Advance Technical Comment Responses
Phase 2 Proposal – Mary River Project

Baffinland Iron Mines Corporation
Mary River Project
NIRB File No. 08MN053

TABLE OF CONTENTS

LIST OF ATTACHMENTS

GOVERNMENT OF NUNAVUT

ID No#	Document Reference	Info Request	Response	Attachment
GN 11 (this is a follow-up to IR response Dec. 20)	Technical Supporting Document (TSD) 07, Atmospheric Assessment, Section B.1 TSD 07, Atmospheric Assessment, Appendix A, Air Quality Model Phase 2 Proposal Mary River Project - Report	Incorporate all available relevant meteorological data in its modelling and updated results should be presented.	An initial response to this Information Request was provided to the NIRB on December 20, 2018 as part of the "IR Responses, Phase 2 Proposal - Mary River Project". Follow-up information is provided below. Upon review of the meteorological data, it was found that on-site data for the modelling year (2006) are limited: only three months of data are available for the Mine Site and for Milne Inlet. US EPA guidance recommends that a comparison of modelling results to observed data should cover at least 75% of the period in order to be valid. On-site meteorological data were not available when the original meteorological data file was created for the air dispersion modelling. Data used in the modelling are considered to be adequate to represent the typical range of weather conditions that can be expected, i.e., they would capture events that would lead to maximum predicted concentrations. For this reason, it is considered that a direct comparison of the available meteorological monitoring data is not recommended at this time.	
GN 12 (this is a follow-up to IR response Dec. 20)	Technical Supporting Document (TSD) 07, Atmospheric Assessment, Section 3.4 of Appendix 1A 2016 Mary River Project Terrestrial Environment Annual Monitoring Report	Provide the following information: 1. Please update the assessment to incorporate fugitive emissions from the stock piles. 2. Provide a reference or evidence to support using 10m/s as a cutoff for entrainment from stockpiles. 3. A complete assessment incorporating particulate from the stockpiles is required.	An initial response to this Information Request was provided to the NIRB on December 20, 2018 as part of the "IR Responses, Phase 2 Proposal - Mary River Project". A more detailed response to the Information Request has been provided below. 1. Wind erosion of the stockpiles was assessed using the modeled wind speed extracted at the Mine Site and the Milne Port. The selected wind height was 10 m above ground surface. Tables 1 and 2 (Appendix 1) show the wind erosion emissions at the Mine Site and the Milne Port. Those emissions are also compared with the total modeled emissions at those facilities. As shown, the wind erosion emissions are many orders of magnitude smaller than the facility total and therefore were considered to be negligible. One could argue that the top of stockpiles may be higher than 10 meters and therefore the wind speed could be stronger than the values used in the previous analysis. [Recent information provided by Baffinland confirmed that the maximum stockpile height for Stockpile #2 is 20.5 m and the maximum height of the fines stockpile, Stockpile #1, will be 16 m.] Wind erosion emissions were re-assessed using predicted wind at 30 meters as a more conservative assessment of emissions from stockpile erosion, see Tables 3 and 4. As shown, the wind erosion emissions are still many orders of magnitude smaller than the facility total and therefore would still be considered negligible. 2. The USEPA method for estimating emissions from stockpiles was used. This guidance document states that field testing of exposed materials indicates that threshold wind speeds exceed 10 m/s at 7 m above the surface. As meteorological data used in evaluating threshold wind speed is based on measurements at 10 m above surface, the assumption of 10 m/s as a threshold velocity for wind erosion is conservative. The wind speed of 10 m/s was derived from the following equation: *U10= 1/0.4 X Ustar_threshold X ln (10 m/zo)* *where zo = 0.003 m (tundra and/or perennial snow), and Ustar_threshold = 0.478 m/s.* 3. Given that predicted emissions from stockpiles due to wind erosion are orders of magnitude lower than overall facility emissions, (even considering wind speeds at a height of 30 m), an assessment incorporating particulate from the stockpiles is not warranted.	GN 12 Attachment 1: Associated Tables
GN 13	Technical Supporting Document (TSD) 07, Atmospheric Assessment, Section 2.2 and appendix C2017 Mary River Project Terrestrial Environment Annual Monitoring Report	Provide the following information: 1. The Proponent should compare the current modelling results to data collected as part of the ongoing dustfall monitoring taking place at the Project. This should include an analysis of production rates versus emission rates and inclusion of all Project source and appropriate meteorology (see Information Request #11; Air Quality Model Phase 2 Proposal). a. If a significant discrepancy exists, the Proponent should calibrate the model with available measured data (e.g., dustfall). b. Following calibration, the Proponent should: i. Revise predictions for maximum ground level concentrations for the requested 30 Mtpa of production. ii. Update the Human Health Risk Assessment and Water Quality Assessment based on the new modelling results if required. iii. Re-assess the effectiveness of current dust management practices and dust suppression activities.	The following is a brief summary of the response to this comment; the full response is provided in Appendix 1. A comparison was made between modelled dust deposition and measured dust deposition. In general, the comparison shows that the model is providing realistic results, but at locations that are in very close proximity to operations at the port, measured levels are higher than modelling, indicating they were likely influenced by dust from additional miscellaneous minor activities at the site (on-site vehicle traffic associated with pick-up trucks, etc.) that were not included in the modelling. Operations during the monitoring period (2013-2018) varied from no production (2013-2014) to 5.4 Mtpa in 2018. However, monitoring was not completed for the full years in 2013-2014; 2015-2017 had full years of monitoring, when operations varied from 0.9, 2.7 and 4.5 Mtpa, and in 2018 (5.4 Mtpa) a full year of monitoring data were obtained but not for all monitoring stations. Therefore, it was assumed that the majority (i.e., the average) of the monitoring data represent dustfall levels from operations of approximately 3.5 million tonnes per annum (Mtpa) of iron ore transported to Milne Port by truck along the existing Tote Road for open water shipping. No calibration of the model based on these monitoring results is recommended.	GN 13 Attachment 1: Full Response

ID No#	Document Reference	Info Request	Response	Attachment
GN 27 (this is a follow-up to IR response Dec. 20)	Technical Supporting Document (TSD) 07, Atmospheric Assessments, Appendix D, Environmental Noise TSD 07, Atmospheric Assessments, Section 2.2.3, Table 4, page 11	Provide the following information: 1. Supporting rationale for why a ground factor G=1.0 is appropriate for winter modeling conditions. 2. A sensitivity analysis to demonstrate that assessment conclusions would not change if a different ground attenuation factor was used for bodies of water such as Milne Inlet, Camp Lake or Sheardown Lake.	A response to this Information Request was provided to the NIRB on December 20, 2018 in "IR Responses, Phase 2 Proposal - Mary River Project". A figure has been produced in support of the Information Request and is provided in Appendix 1.	GN 27 Attachment 1: Noise Figure 5b and 6B
GN 34 (this is a follow-up to IR response Dec. 20)	Technical Supporting Document (TSD) 07, Atmospheric Assessments, Appendix D, Environmental Noise TSD 07, Atmospheric Assessments, Section 3.2.3, Figure 9, page 27	Provide a figure similar to Figure 9 that presents predicted short-term sound levels during a train passby event versus the distance from the rail line.	A response to this Information Request was provided to the NIRB on December 20, 2018 in "IR Responses, Phase 2 Proposal - Mary River Project". Additional information is provided below. Figure 9 shows the requested sound level from the rail centre-line. The title above this figure is correct, but the x axis label "Distance from Centre of Road (meters)" should read "Distance from Centre of Rail (meters)".	
GN 35 (this is a follow-up to IR response Dec. 20)	Technical Supporting Document (TSD) 07, Atmospheric Assessments, Appendix D, Environmental Noise TSD 07, Atmospheric Assessments, Section 3.2.3.2, page 27	Provide the following information: 1. Provide the assumptions used for the train noise modeling. Are train horns included? 2. Confirm the assumptions represent a worst-case scenario (i.e. the construction and/or production period at which the highest frequency of locomotives are travelling between the Mine Site to Milne Port).	A response to this Information Request was provided to the NIRB on December 20, 2018 in "IR Responses, Phase 2 Proposal - Mary River Project". A figure has been produced in support of the Information Request and is provided in Appendix 1.	GN 35 Attachment 1: Noise Figure 3B and 4B
GN 39 (this is a follow-up to IR response Dec. 20)	Technical Supporting Document 07, Atmospheric Assessments, Appendix E, Updated Environmental Noise Impact Assessment, Figures 1 and 2	Provide the following information: 1. The Proponent should explain why the noise contours drop off at this location along the roadway. 2. If necessary, the Proponent should revise any figures that are affected (e.g., Figures 1 and 2 in Appendix E).	A response to this Information Request was provided to the NIRB on December 20, 2018 in "IR Responses, Phase 2 Proposal - Mary River Project". A figure has been produced in support of the Information Request and is provided in Appendix 1.	GN 39 Attachment 1: Noise figure 10 and 11
GN 54 (this is a follow-up to IR response Dec. 20)	Technical Supporting Document (TSD) 11, Evaluation of Exposure Potential from Ore Dusting Events in Selected VECS, Section 07, page 62	Complete further quantitative assessment regarding risks due to blueberry consumption to support its conclusion that ingestion risks are not present. In particular, the assessment should answer whether this conclusion remains valid if blueberries are consumed if this pathway is found to be complete and significant (i.e. if blueberries or other available country foods are available and regularly consumed).	Please refer to the response to HC 03 for additional technical information related to this response.	

CIRNAC

ID No#	Document Reference	Info Request	Response	Attachment
CIRNAC 1	NIRB Amended EIS Guidelines for the Mary River Phase 2 Development Proposal, Section 7.1 – Baseline Information Collection Baffinland FEIS Addendum Mary River Project Phase 2 Proposal, Section 8.2.7 TSD-25 Socio-Economic Assessment	CIRNAC requests that the Proponent provide, as per the EIS Guidelines, a statement on the adequacy of baseline data used for each of the 10 VSECs presented in TSD-25 and the rationale for pronouncing the data as "adequate" or "inadequate."	Baffinland has presented comprehensive socio-economic baseline information in support of the environmental assessment phases of the Mary River Project. Detailed socio-economic baseline conditions within the local and regional study areas (LSA and RSA) were initially described in the Final Environmental Impact Statement (FEIS) for the Approved Project. This information continues to serve as a valuable baseline that has informed the assessment of Project-related effects and the design of Project components. Furthermore, Project socio-economic monitoring has documented changing socio-economic conditions since 2013 and the findings of these annual reports have been summarized in and appended to Baffinland's annual reports to the NIRB. Likewise, the FEIS Addendum for the Phase 2 Proposal includes several new sources of socio-economic information relevant to the assessment of the Project. Key sources of socio-economic baseline information that have been presented by Baffinland are summarized below: • FEIS • Socio-Economic Baseline Report (Appendix 4A of the FEIS; Baffinland 2012) • Economic Impact Model (Appendix 4B of the FEIS; Baffinland 2012) • Land Use Baseline Report (Appendix 4C of the FEIS; Baffinland 2012) • Preliminary Archeological Mitigation Plan (Appendix 4D of the FEIS; Baffinland 2012) • Monitoring Reports • 2013 Socio-Economic Monitoring Report (BDSI 2014) • 2014 Socio-Economic Monitoring Report (BDSI 2015) • 2015 Socio-Economic Monitoring Report (JPCSL 2016) • 2016 Socio-Economic Monitoring Report (JPCSL 2017) • 2017 Socio-Economic Monitoring Report (JPCSL 2018) • 2016 Archaeology Status Update Report (KP 2017) • FEIS Addendum for the Phase 2 Proposal • Updated Socio-Economic Baseline Report (Appendix C to TSD 25) • Updated Economic Impact Model (Appendix A to TSD 25) • Worker Experience Report (Appendix E to TSD 25) • Labour Market Analysis Report (TSD 26) • Phase 2 Proposal Community Workshops Report (TSD 03) • Mary River Inuit Knowledge Study Mapbook (TSD 05) In addition, a revised Labour Market Analysis (LMA; original version was presented as TSD 26) has been prepared and was included with Baffinland's Information Request responses to NIRB on December 18, 2018. This revised LMA incorporates new data released through the 2016 Census on population demographics, education levels, and labour force characteristics of the Local Study Area (i.e. Arctic Bay, Clyde River, Hall Beach, Igloolik, Pond Inlet, and Iqaluit). The revised LMA now also includes new data and analysis pertaining to a 'secondary labour market' (i.e. Cape Dorset, Grise Fiord, Kimmirut, Pangnirtung, Qikiqtarjuaq, Resolute, and Sanikiluaq), to reflect Baffinland's commitment to provide air transportation for Inuit employees from the Baffin Region to and from the Project at no cost to the employee (as per IIBA Article 7.6.2). The revised LMA also incorporates population projections for the LSA and secondary labour market based on a 20-year outlook, so that potential movement of Inuit into the labour force through population growth is addressed. The revised LMA uses this information to provide an estimate of the potential workforce in the LSA (i.e. the ready, able, and willing labour supply). Acknowledging the above, Baffinland considers the baseline data it has presented in support of the Phase 2 Proposal to be adequate for use in the socio-economic assessment of the VSECs discussed in TSD 25. Baffinland's rationale is based on: • The comprehensiveness of socio-economic baseline information that has been presented, dating back to the FEIS for the Approved Project; • Acknowledgement that broad socio-economic conditions within the LSA and RSA have not meaningfully changed since the FEIS was issued, with the exception of changes the Project itself has introduced within the LSA in terms of employment, training, economic opportunities, the Project's land use activities, and associated indirect effects; • Project socio-economic monitoring has documented changing socio-economic conditions since the FEIS, focused on key issues of relevance to the Project; and, • Additional socio-economic baseline information has been updated/provided in support of the Phase 2 Proposal, where appropriate.	

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			References: Baffinland Iron Mines Corporation (Baffinland). 2012. Mary River Project - Final Environmental Impact Statement. February. Brubacher Development Strategies Inc. (BDSI). 2014. Baffinland Iron Mines Corporation - Mary River Project - Socio-Economic Monitoring Report. Prepared for Baffinland Iron Mines Corporation. October 29. Brubacher Development Strategies Inc. (BDSI). 2015. Baffinland Iron Mines Corporation - Mary River Project - 2014 Socio-Economic Monitoring Report. Prepared for Baffinland Iron Mines Corporation. March. Jason Prno Consulting Services Ltd. JPCSL). 2016. Draft 2015 Socio-Economic Monitoring Report for the Mary River Project. Prepared for Baffinland Iron Mines Corporation. March. Jason Prno Consulting Services Ltd. (JPCSL). 2017. 2016 Socio-Economic Monitoring Report for the Mary River Project. Prepared for Baffinland Iron Mines Corporation. March. Jason Prno Consulting Services Ltd. (JPCSL). 2018. 2017 Socio-Economic Monitoring Report for the Mary River Project. Report prepared for Baffinland Iron Mines Corporation. March 31, 2018. Knight Piésold Ltd. (KP). 2017. Mary River Project - 2016 Archaeology Status Update Report for the Government of Nunavut. February.	
CIRNAC 14 (this is a follow-up to IR response Dec. 20)	TSD-06 Climate Change Assessment TSD-08 Landforms, Soil and Permafrost TSD-28 Management Plans, Appendix H - Phase 1 Waste Rock Management Plan	CIRNAC requests that the Proponent provide the following: a) Thermal modelling or analysis and monitoring plans for the entire service life of the infrastructure and related facilities such as the North Railway, docks, railway embankments, bridges, and other relevant components, as well as for the WRF; b) Incorporate the site-specific meteorological information in its climate change assessment and update the relevant modelling accordingly; c) Clarification as to when the Proponent expects suitable data to become available for updating thermal modelling; and d) Thaw consolidation data or thaw strain predictions for various infrastructures, namely North Railway, docks, railway embankments, bridges, and other relevant components.	A response to this Information Request was provided to the NIRB on December 20, 2018 in "IR Responses, Phase 2 Proposal - Mary River Project". Thermal modeling has been produced in support of the Information Request and is provided in Appendix 8.	Appendix 8 Thermal Analysis Model
CIRNAC 15	TSD-28 Appendix H, Phase 1 Waste Rock Management Plan, Section 8 TSD-28 Appendix I, Interim Waste Rock Management Plan	CIRNAC requests that the Proponent provide the following: a) Relevant updates to the Phase 1 Waste Rock Management Plan on closure strategies based on thermal modelling in light of climate change; b) Additional short and long term contingencies for managing potential ARD/ML concerns; and c) Comparison to other relevant mine sites in similar climatic conditions using the strategy establishing and maintaining permafrost in order to encapsulate PAG material within a waste rock storage facility.	The Phase 2 Proposal does not involve any changes to the waste rock facility. The current ARD/ML issue, and questions around permafrost encapsulation, are being addressed as part of ongoing operations under the Type A Water Licence. An updated Interim Waste Rock Management Plan was submitted for review on December 31, 2018. An updated Phase 1 Waste Rock Management Plan will be submitted for review by December 31, 2019.	

ID No#	Document Reference	Info Request	Response	Attachment
CIRNAC 17 (this is a follow-up to IR response Dec. 20)	NIRB Amended EIS Guidelines for the Mary River Phase 2 Development Proposal, Sections 6.5.3.1, 6.5.3.2, 6.5.3.3 and 6.5.13 TSD-02 Project Description TSD-28 Management Plans, Appendix H - Phase 1 Waste Rock Management Plan, Section 5.3 TSD-28 Management Plans, Appendix I - Interim Waste Rock Management Plan	CIRNAC requests that the Proponent provide the following: a) The 2014 version of Mine Rock ML/ARD Characterization Report Deposit 1, Mary River Project, as appended to the Life-of-Mine Waste Rock Management Plan; b) Detailed results from the blast hole data completed in 2017, referred to in the Interim Waste Rock Management Plan; c) Detailed results from 2018 Geochemical Evaluation, referred to in the Interim Waste Rock Management Plan; and d) Geochemical reports or data sets from mine sites in comparable climatic conditions.	A response to this Information Request was provided to the NIRB on December 20, 2018 in "IR Responses, Phase 2 Proposal - Mary River Project". Results from the 2018 geochemical evaluation will be considered and presented as part of the process to develop the Phase 1 Waste Rock Management Plan, due for submission by December 31, 2019.	

FISHERIES AND OCEANS CANADA

ID No#	Document Reference	Info Request	Response	Attachment
DFO 3.2.3		Provide a memorandum to summarize and discuss the results from 2014 and 2015 marine mammal surveillance monitoring program conducted onboard the Project ore carriers in 2014 and 2015.	In 2014, training of Inuit Marine Mammal Observers (MMO) occurred on August 14 and September 6-8. Three marine mammal surveys were completed in 2014. Inuit MMOs boarded the Maria Desgagnés (fuel tanker) at Milne Port on 15 August and disembarked from this vessel at Pond Inlet later that same day. Inuit MMOs boarded the Maria Desgagnés (fuel tanker) again at Milne Port on September 7, 2014 and disembarked at Pond Inlet on September 8. The third survey included boarding the Claude A. Desgagnés (sealift vessel) on September 10 and disembarking at Pond Inlet later that same day. In 2015, training of Inuit Marine Mammal Observers (MMO) occurred on August 20, in Pond Inlet. Three marine mammal surveys were completed in 2015. Inuit MMOs boarded the Sedna Desgagnés (sealift vessel) at Pond Inlet on August 23 and disembarked from this vessel at Milne Port on August.24 Inuit MMOs boarded the Sarah Desgagnés (fuel tanker) again at Pond Inlet on September 1 and disembarked at Milne Port on September 2. The third survey included boarding the Sarah Desgagnés (fuel tanker) on September 25 at Pond Inlet and disembarking at Milne Port on September 26. Marine mammal observations and survey time for the 2014 and 2015 ship-based monitoring (i.e. surveillance) programs are provided in Table 1 (Appendix 2). The 2014 and 2015 ship-based monitoring programs provided limited observations of marine mammals at least partly due to low amount of survey time. These programs also had significant health and safety risk due to Inuit MMOs boarding at sea. The program was suspended after 2015 due to health and safety concerns for Inuit MMOs by BIM. In 2018, the ship-based monitoring program was implemented using an ice management vessel during the shipping shoulder seasons. The 2018 program mitigated BIM's health and safety concerns by boarding Inuit MMOs at Milne Inlet and provided greater survey time since MMOs could remain aboard the vessel for multiple days. The report of the 2018 monitoring will be provided in Q1 of 2019. No marine mammal vessel strikes associated with Project vessels have been observed to date. Current monitoring results support the assessment prediction that Project vessel strikes would have a low likelihood and a negligible residual effect on marine mammals (TSD 24 Marine Mammal Baseline and Impact Assessment, Section 2.0). Continued Project monitoring of marine mammal-vessel strikes will reduce uncertainty regarding marine mammal-vessel strikes and will inform on the accuracy of assessment predictions and mitigation effectiveness. Reports for the 2014 and 2015 ship-based monitoring programs (SEM 2015, 2016) were posted on the NIRB public registry. **References** SEM (Sikumiut Environmental Management Ltd.). 2015. Report on 2014 Ship-based Observer Program. Prepared for Baffinland Iron Mines Corporation by Sikumiut Environmental Management Ltd., St. Johns, NL. SEM. 2016. Report on 2015 Ship-based Observer Program. Prepared for Baffinland Iron Mines Corporation by Sikumiut Environmental Management Ltd., St. Johns, NL.	DFO 3.2.3 Attachment 1: Table 1 Ship-based Observer Program - Marine Mammal Observations and Survey Time (2013 to 2015)
DFO 3.2.2		Provide additional information on: a) Areas that will be impacted by noise that may extend shoreline to shoreline and the potential impacts to mammals that are not expected to display displacement/abandonment; b) Information on proposed anchorage areas including routing, duration of vessels in anchored areas, and maximum number of vessels expected; c) The approaches that will be used to mitigate the cumulative effects of strikes and sound on habitats used by marine mammals in areas where avoidance behaviour may not occur; d) The approaches that will be used to mitigate the cumulative effects of strikes and sound on habitats used by marine mammals for nursery, rearing, and foraging, especially in areas where avoidance behaviour may not occur; and, e) The monitoring approaches that will be used to assess impacts of all activities to marine mammals during shoulder seasons.	a) Maps of the modelled underwater sound fields generated by Phase 2 Proposal construction activities and shipping during operations are provided in Appendix E of JASCO's Underwater Noise Assessment for the Mary River Project – Phase 2 Proposal (see Appendix B of TSD 24 Marine Mammal Baseline and Impact Assessment). Note that underwater noise modelling was only conducted to the behavioural response threshold of 120 dB 1µPa. It is acknowledged that acoustic masking effects may occur at sound levels <120 dB (corresponding with a longer range of potential effects); however, masking was not considered in the model for the following reasons: 1) no established regulatory thresholds for masking exist, 2) predicting masking effects is difficult as masking is species-specific and thus requires detailed information on a species' hearing ability (i.e. audiograms) which is lacking for many arctic species including narwhal, and 3) more research is needed to understand the process of masking, the risk of masking by anthropogenic activities such as shipping, the ecological significance of masking, and what anti-masking strategies are used by animals and their degree of effectiveness before masking can be incorporated into regulation strategies or approaches for mitigation (Erbe et al. 2016). Although acoustic modelling for shipping was only conducted to the behavioural response threshold of 120 dB 1µPa, a conservative approach to approximate the 'zone of masking' from shipping would be to calculate the distance at which ship noise would attenuate to ambient noise levels in the region. As masking effects cannot occur below background noise, this would represent the absolute maximum range masking effects could extend. Note that this is also equivalent to the maximum zone of audibility for all marine mammal species for any sound source of interest. Broadband ambient noise levels in the RSA range from 90 to 115 dB 1µPa (Greeneridge 2015). Based on this approach, all ship transits along the Northern Shipping Route would likely emit a masking zone that extends shoreline to shoreline (around the immediate vicinity of the vessel), and this would be limited to the duration of the vessel passage relative to the receiver. In the RSA, a conservative estimate of the maximum range of masking effects	

ID No#	Document Reference	Info Request	Response	Attachment
			from ship noise is 25 km (13.5 nautical miles) relative to the source. Based on this size of masking zone, and assuming a marine mammal receptor is stationary relative to a transiting vessel (travelling at 9 knots), an animal in Eclipse Sound may be exposed to noise levels capable of masking for a period lasting up to 3 h per vessel interaction (assuming sound propagation is uninterrupted by land). In Milne Inlet, the masking zone (and corresponding noise exposure period) would be smaller given sound propagation is limited in this area by geographical features. Based on the Phase 2 Proposal shipping schedule, a maximum of two ship transits per day is anticipated. Thus, a marine mammal occurring in open waters of Eclipse Sound would have the potential to be exposed to noise levels capable of masking for up to 6 h per day, assuming that the individual remained within 25 km of the shipping corridor during both exposure events. This coarse estimate ignores the different hearing abilities amongst different marine mammal species in the RSA. As noted in TSD 24, narwhal (the most common cetacean in the RSA) are anticipated to be less affected by masking due to the fact that the majority of ship noise energy is<1 kHz; which is below the main frequency range narwhal use for communication and echolocation (5 to 100 kHz), and thus assumed to be outside their sensitive hearing range. Masking typically occurs when the masking noise and the signal of interest share similar frequencies and overlap in time (Richardson et al. 1995). Potential effects to marine mammals that are not expected to demonstrate displacement or abandonment from the 'zone of acoustic impact' would include 1) no changes in behaviour, 2) local avoidance behaviour (changes in dive behaviour, change in travel speed, avoidance of shipping lane, 'freeze' response), and/or 3) auditory masking, with associated changes in vocal behaviour reflective of anti-masking strategies. These effects were considered in TSD 24 (Sections 2.5 to 2.9) and are built into current and future environmental effects monitoring programs to evaluate the accuracy of effect predictions and the effectiveness of mitigation. b) At this time Baffinland is not proposing any positional changes to the current anchorage locations or operations. In 2018, Baffinland instituted a practice whereby no more than 3 vessels are to be in the anchorage location (and/or alternate area identified with input from the community of Pond Inlet, when the captain determines it unsafe to remain at anchorage). Baffinland expects to continue this practice moving forward with the understanding that discussions with the community of Pond Inlet will continue and specific operational changes may evolve through those meetings. Baffinland will also be undertaking additional simulation modelling for the Phase 2 Proposal during Q1 and Q2 of 2019. If updates to operational practices or proposed locations of the anchorage are required as the result of these simulations, Baffinland will provide the updated information during the Phase 2 Proposal review process. c) Mitigation that will be used by the Project (including all Project vessels) to minimize the cumulative effects of marine mammal strikes and acoustic disturbance on marine mammals were presented in TSD 24 (Section 2.5.2.2). Some examples include: • Vessel speed limit of 9 knots in the shipping corridor and 5 knots in Milne Port. Vessels will maintain a constant course and speed when in transit. • Idling will be minimized at the ore dock. • Vessels will avoid marine mammals or stop to allow marine mammals to move away. • Baffinland can only manage the impacts of its own activities, while other proponents are responsible for their own impacts. d) Please see the response to item (c) above. The stated mitigation measures are predicted to be effective for avoiding and/or minimizing the potential for ship strikes and acoustic disturbance in habitat areas marine mammals use for nursing, rearing, and foraging. For narwhal and seals, these habitat areas occur throughout the RSA. Ongoing environmental effects monitoring programs have been developed to evaluate the accuracy of stated effect predictions and the effectiveness of mitigation. e) Proposed example marine mammal monitoring programs that will overlap with the shoulder seasons during Phase 2 Proposal include the following: Ship-based Observer Program; Marine mammal aerial survey program; Narwhal tagging program; and Passive acoustic monitoring program. **References** Erbe, C.E., Reichmut, C., Cunningham, K., Lucke, K. and Dooling R. 2016. Communication masking in marine mammals:A review and research strategy. Marine Pollution Bulletin. 103: 15-38 Greeneridge Sciences Ltd. (Greeneridge). 2015. Acoustic Monitoring near Koluktoo Bay, Milne Inlet, July-September 2014. For Baffinland Iron Mins Corporation. Greeneridge Report 511-2. May 2015. Quijano, J.E., C. O'Neill, and M. Austin. 2018. Underwater Noise Assessment for the Mary River Phase 2 Expansion Project:Construction and operation activities in Milne Port and along the proposed northern shipping corridor. Document 01621, Version 1.0. Technical report by JASCO Applied Sciences for Golder Associates Ltd.	

ECCC

<table>
<tr><th>ID No#</th><th>Document Reference</th><th>Info Request</th><th>Response</th><th>Attachment</th></tr>
<tr><td>ECCC 02</td><td>TSD 6 - Climate Change Assessment</td><td>ECCC requests that the Proponent provide and utilize a broader range of climate projections (low, medium, high RCP scenarios) appropriate for the region from an ensemble of models and RCPs for the 2081-2100 time period to evaluate the potential implications of future climate change on the Project and related environmental conditions.</td><td>Table 1 below provides the full range of temperature-change predictions (minimum, 25th percentile, 50th percentile (median), 75th percentile, and maximum) using CMIP5 global models for the four available representative concentration pathways (RCP2.6, RCP4.5, RCP6.0, and RCP8.5). The following points should be noted:

The purpose of Section 3.4.6 of TSD 06 (Climate Change Assessment) was to qualitatively discuss the wide range of environmental and specific local factors affecting the warming of permafrost soils in the Project region. No attempt was made to quantify the depth of seasonal permafrost thawing due to the large uncertainties and spatial heterogeneity. It was pointed out in Section 3.4.7 that the base depth of permafrost at the project site will be unaffected by climate change over a time scale of roughly 2,000 years. That statement applies to all RCP scenarios.

The focus of the definitions of the RCP scenarios are future anthropogenic emissions. For example, the RCP8.5 scenario is a projection of business-as-usual emissions resulting in additional radiative forcing of 8.5 W/m2 by 2100 (Box SPM.1 in IPCC, 2013). The associated predicted median global warming is approximately 4°C (Figure SPM.7 in IPCC, 2013). At the other end of the scenario range in Table 1, RCP2.6 corresponds to 2.6 W/m2 and about 1°C. The RCP2.6 and RCP8.5 scenarios are often considered to represent the "full range of potential change by end of century" as phrased in the IR. However, to our best knowledge, no assessment is provided by the IPCC if the future emission scenarios are realistic in the context of technological, social, political, and economical factors that will affect future anthropogenic emissions. Without a full assessment of these factors and their interactions, there is no support for the claim that the four emission scenarios presented in Table 1 below represent the full range of potential change by end of century.

The range of temperature predictions across the CMIP5 models in Table 1 does not represent statistical uncertainties of model predictions. For instance, the 75th percentile of the RCP4.5 scenario states that 75% of the 42 CMIP5 models that contributed predictions, predicted warming of up to 4°C in the CGI SREX region by 2100. It does not mean that there is a 75% probability that the temperature increase will be 4°C. Each model is perfectly deterministic and designed to provide the best answer based on the model assumptions and setup. Statistics across different models only provide context for the spread of model predictions based on the different assumptions and model realizations. No attempt is made in the calculation of these statistics to weight the models based on their strengths or weaknesses. Some of the models are slightly different variations of the same model by the same model group, while other models are substantially different. However, no corrections are applied for running four similar versions of the same model versus only one version of a different model. In addition, it causes selection bias when modelling groups choose to model specific scenarios. Finally, percentiles are independent of the number of models, but minimum and maximum become more extreme as the number of models increases; hence, minima and maxima in Table 1 are likely more extreme for RCP4.5 based on 42 models than RCP6.0 based on 25 models.

Table 1: Temperature changes
<table>
<tr><th>Scenario</th><th>Minimum</th><th>25th Percentile</th><th>50th Percentile (Median)</th><th>75th Percentile</th><th>Maximum</th></tr>
<tr><td>RCP2.6[1]</td><td>-2.5</td><td>1.3</td><td>1.7</td><td>2.5</td><td>4.4</td></tr>
<tr><td>RCP4.5[2]</td><td>-0.2</td><td>2.6</td><td>3.2</td><td>4</td><td>6.4</td></tr>
<tr><td>RCP6.0[3]</td><td>1.2</td><td>3.3</td><td>3.9</td><td>4.8</td><td>7.6</td></tr>
<tr><td>RCP8.5[4]</td><td>4.2</td><td>5.6</td><td>6.4</td><td>7.9</td><td>10.5</td></tr>
</table>
Notes:
[1] Ref.: Table 14.SM.1a. Statistics based on 32 CMIP5 models.
[2] Ref.: Table 14.1. Statistics based on 42 CMIP5 models.
[3] Ref.: Table 14.SM.1b. Statistics based on 25 CMIP5 models.
[4] Ref.: Table 14.SM.1c. Statistics based on 39 CMIP5 models.

The temperature changes presented in Table 1 (in degrees Celsius) were predicted by CMIP5 global models from the historical 1986-2005 period to the future 2081-2100 period for the high latitude SREX (IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation) region CGI (Eastern Canada, Greenland, Iceland) for the four representative concentration pathways RCP2.6, RCP4.5, RCP6.0, and RCP8.5. Shown are five statistics across the model predictions based on the number of models specified in the foot notes: maximum, 25th percentile, 50th percentile (median), 75th percentile, and maximum. Table 14.1 can be found in IPCC (2013) and Tables 14.SM.1a-c in Supplementary Material to IPCC (2013).

References:

IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and</td><td></td></tr>
</table>

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<tr><th>ID No#</th><th>Document Reference</th><th>Info Request</th><th>Response</th><th>Attachment</th></tr>
<tr><td></td><td></td><td></td><td>P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp. Accessible at: https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_all_final.pdf

Supplementary Material to IPCC, 2013: Climate Phenomena and their Relevance for Future Regional Climate Change, 14SM Supplementary Material. Accessible at: https://www.ipcc.ch/site/assets/uploads/2018/07/WGI_AR5_Chap.14_SM.pdf</td><td></td></tr>
<tr><td>ECCC 03</td><td>TSD 6 - Climate Change Assessment</td><td>ECCC requests that the Proponent provide specific information on the planned diesel generator sets to be installed at Milne Port as listed below:
a) The model and sizes
b) Expected fuel consumption and greenhouse gas emissions for both the approved project and Phase 2 expansion.
c) Criteria air contaminant emissions and whether the new stationary diesel generator sets will be certified higher than the current Tier 2 emission standards employed at the power plant.</td><td>a. Power generation equipment specifications are provided in Appendix A (Emissions Sources) of the Air Quality Model Report (Appendix A of TSD 07 Atmospheric Assessments). The four additional 1.35 MW generators referenced in TSD 07, Appendix B, will be the same as the Cummings 1.35 MW generators included in the air quality model in Appendix A.

b. A comparison of GHG emissions forecasted for the Phase 2 Proposal relative to the Approved Project is provided in Section 2.3.1 of TSD 06 (Climate Change Assessment).

c. Modelling of CACs including the stationary diesel gensets is presented in TSD 07, Appendix A. The new diesel gensets will meet Tier 2 emissions standards as noted in the generator specifications.</td><td></td></tr>
<tr><td>ECCC 04</td><td>TSD 07: Atmospheric Assessments</td><td>ECCC requests that the Proponent provide an estimate of the locomotive emissions for all rail transport associated with the Phase 2 expansion.</td><td>Locomotive emissions from rail operations to transport ore from the Mine Site to Milne Port along the Northern Transport Corridor were not assessed, as air quality impacts from these operations were considered insignificant. This is because there are a limited number of trains passing by each day (up to five per day), and the trains will not normally be idling in one location for any length of time therefore the contribution to local air quality will be very small. Compared to emissions from train operations at the Mine Site or Milne Port, emissions from trains in transit at any one location, (which the locomotive would pass by within seconds), would clearly be insignificant.

For rail operations at Milne Port and the Mine Site, two locomotives were conservatively assumed to be idling continuously (i.e., 24 hours/day) at both locations. Table 1 shows the emission rates for the locomotives idling and compared those to the facility total emission rates at the Milne Port and the Mine Site.

Table 1: Emissions from locomotives idling
<table>
<tr><th>Contaminant</th><th>Emission rate for 2 locomotives idling (g/s)</th><th>Total emission rate at Milne Port (g/s)</th><th>Locomotive emissions as % of total – Milne Port</th><th>Total emission rate at the Mine Site (g/s)</th><th>Locomotive emissions as % of total – Mine Site</th></tr>
<tr><td>NO_X</td><td>0.78</td><td>126.6</td><td>0.6%</td><td>99.9</td><td>0.8%</td></tr>
<tr><td>CO</td><td>0.33</td><td>13.4</td><td>2.5%</td><td>8.4</td><td>4.0%</td></tr>
<tr><td>SO_2</td><td>0.07</td><td>5.5</td><td>1.2%</td><td>0.2</td><td>38.3%</td></tr>
<tr><td>$PM_{2.5}$</td><td>0.04</td><td>7.5</td><td>0.6%</td><td>9.8</td><td>0.4%</td></tr>
</table>
From Table 1 it can be seen that locomotive emissions represent only a small fraction of overall emissions of NO_X and $PM_{2.5}$, the contaminants that showed exceedances of their air quality criteria.

One could argue that the locomotives are not always idling and instead move the wagons almost continuously in the rail yard. Emission rates were therefore estimated for two locomotives moving the wagons on the rail yards on the property sites. Those emissions were estimated based on the following documents:

• USEPA, Locomotives emission standard, 1997
• Railway Association of Canada, Locomotive Emissions monitoring Program, 2014.

As proposed in the USEPA document, the switching operations in a rail yard still require idling 60% of the time. Details of the calculations of the emission rates can be found in Appendix 3.

Table 2 shows the emission rates for the locomotives moving ore on the rail yard and compared those to the facility total emission rates at the Milne Port and the Mine Site.</td><td>ECCC 4 Attachment 1: Detailed Emission Rates Calculations for Locomotives</td></tr>
</table>

<table>
<tr><th>ID No#</th><th>Document Reference</th><th>Info Request</th><th>Response</th><th>Attachment</th></tr>
<tr><td></td><td></td><td></td><td>
Table 2: Emissions from locomotives moving in the rail yards (compared to locomotives idling only)
<table>
<tr><th>Contaminant</th><th>Emissions for 2 locomotives moving in the rail yards</th><th>Emission increase for locomotives</th><th>Emission increase for locomotives at Milne Port</th><th>Emission increase for locomotives at the Mine Site</th></tr>
<tr><td></td><td>g/s</td><td>g/s</td><td>%</td><td>%</td></tr>
<tr><td>NO_X</td><td>1.48</td><td>0.70</td><td>0.6%</td><td>0.7%</td></tr>
<tr><td>CO</td><td>0.69</td><td>0.35</td><td>2.6%</td><td>4.2%</td></tr>
<tr><td>SO_2</td><td>0.04</td><td>-0.03</td><td>-0.5%</td><td>-15.3%</td></tr>
<tr><td>$PM_{2.5}$</td><td>0.05</td><td>0.004</td><td>0.05%</td><td>0.04%</td></tr>
</table>
From Table 2, it can be seen that the emission rates for locomotives moving in the rail yard have the same magnitude as the ones for idling. The NOx emission rates for the locomotives moving are higher than idling but those represent an increase of less than 1% at both Milne Port and the Mine Site. SO_2 values decrease for moving locomotives because SO_2 emission rates are higher for idling operations.

Detailed emission rates calculations and analysis can be found in Appendix 3.
</td><td></td></tr>
<tr><td>ECCC 05</td><td>TSD 07: Atmospheric Assessments</td><td>ECCC requests that the Proponent:
1. Provide a comparison of modelled ambient concentrations of NO2, SO2, and PM2.5 to the CAAQS in the local study areas, assessing the locations, spatial distribution, and frequency of exceedance.
2. Assess whether the currently proposed mitigation strategy for reducing NO2, SO2, and PM2.5 will be sufficient to reduce concentrations below the CAAQS.</td><td>
A comparison of modelled concentrations to the CAAQS was assessed by calculating the following statistics for the one-year modelled results:

SO_2: 99th percentile of the SO2 daily maximum 1-hour average concentrations;
NO_2: 98th percentile of the NO2 daily maximum 1-hour average concentrations;
$PM_{2.5}$: 98th percentile of the daily 24-hour average concentrations.

Table 1 shows a comparison of modelled ambient concentrations of NO_2, SO_2, and $PM_{2.5}$to the CAAQS at the Mine Site. Only the NO_2 1hr concentrations exceed the CAAQS at the accommodation camps and outside the PDA, as shown in Figure E-4b. The criterion is exceeded 97 days per year at a receptor just south of the PDA, at a location close to the generators. The criterion is exceeded 191 days per year at the accommodation camps. The spatial distribution of modelled concentrations for SO_2, NO_2 and $PM_{2.5}$compared to CAAQS are shown in Figures E-1b, E-3, E-4b, E-6, E-12b and E-15, Appendix 3.

Table 1: Comparison of modelled ambient concentrations to the CAAQS at the Mine Site
<table>
<tr><th>Contaminant</th><th>Period</th><th>Max near ACC building (mg/m^3)</th><th>Max at HTO cabin (mg/m^3)</th><th>Max Outside PDA (mg/m^3)</th><th>Criterion (mg/m^3)</th></tr>
<tr><td>$PM_{2.5}$</td><td>24h 98th</td><td>22</td><td>4</td><td>21</td><td>27</td></tr>
<tr><td></td><td>Annual</td><td>5</td><td>1</td><td>5</td><td>8.8</td></tr>
<tr><td>SO_2</td><td>Daily Max 1h 99th</td><td>22</td><td>0.3</td><td>6</td><td>183</td></tr>
<tr><td></td><td>Annual</td><td>1</td><td>0.02</td><td>0.3</td><td>13</td></tr>
<tr><td>NO_2</td><td>Daily Max 1h 98th</td><td>255</td><td>110</td><td>213</td><td>113</td></tr>
<tr><td></td><td>Annual</td><td>58</td><td>11</td><td>39</td><td>32</td></tr>
</table>
Table 2 shows a comparison of modelled ambient concentrations of NO_2, SO_2, and $PM_{2.5}$to the CAAQS at the Milne Port. The NO_2 1hr concentrations exceed the CAAQS at the accommodation camps, at the HTO cabin and in a large region outside the PDA. The maximum NO_2 1 hour outside the PDA is located on the east side of the PDA. The NO_2 annual concentrations exceed the CAAQS at the accommodation camps. The $PM_{2.5}$24hr concentrations exceed the CAAQS at the accommodation camps and at one receptor located north of the PDA. The spatial distribution of modelled concentrations for SO_2, NO_2 and $PM_{2.5}$compared to CAAQS are shown in Figures D-1b, D-3, D-4b, D-6, D-12b and D-15.
</td><td>ECCC 5 Attachment 1: Figure D1b; Figure D3; Figure D4b; Figure D6; Figure D12b; Figure D15; Figure E1b; Figure E3; Figure E4b; Figure E6; Figure E12b; Figure E15; Figure F16b; Figure F19</td></tr>
</table>

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<tr><th>ID No#</th><th>Document Reference</th><th>Info Request</th><th>Response</th><th>Attachment</th></tr>
<tr><td></td><td></td><td></td><td>
Table 2: Comparison of modelled ambient concentrations to the CAAQS at Milne Port
<table>
<tr><th>Contaminant</th><th>Period</th><th>Max near ACC building (mg/m³)</th><th>Max at HTO cabin (mg/m³)</th><th>Max Outside PDA (mg/m³)</th><th>Criterion (mg/m³)</th></tr>
<tr><td>$PM_{2.5}$</td><td>24h</td><td>30</td><td>7</td><td>28</td><td>27</td></tr>
<tr><td></td><td>Ann</td><td>8</td><td>1</td><td>5</td><td>8.8</td></tr>
<tr><td>SO_2</td><td>Daily Max 1h 99th</td><td>27.6</td><td>10.6</td><td>18</td><td>183</td></tr>
<tr><td></td><td>Ann</td><td>2.4</td><td>0.24</td><td>0.6</td><td>13</td></tr>
<tr><td>NO_2</td><td>Daily Max 1h 98th</td><td>250</td><td>133</td><td>229</td><td>113</td></tr>
<tr><td></td><td>Ann</td><td>65</td><td>15</td><td>29</td><td>32</td></tr>
</table>
Table 3 shows the frequency of exceedance (FOE) at Milne Inlet for the accommodation buildings, the HTO cabin and at the maximum point of impingement outside the PDA. The CAAQS are based on the use of the 8th highest modelling value per year. The values presented in Table 3 represent the number of days in a year with exceedances.
Table 3: Frequency of exceedance (days per year) at selected receptors at Milne Port
<table>
<tr><th>Contaminant</th><th>Period</th><th>FOE at ACC building</th><th>FOE at HTO cabin</th><th>FOE Outside PDA</th><th>Criterion (mg/m³)</th></tr>
<tr><td>$PM_{2.5}$</td><td>24h</td><td>11</td><td>0</td><td>1</td><td>27</td></tr>
<tr><td>NO_2</td><td>1h</td><td>190</td><td>46</td><td>64</td><td>113</td></tr>
</table>
2. Emissions reductions are an ongoing and iterative process for Baffinland that involves the consideration of best practices, new technologies, and updated guidelines and regulations. As part of the Phase 2 Proposal, Baffinland has included installation of wind turbines, which would reduce overall emissions.
</td><td></td></tr>
<tr><td>ECCC 06</td><td>TSD 7 – Atmospheric Assessment Report
2017 Mary River Project Terrestrial Environment Annual Report, Dust Fall Monitoring Program p. 3-30</td><td>ECCC requests that the Proponent:
1. Include emission quantification and modelling of all sources of dust, including but not limited to all vehicle traffic, ore dust from locomotive loading and transport, and wind erosion of all stockpiles using winds at the height of stockpile not at ground level to update their effects assessment accordingly.
2. Reevaluate and update the dust management plan and propose new mitigation measures that target both road dust as well as dust from mine activities that will arise from the Phase 2 expansion.
3. Reevaluate and update the dust monitoring and management actions to reflect the additional activities in the Phase 2 expansion and ensure that the monitoring plan will be able to evaluate predictions made in the Phase 2 FEIS.
4. Consolidate all dust monitoring, mitigation and management plans in one standalone and single report.</td><td>
1. Vehicle Traffic

Vehicle traffic considered all large haul trucks as well as lighter passenger vehicles for all the modelling conducted. See the following sections of Appendix A of the Air Quality Report (Appendix A of TSD 07 Atmospheric Assessments) for the Phase 2 Proposal: A.1.10, A.2.11 and A.3.8.

Locomotive Loading and Transport

Emissions from these operations were assessed at both the Mine Site and Milne Inlet by considering dust generated from train loading/unloading taking place within enclosed buildings. The dust emissions will be exhausted through a baghouse, which will capture the majority of dust. Residual emissions from the baghouses to the environment were estimated and modelled along with other sources. Previous investigation of the potential for dust emissions from the open rail cars during transport indicated that they would be insignificant, given the density and particle size of the iron ore.

Wind Erosion

Wind erosion of the stockpiles was assessed using the modelled wind speed extracted at the Mine site and the Milne Port. The selected wind height was 10 m. Tables 1 and 2 (Appendix 3) show the wind erosion emissions at the Mine Site and the Milne Port. Those emissions are also compared with the total modelled emissions at those facilities. As shown, the wind erosion emissions are many orders of magnitude smaller than the facility total and therefore were considered to be negligible.

One could argue that the top of stockpiles may be higher than 10 meters and therefore the wind speed could be stronger than the values used in the previous analysis. [Recent information provided by Baffinland confirmed that the maximum stockpile height for Stockpile #2 is 20.5 m and the maximum height of the fines stockpile, Stockpile #1, will be 16 m.] Wind erosion emissions were re-assessed using predicted wind at 30 meters as a more conservative assessment of emissions from stockpile erosion, see Tables 3 and 4 (Appendix 3). As shown, the wind erosion emissions are still many orders of magnitude smaller than the facility total and therefore would still be considered negligible.

Given the predicted emissions from stockpiles due to wind erosion are orders of magnitude lower than overall facility emissions, (even considering wind speeds at a height of 30 m), an assessment incorporating particulate from the stockpiles is not required.

2-4. The Air Quality and Noise Abatement Management Plan will be updated and circulated for review following the technical meetings for review and comment during final written submissions. Proposed updates to the plans are being tracked through a commitment register, which is attached as
</td><td>ECCC 6 Attachment 1: Tables

Appendix 7
Commitment Register</td></tr>
</table>

ID No#	Document Reference	Info Request	Response	Attachment
			Appendix 7 to this submission. Vegetation monitoring outlined in the Terrestrial Environment Mitigation and Monitoring Plan may also be adjusted pending the technical review. There is currently no plan to consolidate dust monitoring, mitigation and management in one standalone document.	
ECCC 09	TSD 7 – Atmospheric Environment 2017 Mary River Project Terrestrial Environment Annual Report, Dust Fall Monitoring Program p. 3-30	ECCC requests that the Proponent develop a management plan to mitigate potential effects to adjacent waterbodies from the application of calcium chloride for dust suppression.	Mitigation measures and management strategies used at the Project for the application of calcium chloride on roads are outlined in Section 2.3 of Attachment 7 'Dust Management Protocol' to the Air Quality and Noise Abatement Management Plan (Rev. 6). A copy of the Air Quality and Noise Abatement Management Plan (Rev. 6) is provided as Appendix X of TSD 28 (Management, Mitigation and Monitoring Plans).	
ECCC 12	TSD 13 – Surface Water Assessment - Section 3.5.2.6	ECCC requests that the Proponent provide information on the expected water quality impacts on Phillips Creek due to dust deposition in the Milne Port Area, including predicted metal concentrations.	An assessment of metals concentrations in Phillips Creek resulting from predicted dust deposition at Milne Port is presented as Appendix 3. In summary, the 90th percentile (baseline conditions) in Phillips Creek naturally exceed FW PAL for several metals; dust deposition from Milne Port will increase metals concentrations in Phillips Creek; the highest dust deposition scenario will result in total iron slightly exceeding the FW PAL criterion for iron; the methodology used to calculate the TSS inputs from dust upon which this assessment is based, is highly conservative.	ECCC 12 Attachment 1: Response to Information Request ECCC-12 - Predictive Metal Loading in Phillips Creek from Dust Deposition at Milne Port Memo
ECCC 16	TSD 28 - Explosives Management Plan (Appendix AE) - Section 2.4 Raw Materials Storage	ECCC requests that the Proponent review the planned quantities of ammonium nitrate that are to be present on the project site for more than 72 consecutive hours and determine the applicability of an E2 Plan as per ECCC's Environmental Emergency Regulations at https://www.canada.ca/en/environment-climate-change/services/environmental-emergencies-program/regulations/list-exploding-hazardous-substances.html ECCC also requests that the Proponent conduct and provide fate and behavior modelling for ammonium nitrate for any potential large-volume spills to water during transport to the project site and/or for potential spills to water on the project site.	The planned quantities of ammonium nitrate that are and will continue to be present on site are stored in such a way that Baffinland does not require an E2 Environmental Emergency Plan as per ECCC's Environmental Emergency Regulations. It is understood that the Environmental Emergency Regulations are scheduled to be amended in the near future and BIM will review the amended regulations and ensure that all regulatory requirements continue to be followed for storage of AN (ammonium nitrate) on-site. Any spill to water during transport to the project site (i.e. from a vessel during sealift) would be responded to by the sealift vessel operator, however it would be rapidly dispersed by ocean currents. Any spill to water on the project site would be responded to as per BIM's Spill Contingency Plan. The fate of any large volume spills of AN to freshwater bodies within the project site is dependent upon the volume of material spilled, proximity to a nearby watercourse, the size of the watercourse, and whether or not the watercourse is fish-bearing. As such, there is no benefit to be realized from modelling of the fate and behavior of large volume AN spill. No fate and behaviour modelling has been conducted for ammonium nitrate spills to water bodies at the project site, however the behaviour of ammonium nitrate and its component ions are well understood. Ammonium nitrate is soluble in water and in the event of a spill to water would dissociate into its constituent ammonium (NH_4, NH4+, the ammonium ion), with the proportions of each being highly dependent on the temperature and pH of the water body. For cold, slightly alkaline freshwater bodies (temperature 0-10C, pH 7.0-8.5) expected in the project area, un-ionized ammonia (NH_3) would represent only 0.082 to 5.56% of total ammonia (CCME, 2010). Un-ionized ammonia is more toxic than the ammonium ion, however any large-volume spill of ammonium nitrate, if left unaddressed, would likely result in exceedances of Canadian Water Quality Guidelines for the Protection of Aquatic Life (CCME, 2010) for both ammonia and nitrate (Appendix 3). NH_{4+} and NH_3 are stable under anaerobic conditions, but under aerobic conditions are oxidized to NO_3.by bacteria (nitrification). NO_3.is stable under aerobic conditions, but under anaerobic conditions is reduced to N2 or NH_3 by bacteria (denitrification). Rates of nitrification and denitrification are directly proportional to temperature, and the low temperatures in water bodies at the project site will limit these processes.	ECCC 16 Attachment 1: Canadian Water Quality Guidelines for the Protection of Aquatic Life – Nitrate Ion ECCC 16 Attachment 2: Canadian Water Quality Guidelines for the Protection of Aquatic Life – Ammonia
ECCC 17	TSD 28 - Appendix T - Management and Monitoring plans Section 1.6.3 TSD 28 - Appendix S. Surface Water and Aquatic Ecosystems Management Plan	ECCC request that the Proponent provide an updated Aquatic Effects Monitoring Plan and that this plan monitors for potential impacts to aquatic ecosystems across the whole project (mine site, Milne Port, and transportation corridor including the Northern Railway).	A revised version of the Aquatic Effects Monitoring Plan (AEMP) will be provided as part of the Amendment to the Type 'A' Water Licence process.	
ECCC 19	TSD 28 – Appendix D-Fresh Water Supply, Sewage and Wastewater Management Plan, Rev 5 (dated March 29, 2018): Section 6 (Oily Water/Wastewater Treatment)	ECCC requests that the Proponent provide updates to Section 6 describing the potential maximum volumes of oily water/wastewater, treatment capacity, monitoring and contingency measures associated with Phase 2 expansion.	The Freshwater, Sewage and Wastewater Management Plan will be updated and circulated for review following the technical meetings for review and comment during final written submissions. Proposed updates to the plans are being tracked through a commitment register, which is attached as Appendix 7 to this submission. The requested information is found in Sections 3 and 4 of the Application to Amend the Type A Water Licence (Appendix D of TSD 02 Project Description) and the referenced attachments of the same document.	Appendix 7 Commitment Register

ID No#	Document Reference	Info Request	Response	Attachment
ECCC 20	TSD 28 – Appendix D- Fresh Water Supply, Sewage and Wastewater Management Plan, Rev 5 (dated March 29, 2018) Table 6-1, 6-2 and 6-3	ECCC requests that the Proponent include Total Petroleum Hydrocarbons (TPH) as a monitoring parameter for oily water treatment facilities, bulk fuel storage facilities, and landfarm facilities. ECCC recommends that discharge limits be reduced to 5 mg/L for TPH.	The current Type A Water Licence requires testing for TPH and BTEX parameters at the tank farms and landfarms, and testing for oil & grease and BTEX parameters at the maintenance shop oil-water separators. Any changes to testing parameters or discharge limits are prescribed by the NWB.	
ECCC 23	TSD 28, Table 2 Appendix A (Environmental Protection Plan)	ECCC requests that the Proponent update the Environmental Protection Plan (EPP) to include: • Dust management/suppression during construction and operation of North Railway • Details on water quality monitoring during construction of the ore dock • Updates to the EPP related to changes at Milne Port	The Environmental Protection Plan will be updated and circulated for review following the technical meetings for review and comment during final written submissions. Proposed updates to the plans are being tracked through a commitment register, which is attached as Appendix 7 to this submission"	Appendix 7 Commitment Register

HEALTH CANADA

ID No#	Document Reference	Info Request	Response	Attachment
HC 01 (this is a follow-up to IR response Dec. 20)	- TSD-07 Atmospheric Assessments; - TSD-05 Mary River Inuit Knowledge Study Map book:Figures: 1.7; 1.8; 1.9; 1.11; 1.12;	Health Canada requests: 1. Clarification if the PSL exceeds or does not exceed the PSL at the HTO Cabin – this is currently not clear. 2. Health Canada recommends further evaluation of human health impacts, including vulnerable persons, with regards to noise. Including at locations identified to be places used for camping (TSD-05 Mary River Inuit Knowledge Study Map book:Figures: 1.7; 1.8; 1.9; 1.11; 1.12).	1. Appendix D of TSD 07 (Atmospheric Assessments), Section 3.2.1.4 (Conclusions) indicates that sound levels at the HTO Cabin are predicted to range from 33 to 35 dBA. This is assessed against a PSL of 40 dBA as discussed in Section 1.3.1. The predicted PSL at the HTO cabin does not exceed the PSL criteria. 2. Inuit camp at or near the current HTO cabin located on the east end of the beach at Milne Inlet, or at the HTO cabin on the west side of Camp Lake, several kilometres from the Mine Site. These cabins were treated as receptors in the noise effects assessment. The figures in TSD 05 (Mary River Inuit Knowledge Study Mapbook) show a number of camping locations along the Tote Road and within the Phillips Creek valley. Our understanding is that Health Canada is asking about these camping locations, which were not assessed in the EIS. Despite these camping sites being identified, they have generally not been used since the mine began operating in 2013. There are several reasons for this. First, many of the camping locations identified on Figure 1.7 are locations where people of camped in their lifetime; mainly when the elder informants were young and when travel was predominantly by dog sled. The Phillips Creek valley is typically used as access to other inland areas and is less a destination in itself. Second, Baffinland has been implementing its Hunter and Visitor Site Access Procedure since 2013, which involves restricting non-Project travel on the Tote Road, and instead transporting hunters and their equipment up the road by truck to the Mine Site. Because of this, land users do not need to stop part-way between Milne Port and the Mine Site. Instead, they are transported to the Mine Site area, from which they may stay at the HTO cabin west of the Mine Site, and/or they continue to travel to other areas for hunting to the south or east of Mary River. Baffinland proposes to continue applying the current Hunter and Visitor Site Access Procedure during the Phase 2 Proposal. As such, these previously identified camping areas along the transportation corridor are unlikely to be used with any kind of frequency moving forward. Any noise exposure at the previously assessed cabins or along the corridor would be short-term (hours to days), as camping activities are transient and short-term. As noted in Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise (Health Canada, 2017), the risk of health effects from noise potentially increases if the noise is experienced over a long period of time. Since there is no scenario in which receptors will be exposed to project-related noise over a sustained period of time, the potential for health effects from project-related noise is expected to be negligible.	
HC 02	- TSD-05 Mary River Inuit Knowledge Study Map book: Figures: 3.19; 3.20; - TSD-11 Evaluation of Exposure Potential From Ore Dusting Events in Selected VECs; - TSD-13 Surface Water Rev 01; Section 1.3; page 15	1. Health Canada recommends further evaluation of impacts on human health, including vulnerable persons, with regards to recreational and drinking water quality identified in TSD-05, including those used for hunting. 2. If such impacts are found, and if the same contaminants may have an effect on human health through other exposure routes a quantitative risk assessment, such as an HHRA, is recommended.	The following is a brief summary of the response to this comment; the full response is provided in Appendix 4. 1. Camp Lake was selected as a representative water course for the purposes of this assessment. No impact to drinking water quality in the Camp Lake watershed is predicted. It is unlikely that Camp Lake would be used for recreation due to cold temperatures. Water quality monitoring is conducted annually as part of the Aquatic Effects Monitoring Program (AEMP). This monitoring would identify if additional mitigation is required during operation. 2. As impacts to human health are not predicted, a quantitative risk assessment is not recommended.	HC 02 Attachment 1: Full Response HC 02 Attachment 2: Memo - Assessment of Potential Impacts of the Mary River Project's Phase 2 Proposal on Waterbodies Used by Inuit – Response to Information Request HC-02
HC 03	TSD 11 Evaluation of Exposure Potential From Ore Dusting '- Events in Selected VECs - TSD-07 Atmospheric Assessments - TSD-14 Freshwater Biota and Habitat Assessment	1. Health Canada recommends further evaluation of human health impacts, including vulnerable persons, with regards to country foods consumption. 2. If such impacts are found, and if the same contaminants may have an effect on human health through other exposure routes a quantitative risk assessment, such as an HHRA, is recommended.	TSD 11 (Evaluation of Exposure Potential from Ore Dusting Events in Selected VECs) predicted future concentrations in blueberries and lichen, as a result of dust deposition onto area soils and vegetation and discussed the potential health implications of consumption of foods from the Project area using a screening-level risk assessment approach, rather than using consumption estimates and a consumption assessment of country foods. Health Canada has requested further evaluation of country foods, using consumption rates in a more quantitative modelling approach. This Technical Response (Appendix 4) will build on the screening-level approach used in TSD 11 and will generally follow the recently-released Health Canada Guidance related to country foods consumption (Health Canada 2018), and professional judgement. The sections provided in the Technical Response captures the four (4) key phases in a human health risk assessment, including a Problem Formulation, Exposure Assessment, Effects Assessment and Risk Characterization. The focus of this response is only on country foods consumption as per the IR request from Health Canada. Other relevant exposure pathways have been screened in TSD 11 (soil and soil related pathways; note that soil exposures have been re-screened against human health soil quality guidelines in Technical Response to HC-07, question 2, using a shallower soil mixing depth of 10 cm), the technical response to HC-02 (Drinking water exposure), and HC-04 (air inhalation exposure).	HC 03 Attachment 1: Full Response

<table>
<tr><th>ID No#</th><th>Document Reference</th><th>Info Request</th><th>Response</th><th>Attachment</th></tr>
<tr><td>HC 04</td><td>- TSD-07 Atmospheric Assessments
- TSD-05 Mary River Inuit Knowledge Study Mapbook</td><td>1. Health Canada recommends further evaluation of human health impacts, including vulnerable persons, with regards to air quality.
2. If such impacts are found, and if the same contaminants may have an effect on human health through other exposure routes a quantitative risk assessment, such as an HHRA, is recommended.
3. Health Canada suggests that the evaluation is not limited to the HTO Cabin but also including identified areas in TSD-05 for hunting, travelling, camping, recreational water use, and areas cultural importance.</td><td>TSD 07 Atmospheric Assessment provides an air quality assessment of Criteria Air Contaminants (CACs) such as fine particulate matter (PM2.5), particulate matter of 10 microns or less in diameter (PM10), Total Suspended Particulate matter (TSP), nitrogen oxides (NOx), sulphur dioxide (SO2) and Carbon Monoxide (CO). The TSD 07 assessment focused on areas near the active operational areas (Mine Site, Milne Port, and Tote Road), and areas extending outside of the Project Development Area (PDA) into the Air Quality Local Study Area (AQ LSA). The HTO cabins at the Mine Site and Milne Port were identified as potential locations where local land users could spend time, and both of these cabins are located in the LSA of the Mine Site and Milne Port site.

This technical response (Appendix 4) follows Health Canada (2016a) guidance, and presents the following:
• Spatial and temporal boundaries for the assessment
• Identification and characterization of Human Receptors
• A description of exposure pathways
• Identification of Contaminants of Potential Concern
• Assessment of baseline, project alone and “baseline + project” scenarios</td><td>HC 04 Attachment 1: Full Response</td></tr>
<tr><td>HC 05</td><td>TSD-07 Atmospheric Assessments</td><td>Health Canada requests that:
1. Modelled ambient concentrations of NO2, SO2, and PM2.5 should be compared to the CAAQS .
2. The proponent assesses whether the currently proposed mitigation strategy for reducing NO2, SO2, and PM2.5 will be sufficient to reduce future concentrations below the CAAQS.</td><td>A comparison of modelled concentrations to the CAAQS was assessed by calculating the following statistics for the one-year modelled results:
• SO_2: 99th percentile of the SO_2 daily maximum 1-hour average concentrations;
• NO_2: 98th percentile of the NO_2 daily maximum 1-hour average concentrations;
• $PM_{2.5}$: 98th percentile of the daily 24-hour average concentrations.

Table 1 shows a comparison of modelled ambient concentrations of NO2, SO2, and PM2.5to the CAAQS at the Mine Site. Only the NO2 1hr concentrations exceed the CAAQS at the accommodation camps and outside the PDA, as shown in Figure E-4b. The criterion is exceeded 97 days per year at a receptor just south of the PDA, at a location close to the generators. The criterion is exceeded 191 days per year at the accommodation camps. The spatial distribution of modelled concentrations for SO2, NO2 and PM2.5compared to CAAQS are shown in figures E-1b, E-3, E-4b, E-6, E-12b and E-15 (Appendix 4).

Table 1: Comparison of modelled ambient concentrations to the CAAQS at the Mine Site
<table><tr><th>Contaminant</th><th>Period</th><th>Max near ACC building (mg/m³)</th><th>Max at HTO cabin (mg/m³)</th><th>Max Outside PDA (mg/m³)</th><th>Criterion (mg/m³)</th></tr><tr><td>$PM_{2.5}$</td><td>24h 98th</td><td>22</td><td>4</td><td>21</td><td>27</td></tr><tr><td></td><td>Ann</td><td>5</td><td>1</td><td>5</td><td>8.8</td></tr><tr><td>SO_2</td><td>Daily Max 1h 99th</td><td>22</td><td>0.3</td><td>6</td><td>183</td></tr><tr><td></td><td>Ann</td><td>1</td><td>0.02</td><td>0.3</td><td>13</td></tr><tr><td>NO_2</td><td>Daily Max 1h 98th</td><td>255</td><td>110</td><td>213</td><td>113</td></tr><tr><td></td><td>Ann</td><td>58</td><td>11</td><td>39</td><td>32</td></tr></table>
Table 2 shows a comparison of modelled ambient concentrations of NO2, SO2, and PM2.5to the CAAQS at the Milne Port. The NO2 1hr concentrations exceed the CAAQS at the accommodation camps, at the HTO cabin and in a large region outside the PDA. The maximum NO2 1 hour outside the PDA is located on the east side of the PDA. The NO2 annual concentrations exceed the CAAQS at the accommodation camps. The PM2.524hr concentrations exceed the CAAQS at the accommodation camps and at one receptor located north of the PDA. The spatial distribution of modelled concentrations for SO2, NO2 and PM2.5compared to CAAQS are shown in figures D-1b, D-3, D-4b, D-6, D-12b and D-15 (Appendix 4).

Table 2: Comparison of modelled ambient concentrations to the CAAQS at Milne Port
<table><tr><th>Contaminant</th><th>Period</th><th>Max near ACC building (mg/m³)</th><th>Max at HTO cabin (mg/m³)</th><th>Max Outside PDA (mg/m³)</th><th>Criterion (mg/m³)</th></tr><tr><td>$PM_{2.5}$</td><td>24h</td><td>30</td><td>7</td><td>28</td><td>27</td></tr><tr><td></td><td>Ann</td><td>8</td><td>1</td><td>5</td><td>8.8</td></tr><tr><td>SO_2</td><td>Daily Max 1h 99th</td><td>27.6</td><td>10.6</td><td>18</td><td>183</td></tr><tr><td></td><td>Ann</td><td>2.4</td><td>0.24</td><td>0.6</td><td>13</td></tr><tr><td>NO_2</td><td>Daily Max 1h 98th</td><td>250</td><td>133</td><td>229</td><td>113</td></tr><tr><td></td><td>Ann</td><td>65</td><td>15</td><td>29</td><td>32</td></tr></table></td><td>HC 05 Attachment 1: Figure D1b; Figure D3; Figure D4b; Figure D6; Figure D12b; Figure D15; Figure E1b; Figure E3 ; Figure E4b; Figure E6; Figure E12; Figure E15; Figure F16b; Figure F19</td></tr>
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<tr><th>ID No#</th><th>Document Reference</th><th>Info Request</th><th>Response</th><th>Attachment</th></tr>
<tr><td></td><td></td><td></td><td>Table 3 shows the frequency of exceedance (FOE) at Milne Inlet for the accommodation buildings, the HTO cabin and at the maximum point of impingement outside the PDA. The CAAQS are based on the use of the 8th highest modelling value per year. The values presented in Table 3 represent the number of days in a year with exceedances.

Table 3: Frequency of exceedance (days per year) at selected receptors at Milne Port
<table><tr><th>Contaminant</th><th>Period</th><th>FOE at ACC building</th><th>FOE at HTO cabin</th><th>FOE Outside PDA</th><th>Criterion (mg/m³)</th></tr><tr><td>$PM_{2.5}$</td><td>24h</td><td>11</td><td>0</td><td>1</td><td>27</td></tr><tr><td>NO_2</td><td>1h</td><td>190</td><td>46</td><td>64</td><td>113</td></tr></table></td><td></td></tr>
<tr><td>HC 06</td><td>- TSD-07 Atmospheric Assessments
- Appendix X – AQ mitigation doc</td><td>Health Canada requests additional information on:
1. Overall dust monitoring and mitigation strategies to be updated with newly identified gaps.
2. Proposed mitigations which will be used for transport trucks, rail cars, and conveyors to reduce dust generation.
3. Proposed mitigations which will be used such as dust collectors and other pollution control devices at the crushing and processing plants.
4. Discussion surrounding stringent (Tier III/IV) vehicle and fuel standards for on-Road and off-road equipment.</td><td>1. Overall dust monitoring and mitigation strategies to be updated are outlined in Attachment 6 (Dust Fall Monitoring) and Attachment 7 (Dust Management Protocol) in the Air Quality and Noise Abatement Management Plan. Dust fall monitoring considers all potential dust fall sources, using passive dust fall monitoring methods. Dust mitigation strategies outlined in Attachment 7 are largely focused on the Tote Road as a significant source of dust, namely the application of dust suppression, including water and calcium chloride. Dust mitigation for other sources are generally design-related, as discussed below (#2&3).

2. No new mitigation is planned for transport trucks. Rail cars are not predicted to be a significant source of dust (Section 2.4.3 in TSD 07 Atmospheric Assessments). Conveyors have shrouds installed at transfer points (Dust Mitigation Action Plan (2016)).

3. Proposed mitigation for the crushing and screening plant is to move secondary crushing and screening to a permanent, enclosed plant at Milne Port, and dust collectors will be installed at ore screening and crusher transfer points (Section 4.4.3 TSD 02 Project Description).

4. In the air quality model for the Phase 2 Proposal, Tier III non-road CI standards were used to calculate emission rates for the off-road fleet (Sections A.1.6, A.2.4, and A.3.1; Appendix A, TSD 07).</td><td></td></tr>
<tr><td>HC 07</td><td>- TSD 11 Evaluation of Exposure Potential From Ore Dusting Events in Selected VECs
- TSD-07 Atmospheric Assessments</td><td>Health Canada requests further information and discussions on:
1. Dusting events are known to occur along Tote Road. The dusting events have the potential to impact country foods which are consumed. Please provide further discussion on why PAHs were not included as a CAC associated with transport generated dust along tote road in the assessments and if required update the effects assessment
2. Please provide further discussion on why 20cm of top soil is relevant for the calculations in the area of concern RE:the use of Zs Soil mixing zone depth (assumed 20 cm mixing zone, as per US EPA, 2005); It is unlikely that 20cm is the average top soil depth in the area. If required update the effects assessment
3. Please provide further discussion on the values presented in the tables (2.1; 2.4; 2.6;) related to NO2. The values need to be clarified if they are inclusive of the products of combustion [various hydrocarbons (volatile organic compounds, diesel particulate matter, and polycyclic aromatic hydrocarbons)] and trace contaminants from incineration (such as polycyclic aromatic hydrocarbons, dioxins and furans, acids and trace metals;) OR if they are representative of the products of combustion [various hydrocarbons (volatile organic compounds, diesel particulate matter, and polycyclic aromatic hydrocarbons)] and trace contaminants from incineration (such as polycyclic aromatic hydrocarbons, dioxins and furans, acids and trace metals;).</td><td>1. Generation of PAH's along the Tote Road would be associated with diesel exhaust emissions. Based on professional experience, it is not common to assess PAH emissions on roads, as the quantities in diesel exhausts are relatively small. In one previous study, the US EPA 's Motor Vehicle Emission Simulator (MOVES) was used to estimate emissions of benzo(a)pyrene (BaP), which is considered the most toxic of the PAH species in vehicle exhausts and tends to dominate the overall toxicity potential of PAH. For heavy duty diesel trucks, MOVES indicated that BaP emissions represent approximately 0.005% of the diesel exhaust particulate matter emissions (PM).

Based on the emission estimates used for modelling dust deposition along the Tote Road, diesel exhaust PM amounts to approximately 0.02% of total particulate matter emissions associated with road dust. Given that BaP is about 0.005% of the diesel exhaust PM, and the diesel exhaust PM is about 0.02% of the total particulate matter emissions, we conclude that BaP makes up about 0.0001% of the total particulate matter emissions. The latter percentage can be applied to estimated total dust deposition, to get an approximate estimate of BaP deposition on soils adjacent to the Tote Road.

A dust deposition rate near the Tote Road of 55 g/m2/year was assumed in TSD 11 (Evaluation of Exposure Potential from Ore Dusting Events in Selected VECs) for evaluating potential impacts to soils related to dusting. If 55 g/m2/year contains 0.0001% BaP, the BaP dust deposition rate would be 0.000055 g/m2/year (or 0.055mg/m2/year).

Based on the deposition rate, berries were estimated to accumulate 0.00563 mg/kg-DW BaP or 0.0141 mg/kg-WW, based on methods outlined in TSD 11, for prediction of berries. The mixing depth (i.e., 0.01m) of soils used in this calculation is revised from TSD 11, as outlined in Technical Response to HC-07, Question 2. A consumption rate for berries of 0.013 kg/day for adults was estimated in the Technical Response to HC-03 (Country Foods). If this consumption rate is applied, potential exposure to BaP is estimated at 1.8E-04 mg/day. The ILCR was estimated to be 6.0E-06 (i.e., 0.6 in 100,000 risk) based on the Health Canada slope-factor (2.3 mg/kg/day-1) and exposure of 2.6E-06 mg/kg-BW/day. This ILCR is less than the risk level of 1E-05 (i.e., 1.0 in 100,000 risk), and does not account for amortization and other PAHs, but assumes that all berry consumption comes from this area of high deposition near the Tote Road, over a lifetime. As discussed in technical responses to HC-03 and HC-02, areas near the Tote Road are restricted, and hence continual access to areas in close proximity to the road is unlikely. Considering the remote nature of the Tote Road, and the limited quantities of berries in this area (discussed in TSD 11), it is not plausible that these risks would occur.

2. TSD 11 recognized that the mixing depth of 20 cm was a source of uncertainty, as discussed on page 62, Section 7. In response to this IR, an alternative soil mixing depth is used (10 cm soil depth), as the soil monitoring protocol used in the environmental monitoring program for this Project involves the collection of soils ≤10 cm depth (EDI, 2015). Tables (Appendix 4) with predictions of soil concentrations using this mixing depth are provided compared to ecological soil quality guidelines (see Tables HC-07, 1 to 4).

Lichen predictions are also provided for completeness (Tables HC-07, 5 to 7). There is no change in the conclusions of the assessment, based on the change in soil mixing depth. None of the predicted future soil concentrations exceed ecological health soil quality guidelines. On Table HC-07-1, two metals in the final time interval are predicted at levels equaling the soil quality guideline (selenium and manganese). For selenium, this is a function of the conservative assumptions used in the assessment; selenium is non-detect in the dustfall (see TSD 11; Appendix A) and was assumed to be present</td><td>HC 07 Attachment 1: Tables</td></tr>
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ID No#	Document Reference	Info Request	Response	Attachment
			in dustfall at the detection limit. In addition, selenium is non-detect in baseline soils with the exception of a single sample, and the 90th percentile of baseline soils was assumed to be detection limit. Hence, the predictions are a function of the conservatism in the assessment (adding the Project increment to the detection level which is assumed to be the baseline soil concentration). While manganese is predicted to equal the guideline in 2025 - 2035, the Project + Baseline soil concentration of 220 mg/kg is well within the baseline range of soils (maximum soil concentration of 416 mg/kg), as indicated in Table HC-07-1; therefore, neither of these circumstances are considered to merit further study. As indicated above, reducing the mixing depth of soil has minimal influence on the predicted future lichen concentrations, as lichen exposures are largely affected by deposition, rather than soil concentrations. On average total lichen concentrations outside the PDA increase by 2% if the soil mixing depth is set to 10 cm rather than 20 cm. Tables HC-07-5 to 7 provide lichen predictions using a 10 cm soil depth. Comparisons of the 10 cm mixing depth soil tables to human health soil quality guidelines are presented in Tables HC-07 (8 to 11), are also provided. Berry predictions are not tabulated herein, as berry consumption is addressed under the Technical Response to HC 03 (which is modelled with a 10 cm soil depth and includes berry consumption as well as other dietary items). The only metal that exceeds guidelines at either the Mine Site (Tables HC-07-8 and HC-07-9), Tote Road (Table HC-07-10) or Milne Port (Table HC-07-11) is iron, which also exceeds guidelines in baseline (and exceeded this guideline in TSD 11). Since this area is heavily enriched with iron, this is not surprising. Metals can naturally exceed guidelines (since they are naturally occurring), and the concentrations predicted into the future are within the natural baseline range (even when the accumulated increment over time is added to the 90th percentile of the baseline soil concentration), and hence, are not considered to be an issue of concern from a health perspective. With respect to metals exceeding maximum baseline concentrations, selenium predictions exceed maximum baseline in all tables (Table HC-07-8 to HC-07-11). As discussed previously, this is a function of the conservative assumptions used in the assessment; selenium is non-detect in the dustfall (see TSD 11; Appendix A) and was assumed to be present in dustfall at the detection limit. In addition, selenium is non-detect in baseline soils with the exception of a single sample, and the 90th percentile of baseline soils was assumed to be detection limit. In all cases, the predicted future soil concentration (baseline + accumulated increment) is well below the human health-based soil quality guidelines. Therefore, this is not considered to be an issue of concern, from a human health perspective. Cadmium and mercury are also noted in Table HC-07-8 as being predicted to exceed the maximum baseline soil concentrations in the final time period of 2025 – 2035 only, at the dustfall rate of 144 g/m^{2}2/year only. As per selenium, mercury is non-detect in baseline soils, and the 90th percentile of baseline soils was assumed to be the detection limit. Mercury was also non-detect in all dustfall samples at the Mine Site. Hence, this is a conservatism of the assessment assumptions. For cadmium, this metal was only detected in 1 sample out of 48 samples of dustfall at the mine site (see Table A-4, Appendix A, TSD 11; Stations DF-M-02 and 03). The percentage of cadmium in Mine Site dustfall was based on that single detected sample, which likely biases the concentration high. In both cases, neither of these metals exceed human health guidelines, and hence are not considered to merit further study. Based on this revised modelling at 10 cm soil depth, the conclusions of TSD 11 remain the same as indicated. All references cited in the accompanying tables (Appendix 4), or text can be found in TSD 11. 3. Regarding Item 3 of HC-07, any tables presenting information on NO_2pertain only to NO_2 and not any other contaminants that may be present in combustion emissions, such as volatile and semi-volatile organic compounds, trace metals, acids, etc. For combustion sources, only contaminants that have Nunavut air quality standards were assessed. For diesel combustion sources, NO2 and PM are the dominant air contaminants of concern. For the waste incineration, other contaminants were not modelled but have been addressed through management plans and standard operating procedures to ensure that the incinerators are operated properly, so as to minimize emissions of dioxins, furans, mercury and hydrochloric acid.	

NATURAL RESOURCES CANADA

ID No#	Document Reference	Info Request	Response	Attachment
NRCAN 2 (this is a follow-up to IR response Dec. 20)	- EIS Guidelines 8.1.7 - EIS: Main Document, TSD 2, 8	Please clarify if any ground thermal data have been collected for the Northern Railway Corridor and provide details on these data if they have been collected. If such data have not yet been acquired, please describe any plans to collect these data in the future to support infrastructure design.	A response to this Information Request was provided to the NIRB on December 20, 2018 in "IR Responses, Phase 2 Proposal - Mary River Project". Thermal modeling has been produced in support of the Information Request and is provided in Appendix 8.	Appendix 8 Thermal Analysis Model
NRCAN 3 (this is a follow-up to IR response Dec. 20)	- EIS Guidelines 7.2.1, 8.1.7, 9.4.14 - EIS Main Document, TSD 2, 6, 8	Please clarify if any thermal analysis/modelling has been conducted to support estimates of settlement to inform embankment design for the Northern Railway and provide details on any analysis completed. If such analysis has not yet been conducted, please describe any future plans for detailed thermal/analysis to support embankment design.	A response to this Information Request was provided to the NIRB on December 20, 2018 in "IR Responses, Phase 2 Proposal - Mary River Project". Thermal modeling has been produced in support of the Information Request and is provided in Appendix 8.	Appendix 8 Thermal Analysis Model

PARKS CANADA

ID No#	Document Reference	Info Request	Response	Attachment
PCA 3	Refer to PCA-1 references	PCA-3: Please describe the potential cumulative effects on the marine ecosystem resulting from of all types of increased shipping in the project area. Note that when considering the project shipping cumulatively with other shipping, project shipping must include ore, freight, and fuel vessels.	This is addressed in TSD 27 (Cumulative and Transboundary Effects Assessment), Section 1.4.13. For example, Section 1.4.14.3 states the following: For concurrent vessel activities along the northern shipping route during the open water season, when narwhal is present in the area, it has been assumed that ore carrier movements and vessel mooring events in Milne Inlet will not directly overlap in space and time due to minimum safety distance requirements for shipping and anchoring. However, in the event that multiple vessels overlap in space and time, the cumulative noise field is predicted to encompass a greater spatial area, potentially resulting in a larger area of avoidance by narwhal. However, the cumulative sound level ('loudness') is not predicted to increase when multiple vessels are present in the same area – it would remain roughly equivalent to that of the single (larger) vessel at any single point within the zone of acoustic overlap. This is due to the logarithmic nature of sound underwater (i.e., the cumulative effect of multiple co-occurring noise sources is not linear in scale). Any avoidance behavior is predicted to be temporary and localized.	
PCA 6	Refer to PCA-4 references	PCA-6(a): Please provide an assessment of the effects of ice management activities on VEC's included in TSD_17 (Marine Environmental Effects), TSD_24 (Marine Mammals) and TSD_12 (Birds), and also adding ice as a VEC. This assessment should not be confined only to the extent of presence, absence and mortality of individuals but also population health, and local and regional ecosystem health, including ice as a component of that ecosystem.	The Phase 2 Project Description does not include icebreaking and therefore an assessment of icebreaking impacts on VECs was not undertaken. However, Baffinland acknowledges that the operational period from July 1 to November 15 may include limited periods when ice will be present, and we recognize that a number of IRs have communicated concerns over icebreaking. Therefore, Baffinland has elected to undertake an additional stand-alone assessment of icebreaking effects that addresses this concern, which includes underwater noise modelling of icebreaker transits along the Northern Shipping Route. The acoustic modelling will be based on a conservative scenario for icebreaking noise based on thickest seasonal ice conditions in the RSA and maximum acoustic propagation potential. The stand-alone acoustic modelling report and icebreaking assessment will be submitted to NIRB in 2019 once reporting is completed. Sea Ice was included and assessed as a VEC in TSD 16 Ice Conditions Study.	

THE QIKIQTANI INUIT ASSOCIATION

ID No#	Document Reference	Info Request	Response	Attachment
QIA 04	Mary River Project Phase 2 Terrestrial Wildlife Technical Support Document, TSD 10 (Section 3.3.2, 3.4.1.2)	Baffinland is requested to provide detail on the potential visual disturbance effects and if there may be additive effects associated with the North Railway paralleling the Tote Road.	The Phase 2 Project proposes that a railway will be built and operated in addition to the already existing Tote Road — the traffic on which will substantially decrease once the iron ore is being hauled by rail alone. The impact assessment considered the potential effects of the potential sensory disturbances (including visual) and physical barriers of the road and rail embankments combined. Baffinland has responded in further detail to the potential barrier effect in response to GN 06, 49 and 50. The impact assessment considers all successive and consecutively occurring activities as additive and were considered in the impact assessment as presented. There was no attempt to split the potential impacts of the road from those of the rail, rather the overall impact was assessed as combined potential project impacts.	
QIA 06	Volume 1 FEIS Addendum (Section 10.4, Table 10-4, starting at pg. 10.9 (pdf pg. 211 of 512), Volume 7 TSD 28 (Appendix Y, pdf pg. 177)	It is requested that the Proponent review table 10-4 and provide an updated discussion, including an updated table, including: A. Changes/additions made to mitigation/monitoring plans based on Inuit IQ including a description of input provided by the Community Advisory Group in Pond Inlet B. Details, with timelines, for future collecting, integrating, and verifying IQ for drafting mitigation/monitoring plans relevant to the Phase 2 Proposal. C. Details, with timelines, for ground-truthing key environmental processes and species with IQ users (e.g. fish locations, caribou and other wildlife, vegetation sampling etc.).	A. The IQ collected by Baffinland in support of the Project is both comprehensive and extensive. It has, and continues to be, a valuable source of information that influences project design, environmental assessments, management planning, and environmental monitoring. Modifications to mitigation and monitoring plans based on Inuit IQ and/or community input occur regularly and as part of established processes. These processes include, but are not limited to: • Nunavut Impact Review Board (NIRB) and Nunavut Water Board (NWB) project amendment review processes • Annual reporting to the NIRB and NWB • IQ Workshops; Phase 2 specific IQ sessions, five in total, were carried out between March 2015 and May 2016, the description and results of which are described in TSD 03 (Phase 2 Workshop Report). • Membership of the Mittimatalik Hunters & Trappers Organization (MHTO) in the Terrestrial Environment Working Group (TEWG) and the Marine Environment Working Group (MEWG) • Community participation in the Socioeconomic Monitoring Working Group (SEMWG) • Inuit participation through direct employment or joint-collaboration in annual field monitoring programs • Annual meetings in Pond Inlet with the MHTO and Hamlet before the opening of the shipping season and again after the close • Annual Project Review Forum with QIA and community representatives • Community representative Site Visits It is important to note that not all management plans necessarily benefit from the inclusion of IQ to the same degree (ex. Waste Management Plan vs. Aquatic Effects Monitoring Plan) and some are developed with very narrow scopes to meet specific regulatory requirements (e.g., Oil Pollution Emergency Plan, Metal and Diamond Mining Effluent Regulations Emergency Response Plan). The majority of the management plans listed in Table 10-4 require limited updates to account for additional Phase 2 Proposal infrastructure and activities. All Management and Monitoring Plans will be updated and circulated for review following the technical meetings for review and comment during final written submissions. Proposed updates to the plans are being tracked through a commitment register, which is attached as Appendix 7 to this submission. All updates, including those being the result of collected IQ or community input, will be tracked in the commitment register. B. Three IQ sessions are planned between January and March of 2019 in support of the Phase 2 Proposal. The intent is to better understand the perceived environmental risks of transportation of iron ore by rail and ship through the Nunavut Settlement Area. A key deliverable of these workshops will be a list of recommendations to amend relevant management plans. The status and results of these workshops will be reported to the NIRB and Interveners during the review process as they become available. C. As mentioned in response to A., the majority of management plans require limited updates to account for additional Phase 2 Proposal infrastructure and activities. Monitoring programs applicable to Phase 2Proposal are already in use operationally and their development has demonstrated use of Inuit input and participation. Several current examples of Inuit participation in environmental monitoring include, but are not limited to: • *Height of Land Caribou Surveys:* In 2017, a member of the Mittimatalik Hunters & Trappers Organization (MHTO) participated in all HOL surveys and provided valuable IQ on recent and historical caribou use of the Mary River area, as well as information on caribou behaviour and how to look for caribou on the North Baffin landscape. • *Bruce Head Program:* Inuit marine mammal observers from Pond Inlet assist with the collection of data on narwhal behaviour, group composition, relative abundance and distribution, as well as observations of environmental conditions and vessel activities. • *Ship-Based Observer Program:* Inuit marine wildlife observers from Pond Inlet assist in collecting observational data on distribution, abundance and behaviour of marine wildlife during active ship transits.	Appendix 7 Commitment Register

ID No#	Document Reference	Info Request	Response	Attachment
			• *Marine Ecological Effects Monitoring Program:* Through procurement of an Inuit firm, an Inuit boat operator and field technician (on crew rotations) assisted in a five-week boat-based sampling of water and sediment quality, invertebrates, fish, habitat offset monitoring and an aquatic invasive species monitoring program. • *Tremblay Sound Narwhal Tagging Program:* Inuit participation in the program included boat operators and assistants, although only one participant was hired by Baffinland and the other assistants were employed by DFO. Assistants provided support with tag recovery efforts, assisting in live capture and deploying tags on marine mammals. Further to the above noted examples of Inuit participation in field programs, the MHTO is a regular member of the Terrestrial Environment Working Group (TEWG) and the Marine Environment Working Group (MEWG). These groups meet 4 times a year (twice in person) and provide ample opportunity for MHTO members to share their perspectives on our monitoring results and the monitoring programs themselves.	
QIA 07	Volume 1, FEIS Addendum (Section 10.2, Accidents and Malfunctions, pgs. 10.1 to 10.7), Volume 6 TSD 25 (Section 9)	It is requested that the Proponent provide more details on methods behind and risk calculations associated with: A. Changes to Marine shipping including assessment of any and all potential impacts to Inuit Culture, Resources, and Land Use. B. Potential Impacts to Cultural Heritage resources from all possible accidents. This should include discussion of whether and how Inuit community members and organizations were involved in the updating of the Risk Summary (Table 10-2).	Risk is a function of the consequence or severity of an event, and the likelihood that the event will occur. The risk assessment methodology used to assess accidents and malfunctions is presented in FEIS (2012) Volume 9. It is acknowledged that a marine accident could also result in effects to Inuit resources and land use. A marine spill event, depending upon the location and severity, could impair Inuit use of local waters, and result in effects on wildlife (i.e., seals, birds) that Inuit depend on as a food source. Accidents and malfunctions are not planned, and as such, they are assessed separate from the VEC/VSEC assessments. Although Inuit community members/organizations were not specifically involved in updating the Risk Summary (Table 10-2), the Phase 2 Proposal does not present meaningful changes in the risk assessment of accidents and malfunctions, and this aspect of the FEIS was reviewed previously through the FEIS review. Inuit were consulted through community workshops in 2015 and 2016 when the Phase 2 Proposal contemplated shipping in ice, which would have represented a substantive change to the accidents and malfunctions risk assessment. This component of the Phase 2 Proposal was subsequently dropped as a result of concern from Inuit related to winter shipping.	
QIA 08 (this is a follow-up to IR response Dec. 20)	Volume 1 FEIS Addendum (Sections 1.2, 4.1.2, 4.3.1, and 8.3.11.8), Volume 6 TSD 25 (Section 9), Volume 7 TSD 28 (Appendix AA)	It is requested that the Proponent: A. Confirm whether all ancillary facilities and activities locations are finalized and located within the PDA and if so provide further details on their location and required physical works and activities at these locations. B. Provide a detailed assessment of potential impacts to Cultural Heritage resources and Inuit land and resource use from all ancillary facilities and activities associated with the project. C. Identify all commitments to engaging Inuit in final siting and management planning and monitoring at any yet to be determined ancillary facilities and activity locations, and how IQ will be used to inform final siting decisions.	A. Details on the Project not found in the main part of TSD 02 Project Description can be found in the appendices. This includes 33 detailed 11x17 figures in Appendix B (Figure B.4) that show proposed modifications to the current Commercial Lease Boundaries, and the Water Licence Amendment Application presented in Appendix D. The final footprint of additional project infrastructure is well defined. B. An assessment of potential impacts to Cultural Heritage Resources and Inuit land and resources used from all activities is provided in TSD 25 Socio-Economic Assessment, Section 9. C. Baffinland is carrying out a series of Inuit knowledge workshops on impacts and mitigation measures with community representatives; the most recent workshop was held January 15-18, 2019 and others are planned for February and March. Items such as the siting of the rail relative to Inuit land use and locating snowmobile/ATV crossings will be among the subjects to be discussed.	
QIA 13	FEIS Addendum TSD 3 – Phase 2 Community Workshop Report (page 15 and 16 of 237)	The Proponent's primary data source for IQ data collection and Inuit land and marine use is through community workshops. a. Please identify whether and how this approach to data collection is appropriate in an Inuit context and identify other methods considered to gather cultural, traditional use, and IQ-related information and knowledge. b. Please also provide more information on how it engaged with communities in the identification of the process used to gather IQ and Inuit Land and Marine Use information. c. Identify what opportunities were Inuit given to determine what questions were asked and what topics were focused on in the workshops.	A. Workshops (also known as 'focus groups' or 'group interviews') are a commonly used qualitative research method (Patton 2002) that may be used in IQ-related work (e.g. Armitage and Kilburn 2015, Huntington 2000, Huntington et al. 2002). They have been successfully used by Baffinland in the past to collect IQ (see Table 1, Appendix 5), to collect IQ for other recently approved mining projects in Nunavut (e.g. Kitikmeot Inuit Association 2014; ERM 2016), and for other mining-community focused research in Nunavut (e.g. Pauktuutit Inuit Women of Canada et al. 2014). Workshops typically encourage cooperation between participants, which is an important theme encouraged by Inuit Societal Values (e.g. 'fostering good spirits by being, open, welcoming and inclusive'; 'working together for a common cause'; and 'decision-making through discussion and consensus') (Government of Nunavut 2018). Baffinland acknowledges different data collection methods have their individual strengths and weaknesses, and that no one method is necessarily without limitations (see for example: Armitage and Kilburn 2015, Huntington 2000, Huntington et al. 2002, and Patton 2002). Baffinland has employed several data collection and engagement methods during Project development to share and capture a range of community perspectives. These methods have included desktop studies, interviews, surveys, workshops, and meetings with the public and various stakeholder groups (Appendix 5). Considering Baffinland's success with the workshop model in the past and the considerable amount of IQ that had already been collected for the Project, invited persons workshops were selected to help fill data gaps for the Phase 2 Proposal and supplement existing sources of information. Several open houses were also organized in association with each workshop to provide opportunities for the general public to participate. Likewise, follow-up meetings to each of the workshops were held with the Mary River Community Group (MRCG) where workshop summaries were presented for further input and feedback. Baffinland consulted with the QIA on its Phase 2 Proposal community workshop methodology proposals before commencing the workshops, in order to provide the QIA with an opportunity to comment on and approve all community workshop plans. Various suggestions were made by the QIA during their review of these documents, which were considered and incorporated by Baffinland as appropriate. Th QIA provided formal	QIA 13 Attachment 1: Full Response

ID No#	Document Reference	Info Request	Response	Attachment
			approval of the final workshop methodology proposals before any of the workshops proceeded. The QIA also had several representatives attend these workshops in-person. Considering the above, it is Baffinland's view that properly designed workshops can indeed be appropriate in an Inuit context and particularly when matched with other data collection methods. B. & C. Community-based research in support of the Project began in 2006 and focused on five North Baffin communities which have a traditional land and/or marine use tied to the Project development area (Arctic Bay, Clyde River, Hall Beach, Igloolik, Pond Inlet). In North Baffin, initial information and IQ was collected through the establishment of working groups in each community. Working groups were typically selected to represent a cross-section of people in the community with respect to sex, age, lifestyles and occupation. Baffinland approached Elders committees, hamlet leadership, HTO/HTA, and women's committees, and requested participation by nomination of a representative to the working group. Youth representatives and other recognized community experts such as people familiar with Project areas were later identified by the newly established working group to round out representation in the group. Knowledge was recorded through the course of discussion in working group meetings. Research agreements were negotiated between each of the five North Baffin community working groups and Baffinland and outlined roles and responsibilities of the parties; purpose and methods of the IQ study; and clarification on matters of privacy, informed consent and ownership of data. Subsequently, several methods were used to collect IQ and further engage communities for the FEIS, as described in Table 1 (Appendix 5). FEIS Appendix 2B: Summary of Community-Based Research Undertaken for the Mary River Project 2006 to 2010 (Baffinland 2012) should be consulted for additional details. Information collected during the FEIS has provided an important foundation of IQ on which Baffinland continues to build upon. While the community working groups no longer exist, a Mary River Community Group (MRCG) has since been formed in Pond Inlet in cooperation with the QIA. For the Phase 2 Proposal, workshop topics were identified by Baffinland after an internal review of data gaps in the existing IQ study, through discussions with the QIA, and after soliciting community feedback during an open house hosted by Baffinland on the Phase 2 Proposal in Pond Inlet on January 22, 2015. Preliminary workshop topics were also discussed with the Pisiksik Community Advisory Group (CAG; later dissolved in favour of creating the MRCG) in Pond Inlet on January 23, 2015. CAG members provided valuable feedback on potential workshop topics and structure, while also suggesting a number of potential workshop participants. The CAG members agreed that an invited persons workshop format would be useful for collecting information, but also felt that various members of the public and the CAG themselves should be provided the opportunity to participate. Workshop participants were also generally free to discuss any sub-topics/issues they pleased, within the overarching workshop topic. As noted previously, Baffinland developed and consulted with the QIA on its Phase 2 community workshop methodology proposals before commencing the workshops, in order to provide the QIA with an opportunity to comment on and approve all community workshop plans. Baffinland is committed to working with QIA on future IQ studies and welcomes their feedback on alternative data collection methods that may be employed. Baffinland also acknowledges IIBA Article 16.3 (Collection and Use of IQ) will continue to guide the Company's actions in this area. **References:** Armitage, P. and S. Kilburn. 2015. Conduct of Traditional Knowledge Research – A Reference Guide. Whitehorse, YT: Wildlife Management Advisory Council North Slope. Baffinland Iron Mines Corporation (Baffinland). 2012. Mary River Project - Final Environmental Impact Statement. February 2012. ERM. 2016. Phase 2 of the Hope Bay Project: Caribou Workshop. Prepared for TMAC Resources Inc. by ERM Consultants Canada Ltd.: Vancouver, British Columbia. Government of Nunavut. 2018. Turaaqtavut. 50 pages. Found at https://www.gov.nu.ca/information/turaaqtavut-0. Accessed on April 5, 2018. Huntington, H.P. 2000. Using Traditional Ecological Knowledge in science: Methods and applications. Ecological Applications, 10(5): 1270-1274. Huntington, H.P., P.K. Brown-Schwalenberg, K.J. Frost, M.E. Fernandez-Gimenez, D.W. Norton, and D.H. Rosenberg. 2002. Observations of the workshop as a means of improving communication between holders of traditional and scientific knowledge. Environmental Management, 30(6): 778-792. Kitikmeot Inuit Association (KIA). 2014. Naonaiyaotit Traditional Knowledge Project-Hannigayok (Sabina Gold & Silver Corp. Proposed Back River Project). Results from Data Gaps Workshops, Final Report (June 2014). Kitikmeot Inuit Association, Kugluktuk NU. Patton, M.Q. 2002. Qualitative Research and Evaluation Methods. 3rd ed. Thousand Oaks, California: SAGE. Pauktuutit Inuit Women of Canada, K. Czyzewski, F. Tester, N. Aaruaq, and S. Blangy. 2014. The Impact of Resource Extraction on Inuit Women and Families in Qamani'tuaq, Nunavut Territory: A Qualitative Assessment. Report for the Canadian Women's Foundation, January 2014. Pauktuutit, Inuit Women of Canada and School of Social Work, University of British Columbia.	

ID No#	Document Reference	Info Request	Response	Attachment
QIA 14	FEIS Addendum TSD 3 – Phase 2 Community Workshop Report (page 16 of 237)	The Proponent is requested to provide further detail on how IQ was recorded from Inuit community members during meetings and workshops. Important to this provision of further detail is for the Proponent to address the question of if sessions were not audio recorded, how can data be properly attributed, archived, verified or utilized?	Baffinland is committed to working together with QIA and welcomes their feedback on potential improvements and alternative data collection methods that may be employed in future IQ studies. Baffinland is also pleased to continue its discussions with QIA on plans for additional community workshops occurring in early 2019. IQ was recorded during the community workshops using several methods. During the invited persons workshops and verification meeting, audio recordings (in .mp3 format) and detailed workshop notes (which included the name of the individual(s) sharing information) were taken. This was in addition to the recording of relevant spatial data on poster-sized base maps (later input into a GIS database). The invited persons workshops and verification meeting served as the primary forum for IQ data gathering during the Phase 2 Proposal community workshops. In the public open houses, notes were also taken but the names of individuals who shared information were not recorded as these events were intended to be more informal and some individuals indicated on the sign-in sheets/consent forms they didn't want their names used. Likewise, the open houses were not audio recorded, due to the difficulties associated with audio recording in large group settings where multiple conversations could be occurring simultaneously. The open houses provided an opportunity for the general public to participate in the workshop process; however, they were designed to supplement the invited persons workshops, rather than be a primary forum for IQ data collection. While the open houses were not audio recorded, overall implications for the research program are considered minor as other processes (e.g. notes and maps) were still used to capture information. Table 1 (Appendix 5) summarizes the IQ recording methods used for the Phase 2 Proposal community workshops. Baffinland developed and consulted with the QIA on its community workshop methodology proposals before commencing the workshops, in order to provide the QIA with an opportunity to comment on and approve all Phase 2 Proposal community workshop plans. Various suggestions were made by the QIA during their review of these documents, which were considered and incorporated by Baffinland as appropriate. QIA provided formal approval of the final workshop methodology proposals before any of the workshops proceeded. The QIA also had several representatives attend these workshops in-person.	QIA 14 Attachment 1: Full Response
QIA 15	FEIS Addendum TSD 3 – Phase 2 Community Workshop Report (page 16 of 237)	How was the material chosen to be subject of verification workshops determined?	The verification meeting was intended to summarize and verify key workshop results, provide opportunities for additional participant input, and provide closure to the overall workshop process. Materials reviewed during the verification meeting were identified by members of Baffinland's workshop team, to reflect key topics discussed during the workshops and the major data gathering exercises that were completed. Valuable insights were shared by participants during this meeting which resulted in some revisions to the workshop datasets being made. For greater clarity, a summary of materials reviewed during the Phase 2 Proposal community workshops verification meeting has already been provided in Section 2.2.4 (Verification Meeting) of TSD 03 (Phase 2 Workshops Report). The QIA had representatives attend all workshops and the verification meeting, and Baffinland provided QIA with a copy of the community workshops report (i.e. TSD 03) in January 2017 for review.	
QIA 16	FEIS Addendum TSD 3 – Phase 2 Community Workshop Report, page 20-21 of 237	Further justification for the chosen technique for "interpreting" IQ is required, as well as consideration of what role Inuit should be playing in "interpreting" IQ in the environmental assessment process and how Baffinland will support this.	Research programs typically involve some form of analysis and/or interpretation of results. However, Baffinland attempted to minimize the amount of interpretation that occurred in TSD 03 (Phase 2 Workshops Report) and focused on summarizing information that was provided for key workshop themes that were discussed. Baffinland also allowed workshop voices to speak for themselves in many cases; over 275 direct workshop participant comments were included in the main body of the report in support of the summaries that were provided. Baffinland has not suggested some comments presented in TSD 03 were more valuable than others or that less frequently raised comments were less important. Comprehensive summaries of information obtained during the workshops have been provided in TSD 03. Full workshop notes (totaling approximately 80 pages) were also presented in Appendix D of TSD 03, for the reference of anyone who wished to explore the datasets more fully. Section 2 of TSD 03 includes discussion on community workshop design, data collection and verification methods, data analysis and reporting, data limitations, and other topics. The associative analysis (or 'content analysis') approach utilized in TSD 03 is a very commonly employed qualitative research analysis method (e.g. GSRU 2008; Hsieh and Shannon 2005; Patton 2002). While common themes, patterns, and information in data sets are typically sought out through this approach (where they exist), alternative views and/or perspectives are also of value and should be acknowledged (e.g. unique individual viewpoints were considered and reported on in TSD 03, as appropriate). A key benefit of this approach is its ability to help organize information and provide clarity on important topics relevant to the research. The likelihood of misinterpreting results has been reduced through careful research design and execution, and ensuring experienced personnel complete the work. Baffinland developed and consulted with the QIA on its community workshop methodology proposals before commencing the workshops, in order to provide the QIA with an opportunity to comment on and approve the Phase 2 Proposal community workshop plans. Likewise, the lead author of the community workshops report (TSD 03) was a social scientist with a PhD and 12 years' experience working in Canada's north, including work on several IQ and TK studies for industry, Indigenous, and government clients. Verification and peer review of results has also reduced the likelihood of results being misinterpreted. TSD 03, Section 2.2.4 describes the verification meeting that occurred following the five community workshops to review information that had been collected. QIA also had representatives participate in each of the five workshops and the verification meeting. Likewise, Baffinland provided QIA with a copy of the community workshops report in January 2017 for review. Providing access to raw research data can also create confidence in the results that were reached (e.g. Appendix D of TSD 03 includes full workshop notes, and IIBA Article 16 contains additional guidance for Baffinland and QIA on the collection, use, ownership, and oversight of IQ for the Project).	

ID No#	Document Reference	Info Request	Response	Attachment
			Baffinland has continued to engage Inuit on the Project directly through its public consultation program (described further in TSD 04 Phase 2 Public Consultation Report). This has included various meetings with the public and stakeholder groups (including working groups), and through other means. In accordance with Article 15.10 of the amended IIBA (QIA and Baffinland 2018), the Company further supports enhanced engagement efforts with Inuit by paying for QIA's participation, including technical advisory support, in NPC, NIRB, and NWB proceedings as they relate to the Project. This furthers the participation of QIA in the regulatory process, ensuring that Inuit are engaged both directly and indirectly through QIA. **References:** Government Social Research Unit (GSRU). 2007. Background paper 8: how do you know why (and how) something works? Qualitative methods of evaluation. In the Magenta Book: Guidance Notes for Policy Evaluation and Analysis. London, UK: Government Social Research Unit. Hsieh, H.F. and S.E. Shannon. 2005. Three approaches to qualitative content analysis. Qualitative Health Research 15(9): 1277-1288. Patton, M.Q. 2002. Qualitative Research and Evaluation Methods. 3rd ed. Thousand Oaks, California: SAGE. Qikiqtani Inuit Association (QIA) and Baffinland Iron Mines Corporation (Baffinland). 2018. The Mary River Project Inuit Impact and Benefit Agreement. Amended and restated agreement made on October 22, 2018.	
QIA 17	FEIS Addendum TSD 3 – Phase 2 Community Workshop Report (pages 25 and 34 of 237)	Is the IQ information that has been gathered considered representative of the affected Inuit communities? What is considered to be a representative sample size from each community and how was this number arrived at?	The information presented in TSD 03 (Phase 2 Workshops Report) is not considered 'representative' of the affected Inuit communities, nor was a 'sample size' methodology employed. This type of methodology is more commonly applied to certain types of quantitative studies; it is not commonly applied to IQ or TK studies that are primarily qualitative in nature. TSD 03 notes that it provides a scoping-level review of key issues and suggestions raised by community members regarding the Phase 2 Proposal. The workshops and open houses were not designed to result in final Project decisions being made by the participants or communities. Participants provided independent perspectives and were never assumed to be representing the viewpoints of their communities and/or nominating organizations. While TSD 03 strives to present the information shared by workshop participants in a comprehensive manner, TSD 03 isn't intended to reflect workshop and/or open house participant consensus on all the issues raised or be a complete representation of all viewpoints or knowledge held by community members. Baffinland has acknowledged that TSD 03 provides a scoping-level review of key issues and suggestions raised by community members with regards to the Phase 2 Proposal, and that additional community engagement would be necessary to fully satisfy public consultation requirements on the Phase 2 Proposal. Since completing the community workshops, Baffinland has continued to meet with various community stakeholders (e.g. the public, hamlets, HTOs, MRCG), working groups (e.g. MEWG, TEWG, SEMWG, QSEMC), and the QIA to discuss the Phase 2 Proposal. IQ sessions continue to be held in support of the Phase 2 Proposal to better understand community perceived environmental risks of the transportation of iron ore by rail and ship through the Nunavut Settlement Area, the results of which will be reported to the NIRB and Interveners as they are available. Baffinland is pleased to continue its discussions with QIA on plans for these workshops and welcomes their participation in them.	
QIA 18	Project Summary (pdf pg. 35 of 512), Table 7-2 (pdf pg. 171 of 512), FEIS Addendum TSD 3 - Phase 2 Community Workshop Report (pdf pg. 61 of 237)	The Proponent is requested to provide further information on how IQ and Inuit observation is being incorporated into monitoring of project-specific and cumulative effects.	Baffinland's plans for monitoring project and cumulative effects are outlined within its various Monitoring Plans, as described in TSD 28 Management and Monitoring Plans (e.g., Aquatics Effects Monitoring Plan - Section 5.4, Terrestrial Environment Mitigation and Monitoring Plan - Section 4, Marine Environmental Effects Monitoring Plan – Sections 3 and 4, Socio-economic Monitoring Plan - Section 2). For a greater understanding of current Inuit participation in environmental monitoring programs please review Baffinland's response to QIA-06. Extensive IQ has been collected in support of the Mary River Project and the Phase 2 Proposal specifically, which will influence the proposed modifications to these plans. IQ sessions continue to be held in support of the Phase 2 Proposal to better understand community perceived environmental risks of the transportation of iron ore by rail and ship through the Nunavut Settlement Area, the results of which will be reported to the NIRB and Interveners as they are available. Inuit observation will be considered as part of the monitoring of effects, where appropriate. The Management and Monitoring Plans will be updated and circulated for review following the technical meetings for review and comment during final written submissions. Proposed updates to the plans are being tracked through a commitment register, which is attached as Appendix 7 to this submission.	Appendix 7 Commitment Register
QIA 19	FEIS Addendum TSD 3 – Phase 2 Community Workshop Report (page 147 of 237)	How were Inuit community members involved in effects characterization and significance estimation exercises?	Baffinland benefits from an extensive record of engagement with communities in relation to the Mary River Project that dates back to 2007. Since 2014, the engagement program for the Phase 2 Proposal specifically has included the identification and discussion of topics of interest and concern regarding the proposal and its potential effects. Baffinland uses a StakeTracker system to document and track comments, issues, and concerns that are identified through consultation or engagement, facilitating systematic and effective follow-up and reporting. IQ was also collected and considered throughout the assessment of the Phase 2 Proposal. In 2015 and 2016 a series of 5 IQ workshops were held to discuss different components of the Phase 2 Proposal and the corresponding relationship with the environment and Inuit land use. Project planning took the results of these workshops into account and modified the project design to address apparent concerns, which ultimately contributed to effects determinations. IQ collected as part of the Project is used to guide project planning so as to reduce potential effects on land use activities and/or sensitive areas. IQ sessions continue to be held in support of the Phase 2 Proposal to better understand community perceived environmental	

ID No#	Document Reference	Info Request	Response	Attachment
			risks of the transportation of iron ore by rail and ship through the Nunavut Settlement Area, the results of which will be reported to the NIRB and Interveners as they are available.	
QIA 20	FEIS Addendum TSD 4 – Public Consultation (page 7-8 of 73), Section 11 of the FEIS Addendum – Sustainability Analysis (pdf pg. 229 of 512)	Provide a discussion of whether and specifically how Baffinland's corporate policies, plans and programs recognize and adhere to Inuit laws and norms.	The assessment conclusions presented in the sustainability analysis (Table 11-1, Phase 2 Proposal (2018)), demonstrate that the Phase 2 Proposal will continue to provide sustainable and durable social and economic benefits to Inuit without compromising the integrity of the ecosystem or the right of future generations to the sustainable use of renewable and non-renewable resources. These results therefore show that the proposed Project as designed, inherently considers and adheres to Baffinland's understanding of the intent of the Inuit Laws and norms presented by the QIA. Further, Baffinland sees the Sustainable Development principles that underpin the Company's approach to operating the current Project and planning for the proposed Project as complementary to the Inuit Laws and norms as outlined by the QIA (Appendix 5).	QIA 20 Attachment 1: Table 1
QIA 28	Section 6 (Project Alternatives, pg. 6.1; pdf pg. 165 of 512), TSD 01 (Alternatives Analysis, pdf pg. 5 of 22; and Table 1.1 (Assessed Alternatives))	It is requested that the Proponent provide more information on how it calculated "community acceptability" as a criterion in the assessment of alternatives - who conducted this exercise, how was "community acceptability" calculated, and what role - if any - have Inuit communities played in this calculation? In addition, more detailed information is required on the perspectives of Inuit on some of the proposed alternatives means (see below). From Issues/Concerns: In order to provide a better understanding of Inuit perspectives on alternatives means, the Proponent is requested to provide detailed notes on each of the following issues, with all community inputs from meetings and workshops to date: A. Inuit perspectives on increased shipping season and larger ships B. Inuit perspectives on building and operating a railroad through tundra and effects on caribou and traditional use C. Inuit perspectives on expanding the Milne port facility	The approach to alternatives for the Phase 2 Proposal is consistent with the FEIS (2012), as outlined in Section 1.6 (Key Outcomes) of Section 1 (Consultation) of Volume 1 of the FEIS, and Section 6.1.3 (Social Acceptability) of Section 6 (Alternatives) of Volume 3 of the FEIS. In Section 1 of TSD 01 (Alternatives Analysis), it is stated that the performance criteria for each alternative was qualitatively assessed, and reflect the community perspectives as expressed during community engagement activities. The alternatives assessment was completed by qualified ESIA practitioners based on best available information, engineering considerations (and costs), professional judgment, and a review of community consultation records. "Community acceptability" is a subjective indicator, given that community perspectives varied; common themes or trends derived from community consultation records informed the identification of community acceptability for each alternative. It is through this communication of community perspectives during engagement activities that Inuit communities have provided Baffinland with an understanding of key issues for consideration in Project development, including the selection of alternatives. It is notable however, that any alternatives that would make the project economically or technically infeasible could not be carried forward, irrespective of community acceptability for a proposed option. Inuit perspectives on project alternatives are outlined in TSD 3 (Phase 2 Workshop Report) and TSD 4 (Public Consultation).	
QIA 29	EIS Addendum, Section 11 (Sustainability Analysis) (pgs. 11.1 to 11.3)	It is requested that the Proponent show more evidence to support its "sustainability analysis", especially whether and how it integrated IQ and the Inuit worldview overall into this assessment.	Baffinland's Sustainable Development Policy is referenced in the Sustainability Analysis presented in Section 11 of the EIS. The Sustainable Development Policy is included as Appendix H of the EIS, and provides additional information about Baffinland's commitment to operate with utmost respect for the cultural values and legal rights of Inuit, and to consider the views of local communities when making decisions.	
QIA 30	FEIS Addendum Section 7 Concerns of the Communities (pdf pg. 47 of 512)	It is requested that the Proponent provide further detail to support its assertion that there will likely be more beneficial effects on harvesting than negative outcomes from the Mary River Mine Project overall.	Harvesting can be adversely affected if the Project affects wildlife at the population level, or if access to wildlife is restricted. The Project is not expected to meaningfully affect wildlife populations (TSD 10 Terrestrial Wildlife Baseline and Impact Assessment Sections 3.4.1.5 and 3.4.2.2) or access (TSD 25 Socio-Economic Assessment Section 9.3.2), and compensation is available through the Wildlife Compensation Fund, if effects do occur. Conversely, harvesting requires equipment and the Project provides additional income to individuals in the community and therefore the means to purchase the necessary equipment to harvest wildlife. In this way, the Project may result in a positive effect to harvesting.	
QIA 31	FEIS Addendum, Section 8.2.1.3 (Noise and Vibration) (pdf pg. 175 of 512)	It is requested that the Proponent provide more information on how Inuit sensory observations were integrated into the development of Local Study Areas for specific VECs and VSECs, in the collection of baseline and change over time data, and in the development of thresholds of measurable change and acceptable change, respectively.	Baffinland understands the importance of sensory observations of Inuit. However, rather than trying to develop a theoretical model of Inuit sensitivities to sensory disturbances within the assessment, we have sought to confirm these aspects with our Inuit stakeholders/receptors. For example, HTO cabins are located near to both the mine and the port, and these were identified as sensitive receptors in the Phase 2 Proposal. Baffinland acknowledged in the assessment that noise emissions could be disruptive at the cabins, and that the company is open to relocating (or building a new cabin) at another location as desired. Several weeks ago, Baffinland and the HTO board member responsible for cabins visited the site to look at potential sites for cabin relocation. At Milne Port, the HTO board member identified a new location further from the port but still fairly close to the old site. At the Mine Site, the HTO had selected the current cabin location in 2013 when it was replacing an old cabin that was within the mine site Project Development Area. The HTO decided last month to move the cabin to better ground near to the existing location. Baffinland is committed to continuing dialogue with the HTO regarding cabins and site access, and are open to further changes to accommodate Inuit interests.	
QIA 33	EIS (page 4.3)	The American Railway Engineering and Maintenance of Way Association (2010) guideline is proposed to be used for the design and management of culverts along the North Railway. How does this guideline consider the cold climate and environment experienced at the Mine?	The design of the culverts dictated by the AREMA guideline is for a 1:25 year flood design without static head at the entrance and 1:100 year flood design using the available head at the entrance, the head to 2 feet below the base of the rail or the head to a depth of 1.5 times the culvert diameter, whichever is less. The guideline does not specifically address the climate on site; however, is applicable to the Project environment. The Project will also follow Transport Canada's guideline for Culvert Safety Management. The Project adopted this approach with the exception that the 1:100 flood check was changed to a more conservative 1:200 year flood check. This is to reduce the potential flood risk to the rail line and to ensure culverts are suitably sized to deal with flood events and the variability in	

ID No#	Document Reference	Info Request	Response	Attachment
			concentration of freshet flow on an annual basis. Operational experience on the Tote Road has shown that peak freshet flow varies along the length of the Tote Road on an annual basis. For maintainability, safety and culvert inspection purposes the rail culverts have been limited to 900mm in diameter for all culverts that cross the proposed rail alignment. These aspects are recommended by the AREMA guideline as items to consider when selecting the minimum size of culverts to be adopted. Experience gained along the Tote Road has also shown that larger culverts are easier to maintain and have a reduced risk of ice blocking flow. The Project has adopted a conservative approach for the culvert design hence the high number of culvert installation locations that have been identified to ensure the variability in freshet flow and flood volumes are accounted for. Numerous culvert structures have been added in areas where there is no defined stream but where a low spot has been identified based on the topography. All culverts will be marked for easy identification in the winter months and culverts will be inspected prior to the winter months during periods of low flow. Steaming of culvert inlet and outlets will be adopted as standard practice for the rail culverts, to be completed mainly from rail mounted maintenance vehicles. Consideration and investigations are underway regarding the potential to cover the inlets and outlets of culverts in the fall after stream flow has stopped and then to uncover these in the spring to prevent snow from blowing into the culverts and to make the steaming work easier. No final decision has been made in this regard as it is still in a testing phase and it is subject to the final safe operating procedures to be developed for the rail operations. Geotechnical work is being completed to assess culverts for potential settlement as well as stability. Recommendations from this work will be incorporated into the design once completed. Detail maintenance and safe operating procedures and plans will be prepared as part of the Transport Canada Railway Operating Certificate application. The development of these detail plans will commence later in 2019.	
QIA 36	EIS (Section 6.3, page 6.1)	For the preferred rail alignment, provide description on how the final selected route considered the potential impacts to specific water bodies, land and water uses, sensitive environments and/or wildlife.	Route alternatives, including deviations from the preferred route, are described in more detail in TSD 01 (Alternatives Analysis), Section 3.5. At the local scale, route selection was primarily a function of avoiding ice-rich soils and minimizing interactions with watercourses. No land and water uses were identified that could have influenced the routing at a local level. A number of raptor nests were identified within 500 m of the railway and these will experience short-term disruption during construction (TSD 12 Migratory Birds Baseline and Impact Assessment, Section 3.5.1.4). Several culturally significant archaeological sites were avoided during the planning phase by relocating a quarry (TSD 25 Socio-Economic Assessment, Section 9.7.1).	
QIA 37	(Section 8.3.4)	Clarify the number of overages in water quality criteria that have occurred along the Tote Road for the currently approved Project for each year over the past 3 years.	Total suspended solids (TSS) has been the key parameter in which exceedances have been observed along the Tote Road. A summary of TSS exceedances that have occurred at water crossings along the Tote Road during the last three years (2016 - 2018) is provided in Appendix 5. The tables provided in Appendix 5 identifies the number of samples collected at water crossings along the Tote Road which exceeded the applicable criteria presented in the Type 'A' Water Licence. Contributing factors to the elevated TSS concentrations observed along the Tote Road include both Project related activities and natural factors, evidenced by TSS exceedances observed both upstream and downstream of Tote Road water crossings. The vast majority of TSS exceedances along the Tote Road have been observed during the high flow periods of freshet (May, June). As shown in Appendix 5, continued upgrades to Tote Road water crossings and road side drainage have greatly reduced the frequency of TSS exceedances at Tote Road water crossings in 2018 when compared to 2017. Baffinland will continue to upgrade and maintain the Tote Road to address and mitigate environmental, health, safety and operational concerns.	QIA 37 Attachment 1: TSS Exceedances
QIA 38	EIS (Section 9.3.1, page 9.29)	How was a 40 m corridor width on each side of the rail selected? If applicable, detail if this distance is associated with an impact assessment prediction.	The 40 m corridor was selected based upon the expected embankment width plus a buffer for equipment to operate at the toe of the embankment. It is consistent with the PDA established for the South Railway in the FEIS (2012). Baffinland does not view the PDA as a means to delineate adjustments to the Commercial Lease, since the Lease requires a 50 m undisturbed buffer. Baffinland presented its proposed extensions to the Commercial Lease boundaries to accommodate Phase 2 Proposal infrastructure on Figure B.4, located in Appendix B of TSD 02 Project Description.	
QIA 40	TSD 9 (page 5)	What mitigations will be applied to limit affects to sensitive landforms during construction of the rail and road? What adaptive management triggers and thresholds will be applied to limit potential effects from occurring?	Mitigation measures to minimize impacts on sensitive landforms due to rail construction are listed in TSD 09 Vegetation Baseline and Impact Assessment, Section 2.5.2.3. An additional mitigation measure has been to conduct thermal modelling (see Appendix 8), which will inform rail embankment design.	Appendix 8 Thermal Analysis Model
QIA 41	TSD 8 (page 10)	For each km along the northern rail alignment, provide a graph depicting volume of cuts and volume of fill materials that will be required to construct the road/rail.	Plan and profile drawings of the railway alignment showing the cut and fill profile are provided as Appendix 5.	QIA 41 Attachment 1: Cut/Fill Volume Per Km Graph
QIA 43 (this is a follow-up to IR response Dec. 20)	TSD 8 (page 16)	Describe the adaptive management program that will be applied to the northern rail to address settlement concerns for the northern rail.	A response to this Information Request was provided to the NIRB on December 20, 2018 in "IR Responses, Phase 2 Proposal - Mary River Project". The long term embankment settlement calculations will be available in late March, 2019.	

ID No#	Document Reference	Info Request	Response	Attachment
QIA 45	TSD 8 (page 17)	If PAG rock is encountered in a rock cut area, how will the PAG rock removed from the cut be managed/utilized?	If PAG rock is extracted from a rock cut area, it will be disposed of at a location where it can be encapsulated in permafrost, namely the Waste Rock Facility (WRF) at the Mine Site. Disposal involves encapsulation using a non-PAG cover material.	
QIA 46	TSD 8 (page 20)	A. Describe what geotechnical information remains to be collected to address uncertainty with regards to thaw settlement along the rail. B. Please provide on a map where additional information need to be collected?	A. Thermal modelling has been conducted along the railway (Appendix 8). No geotechnical information remains to be collected. B. Not applicable; see answer to Part A.	Appendix 8 Thermal Analysis Model
QIA 47	TSD 13 (page 8)	A. Will the Tote Road and north rail culverts be design[ed] and constructed with the same design criteria? For example, will the Tote Road culverts located adjacent to the rail be upgraded to the 1 in 200-year storm event? B. What are the potential interactions with regards to water management that could occur between the Tote Road and the rail?	A) New Tote Road culverts will be designed and constructed to meet the 1 in 25-year storm event, according to the Civil Design Philosophy presented as Attachment 5.1 of the Water Licence Application (TSD 02 Project Description, Appendix D). Railway culverts will be designed and constructed to meet the 1 in 200-year storm event, according to the Railway Design Criteria presented as Attachment 5.2 of TSD 02, Appendix D. B) Potential interactions regarding water management between the Tote Road and the Railway are as follows: The capacity of Tote Road culverts will be exceeded more often during storm events than the corresponding rail culvert. The railway is positioned upstream of the Tote Road except for a few kilometers where is located downstream of the Tote Road alignment. As such, due to the design of the rail culverts, a blow-out upstream on a Tote Road culvert will not pose a problem since the rail culverts have been designed for a 1:200 storm event. When the capacity of a Tote Road culvert is exceeded, flows are likely to over-top the road surface without consequence to the railway. It is possible in select locations that the road could cause damming that could affect the rail embankment upstream. Another potential interaction is the effect of combining two streams into one (diversions) due to rock cuts along the railway. This was assessed in Appendix D of TSD 13 (Surface Water Assessment), and four downstream Tote Road culverts will potentially be affected by this. Three of the four crossings are on very small streams and the effect is considered inconsequential. The culvert at one downstream Tote Road crossing will need to be upsized to account for the increased flows.	
QIA 49	TSD 2 (page 1.4)	Describe the temporary construction facilities anticipated for the Phase 2 Proposal to ensure they are scoped into the effects assessment and not require further evaluation as part of the licensing process.	The Type A Water Licence Application (TSD 02 Project Description, Appendix D) describes temporary construction facilities including quarries (Section 2.7), laydown areas (Section 2.8), and construction camps (Section 2.9). Temporary shelters and workshops are noted in Table 1.1 of TSD 02 and small equipment maintenance shops and shelters associated with the Ore Dock construction are described in Section 7.5 of Appendix F (Ore Dock No 2 Project Execution Plan).	
QIA 50	TSD 2 (page 1.5)	A. How many culverts proposed in the ERP project have been replaced to date? B. Will the Phase 2 Proposal require any culverts identified to be replaced in the ERP to change in their design, length or size to accommodate the Phase 2 infrastructure?	a) The Project Description Overview from the FEIS Addendum for the Early Revenue Phase (ERP) indicates the requirement to replace up 75 culverts and extend a further 40 along the Milne Inlet Tote Road (Volume 1, Section 2.1, Table 1-2.1). A summary of culvert works to date along the Tote Road by year and type is provided here: **2015 / 2016 / 2017 / 2018 / Total** Replaced: 11 / 4 / 13 / 5 / **33** Extended: 2 / 0 / 20 / 25 / **47** Repaired: 0 / 0 / 2 / 8 / **10** Removed: 3 / 0 / 0 / 1 / **3** b) There are no current plans to replace or modify any existing culverts along the Tote Road to accommodate the Phase 2 Proposal infrastructure (railway). If future upgrades or changes to sections of the Tote Road are necessary and not captured in the IFC's provided for the ERP, the QIA will have an approval opportunity via the Tote Road Adjustment Notice process prior to implementation.	
QIA 51	TSD 2 (page 1.13)	A. Describe the final operating design configuration of the Tote Road for locations not associated with the railway crossings. Provide a typical design or reference to a design report, if available. B. The current condition and construction of the Tote Road is not in accordance with Issued for Construction (IFC) design provided as part of the ERP project. What is the plan and timing for road upgrades to achieve the IFC design? C. It Tote Road is not constructed to achieve the IFC design, describe how it will perform when subject to increased trucking as proposed in the Phase 2 application.	a) Sections of the Tote Road that are not affected by the railway will continue to be maintained to service Project Operations. If future upgrades or changes to these sections of the Tote Road are required, upgrades or changes to these sections of the Tote Road will be implemented as outlined in the IFCs provided for the ERP (Early Revenue Phase). Upgrades or changes not captured in the ERP IFCs will be approved by the QIA via the Tote Road Adjustment Notice process prior to implementation. b) Baffinland will continue to upgrade the Tote Road as required by Operations. A timeline for the completion of Tote Road upgrades is not available. c) Baffinland anticipates that the Tote Road will perform as required for Project Operations. Since the start of Project Operations, the Tote Road has seen a gradual increase in trucking traffic as production has increased, and with the required maintenance being completed the performance of the Tote Road has continued to meet the needs of the Project. It is anticipated that sections of the Tote Road subjected to increased trucking activity will require an increase in routine maintenance activities, such as grading. It is noted that trucking will only increase during construction of the Phase 2 Proposal. Following commissioning of the rail line, trucking of ore on the Tote Road will cease and overall traffic will be greatly reduced.	

ID No#	Document Reference	Info Request	Response	Attachment
QIA 59	TSD 14 - Freshwater Biota and Habitat Assessment, Sec. 2.5 Effects Assessment, Table 2-3, p. 14 and 15 (p. 23 and 24 of 120)	QIA requests that the Proponent provide a direct comparison of dustfall measurements and modelling estimates at monitoring sites (Mine site, tote road, Milne Port) under baseline conditions and during the ERP (4.2Mt/a now 6MT/a) with those expected during peak Phase 2 truck traffic (12Mt/a) or identify where such a comparison is provided in the EIS.	The following is a brief summary of the response to this comment; the full response is provided in Appendix 5. A comparison was made between modelled dust deposition and measured dust deposition. In general, the comparison shows that the model is providing realistic results, but at locations that are in very close proximity to operations at the port, measured levels are higher than modelling, indicating they were likely influenced by dust from additional miscellaneous minor activities at the site (on-site vehicle traffic associated with pick-up trucks, etc.) that were not included in the modelling. No calibration of the model based on these monitoring results is recommended.	QIA 59 Attachment 1: Full Response
QIA 60	TSD 15 - Conceptual Freshwater Offsetting Plan, Sec. 7.5 Information gaps and next steps, p. 35 of 39 (or p. 40 of 78)	QIA requests that the Proponent clarify what baseline fisheries studies were conducted in summer 2018 to refine the proposed offsetting measures, and when the results will be available.	The candidate offsetting sites were not surveyed in 2018 as originally planned; field programs will be undertaken in 2019 following consultation with the MHTO. Community consultations will also be carried out in 2019 in support of Baffinland's application to DFO for an Authorization under Paragraph 35(2)(b) of the Fisheries Act which is required to construct the second ore dock at Milne Port.	
QIA 61	TSD 15 - Conceptual Freshwater Offsetting Plan, Sec. 6.2 M 71 Lake habitat enhancements, p. 26 of 39 (p. 31 of 78)	QIA requests that the Proponent provide additional information on the KM 71 lake habitat enhancements identified in the freshwater offsetting plan.	Km 71 lake is a relatively shallow 12 ha waterbody that flows into Tom River and potentially supports spawning, summer rearing, and overwintering by Arctic char and ninespine stickleback. The lake bottom is relatively featureless and comprised of low profile alluvium overlain with fine sediments. Rock substrate will be added to increase habitat complexity and surface area to provide substrate for primary production and cover and foraging habitat for fish and invertebrates. Excavation at the lake inlet and sediment from shallow areas is proposed to increase water depth and habitat connectivity for fish. The enhancements at km 71 Lake are proposed because the lake will be affected by the North Railway, but the same enhancements could be undertaken at other fish bearing lakes in the region.	
QIA 62	TSD 15 - Conceptual Freshwater Offsetting Plan, Sec. 6.5, Fish Ladder, p. 26 of 39 (p. 31 of 78)	QIA requests that the Proponent provide information on the expected useful life of the fish ladder identified in the Conceptual Freshwater Offsetting Plan under Arctic climate conditions.	The fish ladder is proposed as a conceptual offsetting measure to provide upstream fish passage at an existing waterfall on Phillips Creek. The useful life of a concrete fish ladder under Arctic conditions is approximately 30 years with ongoing maintenance. Constructed fishways can potentially last for perpetuity if designed and constructed using native materials. At minimum, the fish ladder (if constructed) would be designed and maintained to exceed the operations and post closure phases of the Project. The proposed fish passage concept is also potentially transferable to other fish migration barriers in the region. Pending review comments on the conceptual fish ladder, BIM will undertake further study to support permit applications and monitoring as required by the DFO Fisheries Act Authorization process. This process should result in offsetting measures that address stakeholder concerns, provide benefits, and offset any serious harm to fish habitat that could result from implementation of the Phase 2 Proposal.	
QIA 63	TSD 2 - Project Description, Sec. 4.2 Capesize Ore Dock, p. 4.2 (61 of 87) and Sec. 5.2.1 Proposed Shipping Activities from Milne Port for the Phase 2 Proposal, p. 5.5 (p. 73 of 87), TSD 2 - Project Description, Appendix C. Phase 2 Key Facts Table, pg. 4 of 4, TSD 21 - Risk Assessment for Introduction of Aquatic Invasive Species from Ballast Wa[ter], Summary, p. 2 of 24 and Sec. 2.1 Methods, p. 12 of 24	QIA requests that the Proponent clarify where in the EIS, and how, uncertainties related to the size, number, origin, etc. of vessels used to transport ore, have been factored into shipping risk assessments related to introduction of non-indigenous species, disturbances to marine mammals, bowhead ship strikes and accidental spills.	The Risk Assessment for Introduction of Aquatic Invasive Species from Ballast Water used the most conservative approach and was based on a maximum estimated annual number of ore-carriers of 176 (TSD 17 Marine Environment Effects Assessment, Section 2.6.4). Similarly, a maximum of 176 ore-carriers was assumed for the Marine Mammal Effects Assessment (TSD 24, Section 2.5.2.2), which included an assessment of ship-based disturbance of marine mammals and ship strikes on bowheads (as well as other marine mammal species). Therefore, the various marine-based assessments were based on the upper limit of ship transits per year (n=176) corresponding with the highest potential risk on marine-based VECs identified the Project. With respect to the risk of accidental ship-based spills, the updated risk summary (Section 10.2.2 in the Phase 2 Proposal main report) was updated to reflect the proposed level of ship transects (see also response to IR# WWF 04). The modeling of a diesel spill along a shipping route (TSD 19 Fuel Spill Modelling Report) was updated due to the proposed extension of the ore shipping season into the shoulder season. Larger ore carriers and an increased number of trips are not considered directly in the fuel spill modeling as this considers the effects of a single worst-case spill, and how that scenario would affect the environment.	
QIA 68	TSD 2 - Project Description, Appendix F: Ore Dock No 2, Sec. 3.1 Ice conditions	QIA requests a copy, or information on the location of, the ice design criteria report for the proposed ore dock.	A copy of the Ice Design Criteria Report is provided in Appendix 5.	QIA 68 Attachment 1: Ice Interaction Design Criteria for Detailed Design - Ore Dock - Baffinland Iron Mines: Mary River Expansion Stage 3, December 13, 2018

ID No#	Document Reference	Info Request	Response	Attachment
QIA 70	TSD 16 - Ice Conditions Report	QIA requests that the Proponent clarify whether additional mitigation or adaptive management measures would be required in the event of a summer of heavy ice conditions such as was seen in 2018.	The operative limit of the proposed shipping window is the commitment to not break land fast ice. There is considerable variability in the timing of ice break up from year to year. Ensuring Baffinland's shipping activities are safe for employees and land users is always the first priority. Before Baffinland commences its shipping season each year it will utilize a communication protocol with the community of Pond Inlet to inform Baffinland that residents are no longer using the sea ice. The protocol will be jointly developed and finalized with the community of Pond Inlet. In the event of a summer with heavy ice conditions, the start of the shipping season may be delayed, and ice management and ice breaker operations may be used more frequently. These decisions would be made in keeping with the guidance and requirements laid out in the protocol described above.	
QIA 71	TSD 18 - Ballast Water Dispersion Modelling Report, Sec. 3.2 Shipping Scenarios and Ballast Water Discharge Characteristics, p. 5 and 6 (p. 13 and 14 of 57)	QIA requests that the Proponent clarify whether, and if so how, the ballast water dispersal modelling was tested for sensitivity to assessment parameters such as ballast water volume, exchange efficiency and compliance, changes in source ports, differences in salinity/temperature, and the presence of sea ice.	A systematic sensitivity analysis of the parameters listed in the IR from QIA has not been conducted. However, the model has been tested in 15 simulation runs, where the model has been compared to temperature, salinity, elevation in the water column and current measurements, tested for different fresh water inputs, and for variation of boundary conditions. The ballast water model has been run with two different ballast water source locations and two different ballast water loadings. The conclusion is that the ballast water dispersion in the far field is not sensitive to ballast water source location or variation, but is sensitive to variations in the flow (circulation) and temperature and salinity variations in Milne Inlet. As with previous ballast water modelling undertaken for the project in 2014, it was assumed that ballast water discharges are in compliance with regulations which state that ballast water must be exchanged 200 nautical miles from land and in water of at least 2,000 meters deep (i.e. open seas) and that ballast water must have a minimum salinity of 30 PSU prior to being approved for release in Canadian waters. Open seas of the Atlantic Ocean typically have a surface salinity signal of greater than 32 PSU, therefore the ballast water is expected to have similar physical properties (i.e. salinity and temperature) to surrounding water in Milne Inlet below the halocline (based on oceanographic measurements in Milne Inlet in 2014 and 2018). The results with respect to ballast water volume are conservative based on the maximum anticipated number of ships in a season under peak operations for the Phase 2 Proposal. The presence of sea ice was not considered as ballast water is released primarily during the open water season. Although some sea ice might be present during ballast water discharge operations, it is unlikely to significantly impact variations in flow and circulation to the extent that ballast water dispersion results would be altered overall.	
QIA 72	TSD 21 - Risk Assessment for Introduction of Aquatic Invasive Species from Ballast Water	QIA requests that the Proponent clarify whether, and if so how, the assessment of risk from aquatic invasive species introductions was tested for sensitivity to assessment parameters such as ballast water volume, exchange efficiency and compliance, changes in source ports, and differences in salinity/temperature.	The risk assessment for aquatic invasive species (AIS) introductions was based on guidance provided by Fisheries and Oceans Canada (DFO) (DFO 2012; 2014; Casas-Monroy et al. 2014) using ship specifications and shipping volumes planned for the Phase 2 Proposal. This guidance does not include any procedures for systematic sensitivity testing or analysis using this method. However, the most conservative approach was used in the risk assessment to characterize uncertainty (identified as moderate) as per the guidance provided. Invasion risk associated with the Project was determined by combining the probability of introduction and the magnitude of consequence. Probability of introduction was determined by the combination of probability of arrival and probability of survival. Probability of arrival was calculated based on Baffinland's ore shipping schedule, including the numbers of ships of each class and their ports of destination and ports of origin. Even though numbers of ships may vary from year to year depending on operational needs and other circumstances, ballast water estimates were calculated using the maximum number of ships anticipated per month and the largest ship sizes (i.e., Capesize carriers) corresponding with the highest ballast water volumes. The probability of introduction was based on established methodology using relatively few classification categories based on effective and clear criteria. Probability of survival, a constituent of probability of introduction, was based on the concept of "environmental distance", a comparison of environmental similarity between paired source and recipient ports. The shorter the environmental distance, the higher the probability of survival. The method is focused on salinity and climate (temperature), which are fundamental physical characteristics for survival and reproduction of all aquatic organisms. Since the analysis was limited to two variables, the method sensitivity was low (Barry et al. 2008). Even though there is a wide range of source ports on ore carriers, source ports used in the assessment were selected so both salinity and temperature similarities fell into the most conservative (e.g. 'very high') categories. The magnitude of consequences was established by considering the number of high impact aquatic nonindigenous species that may be introduced into the receiving port. This inventory of harmful nonindigenous species that could potentially be introduced to the Canadian Arctic region was sourced from the national risk assessment (Casas-Monroy et al. 2014) and the Marine Invasive Database of the Nature Conservancy (Molnar et al. 2008) available online. A conservative number of the total of 166 species was used in the risk assessment to determine the magnitude of consequence (very high). The most conservative approach was used in the assessment and due to application of the robust methodology, the sensitivity of risk assessment to higher or lower data values is low. **References** Barry, S.C., Hayes, K.R., Hewitt, C.L., Behrens, H.L., Dragsund, E., Bakke, S.M. 2008. Ballast water risk assessment: principles, processes, and methods. ICES Journal of Marine Science 65(2): 121-131. Casas-Monroy, O., Linley, R.D., Adams, J.K., Chan, F.T., Drake, D.A.R., Bailey, S.A. 2014. National risk assessment for introduction of aquatic nonindigenous species to Canada by ballast water. DFO. Can. Sci. Advis. Sec. Res. Doc. 2013/128. Vi + 73 p.	

ID No#	Document Reference	Info Request	Response	Attachment
			Fisheries and Oceans Canada (DFO). 2012. Science review of Baffinland's Mary River Project final environmental impact statement. DFO Can. Sci. Advis. Sec. Sci. Resp. 2012/016. Fisheries and Oceans Canada (DFO). 2014. Science review of the final environmental impact statement addendum for the early revenue phase of Baffinland's Mary River Project. Canadian Science Advisory Secretariat Science Response 2013/024, February 2014, 51pp. Molnar, J.L., Gamboa, R.L., Revenga, C., and M.D. Spalding, 2008. Assessing the global threat of invasive species to marine biodiversity. Front. Ecol. Environ. 6(9): 485-492.	
QIA 73	TSD 21 - Risk Assessment for Introduction of Aquatic Invasive Species from Ballast Water	QIA requests that the Proponent clarify why data on the number of species and their abundances in the ballast water of Project vessels was not collected to inform the invasive species risk assessment.	The risk assessment undertaken for aquatic invasive species (AIS) introductions via release of ballast water is based on guidance provided by Fisheries and Oceans Canada (DFO) (Casas-Monroy et al. 2014). DFO's national risk assessment is based upon the best available information and assessment methodology and has been peer-reviewed by international biological invasion, risk assessment and shipping experts at meetings overseen by DFO's Centre of Expertise for Aquatic Risk Assessment (CEARA). This form of risk assessment does not require biological data collection from ballast water from Project vessels. (i.e., there is no mechanism in this risk assessment to input this type of data). To date, Baffinland has not collected biological data from ballast water of Project vessels as this is not a requirement under the federal ballast water regulations or under the terms and conditions of Project Certificate No. 005. **References** Casas-Monroy, O., Linley, R.D., Adams, J.K., Chan, F.T., Drake, D.A.R., Bailey, S.A. 2014. National risk assessment for introduction of aquatic nonindigenous species to Canada by ballast water. DFO. Can. Sci. Advis. Sec. Res. Doc. 2013/128. Vi + 73 p	
QIA 74	TSD 17 - Marine Environmental Effects Assessment, Sec. 2.6.4 Ballast Water Discharges, p. 26 (p. 38 of 160)	QIA requests that the Proponent clarify how it plans to verify that the ballast water treatment systems used by ore carriers do not represent a risk for the receiving environment.	The International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention) (IMO 2017) requires all ships to have an International Ballast Water Management Certificate, their own Ballast Water Management Plan (BWMP), and a comprehensive record of ballast water exchange and monitoring results recorded in an on-board ballast water record book. Further, all ships are required to comply with the D-2 performance standards that specify the maximum number of organisms and indicator microbes that are allowed to be discharged to the receiving marine environment according to the schedule set by the IMO (MEPC 2017). Treatment systems to comply with the D-2 standard shall be installed and certified in accordance with the IMO Guidelines for Approval of Ballast Water Management Systems (Resolution MEPC.125(53)) and, in the case of systems that use an active substance, the IMO Procedure for Approval of Ballast Water Management Systems that make use of Active Substances (Resolution MEPC.126(53)) is also required. Such systems are to be operated in accordance with the system design criteria and the manufacture's operational and maintenance instructions. The use of such systems should be detailed in the ship's Ballast Water Management Plan. All failures and malfunctions of the system are to be recorded in the Ballast Water Record Book. In the case of prototype systems being tested and evaluated, this should be done in accordance with the procedures in the IMO Guidelines for Approval and Oversight of Prototype Ballast Water Treatment Technology Programmes (Resolution MEPC.140(54)). The use of a treatment system that does not meet the above criteria may also be acceptable if it is at least equivalent to ballast water exchange, but such systems would have to be evaluated and accepted by Transport Canada on a case by case basis. To verify vessels' compliance with the Regulations and BWM Convention, Baffinland will conduct regular inspections of ships arriving at Milne Port to determine their compliance with federal ballast water regulations and the BWM Convention standards. The inspection would include a review of the following on-board documentation: • Ballast Water Management Plan; • Ballast Water Record Book; • International Ballast Water Management Certificate; and • Any other relevant documentation or assistance as required. **References** International Maritime Organization (IMO). 2017. International convention for the control and management of ships' ballast water and sediments (BWM). Available at: http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships'-Ballast-Water-and-Sediments-(BWM).aspx Accessed on 14 September 2017. IMO Marine Environmental Protection Committee (MEPC), 2017. MEPC 71st Session Brief. Available online: https://ww2.eagle.org/content/dam/eagle/regulatory-news/2017/MEPC%2071%20Brief.pdf. Accessed June 2018.	

ID No#	Document Reference	Info Request	Response	Attachment
QIA 75	TSD 17 - Marine Environmental Effects Assessment, Sec. 3.3 Project monitoring, p. 41 (p. 53 of 160)	QIA requests that the Proponent confirm whether settlement baskets for monitoring aquatic invasive species (AIS) were recovered in 2018 and, if so, when the results will be available	Installation of settlement baskets is focused on studies of hard-substrate colonization by encrusting epifauna. The obtained data is used for both Aquatic Invasive Species (AIS) monitoring program and fish habitat offset monitoring. Besides settlement baskets, the AIS program also consists of collection of data on colonization of all types of substrate by macroflora and epifauna using underwater video surveys, collection of zooplankton, benthic infauna and fish samples, and observations of ship hulls. To date, no invasive species have been detected as a result of the comprehensive AIS monitoring conducted between 2015 and 2017. Settlement baskets deployed in 2016 were retrieved in 2017. The cobble substrate in the settlement baskets exhibited limited evidence of colonization. No organisms were available for processing or taxonomic analysis. Therefore, no samples were collected in 2017 and the settlement baskets were redeployed for recovery in 2018. In 2018, settlement baskets recovered from the south-west and south-east corners of the ore dock showed evidence of colonization. Samples were collected, preserved and submitted to Biological Environmental Services Ltd for taxonomic analysis. These results, in addition to results from all 2018 AIS monitoring methods, will be presented in the 2018 Marine Environment Effects Monitoring Program (MEEMP) report that will be issued in Q1 2019. Please also see response to QIA 76.	
QIA 76	TSD 17 - Marine Environmental Effects Assessment, Sec. 3.3 Project monitoring, p. 41 (p. 53 of 160)	QIA request that the Proponent clarify whether any non-indigenous species, invasive or otherwise, have been collected during Project studies conducted up to and including the 2018 field season.	Project-related AIS studies were conducted by collecting taxonomic data on zooplankton, macroflora, benthic epifauna and infauna, fish and mobile epifauna, and encrusting epifauna. Taxa identified during monitoring surveys were compared to the baseline taxonomic inventory created for the Project based on 2008, 2013 and 2014 baseline surveys and previous monitoring studies. Identification of any newly detected taxa identified during annual AIS monitoring efforts are thoroughly investigated to determine if the organism is invasive or non-native. All taxa are compared against a global invasive species database (Molnar et al. 2008), as well as a known invasive species list within the National Risk Assessment for Introduction of Aquatic Nonindigenous Species to Canada by Ballast Water (Casas-Monroy et al. 2014). In addition, a comprehensive literature review is conducted for each newly identified organism to assess what is known on their home range, distribution, life cycle processes, and habitat preferences. This information is used to determine if the newly identified species is considered non-native to the Arctic region. To date, no newly detected taxa identified as part of the ongoing AIS monitoring programs (2015-2017) are considered non-native to the Arctic region. One species of tube-dwelling amphipod (Monocorophium insidosium) that was detected in Milne Inlet in low abundance in 2017 is listed as invasive in the global database of invasive species (Molnar et al. 2008). However, this species was also observed under an unaccepted name (Corophium insidiosum) during baseline surveys conducted in Milne Port during 2013. The best available literature is inconclusive as to whether this species is invasive to the northeastern Atlantic or if its occurrence in Milne Port falls within the northern range of its natural geographic distribution. This species is considered cryptogenic[1] in the east coast of North America because dispersal by shipping may have happened before taxonomic recognition (Fofonoff et al. 2018, Fofonoff et al. 2003). M. insidosium is not currently listed as an invasive species with potential to arrive by vessels to the Arctic according to the National Risk Assessment for Introduction of Aquatic Nonindigenous Species to Canada by Ballast Water (Casas-Monroy et al. 2014)). Further, this species was identified under a different name during surveys in 2013, meaning it is unlikely that Project shipping activities were the initial vector of its arrival in Milne Port. As a result, no additional mitigation measures were recommended in response to the identification of M. insidosium within Milne Port at this time. Future monitoring studies will continue to determine distribution of this species in the Project area including consulting the best available literature to confirm the geographic ranges of M. insidosium and other identified new species. Samples from the 2018 AIS field survey are still being analysed. The results will be presented in the 2018 Milne Inlet Marine Environmental Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Monitoring Program Report in March 2019. **References** Casas-Monroy, O., Linley, R.D., Adams, J.K., Chan, F.T., Drake, D.A.R., Bailey, S.A. 2014. National risk assessment for introduction of aquatic nonindigenous species to Canada by ballast water. DFO. Can. Sci. Advis. Sec. Res. Doc. 2013/128. Vi + 73 p. Fofonoff, PW., Ruiz, GM., Steves, B, Hines, AH, Carlton, JT. 2003. National Exotic Marine and Estuarine Species Information System: Chesapeake Bay Introduced Species Database. [accessed 4 February 2018] http://invasions.si.edu/nemesis/chesapeake.html Fofonoff PW, Ruiz GM, Steves B, Simkanin C, Carlton JT. 2018. California non-native estuarine and marine organisms (Cal-NEMO) system. [accessed 4 February 2018] http://invasions.si.edu/nemesis/. Molnar, J.L., Gamboa, R.L., Revenga, C., and M.D. Spalding, 2008. Assessing the global threat of invasive species to marine biodiversity. Front. Ecol. Environ. 6(9): 485-492. [1] Of obscure or uncertain origin.	

ID No#	Document Reference	Info Request	Response	Attachment
QIA 79	TSD 24 - Marine Mammal Effects Assessment, Sec. 1.2.2 Spatial and Temporal Boundaries, and Appendix A Marine Mammal Baseline Report, Sec. 3.1.3.1 Population Status and Abundance	QIA seeks information on how the Regional Study Area (RSA) for marine mammals can adequately assess the potential for direct and indirect incremental effects on narwhal, given uncertainty about discreteness of the putative Eclipse Sound and Admiralty Inlet summer stocks.	The RSA for marine mammals captures the extent of incremental direct and indirect effects predicted for the Project as well as the past, existing and reasonably foreseeable future developments that Project activities may interact with. The RSA applied in the current assessment (TSD 24 Marine Mammal Baseline and Impact Assessment) is consistent with the RSA applied in the original FEIS submission as well as the Early Revenue Phase (ERP) Addendum, and appropriately conforms to the NIRB guidelines (PR ID#320082). Research studies and marine mammal monitoring programs are ongoing to reduce some of the uncertainty associated with potential stock mixing between the putative Eclipse Sound and Admiralty Inlet summer stocks.	
QIA 82	Main Document (Sec. 8.3.19 Marine Mammals), TSD 24 - Marine Mammal Effects Assessment Appendix A - Marine Mammal Baseline Report, Sec. 4.1.2.1.2 Shore-based Monitoring at Bruce Head (2014-2017) and Sec. 4.1.5	QIA requests an update on the progress the Proponent and their consultants have made in analyzing and reporting on outstanding marine mammal monitoring activities.	Please note that updates on the status of all marine monitoring activities are regularly reported on through the Marine Environment Working Group (MEWG). Four meetings are held per year, with additional tele-conferences organized as needed, as well as regular communication updates and distribution of information via email. The QIA is a member of this working group and would therefore have access to the latest information on the status of monitoring activities. Most recently, the 2014-2017 Integrated Report for the Bruce Head Shore-based Monitoring Program was submitted to the MEWG in draft form on November 28, 2018. MEWG members were requested to provide comments on the draft report by December 19, 2018. Two MEWG members provided comments on the draft report: QIA and Parks Canada (both on December 21, 2018). Baffinland is presently updating the draft report based on the comments received, and a finalized version of the report will be submitted to MEWG in Q1 of 2019. An in-person meeting of the MEWG was held in Ottawa on December 10, 2018 where five (5) QIA representatives were present. Results from the 2017 Narwhal Tagging Program and 2018 monitoring programs were shared with MEWG members at the in-person meeting on December 10, 2018. Based on comments received from MEWG members at the meeting, the draft reports are being finalized and will be submitted (in draft form) to MEWG members in Q1 of 2019. MEWG members will be requested to provide comments back on the draft reports, based on these comments the reports will be updated and a finalized report will be submitted to MEWG members and posted on Baffinland's document portal.	
QIA 83	Main Document (Sec. 4.1.3 Milne Port), TSD 2 (Project Description, Section 4.11.1 Ore Carries, and TSD 24 (Marine Mammal Effects Assessment, Appendix B)	QIA requests information on how acoustic modelling of tugs reflects the actual numbers that may be employed and the noise potential from ice management activities.	A supplemental modelling report is forthcoming that will include consideration of ice management activities and vessel noise in the presence of ice. Regarding the number of tugs that were modelled, Table 1 (Appendix 5) from the Acoustic Modelling Report (TSD 24 Marine Mammals Baseline and Impact Assessment, App. B) has been copied below and updated to include the number of tugs modelled in each scenario. A maximum of six tugs were included in any given scenario. The model scenarios reflect a realistic representation of the planned activities.	QIA 83 Attachment 1: Table 1 Underwater Noise Scenarios modelled in TSD #24, Appendix B
QIA 84	TSD 24 (Marine Mammal Effects Assessment Appendix B -Underwater Noise Modelling Report) and TSD 2 (Project Description, Section 4.2)	QIA requests information on the variability of noise source levels for different Cape class ore carriers and an assessment of how well the modelled source levels compare with this variation.	The sentence in Section 2.1.3 of the noise modelling analysis report (TSD 24 Marine Mammals Baseline and Impact Assessment, Appendix B), which reads: "…so the measured levels were adjusted to the modelled speeds of 9 and 5 kn using Equation A-1", should in fact read: "…so the measured levels were adjusted to the modelled speeds of 9 and 5 kn and vessel length of 316 m using Equation C-1". The modelling was conducted with source levels that were properly adjusted to account for a carrier length of 316 m, based on the equation C-1 (Appendix 5) (Scrimger and Heitmeyer 1991) and (Hamson 1997) (TSD 24, Appendix B, Appendix C, Equation C1). "Source levels for a carrier of length L_T transiting at speed V_T can be estimated from measured spectral levels $S_T(f)$ of a similar carrier of length L_M and speed V_M, by using the relationship based on (Scrimger and Heitmeyer 1991) and (Hamson 1997): $$S_T(f) = S_M(f) + 60\log(V_T / V_M) + 20\log(L_T / L_M), \quad \text{(C-1)}$$ where S_T (f) is the adjusted source level at the 1/3-octave-band of frequency f (Hz). " **References** Hamson, R.M. 1997. The modelling of ambient noise due to shipping and wind sources in complex environments. Applied Acoustics 51: 251-287. Scrimger, P. and R.M. Heitmeyer. 1991. Acoustic source-level measurements for a variety of merchant ships. Journal of the Acoustical Society of America 89(2): 691-699.	
QIA 85	TSD 24 - Marine Mammal Effects Assessment Appendix B - Underwater Noise Modelling Report	QIA requests additional information on the modelled underwater noise levels from ore carriers.	The tables (Appendix 5) provide radii and areas for the SPL isopleths from model scenarios in the underwater noise modelling report (TSD 24 Marine Mammal Baseline and Impact Assessment, Appendix B) involving vessels. For agate scenarios involving more than one vessel, and sound levels for which the sound isopleths encompass all of the vessels, the distances are measured from the centroid of the vessel locations. In these scenarios, distances for the higher sound levels (for which the isopleths are disjointed around each individual vessel) would have to be seated by vessel. For those sound levels (grey-shaded cells), the reader can refer to the columns for the corresponding single-vessel scenarios. For ease of comparison, the attached (Appendix 5) tables have been grouped by like scenarios.	QIA 85 Attachment 1: Tables 1-8

<table>
<tr><th>ID No#</th><th>Document Reference</th><th>Info Request</th><th>Response</th><th>Attachment</th></tr>
<tr><td>QIA 93</td><td>08MN053_TSD-25_Socio-economic-Assessment</td><td>Can Baffinland predict given their current understanding Inuit Firm capacities the number of Inuit Firms that will be able to compete for the new Phase 2 contracts?</td><td>Baffinland cannot predict the specific number of Inuit or non-Inuit Firms that will be able to compete for new Phase 2 Proposal contracts, as it has no control over the decisions made by potential contractors (e.g. on whether to bid on a contract), their capacities, and/or their trajectories for future growth and development.

As noted in Section 8 (Contracting and Business Opportunities) of TSD 25 (Socio-Economic Assessment), a total of $819.1 million worth of contracts have been awarded to Inuit-owned businesses and joint ventures from 2013 to 2017, with anywhere from 9 to 19 contracts executed annually. Some additional contracting data are available for Q1-Q3 2018 and are presented in Table 1. During this period, 9 to 10 contracts (per quarter) were carried out by Inuit Firms for the Project and approximately $128.7 million in contracts were committed to Inuit Firms.

Table 1: Contracting with Inuit and Non-Inuit Firms, Q1 to Q3 2018
<table>
<tr><th>Period</th><th>Current Contracts – Total Number</th><th>Current Contracts – Inuit Firms</th><th>Value of Committed Contracts – Total Value</th><th>Value of Committed Contracts – Inuit Firms</th></tr>
<tr><td>Q1 2018</td><td>26</td><td>10</td><td>$145.4 million</td><td>$69.8 million</td></tr>
<tr><td>Q2 2018</td><td>25</td><td>9</td><td>$108.9 million</td><td>$34.1 million</td></tr>
<tr><td>Q3 2018</td><td>24</td><td>9</td><td>$121.1 million</td><td>$24.8 million</td></tr>
</table>
Baffinland has also finalized an Inuit Procurement and Contracting Strategy (IPCS; TSD 28 Management and Monitoring Plans, Appendix AH) with QIA, which is expected to enhance the business opportunities available to Inuit under the Phase 2 Proposal. The IPCS addresses several Inuit contracting requirements contained in the IIBA and identifies preferential opportunities and procedures for Inuit Firms to contract with Baffinland. Additional information on Baffinland initiatives to engage Inuit Firms on the contracting opportunities associated with the Phase 2 Proposal were described in Baffinland's response to QIA Information Request #89, provided to the NIRB on December 18, 2018.</td><td></td></tr>
<tr><td>QIA 95</td><td>NIRB Project Certificate 005, Amendment No. 2</td><td>To support the ability to review and respond to management plans it is requested that Baffinland supply a document which provides s standalone definition and description of “adaptive management”. Furthermore, QIA requests that Baffinland provide clarity on how IQ collection and application, and community concerns are applied in the context of “adaptive management”. QIA requests four scenarios area examined in the context of describing Baffinland’s approach to adaptive management.

1. Two consecutive years of limited ability to harvest due to scarcity of marine mammals in traditional harvesting areas during the open water season.

2. Perceived impacts to wildlife in the project area (foxes, hare and ptarmigan) from project generated dust.

3. Concerns that hunters are unable to safety navigate around project based infrastructure while harvesting caribou.

4. Concerns related to the safety of drinking water from traditional water sources.</td><td>On September 19, 2018 Baffinland provided the QIA with a standalone document that provides a definition and description of "adaptive management". This document (Appendix 5) also describes how Baffinland incorporates feedback received from government regulators, the QIA and the North Baffin communities and Hunters and Trappers Organization into environmental monitoring programs and the development of adaptive management measures.

As mentioned in response to other QIA Information Requests, Baffinland is carrying out a series of IQ sessions in support of the Phase 2 Proposal between January and March of 2019 to better understand community perceived environmental risks of the transportation of iron ore by rail and ship through the Nunavut Settlement Area, the results of which will be reported to the NIRB and Interveners as they are available. Although not specifically planned for it is likely the circumstances put forward by the QIA in IR-95 will be discussed to some extent during the sessions. It is also noted that Baffinland has previously conducted extensive IQ data collection throughout the various phases of the Mary River Project. The results of historic IQ Workshops specific to Phase 2 Proposal are summarized in TSD 03 (Phase 2 Workshops Report).</td><td>QIA 95 Attachment 1: Adaptive Management Approach</td></tr>
</table>

WORLD WILDLIFE FUND

ID No#	Document Reference	Info Request	Response	Attachment
WWF 02	TSD 24 Marine Mammals	Can BIMC clarify with what statistical significance and/or level of confidence it made the determination that narwhal abundance and distribution have not changed significantly from 2014-2017? Can BIMC confirm what particular area it refers to in the statement "There was no significant change in overall narwhal abundance and distribution observed in the area from 2014-2017" (emphasis added)? Is this with regard to the RSA? Please clarify.	Section 8.3.10 incorrectly references the period in which there was no observed change in narwhal abundance during the Bruce Head monitoring program. The correct period is 2014 to 2016, which was identified in TSD 24 (Marine Mammal Baseline and Impact Assessment) as a key finding by Smith et al. (2017). According to Smith et al. (2017), year effects were evaluated (in addition to other independent predictor variables) using generalized linear mixed models, where study year was specified as a categorical variable. Smith et al. (2017) report that the study year effect was not statistically significant (Type III, P = 0.52). Smith et al. (2017) also used Tukey adjusted familywise contrasts to test for differences between each pair of study years. Their results indicate no statistical difference in narwhal abundance between 2014 and 2015 (P = 0.88), 2014 and 2016 (P = 0.46) and 2015 and 2016 (P = 0.70). In other words, there was no statistical difference detected among 2014, 2015 or 2016 study years for narwhal abundance. The 2014-2017 Integrated Report for the Bruce Head Shore-based Monitoring Program was submitted to the Marine Environmental Working Group in December 2018 in draft form. This report includes a statistical analysis of narwhal relative abundance in the Bruce Head Stratified Study Area (SSA) over the four-year study period. Using a generalized linear mixed model analysis, no significant change in narwhal abundance was observed in the SSA during this period. The finalized version of this report will be submitted to MEWG in early 2019. The 'area' referenced in the reviewer's comment refers to the SSA monitored as part of the Bruce Head Shore-based Monitoring Program (2014-2017). **References** Smith HR, Moulton VD, Raborn S, Abgrall P, Elliot RE, Fitzgerald M. 2017. Shore-Based Monitoring of Narwhals and Vessels at Bruce Head, Milne Inlet, 2016. Prepared for Baffinland Iron Mines Corporation by LGL Limited, Environmental Research Associates, ON.	
WWF 10	NIRB Amended EIS Guidelines Phase 2 FEIS Addendum s. 5.5	Considering the significant proposed increase in shipping activity, and BIMC's assertion that no significant impacts are expected to result to marine wildlife, it is requested that BIMC submit an updated version of its SMWMP to include a standalone Adaptive Management section that addresses all points in the NIRB's Amended EIS Guidelines for the Phase 2 proposal (2015, section 9.7).	A summary of management plans that require updates resulting from the Phase 2 Proposal is provided in TSD 28 Management and Monitoring Plans. As noted in this document, the management plans represent living documents that will be regularly updated following input provided to Baffinland through the EIS regulatory process, community workshops, community information tours, and other forms of public engagement. The process allowing for this input is still ongoing. The existing SMWMP already includes a section on adaptive management. BIM will provide the updated SMWMP in early 2019 once the public and community workshops are completed. The revised SMWMP will address all points in the NIRB's Amended Guidelines for the Phase 2 Proposal that pertain to shipping and marine wildlife management.	

TRANSPORTATION CANADA

ID No#	Document Reference	Info Request	Response	Attachment
TC 01	Phase 2 Development Plan Technical Supporting Document TSD 28 Appendix AD – Railway Operation and Maintenance Plan (pages 3699-3729)	1. Company operation and maintenances standards, plans and procedures that have been specifically designed to reflect the challenges presented by the uniqueness of the environment, geology and climate conditions of the proposed railway 2. Company training, qualification and oversight of railway activities	1) The railway will be operated by Genesee & Wyoming Canada Inc. (GWCI), a division of Genesee & Wyoming Inc, (GWCI), which already owns and operates railways dedicated to mining operations in northern Quebec and Labrador. Those operations are also affected by similar, severe weather conditions (low temperatures, higher temperature variations between warm and cold months which are a critical factor for track maintenance, significant snowfalls and snow drift accumulations) (see attached photos in Appendix 6)). GWCI will build on their proven and robust experience in similar conditions. GWCI will work with Transport Canada (TC) and BIM to adapt the existing operation and maintenance standards applicable to GWCI's current northern mining operations, so that they are specifically designed to address the unique challenges of the environment, geology and climate of the proposed railway. Please find below a sample of GWCI's relevant current operation and maintenance standards (Appendix 9): • GWCI General Engineering Instructions, which were developed based on applicable TC Canadian Rail Operating Rules (CROR), and wherein we adopted more stringent requirements to adapt to existing northern operations. • GWCI will develop a customized timetable for Baffinland operations, based on current GWCI operations in similar extreme weather conditions and modified in order to address site specific conditions. GWCI has attached as a reference the Safety Management System (SMS) from Knob Lake & Timmins Railway (KLTR) which was audited by TC (November 2015) and will be customized to create the new SMS applicable to BIM's proposed railway. • Track maintenance standards: Digital records are kept of all inspections performed on GWCI railways in order to ensure compliance with TC-prescribed inspection types and frequency, TC Rules respecting Track Safety, GWCI General Engineering Instructions, GWCI Violation Reporting Requirements, GWCI Derail Policy, GWCI Switch Stand Policy (Attachment 6), GWCI Timbering Policy, and GWCI Procedures for the Installation, Adjustment, Maintenance and Inspection of CWR. A template of the GWCI Rail Service Failure Report is provided in Appendix 9. 2) Section 10 of the existing KLTR Railway SMS (audited by TC November 2015, provided in Appendix 9), covers company training and qualification. Section 3 covers oversight of railway activities. Dispatching training requirements are also addressed in the SMS.	TC 1 Attachment 1: KLTR Site Photos Appendix 9 GWCI Policies
TC 02	Phase 2 Development Plan Technical Supporting Document TSD 28 Appendix AD – Railway Operation and Maintenance Plan (pages 3699-3729)	1. Railway Plans and Profile showing main and siding track locations, gradients, curvature, switches, bridge and culvert locations, road crossing locations 2. Details regarding railway infrastructure: - Rail type (CWR, bolted), weight and length - Railway tie type, dimensions, spacing - Fastening system (plate size and fasteners, longitudinal anchoring) - Ballast depth, shoulder width - Track modulus assumptions - Switch/Turnout design details - Bridge design and foundation details - Signal and communication and systems details - Wayside inspection systems details - Geothermal insulation/protection - Wildlife corridor design - Road /ATV/Snowmobile Crossing design	1. Railway plans and profile are provided in Appendix 10. 2. Details on the railway design details are provided in Mary River Expansion Project - Railway Design Criteria and Design Rational (Appendix 6). Specific locations where information can be found within this document are provided below: • Rail type (CWR, bolted), weight and length: Section 9.2.3 Key Track Structure Parameters, Section 9.3.2 Rail Dimensions and Tolerances • Railway tie type, dimensions, spacing: Section 9.2.3 Key Track Structure Parameters, Section 9.4 Ties • Fastening system (plate size and fasteners, longitudinal anchoring): Section 9.2.3 Key Track Structure Parameters, Section 9.5 Fastenings • Ballast depth, shoulder width: Section 9.2.3 Key Track Structure Parameters, Section 9.6 Ballast • Track modulus assumptions: See below • Switch/Turnout design details: Section 9.7 Turnouts • Bridge design and foundation details: Section 8 Bridge and Culvert Design Criteria • Signal and communication and systems details: Signal and communication requirements will be determined as operational procedures are developed for the north railway. • Wayside inspection systems details: Section 11.5 Wayside Condition Monitoring • Geothermal insulation/protection: Discussed in thermal modelling memorandum (Appendix 8) • Wildlife corridor design: Section 9.11 Crossings • Road /ATV/Snowmobile Crossing design: Section 9.11 Crossings It is not clear what modulus that Transport Canada is referring to. Superstructure modulus, such as for the rail, ties, ballast basically follows requirements for standard design for railway track, such as per AREMA, etc. Based on the precedence for current railway construction practice and experience in permafrost (Railways in Alaska, Siberia and Tibet) this can be achieved with a minimum 1 m high granular fill embankments to minimize disturbance of the underlying subgrade permafrost. The subgrade along the railway embankment has been identified to consist of ice-rich to ice-poor glacial lacustrine silt, silty sand to sand, sand and gravel overlying glacial till and bedrock. For a long 100 km stretch, the subgrade conditions is expected to vary considerably depending on varieties factors such as ranges of soil type and conditions with varying degrees of temperatures and moisture contents (reflecting ice-poor or ice-rich soils). Therefore, design for the railway embankment have been based on precedence from previous constructions of the existing Tote Road, as well as experience gained from railway construction in the permafrost region (Alaska, Siberia, and Tibet). Their successful performance has been based on: (a) embankment on granular fill with minimum 1 m thickness to preserve permafrost of the subgrade, (b) avoiding ice rich soils or massive ice areas	TC 2 Attachment 1: Mary River Expansion Project - Railway Design Criteria and Design Rational Appendix 8 Thermal Analysis Model Appendix 10 Railway Plan and Profile Drawings

ID No#	Document Reference	Info Request	Response	Attachment
			as much as possible. Based in site assessment along the Tote Road, as well as along the proposed railway, the soil conditions in the upper part of the overburden which will be affected by permafrost thaw appear to favourably consist of minimum fines content. This will help in reducing long term settlements of the rail-tracks. In limited railway sections with high fills and along ice rich soils, a flatten slope embankment above 6 m high will be constructed to reduce creep settlements and will be identified and determined in the field during construction. A conservative deformation modulus value for ice-poor soils is estimated to be 100 MPa, representing a frozen sand. For ice-rich soils, it is estimated to be 25 MPa, representing frozen silty loam.	
TC 03	Phase 2 Development Plan Technical Supporting Document TSD 28 Appendix AD – Railway Operation and Maintenance Plan (pages 3699-3729)	1. Geotechnical sampling and testing done to determine makeup and load bearing capacity of proposed railway subgrade 2. Identification of areas of weak subgrade or areas susceptible to recurrent conditions that may significantly affect railway infrastructure (e.g. permafrost, flooding) 3. Summary of maintenance experience from operation of Mine Road: areas of soft or problematic subgrade, permafrost, areas with high rates of runoff or susceptible to overland flooding, excessive snow drifting and avalanche susceptibility	1. Field geotechnical investigations between the Mary River and Milne Inlet sites have been carried out since 2006. The initial field work was completed prior to the significant upgrades to the Tote Road. Specific field investigations for the north railway were completed between 2016 and 2018. These field investigations comprised advancement of boreholes to assess overburden and bedrock stratigraphy along the proposed route, including collection of samples for visual identification and laboratory testing. Further information was collected through site visits and field observations, and interpretation of aerial photographs and geologic maps. Geophysical testing consisting of seismic refraction and ground penetrating radar (GPR) surveys were also completed in some areas along the north railway alignment. Thermistors were installed in selected boreholes to record soil temperatures within and below the active layer over time. Information from the field investigations was utilized to evaluate the railway alignment, and to optimize the route by minimizing the extent of the rail alignment which passes through areas with ground ice and ice-rich soils. The Tote Road has been in heavy operation for over six years and provides an existing example of a well-performing high-traffic embankment that is built on permafrost soils. 2. Following site assessments and field investigations along the proposed North Railway alignment, the original alignment was modified and the subsurface stratigraphic profile along the alignment was developed. The expected locations of bedrock and the presence of ice-rich and ice-poor soils were identified through the generation of railway profiles along the alignment which show the expected cuts, fills and locations of culverts. Weak subgrade soil material, as well as areas which are frost susceptible for permafrost soils have been identified. The design of the railway cross sections through cuts and fills were established taking into consideration these site conditions along the railway. Culvert locations were selected and culverts sized to minimize changes to the natural watersheds in the area. 3. Baffinland has gained significant experience in maintenance of the Tote Road through the Early Revenue Phase (ERP) of the Project. Many of the issues requiring maintenance along the Tote Road occur during freshet and are related to drainage of water in and around the Tote Road. This experience has been reflected in the railway design criteria which specifies the application of a 1:200 year design storm for culvert design, compared to the 1:25 year design storm used for culverts along the Tote Road.	
TC 04	Phase 2 Development Plan Technical Supporting Document TSD 28 Appendix AD – Railway Operation and Maintenance Plan (pages 3699-3729)	1. Details regarding the plan/assumptions made regarding time allotment for daily train operations and maintenance activities 2. Details regarding lighting, snow clearing or other methods to ensure that track inspectors are capable of observing track conditions 3. Details regarding the Company track maintenance standard practices and procedures: - regarding visual inspection frequency - regarding construction and maintenance of continuous welded rail - regarding rail wear monitoring and mitigation - regarding electronic geometry testing and frequency - regarding electronic rail testing and frequency including rail flaw mitigation - regarding areas of high curvature - regarding the use of lubricators/greasers - regarding snow clearing for inspection purposes - regarding monitoring and protection for broken rails - regarding monitoring and protection for avalanches and slides	1) GWCI current track inspection schedules are designed to meet Rules respecting track safety. GWCI will work with TC and BIM to adapt existing Standard Practice Circulars, and other various company specific policies in order to adapt them to local conditions. A Safety Management System (SMS) dedicated to BIM operations will be developed based on an existing SMS which audited by TC (November 2015). The SMS lists all applicable regulations and how the modifications are tracked. 2) GWCI already operates in areas of heavy snowfall, with significant snow accumulation on the track. GWCI will have the appropriate snow removal equipment and inspection vehicles will be outfitted with additional lighting to ensure that track inspectors are capable of adequately observing track conditions. 3) GWCI will work jointly with TC and BIM to adapt existing track maintenance standard practices and procedures when required to address site specific conditions at the Mary River Project site: • regarding visual inspection frequency: GWCI current track inspection schedules are designed to meet Rules respecting track safety. • regarding construction and maintenance of continuous welded rail: Refer to Appendix 9: GWCI Procedures for the Installation, Adjustment, Maintenance and Inspection of CWR. • regarding rail wear monitoring and mitigation: Refer to CN Engineering Track Standards and CN General Engineering Instructions for Canadian Lines (Appendix 6). • regarding electronic geometry testing and frequency: GWCI will perform electronic geometry testing as per TC rules respecting track safety. GWCI intends to use an autonomous continuously recording system designed to be mounted on a loaded railcar. This system will allow for more frequent geometry tests than the recommended practice and can be used as an early warning system and continuous track monitoring system. • regarding electronic rail testing and frequency including rail flaw mitigation: GWCI will perform rail flaw detection as per TC rules respecting track safety. • regarding areas of high curvature: GWCI will work jointly with TC and BIM to adapt its existing Standard Practice to site specific conditions. • regarding the use of lubricators/greasers: GWCI will not have fixed lubricators/greasers but will utilize a mobile greaser truck. The rail lubricator's main purpose is to limit rail wear and increase the longevity of track assets. Location and frequency will be determined with BIM and through findings from train handling simulations.	TC 4 Attachment 1: CN Engineering Track Standards TC 4 Attachment 2: CN General Engineering Instructions for Canadian Lines Appendix 9 GWCI Policies

ID No#	Document Reference	Info Request	Response	Attachment
			• regarding snow clearing for inspection purposes: GWCI will have the appropriate snow removal equipment to ensure that track inspectors are capable of adequately observing track conditions (See Part 2 above). • regarding monitoring and protection for broken rails: Refer to Appendix 9: GWCI Movement Over Rail Breaks Policy. • regarding monitoring and protection for avalanches and slides: During the initial risk evaluation session before operations begin, GWCI will identify the areas with a risk of avalanches and slides and implement satisfactory mitigation measures.	
TC 05	Phase 2 Development Plan Technical Supporting Document TSD 28 Appendix AD – Railway Operation and Maintenance Plan (pages 3699-3729)	1. Details regarding plan for hiring, training, qualification and oversight of track inspection and maintenance personnel 2. Details regarding operational restrictions during initial start-up and familiarization of track inspection maintenance personnel	1) Section 10 of the existing KLTR Railway SMS (audited by TC November 2015) covers company training and qualifications requirements and will be adapted to Baffinland's operation. The GWCI Recruitment and Hiring Plan (Appendix 9) outlines the typical method followed by GWCI to aid in the recruitment of qualified personnel. 2) During the start-up phase, GWCI provides experienced, qualified individuals who will work one-on-one with each new employee as they learn to perform duties associated with operating equipment, switching railcars, inspecting and maintaining track, and other related job responsibilities. At no time will a new employee be left to work on his own without sufficient training and having been certified by the transition team at the site. GWCI will continue to provide supervision throughout the start-up phase that will include certified trainers, a safety and compliance officer, and senior managers from all groups involved (i.e., rail switching, track maintenance, etc.) until we are confident the operation is safely performing at maximum productivity. Once the start-up phase is completed, field managers and other senior managers will continue to visit the site frequently and will notify BIM prior to each visit so that meetings can be scheduled, if needed. GWCI already has an extensive pool of qualified and experienced track inspection personnel that will train, coach, and mentor new employees that lack previous maintenance-of-way (MoW) experience. GWCI intends to train newly-hired personnel on its existing operations and equipment. By having access to a large pool of employees and qualified staff members who can be readily mobilized, GWCI can address potential labour shortages.	Appendix 9 GWCI Policies
TC 06	Phase 2 Development Plan Technical Supporting Document TSD 28 Appendix AD – Railway Operation and Maintenance Plan (pages 3699-3729)	1. Details regarding train control and crossing warning signal systems and operational practices related to them.	Trains will operate under CROR Occupancy Control System (OCS) territory. Train control will be performed by a recognized and experienced contractor (Railterm). Dispatching will be done from a remote Rail Traffic Controller (RTC) desk. Broken rail protection will be addressed through additional special inspections when warranted by local conditions and having a geometry monitoring system installed on one of the cars to continuously monitor track geometry condition. An ultrasonic rail flaw detection system (Sperry or similar) will be present on site at all times, and testing frequency will be adapted to local conditions. Automatic Warning devices are regularly tested as per GWCI Signals and Communications (S&C) inspection guidelines which is designed to exceed the minimum AREMA (American Railway Engineering and Maintenance-of-Way Association) and TC requirements. GWCI has an electronic record keeping system for S&C inspections (Signal Asset Pro). In the case of an automatic warning system failure, CROR will apply.	
TC 07	Phase 2 Development Plan Technical Supporting Document TSD 28 Appendix AD – Railway Operation and Maintenance Plan (pages 3699-3729)	1. Details regarding plan for hiring, training, qualification and oversight of signal and communication inspection and maintenance personnel 2. Details regarding operational restrictions during initial start-up and familiarization of signal and communication inspection maintenance personnel	1) Section 10 of the existing KLTR Railway SMS (audited by TC November 2015) covers company training and qualifications requirements and will be adapted to Baffinland's operation. The GWCI Recruitment and Hiring Plan (Appendix 9) outlines the typical method followed by GWCI to aid in the recruitment of qualified personnel. 2) GWCI already has an extensive pool of qualified and experienced S&C personnel that will train, coach, and mentor new employees without previous S&C experience. GWCI intends to train newly-hired personnel on its existing operations and equipment. During the start-up phase, GWCI will provide experienced, qualified individuals who will work one-on-one with each new employee as they learn to perform duties associated with operating equipment, as well as related job responsibilities. At no time will a new employee be left to work on his own without sufficient training and having been certified by the transition team at the site. GWCI will continue to provide supervision throughout the start-up phase that will include certified trainers, a safety and compliance officer, and senior managers from all groups involved until we are confident the operation is safely performing at maximum productivity. Once the start-up phase is completed, field managers and other senior managers will continue to visit the site frequently and will notify Baffinland prior to a visit so that meetings can be scheduled, if needed. By having access to a large pool of employees and qualified staff members which can be readily mobilized, GWCI can address potential labour shortages.	Appendix 9 GWCI Policies
TC 08	Phase 2 Development Plan Technical Supporting Document TSD 28 Appendix AD – Railway	1. Details regarding plan for hiring, training, qualification and oversight of train operating personnel 2. Details regarding operational restrictions during initial start-up and familiarization of train operating personnel	1) Section 10 of the existing KLTR Railway SMS (audited by TC November 2015) covers company training and qualifications requirements, and will be adapted to Baffinland's operation. The GWCI Recruitment and Hiring Plan (Appendix 9) outlines the typical method followed by GWCI to aid in the	Appendix 9 GWCI Policies

ID No#	Document Reference	Info Request	Response	Attachment
	Operation and Maintenance Plan (pages 3699-3729)		recruitment of qualified personnel. Typical training and qualification requirements for personnel involved in the train operations (Locomotive Engineer, Train Conductor, Rolling Stock Maintenance personnel) are provided in Attachments 1, 2 and 3, respectively. 2) GWCI already has an extensive pool of qualified and experienced train operating personnel, that will train, coach, and mentor new employees that lack previous operating experience. GWCI intends to train newly-hired personnel on its existing operations and equipment. During the start-up phase, GWCI will provide experienced, qualified individuals who will work one-on-one with each new employee as they learn to perform duties associated with train operations, as well as related job responsibilities. At no time will a new employee be left to work on his own without sufficient training and having been certified by the transition team at the site. GWCI will continue to provide supervision throughout the start-up phase that will include certified trainers, a safety and compliance officer, and senior managers from all groups involved until we are confident the operation is safely performing at maximum productivity. Once the start-up phase is completed, field managers and other senior managers will continue to visit the site frequently and will notify Baffinland prior to a visit so that meetings can be scheduled, if needed. By having access to a large pool of employees and qualified staff members which can be readily mobilized, GWCI can address potential labour shortages.	
TC 09	Phase 2 Development Plan Technical Supporting Document TSD 28 Appendix AD – Railway Operation and Maintenance Plan (pages 3699-3729)	1. Details regarding train operating procedures in areas with steep gradient 2. Details regarding train operating procedures in areas with sharp curvature 3. Details regarding train operating procedures in areas with avalanche or slide risk 4. Details regarding lighting in areas (yards) with significant switching 5. Details regarding train control in areas with steep gradients	The existing General Operating Instructions (GOI) Applicable to All Canada region Railways (Appendix 9) outlines detailed train operating procedures including considerations for operating in areas of steep gradient, sharp curvature, avalanche or slide risk. These general procedures are complemented by site-specific instructions in the timetable for each individual railway. Locomotive engineers have access to a GWCI proprietary train simulator through their on-the-job training which will simulate train handling on the proposed track profile. A timetable specific to Baffinland's North Railway will be developed based on the existing GWCI GOI, train simulator findings, GWCI's operational experience, and industry best practice, in order to outline site-specific instructions for train handling. It is not anticipated that significant switching will be required during operation of the North Rail. Yard lighting will be designed to be sufficient for all expected activities.	Appendix 9 GWCI Policies
TC 10	Phase 2 Development Plan Technical Supporting Document TSD 28 Appendix AD – Railway Operation and Maintenance Plan (pages 3699-3729)	1. Detail regarding train operating procedures in wild life corridors 2. Details regarding effects of and mitigation train whistling (i.e. at crossings and during switching operations) on wild life	1) GWCI's General Operating Instructions (GOI) Applicable to All Canada region Railways (Appendix 9) contain language regarding reporting requirements in wildlife corridors. Site specific management measures are the subject of discussion with community members through ongoing IQ sessions being held from January to March 2019. The results of these sessions will be reported to the NIRB and Interveners as they become available. 2) Unnecessary use of the whistle is prohibited as per Rule 14 of Canadian Rail Operating Rules (CROR) which reduces the potential impact of train whistling on wildlife. Train whistles are expected to be infrequent and short in duration and are not expected to contribute substantially to noise related effects.	Appendix 9 GWCI Policies
TC 11	Phase 2 Development Plan Technical Supporting Document TSD 28 Appendix AD – Railway Operation and Maintenance Plan (pages 3699-3729)	1. Details regarding method of communicating operating instructions to including emergency broadcasts	A local radio system with adequate redundancy will be implemented along the track in order to permit appropriate radio coverage for rail operations. All GWCI teams (locomotive engineer, track maintenance, etc.) will be equipped with satellite phones as a backup secondary means of communication. Communication with offsite RTC will be through a satellite feed. In case of satellite feed failure, CROR rules will apply.	
TC 12	Phase 2 Development Plan Technical Supporting Document TSD 28 Appendix AD – Railway Operation and Maintenance Plan (pages 3699-3729)	1. Specific plans and operational restrictions during periods of extreme cold or adverse environmental conditions (blizzards, whiteouts, spring runoff, high water etc) 2. Plan for clearing snow from rail line	1) GWCI uses a weather alert system whereby extreme weather forecasts which may affect track are communicated to the Maintenance of Way employees. The GWCI Engineering Response to Earthquake and Weather Alerts Policy (Appendix 9) provides guidelines for protecting track and structures during weather alerts. In addition to observing all applicable safety and operating rules and regulations and TC requirements, GWCI typically performs additional ''Special'' inspections of the rail line in order to mitigate the effect of adverse environmental conditions. 2) Outside of some specific sites (turnouts, wayside detectors, crossings) which are kept clear of snow at all times, trains can continue to operate even if the track is covered with snow without risk or impact to operations. GWCI will have sufficient equipment (spreader, rail mounted equipment) to clear heavy snow falls or address areas of heavy snow accumulations. See photos from KLTR operations (TC 01 Attachment 1) showing the type of conditions GWCI already operates in. GWCI will also develop a site-specific Winter Preparedness Plan.	Appendix 9 GWCI Policies

ID No#	Document Reference	Info Request	Response	Attachment
TC 13	Appendix AD – Railway Operation and Maintenance Plan (page 9 of 22)	1. Details regarding car type, car design, confirmation if these are purpose built cars for this application and location only ("…railcars will be designed…")	The ore car is a standard ore-car design complying with the requirements and specifications as included in this response (Appendix 6). The proposed ore car design is currently in use on another rail operation in Sudbury, Ontario. Although Baffinland's proposed design incorporates some different subcomponents/parts to address colder operating temperatures, the overall car configuration is the same. Currently work is being completed to review the grades of steel to be used in the fabrication of the ore-car such that it is suitable for extreme cold weather temperatures. Current requirements and specifications require an ore-car suitable to operate at -50 °C. Included is a list of specialty components, the ore-car specification we applied on the Project and the preferred suppliers' ore car specification. The Project at this stage has not awarded the final contract to a supplier and as such cannot share more detailed information at this time, further information will be provided through the permitting specific process.	TC 13 Attachment 1: Standard Specification - Railcars Supplier Ore Car Specifications Specialty Component List
TC 14	Phase 2 Development Plan Technical Supporting Document TSD 28 Appendix AD – Railway Operation and Maintenance Plan (pages 3699-3729)	1. Details regarding plan for hiring, training, qualification and oversight of equipment inspection and maintenance personnel 2. Details regarding operational restrictions during initial start-up and familiarization of equipment inspection and maintenance personnel	1) Section 10 of the existing KLTR Railway SMS (audited by TC November 2015) covers company training and qualifications requirements, and will be adapted to Baffinland's operation. The GWCI Recruitment and Hiring Plan (Appendix 9) outlines the typical method followed by GWCI during the recruitment process in order to ensure that personnel are qualified. 2) GWCI already has an extensive pool of qualified and experienced inspection and maintenance personnel, that will train, coach and mentor new employees without previous inspection and maintenance experience. GWCI intends to train newly hired personnel on its existing operations and equipment. During the start-up phase, GWCI will provide experienced, qualified individuals who will work one-on-one with each new employee as they learn to perform duties associated with inspection and maintenance, as well as other related job responsibilities. At no time will a new employee be left to work on his own without sufficient training and having been certified by the transition team at the site. GWCI will continue to provide supervision throughout the start-up phase that will include certified trainers, a safety and compliance officer and senior managers from all groups involved until we are confident the operation is safely performing at maximum productivity. Once the start-up phase is completed, field managers and other senior managers will continue to visit the site frequently and will notify BIM prior to a visit so that meetings can be scheduled, if needed. By having access to a large pool of employees and qualified staff members which can be readily mobilized, GWCI can address potential labour shortages.	
TC 15	Phase 2 Development Plan Technical Supporting Document TSD 28 Appendix AD – Railway Operation and Maintenance Plan (pages 3699-3729)	1. Details regarding railway equipment type, load capacity, braking systems	A detailed technical response on the braking system for the proposed project and supporting documentation is provided in Appendix 6.	TC 15 Attachment 1: Mary River Project - Baffinland & Iron Mines LP, Information Request Response: Railway Equipment - Braking System TC 15 Attachment 2: Automated Train Brake Effectiveness (ATBE) Test Process at Canadian Pacific TC 15 Attachment 3: Update on Technology Driven Train Inspections at Canadian Pacific
TC 16	Phase 2 Development Plan Technical Supporting Document TSD 28 Appendix AD – Railway Operation and Maintenance Plan (pages 3699-3729)	1. Details regarding locomotive maintenance plans and procedures 2. Details regarding railway equipment maintenance inspection procedures. Note made of railcar inspections being conducted in accordance to FRA mileage intervals which rather than current Canadian Rules by trip 3. Details regarding lighting at inspection locations (ports and mine sites)	1) GWCI owns 1,300 locomotives and the Canadian branch GWCI currently maintains a fleet of over 80 locomotives. GWCI has extensive experience, with access to specialized resources through corporate support. GWCI has developed its own maintenance plans and procedures (Appendix 9), including: • GWCI - Periodic Maintenance Work Packet for Locomotive - 1 Year Inspection • GWCI - Periodic Maintenance Work Packet for Locomotive - 92 Day Inspection • GWCI - Periodic Maintenance Work Packet for Locomotive - Air Brake 3 Year Inspection • GWCI - Locomotive Inspection Requirements • GWCI - Safety Defects Inspection 2) GWCI owns ~29,000 railcars and the Canadian branch GWCI owns ~1,500 railcars. Railcare Inc. is a subsidiary of GWCI that specializes in railcar repairs. GWCI railcar maintenance plans and procedures include: • GWCI General Operating Instructions for Equipment Inspection (Appendix 9)	Appendix 9 GWCI Policies TC 16 Attachment 1: Railway Freight Car Inspection and Safety Rules GE TC 16 Attachment 2: Transportation Scheduled Maintenance, 12-Cylinder AC Tier 4 Evolution Series Locomotive

ID No#	Document Reference	Info Request	Response	Attachment
			• Railway Freight Car Inspection and Safety Rules (Appendix 6) • Association of American Railroads - Field Manual of the AAR Interchange Rules Maintenance plans will be based off of the GE Transportation Scheduled Maintenance, 12-Cylinder AC Tier 4 Evolution Series Locomotive (Appendix 6). GWCI will work jointly with TC in order to determine appropriate site-specific inspection requirements. 3) GWCI will supplement all fixed lighting systems installed at the Port and Mine Site with portable individual lighting in order to adequately perform inspections.	
TC 17	Phase 2 Development Plan Technical Supporting Document TSD 28 Appendix AD – Railway Operation and Maintenance Plan (pages 3699-3729)	1. Details regarding wayside inspection systems and operational practices related to them	The attached drawing (Appendix 6) shows the proposed extent of the wayside condition monitoring system. The proposed types of systems and locations will be further evaluated during the wayside monitoring detail design phase. The detail design will be commenced later in 2019. Inputs from the rail operator will be incorporated into the design so as to ensure that the wayside system being proposed will support and align with the rail operator's plan and needs. The system will be designed to be expandable and more monitoring systems can be added in future if the need arises but it is important to supply a wayside design suitable to support the in-service equipment failure monitoring required by the rail operator.	TC 17 Attachment 1: Drawing No. H353004-30000-224-262-0002-0001
TC 18	Phase 2 Development Plan Technical Supporting Document TSD 28 Appendix AD – Railway Operation and Maintenance Plan (pages 3699-3729)	1. Details regarding type and location of equipment for derailment response	Equipment available at the site for derailment response is provided in Table 1 (Appendix 6). Equipment will be dispatched to the derailment site as required. The equipment list will be updated as operational plans continue to be developed. Track material required for repairs will be located at Milne Port or at other designated stockpile locations along the rail alignment. During construction of the North Railway, temporary accommodation camps will be erected at two locations along the rail alignment to support construction. To support recovery efforts in the event of a derailment, consideration is being given to retain one of these camps during the operational period. These camps would provide food, sanitary and accommodation facilities to assist in derailment response. If this is determined to be a desirable option, the camp would be maintained in the same manner as proposed for the temporary construction camps, i.e. water trucked in from approved sources and waste trucked out for treatment at existing facilities.	TC 18 Attachment 1: Table 1
TC 19	Phase 2 Development Plan Technical Supporting Document TSD 28 Appendix G – Hazardous Materials and Hazardous Waste management plan (pages 21-39)	1. Provide a list of the commercial transportation companies to be retained which have first response and clean-up capacities operating in the North Baffin region	Hazardous materials are generally transported to site via sealift through commercial carriers such as NEAS Group and Nunavut Sealink & Supply Inc. These companies have significant experience in maritime shipping in the Arctic region, and are required to follow the International Maritime Dangerous Goods Code and Transport Canada Transportation of Dangerous Goods regulations, which include requirements for Emergency Response Assistance Plans. Any other companies that transport dangerous goods for Baffinland will be required to follow all Transportation of Dangerous Goods regulations.	

APPENDIX 1
GOVERNMENT OF NUNAVUT ATTACHMENTS

GN 12 ATTACHMENT 1: ASSOCIATED TABLES

Table 1: Wind erosion emissions at the Mine Site based on predicted wind at a level of 10 meters.

		Annual emissions (tonnes/year)			
Wind speed (m/s)	**Number of Hours in each bin**	**PM2.5**	**PM10**	**TSP**	
10	22	0.002	0.013	0.025	
11	13	0.005	0.036	0.071	
12	10	0.008	0.053	0.106	
13	0	0.000	0.000	0.000	
14	3	0.005	0.035	0.070	
15	0	0.000	0.000	0.000	
Sum:		0.020	0.137	0.273	
Total emissions at the facility:		**234**	**1987**	**7839**	

Table 2: Wind erosion emissions at the Milne Port based on predicted wind at a level of 10 meters

		Annual emissions (tonnes/year)			
Wind speed (m/s)	**Number of Hours in each bin**	**PM2.5**	**PM10**	**TSP**	
10	4	0.002	0.013	0.025	
11	0	0.000	0.000	0.000	
Sum:		0.002	0.013	0.025	
Total emissions at the facility:		**93**	**291**	**768**	

Table 3: Wind erosion emissions at the Mine Site based on predicted winds at a level of 30 meters.

		Annual emissions (tonnes/year)		
Wind speed (m/s)	**Number of Hours in each bin**	**PM2.5**	**PM10**	**TSP**
10	200	0.017	0.116	0.231
11	110	0.045	0.301	0.602
12	69	0.055	0.367	0.733
13	25	0.031	0.208	0.415
14	32	0.056	0.375	0.750
15	24	0.056	0.373	0.746
16	16	0.047	0.317	0.633
17	4	0.015	0.098	0.196
18	2	0.009	0.059	0.118
19	3	0.016	0.105	0.210
20	0	0.000	0.000	0.000
Sum:		0.348	2.317	4.634
Total emissions at the facility:		**234**	**1987**	**7839**

Table 4: Wind erosion emissions at the Milne Port based on predicted winds at a level of 30 meters

		Annual emissions (tonnes/year)		
Wind speed (m/s)	**Number of Hours in each bin**	**PM2.5**	**PM10**	**TSP**
10	72	0.034	0.229	0.458
11	55	0.124	0.828	1.656
12	9	0.039	0.263	0.526
13	0	0.000	0.000	0.000
Sum:		0.198	1.320	2.640
Total emissions at the facility:		**93**	**291**	**768**

GN 13 ATTACHMENT 1: FULL RESPONSE

GN-IR-13

Info Request:

Provide the following information:

1. The Proponent should compare the current modelling results to data collected as part of the ongoing dustfall monitoring taking place at the Project. This should include an analysis of production rates versus emission rates and inclusion of all Project source and appropriate meteorology (see Information Request #11; Air Quality Model Phase 2 Proposal).

a. If a significant discrepancy exists, the Proponent should calibrate the model with available measured data (e.g., dustfall).

b. Following calibration, the Proponent should:

i. Revise predictions for maximum ground level concentrations for the requested 30 Mtpa of production.

ii. Update the Human Health Risk Assessment and Water Quality Assessment based on the new modelling results if required.

iii. Re-assess the effectiveness of current dust management practices and dust suppression activities.

Response

As discussed in detail below, a comparison was made between modelled dust deposition and measured dust deposition. In general, the comparison shows that the model is providing realistic results, but at locations that are in very close proximity to operations at the port, measured levels were influenced by dust from miscellaneous minor activities at the site (on-site vehicle traffic associated with pick-up trucks, etc.) that were not included in the modelling.

Tables 1 to 3 show a comparison of monitored and modelled dustfall at the Mine Site, Milne Port and the Northern Corridor, respectively. The monitored data available for this comparison were for a period extending from 2013 into 2018. Further details on the monitoring program and specific locations of each monitoring station can be found in Environment Annual Monitoring Reports for 2015, 2016, and 2017, prepared by EDI.

The highlighted red values in the tables below exceed either the annual average criterion (55 g/m^2/year) or the 30-day criterion (5.3 g/m^2-30d) at the specific location.

Operations during the monitoring period (2013-2018) varied from no production (2013-2014) to 5.4 Mtpa in 2018. However, monitoring was not completed for the full years in 2013-2014; 2015-2017 had full years of monitoring, when operations varied from 0.9, 2.7 and 4.5 Mtpa, and in 2018 (5.4 Mtpa) a full year of monitoring data were obtained but not for all monitoring stations. Therefore, it was assumed that the majority (i.e., the average) of the monitoring data represent dustfall levels from operations of approximately 3.5 million tonnes per annum (Mtpa) of iron ore transported to Milne Port by truck along the existing Tote Road for open water shipping.

Mine Site

For the modelling, a mining production of 30 Mtpa was considered (the eventual maximum production rate, with 18 Mtpa eventually being shipped by rail to Steensby).

Table 1: Comparison of Monitored and Modelled Dustfall at the Mine Site

Station ID	Monitored			Modelled	
	Annual Average dustfall ($g/m^2/day$)	Annual Average dustfall ($g/m^2/year$)	30-Day Maximum Dustfall (g/m^2-30d)	Annual Average dustfall ($g/m^2/year$)	30-Day Maximum Dustfall (g/m^2-30d)
DF-M-01	0.29	106	125	25	4.0
DF-M-02	0.20	73	41	286	48.6
DF-M-03	0.16	60	24	261	32.3
DF-M-04	0.01	4	0.3	1	0.2
DF-M-05	0.01	4	0.3	0	0.1
DF-M-06	0.01	4	0.6	11	2.4
DF-M-07	0.01	5	1.4	14	1.8
DF-M-08	0.01	4	0.3	2	0.4
DF-M-09	0.02	7	2.5	2	0.3

The difference in the actual vs modelled production rate would explain why the modelled annual dustfall levels at stations DF-M-02 and DF-M-03 are much higher than the monitoring data. Those two stations are the closest to mining and hauling operations modelled in the 30 million Mtpa scenario. Modelled annual dustfall levels at DF-M-06 and 07 are also much higher than measured values.

Station DF-M-01, which is a station close to the Tote Road, shows the highest measured annual dustfall levels. The modelled results for that station are much lower than the measured values, most likely due to the fact that no ore transport by truck was modelled within the Mine Site model domain in the 30 mtpa scenario, as that scenario represents ore transport by rail.

Monitoring sites DF-M-04, 05, 08 and 09 are all relatively remote sites, more than 3 km away from the disturbed area, and are not significantly impacted by the operations. The measured dustfall levels at these locations are relatively low. The model appears to underestimate at these locations compared to the measurements, but the reality is that the measurements are overestimating the dustfall. At these locations the measured values were below the method detection limit but were reported as equal to the method detection limit. Thus, the model is likely providing realistic values at these locations.

Milne Port

For the more recent modelling scenario, we considered 12 Mtpa of iron ore transiting at this facility. Results from a previous modelling scenario of 3.5 Mtpa were also included in the table for comparison.

Table 2: Comparison of monitored and modelled dustfall at Milne Port

Station ID	Monitored			Modelled at 12 Mtpa		Modelled at 3.5 Mtpa
	Annual Average dustfall ($g/m^2/day$)	Annual Average dustfall ($g/m^2/year$)	30-Day Maximum Dustfall (g/m^2-30d)	Annual Average dustfall ($g/m^2/year$)	30-Day Maximum Dustfall (g/m^2-30d)	Annual Average Dustfall ($g/m^2/year$)
DF-P-01	0.43	155	84.3	273	35.8	25
DF-P-02	0.34	125	18.8	24	3.1	28
DF-P-03	0.01	4	0.4	0	0.0	0
DF-P-04	0.04	13	5.4	1	0.5	2
DF-P-05	0.27	100	32.1	16	2.0	21
DF-P-06	0.03	11	5.5	4	0.6	2
DF-P-07	0.06	23	22.2	206	32.8	92

It should be noted that the 3.5 and 12 Mtpa modelling scenario involved a different layout of dust sources compared to what is actually in place on site at present. Therefore, discrepancies between monitored and modelled dustfall are expected.

At monitoring station DF-P-01, the modelled results are higher than observed in the 12 million Mtpa scenario but lower than observed in the 3.5 Mtpa scenario. At DF-P-07, the modelled results are significantly higher than observed in both model scenarios. DF-P-01 and DF-P-07 are located on the southwest side of the current port operations. In the 12 Mtpa model scenario, they are located close to the proposed Fine Ore Road, which is the likely explanation for why the model results are high at both these locations in that scenario. In the 3.5 Mtpa scenario, DF-P-07 is closer to modelled stockpile operations than DF-P-01, which may explain why the modelled annual dustfall at DF-P-07 is higher than that at DF-P-01 in that scenario. The monitoring data suggests that, in reality, the situation may be the other way around, i.e., DF-P-01 may actually be closer to stockpile operations than DF-P-07, as the measured values at DF-P-01 are significantly higher than those at DF-P-07, and comparable to the modelled levels at DF-P-07. Thus the actual layout of the operations may differ somewhat from what was modelled in the 3.5 Mtpa scenario.

At DF-P-02 and DF-P-05, measured annual dustfall levels are much higher than the modelled levels. This suggests that these monitoring sites are adjacent to a dust source that was not accounted for in the model scenarios (most likely miscellaneous on-site vehicle traffic other than the Tote Road ore transport trucks).

Locations DF-P-03, 04 and 06 are relatively distant from the port operations and the measured levels at these sites are relatively low. The model underestimates at these locations. At DF-P-03, which is on the order of 4 km from the port operations, the problem is actually measurement overestimation rather than model underestimation. It is due to the measured values being below the method detection limit but reported as equal to the detection limit. At DF-P-04 and 06, the measurement detection limit is

partly a factor, but other factors may come into play as well, such as background dustfall and dust from miscellaneous on-site traffic not included in the model.

Northern Transport Corridor

For the Northern Transportation Corridor, an Early Revenue Phase scenario was modelled involving 6 Mtpa or ore transported by truck along the Tote Road, in combination with construction of a railroad parallel to the Tote Road.

For the Northern Transport Corridor scenario, current operations include hauling of 4.2 Mtpa of iron ore on the Tote Road. For the modelled scenario we considered 6 Mpta of iron ore being hauled on the Tote Road.

None of the actual monitoring stations reside within the modelled domain. Therefore, it was not possible to do a direct comparison of observed and model results at specific monitoring locations. However, a general comparison can be made of averaged dustfall at various distances from the Tote road. Table 3 shows average monitored and modelled dustfall as a function of distances.

Table 3: Average monitored and modelled dustfall at various distances from the Tote Road

Approximative Distance from the road (m)	Monitored		Modelled	
	Annual dustfall (g/m^2/year)	30-Day Maximum Dustfall (g/m^2/30d)	Annual Dustfall (g/m^2/year)	30-day Maximum Dustfall (g/m^2/30d)
5000	7	7	0.4	0.1
1000	7	3	4	1
100	48	31	93	12
30	229	175	189	23

Overall, there is relatively good agreement between monitoring data and modelling results. The model slightly underpredicts annual dustfall at 30 m from the Tote road but overestimates it at 100 m. At distances of 1000 and 5000m, the measurement values are affected by the method detection limit and are also based on more limited sampling than at the shorter distances. Therefore, the measurements at these locations are overestimating the annual dustfall. The modelled annual dustfall levels are considered to be realistic at these distances.

Conclusion

Overall, based on the information and analysis presented in this response, no significant discrepancy exists between modelled and observed annual average results. It was found that the comparison of model results to monitoring data varies considerably from one monitoring site to another, but there is no clear trend showing that the model either under-predicts or overpredicts dustfall amounts. Therefore, no calibration of the model based on these monitoring results is recommended.