Parks Canada | Parcs Canada

Nunavut Impact Review Board (NIRB)   July 27, 2020
PO Box 1360
Cambridge Bay, NU
X0B 0C0

Dear NIRB,

Subject: Baffinland Iron Mines Corp. Annual Report 2019 - Mary River Project.

The Parks Canada Agency (PCA) appreciates the opportunity to provide comments on the Mary River Project 2019 Annual Report submitted by Baffinland Iron Mines Corporation (BIMC) to the Nunavut Impact Review Board (NIRB) as requested by the NIRB in their letter dated June 11, 2020. As per that letter, PCA is providing the following comments with respect to the Report:
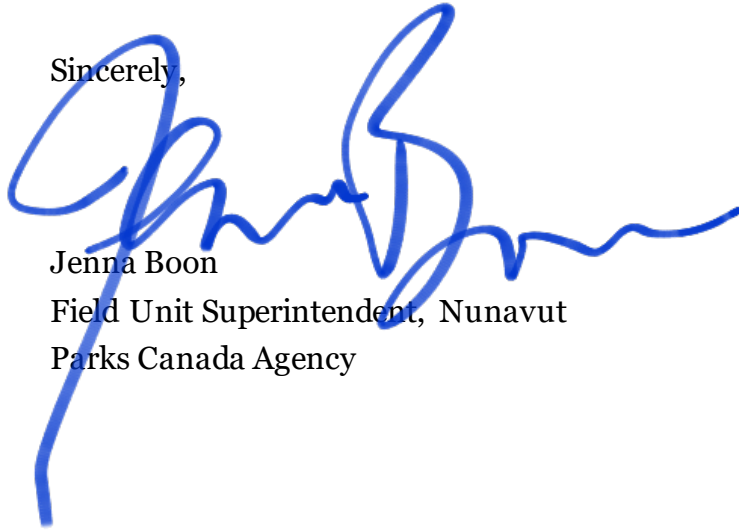
Effects Monitoring
  a. Whether the conclusions reached by Baffinland in the 2019 Annual Report are valid; and
  b. Any areas of significance requiring further supporting information or any changes to the monitoring program which may be required.

A key item of concern, as described further in the following table, is the need to improve the review schedule for comments on draft monitoring reports and the process for resolution of associated issues prior to issuance of this annual monitoring report and prior to each shipping season.

PCA is not providing any comments regarding compliance monitoring as we will not have a regulatory role for this project until Tallurutiup Imanga National Marine Conservation Area is gazetted under Schedule 1 of the *Canada National Marine Conservation Areas Act*. Parks Canada also notes that we support comments, relevant to the marine environment, provided by the Department of Fisheries and Oceans, Transport Canada, and Environment and Climate Change Canada.

If you have any questions, please contact Jacquie Bastick at (613) 213-0275, or by email at Jacquie.Bastick@canada.ca.

Sincerely,

Jenna Boon
Field Unit Superintendent, Nunavut
Parks Canada Agency

			Mary River Project 2019 Annual Report: submitted by Baffinland Iron Mines Corporation (BIMC)	
Cmt #	Section	Page	PCA Comments re: BIMC 2019 Annual Report Conclusions	Areas of significance requiring further supporting information/changes to monitoring program
1	2.5 (Engagement with Working Groups)	29	BIMC indicates that the "Working Groups provide a valuable forum for ongoing Project communication and reporting between Baffinland and interested parties…" • PCA notes that the working groups are in the midst of revising their terms of reference due to concerns around the effectiveness of these groups. This has been an ongoing process and unresolved issues include establishing effective and realistic timelines for report review and methods for resolution and implementation of recommendations.	If timely resolution of issues related to effectiveness of the working groups cannot be achieved, perhaps the concept of these groups needs to be revisited and/or independent expertise sought to help achieve resolution. Note: With the signing of the Inuit Certainty Agreement, perhaps a new/different working group format, or other format for discussing and resolving monitoring related issues, should be considered in place of the MEWG so as to streamline efforts, reduce duplication, and reduce demands upon personnel.
2	4.6.10 (Marine Environment)	251-441	a. The marine sections of this report (pp 251-441) present results based on individual draft 2019 monitoring reports. However, at the time of the report's submission (May 15, 2020) comments on those draft reports had not yet all been provided from other MEWG members to BIMC; the last comment form was due to BIMC on June 15, 2020. This means there has been no opportunity for BIMC to incorporate MEWG feedback into final versions of those reports prior to production of this annual report. • Inclusion of MEWG feedback on draft individual monitoring reports is important as this feedback has the potential to influence BIMC's analysis and final reports which, in turn, inform this annual monitoring report. b. BIMC indicates that "*prior to the beginning of the shipping season in Milne Inlet and as part of annual planning procedures, Baffinland reviews and takes into consideration the previous year's monitoring results, observations and feedback provided by local Inuit, and/or input acquired through MEWG members during the annual teleconference and face-to-face meetings. This information is then used to inform operational planning initiatives for the following year, including adaptive management actions should these be required, such as modifications to existing mitigation or addition of new protective measures*" (pp 345-346). • PCA notes that missing from the list of information considered by BIMC prior to the beginning of the shipping season is the feedback provided by the MEWG on the individual annual draft monitoring reports.	a. BIMC should work with the NIRB, MEWG, and other relevant parties to determine a reporting and review schedule that provides for the inclusion of feedback to BIMC's draft monitoring reports and resolution of associated issues, *prior to preparation of this annual report*. b. BIMC should work with the NIRB, MEWG, and other relevant parties to determine a reporting and review schedule that provides time for the inclusion of feedback to BIMC's draft monitoring reports, resolution of associated issues, *and implementation of adaptive management, prior to commencement of each shipping season*. Note: PCA suggests a tele (video) conference workshop with the parties noted above would be beneficial to identify legislative/permitting, operational, and other deadlines and obligations as a common basis from which to then build a reporting/review cycle and framework

| | | | | that reduces duplication, streamlines effort for all parties, and clearly identifies timelines and roles/responsibilities.

PCA also suggests that this workshop incorporate relevant commitments within the Inuit Certainty Agreement (ICA) and its *Appendix A - Information Sharing Schedule* so as to provide an overall framework for the understanding and guidance of all parties to the EA. |
|---|---|---|---|---|
| 3 | PC Condition No. 76 | 253-263 | DFO and PCA jointly submitted a Working Group Comment Form on the draft 2019 MEEMP-AIS Report with a number of questions/recommendations regarding implementation of the Marine Environmental Effects Monitoring Program (MEEMP) and AIS/NIS Sampling Program (see attached). | BIMC to work with MEWG to resolve issues and provide responses to the Working Group Comment Forms describing how those issues have been resolved <u>through consensus</u>, how the resolutions/recommendations have been incorporated into the final reports, and implemented into the MEEMP and AIS/NIS monitoring program. |
| 4 | PC Condition No. 77 and 183 | 264-266, 585-588 | See comments 1 and 2 above, and:

a. BIMC indicates: "*The MEWG reviews the various annual marine monitoring reports and provides comments to Baffinland for consideration in the final version. Baffinland reviews all comments received on draft reports, makes effort to provide meaningful responses to each comment, and in so doing, takes into consideration the suggestions for improvement of the report and advice provided by MEWG. This mechanism allows MEWG members to provide constructive feedback on annual reporting efforts.*

For 2019 and future <u>final drafts</u> of the Marine Environment Annual Monitoring Report, Baffinland will include an appended table summarizing all comments/suggestions provided by MEWG members during their review, and any accompanying responses, as requested at the June 2019 MEWG meeting." (p 265)

b. PCA notes that while MEWG members are provided with opportunities for feedback and BIMC provides responses, as per note a, above; there is no mechanism within this structure to arrive at resolution of outstanding issues (e.g.: if members are not satisfied with BIMC's responses) and to ensure that recommendations reached through a resolution process are implemented.

c. Re: developing or enhancing impact avoidance and mitigation strategies for the protection of the marine environment (p. 585). | See recommendations in comments 1 and 2 above, and:

a. What are "final drafts" of the annual monitoring report? Is there opportunity to review that draft and when is the <u>final</u> report submitted?

PCA suggests that the final version of this annual report should be produced only once the individual monitoring reports have been finalized with the MEWG (as per comment 2.a above). Those results can then be used to inform this annual report.

b. The Terms of Reference for the MEWG must be amended to include agreement, by all members including BIMC, on a process that provides timely resolution on outstanding issues so that solutions may be effectively implemented into monitoring plans, adaptive management, and mitigation.

c. PCA notes that we continue to support DFO's concerns and recommendations regarding icebreaking. |

5	PC Condition No. 78	267	In their response to the QIA and WWF's comment on this PC condition for the 2018 Annual Monitoring Report, BIMC indicated "*Pack-ice and land-fast ice conditions in the RSA were characterized in Baffinland's Overview of Marine Operations, as well as in Golder's Assessment of Icebreaking Operations during Shipping Shoulder Seasons (see Appendix A for detailed daily ice charts for the 2018 shipping season; also see Table 1.2 icebreaking assessment). Moving forward, Baffinland will provide a <u>similar table</u> in future Annual Reports to NIRB.*" PCA notes that while 14 documents with daily ship tracks and ice imagery for the northern shipping route were submitted as part of this annual report, it is not clear where the "table", mentioned in BIMC's response to the QIA and WWF, is located in this 2019 report.	Please make reference to the location of this table, with information current to 2019, in the "Results" section of page 267.
7	PC Condition No. 87 and 91	288-291	See comment 3 above	See recommendation 3 above
8	PC Condition Nos. 101-113 & 119-123, 184	325-335	DFO and PCA jointly submitted Working Group Comment Forms on the draft 2019 Bruce Head Shore-based Monitoring Report, draft 2019 Ship-based Observer Monitoring Report, draft 2019 Marine Mammal Aerial Survey report, draft 2017–2018 Integrated Narwhal Tagging Study Report, and the draft 2019 Passive Acoustic Monitoring Report with a number of questions/recommendations regarding implementation of these monitoring programs (see attached).	BIMC to work with MEWG to resolve issues and provide responses to the Working Group Comment Forms describing how those issues have been resolved <u>through consensus</u>, how the resolutions/recommendations have been incorporated into the final reports, and implemented across the relevant monitoring programs.

Name: Kim Howland, Sarah Bailey, Jacquie Bastick, Chantal Vis, Alexandra Sorckoff

Agency / Organization: DFO/PCA

Date of Comment Submission: June 21, 2020

#	Document Name	Section Reference	Comment	Baffinland Response
1	2019 MEEMP and AIS Monitoring Program	3.1.7.2 Fish Surveys 4.1.7.1 Catch Data	Sampling in 2019 was largely completed at the end of July and the end of August, with limited sampling occurring between these events (pgs 28-32). DFO notes that in the 2018 MEEMP Report, sampling occurred more frequently between the end of July and the end of August (2018 MEEMP AIS Report, Section 3.1.5.2, pgs 23-25). As demonstrated in Table 4-23 of the 2019 MEEMP, the total number of fish caught and the total number of fish species caught was lower in 2019 than in 2018. What factors influenced the frequency and timing of fish sampling in 2019? Consistency in sampling methodology and frequency each year will better allow for any potential effects to fish community structure from the construction and operation of Milne Port to be detected, and will allow for better comparison of data.	
2	2019 MEEMP and AIS Monitoring Program	General Comments	Baseline is not well established (they often compare to data when the project had already started or only one year of baseline data), and to use CCME guidelines (where available) as baseline or level to stay below and conclude no significant effects is something that should be discussed; these guidelines are set for southern areas, already influenced by many decades of industrialization/pollution, not for pristine Arctic environments.	
3	2019 MEEMP and AIS Monitoring Program	Pdf p 5/1149 and pdf pp 117-118/1149 (Marine Water Quality section)	For marine water quality, the conclusion that there has been no increase in iron is based on the result that iron concentrations in 2019 were no different from those in 2015-2018 (years in which the mine was already operational). As the mine was operational during those years, this cannot serve as a baseline. The comparison might be made with other areas for which water quality data is available.	
4	2019 MEEMP and AIS Monitoring Program	General Comments	Results - Are there any visuals (graphs or charts) that illustrate trend over time of the various parameters for the MEEMP? While there is lots of textual description and comparison to CCME guidelines, it may be beneficial to also see the actual trends so it is clear what is decreasing/increasing/staying the same compared to the actual baseline conditions. This could then be followed by all the textual discussion and comparison of actuals to guidelines etc.	
5	2019 MEEMP and AIS Monitoring Program	Pdf p 198 /1149 (first bullet, water quality)	It is indicated that measured concentrations were "generally consistent" with previous years and CCME guidelines. However, this is not the same as "entirely consistent". Were there significant differences? If so, in what and to what degree and why?	
6	2019 MEEMP and AIS Monitoring Program	Pdf p 188/1149 (section 5.2.6)	It is stated that diving on a ship's hull to conduct specimen collection can be severely hazardous in an active port. Diving may be done elsewhere in Canadian ports. Can those safety protocols be adopted?	
7	2019 MEEMP and AIS Monitoring Program	Pdf p 185/1149 (section 5.2.2)	This section identifies 5 examples of potentially A/NIS and flags them for further review. Do we have a sense of how rapidly this review will occur as, if there is delay in this, there may be a danger of the species becoming established if indeed it is invasive. Is this where there should be a better link to a rapid response program?	
8	2019 MEEMP and AIS Monitoring Program	AIS Monitoring Program 3.2	Multiple references that Casas-Monroy et al. (2014) was used as a definitive list of invasive species in Canada (e.g. Executive Summary, AIS Zooplankton section). Please note that the Casas-Monroy list is a subset of Molnar et al. 2008 data, limited to those species listed by Molnar from ecoregions connected to Canada by ship traffic during the period of study, with some species removed when recognized as being native to Canada. This reference is not an exhaustive list of existing or potential species considered invasive to Canada. As the reference is a subset of Molnar et al, it may be best to retain only the references to the Molnar study and remove the citations to Casas-Monroy completely to avoid misunderstanding. While using global AIS lists such as Molnar can be informative, they are not exhaustive, and quickly become outdated. Criteria used to determine status of a species as nonindigenous and/or invasive should follow that of Goldsmit et al 2014 and Dispas 2019 who used a process of cross referencing with comprehensive historical native species occurrence data to identify species that are new to a given ecoregion or to the Canadian Arctic more generally. All NIS should be treated as having potential to become invasive given the uncertainty as to how they may spread once introduced to a new region.	

#	Document Name	Section Reference	Comment	Baffinland Response
9	2019 MEEMP and AIS Monitoring Program	3.2.6 Ship Hull Monitoring Methods	It is not clear how the ships were selected for hull monitoring. Recommend that ships are selected based on age of anti-fouling paint/time since last dry-dock aiming to survey ships that have not recently been painted or cleaned. Together with the above factors, greater time spent in previous ports of call, and greater number of regions visited since last cleaning have also been shown to be associated with increased extent of fouling and could be used to select vessels for monitoring (e.g. see Sylvester eta l. 2011). DFO recommends identification of factors influencing biofouling risk of vessels calling on Milne Port through a validated risk assessment, however this would require initial sampling from a subset of vessels to assess of percent cover and physical collection of organisms in a representative, standardized and comprehensive manner (including both hull and niche areas) that will allow for identification of non-native species that may be transported through project shipping (DFO 2020).	
10	2019 MEEMP and AIS Monitoring Program	3.2.6 Ship Hull Monitoring Methods	The methods for the surveys are insufficient to understand what was surveyed on each ship. A standardized, stratified survey design should be implemented for consistency, such as used by Sylvester & MacIsaac (2010) Diversity & Distributions 16(1).	
11	2019 MEEMP and AIS Monitoring Program	4.2 accumulation curves 3.2.1	The use of accumulation curves is good, but given that the curves are based on samples collected over 3 days, they may underestimate seasonal diversity. Caution should be used in the interpretation of the asymptote for curves based on a 'single' point in time. i.e. sampling may have been sufficient for that point in time, but underestimate of annual diversity over multiple seasons of the year. Plankton are well known to exhibit high seasonal variability in both abundance and species richness (e.g., McKinstry and Campbell 2018 and references therein). This has been well demonstrated in surveys of other Canadian Arctic ports where variability in density and species richness across months was found to greatly exceed variability among sites at a given port (Dispas 2019). Sampling at regular intervals over a 3 month period versus overs a two week window resulted in a 40% increase in species richness (Dispas 2019). Collection of more frequent plankton samples (at least once/month during open water season when plankton are blooming) is recommended to improve baseline coverage of species that may be present. We note that some of the oblique tows are being done with a 64um net and have concerns that there may be a bow wave created with such a small mesh size which could bias results. This method is best suited to larger mesh nets for capturing larger faster swimming zooplankton and ichthyoplankton. Overall densities of plankton in the oblique hauls are unusually low (suggesting there may be a problem in the way the net is being towed an or bow wave effects.	
12	2019 MEEMP and AIS Monitoring Program	4.2.6	113 minutes of video footage across five ships is very small and may be inadequate to assess fouling coverage adequately, noting that previous studies have taken between 1-3 h per ship (e.g. Sylvester & MacIsaac (2010)).	
13	2019 MEEMP and AIS Monitoring Program	4.2.6 Table 4-46	While the methods section 3.2.6 indicated that much effort was focused on niche areas where biofouling was most likely to occur, this table shows only stern sections and one bow section were surveyed. Combined with the minutes of video footage, it appears the ROV surveys were insufficient to determine biofouling extent on any vessel.	
14	2019 MEEMP and AIS Monitoring Program	5.2.6	Identifications were insufficient due to use of video footage only. Addition of a biologist at the time the ROV is being operated is unlikely to improve the ability to acquire species-level identifications as normally a specimen would be required. ROV technology is currently suitable only for assessing % coverage. Divers in the water are needed to obtain specimens for species level identifications. A combination approach could be used in the future to acquire specimens while minimizing diver time in the water.	
15	2019 MEEMP and AIS Monitoring Program	Executive Summary, Ship Hull Monitoring	The statement that *No NIS or AIS taxa were identified among biofouling species observed in ship hull surveys* is inappropriate for the executive summary considering the limited survey effort (minute of video footage) and the lack of specimen collection and species-level identifications. Similarly, the statement that most of ships' surfaces were found free of biofouling may be an overreach, depending on the extent of hull surface actually surveyed.	
16	2019 MEEMP and AIS Monitoring Program	Executive summary MEEMP 2.2.1	DFO supports the 2019 modifications of extra sampling intensity for benthos and including sculpin in fish tissue sampling, however we would like to know rationale for why the 3 subsamples at each station were combined for a composite sample. It is unclear if this was only done for the Van Veen or the Ponar Grabs as well and unclear why 2 different grab methods were used. If subsampling is used there must be care that the sample is being split evenly from top to bottom so as to not bias results since the distribution of biota from the source to deeper sediments will vary.	
17	2019 MEEMP and AIS Monitoring Program	3.5.1	"Species from several major taxa groups were excluded from the dataset before data analysis because these are meiofauna and not reliably retained on 500 um mesh, or not strictly invertebrates". Although removing these for the MEEP analyses seems reasonable, these species should be retained for the AIS program. Could BIM provide confirmation if this was done.	

#	Document Name	Section Reference	Comment	Baffinland Response
18	2019 MEEMP and AIS Monitoring Program	Executive summary AIS Zooplankton 4.2.1	It is reassuring to see that BIMs annual monitoring is able to pick up new species, demonstrating the benefits of regular monitoring, something which is not feasible in most areas of the Arctic. The specimen of Obelia from the zooplankton samples is of particular interst. This genus is rare in the Canadian Arctic, however, *Obelia longissima* is relatively common in the Eurasian Arctic and north Sea (Europe) – for example, of 1400 records in the GBIF biodiversity database, there are only 2 historical reports of specimens from the Canadian Arctic, one of which is at Canadian Museum of Nature; DFO has requested confirmation of the identity of this specimen. Based on NEMESIS database (http://invasions.si.edu/nemesis/jtmd/SpeciesSummary.jsp?taxon=Obelia%20longissima), the species is thought to be spread via biofouling and considered exotic/cryptogenic in north pacific to Alaska and also listed as non-native to temperate northern Atlantic, however, references in NEMESIS should be checked carefully to confirm this. Type locality for species in Black Sea and Ireland suggesting possible origin in this region. Given the limited reports in Canadian Arctic and possibilities of introductions of this species from other northern locations, the specimen (s) found by BIM should be examined to see if the species can be confirmed and background on the species should be examined more carefully to evaluate if this species would be considered an NIS to the region. We note that recent specimens of *Obelia* spp. were also detected in port of Churchill (Dispas 2019) and Deception Bay (Goldsmit 2016). At least one of these collections has been preserved in ethanol which may allow for further examination of genetic affinities with populations elsewhere. Likewise records of *Hybocodon prolifer* in the Canadian Arctic are limited to a handful of specimens previously found in the port of Iqaluit, but there more frequent detections in northern Europe and the Bering Sea (GBIF, OBIS), suggesting this species should be examined more carefully and museum specimens from the Canadian Arctic verified to confirm previous identifications – there do not, however, appear to reports of the species being invasive or introduced elsewhere. In contrast to these two species, *Onisimus glacialis,* although not common, has been historically reported in a number of areas across the Canadian Arctic through multiple studies, providing better confidence that it is native to the region. Given the above comments, it may be misleading or premature to state that "**No NIS taxa were identified in zooplankton samples**...". A statement that "**Further review of natural ranges and vectors of introduction are re required to confirm NIS status**" similar to the statement regarding benthic infauna would be more appropriate.	
19	2019 MEEMP and AIS Monitoring Program	Executive summary AIS Benthic Infauna 3.2.2	There is mention that benthic specimens identified as potentially non-indigenous were sent to Philippe Archambault's lab for identification. Could Baffinland please provide a list of which species?	
20	2019 MEEMP and AIS Monitoring Program	Executive summary AIS Benthic Infauna 4.2.2 4.2.2.1.1 4.2.2.1.2	The identification of *Marenzellaria viridis* is interesting as this was a species identified as having potential risk for invasion to the Arctic and has been assessed and ranked in two a recent screening level risk assessments (Vizilli et al. submitted; Goldsmit et al. in prep). Although the Bim report suggests multiple specimens have been collected in the &0's and 80's, we found this species has had limited historical reports from the Canadian Arctic: one from an Imperial Oil consultant report (the same record noted in this MEEMP AIS report originally from Conover and Stewart 1978) near Baffin Island and 5 specimens (under the orginal synonym of *Scolecolepides viridis*) from the Beaufort Sea area in 1980's by Hopcroft (2016). The species was also reported in a recent survey at the community of Gjoa Haven (Brown et al. 2011). However, it should be noted that the genus Marenzelleria consists of five species, which are very difficult to discriminate by morphological characters alone (Blank et al 2008). This species (particularly older records) could be confused for *Marenzellaria arctica* which has recently been found in other locations in the Arctic so it is possible these isolated reports represent misidentifications of this closely related species (C. Conlon, Canadian Museum of Nature, pers. comm). We would suggest reexamination of specimens by a Polychaeta expert to verify if specimens found at Milne Inlet are indeed *M. viridis,* a species which has successfully invaded California, Scotland, the North Sea, and the Baltic Sea where it has reached high densities in its, and replaced native infauna/ altered sediment characteristics in some locations (NEMESIS; https://invasions.si.edu/nemesis/browseDB/SpeciesSummary.jsp?TSN=-47). While formalin allows for better preservation of specimens, situations such as this point to the benefits of good preservation in ethanol which would allow for genetic barcoding as a potential option for verifying identity of morphologically challenging species such as this.

While it is helpful to see descriptions of distributions for new species, Table 4-41 would be much more informative if the specific references associated with previously known distributions of each new species were given as another column. This would allow the reader to check references associated with individual species to better assess the quality of baseline data upon which a species designation is based. We request that the table be updated with this information in a similar fashion to how it is presented in supplementary tables of Goldsmit et al. (2014). Once this is done, we would like the opportunity to review each species in light of information contained in supporting refernces and any additional information that may be relevant. Likewise species found in previous years at the port and not included in 4-41 should also have clearly linked references to support their designations as native, invasive or cyptogenic, so as to have a cumulative list covering the life of the monitoring program. | |

#	Document Name	Section Reference	Comment	Baffinland Response
			We would also like to know which of the species in 4-41 were validate in Philippe Archambault's lab – we suggest this be included in the table or tracked somewhere in the document and associated database. Will specimens that could not be identified to species also be sent to experts either from the Archambault lab or to another lab with expertise in the respective taxonomic groups? We recommend this be done as specimens in 2018 that were not identified to species by Biologica, were in some cases be identified by another lab (Archambault's lab). We checked distributions for *Lineas* and could not find evidence of the genus occurring anywhere in the Arctic aside from one record in Alaska. The genus appears widespread elsewhere, particularly in northern Europe, suggesting it could be a potential NIS. We suggest having this specimen verified, examining potential vectors and checking its known distribution carefully to evaluate status. We are pleased to see there will be further work to validate specimens of Moocrophium by a third lab given uncertainties and the potential for this species to be non-indigenous. We would be interested to know which sites this species was found at in 2019 and whether it appears to have spread from the original site near the ore dock. Are there any plans for response to manage/contain this species?	
21	2019 MEEMP and AIS Monitoring Program	Executive summary AIS macroflora and benthic epifauna 4.2.3	Given the difficulty in identifying taxa to species level with video surveys the that "**No NIS or AIS tax were identified...**" is misleading. Rather there should be acknowledgement that these methods are not suitable for identifying most taxa at the level needed for proper assessment of their status as native or introduced and that improvements are needed. We recognize that BIM is working toward improving methods for sampling of epifauna to include more specimen-based collection and encourage them to continue these efforts. Further we note that of the following taxa identified to species may be NIS based on known distributions: *Pecten albicans* was not mentioned, but a search of global data bases (ARMS, GBIF, OBIS) shows that this species only occurs in Japan. There should be verification of footage to determine if this species identification is correct as it would be considered an NIS with potential to compete with other scallop species in the area. *Polycarpa pomeria* is a species with a strictly European distribution and other species of *Pomaria*, while more widely distributed have not been documented anywhere in the Arctic with the exception of northern Europe suggesting this species may be an established NIS given that it was previously observed in benthic infauna samples (2018). Video footage as well as specimens should be verified by a tunicate expert to validate if these identifications are correct.	
22	2019 MEEMP and AIS Monitoring Program	Executive summary AIS encrusting epifauna 4.2.4	*Circeis amoricana* is not listed in either of the sources mentioned to have been used as references supporting a known Arctic distribution for this species. A quick search in global databases (OBIS, GBIF) shows it has only been reported on one occasion recently (2008) in Churchill, the area of highest shipping in the Canadian Arctic at that time. It is interesting to see it reported in Milne inlet for the first time and should be investigated more carefully to better understand it distribution and to confirm identity of specimens found on settlement baskets. *Patinella verrucaria* was only found in the ARMS database reference that is cited in the report (Sirenko et al. 2020), but distribution is shown to be on the Atlantic coasts of north America and Europe, not the Canadian Arctic or elsewhere in the Arctic. A search of global databases (GBIF, OBIS) show this (and the synonym *Lichenopora verrucaria*) to have been found elsewhere in the Canadian Arctic in a range of locations, although the species does not appear to be commonly reported. *Gonothyraea* was not found in any of the cited references, however a search of OBIS and GBIF showed it to be found in a few locations within the Arctic with generally limited distribution information globally. We suggest updating the references to only include those that support statements in the text. We would like to confirm if unidentified species (those only identified to genus) will be given to other experts to try and identify these to the species level. Further, given the above notes, it may be misleading or premature to state that "**No NIS taxa were identified in encrusting epifauna samples**..." in the executive summary until *Circeis amoricana* is investigated further. A statement that "**Further review of natural ranges and vectors of introduction are are required to confirm NIS status**" similar to the statement regarding benthic infauna would be more appropriate.	

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Baffinland

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Agency / Organization: DFO/PCA

Date of Comment Submission: June 8th, 2020

#	Document Name	Section Reference	Comment	Baffinland Response
1	2017-2018 Integrated Narwhal Tagging Study - Technical Data Report	Executive Summary - English	This study only evaluates the behaviour of narwhals that came in contact within 10 km of vessels. It is possible that narwhal actively avoided ships and stayed at distances greater than 10 km. Therefore, these analyses are not designed to answer the question of narwhal avoidance of vessels.	
2	2017-2018 Integrated Narwhal Tagging Study - Technical Data Report	Executive Summary - English	BIM states: "Overall, results from the 2017 and 2018 narwhal tagging study support predictions made in the Final Environmental Impact Statement (FEIS) for the ERP, in that ship noise effects on narwhal will be limited to temporary, short-term avoidance behaviour, consistent with low to moderate severity responses as defined in Section 2.6.3 of this report. No evidence was observed of large-scale avoidance behaviour, displacement effects, or abandonment of the summering grounds (high severity responses), which might in turn result in a population or stock-level consequence (consistent with the definition of a non-significant effect used in the FEIS)." This study was not designed to test for large-scale avoidance behaviour, displacement effects,	

#	Document Name	Section Reference	Comment	Baffinland Response
			or abandonment of the summering grounds. Narwhals that were tagged as part of this study were tagged in the RSA while shipping was occurring. Therefore, they already made the choice to come to the area with the presence of ships. This study was designed to test for the small scale effect of interactions between ship and narwhals. It was also designed to measure levels of noise by narwhal. In order to test for large-scale avoidance, methods for monitoring abundance are required.	
3	2017-2018 Integrated Narwhal Tagging Study - Technical Data Report	3.5.1 Identification of Narwhal Encounters with Vessels	Vessel encounter was defined based on the presence of vessel within 10 km of narwhals. It is stated that the "120 dB re: 1µPa (SPLrms) disturbance threshold was predicted to propagate 9.82 km < Rmax < 19.24 km from a Post-Panamax vessel transiting at 9 knots through Milne Inlet." Given that the 120 dB threshold might be up to 20 km, and given that not disturbance threshold have been developed for narwhals, did BIM consider a different distance threshold for the analysis?	
4	2017-2018 Integrated Narwhal Tagging Study - Technical Data Report	3.5.2 Narwhal Dive Behaviour	For the null hypotheses, what alpha level was considered significant? Given the small sample sizes, could an alpha level of 0.1 be considered?	

#	Document Name	Section Reference	Comment	Baffinland Response
5	2017-2018 Integrated Narwhal Tagging Study - Technical Data Report	4.2.1 Close Encounters with Large and Medium Sized Vessels (CPA Events)	From the information in this paragraph, it seems that 6 narwhals were within 10 km of vessels. Is it correct that the other 14 narwhals did not get within 10 km of vessels? Could you provide some summary about how many tagged narwhals came in close contact to vessels?	
6	2017-2018 Integrated Narwhal Tagging Study - Technical Data Report	5.0 Discussion	This study illustrated the great variation between narwhals in their behaviour. According to a meta-analysis of mega fauna tagging studies (Sequeira et al 2019), sample sizes of around 100 individuals are required to investigate the impact of human disturbance on wild animals. While the tagging report documents the reaction of 6 to 12 narwhals to close contact with vessels, the sample size is not big enough to come up with any significant conclusion.

Sequeira, A.M.M., Heupel, M.R., Lea, M. -A., Eguíluz, V.M., Duarte, C.M., Meekan, M.G., Thums, M., Calich, H.J., Carmichael, R.H., Costa, D.P., Ferreira, L.C., Fernandéz-Gracia, J., Harcourt, R., Harrison, A. -L., Jonsen, I., McMahon, C.R., Sims, D.W., Wilson, R.P., and Hays, G.C. 2019. The importance of sample size in marine megafauna tagging studies. Ecol Appl 29(6). doi:10.1002/eap.1947. | |
| 7 | 2017-2018 Integrated Narwhal Tagging Study - Technical Data Report | 4.2.3.3 Horizontal Displacement | BIM noted: A gap without narwhal GPS locations was evident within approximately 0.5 km of vessel port and starboard, and 1 km of the vessel bow and stern (Figure 4-69). This gap in distribution in close proximity to vessels may indicate | |

#	Document Name	Section Reference	Comment	Baffinland Response
			movement away from the vessel by narwhal (i.e. avoidance) but may also be a function of the low-resolution GPS location data available. It should be noted that the tags do not transmit when narwhals are underwater. Therefore, the horizontal movement of narwhals underwater can only be extrapolated from transmission at the surface. Thus, it is possible that narwhals went underwater in proximity of vessels.	
8	2017-2018 Integrated Narwhal Tagging Study - Technical Data Report	5.0 Discussion	The interpretation of bottom dive result should be considered more carefully. Some of the results should be interpreted in the light of Williams et al (2017) finding that narwhals performed deep dives as a response to a stressor. Therefore, deep dives in narwhal are not always indicative of feeding and in some cases, it might be a stress response. Williams, T.M., Blackwell, S.B., Richter, B., Sinding, M.-H.S., and Heide-Jørgensen, M.P. 2017. Paradoxical escape responses by narwhals (Monodon monoceros). Science 358(6368): 1328–1331. doi:10.1126/science.aao2740.	
9	2017-2018 Integrated Narwhal Tagging Study - Technical Data Report	APPENDIX C Power Analysis	Could you specify which R package was used for the Bootstrapping? Were you able to incorporate the random effect of individuals in the Bootstrapping?	

Name: Marianne Marcoux, Jacquie Bastick, Cory Matthews

Agency / Organization: DFO, PCA

Date of Comment Submission: June 18th, 2020

#	Document Name	Section Reference	Comment	Baffinland Response
1	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	General comment	It would be useful that the results from the different monitoring programs related to marine mammals get interpreted and integrated together. The different monitoring programs were designed to complement each other and their results should feed into each other. In addition, they are all part of the same adaptive management and mitigation plan.	
2	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	General comment	The report provided enough information and detail to be able to assess the data and results. The design, analysis and results seemed appropriate and are in line with previous DFO surveys to estimate abundance of whales.	
3	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	General comments	Would it be possible to add tables with the Mark-recapture distance sampling model considered with their respective AIC values?	

#	Document Name	Section Reference	Comment	Baffinland Response
4	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	3.2.5.3 Narwhal Abundance 3.2.5.3.1 Eclipse Sound Stock	The coefficient of variation (CV) of the Eclipse Sound part of the survey is very low (0.05). This is unusual for a aerial count of whales. The way the CV was calculated seemed correct and the low CV is a result of having most of the narwhals counted in the strata that were fully covered by photos.	
5	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	4.1 Narwhal Abundance Leg 2 – Open-water Season	"Because narwhal were distributed in a relatively small area (mostly in Milne Inlet and Tremblay Sound where most sightings were captured by photographic surveys), low CVs were achieved in the August surveys which provided the best abundance estimate. Narwhals concentrated in areas where shipping activities were high (Milne Inlet South) rather than moving to areas with low shipping activities. This is a sign that the level of shipping activity is not causing displacement. This is consistent with impact predictions made in the FEIS Addendum for the ERP that the Project was unlikely to result in significant residual adverse effects on narwhal in the RSA (defined as effects that would compromise the integrity of the population either through mortality or via large-scale displacement or abandonment of the RSA)." Your results do show that narwhals were present in Milne Inlet/Koluktoo Bay while shipping is occurring. However, in order to investigate large scale displacement, the densities of narwhals need to be compared to the densities of narwhals before shipping started. It would be	

#	Document Name	Section Reference	Comment	Baffinland Response
			informative to compare the current estimates with estimates from before project-related shipping started. In addition, it would be interesting to link these comments to the results of the Integrated Narwhals Tagging Study where small scale displacements were documented.	
6	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	4.2 Narwhal Distribution Leg 2 – Open-water Season	Golder states that killer whales had not been observed in southern Milne Inlet area by the Bruce Head study team during 2013 to 2017 and that killer whales had not been observed by Baffinland aerial survey study teams in 2013–2015. DFO notes that there were reports of killer whales in the area during those years, with prolonged period in 2017.	
7	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	2.5.1 Visual Survey	For the survey of Milne Inlet South during the surveys 2 and 4 of Leg 1, the design of this strata does not meet the standard for distance sampling analysis. It seems like the intent for this strata design was to use surface density modelling. How was this strata analysed?	
8	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	2.5.1.1 Distance Analysis Table 2	Golder used published data for the availability bias correction factors. Did you consider using the data from the 2017-2018 tagging program? Given environmental changes that occurred since 2012, it is recommended to use the most recent data possible. Another approach would be to update the published correction factor with the more recent tag data.	

#	Document Name	Section Reference	Comment	Baffinland Response
9	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	2.5.2.1 Narwhal	How was the 2 m depth determined? How did the photo trainer determine that some narwhals were below 2 m depth?	
10	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	2.5.2.1 Narwhal	The availability correction factor usually takes into account water clarity (or murkiness) and the correction factor can be adjusted according to the depth at which narwhals can be seen. How was the information about the murkiness integrated into the abundance estimates?	
11	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	3.2.5.1 Visual Survey Data Characteristics - Narwhal	Golder combined sightings from early shoulder season survey (Leg 1) and the open-water season survey (Leg 2) were used for estimating the detection function and mark-recapture detection probabilities for narwhal in Eclipse Sound. Golder's justification for combining the two was because of low sample size for the open-water period. Were the same observers present during the two sets of surveys? Do you have evidence to suggest that the detection function should be the same during the two legs of the survey? Could you use color coding on figure 27 to illustrate the sightings from the different legs? In Buckland et al 2001, p.14 section 1.5.1, it is suggested that a sample size of 60-80 should be sufficient to determine the detection function. Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L., Borchers, D.L., and Thomas, L.	

#	Document Name	Section Reference	Comment	Baffinland Response
			2001. Introduction to distance sampling: estimating abundance of biological populations. Oxford University Press, USA, Oxford	
12	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	3.2.5.2 Photographic Survey Data Characteristics Figure 40-41	Have you tried to fit linear detection function to the photographic data? The default function in distance sampling assume a shoulder at the track line but it might not be the case for oblique photos.	
13	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	4.1 Narwhal Abundance	For their stock assessment, DFO aims at conducting the aerial survey between Aug 1 and 24 (Watt et al. 2015). Narwhals tend to start migrating around August 25 when they tend to make more extensive movement and change their dive behaviour (Dietz et al. 2001, Heide-Jørgensen et al. 2002, Heide-Jørgensen et al. 2003, Dietz et al. 2008,). It should be noted that it is possible that the abundance estimate from Aug 25-27 include narwhals from other stocks that have started their fall migration. Watt, C.A., Marcoux, M., Asselin, N.C., Orr, J.R., and Ferguson, S.H. 2015. Instantaneous availability bias correction for calculating aerial survey abundance estimates for narwhal (Monodon monoceros) in the Canadian High Arctic. Canadian Science Advisory Secretariat Res. Doc. 2015/044.	

#	Document Name	Section Reference	Comment	Baffinland Response
14	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	Appendix C. Power analysis 1.0 POWER ANALYSIS - METHODS	This analysis assumes that the coefficient of variation (CV) of future surveys will be similar to the CV of this current survey. As noted above, the 0.05 CV for Eclipse Sound in this current survey is very low and future surveys will likely have a higher CV. It would be helpful to run the power analysis with different values for CV.	

Name: Marianne Marcoux, Jacquie Bastick

Agency / Organization: DFO/PCA

Date of Comment Submission: June 19th, 2020

#	Document Name	Section Reference	Comment	Baffinland Response
1	2019 Bruce Head Shore-based Monitoring Program	General comment	It would be useful to see results integrated with those from other Baffinland marine monitoring programs. For example, how do the responses of tagged narwhals compare with received sound levels from the PAM data? How do observations from Bruce Head compare to observations of narwhals tagged in the 2017-18 integrated tagging study? Or with CPA and behavioural data from the SBO program?	
2	2019 Bruce Head Shore-based Monitoring Program	Executive Summary- Relative Abundance and Distribution And 7.0 SUMMARY OF KEY FINDINGS Relative Abundance and Distribution	It is suggested that the year 2014 is used as a reference. However, according to table 5-2, there were 13 one-way transits recorded in 2014 during the study period. It might be more helpful to compare the number before any project related shipping occurred. In addition, given the variability in narwhal densities between years, it might be helpful to use an average as baseline instead of data from a single year.	
3	2019 Bruce Head Shore-based Monitoring Program	4.4.1.2. Automatic Identification System (AIS) data	BIM has changed the distance of "potential vessel effects" from 15 km to 10 km based on the *2017-2018 Integrated Narwhal Tagging Study - Technical Data Report data report*. However, in the tagging report, there is no test for the 15 km threshold. It might be worth investigating different distance thresholds.	

#	Document Name	Section Reference	Comment	Baffinland Response
4	2019 Bruce Head Shore-based Monitoring Program	4.4.1.8 Data Filtering	It is mentioned that cases with 200 or more narwhal within substratum (3 cases) and cases where group size was <20 narwhal (18 cases) were removed. Do you believe these data points are accurate or are they the result of observer error? If they are real, would it be possible to use a different distribution (data transformation) in your models to accommodate for large data points?	
	2019 Bruce Head Shore-based Monitoring Program	4.4.2.3 Relative Abundance and Distribution	Can you provide more detail about the spatial auto-correlation structure?	
	2019 Bruce Head Shore-based Monitoring Program	5.2.1 Baffinland Vessels and Other Large/Medium-Sized Vessels Table 5-2	50% of the 1-way vessel transits were recorded by observers during the Bruce Head survey period. Would it be possible to increase the percentage of transits observed? It would be beneficial to observe during the entire shipping season to see if there are different impacts at the beginning and end of the season (e.g.: during icebreaking) than only during open-water season.	
	2019 Bruce Head Shore-based Monitoring Program	7.0 SUMMARY OF KEY FINDINGS	As mentioned in the comment below, it would be helpful to include some information about the power analysis here to help interpret non-significant results.	
	2019 Bruce Head Shore-based Monitoring Program	Appendix E. Power Analysis	The power analyses are helpful to put the results in perspective. For example, with the current data, it is very difficult to detect changes in narwhal abundance related to the change in number of vessels from one to more than one. For some analyses, the data was not sufficient to detect any effect. Tables 1 and 2 are great tools to understand and interpret the analysis. We encourage BIM to produce these types of power analysis in the future. In addition, it would be helpful to include Tables 1 and 2 in the main document.	

Baffinland

Name: Marianne Marcoux, Jacquie Bastick

Agency / Organization: DFO and PCA

Date of Comment Submission: June 15th, 2020

#	Document Name	Section Reference	Comment	Baffinland Response
1	2019 Passive Acoustic Monitoring Program	General comments	It would be useful that the results from the different monitoring programs related to marine mammals get interpreted and integrated together. The different monitoring programs were designed to complement each other and their results should feed into each other. In addition, they are all part of the same adaptive management and mitigation plan.	
2	2019 Passive Acoustic Monitoring Program	Executive Summary	It should be clearly noted that heavy ice breaking activities did not take place in 2019 and that it was not possible to compare measured levels of noise emitted by the MSV Botnica breaking ice to the predictions of the models provided in the original assessment.	
3	2019 Passive Acoustic Monitoring Program	2.2.3.3. Narwhal-specific Vocalization Detection	Could you provide a description of what knock trains are in the context of this report?	
4	2019 Passive Acoustic Monitoring Program	2.3. Vessel Sound Level Analysis	It would be useful to provide the ice concentrations that relate to each transit/recording in table 4.	

#	Document Name	Section Reference	Comment	Baffinland Response
5	2019 Passive Acoustic Monitoring Program	4.2. Measurement – Model Comparisons	JASCO stated: "The modelled estimates exceed the measured durations shown in Table 11, indicating that the sound propagation calculations incorporated in the model are quite conservative, despite the under-estimation of the radiated noise levels." Does this statement take into account that the Botnica transited at 8 knot (not 9 knot as modelled)?	
6	2019 Passive Acoustic Monitoring Program	4.5. Recommendations	This is an interesting report. It will be important to continue the Passive Acoustic Monitoring program to capture variation in environmental conditions such as sea ice concentration, especially since recordings made in 2019 did not capture heavy icebreaking conditions.	
7	2019 Passive Acoustic Monitoring Program	4.5. Recommendations	It is not clear if AMAR-R1 and AMAR-B1 will be redeployed in future years. Can you clarify? Are there plans to deploy AMAR in other locations? For example, it would be interesting to compare model predictions to recording levels in Milne Inlet.	
8	2019 Passive Acoustic Monitoring Program	4.5. Recommendations	AMARs were retrieved on September 28-29, 2019. What are the plans to monitor noise levels at the fall shoulder season? Will some of the AMAR be deployed over winter? It is important to monitor noise levels in the fall while narwhals migrate out of the area.	

#	Document Name	Section Reference	Comment	Baffinland Response
9	2019 Passive Acoustic Monitoring Program	4.5. Recommendations	Given that this report indicates that 50% LRR occurs prevalently when the icebreaker was present, the mitigation measures proposed for icebreaking during the shoulder season (as detailed in Assessment of Icebreaking Operations during Shipping Shoulder Seasons on Marine Biophysical Valued Ecosystem Components 1663724-102-R-Rev1-30000) should also apply during the open water season.	

Name: Alexandra Sorckoff/Marianne Marcoux/Jacquie Bastick

Agency / Organization: DFO/PCA

Date of Comment Submission: Thursday, April 30th, 2020

#	Document Name	Section Reference	Comment	Baffinland Response
1	2019 Ship-based Observer Program	2.1	Would it be possible to add detail about the height of the bridge where the observations were performed?	
2	2019 Ship-based Observer Program	2.1	Were the observers able to see the other ships that the MSV Botnica was escorting? Would they be able to make observations in relation to the other ships?	
3	2019 Ship-based Observer Program	2.2.2.1 and 2.2.2.2	Would it be possible to install a camera that would take photographs of the ice in front of the MSV Botnica? It would help to document and describe the ice conditions during ice breaking.	
4	2019 Ship-based Observer Program	2.2.3.1	Observers observed 1,225 seals (unidentified species) in group of up to 560 individuals. They also noted that seals were clustered on large ice pan. This information is interesting because it confirms that seals use the ice for habitat until the ice is completely gone. The ice concentration ranged from 0 to 30% during the observation period.	

#	Document Name	Section Reference	Comment	Baffinland Response
5	2019 Ship-based Observer Program	2.2.3.3	BIM states the closest point of approach (CPA) for sighted marine mammals. When there was enough data, BIM statistically assess if there is a difference in CPA between Leg 1 and Leg 2. We would recommend to refrain from making statistical conclusions on the CPA since these distance were an approximation and might be a biased overestimate.	
6	2019 Ship-based Observer Program	4.0 Summary-Marine Mammals	How do the observations of 2018 and 2019 compare to the original SBO Program in 2013 2014 and 2015? It was mentioned that low number of marine mammals were observed in 2014 and 2015. What about 2013? Were the methods comparable?	
7	2019 Ship-based Observer Program	4.0 Summary-Marine Mammals	It is stated that no ship strikes were recorded. However, could it be clarified that this only applies to the Botnica and that it was not possible to determine if ship strike occurred on the other project related vessels.	
8	2019 Ship-based Observer Program	4.0 Summary-Marine Mammals	It is mentioned that: "*marine mammals in the RSA are likely to demonstrate localized avoidance of Project vessels*". In addition, it is mentioned that: "*that the Project is unlikely to result in significant residual adverse effects on marine mammals in the RSA, defined as effects that compromise the integrity of marine mammal populations in the region either through mortality (i.e., ship strikes) or via large-scale displacement or abandonment of the RSA*". It would be important to point out that these results demonstration some level of disturbance by project vessels on marine mammals and	

#	Document Name	Section Reference	Comment	Baffinland Response
			that more work is required to investigate the long term consequences of the project on the marine mammal populations.	
9	2019 Ship-based Observer Program	Bottom of pdf page 4 and top of pdf page 5.	PC: The report appears to only compare 2019 results to 2018 results and, from that, draws the conclusion that 2019 monitoring results support impact predictions etc. and that the Project is unlikely to result in significant adverse residual effects on marine mammals in the RSA. BIM does note the history of this monitoring program stopping and restarting (e.g.: Section 1.1). For the sake of comprehensive monitoring, BIM should make a comment regarding the ability of limitations in comparing 2019 data to all earlier data collected during any time the SBO program existed and to also try to conduct some kind of analysis using their entire suite of SBO data while acknowledging the limitations due to changes in methodology and an interrupted data set.	
10	Ship-based Observer Program	Last paragraph pdf page 4/150 and on pdf page 74/150 in the second full paragraph	PC: Regarding BIM's conclusions, no significant adverse effects as noted in the comment above. BIM notes that the SBO results "lend confidence to existing EA predictions" - however, there is no discussion about the extent and methodology of how the SBO results are incorporated into overall results so as to "lend confidence". It is worth reiterating some sort of general comment about the need for clarity on BIM's overall monitoring framework, as discussed in the marine monitoring section of CSAS Report #3.	

#	Document Name	Section Reference	Comment	Baffinland Response
11	Feb 25 2020 Meeting Minutes	Table 1. Summary of action items update from February 25, 2020 MEWG Meeting – Item # 2, 12	No update. Will continue to work on completing these action items.	