting relevant aspects of freshwater monitoring data to project intervenors. However, given that the current role of existing working groups (TEWG or MEWG) is not intended to either duplicate or to affect the exercise of regulatory authority, and that there are formal regulatory processes specific to the Fisheries Act and associated fisheries offsetting monitoring processes as mandated by DFO, including Fisheries Authorization-specific submissions, Baffinland sees no need to develop a separate working group that is dedicated to freshwater-related issues at this time. Focused workshops may be held at a future date to address specific issues, such as the Freshwater Workshop held in 2017 regarding the Aquatic Effects Monitoring Program.</p>
v	<p>Marine Environment Working Group: On page 264 of the Annual Report, it states that "The [Marine Environment Working 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." DFO notes that the objective of the MEWG is to "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" (pg. 264, 2019 Annual Report). Thus far, the MEWG has been an imperfect forum to recommend and discuss potential mitigation measures in response to monitoring results, with the majority of time during meetings spent on reviewing results. DFO-FFHPP acknowledges that the Terms of Reference for the MEWG are in the process of being revised, but is uncertain when these will be finalized and approved by the MEWG.</p> <p>DFO-FFHPP also notes that this current comment/response format does not provide a timely mechanism for resolution on incorporation and implementation of outstanding issues and proposed mitigation measures. It is important this be resolved as this feedback has the potential to influence BIM's analysis and final reports which, in turn, inform this annual monitoring report. As discussed above, we have attached DFO's MEWG comments on draft final monitoring reports to this letter, as they remain unresolved and are relevant to this Annual Report.</p>	<p>DFO-FFHPP recommends that presentations and results should be provided at least 14 days in advance of any scheduled MEWG meetings to ensure that MEWG members and observers have sufficient time to review and provide meaningful input, recommendations, and advice, and that an additional day of discussion is scheduled for meetings to ensure any recommendations or questions are addressed in a timely manner. DFO-FFHPP also recommends that BIM work with the NIRB and the MEWG to establish a review and reporting schedule that enables resolution of issues in a meaningful and timely manner.</p>	Page 164	<p>Baffinland will consider the request of DFO to provide presentations at least 14 days in advance of any scheduled MEWG meetings. Baffinland notes however, that in order for this to be accomplished, less timely information will be available to MEWG members. For context, it takes approximately 14 days for all MEWG meeting materials to undergo translation. Subsequently, meeting materials prepared by Baffinland and its consultants would need to be completed 4 weeks in advance of a meeting. This may result in less information being available to MEWG members on monitoring program design (i.e. as details of each program may not be determined) or analysis of results. However, Baffinland is open to further discussing preferences for timing of scheduled meetings with the MEWG.</p> <p>Baffinland also wishes to clarify to DFO that there is an established review and reporting schedule managed by the NIRB. This includes the submission of Baffinland's Annual Monitoring Report to the NIRB on March 31 of each year. (Note, 2020 represents this first year Baffinland did not meet this target, due primarily to delays in data analysis and reporting associated with COVID-19). This report provides information on results of monitoring from the previous year. Following submission of Baffinland's Annual Report, the NIRB seeks comments from interested parties. Comments are then shared with Baffinland for response. Typically this process occurs between March and August of each year. Following a review of all relevant annual monitoring document, the Board provides Baffinland with subsequent recommendations to be implemented the following year. Recommendations are typically issued between October to December.</p>

Table 4 - Response to DFO's Comments on Baffinland's 2019 Annual Report to the NIRB

Cmt. #	Reviewer's Detailed Comment	DFO Recommendations	Reference Section	Baffinland's Response
<b>Compliance Monitoring</b>				
1	<p>DFO-FFHPP notes that on page 165 of the Annual Report, Condition No. 45 indicates that “[t]he 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.” Baffinland has determined that the compliance status of this condition is “In-Compliance”, however DFO-FFHPP is of the opinion that the compliance status for this condition should be modified to be “Partial Compliance” due to the following:</p> <p>Additional Destruction of Marine Fish Habitat: In relation to Fisheries Act Authorization # 18-HCAA-00160 for BIM’s Freight Dock, DFO-FFHPP was notified in November 2019 of additional destruction of marine fish habitat that occurred during construction that was not permitted by the Authorization. DFO’s Conservation &amp; Protection Unit is currently reviewing the situation and will determine if further enforcement action is required to remediate impacts to fish habitat.</p>	<p>Although DFO has a regulatory mechanism to manage compliance in regards to authorizations, transparent details of this compliance issue should have been included in the 2019 Annual Report.</p>	<p>Condition 45, page 145</p>	<p>Baffinland acknowledges DFO’s comment, however despite the potential difference between the proposed footprint of the freight dock and the actual as-built footprint, Baffinland has still adhered to the No-Net-Loss principal and remains in compliance with Term and Condition No. 45.</p> <p>Baffinland did receive a Fisheries Authorization (18-HCAA-00160) on March 21, 2019 for the proposed Freight Dock construction works based on submission of proposed construction drawings and associated offsetting plan. As with most if not all Fisheries Authorizations involving construction below the high water mark, as-built drawings are to be submitted to DFO following in-water infrastructure construction so that final calculations of fish habitat losses post-construction may be determined, providing an opportunity to refine the offsetting requirements and post-construction monitoring plan, as required. It is during development of these as-built drawings (Hatch 2019), and subsequent comparison to proposed drawings and submission to DFO (November 25, 2020) that it was suggested that the initial aerial estimates of in-water footprints differed from the original estimates.</p> <p>A timeline summarizing activities and communications is provided below for context:            Baffinland submits a Post-construction Evaluation Report 'Construction Summary Report: Milne Port Freight Dock' (Hatch 2019) on November 25, 2020. As part of this submission, Baffinland consultant, Knight Piésold Ltd. (KP), presented an as-built survey of the freight dock based on an aerial photograph in a Memorandum (Ref. No VA19-01805) dated November 22, 2019. The aerial photograph was superimposed on the existing engineering linework for the proposed freight dock. Surface areas were estimated from the imagery. A preliminary estimate of 27,566 m<sup>2</sup> was provided for the revised footprint of the freight dock in the November 2019 assessment.</p> <p>As a result of the constructed freight dock varying from the proposed design, Baffinland submitted an application to amend Fisheries Act Authorization 18-HCAA-00160 to Fisheries and Oceans Canada (DFO), on May 26, 2020. The Amendment Application included a Memorandum dated May 21, 2020 (Ref. No. VA20-01011), which provided an updated freight dock as-built survey since a ground-based survey of the dock had since been completed. An updated construction footprint of 26,308 m<sup>2</sup> was provided in the updated assessment.</p> <p>On July 24, 2020, Baffinland received a DFO response to its Amendment Application. In the response, DFO indicated that the Habitat Equivalent Units (HEUs) values provided in the Amendment Application varied from those from a previous as-built survey memorandum provided by KP in 2019. In the letter, DFO also indicated that the actual construction footprint (27,566 m<sup>2</sup>) is higher than the authorized footprint (26,449 m<sup>2</sup>) according to the 2019 as-built survey, and has been deemed as an occurrence. DFO requested for Baffinland to confirm which values should be used by DFO in their review of the Amendment Application.</p> <p>In response to DFO’s July 24 information request, A KP Memorandum (Ref. No. VA20-01623) was submitted to DFO on August 20, 2020. This memorandum clarified the discrepancy between the construction footprint between the 2019 and 2020 assessments, as well as identified what HEU values DFO should use in its review of the Amendment Application. The as-built survey used in the 2020 assessment (Ref. No. VA20-01011) confirms the total construction footprint area as 26,308 m<sup>2</sup>, which is less than the authorized footprint of 26,449 m<sup>2</sup>. The discrepancy between the 2019 and 2020 construction footprints is a result of type of survey method used. Whereas aerial photography was used to estimate the construction footprint in the 2019 assessment, the total construction footprint provided in the 2020 assessment was calculated through use of a ground-based survey, highlighting a 4% difference in footprint between the assessments. While the discrepancy is minor, the ground-based survey is considered a more accurate method of identifying impacted surface areas relative to the aerial survey.</p> <p>Baffinland is awaiting further guidance from DFO based on the most recent information shared.</p>

**Table 4 - Response to DFO's Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	Reviewer's Detailed Comment	DFO Recommendations	Reference Section	Baffinland's Response																																				
2	<p>Fish Passage Obstructions along the Tote Road: As per the DFO Fisheries Act Authorization for the Milne Inlet Tote Road (DFO file no.: 06-HCAA-CA7-00084), condition 2.2 states "Culverts shall be appropriately sized and embedded to maintain upstream and downstream fish passage at each crossing." The Proponent submitted its 2019 Annual Fish Habitat Monitoring Report to DFO and identified issues with fish passage at multiple culvert crossings. Specifically, BIM identified nine Tote Road crossings with fish passage/habitat issues in the Annual Report during the 2019 Crossing Survey, including CV-106, CV-111, CV-114, CV-129, CV-216, CV-225, and BG-50. BIM indicated that "Perching was able to be address 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 perching concerns at these two (2) remaining crossings" (pg. 166, 2019 Annual Report).</p> <p>The following table summarizes the nine identified culverts and associated fish passage and mitigation works. Table 1. Tote Road Culverts associated with fish passage issues in the 2019 Annual Report</p> <table border="1"> <thead> <tr> <th>Culvert</th> <th>Existing issue</th> <th>Remediation work</th> <th>Fish passage solved or not</th> </tr> </thead> <tbody> <tr> <td>BG-29</td> <td>Instream road aggregate rip-rap</td> <td>Removed obstruction</td> <td>Yes, revisit to confirm</td> </tr> <tr> <td>BG-01</td> <td>Instream road aggregate rip-rap</td> <td>Removed obstruction</td> <td>Yes, revisit to confirm</td> </tr> <tr> <td>CV-129</td> <td>Small perch (less than 5cm)</td> <td>Materials placed to create backwater effect. Also added step-pool approach</td> <td>Yes, revisit to confirm</td> </tr> <tr> <td>CV-216</td> <td>Small perch (less than 5cm)</td> <td>Materials placed to create backwater effect. Also added step-pool approach</td> <td>Yes, revisit to confirm</td> </tr> <tr> <td>CV-114</td> <td>Moderate high perch</td> <td>Mitigated through installation of step-pool rocky ramps in 2018, which were modified further in 2019.</td> <td>Yes, revisit to confirm</td> </tr> <tr> <td>CV-106</td> <td>Moderate high perch</td> <td>Mitigated through installation of step-pool rocky ramps in 2018, which were modified further in 2019.</td> <td>The culvert was dry in 2019 so must revisit in 2020 to confirm mitigation works were successful.</td> </tr> <tr> <td>BG-50</td> <td>Moderate high perch</td> <td>Mitigated through installation of step-pool rocky ramps in 2018, which were modified further in 2019.</td> <td>Work on one culvert was successful. The other culvert was dry in 2019 so must revisit in 2020 to confirm mitigation works were successful.</td> </tr> <tr> <td>CV-111</td> <td>High perch</td> <td>A new culvert was installed in 2018/2019 to improve fish passage. A rocky ramp was constructed in 2019 but could not eliminate the perch. Additional works to</td> <td>No. Additional works to be completed in 2020 to provide</td> </tr> </tbody> </table>	Culvert	Existing issue	Remediation work	Fish passage solved or not	BG-29	Instream road aggregate rip-rap	Removed obstruction	Yes, revisit to confirm	BG-01	Instream road aggregate rip-rap	Removed obstruction	Yes, revisit to confirm	CV-129	Small perch (less than 5cm)	Materials placed to create backwater effect. Also added step-pool approach	Yes, revisit to confirm	CV-216	Small perch (less than 5cm)	Materials placed to create backwater effect. Also added step-pool approach	Yes, revisit to confirm	CV-114	Moderate high perch	Mitigated through installation of step-pool rocky ramps in 2018, which were modified further in 2019.	Yes, revisit to confirm	CV-106	Moderate high perch	Mitigated through installation of step-pool rocky ramps in 2018, which were modified further in 2019.	The culvert was dry in 2019 so must revisit in 2020 to confirm mitigation works were successful.	BG-50	Moderate high perch	Mitigated through installation of step-pool rocky ramps in 2018, which were modified further in 2019.	Work on one culvert was successful. The other culvert was dry in 2019 so must revisit in 2020 to confirm mitigation works were successful.	CV-111	High perch	A new culvert was installed in 2018/2019 to improve fish passage. A rocky ramp was constructed in 2019 but could not eliminate the perch. Additional works to	No. Additional works to be completed in 2020 to provide	<p>DFO-FFHPP acknowledges the remedial work BIM has completed in order to address fish passage concerns along the Tote Road, and recommends that all crossings with fish passage concerns be targeted for repair in 2020. However, DFO notes that all new workings, activities or undertakings that occur below the high water mark should be submitted to DFO for review prior to construction. DFO notes that construction and infilling below the high water mark may constitute a HADD of fish habitat, which is prohibited under the Fisheries Act.</p> <p>DFO-FFHPP further recommends that BIM engage DFO in advance of the repairs to discuss remedial action of the chronic fish passage issues occurring along the Tote Road to ensure that no additional HADD of fish habitat occurs.</p>		<p>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 submitted to Fisheries and Oceans Canada (DFO) each year. Baffinland's DFO Tote Road Report was included in Appendix G on the 2019 NIRB Annual Report.</p> <p>Prior to remedial works commencing onsite, Baffinland informed DFO in the fall of 2019 of proposed in-stream work. A fisheries biologist was present to monitor, document and report on in-stream remedial works in 2019. For restoration of an approved design under an existing Fisheries Act Authorization, Baffinland will not seek additional authorizations to complete the required repairs. For all new proposed work incorporating new designs, activities or undertakings that will occur below the high water mark Baffinland will continue to submit to DFO for review prior to construction. Baffinland will also self-evaluate the proposed works against DFO's published Interim Codes of Practice as detailed in the Fish and Fish Habitat Protection Program. Wherever possible, construction during winter frozen conditions will be preferred to in-stream work.</p>
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3	<p>Absence of Juvenile Arctic Char: DFO notes that in the 2017 Annual Report, Baffinland identified an unexpected absence of juvenile arctic char downstream of crossing BG-50 and further investigation was to be conducted during 2018 to determine the potential causes. In the 2018 Annual Report, Baffinland noted that "an absence of fish in BG-50 downstream was observed again in 2018". DFO-FFHPP acknowledges that Baffinland did undertake remedial works at crossing BG-50 in 2019, however notes that no update on the presence of juvenile arctic char downstream of crossing BG-50 is provided in the 2019 Annual Report or in the 2019 DFO Tote Road Report. DFO notes that the loss of juvenile char in the downstream area from the BG-50 crossing may be considered a HADD to fish not accounted for in the issued Fisheries Act Authorization. DFO reminds Baffinland that there is a Duty to Notify DFO when they have caused, or are about to cause, HADD to fish habitat that is not authorized under the Act. Moreover, the Fisheries Act imposes duties to take corrective measures and to provide written reports when there are occurrences that may result in HADD to fish habitat. Failure to notify, take corrective measures or report in such situations may result in penalties.</p>	<p>DFO-FFHPP recommends that Baffinland provide an update on the presence of juvenile arctic char at crossing BG-50, and reiterates the 2019 recommendation that Baffinland develop a response plan for absent juvenile arctic char and propose additional measures to ensure that juvenile arctic char return and are able to use the habitat downstream of crossing BG-50. DFO recommends Baffinland discuss any action and response plans with DFO, and that monitoring the presence of juvenile arctic char continue in 2020.</p>		<p>During the 2020 spring visit, North/South Inc. did not identify juvenile Arctic char at crossing BG-50. It should be noted that freshet 2020 was later as compared to previous years and the survey was conducted much earlier in freshet than in previous years. Arctic char were not captured in many of the streams they are normally captured likely due to a combination of very high flows and cold water temperatures (&lt;5°C).</p> <p>Approximately 2/3 of the streams downstream from the BG-50 will be surveyed as part of the August 2020 planned field work. It is recommended that those results be presented before determining if additional actions are required regarding the absence of Arctic char.</p>																																				

**Table 5 - Response to Parks Canada Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	Reviewer's Detailed Comment	PCA Recommendations	Reference Section	Baffinland's Response
<b>General</b>				
1	<p>BIMC indicates that the "Working Groups provide a valuable forum for ongoing Project communication and reporting between Baffinland and interested parties..."</p> <p>☒ PCA notes that the working groups are in the midst of revising their terms of reference due to concerns around the effectiveness of these groups. This has been an ongoing process and unresolved issues include establishing effective and realistic timelines for report review and methods for resolution and implementation of recommendations.</p>	<p>If timely resolution of issues related to effectiveness of the working groups cannot be achieved, perhaps the concept of these groups needs to be revisited and/or independent expertise sought to help achieve resolution.</p> <p>Note: With the signing of the Inuit Certainty Agreement, perhaps a new/different working group format, or other format for discussing and resolving monitoring related issues, should be considered in place of the MEWG so as to streamline efforts, reduce duplication, and reduce demands upon personnel.</p>	2.5 (Engagement with Working Groups), 29	<p>Baffinland acknowledges that revisions to the Working Group ToRs are ongoing, and that the introduction of additional requirements placed by the Responsible Ministers on PC Condition No. 183 under the recent amendment to PC No. 005, as well as commitments made under the ICA have to some degree conflated with previous discussions with the Working Groups on the operation of MEWG and TEWG.</p> <p>Baffinland is open to revising the format for these Working Groups based on further discussions with its Members once an updated version of the ToR has been provided by Baffinland. It is expected that these discussions will occur in Q4 2020.</p>
2	<p>a. The marine sections of this report (pp 251-441) present results based on individual draft 2019 monitoring reports. However, at the time of the report's submission (May 15, 2020) comments on those draft reports had not yet all been provided from other MEWG members to BIMC; the last comment form was due to BIMC on June 15, 2020. This means there has been no opportunity for BIMC to incorporate MEWG feedback into final versions of those reports prior to production of this annual report.</p> <p>☒ Inclusion of MEWG feedback on draft individual monitoring reports is important as this feedback has the potential to influence BIMC's analysis and final reports which, in turn, inform this annual monitoring report.</p> <p>b. BIMC indicates that "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"(pp 345-346).</p> <p>☒ PCA notes that missing from the list of information considered by BIMC prior to the beginning of the shipping season is the feedback provided by the MEWG on the individual annual draft monitoring reports.</p>	<p>a. BIMC should work with the NIRB, MEWG, and other relevant parties to determine a reporting and review schedule that provides for the inclusion of feedback to BIMC's draft monitoring reports and resolution of associated issues, prior to preparation of this annual report.</p> <p>b. BIMC should work with the NIRB, MEWG, and other relevant parties to determine a reporting and review schedule that provides time for the inclusion of feedback to BIMC's draft monitoring reports, resolution of associated issues, and implementation of adaptive management, prior to commencement of each shipping season.</p> <p>Note: PCA suggests a tele (video) conference workshop with the parties noted above would be beneficial to identify legislative/permitting, operational, and other deadlines and obligations as a common basis from which to then build a reporting/review cycle and framework that reduces duplication, streamlines effort for all parties, and clearly identifies timelines and roles/responsibilities.</p> <p>PCA also suggests that this workshop incorporate relevant commitments within the Inuit Certainty Agreement (ICA) and its Appendix A - Information Sharing Schedule so as to provide an overall framework for the understanding and guidance of all parties to the EA.</p>	4.6.10 (Marine Environment), 251-441	<p>Baffinland wishes to clarify to PC that there is an established review and reporting schedule managed by the NIRB. This includes the submission of Baffinland's Annual Monitoring Report to the NIRB on March 31 of each year. (Note, 2020 represents this first year Baffinland did not meet this target, due primarily to delays in data analysis and reporting associated with COVID-19). This report provides information on results of monitoring from the previous year. Following submission of Baffinland's Annual Report, the NIRB seeks comments from interested parties. Comments are then shared with Baffinland for response. Typically this process occurs between March and August of each year. Following a review of all relevant annual monitoring document, the Board provides Baffinland with subsequent recommendations to be implemented the following year. Recommendations are typically issued between October to December.</p>
3	<p>DFO and PCA jointly submitted a Working Group Comment Form on the draft 2019 MEEMP-AIS Report with a number of questions/recommendations regarding implementation of the Marine Environmental Effects Monitoring Program (MEEMP) and AIS/NIS Sampling Program (see attached).</p>	<p>BIMC to work with MEWG to resolve issues and provide responses to the Working Group Comment Forms describing how those issues have been resolved through consensus, how the resolutions/recommendations have been incorporated into the final reports, and implemented into the MEEMP and AIS/NIS monitoring program.</p>	PC Condition No. 76, 253-263	<p>Baffinland already has a mechanism in place to receive and respond to comments from Working Group members. Responses to all comments on the draft 2019 marine monitoring technical reports received by Working Group members via comment form have been provided back to the MEWG alongside submission of the Final Reports on September 4 2020. Where appropriate, responses included a description of updates made to the analysis/report or 2020 monitoring program design to describe how the comment was resolved or incorporated into the final report.</p> <p>Through the Working Group, five (5) marine technical reports were submitted in DRAFT form for review and comment by all members. As part of DFO/PCs joint submission of comments on these reports, a single, joint-recommendation for mitigation was put forward by DFO/PC on the 2019 Draft Passive Acoustic Monitoring Report. The recommendation however appears to be based on the reviewer misinterpreting the data presented in that report and Baffinland has provided a corresponding response for clarification along with the final report. Please see response to DFO/PC comment number 9 on the 2019 PAM Report for more details. Responses to all other recommendations related to monitoring program design and analysis have been provided in the Final versions of these reports. Where recommendations have resulted in a change to the program design, a corresponding response highlighting a change in the program for 2020 has been provided.</p>
4	<p>See comments 1 and 2 above, and:</p> <p>a. BIMC indicates: "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.</p> <p>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." (p 265)</p> <p>b. PCA notes that while MEWG members are provided with opportunities for feedback and BIMC provides responses, as per note a, above; there is no mechanism within this structure to arrive at resolution of outstanding issues (e.g.: if members are not satisfied with BIMC's responses) and to ensure that recommendations reached through a resolution process are implemented.</p> <p>c. Re: developing or enhancing impact avoidance and mitigation strategies for the protection of the marine environment (p. 585).</p>	<p>See recommendations in comments 1 and 2 above, and:</p> <p>a. What are "final drafts" of the annual monitoring report? Is there opportunity to review that draft and when is the final report submitted? PCA suggests that the final version of this annual report should be produced only once the individual monitoring reports have been finalized with the MEWG (as per comment 2.a above). Those results can then be used to inform this annual report.</p> <p>b. The Terms of Reference for the MEWG must be amended to include agreement, by all members including BIMC, on a process that provides timely resolution on outstanding issues so that solutions may be effectively implemented into monitoring plans, adaptive management, and mitigation.</p> <p>c. PCA notes that we continue to support DFO's concerns and recommendations regarding icebreaking.</p>	PC Condition No. 77 and 183, 264-266, 585-588	<p>Baffinland wishes to clarify to PCA that there is an already established review and reporting schedule managed by the NIRB. This includes the submission of Baffinland's Annual Monitoring Report to the NIRB on March 31 of each year. (Note, 2020 represents this first year Baffinland did not meet this target, due primarily to delays in data analysis and reporting associated with COVID-19). This report provides information on results of monitoring from the previous year. Following submission of Baffinland's Annual Report, the NIRB seeks comments from interested parties. Comments are then shared with Baffinland for response. Typically this process occurs between March and August of each year. Following a review of all relevant annual monitoring document, the Board provides Baffinland with subsequent recommendations to be implemented the following year. Recommendations are typically issued between October to December.</p>

Table 5 - Response to Parks Canada Comments on Baffinland's 2019 Annual Report to the NIRB

Cmt. #	Reviewer's Detailed Comment	PCA Recommendations	Reference Section	Baffinland's Response
5	<p>In their response to the QIA and WWF's comment on this PC condition for the 2018 Annual Monitoring Report, BIMC indicated "Pack-ice and land-fast ice conditions in the RSA were characterized in Baffinland's Overview of Marine Operations, as well as in Golder's Assessment of Icebreaking Operations during Shipping Shoulder Seasons (see Appendix A for detailed daily ice charts for the 2018 shipping season; also see Table 1.2 ice breaking assessment). Moving forward, Baffinland will provide a similar table in future Annual Reports to NIRB."</p> <p>PCA notes that while 14 documents with daily shiptracks and ice imagery for the northern shipping route were submitted as part of this annual report, it is not clear where the "table", mentioned in BIMC's response to the QIA and WWF, is located in this 2019 report.</p>	<p>Please make reference to the location of this table, with information current to 2019, in the "Results" section of page 267.</p>	<p>PC Condition No. 78, 267</p>	<p>Thank you for your comment. Table 2.1 in the Assessment of Icebreaking Operations during Shipping Shoulder Seasons (Golder 2019) presented a 22-year dataset for the purpose of evaluating when shipping operations may potentially start based on the presence of historical landfast ice break-up. Baffinland's response, "Moving forward, Baffinland will provide a similar table in future Annual Reports to NIRB" did not explicitly state that the table would be updated as part of all subsequent Annual Reports to the NIRB. Furthermore, Baffinland does not start shipping along the Northern Shipping Route until it is confirmed that there is no presence of landfast ice, thus regardless of the long-term trend depicted in Table 2.1, Baffinland will continue to assess ice conditions prior to start of shipping season.</p> <p>Baffinland's ice analysts assess ice conditions yearly using a combination of data including Canadian Ice Service and weather charts available through Environment and Climate Change Canada, in addition to satellite imagery (e.g., Sentinel, RADARSAT, MODIS).</p> <p>Baffinland has included in <b>Attachment 3</b> an updated table that includes 2019 and latest 2020 information. Baffinland's ice analysts will continue to collect this data so that it may be presented in future annual reports when it is relevant to update the long-term dataset, though not necessarily including the table on a yearly basis, given that the daily ice coverage, as captured through Canadian Ice Service Charts, is already being included as part of annual reporting efforts.</p>
7	<p>See comment 3 above.</p>	<p>See recommendation 3 above</p>	<p>PC Condition No. 87 and 91, 288-291</p>	<p>See response to comment number 3.</p>
8	<p>DFO and PCA jointly submitted Working Group Comment Forms on the draft 2019 Bruce Head Shore-based Monitoring Report, draft 2019 Ship-based Observer Monitoring Report, draft 2019 Marine Mammal Aerial Survey report, draft 2017-2018 Integrated Narwhal Tagging Study Report, and the draft 2019 Passive Acoustic Monitoring Report with a number of questions/recommendations regarding implementation of these monitoring programs (see attached).</p>	<p>BIMC to work with MEWG to resolve issues and provide responses to the Working Group Comment Forms describing how those issues have been resolved through consensus, how the resolutions/recommendations have been incorporated into the final reports, and implemented across the relevant monitoring programs.</p>	<p>PC Condition Nos. 101-113 &amp; 119-123, 184, 325-335</p>	<p>See response to comment number 3.</p>

**Table 6 - Response to CIRNAC Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	Reviewer's Detailed Comment	CIRNAC Recommendations	Reference Section	Baffinland's Response
<b>Effects Monitoring</b>				
1	<p>The generation of dust by components of the Project and the potential effects of dustfall on land-based ecology along the project drainage ditches, marine shore-line ecology, soil quality, vegetation and forage for caribou are a concern. Dust fall on water courses affects water quality, potentially leading to environmental health issues. Baffinland has undertaken several initiatives such as using a new dust suppressant, 'Dust Stop', to reduce dust emissions particularly along the Tote Road. Monitoring results presented by Baffinland indicate that they have achieved a general decrease in total annual dust fall across the project area as presented in Trends of Project Condition No. 10.</p> <p>Ore dust, with chemical composition of 65% iron on average, as well as waste rock stockpiles are likely to be prone to leaching acidity, sulphate salinity and metals and metalloids. However, Table 4.15 states that ore dust runoff did not exceed the Final Environmental Impact Statement (FEIS) predictions.</p> <p>Additionally, nitrates are a potential contaminant found in ore dust that is associated with blasting activities. This presence can be inferred by above baseline nitrates and/or ammonia concentrations observed in Camp Lake and Sheardown Lake as well as the Mary River system (as defined in the results of Baffinland's self-assessment of Project Condition No. 20). Although, in all cases concentrations at monitoring locations were below the Canadian Council of Ministers of the Environment (CCME) guidelines, the relevance of CCME guidelines for an arctic environment has not been established.</p> <p>CIRNAC acknowledges the efforts Baffinland has made to manage ore dust at the mine site, however, the Department notes that even slight increases in the parameters highlighted above can have long term impacts that the current monitoring programs may not be designed to identify, specifically:</p> <ul style="list-style-type: none"> <li>The current vegetation and soil base metals sites do not appear to be testing for acidity / alkalinity, sulphate, iron, manganese, nickel and nitrate concentrations. Slight changes in soil growth parameters (particularly increased nitrate levels in drainage lines) in an arctic environment and slight increases in sulphate salinity and bioavailable concentrations of iron, manganese, nickel may significantly stress vegetation and surface soil biota.</li> <li>It is unclear whether the selected vegetation and soil base monitoring sites are static (i.e. the same location year by year) or incorporate targeting areas with readily visible dust deposition (via visual or aerial drone survey). These targeted areas should be captured in the monitoring program.</li> </ul> <p>☒ The depth of the profile of base soils represented by the soil sampling program is unclear. This will significantly affect the magnitude of metals concentrations and other parameters (e.g. the very shallow sampling depth which is no greater than the surface to immediately underlying dust deposition, versus a deeper sampling profile).</p> <ul style="list-style-type: none"> <li>It is unclear whether correlations between nitrate increases in terrestrial vegetation and or suspended aquatic biota (e.g., algae) in the water column of water bodies is being monitored.</li> </ul> <p>Overall it is unclear whether the monitoring programs associated with soil, vegetation, water way ecology, and marine ecology are specific enough to identify impacts to an arctic environment.</p> <p>Baffinland has committed to further assess impacts based upon a greater understanding of effects upon an arctic environment; however, the timeline associated with that commitment is unclear.</p>	<p>CIRNAC recommends that Baffinland consider including the following testing measures to increase quality of monitoring activities:</p> <ol style="list-style-type: none"> <li>Inclusion of testing for acidity / alkalinity, sulphate, iron, manganese, nickel and nitrate concentrations in vegetation and soil base metal site tests.</li> <li>Identification and targeting for monitoring areas with readily visible dust deposition (via visual or aerial drone survey) in vegetation and soil base monitoring sites.</li> <li>Clarify the base soils depth of sampling undertaken for the soil sampling program.</li> </ol>	<p>☒ Baffinland Iron Mines' 2019 Annual Report to the NIRB, May 15, 2020.</p> <ul style="list-style-type: none"> <li>o Section 4.6.2 Air Quality, Table 4.6 – Air Quality Impact Evaluation,</li> <li>o Section 4.6.5 Groundwater &amp; Surface Water,</li> <li>o Section 4.6.6 Vegetation and Self-assessed</li> </ul> <p>Performance on Project Conditions 10, 21.</p>	<p>a) Baffinland does include soil pH in the trace metals monitoring program, the results of which were reported in the 2019 TEAMR. A total of 36 elements are analyzed as part of the trace metals laboratory analysis for vegetation and soils, including iron, manganese, and nickel. Of these 36 elements, the six chemicals of potential concern (CoPCs) are examined and reported on thoroughly. Based on CIRNAC's comments, Baffinland will also consider analyzing and examining sulphate and nitrate concentrations to better understand the potential effects of dustfall on soil and vegetation health.</p> <p>b) In 2016, some trace metals sampling sites were repositioned in proximity to dustfall collectors to improve the comparison between dustfall deposition and trace metals concentrations. Some sampling sites have changed between years based on lichen availability and access. Baffinland is attempting to enhance sampling design by establishing new sampling sites in areas with enough lichen for sampling over multiple years, and near dustfall collectors. However, new sites can be limited by 1) a practical number and location of dustfall collectors [i.e. in 2019 there were 39 dustfall collection sites, but 60 metals sampling sites] and 2) lack of lichen availability near dustfall collectors. The trace metals program already targets "Near" sampling sites within 100 m of the PDA due to the expected elevated dustfall in these locations. It uses this as a discrete distance category in analysis to compare to "Far" and "Reference" sites.</p> <p>c) In 2019, the soil was sampled up to a depth of 10 cm. In 2020, the soil was sampled up to a depth of 5 cm based on previous reviewer feedback.</p>

Table 6 - Response to CIRNAC Comments on Baffinland's 2019 Annual Report to the NIRB

Cmt. #	Reviewer's Detailed Comment	CIRNAC Recommendations	Reference Section	Baffinland's Response
2	<p>As stipulated by the Project's Type A and Type B Water Licenses, Baffinland is required to monitor, document and report the Project's water withdrawal rates from approved water sources. Page 92 of the 2019 Annual Report states:</p> <p>"There were twelve (12) reported incidents where the daily water volume withdrawn for domestic purposes exceeded Camp Lake's domestic daily water withdrawal limit (203.8 m3/day). As noted in the Annual Report, these (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." (Baffinland Iron Mines 2019 Annual Report to the NIRB)</p> <p>There is a Table 4.1 in the 2019 Annual Report to NIRB; however it is not related to the daily water withdrawals incidences. Table 4.1 is titled "Status of Self-Assessment Compliance Terminology and Criteria".</p> <p>The QIA and NWB Annual Report however, does highlight these exceedances in Table 4.1 – Daily, Monthly and, Annual Volumes of Water used for Domestic and Industrial Purposes on Inuit-Owned Land Crown Lands – 2019. This creates unnecessary confusion for the Reviewer.</p>	<p>CIRNAC recommends that Baffinland include in subsequent Annual Reports to NIRB a summary table identifying all incidences when exceedances of the daily water withdrawal limits were reported.</p> <p>Specifically:</p> <p>a) Clarify the categorization of water volumes withdrawn.</p> <p>b) Determine if reported exceedances are actual exceedances, or if these exceedances are mis-categorized volume withdrawals, implement measures to avoid future mis-categorization of water volume withdrawals.</p> <p>c) Conduct a detailed investigation on daily water exceedances to determine the root and immediate causes of the incidence, lesson learned and measures to prevent future occurrence and capture it in the 2020 Annual Report to NIRB.</p>	<p>☒ Baffinland Iron Mines 2019 Annual Report to the NIRB, May 15, 2020. Section 4.6.4 (reference to Table 4.1 cited in Project Condition No. 19 – Results).</p> <p>☒ 2019 QIA and NWB Annual Report for Operations, April 30, 2020:</p> <p>o Performance on Project Certificate Conditions;</p> <p>o Project Certificate Condition No. 19.</p>	<p>During 2019, water was withdrawn from approved sources and used at Milne Port, the Mine Site and along the Tote Road for Project activities under the authorization of the Type 'A' Licence. To address the exceedances of daily water limits in 2019 and to prevent future events, Baffinland is committed to improving current operating practices to reduce the risk of reoccurrence. Immediate actions have been implemented onsite to address the daily water limit exceedances from 2019. This included installation of alarms at the Saillivik Camp water treatment plant. Baffinland is also looking to install an additional tank at the Saillivik Camp to have better raw water storage so that the plant has better control on incoming water. Along the Tote Road, a new Tote Road Water Collection Log has been established for Road Maintenance. Road Maintenance has also placed signage at the approved dust suppression withdrawal locations indicating the site name and number of daily loads which can be taken from the location.</p> <p>In addition to the above mitigations, Baffinland plans to take an adaptive management approach to prevent future daily water withdrawal exceedances. This approach is an alignment with Baffinland's Incident Investigation and HSEC Management Standards. The steps to be taken in the investigation are detailed below.</p> <p><u>Environmental Management Response Plan</u></p> <p>Action 1: Environmental Incident Cause Analysis Method (ICAM) Responsible Parties: Environment, Road Maintenance, Mine Operations and Site Services</p> <p>To minimize the likelihood of environmental incidents and to mitigate potential effects on the environment, Baffinland will be documenting a detailed environmental ICAM investigation with the various parties involved the management of daily water withdrawal onsite. The purpose of the ICAM is to identify and prevent the underlying cause.</p> <p>The following details the main steps that will be taken during the investigation:</p> <p>(1) Baffinland plans to further investigate and gather data from the Road Maintenance, Environment, Mine Operations and Site Services Department to better understand the underlying issue. Relevant sources of information will include reviews of the data management system used to track water withdrawals, audits of operator log-books, reviewing training procedures, on-site observations and conducting staff interviews.</p> <p>(2) Based on the information collected, Baffinland will then evaluate based on the data to determine the root cause(s). A "5 Why's Investigation" will be conducted to determine the underlying issue leading to the water withdrawal exceedances (i.e. why did this situation occur?). Some example possible factors could include human factors (training, supervision, distraction, etc.), design defects, equipment defects, documentation and record keeping, or deviations from standard operating procedures.</p> <p>(3) Baffinland will need to determine both long and short term corrective and preventative actions to reduce the likelihood of future water withdrawal exceedances from occurring. Some potential control measures may include installation of additional meters, alarms, updates to standard operating procedures, further training, regular inspections/operator internal audits. Input will be gathered from various staff in the affected departments. Once the controls are identified, the responsible parties will be assigned to implement the actions.</p> <p>Action 2: Implementation of Corrective and Preventative Actions Responsible Parties: Environment, Road Maintenance, Mine Operations and Site Services</p> <p>Once the corrective and preventative actions have been identified through the Environmental ICAM investigation, the responsible parties will be assigned to implement the actions. To track completion of the actions onsite, Baffinland will document progress updates during the weekly compliance meetings with Senior Management. Once the corrective measures have been implemented, Baffinland will assess the effectiveness of the actions taken.</p>

**Table 6 - Response to CIRNAC Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	Reviewer's Detailed Comment	CIRNAC Recommendations	Reference Section	Baffinland's Response
3	<p>Baffinland continued the groundwater monitoring program at the Mine Site Landfill Facility in 2019. Three (3) shallow groundwater wells (1.1 to 1.8 meter depths) down-gradient and two (2) groundwater wells up-gradient and drive-point piezometers were used to collect water near the active layer during September of 2019 (the time permafrost is at its maximum depth).</p> <p>Groundwater quality results during the 2019 program showed elevated values of conductivity, chloride and nitrate as well as some total metals. Due to the limited water quality data set, further groundwater monitoring and assessment of the stratigraphy are required to gain a better understanding of natural groundwater chemistry and hydrogeology at the Project site.</p> <p>Infiltration of runoff and leachate from the Waste Rock Stockpile area may be a source of contamination of groundwater quality; however the groundwater monitoring program does not include monitoring wells in the waste rock stockpiles areas.</p> <p>Additionally, potential nitrate impacts to groundwater at borrow pits / quarries along the transport route (i.e., as a result of blasting) need to be understood in terms of potential infiltration into groundwater and associated impacts.</p> <p>Baffinland recognized that challenges to implementing a groundwater monitoring program in shallow soils do exist; the results of the 2019 monitoring program demonstrate that groundwater monitoring may be feasible using drive-point piezometers at the Project site (or some equivalent method capable of collecting groundwater within the Waste Rock Stockpile). This is particularly important during periods when waste rock with significant acidic soluble sulphate content is being deposited (i.e. to evaluate the effectiveness of seepage containment during these periods).</p>	<p>CIRNAC recommends that Baffinland:</p> <p>a) Expand the groundwater monitoring program to include the Waste Rock stockpile area and other mine site areas (e.g., such as borrow pits and quarries) including shallow and deep wells in future years to gain a better understanding of the groundwater levels, stratigraphy characterization, permeability, groundwater quality and groundwater flow direction.</p> <p>b) Provide at a minimum a risk-based rationale for not implementing a groundwater monitoring program for the quarries.</p> <p>c) Complete a comparative analysis of existing groundwater quality and continue during future years the analysis of data that Baffinland is currently performing, to identify any trends and present a report in next year's annual report.</p>	<p>☒ Baffinland 2019 Annual Report to the NIRB Section 4.6.5 and – Appendix G.5 Groundwater 2019 Monitoring Program, May 2020.</p> <p>☒ Mary River Project 2019 QIA and NWB Annual Report for Operations, April 30, 2020 - Appendix E.12 2019 Groundwater Monitoring Report.</p>	<p>Baffinland is further evaluating the groundwater monitoring program in 2020, Baffinland has retained groundwater consultants knowledgeable in Arctic environments to further assess the current program and provide recommendations in 2020. Baffinland plans to evaluate the groundwater 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.</p> <p>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. Tetra-tech has been hired to evaluate and provide recommendations for the potential expansion of the monitoring locations, as well as the implementation of the 2020 field season. Once assessed, Baffinland will provide further recommendations to CIRNAC, NWB and other relevant parties.</p>
	<p>Baffinland has undertaken several initiatives since the 2018 Annual Report to NIRB, including:</p> <ul style="list-style-type: none"> <li>☒ upgrade of the water treatment plant,</li> <li>☒ increase of the drainage capture catchment,</li> <li>☒ remediation of the WRF pond liner, and</li> <li>☒ updating the Phase 1 Waste Rock Management Plan based upon further geochemical investigation and further review of both geochemical and thermal monitoring data sets.</li> </ul> <p>Overall, these initiatives seem technically sound and will improve operational and post closure management of the WRF.</p> <p>Baffinland reported the following incidents:</p> <ul style="list-style-type: none"> <li>☒ there was a waste rock effluent spill September 28, 2019 (small but undisclosed volume greater than 100 metres from a water body),</li> <li>☒ in June 2019 one exceedance of the MDMER maximum authorized monthly mean discharge concentration for TSS of 15 mg/L, and</li> <li>☒ one non-compliant discharge event of the MDMER grab sample criterion for TSS of 30 mg/L.</li> </ul> <p>Baffinland has made a commitment to improve suspended solids removal via the installation of a second geo-tube settling pond in 2020. Overall, these reported spills and discharge exceedances appear to be relatively minor and manageable and the suggested method to improve suspended solids removal seems appropriate.</p> <p>The geochemical characterization and data review work undertaken by Golder in 2019 and used to inform the current Phase 1 Waste Rock Management Plan (Rev 3) has made significant progress:</p> <ul style="list-style-type: none"> <li>☒ explaining the geological origin and spatial extent within Deposit 1 of the acidic soluble sulphate content within waste rock, that potentially led to unexpected acidic and elevated nickel drainage water in 2017,</li> <li>☒ updating the Potentially Acid Generating (PAG) identification criteria to include a paste pH threshold of 6 to differentiate between PAG and Non-Acid Generating (Non-AG) materials as it appears to be a reliable indicator of acidic soluble sulphate content, and</li> <li>☒ selecting blasthole samples of both PAG and Non-AG material for Acid Base Accounting (ABA) and Shake Flask Extraction (SFE) testing on an ongoing basis (1 hole per 40,000 tonnes) to further inform the geochemical database.</li> </ul> <p>However there still remain the following fundamental issues for identification and management of Acid Rock Drainage and or Metal Leaching (ARD/ML) materials:</p> <ul style="list-style-type: none"> <li>☒ Use of 0.2% total sulphur threshold (an analogue for a Neutralization Potential Ratio [NPR] of 2) to differentiate between PAG and Non-AG materials does not account for an absence of calcium or magnesium</li> </ul>	<p>CIRNAC recommends that Baffinland:</p> <p>a) Review the 0.2% total sulphur threshold that is an analogue for an NPR of 2 based upon further geochemical test work and data review that can be relied upon to explain the implications of an absence of calcium or magnesium carbonate mineral content and associated neutralization potential in the waste rock;</p> <p>b) Perform a sensitivity analysis around the effect of uncertainty in the 0.2% total sulphur threshold and expected tonnages of acidic soluble sulphate waste rock on projected volumes of PAG and Non-AG rock and implications in the design and operation of the WRF;</p> <p>c) Develop specific contingencies in the current Life of Mine Plan to reflect the findings around waste rock management and to reflect any implications for unforeseen amounts of acidic soluble sulphate waste rock approaching mine closure;</p> <p>d) Confirm that the total concentrations of potential contaminants of concern (PCOC) associated with the Non-AG rock WRF cover at closure are likely to be suitable for final intended land use(s) (i.e. not pose either an ecological / human health risk);</p> <p>e) Define the role and responsibility of the Engineer of Record (EOR) for waste rock facility in the Waste Rock Management Plan. Consider including the role and responsibility of the EOR to conduct periodic review of thermal, hydraulic and geotechnical performance of this facility to ensure it meets the design intent;</p> <p>f) Provide an updated thermal analysis including the heat balance and oxygen balance across the WRF; and</p> <p>g) Provide flow characteristics of the frozen waste rock mass and determine if it meets the design requirements.</p>	<p>☒ Baffinland 2019 Annual Report to the NIRB</p> <ul style="list-style-type: none"> <li>o Section 3 - CIRNAC Directive - Waste Rock Facility, May 15, 2020, Section 4 - 4.5.2 and 4.6.5 Self-assessed Performance on Project Conditions 16, 17, 24, 41, 46, Section 5, Section 6, Appendix D, Appendix E.</li> <li>☒ Nunavut Water Board Water Licence No. 2AM-MRY1325, Part F, Section 3.</li> <li>☒ Phase 1 Waste Rock Management Plan. Ref. No. BAF-PH1-830-P16-0029, Rev 2, December 31, 2019 and update Rev 3 June, 16, 2020.</li> <li>o Section 7 Thermal Analysis.</li> <li>☒ Golder Technical Memorandum 1790951. December 31, 2019.</li> <li>☒ Life of Mine Waste Rock Management Plan, (BAF-PH1-830-P16-0031), 2014.</li> </ul>	<p>a) Waste rock characterization and refinement of the criteria used to classify NAG and PAG are an integral part of the WRMP. Baffinland intends to complete an annual sampling program (minimum 1 sample per 40,000 tonnes of blasted waste rock) on representative waste rock that will be submitted for ABA and SFE testing. This testing will be used to further develop Baffinland's geochemical database. The results of this program will be integrated in the 2021 revision of the WRMP and will be used to validate the performance of the current criteria. This analysis will inform the need to refine the current NAG/PAG classification criteria and allow Baffinland to evaluate the need to adjust the site's sampling and testing capacity/capabilities.</p> <p>b) As above, further analysis and investigation into the uncertainty in the 0.2% sulfur cut-off will be completed as part of the next iteration of the WRMP.</p> <p>c) Based on current operating knowledge, soluble sulphates are limited to specific areas of the open pit in proximity to mineralization (particularly in the hanging wall side) while the footwall consists primarily of NAG material. As operations progress, the strip ratio of the open pit increases and a large quantity of NAG waste rock suitable for covering the PAG will become available for placement and covering. Baffinland will continue to monitor and improve its understanding of the geology and geochemistry of the deposit. As a contingency, mine plan modifications would be undertaken in order to ensure that sufficient quantities of NAG waste rock are mined prior to closure to complete the planned 50m outer cover of NAG rock.</p> <p>d) Cover material for the Waste Rock Facility will be sourced from Non-AG rock from Deposit 1 and/or quarry material based on availability at final closure. As a contingency, mine plan modifications would be undertaken in order to ensure that sufficient quantities of NAG waste rock are mined prior to closure to complete the planned 50m outer cover of NAG rock. As with all construction rock, the material will be confirmed suitable prior to use.</p> <p>e) It is unclear in what capacity CIRNAC believes the Engineer of Record would act relative to the operation of the waste rock facility. For clarity, an Engineer of Record oversaw the construction of the Waste Rock Facility pond, and the erection of the Water Treatment Plant, but does not oversee the operation of the Waste Rock Facility. For a complete discussion on Roles and Responsibilities relative to the operation of the WRF and the implementation of the WRMP, please refer to Section 4 of the Phase 1 Waste Rock Management Plan (Rev. 3, June 2020).</p> <p>f/g) An updated analysis of the existing thermistors installed in the dump as well as an evaluation of pile performance will be completed as part of the next WRMP update.</p>

Table 6 - Response to CIRNAC Comments on Baffinland's 2019 Annual Report to the NIRB

Cmt. #	Reviewer's Detailed Comment	CIRNAC Recommendations	Reference Section	Baffinland's Response
4	<p>carbonate mineral content, which significantly reduces effective neutralization capacity;</p> <p>☒ The evidence for sufficient neutralization capacity provided in the Phase 1 Waste Rock Management Plan (Rev 3) are results from 4 Humidity Cell Test (HCT) cell kinetic results and a set of silicate neutralization literature papers. This evidence is not sufficient to base predictions of neutralization potential for the full range of waste rock that will be produced over life of mine from Deposit 1, particularly when field conditions are so different from conditions in the laboratory and those associated with the referenced papers;</p> <p>☒ Even if an NPR threshold of 2 is assumed to be correct, the most recent presentation of the historical data set [Figure 10 from Golder Technical Memorandum 1790951,] suggests the total sulphur threshold would need to be significantly less than 0.2% to reliably achieve an NPR greater than 2;</p> <p>☒ There does not appear to be any sensitivity analysis around the effect of uncertainty in the 0.2% total sulphur threshold and expected tonnages of acidic soluble sulphate waste rock on projected volumes of PAG and Non-AG rock and implications in the design and operation of the Waste Rock Facility (WRF) for 2020 to 2021 (e.g. Section 10.2, Golder Waste Rock Management Plan 2020 to 2021). The current Life of Mine Waste Rock Management Plan developed in 2014 does not acknowledge any of these uncertainties and implications on WRF design and operation, particularly in relation to mine closure when it is assumed there will be sufficient Non-AG rock for a 50 m thick cover. Furthermore, there does not appear to be any specific contingencies in the current life of Life of Mine Waste Rock Management Plan for a significant and unexpected amount of acidic soluble sulphate waste rock approaching mine closure;</p> <p>☒ Neither the Life of Mine Waste Rock Management Plan or the Phase 1 Waste Rock Management Plan (Rev 3) qualify the total concentrations of Potential Contaminants Of Concern (PCOC) that may be associated with the Non-AG rock WRF cover at closure and whether concentrations of PCOC are likely to be suitable for final intended land use(s) (i.e. not pose either an ecological / human health risk);</p> <p>☒ Given the complexity of the WRF and the premise that the permafrost will set in and provide a hydraulic barrier for both water and airflow as an active ARD/ML preventive measure, an Engineer of Record (EOR) for this facility has an important role that has to be defined; and</p> <p>☒ A thermal assessment was undertaken by Baffinland to characterize the freezing patterns of deposited waste rock and assess its thermal performance. The instrumentation program implemented for the thermal assessment included thermistors, oxygen sensors, fluid (held within the waste deposit voids) pressure sensors - barometers and piezometers. Monitoring data from such sensors shall be used to establish the heat balance, and oxygen balance for WRF as Baffinland has done with the water balance. The heat balance should account for heat generation through ARD/ML chemical equations and barometric pump driven convection heat. The thermal assessment shall also help to establish the flow through characteristics of the frozen waste rock mass.</p>			

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5	<p>There are many proposed borrow and quarry pit sites over the Project area. Although each has a relatively small disturbance footprint, collectively they span a great area (particularly along the Tote road and what may be required for the construction of any future rail link) and overall present significant risks to land use, aesthetics, human health and ecology (both terrestrial and aquatic). Baffinland has undertaken extensive and regular geotechnical surveys of existing borrow and quarry pit sites and there appears to be an appropriate set of management measures in the associated Borrow Pit and Quarry Management Plan and Borrow Source Management Plan-Kilometre 97. However, the following issues have yet to be addressed:</p> <ul style="list-style-type: none"> <li>In the Memo dated July 3, 2019, Baffinland committed to avoid mitigate and monitor ARD/ML materials at all rail corridor quarries. The detailed and specific mitigation measures were presented in Baffinland's Memo to ECCC dated May 14, 2019. This includes 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 has also provided both the Phase 1 and Phase 2 ARD/ML test work program results, which are 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. Quarry and borrow pits for road / rail construction represent a low risk in terms of ARD. 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 and water treatment requirements are yet to be determined.</li> <li>Both the Borrow Pit and Quarry Management Plan Borrow Source Management Plan-Kilometer 97 make reference to restoration of the disturbed areas to achieve a site which is physically, chemically, and biologically stable upon closure but there does not appear to be any survey / information regarding the pre-disturbed condition of these areas, particularly in relation to baseline contamination (including baseline nitrate levels in down-stream water ways), vegetation and general aesthetics and most of these aspects are not included in the criteria in terms of successful reclamation and rehabilitation.</li> <li>QMR2 Quarry is a main construction materials quarry at the mine site. 2017 geochemical test work suggested rock materials had low potential for ARD/ML. 2018 aggregate extraction results indicated elevated sulphur concentrations, described as localized PAG areas. A total of 2430 m3 of PAG rock material was shifted to Waste Rock Facility. This development results in a new issue of concern as there is the potential for the creation of exposed PAG wall areas that can generate long term sources of ARD/ML into the watershed that will require monitoring and mitigation both during operations and after mine closure.</li> </ul>	<p>CIRNAC recommends that Baffinland:</p> <ol style="list-style-type: none"> <li>Confirm the origin of elevated concentrations of aluminum, mercury and copper in Shake Flask Extraction test 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 required by the project water licence.</li> <li>Compare the monitoring results with the FEIS Addendum predictions and identify and implement any appropriate mitigation measures. Report Results in the 2020 Annual Report</li> <li>Integrate reclamation / restoration criteria into their Closure and Reclamation Plan with specific reference to desired post disturbance condition of borrow / quarry areas in terms of contamination (including nitrate levels in down-stream water ways), vegetation and general aesthetics.</li> <li>Update the 2017 QMR2 Quarry Management Plan to identify PAG sources on quarry walls as well as monitoring and mitigation for operation and closure. Monitoring and mitigation results should then be included in future Annual reports.</li> </ol>	<ul style="list-style-type: none"> <li>☑ Baffinland 2019 Annual Report to the NIRB May 15, 2020 (Sections 3.1, 3.3, 4.6.5, Self-assessed Performance on Project Conditions 25, 26, 28, 30, 41 and 60.</li> <li>☑ Nunavut Water Board Water Licence No. 2AM-MRY1325, Part F, Section 3.</li> <li>☑ Borrow Pit and Quarry Management Plan (2014, BAF-PH1-830- P16-0004).</li> <li>☑ Borrow Source Management Plan-Kilometer 97 (2014, BAF-PH1-830-P16-0032).</li> <li>☑ Baffinland's Memo to ECCC, May 14, 2019.</li> <li>☑ Baffinland Memo, July 3, 2019.</li> <li>☑ 2017 QMR2 Quarry Management Plan - BAF-PH1-830-P16- 0040 (Section 4.5 – Site Management Measures).</li> <li>☑ 2018 QIA and NWB Annual Report for Operations, April 30, 2020 (Section 9.5 - Summary of Geochemical Analysis for Operated Quarries).</li> </ul>	<ol style="list-style-type: none"> <li>Baffinland will further evaluate the potential origin of elevated concentrations of aluminum, mercury and copper in Shake Flask Extraction test for rock materials sourced from quarry and borrow pits for construction activities associated with Phase 2, including road and railway construction. Further analysis of potential quarry locations for Phase 2, including a comprehensive drilling program, is planned in advance of development of these quarries. However, this work and the assessment of the Phase 2 quarry locations falls outside the scope of the 2019 NIRB Annual Report for current operations.</li> <li>Baffinland provided a summary of geochemical analysis for operated quarries in the 2019 QIA-NWB Annual Report for Operations (Section 9.5). In accordance with terms of the Type 'A' Water Licence (Schedule B, Item g (xiii)), geochemical analysis results for aggregates extracted from approved quarries during 2019 to support construction and road maintenance activities, presented in Appendix E.7. Appendix E.7 also provides a statistical summary of the 2019 geochemical results for each quarry, in addition to the laboratory analytical data. The 2019 results for aggregate extracted from the quarries was also compared to pre-development predictions.</li> <li>Table 5.1 of the Interim Closure and Reclamation Plan (ICRP, Rev. 5, 2018) outlines the Site Wide and quarry specific objectives and criteria, including physical and chemical stability, revegetation promotion, drainage restoration, and aesthetics to name a few. The criteria will need to be refined over the life of the mine, both through ongoing monitoring and reclamation research, and through consultation with regulatory bodies and communities on the desired end land use.</li> <li>Please refer to Section 9.5 of the 2019 QIA-NWB Type A Annual Report for a description of the monitoring and mitigations in place for potential PAG management in QMR2.</li> </ol>

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Cmt. #	Reviewer's Detailed Comment	CIRNAC Recommendations	Reference Section	Baffinland's Response
6	<p>In the 2019 QIA and NWB Annual Report, Baffinland mentions the continued implementation of a long-term multi-year plan to address localized areas of permafrost degradation associated with some borrow areas. The Borrow Source Management Plan implemented during 2018 was continued in 2019. As stated in the report, "Borrowing in the Km 97 areas has led to thawing of the underlying permafrost soils, which has caused a considerable increase in ponded water, and as a result there is settlement from thaw of both the ground ice in the soil matrix". During 2019, Baffinland notes the reclamation efforts included significant dewatering of the Km 97 borrow areas to reduce permafrost degradation.</p> <p>Baffinland further indicates that the Tote Road conditions were evaluated and an action plan has been implemented in 2019 / 2020, including to address historic borrow sources. Section 2.2 of the 2019 Milne Inlet Tote Road and Borrow Sources notes that "2019 work was carried out to guide possible progressive reclamation activities for the numerous borrow pits. Minor reclamation has been conducted to date, but many remain untouched." This has resulted in deteriorating conditions over time, as demonstrated by a number of sites being given higher priority rankings than before.</p> <p>Section 4.6.4 of the 2019 Annual Report to t indicates as path forward that Baffinland plans to continue with implementation of its Tote Road Earthworks Execution Plan which proposed reclamation in 2019-20 of all 17 Priority A to A++++ sites. Priority B and Priority C sites are not addressed therein. CIRNAC is concerned that over time these lower priority sites have tended to become destabilized and conditions worsened.</p> <p>Section 6 of the Interim Closure and Reclamation Plan describes proposed progressive rehabilitation measures to be implemented. It would be beneficial if the main body of the Annual Report provided a high level summary of progressive reclamation and closure activities for all areas and facilities that were carried out in the previous year as well as future planned activities. For borrow pits/areas, information should be presented in a table format which can specifically identify the priority rating, recommended reclamation measure and status, and results of follow-up inspections/monitoring.</p> <p>Section 8.2 of the 2019 QIA and NWB Annual Report states that additional closure activities are outlined in the 2019 Work Plan (Rev.1). This document is not part of the 2019 Annual Report to NIRB. A summary of the closure activities included in the Work Plan and a concordance table relating the activities performed during 2019 (listed in Table 8.0), would be useful to complete the Annual Report.</p> <p>Furthermore, the Borrow Pit and Quarry Management Plan, and the Borrow Source Management Plan-Kilometre 97 make reference to restoration of the disturbed areas to achieve a site which is physically, chemically, and biologically stable upon closure.</p> <p>However, there does not appear to be any survey / information regarding the pre-disturbed condition of these areas, particularly in relation to baseline contamination (including baseline nitrate levels in downstream water ways), vegetation and general aesthetics and most of these aspects are not included in the criteria in terms of successful reclamation and rehabilitation. This is also the case for dust fall impacts across the project area.</p> <p>Finally, there appears to be a lack of third party review of whether methods of impact assessment and rehabilitation criteria and strategies related to disturbed areas and terrestrial environment are relevant to an arctic environment (BIMC Methods for PC No. 39, 40 and 56).</p>	<p>CIRNAC recommends that Baffinland:</p> <p>a) Include in the 2020 Annual Report, an overview of the long-term multiyear plan to address the permafrost degradation in the borrow pits/areas, including a table summary that includes all borrow sites.</p> <p>b) Include in the 2020 Annual Report, a summary description of other closure and reclamation activities, including those outlined in the 2019 Work Plan (Rev.1).</p> <p>c) Revisits Reclamation / restoration criteria with specific reference to target conditions of borrow / quarry areas in terms of contamination (including nitrate levels in downstream water ways), vegetation and general aesthetics. As part of that process, validate that these criteria are relevant to the arctic environment.</p>	<p>☑ Baffinland, 2019 Annual Report to the NIRB May 15, 2020, including:</p> <ul style="list-style-type: none"> <li>o Appendix G.15: 2019 Milne Inlet Tote Road and Borrow Sources (File No. ENG.EARC03171-01);</li> <li>o Appendix G.16: Borrow Source Action Plan.</li> </ul> <p>☑ Borrow Pit and Quarry Management Plan (2014, BAF-PH1-830-P16-0004).</p> <p>☑ Borrow Source Management Plan-Kilometre 97 (2014, BAFPH1-830-P16-0032).</p> <p>☑ Interim Closure and Reclamation Plan (2018, BAF-PH1-830-P16-0012), October 2018.</p> <p>☑ 2019 QIA and NWB Annual Report for Operations, April 30,2020:</p> <ul style="list-style-type: none"> <li>o Section 8.0 – Reclamation, Closure and Financial Security.</li> </ul>	<p>a) For the 2020 NIRB Annual Report, Baffinland will continue to report on the development and implementation of a long term multi-year plan to address localized areas of permafrost degradation associated with the current and historic borrow areas. During 2019, Baffinland continued the reclamation efforts in the borrow pit/areas including significant dewatering of the KM97 borrow areas to reduce permafrost degradation. Evaluation of the condition of the Tote Road by Tetra Tech led to the implementation of an action plan to address the historic borrow sources on the Tote Road, to be executed in 2019 and 2020. As outlined in the reclamation plan, onsite reclamation efforts are expected to continue in 2020.</p> <p>b) A summary description of other closure and reclamation activities onsite is reported annually in the QIA-NWB Type A Annual Report for Operations, please refer to reclamation works presented in Table 8 - Reclamation Works Related to Project Operations on Inuit-Owned and Crown Lands - 2019.</p> <p>c) Table 5.1 of the Interim Closure and Reclamation Plan (ICRP, Rev. 5, 2018) outlines the Site Wide and quarry specific objectives and criteria, including physical and chemical stability, revegetation promotion, drainage restoration, and aesthetics to name a few. The criteria will need to be refined over the life of the mine, both through ongoing monitoring and reclamation research, and through consultation with regulatory bodies and communities on the desired end land use.</p>

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Cmt. #	Reviewer's Detailed Comment	CIRNAC Recommendations	Reference Section	Baffinland's Response
7	<p>Table 4-1 of the Stakeholder Engagement Plan identifies 5 key community concerns, including “environmental degradation due to spills.” However, spills continue to be a concern, as discussed below.</p> <p>Table 4.3 of the 2019 Annual Report summarizes unauthorized discharges and spills for 2019. This table is a beneficial addition to the report; however, the location of the spill was not provided.</p> <p>To compare 2019 with 2018 spills, CIRNAC reviewed “Table 6.1 -List of Reported Spills and Unauthorized Discharges - 2018” from the 2018 QIA and NWB Annual Report. There were 25 reportable spills in 2019. Baffinland notes that this is a 28% decrease from the 36 spills reported in 2018. Baffinland indicates adherence to its Spill Contingency Plan, including notification within 24 hours and follow- up spill reports. Immediate causes, corrective and preventative actions are reported.</p> <p><b>Sewage and Grey Water</b></p> <p>The majority of spills continue to be sewage and grey water, which dropped frequency from 23 spills in 2018 to 15 spills in 2019.</p> <p>However, the total volume of the spills increased by approximately 20% (16 m3 in 2018 to 21 m3 in 2019). The primary recommendation for these types of spills in the follow-up reports (Appendix E.8.4 of the 2019 QIA and NWB Annual Report) continues to be routine or continued checks and inspections.</p> <p>Section 6.1 of the 2018 QIA and NWB Annual Report provided a more detailed analysis for 2018 spills. The most common causes were attributed to equipment failure, improper equipment use and procedural issues.</p> <p>Although there is no such analysis in the -2019 Annual Report, a review of the 2019 follow-up reports indicates that the root causes for most of the 2019 reportable sewage and greywater spills are similar. This suggests improved preventative maintenance, training and inspections could reduce the number and quantity of sewage and greywater spills.</p> <p>Finally, the follow-up reports contain some specific recommendations, such as snow and ice removal from the lines (Spill No. 18-492) and reference to piping schematics prior to snow removal in high risk areas (Spill No. 19-007). These types of recommendations should be incorporated into environmental management plan updates to avoid future reoccurrences.</p> <p><b>Hydrocarbon</b></p> <p>The number of reportable hydrocarbon releases dropped from seven in 2018 to four in 2019, including a reduced quantity spilled. Recommendations from follow-up reports in Appendix E.8.4 of the 2019 QIA and NWB Annual Report include: regular and/or increased inspections; operator review of Standard Operating Procedures and, daily toolbox reinforcement. Updates to future environmental management plans should include these types of recommendations, as appropriate, to avoid future reoccurrences.</p> <p><b>Sediment</b></p> <p>The number of reportable sediment releases decreased from four in 2018 to two in 2019. The 2019 Freshet Monitoring Report documents the sediment releases and the corrective actions taken to avoid future sediment releases during the freshet.</p> <p>Recommendations from spill follow-up reports should be incorporated, as appropriate, into updates of the environmental management plans.</p>	<p>CIRNAC recommends that Baffinland:</p> <p>a) Include in the 2020 Annual Report a more detailed analysis of unauthorized discharges and spills, including quantity spilled and an overview of root causes and corrective/preventative measures.</p> <p>b) Include in the 2020 Annual Report an update on the measures taken to ensure that the necessary equipment has been maintained and the necessary training provided to personnel to respond to all sizes of spills at the various Project locations.</p> <p>c) Incorporate recommended corrective/preventative measures from follow-up reports as outlined in Appendix E.8.4 of the 2019 QIA and NWB Annual Report into future environmental management plan updates.</p> <p>d) Implement recommended corrective/preventative measures, as outlined in Appendix E.8.4 of the 2019 QIA and NWB Annual Report, in the execution of the work.</p>	<p>☑ Baffinland, 2019 Annual Report to the NIRB, May 15, 2020, including Appendix G.4 – Freshet 2019 Monitoring Report.</p> <p>☑ Stakeholder Engagement Plan, Doc. No. BAF-PH1-830-P16- 0025, Rev 1, March 14, 2016.</p> <p>☑ Baffinland’s Spills Contingency Plan, Doc. No. BAF-H1-830- P16-003, April 29, 2020.</p> <p>☑ 2018 QIA and NWB Annual Report for Operations, March 31, 2019.</p> <p>☑ 2019 QIA and NWB Annual Report for Operations, April 30, 2020, including Appendix E.8.4 - Initial and Follow-Up Reports and Appendix E.11 - Freshet 2019 Monitoring Report.</p>	<p>a) Each year Baffinland provides a detailed review of reported incidents including spills in the QIA-NWB Annual Report for Operations. All spills reported to the NT-NU Spill Line in 2019 are summarized in Table 6.1 and presented in Figure 8. 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. The follow-up reports included a description of the event, the immediate cause(s), corrective and preventative action(s), photos, and a map showing the location of the spill. The follow-up spill reports and original spill reports are provided in Appendix E.8.4.</p> <p>b) Each follow-up spill report, as provided in Appendix E.8.4 includes a detailed description of the event, the immediate cause(s), corrective and preventative action(s), photos, and a map showing the location of the spill. If equipment malfunctioned and caused the spill, the immediate and corrective actions are provided in the follow up reports.</p> <p>In terms of onsite training for spill response, all employees/contractors are trained during orientation and review the Spill Contingency Plan during their onboarding. Supervisors receive additional training on spill response and incident reporting. To ensure Baffinland’s emergency response teams have the skills needed to safely and effectively respond to marine spills, marine spill response training was provided by external consultants at Milne Inlet, prior to the 2019 fuel resupply. During the training, the Project’s Emergency Response Plan (ERP; BAF-PH1-840-P16-0002), Spill Contingency Plan (SCP; BAF-PH1-830-P16-0036) and Milne Inlet Oil Pollution Emergency Plan (OPEP; BAF-PH1-830-P16-0013) were reviewed. During the practical deployment exercises, the responders were provided with the opportunity to learn and then practice skills by responding to marine spill scenarios using the Milne Port resident spill response equipment. The findings related to the annual training sessions continue to be used to inform revisions to the OPEP, ERP and SCP.</p> <p>c) It is Baffinland’s practice to incorporate recommended corrective/preventative measures from previous spills into future management plan updates. Baffinland also incorporates any identified equipment malfunctions resulting in a spill event into current preventative maintenance programs onsite.</p> <p>d) Baffinland completed a review of all recommended corrective/preventative measures from follow-up reports as outlined in Appendix E.8.4. All actions involving the replacement of equipment or parts have been implemented. Some examples include replacement of failed membrane at the sewage treatment plant, addition of a final filtration bag filter at the waste rock facility water treatment plant and replacement of media for the mobile oily water treatment system.</p>
8	<p>T&amp;C No. 64 requires Baffinland to implement systems and procedures to prevent the attraction of carnivores to the Project site. The Waste Management Plan in part focusses on preventing carnivore attractants from being disposed at the landfill, including food wastes and materials such as cardboard, wrappers or other paper products which may carry food odours. The Polar Bear Safety Plan further stresses, as a priority, preventing polar bears from developing bad habits by keeping food inaccessible.</p> <p>Baffinland considers the installation of the fencing at the Mary River Landfill, containing landfill litter from reaching the tundra, as one of its key 2019 environmental initiatives. The fence with a single locked gate can restrict unauthorized access to the landfill and possibly the dumping of prohibited wastes, including food wastes. The fence, however, does not prevent the ingress and egress of carnivores, including smaller animals which could attract larger carnivores. The Waste Management Plan identified measures to deter or otherwise not attract animal, including: animal-proof containers; incineration of food/food contaminated wrappers and cardboard; and installation of metal skirting on the accommodation and kitchen complexes to prevent denning near humans. All of these are ongoing measures, requiring: staff training; continued vigilance to ensure all food wastes are properly stored and the food waste containers are intact; and, inspections of the landfills for banned wastes. The success of these measures can be undermined however, for example, by a single event of unauthorized dumping of food wastes at the landfill.</p> <p>The mitigation measures are not specific in quantified evidence, such as frequency of landfill inspections and outcomes of the prevention measures. Evidence of the presence of an Arctic fox indicates that the current measures are either underperforming or are not sufficient. Additional measures may be warranted.</p>	<p>CIRNAC recommends that Baffinland:</p> <p>a) Provide in its future annual reports more quantified information on the frequency of landfill inspections and the results of such inspections. This includes any indication of unauthorized food waste disposal or the presence of animals, including smaller animals (pets) at the landfill that could attract larger carnivores.</p> <p>b) Indicate in its annual report the number of times food waste containers have been found damaged by animals or food wastes not properly contained therein.</p> <p>c) Document animal denning or otherwise frequenting the Project sites.</p>	<p>☑ Baffinland, 2019 Annual Report to the NIRB, May 15, 2020, including Appendix G.4 – Freshet 2019 Monitoring Report.</p> <p>☑ Waste Management Plan - Document No. BAF-PH1-830-P16-0028, Revision 8, March 31, 2020.</p> <p>☑ Polar Bear Safety Plan - Document No. BAF-PH1-830-P16-0041, Revision 1, March 7, 2016.</p>	<p>a) Baffinland currently sends all weekly waste reports to CIRNAC, capturing in real-time any internal non-conformances with the Waste Management Plan. For future reporting, Baffinland will consider presenting more quantified information pertaining to the landfill in next year’s annual reporting.</p> <p>b) Baffinland conducted an internal waste audit in 2020 to assess the life cycle of waste from source control to segregation and final disposal of products onsite. For future reporting, Baffinland will consider reporting on metrics related to internal waste sorting non conformances and corrective actions.</p> <p>c) All wildlife interactions are documented through Baffinland’s incident reporting procedure.</p>

**Table 6 - Response to CIRNAC Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	Reviewer's Detailed Comment	CIRNAC Recommendations	Reference Section	Baffinland's Response
9	<p>Under the Mary River Annual Report section for PC No. 25, it was indicated that the minor repairs and actions recommended by reviewers of previous annual report had not been completed, including;</p> <ul style="list-style-type: none"> <li>☒ remove timbers and other miscellaneous items from the Hazardous Waste Berm 6 at the Mine Site to ensure liner integrity, and</li> <li>☒ correct minor disturbance by foot traffic at the generator fuel berm as well as the Milne Port Hazardous Waste Storage facility.</li> </ul> <p>They are scheduled to be addressed prior to July 2020.</p> <p>Section 6.4 of the Hazardous Materials and Hazardous Waste Management Plan, Document No. BAF-PH1-830-P16-0011, requires, as part of reporting, that:</p> <p>"Project hazardous materials and hazardous materials activities including quantities of contaminated soils, water or waste that is generated at Project sites are included in Baffinland's submission of the NWB, QIA and NIRB annual reports."</p> <p>The 2019 Annual Report to NIRB should include a high level summary table identifying the types and quantities of contaminated soil and hazardous wastes generated by the different activities performed in the preceding year and outcomes of inspections and management of temporary hazardous waste storage locations.</p>	<p>CIRNAC recommends that Baffinland:</p> <ul style="list-style-type: none"> <li>a) Ensure a timely implementation of repairs and actions recommended by reviewers of previous annual report, regarding the hazardous waste storage facilities.</li> <li>b) Include in 2020 Annual Report to the NIRB, a summary table for hazardous wastes and contaminated soils, including type and quantity and a supporting narrative of wastes generated by the different activities performed and outcomes of inspections and management action.</li> </ul>	<ul style="list-style-type: none"> <li>☒ Baffinland, 2019 Annual Report to the NIRB, May 15, 2020.</li> <li>☒ Hazardous Materials and Hazardous Waste Management Plan - Document No. BAF-PH1-830-P16-0011.</li> </ul>	<ul style="list-style-type: none"> <li>a) In 2019, geotechnical investigations continued to be conducted at Project sites including the hazardous waste storage facilities. 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. If repairs and actions recommended by reviewers are identified during inspections, corrective actions are implemented in a timely manner. All actions taken to date are summarized in the Geotechnical Inspection Reports included as Appendix C.2 in the QIA-NWB Annual Report for Operations.</li> <li>b) For 2020 reporting, Baffinland will consider presenting a summary table of activities resulting in the generation of contaminated soils. For 2019 reporting, please refer to Table 5.5 of the QIA-NWB Annual Report for Operations for a summary of quantities of hydrocarbon impacted soil, water, and snow deposited in the Milne Port Landfarm Facility.</li> </ul>
10	<p>Term and Condition #134 requires Baffinland to report project-specific information on employee origin for labour analysis purposes. Pursuant to this T&amp;C, Baffinland must provide the following information within their annual report submission:</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; and</li> <li>d) The number of non-Canadian foreign employees hired, specifying the locations and number from each foreign point of hire.</li> </ul> <p>Baffinland has not provided information for items b), c), and d) in their 2019 Annual Report. This issue was raised during the June 24, 2020 Mary River Socio-economic Monitoring Working Group meeting and Baffinland subsequently provided the required information to working group members on June 26, 2020.</p>	<p>CIRNAC recommends that Baffinland include employee origin data for all of the parameters identified in T&amp;C #134 in future annual report submissions.</p>	<ul style="list-style-type: none"> <li>☒ NIRB Project Certificate No. 5, Term and Condition #134</li> <li>☒ Baffinland, 2019 Annual Report to the NIRB, May 15, 2020</li> <li>o Section 4.7.7 Culture, Resources &amp; Land Use (PC Conditions 162 through 166).</li> </ul>	<p>Please refer to Baffinland's response to QIA 2019 AMR SE #1.</p>

**Table 7 - Response to WWF's Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt #	Reviewer's Detailed Comment	Reference Section / Condition	Baffinland's Response
<b>Effects Assessment</b>			
1	<p>WWF Canada acknowledges that in some instances, Baffinland compares current trends and effects against FEIS predictions. However, on the whole, and specifically for Valued Ecosystem Components (VECs) such as caribou and marine mammals, we are not convinced that current monitoring programs are effective to provide statistically relevant certainty through analysis of trends and/or impacts to these important resources. Despite nearly doubling the processing and transportation of ore from the ERP proposal, Baffinland continues to confirm no significant impact to marine mammals, terrestrial wildlife, or other VECs identified within its assessment materials.</p> <p>Baffinland's Annual Report includes the statement "to the extent that Project impacts on the [various component of the] environment can be evaluated, the effects of the Project appear to be within FEIS predictions." For example, within the 2019 Annual Report, Table 4.30: Marine Mammals Impact Evaluation indicates that effects are within FEIS predictions for all components and effects. WWF Canada suggests this may not be an accurate conclusion/finding, given Baffinland's own admission of limitations on the extent to which impacts can be evaluated.</p> <p>Relating to effects assessment in particular, Baffinland's 2019 Annual Report suggests that "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." However, Sections 4.5-4.7 deal with Project Certificate conditions specifically, and do not engage in discussion around effects assessment. WWF Canada would prefer to see a more holistic discussion of effects to project VECs, including as this relates to the limitations of its evaluation of Project impacts.</p> <p>Having a discussion around where Baffinland feels it is constrained in terms of evaluating Project effects could be a starting point for developing and adjusting the programs to better understand those potential impacts. We recognize the value in the many reports Baffinland submits in respect of its monitoring programs, however the larger integrated discussion and justification for its finding of effects being within predictions from the Mary River FEIS and subsequent FEIS Addendums, is lacking. WWF Canada requests that Baffinland provide an outline of limitations on determination of project effects and how it plans to further develop its monitoring work to address uncertainties and improve the evaluation of Project effects. This is likely best undertaken from a VEC-specific approach, and from there, included in a larger discussion around environmental components (i.e. terrestrial environment, marine environment, marine mammals).</p>		<p>Baffinland acknowledges the comments provided by the WWF and their reflections on the conclusions made about Project effects. Comments provided by WWF and other parties involved in review of the monitoring programs have identified what they believe to be limitations on Baffinland's determinations of project effects.</p> <p>Baffinland will continue to provide detailed reporting on valid and robust monitoring efforts and analysis to support the general conclusions on impact predictions, and those conclusions will be based on the available evidence. Baffinland acknowledges that there may be ongoing differences in opinion on conclusions regarding Project-related effects.</p>
<b>Baseline Data Collection</b>			
1	<p>We note that Project Certificate Term and Condition 11 indicates 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."</p> <p>The 2019 Annual Report states that its operational activities in 2019 included "ongoing environmental effects studies and baseline data collection to support the construction and operation of the Project as well as for future engineering requirements."</p> <p>Baffinland's 2019 report indicates with regard to caribou, for example, that "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." These are all of Baffinland's monitoring programs relevant to caribou, however it is unclear how these surveys would enhance baseline data, or if the data collected is even compatible with the types of surveys and information collected prior to Project approval when baseline conditions were being studied.</p> <p>WWF Canada requests that Baffinland confirm specifically which additional baseline data has been collected during its 2019 monitoring programs, what predictions have been updated, and how predictions reflect the inclusion of new baseline data.</p> <p>Input from the NIRB has been very limited in terms of the need for updated baseline information, and discussion around effects consideration and assessment. WWF Canada is concerned that Mary River is now moving into another year of project operations without a monitoring framework in place, and without agreed-upon indicators or thresholds available to identify if and when an impact is occurring, and adaptive management is warranted.</p> <p>WWF Canada requests that the NIRB provide an update to parties with regard to the development of a framework that will guide Baffinland's monitoring work and provide clarification around what reviewers should expect from the Proponent's ongoing monitoring programs. It further requests the NIRB clarify its expectations regarding updates to baseline information which could or should be made as Project monitoring continues on an on-going basis.</p>	Condition 11	<p>Baseline data would encompass any data collection that is collected outside of potential Project-related influences (e.g., sampling completed at reference sites, Red Knot monitoring completed in collaboration with CWS-ECCC) and/or prior to any future Project-related activities (e.g., prior to commencement of construction works such as fish presence/absence and fish habitat assessment surveys along proposed future water crossings). Future baseline data collection efforts related to future proposed expansions (e.g., Phase 2) or initiation of Steensby-related development activities will be communicated as part of future annual reporting efforts when relevant.</p> <p>As requested by WWF, an example of this would include updating effects predictions about the potential for Project interactions with SAR bird populations, such as red knot. The lack of identification of any red knot near Project infrastructure, reduced uncertainty that previously existed in effects predictions made for the Project. Another example would include collection of data on the Admiralty Inlet narwhal stock (i.e. marine mammal aerial surveys conducted near Arctic Bay). Previous studies (i.e. DFO, 2013) have suggested mixing between the Admiralty Inlet and Eclipse Sound narwhal stock may occur. Collection of this baseline data collection (i.e. near Arctic Bay where Project interactions are not occurring), will be used to reduce uncertainty around predictions related to the potential for large-scale displacement or abandonment of narwhal in the LSA as a result of Project shipping.</p> <p>Baffinland notes that the NIRB has already initiated the development of the Mary River Monitoring Framework for attachment to Project Certificate 005, circulating a draft Appendix A Framework for public comment in 2017. Baffinland supports this initiative and will continue to participate in the development process following the completion of the Phase 2 reconsideration process.</p> <p>Baffinland's comprehensive monitoring program that includes indicators for all of the VECs and VSECs that were identified in consultation with Project stakeholders throughout the Environmental Assessment process. Annual reporting includes several reports, not limited to: The Terrestrial Environment Annual Monitoring Report; the Marine Environment Effects and Aquatic Invasive Species Monitoring Report; the Ore Dock Construction Monitoring Report; the NWB/QIA Annual Report; the NIRB Annual Report; Marine Mammal Monitoring Reports (e.g. Bruce Head Monitoring Report). This approach is consistent with the draft Post-Environmental Assessment Monitoring Plan put forth by the NIRB.</p>

**Table 7 - Response to WWF's Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt #	Reviewer's Detailed Comment	Reference Section / Condition	Baffinland's Response
<b>Terms and Conditions</b>			
1	<p>The 2019 Annual Report states "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."</p> <p>WWF Canada requests that Baffinland provide an update with respect to the release of its Draft Climate Change Strategy, and importantly how Baffinland intends to reduce emissions and commitments to targets and timelines to achieve those emission reductions. From its response to comments from the Qikiqtani Inuit Association on the 2018 Annual Report, Baffinland indicated that the Draft Strategy would be sent out for comment in Q4 2019, and in its January 6, 2020 Production Increase Proposal Information Package, it indicated external engagement processes would begin in either Q1 or Q2 of 2020.</p> <p>While WWF Canada appreciates Baffinland's updates and will await the draft Strategy for review, we are concerned with the approach that Baffinland has indicated will be used to measure impacts of Project on the climate. WWF Canada requests that Baffinland clarify what impacts the Project may have on the climate and provide a suggested approach for how it will measure such impacts. WWF Canada notes that the 2019 Report indicates that ongoing emissions are not resulting in climate change or impacts to climate - WWF Canada requests that Baffinland clarify what other Project activities it expects could result in measurable impacts to the climate? Further, if the current Project activities do not contribute to climate impact, WWF Canada requests that Baffinland clarify at what threshold emissions from the Project would need to reach before it could determine the Project is having an impact on the climate?</p>	Meteorology and Climate (PC Conditions 1 through 6)	<p>During Q1, Baffinland was progressing through the various tasks as proposed by the external consultancy hired in 2019, and had completed the internal/external scans and identified potential options for positioning which were essential for informing the subsequent development of a refined Draft Climate Change Strategy (the Draft Strategy). Accordingly, Baffinland had plans to complete a Draft Strategy that would be ready to discuss as part of external engagement activities by end of April/early May 2020. Unfortunately, progress on the Draft Strategy initiative came to an abrupt halt due to the COVID-19 pandemic. Because progress on the development of the Draft Strategy required the input of individuals across the organization including operations and corporate-level teams, it was no longer feasible to move forward over the short-term due to the emerging challenges associated with managing the various health and safety and operational considerations associated with the COVID-19 crisis. As Baffinland habituates to the "new COVID-19 normal", it is ready to finally resume its activities related to the Climate Change Strategy initiative.</p> <p>Baffinland's current timeline is to complete all tasks of stage 1 by end of Q4 2020, and then to begin planning and implementation of stage 2 tasks, with the objective of completing all tasks required to finalize a Climate Change Strategy and implementation action plan by end of Q2 2021. Baffinland has requested from its environmental and sustainability consultancy a revised plan for implementation of next steps in consideration of COVID-19 and potential restrictions associated with physical distancing and travel, particularly since the second stage of activities depends heavily on external engagement with various parties. Updates to progress made in 2020 will be reported as part of the 2020 Annual Report to the NIRB.</p>
2	<p>In WWF Canada's comment on Baffinland's 2018 Annual Report, it requested that Baffinland provide an updated analysis for pack and land fast ice for the Northern Shipping Route every year, as required by Condition 78. Baffinland's 2018 and 2019 Annual Reports stated the ice condition report for the Northern Shipping Route would be updated periodically as new data became available. The Condition states "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." WWF Canada suggests that this condition applies to current operations, and that Baffinland is not in compliance with this condition.</p> <p>WWF Canada requests that Baffinland provide data for 2019 and 2020 at this time, and that the 2020 data be synthesized and where necessary (i.e. changes are observed warranting updates), incorporated into management plans.</p>	Condition 78	<p>Thank you for your comment. Baffinland would like to reiterate to WWF that Baffinland does not ship during winter and does not break any landfast ice during transits along the Northern Shipping Route. Certain aspects of the condition are thus not relevant for existing operations. Appendix G.19 includes daily ice coverage when shipping was active in the Regional Study Area. Baffinland presented daily ice charts for each day that shipping occurred.</p> <p>Baffinland's ice analysts assess ice conditions yearly using a combination of data including Canadian Ice Service and weather charts available through Environment and Climate Change Canada, in addition to satellite imagery (e.g., Sentinel, RADARSAT, MODIS).</p> <p>Baffinland has included in Attachment 3 an updated table that includes 2019 and latest 2020 information. Baffinland's ice analysts will continue to collect this data so that it may be presented in future annual reports when it is relevant to update the long-term dataset, though not necessarily including the table on a yearly basis, given that the daily ice coverage, as captured through Canadian Ice Service Charts, is already being included as part of annual reporting efforts.</p>
3	<p>Condition 105 requires that Baffinland ensure that measures to reduce the potential for interactions with marine mammals in Milne Inlet are identified and implemented, including: a) changes in the frequency and timing (including periodic suspensions) of shipping when interactions with marine mammals are likely to be the most problematic and b) reduced shipping speeds where ship-marine mammal interactions are most likely...</p> <p>In its comment on the 2018 Annual Report, WWF Canada requested that in respect of item a, Baffinland develop a protocol to implement shipping suspensions during periods of increased narwhal presence/abundance, or when nursing or calving behaviours are observed. Baffinland's response indicated that while narwhal calving and nursing behaviour may occur throughout the RSA during the full course of the shipping season... undertaking suspension of shipping during nursing/calving events is not logistically possible, nor is it considered warranted given that to date, Project monitoring has not detected any adverse behavioral effects on narwhal (i.e. large scale displacement or abandonment) from shipping beyond those predicted in the environmental assessment. Baffinland also clarified that this finding was provided in light of a continuous year-to-year increase in ship traffic in the Regional Study Area since the start of Project operations, both Project and non-Project related.</p> <p>WWF Canada requests that Baffinland clarify a) which Project monitoring programs have captured behavioural responses of narwhal, b) which of those programs are occurring in the shoulder season, and c) which of those programs include areas along the entire RSA shipping route (i.e. from entrance at Eclipse Sound, through Pond Inlet and Milne Port), and clarify the timing for each (i.e. open water, close of season, etc.).</p> <p>WWF Canada also requests that Baffinland provide monitoring information to provide clarity around its statement that "nursing or calving behaviours may occur during the RSA during the full course of the shipping season" - specifically, when and where has Baffinland observed nursing and calving behaviours? Having detailed information about where/when these behaviours occur, or where they may be concentrated to occur, could assist in recommending adaptive management measures that are responsive to those specific behaviours when narwhal may be more sensitive to disturbance.</p> <p>To emphasize the main point related to this condition and to the overall flaw in the project's approach to adaptive management, Baffinland continues to argue that conditions like 105 do not apply because monitoring continues to have statistically weak or insignificant findings, suggesting that project operations have no impact, therefore not needing to adhere to these conditions. WWF is suggesting and has suggested for many years that it's not that the Project isn't having an impact but rather the monitoring programs aren't being integrated, haven't established defined thresholds, and there isn't clear accountability through the establishment of a monitoring framework from NIRB.</p>	Condition 105	<p>All of the information requested by WWF is available in existing / filed Project documentation, including the annual monitoring reports, the Summary of Results for the 2019 Marine Mammal Monitoring Programs Technical Memorandum (dated 25 May, 2020), and Baffinland's 2019 Annual Report to NIRB. We would encourage WWF to review these reports to source this information. Available IQ indicates that calving and nursing occurs largely in the southwestern inlet/fjords of Eclipse Sound and Milne Inlet (including Tremblay Sound), but can occur anywhere in the RSA (Prno Consulting Services Ltd. 2017, included as TSD #03). Nursing has occasionally been observed from the Bruce Head monitoring platform - this is the only monitoring program currently being implemented that would have the potential to detect nursing (unobservable from a ship, aircraft or via tagging data). The Bruce Head Program generally runs from late July to late August/early September, which covers the early shoulder season and open-water season. The Narwhal Tagging Program, the Ship-based Observer Program and the Marine Mammal Aerial Survey Program all cover areas extending over the entire RSA shipping route. Timing for each program varies annually; this information is readily available in the annual monitoring reports. With respect to WWF's last comment, if significant behavioural responses are observed (those exceeding levels predicted in the impact assessment or those likely to result in population level effects), this would trigger a need to evaluate and consider adoption of adaptive management measures or a refinement to current mitigations. Based on results available to date from all marine mammal monitoring programs, a need for these actions has not yet been identified. We disagree with WWF's comment that monitoring continues to have statistically weak findings. We encourage WWF to review the power analysis evaluations included in each monitoring report which demonstrate that the monitoring programs have reasonable power for detecting Project effects.</p> <p>Baffinland also notes that new mitigation measures have been introduced over the years (e.g., reduction of speeds to maximum of 9 knots, maximum of 3 ore carriers to anchor at Ragged Island and no drifting to the extent possible in Eclipse Sound, development of a 40-km buffer zone to the east of the Regional Study area to minimize noise field in area where narwhal may be staging at the floe edge prior to entering Eclipse Sound, reduction of transits through ice dependent on ice conditions (e.g., maximum of 1 transit per 24 hours when ice conditions are &gt;6/10 concentrations)). All of these new measures demonstrate Baffinland's willingness for considering and incorporating changes into its operations when concerns are brought forward (e.g., vessel noise and potential impact on marine mammals).</p>

**Table 7 - Response to WWF's Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt #	Reviewer's Detailed Comment	Reference Section / Condition	Baffinland's Response
4	<p>WWF Canada has provided comment on this condition in the past three responses to Annual Reporting, specifically with respect to Baffinland's inability to undertake adequate monitoring programs to address the aspects of the condition related to beluga, bowhead, and walrus (and WWF Canada would suggest, seal as well). WWF Canada understands the limits Baffinland has cited, but suggests Baffinland remains in non-compliance for this condition since Project approval. We acknowledge that remedying this may not be simple, or even possible, based on justifications provided by Baffinland. Given the continued response which points out the inability of Baffinland to properly monitor species in addition to narwhal, WWF Canada suggests Baffinland pursue an amendment to the Terms and Conditions of this Project Certificate to remove this requirement.</p>	Condition 109	<p>Baffinland acknowledges WWF's comments, though notes that the condition, as originally written, was in consideration of marine mammal presence along the Southern Shipping Route where beluga and walrus are known to be more prevalent. All elements of the PC condition 109 will become relevant and applicable once Baffinland initiates construction and subsequently begins operations via Steensby Inlet. When appropriate, Baffinland will seek input into the development of future monitoring programs implemented with respect to the Southern Shipping Route.</p>

**Table 8 - Response to Oceans North's Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt #	Reviewer's Detailed Comment	Oceans North Recommendations	Reference Section	Baffinland's Response																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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1	<p>We have found in our analyses of the monitoring reports that vital information is unorganized and located within many different reports. We find that the results from each individual report are not combined to create important correlations regarding impacts to marine mammals. For example, our comments for the Integrated Narwhal Tagging Study are based on information from the Passive Acoustic Monitoring Report, the Bruce Head Shore-based Monitoring Report, Phase 2 Proposal documents, including the Technical Supporting Document 24 and Appendix N, and various shipping reports and AIS data. The information in the Annual Report remains unintegrated and divided between the specific monitoring reports.</p>	<p>We recommend that NIRB reorganize marine monitoring requirements to allow for information to be focused on answering questions such as: "What are the distances from each type of project-related ship at which noise levels from 100dB to 135dB will be received?" "How do the underwater noise levels from ship transits change during shipping with ice-breaking or ice management operations compared to shipping without icebreaking?" "Based on evidence from observed behavioural responses of marine mammals, at what estimated received underwater noise levels did different levels of disturbance initially occur?" We recommend the creation of a table that outlines the different effects, distances and received sound levels. We have provided an example here:</p> <table border="1"> <thead> <tr> <th>Type of disturbance</th> <th>Radius of disturbance</th> <th>1000 Hz SPL (dBS re 1 µPa)</th> <th>Estimated sound pressure level (dB)</th> <th>1000 Hz SPL (dBS re 1 µPa)</th> </tr> </thead> <tbody> <tr> <td>Surface noise</td> <td>&lt; 5 km</td> <td>150</td> <td>130-135 dB</td> <td>170-175</td> </tr> <tr> <td>Ice noise</td> <td>5-10 km</td> <td>110</td> <td>100-110 dB</td> <td>130-135</td> </tr> <tr> <td>Small icebreaker (icebreaker class)</td> <td>&lt; 5 km</td> <td>115</td> <td>100-110 dB</td> <td>130-135</td> </tr> <tr> <td>Large icebreaker (icebreaker class)</td> <td>&lt; 5 km</td> <td>120</td> <td>100-110 dB</td> <td>130-135</td> </tr> <tr> <td>Time of day (icebreaker)</td> <td>&lt; 5 km</td> <td>125</td> <td>100-110 dB</td> <td>130-135</td> </tr> <tr> <td>Icebreaker</td> <td>&lt; 5 km</td> <td>130</td> <td>100-110 dB</td> <td>130-135</td> </tr> <tr> <td>Research vessel</td> 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<td>610-615 km</td> <td>740</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Icebreaker (icebreaker class)</td> <td>615-620 km</td> <td>745</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Research vessel</td> <td>620-625 km</td> <td>750</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Shipping vessel (icebreaker)</td> <td>625-630 km</td> <td>755</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Icebreaker (icebreaker class)</td> <td>630-635 km</td> <td>760</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Research vessel</td> <td>635-640 km</td> <td>765</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Shipping vessel (icebreaker)</td> <td>640-645 km</td> <td>770</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Icebreaker (icebreaker class)</td> <td>645-650 km</td> <td>775</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Research vessel</td> <td>650-655 km</td> <td>780</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> 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dB</td> <td>130-135</td> </tr> <tr> <td>Shipping vessel (icebreaker)</td> <td>700-705 km</td> <td>830</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Icebreaker (icebreaker class)</td> <td>705-710 km</td> <td>835</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Research vessel</td> <td>710-715 km</td> <td>840</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Shipping vessel (icebreaker)</td> <td>715-720 km</td> <td>845</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Icebreaker (icebreaker class)</td> <td>720-725 km</td> <td>850</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Research vessel</td> <td>725-730 km</td> <td>855</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Shipping vessel (icebreaker)</td> <td>730-735 km</td> <td>860</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Icebreaker (icebreaker class)</td> <td>735-740 km</td> <td>865</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Research vessel</td> <td>740-745 km</td> <td>870</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Shipping vessel (icebreaker)</td> <td>745-750 km</td> <td>875</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Icebreaker (icebreaker class)</td> <td>750-755 km</td> <td>880</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Research vessel</td> <td>755-760 km</td> <td>885</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Shipping vessel (icebreaker)</td> <td>760-765 km</td> <td>890</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Icebreaker (icebreaker class)</td> <td>765-770 km</td> <td>895</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Research vessel</td> <td>770-775 km</td> <td>900</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Shipping vessel (icebreaker)</td> <td>775-780 km</td> <td>905</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Icebreaker (icebreaker class)</td> <td>780-785 km</td> <td>910</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Research vessel</td> <td>785-790 km</td> <td>915</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Shipping vessel (icebreaker)</td> <td>790-795 km</td> <td>920</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Icebreaker (icebreaker class)</td> <td>795-800 km</td> <td>925</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Research vessel</td> <td>800-805 km</td> <td>930</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Shipping vessel (icebreaker)</td> <td>805-810 km</td> <td>935</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Icebreaker (icebreaker class)</td> <td>810-815 km</td> <td>940</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Research vessel</td> <td>815-820 km</td> <td>945</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Shipping vessel (icebreaker)</td> <td>820-825 km</td> <td>950</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Icebreaker (icebreaker class)</td> <td>825-830 km</td> <td>955</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Research vessel</td> <td>830-835 km</td> <td>960</td> <td>110-120 dB</td> <td>130-135</td> </tr> <tr> <td>Shipping vessel (icebreaker)</td> <td>835-840 km</td> <td>9</td></tr></tbody></table>	Type of disturbance	Radius of disturbance	1000 Hz SPL (dBS re 1 µPa)	Estimated sound pressure level (dB)	1000 Hz SPL (dBS re 1 µPa)	Surface noise	< 5 km	150	130-135 dB	170-175	Ice noise	5-10 km	110	100-110 dB	130-135	Small icebreaker (icebreaker class)	< 5 km	115	100-110 dB	130-135	Large icebreaker (icebreaker class)	< 5 km	120	100-110 dB	130-135	Time of day (icebreaker)	< 5 km	125	100-110 dB	130-135	Icebreaker	< 5 km	130	100-110 dB	130-135	Research vessel	5-10 km	135	110-120 dB (100-110 dB)	130-135	Shipping vessel (icebreaker)	10-15 km	140	110-120 dB (100-110 dB)	130-135	Icebreaker (icebreaker class)	15-20 km	145	110-120 dB (100-110 dB)	130-135	Research vessel	20-25 km	150	110-120 dB	130-135	Shipping vessel (icebreaker)	25-30 km	155	110-120 dB	130-135	Icebreaker (icebreaker class)	30-35 km	160	110-120 dB	130-135	Research vessel	35-40 km	165	110-120 dB	130-135	Shipping vessel (icebreaker)	40-45 km	170	110-120 dB	130-135	Icebreaker (icebreaker class)	45-50 km	175	110-120 dB	130-135	Research vessel	50-55 km	180	110-120 dB	130-135	Shipping vessel (icebreaker)	55-60 km	185	110-120 dB	130-135	Icebreaker (icebreaker class)	60-65 km	190	110-120 dB	130-135	Research vessel	65-70 km	195	110-120 dB	130-135	Shipping vessel (icebreaker)	70-75 km	200	110-120 dB	130-135	Icebreaker (icebreaker class)	75-80 km	205	110-120 dB	130-135	Research vessel	80-85 km	210	110-120 dB	130-135	Shipping vessel (icebreaker)	85-90 km	215	110-120 dB	130-135	Icebreaker (icebreaker class)	90-95 km	220	110-120 dB	130-135	Research vessel	95-100 km	225	110-120 dB	130-135	Shipping vessel (icebreaker)	100-105 km	230	110-120 dB	130-135	Icebreaker (icebreaker class)	105-110 km	235	110-120 dB	130-135	Research vessel	110-115 km	240	110-120 dB	130-135	Shipping vessel (icebreaker)	115-120 km	245	110-120 dB	130-135	Icebreaker (icebreaker class)	120-125 km	250	110-120 dB	130-135	Research vessel	125-130 km	255	110-120 dB	130-135	Shipping vessel (icebreaker)	130-135 km	260	110-120 dB	130-135	Icebreaker (icebreaker class)	135-140 km	265	110-120 dB	130-135	Research vessel	140-145 km	270	110-120 dB	130-135	Shipping vessel (icebreaker)	145-150 km	275	110-120 dB	130-135	Icebreaker (icebreaker class)	150-155 km	280	110-120 dB	130-135	Research vessel	155-160 km	285	110-120 dB	130-135	Shipping vessel (icebreaker)	160-165 km	290	110-120 dB	130-135	Icebreaker (icebreaker class)	165-170 km	295	110-120 dB	130-135	Research vessel	170-175 km	300	110-120 dB	130-135	Shipping vessel (icebreaker)	175-180 km	305	110-120 dB	130-135	Icebreaker (icebreaker class)	180-185 km	310	110-120 dB	130-135	Research vessel	185-190 km	315	110-120 dB	130-135	Shipping vessel (icebreaker)	190-195 km	320	110-120 dB	130-135	Icebreaker (icebreaker class)	195-200 km	325	110-120 dB	130-135	Research vessel	200-205 km	330	110-120 dB	130-135	Shipping vessel (icebreaker)	205-210 km	335	110-120 dB	130-135	Icebreaker (icebreaker class)	210-215 km	340	110-120 dB	130-135	Research vessel	215-220 km	345	110-120 dB	130-135	Shipping vessel (icebreaker)	220-225 km	350	110-120 dB	130-135	Icebreaker (icebreaker class)	225-230 km	355	110-120 dB	130-135	Research vessel	230-235 km	360	110-120 dB	130-135	Shipping vessel (icebreaker)	235-240 km	365	110-120 dB	130-135	Icebreaker (icebreaker class)	240-245 km	370	110-120 dB	130-135	Research vessel	245-250 km	375	110-120 dB	130-135	Shipping vessel (icebreaker)	250-255 km	380	110-120 dB	130-135	Icebreaker (icebreaker class)	255-260 km	385	110-120 dB	130-135	Research vessel	260-265 km	390	110-120 dB	130-135	Shipping vessel (icebreaker)	265-270 km	395	110-120 dB	130-135	Icebreaker (icebreaker class)	270-275 km	400	110-120 dB	130-135	Research vessel	275-280 km	405	110-120 dB	130-135	Shipping vessel (icebreaker)	280-285 km	410	110-120 dB	130-135	Icebreaker (icebreaker class)	285-290 km	415	110-120 dB	130-135	Research vessel	290-295 km	420	110-120 dB	130-135	Shipping vessel (icebreaker)	295-300 km	425	110-120 dB	130-135	Icebreaker (icebreaker class)	300-305 km	430	110-120 dB	130-135	Research vessel	305-310 km	435	110-120 dB	130-135	Shipping vessel (icebreaker)	310-315 km	440	110-120 dB	130-135	Icebreaker (icebreaker class)	315-320 km	445	110-120 dB	130-135	Research vessel	320-325 km	450	110-120 dB	130-135	Shipping vessel (icebreaker)	325-330 km	455	110-120 dB	130-135	Icebreaker (icebreaker class)	330-335 km	460	110-120 dB	130-135	Research vessel	335-340 km	465	110-120 dB	130-135	Shipping vessel (icebreaker)	340-345 km	470	110-120 dB	130-135	Icebreaker (icebreaker class)	345-350 km	475	110-120 dB	130-135	Research vessel	350-355 km	480	110-120 dB	130-135	Shipping vessel (icebreaker)	355-360 km	485	110-120 dB	130-135	Icebreaker (icebreaker class)	360-365 km	490	110-120 dB	130-135	Research vessel	365-370 km	495	110-120 dB	130-135	Shipping vessel (icebreaker)	370-375 km	500	110-120 dB	130-135	Icebreaker (icebreaker class)	375-380 km	505	110-120 dB	130-135	Research vessel	380-385 km	510	110-120 dB	130-135	Shipping vessel (icebreaker)	385-390 km	515	110-120 dB	130-135	Icebreaker (icebreaker class)	390-395 km	520	110-120 dB	130-135	Research vessel	395-400 km	525	110-120 dB	130-135	Shipping vessel (icebreaker)	400-405 km	530	110-120 dB	130-135	Icebreaker (icebreaker class)	405-410 km	535	110-120 dB	130-135	Research vessel	410-415 km	540	110-120 dB	130-135	Shipping vessel (icebreaker)	415-420 km	545	110-120 dB	130-135	Icebreaker (icebreaker class)	420-425 km	550	110-120 dB	130-135	Research vessel	425-430 km	555	110-120 dB	130-135	Shipping vessel (icebreaker)	430-435 km	560	110-120 dB	130-135	Icebreaker (icebreaker class)	435-440 km	565	110-120 dB	130-135	Research vessel	440-445 km	570	110-120 dB	130-135	Shipping vessel (icebreaker)	445-450 km	575	110-120 dB	130-135	Icebreaker (icebreaker class)	450-455 km	580	110-120 dB	130-135	Research vessel	455-460 km	585	110-120 dB	130-135	Shipping vessel (icebreaker)	460-465 km	590	110-120 dB	130-135	Icebreaker (icebreaker class)	465-470 km	595	110-120 dB	130-135	Research vessel	470-475 km	600	110-120 dB	130-135	Shipping vessel (icebreaker)	475-480 km	605	110-120 dB	130-135	Icebreaker (icebreaker class)	480-485 km	610	110-120 dB	130-135	Research vessel	485-490 km	615	110-120 dB	130-135	Shipping vessel (icebreaker)	490-495 km	620	110-120 dB	130-135	Icebreaker (icebreaker class)	495-500 km	625	110-120 dB	130-135	Research vessel	500-505 km	630	110-120 dB	130-135	Shipping vessel (icebreaker)	505-510 km	635	110-120 dB	130-135	Icebreaker (icebreaker class)	510-515 km	640	110-120 dB	130-135	Research vessel	515-520 km	645	110-120 dB	130-135	Shipping vessel (icebreaker)	520-525 km	650	110-120 dB	130-135	Icebreaker (icebreaker class)	525-530 km	655	110-120 dB	130-135	Research vessel	530-535 km	660	110-120 dB	130-135	Shipping vessel (icebreaker)	535-540 km	665	110-120 dB	130-135	Icebreaker (icebreaker class)	540-545 km	670	110-120 dB	130-135	Research vessel	545-550 km	675	110-120 dB	130-135	Shipping vessel (icebreaker)	550-555 km	680	110-120 dB	130-135	Icebreaker (icebreaker class)	555-560 km	685	110-120 dB	130-135	Research vessel	560-565 km	690	110-120 dB	130-135	Shipping vessel (icebreaker)	565-570 km	695	110-120 dB	130-135	Icebreaker (icebreaker class)	570-575 km	700	110-120 dB	130-135	Research vessel	575-580 km	705	110-120 dB	130-135	Shipping vessel (icebreaker)	580-585 km	710	110-120 dB	130-135	Icebreaker (icebreaker class)	585-590 km	715	110-120 dB	130-135	Research vessel	590-595 km	720	110-120 dB	130-135	Shipping vessel (icebreaker)	595-600 km	725	110-120 dB	130-135	Icebreaker (icebreaker class)	600-605 km	730	110-120 dB	130-135	Research vessel	605-610 km	735	110-120 dB	130-135	Shipping vessel (icebreaker)	610-615 km	740	110-120 dB	130-135	Icebreaker (icebreaker class)	615-620 km	745	110-120 dB	130-135	Research vessel	620-625 km	750	110-120 dB	130-135	Shipping vessel (icebreaker)	625-630 km	755	110-120 dB	130-135	Icebreaker (icebreaker class)	630-635 km	760	110-120 dB	130-135	Research vessel	635-640 km	765	110-120 dB	130-135	Shipping vessel (icebreaker)	640-645 km	770	110-120 dB	130-135	Icebreaker (icebreaker class)	645-650 km	775	110-120 dB	130-135	Research vessel	650-655 km	780	110-120 dB	130-135	Shipping vessel (icebreaker)	655-660 km	785	110-120 dB	130-135	Icebreaker (icebreaker class)	660-665 km	790	110-120 dB	130-135	Research vessel	665-670 km	795	110-120 dB	130-135	Shipping vessel (icebreaker)	670-675 km	800	110-120 dB	130-135	Icebreaker (icebreaker class)	675-680 km	805	110-120 dB	130-135	Research vessel	680-685 km	810	110-120 dB	130-135	Shipping vessel (icebreaker)	685-690 km	815	110-120 dB	130-135	Icebreaker (icebreaker class)	690-695 km	820	110-120 dB	130-135	Research vessel	695-700 km	825	110-120 dB	130-135	Shipping vessel (icebreaker)	700-705 km	830	110-120 dB	130-135	Icebreaker (icebreaker class)	705-710 km	835	110-120 dB	130-135	Research vessel	710-715 km	840	110-120 dB	130-135	Shipping vessel (icebreaker)	715-720 km	845	110-120 dB	130-135	Icebreaker (icebreaker class)	720-725 km	850	110-120 dB	130-135	Research vessel	725-730 km	855	110-120 dB	130-135	Shipping vessel (icebreaker)	730-735 km	860	110-120 dB	130-135	Icebreaker (icebreaker class)	735-740 km	865	110-120 dB	130-135	Research vessel	740-745 km	870	110-120 dB	130-135	Shipping vessel (icebreaker)	745-750 km	875	110-120 dB	130-135	Icebreaker (icebreaker class)	750-755 km	880	110-120 dB	130-135	Research vessel	755-760 km	885	110-120 dB	130-135	Shipping vessel (icebreaker)	760-765 km	890	110-120 dB	130-135	Icebreaker (icebreaker class)	765-770 km	895	110-120 dB	130-135	Research vessel	770-775 km	900	110-120 dB	130-135	Shipping vessel (icebreaker)	775-780 km	905	110-120 dB	130-135	Icebreaker (icebreaker class)	780-785 km	910	110-120 dB	130-135	Research vessel	785-790 km	915	110-120 dB	130-135	Shipping vessel (icebreaker)	790-795 km	920	110-120 dB	130-135	Icebreaker (icebreaker class)	795-800 km	925	110-120 dB	130-135	Research vessel	800-805 km	930	110-120 dB	130-135	Shipping vessel (icebreaker)	805-810 km	935	110-120 dB	130-135	Icebreaker (icebreaker class)	810-815 km	940	110-120 dB	130-135	Research vessel	815-820 km	945	110-120 dB	130-135	Shipping vessel (icebreaker)	820-825 km	950	110-120 dB	130-135	Icebreaker (icebreaker class)	825-830 km	955	110-120 dB	130-135	Research vessel	830-835 km	960	110-120 dB	130-135	Shipping vessel (icebreaker)	835-840 km	9
Type of disturbance	Radius of disturbance	1000 Hz SPL (dBS re 1 µPa)	Estimated sound pressure level (dB)	1000 Hz SPL (dBS re 1 µPa)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
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**Table 8 - Response to Oceans North's Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt #	Reviewer's Detailed Comment	Oceans North Recommendations	Reference Section	Baffinland's Response
2	<p>Listening Space Reduction is a function of the change in noise added by the ship (NL2; Sect.2.4 Eqn.1) over some reference level of 'background' noise (NL1; Sect.2.4 Eqn.1). Estimates of LSR are sensitive to the difference (NL2-NL1). For example, a 10 dB increase in noise is the difference between LRR 50% and LRR 90% (i.e. LSR75% and LSR99%; Fig 1 below).</p> <p>NL1 is defined (Sect. 2.4 p.18) from "the maximum of the mid-frequency cetacean audiogram (see Table A-9 in Finneran 2015) or the median 1-minute SPL without vessels in each of the 1/3-octave-bands of interest. Please provide the actual dB values used to define NL1 for each recording site. These values should include the median 1- minute SPL without vessels and the specific values used from the mid-frequency cetacean audiogram for each of the 1/3rd octave bands assessed. Using a single background noise reference level that is lower than actual noise levels about half the time (50th percentile) may result in assuming a larger value for NL2-NL1 more often than occurred relative to noise levels at the time of each ship transit. This overestimation of LSR levels may especially occur during the months of Sept and Oct with higher average background noise levels caused by increased wind-driven surface noise in the frequency bands of interest. Again, a single averaged reference noise level does not account for these relatively 'noisy' periods and may make it more difficult to identify LSR caused by ship transits vs. natural noise when ships are not present.</p> <p>Please provide evaluation of LSR under different noise conditions. For example, Pine et al., (2018) estimate LSR for container ship transits under 'noisy' and 'quiet' ambient noise conditions. Without this, we may often overestimate LSR occurring due to the addition of ship noise and it's difficult to understand what the range of LSR effects may be under normal environmental conditions. An example of two general cargo vessel transits with LSR estimated using median and 90th percentile background noise is provided in Fig 5 below (adapted from Jones, 2020).</p> <p>What steps are taken to avoid long-range ship noise entering 'background' noise periods used to estimate ambient noise for NL1 in LSR calculations? How far are the ships away during background noise periods? As defined in this report, it is not clear that recording periods 'without ships' do not include &lt;200 Hz noise from ships, propagating over large distances.</p>		<p>Draft 2019 Passive Acoustic Monitoring Program Report, Section 2.4 p.18 Eqn. 1 (Listening range reduction)</p> <p>Section 2.2.1 p.26 (sound spectrum level percentile plots; Fig 18)</p> <p>Section 1.0, pg. 5. Objective of the Report: "Estimate the extent of listening range reduction (LRR) associated with vessel transits along the Northern Shipping Route relative to ambient noise conditions"</p>	<p>A Table has been added to the report (Table 5) which contains the baseline and audiogram levels requested.</p> <p>For each AMAR, we apply a single fixed value for NL1. Using the median ambient level to define NL1 gives a conservative assessment of the extent of LRR that occurs in the presence of vessel noise relative to that under natural ambient conditions.</p> <p>Oceans North correctly states that our calculations will overestimate the degree of LRR for noisier ambient sound conditions. However, as the calculations provide a more conservative assessment of potential effects, we do not agree that the calculations should be repeated for different baseline ambient sound levels (i.e. for quiet and loud conditions).</p> <p>An alternative approach to calculating LRR during vessel transits, that would allow us to consider varying background sound conditions, would be to calculate a variable NL1 based on the ambient sound levels from a time period just before and/or just after the vessel transit occurred. However, that approach would not allow us to investigate the range of LRR for fluctuating environmental conditions and for conditions with vessel noise in a consistent way.</p> <p>Furthermore, at 1 kHz the value for NL1 is the MFC composite audiogram level. This value is higher than even the 90th percentile ambient sound level at all locations, so the analysis for the 1/3-octave band centered at 1 kHz would be unchanged under consideration of different ambient sound conditions.</p> <p>We calculate LRR separately for data collected when no vessels are detected (i.e. normal environmental conditions) and for data collected when vessels are detected, to allow us to examine and compare the range of LRR effects under normal environmental conditions versus conditions with vessel noise, relative to a common median baseline level.</p> <p>The classification of periods with and without vessel detections is not a function of the distance between the vessel and the recorder; it is dependent on the characteristics of the received sounds. The distances between the vessels and the AMARs at these times is variable and dependent on the vessel and ambient sounds at the time. Periods that contain shipping noise are identified using JASCO's vessel noise detector, which is described in Section 2.2.2 of the report. The vessel noise detector looks for tonal sounds within the shipping frequency range (40 Hz to 315 Hz) that are within a specified threshold. Periods flagged as containing vessels are those with 5 or more tonals (0.125 Hz bandwidth), that exceed by 3 dB the median sound level in the shipping frequency band (computed over a 12 hour window centered on the tonal) and that are within 8 dB of the broadband SPL in that window. It is possible that periods flagged as being absent of vessel detections could contain some low-level, long-range sound produced by vessels. The ambient soundscape is commonly defined to consist of both natural sources (wind, waves, rain, biologic sounds, seismic events, etc) and anthropogenic sources such as long-range vessel noise. Our analysis is consistent with this definition.</p>
3	<p>What are the characteristics of underwater noise levels recorded by the proponent from all project-related vessels (e.g. bulk carrier, general cargo, tanker, tug)? For reference and as an example, Table 1 below (from Jones 2020) includes some noise measurements for 4 common types of project-related vessel.</p> <p>The noise levels reported should be accompanied by some context regarding ship characteristics wherever possible.</p>		<p>Draft 2019 Passive Acoustic Monitoring Program Report, Figure 24, page 30.</p>	<p>Detailed analysis of individual sound signatures for each Project vessel was beyond the scope of this data summary report. Rather, in this analysis, we consider the total noise from all vessels which is appropriate for considering the total vessel noise contribution to the soundscape.</p> <p>Analysis of these data is ongoing to determine more refined characterization of individual vessels and these results will be provided as they become available.</p> <p>A graduate student from the University of New Brunswick is also undertaking a more detailed analysis of the received sound levels for individual transits of all project vessels and a comparison of the relative sound levels from each. Results from those studies will be available in 2021.</p>
4	<p>Model results for ranges to lower broadband received sound pressure levels SPLBB than 120 dB have been requested by DFO (e.g. 110, 115 dB). What are the distances to transiting ships when measured received levels were &gt; 110dB for each of the project vessel types?</p> <p>Modelled versus measured ranges should be included in this report for each different project-related ship type.</p> <p>There should be a table showing these ranges in the report. An example of two transits of project-related general cargo vessels is provided in Figures 2-4 below (figures adapted from Jones, 2020) .</p>		<p>Draft 2019 Passive Acoustic Monitoring Program Report, Table 11</p>	<p>There is no scientific justification for computing distances to received sound levels lower than 120 dB re 1 µPa. JASCO does not see value in including these distances in this data summary report.</p>

**Table 8 - Response to Oceans North's Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt #	Reviewer's Detailed Comment	Oceans North Recommendations	Reference Section	Baffinland's Response
0	<p>The number of transits and how many vessels travelled within the project area is not clear. Periods when vessels were detected does not translate easily into transits and therefore needs context provided by other data such as AIS messages. This helps to understand the relationship between ship type and received level and to better evaluate cumulative impacts of ship noise.</p> <p>We cannot estimate Phase 1 or proposed Phase 2 impacts without understanding the current and proposed number of transits and types of ships. To estimate impacts, especially if Phase 2 goes forward, the number and type of ship transits should be determined ahead of time as much as possible.</p>		<p>Draft 2019 Passive Acoustic Monitoring Program Report, 1.0, pg. 5. Objective of the Report: "Estimate the extent of listening range reduction (LRR) associated with vessel transits along the Northern Shipping Route relative to ambient noise conditions"</p>	<p>The following text has been added to Section 1.3.1 of the report, to provide context around the number of transits (by type of vessel) that occurred while the AMARs were deployed and recording data:</p> <p>"During the 2019 shipping season, there were 231 one-way transits of Project related vessels, 177 of which occurred while AMARs were deployed and recording acoustic data (Table 3)". Table 3 has been added to the report, which breaks down the one-way transits by Project vessel type.</p>
6	<p>What is the definition of "detected vessels passing the recorder" (Sect 3.1.2.1 p.28 Fig 20, 25)? Is it a period when multiple vessels were present or is it one individual transit of one vessel? To evaluate the relationship between number of vessel transits daily and reported noise levels it would be helpful to have an understanding of the degree to which multiple vessel transits are included in each 'detection'.</p>		<p>Draft 2019 Passive Acoustic Monitoring Program Report, Sect 3.1.2.1 Figures 20 and 25.</p>	<p>The vessel detector is described in Section 2.2.2. The vessel detector can identify distinct vessel events if the vessels' closest points of approach are separated by at least 30 minutes. Vessels whose passages are more closely spaced would be considered a single vessel detection event.</p>
7	<p>Low-frequency ambient noise median sound spectrum levels below 100 Hz are &gt; 10 dB less than reported for other areas of the Arctic with similar depth (e.g. AMAR-3 and AMAR-BI compared to Roth et al., 2012). What is the explanation for this divergence from expected ambient noise level? This is important to understand as, for example, a systematic underestimate of SPLBB 120 dB occurrence or overestimate of LSR (LRR) for low frequencies (e.g. ringed seal, bowhead whale) could result from the undermeasurement of noise levels in these frequencies.</p>		<p>Draft 2019 Passive Acoustic Monitoring Program Report, Figure 18 (p.26)</p>	<p>The low-frequency (&lt; 100 Hz) median sound spectral data are not unexpected. Some examples of underwater acoustic recordings from the Arctic that show similar trends of low frequency sound spectral levels include those from: Frouin-Mouy et al, 2016; Insley et al 2017; Kim and Conrad 2015 and 2016; and O'Neill 2016.</p> <p>Frouin-Mouy, H., J. MacDonnell, J. Delarue, X. Mouy, B. Martin, and D. Hannay. 2016. Northeastern Chukchi Sea Joint Acoustic Monitoring Program 2014–2015. Document #01214. Technical report by JASCO Applied Sciences for Shell Exploration &amp; Production Company.</p> <p>Insley, S.J. and W.D. Halliday, and T. deJ. 2017. Seasonal Patterns in Ocean Ambient Noise near Sachs Harbour, Northwest Territories. Arctic. 70(3), p239-248. <a href="https://doi.org/10.14430/arctic4662">https://doi.org/10.14430/arctic4662</a></p> <p>Kim, K.H., and A.C. Conrad. 2015. Acoustic Monitoring Near Koluktoo Bay, Milne Inlet, July–September 2014. Greeneridge Rep. 511-2. Rep. from Greeneridge Sciences Inc. (Santa Barbara, CA) for Baffinland Iron Mines Corporation (Oakville, ON). viii + 56 p.</p> <p>Kim, K.H., and A.C. Conrad. 2016. Acoustic Monitoring Near Koluktoo Bay, Milne Inlet, August–October 2015. Greeneridge Rep. 522-2. Rep. from Greeneridge Sciences Inc. (Santa Barbara, CA) for Baffinland Iron Mines Corporation (Oakville, ON). x + 69 p.</p> <p>O'Neill, C. 2016. Oceanography and Underwater Acoustics in Resolute Bay, Nunavut: 2012-2015. Master's Thesis. University of Victoria.</p>
<p><b>Comments on Draft 2019 Bruce Head Shore-based Monitoring Report</b></p>				
1	<p>Clarify for each of these ranges, what is the range of distance to the animal. The behavioral study area (BSA) is about 1km wide, there is a generalization made that impact across the BSA is the same. Would a reported range of 1-3km between ship and the BSA for a particular behavioral response translate to a range of 1-4 km between the ship and the animal? This information is important to estimate the received sound levels corresponding to the reported radii of impact around the ship.</p>		<p>Draft 2019 Bruce Head Shore-based Monitoring Report</p> <ol style="list-style-type: none"> <li>1. Increased instance of narwhal travel following ship southbound transit when vessels at range 1-3 km (p.82)</li> <li>2. More likely to be in tight group spread when vessels 3-4 km away in BSA (p.75)</li> <li>3. Increased probability of slow swimming when vessel 2-3 km S of behavioral study area (BSA; p.88)</li> <li>4. Lower probability of observing slow swimming groups when vessels at range 2-3 km N of BSA (p.88)</li> <li>5. Decreased distance from shore when vessels within 3 km (p.94)</li> <li>6. Larger probability of observing groups nearer to shore when vessels transiting toward the BSA</li> </ol>	<p>We agree that the large size of the substrata (and the BSA) means that while the effect is estimated based on distance to the centroid of the substrata (or the BSA), the individual animals within the substrata would likely experience different received levels with varying disturbance effects. However, without specific coordinates for each individual group sighting, it is not currently possible to refine this approach. For the 2020 Bruce Head Monitoring Program, drones will be used to monitor narwhal groups, which will ultimately provide specific coordinates of individual groups and allow for more precise calculation of distances from vessels. Of note, more precise locations of narwhal groups will be documented via the UAV in focal follow surveys near Koluktoo and in UAV surveys of narwhal near the AMAR. Assessment of received noise levels and associated changes in behavior will be evaluated as part of a Vocal-Acoustic Correlation (VAC) analysis that will consider changes in narwhal vocal behaviour in relation to vessel distance.</p>

**Table 8 - Response to Oceans North's Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt #	Reviewer's Detailed Comment	Oceans North Recommendations	Reference Section	Baffinland's Response
2	In terms of the Southall et al. (2007) ranking of the severity of behavioral responses to underwater noise (p.450, Table 4), each of these behavioural changes has a score that fits into the noise impact framework proposed by the proponent. What are the specific behavioral response severity scores assessed by the proponent for the observed responses? For each response, what were the post-exposure times observed for re-establishing post-exposure behavior?		Draft 2019 Bruce Head Shore-based Monitoring Report, Page 32	<p>Narwhal behavioural responses (i.e., change in relative abundance, changes in group direction, change in distance from shore) that were shown to be significantly influenced by vessel noise or close vessel encounters corresponded with severity scores ranging from 1 to 4.</p> <p>Narwhal demonstrated a return to pre-response behavior shortly following the exposure event (and within the time frame the vessel would have been audible to the animal). For example, 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 SSA, and only at close exposure distances of 2-3 km. Assuming an ore carrier transit speed of 9 knots (16.7 km/h) in the RSA, the acoustic exposure period associated with this response would be 22 minutes per vessel transit. This nature of response was considered short-term as it did not persist beyond the vessel exposure period (consistent with the time period an animal would occur within the 120 dB exposure zone of a passing ship).</p>
3	In previous reports, the stratified study area would suggest there is a longer range behavioural response. And in this study, the maximum distance for responses is 4km – were there no behavioral responses to ship noise observed past 4km?		Draft 2019 Bruce Head Shore-based Monitoring Report, Page 78	In the 2014-2017 Bruce Head Shore-based Monitoring Report (Golder 2019), RAD data suggested effects occurred within 10 km, and not at longer distances. The decision to decrease the spatial extent from 15 km to 10 km was based on an integrated review of the results from the 2014-2017 Bruce Head Shore-based Monitoring Program, the 2017-2018 Narwhal Tagging Study (Golder 2020) and the Passive Acoustic Monitoring Program (JASCO 2020). Significant behavioral responses observed in the Bruce Head study and in the 2017-2018 Tagging Study occurred at relatively restricted spatial extents (at closer distances than those corresponding with the 120 dB disturbance zone).
<b>Comments on the Draft 2017-2018 Integrated Narwhal Tagging Study</b>				
1	<p>In Jones (2020), the 10km distance radius around the ship is assessed to have a broadband received sound pressure level (SPL) of 110 dB or less for bulk carriers, the most common project-related ship type (e.g. Jones, 2020; Table 3, Figs 7,8,9). As the full extent of reported avoidance post-CPA is 10km, it is important to include information on these lower levels of noise in impact assessments and monitoring programs.</p> <p>The 10km range limit for evaluating disturbance may not be appropriate. Observed radii to behavioral disturbance in tagged narwhal (1-10 km) suggest that a range of received ship noise levels may provoke a behavioral response.</p> <p>Depending on ship type, ranges to 120 dB broadband SPL may be greater than 10 km, as predicted and observed for project icebreakers and tanker vessels. Also, ranges to ships when behavioral disturbance is observed in tagged animals may correspond to lower received SPL than 120 dB. Received levels at actual ranges to behavioral disturbance should be evaluated by comparing these ranges with received levels measured in separate/concurrent acoustic studies undertaken by BIMC.</p> <p>Previous visual observation study reports from Bruce Head included response to radii of up to 15 km. Is there a difference in the way the data is being analyzed for tag data that no longer include these longer distances?</p>		Draft 2017-2018 Integrated Narwhal Tagging Study, Pg. 125, Paragraph 3. "Results suggest that narwhal orient themselves away from transiting vessels, potentially demonstrating avoidance, within 4-5km of a transiting vessel prior to the CPA, but for the full extent of 10km post CPA."	<p>Of the response variables considered in this study, significant responses of narwhal were not observed beyond 5 km from a vessel, with the exception of narwhal travel orientation relative to vessels, specifically post-CPA, in which responses were observed for the full extent of the 10km exposure zone. The usefulness of how this particular response variable is able to inform behavioral change, however, is currently being examined given that different types of interactions between a narwhal-vessel can result in mixed interpretations of this response.</p> <p>Baffinland acknowledges that the range from ships at which narwhal exhibit a response may correspond to lower received levels than 120 dB (or it may alternatively correspond to higher received levels). This is presently unknown. Without having acoustic tags attached to the animals collecting data on received sound levels in concert with behavioral data, it was necessary that the spatial extent of the exposure zone be informed by other data sources available.</p> <p>The distance used to delineate exposure vs. non-exposure zones (i.e. 10 km) is supported by acoustic modeling conducted by JASCO in which the majority of the disturbance noise field falls within 10 km of the source. Of note, the R95% values indicated a disturbance zone of between 5.93 and 11.20 km.</p> <p>Furthermore, the behavioral threshold commonly referred to in the literature is not weighted to account for the frequency range in which marine mammals are sensitive to hearing. As the majority of underwater sound generated by vessel traffic is concentrated below 200 Hz (Veirs et al. 2016), which is well below the assumed peak hearing sensitivity of narwhal (&gt;1 kHz), accounting for species-specific hearing sensitivity would decrease the 10 km distance associated with the disturbance zone rather than increase it.</p> <p>Therefore, as stated in the report and further supported by passive acoustic monitoring undertaken in 2018, 10 km is likely an overestimate of the disturbance zone for narwhal and received sound levels are likely much lower than 120 dB within this range.</p> <p>Response radii considered in the Bruce Head reports were restricted to 10 km in 2019, based on the rationale stated previously and on results from previous years indicating that behavioral responses to ships were typically evident at ranges closer than 10 km.</p>
2	There are no results from the icebreaking shoulder season for the narwhal tagging results included in this referenced report. Please clarify why these data not included in the Integrated report.		Draft 2017-2018 Integrated Narwhal Tagging Study, Document reference number Baffinland Mary River Project Phase 2 Proposal, Appendix N, Attachments related to the Marine Environment. Attachment 2, Technical Memorandum - Analysis of 2018 Narwhal Tagging Data during Fall Shoulder Season. 1663724-162-TM-Rev0-12000, Oct. 15, 2019. Section 3.2 Page 7-9.	<p>Refer to response to comment #3.</p> <p>Icebreaking vessels transiting through the RSA during the 2018 fall shoulder season are included in the analysis of 2017- 2018 tagging data. A separate analysis of narwhal interactions with icebreaking vessels is presented in a Technical Memorandum on shoulder season shipping, dated 15 October 2019.</p> <p>A reference to the Technical Memorandum has been added in section 3.5.4. of the report.</p>

**Table 8 - Response to Oceans North's Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt #	Reviewer's Detailed Comment	Oceans North Recommendations	Reference Section	Baffinland's Response
3	<p>In Jones (2020), there are 19 and 35 ship transit events of the icebreaker Botnica passing the Pond Inlet and Milne Inlet reference locations, respectively, from Sept 28, 2018 to Sept 22, 2019 (Jones, 2020; Table 1).</p> <p>This period includes one late and one early shoulder shipping season during which concurrent acoustic measurements of received noise levels from ships were made by and are reported in Jones 2020.</p> <p>Why are these icebreaking ship events in proximity to tagged narwhal not included or analyzed in the Integrated Report? It would be helpful to see tagged narwhal behavioral response ranges and data analysis for the 2018 fall shoulder season for comparison with acoustic results.</p> <p>Icebreaking is the largest sound source associated with the project and occurs during the quietest time of the shipping year (i.e. July). Icebreaker ship transits are highest both in measured received sound pressure levels relevant to behavioral disturbance and with respect to listening space reduction (LSR). It is important to analyze these data in relation to the radius from the ship at the time of observed behavioural responses as much as possible.</p>		<p>Draft 2017-2018 Integrated Narwhal Tagging Study, There are no sections to reference as the comments center on what is not included in the report.</p>	<p>Narwhal responses to ships during the 2018 Fall shoulder season are presented in a technical memorandum dated 15 October 2019. A reference to the Technical Memorandum has been added in section 3.5.4. of the report. Only two animals were outfitted with satellite tags during this time, of which one provided relatively low- resolution GPS data. Dive and acoustic data collected for both animals did not extend into the 2018 Fall shoulder season. Therefore, the memorandum focuses on narwhal positional data collected between 29 September and 17 October 2018, coincident with the period that the MSV Botnica was conducting Project- related icebreaking operations along the Northern Shipping Route. A total of 26 events took place in which a tagged narwhal came within the acoustic disturbance zone of an icebreaking vessel (i.e., 54.4 km, as determined by acoustic modelling conducted by Jasco Applied Sciences). No narwhal were tagged in 2019, during either the shoulder or open water seasons.</p>
4	<p>Please clarify how the Southall (2007; Table 4) severity scale is applied to the post-CPA behaviour, and how it was determined when behavior had returned to pre-response behaviour to then assess the disturbance at the level of moderate.</p> <p>What estimated severity scores are assigned to each of the types of behavioral disturbance significantly related to ship proximity in this study?</p>		<p>Draft 2017-2018 Integrated Narwhal Tagging Study, Section 6.0 Pg. 154-155</p>	<p>Narwhal surface movement behavioural responses (i.e., changes in orientation and turning angle) that were shown to be significantly influenced by vessel noise or close vessel encounters corresponded with severity scores ranging from 1 to 3.</p> <p>Narwhal dive behavioural responses (i.e., changes in surface time, dive duration and bottom dives) that were shown to be significantly influenced by vessel noise or close vessel encounters corresponded with severity scores ranging from 3 to 4. Severity Score 4 is defined as 'moderate changes in locomotion speed, direction and/or dive profile...' (Southall et al. 2007).</p> <p>No prolonged changes in dive behaviour were evident in the tagging data which would correspond with severity scores of 5 or higher. Changes were considered prolonged (or long-term) if they persisted beyond the vessel exposure period (consistent with the time period an animal would occur within the 120 dB exposure zone of a passing ship).</p>

**Table 9 - Response to NIRB's Comments on Baffinland's 2019 Annual Report to the NIRB**

Cmt. #	Reviewer's Detailed Comment	NIRB Recommendations	Reference Section	Baffinland's Response
1	Identify all the parameters that are elevated relative to background levels and confirm whether the constituents have exceeded groundwater quality threshold/trigger values identified in the FEIS or subsequent addendums, or provide evidence to substantiate that the elevated parameters observed resulted from error in sampling, analysis, or natural variation in ground water quality.			<p>Baffinland has retained Tetra Tech to complete a desktop review of monitoring data from 2017 through 2019 and the methodologies utilized in the execution of the previous groundwater monitoring program. Tetra Tech will reviewing any trends in ground water quality, ground water flow, and a provide recommendations to improve sample collection, repeatability of sample collection, installation methodologies, and materials, all in the context of assessing shallow groundwater flow in a permafrost environment.</p> <p>As part of this work, Baffinland and the supporting consultants will be reevaluating the Water Quality Guidelines utilized for analysis in future monitoring years. Once assessed Baffinland will provide further recommendations to CIRNAC, NWB and other relevant parties.</p>
2	Detail any follow-up monitoring plan or groundwater contingency planning Baffinland intends to implement for the constituents that are elevated and exceed the identified groundwater quality threshold/trigger values.			Baffinland is further evaluating the groundwater monitoring program in 2020, Baffinland has retained groundwater consultants knowledgeable in Arctic environments to further assess the current program and provide recommendations in 2020.
3	Provide information regarding increased sampling effort for 2020 at site to ensure a consistent and site-wide groundwater monitoring program and committed to in Baffinland's response to Board Recommendation #3 in 2019.			Baffinland has retained Tetra Tech to complete a desktop review of monitoring data from 2017 through 2019 and the methodologies utilized in the execution of the previous groundwater monitoring program. Tetra Tech will reviewing any trends in ground water quality, ground water flow, and a provide recommendations to improve sample collection, repeatability of sample collection, installation methodologies, and materials, all in the context of assessing shallow groundwater flow in a permafrost environment. Once assessed Baffinland will provide further recommendations to CIRNAC, NWB and other relevant parties.
4	Description of the long-term measures to be implemented for controlling the source or release of leachate plumes to reduce or eliminate further contaminant releases into the groundwater environment around the vicinity of the landfill.			Leachate from the landfill facility is not anticipated, as the facility only accepts inert wastes. All organic materials, hazardous materials, and constituents that would readily degrade over time to form leachate when interacting with infiltrating precipitation will be mitigated and prevented from entering the landfill facility in accordance with the Waste Management Plan. While monitoring to date has identified elevated parameters in proximity to the landfill facility, a longer record of groundwater data is required to establish trends and any meaningful interpretation and source identification, and establishing if the parameters exceed the range of natural variability for the project area and could therefore be mine-related. Risk-based criteria may be developed to establish the potential for impact to human and/or ecological health in the event that project related impacts to groundwater are identified. Mitigation measures (natural bioattenuation, active pumping and treatment, passive in-situ treatment, etc.) may be evaluated if unacceptable risks to human and/or ecological health are identified or impacts to receiving waters exceed FEIS predictions.

**Table 10 - DFO-FFHPP notes that additional comments relative to marine mammal monitoring have been provided to BIM through the MEWG for all the 2019 draft monitoring reports in advance of this Annual Report**

Cmt. #	Reviewer's Detailed Comment	Reference Section	Baffinland's Response
<b>Date of Comment Submission: Thursday, April 30th, 2020</b>			
1	Would it be possible to add detail about the height of the bridge where the observations were performed?	2019 Ship-based Observer Program, 2.1	The text has been revised to include: "The height of the bridge of the MSV Botnica is 20 m above sea level".
2	Were the observers able to see the other ships that the MSV Botnica was escorting? Would they be able to make observations in relation to the other ships?	2019 Ship-based Observer Program, 2.1	While the bridge of the MSV Botnica offers good visibility all around the vessel, most marine wildlife observer (MWO) detection effort is focused ahead of the vessel. This allows the MWO to assess any potential upcoming risk of ship strike with marine mammals for all vessels in the convoy. If an animal is observed by a MWO on the MSV Botnica, the animal is tracked and any observations regarding interactions with escorted vessels noted. If there was a risk of potential interaction with an escorted vessel, the bridge of that vessel would be notified by the MSV Botnica.
3	Would it be possible to install a camera that would take photographs of the ice in front of the MSV Botnica? It would help to document and describe the ice conditions during ice breaking.	2019 Ship-based Observer Program, 2.2.2.1 and 2.2.2.2	As has been previously shared with DFO, this was completed in 2019. In future years, Baffinland may again decide to place a dedicated ice analyst and/or camera on the front of the vessel to capture ice conditions. Ice conditions around the MSV Botnica were also recorded by MWOs, both in terms of Near Field (<100 m) and Far Field (>100 m) Ice Cover.
4	Observers observed 1,225 seals (unidentified species) in group of up to 560 individuals. They also noted that seals were clustered on large ice pan. This information is interesting because it confirms that seals use the ice for habitat until the ice is completely gone. The ice concentration ranged from 0 to 30% during the observation period.	2019 Ship-based Observer Program, 2.2.3.1	No response requested.
5	BIM states the closest point of approach (CPA) for sighted marine mammals. When there was enough data, BIM statistically assess if there is a difference in CPA between Leg 1 and Leg 2. We would recommend to refrain from making statistical conclusions on the CPA since these distance were an approximation and might be a biased overestimate.	2019 Ship-based Observer Program, 2.2.3.3	It is agreed that the distances are approximation, as are all distances of moving marine mammals reported by observers on a moving platform, and that the reported values may be overestimates as the animal could have approached closer when underwater and not visible to the MWO. The intent of the statistical analysis was to provide a method to objectively compare CPA values. Statistical analyses of the CPA have been removed from this report and will not be included in future reporting.
6	How do the observations of 2018 and 2019 compare to the original SBO Program in 2013 2014 and 2015? It was mentioned that low number of marine mammals were observed in 2014 and 2015. What about 2013? Were the methods comparable?	2019 Ship-based Observer Program, 4.0 Summary- Marine Mammals	The 2018 SBO Program was redesigned to allow for a comparison of multi-year data sets based on monitoring conducted off the MSV Botnica during shoulder seasons. A comparative analysis between data collected in 2018 and 2019 is provided for in the report. Comparisons to previous SBO Programs would not be representative. The reasons for this are provided in Section 1.1.
7	It is stated that no ship strikes were recorded. However, could it be clarified that this only applies to the Botnica and that it was not possible to determine if ship strike occurred on the other project related vessels.	2019 Ship-based Observer Program, 4.0 Summary- Marine Mammals	No marine mammal ship strikes were recorded by observers on the MSV Botnica. As part of the Standing Instructions to Masters that is issued to all ship owners/operators prior to the start of the shipping season, all ship strikes on marine wildlife species are to be reported to Baffinland. To date, no vessel operators have reported any ship strikes occurring on marine mammals.
8	It is mentioned that: "marine mammals in the RSA are likely to demonstrate localized avoidance of Project vessels". In addition, it is mentioned that: "that the Project is unlikely to result in significant residual adverse effects on marine mammals in the RSA, defined as effects that compromise the integrity of marine mammal populations in the region either through mortality (i.e., ship strikes) or via large-scale displacement or abandonment of the RSA". It would be important to point out that these results demonstration some level of disturbance by project vessels on marine mammals and that more work is required to investigate the long term consequences of the project on the marine mammal populations.	2019 Ship-based Observer Program, 4.0 Summary- Marine Mammals	This is indicated in the final paragraph of the Marine Mammals section of the Summary (see Section 4.0). "Continuation of the SBO Program is recommended for 2020 in accordance with NIRB Project Certificate No. 005 Terms and Conditions. Ongoing annual monitoring will allow for additional data comparison between monitoring years, which will serve to identify whether any additional adaptive management measures during the shoulder seasons are required."
9	PC: The report appears to only compare 2019 results to 2018 results and, from that, draws the conclusion that 2019 monitoring results support impact predictions etc. and that the Project is unlikely to result in significant adverse residual effects on marine mammals in the RSA. BIM does note the history of this monitoring program stopping and restarting (e.g.: Section 1.1). For the sake of comprehensive monitoring, BIM should make a comment regarding the ability of limitations in comparing 2019 data to all earlier data collected during any time the SBO program existed and to also try to conduct some kind of analysis using their entire suite of SBO data while acknowledging the limitations due to changes in methodology and an interrupted data set.	2019 Ship-based Observer Program, Bottom of pdf page 4 and top of pdf page 5.	The 2018 SBO Program was redesigned to allow for a comparison of multi-year data sets based on monitoring conducted off the MSV Botnica during shoulder seasons. A comparative analysis between data collected in 2018 and 2019 is provided for in the report. Comparisons to previous SBO Programs would not be representative. The reasons for this are provided in Section 1.1.
10	PC: Regarding BIM's conclusions, no significant adverse effects as noted in the comment above. BIM notes that the SBO results "lend confidence to existing EA predictions" - however, there is no discussion about the extent and methodology of how the SBO results are incorporated into overall results so as to "lend confidence". It is worth reiterating some sort of general comment about the need for clarity on BIM's overall monitoring framework, as discussed in the marine monitoring section of CSAS Report #3.	Ship-based Observer Program, Last paragraph pdf page 4/150 and on pdf page 74/150 in the second full paragraph	The results simply indicate that marine mammals are not generally found in the near vicinity of the vessel, hence suggesting localized avoidance. A Technical Memorandum entitled "Summary of Results for the 2019 Marine Mammal Monitoring Programs" was submitted in May 2020 and incorporated a summary of the overall results of the marine mammal monitoring programs. Baffinland also suggests DFO review Baffinland's 2019 Annual Report to the NIRB where this information is provided. <b>(See also Attachment 6)</b> .
<b>Date of Comment Submission: June 15th, 2020</b>			
1	It would be useful that the results from the different monitoring programs related to marine mammals get interpreted and integrated together. The different monitoring programs were designed to complement each other and their results should feed into each other. In addition, they are all part of the same adaptive management and mitigation plan.	2019 Passive Acoustic Monitoring Program, General comments	Comment noted.  The various programs undertaken by Baffinland are designed to obtain a comprehensive understanding of narwhal response to vessel traffic. A Technical Memorandum entitled "Summary of Results for the 2019 Marine Mammal Monitoring Programs" was submitted to DFO in May 2020 and incorporated an integrated summary of the results of all the marine mammal monitoring programs. <b>(See also Attachment 6)</b> .
2	It should be clearly noted that heavy ice breaking activities did not take place in 2019 and that it was not possible to compare measured levels of noise emitted by the MSV Botnica breaking ice to the predictions of the models provided in the original assessment.	2019 Passive Acoustic Monitoring Program, Executive Summary	The following sentences have been added to the Executive Summary: "There was limited active icebreaking in 2019, as the vessels preferentially transited through safer open water conditions where possible. As such, all icebreaker transits near to the acoustic recorders occurred in open water conditions."
3	Could you provide a description of what knock trains are in the context of this report?	2019 Passive Acoustic Monitoring Program, 2.2.3.3. Narwhal-specific Vocalization Detection	Knock train is a typo. It, actually, refers to the name of the knock detector (pulse train detector) developed for this specific Project. The report should refer to knock (instead of knock train) in this context. The sentence has been modified and can be read as: "Vocalization-specific automated detectors were developed for five types of narwhal-produced sounds: echolocation clicks, high-frequency buzzes, low-frequency buzzes, whistles, and knocks".

**Table 10 - DFO-FFHPP notes that additional comments relative to marine mammal monitoring have been provided to BIM through the MEWG for all the 2019 draft monitoring reports in advance of this Annual Report**

Cmt. #	Reviewer's Detailed Comment	Reference Section	Baffinland's Response
4	It would be useful to provide the ice concentrations that relate to each transit/recording in table 4.	2019 Passive Acoustic Monitoring Program, 2.3. Vessel Sound Level Analysis	As indicated in the Table Caption, each of these transits occurred in open water conditions.
5	JASCO stated: "The modelled estimates exceed the measured durations shown in Table 11, indicating that the sound propagation calculations incorporated in the model are quite conservative, despite the under-estimation of the radiated noise levels." Does this statement take into account that the Botnica transited at 8 knot (not 9 knot as modelled)?	2019 Passive Acoustic Monitoring Program, 4.2. Measurement – Model Comparisons	Yes. The estimated radiated noise levels for the Botnica at 8 knots were louder than those assumed in the modelling for the Botnica transiting in open water at 9 knots. If the measurements were corrected (i.e. increased) for an assumed transit speed of 9 knots, the measured levels would even further exceed those used in the model. The measurements indicate that a louder source resulted in shorter exposure durations compared to what was estimated through modelling for a quieter source. One would expect a louder source to result in longer exposure durations. This indicates that the model is underestimating the amount of sound transmission loss in the environment. In other words, this shows that the model has overestimated the distances over which the sound travels, resulting in a conservative estimation of the exposure durations.
6	This is an interesting report. It will be important to continue the Passive Acoustic Monitoring program to capture variation in environmental conditions such as sea ice concentration, especially since recordings made in 2019 did not capture heavy icebreaking conditions.	2019 Passive Acoustic Monitoring Program, 4.5. Recommendations	Passive Acoustic Monitoring has been extended for another year. As mentioned in the Introduction, two acoustic recorders were deployed at the end of the open water season in 2019 to record sounds through the late shoulder season. These hydrophones, deployed near to Ragged Island and Bylot Island, will also record sounds through the early shoulder season (recording started on July 12, 2020). During summer 2020, another hydrophone will be deployed at Bruce Head to record sounds during the open water season.
7	It is not clear if AMAR-R1 and AMAR-B1 will be redeployed in future years. Can you clarify? Are there plans to deploy AMAR in other locations? For example, it would be interesting to compare model predictions to recording levels in Milne Inlet.	2019 Passive Acoustic Monitoring Program, 4.5. Recommendations	Constraints for the 2020 field season limited the 2020 open- water acoustic monitoring program to a single AMAR deployed off Bruce Head. The anticipated scope for future acoustic monitoring programs is not known at this time.
8	AMARs were retrieved on September 28-29, 2019. What are the plans to monitor noise levels at the fall shoulder season? Will some of the AMAR be deployed over winter? It is important to monitor noise levels in the fall while narwhals migrate out of the area.	2019 Passive Acoustic Monitoring Program, 4.5. Recommendations	As stated previously, and as mentioned in the Introduction, two acoustic recorders were deployed at the end of the open water season in 2019 to record sounds through the late (fall) shoulder season. These hydrophones, deployed near to Ragged Island and Bylot Island, will also record sounds through the early shoulder season (recording will start on July 12, 2020 and continue until the batteries are depleted). The following sentence has been added at the end of Recommendations in Section 4.5 : "Moreover, two acoustic recorders deployed near Ragged Island and Bylot Island at the end of the 2019 open water season will record sounds through the 2019 late shoulder season and through the 2020 early shoulder season (scheduled to start recording sounds on July 12, 2020), to document ambient underwater noise levels along the shipping corridor during both late and early shoulder seasons, and allowing further comparison of measured (actual) ship noise levels to estimated ship noise levels determined through underwater noise modelling."
9	Given that this report indicates that 50% LRR occurs prevalently when the icebreaker was present, the mitigation measures proposed for icebreaking during the shoulder season (as detailed in Assessment of Icebreaking Operations during Shipping Shoulder Seasons on Marine Biophysical Valued Ecosystem Components 1663724- 102-R-Rev1-30000) should also apply during the open water season.	2019 Passive Acoustic Monitoring Program, 4.5. Recommendations	The icebreaker remains at anchor at Milne Port during the open water season and does not escort vessels along the shipping lane during this time.  It is not clear which results in the report indicate to DFO and PCA that 50% LRR occurs prevalently when the icebreaker was present. 50% LRR was in fact more prevalent during the open water season recordings compared to the early shoulder season recordings.
<b>Date of Comment Submission: June 18th, 2020</b>			
1	It would be useful that the results from the different monitoring programs related to marine mammals get interpreted and integrated together. The different monitoring programs were designed to complement each other and their results should feed into each other. In addition, they are all part of the same adaptive management and mitigation plan.	REPORT 2019 Marine Mammal Aerial Survey Mary River Project, General comment	A Technical Memorandum entitled "Summary of Results for the 2019 Marine Mammal Monitoring Programs" was submitted to the MEWG in May 2020 and incorporated an integrated summary of the results of all the marine mammal monitoring programs. Baffinland's Annual Report to the NIRB also provides for an integrated summary of results from all marine monitoring programs. All monitoring programs are captured in the Marine Monitoring Plan. <b>(See also Attachment 6).</b>
2	The report provided enough information and detail to be able to assess the data and results. The design, analysis and results seemed appropriate and are in line with previous DFO surveys to estimate abundance of whales.	REPORT 2019 Marine Mammal Aerial Survey Mary River Project, General comment	No response required, although it is noted that this comments somewhat contradicts reviewer comment number 13 and feedback provided by DFO during the June/July 2020 MEWG Meeting. See also response to comment number 13.
3	Would it be possible to add tables with the Mark-recapture distance sampling model considered with their respective AIC values?	REPORT 2019 Marine Mammal Aerial Survey Mary River Project, General comments	These have been included in the report in Appendix E.
4	The coefficient of variation (CV) of the Eclipse Sound part of the survey is very low (0.05). This is unusual for a aerial count of whales. The way the CV was calculated seemed correct and the low CV is a result of having most of the narwhals counted in the strata that were fully covered by photos.	REPORT 2019 Marine Mammal Aerial Survey Mary River Project, 3.2.5.3 Narwhal Abundance 3.2.5.3.1 Eclipse Sound Stock	No response required.
5	"Because narwhal were distributed in a relatively small area (mostly in Milne Inlet and Tremblay Sound where most sightings were captured by photographic surveys), low CVs were achieved in the August surveys which provided the best abundance estimate. Narwhals concentrated in areas where shipping activities were high (Milne Inlet South) rather than moving to areas with low shipping activities. This is a sign that the level of shipping activity is not causing displacement. This is consistent with impact predictions made in the FEIS Addendum for the ERP that the Project was 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)." Your results do show that narwhals were present in Milne Inlet/Koluktoo Bay while shipping is occurring. However, in order to investigate large scale displacement, the densities of narwhals need to be compared to the densities of narwhals before shipping started. It would be informative to compare the current estimates with estimates from before project-related shipping started. In addition, it would be interesting to link these comments to the results of the Integrated Narwhals Tagging Study where small scale displacements were documented.	REPORT 2019 Marine Mammal Aerial Survey Mary River Project, 4.1 Narwhal Abundance Leg 2 – Open- water Season	A comparison between the 2019 abundance estimate of 9,931 (CV = 0.05) and the 2013 DFO abundance estimate of 10,489 (CV = 0.24) is now included in Section 4.1. A Technical Memorandum entitled "Summary of Results for the 2019 Marine Mammal Monitoring Programs" was submitted to the MEWG in May 2020 and incorporated an integrated summary of the results of all the marine mammal monitoring programs. <b>(See also Attachment 6).</b>

**Table 10 - DFO-FFHPP notes that additional comments relative to marine mammal monitoring have been provided to BIM through the MEWG for all the 2019 draft monitoring reports in advance of this Annual Report**

Cmt. #	Reviewer's Detailed Comment	Reference Section	Baffinland's Response
6	Golder states that killer whales had not been observed in southern Milne Inlet area by the Bruce Head study team during 2013 to 2017 and that killer whales had not been observed by Baffinland aerial survey study teams in 2013–2015. DFO notes that there were reports of killer whales in the area during those years, with prolonged period in 2017.	REPORT 2019 Marine Mammal Aerial Survey Mary River Project, 4.2 Narwhal Distribution Leg 2 – Open- water Season	Additional studies documenting recent killer whale activity in the RSA have been identified in Section 4.2 and included in the reference list.
7	For the survey of Milne Inlet South during the surveys 2 and 4 of Leg 1, the design of this strata does not meet the standard for distance sampling analysis. It seems like the intent for this strata design was to use surface density modelling. How was this strata analysed?	REPORT 2019 Marine Mammal Aerial Survey Mary River Project, 2.5.1 Visual Survey	Narwhal were not observed in Milne Inlet South during either survey 2 or survey 4 of Leg 1 in 2019, therefore the strata was not analyzed using these track lines. Leg 1 survey analysis focuses on encounter rate and has not been used for generating animal abundance estimates using distance sampling methods.
8	Golder used published data for the availability bias correction factors. Did you consider using the data from the 2017-2018 tagging program? Given environmental changes that occurred since 2012, it is recommended to use the most recent data possible. Another approach would be to update the published correction factor with the more recent tag data.	REPORT 2019 Marine Mammal Aerial Survey Mary River Project, 2.5.1.1 Distance Analysis Table 2	A number of environmental and biological factors could affect the diving behaviour of whales in any given year thus affecting the availability bias correction factors. Since the 2017-2018 tagging data was not from the same year as the 2019 aerial survey, Golder decided to use the same availability bias correction factors that DFO used for their 2016 abundance estimate. This also allowed for a more accurate comparison between the 2016 and 2019 population estimates.
9	How was the 2 m depth determined? How did the photo trainer determine that some narwhals were below 2 m depth?	REPORT 2019 Marine Mammal Aerial Survey Mary River Project, 2.5.2.1 Narwhal	Only narwhal that could be positively identified were included in the photo analysis. As noted in Richard et al. (1994), experiments with narwhal-shaped models showed that narwhals could be seen and identified by observers at depths of about 2 m but not deeper.
10	The availability correction factor usually takes into account water clarity (or murkiness) and the correction factor can be adjusted according to the depth at which narwhals can be seen. How was the information about the murkiness integrated into the abundance estimates?	REPORT 2019 Marine Mammal Aerial Survey Mary River Project, 2.5.2.1 Narwhal	No narwhal were observed in murky water during the 2019 photographic surveys. Had there been narwhal observed in murky water, the appropriate correction would have been applied to that photograph.
11	Golder combined sightings from early shoulder season survey (Leg 1) and the open-water season survey (Leg 2) were used for estimating the detection function and mark-recapture detection probabilities for narwhal in Eclipse Sound. Golder's justification for combining the two was because of low sample size for the open-water period. Were the same observers present during the two sets of surveys? Do you have evidence to suggest that the detection function should be the same during the two legs of the survey? Could you use color coding on figure 27 to illustrate the sightings from the different legs? In Buckland et al 2001, p.14 section 1.5.1, it is suggested that a sample size of 60-80 should be sufficient to determine the detection function. Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L., Borchers, D.L., and Thomas, L. 2001. Introduction to distance sampling: estimating abundance of biological populations. Oxford University Press, USA, Oxford	REPORT 2019 Marine Mammal Aerial Survey Mary River Project, 3.2.5.1 Visual Survey Data Characteristics - Narwhal	When the covariates of the selected model for the combined data are applied to the Leg 1 and Leg 2 data separately, the detection function probabilities are within two percent of each other (0.416 and 0.402, respectively). The Eclipse Sound secondary observers were the same for both legs, while one of the three primary observers for Leg 2 was also on Leg 1. Golder is not aware of a method that would allow for the differentiation of data sources in Figure 27. The inclusion of covariates and mark-recapture analysis increases the need for larger sample sizes. Buckland et al. 2001, p.15 end of the same paragraph, also states that "sample sizes of several hundred are often required for effective management".
12	Have you tried to fit linear detection function to the photographic data? The default function in distance sampling assume a shoulder at the track line but it might not be the case for oblique photos.	REPORT 2019 Marine Mammal Aerial Survey Mary River Project, 3.2.5.2 Photographic Survey Data Characteristics Figure 40-41	Since there was no logical reason for detections to diminish close to the trackline of the photographic data, it was assumed that any apparent reduction in detections near the trackline was an artifact of the clumped distribution of the narwhal. Fitting a linear regression was not attempted since the reduction in detections at increasing distances was not uniform (i.e. drop was most pronounced in the farthest third/half of the data). Fitting a linear function to this data would push the fitted detection function above the data at the trackline, where it is most sensitive to adjustments (i.e. the correction factor would be higher than logically warranted by the data).
13	For their stock assessment, DFO aims at conducting the aerial survey between Aug 1 and 24 (Watt et al. 2015). Narwhals tend to start migrating around August 25 when they tend to make more extensive movement and change their dive behaviour (Dietz et al. 2001, Heide-Jørgensen et al. 2002, Heide-Jørgensen et al. 2003, Dietz et al. 2008). It should be noted that it is possible that the abundance estimate from Aug 25- 27 include narwhals from other stocks that have started their fall migration. Watt, C.A., Marcoux, M., Asselin, N.C., Orr, J.R., and Ferguson, S.H. 2015. Instantaneous availability bias correction for calculating aerial survey abundance estimates for narwhal (Monodon monoceros) in the Canadian High Arctic. Canadian Science Advisory Secretariat Res. Doc. 2015/044.	REPORT 2019 Marine Mammal Aerial Survey Mary River Project, 4.1 Narwhal Abundance	The impact of survey timing on diving behaviour was accounted for in the analysis using the appropriate availability bias correction factor from Watt et al. (2015) for the time at which the survey was conducted (see Section 2.5.1.1). The tagging data from the references used to support the statement that narwhal tend to start migrating around August 25 actually indicate that narwhal start their fall migration in mid to late September (Dietz et al. 2001, Heide-Jørgensen et al. 2002, Heide-Jørgensen et al. 2003, and Dietz et al. 2008). Dietz et al. 2001, Heide-Jørgensen et al. 2003, and Dietz et al. 2008 did not observe any movement of narwhal out of their summer stock area in August. Dietz et al. 2001: Ten narwhal were tagged in Tremblay Sound in 1997–1998. Five were tagged in 1997 between 8–24 August and five were tagged in 1998 between 14–25 August. In both years, the whales left the Bylot Island area between 20 and 29 September. Heide-Jørgensen et al. 2003: Sixteen narwhal were tagged at Somerset Island in 2000–2001. Nine were tagged in 2000 between 14–24 August and seven were tagged in 2001 between 7–12 August. In mid to late September, most whales began to migrate into western Lancaster Sound. The eastward migration out of Lancaster Sound started in early October with most whales moving close to the southern shore of Devon Island. Dietz et al. 2008: Twenty-one narwhal were tagged in Admiralty Inlet in 2003–2004. Thirteen were tagged in 2003 between 16–21 August and eight were tagged in 2004 between 11– 22 August. Outmigration from Admiralty Inlet took place between 14 September and 11 October (mean: 28 September). Evidence of narwhal movements between stocks in August from these four papers is limited to one tagged narwhal in Tremblay Sound in August 1999 that exited the RSA on 26 August through Navy Board Inlet and moved into Admiralty Inlet (Heide-Jørgensen et al. 2002). Three of the other tagged narwhal from this 1999 tagging program stayed in the deep northern parts of Eclipse Sound until 13–30 September. The two other tagged narwhal that year moved into Navy Board Inlet in late August and both remained there until 11 September before heading into Lancaster Sound. From these four papers, only one out of 53 tagged whales started their fall migration on 26 August. The other 52 whales all began their fall migration on 11 September or later.

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Cmt. #	Reviewer's Detailed Comment	Reference Section	Baffinland's Response
14	This analysis assumes that the coefficient of variation (CV) of future surveys will be similar to the CV of this current survey. As noted above, the 0.05 CV for Eclipse Sound in this current survey is very low and future surveys will likely have a higher CV. It would be helpful to run the power analysis with different values for CV.	REPORT 2019 Marine Mammal Aerial Survey Mary River Project, Appendix C. Power analysis 1.0 POWER ANALYSIS - METHODS	If a higher CV (>0.05) is identified for the 2020 aerial survey, or any future survey, we can revise the power analysis accordingly.
<b>Date of Comment Submission: June 19th, 2020</b>			
1	It would be useful to see results integrated with those from other Baffinland marine monitoring programs. For example, how do the responses of tagged narwhals compare with received sound levels from the PAM data? How do observations from Bruce Head compare to observations of narwhals tagged in the 2017-18 integrated tagging study? Or with CPA and behavioural data from the SBO program?	2019 Bruce Head Shore-based Monitoring Program, General comment	<p>Comment noted.</p> <p>The various programs undertaken by Baffinland are designed to obtain a comprehensive understanding of narwhal response to vessel traffic. A Technical Memorandum entitled "Summary of Results for the 2019 Marine Mammal Monitoring Programs" was submitted to DFO in May 2020 and incorporated an integrated summary of the results of all the marine mammal monitoring programs. <b>(See also Attachment 6).</b></p> <p>Results obtained from other studies (e.g. the 2017-2018 Narwhal Tagging Study) have helped to inform the study design for the Bruce Head Program. For example, the locations of the survey grids for the 2020 UAV (drone) program component at Bruce Head were informed by the surface movements of narwhal derived from the 2017/2018 tagging data.</p> <p>Baffinland will be preparing a standalone technical report that will correlate visual and acoustic data collected on narwhal during the 2019 field season. This report will use data collected from the various studies (i.e. Tagging Study, Bruce Head Shore-based monitoring, PAM) to inform the overall study design and an integrated interpretation of narwhal behavioral results.</p>
2	It is suggested that the year 2014 is used as a reference. However, according to table 5-2, there were 13 one-way transits recorded in 2014 during the study period. It might be more helpful to compare the number before any project related shipping occurred. In addition, given the variability in narwhal densities between years, it might be helpful to use an average as baseline instead of data from a single year.	2019 Bruce Head Shore-based Monitoring Program, Executive Summary- Relative Abundance and Distribution And 7.0 SUMMARY OF KEY FINDINGS Relative Abundance and Distribution	Text in the report has been modified to account for a correction in the number of vessels reported in the SSA rather than in the RSA (the SSA is the study area relevant to the Bruce Head program). As noted in the report, only five Project support vessels (i.e. cargo vessels) passed through the SSA in 2014 and none were carrying iron ore. The other 48 vessels present in the broader RSA (of which 13 transited through the SSA) were not Project-related. It is likely that a similar number of non-Project-related vessels were present in previous years, making it nearly impossible to assess relative abundance of narwhal in the complete absence of vessel traffic (Project-related or not). As such, Golder is of the opinion it is remains valid to consider data collected in 2014 as baseline for assessing relative abundance of narwhal within the SSA.

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Cmt. #	Reviewer's Detailed Comment	Reference Section	Baffinland's Response
3	BIM has changed the distance of "potential vessel effects" from 15 km to 10 km based on the 2017-2018 Integrated Narwhal Tagging Study - Technical Data Report data report. However, in the tagging report, there is no test for the 15 km threshold. It might be worth investigating different distance thresholds.	2019 Bruce Head Shore-based Monitoring Program, 4.4.1.2. Automatic Identification System (AIS) data	<p>The distance used to delineate exposure vs. non-exposure zones (i.e. 10 km) is supported by acoustic modeling conducted by JASCO in which the majority of the disturbance noise field falls within 10 km of the source (Quijano et al. 2018 included as Appendix B of TSD #24). Of note, the R95% values indicated a disturbance zone of between 5.93 and 11.20 km. Monitoring results collected to date as part of JASCO's Passive Acoustic Monitoring (PAM) program suggest that modelling estimates are conservative (i.e., the 120 dB disturbance zone is likely well under 10 km).</p> <p>Furthermore, the behavioral threshold commonly referred to in the literature is not weighted to account for the frequency range in which marine mammals are sensitive to hearing. As the majority of underwater sound generated by vessel traffic is concentrated below 200 Hz (Veirs et al. 2016), which is well below the assumed peak hearing sensitivity of narwhal (&gt;1 kHz), accounting for species-specific hearing sensitivity would likely decrease the 10 km distance associated with the disturbance zone rather than increase it.</p> <p>The 10 km cut-off distance is further supported by other available marine mammal research including a review of sonar and seismic survey marine mammal monitoring literature, in which no significant behavioural reactions by toothed whales (excluding beaked whales and harbour porpoise) have been observed beyond several kilometers (Stone and Tasker 2006; Weir 2008; Southall et al 2014; Finneran et al. 2017). Based on this body of research, The US Navy uses a 10 km cutoff distance for limiting assessment of significant behavioural reactions for sonar emissions on toothed whales (Finneran et al 2017). As sonar and seismic noise sources are considerably louder than vessel noise, marine mammals are considerably more responsive to these types of sound sources than they are to vessel noise. If toothed whale responses to sonar or seismic are deemed to be insignificant beyond 10 km, it is reasonable to assume the same would apply for toothed whale responses to vessel noise (10 km would actually be quite conservative in this sense).</p> <p>Therefore, as stated in the report and further supported by existing literature and passive acoustic monitoring results from 2018 and 2019, 10 km is likely an overestimate of the disturbance zone for narwhal. Should different distance thresholds be examined in the future, distances of interest would be those less than 10 km rather than greater than 10 km.</p> <p>Quijano, J.E., C. O'Neill, and M. Austin. 2018. Underwater Noise Assessment for the Mary River Project - Phase 2 Proposal: Construction and operation activities in Milne Port and along the Northern Shipping Route. Document 01621, Version 1.0. Technical report by JASCO Applied Sciences for Golder Associates Ltd.</p> <p>Stone, C.J. and M.L. Tasker. 2006. The effects of seismic airguns on cetaceans in UK waters. <i>Journal of Cetacean Management</i>. 8(3): 255-263.</p> <p>Veirs, S., Veirs, V., and Wood, J. D. (2016). Ship noise extends to frequencies used for echolocation by endangered killer whales. <i>PeerJ</i> 4:e1657.</p> <p>Weir, C.R. 2008. Overt responses of humpback whales (<i>Megaptera novaeangliae</i>), sperm whales (<i>Physeter macrocephalus</i>), and Atlantic spotted dolphins (<i>Stenella frontalis</i>) to seismic exploration off Angola. <i>Aquat. Mamm.</i> 34(1): 71-83.</p>
4	It is mentioned that cases with 200 or more narwhal within substratum (3 cases) and cases where group size was <20 narwhal (18 cases) were removed. Do you believe these data points are accurate or are they the result of observer error? If they are real, would it be possible to use a different distribution (data transformation) in your models to accommodate for large data points?	2019 Bruce Head Shore-based Monitoring Program, 4.4.1.8 Data Filtering	For the RAD analysis, 3 cases were removed (with counts ≥200) out of a total of 32,466 cases, which represents 0.009% of the data. For the analysis of behavioural data, where cases with group sizes >20 were removed (18 cases out of a total of 5,025 cases), the omitted cases accounted for 0.36% of the data. We assume that these cases were accurate and thus removed them as they were affecting model fitting. The objective of the analyses was to capture the effect of shipping on the overall narwhal population present around Bruce Head. Since these cases represent very rare events, including them in the analysis would reduce our ability to capture the effects of primary interest.
5	Can you provide more detail about the spatial auto-correlation structure?	2019 Bruce Head Shore-based Monitoring Program, 4.4.2.3 Relative Abundance and Distribution	Text regarding the spatial auto-correlation structure has been added to section 4.4.2.3.
6	50% of the 1-way vessel transits were recorded by observers during the Bruce Head survey period. Would it be possible to increase the percentage of transits observed? It would be beneficial to observe during the entire shipping season to see if there are different impacts at the beginning and end of the season (e.g.: during icebreaking) than only during open-water season.	2019 Bruce Head Shore-based Monitoring Program, 5.2.1 Baffinland Vessels and Other Large/Medium-Sized Vessels Table 5-2	Baffinland aims to increase the percentage of vessel transits observed by MMOs during active observation shifts at Bruce Head. This will be done by closely tracking vessel movements via the shore-based AIS system and, wherever possible, observation shifts will be timed to overlap with incoming/outgoing vessels. Due to logistical constraints of maintaining an operational camp (e.g. colder temperatures causing water lines to freeze, etc.), the field program cannot be extended longer to capture the entire shipping season.
7	As mentioned in the comment below, it would be helpful to include some information about the power analysis here to help interpret non-significant results.	2019 Bruce Head Shore-based Monitoring Program, 7.0 SUMMARY OF KEY FINDINGS	Comment noted. Text in the summary has been updated to include more information on the power analysis.
8	The power analyses are helpful to put the results in perspective. For example, with the current data, it is very difficult to detect changes in narwhal abundance related to the change in number of vessels from one to more than one. For some analyses, the data was not sufficient to detect any effect. Tables 1 and 2 are great tools to understand and interpret the analysis. We encourage BIM to produce these types of power analysis in the future. In addition, it would be helpful to include Tables 1 and 2 in the main document.	2019 Bruce Head Shore-based Monitoring Program, Appendix E. Power Analysis	Comment noted. Baffinland will provide similar tables in monitoring reports going forward. However, tables will remain in the appendix in an effort to avoid redundancy in reporting.

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Cmt. #	Reviewer's Detailed Comment	Reference Section	Baffinland's Response
<b>Date of Comment Submission: June 21, 2020</b>			
1	Sampling in 2019 was largely completed at the end of July and the end of August, with limited sampling occurring between these events (pgs 28-32). DFO notes that in the 2018 MEEMP Report, sampling occurred more frequently between the end of July and the end of August (2018 MEEMP AIS Report, Section 3.1.5.2, pgs 23-25). As demonstrated in Table 4-23 of the 2019 MEEMP, the total number of fish caught and the total number of fish species caught was lower in 2019 than in 2018. What factors influenced the frequency and timing of fish sampling in 2019? Consistency in sampling methodology and frequency each year will better allow for any potential effects to fish community structure from the construction and operation of Milne Port to be detected, and will allow for better comparison of data.	2019 MEEMP and AIS Monitoring Program, 3.1.7.2 Fish Surveys 4.1.7.1 Catch Data	It is, and has been, our intention to maintain consistency in sampling methodology, timing, and frequency among years for the MEEMP components to the extent possible. An unexpected health and safety incident affected the 2019 sampling schedule, such that on-water sampling was not possible for a period of time during the program. The 2019 MEEMP report has been updated to provide this explanation. And, moving forward, when factors beyond the field crews' reasonable control affect the field schedule or the ability to complete all scheduled tasks within the planned timeframe, these deviations will be clearly reported in the MEEMP annual report.
2	Baseline is not well established (they often compare to data when the project had already started or only one year of baseline data), and to use CCME guidelines (where available) as baseline or level to stay below and conclude no significant effects is something that should be discussed; these guidelines are set for southern areas, already influenced by many decades of industrialization/pollution, not for pristine Arctic environments.	2019 MEEMP and AIS Monitoring Program, General Comments	If there are other regulatory guidelines more appropriate for the north established by DFO or other crown agencies (i.e. ECCC), we would be happy to use these. In the meantime, we will continue to use the CCME guidelines as these represent the only widely accepted option available (i.e., most environmental assessments in Canada employ CCME guidelines). CCME guidelines are effects-based and derived to be inherently conservative using laboratory-based toxicity test data that includes some species present in northern environments or species that are representative of northern taxa.  For major elements of the MEEMP, the baseline is well established; for example, sediment, water quality, and benthics data were first collected in 2014 (prior to project operations) and have been collected annually since.
3	For marine water quality, the conclusion that there has been no increase in iron is based on the result that iron concentrations in 2019 were no different from those in 2015-2018 (years in which the mine was already operational). As the mine was operational during those years, this cannot serve as a baseline. The comparison might be made with other areas for which water quality data is available.	2019 MEEMP and AIS Monitoring Program, Pdf p 5/1149 and pdf pp 117-118/1149 (Marine Water Quality section)	The water quality (WQ) monitoring component of the MEEMP is designed to act as a surveillance study to monitor WQ in the receiving environment for compliance at select stations down gradient of the effluent through comparisons to CCME guidelines; it is not designed to characterize, or be representative of, WQ conditions in Milne Inlet as a whole. Further, because baseline water investigations were predominantly conducted offshore, it was not considered appropriate to make direct comparisons with nearshore sampling stations collected as part of the MEEMP, where turbidity levels are likely to be greater; this is consistent with the approach used in previous years. Because iron ore particulates potentially blowing off the stockpiles and into the marine environment are in a mineral form, they would be expected to settle and accumulate in marine sediments; thus, as outlined in the Baffinland (2016) Marine Environment Effects Monitoring Plan, the marine sediment program was considered to represent a more appropriate medium than surface water to monitor for temporal changes in iron concentrations within the marine environment. Measured sediment iron concentrations collected in 2019 were not determined to be statistically different than those measured in 2014 (pre-operations), with the exception of two stations toward the distal end of the East Transect.  It is acknowledged that a statement indicating that levels of iron in water samples collected in 2019 are within the range of concentrations observed between 2015 and 2018 was included in the 2019 MEEMP report; however, to clarify, this relates to effluent monitoring only. For effluent to be discharged, the mine must be operational, hence 2015 is considered an appropriate baseline in this particular instance. It must be reiterated that marine water quality results reported in the MEEMP are linked to effluent discharge and are not an indication of overall water quality at Milne Port or in Milne Inlet.  Baffinland Iron Mines Corporation (Baffinland). 2016. Marine Environmental Effects Monitoring Plan. Prepared by Sikumiut Environmental Management Limited (SEM) and LGL Limited for Baffinland Iron Mines Corporation, Oakville, ON. 81 pp.
4	Results - Are there any visuals (graphs or charts) that illustrate trend over time of the various parameters for the MEEMP? While there is lots of textual description and comparison to CCME guidelines, it may be beneficial to also see the actual trends so it is clear what is decreasing/increasing/staying the same compared to the actual baseline conditions. This could then be followed by all the textual discussion and comparison of actuals to guidelines etc.	2019 MEEMP and AIS Monitoring Program, General Comments	For water quality, the maximum, minimum, and mean concentrations for key parameters assessed between 2015 and 2019 are summarized in Table 4-2. Additional figures were not considered warranted due to the low concentrations measured relative to available water quality guidelines that are conservatively derived.  For sediment concentrations, temporal trends are depicted in Figures 4-9 and 4-13 for percent fines and iron concentration, respectively. Figure 4-9 shows that fines have not significantly changed over time while, similarly, Figure 4-13 verifies that the primary contaminant of concern, iron, has not measurably increased along the north, west or east transect over the six years that the MEEMP has been implemented.
5	It is indicated that measured concentrations were "generally consistent" with previous years and CCME guidelines. However, this is not the same as "entirely consistent". Were there significant differences? If so, in what and to what degree and why?	2019 MEEMP and AIS Monitoring Program, Pdf p 198 /1149 (first bullet, water quality)	Results for conventional water quality parameters, major ions, nutrients, metals, hydrocarbons, and PAHs showed no exceedances of CCME water quality guidelines. As would be expected, there is some variability in measured concentrations for some parameters (as summarized in Appendix B3) – hence the use of the phrase "generally consistent"; however, the data did not indicate an increasing trend that would suggest the potential for adverse biological effects.  The only exception to this trend of consistent water quality was copper, as discussed in detail in Section 5.1.1 of the MEEMP report. While individual exceedances were reported, the
6	It is stated that diving on a ship's hull to conduct specimen collection can be severely hazardous in an active port. Diving may be done elsewhere in Canadian ports. Can those safety protocols be adopted?	2019 MEEMP and AIS Monitoring Program, Pdf p 188/1149 (section 5.2.6)	There are different protocols for diving in a port versus diving on a vessel. Both Golder and Baffinland health and safety protocols regarding diving prohibits diving in and around vessels, due to requirements for locking out the vessel, and other additional risks.
7	This section identifies 5 examples of potentially A/NIS and flags them for further review. Do we have a sense of how rapidly this review will occur as, if there is delay in this, there may be a danger of the species becoming established if indeed it is invasive. Is this where there should be a better link to a rapid response program?	2019 MEEMP and AIS Monitoring Program, Pdf p 185/1149 (section 5.2.2)	The delay is due to lab closures under COVID-19 restrictions therefore it is uncertain how long it will take for the review of the specimens.  In the interim, if DFO has any guidance for RRP with respect to the sample sent for further investigation, we would be happy to review this.

**Table 10 - DFO-FFHPP notes that additional comments relative to marine mammal monitoring have been provided to BIM through the MEWG for all the 2019 draft monitoring reports in advance of this Annual Report**

Cmt. #	Reviewer's Detailed Comment	Reference Section	Baffinland's Response
8	<p>Multiple references that Casas-Monroy et al. (2014) was used as a definitive list of invasive species in Canada (e.g. Executive Summary, AIS Zooplankton section). Please note that the Casas-Monroy list is a subset of Molnar et al. 2008 data, limited to those species listed by Molnar from ecoregions connected to Canada by ship traffic during the period of study, with some species removed when recognized as being native to Canada. This reference is not an exhaustive list of existing or potential species considered invasive to Canada. As the reference is a subset of Molnar et al, it may be best to retain only the references to the Molnar study and remove the citations to Casas-Monroy completely to avoid misunderstanding.</p> <p>While using global AIS lists such as Molnar can be informative, they are not exhaustive, and quickly become outdated. Criteria used to determine status of a species as nonindigenous and/or invasive should follow that of Goldsmit et al 2014 and Dispas 2019 who used a process of cross referencing with comprehensive historical native species occurrence data to identify species that are new to a given ecoregion or to the Canadian Arctic more generally. All NIS should be treated as having potential to become invasive given the uncertainty as to how they may spread once introduced to a new region.</p>	<p>2019 MEEMP and AIS Monitoring Program, AIS Monitoring Program 3.2</p>	<p>The references in the Executive Summary were intended to be examples, and not exhaustive, to demonstrate that due diligence was being performed in terms of comparing to both global and domestic databases. Collected specimens not listed on Baffinland's existing inventory are evaluated against multiple sources, which are detailed in Section 3.2. Casas-Monroy and Molnar were both used as starting points, but not as a definitive list of invasive species in Canada. The literature review that was performed for each flagged species involved cross-referencing with collection records and regional specimen lists as well as broader taxonomic records, as recommended by DFO.</p>
9	<p>It is not clear how the ships were selected for hull monitoring. Recommend that ships are selected based on age of anti-fouling paint/time since last dry-dock aiming to survey ships that have not recently been painted or cleaned. Together with the above factors, greater time spent in previous ports of call, and greater number of regions visited since last cleaning have also been shown to be associated with increased extent of fouling and could be used to select vessels for monitoring (e.g. see Sylvester et al. 2011). DFO recommends identification of factors influencing biofouling risk of vessels calling on Milne Port through a validated risk assessment, however this would require initial sampling from a subset of vessels to assess of percent cover and physical collection of organisms in a representative, standardized and comprehensive manner (including both hull and niche areas) that will allow for identification of non-native species that may be transported through project shipping (DFO 2020).</p>	<p>2019 MEEMP and AIS Monitoring Program, 3.2.6 Ship Hull Monitoring Methods</p>	<p>Due to the limited time the ROV is available for AIS surveys, selecting ships based on risk factors such as anti-fouling paint is not practicable. Efforts are made to survey as many of the ships as possible while the equipment and operator are on site.</p> <p>It is also noted that the paper referenced by DFO in Comment No. 10 (Sylvester &amp; MacIsaac (2010) Diversity &amp; Distributions 16(1)) describes the use of an opportunistic sampling method, making efforts where feasible to sample a range of vessels. This method is consistent with the current approach undertaken by Golder.</p>
10	<p>The methods for the surveys are insufficient to understand what was surveyed on each ship. A standardized, stratified survey design should be implemented for consistency, such as used by Sylvester &amp; MacIsaac (2010) Diversity &amp; Distributions 16(1).</p>	<p>2019 MEEMP and AIS Monitoring Program, 3.2.6 Ship Hull Monitoring Methods</p>	<p>Surveys were systematic and conducted along the hulls of the ore carriers covering a representative range of depths of 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-chest grating, stern tube, rope guard, propeller nose cone and blades, rudder side, bottom, leading and trailing edges), consistent with Sylvester and MacIsaac (2010).</p>
11	<p>The use of accumulation curves is good, but given that the curves are based on samples collected over 3 days, they may underestimate seasonal diversity. Caution should be used in the interpretation of the asymptote for curves based on a 'single' point in time. i.e. sampling may have been sufficient for that point in time, but underestimate of annual diversity over multiple seasons of the year.</p> <p>Plankton are well known to exhibit high seasonal variability in both abundance and species richness (e.g., McKinstry and Campbell 2018 and references therein). This has been well demonstrated in surveys of other Canadian Arctic ports where variability in density and species richness across months was found to greatly exceed variability among sites at a given port (Dispas 2019). Sampling at regular intervals over a 3 month period versus over a two week window resulted in a 40% increase in species richness (Dispas 2019). Collection of more frequent plankton samples (at least once/month during open water season when plankton are blooming) is recommended to improve baseline coverage of species that may be present.</p> <p>We note that some of the oblique tows are being done with a 64um net and have concerns that there may be a bow wave created with such a small mesh size which could bias results. This method is best suited to larger mesh nets for capturing larger faster swimming zooplankton and ichthyoplankton. Overall densities of plankton in the oblique hauls are unusually low (suggesting there may be a problem in the way the net is being towed and/or bow wave effects).</p>	<p>2019 MEEMP and AIS Monitoring Program, 4.2 accumulation curves 3.2.1</p>	<p>The point around accumulation curves and seasonal diversity is acknowledged; however, sampling is limited to the open water season in Milne Inlet. Additionally, there is recent evidence to suggest seasonal invariability in benthic community functioning, despite high seasonal variability of environmental conditions in Arctic systems (e.g., Mazurkiewicz et al. 2019), suggesting a summer "snapshot" may be fairly representative of multiple seasons.</p> <p>The recommendation to sample at regular intervals over a 3-month period consistent with Dispas 2019 is not feasible, given the length of the open water season at Milne Port.</p> <p>We agree that plankton exhibit high variability, due to many factors, and are therefore not considered a reliable indicator with which to evaluate potential Project effects. Accordingly, zooplankton abundance is not discussed within the MEEMP Report; however, species diversity is presented as part of the AIS/NIS component only. Species richness and abundances are simply presented as supplemental information which helps place the information in the context of previous sample years.</p> <p>With respect to the comment around oblique tows, we acknowledge an incorrect net was accidentally used for some of the oblique tows during field sampling in 2019. This led to the loss of the 64 um net during sampling and the 250 um net (normally used for oblique tows in this program) was used for the rest of the program. Larger mesh size were used for oblique tows in 2020.</p> <p>The "unusually low" densities referred to in the comment were due to tows with the 250 um net. Abundances within four survey efforts, including both oblique tows at Ragged Island, were very low compared to the tows that used the 64 um net (with comparable species richness between all tows). However, these low abundances are similar to values observed in all previous MEEMP oblique tows since 2014 (range of 54-351 org/m<sup>3</sup>). Note there was mistake in the data entry and the abundances in Milne Port (which primarily used the 64 um net) were much higher than all previous MEEMP surveys, with 769 org/m<sup>3</sup>.</p>

**Table 10 - DFO-FFHPP notes that additional comments relative to marine mammal monitoring have been provided to BIM through the MEWG for all the 2019 draft monitoring reports in advance of this Annual Report**

Cmt. #	Reviewer's Detailed Comment	Reference Section	Baffinland's Response
12	113 minutes of video footage across five ships is very small and may be inadequate to assess fouling coverage adequately, noting that previous studies have taken between 1-3 h per ship (e.g. Sylvester & MacIsaac (2010)).	2019 MEEMP and AIS Monitoring Program, 4.2.6	Acknowledged. However, the ~23 minutes of footage per ship is considered sufficient to assess fouling coverage, particularly considering the ROV is collecting video for post-processing and can be slowed down when reviewed.
13	While the methods section 3.2.6 indicated that much effort was focused on niche areas where biofouling was most likely to occur, this table shows only stern sections and one bow section were surveyed. Combined with the minutes of video footage, it appears the ROV surveys were insufficient to determine biofouling extent on any vessel.	2019 MEEMP and AIS Monitoring Program, 4.2.6 Table 4-46	Table 4-46 was not as specific as it could be with regard to location of survey in that it simply lists "bow section" or "stern section". However, the niche areas described in Section 3.2.6 are nested under the heading of either bow or stern; for example, "stern" refers to the propeller nose and blades, any crevices, intake ports etc.
14	Identifications were insufficient due to use of video footage only. Addition of a biologist at the time the ROV is being operated is unlikely to improve the ability to acquire species-level identifications as normally a specimen would be required. ROV technology is currently suitable only for assessing % coverage. Divers in the water are needed to obtain specimens for species level identifications. A combination approach could be used in the future to acquire specimens while minimizing diver time in the water.	2019 MEEMP and AIS Monitoring Program, 5.2.6	Due to safety concerns around diving on a vessel undergoing active loading, combined with the difficult access to areas where biofouling has been observed, collection of samples for identification by divers from ship hulls is not feasible. Both Golder and Baffinland's Health and Safety regulations surrounding diving prohibit divers from surveying ore carriers.  That said, divers will be part of the 2020 program for monitoring offset habitat along the freight dock, checking and redeploying AIS belt transects, and will be used opportunistically along AIS transects as time allows. During these surveys, specimen collections will be made opportunistically to aid in identification of species.
15	The statement that No NIS or AIS taxa were identified among biofouling species observed in ship hull surveys is inappropriate for the executive summary considering the limited survey effort (minute of video footage) and the lack of specimen collection and species-level identifications. Similarly, the statement that most of ships' surfaces were found free of biofouling may be an overreach, depending on the extent of hull surface actually surveyed.	2019 MEEMP and AIS Monitoring Program, Executive Summary, Ship Hull Monitoring	Acknowledged. Sentence has been edited to "No NIS or AIS taxa were flagged among the biofouling species observed on the ship hulls during surveys". Further, "Where observations were made" was added to the free of biofouling statement.
16	DFO supports the 2019 modifications of extra sampling intensity for benthos and including sculpin in fish tissue sampling, however we would like to know rationale for why the 3 subsamples at each station were combined for a composite sample. It is unclear if this was only done for the Van Veen or the Ponar Grabs as well and unclear why 2 different grab methods were used. If subsampling is used there must be care that the sample is being split evenly from top to bottom so as to not bias results since the distribution of biota from the source to deeper sediments will vary.	2019 MEEMP and AIS Monitoring Program, Executive summary MEEMP 2.2.1	Using a composite of three grabs comes from the Metal Mining Diamonds Environmental Regulations, specifically the Metal Mining Technical Guidance for EEM, to help ensure replication is achieved. To clarify, the methodology has always been to collect a composite of three subsamples; the only difference in 2019 being the switch to the Van Veen grab from the Ponar.  The experimental design originally called for the Ponar to be used for all stations; however, during sampling, the Ponar was unable to make grabs past certain depths, prompting the switch to the Van Veen grab. The Van Veen was used for all benthic and sediment collection in 2020. The design of the splitter allows for an even split from top to bottom to address any potential issues associated with introducing a bias to the results.
17	"Species from several major taxa groups were excluded from the dataset before data analysis because these are meiofauna and not reliably retained on 500 um mesh, or not strictly invertebrates". Although removing these for the MEEP analyses seems reasonable, these species should be retained for the AIS program. Could BIM provide confirmation if this was done.	2019 MEEMP and AIS Monitoring Program, 3.5.1	All species collected were retained for the AIS analysis, even when excluded from other analyses.
18	It is reassuring to see that BIMs annual monitoring is able to pick up new species, demonstrating the benefits of regular monitoring, something which is not feasible in most areas of the Arctic. The specimen of <i>Obelia</i> from the zooplankton samples is of particular interest. This genus is rare in the Canadian Arctic, however, <i>Obelia longissima</i> is relatively common in the Eurasian Arctic and north Sea (Europe) – for example, of 1400 records in the GBIF biodiversity database, there are only 2 historical reports of specimens from the Canadian Arctic, one of which is at Canadian Museum of Nature; DFO has requested confirmation of the identity of this specimen. Based on NEMESIS database ( <a href="http://invasions.si.edu/nemesis/jtmd/SpeciesSummary.jsp?taxon=Obelia%20longissima">http://invasions.si.edu/nemesis/jtmd/SpeciesSummary.jsp?taxon=Obelia%20longissima</a> ), the species is thought to be spread via biofouling and considered exotic/cryptogenic in north pacific to Alaska and also listed as non-native to temperate northern Atlantic, however, references in NEMESIS should be checked carefully to confirm this. Type locality for species in Black Sea and Ireland suggesting possible origin in this region. Given the limited reports in Canadian Arctic and possibilities of introductions of this species from other northern locations, the specimen (s) found by BIM should be examined to see if the species can be confirmed and background on the species should be examined more carefully to evaluate if this species would be considered an NIS to the region. We note that recent specimens of <i>Obelia</i> spp. were also detected in port of Churchill (Dispas 2019) and Deception Bay (Goldsmith 2016). At least one of these collections has been preserved in ethanol which may allow for further examination of genetic affinities with populations elsewhere. Likewise records of <i>Hybocodon prolifer</i> in the Canadian Arctic are limited to a handful of specimens previously found in the port of Iqaluit, but there more frequent detections in northern Europe and the Bering Sea (GBIF, OBIS), suggesting this species should be examined more carefully and museum specimens from the Canadian Arctic verified to confirm previous identifications – there do not, however, appear to reports of the species being invasive or introduced elsewhere. In contrast to these two species, <i>Onisimus glacialis</i> , although not common, has been historically reported in a number of areas across the Canadian Arctic through multiple studies, providing better confidence that it is native to the region. Given the above comments, it may be misleading or premature to state that "No NIS taxa were identified in zooplankton samples...". A statement that "Further review of natural ranges and vectors of introduction are re required to confirm NIS status" similar to the statement regarding benthic infauna would be more appropriate.	2019 MEEMP and AIS Monitoring Program, Executive summary AIS Zooplankton 4.2.1	Acknowledged. The statement has been edited as suggested in section 4.2.1 and Section 5.2.1
19	There is mention that benthic specimens identified as potentially non-indigenous were sent to Philippe Archambault's lab for identification. Could Baffinland please provide a list of which species?	2019 MEEMP and AIS Monitoring Program, Executive summary AIS Benthic Infauna	Baffinland commits to providing a list of specimens sent for independent verification.

**Table 10 - DFO-FHPP notes that additional comments relative to marine mammal monitoring have been provided to BIM through the MEWG for all the 2019 draft monitoring reports in advance of this Annual Report**

Cmt. #	Reviewer's Detailed Comment	Reference Section	Baffinland's Response
20	<p>The identification of <i>Marenzelleria viridis</i> is interesting as this was a species identified as having potential risk for invasion to the Arctic and has been assessed and ranked in two a recent screening level risk assessments (Vizilli et al. submitted; Goldsmit et al. in prep).</p> <p>Although the Bim report suggests multiple specimens have been collected in the 80's and 80's, we found this species has had limited historical reports from the Canadian Arctic: one from an Imperial Oil consultant report (the same record noted in this MEEMP AIS report originally from Conover and Stewart 1978) near Baffin Island and 5 specimens (under the original synonym of <i>Scolecoplepides viridis</i>) from the Beaufort Sea area in 1980's by Hopcroft (2016). The species was also reported in a recent survey at the community of Gjoa Haven (Brown et al. 2011). However, it should be noted that the genus <i>Marenzelleria</i> consists of five species, which are very difficult to discriminate by morphological characters alone (Blank et al 2008). This species (particularly older records) could be confused for <i>Marenzelleria arctica</i> which has recently been found in other locations in the Arctic so it is possible these isolated reports represent misidentifications of this closely related species (C. Conlon, Canadian Museum of Nature, pers. comm). We would suggest reexamination of specimens by a Polychaeta expert to verify if specimens found at Milne Inlet are indeed <i>M. viridis</i>, a species which has successfully invaded California, Scotland, the North Sea, and the Baltic Sea where it has reached high densities in its, and replaced native infauna/ altered sediment characteristics in some locations (NEMESIS; <a href="https://invasions.si.edu/nemesis/browseDB/SpeciesSummary.jsp?TSN=47">https://invasions.si.edu/nemesis/browseDB/SpeciesSummary.jsp?TSN=47</a>).</p> <p>While formalin allows for better preservation of specimens, situations such as this point to the benefits of good preservation in ethanol which would allow for genetic barcoding as a potential option for verifying identity of morphologically challenging species such as this.</p> <p>While it is helpful to see descriptions of distributions for new species, Table 4-41 would be much more informative if the specific references associated with previously known distributions of each new species were given as another column. This would allow the reader to check references associated with individual species to better assess the quality of baseline data upon which a species designation is based. We request that the table be updated with this information in a similar fashion to how it is presented in supplementary tables of Goldsmit et al. (2014). Once this is done, we would like the opportunity to review each species in light of information contained in supporting references and any additional information that may be relevant. Likewise species found in previous years at the port and not included in 4-41 should also have clearly linked references to support their designations as native, invasive or cyptogenic, so as to have a cumulative list covering the life of the monitoring program.</p>	<p>2019 MEEMP and AIS Monitoring Program, Executive summary AIS Benthic Infauna 4.2.2 4.2.2.1.1 4.2.2.1.2</p>	<p>The specimens identified as <i>M. viridis</i> were sent for independent verification, which confirmed the identification. Plans were discussed to subsequently send the specimen for additional verification by a polychaete specialist; however, this was hampered by COVID-19 related lab closures resulting in an inability to have the sample forwarded.</p> <p>During the 2020 program, the locations where <i>M. viridis</i> were collected in 2019 will be sampled again with the specific intent of preservation of the samples in ethanol. Any taxa of interest (including <i>M. viridis</i>, <i>Monocorophium</i> and other potential NIS) in the ethanol preserved samples will be sent for genetic barcoding.</p> <p>Table 4-41 will be adjusted for the 2020 report to include specific references requested. Further, the updated list of taxa sent for verification will be included in the 2020 report. This will include details on the lab where the taxa are verified, the specific identifications made by each lab, and comments detailing the reasons for verification</p> <p>Coe 1944 describes four species of the genus <i>Lineus</i> (<i>koalensis</i>, <i>maris-albi</i>, <i>ruber</i> and <i>saint-hilairi</i>) with known Arctic distributions, of these <i>L. marisalbi</i>, <i>ruber</i> and <i>sainthilairi</i> all have documented distributions in the Arctic Ocean according to WoRMS. See Coe 1944 <i>Nemertean from the Northwest Coast of Greenland and Other Arctic seas</i>. <i>Journal of the Washington Academy of Sciences</i> 34(2):59-61. GBIF also indicates a specimen of <i>Lineus ruber</i> in the Arctic Ocean on the Northern Alaskan Coast.</p> <p>We are unable to determine if <i>Monocorophium</i> has spread from the original site near the ore dock. The sites where this species was identified in 2019 were not sampled in previous years, but they occur in the general ore dock area where it was observed previously. In 2020, effort will be made to sample in those areas where this species has been identified, and at representative step out locations. Samples will be preserved in ethanol for genetic barcoding to help resolve the identification. This is part of the early plans to confirm the identification and monitor potential spread in order to inform possible steps for management or containment.</p>
21	<p>Given the difficulty in identifying taxa to species level with video surveys the that "No NIS or AIS tax were identified..." is misleading. Rather there should be acknowledgement that these methods are not suitable for identifying most taxa at the level needed for proper assessment of their status as native or introduced and that improvements are needed. We recognize that BIM is working toward improving methods for sampling of epifauna to include more specimen-based collection and encourage them to continue these efforts.</p> <p>Further we note that of the following taxa identified to species may be NIS based on known distributions:</p> <p><i>Pecten albicans</i> was not mentioned, but a search of global data bases (ARMS, GBIF, OBIS) shows that this species only occurs in Japan. There should be verification of footage to determine if this species identification is correct as it would be considered an NIS with potential to compete with other scallop species in the area.</p> <p><i>Polycarpa pomeria</i> is a species with a strictly European distribution and other species of <i>Pomaria</i>, while more widely distributed have not been documented anywhere in the Arctic with the exception of northern Europe suggesting this species may be an established NIS given that it was previously observed in benthic infauna samples (2018). Video footage as well as specimens should be verified by a tunicate expert to validate if these identifications are correct.</p> <p>We would also like to know which of the species in 4-41 were validate in Philippe Archambault's lab – we suggest this be included in the table or tracked somewhere in the document and associated database. Will specimens that could not be identified to species also be sent to experts either from the Archambault lab or to another lab with expertise in the respective taxonomic groups? We recommend this be done as specimens in 2018 that were not identified to species by Biologica, were in some cases be identified by another lab (Archambault's lab).</p> <p>We checked distributions for <i>Lineas</i> and could not find evidence of the genus occurring anywhere in the Arctic aside from one record in Alaska. The genus appears widespread elsewhere, particularly in northern Europe, suggesting it could be a potential NIS. We suggest having this specimen verified, examining potential vectors and checking its known distribution carefully to evaluate status.</p> <p>We are pleased to see there will be further work to validate specimens of <i>Moocrophium</i> by a third lab given uncertainties and the potential for this species to be non-indigenous. We would be interested to know which sites this species was found at in 2019 and whether it appears to have spread from the original site near the ore dock. Are there any plans for response to manage/contain this species?</p>	<p>2019 MEEMP and AIS Monitoring Program, Executive summary AIS macroflora and benthic epifauna 4.2.3</p>	<p>Acknowledged, the statement in the Executive summary has been edited.</p> <p><i>Pecten albicans</i> was erroneously entered in the table, the scallop seen was not identifiable to species, the report has been corrected.</p> <p>The identification of <i>Polycarpa pomeria</i> in 2018 was updated to <i>Polycarpa fibrosa</i> following independent verification. Arctic specimens have been collected (including in the Greenland Sea). The identification in the 2019 report should have been <i>Polycarpa sp.</i> and has been corrected.</p>

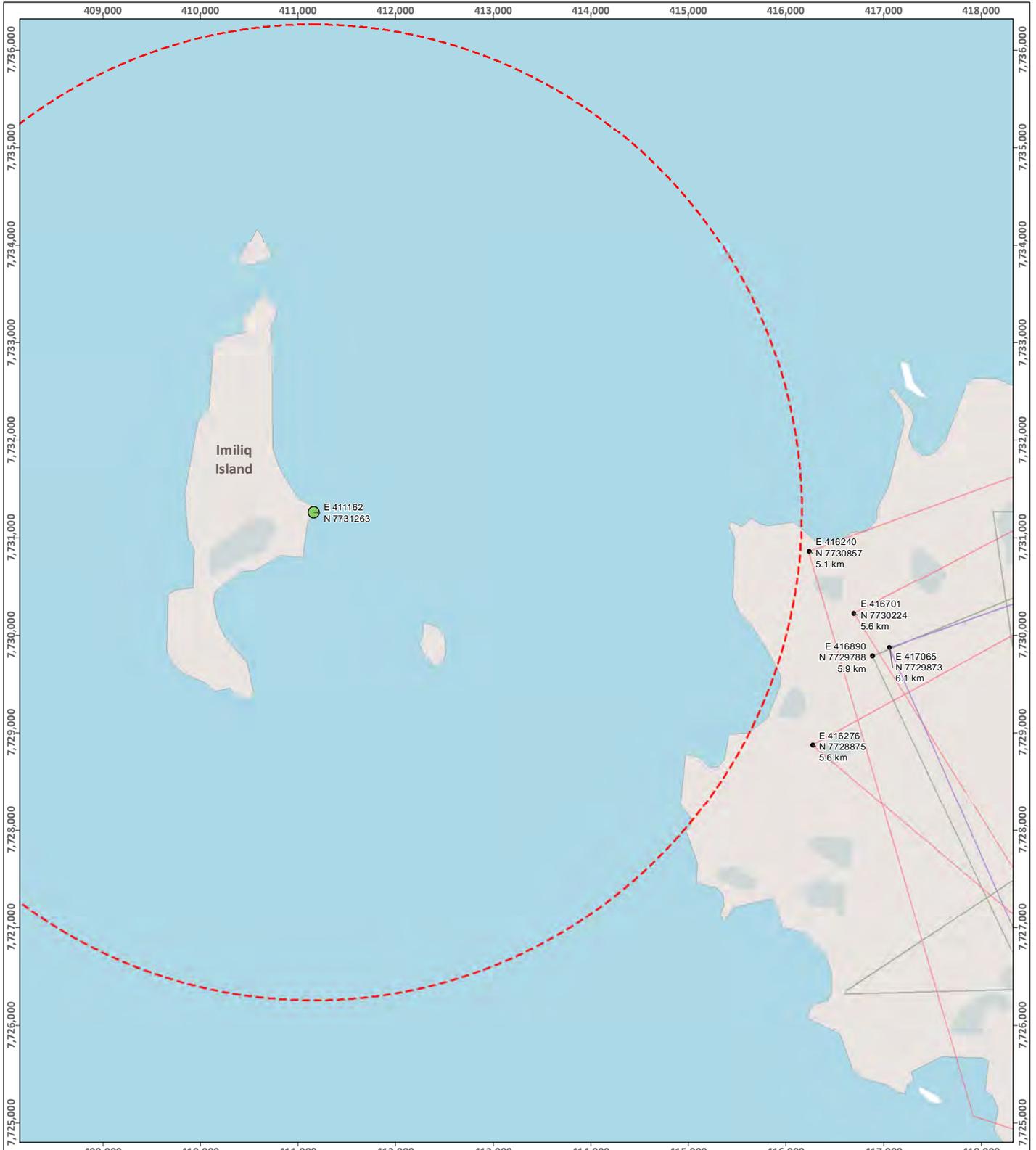
**Table 10 - DFO-FFHPP notes that additional comments relative to marine mammal monitoring have been provided to BIM through the MEWG for all the 2019 draft monitoring reports in advance of this Annual Report**

Cmt. #	Reviewer's Detailed Comment	Reference Section	Baffinland's Response
22	<p>Circeis americana is not listed in either of the sources mentioned to have been used as references supporting a known Arctic distribution for this species. A quick search in global databases (OBIS, GBIF) shows it has only been reported on one occasion recently (2008) in Churchill, the area of highest shipping in the Canadian Arctic at that time. It is interesting to see it reported in Milne inlet for the first time and should be investigated more carefully to better understand its distribution and to confirm identity of specimens found on settlement baskets.</p> <p>Patinella verrucaria was only found in the ARMS database reference that is cited in the report (Sirenko et al. 2020), but distribution is shown to be on the Atlantic coasts of North America and Europe, not the Canadian Arctic or elsewhere in the Arctic. A search of global databases (GBIF, OBIS) shows this (and the synonym Lichenopora verrucaria) to have been found elsewhere in the Canadian Arctic in a range of locations, although the species does not appear to be commonly reported.</p> <p>Gonothyraea was not found in any of the cited references, however a search of OBIS and GBIF showed it to be found in a few locations within the Arctic with generally limited distribution information globally.</p> <p>We suggest updating the references to only include those that support statements in the text.</p> <p>We would like to confirm if unidentified species (those only identified to genus) will be given to other experts to try and identify these to the species level.</p> <p>Further, given the above notes, it may be misleading or premature to state that "No NIS taxa were identified in encrusting epifauna samples..." in the executive summary until Circeis americana is investigated further. A statement that "Further review of natural ranges and vectors of introduction are required to confirm NIS status" similar to the statement regarding benthic infauna would be more appropriate.</p>	<p>2019 MEEMP and AIS Monitoring Program, Executive summary AIS encrusting epifauna 4.2.4</p>	<p>The reference to the Churchill specimen was one of the points of verification as an Arctic species in this report, there was also a record in the Arctic in Scandinavia as seen in GBIF.</p> <p>We note that the method of presenting the most commonly used references in the text and generally listing the others has led to difficulties in following the path of verification. The 2020 report will be edited to include a reference column in the species list table as suggested in Comment #20 which should be able to address this issue.</p> <p>Unidentified species will only be sent to specialists when there is concern that it may be NIS or AIS (based on the literature review, e.g. where a genus contains a flagged species of concern for the Canadian Arctic). Due to the large number of unidentified taxa and the reasons for the lack of identification typically being due to specimen condition, it is not practical to send all for verification.</p> <p>The statement in the executive summary has been amended as suggested.</p>

**Attachment 2**

2019 Helicopter Flight Paths

SAVED: C:\Users\katie.mcguire\Documents\4 - Maps\Environment\Walrus Haulouts\2019\BIM\_Fig 3 Walrus Haulout wBuffer 2019.mxd: 27-Aug-20



**LEGEND**

**2019 Helicopter Flight Path**

- May
- June
- July
- August
- September
- October

**Walrus Haulout Status**

- Active
- Uncertain
- Walrus Haulout (5 km Buffer)

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**MARY RIVER PROJECT**

**2019 Helicopter Flight Paths**

Projection: NAD 1983 UTM ZONE 18N.  
Base Map: © Queen's Printer for Ontario, 2020.

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**FIGURE**

**3**

**Attachment 3**

2019 – 2020 Ice Conditions

Year	Break-up	Open water	Freeze-up	Fast Ice	Presence of drift ice during OW season	Open water season
1997	24-Jul	07-Aug	02-Oct	13-Nov	Late Aug/early Oct	56 days
1998	16-Jul	10-Aug	19-Oct	16-Nov	No	70 days
1999	26-Jul	18-Aug	11-Oct	08-Nov	No	54 days
2000	12-Jul	31-Aug	16-Oct	06-Nov	No	77 days
2001	23-Jul	15-Aug	15-Oct	05-Nov	No	61 days
2002	27-Jul	15-Aug	21-Oct	04-Nov	No	67 days
2003	15-Jul	01-Aug	29-Sept	10-Nov	Mid Aug/late Sept	59 days
2004	19-Jul	11-Aug	18-Oct	15-Nov	Late Sept/early Oct	68 days
2005	28-Jul	13-Aug	14-Oct	Late Dec	No	60 days
2006	24-Jul	31-Jul	23-Oct	27-Nov	No	87 days
2007	22-Jul	06-Aug	11-Oct	19-Nov	No	66 days
2008	20-Jul	30-Jul	06-Oct	24-Nov	No	66 days
2009	21-Jul	06-Aug	12-Oct	16-Nov	No	67 days
2010	16-Jul	04-Aug	08-Oct	15-Nov	No	67 days
2011	11-Jul	27-Jul	22-Oct	14-Nov	No	84 days
2012	14-Jul	25-Jul	14-Oct	19-Nov	No	58 days
2013	19-Jul	30-Jul	10-Oct	12-Nov	No	59 days
2014	28-Jul	08-Aug	21-Oct	28-Nov	No	72 days
2015	20-Jul	05-Aug	17-Oct	09-Nov	No	86 days
2016	11-Jul	24-Jul	10-Oct	14-Nov	Early Oct	78 days
2017	15-Jul	08-Aug	10-Oct	06-Nov	Mid Aug/early Oct	63 days
2018	20-Jul	14-Aug	27-Sept	22-Oct	Early Aug/early Oct	45 days
2019	12-Jul	25-Jul	25-Oct	18-Nov	No	92 days
2020	19-Jul	30-Jul	N/A	N/A	N/A	N/A
<b>Mean</b>	<b>19-Jul</b>	<b>06-Aug</b>	<b>13-Oct</b>	<b>13-Nov</b>	<b>N/A</b>	<b>68 days</b>
<b>Variability</b>	<b>17 days</b>	<b>38 days</b>	<b>28 days</b>	<b>37 days</b>	<b>N/A</b>	<b>47 days</b>

**Attachment 4**

Early Warning Indicators for Marine Mammals Memo – August 20,  
2020

## TECHNICAL MEMORANDUM

**DATE** 20 August 2020

1663724-231-TM-Rev0-38000

**TO** Lou Kamermans  
Baffinland Iron Mines Corporation

**FROM** Patrick Abgrall, Golder Associates Ltd.

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### EARLY WARNING INDICATORS FOR MARINE MAMMALS

#### 1.0 INTRODUCTION

The Mary River Project (the Project) is an operating iron ore mine owned by Baffinland Iron Mines Corporation (Baffinland) and located in the Qikiqtani Region of North Baffin Island, Nunavut. The operating mine site is connected to Milne Port, located at the head of Milne Inlet, through which iron ore is transported to chartered ore carrier vessels for shipping along the Project's Northern Shipping Route.

This technical memorandum outlines protocol used for the development of early warning indicators (EWIs) selected for detecting potential adverse effects of the Project on marine mammals in the Regional Study Area (RSA) in accordance with existing Terms and Conditions outlined in Project Certificate (PC) No. 005.

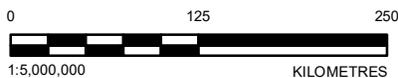
#### 1.1 Background

Project Certificate No. 005, amended by the Nunavut Impact Review Board (NIRB) on 27 May 2014, authorizes Baffinland to mine up to 22.2 million tonnes per annum (Mtpa) of iron ore from Deposit No. 1. Of this 22.2 Mtpa, Baffinland is currently authorized to transport 18 Mtpa of ore by rail to Steensby Port for year-round shipping through the Southern Shipping Route (via Foxe Basin and Hudson Strait), and 4.2 Mtpa of ore by truck to Milne Port for open water shipping through the Northern Shipping Route using chartered ore carrier vessels. A Production Increase to ship 6.0 Mtpa from Milne Port was later approved for the 2018 to 2021 shipping seasons. The northern shipping route (Figure 1) overlaps with waters inhabited by a variety of marine mammals, predominantly narwhal (*Monodon monoceros*), ringed seal (*Pusa hispida*), harp seal (*Pagophilus groenlandicus*), bowhead whale (*Balaena mysticetus*), polar bear (*Ursus maritimus*), bearded seal (*Erignathus barbatus*), beluga (*Delphinapterus leucas*), and walrus (*Odobenus rosmarus*).



**LEGEND**

- PROJECT SITE
- COMMUNITY
- FUTURE SOUTH RAILWAY
- MILNE INLET TOTE ROAD
- NUNAVUT SETTLEMENT AREA
- SHIPPING ROUTE
- MARINE MAMMAL REGIONAL STUDY AREA
- SIRMILIK NATIONAL PARK
- WATER



**REFERENCE(S)**

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 PROJECTION: UTM ZONE 17 DATUM: NAD 83

CLIENT  
**BAFFINLAND IRON MINES CORPORATION**

PROJECT  
**MARY RIVER PROJECT**

TITLE  
**PROJECT LOCATION**

CONSULTANT	YYYY-MM-DD	2020-08-20
<b>GOLDER</b>	DESIGNED	PA
	PREPARED	AJA
	REVIEWED	PA
	APPROVED	PA

PROJECT NO.	CONTROL	REV.	FIGURE
1663724	38000-11	0	1

PATH: I:\2016\1663724\MapInfo\MapInfo\1663724\_38000\_11\_Digit\_Project\_Location\_Rev0.mxd PRINTED ON: 2020-08-20 AT: 10:00:34 AM

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## 1.2 Relevant Project Certificate Conditions

Under the existing Terms and Conditions of PC No. 005, Baffinland is required to work with the Marine Environmental Working Group (MEWG) to determine appropriate EWI(s) and thresholds for determining if negative impacts are occurring on marine mammals as a result of vessel noise exposure. The goal is to provide a mechanism that will allow for rapid identification of potential negative impacts along the southern and northern shipping routes and apply mitigation and adaptive management practices, as required. To date, only the northern shipping route component of the Project is active and being monitored. This document describes the protocol used to identify EWI(s) and thresholds that are relevant to the current active phase of the Project. This protocol will be updated to include the southern shipping route when that component of the project becomes active.

The following Project Certificate (PC) Conditions are relevant to the identification of EWI(s) and corresponding thresholds.

### ***Project Certificate Condition 110: Marine Environment – Ship Noise***

“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.”

### ***Project Certificate Condition 112: Marine Environment – Ship Noise***

“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.

## 1.3 FEIS – Predicted Effects of Vessel Noise on Marine Mammals

This section summarizes the impact predictions made in the Final Environmental Impact Statement (FEIS) (Baffinland 2012) and ERP Addendum (Baffinland 2013) relative to the effects of vessel noise on marine mammals.

In the FEIS and ERP Addendum, underwater noise effects on marine mammals were assessed for vessels travelling at a speed of 10 knots in the RSA. Seven indicator species were considered in the assessment: ringed seal, walrus, beluga, narwhal, bowhead whale, polar bear and bearded seal. Thresholds were selected for each measurable parameter which represented the level beyond which a Project effect would result in an unacceptable change. If a change approached or exceeded an identified threshold, or if the level of certainty of a Project effect was considered low, then a commitment to follow-up monitoring was made. For marine mammals, the threshold used to assess the potential effect of disturbance from underwater noise was established as ‘≥10 % of animals in the RSA exhibit strong avoidance reactions that lead to (seasonal) abandonment of areas identified as important habitat’. A summary of the residual effect ratings for vessel noise impacts on marine mammals is provided in Table 1.

**Table 1: Residual Effects Ratings - Vessel Noise on Marine Mammals (ERP Addendum).**

Species	Magnitude <sup>1</sup>	Reversibility <sup>2</sup>	Significance Rating	Level of Confidence
Ringed seal	Level I	Level I	Not Significant	High
Walrus	Level I	Level I	Not Significant	High
Beluga	Level I	Level I	Not Significant	Low-Medium
Narwhal	Level I-II	Level I	Not Significant	Low
Bowhead whale	Level I-II	Level I	Not Significant	Low
Polar bear	Level I	Level I	Not Significant	High
Bearded seal	Level I	Level I	Not Significant	High

<sup>1</sup> Level I = a change that is less than threshold values; Level II = a change that is greater than threshold values; Level III = a change that is an order of magnitude greater than threshold values.

<sup>2</sup> Level I = fully reversible after activity is complete; Level II = partially reversible after activity is complete; Level III = non-reversible after the activity is complete.

Impact predictions for vessel noise effects on marine mammals included the following:

- Ringed and bearded seal avoidance to a passing ore carrier during the open-water period is expected to be localized and short-term.
- Very few walrus are expected along the Northern Shipping Route and if walrus occur nearby, they may exhibit localized avoidance.
- It is possible that small numbers of beluga may exhibit temporary avoidance of ore carriers in Milne Inlet. However, beluga avoidance of ore carriers along the Northern Shipping Route is not expected to exceed the disturbance threshold level.
- Narwhal avoidance of ore carriers along the Milne Inlet shipping route is not expected to exceed the disturbance threshold level. However, the level of uncertainty associated with this assessment requires follow-up monitoring.
- Bowhead whale avoidance of ore carriers, particularly if bowhead whales are engaged in feeding, is likely to be localized and short-term. Although there is uncertainty associated with these estimates, bowhead whale avoidance of ore carriers along the Northern Shipping Route is estimated to be much less than the disturbance threshold level.
- Interactions between polar bears and vessel traffic along the Northern Shipping Route during the open-water period will be limited because bears are primarily located on shorelines and islands at that time. A swimming bear may avoid a vessel, including an ore carrier, if it gets close enough, but such effects are likely to have little consequence.
- For all marine mammal indicator species, the residual environmental effects of disturbance from ERP activities were predicted to be Not Significant (Baffinland 2013).

## 1.4 Marine Mammal Monitoring Programs

The objective of the marine mammals monitoring programs are to confirm accuracy of effects predictions, to identify new effects that were not anticipated in the effects assessment, and to assess the effectiveness of implemented mitigation measures. Predictions of potential effects of Project activities on the marine environment are outlined in the FEIS (Baffinland 2012), the Addendum for the ERP (Baffinland 2013), and discussed above (see Section 1.3).

As outlined in the FEIS, the Project has the potential to affect the abundance, distribution and behaviour of marine mammals within the Marine Mammal Regional Study Area (RSA; see Figure 1). The assessment determined with a high level of confidence that potential Project effects on most of these species would be low or negligible. One notable exception to this was for acoustic impacts on narwhal from Project shipping in which potential Project effects were expected to be limited, but the assessment confidence was low due to uncertainties in the anticipated degree of behavioural response by marine mammals to shipping effects in the RSA.

Baffinland has developed comprehensive and integrated marine mammal monitoring programs to address identified uncertainty in the FEIS predictions as it relates to the impacts of vessel noise on narwhal and other marine mammal species. Where possible, the monitoring programs integrate Inuit Qaujimagatuqangit (IQ) knowledge into their development and implementation.

Baffinland's marine mammal monitoring programs are designed based on the following principles:

- Compare Project effects against predictions made in the impact assessment.
- Monitor and evaluate the effectiveness of mitigation measures.
- Identify unanticipated effects.
- Consult Inuit on their perspectives of Project effects and the effectiveness of mitigation measures to understand where alignment or gaps between scientific monitoring programs and IQ exist; and
- Inform adaptive management measures.

The marine mammal monitoring programs are designed to provide data and analyses that are meaningful, informative, robust and useful for decision making about implementing adaptive management practices. It is important that the individual programs are regarded holistically instead of independently. The results of one program alone may not provide a complete view of potentially emerging trends or impacts (or lack thereof) nor that they stem from Project-related causes. Not all programs need to be conducted on an annual basis throughout the life of the Project. Timing and frequency will depend on there being a response variable (e.g., relative abundance and distribution of narwhal in the RSA), the potential for data availability (e.g., some features may not exist in sufficient quantity to provide a robust evaluation of potential Project effects), and an evaluation of a cost versus effort (e.g., the effort required to collect sufficient data may be unreasonable when there is a low to nil possibility that the Project will have a significant impact, or only a small interaction with a response variable).

Table 2 summarizes the marine mammal monitoring programs conducted by Baffinland since the start of baseline data collection. A brief summary of the program objectives and data collection methods is presented below.

**Table 2: Baffinland Marine Mammal Monitoring Programs**

Monitoring Program	Baseline						Early Revenue Phase			6 MTPA		
	2006	2007	2008	2010	2013	2014	2015	2016	2017	2018	2019	2020
Bruce Head	—	—	—	—	X	X	X	X	X	—	X	X
Acoustic Monitoring	—	—	—	—	—	X	X	—	—	X	X	X
Ship-based Observer	—	—	—	—	X	X	X	—	—	X	X	—
Aerial Survey	X	X	X	—	X	X	X	X <sup>1</sup>	—	—	X	X
Narwhal Tagging	—	—	—	—	—	—	—	X	X	—	—	—

— = no monitoring data collected

<sup>1</sup> DFO 2016 aerial survey data analyzed by Baffinland

### ***Bruce Head Shore-based Monitoring Program***

The Bruce Head Shore-based Monitoring Program is designed to investigate narwhal response to shipping noise and close ship encounters along a confined section of the northern shipping route. This program has been conducted annually since 2014, following a pilot project in 2013. This program was designed to specifically evaluate potential disturbance of marine mammals from shipping activities that may result in changes in animal relative abundance, distribution, and migratory movements within a representative portion of the RSA.

During the program, visual survey data are collected by a team of biologists and Inuit researchers from a cliff-based observation platform overlooking a portion of the northern shipping route to investigate potential narwhal response to shipping activities, with information collected on relative abundance and distribution (RAD), group composition, and behaviour of narwhal. Additional data are 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. A detailed description of data collection and analytical methodology can be found in Golder (2020a).

### ***Acoustic Monitoring Program***

A passive acoustic monitoring (PAM) program was implemented in 2014–2015 by Greeneridge Sciences Inc. (Greeneridge) and in 2018–2020 by JASCO Applied Sciences (JASCO) to characterize the local soundscape in terms of ambient noise levels, shipping sounds and marine mammal calls in the RSA.

The PAM programs collected data through the deployment of autonomous underwater acoustic recorders (ASARs and AMARS for Greeneridge and JASCO, respectively) during the open-water season during all PAM programs and during the shoulder shipping season in 2019 and 2020. A detailed description of data collection and analytical methodology can be found in Kim and Conrad (2015, 2016) and Frouin-Mouy et al. (2019, 2020).

### ***Ship-based Observer Program***

The primary objective of the Ship-based Observer (SBO) Program is to monitor for potential ship strikes to marine mammals in the RSA. The program also serves as an opportunistic platform to collect data on the occurrence and distribution of marine mammals. The SBO Program was run from 2013–2015 before being stopped for safety concerns related to observers having to join project vessels at sea. The SBO Program resumed in 2018 and 2019 using the MSV *Botnica*, an icebreaking escort vessel, as a surveying platform.

During the program, visual observations are collected by a team of biologists and Inuit researchers from a Project vessel transiting along the Northern Shipping Route. A detailed description of data collection and analytical methodology can be found in Golder (2020b).

### ***Marine Mammal Aerial Survey Program***

The objectives of marine mammal aerial surveys are to obtain abundance and density estimates of narwhal during the peak open-water season for the Eclipse Sound summer stock area. This program evaluates potential disturbance of marine mammals from shipping activities that may result in changes in animal abundance and distribution within the RSA.

Aerial surveys are conducted using visual/observer-based line-transect sampling combined with aerial photography surveys. A detailed description of the methodology for the program is provided in Golder (2020c).

### ***Narwhal Tagging Program***

The objective of the narwhal tagging program is to investigate the individual behavioural response of narwhal to vessels transiting the Northern Shipping Route. This program collects data on the vertical and horizontal (dive) movements of narwhal in the presence and absence of vessel traffic. A detailed description of the methodology for the program is provided in Golder (2020d).

## **1.5 Marine Environmental Working Group Engagement**

As part of ongoing efforts to achieve compliance with the relevant PC Conditions (see Section 1.2) during the 2018 spring in-person MEWG meeting held on 6 June 2018 in Ottawa, ON, Baffinland committed to providing the MEWG with a framework for the development of EWIs (see Appendix A). The framework was to be provided by Baffinland for the next scheduled MEWG teleconference meeting. As part of these discussions, MEWG members agreed to work on the development of indicators and thresholds for adaptive management as an action item for the next in-person meeting.

Accordingly, on 13 September 2018, Baffinland provided a proposed framework for the development of EWIs via email to MEWG members. This framework was outlined and discussed during the MEWG teleconference meeting, held on the same day (see Appendix B). This provided Baffinland an opportunity to explain the framework and enable MEWG members to ask questions and clarifications, as needed. The first step of the framework requested MEWG members to propose indicators for consideration as EWIs through a Submission Sheet provided with the framework. This Submission Sheet was to be returned to Baffinland within four weeks

after the teleconference meeting (i.e., by 11 October 2018) based on the milestones included in the proposed timeline, which consisted as follows:

- 13 September 2018 – MEWG Teleconference Meeting: present Early Warning Indicator Submission Sheet to the MEWG.
- 11 October 2018 – 4 weeks following Teleconference Meeting: MEWG members to submit their EWI Suggestion Sheet(s).
- December 2018 – In-person Meeting in Iqaluit: MEWG members to review the compiled suggestions and select appropriate EWIs and corresponding thresholds.
- 25 January 2019: MEWG members to submit proposed additional mitigations and adaptive management practices to be triggered upon reaching of EWI thresholds.
- Spring 2019 – Teleconference Meeting: compiled additional mitigations and adaptive management practices to be triggered by reaching EWI thresholds suggestions to be presented to the MEWG.
- Spring 2019 – In-person Meeting in Ottawa: finalization of additional mitigations and adaptive management practices to be triggered by reaching EWI thresholds.

Although the proposed timeline presented above was agreed upon by MEWG members attending the 13 September 2018 meeting, no proposed species, indicators or thresholds had been submitted by MEWG members by 10 October 2018. A response was provided by Oceans North on 11 October 2018 via email indicating that they were not able to provide comments without input from the community and other decision makers. Due to a lack of responses from the MEWG, Baffinland extended the submission deadline to provide additional time for MEWG members to provide feedback. In response, Parks Canada subsequently provided a submission on 23 October (see Appendix C), and Fisheries and Oceans Canada (DFO) provided a submission on 26 October 2018 (see Appendix D). No other submissions were provided by other MEWG members.

The October submissions from MEWG members did not formally narrow down the list of species to which EWIs should be applied. Rather, it was suggested that they be applied to all marine mammal species. With regards to establishing thresholds, DFO suggested in their October 2018 submission that “any statistically significant change detected in any parameter measured should represent the “warning” indicator” (see Appendix D). Parks Canada generally deferred to DFO for discussions on specific thresholds/monitoring plans though suggested some variables to monitor as potential short-term, long-term and cumulative options see (Appendix C).

On 29 November 2018, Baffinland met in person with the Mittimatalik Hunters and Trappers Organization (MHTO) in Pond Inlet, NU, to present the framework and the MEWG submissions received to date, and receive the MHTO’s feedback with regards to important indicators to the MHTO. During this meeting, the MHTO indicated that they were particularly concerned with the number of narwhals (population size), potential impact on calving rate, and narwhal body condition.

At the 10 December 2018 fall MEWG meeting, the feedback received by Baffinland on potential indicator species and variables for consideration as EWIs was relayed to MEWG members (see Appendix E), along with a summary of variables that were of highest concern to the MHTO. The proposed variables presented during the meeting for consideration as EWIs included the following parameters:

- Decrease in regional abundance
- Change in calving rate
- Ship avoidance behaviour
- Change in diving and surface behaviour
- Change in vocalization characteristics
- Increase in stress hormones
- Change in body condition
- Change in harvest data (age, sex)
- Injury/mortality occurrence

As part of these meeting discussions, the MHTO noted that both narwhal and ringed seal should be considered priority species for monitoring, while the Qikiqtani Inuit Association (QIA) also provided support for the inclusion of bowhead whale.

Following group discussions, it was assessed that EWIs should apply to the most commonly encountered and hunted species in the RSA. This included narwhal, and perhaps seal, given the concerns of the MHTO's MEWG representatives about Project effects on ringed seal. However, there remained uncertainty as to whether seals could be monitored in a manner against EWIs. A takeaway action from this meeting was for Baffinland to develop an EWI screening table to support future discussions regarding the selection of indicators (and thresholds) for consideration as EWIs.

Accordingly, the EWI Screening Table was submitted by Baffinland via email to MEWG members on 26 February 2019 (see Appendix F). The bolded variables (i.e., those considered as highest concern for use as EWIs) included a decrease in narwhal regional abundance and a change in narwhal calving rate. The Screening Table also included monitoring methods already being implemented as part of ongoing monitoring efforts associated with the Project that could continue to be used to effectively monitor variables selected as EWIs for narwhal. The Screening Table also requested that MEWG members provide proposed thresholds for these indicators. As part of this email exchange, Baffinland requested that feedback be provided by 31 March 2019. Only the QIA provided feedback to this EWI on 31 March 2019 (see Appendix G). However, the feedback provided by the QIA did not provide specific thresholds suggestions, but rather indicated the challenges in providing such thresholds as "Thresholds need to be biologically appropriate and logistically feasible" and that the QIA "cannot suggest thresholds without additional information". No other MEWG members provided any feedback.

The limited feedback provided by MEWG members during the process has contributed to delays in the timeline and prevented completion of specific milestones as proposed in the initial framework proposed in September 2018, including finalizing the list of appropriate variables for use as EWIs, establishment of thresholds, and identifying additional mitigations and adaptive management practices to be triggered should EWI thresholds be reached during the 2019 shipping season. As such, Baffinland intended to present a revised timeline during the MEWG meeting held on 21 June 2019 in Iqaluit, NU, based on proposed meeting agenda and presentation slides sent to members (see Appendix H). However, due to lack of time during the meeting, MEWG members were unable to engage in further discussions about EWIs nor provide input on the revised schedule which was aimed at finalizing this process for the 2020 shipping season.

During the 25 February 2020 in-person meeting in Ottawa, Baffinland summarized the progress that had been made to-date on the development of EWIs as it relates to meeting PC Conditions. During this meeting, Baffinland suggested moving forward with a metric of narwhal calving rate as the EWI. The MEWG participants did not reach a consensus to support this EWI. The QIA and MHTO indicated that ringed seal were not included in this proposed EWI and that ringed seal were important to local hunters. MEWG participants also raised a concern that looking at calving rates was not an “early” warning indicator and that the Project would already be affecting the population if this were observed. It was suggested that perhaps a behavioural measure of avoidance should be used.

## **2.0 EARLY WARNING INDICATORS**

In the absence of consensus from MEWG participants on what should be used as an early warning indicator of the potential effects of vessel noise on marine mammals to meet PC Conditions, Baffinland has taken the initial feedback provided by the MEWG and the MHTO as outlined in Section 1.5 to evaluate Candidate EWIs. The practical application of the Candidate EWIs as a monitoring and mitigation tool was then evaluated based on the information available in peer-reviewed published literature and other comparable applications of marine development projects. One or more of the Candidate EWIs would then be selected and the ability to effectively monitor them using data currently being collected through marine mammal monitoring programs will be evaluated.

### **2.1 Candidate Early Warning Indicators**

Based on the initial feedback provided by MEWG members, three of the nine indicators proposed by DFO were carried forward as Candidate EWIs. The three indicators that were selected as Candidate EWIs were decrease in regional abundance, change in calving rate, change in body condition. These three were selected because they were the three indicators of highest concern to the MHTO as expressed during an in-person meeting in Pond Inlet on 29 November 2018 (see Section 1.5).

Narwhal and ringed seal were the two species of highest concern to the MHTO in the RSA. The impact assessment identified a non-significant impact for narwhal based on a Level I-II magnitude for the effect of vessel noise with a low level of confidence (see Section 1.3; Baffinland 2013), and a non-significant impact for ringed seal based on a Level I magnitude for the effect of vessel noise with a high level of confidence (see Section 1.3; Baffinland 2013). As a result of the low level of magnitude and high level of confidence attached to the non-significant impact rating for the ringed seal, it was determined that narwhal be prioritized for monitoring relative to the Candidate EWIs.

## 2.2 Literature Review

There is limited literature available with respect to the application of EWIs for marine mammal population monitoring. Because this is an emerging topic in the field of marine mammalogy, the literature primarily deals with this topic in a conceptual manner (NASEM 2017; Agarty et al. 2019; Booth et al. 2020) with no examples of successful field applications.

The National Academies of Sciences, Engineering, and Medicine (NASEM 2017) indicates that, to be most effective in providing an early warning, the variables monitored will depend on the species and situation, and may change over time with the development of new technology and increased ecological knowledge. Population size is the most basic measure of population state, but for most marine mammal species, monitoring total population size (or density) over time or space is not a sensitive way to obtain early warning or distinguish between potential management actions (NAMES 2017). Population dynamics are controlled by four fundamental demographic parameters: survival, fecundity, immigration, and emigration. One or more of these must decrease (or increase in the case of emigration) for a population decline to occur. Measuring these parameters may be preferable than waiting for a detectable change in population size. It is typically infeasible to monitor all of these parameters, so prioritization will be required (NAMES et al. 2017).

Ecological theory suggests that reproductive-age adult females evolve strategies that enable them to delay breeding or abandon investment in young when conditions are harsh to prioritize their own survival and maximize their future reproductive output when conditions improve. In a fluctuating environment, it would be expected that adult female survival will remain high and relative constant while fecundity and calf or pup survival fluctuates. As such, from an early warning perspective, fecundity and calf or pup survival, would be parameters to target (NAMES 2017). The authors also warned that natural population processes such as density dependence will also result in low birth rates and/or pup or calf survival and, as such, these demographic parameters are expected to show the highest levels of natural variation. Finally, the authors suggested that detecting a change in status would be improved if the selected indicator can be relatively inexpensive to feasibly monitor and measure in the field. As such, the collection and analysis of demographic parameters such as stage-structured population data may provide a useful early warning of poor population status (NAMES 2017).

Agarty et al. (2019) provided a theoretical framework for the establishment of early warning systems (EWS). They specified that indicators need to be tailored to particular regions and should include some form of demographic information about marine mammals present. Overall, Agarty et al. (2019) indicated that EWS need five basic components: 1) a set of indicators that can incorporate new data or information; 2) information collected or acquired from existing databases, traditional and local knowledge; 3) thresholds that would trigger early warning about a region or management tools; 4) an articulated process for making management decisions; and 5) coordination and communications mechanism. The authors also provided a list of example of indicators (significant distribution shifts, presence in new areas, population reduction in region, emigration from region, increase in adult mortality, increase in juvenile mortality, decline in recruitment, increase in disturbance/area avoidance, increase in boat traffic, prey overfishing). The EWS is meant to use existing data sources and not necessarily launch novel research protocols, and are best applied on a region-specific basis, or an individual species basis within a region (Agarty et al. 2019). The authors concluded by stating that the key to a successful EWS will be its user friendliness.

Booth et al. (2020) published a review of methods for monitoring for the population consequences of disturbance in marine mammals. The authors acknowledged that cetacean population size or density is typically monitored through surveys, such as line-transect surveys, but that these tend to provide imprecise estimates, because marine mammal populations are often spread over wide areas and individuals are often submerged, when they cannot be sighted. It may take many years before changes in vital rates manifest themselves as changes in population size if a species is long-lived and the authors agreed with NAMES (2017) that there could be merit in monitoring demographic characteristics (such as the age- or stage-structure of the population) and indicators of individual health to provide an early warning of population level effects.

Booth et al. (2020) examined population consequences of disturbance models to evaluate whether monitoring demographic characteristics, rather than population size or density, could provide an early warning of population decline. They investigated the sensitivity of two demographic characteristics to changes in vital rates that might be caused by disturbance: 1) the ratio of calves/pups to mature females; and 2) the proportion of immature animals in the population. The first is sensitive to changes in fertility and calf survival while the second is sensitive to changes in fertility, calf survival and juvenile survival. The results of the population simulations indicated that the ratio of calves to mature females may not be a representative early warning indicator (simulations resulted in an unacceptable numbers of positives or false negatives), but that the proportion of immature animals in the population may be a more reliable indicator of a potential population decline. Booth et al. (2020) also indicated that body condition is a potentially useful measure of health, but that observed changes in body condition may be the result of a change in environmental quality rather than a result of exposure to disturbance.

### 2.3 Early Warning Indicators and Development Projects in Canada

The following section reviews other marine development projects in Canada with a shipping component to better understand existing precedence as well as to incorporate relevant information or lessons learned with respect to EWIs (Table 3).

**Table 3: Requirement to Identify Marine Mammal EWIs in other Marine Development Projects in Canada**

Requirement	Mary River	Northern Gateway	LNG Canada	Trans-Mountain	Roberts Bank Terminal 2	Agnico Eagle Meliadine	Agnico Eagle Amuraq Whale Tail
Early Warning Indicators	✓	X	X	X	X	X	X

Baffinland had 81 ore carriers servicing Milne Port through the Northern Shipping Route in 2019 based on the currently approved Production Increase to the ERP Addendum of the FEIS. This level of activity is being compared to other marine development projects that have been approved by the federal government across Canada summarized below, none of which have a requirement to monitor for EWIs, despite often being operated in areas where known threatened or endangered species occur.

### **Enbridge Northern Gateway Project**

The Enbridge Northern Gateway Project was a proposal to construct and operate two pipelines and a marine terminal. The pipelines would have run 1,172 kms between Bruderheim, Alberta and Kitimat, British Columbia, where the marine terminal would have been located (Enbridge 2010). The marine terminal for the Project was proposed for Kitimat Arm, and Project related tanker traffic would have included container ships to pass through the Wright Sound. Project-specific marine vessel traffic would have resulted in an increase by (440 transits/year) to the existing (3,330 transits/year) in Wright Sound (Enbridge 2011). The Project was approved by the federal government in June 2014 but has never materialized.

A total of twenty marine mammal species were expected to occur along project shipping routes (Enbridge 2010). Five of these species are of conservation concern and are listed under Schedule 1 of the *Species at Risk Act* (SARA), including killer whale — Northern resident (Threatened) transient (Threatened) and offshore (Threatened) populations, North Pacific right whale (Endangered), blue whale (Endangered), fin whale (Threatened), and sei whale (Endangered; Government of Canada 2019).

### **LNG Canada**

Construction of the LNG Canada Export Terminal Project is currently underway in Kitimat, BC. When complete, this project will comprise a facility with liquefied natural gas (LNG) storage, power generation, and a marine terminal to facilitate the export of as much as 26 million tonnes of LNG per year (EAO 2015). Shipping channels for export of LNG are planned to go through Douglas Channel and Principe Channel, where existing vessel traffic consists of 141 large vessel transits/year and 191 large vessel transits/year, respectively. Upon completion, Project-related vessel traffic is anticipated to result in an additional 700 large vessel transits/year (EAO 2015).

Marine mammals that are listed under SARA Schedule 1 and have the potential to occur within the Project's shipping routes include fin whales (Threatened) and killer whales — the Northern resident (Threatened) and transient (Threatened) populations (Government of Canada 2019).

### **Trans Mountain Expansion Project**

Trans Mountain Pipeline ULC is currently undertaking the upgrade of facilities located at the Westridge Marine Terminal on Burrard Inlet in the Port of Vancouver and Burnaby, British Columbia. This upgrade will support the transport of petroleum products from Alberta, Canada through Trans Mountain's existing (and future twinned) pipeline to international markets. Upgrade of the Westridge Marine terminal will involve an increase in the number of tankers berthing at the facility from five to 34 per month, increasing Project-related tanker traffic through Burrard Inlet from 53 oceangoing oil tankers in 2018 (106 total transits) to 408 oceangoing oil tankers annually upon project completion (816 total transits; Trans Mountain 2019).

Killer whales have been the subject of considerable attention in the context of anticipated increases in underwater noise disturbance and marine vessel strikes associated with the Westridge Marine Terminal Project. Both the southern resident and transient populations have the potential to overlap with project shipping routes (Kinder Morgan 2017) and are respectively listed under Schedule 1 of SARA as Endangered and Threatened (Government of Canada 2019).

## **Roberts Bank Terminal 2**

The Vancouver Fraser Port Authority is proposing to construct a new three-berth container terminal at Roberts Bank in Delta, British Columbia. The proposed marine terminal would result in an increased import/export capacity of 2.4 million twenty-foot equivalent units (TEUs), when compared to the existing facility (PMV 2015). Upon completion, the proposed facility would result in 520 additional vessel transits through the Strait of Georgia, Haro Strait and Juan de Fuca Strait, and 780 transits in the waters south of Victoria, resulting in a 9–12% increase in cargo vessel movements per year relative to prior (2012) conditions (PMV 2015).

A total of twenty-two marine mammal species are expected to occur along the Roberts bank Terminal 2 shipping lanes. Five of these species are of conservation concern and are listed under Schedule 1 of SARA, including killer whales — Southern resident (Endangered), northern resident (Threatened), transient (Threatened) and offshore (Threatened) populations, fin whales (Threatened), sei whales (Endangered), blue whales (Endangered), and North Pacific right whales (Endangered; Government of Canada 2019).

## ***Meliadine Gold Mine Project***

The Meliadine Gold Mine Project is an existing gold mine located in the Kivalliq region of Nunavut, 25 kilometres (km) north from Rankin Inlet and 80 km southwest from Chesterfield Inlet. Ongoing project operations require as many as six cargo vessels (freighters) and six fuel tankers annually to deliver approximately 40,000 tonnes of dry cargo and 122 million litres of diesel fuel to Itivia Harbour. All shipping is carried out during the open water season (typically from early August to late October) and follow established shipping lanes that are presently being used. The project contributes between eight and 12 additional marine vessels to shipping activities in Hudson Strait and Hudson Bay annually (NIRB n.d., Agnico Eagle 2013).

Twelve marine mammal species are expected to overlap with the project's shipping routes (Agnico Eagle 2013). None of these species are of conservation concern (listed at Endangered or Threatened under Schedule 1 of SARA).

## ***Amuraq Whale Tail Pit Project***

The Whale Tail Pit Project is a proposed development of a satellite ore deposit located approximately 150 km north of the Hamlet of Baker Lake and 50 km northwest of the existing Meadowbank Gold Mine Project. The proponent (Agnico Eagle Mines Limited) is proposing mining an estimated 8.3 million tonnes of ore over 3–4 years. Ore will be transported to existing infrastructure at the Meadowbank Gold Mine for processing, then will be transported offsite using existing shipping arrangements already in place for the Meadowbank Mine. As a result, no project-related increase in shipping volume within Hudson Bay and Hudson Strait is anticipated to occur. The Meadowbank Mine Project requires a total of three to six vessels annually deliver dry goods, and a total of 18 tankers annually deliver diesel fuel for the Project (Agnico Eagle 2016).

Twelve marine mammal species are expected to overlap with the project's shipping routes (Agnico Eagle 2013). None of these species are of conservation concern (listed at Endangered or Threatened under Schedule 1 of SARA).

## 2.4 Selection Criteria

The selection criteria for the marine mammal species to use was based on the impact assessment determination of magnitude and level of confidence (see Section 2.1).

The selection criteria for EWI are based on the limited feedback provided by the MEWG through multiple engagement efforts (see Section 1.5), feedback provided by the MHTO during an in-person meeting in Pond Inlet on 29 November 2018, the merit of the indicator as supported by the scientific literature (see Section 2.2), the ability to collect accurate and statistically comparable data that can be analysed in a relatively short timeframe and linked to project-related effects, the availability of baseline data, consideration of geographical constraints with repeatable yearly access to the study area, and cost of data acquisition.

## 2.5 Assessment of Candidate Early Warning Indicators

This section evaluates the merit of the Candidate EWIs of highest importance to the MHTO as outlined in Section 2.1 against the selection criteria described in Section 2.4 (Table 4).

### ***Regional Narwhal Abundance***

Baffinland has been monitoring the narwhal population size in the RSA using aerial line-transect surveys, a well-established survey method for cetaceans, since 2006. NAMES (2017) and Booth et al. (2020) highlight that these surveys are expensive and, particularly in the case of cetacean populations, tend to provide imprecise estimates (Table 4). This is because marine mammal populations are spread over wide areas, spend a lot of time submerged where they cannot be sighted, and, in the case, of narwhal, have a highly clustered distribution. Because of the long lifespan of marine mammals, it can take a long time before changes in vital rates can be detected through changes in population such a program may only have the power to detect severe population declines (Booth et al. 2020).

Booth et al. (2020) conclude that simply monitoring population density or abundance is unlikely to provide an early warning of population decline because of the relatively low precision associated with most density estimates line-transect surveys and highlighted the merit in monitoring demographic characteristics (such as the age- or stage-structure of the population) and indicators of individual health rather than population size. Population abundance surveys remain the primary tool used by DFO for stock management and, for this reason, narwhal abundance in the RSA will continue to be periodically monitored as part of the marine mammal monitoring program. It was, however, not carried forward as a Selected EWI to comply with the PC Conditions 110 and 112.

### ***Narwhal Body Condition***

Monitoring narwhal body condition might be a suitable approach to identify “unhealthy” animals although determining causation may be difficult (Booth et al. 2017). Booth et al. (2020) have highlighted the value of monitoring demographic and health variables in providing an early warning of a population decline or other anthropogenic stressor, but also warned that these variables are subject to natural variation and can be impacted by density dependent factors (Table 4). As such, although body condition is a potentially useful measure of health in the presence of an adequate baseline, observed changes in body condition may be the result of a change in

environmental quality rather than a result of exposure to disturbance (Booth et al. 2020). For these reasons, narwhal body condition was not carried forward as an EWI for Project compliance with PC Conditions 110 and 112. Community concerns with narwhal body condition are nonetheless noted by Baffinland and non-invasive aerial photography pilot studies using drones and the data collected through the marine mammal aerial survey program are being explored in 2020 as potential ways to add this variable to the overall marine mammal monitoring program, although not as an EWI. Further studies of narwhal body condition may also be effective as a community-based monitoring program.

### Change in Calving Rate

NAMES (2017) highlights the need to identify variables that can provide an early warning of population decline. The report notes that monitoring demographic variables might allow for early detection of population level effects. Narwhal calving rate was proposed as an indicator to monitor by the MEWG (see Section 1.5). The results of population simulation models from Booth et al. (2020) indicated that the proportion of immature animals in the population may be a more reliable indicator of a potential population decline than ratio of calves to mature females.

**Table 4: Assessment of Selection Criteria for Candidate Early Warning Indicators.**

Candidate EWI	Scientific Merit	Data Accuracy	Available Baseline Data	Site Access	Cost	MHTO
Regional Abundance	✓	X	✓	✓	X	✓
Body Condition	✓	X	X	X	✓	✓
Calving Rate	✓	✓	✓	✓	✓	✓

## 2.6 Selected EWI

Following a review of the above, the proposed Candidate EWI looking at a change in calving rate is being retained as a Selected EWI. The Selected EWI is a decrease in the proportion of immature animals. Immature animals are being defined as calves and yearling for this Selected EWI to ensure data collection accuracy as there is a risk of misidentifying juveniles and small adults in the field. This was an indicator that was suggested by DFO as part of Baffinland’s initial MEWG engagement in the EWI framework and was identified as being of high importance by the MHTO following an in-person meeting in Pond Inlet. This selection is consistent with best available science, is appropriate to region, can be compared to pre-ERP baseline data and can be cost-effectively monitored in parallel with the Bruce Head shore-based narwhal monitoring program (see Table 4).

## 2.7 Marine Mammal Monitoring of EWI Data

Agarty et al. (2019) proposed a framework for an EWS and specified that an EWS should be designed to use existing data sources and not necessarily launch novel research protocols. NAMES (2017) also indicated that a selected indicator should be relatively inexpensive to feasibly monitor and measure in the field. Monitoring annual change in the proportion of immature narwhals fits these needs.

Narwhal are common along the northern shipping route during the open-water season, with many mother/calf pairs observed at this time, confirming the importance of this area as a summer calving ground as reported through IQ and Baffinland’s marine mammal monitoring programs (JPCS 2017; QIA 2018; Golder 2020a). Data on the narwhal group composition has been collected from the Bruce Head shore-based monitoring program on an annual basis since 2014 by teams composed in equal part of biologists and Inuit researchers hired from the Pond Inlet, NU. This indicator also thus relies heavily on Inuit participant knowledge of narwhal population age-structure.

The marine mammal aerial survey program includes both a visual survey and a photographic survey component. Visual surveying cannot be used to accurately record narwhal group composition, but the photographic surveys could potentially be used as an additional source of information to compare proportion of immature narwhals in other regions of the RSA. Aerial survey, as currently flown under DFO Guidelines, are flown at 1,000 m during visual surveys and 2,000 m during photographic surveys of narwhal aggregations. Photographic surveys from 2,000 m will not have the required resolution to accurately record the age-structure of the population surveyed, but photography taken at 1,000 m during visual surveys would potentially enable this. This provides a second data source that could be used if the assessment of the EWI needs to be reviewed over a large geographic scale in the RSA through adaptive management practices.

### 3.0 THRESHOLDS

PC Condition 112 states that “Thresholds shall be developed to determine if negative impacts as a result of vessel noise are occurring”. This section outlines the threshold for the Selected EWI that will result in triggering adaptive management practices (see Section 4.0 below).

#### 3.1 Proportion of Immature Narwhals

The annual values of proportion of immature narwhal recorded from the Bruce Head shore-based monitoring program from 2014–2019 are presented in Table 4. Values from 2014–2015 represent pre-ERP data (the number of calves and immature animals present in a monitoring season is the result of impacts from the previous season) and are used as a baseline of natural variability. Values from 2016–2019 represent values of the proportion of immature narwhal potentially impacted from years of active shipping during the ERP and being compared to baseline values.

**Table 5: Annual Proportion of Immature Narwhal Recorded during the Bruce Head Shore-based Monitoring Program.**

Year	Proportion of Immature Narwhal
2014	0.399
2015	0.359
2016	0.368
2017	0.335
2018	N/A <sup>1</sup>
2019	0.368

<sup>1</sup> Pilot vessel-based monitoring program replaced the Bruce Head shore-based monitoring program in 2018. The pilot program was not successful in yielding a comparable dataset for inclusion in this analysis.

The EWI threshold to be used to assess whether marine mammals and marine mammal populations are being affected by the effects of vessel noise is a 10% decrease in the proportion of immatures individuals in the population from the lowest natural variability baseline value available. The 10% decrease is used to maintain consistency with the threshold level used in the FEIS and FEIS ERP Addendum marine mammal impact assessment (Baffinland 2012, 2013; see Section 1.3).

The lowest available baseline value for the proportion of immature narwhals recorded from Bruce Head is 0.359 (recorded in 2015). This means that a threshold level of 0.323 (i.e., a 10% decrease from 0.359) would need to be reached as a proportion of immature narwhal recorded from Bruce Head to trigger EWI adaptive management practices (see Section 4.0 below). This threshold has yet to have been reached despite an increase in year-over-year shipping associated with the Project.

## 4.0 ADAPTIVE MANAGEMENT PRACTICES

Project Certificate Condition 112 states that “Mitigation and adaptive management practices shall be developed to restrict negative impacts as a result of vessel noise”.

In the event that a 10% decrease in the EWI (proportion of immature narwhal) is detected from the Bruce Head shore-based narwhal monitoring program, adaptive management measures will be developed in collaboration with MEWG members which include relevant governmental and Inuit organizations. These measures could involve:

- Undertaking timely research and/or focused engagement with Inuit to understand if the change is related to the Project or potentially linked to other environmental stressors or regional variable(s).
- Increasing the amount of monitoring effort for subsequent years to better describe and/or confirm the original exceedance – with the goal at better identifying areas within the study area, or Project-related sources of underwater noise, which may be causing the exceedance.
- Undertaking alternative monitoring methods to better describe and/or confirm the exceedance (i.e., using aerial survey photographic data to expand the monitoring for the EWI beyond Bruce Head and include other areas of the RSA).
- Other actions as determined via collaborative discussions between Baffinland, Inuit and relevant governmental organizations.

### 4.1 Reporting and Communication Protocol

Baffinland will communicate the results of EWI monitoring annually as part of the NIRB Annual Reporting Process. In the event that the EWI threshold is exceeded Baffinland will contact governmental and Inuit organizations immediately to initiate discussions on potential adaptive management measures prior to the start of the following shipping season.

## 4.2 Adaptive Management Practices

Given the scientific ability to effectively monitor this EWI, Baffinland's experience in conducting such monitoring and invoking adaptive management measures as result of these monitoring program and continuous Inuit engagement, and the high level of Inuit involvement in the Bruce Head shore-based narwhal monitoring program, there is high confidence that the commitment to undertake adaptive management of underwater noise from the Project will be met.

## 5.0 CONCLUSION

This purpose of this technical memorandum was to outline the protocol for the development of EWIs of the effects of vessel noise on marine mammals in accordance with existing Terms and Conditions of the NIRB PC Conditions 110 and 112. This document reviewed the effects of vessel noise on marine mammal indicator species as outlined in the approved FEIS and ERP Addendum for the Project (Baffinland 2012, 2013), the marine mammal monitoring programs developed as a result of this assessment, and Baffinland's engagement efforts with the MEWG in the development of EWIs as required by PC Conditions.

Based on MEWG engagement, particularly an in-person meeting with the MHTO on the subject of EWIs, three Candidate EWIs for were chosen for consideration. Selection criteria were outlined, including impact assessment determinations outlined in the FEIS and ERP Addendum, merit of the indicator as supported by a review of scientific literature, and the ability to collect accurate and statistically comparable data that can be analysed in a relatively short timeframe and linked to project-related effects. As a result of this process, the decrease in the proportion of immature narwhal in the population was selected as the EWI. The data for monitoring this EWI will continue to be collected via a monitoring program that relies heavily on Inuit participant knowledge, the Bruce Head shore-based narwhal monitoring program, and will be compared against data reflective of baseline conditions (before the start of potential ERP effects). The threshold value that would trigger the need to apply adaptive management practices was a 10% decrease in the proportion of immatures individuals in the population from the lowest natural variability baseline value available. As such, a threshold level of 0.323 will need to be reached as a proportion of immature narwhal recorded from Bruce Head to trigger EWI adaptive management practices as identified through collaborative discussions between Baffinland, Inuit and relevant governmental organizations. This threshold has yet to have been reached.

## 6.0 CLOSURE

We trust the above meets your present requirements. If you have any questions or require additional information, please contact the undersigned.

### Golder Associates Ltd.



Patrick Abgrall, PhD  
*Senior Marine Biologist*



Bart DeFreitas  
*Associate, Senior Biologist*

PA/BDF/lmk

[https://golderassociates-my.sharepoint.com/personal/lkraeker\\_golder\\_com/Documents/User Drive/16637724-231-TM-Rev0-38000/1663724-231-TM-Rev0-38000-BIM EWI-20AUG\\_20.docx](https://golderassociates-my.sharepoint.com/personal/lkraeker_golder_com/Documents/User Drive/16637724-231-TM-Rev0-38000/1663724-231-TM-Rev0-38000-BIM EWI-20AUG_20.docx)

## 7.0 REFERENCES

- Agardy T, Cody M, Hastings S, Hoyt E, Nelson A, Tetley M, Notarbartolo di Sciara G. 2019. Looking beyond the horizon: An early warning system to keep marine mammal information relevant for conservation. *Aquatic Conserv: Mar Freshw Ecosyst.* 2019;29(S2):71–83.
- Agnico Eagle. 2013. Volume 8.0 Marine Environment and Impact Assessment Draft Environmental Impact Statement (DEIS) - Meliadine Gold Project, Nunavut. Prepared by Golder Associates for Agnico Eagle.
- Agnico Eagle. 2016. Whale Tail Pit Shipping Management Plan. Prepared by Golder Associates for Agnico Eagle.
- Baffinland. 2012. *Mary River Project – Final Environmental Impact Statement*. Volume 8: Marine Environment. Appendix 8A-2. Marine Mammal Baseline. February 2012.
- Baffinland. 2013. *Mary River Project – Addendum to the Final Environmental Impact Statement*.
- Baffinland. 2020. Adaptive Management Plan (Revised Draft). Jointly approved draft between Baffinland and the Qikiqtani Inuit Association in relation to the Inuit Certainty Agreement. 15 June 2020. 50 p.
- Booth CG, Plunkett R, and Harwood J. 2017. Identifying Monitoring Priorities for Population Consequences of Disturbance – Interim Report. Report Code SMRUC-ONR-2017-017, submitted to the Office of Naval Research – Marine Mammal & Biology program, Nov 2017 (unpublished).
- Booth CG, Sinclair RR, and Harwood J. 2020. Methods for Monitoring for the Population Consequence of Disturbance in Marine Mammals: A Review. *Front. Mar. Sci.* 7:115. doi: 10.3389/fmars.2020.00115.
- Enbridge (Enbridge Northern Gateway Pipelines). 2010. Sec. 52 Application for the Enbridge Northern Gateway Pipelines Project. Available online: <https://aeic-iaac.gc.ca/050/evaluations/document/43426?wbdisable=true>. Accessed August 2020.
- Enbridge (Enbridge Northern Gateway Pipelines). 2011. Northern Gateway Pipelines Application to the National Energy Board Enbridge Northern Gateway Project. File No: OF-Fac-Oil-N304-2010-01 01. Northern Gateway Responses to Round 2 Information Requests (Aboriginal). Available online: <https://iaac-aeic.gc.ca/050/documents/p21799/84247E.pdf>. Accessed August 2020.
- Enbridge (Enbridge Northern Gateway Pipelines). 2010. Section 52 Application Volume 8A: Environmental and Socio-Economic Assessment (ESA).
- EAO (Environmental Assessment Office). 2015. LNG Canada Export Terminal Project Assessment Report. Available online: <https://iaac-aeic.gc.ca/050/documents/p80038/101852E.pdf>. Accessed August 2020.
- Frouin-Mouy H, Maxner EE, Austin ME, and Martin SB. 2019. *Baffinland Iron Mines Corporation–Mary River Project: 2018 Passive Acoustic Monitoring Program*. Document Number 01720, Version 4.0. Technical report by JASCO Applied Sciences for Golder Associates Ltd.
- Frouin-Mouy H, Wilson C, and Austin M. 2020. Baffinland Iron Mines Corporation. Mary River Project: 2019 Passive Acoustic Monitoring Program. Document 02007, Version 4.0. Technical report by JASCO Applied Sciences for Golder Associates Ltd.
- Golder. 2020a. Draft 2019 Bruce Head Shore-based Monitoring Program. Final Report submitted to Baffinland Iron Mines Corporation. Report No. 1663724-199-R-RevA-23000. 17 April 2020.

- Golder. 2020b. 2019 Ship-based Observer Program. Report submitted to Baffinland Iron Mines Corporation. Report No. 1663724-185-R-Rev0-31000. 24 July 2020.
- Golder. 2020c. 2019 Marine Mammal Aerial Survey – Eclipse Sound and Admiralty Inlet. Report submitted to Baffinland Iron Mines Corporation. Report No. 1663724-191-R-Rev0-31000. 5 August 2020.
- Government of Canada. 2019. Species at Risk Public Registry. Available online: <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html>. Accessed August 2020.
- Jason Prno Consulting Services Ltd. 2017. Results of Community Workshops Conducted for Baffinland Iron Mines Corporation's Phase 2 Proposal. Report prepared for Baffinland Iron Mines Corporation. January 2017.
- Kim KH and Conrad AC. 2015. Acoustic Monitoring Near Koluktoo Bay, Milne Inlet, July–September 2014. Greeneridge Rep. 511-2. Rep. from Greeneridge Sciences Inc. (Santa Barbara, CA) for Baffinland Iron Mines Corporation (Oakville, ON). viii + 56 p.
- Kim KH and Conrad AC. 2016. Acoustic Monitoring Near Koluktoo Bay, Milne Inlet, August–October 2015. Greeneridge Rep. 522-2. Report from Greeneridge Sciences Inc. (Santa Barbara, CA) for Baffinland Iron Mines Corporation (Oakville, ON). x + 69 pp.
- Kinder Morgan (Kinder Morgan Canada Inc.). 2017. Westridge Marine Terminal Application for Authorization under Paragraph 35(2)(b) of the Fisheries Act. Prepared by Stantec Consulting Ltd. For Kinder Morgan Canada Inc.
- National Academies of Sciences, Engineering, and Medicine. 2017. Approaches to Understanding the Cumulative Effects of Stressors on Marine Mammals. Washington, DC: The National Academies Press. doi.org/10.17226/23479.
- NIRB (Nunavut Impact Review Board). N.d. Meliadine Gold Project Summary. Available online: <https://www.nirb.ca/project/124106>. Accessed August 2020.
- NIRB (Nunavut Impact Review Board). N.d. Whale Tail Pit and Haul Road Project Summary. Available online: <https://www.nirb.ca/project/124683>. Accessed August 2020.
- PMV (Port Metro Vancouver). 2015. Roberts Bank Terminal 2 Project Marine Shipping Supplemental Report Addendum to the Environmental Impact Statement. Prepared by Hemmera for the Port of Vancouver. Available online: <https://www.ceaa-acee.gc.ca/050/documents/p80054/103687E.pdf>. Accessed August 2020.
- QIA (Qikiqtani Inuit Association). 2018. Qikiqtaaluk Inuit Qaujimajatuqangit and Inuit Qaujimajangit Iliqqusingitigut for the Baffin Bay and Davis Strait Marine Environment. Prepared by Heidi Klein, Sanammanga Solutions Inc. for submission to the Nunavut Impact Review Board for the Baffin Bay and Davis Strait Strategic Environmental Assessment.
- Trans Mountain. 2019. Tankers are a Small Portion of Overall Vessel Traffic in the Salish Sea. Available online: <https://www.transmountain.com/news/2019/tankers-are-a-small-portion-of-overall-vessel-traffic-in-the-salish-sea>. Accessed August 2020.



**Appendix A:  
MEWG Meeting – 6 June 2018**

## Marine Environment Working Group Meeting

**Date:** June 6, 2018

**Location:** Ottawa Delta City Centre  
101 Lyon Street North, Ottawa, ON, K1R 5T9, Canada

Member Organization	Participants		Member Organization	Participants	
Baffinland Iron Mines Corporation (Baffinland)	Megan Lord-Hoyle (MLH)	I	Parks Canada	Francine Mercier (FM)	I
	Joe Tigullaraq (JT)	I	Makivik	Gregor Gilbert (GG)	N
	Emma Malcolm (EM)	I			
Qikiqtani Inuit Association (QIA) and Consultants	Stephen Williamson Bathory (SB)	N	Mittimatalik Hunters and Trappers Organization (MHTO)	Elijah Panipakoocho (EP)	I
	Sean Joseph (SJ)	N		Phanuel Enoogak (PE)	I
	Fai Ndofor (FN)	N			
	David Qamaniq (DQ)	N			
	Jeff Higdon (JH)	I			
Fisheries and Oceans Canada (DFO)	Kim Howland (KH)	I	World Wildlife Fund – Canada (WWF)	Andrew Dumbrille (AD)	I
	Laura Watkinson (LW)	I		Amanda Main Hanson	P
Environment and Climate Change Canada (ECCC)	Grant Gilchrist (GG)	I	Oceans North Canada	Erin Abou-Abssi (EAA)	I
	Anne Wilson (AW)	N			
	Loretta Ransom (LR)	N		Kristen Westdal	N
				Chris Debicki	N
Government of Nunavut	Brad Pirie (BP)	I	<b>Baffinland Consultants</b>	<b>Participants</b>	
	Lauren Perrin (LP)	I	Golder	Patrick Abgrall (PA)	I
	Jon Neely (JN)	N	Golder	Erin Linn (EL)	I
	John Ringrose (JR)	N	Golder	Phil Rouget (PR)	N
EDI			Mike Settingington (MS)	I	

P-phone in participation, I – In person, N- Not attending

**Discussion and Comments**

**Baffinland Project Update**

**6MTPA Application**

- Baffinland has applied to the Nunavut Impact Review Board (NIRB) for an amendment to Project Certificate No. 005 to increase the amount of iron ore that the Company can truck and ship. Also included in the 6 Million Tonnes Per Year (MTPA) application is a proposal to build a 380-person camp and increase fuel storage at Milne Port.
- The application proposes that Baffinland Iron Mines (BIM) will truck 5.5 MTPA and ship 5 MTPA in 2018, and increase this to 6 MTPA for both trucking and shipping in 2019.
- AD: How many additional ships does this mean there will be in 2018?
- MLH: It would result in an increase in 12 ships in 2018.
- AD: So in an 80-day season does that mean 2 transits by Pond Inlet every day?
- MLH: Yes
- EAA: Will this mean that there are multiple ships coming through the corridor at once?
- MLH: Vessels will wait at anchor ports before being called into ship by the Port Captain.
- BP: What types of ships will be used for the 6 MTPA operations?
- MLH: Panamax ships will be used within the current shipping season.

**Fuel freight dock**

- This is an approved activity under the Early Revenue Phase (ERP) Project Certificate, but this year we are seeking our Fisheries Act Authorization (FAA) to construct the freight dock.

**Agenda Overview**

- EL: The purpose of discussions today will be to review proposed marine programs for 2018. The objectives of the marine monitoring programs are to measure effects of the Project on the marine environment, confirm monitoring of terms and conditions of the project certificate, assess accuracy of predictions in Final Environmental Impact Statement (FEIS), and determine adaptive mitigation measures.

**2018 Tremblay Sound Narwhal Tagging Program**

- PA: Participation in the Department of Fisheries and Oceans (DFO) Tremblay Sound Narwhal Tagging Program allows us to retrieve better data related to narwhal acoustic sounds/communications, using Acousonde tags, and behaviour patterns (dive + movement). Satellite location tags will provide horizontal data and Pop-up Archival Transmitting (PAT) tags will collect vertical (dive) data. Data from the tags will be sent to satellites and land-based receiving MOTES for data collection and storage.
- This program will help us understand behavioural changes narwhal may be experiencing as a result of shipping activities based on the direction they head in, how close they go to the ship, their distance from the shore, and their rate of travel.
- AD: Have the results from the 2017 narwhal tagging program been shared with the group yet?
- PA: They have not yet been fully shared with the group, although preliminary results were discussed at the March 2018 MEWG meeting. We are expecting final results in Quarter 3 of 2018.
- AD: Does the DFO intend to complete their own analysis outside of the results that Baffinland produces?
- EL: The current focus on behavioural changes from shipping is not the primary focus of DFO. They have their own research priorities to support stock assessment and fisheries management needs.

- EAA: Who are the partners of the program?
- PA: The University of Windsor, Parks Canada, DFO and Golder are involved. Additional veterinary staff and other groups also participate, including the World Wildlife Fund (WWF).
- AD: Discussing this without having DFO in the room has been an ongoing issue with the MEWG. We did say that we were going to try and encourage participation from a marine mammal expert from DFO, but it seems like there is a huge gap without DFO being here.
- KH: I have encouraged marine mammal experts from DFO to participate in the meetings, but perhaps because Golder is here DFO may already feel the consultants have a thorough understanding of the data and program.
- MLH: Baffinland has also tried to request for marine mammal experts from DFO. It would be beneficial if another organization from the MEWG could volunteer to send a letter to DFO and NIRB requesting participation from one of their members. Golder is here, however, and able to present on the data that is relevant to BIM's monitoring for our own objectives. We also have the right information to present on the data that is relevant to BIM.
- PA: This year we will be getting additional information on fine-scale impacts, for example specific information relative to impacts on narwhal from shipping. Baffinland and DFO will be installing 2 new MOTE stations in 2018, for a total of 4 MOTE stations. These stations provide an opportunity to collect enhanced information on positions and movements of the narwhal. Adding 2 more MOTE stations will also give us the opportunity to collect additional fine-scale information across a broader geographical extent.
- EAA: Has behavioural changes been identified in the data – for example, are narwhals diving to avoid the ships? Is this something that's being looked at?
- PA: This will be included in the results if it is relevant.
- KH: With the shore-based land receivers, could a location be put in that would help the communities to understand the effects of other ship traffic (e.g. cruise ships) that could also be affecting the communities of Pond Inlet – or ship traffic near Pond Inlet?
- PA: We will be discussing locations of the shore-based station with MHTO later in consultation with the communities. We will determine a location that is suitable to them, but also allows for maintenance on the MOTE (as required) and will provide the best data relative to understanding interacting with shipping for the Project.
- AD: It is difficult to comment on this program without all of the results or without understanding how the data is going to be used in conjunction with other monitoring programs.
- EL: This is a DFO program so the program is running regardless. We are contributing to this through our tags and logistic support, and we are looking at studying what's happening in terms of relationship with shipping (Baffinland). The other elements of program are up to DFO.
- KH: Marianne Marcoux at DFO has informed me that we can expect DFO's results over the next couple of years.
- GG: It would be beneficial to the group, and likely to the collaborators, if there was a spreadsheet of all the programs/components and researchers, so that we understand which partners in the collaboration are using which data sets, analyzing it, reporting it, etc. Each group may have a different time frame. It would be helpful to know who controls which.
- MLH: That's an excellent suggestion, and Baffinland can have Golder put that together. That is often what happens with government research, but as a proponent we have a responsibility to turn these results around. Given that this is a much larger program, it would be beneficial to share what the group roles and responsibilities are. We are only able to discuss what information is available for Baffinland objectives, and there is still value in us seeking feedback from the MEWG without the results.

- JH: The issue is that we can't discuss how things should be done in 2018 until we see results from 2017.
- PA: We are still going to use this as an opportunity to share what we learned in 2017 to inform changes to the program in 2018.
- AD: Does Golder believe that the 2017 tagging program met the set goals? Was it successful? Did it allow the determination of shipping impacts on narwhal?
- EL: Yes. The DFO has also agreed that it is one of the most successful programs they have ever run and there was consensus that a second year with a finer scale data will be very valuable. This program will allow us to understand potential impacts at far more detail than programs prior to 2017. We really feel this will give us the information we need to make informed decisions, and to assess how narwhal are responding to vessel traffic to make informed decisions.
- AD: Should the MEWG recommend that there not be an increase in shipping until we have those results? We don't know the effect that is occurring, so maybe we should recommend that the Project footprint be frozen until we know the effects.
- EL: We do have an understanding of how narwhal are responding to shipping, but we do not have final results from this tagging program to present at this meeting.
- AD: We need to see results and discuss adaptive management. We don't do this at the MEWG.
- MLH: Full results from the tagging program are not available, but all other results from every other program are and have been discussed on an annual basis. All other monitoring reports are also available. WWF did not participate in the last MEWG meeting where the 2018 results were the focus of discussion – but these results are available and have been distributed to the MEWG. In this case we do not need the complete data set to help inform this year's program. Further, on of the intention of this group is to provide advice and guidance on the design of programs.
- EP: The study with DFO is very useful because at Bruce Head we observed and counted narwhals and estimated of whale numbers. The time to do this study was a long time ago, before you even thought of shipping your ore by boat. We have seen that narwhal behaviour does change when the ships are in the area. We had some video tapes to look at Greenland sharks and narwhals, and we did an estimate of where the ships would be. Nowadays we have cruise ships and so on; in my community they started shipping and using a sealift. When hunting in the spring and fall, the ship comes through then usually we have a school of narwhals. Now that you have a sealift this year, we didn't see any, so we feel shipping has affected narwhals. The tagging program will be useful to tell us if narwhals are fleeing. Seals are smarter than narwhals and will go a distance to get away from noise. Yes, the study is good – but it's too late.
- PE: Our observations of the movements of narwhals in Pond Inlet are similar to what EP is saying. Yes, because we are affected by the activity in our area, we do not want it do any harm to the wildlife in our area. Do it well and do it right.
- PA: Yes, it would have been helpful to have baseline, but we are still getting good information now that can inform decisions later.
- GG: What they are most interested in is in the next meeting seeing a table of topics with all of the topics and persons responsible etc. This could give us a sense of the number of people responsible for managing the data.
- MLH: Golder to provide this in the next meeting.
- FM: We are very impressed you are still looking to improve the data collection for 2018 – not everything is negative about this program. I think it will be very useful for understanding these key issues.

- We have 5 consecutive years of data from Bruce Head. In 2018, we are integrating an acoustic component and running a pilot program from vessel-based observations, rather than from the cliff face at Bruce Head. We are also going to integrate the use of drone video and still photography, which is one of the recommendations that has been made by the MEWG in the past.
- EP: What I saw at Bruce Head is that the narwhals were fleeing when the boat came. Once the boat was gone they will go back to their areas. When a boat is passing by, as long as they are not loading or offloading, if they are just passing through, it is not as scary to them. The boat that you see went to fjord to load or unload this is what upsets the narwhal because the boat travels faster. I think we need to tell the operators that once they are close to the land they need to tell the operators to slow down so it is not as noisy.
- PE: Hunters hunt and travel that route. We used to have narwhals in our ocean and they move away now. When you're a hunter at the fjord there is already a strong current. Once you increase the ship traffic, the hunters will be affected. If the ships were to go another way – not directly by Bruce Head – there should be another travel route.
- AD: Why is this is not at the same location as last year?
- EM: The Bruce Head platform blew off last fall during a high wind storm after the program was over. Baffinland is doing an internal safety audit and the Bruce Head monitoring area cannot be used until this is completed.

#### **Ship-Based Observer Program**

- There is an opportunity in 2018 to reinitiate the Ship-Based Observer (SBO) program with the use of an Ice Management Vessel (IMV) to support shipping season for 2018.
- AD: In 2017, did you hire an IMV but end up not needing it?
- MLH: That is correct – in the end it wasn't needed.
- AD: Will they still be running this program even if the IMV isn't needed?
- MLH: The contract with the IMV includes supporting Marine Mammal Observers (MMOs) surveys.
- LW: Will the IMV stay in the area all season, or would it only be present during the shoulder seasons?
- MLH: The vessel will come in to the area for the start and end of the seasons, but will not be in the areas during the open water shipping season.
- AD: A few years ago, part of the ambition around the observer program was that the observers would also help with navigation and give advice to the captain of the ships about observing whale pods or maneuvering around certain areas. This seems like a good opportunity between the IMV and ore carriers and around some of these issues. I think this year there is going to be improved communications between the captains of ships and the communities. There is a good opportunity with this program to put this into practice.
- MLH: Baffinland will be in Pond Inlet tomorrow to talk about vessel traffic management and opportunities for improved communications.
- JH: We had a call a couple of weeks ago and we discussed this program – and we talked whether the MMOs will implement the Canadian Wildlife Service (CWS) protocol – so if I understand correctly that this has been revised and improved since that last call.
- PA: Yes, we were able to confirm with CWS that the program protocol design was appropriate and aligned with CWS.
- JH: Will the same MMOs participate in both the July and October programs, or will 4 separate MMOs participate?

- PA: We are going to consult on the HTO with this to determine what would be best.
- GG: This is a unique opportunity because CWS does not have the resources to conduct ship-based monitoring at this time. The protocol is accessible, and the data collected can be uploaded into a national database, so the research can be easily integrated with other data sets. There may even be an opportunity for Inuit MMOs to learn the protocol and how to upload into the database.
- GG: What have the narwhals been feeding on?
- EP: We look at stomach contents to see what they eat – trout, cod, lake fish, freshwater fish – also deep-water fish like turbot, certain kinds of crabs, and arctic char. Narwhals eat more deep-water fish than belugas.

#### **Discussion on Ship Traffic Concerns**

- EP: The hunters are worried about the narwhals. We wish for the ships not to get too close to that hunting area, so the narwhals don't leave. The area near Milne Inlet – there are cabins. People summer there in their cabins – it's a very good hunting area and we also camp along (BH) area towards Koluktoo – there are other hunter cabins along Milne Inlet where people are – it's too close the route.
- PE: The ships are not staying at the docking station; they are drifting. They are being told to stay at their docking stations, but they are still going there.
- MLH: Thanks for the comments. These are concerns that Baffinland has heard before as well. We will be talking in more detail to these concerns at the meeting in Pond this week – and additional management measures that we will be implementing this year to share with HTO in Pond. Input from community members and from the MEWG has shaped some of our operational procedures to date including:
  - All vessels having to follow the 9 knot limit, not just ore carriers.
  - Ensuring vessels stay near anchorage locations –and holding until vessel one coming north/south has passed a certain point.
  - Not having more than 3 vessels at anchorage locations.
  - Update the Standing Instructions to Master (SITM) to support improved vessel management.
- EP: I believe that vessel traffic should be very tightly controlled while one dock is loading, and that once the other boat has left, a few days later the other one can come. You should not have 2 ships loading or unloading at a time. Hunting provides our subsistence. So what we say to you is that you have to respect our food source and our lives. There was a lot of ships parked at Ragged Island last summer, and many of these ships that are supposed to park at Ragged Island drifted off and ended up getting in the way of harvesters. Drifting vessels sitting at anchorage locations are conflicting with harvesters. HTO is suggesting to minimizing the number of ships that are parked at anchorage locations.
- MLH: Baffinland is committed to working with the community to minimize any potential effects to the communities' traditional lifestyle and subsistence – we need to continue to work with the community – to be respectful because we know how important this is for the community.
- EAA: Nunavut Tunngavik Inc. (NTI) is concerned that hunters are losing control of the water and their ability to harvest. NTI is running a program to make sure that guidelines of where ships can go is being followed.
- EP: We can inform you from HTO how it has affected us and the community and environment. QIA should be helping us, and we can use additional support from QIA and we need to have a coordinated approach with them. However, it is very hard to get across to people who don't value Inuit Quajimajatuqangit (IQ) and experience and it is very frustrating. We have a lot of concerns and need to work together and it is

<p>better to be honest with your partners. We need to coordinate to protect the environment and our own lives.</p>
<p><b>Grant Gilchrist's Presentation: Inuit Science Training Program</b></p>
<ul style="list-style-type: none"> <li>• JH: This is a fantastic program.</li> <li>• JT: This would be great if your group can present to high schools to inspire students to join this program and hear about these opportunities and opportunities to work in science and environmental studies</li> <li>• KH: Will the program only focus on teaching protocols that are relevant to your studies, or will there be a broader training program as you upscale?</li> <li>• GG: There will be other scientists who have other backgrounds including contaminants, water, vegetation and how local knowledge is complimenting scientific understanding / research occurring in this area.</li> <li>• The first summer will be with individuals from Coral Harbour. As we move our field stations, we will recruit from different communities that are nearby. The goal with the program is long-term mentorship.</li> </ul>
<p><b>Marine Ecological Effects Monitoring Program (MEEMP)</b></p>
<ul style="list-style-type: none"> <li>• EL: We have had the opportunity to revise and update the 2018 program. Based on our 2017 field season feedback from the Working Group through discussions and comments on the reports, the 2018 MEEMP program has undergone some changes. It is important to note that to date we have not seen any project related effects in the marine environment, or on water quality.</li> <li>• Benthic infauna was added as a study component in 2018, added this so we can also monitor for potential changes in the local infauna community. This will occur while we are completing our sediment samples at the same transects.</li> <li>• KH: I thought we were doing benthic infauna sampling last year?</li> <li>• EL: It is more than just doing the grab samples. Last year focused more on epifauna and epiflora. Some of the updates that have been made to the benthic epifauna and epiflora were based on comments received from MEWG members. This year we are going to be putting out and monitoring 10 rectangular belts (5 in study area / 5 reference points).</li> <li>• KH: Will having similar types of habitat in the reference areas be attempted? I would recommend you find a reference location with similar habitat types – ideally these should be comparable to the impact areas.</li> <li>• EL: These will be set primarily along in the existing transect areas. Exact locations will be set and that similar reference locations will be a consideration/factor.</li> </ul>
<p><b>Marine Fish</b></p>
<ul style="list-style-type: none"> <li>• Based on feedback received from Inuit technicians, the Working Group, and regulatory comments we are proposing to increase sampling efforts for fish. Last year we added quite a few additional techniques for fish sampling. The sampling program will occur 2 to 3 times over the 6-week program. Previously we have not sacrificed any fish for taxonomic analysis. Last year there were 2 incidental mortalities. HTO members have asked us to send more arctic char to the lab for body burden analysis – so we are going to increase this to 10 in 2018, with the HTO's approval. The Working Group also requested to see shellfish samples for taxonomic analysis so we will be adding this as well.</li> </ul>
<p><b>Aquatic Invasive Species (EIS)</b></p>
<ul style="list-style-type: none"> <li>• In 2017 we expanded this program to Ragged Island and increased the number of sampling areas at Milne Port. At previous MEWG meetings we discussed improving taxonomic identification, so for 2018 we are</li> </ul>

proposing to send for DNA analysis if we are unable to identify through taxonomy. Last year we contemplated running a dive program. Due to health and safety reasons, we could not do this so we have developed solution (similar to 2017) to monitor hull biofouling via Remotely Operated Vehicle (ROV).

- KH: Was there anything mentioned about settlement plates?
- EL: Last year we collected the settlement baskets, they had little colonization, and we redeployed them and new settlement plates. We will be collecting them for analysis this year. The results of these reports were distributed to the MEWG in February of 2018.
- AD: Are ship emissions being monitored? Are there thoughts of doing that?
- MLH: We do monitor all emissions at the site and at the port site. Currently we don't monitor or report on this for vessel transits.
- FM: It was said that tidal gauges will be reinstalled at the dock. We had a conversation about whether the ballast water discharge could affect tidal gauge readings.
- EL: The location of the tidal gauge may still need to be refined and will have to be considered relative to discharge.
- FM: Most of Parks Canada's comments on the annual reports were responded to and have been incorporated into the report / program design.
- EL: I would like to request feedback on the MEEMP program (specifically around catch / kill for fish for taxonomic analysis).
- EP: We have not gotten information about what happened to the fish that died when you were analyzing them. When it comes to tools from when we were working on the dock, the people that were drilling in the ocean, and explosives that you may have used when you were building the dock may have killed them. Maybe metal is also making them die off. We were informed recently that Greenland fish are now making it into our oceans so we may have invasive species from climate change that could affect our wildlife. The Greenland species eat the smaller fish. They are unsafe to eat because they are new to us and we have been informed that they are unsafe to eat. We know that the body burden analysis you did with the incidental mortalities will help us have a better understanding of any effects that are occurring.
- EL: On incidental mortalities – within the monitoring program, we are setting short-duration gill nets; two of the arctic char in the sampling program were not able to be released alive. Through the capture process they were injured and were euthanized. They were sent to the lab for body burden analysis, with weight, age class of the fish determined. Fish ages were 4 and 7, but need to check ages, and body burden analysis did not result in consumption concerns.
- KH: Do we know if the Greenland species is the same species that Baffinland was observing as well?
- EP: On the two invasive species; we are not used to seeing that fish, it is by Ragged Island, it was a small fish, foreign fish, saltwater fish. The man who caught the fish brought it to HTO to see what kind of species it was. It was sent to a lab and they were informed in Greenland they have that fish. This may have come from the ballast water. Our wildlife species are changing a lot.
- KH: Were there species that may have been new?
- EL: None of the fish species we captured last year were deemed to be aquatic invasive species; however a sand lance, was captured for the first time in the sampling program in 2018.
- EP: Could it be a capelin?
- EL: A capelin isn't considered an invasive species in the Canadian Arctic, they are already occurring. If you are seeing more capelin, it is likely due to increased populations or extension of ranges, but not something that was being introduced by ballast water.
- KH: Have new species that were documented been sent for a second lab analysis? Another level of classification would be useful to confirm.

- EL: This year we will complete DNA analysis if there is any uncertainty in the program. Will look into whether lab samples from last year are still available for a third level classification.
- KH: With our invasive species program – we preserve things in 90% ethanol – because it helps preserve some species. Another option is to do one in ethanol and one in formalin.

**WWF Eastern Arctic Mariners Guide - Presentation from AD**

- Discussed increase in ship traffic over the past couple of years. 11% of all traffic in the Arctic comes from the Mary River Mine.
- One objective of the mariner guide is to operationalize relevant Nunavut Impact Review Board conditions from Mary River Project and the draft Nunavut Land Use plan.
- Baffinland is reducing all vessels (including ore carriers and other vessel types) ship speeds to 9 knots – which is a really good example of adaptive management. Baffinland is also considering incorporating the WWF Guide into the SITM.
- WWF is looking to have these embedded into Canadian Hydrographic Services Charts.
- BP (seconded by MLH): has the WWF analyzed the percentage of the tonnage? AD had said that 11% of the total traffic in Arctic is from Mary River.
- AD: The 11% is the distance travelled in the Arctic based on km travelled by ships, not just ship traffic or number of vessels. We have all the automatic information system ship data from 2016 for the Arctic – which I can happily share with the group.
- MS: Why was Baffinland’s shipping route highlighted on the Eastern Arctic Mariner’s Guide when no other shipping tracks in the area were?
- AD: Because it is the biggest development this region has seen, so we are using this as an education tool. There are other well developed routes, but Baffinland is the only one that has a defined shipping route through the North Baffin Region Land Use Plan.
- EP: One other concern from the HTO is that there are many ways of doing studies and different methods. We don’t mind the audio equipment, but the elders in our community did not like the tidal monitor because the animals can hear the echo and noise. I believe the tidal wave monitor may drive marine life further away from the community
- PA: For the tidal gauge – we are not emitting any sonar – they are strictly collecting passive data and monitoring the tides. For current monitoring, the Doppler does emit a high pitch sound that is well above the range of narwhal auditory range (it’s high frequency, higher than what narwhal are hearing) so narwhal would have to swim directly above it to be influenced by it, although they still shouldn’t be hearing or noticing them.

**Thresholds / Early Indicators for Adaptive Management**

- MLH: Several comments were submitted to NIRB on Baffinland’s 2017 Annual Report by reviewers of organizations who participate in the MEWG regarding the status of Baffinland’s development of a framework for early warning indicators and thresholds. The MEWG is the forum through which these types of concerns should be raised and discussed, and as indicated in Project Certificate Conditions 110, 111 and 112 this is to be developed in concert with the MEWG. However, while concerns related to the status of compliance with PC Conditions 110, 111 and 112 were raised in comments to NIRB, we are yet to have these types of discussions at the MEWG. We would like to propose to spend time today discussing these, and hearing the group’s recommendations for the development of thresholds and early-warning indicators.

- EP: There is collective concern about the impacts – from hunters especially – those who are not employed with full time jobs. In 2011 when QIA approved going ahead with Baffinland, when we were working on protecting animals and wildlife in the environment, operating safely, and supporting each other and networking. We don't mind the way it is going ahead but if we had prepared ourselves more in the beginning and QIA was operated and managed by Inuit – then we would partner with Baffinland on an equal basis. I believe we need to focus more on listening to IQ because our Inuit values have informed us and kept us alive for so many years. It is very important that we think critically and work together to keep things safe and healthy.
- PA: It is important to collect IQ knowledge, and this is why it is so important for Baffinland to include Inuit in monitoring programs and consult with them on the project and on the monitoring programs.
- AD: Indicators and thresholds mean something different to other people We could develop a process over the next year where would could debate this and come up with collective thoughts. Also, the seals were not around last fall for the hunt – that is probably an indicator that it can be tied to shipping activity, so that's an example of a potential indicator. Noise thresholds; how much ship noise there can be before it affects the narwhal, also one ship at a time is a threshold. Based on community feedback, what is too much shipping – some of them are social values and some of them are scientific values. We could table this for the next call so that people can research and put some ideas together.
- MLH: The takeaway is that individuals who are interested in this conversation can do some research and come to next discussion with ideas of what they would like to see, and Baffinland can try to formalize this process. We do, however, need a better idea of what you are looking for. So when comments have been submitted about indicators and thresholds – what specifically are you looking to see?
- JH: The comments are based on the terms and conditions from NIRB – and so we need their input on this.
- KH: We can comment on whether or not the approach we've used is going to be able to detect changes – e.g. does your data have enough variation for you to detect a change to the level or granularity that you can detect a change for a set threshold.
- MLH: We don't want to lose sight of the fact that these thresholds have already been developed for the approved project – so maybe the question is where do you put your time and resources for best understanding the objectives.
- JH: At a broad level, coming up with these thresholds is fairly simple; for narwhal you can have both scientific and social thresholds. If we can't actually detect a 10% change, then the threshold is relatively useless so we need to give it more thought. I would suggest we go back to looking at Valued Components (VCs) as a guideline to flesh out everything else from there.
- MLH: There doesn't seem to be as much concern in areas where there are already regulatory guidelines; concerns are more where there are less established guidelines (e.g. fish populations / narwhal populations, etc.).
- MS: There are thresholds on both the marine and terrestrial side. In some cases, we have always predicted that narwhals would respond to ships; we expect that 100% of narwhals would swim away from ships but that doesn't mean we are having an effect. It is a fine line between threshold of response and effect at a population level. On the terrestrial side, with power analysis we have been able to understand our detection levels but this still doesn't mean we have a clearly defined threshold per se or an effect. If EP says there were no seals to hunt last year – well that is a big threshold. We cannot wait for NIRB to come up with thresholds – that is what the NIRB has mandated the Working Groups to do.
- EP: The narwhal might get used to the traffic over the years – but animals do not adapt very quickly. Fish numbers are different every year. We eat seals every day so we don't want to lose that food source at all. When they come back, if they are familiar with ship traffic and noise hopefully they will get used to it and

come back. Caribou are our land animals, they can go a long distance, so we believe if they are affected by the mine they will go away and maybe they will never come back. This is the food source we are talking about – both land and sea. From my understanding the shipping does affect the narwhal.

- MLH: I suggest to look at the Final Environmental Impact Statement (FEIS) – indicators for thresholds – and circulate with the group.
- MS: These are geared towards identifying something that is much earlier than a major significant impact.
- KH: If suggestions are made, are they likely to go anywhere? Because I've made suggestions in the past – but then they are not necessarily incorporated into monitoring programs.
- MLH: Baffinland would have to evaluate what the recommendation was – but we have clearly demonstrated that we have taken recommendations into consideration and operationalized them. My question is we are getting comments requesting for development of early warning indicators – so we are still unsure of whether or not your concern is related to fulfilling the question in the terms and conditions – or whether you have an idea of just trigger points. I think one of the benefits of the MEWG is that it can help inform evolving best practices for Baffinland.
- KH: Are thresholds developed? Will we need to develop adaptive mitigations?
- JH: The caribou decision tree that was developed by Baffinland – impact / action, and suggests looking into developing a similar tool for noise related to narwhal, or maybe a cumulative noise budget so that total noise vs behavioural response is looked at.
- PA: This is an example of what we can consider to determine if it is possible to assess this or measure with enough precision, etc. That way we can take this further as a possible threshold.
- EL: This discussion has been spurred on by comments received from MEWG members – and the directions in Project Condition (PC) 110 and PC 111 which say that it is the responsibility of the MEWG to come up with this, so it is important that each party is making real contributions. At the same time, if we can corroborate this with results from the narwhal tagging program, we can have a much more structured and productive conversation.
- JH: When QIA makes comments that Baffinland is out of compliance with PC 110 and 111 – this is the definition of early warning indicators that are being referred to.
- FM: This is why we need a marine mammal expert from DFO, so at the very least they can provide us with input regarding thresholds, as a starting point.
- EL: We can agree that at the next MEWG meeting, each of the working group members will come prepared to discuss thresholds and early indicators for adaptive management.
- MEWG members agreed to have thresholds and early indicators for adaptive management as an action item for the next in-person meeting.

#### **Timing of Meetings: Suggestions**

- The floor was opened to anyone with suggestions / recommendations to alter schedule of meetings.
- BP: It was beneficial for them that the meetings for the annual report review had just occurred because it allowed for really productive conversations. It is really difficult to get technical experts in for spring meetings.
- MLH: We can try and keep this in the end of May for next year, or get technical experts at one of the meetings. Is the group OK with still having an August call and then next face-to-face end of November in Iqaluit? Baffinland feels the 4 meetings per year are productive to ensure ongoing communication and allow for full participation.
- MEWG agreed this was a good next step.

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	Action Item	Action By	Update
1	MLH to look back at FEIS indicators for thresholds and circulate with the group.	Baffinland	These were reviewed and considered in development of EWI framework.
2	Golder to support Baffinland in providing some structure in next meeting relative to PC 110 111 and 112 and get confirmation from group on whether or not this should be scoped just to PC 110, 111 and 112.	Baffinland	EWI framework was based on description of objective as outlined in PC 110, 111 and 112.
3	Provide summary of what we heard in this meeting, share with this group, and assign some 'homework' to be done in advance of next meeting.	Baffinland	Partially-Complete on July 11, 2018. MEWG meeting minutes summarize what was discussed at the meeting. Correspondence sent with draft MEWG meeting minutes requesting MEWG participants to provide thoughts regarding framework for early-warning indicators in advance of next MEWG meeting.
4	On MEEMP: This year we will complete DNA analysis if there is any uncertainty in the program and will look into whether lab samples from last year are still available for a third level classification.	Baffinland	
5	On ballast water: MLH to follow up and share information about specific discharge locations.	Baffinland	If ballast water testing is performed while vessel is at Milne anchorage, then ballast water is discharged at Milne anchorage. If ballast water testing occurs when vessel is alongside Panamax Dock, then ballast is discharged alongside.
6	Consider whether or not Desgagnés MMO program has opportunity for cross-collaboration with our own SBO program.	Baffinland	Baffinland seeking more information from Desgagnés Group on the MMO program.
8	On DFO: Request that someone from the MEWG write a letter to Baffinland / DFO writing a letter to request marine mammal expert participation in the Working Group. Jeff to bring this request back to QIA – to see if they will write a letter requesting DFO participation in the group.	QIA	

9	Prepare a tagging table with all of the topics, persons responsible, which partners in the collaboration for the next meeting.	Golder	Golder will provide an update table for the Tremblay Sound Ecosystem Approach 2018 Program including components and contributors for the 4 <sup>th</sup> MEWG meeting of 2018.
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**Appendix B:  
MEWG Meeting – 13 September 2018**



**Marine Environment Working Group**

Thursday September 13, 2018

10:00 am – 12:00 pm (EST)

**Call-In Number: +1-416-607-0170 Access Code: 990 832 957 #**

<b>Member Organization</b>	<b>Participants</b>	<b>Member Organization</b>	<b>Participants</b>
Baffinland Iron Mines Corporation (Baffinland)	Megan Lord-Hoyle (MLH)	Parks Canada	Francine Mercier (FM)
	Joe Tigullaraq (JT)	Makivik	Gregor Gilbert (GG)
	Emma Malcolm (EM)		
Qikiqtani Inuit Association (QIA) and Consultants	Stephen Williamson Bathory (SB)	Mittimatalik Hunters and Trappers Organization (MHTO)	Elijah Panipakoocho (EP)
	Sean Joseph (SJ)		Phaniel Enooagak (PE)
	Fai Ndofor (FN)		
	David Qamaniq (DQ)		
	Jeff Higdon (JH)		
		<b>Observer Organization</b>	<b>Participants</b>
Fisheries and Oceans Canada (DFO)	Kim Howland (KH)	World Wildlife Fund – Canada (WWF)	Andrew Dumbrille (AD)
	Laura Watkinson (LW)		
Environment and Climate Change Canada (ECCC)	Grant Gilchrist (GG)	Oceans North Canada	Kristen Westdal
	Anne Wilson (AW)		
			Chris Debicki
Government of Nunavut	Brad Pirie (BP)	<b>Baffinland Consultants</b>	<b>Participants</b>
	Lauren Perrin (LP)	Golder	Patrick Abgrall (PA)
		Golder	Erin Linn (EL)
		Golder	Phil Rouget (PR)

**Agenda**

<b>Time</b>	<b>Activity</b>
10:00am – 10:30am	Baffinland Update (Baffinland)



Time	Activity
	<ul style="list-style-type: none"> <li>• 2018 Shipping Season Update</li> <li>• 6MTPA production and shipping increase application</li> <li>• Phase 2 EIS Submission</li> </ul>
10:30am - 11:00pm	2018 Marine Monitoring Programs Update (Golder) <ul style="list-style-type: none"> <li>• Tremblay Sound Narwhal Tagging Program</li> <li>• Bruce Head Vessel-Based Monitoring</li> <li>• Ship-Based Observer Program</li> <li>• MEEMP</li> <li>• Physical Oceanography</li> <li>• Ballast Water Monitoring Program</li> </ul>
11:00am – 11:30pm	Adaptive Management Framework Development Template <ul style="list-style-type: none"> <li>• Overview of how to use template</li> <li>• Next steps</li> </ul>
11:30am – 12:00pm	Roundtable and Action Items



## Identifying Early Warning Indicators and Thresholds

The following Project Certificate (PC) Conditions are relevant to the identification of Early Warning Indicators (EWIs) and thresholds.

### Project Certificate Condition 110: Marine Environment – Ship Noise

“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.”

### Project Certificate Condition 111: Marine Environment – Ship Noise

“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:

- a. 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.);
- b. 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.”

### Project Certificate Condition 112: Marine Environment – Ship Noise

“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:

- c. 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.);
- d. Vessel transit planning, for all seasons.
- e. 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.”



## BACKGROUND

### RELEVANT PROJECT INDICATOR SPECIES:

Marine mammals and marine mammal populations.

### PROJECT ACTIVITIES THAT COULD INTERACT WITH INDICATOR SPECIES:

Shipping – Noise created by vessels

### POTENTIAL PROJECT EFFECTS:

- Acoustic Disturbance
- Change in animal distribution in the region
- Change in abundance in the region
- Alteration of migration patterns
- Availability of marine mammals for harvesting

## Early Warning Indicator Submission Guidelines

To aid in the submission process, the following guidelines have been drafted for use by the MEWG members to help provide a consistent streamlined process. The submission guidelines are outlined below.

### General Guidelines:

- EWIs are to be identified for marine mammals and marine mammal populations only as indicated in Project Certificate Condition 110.
- EWIs should allow for evidenced changes to the indicator species or population.
- EWIs should be characteristics of marine mammal behaviour, population distribution and abundance, habitat use that can be effectively observed and/or quantified through monitoring programs. This means monitoring programs being currently or previously undertaken or potentially new monitoring programs that can be realistically undertaken to detect these EWIs, should they occur.
- More than one EWI can be proposed for a species.
- The same EWI can be proposed for multiple species.

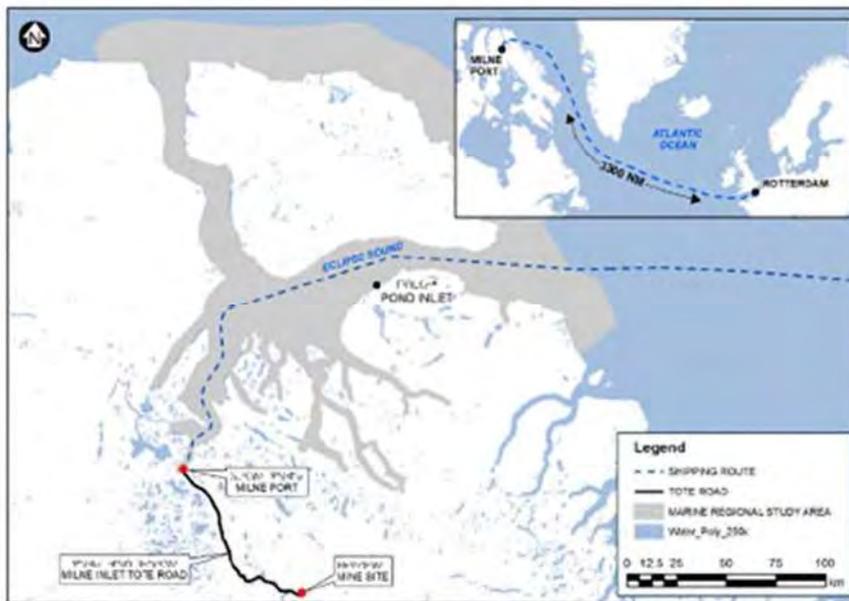
### Step by Step Process:

The development of early warning indicators should consist of the following steps:

#### *Review of potential effects / interactions*

Consider and define what potential effects you think the Project could be having on marine mammals.

- Potential effects need to be directly related to the specifics of the approved project, be likely to occur and be within the geographical scope of the project's area of influence.
- For context, the relevant project operation is the shipment of iron ore through the Northern Shipping Corridor during the open-water season.
- The geographic extent is based on the Project's area of influence (e.g within the Northern Shipping Corridor, which encompasses Milne Inlet, Eclipse Sound, Pond Inlet and adjacent water bodies). See Figure 1 below:



*Selection of early warning indicators:*

- The early warning indicators should clearly indicate how the noise from Project-vessels are interacting with indicator species (e.g. narwhal) and be measurable through a quantifiable threshold.
- Indicators could be the number of individuals using an area (regional abundance), the type of individuals using an area (e.g. mother-calves), a change in the timing of the area being used (e.g. arrival date in an area or departure date from an area), or other characteristics of individual marine mammals or populations.
- Indicators should speak to a change that has occurred which is likely to be a direct result of noise from shipping activities.

*Determine Appropriate Threshold for Indicator Species:*

- Thresholds are limits of “acceptable change”.
- Quantitative thresholds need to be identified to determine whether the effect of noise from shipping activities is resulting in “acceptable changes” to an indicator (i.e. marine mammals).
- Examples of thresholds include the number of individuals or type of individuals in a regional population, a percentage decrease in the number of individuals or type of individuals in a regional population, and an arrival or departure date from an area.



## Timeline for MEWG Development of EWIs

The following timeline has been created to introduce and develop the Early Warning Indicators as a group and promote participation from MEWG members and MEWG observers as per the above Project Conditions.

- 13 September 2018 – MEWG Teleconference Meeting: present Early Warning Indicator Submission Sheet to the MEWG.
- 11 October 2018 – 4 weeks following Teleconference Meeting: MEWG members submit their EWI Suggestion Sheet(s).
- December 2018 – In-person Meeting in Iqaluit: MEWG members to review the compiled suggestions and select appropriate EWIs and corresponding thresholds.
- 25 January 2019: MEWG members to submit proposed additional mitigations and adaptive management practices to be triggered by reaching EWI thresholds.
- Spring 2019 – Teleconference Meeting: compiled additional mitigations and adaptive management practices to be triggered by reaching EWI thresholds suggestions to be presented to the MEWG.
- Spring 2019 – In-person Meeting in Ottawa: finalization of additional mitigations and adaptive management practices to be triggered by reaching EWI thresholds.



## Early Warning Indicator – Submission Sheet

Indicator species or population: \_\_\_\_\_

Proposed Early Warning Indicator: \_\_\_\_\_

Proposed Threshold: \_\_\_\_\_

Indicator species or population: \_\_\_\_\_

Proposed Early Warning Indicator: \_\_\_\_\_

Proposed Threshold: \_\_\_\_\_

Indicator species or population: \_\_\_\_\_

Proposed Early Warning Indicator: \_\_\_\_\_

Proposed Threshold: \_\_\_\_\_

Indicator species or population: \_\_\_\_\_

Proposed Early Warning Indicator: \_\_\_\_\_

Proposed Threshold: \_\_\_\_\_

Indicator species or population: \_\_\_\_\_

Proposed Early Warning Indicator: \_\_\_\_\_

Proposed Threshold: \_\_\_\_\_

Indicator species or population: \_\_\_\_\_

Proposed Early Warning Indicator: \_\_\_\_\_

Proposed Threshold: \_\_\_\_\_



## 2018 Summer Update

MEWG Meeting  
13 September 2018



**Baffinland**

The Baffinland logo consists of a stylized red icon on the left, resembling a vertical bar with a small protrusion at the top and three horizontal bars below it. To the right of this icon, the word "Baffinland" is written in a bold, red, sans-serif font.

# Baffinland Project Update

- 1) 2018 Shipping Season Update
  - Start of shipping season and IMV
  - Vessel transits and ore shipped to-date
  - Vessel traffic management updates
  - Fuel Spill
- 2) 6MTPA Application
- 3) Phase 2 EIS Submission

# Baffinland Project Update – Shipping Season Overview

- ‡ Shipping season officially commenced on July 20
- ‡ Notification of start of season was provided to Hamlet of Pond Inlet and MHTO on July 20
- ‡ Ice management vessel was active from July 20 to August 10
- ‡ Ice management vessel is expected to re-enter Inlet September 28
- ‡ To date:
  - Ore carriers: 41
  - Fuel tanker: 3
  - Resupply: 3

# Baffinland Project Update – Shipping Season – Vessel Traffic Management

- ✚ Baffinland held a meeting with Pond Inlet HTO in July to finalize vessel traffic adaptive management measures for 2018
  - Ensure all Project vessels comply with speed limit in the Inlet (9 knots)
  - Ensure all Project vessels navigate along way points for nominal shipping route
  - Ensure all Project vessels are aware of anchorage locations and restrictions for drifting
- ✚ Follow up site visit with MHTO occurred on August 30 and 31 to continue discussions regarding development of further enhanced vessel traffic management alternatives and options for improving communications between community and vessel operators
- ✚ Two avenues established for tracking and reporting on adherence to SITM
  - Community shipping complaint and response mechanism
  - Monitoring through AIS

# Baffinland Project Update – Shipping Season – Fuel Spill

- ✚ July 22 - notification was provided to Canadian Coast Guard (CCG) that a tug boat had experienced a gearbox failure while travelling through Eclipse Sound
- ✚ Notification of event was also provided by Baffinland and the CCG to Hamlet of Pond Inlet and Hunter and Trappers Organization
- ✚ Once tug arrived at Milne Port, Baffinland deployed oil containment booms and sorbents to contain release
- ✚ Investigation revealed that approximately 30 L of gear oil had been released in Milne Inlet
- ✚ It appeared that oil dissipated quickly due to weather and wave conditions
- ✚ Baffinland confirmed with CCG that additional spill recovery methods were not recommended and tug was cleared by CCG for operations
- ✚ Follow-up spill report was issued to ECCC, CIRNAC and QIA on August 22

# Baffinland Project Update – 6MTPA Application

- 📍 Community information session in Pond Inlet on July 12, 2018
- 📍 Comments submitted from reviewers on July 26
- 📍 Baffinland provided response to reviewer comment on August 9
- 📍 NIRB issued recommendation report to the Minister on August 31

# Baffinland Project Update – Phase 2 EIS

- ✦ Baffinland submitted Phase 2 Amendment to NIRB on August 15
- ✦ NIRB concordance review will occur from September 4 to September 14
- ✦ Following successful conformity review NIRB and NWB will issue a coordinated review process timeline
- ✦ A copy of the Phase 2 EIS amendment will be available on NIRB public registry following conformity review

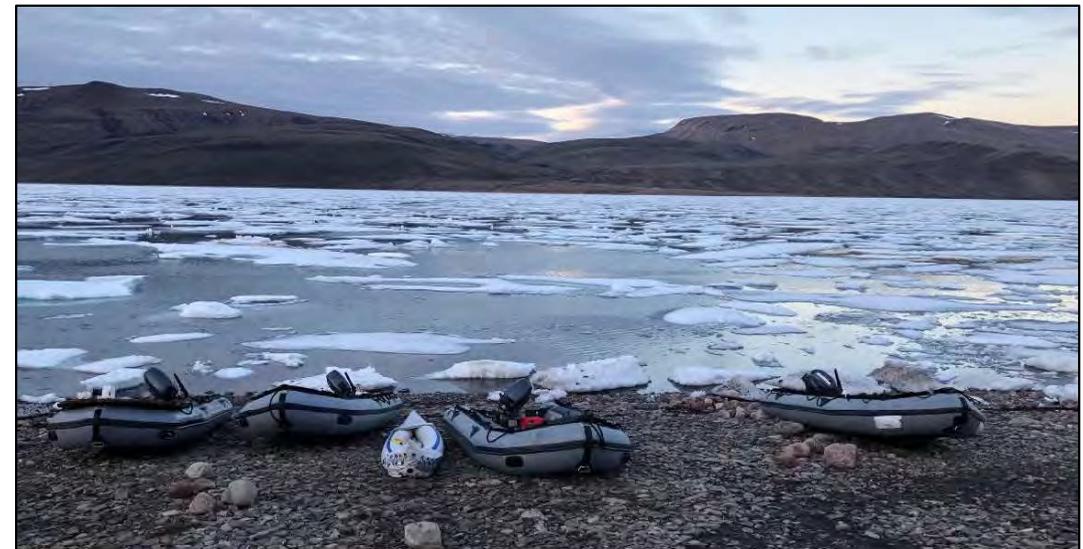
# 2018 Monitoring Programs

- 1) Tremblay Sound (Kangirluarjuk) Narwhal Tagging Program
- 2) Bruce Head (Iluvilik) Vessel-based Monitoring Program
- 3) Ship-based Observer (SBO) Program
- 4) Marine Ecological Effects Monitoring Program (MEEMP)
- 5) Physical Oceanography



# Tremblay Sound Narwhal Tagging Program

- ✦ 14 July: Set up 2 new receiving stations (MOTES)
- ✦ 17 July: Arrival at Tremblay Camp
- ✦ Heavy ice on shoreline delayed net deployment
- ✦ 2 narwhals tagged in August



# Bruce Head Vessel-based Program

- ✦ 16 July: AIS installation at MHTO
- ✦ 3 August: Training in Pond Inlet
- ✦ 4 August: 5 acoustic recorders deployed
- ✦ 7-14 August: Surveying
- ✦ 84 Relative Abundance and Distribution Counts over 8 days
- ✦ No narwhals observed in the Project Area during the study



# Ship-based Observer (SBO) Program

- ‡ Leg 1: 28 July – 7 August 2018
- ‡ 147 marine mammal watch hours
- ‡ 1,680 marine mammals observed
  - 19 narwhals
  - 1,660 seals
- ‡ 102 5-minute seabird watches completed
- ‡ Most common seabird species: Northern fulmar and black-legged kittiwake
- ‡ Leg 2: 28 September – 24 October



# Marine Ecological Effects Monitoring Program (MEEMP)

- ‡ The 2018 MEEMP program started with the arrival of Golder staff at Port on July 25, weather and ice delayed the arrival of the Inuit crew and boat from Pond Inlet until August 2. The program was successfully completed on August 28.
- ‡ Water, sediment and benthic samples were successfully obtained. All samples collected were shipped for laboratory analysis. Permanent transect plots were deployed and surveyed using the ROV.
- ‡ AIS program was completed. The ROV was used to collect video of 3 ore carrier hulls, no accessible epifaunal growth was found for sample collection. Rocks from settlement baskets deployed in 2016 were photographed, collected and sent for taxonomic analysis.
- ‡ *Fisheries Act* offset monitoring was completed. Cod were observed during video surveys of the offset habitat.
- ‡ Fishing efforts were completed weekly throughout the program as recommended by MEWG and the HTO.
- ‡ The MEEMP crew also supported tag recovery efforts for the Tremblay program.



# Physical Oceanography

- ‡ The 2018 program consisted of tidal gauge installation and monitoring at Milne Port and the collection of metocean data at Bruce Head and Milne Port.
- ‡ The tidal gauge was installed at Milne Port on 30 June 2018 to extend the tidal data set previously collected and provide insight to relative sea level and storm surges at the project site.
- ‡ Metocean data collection at Bruce Head and Milne Port occurred via subsurface tautline moorings installed at Bruce Head and Milne Port to provide a time series of water level and current throughout the water column as well as salinity and temperature data.
- ‡ Golder deployed 3 moorings from August 3-6, 2018.

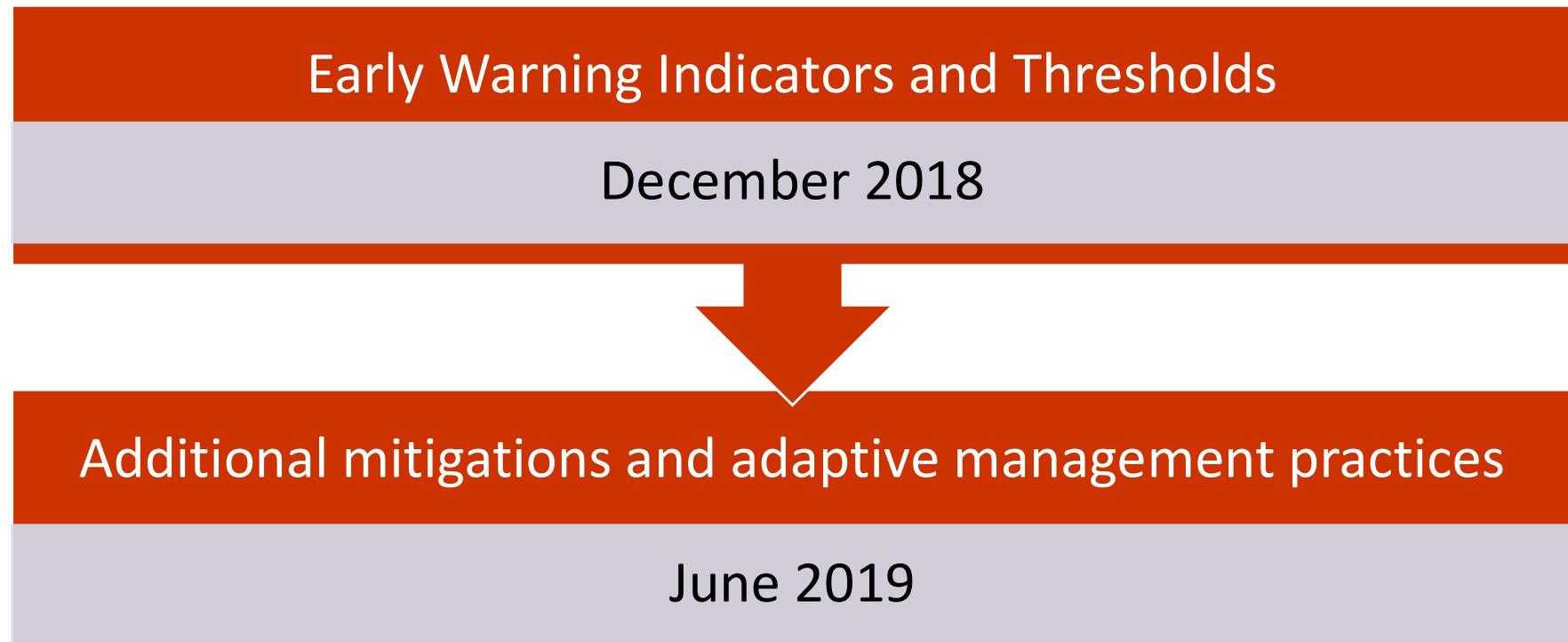


# Early Warning Indicators

📄 See separate handout as well

📄 Project Conditions 110-112

📄 Timeline



# Early Warning Indicators (EWI) - Guidelines

- 📌 For marine mammals and marine mammal populations.
- 📌 Linked to noise from shipping activities.
- 📌 Characteristics of behaviour, population distribution and abundance, or habitat use.
- 📌 Can be observed and/or quantified through monitoring programs.
- 📌 Can propose more than one EWI for each species.
- 📌 Can propose the same EWI for multiple species.
- 📌 Thresholds are quantitative limits to “acceptable change”.

# Questions & Discussion





## Marine Environment Working Group Meeting

**Date:** September 13, 2018

**Location:** Teleconference

**Time:** 10:00 am – 12:00 pm (EST)

**Call-In Number:** +1-416-607-0170 **Access Code:** 990 832 957 #

Member Organization	Participants		Member Organization	Participants	
Baffinland Iron Mines Corporation (Baffinland)	Megan Lord-Hoyle (MLH)	N	Parks Canada	Francine Mercier (FM)	N
	Joe Tigullaraq (JT)	P	Makivik	Gregor Gilbert (GG)	N
	Emma Malcolm (EM)	P			
Qikiqtani Inuit Association (QIA) and Consultants	Stephen Williamson Bathory (SB)	N	Mittimatalik Hunters and Trappers Organization (MHTO)	Elijah Panipakoocho (EP)	P
	Sean Joseph (SJ)	N		Joshua Arreak (JA)	P
	Fai Ndofor (FN)	N		Billy Merkosak (BM)	P
	David Qamaniq (DQ)	P			
	Jeff Higdon (JH)	P	<b>Observer Organization</b>	<b>Participants</b>	
Fisheries and Oceans Canada (DFO)	Kim Howland (KH)	N	World Wildlife Fund – Canada (WWF)	Andrew Dumbrille (AD)	N
	Laura Watkinson (LW)	N		Amanda Main Hanson	P
				Brandon Laforest	P
Environment and Climate Change Canada (ECCC)	Grant Gilchrist (GG)	N	Oceans North Canada	Kristen Westdal	P
	Anne Wilson (AW)	N		Chris Debicki	N
Government of Nunavut	Brad Pirie (BP)	P	<b>Baffinland Consultants</b>	<b>Participants</b>	
	Lauren Perrin (LP)	N	Golder	Patrick Abgrall (PA)	P
			Golder	Erin Linn (EL)	P
		Golder	Phil Rouget (PR)	N	

P-phone in participation, I – In person, N- Not attending

**Discussion and Comments****Baffinland Project Update****Overview of Shipping Season (EM)**

Baffinland's shipping season started on 20 July, with the first ore carrier being loaded on 24 July. The ice management vessel, (Botnica) was active until 10 August. We are expecting the Botnica to return 28 September until approximately 20 October. To date, we have had 41 ore carriers, 3 fuel tankers, 3 resupply vessels called to Port.

AHM: Was the IMV used for wildlife observers as planned?

EM: Yes, there will be a slide later speaking to the SBO program.

**Vessel Traffic Management (EM)**

Throughout the 2018 season, Baffinland has made an effort to continue to improve shipping practices. To kick-off the season, we held a meeting with the Pond Inlet HTO in July before the start of the shipping season. Both the HTO and Hamlet were notified on July 20 when the Botnica first entered the Inlet. Key mitigations for the 2018 season include:

- Ensure compliance with speed limit (9 knots).
- Ensure vessels follow nominal shipping route.
- Ensure usage of anchorage locations and restriction of drifting is understood.

We also held a site meeting with MHTO members on 30-31 August to discuss their perspectives on efficacy of 2018 vessel traffic management measures to seek feedback on recommendations for further mitigations that could be applied during the latter end of the season and into 2019.

Two avenues were established for tracking and reporting on adherence to the Standing Instructions to Masters, which included development of a community shipping complaint and response mechanism, as well as setting up an AIS monitoring station at Pond Inlet HTO office. Baffinland also used AIS data for compliance monitoring to actively respond to alerts when vessels were not adhering to speed restrictions.

**Fuel Spill (EM)**

At the beginning of the season, we had a minor fuel spill as a result of one of the tug boats suffering a gearbox failure. Baffinland responded quickly by deploying oil containment booms and sorbents to contain the release. Investigation indicated that approx. 30 L of gear oil had been released, and that is dissipated quickly.

Baffinland confirmed with Canadian Coast Guard (CCG) that additional measures for spill clean-up were not recommended and the tug was cleared by the CCG for operations.

MHTO: Are all the tugs and ore carriers inspected by Transport Canada?

EL: Transport Canada is regularly at site. Our small zodiac MEEMP boat is even reviewed to ensure it meets standards.

MHTO: What spill equipment do the tug boats have on board?

EM: I will reach out to the operators to provide a response.

MHTO: We don't think the fuel spill has been cleaned up yet?

EM: We completed reconnaissance surveys that show the spill has dissipated. There is no visible sheen left, and the CCG recommended that no additional clean-up measures were required. The follow up report has been shared with MHTO, which details information related to this incident.

#### **6MTPA Application (EM)**

NIRB recommendation was that Baffinland should not be approved to proceed with proposed activities of increasing hauling and shipping to 6MTPA. Baffinland will be issuing a public response in the coming weeks on how we plan to follow up on this recommendation.

DQ: When does Baffinland expect to hear back from the Minister on a decision?

EM: At this point, we are not sure. Baffinland is planning to issue a response respond in the next 2 weeks or so.

JT: As a clarification, the Minister has 90 days to issue a decision, but we are not sure when a decision will come within this timeframe.

#### **Phase 2 EIS (EM)**

Baffinland submitted our Phase 2 EIS on 15 August to NIRB. We are expecting to hear a response from NIRB on conformity with the EIS Guidelines by 14 September.

### **2018 Marine Monitoring Program Overview**

#### **Narwhal Tagging Program**

Golder presented an overview of the marine monitoring programs and preliminary results to date

JH: What were the age and sex of the narwhal tagged with the MiniPat tags?

PA: They were females. Both the Acousonde and MiniPat tags that were deployed were recovered. We are expecting some interesting data as the two tagged narwhals appeared to have stayed in the Project area.

*Post-Meeting Note: At the time of the call, Golder was unable to recall the sex of the whales that were tagged. The meeting minutes have been updated to reflect the confirmed sex of narwhals tagged with MiniPat tags.*

DQ: Were you able to recover all of the tags?

PA: Yes, at one point we thought we may lose one of the tags when the narwhal entered Lancaster Sound, but we were able to retrieve.

DQ: I heard at the co-op that we could earn \$200 if we recovered the tags.

EM: Baffinland was not part of this program, although DFO could have led that initiative. However, we do hire local boat operators to help retrieve the tags.

PA: There were 4 whales tagged in total during 2018: 2 with GPS tags positioning and 2 with Acousondes only.

MHTO: Where were the acoustic recorders deployed?

PA: We will present a map at the next MEWG meeting illustrating where the recorders were deployed.

#### **Bruce Head Vessel-Based Program**

DQ: Is Baffinland going to run the vessel-based program again next year, or will you reinstate the shore-based program from Bruce Head?

MHTO: The observation station at Bruce Head is much better than the vessel-based program, because there is no additional noise created by the vessel when conducting shore-based monitoring.

PA: We are exploring options for the program next year. We should note however, that the vessel used for the Bruce Head program was anchored, and therefore was not producing noise during the observation period.

JH: Were drones used as part of this program?

PA: Yes, but as there was no narwhal spotted during this time, we were not able to complete counts as part of this program in the same way we have done in the past.

EM: Baffinland acknowledges that the Bruce Head shore-based observation program is important to the community of Pond Inlet. We will continue to investigate ways to revitalize the program in future years, depending on the enhancement of safety features for the program.

**Marine Environmental Effects Monitoring and Aquatic Invasive Species Program**

MHTO: We have seen some new species of fish in the area this year. We are not sure what they are called, but we are looking to see what the results of the program will be.

PA: Once we have results we can discuss at upcoming MEWG meetings.

DQ: Did you fish in any of the areas where we wanted to see if fish were being contaminated?

EL: yes, we fished in the DFO permitted areas around Milne Port and Inlet as permitted and planned for 2018.

Mortalities from those efforts are being analyzed for body burden analysis. We were not able to add extra areas in the field as we didn't have the permits needed to sample fish in other locations. We can discuss expanding the Arctic Char monitoring program or areas at upcoming MEWG meetings.

**Early Warning Indicators**

In advance of the meeting, Baffinland provided MEWG participants with an Early Warning Indicator (EWI) submission form template in both English and Inuktitut.

Golder presented on the proposed timelines for developing EWIs to meet Project Certificate Conditions No. 110-112, and provided guidance on the development of indicators to be proposed by MEWG participants.

	<b>Action Item</b>	<b>Action By</b>	<b>Update</b>
1	EM to retrieve list of spill response equipment on tug boats.	Baffinland	
2	Golder to include map identifying where acoustic recorders were deployed at the December MEWG meeting	Golder	
3	MEWG participants to submit EWI comment forms to Baffinland by	MEWG Members / Baffinland	Baffinland received comments from Parks Canada and DFO. Oceans North indicated that they were not able to provide comments without first hearing input from QIA and MHTO. No other comments from MEWG members were received. Separate consultation with MHTO members on the EWIs is scheduled for November 28, 2018.



**Appendix C:  
Final MEWG EWI Submission – Parks  
Canada, 23 October 2018**

Cc: Mercier, Francine (PC) <[francine.mercier@canada.ca](mailto:francine.mercier@canada.ca)>

Subject: [External]RE: [External]RE: [EXTERNAL] Early Warning Indicators and Thresholds Template- Parks canada

**CAUTION:** This email was received from outside of Baffinland systems. It may contain malicious attachments or links. If you are not familiar with the content of the email do not open the attachments or click embedded links.

Hello Emma,

Sorry for the delay, our team has been very busy with a lot of files this month. Due to our limited science capacity in Parks Canada we will leave much of the specific thresholds/monitoring plans to DFO as this is far more their field of expertise. However we have submitted a number of possible options for the MEWG to consider basing formal monitoring plans off of.

**1) Short-term**

- narwhal, bowhead whale, and pinniped behavioural response utilizing existing monitoring programs (i.e. heading change, speed change, group composition change, etc...)
- narwhal and bowhead whale acoustic response (i.e. changes or cessation of vocalisations, can be monitored with hydrophones)
- acoustic tags attached to narwhals, bowhead whales, and/or pinnipeds to provide live information of noise levels experiences by individual mammals.

**2) Long-term**

- population status of narwhal, bowhead whales, and pinnipeds assessed through long term monitoring programs
- changes in time spent within Milne inlet once entered over time for narwhals and bowhead whales (i.e. through use of tagged narwhal data collected by DFO).

**3) Cumulative**

- body condition of observed narwhal

It is difficult to create a monitoring program without initial baselines, and it is unfortunate that these plans were not put in place several years ago as outlined in the project certificate.

Let me know if you have any questions or concerns

Cheers,  
Ryan Eagleson

---

**From:** Emma Malcolm [<mailto:Emma.Malcolm@baffinland.com>]

**Sent:** October-18-18 3:46 PM

**To:** Eagleson, Ryan (PC) <[ryan.eagleson@canada.ca](mailto:ryan.eagleson@canada.ca)>

**Cc:** Mercier, Francine (PC) <[Francine.Mercier@pc.gc.ca](mailto:Francine.Mercier@pc.gc.ca)>

**Subject:** RE: [External]RE: [EXTERNAL] Early Warning Indicators and Thresholds Template- Parks canada

Hi Ryan,

Wondering if you're planning on submitting something on behalf of Parks Canada?

Thanks  
Emma

**Emma Malcolm | Sustainability Specialist**

Oakville - 2265

T: +1 416 364 8820 x5089



2265 Upper Middle Road East, Suite 100, Oakville, Ontario, Canada, L6H 0G5

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---

**From:** [ryan.eagleson@pc.gc.ca](mailto:ryan.eagleson@pc.gc.ca) [<mailto:ryan.eagleson@pc.gc.ca>]

**Sent:** Wednesday, October 10, 2018 2:25 PM

**To:** Emma Malcolm <[Emma.Malcolm@baffinland.com](mailto:Emma.Malcolm@baffinland.com)>

**Subject:** [External]RE: [EXTERNAL] Early Warning Indicators and Thresholds Template- Parks canada

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Sorry. I meant if you had a copy from other government departments (i.e. ECCC and DFO). Thanks :)

cheers,



**Ryan Eagleson**

Conseiller du programme marine  
Direction générale de l'établissement et de la conservation des aires protégées  
Parcs Canada  
[ryan.eagleson@pc.gc.ca](mailto:ryan.eagleson@pc.gc.ca)  
Tél: 819-938-0326

Marine Program Advisor  
Protected Areas Establishment and Conservation Directorate  
Parcs Canada  
[ryan.eagleson@pc.gc.ca](mailto:ryan.eagleson@pc.gc.ca)  
Tel: 819-938-0326

Parcs Canada - 450 000 km<sup>2</sup> de souvenirs / Parks Canada - 450 000 km<sup>2</sup> of memories

From: Emma Malcolm <[Emma.Malcolm@baffinland.com](mailto:Emma.Malcolm@baffinland.com)>  
To: "[ryan.eagleson@pc.gc.ca](mailto:ryan.eagleson@pc.gc.ca)" <[ryan.eagleson@pc.gc.ca](mailto:ryan.eagleson@pc.gc.ca)>  
Date: 10/10/2018 02:20 PM  
Subject: RE: [EXTERNAL] Early Warning Indicators and Thresholds Template- Parks canada

---

Hi Ryan,

I haven't received anything from Parks Canada to-date.

Thanks  
Emma

**Emma Malcolm | Sustainability Specialist**

Oakville - 2265

T: +1 416 364 8820 x5089



2265 Upper Middle Road East, Suite 100, Oakville, Ontario, Canada, L6H 0G5

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**From:** [ryan.eagleson@pc.gc.ca](mailto:ryan.eagleson@pc.gc.ca) [<mailto:ryan.eagleson@pc.gc.ca>]

**Sent:** Wednesday, October 10, 2018 2:05 PM

**To:** Emma Malcolm <[Emma.Malcolm@baffinland.com](mailto:Emma.Malcolm@baffinland.com)>

**Subject:** [EXTERNAL] Early Warning Indicators and Thresholds Template- Parks canada

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Hello Emma,

I was just wondering if you had any copies of the templates you were emailed so far? I am just checking to make sure we don't repeat the exact same thing from each department. Thanks :)

cheers,



**Ryan Eagleson**

Conseiller du programme marine

Direction générale de l'établissement et de la conservation des aires protégées

Parcs Canada

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Parcs Canada - 450 000 km<sup>2</sup> de souvenirs / Parks Canada - 450 000 km<sup>2</sup> of memories

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**Appendix D:  
Final MEWG EWI Submission – Fisheries  
and Oceans Canada, 25 October 2018**