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July 11, 2023

*Your file*            *Votre référence*  
08MN053

*Our file*            *Notre référence*  
07-HCAA-CA7-00050

Nunavut Impact Review Board (NIRB)  
PO Box 1360  
Cambridge Bay, NU  
X0B 0C0

**Subject:            Baffinland Iron Mines Corp. Annual Report 2022- Mary River Project**

Dear NIRB,

Department of Fisheries and Oceans, Fish and Fish Habitat Protection Program (DFO-FFHPP) is providing the following submission in response to the Nunavut Impact Review Board's (NIRB) correspondence, dated May 26, 2023, which invited parties to review and provide comments with respect to their jurisdiction and/or area of expertise by July 11, 2023.

DFO understands that the NIRB would like parties to provide comments regarding:

- 1) *Effects Monitoring*
  - a) *Whether the conclusions reached by Baffinland in the 2022 Annual Report are valid; and*
  - b) *Any areas of significance requiring further supporting information or any changes to the monitoring program which may be required.*

DFO has reviewed the Baffinland's 2022 Annual Report, and have attached our technical comments in a table, however, a general summary regarding the Proponent's conclusions around effects monitoring is provided below:

**Marine Mammals and Adaptive Management:**

DFO remains concerned with the ongoing, significant decline in the abundance of Narwhal in Eclipse Sound over the last three years. In 2013, DFO estimated the population of Narwhal within Eclipse Sound to be 10,500, current reporting, from Baffinland's 2022 Annual Report, estimates the population to be 4,600. Other factors cited are not specific to Eclipse Sound, for instance Narwhal and Orcas are concurrent in Admiralty Inlet where Narwhal populations may be increasing, climate change would impact either area similarly and that the decline was occurring prior to project-related shipping. Tagging studies have indicated an exchange rate of approximately 30%, which

agrees with our understanding of Inuit Qaujimagatuqangit for the Eclipse Sound summer stock, however, this does not explain or account for the sustained decline being observed.

Recent publications have indicated negative effects to Narwhal caused through anthropogenic noise (i.e., shipping), even if it is below ambient noise levels (Finley et al. 1990; Tervo et al. 2021). As the Proponent mentions “*it is generally accepted that cetaceans exposed to received sound levels above 120 dB re: 1µPa (SPLrms) will begin to demonstrate behavioural disturbance*” (Annual Report, Appendix G.6.8, p21), statements such as these, regarding the effects of underwater noise effects on Narwhal require caution in interpretation as Narwhal hearing abilities have not been studied (contrary to implications in Sweeney et al. 2022). Recent research shows Narwhal react to underwater noise at levels lower than the 120 dB threshold that has been used in the proponent’s acoustic modelling (Finley et al. 1990; Tervo et al. 2021).

In order to address this and other uncertainties, DFO continues to recommend the development and recognition of additional performance indicators and thresholds (PIT; previously referred to as early warning indicators; EWI). The selected performance indicators and threshold, juvenile Narwhal, have experienced a local decline, as observed from the results of the 2022 Bruce Head Annual Monitoring Report; which DFO believes requires further investigation as well as using the best practices in data analysis. The Proponent claims the 2020, 2021 and 2022 proportion of immature narwhal fell within the range of the baseline condition in 2014 and 2015, however it is also stated that “*Findings from the EWI analysis of 2022 aerial survey [...] was associated with high variability and low sample sizes, resulting in high uncertainty of the EWI estimates*” (Annual Report, p399). Reiterating from previous years, PITs may be confounded by inter-annual variability in other factors, monitoring of only one PIT is insufficient to detect early warning signs that potential adverse impacts may be occurring in any given year or set of years, and may not capture the full suite of potential impacts and associated responses in narwhal.

Adaptive Management plans, including thresholds for responses, and the responses themselves, must take into consideration that narwhal remain at a significantly reduced level within Eclipse Sound, and that this decline in multiple PITs is a significant indication to regional effects on this stock. The combination of multiple PITs being triggered over multiple years provides evidence that there are significant impacts occurring to Narwhal in Eclipse Sound; an observed decline in immature ratio, changes in behaviour and relative abundance, and displacement from Eclipse sound, are all indications that there has been regional changes to Narwhal behaviours and group composition as a result of the ongoing shipping within Eclipse Sound. These results should trigger Adaptive Management responses, at a significant threshold.

### **Aquatic Invasive Species and Non-Indigenous Species (AIS/NIS)**

DFO has concerns with the Proponents ballast water management plans, and the lack of response to the newly detected species, that were not identified during baseline studies,

during the 2022 AIS/NIS Monitoring Program in Milne Port (Annual Report 4.6.10, p267). DFO agrees that the flagged species require continued practices to verify their identification and potential harm, but also recommends that a number of the newly detected species be considered for inclusion on the trigger list, given many were not previously found in baseline studies (criteria given in Figure 8-3, of Annual Report, Appendix G.6.9). DFO also notes the two, newly identified algal specimen, (*Punctaria latifolia* and *Stictyosipon soriferus*) which have no or limited records in the Canadian Arctic, to be of concern and require further investigation, as they have only been detected within northern European waters and introduced elsewhere; likely due to shipping activity.

DFO believes that the introduction of any aquatic invasive species and non-indigenous species from shipping activities remains a significant risk. While no introduced species to date has been declared as an aquatic invasive species, the identified non-indigenous still pose a risk of altering the marine environment if not managed properly; non-indigenous species have an unknown capability to become invasive and warrant the same level of concern as aquatic invasive species.

DFO acknowledges that the Proponent is in the process of developing a ballast water study program with DFO, which is currently in the initial stage, and strongly encourages the continued support from the Proponent on this development. DFO recommends that the Proponent continue discussion with Transport Canada and DFO on a path forward to ensure the ongoing protection of Arctic Waters from aquatic invasive species and non-indigenous species. Further, DFO recommends the Proponent take action and consideration of residual effects to the biome in Milne Port, as stated in Term and Condition 88 in the Project Certificate “*the Proponent shall provide an updated risk analysis regarding ballast water discharge to assess the adequacy of treatment and implications on the receiving environment. This risk analysis shall consider, but not be limited to [...] e. Residual physical, chemical, and/or biological effects*” (Annual Report, p 310).

### **Compliance Monitoring:**

- a) *Provide a summary of any compliance monitoring and/or site inspections undertaken in association with the Project, including specifically;*
  - i) *Identify the terms and conditions from the Project Certificate which have been incorporated into any permits, certificates, licenses, or other approvals issued for the Project, where applicable, and report annually to the NIRB on the status of those incorporated terms and conditions;*

The Proponent currently operates under three *Fisheries Act* Authorizations for the Milne Inlet Tote Road, Milne Inlet Ore Dock, and Milne Inlet Freight Dock. Terms and Conditions # 87, 105, 109, 110 and 121 from the Nunavut Impact Review Board’s Project Certificate No. 005 for the Mary River Project are directly incorporated into DFO’s *Fisheries Act* Authorization for the Milne Inlet Ore Dock.

Other terms and conditions from the NIRB Project Certificate No. 005 for the Mary River Project, while not directly incorporated, fall under DFO's mandate and overlap with conditions in Baffinland's existing Fisheries Act Authorizations as follows:

- Milne Inlet Tote Road: Project Certificate No. 005, Terms and Conditions 19, 26, 45, 47, 48(a);
- Milne Inlet Ore Dock: Project Certificate No. 005, Terms and Conditions 45, 76, 88, 99, 101, 106, 113, 115, 123;
- Milne Inlet Freight Dock: Project Certificate No. 005, Terms and Conditions 14 (a), 45, 76, 88, 99, 101, 113, 115, 123, 128.

*ii. A summary of any inspections conducted during the 2022 reporting period, and the results of these inspections;*

During 2022, DFO issued a *Corrective Measures Order*, pursuant to the *Fisheries Act*, requiring Baffinland to develop and submit a targeted Sediment and Erosion Control Plan and a Permanent Crossing Plan for crossings where sediment deposition and barriers to fish passage have previously been reported and identified.

DFO conducted a site inspection of the Tote Road to inspect fish-bearing crossings, focusing on specific sites that have experienced fish passage issues, due to failing culverts. DFO plans to complete a follow up inspection in August 2023. Baffinland is working with DFO to finalize the plans and to explore any additional authorizations that may be required. The work is anticipated to commence in 2023.

*iii. A summary of Baffinland's compliance status with regard to authorizations that have been issued for the Project.*

Baffinland is operating under three *Fisheries Act* Authorizations for the Mary River Project. As a general condition of the Authorizations, Baffinland is required to report on their compliance with all conditions therein to DFO annually. These reports are typically submitted to the MEWG, and to the NIRB through the Annual Report.

The following comments are from DFO's review of Baffinland's submitted reports for 2022.

**Milne Inlet Tote Road (DFO File # 06-HCAA-CA7-00084):** DFO has issued an enforcement action for the Tote road based on the June 2022 site visit. We are currently working with the proponent to ensure that crossing design is protective of fish passage. *Condition 2.2 states "Culverts shall be appropriately sized and embedded to maintain upstream and downstream fish passage at each crossing."*

**Milne Inlet Freight Dock (DFO File # 18-HCAA-00160):** The *Fisheries Act* Authorization for the Milne Inlet Freight Dock requires Baffinland to create 2729 Habitat Equivalent Units (HEUs) of fish habitat to offset for the destruction of 2170 HEUs of fish

habitat from the Freight Dock construction. As such, Baffinland placed coarse rock substrate around the perimeter of the ore dock and at moorings to create a rocky reef. The Freight Dock is currently in a monitoring phase, DFO will be conducting a site visit in August 2023 to ensure adherence to the *Fisheries Act*.

## **Summary of Recommendations**

### **Narwhal**

DFO recommends the proponent consider all project related shipping, inclusive of ore carriers, construction related shipments, and trial shipping phases, when considering when baseline conditions existed and for future comparisons. Best practices are requested to be used at all phases of data collection and analysis of narwhal data to generate robust conclusions. DFO supports QIA's recommendation for joint development and approval of adaptive management elements for the Inuit and non-Inuit Objectives, Indicators, Thresholds and Responses for the Adaptive Management Plan and further recommends the proponent to work with QIA and DFO on the scale and scope of the performance indicators and thresholds monitoring programs. Furthermore, DFO continues to recommend the selection of additional PITs in collaboration with the Marine Environmental Working Group and QIA.

### **Aquatic Invasive Species**

DFO recommends a number of the newly detected species be considered for inclusion on the trigger as many were not previously found during baseline studies. Furthermore, the proponent should develop a proactive measures and response plan for *Marenzelleria sp.* DFO recommends the use of biogeographic information in combination with ocean circulation patterns for improved criteria to define 'surrounding region' and distribution categories. DFO recommends investigating technologies and/or methods to monitor ballast water/bio-fouling to achieve species-level identification. While investigating these approaches, DFO strongly recommends the proponent reinstate the previously used ROV surveys and sampling at Ragged Point. Lastly, DFO requests details of the specific datasets used to generate Figure 8-6 (Appendix G.6.9).

### **Freshwater**

DFO recommends the Proponent explore opportunities to collaborate with Inuit harvesters and other interested parties to align sampling goals to minimize sampling impacts on the Arctic Char population.

If you have any questions with the content of this letter, please contact Jennifer Loughery at our Yellowknife office at 867-445-3928, or by email at [Jennifer.loughery@dfo-mpo.gc.ca](mailto:Jennifer.loughery@dfo-mpo.gc.ca). Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,

Bev Ross  
A/Director  
Fish and Fish Habitat Protection, TMX and Aquaculture  
Fisheries and Oceans Canada / Government of Canada

cc: Alasdair Beattie

Attachments:

**Table 1.** DFO Technical Comments on Baffinland's 2022 Annual Report –Marine Environment – Narwal and Early Warning Indicators

**Table 2.** DFO Technical Comments on Baffinland's 2022 Annual Report – Marine Environment –Aquatic Invasive Species and Non-Indigenous Species

**Table 3.** DFO Technical Comments on Baffinland's 2022 Annual Report – Freshwater Environment

**Table 1.** DFO Technical Comments on Baffinland’s 2022 Annual Report –Marine Environment – Narwal and Early Warning Indicators

Comment Number	DFO – 1
Subject/Topic	Marine Environment: Narwhal RSA Abundances and Early Warning Indicator Assessment
References	<p>BIM 2023. 2022 NIRB Annual Report – Appendix G.6.2 Final Marine Mammal Aerial Survey Program.</p> <p>BIM. 2023. 2022 Annual Report – Appendix G.6.3 NAMMP – Section 4.2.3</p> <p>Marcoux, M. 2022. Review of the 2020 and 2021 Narwhal Surveys in Eclipse Sound and Admiralty Inlet Conducted by WSP Gold der Inc.</p> <p>Tervo, O.M., Blackwell, S.B., Ditlevsen, S., Conrad, A.S., Samson, A.L., Garde, E., Hansen, R.G., and Mads Peter, H.-J. 2021. Narwhals react to ship noise and airgun pulses embedded in background noise. <i>Biol. Lett.</i> 17(11): 20210220. Doi:10.1098/rsbl.2021.0220.</p> <p>WSP Canada Inc 2023. 2022 Bruce Head Shore-based Monitoring Program.</p>
Comment	<p>1. DFO recommends reassessing the data analyses of summer stock narwhal abundance estimates, as current practices use higher estimates when differences are found between observers, and overestimates in photographic analyses. DFO recommends implementing best practices and using the average of survey repeats and recommend avoiding using the highest estimate. (i.e., recommend using the average estimates from Marcoux, 2022 “..an estimate of 4,381 (CV 0.14) and 2,081 (CV 0.17) narwhals for Eclipse Sound 2020 and 2021 respectively. For admiralty Inlet, I recommend using 25,166 (CV 0.15) and 48,652 (CV 0.16) for 202 and 2021 respectively” (Review of the 2020 and 2021 narwhal surveys in Eclipse Sound and Admiralty Inlet conducted by WPS Golder Inc.) instead of the Annual Report “Eclipse sound ... 2020 abundance estimate of 5,018 (CV = 0.03, 95% CI of 4,736–5,317; Golder 2021a)...2021 estimate of 2,595 (CV = 0.33, 95% CI of 1,369–4,919; Golder 2022)” And “Admiralty Inlet... the 2020 Baffinland estimate of 31,026 (CV = 0.14, 95% CI of 23,406–41,126)... and 2021 Baffinland estimate of 72,582 (CV = 0.09, 95% CI of 61,333–85,895)” (Annual Report pg338)).</p>

	<p>2. The co-efficient of variation (CV) of the surveys should be recalculated as they are currently too low, reflecting a low CV for the correction factor for availability bias. Based on new research now available, DFO recommends using 20%CV for the availability bias. A discussion on the topic can be found on p. 6-7 of the report below. We further recommend that all values dependent on the current CVs be recalculated. Additionally, DFO asks the Proponent to justify the use of a one-tailed t-test used in the Ariel Survey Report, and how the direction of the difference can be determined.</p> <p>NAMMCO-JCNB Joint Working Group (2021). Report of the Joint Working Group Meeting of the NAMMCO Scientific Committee Working Group on the Population Status of Narwhal and Beluga in the North Atlantic and the Canada/Greenland Joint Commission on Conservation and Management of Narwhal and Beluga Scientific Working Group. December 2021, Winnipeg, Canada.  <a href="https://nammco.no/wp-content/uploads/2022/04/report_jwg_2021.pdf">https://nammco.no/wp-content/uploads/2022/04/report_jwg_2021.pdf</a></p> <p>3. Appendix G.6.2 pg iii, please clarify how the total combined abundance of Narwhal is calculated, as the numbers do not add up: <i>“For Eclipse Sound stock alone, the narwhal abundance estimate was <b>4,592 narwhal</b> (CV = 0.10, 95% CI of 3,754–5,617)...For Admiralty Inlet stock alone, the narwhal abundance estimate was <b>43,042 narwhal</b> (CV = 0.15, 95% CI of 32,218–57,502)...The 2022 narwhal abundance estimate for the combined Eclipse Sound and Admiralty Inlet stocks was <b>46,408 narwhal</b> (CV = 0.13, 95% CI of 36,129-59,611)”</i> DFO recommends reassessing how the abundance measurement is calculated, noting that best practice is to average all the study replicates.</p> <p>4. Narwhal abundance within Eclipse Sound continues to decline. DFO contests the proponent’s assessment of Narwhal abundance, behavioural responses and group composition, and lack of relation to project activities. DFO agrees with QIA’s response in the SOP of; <i>“The deferral/deflecting of responsibility regarding narwhal remains a serious issue in this SOP application. The Proponent considers open-water shipping to not be a major factor driving the significant decline in narwhal abundance in Eclipse Sound. Other intervenors disagree with this assertion, and the Proponent has provided very limited evidence to support its position.”</i> DFO recommends further</p>
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	<p>investigation into the decline of narwhal within Eclipse sound.</p> <p>5. DFO recommends further monitoring of narwhal exchange between Eclipse sound and Admiralty Inlet, as tagging programs were not conducted during the 2022 monitoring program, which would provide evidence for the Proponent claiming; <i>“The observed changes in narwhal abundance in Eclipse Sound in recent years likely reflects a natural exchange between the two putative stock areas that began prior to Baffinland shipping operations, with animals shifting between Eclipse Sound and Admiralty Inlet based on where habitat conditions may be more favorable that season (e.g., ice coverage, prey availability, predation pressure).”</i> (Annual Report Appendix G.6.2 piii). DFO suggest the Proponent provide data or references that are specific to Eclipse Sound and Admiralty Inlet, as previously suggested in 2021; currently there is no support for the hypothesis that the conditions are vastly different between Eclipse Sound and Admiralty Inlet and are the cause of the change in distribution of narwhals. DFO acknowledges that there is some movement of narwhals between Eclipse Sound and Admiralty Inlet summer stocks (30%), but DFO still recommend to manage the two stocks separately. Narwhals are managed at the stock level to avoid local depletion.</p> <p>Information related to the delineation of the Eclipse Sound and Admiralty Inlet narwhal stocks. Canadian Science Advisory Secretariat , Science Advisory Report 2020/048. <a href="https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/40951881.pdf">https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/40951881.pdf</a></p> <p>6. DFO recommends further investigation into the results of the Bruce Head study, which demonstrates there is a localized effect on the group composition of narwhal; an observed decrease in the ratio of immature narwhal (an early warning indicator (EWI)). The EWI has been triggered, as it has surpassed the threshold of a 10% decline from baseline (2014, 0.152), and to present (2022, 0.105), which demonstrates a 32% decrease in the proportion of immature narwhal at Bruce Head. <i>“In summary, there appears to be variability between years, but while the EWI data collected at Bruce Head suggested a localized change in narwhal group composition, the equivalent EWI analysis derived from the spatially broader photographic aerial survey dataset provides no indication that the proportion of immature narwhal in the RSA has declined compared to</i></p>
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	<p>2021–2020” (Annual Report p394). DFO agrees that a localized change in narwhal group composition at Bruce Head is being observed. However, DFO does not agree that there is enough supporting evidence to definitively conclude that the proportion of immature narwhal in the RSA has not been negatively affected. DFO recommends further investigation into the localized effects at Bruce Head, as this is an indication of changes in Narwhal group composition. The 32% decline seen in 2022, with the support of the 24% decline in 2021, should trigger an Adaptive Management response along with mitigation measures, as this is meant to be an early warning indicator.</p>
<p>Conclusion/Requests</p>	<ul style="list-style-type: none"> <li>• DFO recommends the Proponent consider all project related shipping, including the construction and trial shipping phases, when referring to baseline conditions, as current baseline data refers to 2014 conditions, however, project related shipping was occurring prior to this, beginning in 2006. DFO requests that the Proponent identify a baseline period, and adhere to that for future baseline comparisons.</li> <li>• DFO requests that the Proponent use best practices when analysing; including, but not limited in, the application to the average of survey repeats.</li> <li>• DFO supports QIA’s recommendation within the SOP on Adaptive Management (AM-1); “QIA and Baffinland to jointly develop and approve the adaptive management elements for monitoring programs, including both Inuit and non-Inuit Objectives, Indicators, Thresholds and Responses for the Adaptive Management Plan.” DFO recommends that in the future BIM work with QIA and DFO on scale and scope of EWI Monitoring Programs to maintain consistency to see any localized changes and group composition of narwhal; improving the Adaptive Management framework.</li> <li>• DFO continues to recommend additional PITs beyond calf/cow proportion to better mitigate inter annual variation of tracked indices, as stated in our review of the 2020 and 2021 Annual Report. The Proponent should work with the MEWG and QIA to select additional PITs to ensure that the full suite of potential impacts on narwhal are fully captured in monitoring.</li> </ul>

**Table 2.** DFO Technical Comments on Baffinland’s 2022 Annual Report – Marine Environment – Aquatic Invasive Species and Non-indigenous Species

Comment Number	DFO – 2
Subject/Topic	Marine Environment: Aquatic Invasive Species/Non-Indigenous Species
References	<p>Bailey, S.A., Brydges, T., Casas-Monroy, O., Kydd, J., Linley, R.D., Rozon, R.M., and Darling, J.A. 2022. First evaluation of ballast water management systems on operational ships for minimizing introductions of nonindigenous zooplankton. <i>Mar. Poll. Bull.</i> 182, 113947. <a href="https://doi.org/10.1016/j.marpolbul.2022.113947">https://doi.org/10.1016/j.marpolbul.2022.113947</a></p> <p>BIM. 2023. 2022 NIRB Annual Report – Appendix G.6.9 2022 Final Marine Environmental Effects Monitoring Program Report</p> <p>BIM. 2023. 2022 NIRB Annual Report – Appendix G.8.1 Ballast Water Management, 1.4 AIS and Shipping. Pg 5</p> <p>BIM. 2023. 2022 NIRB Annual Report – SMWMP 3.3.4.2 Anti-Fouling Management. Pg 54</p> <p>Brinklow, T.R., Chan, F.T., Etemad, M., Deb, J.C., Bailey, S.A. 2022. Vessel Biofouling as a Vector for Nonindigenous Species Introductions in Canada. Canadian Science Advisory Secretariat. Research Document 2022/072</p> <p>Cardeccia A, Marchini A, Occhipinti-Ambrogi A, Galil B, Gollasch S, Minchin D, Narščius A, Olenin S, Ojaveer H (2018) Assessing biological invasions in European Seas: Biological traits of the most widespread non-indigenous species. <i>Estuarine, Coastal and Shelf Science</i> 201: 17–28.</p> <p>Galil BS, Marchini A, Occhipinti-Ambrogi A, Minchin D, Narščius A, Ojaveer H, Olenin S (2014) International arrivals: widespread bioinvasions in European Seas. <i>Ethology Ecology &amp; Evolution</i> 26(2–3): 152–171.</p> <p>Golubkov, S., Tiunov, A., Golubkov, M. 2021. Food-web modification in the eastern Gulf of Finland after invasion of <i>Marenzelleria arctica</i> (Spionidae, Polychaeta). doi:10.3897/neobiota.66.63847.</p> <p>Radashevsky, V.I., Pankova, V.V., Neretina, T.V., Tzetlin, A.B. 2022. Canals and invasions: a review of the distribution of <i>Marenzelleria</i> (Annelida: Spionidae) in Eurasia, with a key to <i>Marenzelleria</i> species and insights on their relationships. <i>Aquat Invasions</i> 17(2): 186-206.</p>

	<p>Spalding, M.D., Fox, H.E., Allen, G.R., Davidson N., Ferdaña, Z.A., et al. 2007. Marine Ecoregions of the World: A Bioregionalization of Coastal and Shelf Areas. <i>BioScience</i>. 57(7):573-583.  <a href="https://doi.org/10.1641/B570707">https://doi.org/10.1641/B570707</a></p>
Review Comment	<ol style="list-style-type: none"> <li>1. Has the proponent developed a response plan to the findings of the 2022 ASI/NIS Monitoring Program which flagged species within the “<i>detected 29 taxa that had not been identified previously at Milne Port during baseline sampling</i>” (Annual Report, p 266), along with the “<i>unidentified specimens from the genus Hesperonoe were found in benthic infauna samples.</i>” (Annual Report, p313), as well as adding these species to a trigger list? DFO agrees with the Proponent’s recommendation under T/C 87, of “<i>sampling across multiple trophic levels continues in 2023, that the taxonomic inventory for Milne Inlet continue to be expanded upon, and that all flagged specimens continue to be screened for known geographic ranges and NIS/AIS status</i>” (Annual Report pg35). DFO also suggests further investigation into the long-term effects of the introduction of these non-indigenous species and the cumulative effects on the biome, and the development of future mitigation and avoidance of introducing further non-indigenous taxa into Milne Port.</li>   <li>2. DFO has concerns with the lack of targeted sampling for flagged species in 2022 and the proposal to look at previous year’s samples (“subfractions remaining following analysis of samples collected for genetic analysis in 2021 will be sorted for targeted organisms”) as an alternative. The premise behind the targeted sampling is not only to collect specimens but also to track changes in densities of organisms of concern over time to see if they show changes characteristic of establishment and spread (as indicated in figure 8-3- ‘watch list -heightened monitoring’). Thus sampling must be conducted annually (as stated in Fig 8-3) at existing sites regardless of whether “additional locations are identified for potential flagged taxa”. Given the small number of target sites it is unclear why original samples from 2021 were not fully sorted in the first place: this should be quite feasible and would increase chances of finding suitable specimens for flagged target taxa. DFO recommends continuing targeted sampling at existing sites and doing complete sorts on these samples in future monitoring.</li>   <li>3. DFO disagrees with the results in the Marine Environmental Effects Monitoring Program Report, and the statement that <i>Marenzelleria wireni</i> is previously known from Milne port – this statement implies it has always been there when in fact it</li> </ol>

	<p>is a new species not found in previous baseline studies. It is only known from Eurasia (CABI compendium 2023; Radashevsky 2022). It is also a well-established known invader in northern Europe (where ships originate) together with several other species in the <i>Marenzelleria</i> species complex including <i>M. arctia</i>; both species are listed in the CABI invasive species compendium and in other publications describing invasions in northern Europe.</p> <p><a href="https://www.cabidigitallibrary.org/doi/10.1079/cabicompndium.115493">https://www.cabidigitallibrary.org/doi/10.1079/cabicompndium.115493</a></p> <ol style="list-style-type: none"> <li>4. DFO is pleased to see zooplankton sampling has been reinstated in the MEEMP and AIS monitoring in 2022 together with expansion of the basket and plate methods for sampling for fouling organisms, but note that plankton sampling was temporally limited (Table 8-3) - DFO recommends this to be expanded to include different seasons to get more robust coverage of different taxa and improve chances detecting introduced species and other types of project effects on the plankton community. Both are important - introductions or other kinds of project effects on the plankton community could affect the food-web with consequences for fish and marine mammals. DFO notes that the proponent shared a design to include season zooplankton sampling, sought input and has made changes based on DFO recommendation with plans for implementation in 2023 monitoring.</li> <li>5. For ballast water management systems using an active substance for disinfection (e.g., chemical agent) will any monitoring be in place to confirm neutralization? Discharges of large volumes of highly chlorinated water has not been modelled and may need to be evaluated for effects on the marine environment. (see BIM 2023 Appendix G.8.1, p38). DFO encourages further investigation and modelling for the larger vessels that are proposed to commence shipping to Milne Port, to identify if the dispersion models change, or if larger pulses are experienced during ballast water exchange.</li> <li>6. The Proponent states <i>“in order to reduce or eliminate the risk of invasive aquatic species and pathogens being introduced into Canadian waters as a result of ship hull biofouling, an anti-fouling coating will be in applied to the hulls of all Project Vessels that will Arrive and depart from Milne Port. The anti-fouling coating used will comply with the anti-fouling convention as well as be approved under the Pest Management Regulatory Agency of Canada and Regulations</i></li> </ol>
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	<p><i>for the Prevention of Pollution from Ships and for Dangerous Chemicals. This convention prohibits the use of dangerous organotin chemicals in anti-fouling systems.”</i> (Annual Report pg332). DFO requests the Proponent confirm that the vessels are meeting the regulation standards for the anti-fouling coating, as well as provide monitoring data to confirm compliance with the convention. DFO recommends the Proponent establish adequate monitoring of the hull and biofouling system (Term and Condition 91) as the Proponent stated that <i>“Ship hull surveys were not conducted during the 2022 open water season as an options analysis for hull fouling monitoring is in progress, following the conclusion that results from the three-year ROV-based ship hull biofouling program demonstrated that the ROV-based video surveys do not allow for adequate taxonomic resolution”</i> (Annual Report p323).</p> <p>7. Why was <i>Myrianida</i> sp. only identified to the level of genus; given that at least one species in this genus is known to be introduced elsewhere and that this genus has been detected at Milne Port for the first time, will efforts be made to send the specimen(s) for further verification? Further verification to species level is needed and there is insufficient evidence to state, with any confidence, that <b>“<i>Myrianida</i> sp. is not considered a taxon of concern in Milne Port” (P.35)</b>; likewise, more information is required before making similar statements with genus level taxa for which NIS of the same genus are known elsewhere (e.g., <i>Ulvella</i> sp.; cf. <i>Hincksia</i> sp.; cf. <i>Punctaria</i> sp.; <i>Stictyosiphon</i> sp./cf. <i>Stictyosiphon</i> sp.; cf. <i>Erythrotrichia</i> sp.; cf. <i>Polysiphona</i> sp.; Buguloidea indet.). Given that both <i>Punctaria latifolia</i> and cf <i>Stictyosiphon soriferus</i> are new detections, not previously known from the project region, or the Canadian Arctic, both are found in northern Europe where ships originate and known to be introduced elsewhere, they pose a concern and potential risk. What will “further review” of these species entail?</p> <p>8. It would be preferable to include ecoregions where taxa were previously found/known to be distributed (e.g., numbered ecoregions in Spalding et al. 2007). These could be included in brackets after written descriptions (e.g., Ellesmere Baffin Island area) or after the numbered references to help readers in evaluating what is being considered the “surrounding region” for previous occurrence records and to have a more precise understanding of the known distributions of each species.</p>
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	<p>In reference to Results Tables 8-7, if there are earlier baseline data (prior to 2014) it would be helpful to include this in a column. If space is an issue, it could just be shown in a single column as presence/absence prior to 2014.</p> <p>9. DFO does not agree with rationale for removing <i>Ampharete petersenae</i> from the “Watch List” based on presence in the European Arctic. This species has not previously been detected in the Canadian Arctic, was not found in Baffinland baseline studies and appears to be relatively common in northern Europe where Project ships originate; it therefore could be a potential introduction and fits the description of species that should be included on the watch list.</p> <p>10. Given that many of the taxa are being identified from early life stages and therefore lack characteristics for species-level identifications, the proponent should consider preservation to allow for bar-code identifications of the numerous taxa that were only identified at the genus level. This level of identification is far more informative for early detection of NIS/AIS.</p> <p>11. For reasons outlined above in comment 3, DFO disagrees with the conclusion that “<i>Marenzelleria wireni</i> and <i>Marenzelleria arctia</i> are designated No Risk and are not considered taxa of concern in Milne Port.” These species should remain on the watch list and be considered for inclusion on a trigger list given the known invasion history of this species complex. Previous annual reports have documented an increase in abundance and some spread from the original detection site, two of three important indicators that a species is becoming established and has potential to be invasive. Several species of this genus are known having invasive characteristics, are considered on the most successful invaders introduced to the Baltic Sea and are listed among widespread non-indigenous species in marine waters of Europe (Galil et al 2014; Cardeccia et al 2018; Golubkov et al. 2021).</p> <p>Several statements are inconsistent:</p> <ul style="list-style-type: none"> <li>• “<i>Similar to 2021, benthic sampling in 2022 included targeted collections where Marenzelleria specimens were previously collected. Only two of the four targeted stations had Marenzelleria present, with no records at adjacent stations reinforcing the observation that invasive behaviour is not apparent in Marenzelleria in Milne Port.</i>” – this statement is inconsistent with the</li> </ul>
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	<p>methods and results which state that no targeted sampling was conducted in 2022.</p> <ul style="list-style-type: none"> <li>• “<i>Biogeographic evidence suggests multiple species are indigenous to the Canadian Arctic or may be cryptogenic....Further, documented occurrences of the genus in waters around Baffin Island prior to the commencement of shipping operations confirm this is not a Project-related introduction (if it is to be considered an introduction at all).</i>” – Records of this genus in the Canadian Arctic are scant and there are no reliable documented occurrences in the eastern Arctic. There are only 2 recorded occurrences of this genus in the Eastern Arctic (identified as <i>M. viridis</i>); both were from an older unpublished consultant report and recorded in depths that are hundreds of meters beyond the known depth range of &lt;30m for all taxa in this genus. These records are thus considered to be misidentifications.</li> </ul>
Conclusion/Requests	<ul style="list-style-type: none"> <li>• DFO recommends the development of proactive measures and a response plan for <i>Marenzelleria sp.</i> identified, during the 2022 NIS/AIS sampling.</li> <li>• DFO suggests that a number of newly detected species should be considered for inclusion on the trigger list given many were not previously found in baseline studies (criteria given in Figure 8-3).</li> <li>• DFO recommends that the Proponent investigate other technologies and methodologies to monitor ballast water/biofouling and achieve species-level identification. However, until these methodologies can be achieved DFO strongly recommends the Proponent reinstate the previous ROV surveys to continue to collect samples for biofouling, as well as carry out further sampling at Ragged Point as it was not completed in 2022.</li> <li>• As noted in our comments in 2021, DFO requests details of what specific datasets were used to generate the map in figure 8-6 of Appendix G.6.9. DFO did not find specific occurrence data in ArcOD, but rather links to the Global Biodiversity Information Facility(GBIF; hosts the Global Invasive Species Database) and Ocean Biodiversity Information System (OBIS). These datasets contain many occurrences within Canadian Arctic waters so it seems the map in 8-5 may be biased by missing substantial occurrences from this region.</li> </ul>

	<ul style="list-style-type: none"><li>• DFO recommends the use of biogeographic information in combination with knowledge of circulation patterns to better develop criteria for “surrounding region” and distribution categories.</li></ul>
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**Table 3.** DFO Technical Comments on Baffinland’s 2022 Annual Report – Freshwater Environment

Review Comment	DFO – 3
Subject/Topic	Fresh Water Environment: Arctic Charr
References	BIM 2023. 2022 NIRB Annual Report – Appendix G.4.1. Fresh Water CREMP
Review Comment	<p>1. DFO requests clarification on total amount of Arctic Charr removed from Mary Lake (and other reference lakes) annually during sampling events, and if sampling events are individual or combined;</p> <p><i>“...fish population survey targeted the collection of approximately 100 arctic charr from nearshore lake habitat and 100 arctic charr from littoral/profundal lake habitat. The four mine-exposed study lakes used for the fish population survey were the same as those used to document baseline conditions, namely Camp, Sheardown NW, Sheardown SE, and Mary lakes...”</i> (Freshwater CREMP pg 27)</p> <p>And</p> <p><i>“A total of 104 arctic charr were captured from nearshore habitats at both Mary Lake and Reference Lake 3 in August 2022...”</i></p> <p><i>“...A total of 99 and 94 arctic charr were sampled from littoral/profundal habitat of Mary Lake and Reference Lake 3, respectively, in August 2022.”</i> (Aquatic effects Monitoring Reports Pg 84).</p> <p>2. In the 2022 NIRB Shipping Report; <i>“MHTO did address concerns related to decreased char abundances that have been observed by community members.”</i> The Proponent responded; <i>“...Baffinland then sent a more in-depth response via email to the MEWG on July 7th, 2022, comparing methodologies and results of the Baffinland 2021 char studies to the historical DFO char studies conducted in the RSA during the late 1990s. A comparison of these studies indicated that no temporal changes were detected for Arctic Char populations based on samples collected from Tugaat and Qurluktuk Lakes.”</i> DFO would like further explanation and clarification on the conclusion that there is no temporal change detected from the sampled lakes, as in the Milne Inlet Fresh Water Fish Health Program 2022, the reported CPUE for Arctic Charr within Tugaat and Qurluktuk lakes both dropped significantly from 2021 (Tugaat: 2021 = 9.33, 2022 = 1.75 Qurluktuk: 2021 = 6.98, 2022 = 1.0).</p>

	<p>3. The Proponent states “variability in CPUE can be attributed to many things such as weather at the time of study, locations chosen for net deployment, the use of overnight versus daytime sets, and inter-annual climatic factors (e.g., wet years versus dry years).“ DFO recommends further measures be taken to ensure the drop in CPUE is attributed to external factors and that the fish population is in fact stable.</p>
Conclusion/Requests	<ul style="list-style-type: none"><li>• DFO recommends the Proponent explore opportunities to collaborate with Inuit harvesters and other interested parties to align sampling goals to minimize sampling impacts on the Arctic Char population.</li></ul>