GOLDER
MEMBER OF WSP

FINAL REPORT

Chapter 1.0 Program Overview

2021 Marine Environmental Effects Monitoring Program (MEEMP) and Non-Indigenous Species/Aquatic Invasive Species (NIS/AIS) Monitoring Program

Submitted to:

Baffinland Iron Mines Corporation

2275 Upper Middle Road East, Suite 300
Oakville, ON L6H 0C3

Submitted by:

Golder Associates Ltd.
Suite 200 - 2920 Virtual Way, Vancouver, British Columbia, V5M 0C4, Canada

+1 604 296 4200

1663724-349a-R-Rev0

21 October 2022

Distribution List

1 Electronic Copy - Baffinland Iron Mines Corporation

1 Electronic Copy - Golder Associates Ltd.

Executive Summary

MARINE WATER QUALITY (CHAPTER 2.0)

The marine water quality component of the MEEMP ensures that site discharges are in compliance with requirements outlined in the Type A Water License and satisfies PC Conditions No. 76, 87, 89 and 99(a). Water quality samples are collected at four sampling stations in Milne Inlet downstream from the primary discharge point (MP-05), as well as four sampling stations downstream from a second discharge point (MP-06) at Milne Port. These receiving environment stations were distributed in a radial design up to 250 m from each discharge point to monitor for potential changes in water quality due to site drainage and operational discharges, including iron ore stockpile run-off.

In 2021, reported analytical results for water quality parameters (i.e., major ions, nutrients, metals, hydrocarbons, and polycyclic aromatic hydrocarbons [PAHs]) were generally within ranges observed during previous MEEMP sampling programs (2015 to 2020), with no exceedances of CCME WQGs. Consistent with previous programs, hydrocarbons and PAHs were not detected in the 2021 water samples. In fact, a substantial proportion of parameters analyzed in the water samples from Milne Inlet were not detected at all in downstream sampling stations.

Collectively, measured concentrations of parameters of potential concern (e.g., metals, nutrients, hydrocarbons) were either not detected or were present at low concentrations, such that adverse impacts to the biota in the Milne Inlet receiving environment are unlikely to occur. Increased iron deposition in the marine environment as a result of Project activities is a primary interest for local Inuit. Given that CCME marine WQGs for iron have not been developed, iron levels measured in water during 2021 were compared to measurements made during previous MEEMP programs (2015 to 2020) to evaluate whether increases in production at Milne Port have led to associated increases in iron concentrations. Analysis shows that iron concentrations have not increased over time, despite production increases, and concentrations measured in 2021 water samples remain well within the range of what has been detected previously.

Overall, results indicate that, to date, water discharged from the Milne Port operational site into the marine receiving environment meets discharge requirements of the Water License and that parameters of potential concern remain well below thresholds associated with potential harm of marine biota. Moving forward, continued compliance monitoring for water quality is recommended.

MARINE SEDIMENT QUALITY (CHAPTER 3.0)

Sediment sampling in Milne Inlet is conducted to satisfy PC Conditions No. 83(a) and 99(a). After three consecutive years of implementation, the joint radial benthic and sediment sampling program was not conducted in 2021 commensurate with the lack of directional trends observed to date in sediment quality indicators. Baffinland is committed to continued implementation of the full sampling program with an adjusted monitoring frequency of every three years, which is consistent with routine environmental effects monitoring (EEM) programs for other mining projects in Canada.

In 2021, sediment sampling effort focussed on station SW-2, a station west of the existing Ore Dock for which anomalous patterns in sediment and benthic infaunal indicators were observed in 2020, specifically increased sand content, decreased percent fines content and decreased species richness and species density values

compared to other sampling stations along the West transect. The Marine Environmental Working Group (MEWG) requested that Baffinland revisit this site in 2021 and investigate whether changes at this station could be Project-related. This chapter therefore presents the results of targeted sampling completed in 2021 in comparison to historical data collected at station SW-2.

In general, measured sediment quality parameters at SW-2 in 2021 were consistent with previous years' results with no exceedances of CCME sediment quality guidelines observed. However, sediment grain size results at SW-2 indicate that the substrate in this area was subject to some level of physical disturbance during the 2020 shipping season. Propellor wash generated by tug-assisted ore carrier movements on the west side of the Ore Dock during the 2020 shipping season is considered the most likely cause for this disturbance (i.e., scour effects) given SW2's proximity to the Ore Dock. The observed change in sediment grain size distribution is likely attributed to small-scale shifts in the position of bedforms formed under the propellor-generated currents, which act to mobilize finer sediments resulting in coarsening of substrates. This area of disturbance due to propellor wash is within the limits predicted in the original FEIS.

Overall, monitoring results remain within original FEIS predictions, which forecasted the potential for minor and localized sediment disturbance associated with propellor wash, which is expected to stabilize over time. We recommend continued targeted sampling in 2022 to further evaluate sediment grain size variability in this area and potential changes in local sediment distribution due to ongoing shipping and berthing activities at Milne Port.

BENTHIC INFAUNA (CHAPTER 4.0)

Benthic infaunal sampling in Milne Inlet is conducted to satisfy PC Condition 99(a) and 99(c). After three consecutive years of implementation, the joint radial benthic and sediment sampling program was not conducted in 2021 commensurate with the lack of directional trends observed to date in benthic infaunal community indicators. Baffinland is committed to continued implementation of the full sampling program with an adjusted monitoring frequency of every three years, which is more consistent with routine biological sampling for other mining effects monitoring programs (e.g., the federal Environmental Effects Monitoring Program [EEM]).

In 2022, benthic infaunal sampling effort focussed on station SW-2, a station west of the existing Ore Dock for which anomalous patterns in sediment and benthic infaunal indicators were observed in 2020, specifically increased sand content, decreased percent fines content and decreased diversity, taxonomic richness, and density values compared to other sampling stations along the West transect. The MEWG requested that Baffinland revisit this site in 2021 to investigate whether changes at this station could be Project-related.

Benthic infaunal sampling results in in 2021 indicated an increase in animal density, species richness, and species diversity relative to values observed in 2020. Specifically, this included an order of magnitude increase in animal density and species richness, while species diversity returned to similar levels recorded at SW-2 in 2019. While natural variability may have partially contributed to the changes documented at SW-2 in 2020 (benthic infaunal communities can demonstrate pronounced changes in population metrics at restricted spatial scales), an external stressor was likely responsible for this change given similar changes were not observed at any of the other 59 stations sampled in 2020. Given the site's proximity to the Ore Dock, it is considered likely that tug-assisted berthing activities in 2020 resulted in localized propellor wash effects (lateral mobilization of finer grained sediments) resulting in a coarsening and/or scouring of the existing substrate at SW-2, and possibly, a shift in the position of bedforms at this station. This, in turn, resulted in alterations to the local benthic community, given the

close relationship between sediment grain size and the distribution and abundance of infauna (with higher abundance and diversity typically associated with smaller, finer grain sizes). However, benthic communities are known to be naturally dynamic and able to rapidly recover from non-chronic disturbance effects, as evidenced by the increases in benthic community indicators observed in 2021 commensurate with changes implemented by Baffinland in 2021 with respect to tug-assisted berthing operations on the west side of the Ore Dock.

Overall, marine sediment and benthic infaunal analytical results indicate that the seabed area surrounding station SW-2 shows evidence of physical disturbance that is assumed to be the result of propellor wash generated during tug-assisted ore carrier movements on the west side of the Ore Dock during the 2020 shipping season. Targeted sampling undertaken in 2021 indicates that the benthic infaunal community in this area is showing signs of recovery given observed increases in animal density, species richness, and species diversity. The observed results are consistent with FEIS predictions, which predicted localized resuspension of fine-grained sediments from propellor-generated currents and associated alteration to benthic community composition. We recommend continued targeted sampling in 2022 to further monitor for potential Project effects on the local benthic community at Milne Port.

SUBSTRATE, MACROFLORA AND BENTHIC EPIFAUNA (CHAPTER 5.0)

Sampling of substrate, macroflora, and benthic epifauna fulfills PC Condition No. 99(a), (c) and is relevant to PC Conditions 76, 83(a), 84 and 87. To evaluate potential project-related effects on substrate, macroflora, and benthic epifauna, standardized underwater visual census methods were employed by SCUBA-based scientific divers to survey marine vegetation, invertebrate, and fish species and to record habitat type within a series of survey quadrats permanently installed on the seafloor in both an exposure area and a reference area. Quadrats were analyzed to record percent cover (%) of substrate type, benthic macroflora, and sessile benthic epifauna, density (counts) for motile epifauna, as well as taxonomic identification to the lowest practical taxonomic level. Specimens were opportunistically collected and sent to an accredited taxonomy laboratory (Biologica Environmental Services Ltd.) for taxonomic identification. Taxa richness and diversity (Simpson's Diversity Index) were calculated for macroflora and epifauna.

Quadrat sampling results in 2021 indicated a primarily soft substrate environment, composed primarily of silt and sand. Similar macroflora and epifaunal taxa were observed in 2021 as in previous years (2018-2020). Community indicators (i.e., percent cover, density, species richness, and diversity) were shown to be variable within and among quadrats and between the reference and exposure areas; with no statistically significant differences observed between the exposure and reference areas for any of the indicators. Overall, survey results suggest that macrofloral and epibenthic community assemblages are comparable between the Project exposure and reference areas with no obvious evidence of Project-related influence or impairment.

Power analysis results in combination with a taxa accumulation curve generated for this dataset indicate that the current sampling design is insufficient to reliably detect a Project-induced change in community structure or fully characterize the epibenthic community with the existing dataset. As such, the current results should be interpreted with caution. The predicted sampling effort that would be required to achieve reasonable detection power (as determined by the power analysis) for this program was determined to be unattainable within the limited open-water sampling window (August/September). Therefore, three options for moving forward were presented to the MEWG in the draft 2021 MEEMP Report: (i) remove this study component entirely from the 2022 MEEMP design and focus on other components that offer adequate statistical detection power (e.g., benthic infauna, sediment quality); (ii) retain quadrat sampling using the same sampling effort while accepting the associated statistical

limitations (i.e., ability to detect large-scale trends only); or, (iii) adding several additional quadrats in each of the reference and exposure areas in order to moderately increase detection power for the majority of the selected indicators. Through subsequent engagement with the MEWG in June 2022, Baffinland has agreed to proceeding with Option #3, which will see three additional quadrats installed in both the study and reference area in 2022, resulting in a total of 13 survey quadrats per area.

Overall, the 2021 survey results indicate that Project activities to date have not resulted in adverse effects on macrofloral and epifaunal communities in Milne Port, however, results of the power analysis suggest that detection power is low for this study component.

MARINE FISH COMMUNITY AND CATCH DATA (CHAPTER 6.0)

To satisfy PC Condition No. 99(b)(ii), (c), 113, and 114, sampling was conducted to assess the relative abundance of Arctic Char (*Salvelinus alpinus*) and other fish species in the Milne Port area. Multiple sampling methodologies were employed to target different species and habitat types, including gill net, angling (jigging and trolling), Fukui trap, hoop net, otter trawl and longline sampling. Collected fish were identified to the lowest practicable taxonomic level (typically to species-level) before being released. Fish not identified to species-level in the field were retained for subsequent identification by an accredited taxonomic and/or genetic laboratory.

Fish captures in 2021 (n = 603 fish) and 2020 (n = 852 fish) were higher compared to 2014-2019, likely due to increased sampling effort in 2020 and 2021. Community composition was similar to previous sampling years, with the local fish community during summer consisting primarily of Arctic Char, Fourhorn Sculpin (*Myoxocephalus quadricornis)* and Shorthorn Sculpin (*Myoxocephalus scorpius)*. In previous survey years, these three species comprised approximately 90% of the total catch, whereas in 2020 and 2021, the three species comprised approximately 74% of the total catch, with Arctic Sculpin, Greenland Cod, and Ribbed Sculpin combining to represent approximately 23% of the total catch.

Eight other fish species were recorded in the Project area in 2021, including Greenland Cod (*Gadus ogac*), Arctic Sculpin (*Myoxocephalus scorpioides*), Ribbed Sculpin (*Triglops pingelii*), Shorthorn Sculpin (*Myoxocephalus Scorpius)*, Arctic Staghorn Sculpin (*Gymnocanthus tricuspis*), Arctic Alligatorfish (*Aspidophoroides olrikii*), Atlantic Poacher (*Leptagonus decagonus*) and Saddled Eelpout (*Lycodes mucosus*). Captures of Ribbed Sculpin, Atlantic Poacher, and Arctic Alligatorfish represent the first recorded occurrences of these species in the 2014-2021 MEEMP, likely due to the increased sampling effort and additional sampling methods integrated into the program in 2021.

Of the six fish sampling methods used in 2021, angling contributed the most to overall catch, capturing five taxa and accounting for 43% of the total catch, followed by gill net sampling which captured five taxa and accounted for 40% of the total catch. The remaining 17% of the total catch were collected via trawling (12% of catch, nine species detected), Fukui traps (3% of catch, two species detected) and hoop net sampling (2% of catch, one species detected). Hoop nets were added to the MEEMP study design in 2021 (following a trial in 2019) based on recommendations from the MEWG for a replacement sampling method for Fukui traps, which have historically yielded low catch rates. Longline sampling was added in 2021 as Commitment No. 37 to the MEWG (Appendix 1A in Golder 2021) in order to target large-bodied demersal fish; however, catch efforts were unsuccessful (zero catch rates).

Two distinct Fishing Areas (FAs) were delineated in Milne Port based on habitat features and their location relative to existing port infrastructure and operational activities. This included a Direct Project Footprint (DPF) area and an Indirect Project Footprint (IPF) area. The FAs are intended to help standardize sampling efforts and address variability in the catch data across Milne Port. Using 2020 and 2021 datasets, Catch per Unit Effort

(CPUE) was compared across FAs and across years using an Analysis of Variance (ANOVA). While no statistically significant differences in fish abundance were noted between the FAs, fish abundance was generally highest within the DPF FA. Angling CPUE was significantly different between years; however, the analysis was constrained by a small sample size, and some inconsistencies in sampling effort between years with respect to gear type and sampling locations.

Overall, fishing methods were deemed effective in characterizing the marine fish community in terms of species presence and relative abundance. Fish sampling in 2020 and 2021 yielded similar numbers and proportional representation of the dominant fish species in Milne Port (Arctic Char, Fourhorn Sculpin and Shorthorn Sculpin) relative to previous years. The delineation of FAs and the standardization of fishing methods in 2021 will allow for future assessments of interannual change in relative fish abundance and distribution at Milne Port.

FISH HEALTH AND TISSUE CHEMISTRY (CHAPTER 7.0)

Fish health and tissue chemistry data are relevant to Relevant to PC Conditions No. 76, 83 (a), 87, 99 (a), 99 (b) (ii), 99 (c), 113, and 114. Fish health data were collected for Fourhorn Sculpin (*Myoxocephalus quadricornis*) and *Hiatella arctica* (*H. arctica*, wrinkled rock-borer) in 2021 using methods aligned with monitoring requirements under the Metal and Diamond Mine Effluent Regulations (MDMER; Government of Canada 2002).

Based on internal and external examinations, Fourhorn Sculpin from the Milne Port area in 2021 appear to be healthy. Sample timing was appropriate for evaluating reproduction in Fourhorn Sculpin and *H. arctica*, meaning adequate gonad development had occurred to assess gonad endpoints (e.g., gonadosomatic index [GSI]). *H. arctica* collected in 2021 also appear to be healthy. Gonad endpoints exhibited relatively low variability for both species. Health data from 2021 were compared against 2020; while significant differences were found for condition, the magnitude of difference was relatively small (<10%). The gonad weights for *H. arctica* could not be compared with previous years as gonad tissues had not previously been collected.

Fish tissue chemistry results for Arctic Char sampled in 2021 were similar to historical data collected for the Milne Port area since 2010. Results for Fourhorn Sculpin and *H. arctica* were also similar to data collected in recent years for most metals. Statistically significant increases were observed since 2018 for some contaminants of potential concern in Arctic Char and *H. arctica* (e.g., aluminum and magnesium); however, differences were small (<100%) and often inconsistent, likely indicating natural variability in both the bioavailability and subsequent uptake of metals, reflected in the tissue concentrations.

All tissue samples for Arctic Char, Fourhorn Sculpin and *H. arctica* collected from 2018 to 2021 were below Health Canada's Maximum Levels for Chemical Contaminants in Foods mercury consumption guideline (Health Canada 2015) and below the British Columbia Ministry of Environment fish tissue guidelines for selenium (BC MOE 2014). Impact predictions in the original FEIS (Baffinland 2012) forecasted the potential for low magnitude changes in some ecological parameters, such as water quality and Arctic Char tissue chemistry, but characterized these changes as not significant.

Overall, monitoring data from 2021 align with FEIS predictions, as any observed changes have generally been minor – either within established guidelines or consistent with baseline conditions. At present, monitoring indicates that mitigation measures are functioning as intended and that Project activities are being managed in a way that has not resulted in adverse effects on the marine ecosystem. To date, construction and operational activities at Milne Port do not appear to have negatively affected fish health

or tissue chemistry in the Milne Port area. Moving forward, continued monitoring is recommended to maintain continuity in established time series data for Arctic Char and to provide a benchmark for Fourhorn Sculpin and *H. arctica* health and tissue chemistry on which to base future comparisons.

NIS/AIS MONITORING (CHAPTER 8.0)

Comprehensive sampling has been conducted in the Milne Inlet marine environment to monitor for the presence of non-indigenous species (NIS) and aquatic invasive species (AIS), fulfilling PC Conditions No. 87, 89, and 91. The program includes both targeted (e.g., benthic grabs, settlement plates) and general (e.g., screening all species identified through MEEMP components, such as fish and macroflora surveys) sampling efforts. All species are compared to a taxonomic inventory for Milne Inlet, which has been developed over time (starting with pre-Project baseline) and is updated annually. Literature reviews are performed on any taxa that are not part of the inventory to determine if their range on record includes north Atlantic, Arctic and/or Canadian Arctic waters; in addition, these taxa are cross-referenced against both global and domestic databases of known invasive taxa (e.g., Molnar et al. 2008) or “Trigger List”. The Watchlist is comprised of taxa considered to be low-risk (i.e., not listed on AIS databases but accepted range on record does not include Canadian Arctic) or high-risk (i.e., listed on AIS databases and accepted range on record does not include Canadian Arctic). Species placed on the Watchlist include low to high-risk species that have a confirmed presence in the Project area that is not directly attributable to the Project, in addition to those species that require more supportive data. The Trigger List is comprised of high-risk taxa that are considered potentially introduced via Project shipping activities.

A total of 432 taxa were identified in 2021 surveys, of which 54 were new additions to the taxonomic inventory for Milne Inlet (i.e., had not been observed in previous surveys). Of the new taxa, all but one (*Tricellaria* sp.) had records of occurrence in the Canadian Arctic with no record in the AIS databases. Several species of *Tricellaria* are found in the Canadian Arctic, however, one species (*T. inopinata*) is listed on the National Risk Assessment as a potential invader to Canadian waters, including the Arctic region. The specimen of *Tricellaria* sp. was sent to the Benthic Ecology Lab at Université Laval (Laval) for independent verification as a precaution. Due to similarities between *Tricellaria* and the genus *Scrupocellaria,* Laval recommended the identification be brought to family level (Candidae indet.). Based on the presence of multiple Candidae species in the eastern Canadian arctic (including previous observations in Milne Port during baseline sampling) and poor range descriptions for bryozoans in general, it is considered highly probable the Candidae indet. specimen is a Canadian Arctic species rather than a new species introduction to the Project area. Therefore, Candidae indet. is designated No Risk and is not considered to be of concern for Milne Inlet.

Additionally, AIS/NIS sampling in 2021 recorded five taxa that were flagged in previous years due to uncertainties in their natural range or because they were listed in an existing AIS database. This included *Pseudofabricia aberrans*, *Marenzelleria* sp., *Ampharete petersenae, Paramphitrite birulai* and *Crassicorophium* sp. These specimens were sent to taxonomic experts for independent verification and/or molecular analysis. Results are summarized below.

Molecular (DNA) results confirmed the 2021 *Marenzelleria* sp. specimens as *Marenzelleria wireni* – an Arctic Basin species. This taxon has a probable range that includes the Project area and was designated “No Risk”. That said, as a precaution, *Marenzelleria* specimens (aside from *M. arctia* and *M. wireni*) will continue to be subject to heightened monitoring, including genetic analysis, until there is more certainty that *M. viridis* is not present at Milne Port.

Molecular results for *Crassicorophium* sp. were largely inconclusive, with no match to the taxa of concern. The closest molecular match was to an unidentified amphipod specimen (presumed to be *Crassicorophium clarencense*) collected near Victoria Island in Nunavut, indicating that these are likely representative of an indigenous taxon, supported by the identification of similar specimens during the Program baseline. Independent morphological assessments agreed with the identification of *C. clarencense*.

Inconclusive results were also received for the *Pseudofabricia* sp. nr. *aberrans.* The specimens were confirmed to not match *Fabricia stellaris* (a previously suggested alternative identification for the specimens), but also did not match existing records for any other species. Taxonomic experts suggested it is probable that these specimens are from a currently undescribed species that is indigenous to the Project area. The status of *P.* sp. nr. *aberrans* has been revised to “No Risk” and has been removed from the Program Watchlist.

Following a literature review of collection information, *A. petersenae* has been reclassified as “No Risk” and has been removed from the Project Watchlist. The majority of identified taxa in benthic infauna samples collected in Milne Inlet were not considered NIS or AIS.

The Baffinland NIS/AIS program represents the most comprehensive monitoring program for NIS/AIS conducted by a marine port in Canada. Approximately 870 taxa have been identified in Milne Inlet through monitoring to date, and include macroflora, zooplankton, benthic invertebrates and fish. The identification and flagging of individual taxa out of the hundreds identified in Milne Inlet indicate this surveillance program is effective and functioning as intended. The vast majority of these taxa have been designated as “No Risk” and are not considered to be of concern.

TIDE GAUGE (CHAPTER 9.0)

The tide gauge program at Milne Port demonstrated a distinct seasonal pattern for near-surface water in Milne Inlet. The processes observed have occurred in every year since tide gauge monitoring began in 2017 and can be delineated into the following two general time periods.

From early July through early September 2021, temperature fluctuated between approximately 0 and 8 degrees C and salinity fluctuated between approximately 4 and 32 PSU. This range is most likely the result of freshwater runoff from Phillips Creek during the spring freshet and the melting of sea ice in Milne Inlet near Milne Port. These processes cause the surface layer to be warmer and less saline than the water column beneath the pycnocline.

The second time period extends from early September to the tide gauge’s retrieval on 31 October 2021. Overall, temperature was generally lower and salinity was generally higher in the second time period than in the first time period. In the second time period, temperature ranged from -1 to 3 degrees C, with a mean of 1 degree C; and salinity ranged from 20 to 32 PSU, with a mean of 29 PSU. This likely occurs in response to decreasing air temperature in Milne Port and autumn storms with high winds which cause the surface layer of the water column to become well mixed with the layers below. This results in generally colder and more saline surface waters, as observed in the temperature and salinity measurements from early September to the end of the deployment.

The water level data shows that tides in Milne Port follow a mixed semidiurnal tidal cycle. 8 neap tides and 8 spring tides occurred during the tide gauge deployment. The mean water level observed was -0.04 m CGVD. The maximum water level observed was 1.16 m CGVD and the minimum water level observed was -1.14 m CGVD. This 2021 tide gauge results are consistent with tide data from the previous four years of monitoring (2017-2020)

MEWG COMMENTS OF DRAFT REPORT

Comments on the draft 2021 MEEMP and NIS/AIS Monitoring Program Report were received from the Marine Environmental Working Group (MEWG) in June of 2022. Baffinland's responses to MEWG comments and recommendations on the draft report are included as Appendix A.

ᓯᕗᓕᖅᑎᒍᑦ ᓇᐃᓈᖅᓯᒪᔪᖅ

ᑕᓇᐅᑉ ᐃᒪᖓᑕ ᖃᓄᐃᓐᓂᖓ (ᐅᖃᓕᒫᒐᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖏᑦ 2.0)

ᑕᓇᐅᑉ ᐃᒪᖓᑕ ᖃᓄᐃᓐᓂᖓᓄᑦ ᐃᓗᓕᕆᔭᐅᔪᑦ ᑕᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᐃᓐᓇᕐᓂᕐᒧᑦ ᐸᕐᓇᐊᖅ (MEEMP) ᓇᓗᓇᐃᖅᓯᖕᒪᑦ ᐃᓂᐅᔪᒥᑦ ᑯᕕᔭᐅᔪᑦ ᒪᓕᒃᑲᓗᐊᕐᒪᖔᑦ ᐱᔭᕇᐊᖃᖅᑐᓂᑦ ᓇᓗᓇᐃᖅᓯᒪᔪᖅ ᖃᓄᐃᑦᑑᓂᖓ A ᐃᒪᕐᒧᑦ ᓚᐃᓴᓐᓯᒥᑦ ᐊᒻᒪᓗ ᓈᒻᒪᒋᔭᐅᓗᓂ ᐅᔭᕋᓐᓂᐊᕈᓐᓇᐅᑎᒧᑦ ᒪᓕᒃᑕᐅᔭᕇᐊᓖᑦ ᓈᓴᐅᑎᖏᑦ 76, 87, 89 ᐊᒻᒪᓗ 99(ᐃ). ᐃᒪᐅᑉ ᖃᓄᐃᓐᓂᖓᓄᑦ ᖃᐅᔨᓴᒃᓴᓕᐊᖑᔪᑦ ᑲᑎᑕᐅᖃᑦᑕᖅᑐᑦ ᑎᓴᒪᓂ ᖃᐅᔨᓴᒃᓴᓕᐅᕐᕕᖕᓂ ᕿᓚᒧᐊᓂ ᑰᕕᐅᔪᒥ ᑯᕕᓯᕝᕕᓗᐊᑕᕐᒥ (MP-05), ᐊᒻᒪᓗ ᑎᓴᒪᓂ ᖃᐅᔨᓴᒃᓴᓕᐅᕐᕕᖕᓂ ᑰᒃᑐᓂ ᐱᖃᑖᓂᑦ ᑯᕕᕝᕕᐅᖃᑦᑕᖅᑐᒥ (MP-06) ᑕᐃᑲᓂ ᕿᓚᒧᐊᓂ ᑐᓇᒃᑕᕐᕕᖕᒥᑦ. ᑖᒃᑯᐊ ᐊᕙᑎᓕᓴᕝᕚᑦ ᐋᖅᑭᒃᓱᖅᑕᐅᓯᒪᔪᑦ ᖃᓂᒋᔮᖓᓂ 250 ᒦᑕᓂᒃ ᐅᖓᓯᒃᑎᒋᔪᒥᒃ ᐊᑐᓂ ᑯᕕᓯᕝᕕᐅᕙᒃᓂᑦ ᖃᐅᔨᓴᖅᐸᓕᐊᖏᓐᓇᕐᑯᓗᒋᑦ ᐊᓯᔾᔨᑐᐃᓐᓇᓇᐊᓕᖕᓂᒃ ᐃᒪᐅᑉ ᖃᓄᐃᓐᓂᖓᓄᑦ ᐅᔭᕋᓐᓂᐊᕐᕕᐅᑉ ᑯᕕᓯᕝᕕᕆᕙᒃᑕᖓᓂ ᐊᒻᒪ ᐊᐅᓚᓂᖓᓄᑦ ᑯᕕᑎᑕᐅᔪᓂᑦ, ᐱᖃᓯᐅᑎᓪᓗᒋᑦ ᓴᕕᒃᓴᐃᑦ ᑲᑎᖅᓱᖅᑕᐅᔪᓂᖔᖅᑐᑦ ᑰᒃᑐᑦ.

2021–ᒥ, ᐅᓂᒃᑳᓯᐅᔪᑦ ᖃᐅᔨᓵᕆᑕᐅᓚᐅᖅᑐᑦ ᐃᒪᐅᑉ ᖃᓄᐃᓐᓂᖓᓄᑦ ᑭᒡᓕᒋᔭᐅᔪᓄᑦ (ᓱᕐᓗ, ᐱᕐᔪᐊᑦ ᑭᓲᓂᓕᓚᑯᓗᐃᑦ, ᐱᕈᖅᑐᑦ, ᓴᕕᕋᔭᑦ, ᐅᖅᓱᐊᓗᒃᓴᑦ, ᐊᒻᒪ ᐃᓚᐅᕈᑎᒃᓴᕐᓂᒃ (ᐅᕕᓂᖕᒧᑦ ᐋᓇᖅᑐᓖᑦ ᐅᖅᓱᐊᓗᒃᓴᐃᑦ [PAHs]) ᐊᔾᔨᒌᖕᒋᕈᓘᔭᖅᑐᓂᒃ ᖃᐅᔨᔭᐅᒃᑕᓚᐅᖅᑐᑦ ᑭᖑᓂᖔᑦᑎᓐᓂ ᑕᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᐃᓐᓇᕐᓂᕐᒧᑦ ᐸᕐᓇᐊᕐᒥ (MEEMP) ᖃᐅᔨᓴᒃᓴᓕᐅᖅᑎᓗᒋᑦ ᐃᓕᓇᓂᕐᓂ (2015-ᒥ 2020-ᒧᑦ), ᖄᖏᐅᑎᓯᒪᙱᕐᓗᑎᒃ ᑲᓇᑕᒥ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᖃᓄᐃᓐᓂᖓᓄᑦ ᖃᐅᔨᒪᔾᔪᑏᑦ (CCME) ᐃᒥᕐᒧᑦ ᖃᐅᔨᒪᔾᔪᑏᑦ (WGs). ᐊᒻᒥᓲᖅ, ᐊᖏᔪᒃᑲᓪᓚᖕᒥᑦ ᑭᒡᓕᐅᔪᓂᑦ ᖃᐅᔨᓴᖅᑕᐅᓚᐅᖅᑐᑦ ᐃᒪᖕᒥᑦ ᖃᐅᔨᓴᒃᓴᓂ ᕿᓚᒧᐊᓂ ᖃᐅᔨᔭᐅᓚᐅᙱᑦᑎᐊᖅᑐᑦ ᑰᒻᑯᐅᔪᓂ ᖃᐅᔨᓴᕐᕕᖕᓂᑦ.

ᑲᑎᕝᕙᒋᑦ, ᐆᒃᑐᕋᖅᑕᐅᔪᑦ ᑲᑎᓯᒪᔪᑦ ᑭᒡᓕᐅᔪᓂᑦ ᐃᓱᒫᓘᑕᐅᑐᐃᓐᓇᓇᐊᓖᑦ (ᓱᕐᓗ ᓴᕕᕋᔭᐃᑦ, ᐆᒪᑦᑎᐊᕆᖕᓇᖅᑐᑦ, ᐅᖅᓱᐊᓗᒃᓴᑦ) ᖃᐅᔨᔭᐅᓚᐅᙱᑦᑐᓗᓐᓃᑦ ᐱᑕᖃᓚᐅᙱᑦᑐᓗᓐᓃᑦ ᐅᕝᕙᓘᓐᓃᑦ ᐊᒃᐸᓯᒃᑐᒥ ᐱᑕᖃᓚᐅᖅᑐᑦ ᑲᑎᑎᓯᒪᔪᓂᑦ, ᑕᒪᒃᑯᐊ ᐊᒃᑐᐃᓂᕐᓗᓐᓃᑦ ᐆᒪᔪᑦ ᓇᔪᒐᖏᓐᓂᑦ ᕿᓚᒧᐊᓂᑦ ᓴᖅᑭᕝᕕᐅᕙᒃᑐᑦ ᐊᕙᑎᖏᓐᓂᑦ ᑕᐃᒪᐃᔾᔭᙱᑦᑐᒃᓴᐅᔪᑦ. ᐱᑕᖃᕐᓂᖅᓴᐅᓂᖏᑦ ᓴᕕᒃᓴᑦ ᐃᒪᐅᑉ ᐊᕙᑎᖓᓂ ᐱᔾᔪᑕᐅᓗᓂ ᐸᓕᓇᐊᖑᔪᖅ ᐃᓱᒪᒋᔭᐅᓗᐊᑕᖅᐳᖅ ᓄᓇᖃᖅᑐᓂᑦ ᐃᓄᖕᓂᑦ. ᑖᒃᑯᐊ ᑲᓇᑕᒥ ᐊᕙᑎᓕᓇᓂᕐᒧᑦ ᖃᓄᐃᓐᓂᖓᓄᑦ ᖃᐅᔨᒪᔾᔪᑏᑦ (CCME) ᐃᒪᕐᒥᐅᑕᐃᑦ ᐃᒪᐅᑉ ᖃᓄᐃᓐᓂᖓᓄᑦ ᖃᐅᔨᒪᔾᔪᑏᑦ (WGs) ᓴᕕᒃᓴᒧᑦ ᐋᖅᑭᒃᑕᐅᓚᐅᙱᑦᑐᑦ, ᓴᕕᒃᓴᑦ ᐆᒃᑐᕋᖅᑕᐅᓚᐅᖅᑐᑦ ᐃᒫᓂᑦ 2021–ᒥᑦ ᖃᓄᐃᓐᓂᖅᓴᐅᖕᒪᖔᑕ ᖃᐅᔨᓴᖅᑕᐅᓚᐅᖅᑐᑦ ᑭᖑᓂᖔᑦᑎᓐᓂ ᑕᓇᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᐃᓐᓇᕐᓂᕐᒧᑦ ᐸᕐᓇᐊᕐᒥ (MEEMP) (2015–ᒥᑦ 2020–ᒧᑦ) ᖃᐅᔨᓴᕋᓱᒃᓗᑎᒃ ᐅᔭᕋᓐᓂᐊᓇᐊᓪᓚᖓᓂᖅ ᕿᓚᒧᐊᓂ ᑐᓚᒃᑕᕐᕕᖕᒥᑦ ᐃᓚᒋᐊᕈᑕᐅᓯᒪᖕᒪᖔᑦ ᓴᕕᒃᓴᓂᑦ ᑲᑎᓯᒪᔪᓄᑦ. ᖃᐅᔨᓴᖅᑕᐅᔪᑦ ᑕᑯᒃᓴᐅᑎᑦᑎᕗᑦ ᓴᕕᒃᓴᒧᑦ ᑲᑎᓯᒪᔪᑦ ᐅᓄᖅᓯᕚᓕᖅᓯᒪᙱᓐᓂᖏᓐᓂᒃ ᖃᑯᙳᖅᐸᓕᐊᑎᓗᒍ, ᐅᔭᕋᓐᓂᐊᓇᐊᓚᒃᑲᓗᐊᖅᑎᓗᒋᑦ, ᐊᒻᒪ ᑲᑎᑎᓯᒪᔪᑦ ᖃᐅᔨᓴᖅᑕᐅᓚᐅᖅᑐᑦ 2021–ᒥ ᐃᒫᓂᒃ ᖃᐅᔨᓴᒃᓴᓕᐊᑦ ᓱᓕ ᓈᒻᒪᒃᑑᕗᑦ ᖃᐅᔨᔭᐅᓛᓚᐅᖅᑐᓂᒃ ᑭᖑᓂᖔᑦᑎᓐᓂ.

ᑕᒪᐃᑎᒎᑦ, ᖃᐅᔨᔭᐅᔪᑦ ᓇᓗᓇᐃᖅᓯᔪᑦ ᑕᐃᒪᒃᑯᐊ, ᐅᐸᓗᒥᒧᑦ ᑎᑭᕝᕙᒎ, ᐃᒪᖅ ᑯᕚᔪᖅ ᕿᓚᒧᐊᓂ ᑐᓇᒃᑕᕐᕕᖕᒥᑦ ᐊᐅᓚᓂᖏᓐᓂᑦ ᐅᔭᕋᓐᓂᐊᕐᕕᐅᔪᒥᑦ ᑕᓇᐅᕐᒧᑦ ᑎᑭᐅᑎᔪᖅ ᑯᕕᓂᕐᒧᑦ ᐱᔭᓇᐊᖅᑲᕐᓂᐅᔪᓂᒃ ᐃᒪᕐᒧᑦ ᓚᐃᓴᓐᓯᒥᑦ ᐊᒻᒪᓗ ᑭᒡᓕᐅᔪᑦ ᐃᓱᒫᓘᑕᐅᑐᐃᓐᓇᓇᐊᓕᖕᓄᑦ ᑐᖓᐅᑎᓯᒪᓕᕐᓗᑎᒃ ᖃᓄᐃᓕᔪᖃᖅᖄᖅᑎᓇᒍ ᑭᒡᓕᐅᔪᓂᒃ ᓱᕋᐃᑐᐃᓐᓇᓇᐊᖃᕐᓂᕐᒧᑦ ᐃᒫᓂᑦ ᐆᒪᓂᖃᖅᑐᓂᒃ. ᓯᕗᒻᒧᐊᒃᑎᓗᑕ, ᒪᓕᑦᑎᐊᖏᓐᓇᕐᓂᕐᒧᑦ ᖃᐅᔨᓴᖅᐸᓕᐊᖏᓐᓇᕐᓂᖅ ᐃᒪᐅᑉ ᖃᓄᐃᓐᓂᖓᓂᒃ ᐊᑐᓕᖅᑎᑕᐅᕐᑯᔭᐅᔪᖅ.

ᐃᒪᐅᑉ ᐃᓱᕐᓂᖓᑕ ᖃᓄᐃᓐᓂᖓ (ᐅᖃᓕᒫᒐᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖏᑦ 3.0)

ᐃᓱᕐᓂᕐᒥᒃ ᖃᐅᔨᓴᒃᓴᓕᐅᕐᓂᖅ ᕿᓚᒧᐊᓂᑦ ᐱᓕᕆᐊᖑᓚᐅᖅᑐᖅ ᓈᒻᒪᒃᓯᕐᑯᓗᒍ ᐅᔭᕋᓐᓂᐊᕈᓐᓇᐅᑎᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᒃ ᓈᓴᐅᑎᖓ 83(ᐃ) ᐊᒻᒪ 99(ᐃ). ᐊᕐᕌᒍᑦ ᐱᖓᓱᑦ ᑭᖑᓕᕇᑦ ᐊᑐᓕᖅᑎᑕᐅᓚᐅᖅᑎᓗᒍ, ᑲᑐᔾᔭᐅᓗᓂ ᖃᓂᒌᔭᓂ ᐃᖅᑲᖓᓂᑦ ᐊᒻᒪᓗ ᐃᓱᕐᓂᕐᒧᑦ ᖃᐅᔨᓴᒃᓴᓕᐅᕐᓃᑦ ᐱᓕᕆᐊᖑᓚᐅᖏᑦᑐᖅ 2021–ᒥ ᒪᓕᑐᐃᓐᓇᖅᑐᖅ ᑐᑭᒧᐊᒃᓯᒪᑦᑎᐊᖏᓐᓂᖏᓐᓄᑦ ᖃᓄᐃᓕᕙᓕᐊᓂᓇᔪᑦ ᖃᐅᔨᔭᐅᓯᒪᔪᑦ ᐅᓗᒥᒧᑦ ᐃᓱᕐᓂᕐᐅᑉ ᖃᓄᐃᓐᓂᖓᓄᑦ ᓇᓗᓇᐃᖅᓯᔾᔪᑏᑦ. ᐹᕙᓖᓐᑯᑦ ᐊᖏᖅᓯᒪᔪᑦ ᐊᑐᓕᖅᑎᑦᑎᕙᓕᐊᖏᓐᓇᓂᕐᒥᑦ ᐊᑕᖏᕐᓗᒍ ᖃᐅᔨᓴᒃᓴᓕᐅᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᒥ ᐋᖅᑭᐊᖅᑕᐅᓯᒪᔪᒥᑦ ᖃᐅᔨᓴᖅᐸᓕᐊᖏᓐᓇᕐᓂᕐᒧᑦ ᕿᓚᒻᒥᐅᑦᑕᕐᓂᖏᑦ ᐊᕐᕌᒍᐃᑦ ᐱᖓᓱᑦ

ᐊᓂᒍᕌᖕᒐᑕ, ᑕᒪᓐᓇᓗ ᒪᓕᒃᓱᓂ ᐊᕙᑎᐅᑉ ᐊᒃᑐᖅᑕᐅᓂᖓᓄᑦ ᖃᐅᔨᓴᓂᕐᒥᑦ (EEM) ᐱᓕᕆᐊᓂᑦ ᐊᔪᖕᒋᓐᓄᑦ ᐅᔾᕋᓂᐊᓂᕐᒧᑦ ᐱᓕᕆᐊᓄᑦ ᑲᓇᑕᒥ.

2021–ᒥ, ᐃᓱᓂᕐᒥᒃ ᖃᐅᔨᓴᕐᕕᓕᐅᕋᔪᖕᓂᑦ ᑐᕌᕐᕈᑕᐅᖅᐳᑦ ᐱᓕᕆᕝᕕᐅᔪᒥ SW-2-ᒥ, ᖃᐅᔨᓴᕐᕕᐅᔪᖅ ᐱᖓᓐᓇᖕᖏᖕᖏᓂ ᒫᓐᓇ ᑐᓚᒃᑕᕐᕕᐅᑉ ᑕᒪᒃᑯᓄᖓ ᖃᓄᐃᓕᖓᓂᐅᔪᓄᑦ ᐊᒻᒪ ᐃᖅᑲᕐᒥᐅᑕᑦ ᐱᕐᑯᑦᑐᖕᒋᑕ ᓇᓗᓇᐃᒃᑯᑕᖕᒋᑦ ᑕᑯᔭᐅᓚᐅᖅᑐᑦ 2020-ᒥ, ᑖᒃᑯᓄᖓᓪᓚᑦᑖᖅ ᐅᓄᖅᓯᒋᐊᖅᓯᒪᔪᑦ ᓯᐅᕋᖃᕐᓂᖓ, ᐅᓄᕈᓐᓂᖅᐹᓪᓕᖅᓱ ᐳᓴᖕᒋᑦ ᒥᑭᑦᑑᑎᕋᓛᑦ ᐱᑕᖃᖅᑐᑦ ᐊᒻᒪᓗ ᐅᓄᕈᓐᓂᖅᓱᑎᒃ ᐊᔾᔨᒌᖏᑦᑐᑦ ᐆᒪᔪᑦ ᐱᑕᖃᑦᑎᐊᕐᓂᖕᒋᓐᓄᑦ ᐊᒻᒪ ᐊᔾᔨᒌᖏᑦᑎᑐᑦ ᐆᒪᔪᑦ ᐅᓄᕐᓂᖕᒋᓐᓄᑦ ᐱᒻᒪᕆᐅᔪᑦ ᖃᓄᐃᓐᓂᖅᓴᐅᓂᖕᒋᑦ ᑕᑯᓪᓗᒋᑦ ᐊᔪᖕᒋᓐᓄᑦ ᖃᐅᔨᓴᕐᕕᓕᐅᕐᕕᖕᓂ ᑕᐅᕝᕙ ᐱᓇᖕᓇᖕᖏᓐᖏᓂ ᑐᑭᓕᐊᖕᒐᔪᑦ. ᑖᒃᑯᐊ ᑕᓇᐅᑉ ᐊᕙᑎᖕᒐᓄᑦ ᐱᓕᕆᖃᑎᒌᖕᒍᔪᑦ (MEWG) ᑐᒃᓯᕋᓚᐅᖅᐳᑦ ᐹᕙᓐᓇᓐᑯᑦ ᑲᒪᓕᖅᑭᓪᓗᑎᒃ ᐃᓂᐅᔪᓂᒃ 2021–ᒥᑦ ᖃᐅᔨᓴᕐᓗᑎᓪᓗ ᐊᔾᔨᖕᓂᐅᔪᑦ ᑖᕙᓂ ᖃᐅᔨᓴᕐᕕᐊᓂᑦ ᐱᓕᕆᐊᒍᑦ–ᐊᒃᑐᐊᖕᒪᖕᒋᑕ. ᑖᓐᓇ ᐅᖃᓕᒫᓪᓚᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖕ ᑕᐃᒪᐃᓐᓂᖕᒐᓄᑦ ᓴᖅᑭᑎᑦᑎᕙᖅ ᖃᐅᔨᔭᐅᔪᓂᒃ ᑐᕌᕆᔭᐅᔪᓄᑦ ᖃᐅᔨᓴᕐᓴᓄᑦ ᐱᔭᕇᖅᑕᐅᔪᓄᑦ 2021–ᒥ ᖃᓄᐃᓐᓂᖅᓴᐅᖕᒪᖕᒌᑕ ᑕᑯᓪᓗᒋᑦ ᐊᑐᖅᑕᐅᕙᒃᑐᑐᖃᕕᓂᕐᓄᑦ ᑎᑎᕋᖅᑕᐅᓯᒪᔪᓄᑦ ᑲᑎᑕᐅᓯᒪᔪᓄᑦ ᑕᐃᑲᓂ SW-2–ᒥ.

ᑕᒪᐃᑎᒍᑦ, ᐆᒃᑐᕋᖅᑕᐅᔪᑦ ᐃᓱᕐᓃᑦ ᖃᓄᐃᓕᖓᓂᓐᓄᑦ ᑭᓪᓕᐅᔪᑦ SW-2-ᒥ 2021-ᒥ ᒪᓕᑐᐃᓐᓇᓚᐅᖅᑐᑦ ᐊᕐᕌᒎᓚᐅᖅᑐᓂᑦ ᖃᓄᐃᖓᓂᐅᔪᓂᒃ ᐅᖓᑕᐅᔾᔨᓂᖃᖕᒋᕐᓱᑎᒃ ᑲᓇᑕᒥ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᖃᓄᐃᓐᓂᖓᓄᑦ ᖃᐅᔨᒪᔾᔪᑎᓂᒃ (CCME) ᐃᓱᕐᓂᕐᒧᑦ ᖃᓄᐃᓕᖓᓂᐅᔪᓄᑦ ᒪᓕᒃᑕᐅᔪᒃᓴᓂᑦ ᑕᑯᔭᐅᔪᓂᑦ. ᑭᓯᐊᓂ, ᐃᓱᕐᓃᑦ ᐊᖏᓂᖕᒋᑦ ᖃᐅᔨᔭᐅᔪᑦ SW-2–ᒥ ᓇᓗᓇᐃᖅᓯᔪᑦ ᐱᑕᖃᕐᓂᖓ ᑕᐅᕙᓂ ᐱᔾᔪᑎᖃᓚᐅᖅᐳᖅ ᐃᓚᖓᒍᑦ ᑕᑯᒃᓴᐅᔪᑦ ᐸᕝᕕᓴᕝᕕᐅᓂᕐᒥᒃ 2020–ᒥ ᐅᒥᐊᕐᔪᐊᖃᕐᓇᒥ. ᐊᖍᑎᖕᒋᓐᓂ ᐊᐅᓚᔾᔪᑎᑕᐅᔪᑦ ᓯᑲᐅᓂᒃ ᐃᑲᔪᖅᑕᐅᑎᓪᓗᒋᑦ ᓴᕝᕙᓂᒃ ᐅᓯᔪᒃᓴ ᐅᒥᐊᕐᔪᐊᑦ ᐊᐅᓚᔾᔪᑎᑕᐅᓇᓱᒃᑎᓪᓗᒋᑦ ᐱᓇᖕᓇᖕᖏᓂ ᑐᓚᒃᑐᕐᕕᖕᒥ 2020–ᒥ ᐅᒥᐊᕐᔪᐊᖅᑲᐅᑎᓪᓗᒍ ᐃᓱᒪᒋᔭᐅᕗᖅ ᐸᕝᕕᓴᐃᓂᖅᐹᖑᓚᐅᕋᓱᒋᔭᐅᓪᓗᑎᒃ (ᓱᕐᓗ ᐲᔭᐃᕙᓪᓕᐊᓪᒥᑦ ᐊᒃᑐᐃᓐᑦ) ᐱᔾᔪᑎᒋᓪᓗᒋᑦ SW2 ᖃᓂᓐᓂᖕᒐᓄᑦ ᑐᓚᒃᑕᕐᕕᖕᒧᑦ. ᖃᐅᔨᔭᐅᓯᒪᔪᖅ ᐊᔾᔨᖅᑐᖅ ᐃᓱᕐᓂᕐᒧᑦ ᐊᖏᓂᖕᒋᓐᓄᑦ ᓯᐊᒻᒪᑦᑎᕆᓂᖅ ᐱᔾᔪᑎᖃᑐᐃᓐᓇᕆᐊᓕᒃ ᒥᑭᔪᓂᑦ-ᐊᔾᔨᖅᑐᓂᑦ ᐃᖅᑲᖕᒐᓂ ᐋᖅᑭᑦᑕᐅᔪᑦ ᐊᖍᑎᖕᒋᓐᓂᖕᒌᖅᑐᑦ ᐃᖕᒋᕐᕋᓂᕐᓂ, ᐃᖕᒋᕐᕋᑎᑦᑎᓲᑦ ᒥᑭᓐᓂᖅᓴᓂᒃ ᐃᓱᕐᓂᕐᓂᒃ ᓴᖅᑮᓗᑎᒃ ᐊᖏᓂᖅᓵᕐᔪᖕᓂᒃ ᑕᖕᒋᓕᖕᓂᒃ. ᑕᒪᓐᓇ ᐃᓂᐅᔪᖅ ᐸᕝᕕᓴᒃᑕᐅᓯᒪᔪᖅ ᐱᔾᔪᑎᒋᓪᓗᒋᑦ ᐊᖍᑏᑦ ᐃᖕᒋᕐᕋᓂᖕᒋᑦ ᑭᓪᓕᐅᔪᓂ ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᑦ ᑕᐃᑲᓂ ᑎᑎᕋᖅᑕᐅᕐᖕᒐᖅᓯᒪᔪᒥ ᑭᖑᓪᓕᖅᐹᖅᓯᐅᑏᑦ ᐊᕙᑎᒧᑦ ᐊᒃᑐᐃᓂᕐᒧᑦ ᐅᓂᒃᑳᓂ (FEIS).

ᑕᒪᒃᑭᕐᓱᒋᑦ, ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓐᓇᓂᕐᒥᑦ ᖃᐅᔨᔭᐅᔪᑦ ᒪᓖᓐᓇᖅᑐᑦ ᑎᑎᕋᕆᐊᖕᒐᖅᑕᐅᓯᒪᔪᓂ ᑭᖑᓪᓕᖅᐹᒥᒃ ᐊᕙᑎᒧᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᐅᓂᒃᑳᒥ (FEIS) ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᓂ, ᓇᓚᐅᑦᑖᕐᓱᑎᒃ ᒥᑭᑦᑑᑐᐃᓐᓇᕆᐊᖃᕐᓂᖕᒋᓂᒃ ᐊᒻᒪᓗ ᖃᓂᒋᔫᓂᑐᐊᖅ ᐃᓱᖅᑐᑦ ᐸᕝᕕᓴᒃᑕᐅᓗᑎᒃ ᐊᒃᑐᐊᔪᑦ ᐊᖍᑎᖕᒋᑕ ᐃᖕᒋᕐᕋᓂᖕᒋᓐᓄᑦ, ᓂᕆᐅᒋᔭᐅᔪᖅ ᓱᕐᕌᕙᓪᓕᐊᔪᓐᓂᕐᓂᐊᕋᓱᒋᔭᐅᓗᓂ ᑕᐃᒪᐃᓕᐅᖕᒋᓐᓇᖅᑲᑦᑕᓕᕈᑎᒃ. ᐊᑐᓕᕐᑯᔨᔪᒍᑦ ᑐᕌᕐᕈᑕᐃᓐᓇᕐᓗᑎᒃ ᖃᐅᔨᓴᕐᕕᓕᐅᕐᓂᒃ 2022-ᒥ ᖃᐅᔨᓴᖅᑕᐅᒃᑳᓐᓂᐅᔭᕐᓗᑎᒃ ᐃᓱᕐᓃᑦ ᐊᖏᓂᖕᒋᑦ ᐊᔾᔨᒌᖏᑦᑐᑦ ᑕᐅᕙᓂ ᐊᒻᒪᓗ ᐊᔾᔨᐅᑕᐅᑐᐃᓐᓇᕆᐊᓖᑦ ᓄᓇᖕᒐᓂ ᐃᓱᖅᑐᑦ ᓇᓃᖅᑲᑦᑕᕐᓂᖕᒋᓐᓄᑦ ᐱᔪᑕᐅᓗᑎᒃ ᐅᓯᒃᑲᖅᑕᐃᓐᓇᕐᓂᖕᒋᓐᓄᑦ ᐊᒻᒪᓗ ᑐᓚᖃᑦᑕᐃᓐᓇᕐᓂᖕᒋᓐᓄᑦ ᕿᑭᖕᒍᐊᓂ ᑐᓚᒃᑕᕐᕕᖕᒥ.

ᐃᖅᑲᖕᒐᓂ ᐱᕈᖅᑐᑦ (ᐅᖃᓕᒫᓪᓚᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖕᒋᑦ 4.0)

ᐃᓱᕐᓂᕐᒥᒃ ᖃᐅᔨᓴᕐᕕᓕᐅᕐᓂᖅ ᕿᑭᖕᒍᐊᓂᑦ ᐱᓕᕆᐊᖑᓚᐅᖅᑐᖅ ᓈᒻᒪᒃᓯᕐᑯᓪᓗᒍ ᐅᔾᕋᖕᓂᐊᕈᓐᓇᐅᑎᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᒃ ᓈᓴᐅᑎᖓ 99(ᐃ) ᐊᒻᒪ 99(ᑎ). ᐊᕐᕌᒍᑦ ᐱᖓᓱᑦ ᑭᖑᓕᕇᑦ ᐊᑐᓕᖅᑎᑕᐅᓚᐅᖅᑎᓪᓗᒍ, ᑲᑐᔾᔨᐅᓪᓗᓂ ᖃᓂᒋᔫᓂ ᐃᖅᑲᖕᒐᓂ ᐊᒻᒪᓗ ᐃᓱᕐᓂᕐᒧᑦ ᖃᐅᔨᓴᕐᕕᓕᐅᕐᓃᑦ ᐱᓕᕆᐊᖑᓚᐅᖕᒋᑦᑐᖅ 2021–ᒥ ᒪᓕᑐᐃᓐᓇᖅᑐᖅ ᑐᑭᒧᐊᒃᓯᒪᑦᑎᐊᖕᒋᓐᓂᖕᒋᓐᓄᑦ ᖃᓄᐃᓕᕙᓪᓕᐊᓂᕆᔭᐅᔪᑦ ᖃᐅᔨᔭᐅᓯᒪᔪᑦ ᐅᓪᓗᒥᒧᑦ ᐃᓱᕐᓂᕐᐅᑉ ᖃᓄᐃᓐᓂᖕᒐᓄᑦ ᓇᓗᓇᐃᖅᓯᔾᔩᑦ. ᐹᕙᓐᓇᓐᑯᑦ ᐊᖕᒋᖅᓯᒪᔪᑦ ᐊᑐᓕᖅᑎᑦᑎᕙᓪᓕᐊᖕᒋᓐᓇᓂᕐᒥᑦ ᐊᑕᖕᒋᕐᓗᒍ ᖃᐅᔨᓴᕐᕕᓕᐅᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᒥ ᐋᖅᑭᒋᐊᖅᑕᐅᓯᒪᔪᒥᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓇᕐᓂᕐᒧᑦ ᕿᓚᒻᒥᐅᑦᑕᕐᓂᖕᒋᑦ ᐊᕐᕌᒍᐃᑦ ᐱᖓᓱᑦ ᐊᓂᒍᕌᖕᒐᑕ, ᑕᒪᓐᓇᓗ ᒪᓕᒃᓱᓂ ᐊᑯᓚᐃᓕᕆᓂᒃ ᑎᒥᒥᖕᒌᖅᑐᓂᒃ ᖃᐅᔨᓴᕐᕕᓕᐅᕐᓂᕐᓂᒃ ᐊᔪᖕᒋᓐᓄᑦ ᐅᔾᕋᓂᐊᓂᕐᒧᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᓄᑦ (ᓲᕐᓗ, ᓚᕙᒪᑐᖅᑲᒃᑯᑦ ᐊᕙᑎᐅᑉ ᐊᒃᑐᖅᑕᐅᓂᖓᓄᑦ ᖃᐅᔨᓴᓂᕐᒥᑦ [EEM]).

2022–ᒥ, ᐃᖅᑲᖕᒐᓂ ᐱᕈᖅᑐᓂᒃ ᖃᐅᔨᓴᕐᕕᓕᐅᕋᔪᖕᓂᑦ ᑐᕌᕐᕈᑕᐅᖅᐳᑦ SW-2–ᒥ, ᖃᐅᔨᓴᕐᕕᓕᐅᕐᕕᒃ ᐱᖓᓐᓇᖕᖏᖕᖏᓂ ᑐᓚᒃᑕᕐᕕᐅᑉ ᐊᔾᔨᒌᖏᑦᑐᑎᒍᑦ ᖃᓄᐃᓕᖓᓂᐅᓕᖅᐸᒃᑐᑦ ᐃᓱᕐᓂᒥ ᐊᒻᒪ ᐃᖅᑲᖕᒐᓂ ᐱᕈᖅᑐᑦ ᓇᓗᓇᐃᖅᓯᔾᔪᑎᖕᒋᑦ ᖃᐅᔨᔭᐅᓚᐅᖅᑐᑦ 2020–ᒥ, ᐱᓗᐊᖅᑐᒥᒃ ᐅᓄᖅᓯᕚᓪᓕᖅᓯᒪᔪᑦ ᓯᐅᕋᐃᑦ ᖃᓄᐃᓕᖓᓂᖕᒋᑦ, ᒥᒃᓵᒋᐊᖅᓯᒪᔪᑦ ᐳᓴᓐᑎᑦ ᒥᑭᑦᑑᑎᐅᓂᖅᓴᑦ ᐊᒻᒪ ᐊᔾᔨᒌᖏᑦᑑᑕᐅᓗᐊᕆᐊᓗᑎᒃ, ᐆᒪᔪᕋᓛᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᑦ ᐱᑕᖃᑦᑎᐊᕐᓂᖕᒋᑦ, ᐊᒻᒪ ᐅᓄᕐᓂᖕᒋᑦ ᒥᒃᓵᑦᑎᓯᒪᔪᑦ ᐊᔪᖕᒋᑦ ᑕᑯᓪᓗᒋᑦ

ᖃᓄᐃᓐᓂᖅᓴᐅᖕᒪᖔᑕ ᖃᐅᔨᓴᕐᕕᖕᒥ ᐱᖕᖓᖕᓇᖕᖔᖕᖓᓂ. ᑕᕆᐅᑉ ᐊᕙᑎᖕᖓᓄᑦ ᐱᓕᕆᖃᑎᒌᑦᑐᑦ (MEWG) ᑐᒃᓯᕋᓚᐅᖅᐳᑦ ᐹᕙᓖᓐᑯᓐᓄᑦ ᐅᐸᒃᑲᓐᓂᕐᑯᔮᓪᓗᑎᒃ ᑖᔅᓯᒥᖕᖓ ᐃᓂᒥᒃ 2021−ᒥ ᖃᐅᔨᓴᕈᕐᑯᓪᓗᒋᑦ ᐊᓯᔾᔨᖅᑐᑦ ᑕᕝᕙᓂ ᖃᐅᔨᓴᕐᕕᖕᒥ ᐱᓕᕆᐊᖑᔪᒧᑦ−ᐊᒃᑐᐊᓂᖃᙳᒋᒃᑲᓗᐊᕐᒪᖔᑕ.

ᐃᖅᑲᖕᖓᓂ ᐱᕈᖅᑐᑦ ᖃᐅᔨᓴᖑᒃᓴᓕᐅᕐᓂᕐᒥ ᖃᐅᔨᔭᐅᔪᑦ 2021−ᒥ ᓇᓗᓇᐃᖅᑕᐅᓚᐅᖅᐳᑦ ᓂᕐᔪᑎᑦ ᐅᓄᕐᓂᖕᒋᑦ, ᐆᒪᔪᑦ ᐱᑕᖃᑦᑎᐊᕐᓂᖕᒋᑦ, ᐊᒻᒪ ᐆᒪᔪᑦ ᐊᔾᔨᒌᙱᑦᑐᓘᔭᖅᑐᑦ ᐊᒃᑐᐊᔪᑦ ᓇᐃᓴᐅᑎᖕᒋᓐᓄᑦ ᖃᐅᔨᔭᐅᓚᐅᖅᑐᑦ 2020−ᒥ. ᐱᓗᐊᖅᑐᒥᒃ, ᑕᒪᓐᓇ ᐃᓚᖃᓚᐅᖅᐳᖅ ᐅᓄᖅᓯᕐᔪᐊᖅᑐᓂᒃ ᓂᕐᔪᑏᑦ ᐅᓄᕐᓂᖕᒋᓐᓄᑦ ᐊᒻᒪ ᐆᒪᔪᐃᑦ ᐊᔾᔨᒌᖕᒋᐊᕐᔪᓐᓂᖕᒋᑦ ᐱᑕᖃᑦᑎᐊᕐᓂᖕᒋᑦ, ᐆᒪᔪᐃᑦ ᐊᔾᔨᒌᙱᑦᑐᓘᔭᕐᓂᖕᒋᑦ ᐅᑎᖅᓯᒪᓕᖅᑐᑦ ᐊᔾᔨᐸᓗᖕᒋᓐᓄᑦ ᑎᑎᕋᖅᑕᐅᓯᒪᔪᑦ SW-2−ᒥ 2019−ᒥ. ᓄᓇᒥᙵᖅᑐᑦ ᐊᔾᔨᒌᙱᓐᓂᖕᒋᑦ ᐃᓚᖕᖓᒍᑦ ᐃᑲᔫᑎᓯᒪᑐᐃᓐᓇᕆᐊᖃᓚᐅᕋᓗᐊᖅᑎᓪᓗᒋᑦ ᐊᓯᔾᔨᖅᑐᓄᑦ ᑎᑎᕋᖅᑕᐅᓯᒪᔪᓂᑦ SW-2−ᒥ 2020−ᒥ (ᐃᖅᑲᖕᖓᓂ ᐱᕈᖅᑐᑦ ᓄᓇᖕᖓ ᓴᖅᑮᔭᖅᑎᑦᑎᔪᓐᓇᖅᑐᖅ ᐊᓯᔾᔨᖅᓯᒪᔪᓂᒃ ᐅᓄᕐᓂᖕᒋᓐᓄᑦ ᖃᐅᔨᓴᐅᑎᖕᒋᓐᓄᑦ ᑭᒡᓕᖃᖅᑎᑕᐅᔪᓂᒃ ᐃᓂᖕᒋᓐᓄᑦ), ᓯᓚᑖᓂᙶᖅᑐᑦ ᐊᒃᓱᕈᕐᓇᖅᑐᖅᓯᐅᕈᑕᐅᔪᑦ ᐱᔾᔪᑕᐅᓚᐅᖅᐳᑦ ᑖᒃᑯᓄᖕᖓ ᐊᓯᔾᔨᐅᑎᓄᑦ ᐱᔾᔪᑎᒋᓪᓗᒋᑦ ᐊᔾᔨᐸᓗᖕᒋᑦ ᐊᓯᔾᔨᖅᓯᒪᔪᑦ ᖃᐅᔨᔭᐅᓚᐅᙱᓪᓚᑕ ᓇᓕᐊᖕᓂᑐᐃᓐᓇᕐᓂ 59−ᓂᒃ ᖃᐅᔨᓴᕐᕕᖕᓂ 2020−ᒥ. ᐱᔪᑕᐅᓪᓗᑎᒃ ᐃᓂᐅᔫᑉ ᖃᓂᒃᓴᓂᕐᓂᖕᖓᓄᑦ ᑐᓚᒃᑕᕐᕕᖕᒨᑦ, ᐃᓱᒪᒋᔭᐅᔮᖅ 2020-ᒥ ᓯᑦᔭᒥ ᓯᑲᐅᒨᑦ−ᐃᑲᔪᖅᑕᐅᔪᑦ ᑐᓚᒃᓯᒪᓂᐅᖃᑦᑕᓚᐅᖅᑐᖅ 2020-ᒥ ᓴᖅᐹᓯᒪᔪᑦ ᓄᓇᖕᖓᓂ ᐊᖑᑎᓄᑦ ᐊᐅᓚᔾᔭᒃᑕᐅᓯᒪᓪᓗᑎᒃ ᐊᒃᑐᖅᑕᐅᔪᑦ (ᐊᐅᓚᔾᔭᒃᑎᑕᐅᓂᖕᒋᑦ ᒥᑭᓐᓂᖅᓴᐃᑦ ᐃᓱᖅᑐᑦ) ᓴᖅᑮᓪᓗᑎᒃ ᐊᖕᒋᔫᑕᐅᓂᖅᓴᓂᒃ ᐊᒻᒪᓗ/ᐅᕝᕙᓘᓐᓃᑦ ᐋᔭᐃᕝᕕᐅᓪᓗᑎᒃ ᒫᓐᓇ ᐃᖅᑲᖕᖓ SW-2-ᒥ, ᐃᒪᐃᑐᐃᓐᓇᕆᐊᖃᕆᓪᓗᓂᓗ, ᐊᐅᓚᔾᔭᖕᓂᖕᒋᑦ ᖃᐃᖅᓱᐃᑦ ᐃᖅᑲᖕᖓᓂ ᑕᐃᑲᓂ ᖃᐅᔨᓴᕐᕕᐅᔪᒥ. ᑕᒪᓐᓇ, ᑕᐃᒪᐃᓐᓂᖕᖓᓄᑦ, ᓴᖅᑭᑎᑦᑎᓚᐅᖅᐳᖅ ᐊᓯᔾᔨᖅᓯᓂᕐᒥᒃ ᓄᓇᖕᖓᓂ ᐃᖅᑲᖕᖓᑕ ᖃᓄᐃᓕᖕᖓᓂᖕᖓᓄᑦ, ᐱᔾᔪᒍ ᐊᒃᑐᐊᓂᖃᓪᓚᑦᑖᕐᓂᖕᖓᓄᑦ ᑖᒃᑯᓇᓂ ᐃᓱᖅᑐᑦ ᐊᖕᒋᕆᓐᓂᖕᒋᓐᓄᑦ ᐊᒻᒪ ᓇᓃᖃᑦᑕᕐᓂᖕᒋᑦ ᐱᑕᖃᑦᑎᐊᕐᓂᖕᒋᓪᓗ ᐱᕈᖅᑐᑦ (ᐱᑕᖃᑦᑎᐊᕐᓂᖅᓴᐅᓪᓗᑎᒃ ᐊᔾᔨᒌᙱᑦᑑᑕᐅᓪᓗᑎᒡᓗ ᐊᒃᑐᐊᓂᖃᕋᔪᒃᐸᒃᐳᑦ ᒥᑭᓐᓂᖅᓴᓄᑦ, ᒥᑭᓐᓂᖅᓴᐃᑦ ᒥᑭᓐᓂᖕᒋᓐᓄᑦ). ᑭᓯᐊᓂ, ᐃᖅᑲᖕᖓᓂ ᓄᓇᖕᖓ ᖃᐅᔨᒪᔭᐅᔮᖅ ᐆᒪᕆᖕᓂᖕᖓᓂᒃ ᐊᒻᒪ ᐅᑎᖅᓵᓕᔾᔪᓇᕐᓂᖕᖓᓄᑦ ᑕᐃᒪᐃᖕᒋᓐᓇᒐᔪᙱᑦᑐᓂᒃ ᐸᒡᕕᓵᕆᓂᒃᑯᑦ ᐊᒃᑐᐃᔪᑕᐅᓲᓂᒃ, ᖃᐅᔨᔭᐅᓯᒪᖕᒪᑕ ᐅᓄᖅᓯᕚᓕᖅᓯᒪᓂᖕᒋᓐᓂᒃ ᐃᖅᑲᖕᖓᓂ ᓄᓇᖕᖓᓂ ᓇᓗᓇᐃᒃᑯᑕᑦ ᖃᐅᔨᔭᐅᓚᐅᖅᑐᑦ 2021−ᒥ ᒪᓕᒃᓗᑎᒃ ᐊᓯᔾᔨᖅᑐᓄᑦ ᐊᑐᓕᖅᑎᑕᐅᔪᑦ ᐹᕙᓖᓐᑯᓐᓂ 2021−ᒥ ᐱᔪᑎᒋᓪᓗᒋᑦ ᓯᑲᐅᒨᑦ-ᐃᑲᔪᖅᑕᐅᓪᓗᑎᒃ ᑐᓚᒃᓯᒪᓂᕐᒨᑦ ᐊᐅᓚᓂᕆᔭᐅᔪᑦ ᐱᖕᖓᖕᓇᖕᖔᖕᖓᓂ ᑐᓚᒃᑕᕐᕕᖕᒥ.

ᑕᒪᐃᓐᓂᒃᑯᓕ, ᐃᒫᓂ ᐃᓱᖅᑐᖅ ᐊᒻᒪ ᖄᖕᖓᓃᑦᑐᑦ ᐱᕈᖅᑐᑦ ᖃᐅᔨᓴᖅᑕᐅᓚᐅᖅᑐᑦ ᓇᓗᓇᐃᖅᓯᖕᒪᑕ ᑕᕆᐅᑉ ᐃᖅᑲᖕᖓᓂ ᖃᓂᒌᔭᓂ ᖃᐅᔨᓴᕐᕕᐅᑉ SW-2-ᒥ ᑕᑯᒃᓴᐅᑎᑦᑎᔪᑦ ᐊᒃᑐᕐᑯᓇᖅᑕᑦᑕ ᐸᒡᕕᓴᒃᑕᐅᓂᖕᒋᓐᓂᒃ ᐃᓱᒪᒋᔭᐅᔪᑦ ᐊᖕᒎᑎᖕᒋᓐᓂᒃ ᐊᐅᓚᔾᔭᒃᑎᑕᐅᓯᒪᔪᑦ ᓯᑲᐅᒥᒃ-ᐃᑲᔪᖅᑕᐅᓪᓗᑎᒃ ᓴᕝᕕᒃᓴᓂᒃ ᐅᓯᔪᑦ ᐃᖕᒋᕋᑎᑕᐅᖃᑦᑕᕐᓂᖕᒋᓐᓂᑦ ᐱᓇᖕᓇᖕᖓᓂ ᑐᓚᒃᑕᕐᕕᐅᑉ 2020-ᒥ ᐅᒥᐊᕐᔪᐊᖃᕐᓇᐅᑎᓪᓗᒍ. ᑐᕋᖕᒋᔭᐅᓚᐅᖅᑐᑦ ᖃᐅᔨᓴᖑᒃᓴᓕᐅᕐᓃᑦ ᐱᓕᕆᐊᖑᓚᐅᖅᑐᑦ 2021-ᒥ ᓇᓗᓇᐃᖅᓯᔪᑦ ᑕᒪᒃᑯᐊ ᐃᖅᑲᖕᖓᓂ ᐱᕈᖅᑐᑦ ᓄᓇᖕᖓ ᑕᐅᕙᓂ ᓴᖅᑮᔭᖅᑎᑦᑎᖕᒪᑦ ᐅᑎᖅᐸᒡᓕᐊᓂᐅᔪᓄᑦ ᓇᓗᓇᐃᒃᑯᑕᓂᒃ ᐱᔪᑕᐅᓪᓗᑎᒃ ᑕᑯᔭᐅᓯᒪᔪᑦ ᐅᓄᖅᓯᒋᐊᕐᓯᒪᔪᑦ ᓂᕐᔪᑎᑦ ᐅᓄᕐᓂᖕᒋᑦ, ᐆᒪᔪᑦ ᐱᑕᖃᑦᑎᐊᕐᓂᖕᒋᑦ ᐊᒻᒪᓗ ᐆᒪᔪᑦ ᐊᔾᔨᒌᙱᑦᑐᑦ. ᑕᑯᔭᐅᔪᑦ ᖃᐅᔨᔭᐅᓯᒪᔪᑦ ᒪᓕᑐᐃᓐᓇᖅᑐᑦ ᑭᖑᓪᓕᖅᐹᒥᒃ ᐊᕙᑎᒧᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᐅᓂᒃᑳᓂᑦ (FEIS) ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᑦ, ᓇᓚᐅᖅᑖᖅᓯᒪᔪᑦ ᓄᓇᖕᖓᓂ ᓴᖅᑭᒃᑲᓐᓂᕋᔭᕐᓂᖕᒋᑦ ᒥᑭᑦᑑᑕᐅᓂᖅᓴᑦ-ᐃᓱᕐᓃᑦ ᐊᖕᒎᑎᓂᖕᖔᕐᑐᑦ ᐃᖕᒋᕐᕋᓂᖕᖓᓄᑦ ᐊᒻᒪᓗ ᐊᒃᑐᐊᔪᑦ ᐊᓯᔾᔨᖅᑕᐅᓴᔭᖅᑐᑦ ᐃᖅᑲᖕᖓᑕ ᓄᓇᖕᖓᓂ ᖃᓄᐃᓕᖕᖓᓂᐅᔪᓄᑦ. ᐊᑐᓕᕐᑯᔨᒐᓗᐊᖅᑐᖕᒍᑦ ᑕᕋᒐᖃᐃᓐᓇᕐᓗᑎᒃ ᖃᐅᔨᓴᖑᒃᓴᓕᐅᕐᓂᕐᒥᒃ 2020-ᒥ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖕᒋᓐᓇᕐᑯᓪᓗᒋᑦ ᐱᓕᕆᐊᒥᖕᖔᑐᐃᓐᓇᕆᐊᓖᑦ ᐊᒃᑐᐃᓃᑦ ᓄᓇᖕᖓᓂ ᐃᖅᑲᓇᑕ ᓄᓇᕐᑯᑖᓂ ᕿᙳᐊᓂ.

ᓄᓇᖕᖓ, ᐱᕈᖅᑐᑦ ᐊᒻᒪ ᐃᖅᑲᖕᖓᓂᕐᒥᐅᑕᑦ (ᐅᖃᓕᒫᖓᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖕᒋᑦ 5.0)

ᖃᐅᔨᓴᖑᒃᓴᓕᐊᖑᔪᓯᒪᔪᑦ ᓄᓇᖕᖓᓂ, ᐱᕈᖅᑐᓂ, ᐊᒻᒪᓗ ᐃᖅᑲᖕᖓᓂᕐᒥᐅᑕᑦ ᓈᒻᒪᒃᓯᕐᑯᓪᓗᒍ ᐅᔭᕋᖕᓂᐊᕈᓐᓇᐅᑎᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᒃ ᓈᓴᐅᑎᖕᖓ 99(ᐃ), (ᑎ) ᐊᒻᒪᓗ ᐊᒃᑐᐊᔪᑦ ᐅᔭᕋᖕᓂᐊᕈᓐᓇᐅᑎᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓖᑦ 76, 83(ᐃ), 84 ᐊᒻᒪᓗ 87. ᖃᐅᔨᓴᖅᑕᐅᕐᑯᓪᓗᒋᑦ ᐱᓕᕆᐊᒥᖕᖔᑐᐃᓐᓇᕆᐊᓖᑦ−ᐊᒃᑐᐊᔪᑦ ᐊᒃᑐᐃᓃᑦ ᓄᓇᒧᑦ, ᐱᕈᖅᑐᓄᑦ, ᐊᒻᒪᓗ ᐃᖅᑲᖕᖓᓂᕐᒥᐅᑕᑦ, ᐊᔾᔨᓕᖅᑎᑕᐅᓯᒪᔪᑦ ᐃᒫᓂ ᑕᑯᔭᐅᔪᓐᓇᖅᑐᑦ ᓇᐃᓴᖅᓯᔾᔪᓯᖕᒋᑦ ᐊᑐᖅᑕᐅᓚᐅᖅᑐᑦ SCUBA−ᒥᒃ ᑐᙵᕕᖃᖕᓗᑎᒃ ᑭᒡᓕᓯᓂᐊᕐᓃᑦ ᐳᐃᔪᕌᖅᑏᑦ ᖃᐅᔨᓴᕐᑯᓪᓗᒋᑦ ᑕᕆᐅᑉ ᐱᕈᖅᑐᖕᒋᓐᓂᒃ, ᕿᒥᕐᓗᖃᙱᑦᑐᓂᒃ ᐊᒻᒪᓗ ᐃᖃᓄᖕᓂᒃ ᐊᔾᔨᒌᙱᑦᑐᓂᒃ ᑎᑎᕋᖅᑕᐅᕐᑯᓪᓗᒋᑦ ᓇᔪᖕᒋᑦ ᖃᓄᐃᑦᑑᓂᖕ ᑖᒃᑯᓇᓂ ᑭᐸᖕᓇᒃᓯᓯᒪᔪᓂ ᖃᐅᔨᓴᕐᕕᐅᓂᐊᖅᑐᓂ ᐋᖅᑭᒃᑕᐅᓚᑦᑖᖅᓯᒪᔪᑦ ᐃᖅᑲᖕᖓᓂ ᑕᒪᕐᒥᖕᓂᒃ ᓴᖅᑮᕐᕈᐅᔪᓐᓇᖅᑐᒥ ᐃᓂᒥ ᐊᒻᒪᓗ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᒥ ᐃᓂᒥ. ᑭᐸᖕᓇᒃᑑᑎᒐᓛᑦ ᖃᐅᔨᓴᖅᑕᐅᓚᐳᖅᑐᑎ ᑎᑎᕋᖅᑕᐅᕐᑯᓪᓗᒋᑦ ᐳᓴᓐᖏᑦ ᐱᑕᖃᕐᕕᐅᔪᑦ (%) ᓄᓇᖕᖓ ᖃᓄᐃᑦᑑᓂᖕᖓᓄᑦ, ᐃᖅᑲᖕᖓᕐᒥᐅᑕᑦ ᐱᕈᖅᑐᑦ, ᐊᒻᒪᓗ ᑖᒃᑯᓯᓐᓇᙱᑦᑐᑦ ᐃᖅᑲᖕᖓᓂᕐᒥᐅᑕᑦ ᐱᕈᖅᑐᑦ, ᐅᓄᕐᓂᖕᒋᑦ (ᓇᐃᓴᖅᑕᐅᓗᑎᒃ) ᓅᑦᑐᓇᖅᑐᑦ ᐱᕈᖅᑐᑦ, ᐊᒻᒪᓗᑦᑕᐅᖅ ᐊᕕᒃᑐᖅᓯᒪᓂᖕᒋᑦ ᓇᓗᓇᐃᔭᖅᑕᐅᓗᑎᒃ ᐅᓄᙵᓖᓄᑦ ᐊᑐᕈᓐᓇᖅᑐᓄᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᓄᑦ

ᖁᕝᕙᓯᓕᕇᓄᑦ. ᖃᐅᔨᓴᒃᓴᑦ ᐱᔭᐅᔪᓐᓇᕌᖓᑕ ᑲᑎᑕᐅᖃᑦᑕᓚᐅᖅᑐᑦ ᓇᒡᓯᐅᔾᔭᐅᓪᓗᑎᒡᓗ ᐃᓕᓴᕆᔭᐅᓯᒪᔪᓄᑦ ᐆᒪᔪᑦ ᐊᕙᒃᑐᖅᓯᒪᓂᖏᓐᓄᑦ ᖃᐅᔨᓴᕝᕕᖕᓄᑦ (Biologica Environmental Services Ltd.) ᐊᕙᒃᑐᖅᓯᒪᓂᖏᑦ ᓇᓗᓇᐃᖅᔭᖅᑕᐅᖁᓪᓗᒋᑦ. ᐊᕙᒃᑐᖅᓯᒪᓂᖏᑦ ᐱᑕᖃᑦᑎᐊᕐᓂᖏᓐᓄᑦ ᐊᔾᔨᒌᙱᑦᑐᓘᔭᕐᓂᖏᓐᓄᓪᓗ (Simpson’s Diversity Index) ᖃᐅᔨᓴᖅᑕᐅᓚᕗᖅᑐᑦ ᐱᔾᔪᑎᖏᓐᓄᑦ ᐃᖅᑲᖓᓂᕐᒥᐅᑕᓪᓗ.

ᑭᐸᓖᓐᑉᓯᓯᒪᔪᑦ ᖃᐅᔨᓴᒃᓴᕆᐅᕝᕕᖕᓂ ᖃᐅᔨᔭᐅᓚᐅᖅᑐᑦ 2021–ᒥ ᓇᓗᓇᐃᖅᓯᓚᐅᖅᐳᑦ ᐊᕿᑦᑐᒥ ᓄᓇᖓ ᐊᕙᑎᖃᕐᓂᖓᓂᒃ, ᐅᑯᐊᖑᓪᓗᑎᒃ ᒪᕋ ᐊᒻᒪ ᓯᐅᕋᖅ. ᐊᔾᔨᐸᓗᖏᑦ ᐱᔾᔪᑦ ᐊᒻᒪ ᐃᖅᑲᕐᒥᐅᑦᑕ ᐊᕙᒃᑐᖅᑕᐅᓯᒪᔪᑦ ᖃᐅᔨᔭᐅᓚᐅᖅᑐᑦ 2021–ᒥ ᐊᕐᕌᒍᓂ ᐊᓂᒍᖅᑐᓂᒃ (2018-2020). ᓄᓇᖓᓄᑦ ᓇᓗᓇᐃᖅᓯᔾᔪᑎᑦ (ᓲᕐᓗ, ᐳᓴᓐᑎ ᐱᑕᖃᕐᓂᖓᓄᑦ, ᐅᓄᕐᓂᖏᑦ, ᐆᒪᔪᑦ ᐱᑕᖃᑦᑎᐊᕐᓂᖏᑦ, ᐊᒻᒪ ᐊᔾᔨᒌᙱᓐᓂᖏᑦ) ᐊᔾᔨᒌᙱᑦᑐᓘᔭᓚᐅᖅᐳᑦ ᐃᓗᐊᓂ ᐊᒻᒪ ᑖᒃᑯᓇᓂ ᑭᐸᓖᓐᑑᑎᓂ ᑖᒃᑯᓇᓂᓗ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᓂ ᓴᖅᑮᔭᕝᕕᐅᔪᓂ; ᓇᐃᓴᐃᑎᑎᒍᑦ ᐊᓯᔾᔨᒌᙱᕐᔪᐊᓗᐊᕐᓇᑎᒃ ᑕᑯᔭᐅᔪᑎᒍᑦ ᑖᒃᑯᓇᓂ ᓴᖅᑮᔭᕝᕕᐅᔪᓂ ᐊᒻᒪᓗ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᓂ ᐃᓂᓂ ᓇᓕᐊᖕᓄᑐᐃᓐᓴᖅ ᓇᓗᓇᐃᕈᑎᒃᓴᕐᓄᑦ. ᑕᒪᐃᓐᓂᒡᓕ, ᖃᐅᔨᓴᕈᑎᕙᓃᑦ ᓇᓗᓇᐃᖅᓯᕗᑦ ᐃᒪᐃᓐᓇᓱᒋᓐᓈᓪᓗᑎᒃ ᑖᒃᑯᐊ ᐱᔾᔪᑎᖏᑦ ᐊᒻᒪ ᐃᖅᑲᓇᓂᕐᒥᐅᑦ ᓄᓇᖓᑕ ᐋᖅᑮᒃᓯᒪᓂᖓ ᖃᓄᐃᓐᓂᖅᓴᐅᖕᒪᖔᑕ ᑖᒃᑯᓇᓂ ᐱᓕᕆᕝᕕᐅᔪᒥ ᐊᒻᒪ ᖃᐅᔨᒋᐊᕐᕕᐅᔪᓐᓇᖅᑐᑦ ᐃᓅᑦ ᓇᓗᓇᒃᑯᑕᖅᑰᔨᙱᑦᑐᑦ ᐱᓕᕆᐊᓄᑦ–ᐊᒃᑐᐊᓂᕈᑦ ᐊᒃᑐᐃᔾᔪᑕᐅᓲᑦ ᐅᕝᕙᓘᓐᓃᑦ ᐊᔾᔨᙳᓐᓂᕈᑎᖏᑦ.

ᒥᒃᓵᓴᒃᑕᐅᔪᑦ ᖃᐅᔨᓴᕈᑎᕙᓂᕐᓂ ᖃᐅᔨᔭᐅᔪᑦ ᐃᓚᖅᑲᖅᓱᑎᒃ ᐆᒪᔪᕋᓛᑦ ᐊᕙᒃᑐᖅᓯᒪᓂᖏᓐᓄᑦ ᑲᑎᑉᐸᓪᓕᐊᔪᑦ ᓴᙱᕙᓪᓕᐊᓂᖓ ᑎᑎᖅᑲᕐᑎᓄᑦ ᓇᓗᓇᐃᖅᓯᖓᒪᑦ ᒫᓇ ᖃᐅᔨᓴᒃᓴᓕᐅᕐᓂᕐᒧᑦ ᐋᖅᑭᒃᑕᐅᓯᒪᔪᑦ ᓈᒻᒪᓂᙱᓐᒪᑕ ᑕᑎᒋᓗᒋᑦ ᖃᐅᔨᔾᔪᑎᒋᓇᓲᓪᓗᒋᑦ ᐱᓕᕆᐊᒥᑦ–ᓴᖅᑭᑕᐅᔪᑦ ᐊᓯᔾᔨᐅᑏᑦ ᓄᓇᖓᑕ ᖃᓄᐃᓕᖓᓂᖓᓄᑦ ᐅᕝᕙᓘᓐᓃᑦ ᓇᓗᓇᐃᔅᓕᓪᓚᑦᑖᕐᓗᒍ ᐃᖅᑲᖓᓂ ᓄᓇᖓ ᒫᓇ ᑎᑎᖅᑲᖁᑎᑎᒍᑦ. ᑕᐃᒪᓐᓂᖓᓄᑦ, ᒫᓇ ᖃᐅᔨᔭᐅᓯᒪᔪᑦ ᑐᑭᓕᐅᖅᑕᓪᓗᐊᖅᑐᑦ ᐅᔾᔨᖅᓱᖅᑕᐅᑦᑎᐊᕐᓗᑎᒃ. ᒥᒃᓵᓴᐃᓐᓂᑦ ᖃᐅᔨᓴᒃᓴᓕᐅᕐᓂᕐᒧᑦ ᐱᑕᖅᑎᑦᑎᔭᕆᐊᓖᑦ ᑎᑭᑕᐅᑦᑎᐊᕈᓐᓇᕐᓗᓂ ᖃᐅᔨᔪᓐᓇᐅᑎᓄᑦ ᒥᒃᓵᒃᑕᐅᔪᓄᑦ (ᓲᕐᓗ ᓇᓗᓇᐃᖅᑕᐅᓗᓂ ᒥᒃᓵᒃᑕᐅᔪᑦ ᖃᐅᔨᓴᕈᑏᑦ) ᑕᒪᑐᒧᖓ ᐱᓕᕆᐊᒧᑦ ᓇᓗᓇᐃᖅᑕᐅᓚᐅᖅᑐᑦ ᑎᑭᑕᐅᔪᓐᓇᙱᓐᓂᖏᓐᓂᒃ ᐃᓗᐊᓂ ᑭᒡᓕᖅᑐᑦ ᓯᑯᖅᙱᑎᓪᓗᒍ ᖃᐅᔨᓴᒃᓴᓕᐅᕝᕕᐅᕙᒃᑐᒥ (ᐋᒡᕖᓯ/ᓯᑎᐱᕆ). ᑕᐃᒪᐃᒻᒪᑦ, ᒫᓇ ᖃᐅᔨᔭᐅᓯᒪᔪᑦ ᑐᑭᓕᐅᖅᑕᐅᓗᐊᖅᑐᑦ ᐅᔾᔨᖅᓱᖅᑕᐅᓗᑎᒃ. ᑕᐃᒪᐃᒻᒪ, ᐱᙳᓱᑦ ᐊᑐᖅᑕᐅᙶᕈᓐᓇᖅᑐᑦ ᓯᕗᒻᒧᐊᓚᓱᒃᑎᓪᓗᑕ ᓴᖅᑕᐅᓚᐅᖅᑐᑦ 2021 ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᐃᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᖅ (MEEMP) ᐅᓂᒃᑳᖓᓂ: (i) ᐱᖅᓯᓚᐅᖅᐳᑦ ᑖᓯᒥᖓ ᖃᐅᔨᓴᕈᑎᑦ ᐃᓗᓕᖅᑭᓂᒃ 2022–ᒥ ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᐃᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᒥ (MEEMP) ᐋᖅᑭᒃᓯᒪᓂᖓᓂ ᐊᒻᒪᓗ ᑐᕌᖓᖅᑭᓂ ᐊᓯᖏᓐᓄᑦ ᐃᓗᓕᖅᑭᓄᑦ ᐊᑐᐃᓐᓇᕈᐃᔪᑦ ᓈᒻᒫᖅᓯᒪᔪᓂᒃ ᓇᐃᓴᐅᑎᑎᒍᑦ ᖃᐅᔨᓴᐅᓂᕐᒧᑦ ᒥᒃᓵᓴᒃᑕᐅᔪᓄᑦ (ᓲᕐᓗ, ᐃᖅᑲᖓᓂ ᐱᔾᔪᑦ, ᐃᓱᕐᓂᐅᑉ ᖃᓄᐃᓕᖓᓂᖓ); (ii) ᐱᓕᕆᐊᖑᓐᓇᕐᓗᑎᒃ ᑭᐸᓖᓐᑉᓯᑎᓯᒪᔪᑦ ᖃᐅᔨᓴᒃᓴᕆᐅᕐᑰᑦ ᐊᑐᕐᓗᑎᒃ ᐊᔾᔨᖓᓂᒃ ᖃᐅᔨᓴᒃᓴᕆᐅᕋᓱᙳᓂᕐᒧᑦ ᓈᒻᒪᒋᓗᒋᑦ ᐊᒃᑐᐊᔪᑦ ᓇᐃᓴᐃᓯᓇᓂᕐᒧᑦ ᑭᒡᓕᕆᐅᕙᒃᑐᑦ (ᓲᕐᓗ, ᖃᐅᔨᔪᓐᓇᕐᓂᖅ ᐊᓯᔪᒥᒃ-ᐊᑐᕐᓗᒃ ᖃᓄᐃᓂᖓᓕᕐᓂᐅᕙᒃᑐᓂᑐᐊᖅ); ᐅᕝᕙᓘᓐᓃᑦ (iii) ᐃᓚᓯᓗᓂ ᐊᒥᓱᓕᖕᓂᒃ ᑭᐸᐋᓐᑉᑐᓂ ᐊᑐᓂ ᖃᐅᔨᒋᐊᕐᕕᐅᔪᓐᓇᖅᑐᓂ ᐊᒻᒪᓗ ᓴᖅᑮᔭᕝᕕᐅᔪᓂ ᐃᓂᐅᔪᓂᑦ ᐊᖏᓪᓕᒋᐊᖅᑎᐊᕐᔪᓪᓗᒋᑦ ᖃᐅᔨᔭᐅᔪᓐᓇᖅᑐᑦ ᒥᒃᓵᒃᑕᐅᓯᒪᔪᑦ ᐅᓄᕐᓂᖅᓴᓄᑦ ᓂᕈᐊᖅᑕᐅᓯᒪᔪᓄᑦ ᓇᓗᓇᐃᖅᓯᔾᔪᑎᓄᑦ. ᑭᙳᓂᐊᒍᑦ ᐱᓕᕆᖃᑎᖃᓚᐅᖅᑎᓪᓗᒋᑦ ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᒌᒃᑯᓐᓂ (MEWG) ᔫᓂ 2022–ᒥ, ᐸᕙᓐᓛᒃᑯᑦ ᐊᖏᓚᐅᖅᐳᑦ ᑲᔪᓯᔪᒪᓪᓗᑎᒃ ᐱᓕᕆᐊᖑᖕᓃᕈᓐᓇᖅᑐᒥᒃ #3–ᒥ, ᐱᖓᓱᓂᒃ ᑭᐸᓖᓐᑉᓯᑎᓯᒪᔪᓂᒃ ᐃᓕᐅᖅᑲᒃᑲᓐᓂᕐᓂᐊᖅᐳᑎᒃ ᑕᒪᐃᓐᓂᒃ ᖃᐅᔨᓴᕝᕕᐅᔪᓂᒃ ᐊᒻᒪ ᖃᐅᔨᒋᐊᕐᕕᐅᔪᓐᓇᖅᑐᓂᒃ 2022–ᒥ, ᐃᒪᐃᓕᖓᓕᕈᑕᐅᓪᓗᓂ ᑲᑎᙵᒋᑦ 13-ᙳᓕᕐᓗᑎᒃ ᑭᐸᓖᓐᑦ ᐊᑐᓂ ᐃᓂᒥ.

ᑕᒪᐃᓐᓂᒡᓕ, 2021-ᒥ ᖃᐅᔨᓴᕐᓂᕐᓂ ᖃᐅᔨᔭᐅᔪᑦ ᓇᓗᓇᐃᖅᓯᔪᑦ ᐱᓕᕆᐊᒥ ᐱᓕᕆᓃᑦ ᐅᓪᓗᒥᒨᑦ ᓵᖅᑭᓯᒪᙱᓪᓚᑦ ᐊᒃᑐᐃᓂᕐᓗᓐᓂᕐᓂᒃ ᐱᔾᔪᑎᓄᑦ ᐊᒻᒪᓗ ᐃᖅᑲᕐᒥᐅᑦ ᓄᓇᖏᓐᓄᑦ ᕿᙵᒍᐊᓂ ᑐᓇᒃᑕᕝᕕᖕᒥᑦ, ᑭᓯᐊᓂᓕ, ᒥᒃᓵᓴᒃᑕᐅᔪᑦ ᖃᐅᔨᓴᕈᑎᕙᓃᑦ ᖃᐅᔨᓂᕐᒧᑦ ᒥᒃᓵᓴᐃᔾᔪᑕᐅᔪᖅ ᐊᑦᑎᒃᑑᓂᖑᐃᕗᑦ ᖃᐅᔨᓴᙱᓂᐅᑉ ᐃᓗᓕᖅᑭᓂᑦ.

ᑕᕆᐅᒥ ᐃᖃᓗᐃᑦ ᓄᓇᖃᕝᕕᖏᑦ ᐊᖑᓂᒃᑕᐅᔪᓪᓗ ᑎᑎᕋᖅᓯᒪᔪᑦ (ᐅᖃᓕᒫᓚᑦ ᐊᕙᒃᑐᖅᓯᒪᓂᖏᑦ 6.0)

ᓈᒻᒪᒃᓯᕐᖁᓪᓗᒍ ᐅᔭᕋᖕᓂᐊᕈᓐᓇᐅᑎᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᒃ ᓈᓴᐅᑎᖓ 99(ᐱ)(ii), (ᑎ), 113, ᐊᒻᒪᓗ 114, ᖃᐅᔨᓴᒃᓴᕆᐅᖅᑐᖃᓚᐅᖅᑐᑦ ᖃᐅᔨᓴᖅᑕᐅᖁᓪᓗᒋᑦ ᐊᒃᑐᐊᒍᑦ ᐅᓄᕐᓂᖏᓐᓄᑦ ᑕᕆᐅᕐᒥᐅᑦ ᐃᖃᓗᐃᑦ (*Salvelinus alpinus*) ᐊᒻᒪ ᐊᓯᖏᑦ ᐃᖃᓗᐃᑦ ᐃᒪᕐᒥᐅᑕᐃᑦ ᕿᙵᕐᖃᓂ ᑐᓇᒃᑕᕝᕕᖕᒥᑭᔪᒃ. ᐊᒥᓱᑦ ᖃᐅᔨᓴᒃᓴᕆᐅᕐᓂᕐᓄᑦ ᐱᓕᕆᔾᔪᑏᑦ ᐊᑐᖅᑕᐅᓚᐅᖅᑐᑦ ᑐᕌᖓᖃᖅᑎᑕᐅᓪᓗᑎ ᐊᔾᔨᒌᙱᑦᑐᓂᑦ ᐆᒪᔪᓂᒃ ᓇᔪᖅᐸᒃᑕᖏᓐᓂᓪᓗ, ᐊᑐᖃᓯᐅᑎᓪᓗᒋᑦ ᒪᑎᑦᑕᐅᑏᑦ, ᐊᐅᓚᓵᕐᓃᑦ (ᐊᐅᓚᓵᖅ ᐊᒻᒪ ᑲᓕᓐᓃᑦ) ᐃᓯᕝᕕᐅᔪᓐᓇᖅᑐᑦ, ᒪᑦᑎᑦᑕᐅᑏᓚᐅᔦᑦ ᐃᓯᕝᕕᐅᔪᓐᓇᖅᑐᑦ, ᑲᓕᒃᓂᒃ ᐊᒻᒪ ᓂᖏᑦᑎᓂᖅ ᖃᔾᔮᓴᖅᑐᓂᒃ. ᑲᑎᑕᐅᔪᑦ ᐃᖃᓗᐃᑦ ᓇᓗᓇᐃᖅᑕᐅᓚᐅᖅᑐᑦ ᐊᒃᐸᓯᕈᒥᒃ ᐊᑐᖅᑕᐅᔪᓐᓇᖅᑐᒥ ᐆᒪᔪᑦ ᐊᕙᒃᑐᖅᓯᒪᓂᖏᓐᓄᑦ ᖁᕝᕙᓯᓕᕇᓄᑦ (ᐃᒪᐃᑦᑑᓚᔪᕐᒃᑎᒃ ᓂᕐᔪᑎᑦ ᐊᔾᔨᒌᙱᑦᑐᓄᑦ–ᖁᕝᕙᓯᓕᕇᑦ)

ᐅᑎᖅᑎᑕᐅᓚᐅᖅᑳᖅᑎᓐᓇᒋᑦ. ᐃᖃᓗᐃᑦ ᓇᓗᓇᐃᖅᑕᐅᓚᐅᙱᑦᑐᑦ ᓂᕐᔪᑏᑦ ᐊᔾᔨᒌᙱᑦᑐᓄᑦ−ᕐᑯᖏᕙᓯᓂᓄᑦ ᑕᐅᕙᓂ ᐱᔭᐅᓚᐅᖅᑐᑦ ᑭᖑᓂᖕᒫᒍᑦ ᓇᓗᓇᐃᖅᑕᐅᔪᓐᓇᕐᑯᓗᒋᑦ ᐃᓕᓴᕆᔭᐅᓯᒪᔪᓄᑦ ᓂᕐᔪᑏᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖏᓐᓄᑦ ᐊᒻᒪᓗ/ᐅᕝᕙᓘᓐᓃᑦ ᑭᓲᓂᕐᒧᑦ ᖃᐅᔨᓴᕐᕕᖕᒥ.

ᐃᖃᓗᒃᑕᑦ ᐱᔭᐅᔪᑦ 2021−ᒥ (n = 603 ᐃᖃᓗᐃᑦ) ᐊᒻᒪ 2020 (n = 852 ᐃᖃᓗᐃᑦ) ᐅᓄᕐᓂᖅᓴᐅᓚᐅᖅᐳᑦ 2014-2019−ᒥᓂ, ᐱᔾᔪᑕᐅᑐᐃᓐᓇᕆᐊᖃᖅᑐᖅ ᖃᐅᔨᓴᒃᓴᓕᐅᕈᓯᖕᓂᖅᓴᐅᓂᖏᓐᓄᑦ ᑖᒃᑯᓇᓂ ᐊᕐᕌᒍᓂ. ᓄᓇᖓᑕ ᖃᓄᐃᓕᖓᓂᖏᑦ ᐊᔾᐸᓗᒋᔭᐅᓚᐅᖅᑐᑦ ᑭᖑᓂᖕᒫᑦᑎᓐᓂ ᖃᐅᔨᓴᒃᓴᓕᐅᕐᓂᕐᒧᑦ ᐊᕐᕌᒍᔾᔪᓂ, ᓄᓇᓕᖕᓂ ᐃᖃᓗᓕᕆᔩᑦ ᐊᐅᔾᔭᒃᑯᑦ ᐃᖃᓗᒃᑕᓪᓗᐊᑕᖃᖅᖢᑎᒃ ᑕᕆᐅᕐᒥᐅᑕᓂᒃ, ᐅᑭᐅᖅᑕᖅᑐᕐᒥᐅᑕᑦ ᑲᓇᔪᐃᑦ (*Myoxocephalus quadricornis)* ᐊᒻᒪ ᑲᓇᔪᕐᓂᒃ (*Myoxocephalus scorpius).* ᑭᖑᓂᖕᒫᑦᑎᓐᓂ ᖃᐅᔨᓴᕐᓂᐅᓚᐅᖅᑐᑦ ᐊᕐᕌᒍᓂ, ᑖᒃᑯᐊ ᐱᖓᓱᑦ ᐊᔾᔨᒌᙱᑦᑐᑦ ᐆᒪᔪᑦ 90%−ᖏᓐᓂᓚᐅᖅᐳᑦ ᑲᑎᖅᓱᕆᑦ ᐊᖑᔭᐅᔪᑦ, ᐃᒪᐃᒃᑲᓗᐊᖅᑎᓪᓗᒍ 2020−ᒥ ᐊᒻᒪ 2021−ᒥ, ᐱᖓᓱᑦ ᐊᔾᔨᒌᙱᑦᑐᑦ ᐆᒪᔪᑦ 74%−ᖏᓐᓂᓚᐅᖅᐳᑦ ᑲᑎᖅᓱᕆᑦ ᐊᖑᔭᐅᔪᑦ, ᐅᑭᐅᖅᑕᖅᑐᒥ ᑲᓇᔪᑦ, ᐊᑯᑭᑦᑐᒥᐅᑦ ᐆᒐᖏᑦ, ᐊᒻᒪ ᑲᓇᔪᑦ ᑲᑎᖅᓱᕆᑦ ᓴᖅᑭᔮᖅᑎᑦᑎᔪᑦ 23%−ᖏᓐᓂᐸᓗᒃ ᑲᑎᖅᓱᕆᑦ ᐊᖑᔭᐅᔪᑦ.

8-ᖑᔪᑦ ᐊᔾᔨᒋᑦ ᐆᒪᔪᑦ ᐱᔭᐅᓚᐅᖅᑐᑦ ᐃᖃᓗᒐᓱᒃᑎᓪᓗᒋᑦ, ᐃᓚᐅᓪᓗᑎᒃ ᐊᑯᑭᑦᑐᒥᐅᑦ ᐆᒐᖏᑦ (*Gadus ogac*), ᐅᑭᐅᖅᑕᖅᑐᕐᒥᐅᑕᑦ ᑲᓇᔪᐃᑦ (*Myoxocephalus scorpioides*), ᓂᐱᓴᑦ (*Triglops pingelii*), ᑲᓇᔪᑦ (*Myoxochalus Scorpius)*, ᓇᒡᔪᖃᐅᖅᑐᑦ ᑲᓇᔪᑦ (*Gymnocanthus tricuspis*), ᓱᓗᒃᐸᐅᓚᑦ (*Aspidobiides) olrikii*), ᐃᖃᓗᑯᑖᑯᓗᐃᑦ (*Leptagonus decagonus*) ᐊᒻᒪ ᓂᒥᕆᐊᑦ (*Lycodes mucosus*). ᐱᔭᐅᔪᑦ ᑲᓇᔪᕋᓛᑦ, ᑐᕐᑯᖓᔪᓂᒃ ᓂᕆᕙᒃᑐᑦ ᐃᖃᓗᑯᓗᐃᑦ, ᐊᒻᒪ ᓱᓗᖅᐸᐅᓚᑦ ᑭᒡᓚᖅᑐᐃᕗᑦ ᓯᕗᓪᓕᖅᐹᒥ ᑎᑎᕋᖅᑕᐅᓚᐅᖅᑐᓂᒃ ᑖᒃᑯᓇᓂ ᐊᔾᔨᒌᙱᑦᑐᓂ ᐆᒪᔪᕐᓂᒃ 2014-2021 ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᐃᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᕐᒥ (MEEMP), ᐱᔾᔪᑕᐅᑐᐃᓐᓇᕆᐊᖃᖅᑐᖅ ᐅᓄᖅᓯᕚᓕᖅᓯᒪᓂᖏᓐᓄᑦ ᖃᐅᔨᓴᒃᓴᓕᐊᖑᔪᑦ ᐊᒻᒪ ᖃᐅᔨᓴᒃᓴᓕᐅᒃᑲᓂᕐᓃᑦ ᐱᓕᕆᔾᔪ]ᑦ ᐃᓚᓕᐅᔾᔭᐅᓯᒪᔪᑦ ᐱᓕᕆᐊᒧᑦ ᐊᕐᕌᒍᓂ ᐊᓂᒎᓯᖅᑐᓂᒃ.

ᑖᒃᑯᓇᓂ 6−ᖑᔪᑦ ᐃᖃᓗᖕᓄᑦ ᖃᐅᔨᓴᒃᓴᓕᐅᕐᓂᕐᒧᑦ ᐱᓕᕆᔾᔪᓯᑦ ᐊᑐᖅᑕᐅᓚᐅᖅᑐᑦ 2021−ᒥᑦ, ᐃᖅᑲᑦᑕᖅᐸᑎᒃ ᐃᖃᓗᖕᓂᖅᐹᖑᓚᐅᖅᑐᑦ ᑲᑎᓗᒃᑖᖅᐸᒋᑦ ᐃᖃᓗᒃᑕᐅᔪᓂ, ᑕᓪᓕᒪᓂᑦ ᐆᒪᔪᓂᒃ ᐊᕕᒃᑐᖅᓯᒪᔪᓂᑦ ᐱᓗᑎᒃ 43% ᑲᑎᖅᓱᕆᑦ ᐊᖑᓂᒃᑕᐅᔪᓕᒫᓂ, ᑭᖑᓂᐊᕈᑎᒃ ᒪᑎᑦᑕᐅᑎᓂᒃ ᐊᑐᖅᐸᑎᒃ ᖃᐅᔨᓴᒃᓴᖅᑖᕐᓃᑦ ᐱᓚᐅᖅᑐᑦ ᑕᓪᓕᒪᓂᑦ ᐆᒪᔪᓂᒃ ᐊᕕᒃᑐᖅᓯᒪᔪᓂᑦ 40% ᑲᑎᖅᓱᕆᑦ ᐊᖑᓂᒃᑕᐅᔪᑦ. ᐊᒥᐊᒃᑯᖏᑦ 17% ᑲᑎᖅᓱᕆᑦ ᐊᖑᓂᒃᑕᐅᔪᑦ ᑲᑎᖅᓯᖅᑕᐅᓚᐅᖅᐳᑦ ᑲᓕᕐᓄᑦ (12% ᐊᖑᓂᒃᑕᐅᔪᑦ, 9 ᐆᒪᔪᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᑦ ᐊᔾᔨᒌᙱᓐᓂᖏᓐᓄᑦ ᖃᐅᔨᔭᐅᔪᑦ), ᐃᓯᕐᕕᐅᔪᓐᓇᖅᑐᑦ (3% ᐱᔭᐅᔪᑦ, ᒪᕐᕉᒃ ᐆᒪᔪᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᑦ ᐊᔾᔨᒌᙱᓐᓂᖏᓐᓄᑦ ᖃᐅᔨᔭᐅᓪᓗᑎᒃ), ᐊᒻᒪ ᐃᓯᕐᕕᐅᔪᓐᓇᖅᑐᑦ ᒪᑎᑦᑕᐅᑎᓕᖅᓯᒪᔪᓂ ᖃᐅᔨᓴᒃᓴᑦ (12% ᐊᖑᓂᒃᑕᐅᔪᑦ, ᐊᑕᐅᓯᖅ ᐊᕕᒃᑐᖅᓯᒪᔪᑦ ᐊᔾᔨᒌᙱᓐᓂᖏᓐᓄᑦ ᖃᐅᔨᔭᐅᔪᑦ). ᐃᓯᕐᕕᐅᔪᓐᓇᖅᑐᑦ ᒪᑎᑦᑕᐅᑏᑦ ᐊᑐᖅᑕᐅᖃᓯᐅᔾᔭᐅᓕᓚᐅᖅᑐᑦ ᑕᐃᒃᑯᖓ ᐃᓚᓕᐅᔾᔭᐅᓚᐅᖅᐳᑦ ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐊᒃᑐᐃᓂᕐᓄᑦ ᖃᐅᔨᓴᐃᓐᓇᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᕐᒧᑦ (MEEMP) ᖃᐅᔨᓴᕈᑏᑦ ᐋᖅᑭᒃᓯᒪᓂᒃᓴᖓᓄᑦ 2021−ᒥ (ᒪᓕᒃᖢᒍ ᖃᐅᔨᓴᕈᑎᒋᔭᐅᓚᐅᖅᑐᖅ 2019−ᒥ) ᑐᙵᕕᒋᔭᐅᓪᓗᑎᒃ ᐊᑐᓕᕐᑯᔭᐅᔪᑦ ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᖏᒃᑯᓂ (MEWG) ᑭᖑᕝᕙᖅᑕᐅᕐᑯᓗᒋᑦ ᖃᐅᔨᓴᕈᑎᒃᓴᑦ ᐱᓕᕆᔾᔪᓯᖏᑦ ᐃᓯᕐᕕᐅᔪᓐᓇᖅᑐᑦ, ᐅᓄᙱᓗᐊᖅᑐᓂᒃ ᐱᔭᖃᑦᑕᖅᓯᒪᔪᑐᖃᐅᓕᕐᓂᖏᓐᓄᑦ. ᓂᖏᑦᑎᓂᖅ ᖃᕐᔪᒃᓴᖃᖅᑐᓂᒃ ᐃᓚᓕᐅᔾᔭᐅᓚᐅᖅᑐᑦ 2021−ᒥᑦ ᐊᖏᖅᓯᔭᐅᔪᑦ ᓇᐃᓴᐅᑖ 37−ᒥᑦ ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐱᓕᕆᖃᑎᖏᖕᓄᑦ (MEWG) (ᐅᐃᒍᖅ 1A−ᒥᑦ ᒎᑐᒃᑯ 2021−ᒥᑦ) ᑐᕌᒐᖅᑲᐳᓐᓇᕐᑯᓗᒋᑦ ᐊᖏᔪᓂᑦ ᐃᖃᓗᖕᓂᑦ; ᑭᓯᐊᓂᓕ, ᐱᓕᕆᓇᓱᖕᓂᖏᑦ ᑲᔪᓯᑎᐊᓚᐅᙱᑦᑐᑦ (ᐊᖑᓂᙱᑦᑎᐊᒻᒪᕆᒃᖢᑎᒃ).

ᒪᕐᕉᒃ ᐊᔾᔨᒌᙱᑦᑑᒃ ᐃᖃᓗᓕᓯᒻᕕᐅᔫᒃ (FAs) ᓇᓗᓇᐃᖅᑕᐅᓚᐅᖅᐳᑦ ᖄᖑᐊᓂ ᑐᓚᒃᑕᕐᕕᖕᒥ ᑐᙵᕕᒋᔭᐅᓪᓗᑎᒃ ᓇᔪᒐᖏᑦ ᓇᓃᓐᓂᖏᓪᓗ ᐊᒃᑐᐊᔪᑦ ᒫᓐᓇ ᑐᓚᒃᑕᕐᕕᖕᒥ ᐱᕐᑯᑎᕐᔪᐊᓄᑦ ᐊᒻᒪ ᐊᐅᓚᓂᕐᒧᑦ ᐱᓕᕆᐊᓄᑦ. ᑕᒪᓐᓇ ᐱᖃᓯᐅᔾᔨᓚᐅᖅᑐᑦ ᐱᓕᕆᐊᒥᓪᓚᑦᑖᖅ ᐃᓂᐅᔪᑦ (DPF) ᐃᓂᖏᓐᓂᒃ ᐊᒻᒪᓗ ᐊᒃᑐᐊᓪᓚᖓᙱᑦᑐᑦ ᐱᓕᕆᐊᒥ ᐃᓂᐅᔪᓂᒃ (IPF) ᐃᓂᖏᓐᓂᒃ. ᐃᖃᓗᓕᓯᒻᕕᐅᔪᑦ (FAs) ᐊᑐᖅᑕᐅᓇᓱᒃᑐᑦ ᐃᑲᔪᕐᑯᓗᒋᑦ ᐊᔾᔨᒌᓕᖅᑎᑦᑎᓂᖅ ᖃᐅᔨᓴᓴᒃᓴᓕᐅᕋᓱᒃᑐᓂᒃ ᐊᒻᒪᓗ ᑲᒪᒋᔭᐅᓗᑎᒃ ᐊᔾᔨᒌᖃᑦᑕᙱᓐᓂᖏᓐᓄᑦ ᐊᖑᓂᒃᑕᐅᔪᑦ ᑎᑎᖅᑲᖅᑯᑎᖏᑦ ᖄᖑᐊᓂᓗᒃᑖᖅ. ᐊᑐᖅᐸᑦ 2020 ᐊᒻᒪᓗ 2021 ᑎᑎᖅᑲᕐᑯᑏᑦ, ᐊᖑᓂᒃᑕᐅᔪᑦ ᐊᑐᓂ ᐊᖑᓇᓱᒃᑕᐅᔪᓂ (CPUE) ᖃᓄᐃᓐᓂᖅᓴᐅᖕᒪᖔᑕ ᖃᐅᔨᒋᐊᖅᑕᐅᓯᒪᔪᑦ ᐃᖃᓗᓕᓯᒻᕕᐅᔪᓂ (FAs) ᐊᒻᒪᓗ ᐊᕐᕌᒍᓂ ᐊᑐᖅᐸᑎᒃ ᖃᐅᔨᓴᕈᓯᕐᒥᒃ ᐊᔾᔨᒌᖃᑦᑕᙱᑦᑐᑦ (ANOVA). ᓇᐃᓴᐅᑎᑎᖑᑦ ᐊᔾᔨᒌᙱᕐᔪᐊᖅᑐᖃᙱᒃᑲᓗᐊᖅᑎᓪᓗᒍ ᐃᖃᓗᐃᑦ ᐱᑕᖃᕐᓂᖏᓐᓄᑦ ᓇᓗᓇᐃᖅᑕᐅᔪᓂ ᑕᐃᒃᑯᓇᓂ ᐃᖃᓗᓕᓯᒻᕕᐅᔪᓂ (FAs), ᐃᖃᓗᐃᑦ ᐱᑕᖃᕐᓂᖏᑦ ᐅᓄᕐᓂᖑᓚᐅᖅᑐᑦ ᐃᓗᐊᓂ ᐱᓕᕆᐊᒥᓪᓚᑦᑖᖅ ᐃᓂᐅᔪᒥ (DPF) ᐃᖃᓗᓕᓯᒻᕕᐅᔪᓂ (FA). ᐃᖅᑲᑦᑕᕐᓂᒃᑯᑦ ᐊᖑᓂᒃᑕᐅᔪᑦ ᐊᑐᓂ ᐊᖑᓇᓱᒃᑕᐅᔪᓂ (CPUE) ᐊᔾᔨᒌᖕᕐᔪᐊᓃᖑᖅᑲᑦᑕᓚᐅᖅᑐᑦ ᐊᕐᕌᒍᓂ; ᑭᓯᐊᓂᓕ, ᖃᐅᔨᓴᕈᑏᑦ ᑭᒡᓕᓕᖅᑕᐅᓯᒪᓚᐅᖅᑐᑦ ᐅᓄᙱᓐᓂᖏᓐᓄᑦ ᖃᐅᔨᓴᒃᓴᓕᐊᖑᔪᑦ, ᐃᓚᖏᑦ ᒪᓕᙱᓗᑎᒃ ᖃᐅᔨᓴᒃᓴᓕᐅᕐᓂᕐᒧᑦ ᐋᕐᕌᒍᓂ ᐱᔪᑎᖃᖅᐸᑎᒃ ᐱᖁᑏᑦ ᖃᓄᐃᑦᑑᓂᖏᑦ ᐊᒻᒪᓗ ᖃᐅᔨᓴᒃᓴᓕᐅᕐᕕᐅᔪᖅ ᐃᓂᒥᒃ.

ᑕᒪᐃᓐᓂᒡᓕ, ᐃᖃᓗᓕᓯᒍᓰᑦ ᐊᑑᑎᖃᕆᔭᐅᓚᐅᖅᑐᑦ ᓇᓗᓇᐃᕐᓯᐊᕐᓗᒋᑦ ᑕᕆᐅᒥ ᐃᖃᓗᐃᑦ ᓄᓇᖏᓐᓂ ᐆᒪᔪᐃᑦ ᐊᔾᔨᒌᖕᓂᖏᓐᓂᑦ ᐱᑕᖃᖕᓂᖏᓐᓄᑦ ᖃᓄᖅ ᐊᒥᒎᓂᖏᓐᓄᑦ. ᐃᖃᓗᖕᓂᒃ ᖃᐅᔨᓴᒃᓴᓕᐅᕐᓃᑦ 2020-ᒥ ᐊᒻᒪ 2021-ᒥ ᓴᖅᑭᑦᑎᑕᐅᓚᐅᖅᐳᑦ ᐊᔾᐸᓗᖏᓐᓂᒃ ᓇᐃᓴᐅᑎᓂᒃ ᐊᒻᒪ ᐃᓚᖏᓐᓂᒃ ᑭᒡᓕᖅᑐᐃᔪᓂᒃ ᐃᖃᓗᖃᕐᓂᖅᐹᖏᓐᓂ ᖄᖑᐊᓂ ᑐᓇᒃᑕᕐᕕᖕᒥ (ᑕᕆᐅᕐᒥᐅᑕᑦ ᐃᖃᓗᐃᑦ, ᑲᓇᔪᑦ ᐊᒻᒪ ᑲᓇᔪᕋᓛᑦ) ᐊᕐᕌᒍᓂ ᐊᓂᒍᖅᑐᓂᒃ. ᓇᓗᓇᐃᔭᖅᑕᐅᓂᖏᑦ ᐃᖃᓗᓕᓯᒻᕕᐅᔪᑦ (FAs) ᐊᒻᒪᓗ ᐊᔾᔨᒌᓕᖅᑎᑦᑎᓂᖅ ᐃᖃᓗᓕᓯᒍᓯᕐᓂᒃ

ᐊᑐᐃᓐᓇᕈᐃᓚᐅᖅᑐᑦ ᖃᐅᔨᓴᕐᓂᓪᓚᑦᏟᒥᒃ ᐋᖅᑭᒃᓯᒪᔪᒥᒃ ᐊᖑᓂᒃᑕᐅᕚᒃᑐᑦ ᓇᐃᓴᐅᑎᖏᓐᓂᒃ ᖃᓄᐃᓐᓂᖅᓴᐅᖅᒪᖔᑕ ᖃᐅᔨᓴᖅᑕᐅᔪᓐᓇᖅᑐᓂᒃ ᖃᐅᔨᓴᖅᑎᓪᓗᒋᑦ ᖃᓄᐃᓕᖓᓕᖅᐸᖕᓂᖏᑦ ᐅᓄᕐᓂᖏᓐᓄᑦ ᐱᑕᖃᕐᓂᖏᓐᓄᓪᓗ ᐃᖃᓗᐃᑦ ᕿᙵᐊᓂ ᓯᕗᓂᒃᓴᒧᓰᖓᖅ.

ᐃᖃᓗᐃ ᖃᓄᐃᙱᑦᑎᐊᕐᓂᖏᑦ ᓄᑭᖓᑕᓗ ᖃᓄᐃᓕᖓᓂᖏ (ᐅᖃᓕᒫᒐᑦ ᐊᑲᒃᑐᖅᓯᒪᓂᖏᑦ 7.0)

ᐃᖃᓗᐃᑦ ᖃᓄᐃᙱᑦᑎᐊᕐᓂᖏᑦ ᓂᕿᖓᑕᓗ ᖃᓄᐃᓕᖓᓂᖏᑦ ᐊᒃᑐᐊᔪᑦ ᐅᔾᔪᕐᓂᐊᕈᓐᓇᐅᑎᒧᑦ ᒪᓕᒃᑕᐅᔪᓇᐊᓖᑦ ᓇᐃᓴᐃᑎᖓ 76, 83 (ᐃ), 87, 99 (ᐃ), 99 (b) (ii), 99 (ᑎ), 113, ᐊᒻᒪᓗ 114. ᐃᖃᓗᐃᑦ ᖃᓄᐃᙱᑦᑎᐊᕐᓂᖏᓐᓄᑦ ᑎᑎᕋᖅᑲᖅᑰᑦ ᑲᑎᑕᐅᔪᑦ ᖃᓇᔾᓄᑦ (*Myoxocephalus quadricornis*) and *ᐊᒻᒨᒪᔪᑦ* (*H. arctica*, wrinkled rock-borer) 2021-ᒥ ᐊᑐᖅᑐᑎᒃ ᐱᔨᕆᔾᔪᓯᕐᓂᒃ ᒪᓕᒃᑐᓂᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᕐᒧᑦ ᐱᑕᖃᕆᐊᓖᑦ ᒪᓕᒃᑕᐅᓪᓗᑎᒃ ᓴᕿᔭᐃᑦ ᐊᒻᒪᓗ ᐅᔾᔪᑦ ᑎᓯᔪᑦ ᓴᓗᒻᒪᖅᓴᖅᓯᒪᔪᑦ ᐃᒥᑦ ᒪᓕᒐᖏᑦ (MDMER; ᑲᓇᑕᒥ ᒐᕙᒪᒃᑯᑦ 2002).

ᑐᙵᕕᒋᓪᓗᒋᑦ ᐃᓗᐊᓂ ᓯᓚᑖᓂᓗ ᖃᐅᔨᓴᖅᑕᐅᓃᑦ, ᑲᓇᔪᐃᑦ ᕿᙵᐊᓂᕈᔪᒃ 2021–ᒥ ᖃᓄᐃᙱᑦᑎᐊᖅᑯᖏᓚᐅᖅᑐᑦ. ᖃᐅᔨᓴᒐᒃᓴᑦ ᐱᕕᒃᓴᖏᑦ ᓈᒻᒪᓚᐅᖅᐳᑦ ᖃᐅᔨᓴᖅᑕᐅᓂᐊᖅᑎᓪᓗᒋᑦ ᐃᕐᓂᐅᖅᑐᑦ ᑲᓇᔪᑦ ᐊᒻᒨᒪᔪᐃᓪᓗ (*H. arctica*) ᑐᑭᑖᖅᑲᓂ ᓈᒻᒪᓈᖅᓯᒪᔪᖅ ᕿᑐᕐᖏᐅᕈᑎᖏᑦ ᐱᕙᓪᓕᐊᓂᖏᑦ ᑕᐃᒪᐃᓯᒪᔪᑦ ᖃᐅᔨᓴᖅᑕᐅᕐᑯᓪᓗᒋᑦ ᕿᑐᕐᖏᐅᕈᑎᖏ ᑐᑭᑖᕈᑎᖏᑦ (ᓱᕐᓗ ᕿᑐᕐᖏᐅᕐᓂᕐᒧᑦ ᓇᓗᓇᐃᔭᖅᓯᒪᔪᑦ [GSI]). ᐊᒻᒨᒪᔪᑦ ᐱᔭᐅᔪᑦ 2021-ᒥ ᖃᓄᐃᙱᑦᑎᐊᖅᑯᖏᓚᐅᕐᒥᔪᑦ. ᕿᑐᕐᓂᐅᕐᓂᕐᒧᑦ ᑐᑭᑖᕈᑎᖏᑦ ᓴᖅᑮᔭᖅᑎᑦᑎᓚᐅᖅᑐᑦ ᐊᒃᑐᐊᔪᑦ ᐊᔾᔨᙱᑦᑐᐊᕐᔪᖃᑦᑕᕐᓂᖏᓐᓄᑦ ᑕᒪᕐᒥᖕᓄᑦ ᐊᔾᔨᙳᖏᑦᑐᓄᑦ ᐆᒪᔪᓄᑦ. ᐋᓐᓂᐊᖃᖅᑕᐃᓕᒪᓂᕐᒧᑦ ᑎᑎᕋᖅᑲᖅᑰᑦ 2021-ᒥ ᖃᓄᐃᓐᓂᖅᓴᐅᖅᒪᖔᑕ ᕿᒥᕐᕈᔭᐅᓚᐅᖅᑐᑦ ᑖᒃᑯᓄᖓ 2020-ᒧ; ᑕᒪᒃᑯᐊ ᐊᔾᔨᙱᖅᑐᐊᕈᑏᑦ ᖃᐅᐃᔨᔭᐅᓚᐅᖅᑐᑦ ᖃᓄᐃᑑᓂᖓᓄᑦ, ᐊᖏᓂᖓᓄᑦ ᐊᔾᔨᙱᖅᑐᐊᕈᑏᑦ ᒥᑭᑐᑦᑐᓚᐅᖅᑐᑦ (<10%). ᕿᑐᕐᓂᐅᕐᓂᕐᒧᑦ ᐊᑐᖅᑕᐅᔪᑦ ᐊᒻᒨᒪᔪᓄᑦ ᖃᓄᐃᓐᓂᖅᓴᐅᖅᒪᖔᑕ ᖃᒪᕆᔭᐅᔪᓐᓇᓚᐅᙱᑦᑐᑦ ᑭᖑᓂᖕᖔᑦᑎᓐᓂ ᐊᕐᕋᒍᓂ ᕿᑐᕐᖏᐅᕈᓇᐅᑎᖏᑦ ᐱᔭᐅᖃᑦᑕᓚᐅᙱᓐᓂᖏᓐᓄᑦ.

ᐃᖃᓗᐃᑦ ᓂᕿᖏᓐᓂᙳᖅᑐᖅ ᖃᐅᔨᔭᐅᔪᑦ ᑕᕆᐅᕐᒥᐅᑕᓄᑦ ᐃᖃᓗᖕᓂ ᖃᐅᔨᓴᒐᒃᓴᓕᐊᖑᔪᓂ 2021–ᒥ ᐊᔾᔨᐸᓗᒋᕙᖏᑦ ᐊᑐᖅᑕᐅᕚᒃᑐᑐᖃᕕᓂᕐᓄᑦ ᑲᑎᖅᑕᐅᓯᒪᔪᓄᑦ ᑎᑎᖅᑲᕐᑯᑎᓄᑦ ᕿᙵᐊᓂ ᑐᓚᒃᑕᕐᕕᐅᑉ ᖃᓂᒌᔭᓄᑦ ᑕᐃᒪᙵᑦ 2010–ᒥ. ᖃᐅᔨᔭᐅᔪᑦ ᑲᓇᔪᕐᓂᑦ ᐊᒻᒪ *ᐊᒻᒨᒪᔪᓂᑦ* (*H. arctica*) ᐊᔾᔨᐸᓗᒋᓚᐅᕐᒥᔭᖏᑦ ᑎᑎᕋᖅᓯᒪᔪᑦ ᖃᐅᔨᓴᖅᑕᐅᓂᑯᐃᑦ ᓄᐊᑕᐅᓯᒪᔪᑦ ᒫᓐᓇᓕᓴᑦ ᓴᕕᕋᔭᓐᓄᑦ. ᓇᐃᓴᑎᖏᑦ ᐅᔾᔨᕐᓇᖅᑐᒥᒃ ᐅᓄᖅᓯᕚᓪᓕᖅᓯᒪᔪᑦ ᖃᐅᔨᔭᐅᓚᐅᖅᑐᑦ ᑕᐃᒪᙵᑦ 2018–ᖑᓚᐅᖅᑎᓪᓗᒍ ᐃᓚᖏᓐᓄᑦ ᓱᕈᕐᓇᖅᑐᓄᑦ ᐃᔅᒫᓘᑕᐅᑐᐃᓐᓇᓇᐊᓕᖕᓄᑦ ᑕᕆᐅᕐᒥᐅᑕᓄᑦ ᐃᖃᓗᖕᓄᑦ *ᐊᒻᒨᒪᓄᑦ* (*H. arctica*) (ᓲᕐᓗ, ᓴᕕᖅᓴᒃ ᐊᒻᒪ ᐋᖅᑭᒃᓱᖅ); ᑭᓯᐊᓂ, ᐊᔾᔨᙱᖅᑐᓂᖏᑦ ᒥᑭᑦᑐᑯᓘᓚᐅᖅᑐᑦ (<100%) ᐊᔾᔨᙱᖅᑲᔪᒃᑯᑎᒃ, ᓇᓗᓇᐃᖅᓯᑐᐃᓐᓇᓇᐊᖅᑲᖅᑯᑎᒃ ᐊᔾᔨᙱᖅᑐᓂᖏᓐᓂᒃ ᑕᒪᐃᓐᓂᒃ ᐆᒪᔪᑦ ᐊᔾᔨᙱᑦᑐᑦ ᐊᒻᒪ ᑭᖑᓂᐊᒍᑦ ᓴᕕᖅᓴᑖᖃᑦᑕᕐᓂᖏᑦ, ᑕᑯᒃᓴᐅᑎᑕᐅᔪᑦ ᕿᓂᖏᓐᓂᒃ.

ᓂᖏᓕᒫᖏᓐᓄᑦ ᖃᐅᔨᓴᒐᒃᓴᑦ ᑕᕆᐅᕐᒥᐊᑕᓄᑦ ᐃᖃᓗᖕᓄᑦ, ᑲᓇᔪᕐᓄᑦ ᐊᒻᒪ *ᐊᒻᒨᒪᔪᓄᑦ* (*H. arctica*) ᑲᑎᑕᐅᔪᑦ 2018–ᒥᑦ 2021–ᒧᑦ ᑐᖔᓃᓚᐅᖅᑐᑦ ᐋᓐᓂᐊᖃᕐᓇᙱᑦᑐᓕᕆᔾᔪᑎᒃᑯᑦ ᑲᓇᑕᒥ ᐊᖏᕇᕆᔭᖓᓂ ᐃᓚᐅᕈᑎᒃᓴᓄᑦ ᓱᕈᕐᓇᖅᑐᓄᑦ ᓂᕿᓂ ᐊᕿᕐᕉᔭᖅᑲᕐᓂᕐᒧᑦ ᖃᐅᔨᒪᔾᔪᑎᓂᑦ (ᐋᓐᓂᐊᖃᕐᓇᙱᑦᑐᓕᕆᔾᔪᑎᒃᑯᑦ ᑲᓇᑕᒥ 2015) ᑐᖔᓂᖅᑎᒡᓗ ᐳᓇᑎᒃ ᑲᓚᐱᐊᒥ ᒥᓂᔅᑕᖅᑲᕖ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ ᐃᖃᓗᐃᑦ ᓂᕿᖏᓐᓄᑦ ᒪᓕᒐᒃᓴᖏᓐᓂ ᒪᕋᒃᓴᒧᑦ (selenium) (ᐳᓇᑎᒃ ᑲᓚᐱᐊᒥ ᒥᓂᔅᑕᖅᑲᕖ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ (MOE) 2014). ᐊᒃᑐᐃᓂᐊᕋᑦᓯᕆᔭᐅᔪᑦ ᑎᑎᕋᖅᑕᐅᕆᐊᙵᖅᑎᓪᓗᒍ ᑭᖑᓪᓕᖅᐹᖅᓯᐅᑏᑦ ᐊᕙᑎᒧᑦ ᐊᒃᑐᐃᓂᕐᒧᑦ ᐅᓂᒃᑳᓂ (FEIS). (ᐹᕗᓐᑏ 2012) ᓇᓚᐅᑦᑖᓚᐅᖅᐳᑦ ᑐᖔᓃᓐᓂᐊᕋᓱᕆᔭᐅᓪᓗᑎᒃ ᐃᓚᖏᓐᓄᑦ ᐆᒪᔪᖃᕕᐅᔪᑦ ᑭᓪᓕᖏᓐᓂ, ᓱᕐᓗ ᐃᒪᐅᑉ ᖃᓄᐃᓐᓂᖓ ᐊᒻᒪ ᑕᕆᐅᕐᒥᑦ ᐃᖃᓗᐃᑦ ᓂᕿᖓᓄᑦ ᐃᓚᐅᕈᑎᒃᓴᑦ, ᑭᓯᐊᓂ ᓇᓗᓇᐃᖅᑕᐅᓪᓗᑎᒃ ᑖᒃᑯᐊ ᐊᓯᔾᔨᖅᑐᑦ ᐅᔾᔨᕐᓇᓗᐊᙱᓐᓂᖏᓐᓂᒃ.

ᐊᑕᖏᖅᑯᒋᑦ, ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕈᑎᑦ ᑎᑎᖅᑲᖅᑰᑦ 2021-ᒥ ᒪᓕᒃᑐᑦ ᑭᖑᓪᓕᖅᐹᖅᓯᐅᑏᑦ ᐊᕙᑎᒧᑦ ᐊᒃᑐᐃᓂᕐᒧᑦ ᐅᓂᒃᑳᓂ (FEIS) ᓇᓚᐅᑦᑖᖅᑕᐅᔪᓄᑦ, ᓇᓕᐊᑐᐃᓐᓇᖅ ᐅᔾᔨᕆᔭᐅᔪᑦ ᐊᓯᔾᔨᕐᓃᑦ ᒥᑭᑦᑑᓗᔪᖅᒪᑕ - ᐋᖅᑭᒃᑕᐅᓯᒪᔪᓂ ᖃᐅᔨᒪᔾᔪᑕᐅᔪᓃᖅᑎᓪᓗᓐᓃᑦ ᒪᓕᒃᑲᓗᐊᖅᑎᓪᓗᒋᓪᓗ ᐱᒋᐊᕈᑕᐅᔪᓄᑦ ᖃᐅᔨᓴᕈᑎᓄᑦ ᖃᓄᐃᓕᖓᓂᖏᓄᑦ. ᒫᓐᓇᐅᔪᖅ, ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᖅ ᓇᓗᓇᐃᖅᓯᔪᖅ ᐊᒃᑐᐃᓗᐊᖅᑕᐃᓕᑎᑦᑎᓂᖅ ᐊᐅᓚᖓᑕ ᐊᑑᑎᒃᓴᖏᓐᓄᑦ ᐊᒻᒪᓗ ᐱᓕᕆᐊᒧᑦ ᖃᓄᐃᓕᐅᕐᓂᐅᔪᑦ ᐊᐅᓚᑕᐅᓪᓗᑎᒃ ᓴᖅᑭᑎᑦᑎᓯᒪᙱᑦᑐᒥᒃ ᐊᒃᑐᐃᓂᕐᓗᖕᓂᐅᔪᒥᒃ ᐃᒪᕐᒥᐅᑕᐃᑦ ᐊᕙᑎᖏᓐᓂᑦ. ᐅᓪᓗᒥᒧᑦ, ᓴᓇᔭᐅᔪᑦ ᐊᒻᒪ ᐊᐅᓚᓂᕐᓂᑦ ᐱᓕᕆᐊᑦ ᕿᙵᐊᓂ ᑐᓚᒃᑕᕐᕕᖕᒥ ᐱᐅᙱᑦᑐᒥᒃ ᐊᒃᑐᐃᔾᔭᐅᖅᑰᙱᖦᖢᑎᒃ ᐃᖃᓗᐃᑦ ᖃᓄᐃᙱᑦᑎᐊᕐᓂᖏᓐᓄᑦ ᐅᕝᕙᓘᓐᓃᑦ ᓂᕿᖏᓐᓄᑦ ᐃᓚᐅᕈᑎᒃᓴᓄᑦ ᕿᙵᐊᓂ ᑐᓚᒃᑕᕐᕕᖕᒥ. ᓯᕗᒧᐊᒃᑎᓪᓗᑕ, ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓃᑦ ᑲᔪᓯᓂᐊᖅᑐᑦ ᑲᓚᖏᔭᐅᖏᓐᓇᖁᓪᓗᒋᑦ ᐱᕕᒃᓴᓇᑎᑕᐅᔪᓂᒃ ᑎᑎᕋᖅᓯᒪᔪᓂᒃ ᑕᕆᐅᕐᒥᐅᑕᓄᑦ ᐃᖃᓗᖕᓄᑦ ᐱᑕᖃᕐᑯᓪᓗᒋᑦ ᐱᒋᐊᕈᑎᒃᓴᑦ ᑲᓇᔪᕐᓄᑦ ᐊᒻᒪ ᐊᒻᒨᒪᔪᕐᓄᑦ *(H.*

***arctica).* ᖃᓄᐃᙱᑦᑎᐊᕐᓂᖏᓐᓄᑦ ᓂᕿᖏᓐᓄᓪᓗ ᐃᓚᐅᕈᑎᒃᓴᓕᕆᓂᕐᒧᑦ ᑐᙵᕕᐅᓕᕐᓂᐊᖅᑐᑦ ᓱᕗᓂᒃᓯᒥ ᖃᓄᐃᓐᓂᖅᓴᐅᓕᕐᒪᖔᑕ ᖃᐅᔨᒋᐊᕈᑎᒃᓴᓄᑦ.**

ᑕᒫᓂᕐᒥᐅᑕᐅᙱᑦᑐᑦ ᐆᒪᔪᕋᓛᑦ (NIS)/ᐃᒫᓂ ᑎᑭᑉᐸᒃᑐᑦ ᐆᒪᔪᕋᓛᓂᒃ (AIS) ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓂᖅ (ᐅᖃᓕᒫᒐᑦ ᐊᕕᒃᑐᖅᓯᒪᓂᖏᑦ 8.0)

ᐊᑕᖏᑦᑎᐊᖅᓯᒪᔪᒥᒃ ᖃᐅᔨᓴᐅᑉᓴᓕᐅᕐᓂᖅ ᕿᙵᐊᓂ ᑕᕆᐅᑉ ᐊᕙᑎᖏᓐᓂᑦ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᖏᓐᓇᕐᓗᑎᒃ ᐱᑕᖃᓕᕐᒪᖔᑕ ᑕᒫᓂᕐᒥᐅᑕᐅᙱᑦᑐᑦ ᐆᒪᔪᐃᑦ (NIS) ᐊᒻᒪ ᐃᒫᓂ ᑎᑭᑉᐸᒃᑐᑦ ᐆᒪᔪᕋᓛᑦ (AIS), ᓈᒻᒪᒃᓯᕐᑯᓪᓗᒍ ᐅᔭᕋᖕᓂᐊᕈᓐᓇᐅᑎᒧᑦ ᒪᓕᒃᑕᐅᔭᕆᐊᓕᒃ ᓇᐃᓭᐅᑏᑦ 87, 89, ᐊᒻᒪ 91. ᑖᓐᓇ ᐱᓕᕆᐊᖑᔪᖅ ᐱᖃᓯᐅᔾᔨᔪᖅ ᑕᒪᕐᒥᙵᓂᒃ ᑐᕋᖓᕆᔭᐅᔪᓂᒃ (ᓲᕐᓗ ᐃᖅᑲᖓᓂ ᐱᔭᐅᔪᑦ, ᓄᓇᖓᑕ ᓇᑎᖓᓂ) ᐊᑕᖏᕐᓗᒋᓪᓗ (ᓲᕐᓗ, ᖃᐅᔨᓴᖅᓯᓂᖅ ᑕᒪᐃᓐᓂᑦᑎᐊᖅ ᐆᒪᔪᓂᒃ ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᓂᒃ ᑕᕆᐅᑉ ᐊᕙᑎᖓᓄᑦ ᐊᒃᑐᐃᓂᒃᓄᑦ ᖃᐅᔨᓴᐃᓐᓇᕐᓂᒃᒧᑦ ᐱᓕᕆᐊᒥᑦ (MEEMP) ᐃᓗᓕᖏᓐᓂᒃ, ᓲᕐᓗ ᐃᖃᓗᙵᓂᒃ ᐱᕈᖅᑐᕋᓛᓂᓪᓗ ᖃᐅᔨᓴᕐᓃᑦ) ᖃᐅᔨᓴᐅᑉᓴᓕᐅᕋᓱᖕᓃᑦ. ᐆᒪᔪᓕᒫᑦ ᐊᔾᔨᒌᙱᑦᑕᕈᓘᔭᖅᑐᑦ ᖃᓄᐃᓐᓂᖅᓴᐅᖕᒪᖔᑕ ᐊᕕᒃᑐᖅᓯᒪᓂᖏᓐᓄᑦ ᐃᓕᐅᖅᑲᖅᑕᐅᓯᒪᔪᑦ ᖃᐅᔨᓴᖅᑕᐅᕙᑦᑐᑦ ᕿᙵᐊᓂᑦ, ᐱᕙᓪᓕᐊᑎᑕᐅᓯᒪᔪᑦ ᐱᓕᕆᕙᓪᓕᐊᑎᓪᓗᒋᑦ (ᐱᒋᐊᖅᓱᑎᒃ ᓯᕗᓂᐊᒍᑦ–ᐱᓕᕆᐊᑉ ᐱᒋᐊᕈᑕᐅᔪᑦ ᖃᐅᔨᓴᕈᑏᑦ) ᓄᑖᙳᕆᐊᖅᑕᐅᕙᒃᓱᑎᓪᓗ ᐊᕐᕌᒍᑕᒫᑦ. ᑎᑎᖅᑲᐃᑦ ᕿᒥᕐᕈᔭᐅᓲᑦ ᓇᓕᐊᕐᓄᑐᐃᓐᓇᖅ ᐊᕕᒃᑐᖅᓯᒪᔪᓄᑦ ᐃᓚᒋᔭᐅᙱᑦᑐᑦ ᓇᐃᓴᐃᓂᕐᒧᑦ ᓇᓗᓇᐃᖅᑕᐅᖁᓪᓗᒋᑦ ᑕᒪᐃᓪᓗᐊᕐᒪᖔᑕ ᑎᑎᕋᖅᑕᐅᓯᒪᓂᖏᑦ ᐃᓚᖃᖕᒪᖕᖏᑦ ᐅᐊᓐᓇᖓᓂᑦ ᐊᑦᑏᓐᑎᒃ, ᐅᑭᐅᖅᑕᖅᑐᒥᑦ ᐊᒻᒪᓗ/ᐅᕝᕙᓘᓐᓃᑦ ᑲᓇᑕᐅᑉ ᐅᑭᐅᖅᑕᖅᑐᖓᑕ ᐃᒪᖏᓐᓂ; ᐊᒻᒪ ᓱᓕ, ᑖᒃᑯᐊ ᐊᕕᒃᖅᓯᖅᓯᒪᔪᑦ ᓇᑭᙶᕈᓘᔭᖅᑐᑦ ᑕᒪᐃᓐᓄᑦ ᓄᓇᕐᔪᐊᕐᒥ ᐊᒻᒪ ᓄᓇᖓᓂ ᖃᓇᓴᐅᔭᒥ ᑎᑎᕋᖅᓯᒪᔪᑦ ᖃᐅᔨᒪᔭᐅᔪᑦ ᑎᑭᑉᐸᒃᑐᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᓃᑦᑐᑦ (ᓲᕐᓗ, ᒌᓐᓇᐅ ᐊᑕᖏᖅᓱᑎᒃ 2008) ᐅᕝᕙᓘᓐᓃᑦ "ᐱᒋᐊᕈᑏᑦ ᑎᑎᕋᖅᓯᒪᔪᑦ". ᐅᔾᔨᕆᔭᐅᓇᓱᒃᐸᒃᑐᑦ ᐃᓗᓕᖅᑲᖅᑐᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᓂ ᐃᓱᒪᒋᔭᐅᖃᓯᐅᑎᓪᓗᑎᒃ ᐊᑦᑕᕐᓇᓗᐊᕋᓱᒋᔭᐅᙱᑦᑐᑦ (ᓲᕐᓗ, ᑎᑎᕋᖅᑕᐅᓯᒪᙱᑦᑐᑦ ᐃᒫᓂ ᑎᑭᑉᐸᒃᑐᑦ ᐆᒪᔪᕋᓛᑦ (AIS) ᖃᓇᓴᐅᔭᒃᑯᑦ ᑐᖅᑯᖅᑐᐃᕕᖓᓂ ᑭᓯᐊᓂ ᑲᓇᑕᐅᑉ ᐅᑭᐅᖅᑕᖅᑐᖓᓂ ᐃᓚᒋᔭᐅᙱᑦᑐᑦ ᓈᒻᒪᒋᔭᐅᔪᓄᑦ ᑎᑎᕋᖅᑕᐅᓯᒪᔪᓄᑦ) ᐅᕝᕙᓘᓐᓃᑦ ᐊᑦᑕᕐᓇᖅᑐᒦᕐᔪᐊᖅᑐᓄᑦ (ᓲᕐᓗ, ᑎᑎᕋᖅᓯᒪᔪᑦ ᐃᒫᓂ ᑎᑭᑉᐸᒃᑐᑦ ᐆᒪᔪᕋᓛᑦ (AIS) ᖃᓇᓴᐅᔭᒃᑯᑦ ᑎᑎᕋᖅᓯᒪᔪᑦ ᐊᒻᒪ/ᐅᕝᕙᓘᓐᓃᑦ ᑲᓇᑕᐅᑉ ᐅᑭᐅᖅᑕᖅᑐᖓᓂ ᐃᓚᒋᔭᐅᙱᑦᑐᑦ ᑎᑎᕋᖅᑕᐅᓯᒪᔪᓄᑦ) ᑭᓯᐊᓂ ᐱᔾᔪᑕᐅᙱᓪᓗᓂ ᐱᓕᕆᐊᒧᑦ, ᑖᒃᑯᐊ ᐱᒋᐊᕈᑏᑦ ᑎᑎᕋᖅᓯᒪᔪᑦ ᐃᓗᓕᖅᑐᑦ ᐊᑦᑕᕐᓇᖅᑐᒦᕐᔪᐊᖅᑐᓂᒃ ᐊᕕᒃᑐᖅᓯᒪᔪᓂ ᓴᖅᑭᑦᑐᑦ ᐊᑐᖅᑕᐅᓪᓗᑎᒃ ᐱᓕᕆᐊᒥ ᐅᒥᐊᕐᔪᐊᒃᑯᑦ ᐱᓕᕆᓃᑦ.

ᑲᑎᓪᓗᒋᑦ 432 ᐊᕕᒃᑐᖅᓯᒪᔪᑦ ᓇᓗᓇᐃᖅᑕᐅᓚᐅᖅᐳᑦ 2021–ᒥ ᖃᐅᔨᓴᕐᓂᕐᓂ, 54–ᖑᓪᓗᑎᒃ ᓴᖅᑮᔾᙱᑦᑐᑦ ᑎᑎᕋᖅᑕᐅᓯᒪᙱᓪᓗᑎᒃ ᕿᙵᐊᓂ (ᓲᕐᓗ, ᐅᔾᔨᕆᔭᐅᓚᐅᙱᑦᑐᑦ ᖃᐅᔨᓴᕐᓂᐅᓚᐅᖅᓯᒪᔪᓂ). ᓄᑖᓂ ᐊᕕᒃᑐᖅᓯᒪᔪᓂ, ᑕᒪᕐᒥᓗᒃᑖᖅ ᑭᓯᐊᓂ ᐊᑕᐅᓯᖅ (*Tricellaria* sp.) ᑎᑎᖅᑲᖁᑎᖃᓚᐅᖅᐳᑦ ᑲᓇᑕᐅᑉ ᐅᑭᐅᖅᑕᖅᑐᖓᓂ ᑎᑎᖅᑲᖁᑎᖃᙱᓐᓗᑎᒃ ᐃᒫᓂ ᑎᑭᑉᐸᒃᑐᑦ ᐆᒪᔪᕋᓛᑦ (AIS) ᖃᓇᓴᐅᔭᒃᑯᑦ ᑎᑎᕋᖅᓯᒪᔪᓂᒃ. ᐊᒥᓱᓚᑦ ᐆᒪᔪᑦ ᐊᔾᔨᒌᙱᑦᑐᑦ *ᖁᐱᕿᐊᕐᔪᐃᑦ* (*Tricellaria*) ᑕᑯᔭᐅᔪᓐᓇᖅᑐᑦ ᑲᓇᑕᐅᑉ ᐅᑭᐅᖅᑕᖅᑐᖓᓂ, ᑭᓯᐊᓂᓕ, ᐊᑕᐅᓯᖅ ᐆᒪᔪᖅ (*T. Inopinata*) ᑎᑎᕋᖅᑕᐅᓯᒪᕗᖅ ᑲᓇᑕᓕᒫᒥ ᖁᐊᖅᓵᓐᓇᖅᑐᓂᒃ ᖃᐅᔨᓴᖅᓯᓂᕐᒥᒃ ᑎᑭᑐᐃᓐᓇᕆᐊᖃᕐᓂᖓᓂᒃ ᑲᓇᑕᐅᑉ ᐃᒪᖏᓐᓄᑦ, ᐃᓚᒋᔭᐅᓪᓗᓂ ᐅᑭᐅᖅᑕᖅᑐᑉ ᓄᓇᖁᑎᖏᓐᓄ. *ᖁᐱᕿᐊᕐᔪᐃᑦ* (*Tricellaria* sp.) ᓇᒃᓯᐅᔾᔭᐅᓚᐅᖅᑐᖅ ᐃᓛᒃᑯᖅᓱᓂ ᓇᓗᓇᐃᖅᑕᐅᓪᓚᑦᑖᕆᐊᖃᕐᓂᖓᓂᒃ ᐅᔾᔨᖅᓱᕐᓂᕐᒧᑦ, ᖃᓄᐃᓕᖓ ᐅᑕᖅᑭᔭᐅᔪᖅ ᓱᓕ. ᒪᓕᒃᓱᒋᑦ ᐱᑕᖃᕐᓂᖏᑦ ᑎᓴᒪᓪᓗᐊᑕᐃᑦ *ᖁᐱᕿᐊᕐᔪᐃᑦ* (*Tricellaria*) ᐆᒪᔪᑦ ᑲᓇᖕᓇᖓᓂ ᑲᓇᑕᐅᑉ ᐅᑭᐅᖅᑕᖅᑐᖓᓂ ᐊᒻᒪ ᖃᓄᐃᓕᖓᓪᓚᑦᑖᒪᖓᑕ ᓇᓗᓇᐃᖅᑕᐅᓪᓚᑦᑖᖅᓯᒪᙱᑦᑐᑦ ᑕᒪᒃᑯᓄᖓ ᐊᑦᑕᑦᓲᑦ ᐱᕈᖅᑐᑦ (bryozoans), ᐃᓱᒪᒋᔭᐅᕙᖅ *ᖁᐱᕿᐊᕐᔪᓇᓯᒋᔭᐅᓪᓗᓂ* (*Tricellaria* sp.) ᑲᓇᑕᒥ ᐅᑭᐅᖅᑕᖅᑐᒥᐅᑕᐅᓪᓗᓂ ᐆᒪᔪᖅ ᐊᔾᔨᒌᙱᓚᐃᒃᑐᓂ ᑮᓚᖅᑐᐃᙱᖕᖔᕐᓗᓂ ᓄᑖᒥᒃ ᐆᒪᔪᐃᑦ ᐊᔾᔨᒌᖏᐊᕐᔪᓐᓂᖏᓐᓄᑦ ᓴᖅᑭᑦᑐᑦ ᐱᓕᕆᕝᕕᐅᔪᒥ. ᑕᐃᒪᐃᒻᒪᑦ, ᑭᓯᐊᓂ ᓇᓗᓇᐃᖅᑕᐅᒃᐸᑦ ᐆᒪᔪᖅ (*T. Inopinata*) ᓇᓗᓇᐃᖅᑕᐅᔪᖅ, *ᖁᐱᕿᐊᕐᔪᐃᑦ* (*Tricellaria* sp.) ᓇᓗᓇᐃᖅᑕᐅᓯᒪᔪᖅ ᐊᑦᑕᕐᓇᕐᓂᙱᓕᓐᓂᒃ ᒫᓐᓇᓗ ᐃᓱᒪᒋᔭᐅᖏᑦᑐᖅ ᐃᓱᒫᓘᑕᐅᑎᐊᖕᓂᑦ ᕿᙵᐊᓂ ᑐᓚᒃᑕᕝᕕᖏᑦ.

ᖄᒃᑲᓐᓂᐊᒍᑦ, ᐃᒫᓂ ᑎᑭᑉᐸᒃᑐᑦ ᐆᒪᔪᕋᓛᓂᒃ (AIS) / ᑕᒫᓂᕐᒥᐅᑕᐅᙱᑦᑐᑦ ᐆᒪᔪᓂᒃ (NIS) ᖃᐅᔨᓴᐅᑉᓴᑦ 2021–ᒥ ᑎᑎᕋᓚᐅᖅᐳᑦ ᑕᓪᓕᒪᓂᒃ ᐊᕕᒃᑐᖅᓯᒪᔪᓂ ᓇᓗᓇᐃᖅᑕᐅᓚᐅᖅᑐᓂᒃ ᐊᕐᕌᒍᓂ ᐊᓂᒍᖅᑐᓂᒃ ᓇᓗᓇᕐᓂᖏᓐᓄᑦ ᓇᔪᖓᓂ ᐅᕝᕙᓘᓐᓃᑦ ᑎᑎᕋᖅᑕᐅᓯᒪᓂᖏᓐᓄᑦ ᐃᒫᓂ ᑎᑭᑉᐸᒃᑐᑦ ᐆᒪᔪᕋᓛᑦ (AIS) ᖃᓇᓴᐅᔭᒃᑯᑦ ᑎᑎᕋᖅᓯᒪᔪᓂᒃ (*Pseudofabricia aberrans*, *Marenzelleria* sp., *Ampharete Petersenae, Paramphitrite birulai* ᐊᒻᒪ *Crassicophium* sp.). ᑖᒃᑯᐊ ᖃᐅᔨᓴᐅᑉᓴᑦ ᓇᒃᓯᐅᔾᔭᐅᓚᐅᖅᑐᑦ ᐊᕕᒃᑐᖅᓯᒪᔪᓄᑦ ᖃᐅᔨᒪᔨᑕᒻᒪᕆᖕᓄᑦ ᐊᒻᒪᓗ/ᐅᕝᕙᓘᓐᓃᑦ ᕿᙵᒻᒥᒐᖅᑕᐅᓪᓗᑎᒃ ᖃᐅᔨᓴᖅᑕᐅᓂᕐᒧᑦ ᐊᒻᒪ, ᖁᓛᓂᑦᑐᑎᑐᑦ, ᖃᓄᐃᓐᖓᓕᕐᓂᖏᑦ ᐅᑕᖅᑭᑎᑕᐅᔪᑦ.

ᕿᓐᖑᒻᒥᒐᖅᑕᐅᔪᕕᓂᕐᓂ (DNA) ᖃᐅᔨᔭᐅᔪᑦ ᓇᓄᓇᐃᖅᑕᐅᓚᐅᖅᐳᑦ 2021–*ᒥ ᖁᐱᕐᕈᑖᑦ (Marenzelleria* sp) ᖃᐅᔨᓴᒐᒃᓴᑦ *ᖁᐱᕐᕈᑖᖑᓂᖏᓐᓂᒃ (Marenzelleria wireni)* – ᐅᑭᐅᖅᑕᖅᑐᒥ ᑲᖏᖅᓱᖕᓂ ᓂᕐᔪᑎᐅᔪᑦ. ᑖᓐᓇ ᐊᕙᒃᑐᖅᓯᒪᔪᖅ ᐃᓂᖃᑐᐃᓐᓇᕆᐊᓕᒃ ᐱᖃᓯᐅᑎᓪᓗᒍ ᐱᓕᕆᐊᒃ ᐃᓂᖓᓂᒃ ᑎᒃᑯᐊᖅᑕᐅᓪᓗᓂᓗ "ᐊᑦᑕᕐᓇᖅᑑᖏᓐᓂᖓᓂᒃ". ᑕᐃᒪᓐᓇ ᐅᖃᖅᓯᒪᖕᒪᑦ, ᐅᔾᔨᖅᓲᑕᐅᓪᓗᓂᑦ, *ᖁᐱᕐᕈᑖᑦ (Marenzelleria)* ᖃᐅᔨᓴᖅᐸᓪᓕᐊᔭᐅᓂᖅᓴᐅᓂᐊᖅᑐᑦ ᐱᖃᓯᐅᑎᓪᓗᒋᑦ ᑭᓲᓂᖏᓐᓄ ᖃᐅᔨᓴᖅᑕᐅᓗᑎᒃ, ᑭᓯᐊᓂ ᓇᓄᓇᐃᖅᑕᐅᒃᑲᓂᖅᐸᑦ ᖁᐱᕐᕈᑖᒃ (*M. Viridis)* ᐱᑕᖃᙱᓐᓂᖏᓐᓂᒃ ᕿᓐᖑᐊᓂ ᑐᓇᒃᑕᕝᕕᖕᒥᑦ.

ᕿᓐᖑᒻᒥᒐᖅᑕᐅᔪᕕᓂᕐᓂ ᖃᐅᔨᔭᐅᔪᑦ ᑭᖑᐃᑦ (*Crassicorophium* sp.) ᓇᓄᓇᐸᓘᔭᓚᐳᖅᑐᑦ, ᓇᓕᒧᑦᑐᖅᑲᙱᕈᓂ ᑖᒃᑯᓄᐊ ᐊᕙᒃᑐᖅᓯᒪᔪᓄᑦ ᐃᓱᒫᓘᑕᐅᔪᓄᑦ. ᑲᓂᓲᖑᔪᖅ ᕿᓐᖑᒻᒥᒐᖅᑕᐅᔪᕕᓂᕐᓂ ᓇᓕᒧᐸᓗᓲᖓ ᓇᓄᓴᐃᖅᑕᐅᓯᒪᙱᑦᑐᑦ ᑭᖑᖕᓄᑦ ᖃᐅᔨᓴᒐᒃᓴᒧᑦ (ᐃᓱᒪᒋᔭᐅᔪᖅ ᑭᖑᒃ (*Crassicorophium clarencense)*) ᑲᑎᑕᐅᔪᑦ ᑮᓕᓂᕐᒥ ᓄᓇᕘᒻᒥ, ᓇᓄᓇᐃᖅᓯᓪᓗᓂ ᑖᒃᑯᐊ ᑭᒡᒐᖅᑐᐃᔪᒃᓴᐅᔪᑦ ᑕᒫᓂᕐᒥᐅᑕᓂᒃ ᐊᕙᒃᑐᖅᓯᒪᔪᓂᒃ, ᐃᑲᔪᖅᓯᖅᑕᐅᓯᒪᓪᓗᓂᓗ ᓇᓄᓇᐃᔭᖅᑕᐅᓯᒪᔪᑦ ᐊᔾᔨᐸᓗᙱᑦ ᖃᐅᔨᓴᖕᒐᒃᓴᑦ ᐱᓕᕆᐊᖑᑎᓪᓗᒋ ᐱᒋᐊᕈᑕᐅᔪᑦ ᖃᐅᔨᓴᕈᑏᑦ. ᓇᓄᓇᖅᑐᑦ ᖃᐅᔨᔭᐅᔪᑦ ᑐᓂᔭᐅᓚᐅᖅᑐᑦ ᖁᐱᕐᕈᑖᑦ (*Pseudofabricia* sp. nr. *Aberrans)*. ᑖᒃᑯᐊ ᖃᐅᔨᓴᒐᒃᓴᑦ ᓇᓄᓇᐃᖅᑕᐅᓚᐅᖅᑐᑦ ᓇᓕᒧᙱᓐᓂᖏᓐᓄᑦ ᖁᐱᕐᕈᑖᑦ ᓴᖅᐱᐅᔮᖅᑲᖅᑰᔨᔪᑦ *(Fabricia stellaris)* (ᑭᖑᓂᖕᒌᑦᑎᓐᓂ ᑕᐃᒪᐃᑦᑑᓇᓯᒋᔭᐅᓚᐅᖅᑐᑦ ᑖᒃᑯᓄᖕᒐᖕᒌᖅ ᓇᓄᓇᐃᖅᑕᐅᓗᑎᒃ ᖃᐅᔨᓴᒐᒃᓴᐃᑦ), ᑭᓯᐊᓂᓕ ᓇᓕᒧᓚᐅᙱᑦᑐᑦ ᒫᓐᓇ ᑎᑎᖅᑲᖁᑎᓄᑦ ᐊᓯᖏᓐᓄᑦ ᐆᒪᔪᓄᑦ. ᐊᕙᒃᑐᖅᓯᒪᔪᓕᕆᓂᕐᒧᑦ ᖃᐅᔨᒪᔨᑕᑦ ᐃᒪᐃᑦᑑᓇᓯᒋᓈᓚᐅᖅᑐᑦ ᑕᒪᓐᓇ ᑕᐃᒪᐃᑐᐃᓐᓇᕆᐊᖃᕐᓂᖓᓂᒃ ᑕᒪᒃᑯᐊ ᖃᐅᔨᓴᒐᒃᓴᑦ ᒫᓐᓇ ᓇᓄᓇᐃᖅᑕᐅᓯᒪᙱᑦᑐᑦ ᐆᒪᔪᑦ ᑕᒫᓂᕐᒥᐅᑕᐅᔪᑦ ᐱᓕᕆᕝᕕᐅᑉ ᐃᓂᐊᓂ. ᖃᓄᐃᓕᖓᓂᖓ ᖁᐱᕈᑦ (*P.* sp. nr. *Aberrans)* ᐋᖅᑭᒋᐊᖅᑕᐅᓯᒪᓕᖅᑐᑦ "ᖁᐊᖅᓵᕐᓇᙱᑦᑐᒧᑦ" ᐊᒻᒪᓗ ᐲᖅᑕᐅᓯᒪᓕᖅᓱᓂ ᐱᓕᕆᐊᖑᔪᓄᑦ ᓇᑦᑎᖅᓯᖅᑕᐅᔪᓂᑦ.

ᑎᑎᕋᖅᓯᒪᔪᓂᒃ ᕿᒥᕐᕈᓚᐅᖅᑎᓪᓗᒋᑦ ᑲᑎᑕᐅᓯᒪᔪᑦ ᑐᓴᐅᒪᔾᔪᑏᑦ, ᖁᐱᕐᕈᑖᑦ (*A. Petersenae)* ᓇᓄᓇᐃᖅᑕᐅᒃᑲᓂᓚᐅᖅᑐᖅ "ᐊᑦᑕᕐᓇᙱᑦᑐᑦ" ᐲᖅᑕᐅᓪᓗᓂᓗ ᐱᓕᕆᐊᒃᓴᒥᑦ ᐊᒻᒪᓗ ᐲᖅᑕᐅᓯᒪᓕᖅᓱᓂ ᐱᓕᕆᐊᖑᔪᓄᑦ ᓇᑦᑎᖅᓯᖅᑕᐅᔪᓂᑦ. ᐅᓄᕐᓂᖅᓴᑦ ᓇᓄᓇᐃᖅᑕᐅᓯᒪᔪᑦ ᐊᕙᒃᑐᖅᓯᒪᔪᑦ ᐃᖅᑲᖓᓂ ᐱᕈᖅᑐᑦ ᖃᐅᔨᓴᒐᒃᓴᓕᐊᖑᔪᑦ ᕿᓐᖑᐊᓂ ᐃᓱᒪᒋᔭᐅᙱᑦᑐᑦ ᑕᒫᓂᕐᒥᐅᑕᐅᙱᑦᑐᑦ ᐆᒪᔪᓂᖏᓐᓂᒃ (NIS) ᐅᕝᕙᓘᓐᓃᑦ ᐃᒫᓂ ᑎᑭᐸᒃᑐᑦ ᐆᒪᔪᖃᓲᖑᓇᑎᒃ (AIS).

ᐹᕙᓐᓛᓐᑯᑦ ᑕᒫᓂᕐᒥᐅᑕᐅᙱᑦᑐᑦ ᐆᒪᔪᓂᖏᓐᓂᒃ (NIS) / ᐃᒫᓂ ᑎᑭᐸᒃᑐᑦ ᐆᒪᔪᖃᓲᓂᒃ (AIS) ᐱᓕᕆᐊᑦ ᓴᖅᑮᔮᖅᑎᑦᑎᔪᑦ ᐱᓕᕆᔭᐅᕐᔪᐊᕐᓂᖅᐹᖑᓪᓗᓂ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᓂᖅ ᐱᓕᕆᐊᖅ ᑕᒪᒃᑯᓄᖓ ᑕᒫᓂᕐᒥᐅᑕᐅᙱᑦᑐᑦ ᐆᒪᔪᓂᖏᓐᓂᒃ (NIS) / ᐃᒫᓂ ᑎᑭᐸᒃᑐᑦ ᐆᒪᔪᖃᓲᓂᒃ (AIS) ᐱᓕᕆᐊᖑᓯᒪᔪᖅ ᑕᕆᐅᒥ ᑐᓚᒃᑕᕝᕕᐅᔪᓂ ᑲᓇᑕᒥ. ᒥᒃᓴᐅᓴᒃᑕᐅᓯᒪᔪᑦ 870 ᐊᕙᒃᑐᖅᓯᒪᔪᑦ ᓇᓄᓇᐃᖅᑕᐅᓯᒪᔪᑦ ᕿᓐᖑᐊᓂ ᐊᑐᖅᑕᐅᓪᓗᑎᒃ ᖃᐅᔨᓴᖅᐸᓪᓕᐊᓃᑦ ᐅᓪᓗᒥᒧᑦ, ᐊᒻᒪᓗ ᐱᖃᓯᐅᔾᔨᔪᑦ ᐃᖅᑲᐅᑉ ᐃᑭᐊᖓᓂ ᐆᒪᔪᖃᓛᑦ, ᖁᐱᕐᕈᐊᕐᔪᐃᑦ ᐃᒪᕐᒥᐅᑕᑦ, ᐃᖅᑲᖓᓂ ᕿᒥᕐᓗᖃᙱᑦᑐᑦ ᐃᖃᓗᐃᓪᓗ. ᓇᓄᓇᐃᔭᐃᓂᖅ ᐊᒻᒪᓗ ᑎᑎᕋᖅᓯᓂᖅ ᐊᑐᓂ ᐊᕙᒃᑐᖅᓯᒪᔪᓂ Hᐋᓐᓇᓚᖏᓐᓃᑦᑐᑦ ᓇᓄᓇᐃᖅᑕᐅᓯᒪᔪᒃ ᕿᓐᖑᐊᓂ ᓇᓄᓇᐃᖅᓯᓪᓗᑎᒃ ᑕᒪᓐᓇ ᓇᐅᑦᑎᖅᓱᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᖅ ᐊᑑᑎᓂᖓᓂᒃ ᐊᒻᒪᓗ ᐊᐅᓚᓂᖅᓱᓂ ᐊᑑᑎᒃᓴᖏᓐᓄᑦ. ᐊᒥᓱᕐᔪᐊᖑᓂᖅᓴᐃᑦ ᑖᒃᑯᓇᓂ ᐊᕙᒃᑐᖅᓯᒪᔪᓂ ᑕᐃᔭᐅᓯᒪᔪᑦ "ᖁᐊᖅᓵᕐᓇᙱᑦᑐᑦ" ᐊᒻᒪᓗ ᐃᓱᒪᒋᔭᐅᖅᓯᒪᐅᔾᔭᐅᙱᑦᑐ ᐃᓱᒫᓘᑎᓄᑦ.

Study Limitations

Golder Associates Ltd. (Golder) has prepared this document in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practicing under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this document. No warranty, express or implied, is made.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, has been prepared by Golder for the sole benefit of Baffinland Iron Mines Corporation (Baffinland). The Executive Summary was translated into Inuktitut and provided by Baffinland to Golder. In the event of discrepancies in information or interpretation, the English version shall prevail. This report represents Golder's professional judgement based on the knowledge and information available at the time of completion. Golder is not responsible for any unauthorized use or modification of this document. All third parties relying on this document do so at their own risk.

The factual data, interpretations, suggestions, recommendations, and opinions expressed in this document pertain to the specific project, station conditions, design objective, development and purpose described to Golder by Baffinland, and are not applicable to any other project or station location. In order to properly understand the factual data, interpretations, suggestions, recommendations and opinions expressed in this document, reference must be made to the entire document.

This document, including all text, data, tables, plans, figures, drawings and other documents contained herein, as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder. Baffinland may make copies of the document in such quantities as are reasonably necessary for those parties conducting business specifically related to the subject of this document or in support of or in response to regulatory inquiries and proceedings. Electronic media is susceptible to unauthorized modification, deterioration, and incompatibility and therefore no party can rely solely on the electronic media versions of this document.

Table of Contents

TABLES

FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

Acronym or Abbreviation	Definition
AIS	Aquatic Invasive Species
ARCH	Arctic Char
BACI	Before/After Control/Impact
Baffinland	Baffinland Iron Mines Corporation
BC	British Columbia
BC MOE	BC Ministry of Environment and Climate Change Strategy
BOD	Biological Oxygen Demand
CCME	Canadian Council of Ministers of the Environment
CPUE	Catch Per Unit Effort
DFO	Fisheries and Oceans Canada
EEM	Environmental Effects Monitoring
ERP	Early Revenue Phase
FEIS	Final Environmental Impact Statement
FHSC	Fourhorn Sculpin
GPS	Global Positioning System
HIAT	Arctic Hiatella
Indet.	Indeterminate
ISQGs	Interim Sediment Quality Guidelines
ISSG	Invasive Species Specialist Group
Laval	The Benthic Ecology Lab at Université Laval
LSA	Local Study Area
LSI	Liver Somatic Index
m	Metres
MDMER	Metal and Diamond Mining Effluent Regulations
MEEMP	Marine Environmental Effects Monitoring Program
MEWG	Marine Environmental Working Group
mg/kg	Milligrams per Kilogram
mm	Millimetre
mtpa	million tonnes per annum
n	Sample Size
N/A	Not Applicable

Acronym or Abbreviation	Definition
NIRB	Nunavut Impact Review Board
NIS	Non-Indigenous Species
NIS/AIS	Non-Indigenous Species / Aquatic Invasive Species
No.	Number
PAHs	Polycyclic Aromatic Hydrocarbons
PC	Project Certificate
ROV	Remotely Operated Vehicle
SEM	Sikumiut Environmental Management Ltd.
SHSC	Shorthorn Sculpin
sp.	Species
sp. nr.	Species Near To
spp.	Species (plural)
TSS	Total Suspended Solids
VEC	Valued Ecosystem Components

1.0 INTRODUCTION

Baffinland Iron Mines Corporation (Baffinland) completed its seventh consecutive year of the marine ecological effects monitoring program (MEEMP) and non-indigenous/aquatic invasive species (NIS/AIS) monitoring program for the Mary River Project (the Project). This report presents the results for the 2021 field programs conducted in Milne Inlet during the open-water season. Both the MEEMP and NIS/AIS programs were originally developed in 2015 following completion of marine baseline studies in Milne Port during 2013 and 2014 and are intended to provide a primary means to identify and quantify potential Project-related changes in the marine environment. Where such changes occur, the programs assist in identifying appropriate modifications to, or mitigation of, Project operational activities to avoid and/or minimize potential adverse effects on the marine environment. Results from the MEEMP and NIS/AIS monitoring programs also provide information to the Nunavut Impact Review Board (NIRB) to support its annual review of the Mary River Project.

1.1 Project Context

The Mary River Project is an operating iron ore mine located in the Qikiqtani Region of North Baffin Island, Nunavut (Figure 1-1). Baffinland Iron Mines Corporation (Baffinland, the Company) is the owner and operator of the Project. The operating Mine Site is connected to a port at Milne Inlet (Milne Port) via the 100-km long Milne Inlet Tote Road. Undeveloped components of the Project include a South Railway connecting the Mine Station to a future port at Steensby Inlet (Steensby Port).

Baffinland is currently operating in the Early Revenue Phase (ERP) of the Project. Project Certificate No. 005, amended by the Nunavut Impact Review Board on 18 June 2020 (Amendment No. 03), authorizes the Company to mine up to 22.2 million tonnes per annum (mtpa) of iron ore from Deposit No. 1. Of the 22.2 mtpa, Baffinland is authorized to transport 6.0 mtpa of ore by truck to Milne Port for open water shipping through the Northern Shipping Route using chartered ore carrier vessels until December 31, 2021 (Condition 179(a)). The Company is also currently authorized to transport 18 mtpa by rail to Steensby Port for year-round shipping through the Southern Shipping Route (via Foxe Basin and Hudson Strait), as part of the currently undeveloped Project component.

Shipping of ore from Milne Inlet during the early revenue phase began in 2015 and is expected to continue for the life of the Project (20+ years). During the first year of ERP Operations in 2015, Baffinland shipped approximately 900,000 tonnes via 13 ore carrier voyages. In 2021, a total of 5.6 Mtpa of iron ore was shipped via 73 return voyages with the first inbound transit of the season occurring on 27 July and the last outbound transit of the season occurring on 31 October 2021. One additional vessel was called to Milne Port in 2021, but not loaded due to timing constraints at the end of the shipping season.

KEY MAP

GREENLAND
RESOLUTE
Lancaster Sound
Baffin Bay
NORTHERN SHIPPING ROUTE
POND INLET
MILNE PORT
MINE SITE
NORTHERN TRANSPORTATION CORRIDOR
NUNAVUT INUIT SETTLEMENT AREA
BAFFIN ISLAND
IGLOOLIK
NUNAVUT
Foxe Basin
PANGNIRTUNG
CAPE DORSET
IQALUIT
Hudson Bay
QUEBEC

Ragged Island
Milne Inlet
Stephens Island
Bruce Head
Koluktoo Bay
Poirier Island

SEE DETAIL MAP
Phillips Creek

DETAIL MAP - MILNE PORT/LOCAL STUDY AREA
Milne Inlet
0 500 1,000
1:50,000 METRES

490000 500000 510000 520000 530000 540000 550000
8050000 8040000 8030000 8020000 8010000 8000000 7990000 7980000

LEGEND

- MINE SITE
- PROJECT LOCATION
- MILNE INLET TOTE ROAD
- PROPOSED NORTH RAILWAY
- SHIPPING ROUTE
- WATERCOURSE
- EXISTING INFRASTRUCTURE
- EXISTING ORE DOCK
- PROPOSED FREIGHT DOCK AND CAUSEWAY
- INAC FORESHORE LEASE
- LOCAL STUDY AREA
- NUNAVUT SETTLEMENT AREA
- PDA / QIA COMMERCIAL LEASE
- REVISED PDA FOR PHASE 2 PROPOSAL
- WATERBODY

0 5 10
1:250,000 KILOMETRES

REFERENCE(S)

LOCAL STUDY AREA BOUNDARY DIGITIZED FROM THE MARY RIVER PROJECT FINAL ENVIRONMENTAL IMPACT STATEMENT (FEBRUARY 2012). FREIGHT DOCK DATA PROVIDED BY CLIENT, MAY 21, 2020. ADDITIONAL MILNE PORT INFRASTRUCTURE PROVIDED BY CLIENT, MAY 28, 2018 AND PROVIDED BY HATCH, JANUARY 25, 2017, RETRIEVED FROM KNIGHT PIESOLD LTD. FULCRUM DATA MANAGEMENT SITE MAY 19, 2017. HYDROGRAPHY AND TOPOGRAPHY DATA BY EAGLE MAPPING (2005), RETRIEVED FROM KNIGHT PIESOLD LTD. FULCRUM DATA MANAGEMENT SITE, MAY 2017. HYDROGRAPHY, POPULATED PLACE, AND PROVINCIAL BOUNDARY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 17 DATUM: NAD 83

CLIENT
BAFFINLAND IRON MINES CORPORATION

PROJECT
MARY RIVER PROJECT

TITLE
PROJECT LOCATION

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-06-30
DESIGNED	CB
PREPARED	AJA
REVIEWED	PR
APPROVED	PR

PROJECT NO.	CONTROL	REV.	FIGURE
1663724	44000-04	0	1-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25mm
0

1.2 Background

As a part of regulatory commitments, Baffinland has developed and implemented a multi-disciplinary Marine Environmental Effects Monitoring Program (MEEMP). The MEEMP is designed to evaluate potential Project-related effects on the marine environment as predicted in the Final Environmental Impact Statement (FEIS; Baffinland 2013) and subsequent addendums; original FEIS predictions, associated mitigation measures, and current status are presented in Table 1-1 below.

The MEEMP includes monitoring of marine water and sediment quality, marine invertebrates, marine vegetation, and fish and fish habitat. The MEEMP sampling design is generally based on the Metal Mining Environmental Effects Monitoring guidelines (Environment Canada 2012) and includes statistical approaches for detecting potential Project-induced impacts on the marine environment. NIS/AIS monitoring is an integral component of the MEEMP and is designed to address the potential risks of species introductions to the marine environment from ship ballast water and hull biofouling.

Sikumiut Environmental Management Ltd. (SEM) was originally retained by Baffinland to design and implement the MEEMP. The MEEMP program was first implemented in 2015, at which time monitoring efforts focused primarily on further characterization of baseline conditions in Milne Port prior to commencement of Project operations in 2015 (SEM 2015). Environmental effects monitoring was completed by SEM in 2015 and 2016. Golder completed environmental effects monitoring from 2017 through 2021, which included modifications to the 2014-2016 MEEMP and NIS/AIS sampling design to better address the objectives of the programs.

1.3 Objectives

This report presents the results of the MEEMP and NIS/AIS monitoring programs conducted in Milne Inlet during the 2021 open-water season. The GPS/tidal gauge component for the monitoring of sea levels and storm surges is presented in a separate report, included as Appendix 1A.

In accordance with existing Terms and Conditions of Project Certificate (PC) No. 005, Baffinland is responsible for the establishment and implementation of the MEEMP, which comprises monitoring studies that are conducted over a defined time period with the following objectives:

- Assess the accuracy of effects predictions in the FEIS (Baffinland 2012) and subsequent addendums.
- Assess the effectiveness of Project mitigation measures.
- Verify compliance of the Project with regulatory requirements, Project permits, standards and policies.
- Identify unforeseen adverse effects and provide early warnings of undesirable changes in the environment.
- Improve understanding of local environmental processes and potential Project-related cause-and-effect relationships.
- Provide feedback to the applicable regulators (e.g., NIRB) and advisory bodies (e.g., Marine Environmental Working Group [MEWG]) with respect to:
  - Potential adjustments to existing monitoring protocols or monitoring framework to allow for the most scientifically defensible synthesis, analysis, and interpretation of data.
  - Considerations for the modification of operational practices where and when necessary.

Table 1-1: Summary of FEIS/ERP Predictions for Milne Port, Associated Mitigation Measures, and Current Status

FEIS/ERP Predictions				Relevant MEEMP Sections	Current Status
VEC	**Activity**	**Impact/Significance**	**Associated Mitigation Measures**		
Water and Sediment Quality	Barge and ship traffic to/from Milne Inlet	Negligible effects to total suspended solids (TSS), nutrient, or metal concentrations in the water or sediment due to resuspension of substrates from propeller currents; expected that the new equilibrium state will be reached early within the operation phase of the Project.	• Environmental Monitoring and Mitigation Plan outlines measures such as use of silt curtains and drainage ditches, as well as treatment and testing of effluent/run-off prior to discharge, to mitigate potential effects to water and sediment quality. • Emergency Response and Spill Contingency Plan outlines measures to mitigate potential fuel spills. • Shipping Management Plan outlines measures to mitigate potential effects associated with vessel traffic such as a mandatory mid-ocean ballast water exchange and compliance with Anti-Fouling Systems Convention.	Chapter 2.0 Chapter 3.0, Chapter 5.0	No indications of impacted marine water or sediment quality. Measured metals concentrations are low, typically below applicable guidelines, and generally consistent with previous years. No observance of ore dust deposition in substrate. One station, SW-2, showed signs of propwash effects in 2020 (i.e., lower percent fines and higher sand content); effects are localized.
		No anticipated increases in hydrocarbon concentrations in water or sediments through normal vessel operations.			
	Discharge of ballast water	Open-water season: no anticipated effects to water or sediment quality.			
		Ice-cover season: increases in temperature and nitrate concentrations in the water; increases in nitrogen concentrations in the sediment; no anticipated changes in the concentrations of metals or other nutrients in water or sediment.			
	Dispersion and deposition of dust from the ore stockpile	Increases in concentrations of TSS and metals (primarily iron) in the water.			
		Increases in concentrations of metals (primarily iron) in the sediment.			
	Discharge of wastewater and site run-off	Increases in biological oxygen demand (BOD) and concentrations of TSS, nutrients, metals, and hydrocarbons in the water.			
		Increases in concentrations of nutrients, metals, and hydrocarbons in the sediment.			

FEIS/ERP Predictions				Relevant MEEMP Sections	Current Status
VEC	**Activity**	**Impact/Significance**	**Associated Mitigation Measures**		
Marine Fish Habitat	Habitat Alteration (Sediment introduction and resuspension)	Wastewater discharge and site runoff may introduce TSS into the water column, increasing the amount of fine-grained sediments in the immediate vicinity of the discharge point.	• Environmental Monitoring and Mitigation Plan outlines measures such as use of silt curtains and drainage ditches, as well as treatment and testing of effluent/run-off prior to discharge, to mitigate potential effects to water and sediment quality. • Emergency Response and Spill Contingency Plan outlines measures to mitigate potential fuel spills • Shipping Management Plan outlines measures to mitigate potential effects associated with vessel traffic such as a mandatory mid-ocean ballast water exchange and compliance with Anti-Fouling Systems Convention. • Minimize vessel operations to the extent possible. • Mitigation by design and through compliance of Fisheries and Oceans Canada's (DFO) no net loss habitat policy.	Chapter 2.0 Chapter 3.0 Chapter 4.0 Chapter 5.0, Chapter 8.0	No indications of impacted marine sediment quality. Measured metals concentrations are low, typically below applicable guidelines, and/or generally consistent with previous years. No observance of ore dust deposition in substrate Generally no evidence of altered benthic infauna, epifauna, or macroflora community composition or productivity. One station, SW-2, showed signs of propwash effects (i.e., lower density and diversity metrics) in 2020, but rebounded substantially in 2021; effects are temporary and localized.
		Potential increases in concentrations of TSS in the water column and accumulation of fines in the sediments could alter the nearshore habitat, although tidal fluxes are expected to disperse the effluents and minimize effects on habitat.			
	Habitat Alteration (Substrate alteration)	Sediment resuspension due to occasional (<1 per year) vessels and propeller-generated currents expected to lessen as fine-grained sediments on seabed are removed and seabed sediment composition stabilizes.			
		Removal of fine-grained sediments may alter benthic community composition.			
	Habitat Alteration (Noise disturbance)	Intermittent noise disturbance due to occasional vessel operations and loading activities.			
	Habitat Alteration (Fugitive ore dust deposition)	Fugitive ore dust deposition to marine environment.			
		Possible change to water and sediment chemistry and seabed grain size composition.			
		Possible change to benthic productivity.			

FEIS/ERP Predictions				Relevant MEEMP Sections	Current Status
VEC	**Activity**	**Impact/Significance**	**Associated Mitigation Measures**		
Arctic Char (*Salvelinus alpinus*) Health	Sediment Resuspension	Increases in concentrations of TSS, nutrients, and metals in the water column as a result of sediment disturbance from propeller currents are expected infrequently during operation. Short-term exposure of arctic char to these conditions has minimum potential to affect fish health.	• Environmental Monitoring and Mitigation Plan outlines measures such as use of silt curtains and drainage ditches, as well as treatment and testing of effluent/run-off prior to discharge, to mitigate potential effects to water and sediment quality. • Emergency Response and Spill Contingency Plan outlines measures to mitigate potential fuel spills. • Shipping Management Plan outlines measures to mitigate potential effects associated with vessel traffic such as a mandatory mid-ocean ballast water exchange and compliance with Anti-Fouling Systems Convention.	Chapter 6.0 Chapter 7.0	No indications of changes in relative abundances of Arctic Char and other fish species. No notable trends observed in tissue concentrations of contaminants of concern (e.g., aluminum, iron, magnesium, mercury, and selenium) over time.
		The redistribution of sediments near the docks is not expected to directly affect fish health or condition.			
	Discharge of ballast water	Slight reductions in nutrient concentrations and short-term, localized increases water temperature in Milne Inlet are expected to have negligible effects on fish health and condition.			
		Metal concentrations in water and fish tissues are not expected to change.			
	Discharge of wastewater, contact water, and site drainage	Potential increases in metal and hydrocarbon concentrations in fish tissues and reductions in fish health and condition are possible as a result of release of site drainage (with elevated BOD and concentrations of TSS, nutrients, metals, and hydrocarbons) to the marine environment.			
		Combined effluents will be tested to ensure that they are not acutely toxic.			

VEC = Valued Ecosystem Component

The MEEMP was developed in consideration of the anticipated and potential Project-related impacts to the marine environment as identified in the 2012 FEIS and subsequent ERP Addendum, as well as monitoring requirements outlined in several PC Terms and Conditions; relevant PC conditions are listed in Table 1-2, along with a description of how the conditions are addressed through the MEEMP/NIS/AIS program.

Table 1-2: PC Conditions Relevant to MEEMP Surveys

Condition #	Condition	Relevant MEEMP Chapter(s)
76	The Proponent shall develop a comprehensive Environmental Effects Monitoring Program to address concerns and identify potential impacts of the Project on the marine environment.	Chapter 2.0 Chapter 3.0 Chapter 4.0 Chapter 5.0 Chapter 6.0 Chapter 7.0 Chapter 8.0
1 and 83	GPS/tidal gauge monitoring of sea levels and storm surges. Install tidal gauges at Steensby and Milne Port to monitor seas levels and storm surges.	Appendix 1A
83(a)	The Proponent shall conduct hydrodynamic modelling in the Milne Inlet Port area to determine the potential impacts arising from disturbance to sediments including re-suspension and subsequent transport and deposition of sediment. The modelling results shall be used to update the marine water and sediment quality monitoring and mitigation program to include activities associated with the construction and operation of the Milne Inlet Port. The monitoring program shall include an ongoing assessment of the potential introduction of metals that bio-accumulate in the marine food chain.	Chapter 3.0 Chapter 5.0 Chapter 7.0
84	The Proponent shall update its sediment redistribution modeling once ship design has been completed and sampling should be undertaken to validate the model and to inform sampling sites and the monitoring plan.	Chapter 3.0 Chapter 5.0
85	The Proponent shall develop a monitoring plan to verify its impact predictions associated with sediment redistribution resulting from propeller wash in shallow water locations along the shipping route. If monitoring detects negative impacts from sediment redistribution, additional mitigation measures will need to be developed and implemented.	Chapter 3.0
86	Prior to commercial shipping or iron ore, use more detailed bathymetry collected from Steensby and Milne Inlets to model anticipated ballast water discharges from ore carriers. This information should be used to update ballast water discharge impact predictions and sampling should be conducted to validate the model.	N/A
87	The Proponent shall develop a detailed monitoring program at a number of sites over the long term to evaluate changes to marine habitat and organisms and to monitor for non-native introductions resulting from Project-related shipping. This program needs to be able to detect changes that may have biological consequences and should be initiated several years prior to any ballast water discharge into Steensby Inlet and Milne Inlet to collect sufficient baseline data and should continue over the life of the Project.	Chapter 2.0 Chapter 3.0 Chapter 4.0 Chapter 5.0 Chapter 6.0 Chapter 7.0 Chapter 8.0

Condition #	Condition	Relevant MEEMP Chapter(s)
89	The Proponent shall develop and implement an effective ballast water management program that may include the treatment and monitoring of ballast water discharges in a manner consistent with applicable regulations and/or exceed those regulations if they are determined to be ineffective for providing the desired and predicted results. The ballast water management program shall include, without limitation, a provision that requires ship owners to test their ballast water to confirm that it meets the salinity requirements of the applicable regulations prior to discharge at the Milne Port, and a requirement noting that the Proponent, in choosing shipping contractors will, whenever feasible, give preference to contractors that use ballast water treatment in addition to ballast water exchange.	Chapter 2.0 Chapter 8.0
91	The Proponent shall develop a detailed monitoring plan for Steensby Inlet and Milne Inlet for fouling that complies with all applicable regulatory requirements and guidelines as issued by Transport Canada, and includes sampling areas on ships where antifouling treatment is not applied such as the areas where non-native species are most likely to occur.	Chapter 8.0
99(a)	Establish shipping season, inter-annual baseline in Steensby Inlet and Milne Inlet that enables effective monitoring of physical and chemical effects of ballast water releases, sewage outfall, and bottom scour by ship props, particularly downslope and downstream from the docks. This shall include the selection and identification of physical, chemical, and biological community/indicator components. The biological indicators shall include both pelagic and benthic species but with emphasis on relatively sedentary benthic species (e.g., sculpins).	Chapter 2.0 Chapter 3.0 Chapter 4.0 Chapter 5.0 Chapter 6.0 Chapter 7.0 Chapter 8.0
99(b)(ii)	The collection of additional baseline data in Milne Inlet on narwhal (*Monodon monoceros*), bowhead whale (*Balaena mysticetus*) and anadromous Arctic char abundance, distribution ecology and habitat use.	Chapter 6.0 Chapter 7.0
99(c)	Enhance baseline data on marine wildlife (fish, invertebrates, birds, mammals, etc.) and to provide more details on species abundance and distribution found in the Project area.	Chapter 3.0 Chapter 4.0 Chapter 5.0 Chapter 6.0 Chapter 7.0 Chapter 8.0
113	The Proponent shall conduct monitoring of marine fish and fish habitat, which includes but is not limited to, monitoring for Arctic char stock size and health condition in Steensby Inlet and Milne Inlet, as recommended by the Marine Environment Working Group.	Chapter 6.0 Chapter 7.0
114	In the event of the development of a commercial fishery in the Steensby Inlet area or Milne Inlet-Eclipse Sound areas, the Proponent, in conjunction with the Marine Environment Working Group, shall update its monitoring program for marine fish and fish habitat to ensure that the ability to identify Arctic char stock(s) potentially affected by Project activities and monitor for changes in stock size and structure of affected stocks and fish health (condition, taste) is maintained to address any additional monitoring issues identified by the MEWG relating to the commercial fishery.	Chapter 6.0 Chapter 7.0
126	The Proponent shall design monitoring programs to ensure that local users of the marine area in communities along the shipping route have opportunity to be engaged throughout the life of the Project in assisting with monitoring and evaluating potential Project-induced impacts and changes in marine mammal distributions.	Chapter 4.0 Chapter 6.0

1.4 VECs and Indicators

1.4.1 VECs and Criteria for Magnitude Determination (FEIS)

The original MEEMP design was based on indicators and thresholds as presented in the FEIS, centred around three Valued Ecosystem Components (VECs): Marine Water and Sediment Quality, Marine Fish Habitat and Arctic Char Health.

Indicators used to determine the magnitude thresholds were based on guidelines, where available (Table 1-1). A reduction in productive capacity (measured as a proportion of lost or altered habitat to the total area of the Local Study Area, or LSA) was used as an indicator for the Marine Fish Habitat VEC (Baffinland 2012 and 2013). Thresholds were established based on degree of exceedance relative to guidelines. For certain parameters where no guidelines or quality criteria exist, the MEEMP used a significance criterion of two standard deviations of the baseline year as a threshold (Baffinland 2016).

The assessment predicted that Project activities may result in localized changes above threshold values for VECs, confined within the LSA. It was predicted that changes would not exceed thresholds for the Marine Fish Habitat VEC. All predicted residual environmental effects were rated as “Not Significant” since they were localized within the LSA (Table 1-1, Baffinland 2012 and 2013).

1.4.2 Indicators and Thresholds Currently Used for the MEEMP

Since 2016, the MEEMP and NIS/AIS program study design has evolved through consultation with regulatory agencies and Inuit organizations, as well as in response to recommendations made in previous survey years. Modifications to study designs are discussed in Sections 1.5.3.1 and 1.5.4.1. Changes to the program have also included updates or additions to the indicators and thresholds used to determine Project-related impacts to the environment in Milne Port. Sampling parameters and indicators used in 2021 are summarized in Table 1-3.

Table 1-3: Sampling Parameters and Indicators for the 2021 MEEMP and NIS/AIS Monitoring Program

MEEMP Component	Indicator	Context
Marine Water Quality	Metals Total Suspended Solids Nutrients Hydrocarbons	Temporal
Marine Sediment Quality	Percent Fines Nutrients Metals Hydrocarbons	Spatial Temporal
Benthic Invertebrates	Total Density Taxa Richness Simpson's Diversity Index Simpson's Evenness Index	Spatial Temporal
Substrate, Macroflora, and Epifauna	Taxa Richness Relative Abundance Simpson's Diversity Index Abundance/Percent Cover	Spatial Temporal
Fish Population	Taxa Richness Relative Abundance Arctic Char Abundance Catch Per Unit Effort (CPUE)	Qualitative Temporal
Fish Health	Survival Growth Condition Reproduction	Temporal
Fish Tissue Chemistry	Total Metals Total Polycyclic Aromatic Hydrocarbons (PAHs)	Temporal
NIS/AIS	Presence of NIS or AIS	No Context

1.5 Study Design

1.5.1 Study Area

Consistent with previous years, the 2021 MEEMP and NIS/AIS field surveys were conducted primarily within the Local Study Area[1] (LSA) for the Marine Environment as defined in the FEIS and Addendum 1 (Baffinland 2012; 2013). The LSA includes all of Milne Port (Assomption Harbour) and extends north up to 4 km from the existing terminal (spanning the full width of Milne Inlet at the northern boundary; Figure 1-2). The southeast boundary of the LSA ends at the mouth of Phillips Creek.

In 2019, following feedback provided from MEWG members and the community during 2016 community workshops, additional NIS/AIS and physical oceanographic monitoring was conducted north of the LSA boundary extending to Ragged Island and Eclipse Sound (Figure 1-1). No sampling was conducted at Ragged Island in 2021, though new settlement substrates were deployed for collection in 2022.

1.5.2 Inuit Participation

Inuit personnel have been integral to the overall success and safe execution of Baffinland's monitoring programs to date. The success of the MEEMP is greatly reliant on local expertise/knowledge and the continued participation of Pond Inlet community members with respect to study design, program implementation, and field logistics. For the 2021 MEEMP program, Inuit participation included field technicians supporting sampling and processing for the various components.

1.5.3 MEEMP

The MEEMP was initially designed in 2014 to evaluate potential Project-related impacts on the marine environment as predicted in the FEIS and subsequent FEIS Addendum (Baffinland 2013). The original sampling design for the MEEMP (Baffinland 2016; SEM 2015) was based on a radial gradient transect design extending out from the ore dock (Figure 1-2), which represents a potential point source for contaminants (e.g., ore dust, hydrocarbon release, wastewater, and site runoff) and physical perturbations (e.g., sediment re-suspension and transportation). The radial pattern was designed to detect potential Project-related effects based on a gradient of key components with numerical indicators (e.g., metal concentrations in sediment) along a series of transects with increasing distance from the point source.

The initial MEEMP design (excluding NIS/AIS monitoring) comprised the following study components:

- Marine sediment quality
- Benthic epifauna and epiflora dive surveys
- Fish

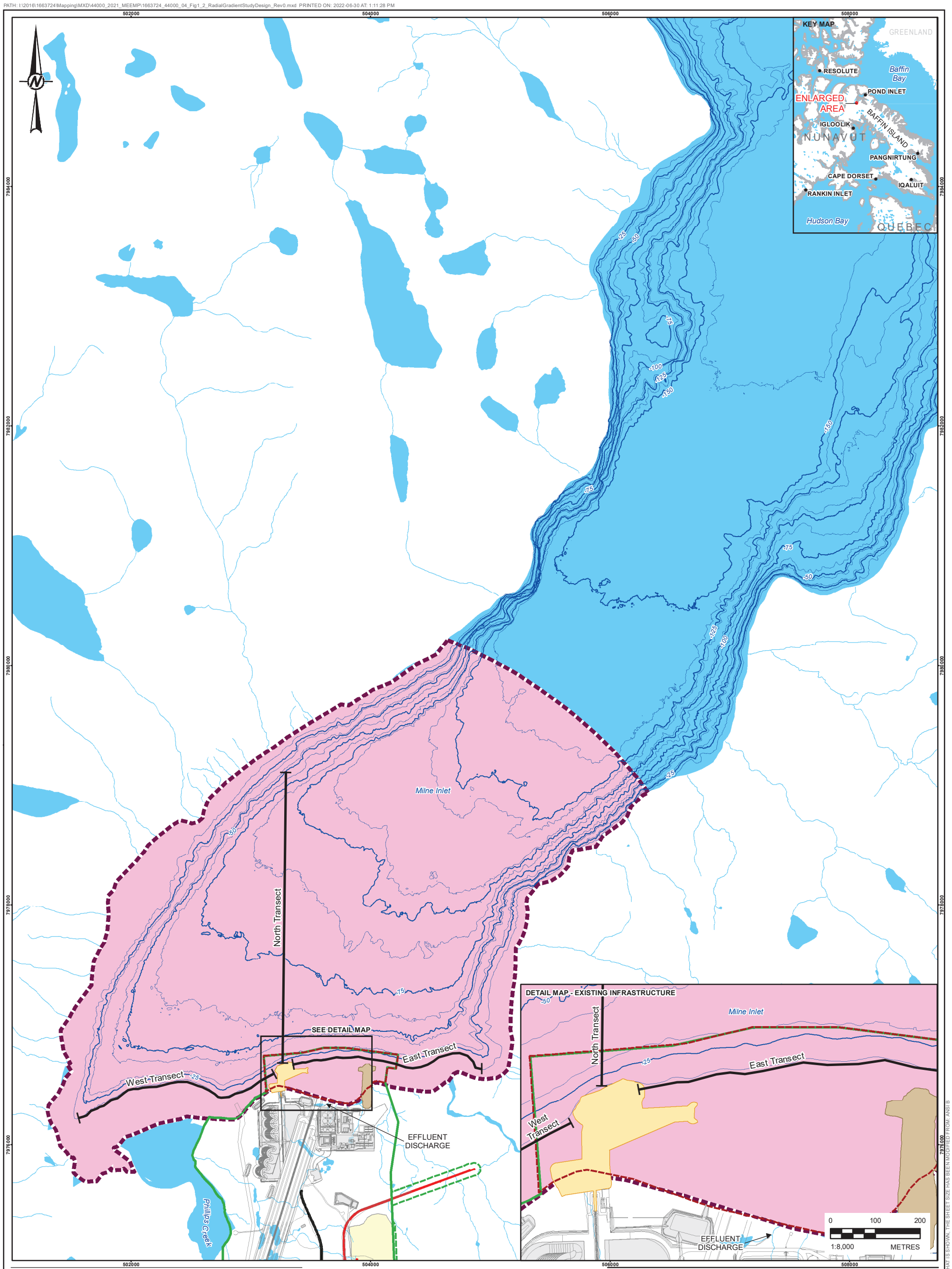
While the original radial gradient design has remained since 2014, the program has been updated to include more components and changes have been made to sampling methodologies and frequencies. Modifications to the MEEMP are summarized below in Section 1.5.3.1. Sampling efforts for the MEEMP in 2021 are summarized in Table 1-4.

[1] The LSA includes all marine waters where there exists a reasonable potential for direct measurable effects from Project activities on the marine environment.

Table 1-4: Summary of Sampling Efforts Performed in Milne Port as Part of MEEMP Surveys, 2021

MEEMP Component	Relevant PC Conditions	Collection Method	Sampling Effort	Sampling Frequency	Years of Data
Marine Water Quality	89 and 99 (a)	Vessel-based using 5.0L Niskin sampling bottles	8 stations	Annual; 5 sampling events/year	6
Marine Sediment Quality	76, 83 (a), 87, 99 (a), and 99 (c).	Vessel-based using Van Veen grab	1 station	Every three years	8
Benthic Infauna	99 (a), and 99 (c)	Vessel-based using Van Veen grab	26 stations (17 taxonomic; 9 genetic)	Every three years	3
Substrate, Macroflora, & Epifauna	76, 83a, 84, 87, 99 (a) and (c)	Quadrat surveys by SCUBA divers (formerly ROV video)	17 quadrats	Annual	2
Fish Population	99 (b)(ii), 99 (c), 113, and 114	Angling	48 hours	32 stations	5
		Fukui Trap	3,853 hours	14 stations	9
		Gill Net	66 hours	25 stations	10
		Hoop Net	616 hours	7 stations	3
		Longline	61 hours	3 stations	1
		Trawling	2 hours	4 stations	2
Fish Health & Tissue Chemistry	76, 83 (a), 87, 99 (a), 99 (b) (ii), 99 (c), 113, and 114.	See above for fish collection methods. Chemistry analyses completed by specialized laboratories.	Incidental ARCH 40 FHSC 40 HIAT	Annual	11 (ARCH) 3 (FHSC) 4 (HIAT)

ROV = Remotely Operated Video; ARCH = Arctic char; FHSC = Fourhorn sculpin (*Myoxocephalus quadricornis)*; HIAT = Arctic hiatella (*Hiatella arctica*)



LEGEND

- BATHYMETRIC CONTOUR (15 m INTERVAL)
- BATHYMETRIC CONTOUR (25 m INTERVAL)
- MILNE INLET TOTE ROAD
- PROPOSED NORTH RAILWAY
- TRANSECT
- WATERCOURSE
- AGGREGATE SOURCE (BORROW PIT OR QUARRY)
- EXISTING INFRASTRUCTURE
- EXISTING ORE DOCK
- PROPOSED FREIGHT DOCK AND CAUSEWAY
- LOCAL STUDY AREA
- PDA / QIA COMMERCIAL LEASE
- REVISED PDA FOR PHASE 2 PROPOSAL
- WATERBODY

0 500 1,000
1:30,000 METRES

REFERENCE(S)

BATHYMETRY CREATED BY GOLDER FROM MULTIPLE DATA SOURCES. FREIGHT DOCK DATA PROVIDED BY HATCH, MAY 21, 2020. ADDITIONAL MILNE PORT INFRASTRUCTURE PROVIDED BY CLIENT, MAY 28, 2018 AND PROVIDED BY HATCH, JANUARY 25, 2017, RETRIEVED FROM KNIGHT PIESOLD LTD. FULCRUM DATA MANAGEMENT SITE MAY 19, 2017. HYDROGRAPHY AND TOPOGRAPHY DATA BY EAGLE MAPPING (2005), RETRIEVED FROM KNIGHT PIESOLD LTD. FULCRUM DATA MANAGEMENT SITE, MAY 2017. HYDROGRAPHY, POPULATED PLACE, AND PROVINCIAL BOUNDARY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
PROJECTION: UTM ZONE 17 DATUM: NAD 83

CLIENT
BAFFINLAND IRON MINES CORPORATION

PROJECT
MARY RIVER PROJECT

TITLE
STUDY AREA FOR THE MARINE ENVIRONMENTAL EFFECTS MONITORING PROGRAM (MEEMP), 2021

CONSULTANT
GOLDER
MEMBER OF WSP

YYYY-MM-DD	2022-06-30
DESIGNED	CB
PREPARED	AJA
REVIEWED	PR
APPROVED	PR

PROJECT NO.	CONTROL	REV.	FIGURE
1663724	44000-04	0	1-2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25mm
0

1.5.3.1 Modifications to the Program

Since program inception, survey design has continually evolved based on refinements identified through consultation with regulatory agencies and Inuit organizations and recommendations made in previous survey years. Table 1-5 summarizes key changes to the program since 2014.

Table 1-5: Summary of Modifications to the MEEMP Study Design from 2014 to 2021.

Year	MEEMP Component	Description of Modification
2015	Marine Water Quality	Addition of water quality component to monitor for potential changes associated with site drainage and treated effluent discharges to the marine environment (including iron ore stockpile run-off). Four water quality stations were established near the site discharge point for compliance monitoring; one station next to the site discharge point, and three stations located slightly offshore to the northeast, north and northwest of the source.
2017	Physical Oceanography	Addition of sea level monitoring (using a tidal gauge) and vertical physical profiles of physical oceanographic parameters at Milne Port.
2017/18	Fish Population	In 2017, fish sampling was limited to a two-week period in August, which was not necessarily representative of the entire open-water shipping season (late July to mid-October). In 2018, fish sampling was conducted throughout the duration of the MEEMP program (over four weeks, from the end of July to the end of August) for better representation of the shipping season. Fishing methods included gill netting and Fukui traps, with angling added in 2017, and beach seines added in 2018.
2018	Physical Oceanography	Sea level monitoring was expanded to include physical oceanographic monitoring throughout Milne Inlet including two sites at Milne Port and one at Bruce Head, and additional vertical physical profiles at select times and locations throughout Milne Inlet.
2018	Marine Sediment Quality	The number of sediment samples analyzed for hydrocarbon concentrations was reduced from three samples to one sample at each station, as hydrocarbon concentrations had been below detection limits (DL) in all samples to date. Additionally, two new sediment sampling stations were included along the East Transect to account for anticipated construction associated with the proposed Phase 2 ore dock and freight dock.
2018	Benthic Infauna	Addition of benthic infaunal sampling program, with input from MEWG. Previous years did not include infaunal sampling but, rather, evaluated changes to the benthic community using epifauna[2] and epiflora[3] as indicators using towed underwater video transect surveys – an approach that did not yield consistent nor reliable data primarily due to issues associated with video resolution.
2018	Epifauna and Epiflora	Study design was changed from one long video transect to a Before - After Control - Impact (BACI) approach with five belt transects (1 m x 5 m plots) permanently installed on the seabed in each of the exposure and reference areas; monitoring was conducted using a remotely operated vehicle underwater video system.

[2] benthic invertebrates living on the substrate

[3] marine vegetation attached to the substrate (e.g. kelp)

Year	MEEMP Component	Description of Modification
2018	Fish Health & Tissue Chemistry	Addition of local shellfish species, wrinkled rock borer (*Hiatella arctica)*, as an additional effects indicator in the event finfish species (Arctic char or sculpins) were sampled in insufficient numbers to adequately support statistical analyses. Measurement endpoints included body weight to length ratio and tissue (body burden) analysis. Prior to 2018, fish tissue sampling was limited to incidental Arctic char mortalities, which fluctuated from year to year and did not always yield enough samples for a meaningful statistical analysis.
2019	Physical Oceanography	Vertical physical profiles of water quality parameters including temperature, salinity, conductivity, turbidity, pH, chlorophyll-a, and dissolved oxygen were taken north of Ragged Island in Eclipse Sound in August and September 2019.
2019	Benthic Infauna/ Marine Sediment Quality	Following the results of a power analysis, sampling intensity for benthic infauna and marine sediment was increased from four transects with 5 stations, to five transects with 15 stations each to improve statistical power and the ability to detect Project-related effects. Unlike in previous years, separate NIS/AIS stations were not sampled due to the expansion of the benthic sampling program.
2019	Benthic Infauna	In previous years, 3 subsamples were taken at each benthic infauna sampling station. In 2019, the three subsamples were composited into a single sample for each station.
2019	Fish Health & Tissue Chemistry	Inclusion of sculpin (*Myoxocephalus sp*.) as a sentinel species and effects indicator due to the number of incidental mortalities being sufficient to support analyses.
2019	Fish Health & Tissue Chemistry	Instead of collecting length and weight measurements of *Hiatella arctica* samples in the field, *H. arctica* specimens were submitted for age analysis in addition to the tissue (body burden) analysis.
2019	Fish Population	Hoop nets were introduced to the fish sampling program to determine the capture efficiency of the method in Milne Port and to assess its potential as a replacement for Fukui trapping. Fukui traps will continue to be used in addition to hoop nets to meet commitments of continuing to sample at old locations for a minimum of three years to facilitate comparison of old and new methods/results.
2020	Marine Water Quality	Addition of a second water quality monitoring station at the discharge location of MP-06, consistent with the study design for the existing water quality monitoring station at the discharge location for MP-05.
2020	Marine Water Quality	The collection of water samples was scheduled to coincide with at least one active discharge event at each discharge. One collection event also coincided with a de-ballasting event along the Ore Dock.
2020	Marine Sediment Quality/Benthic Infauna	Following time constraints in 2019, the sampling effort was increased from 8 to 10 sampling stations per transect to 15 sampling stations per transect.
2020	Marine Sediment Quality/Benthic Infauna	Benthic infauna and sediment sampling methodology and equipment was standardized across all stations to ensure consistency and comparability of results.
2020	Marine Sediment Quality/Benthic Infauna	The Coastal Transect was removed from the sampling plan after being determined as not contributing to the radial gradient design of the sediment and benthic sampling components.
2020	Substrate, Macroflora, and Benthic Epifauna	Due to the previously deployed belt transects being moved, twisted, and obscured following a short deployment period, the belt transects were replaced with 10 steel quadrats that should be more robust under the local conditions.

Year	MEEMP Component	Description of Modification
2020	Substrate, Macroflora, and Benthic Epifauna	Following limitations in species identification in ROV footage on the belt transects, a dive team trained in the identification of marine biota were used in addition to ROV for survey of the quadrats.
2020	Fish Population	Based on input and recommendations by Inuit field personnel, fishing locations were selected, and modifications were made to the methodologies for Fukui traps and hoop nets. Modifications included setting the traps in deeper locations to target demersal species and improve capture efficiency.
2020	Fish Health and Tissue Chemistry	Fourhorn Sculpin were added as a targeted species for fish health and tissue chemistry/body burden analysis to monitor for impacts to resident fish species in Milne Port.
2020	Fish Health and Tissue Chemistry	Additional indicators were added to the fish health program to align with a Metal and Diamond Mining Effluent Regulations (MDMER) Environmental Effects Monitoring (EEM) program design. This included the addition of targeted lethal fish sampling to meet a minimum sample size.
2021	Marine Sediment Quality/Benthic Infauna	Monitoring frequency for the joint radial sediment and benthic sampling program has been adjusted to every three years, consistent with routine biological sampling for other mining effects monitoring programs and reflective of federal guidance (e.g., the federal Environmental Effects Monitoring Program [EEM]).
2021	Substrate, Macroflora, and Benthic Epifauna	Ten additional quadrats were fabricated and deployed: 5 in each the reference and impact areas. ROV methods were replaced by exclusive use of divers to improve taxonomic resolution of the data. 2021 was the first year that opportunistic samples of macroflora and epifauna were collected for taxonomic/genetic identification.
2021	Fish Population	Longlines were added as a fishing method to the 2021 program. In addition, two Fishing Areas (FAs) were delineated based on habitat features and their location relative to Milne Port to help standardize sampling efforts and address variability in the catch data across Milne Port.

1.5.4 NIS/AIS Monitoring

The NIS/AIS monitoring program was designed to detect for the potential introduction of non-native species from ballast water discharges and/or hull biofouling and focuses in areas with the highest likelihood of marine invasion. Due to ballast water releases occurring in Milne Port, NIS/AIS sampling largely focuses on southern Milne Inlet. The NIS/AIS Monitoring Program is conducted at a surveillance level, where detection of a single Project-related invasive species is the threshold for triggering of adaptive management measures (e.g., species rapid response plans) and/or potential corrective actions (e.g., measures to eradicate the NIS/AIS), if deemed feasible. The NIS/AIS monitoring program consists of data collected across multiple trophic levels (marine vegetation, benthic invertebrates and fish) to establish a comprehensive inventory of existing marine biota in the Project area that is intended to serve as a point of reference for any new species identified over time, and to evaluate potential changes in community structure that may be linked to NIS/AIS introductions. Sampling efforts that contribute to the NIS/AIS monitoring program are summarized in Table 1-6. NIS/AIS monitoring is recommended to be conducted annually until results of ballast water sampling are deemed satisfactory to recommend reducing the frequency of monitoring in the receiving environment.

Table 1-6: Summary of Sampling Efforts Performed in Milne Port as Part of NIS/AIS Monitoring Program Surveys, 2021

Relevant PC Conditions	Collection Method	Sampling Effort	Sampling Frequency	Years of Data
76, 87, 89, 91, 99 (a), and 99 (c)	Permanent Quadrats	17 Quadrats	Annual	4
	Active Fish Sampling	85 Stations	Repetitive, Annually	10
	Fish Stomach Contents	33 Incidental Mortalities	Repetitive, Opportunistic, Annually	9
	Benthic Infauna	26 Stations	Annual	10
	Settlement Substrates	18 Plates 9 Baskets	Annual	1
	Incidental Specimen Collection	N/A	Opportunistic, Annually	3

1.5.4.1 Modifications to the Program

The initial NIS/AIS surveys were conducted in 2014 to enhance marine flora and fauna inventories collected during baseline sampling in 2008 and 2013. In subsequent years, NIS/AIS monitoring focused on identification of organisms not previously detected during the baseline program (as primary indicators of invasion). Equivalent NIS/AIS monitoring was continued in Milne Port area, although the program was expanded and modified based on refinements identified through consultation with regulatory agencies and Inuit organizations and recommendations made in previous survey years. Table 1-7 summarizes key changes to the program.

Table 1-7: Summary of Modifications to the NIS/AIS Monitoring Program Study Design from 2015 to 2021.

Year	Program Component	Description of Modification
2015	Overall Program	Baskets were redeployed instead of being collected for annual analysis due to insufficient colonization on the substrate.
2015	Settlement Baskets	Baskets were redeployed instead of being collected for annual analysis due to insufficient colonization on the substrate.
2016	Settlement Baskets	New settlement baskets were deployed in Milne Port to replace sets previously lost.
2017	Benthic Infauna and Zooplankton	Four new sampling locations were added at Ragged Island to sample specifically for the NIS/AIS monitoring program in response to public concern over ships potentially discharging ballast water while occupying anchorage sites in this area.
2017	Zooplankton	Four new sampling locations were established in Milne Port for vertical zooplankton hauls, and two new locations for oblique zooplankton tows.
2017	Zooplankton	Modifications to the methodology for oblique zooplankton tows were made to target faster moving species and increase the total number of species identified.
2018	ROV Surveys	ROV based surveys were made along the hulls of several ore carriers to assess for potential biofouling on vessels originating from outside of Canadian waters.
2019	Benthic Infauna	In 2019, no benthic infauna sampling occurred at the original NIS/AIS specific stations, due to the significant expansion of the benthic sampling program. A greater number of stations were sampled for identification of benthic infauna. NIS/AIS status was determined for all infauna identified in benthic sampling.

Year	Program Component	Description of Modification
2019	Macroflora and Epifauna	A new NIS/AIS towed video survey transect was added east of the new freight dock at Milne Port to account for potential changes in shipping rates in Port.
2019	Zooplankton	Two oblique zooplankton tow sampling locations were added to the Ragged Island component.
2020	Overall Program	The program name was changed from AIS Monitoring to NIS/AIS monitoring to emphasize efforts to monitor for all potential species introductions to Milne Port, regardless of invasive status.
2020	ROV Surveys	Survey methodology was reviewed with the operator to ensure the methodology was aligned with the stratified survey design used in Sylvester and MacIsaac (2010).
2020	Ship Hull Monitoring	Performed ship hull monitoring on two ships at anchorage to avoid limitations with hull visibility and accessibility when ships are moored at the Ore Dock, increasing the total area and survey time for each ship.
2020	Settlement Baskets	Deployment of nine new sets of settlement baskets and plates along the Freight Dock, as well as 10 sets of settlement plates in other locations around Milne Port to increase monitoring of recruitment of encrusting biota.
2020	DNA Sampling	To improve taxonomic resolution, a DNA sampling component was added. Targeted sampling occurred at locations where potential NIS/AIS taxa had been observed previously, samples were preserved for DNA analysis at the Canadian Centre for DNA Barcoding at the University of Guelph. Incidentally-collected specimens were also selectively preserved for barcoding and taxonomic confirmation.
2021	Zooplankton	Zooplankton tows were removed from the sampling program due to the high variability in the data and limited sampling not capturing the seasonal presence of many taxa.
2021	Ship Hull Monitoring	Monitoring of ship hulls was not conducted in 2021 as Baffinland works with DFO to design a methodology that will improve the taxonomic resolution of the data collected to better inform assessment of NIS/AIS risk

1.6 Conclusion and Recommendations

The MEEMP has been designed to meet the objectives of the various conditions associated with Project Certificate 005, as well as to evaluate whether Project activities have impacted the marine environment over time. Original FEIS predictions indicated the potential for low magnitude changes in some ecological parameters, such as water quality and Arctic char tissue chemistry, but characterized these as “not significant”. Overall, monitoring data align with these predictions, as observed changes are typically minor and either within established guidelines or consistent with baseline levels. Thus, monitoring to date suggests that mitigation measures are functioning as intended and that Project activities are being managed in a way that has not adversely affected the marine ecosystem.

The main conclusions and recommendations based on the results of the 2021 MEEMP studies are as follows:

- **Marine Water Quality**
  - Relevant to PC No. 76, 87, 89, 99(a).

- Site discharges from MP-05 and MP-06 are in compliance with the requirements outlined in the Water License
- Measured concentrations of metals were generally consistent with previous years and remain below CCME water quality guidelines for the protection of aquatic life while hydrocarbons and PAHs were not detected at all.
- Laboratory analyses have not revealed an observed trend of increased levels of iron in water samples collected between 2017 and 2021; iron is well within the 2015-2020 range of detected concentrations.
- Monitoring results remain within original FEIS predictions, which forecasted no significant residual effects on water quality, but indicated the potential for minor localized increases in TSS, nutrient, metal, and hydrocarbon concentrations.
- **It is recommended that the water quality sampling program continue in 2022 to ensure compliance with Project permits and that parameters of potential concern remain well below thresholds of harm for marine biota.**

- **Marine Sediment Quality**
  - Relevant to PC No. 76, 83 (a), 84, 85, 87, 99 (a), and 99 (c).
  - To date, construction and operation of Milne Port does not appear to have negatively affected sediment quality, as measured concentrations were low and generally consistent with previous years.
  - Laboratory analysis of sediment from SW-2 shows that indicators (i.e., nutrients, metals, PAHs, hydrocarbons) are within the range measured in previous years and either not detectable or are below CCME sediment quality guideline thresholds.
    - Iron concentration in 2021 was comparable to concentrations measured in previous years at this station.
    - Sediment grain size measurements indicate a coarsening of substrate at this site in recent years, reflected in higher sand, and lower fines, content. This is attributed to propellor wash from berthing ore carriers mobilizing fine sediments and is considered to be a localized physical disturbance.
  - Monitoring results largely remain within original FEIS predictions, which forecasted no significant residual effects on sediment quality, but indicated the potential for minor localized increases in nutrient, metal, or hydrocarbon concentrations that would not exceed Canadian Council of Ministers of the Environment (CCME) sediment quality guidelines for the protection of aquatic life as well as potential for localized fine sediment resuspension as a result of propellor-generated currents.
  - **It is recommended to continue targeted sampling in 2022 to increase understanding of sediment grain size variability and monitor for potential effects of Project activities on grain size distribution.**

- **Benthic Infauna**
  - Relevant to PC No. 76, 99(a) and 99(c).
  - To date, construction and operation of Milne Port does not appear to have negatively affected benthic infaunal communities, which continue to be diverse and well established in both nearshore and offshore habitats.

- Evaluation of benthic community effect indicators show an increase in total density, richness, and diversity relative to the 2020 sampling program. suggesting the benthic infaunal community is rebounding, or has rebounded, from a physical disturbance linked to propellor wash from berthing ore carriers that caused localized and temporary changes in community indices.
- Monitoring results largely remain within original FEIS predictions, which forecast the potential for localized alterations to benthic community composition from fine sediment resuspension as a result of propellor-generated currents.
- **It is recommended to continue targeted sampling in 2022 to increase understanding of variability in benthic community indicators as well as to monitor for signs of continued recovery in the benthic community.**

- **Substrate, Macroflora and Benthic Epifauna**
  - Relevant to PC No. 76, 83 (a), 87, 99 (a), and 99 (c).
  - Substrates documented within the quadrats are predominantly soft, dominated by silt and sand, consistent with what has been observed previously at Milne Port.
  - Similar macroflora and benthic epifaunal taxa were observed in 2021 as in previous years (2018-2020) and no statistically significant differences were noted between the exposure and reference areas for any of the indicators evaluated (i.e., percent cover, density, species richness, and diversity).
  - Results reveal no evidence of Project-related influence or impairment, consistent with FEIS predictions.
  - Results of both a power analysis and taxa accumulation curve indicate that the current sampling design is insufficient to detect change and fully characterize the epibenthic community, respectively, such that these results should be interpreted with some caution.
  - **Given that sampling effort has not been adequate to detect community change with acceptable statistical power, following discussion with the MEWG the decision was made to add three additional quadrats in both the study and reference areas during field sampling in 2022 to increase statistical detection power over previous years.**
- **Marine Fish Community and Catch Data**
  - Relevant to PC No. 99 (b)(ii), (c), 113, and 114.
  - Construction and operation of Milne Port does not appear to have triggered detectable changes in local fish communities to date.
  - Overall, fishing methods were deemed effective in characterizing the marine fish community in terms of species presence and relative abundance.
  - The delineation of FAs and standardization of fishing methods provides a rigorous study design for generating catch statistics that can be compared for assessing trends in the abundance and distribution of fish at Milne Port into the future.
  - Monitoring results align with original FEIS predictions, which forecasted that the Project would have no significant effects on marine fish habitat, nor would it affect the size of Arctic char populations.

- **It is recommended that standardized fish sampling continue in 2022.**

- **Fish Health and Tissue Chemistry**
  - Relevant to PC No. 76, 83 (a), 87, 99 (a), 99 (b) (ii), 99 (c), 113, and 114.
  - Monitoring results remain well within original FEIS predictions, which indicated the potential for non-significant, low magnitude effects on Arctic Char health and body condition that are expected to be reversible. Observed changes have generally been small and either within established guidelines, or consistent with baseline conditions, and are thus considered to reflect natural variability rather than effects resulting from the Project.
  - Differences were observed among years in fish size; however, these differences were small and inconsistent among years and likely reflect natural variability in these fish populations over time.
  - Statistically significant elevations in tissue concentrations of some metals were noted for the clam *H. arctica* and Arctic char in 2021 relative to concentrations in 2020, however, these differences were small and often inconsistent, likely reflecting natural variability in both the bioavailability and subsequent uptake of metals, reflected in the reported tissue concentrations.
  - **Continued monitoring is recommended to maintain continuity in established time series data for Arctic Char and the collection of additional fish health and tissue chemistry for Fourhorn Sculpin and *H. arctica,* to provide a benchmark for comparisons in the future.**

- **NIS/AIS Program**
  - Relevant to PC No. 76, 87, 89, 91, 99 (a), and 99 (c).
  - Hundreds of taxa (800+) have been documented to date, the vast majority of which are not NIS/AIS.
  - Taxa identified in 2021 surveys included 53 benthic infauna taxa not previously reported in Milne Port; of these, only one was flagged based on literature review and sent for independent verification as a precaution. Results are pending.
  - 2021 samples included five taxa currently listed on the Watch List. These specimens were sent to taxonomic experts for independent verification and/or molecular analysis.
  - Targeted sampling occurred at nine locations in Milne Port to capture taxa designated as “High Risk” for DNA verification.
  - Genetic results indicate:
    - The 2021 *Marenzelleria* sp. specimens were confirmed to be *Marenzelleria wireni* – an Arctic basin species.
    - *Crassicorophium* sp. were largely inconclusive, with no match to the taxa of concern. The closest molecular match was to unidentified amphipod specimens (presumed to be *Crassicorophium clarencense*) collected from Victoria Island in Nunavut, indicating that these are likely representative of an indigenous taxon, supported by the identification of similar specimens during the Program baseline.

  - Inconclusive results were also received for the *Pseudofabricia* sp. nr. *aberrans.* The specimens were confirmed to not match *Fabricia stellaris* (a previously suggested alternative identification for the specimens), but also did not match existing records for any other species. Taxonomic experts suggested it is probable that these specimens are from a currently undescribed species that is indigenous to the Project area.
- There are currently no taxa on the Trigger List and no taxa were added in 2021.
- No taxa were added to the Watchlist in 2021, though one species was removed (*Ampharete petersenae*)
- **It is recommended to continue:**
  - **sampling across multiple trophic levels continue in 2022 and building the Milne Inlet Taxonomic Inventory**
  - **using external accredited laboratories and/or global specialists to confirm identifications of flagged specimens**
  - **collecting targeted samples for DNA analysis at locations where high-risk taxa have previously been observed.**

Further details on each component of the MEEMP are provided in topic specific chapters: Marine Water Quality (Chapter 2.0); Marine Sediment Quality (Chapter 3.0); Benthic Infauna (Chapter 4.0); Substrate, Macroflora, and Epifauna (Chapter 5.0); Marine Fish Community (Chapter 6.0); Fish Health and Tissue Chemistry (Chapter 7.0); and, NIS/AIS Monitoring (Chapter 8.0).

Comments on the draft 2021 MEEMP and NIS/AIS Monitoring Report were received from the MEWG in June of 2022. Baffinland's responses to MEWG comments and recommendations on the draft report are included as Appendix A.

1.7 REFERENCES

Baffinland (Baffinland Iron Mines Corporation), 2012. Mary River Project. Environmental Impact Statement (EIS). Volume 8: Marine Environment. 318 pp, + appendices.

Baffinland, 2013. Mary River Project – Addendum to the Final Environmental Impact Statement.

Baffinland. 2016. Marine Environmental Effects Monitoring Plan. 78 pp.

British Columbia Ministry of Environment (BC MOE). 2014. Companion Document to: Ambient Water Quality Guidelines for Selenium Update. Water Protection and Sustainability Branch Environmental Sustainability and Strategic Policy Division British Columbia Ministry of Environment. 28pp.

Casas-Monroy O, Linley RD, Adams JK, Chan FT, Drake DAR, Bailey SA. 2014. National risk assessment for introduction of aquatic nonindigenous species to Canada by ballast water. Canadian Science Advisory Secretariat Research Document 2013/128. VI + 73 p.

Environment Canada. 2012. Metal Mining Technical Guidance for Environmental Effects Monitoring. EN14-61/2012E-PDF.

Falardeau M, Bouchard C, Robert D, Fortier L. 2017. First Records of Pacific Sandlance in the Canadian Arctic Archipelago. Polar Biology 40:2291-2296.

Golder (Golder Associates Ltd.). 2018. Mary River Project 2017 Marine Environmental Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Monitoring Program. Prepared for Baffinland Iron Mines Corporation, Oakville, Ontario. Golder Doc. No. 1663724-048R-Rev1; 9 April 2018. 504 p. https://www.baffinland.com/_resources/document_portal/1663724-048-r-rev0-meemp-2017-report-20feb18-2018-16-05-01-2018-09-07-11.pdf

Health Canada. 2015. Health Canada's Maximum Levels for Chemical Contaminants in Foods. Available at: https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/chemical-contaminants/maximum-levels-chemical-contaminants-foods.html. Retrieved 12 February 2021.

Molnar JL, Gamboa RL, Revenga C, Spalding MD. 2008. Assessing the global threat of invasive species to marine biodiversity. Frontiers in Ecology and the Environment. [Accessed February 2021] http://www.conservationgateway.org/ConservationPractices/Marine/Pages/marineinvasives.aspx

SEM (Sikumiut Environmental Management Ltd.). 2015. Marine Biological and Environmental Baseline Surveys Milne Inlet 2014. Prepared for Baffinland Iron Mines Corporation, Oakville, Ontario.

Sylvester F, MacIsaac HJ. 2010. Is Vessel Hull Fouling an Invasion Threat to the Great Lakes? Diversity and Distributions 16: 132-143.

APPENDIX A

Responses to MEWG Comments on 2021 Draft Report

Baffinland

Baffinland Mary River Project Report Working Group Comment Form

Reviewer Agency/Organization:	*Parks Canada Agency*
Reviewers:	*Allison Stoddart, Jordan Hoffman, Chantal Vis*
Document(s) Reviewed:	*2021 Bruce Head Shore Based Monitoring Program, 2021 MEEMP and AIS Monitoring Program, 2021 Marine Mammal Aerial Survey, 2021 Ringed Seal Aerial Survey, 2021 Underwater Acoustic Monitoring Program (Open-water Season), Year 2 Freight Dock Offset Habitat Monitoring Program*
Date Review Completed	*2022-05-17*

Comment No.:	PCA-06
Section Reference:	2021 Marine Environmental Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Monitoring Program, Section 2.0 Water quality, pages 1-12
Comment:	

The stated objectives are to "Assess potential changes in marine water quality parameters" (p.1), however, the report does not provide any statistically-based inter-annual comparisons of water quality parameters through time at all sites. Figures 2.2- and 2-3 summarize trends through time for iron concentrations, however for only select sites. In general, results presented are descriptive and selective, and it is hard to discern if any significant changes in any of the parameters monitored have occurred through time. We suggest a statistical analysis of change through time of the key water quality parameters (e.g., iron, etc.) of all sites combined would be required to assess the significance of changes in water quality parameters through time.

Baffinland Response:

The objective of the marine water quality component is stated in Section 2.1.1 as: *Assess potential changes in marine water quality parameters in the receiving environment related to site drainage and the treated effluent discharges MP-05 and MP-06.* The water quality program is a discharge monitoring program primarily designed to ensure site discharges from MP-05 and MP-06 are compliant with federal water quality guidelines (WQGs), such as the Canadian Council of Ministers of the Environment (CCME)

Protection of Aquatic Life (PAL) guidelines and requirements outlined in the Type A Water License No. 2AM-MRY1325; it is not designed to assess changes in water quality parameters through time.

As outlined in the original study design for the MEEMP (BIMC 2016), marine water quality is not a suitable monitoring parameter for an Environmental Effects Monitoring (EEM) program because of the natural variability created by freshwater inputs and tidal exchanges. Therefore, this parameter is only monitored at a surveillance level as part of an 'end-of-pipe' compliance monitoring program rather than integrated into the overall EEM sampling design (see Section 3.2.3 and Table 3.1 in BIMC 2016). Other monitoring parameters such as marine sediment quality or benthic infauna are more appropriate parameters for detection of environmental change(s) attributable to Project activities (e.g., ore dust emissions/dispersion) because contaminants are less likely to be flushed through tidal exchanges and thus have the potential to accumulate over longer time scales. As such, a statistical analysis of temporal and/ or spatial changes in water quality indicators (e.g., iron concentration, etc.) is not justified.

In 2021, measured metal concentrations downstream of both discharges were lower than applicable Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines (WQGs) over the five sampling events. In response to recommendations from the MEWG on the 2020 MEEMP report, Baffinland made a commitment to present marine water quality data collected over time in graphical form to facilitate data interpretation. To support the evaluation of iron (metal of primary interest) and provide a more visual presentation of the data, Figures 2-2 and 2-3 were included in the 2021 MEEMP report for Total Iron. The data show there has been no trend of increasing iron concentrations in water samples from Milne Inlet to date, which is as expected given that iron ore stockpiled at Milne Port is in a mineral/particulate form and would therefore likely settle and accumulate in marine sediment rather than dissolve in the water column if it were to enter the marine environment via run-off, discharge and/or airborne transport. This is why the marine sediment and benthic program is considered to represent a more appropriate medium than surface water to monitor for temporal changes in iron concentrations within the marine environment. Results from sediment monitoring demonstrate that iron has not been accumulating in Milne Inlet sediments, while tissue chemistry results for various ecological receptors including fish (Arctic char, fourhorn sculpin) and shellfish (Hiatella arctica) demonstrate that iron is neither entering the food chain nor accumulating in fish tissues.

References:

Baffinland Iron Mines Corporation (BIMC). 2016. Marine Environmental Effects Monitoring Plan. Rev 1.1. Prepared by LGL Limited - Environmental Research Associates and Sikumiut Environmental Management (SEM) Ltd.

Comment No.:	PCA-07
Section Reference:	2021 Marine Environmental Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Monitoring Program, Section 8.0 Non-Indigenous and Aquatic Invasive Species monitoring, page 4
Comment:	

The NIS/AIS program is designed as a surveillance survey, and does not have traditional indicators or

thresholds, and as a result – it is unclear what adaptive management actions or responses would be implemented should a species on the Trigger list be detected. The report presents an overview of the response protocol aimed at assessing the risk and determining the appropriate course of action, however, the course of action leads to many steps (validation of identification, heightened monitoring, etc.) which could take months or years to complete, prior to initiating an actual response plan. Does Baffinland have an early response/action plan ready for species on the trigger list? Or would this only be developed once the species is found and confirmed related to project. We suggest that an Early Response Plan (containment, eradication) and an Incident Command approach to responding to the species on the Trigger list could be prepared as part of the surveillance program to help reduce probability of species establishment.

Baffinland Response:

While it is true that the NIS/AIS program is designed as a surveillance program, Baffinland would like to clarify that it is concurrently working on the prevention of species introductions through its ongoing commitments related to ballast water exchange and treatment practices, which exceed current federal regulations.

Development of a response plan would occur should a species be placed on the trigger list (i.e., following confirmation of a Project-introduced invasive species in the RSA; see Figure 8-3). There are currently no species on the trigger list and, therefore, no species-specific response or action plans have been developed to date. Should a species be added to the trigger list, a species-specific response plan would be developed in consultation with DFO.

Baffinland disagrees that an Early Response Plan should detail containment and eradication efforts. Rather, as outlined in current literature, early response plans should focus on determining the best course of action to respond to the specific non-indigenous/invasive species in question in the context of the local environment, including observations of the behaviour and competitive interactions in relation to the local community. Green and Grosholz (2020) provide a valuable discussion on the limitations and information requirements for choosing to begin eradication and control programs. Notably, the best course of action may not necessarily be an active response. Monitoring may indicate that the local environment is resilient or competitive to pressures from the non-indigenous species, resulting in a natural biocontrol program, which could be disrupted by an intervention; in other words, detection of an AIS/NIS does not necessarily mean that it has established and requires intervention.

Additionally, eradication and control methods should neither be rushed nor undertaken lightly. These methods can be highly indiscriminate and destructive, resulting in the complete eradication or destruction of entire benthic communities and/or habitats, not just the target species. These actions may have unintended long-term consequences such as extirpation of more sensitive native species, creation of conditions more suitable to recruitment of additional AIS due to lack of competition or loss of functional diversity, or cascading effects to the broader ecosystem due to eradication of primary producers and lower trophic level species (Veitch and Clout 2002). Eradication should be considered only when absolutely necessary such as when observations indicate the AIS is showing signs of aggressive establishment with threat of overtaking the communities in the broader region, is having a significant negative impact on native populations with flow on effects to higher trophic levels, other control or suppression methods have failed in comparable environments, or when the loss of natural fauna is considered inconsequential (Bax et al. 2002). Successful eradication programs are generally reliant on the ability to fully isolate the ecosystem, such as in closed harbors or island habitats, where containment is already occurring (see examples in Veitch and Clout 2002).

References

Bax, N., H. Hayes, A. Marshall, D. Parry and R. Thresher. 2002. Man-made marinas as sheltered islands for alien marine organisms: Establishment and eradication of an alien invasive marine species. In: Veitch CR, Clout MN, editors. Turning the Tide: The Eradication of Invasive Species, Proceedings of the International Conference on Eradication of Island Invasives IUCN Species Survival Commission, Invasive Species Specialist Group. ISBN 978-2-98317-0682-5

Green S.J. and E.D. Grosholz. 2020. Functional Eradication as a Framework for Invasive Species Control. Frontiers in Ecology and the Environment. 19(2):98-107

Veitch C.R and M.N. Clout, editors. 2002. Turning the Tide: The Eradication of Invasive Species, Proceedings of the International Conference on Eradication of Island Invasives. IUCN Species Survival Commission, Invasive Species Specialist Group. ISBN 978-2-98317-0682-5

Reviewer Agency/Organization:	*DFO*
Reviewers:	Marianne *Marcoux, Kimberly Howland, Joclyn Paulic, Daniel Coombs, Edyta Ratajczyk*
Document(s) Reviewed:	2021 Marine Environment Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Monitoring Program
Date Review Completed	

Comment No.:	*DFO-12*
Section Reference:	8.2.1 Modifications to the Program (2021)
Comment:	

Issue:
The recommendation for the removal of Zooplankton sampling from the program in 2021 was not developed in consultation with DFO or the MEWG.

Recommendation:
Consult with DFO and the MEWG on modifications to monitoring programs.

Baffinland Response:

Zooplankton sampling has been reinstated as a component of the 2022 Aquatic Invasive Species / Non-indigenous Species (AIS/NIS) Monitoring Program at Milne Port. Zooplankton samples will be collected using vertical and horizontal oblique zooplankton tows (same methods as 2020).

Comment No.:	*DFO-13*
Section Reference:	8.4.3 Independent Verification
Comment:	

Issue:
"Seven taxa were flagged for review in 2021, due to concerns regarding possible NIS/AIS status, presence on the program Watchlist, limited descriptions of geographic range, to gain clarity or confirmation of uncertain identifications, or as part of QAQC procedures (Table 8-8). Results of independent review will be summarized in table 8-9, once the information becomes available.

Recommendation:
Provide DFO with Table 8-9 information once available.

Baffinland Response:

Results have been received for three of the independent verifications. Table 8-9 has been revised with the updated laboratory results in the final MEEMP report.

Comment No.:	*DFO-14*
Section Reference:	8.5.3.3. Bryozoans
Comment:	

Issue:
"Due to the presence of Eastern Canadian Arctic species within the genus, and poor range descriptions for bryozoans in general, *Tricellaria* sp. Is designated No Risk and is not considered to be of concern for Milne Inlet.

Clarification:
DFO does not agree with the conclusion. Independent verification of samples sent have not been received as of date. The genus as stated has been included on species listed on databases as alien (Rius et al. 2022, Fofonoff et al. 2022, Molnar et al. 2008).

Recommendation:
Without proper verification of samples collected, it cannot be ruled out that the sample contains *T. inopinata*, which is listed on the National Risk Assessment as a potential invasive species in Canadian waters.

Baffinland Response:

When a taxa is not identifiable to species level, procedure is to confirm if there are any species within the broader taxonomic group that have a range that would include the Project area. If there is at least one species with a natural range that includes the Project area, it is assumed that the unidentified species has a reasonable probability of being indigenous. This is an assumption that is applicable to all taxa not

identifiable to species level.

A review of the genus indicated that *Tricellaria* contains four species native to the Project area, and one species (*T. inopinata*) flagged as a potential invader. It is thus considered probable that the unidentified *Tricellaria* would be one of the four species with a documented Canadian Arctic range rather than an unconfirmed NIS; therefore, this identification was designated "No Risk". However, due to the presence of *T. inopinata* on AIS databases, the specimen was treated with extra caution and sent for independent verification; results remain pending.

Baffinland will revise the text to frame "No Risk" as a statement of probability, rather than a conclusion (i.e., most likely, this specimen is among the indigenous species of the genus) and indicate the extra steps being undertaken to resolve the identification. Should the identification be resolved to *T. inopinata*, the risk determination would be revised, the taxa would be placed on the watchlist and flagged for further review. Should more specimens of *Tricellaria* sp. be found in future studies, they would be treated with the same caution and sent for independent verification (i.e., treated as non-indigenous until confirmed otherwise).

Comment No.:	*DFO-15*
Section Reference:	8.3.2 Sample Collection for Genetic Analysis
Comment:	

Issue:
"These samples were collected and processed in a similar manner to the other benthic infauna samples, however, the samples were preserved in 90% ethanol, rather than formalin, to allow for DNA analysis should the flagged taxa be identified again in 2021. "

Recommendation:
Could BIM provide rational as to the reasoning for using 90% ethanol? DFO generally uses 95% ethanol or higher based on recommendations from experts within the DNA field.

Baffinland Response:

Baffinland would like to clarify that the reference to 90% ethanol was a typographic error: samples were preserved in either 95% ethanol or 80% ethanol.

It was not possible to source enough 95% ethanol product to meet the 2021 program needs without major shipping restrictions. Therefore, in consultation with Biologica Environmental Services Ltd. and the Canadian Centre for DNA Barcoding, it was confirmed that 80% molecular biology grade ethanol was appropriate for the preservation of samples scheduled for DNA analysis given the relatively short time the samples would be in the preservative prior to being analyzed. Samples slated for taxonomic analysis were preserved in 95% ethanol (Tara Macdonald, Biologica Environmental Services Ltd., pers. comm.).

Baffinland

Baffinland Mary River Project Report Working Group Comment Form

Reviewer Agency/Organization:	Qikiqtani Inuit Association
Reviewers:	D. Bruce Stewart, Jeff W. Higdon
Document(s) Reviewed:	Mary River 2021 Marine Environmental Effects Monitoring Program (MEEMP) and Aquatic Invasive Species (AIS) Monitoring Program 2021 Annual Monitoring Report Draft (2021 MEEMP AIS Report Draft for MEWG.pdf)
Date Review Completed	2022-06-06

Comment No.:	QIA-01
Section Reference:	Entire Document

Comment:

Yet again Golder has provided a document for review that is protected to prevent copying of text for inclusion in comments. This practice, intentionally or unintentionally, wastes reviewer's time. QIA's comment to that effect on the 2020 draft was "Noted" by Baffinland but not acted upon.

- QIA requests that in future Baffinland provide these documents in a format that allows highlighting, addition of comments, and copying of text. None of these should affect the security of the original documents.

Baffinland Response:

Noted. In future, Baffinland will provide unsecured PDF versions of its draft annual monitoring reports to the MEWG. Final reports will be provided as secured PDF files.

Comment No.:	QIA-02
Section Reference:	Executive Summary, p. 4 of 1047; see also 3.2.1 Modifications to the Program (2021), p. 513 of 1047

Comment:

QIA was surprised and dismayed at the 29 June 2021 MEWG meeting to learn that Baffinland would not be conducting the radial sampling programs for sediment and benthic biota in 2021.

- The rationale provided for making this change was that the radial sampling design had been implemented for three consecutive years without directional trends having been observed (p.

513). This rationale misses the fact that power analyses found the 2018 design (20 stations) unable to detect change at an acceptable level; that the 2019 sampling program was not completed due to time constraints (32 stns.). This leaves 2020 as the only year of full implementation of the recommended design (60 stns) and only year to use exclusively Van Veen grab samplers, with the next sampling now in 2023. This change weakens understanding of current conditions and natural variability at a time when construction of a second ore dock and doubling of shipping has been proposed. The approach to this monitoring program going forward requires fulsome discussion by the MEWG.

Baffinland Response:

While Baffinland acknowledges QIA's concerns regarding ongoing continuity in the full-scale radial monitoring program, we are confident that a monitoring frequency of every three years is appropriate (although scaled-back sampling still occurs in off-years), aligned with regulatory guidance, and capable of detecting changes/trends in indicators.

Baffinland would like to address the power analyses and the perception of data collected under the MEEMP being "unable to detect change at an acceptable level". The original power analysis appended to the 2019 MEEMP report was based on data simulation using residual bootstrapping – the target sample size of 60 stations was set based on results of these analyses. However, follow-up analyses were completed for both 2019 and 2020 using sediment and benthic data collected in the field, which confirmed there was sufficient statistical power (i.e., >80%) for both sediment variables (percent fines and iron content) and all four benthic community variables (density, richness, Simpson's Diversity Index (SDI), and Simpson's Evenness Index (SEI) *even in 2019 where only 32 of the planned 60 stations were sampled*. This demonstrates Baffinland's understanding of current conditions and natural variability in terms of sediment quality and composition and benthic communities is robust and that the monitoring programs are functioning as intended (i.e., able to detect change). The 2020 power analyses were not appended to the final 2020 MEEMP report – an oversight on Golder's part for which we apologize. The final 2021 MEEMP Report has now been revised to include the results of the 2020 power analyses (see Appendix E of Chapter 2 – Sediment Quality).

Comment No.:	QIA-03
Section Reference:	Executive Summary, p. 4 of 1047.

Comment:

Sampling that focused on sediment station SW-02 was in response to a request from QIA and discussion by the MEWG.

- QIA welcomes this investigation and Baffinland's intention to continue this monitoring but is concerned that without a robust baseline and ongoing radial monitoring such anomalies will not be detected in the Milne Port area in the future. How does Baffinland plan to identify and address such anomalies in a timely manner while monitoring at 3-year intervals?

Baffinland Response:

While Baffinland acknowledges QIA's concerns regarding ongoing continuity in the full-scale radial monitoring program, we are confident that a monitoring frequency of every three years is appropriate (although scaled-back sampling is occurring on off-years), aligned with regulatory guidance (e.g.,

Environment and Climate Change Canada's Environmental Effects Monitoring (EEM) program), and capable of detecting changes/trends in indicators. Baffinland would also like to note that the "anomalies" detected at station SW-02 are well within the predictions made in the FEIS, which indicated the potential for localized fines mobilization and subsequent coarsening of sediment in areas exposed to propellor wash from vessels.

In an innately variable ecosystem such as Milne Inlet, an anomaly noted within a single year would not necessarily trigger a management response given the degree to which environmental parameters fluctuate naturally. What we are monitoring for is year over year directional change beyond the natural variability of the system. The intensive sampling that has occurred over the last three years, coupled with previous (albeit less intensive) sampling dating back to pre-shipping, has given us a solid understanding of sediment composition and quality from which to base comparisons. As outlined in the response to QIA-02 above, sampling 32 stations (out of a planned 60) yielded sufficient statistical power to detect changes in sediment and benthic indicators.

Moving forward, Baffinland will continue to conduct targeted sediment and benthic infaunal sampling in the proximity of SW-02 in summer 2022 to further enhance our understanding of natural variability as well as to monitor for any potential effects of Project activities.

Comment No.:	QIA-04
Section Reference:	Executive Summary, p. 4 – 9 of 1047.
Comment:	

QIA supports the following recommendations in the report:

- Marine water quality, p. 3 of 1047. "Marine water quality monitoring for Site drainage and treated effluent discharges is recommended to continue, to keep monitoring for potential changes in downstream water chemistry from Site operations and provide continuity in the established time series for the MEEMP." (see also 2.6 Conclusions and recommendations, p. 77 of 1047)
- Marine sediment quality, p. 4 of 1047. "It is recommended to continue targeted sampling in 2022 to increase understanding of sediment grain size variability and to continue monitoring for potential effects of Project activities on grain size distribution." (see also 3.6, p. 519 of 1047)
- Benthic infauna, p. 5 of 1047. "…it is recommended to continue targeted sampling in 2022 to increase understanding of natural variability as well as to monitor for additional changes in benthic community indicators." (see also 4.6, p. 574)
- Benthic epifauna, p. 609 of 1047. "It is recommended that a diver-based methodology permanently replace the combined use of ROVs and underwater video."; "Future dive surveys should analyze the quadrats as a whole (not by subquadrat) to reduce dive time."; "…a new quadrat should be deployed to replace the missing quadrat (Q2) and the location of Q12 should be moved to a deeper site…"; and, "Future field surveys should incorporate enough field days to buffer for inclement weather."
- Fish health and tissue chemistry, p. 8 of 1047. "…continued monitoring is recommended to maintain continuity in established time series data for Arctic Char and to provide a benchmark for Fourhorn Sculpin and *H. arctica* health and tissue chemistry on which to base future

comparisons."

- 2.6 Conclusions and recommendations, p. 77 of 1047. "…annual marine water quality monitoring is recommended to continue to evaluate whether Site operations are affecting downstream water chemistry and to provide continuity in the established time series for the MEEMP."
- NIS/AIS, p. 967 of 1047: "It is recommended that sampling across multiple trophic levels continues in 2022, that taxonomic inventory for Milne Inlet continue to be expanded upon, and that all flagged specimens continue to be screened for known geographic ranges and AIS/NIS status. It is further recommended that efforts are continued to collect and review genetic evidence for *Marenzelleria* sp. and *Monocorophium* sp. (both flagged as High Risk but not Project-related), including targeted sampling to obtain specimens for DNA barcoding."

Baffinland Response:

Acknowledged.

Comment No.:	QIA-05
Section Reference:	Executive Summary, p. 5 of 1047, and 5.6 Conclusions and recommendations, p. 609 of 1047

Comment:

Power analysis and the taxa accumulation curve indicate that the current sampling design is insufficient to detect change and fully characterize the epibenthic community, and that the sampling effort required to detect change with statistical power is not feasible within the open water season. The power analyses were considering statistical power values of 0.8 and 0.9 (p. 681). Baffinland has proposed the MEWG discuss: 1) removing this component and focusing on other components that have the ability to detect change with statistical power (e.g., benthic infauna, sediment quality) or 2) to continue current sampling and accept its statistical limitations.

1. A third approach to discuss is increasing the sample size incrementally to increase the number of indices capable of detecting changes of ±40%. For example, increasing the number of quadrats in both the reference and exposure areas to 12, would increase the number of summary indices with the power to detect changes of ±40% from ca. 2 at present to ca. 6. (pp. 682 and 683)
2. Appendices 5E and 5F are mislabeled in the Bookmarks as 5F and FG, respectively.

Baffinland Response:

Baffinland is in agreement with QIA's proposed "third" approach, which was also raised during the June 2022 MEWG meetings, and will increase the number of quadrats in each the exposure and reference areas to 13.

Baffinland will revise the report to correct the Appendix labelling in the Bookmarks.

Comment No.:	QIA-06
Section Reference:	Executive summary, p. 7 and 8 of 1047.
Comment:	

Significant differences between 2020 and 2021 samples were found in the condition of both Fourhorn Sculpin and *Hiatella arctica*.

- This finding of significance was qualified as being "relatively small (<10%)". However, this magnitude of change can be biologically significant and should not be downplayed. Further monitoring is needed in 2022 to assess whether a trend exists.

Baffinland Response:

A magnitude of change in condition of <10% is consistent with Metal and Diamond Mining Effluent Regulations (MDMER) effect sizes. Additional monitoring is planned for 2022 and trends in condition over time will be evaluated in the 2022 annual report.

References

MDMER regulations: https://laws-lois.justice.gc.ca/eng/regulations/sor-2002-222/FullText.html

Comment No.:	QIA-07
Section Reference:	1.4.2 Indicators and thresholds currently used for the MEEMP, p. 22 of 1047
Comment:	

“Section 1.4.2 Indicators and thresholds currently used for the MEEMP” mentions that “Changes to the program also included updates or additions to the indicators and thresholds used to determine Project-related impacts to the environment in Milne Port”

- Sampling parameters and indicators used in 2021 were summarized in Table 1-3 but not thresholds. Were changes made to the thresholds in 2021 and, if so, what were they?

Baffinland Response:

No changes to thresholds were made in 2021. The sentence was referencing modifications made to the MEEMP since 2016, not modifications made exclusively in 2021. The sentence has been edited to clarify.

Comment No.:	QIA-08
Section Reference:	2.1.1 Objectives, p. 67 of 1047.
Comment:	

The objective of this program is to "Assess potential changes in marine water quality parameters in the receiving environment related to site drainage and treated effluent discharges MP-05 and MP-06."

- What water quality monitoring is conducted at Milne Port during the open water season for changes in water quality related to shipping?

Baffinland Response:

No monitoring is conducted to assess changes in water quality related to shipping at Milne Port during the open water season. This is because shipping is not anticipated to measurably affect water quality in Milne Inlet: as noted in the FEIS, vessels will be operated and maintained in accordance with all applicable pollution prevention laws (e.g., Arctic Waters Pollution Prevention Act; Canada Shipping Act), discharges of bilge or sewage at Port or any associated anchorages is prohibited, and ballast water modelling indicates that any increases in temperature or salinity would be highly localized and dissipate within a few meters of the discharge point. Further, in the unlikely event of a refuelling spill, effects to water quality would be monitored and managed through the Emergency Response and Spill Contingency Plans (FEIS Appendix 10C).

In contrast, land-based operations via site drainage and effluent discharge do have the potential to adversely and measurably affect water quality in Milne Port, hence the focus of monitoring efforts on these potential pathways of effects. In addition to monitoring discharge points in the marine environment, Baffinland's environment team also conducts stream sampling at outfalls which feed directly into Milne Inlet; Baffinland can provide the relevant annual reports upon request. Further, dispersion and deposition of ore dust from stockpiles was also identified in the FEIS as a potential effect pathway. Because the iron occurs in a mineralized, particulate form, it is most likely to settle to the bottom and integrate into the sediments rather than dissolve in the water column, such that this potential pathway is best assessed through monitoring of sediments and associated benthic communities in Milne Inlet that act as integrators of exposure conditions over the longer term, rather than water quality monitoring. See also response to PCA-06.

Comment No.:	QIA-09
Section Reference:	2.2 Study Design, p. 67 of 1047; and 2.3.1 Field methodology, p. 69
Comment:	

RE: "...effort was made to collect water quality samples during active effluent discharge periods..." (p. 67) and "Water quality samples were collected during five sampling events scheduled between 2 August and 19 August..." (p. 69)

- Were these collection efforts successful at obtaining samples during all active effluent discharge

periods in 2021?

Baffinland Response:

In 2021, active discharges to the marine environment were monitored during 2 of the 5 water quality sampling events (2 and 19 August). While effort is made to overlap sampling with active discharge periods, this is not always possible given that MP-05 and MP-06 are intermittent discharges, meaning that sometimes there isn't enough water in the containment ponds on site for a discharge to occur when sampling is scheduled within the scheduled 3-week sampling period.

Baffinland would like to clarify that regulations are closely followed and, prior to any discharge into the marine environment, specific water quality requirements are to be met as per the Type "A" Water Licence No. 2AM-MRY1325; this is reported on annually in the NWB/QIA report.

Comment No.:	QIA-10
Section Reference:	2.3.1 Field methodology, p. 69 of 1047

Comment:

Water samples were collected mid-water at deeper stations.

- The freshwater effluent should be lighter than the receiving waters and tend to spread across the surface. What are the rationale for collecting samples at deepwater stations from mid-water depths rather than at the surface?

Baffinland Response:

Multiple stations are sampled for each of the site discharges and these include both surface and mid-depth samples. Mid-depth samples were taken at the deeper stations because they are representative of the water column at those depths.

Comment No.:	QIA-11
Section Reference:	2.3.1 Field methodology, p. 70 of 1047

Comment:

RE: "...dissolved metals and mercury samples were field filtered and preserved."

- How does this change in methodology from 2020, when samples were not filtered or preserved in the field (Baffinland 2021 MEEMP AISNIS Final Report, p. 137 of 1581), affect sample comparability?

Baffinland Response:

Field filtering and preservation does not influence or change the total metal concentrations measured, and it is these data that are screened against CCME water quality guidelines and upon which conclusions are drawn. Going forward, field filtration and preservation will be implemented in the water quality sampling program because it limits the influence of any delays in shipping the samples to the laboratory.

Comment No.:	QIA-12
Section Reference:	2.3.1 Field methodology, p. 70 of 1047
Comment:	

Monitoring of bacteria in receiving water around each discharge was discontinued in 2021, as fecal coliforms were not detected by sampling of the receiving waters in 2017 through 2020.

- The objective of monitoring is to detect problems with effluent discharge quality. Absence of fecal coliforms in past years' monitoring confirms that the systems were working but is not a good reason for discontinuing monitoring, since without monitoring there is no check on whether these systems are still working or for unexpected sources of bacterial contamination. QIA recommends that bacterial monitoring continue.

Baffinland Response:

Baffinland notes that there is no potential pathway of effect related to the introduction of fecal coliform at discharge locations MP-05 and MP-06 because these are discharges for the settling ponds that collect water specifically from the ore pad. Accordingly, monitoring of fecal bacteria or other bacterial parameters in the site discharges MP-05 and MP-06 is not a required sampling parameter under the current Type A Water License; nevertheless, Baffinland included it within the monitoring scope for the past four years with results confirming that MP-05 and MP-06 are not sources of fecal coliforms. For these reasons, monitoring of bacteria was discontinued in 2021.

However, there is a separate water containment facility (MP-01A), which acts as a sewage pond for when the water treatment facilities are at capacity. This pond is sampled monthly for fecal coliforms as part of Type A Water Licence 2AM-MRY-1325 and cannot be discharged until a compliant pre-discharge sample is collected and analyzed. For further details, refer to Baffinland's 2021 Qikiqtani Inuit Association and Nunavut Water Board Annual Report for Operations.

Comment No.:	QIA-13
Section Reference:	2.4.1 QA/QC results, p. 72 of 1047
Comment:	

RE: water quality monitoring, "There was a low frequency and magnitude of notable detected concentrations in blanks and low variability and high precision between duplicates."

- How are" low" and "high" defined in these contexts? Appendix 2C could also be referred to here.

Baffinland Response:

"Low" and "high" were not defined per se. The intent was to communicate that the parent samples and their respective duplicates were not substantially different using low and high as qualitative descriptors (low variability and thus high precision in sampling) and, therefore, the water chemistry data collected during the 2021 MEEMP were of acceptable quality. However, it is acknowledged that clearer language could have been used to make that point with a more direct reference to Appendix 2C.

Comment No.:	QIA-14
Section Reference:	2.4.3.2 Metals, p. 73 of 1047
Comment:	

The 2021 iron concentrations did not exceed iron concentrations measured in September 2017 that were elevated by a storm event.

- If a comparable storm event was not mobilizing iron in 2021, that data should be compared instead with sampling events that were not affected by a storm (i.e., compare apples to apples).

Baffinland Response:

Baffinland wishes to clarify that iron data collected in 2021 were compared to all data collected from 2017 through 2020, and not just a single storm event in 2017 as implied by the text in the report. Results across sampling events and years indicate that Total Iron water concentrations in the marine receiving environment are stable (i.e., no increasing trend observed) despite increases in production over the same time period.

Comment No.:	QIA-15
Section Reference:	Appendix 2B. Analysis of hold time compliance, p. 105ff of 1047
Comment:	

Hold times were exceeded for some water samples, for example nitrates and nitrites (10 d held cf. 3 d recommended; p. 109ff and p. 182ff), pH meter (115 h cf 0.25 h; p. 122ff and p. 192ff), and total dissolved solids (TDS) (19 d cf. 7 d; p. 198).

1. How do these exceedances alter precision and accuracy of the results and what will be done to avoid hold exceedances in 2022?
2. The Baffinland 2021 Annual Report to QIA and NWB on Operations (Section 7.8, p. 70) states “An on-site accredited field laboratory, located at the Mine Site and also operated by ALS, performed select analyses in 2021 (i.e. pH, TSS, Total Dissolved Solids [TDS], turbidity), reducing logistical costs while providing timely results.” Why were the marine pH and TDS samples not sent there for timely analysis?

Baffinland Response:

1. In short, these exceedances are not anticipated to affect the precision and/or accuracy of results. A discussion of exceedances for some parameters with short hold times, within the context of northern environments, is provided in Section 2.4.1. Overall, the discussion concluded that, despite the hold time exceedances, the data are considered valid and are comparable to other years. Baffinland has already made attempts to avoid hold exceedances; for example, by changing couriers to Purolator to have a direct contact to facilitate shipments and arranging direct couriers with “NextFlight” for sample shipments with short hold times.
2. The marine pH and TDS samples were not sent to the onsite ALS lab because these particular measurements (i.e., for pH, conductivity, and turbidity (among other water quality parameters))

are collected in situ (at the time of sampling) and thus provide real-time measurements. Further, the onsite ALS laboratory is responsible for processing all of the general chemistry samples for site environment, including tote road monitoring, freshet, SNP etc., such that it would not be feasible to complete MEEMP analysis in addition to current analysis load.

Comment No.:	QIA-16
Section Reference:	Matrix spike (MS) report, p. 154ff and p. 230ff of 1047
Comment:	

Some matrix spikes were exceeded by the background level, resulting in loss of analyte recovery data.

- What will be done in 2022 to improve information regarding analyte recovery?

Baffinland Response:

Previously, Baffinland staff and consultants would manually add preservatives to sample bottles, which leaves room for error. To improve on this, sample bottles now come pre-charged to eliminate risk of analyte recovery data loss.

Comment No.:	QIA-17
Section Reference:	3.3.1 Field methodology, p. 514 of 1047
Comment:	

At each station depending on grab volume and penetration depth, multiple grab samples were collected to obtain sufficient volume of surficial sediments for the selected analyses.

- How does gathering shallow surface sediment from multiple locations affect the sediment comparisons relative to gathering a greater volume from fewer samples that have greater depth?

Baffinland Response:

As described in Section 3.3.1 of the 2021 MEEMP report and as per standard practice, only the upper 5 cm layer is sampled for sediment chemistry, so sampling depth is standardized. The number of grabs taken (area sampled) is determined by the volume of sediment needed for the analysis required at that station and does not affect sediment comparisons. Sampling depth (upper 5 cm) is different from the grab penetration depth (variable). To obtain an undisturbed 5 cm layer, the grab penetration depth should be deeper than 5 cm and is noted to assess whether the grab should be accepted or not; however, grab penetration depth does not affect the volume of sample submitted to the laboratory for analysis because the sampling depth is standardized. The final 2021 MEEMP report has been edited for clarity.

Comment No.:	QIA-18
Section Reference:	3.3.4 Sediment quality QA/QC results, p. 517 of 1047 Appendix C. Sediment quality laboratory data, p. 530ff Appendix D. Sediment screening table and QA/QC results, p. 561ff

Comment:

RE: "There was low variability and high precision between duplicate samples, with the exception of a number of metals."

1. Greater detail is needed to put the quoted text in proper perspective. Twenty-five of the 35 metals measured were at least 50% different between the two sediment subsamples (p. 523).

RE: "The data are considered to be reliable because accounting for variability does not substantially change the data screening results at the metal concentrations reported."

2. In 2021 at site SW-02, 18 of the 35 metals measured were present in the highest concentrations measured during sediment sampling at the site over the period 2018-2021 (p. 562). Twenty - three of the 35 metals analyzed had a relative percent difference (RPD) of greater than 50% between SW-02 and Dup A (p. 563). These differences are much greater than those of the laboratory sample and duplicate (p. 542). Duplicate outliers and surrogate recovery outliers were identified in the quality control samples (p. 534). QIA recommends that Golder review the sediment sampling methodology to see if measures can be taken to reduce variability, and more samples be taken at this site to provide a better assessment of how sediment composition at the site varies and may be changing.

Baffinland Response:

Noted. The observed differences between the duplicates and the original sediment samples could be a result of heterogeneity in concentrations inherent within the sediment matrix, or 'incomplete' homogenization of the sediment sample such that subsampling for laboratory analysis could have introduced some variability. Golder will review the sediment sampling methodology with the aim of identifying measures that can be taken to reduce variability between duplicate samples and make modifications as necessary. It should also be noted that variability in sediment composition and chemistry at this site might be naturally higher relative to some other areas given the dynamic influences of tides, ice scour, storm events, and freshwater input.

Comment No.:	QIA-19
Section Reference:	4.2.1 Modifications to the program (2021) p. 569 of 1047
Comment:	

The radial monitoring program was suspended in 2021 for both sediment and benthic infauna on the basis that 3 years of monitoring had not found evidence of Project impacts. However, directed sampling at site SW-02 for both parameters in 2021 confirmed that the anomalies at this site appear to be Project-related.

- Will Baffinland be restoring its radial sampling programs for sediment and benthic infauna in 2022?

Baffinland Response:

Baffinland will be conducting the full radial sampling programs for sediment and benthic infauna every 3 years. The next full-scale sampling program for these parameters is scheduled for 2023.

The effects observed at SW-02 are well within the predictions made in the FEIS, which indicated the potential for fine sediment mobilization as a result of propeller wash from ships. Additional targeted sampling in the SW-02 area is planned for the 2022 sampling program with effort similar to that completed in 2021.

Comment No.:	QIA-20
Section Reference:	5.2.3 Indicators, p. 585 of 1047.
Comment:	

RE: “The 2021 quadrat survey results are to serve as a baseline for quantitative comparisons to future survey years so long as field methodologies remain consistent.”

- This is a benchmark, not a baseline which would imply pre-development and given the variability, needs more than a single year of comparable data to be useful for future comparisons. Will Baffinland replicate this study in 2022 and 2023?

Baffinland Response:

The final 2021 MEEMP report has been updated to change the term “baseline” to “benchmark”. The quadrat survey will be replicated in 2022 and in future monitoring years, with three additional quadrats added to each of the reference and exposure areas.

Comment No.:	QIA-21
Section Reference:	5.4.1 Substrate, Figure 5-4, p. 593 of 1047
Comment:	

Panels of the figure need to be identified using A to E labels to link them to the caption, or the caption needs editing (e.g., "...Milne Port (clockwise from upper left panel), a) silt/sand, ...".

Baffinland Response:

Labels (A to E) will be added to Figure 5-4 to reference with the Figure caption.

Comment No.:	QIA-22
Section Reference:	5.4.3.2 Motile epifauna, Table 5-8, p. 603 of 1047
Comment:	

The caption does not appear to fit the table, which does not include information on "Total Percent Cover". The SDI means and SEs were identical for the Exposure and Reference areas.

- Are these correct?

Baffinland Response:

Caption for Table 5-8 has been updated to include "Density", instead of "Total Percent Cover." The Simpson's Diversity Index (SDI) means and standard errors were corrected in Table 5-8. These corrections do not affect the content of the results section.

Comment No.:	QIA-23
Section Reference:	5.4.3.2 Motile epifauna, Figure 5-8 p. 604 of 1047.
Comment:	

Panel A) describes "Density" but the caption describes it as "Total Percent Cover".

- Correct the caption or replace the panel?

Baffinland Response:

The caption has been revised to accurately reflect the graph with "Density".

Comment No.:	QIA-24
Section Reference:	5.5 Discussion, p. 608 of 1047
Comment:	

RE: quadrat surveys, "Taxonomic resolution was improved in 2021 due to the exclusive use of divers…"

- QIA recognizes that identification of 16 of the 44 taxa found in the quadrat surveys to species (Appendix F, p. 686) is an improvement and encourages further improvement.

Baffinland Response:

Baffinland continues to work on improving taxonomic resolution of diver-based quadrat surveys via opportunistic collection of samples that can be sent for laboratory taxonomy analysis. If QIA has further recommendations on how to further improve taxonomic resolution, Baffinland would appreciate receiving those in writing so they can be considered for future implementation.

Comment No.:	QIA-25
Section Reference:	6.2.1 2021 modifications to the program, p. 694
Comment:	

RE: "Previously, CPUE was calculated by using the following general equation: no. of fish/hour(h) fishing." The change in 2021 to reporting catch per unit of sampling effort (CPUE) in terms of the gear employed (e.g., /rod, /100 m of gillnet, /trap) is important as it facilitates comparisons with other studies.

- Because the gillnets use panels of different mesh sizes and the vulnerability of fish to capture varies with mesh size, reporting the mesh size each fish was caught in provides useful information for future comparisons. Is this information recorded and, if not, will it be in 2022 and future monitoring?

Baffinland Response:

Although useful for fish population estimates, this information is beyond the scope of the MEEMP Fish Community objective 'Characterize the marine fish community at Milne Port in terms of species presence and relative abundance'. This information has been collected in previous programs but was discontinued when it was determined to increase handling time of the fish during recovery of the nets and did not provide added value to the fish community monitoring objectives.

Comment No.:	QIA-26
Section Reference:	6.3.1.3 Gill nets, p. 702
Comment:	

RE: "Gillnets were either suspended just below the water surface or weighted to run along the seabed."

- Gill net placement in the water column (surface, midwater, bottom) and water depth affect the vulnerability of fish species and fish of different sizes to capture and provide information on their habitat use. Do the CUPE (etc.) data differentiate between the floating and sinking nets and were depths at each end of the net recorded? If not, these data should be recorded in future sampling.

Baffinland Response:

While data from the floating and sinking nets were recorded separately, they were combined to increase the strength of the bin size for comparative statistics rather than separated into smaller bins. Baffinland does not intend to analyze the data separately, as doing so would not advance the overall objective of this component of the MEEMP which is to 'characterize the marine fish community at Milne Port in terms of species presence and relative abundance'.

Comment No.:	QIA-27
Section Reference:	6.3.1.5 Fukui traps, p. 706 of 1047 and 6.3.1.6 Hoop nets, p. 707 of 1047
Comment:	

Fukui traps were not deployed in the East Shore area due to limited suitable habitat and time constraints (p. 706), and hoop nets were not deployed at the Phillips Creek or East Shore areas (p. 707).

- How does this data gap affect future comparisons and how will it be avoided in the future?

Baffinland Response:

While every effort will be made to ensure all Fishing Areas (FAs) are sampled, and with similar fishing pressure, this is not always possible. A tremendous amount of sampling, across multiple disciplines, occurs within a limited open-water season and inclement weather can ground the field crews for multiple days.

Data are compared over time in these regions specifically (Phillips Creek and East Shore), and for only those specific types of effort (Fukui Traps and Hoop Nets). The 2021 data will be absent in future comparisons for these efforts but will not influence the year-to-year comparison of other FAs and efforts. Over time, and with the increase of interannual data sets for established suitable sampling locations these data gaps are expected to be observed as outliers.

Comment No.:	QIA-28
Section Reference:	6.3.1.6 Hoop nets, p. 707 of 1047
Comment:	

RE: Shore-based "Hoopnets were checked every 1 to 5 days after deployment."

- Please explain why there were intervals of up to 5 days between checks and how this may affect CPUE comparisons?

Baffinland Response:

Time and weather constraints dictated the frequency with which hoop nets could be checked. Field crews have a limited time to complete an ambitious sampling scope, across disciplines, with often inclement weather – they do their best in often challenging conditions. The intervals ranging from 1 to 5 days would not affect CPUE comparisons (as the nets were never saturated with fish upon collection), as the calculations are based on total soak time per effort.

Comment No.:	QIA-29
Section Reference:	6.4.1.1 2021 Summary, p. 711 of 1047 6.4.2 CPUE comparisons, p. 724
Comment:	

RE: use of the term "abundance" as in "…Fourhorn Sculpin (44.56%) were the most abundant fish species caught." (p. 711) and "…fish abundance was higher in Ore Dock West relative to other FAs."

- As noted in past comments, these sampling methods do not necessarily reflect abundance in the environment. The sculpins may have been caught more frequently but this may be related to their vulnerability to capture in the various fishing gear, which varies with factors such as gear type, set location/habitat/depth, species, and fish size. A better way to describe the results would be: Fourhorn sculpin comprised 44.56% of the catch.

Baffinland Response:

Fish abundance in section 6.4.2 is calculated as catch per unit effort, which corrects catch for gear type and effort. Sentences were edited to indicate relative abundance.

Section 6.4.1.1 was revised to clarify that Fourhorn sculpin were the most numerous fish species collected.

Comment No.:	QIA-30
Section Reference:	6.4.1.3. Fishing areas, p. 716 of 1047
Comment:	

RE: "the ore Dock was the most productive fishing area."

- The sampling was more productive at this site but the site was not necessarily more biologically productive. This is an important distinction that should be made in text. Further information is needed to assess whether the fish (e.g., sculpins) were simply more vulnerable to the gear, or the area was really more productive.

Baffinland Response:

Noted. The statement in the report was edited to reflect this distinction (the statement no longer alludes to relative *productivity)* and clarify the area had the highest captures, not corrected for fishing effort. Comparative CPUE for different methodologies across the different fishing areas (direct project footprint and indirect project footprint) were assessed statistically and the result was no significant spatial differences (Table 6.14). CPUE values for each method across each area in 2020 and 2021 are presented in Table 6.15.

Comment No.:	QIA-31
Section Reference:	6.4.1.5 Gill nets, p. 719 of 1047
Comment:	

RE: "…gillnet CPUE was second highest after trawling…"

- Comparisons of CPUE from different gear types should be avoided unless the CPUE metrics have been standardized in some way, otherwise it is comparing apples to oranges. CPUE comparisons are best used for comparisons between stations or years for a particular gear within a sampling program that is itself standardized.

Baffinland Response:

Sentence was edited to remove comparison to other methods.

Comment No.:	QIA-32
Section Reference:	6.4.1 Catch Data, Figures 6-12 - 6-15 (p. 720 – 723)
Comment:	

RE: Figures 6-11 to 6-15 depicting total catch by different gear types

- These numbers graphed do not provide a useful metric for comparing how well or poorly a particular species is, or fish in general are, faring post development. What should be compared

here is CPUE for each species over time between fishing areas. To do this most effectively other variables such as habitat type/location/depth, set/check time, survey timing, mesh size, etc. need to be controlled (i.e., follow a consistent monitoring plan design over time). QIA recommends these figures be repeated but replacing the species totals in each bar with their CPUE. Comparison of the total catch and CPUE figures might provide insights into how changes in the monitoring programs have altered the total catches cf. catch effort.

Baffinland Response:

Due to inconsistent methodologies and the lack of standardization between sampling locations, it is not possible to make these comparisons between survey years. Standardization of methodology started in 2021 and will continue in 2022, which may allow for this level of comparison in future reports; however, a detailed analysis on the level of relative abundance by species is not possible at this time.

Comment No.:	QIA-33
Section Reference:	6.4.1.9 Trawling, p. 723
Comment:	

The fish species composition of trawl catches in 2020 and 2021 were quite different. In 2020, trawling began when the net reached the bottom and was conducted at sample depths ranging from 23 to 27 m over sand bottom at a speed of 1 knot (2020 MEEP AISNIS Report, p. 1259 of 1581). In 2021, trawling began after the trawl contacted bottom and had been raised 2 to 3 m, and was conducted at sample depths of 30 to 50 m; tow speed and bottom type were not stated in the Methods (p. 708 of 1047).

- The composition of the catches is very different and likely reflects differences in methodology rather than interannual changes. Is the objective of these trawls primarily to characterize fish presence at various depths and habitats or is it to facilitate interannual comparisons, in which case how will the 2022 trawling be conducted?

Baffinland Response:

Trawling is a new method being trialed for the program. Trawling efforts in 2020 and 2021 were intended to test different methodologies to determine the effectiveness of the method for the program. Methods in 2021 were refined to improve on limitations found during 2020 trials and the efforts are not comparable. Methods in 2022 will follow 2021 efforts, with potential changes based on limitations identified in 2021.

Comment No.:	QIA-34
Section Reference:	6.4.2 CPUE comparisons, p. 725
Comment:	

RE: “Table 6-16 Statistical comparisons of CPUE among areas and years and for gear types” (p. 725).

- QIA recommends that similar comparisons for key species and gear (e.g., Arctic Char and gillnets) be assessed to see whether they might provide insights into trends within and among FAs over

time that are not otherwise apparent.

Baffinland Response:

Baffinland acknowledges QIA's recommendation and will consider the option of adding similar comparisons into future monitoring reports. This level of data analyses is possible for Arctic Char in Fishing Areas by gear type where there is sufficient catch for statistical analysis. We agree that this is valuable data, and it can be incorporated into future reports.

Comment No.:	QIA-35
Section Reference:	6.5 Discussion, p. 728 of 1047 6.6 Conclusions and recommendations, p. 729

The 2021 results "…when combined with the 2020 dataset, provides a reliable characterization of the status of the marine fish community."

- Lumping together all the species caught by a particular gear, or all gears' catches of a species, will obscure trends in relative abundance of key species that are useful for identifying Project impacts, so characterizing the treatment of the results as yielding a "reliable characterization of the current status of the marine fish community" is not supported.

Baffinland Response:

QIA's comment is noted. Text has been updated to clarify that the fish community has been characterized, and not its status. We further note that the objective of this particular exercise was to provide a characterization of the marine fish community, not identify trends in relative abundance of key species. Nonetheless, "reliable" was replaced with the word "general" to more accurately indicate the level of comparison.

Comment No.:	QIA-36
Section Reference:	6.5 Discussion, p. 728 of 1047
Comment:	

RE: "Recommendations for future monitoring includes a minimum three fishing efforts per gear type in the focal FAs."

- Please clarify what "three fishing efforts" translates to for each gear type, and which fishing areas are considered "focal FAs".

Baffinland Response:

Focal was removed from this sentence. The recommendation was to conduct a minimum of three deployments per fishing methodology per fishing area (FA) in order to support statistical comparisons between each FA for each fishing method. Please note that this specific analysis approach for fish community has since been revised (as outlined in revisions made to Chapter 6) such that there are now only two distinct FAs (Indirect Project Footprint, Direct Project Footprint) in Milne Port, as opposed to

five FAs as originally identified in the draft report. This change was made because there was not enough biophysical variation between the 5 FAs to warrant their independent classification. The two FAs offer a more reasonable segregation of the sampling stations based on their relative proximity to port activities (i.e., marine infrastructure, discharge activities, and berthing operations) and will provide for a more robust statistical comparison given the larger sample sizes that will available per FA.

Comment No.:	QIA-37
Section Reference:	7.4.1.1 Fourhorn Sculpin, p. 781 of 1047
Comment:	

RE: The y-axis of Figure 7-1 Length frequency distributions of Fourhorn Sculpin sampled from the Milne Port area, 2021, p. 781.

- In % Frequency figures the total of the columns would normally add up to 100%. These don't and some clarification would be helpful. Do the columns represent the percentage of the total Fourhorn Sculpin catch that was sampled for males and females of a particular length class? To provide context, the sample sizes should be included in the figure or caption for both the number of sculpins of each sex sampled and the total number of each sex caught.

Baffinland Response:

There was an error in the depiction of relative frequency in this figure that has been corrected. Columns represent the relative frequency of a particular size class, compared with the total Fourhorn Sculpin catch. The relative frequency of each size class sums to 100% across sexes (i.e., females and males together). Sample sizes for each sex have been added to improve figure clarity.

A similar error was also found in Figure 7-9, where relative frequency was not depicted correctly. This figure has also been revised, similarly to Figure 7-1. The relative frequency for each size class of *Hiatella arctica* sums to 100% across sampling years (i.e., 2020 and 2021 together). Sample sizes for each year have been added to improve figure clarity.

Comment No.:	QIA-38
Section Reference:	7.4.1.1 Fourhorn Sculpin, p. 785 of 1047
Comment:	

Figures 7-2 though 7-5 provide nice clear illustrations of the data.

- Figures 7-6 and 7-7, p. 785 and 786 could be improved by using the same x and y-scale axes to facilitate direct comparisons, or by noting in the captions that the left and right panels of each figure have different x- and y-scales.

Baffinland Response:

The same x and y axis scaling have been applied for female and male fish in figures 7-6 and 7-7.

Comment No.:	QIA-39
Section Reference:	7.4.2.1 Arctic char, p. 792 of 1047.
Comment:	

RE: “One Arctic Char sampled had tissue concentrations of several metals which were notably different than other Arctic Char sampled the same year.” (p. 792) Golder suggests that, based on its small size, this fish may have been a smolt on its first migration to sea and “[t]he elevated concentrations of metals, including some COPCs [i.e., contaminants of potential concern], may be attributable to differences in water chemistry between its originating lake and Milne Inlet.” (p. 793)

- These elevated tissue metals argue the need to sample char of this size from rivers draining into Milne Port to learn where these fish are being exposed to higher metal concentrations (i.e., which river system).

Baffinland Response:

Concentrations of several metals naturally occur in greater concentrations in freshwater when compared to the marine environment. Therefore, it is not unusual for fish originating from freshwater to have greater tissue concentrations of these metals when compared to individuals of the same species collected from the marine environment; one explanation is that prolonged periods of reduced feeding, such as those that occur for overwintering Arctic char, can have significant consequences for tissue contaminant levels (Martyniuk et al. 2020). Over time, the tissue concentrations of these metals would be expected to decrease as the fish reaches equilibrium within the marine environment.

As described in Section 7.4.2.1: “Characteristic differences in water chemistry, including metals concentrations, between freshwater and marine environments may explain the abnormal metals concentrations in this individual Arctic Char. A recent study of tissue metals burdens in Arctic Char from the Nunavik region of northern Quebec found that concentrations of chromium, lead, and nickel were significantly higher in muscle tissue samples from Arctic Char in the post-winter period before they returned to the ocean when compared with Arctic Char caught in the ocean during summer (Martyniuk et al. 2020). Given this individual Arctic Char had elevated concentrations of chromium, lead, and nickel, and its stomach contents were comprised entirely of freshwater insects, it is likely that this individual was a first-year smolt that had migrated from a lake upstream of Milne Port. The elevated concentrations of metals, including some COPCs, may be attributable to differences in water chemistry between its originating lake and Milne Inlet.”

References:

Martyniuk, M.A.C., Couture, P., Tran, L., Beaupre, L. and M. Power. 2020. Seasonal variation of total mercury and condition indices of Arctic charr (*Salvelinus alpinus*) in Northern Quebec, Canada. Science of the Total Environment. 738: 139450.

Comment No.:	QIA-40
Section Reference:	7.4.2.1 Arctic char, pp. 781 to 798 of 1047.
Comment:	

RE: Figures 7-2, 7-4, 7-5, 7-6, 7-7, 7-11, 7-12, and 7-13.

- What are the R-squared values for the linear relationships shown in these figures?

Baffinland Response:

The linear relationships shown in these figures are visual representations of several ANCOVA models. Given the nature of ANCOVA and the assumptions of this test, specifically parallel slopes among factor groups, individual R^2 values cannot be derived for each linear relationship depicted. Instead, R^2 values for each ANCOVA model depicted in the indicated figures are provided in the table below.

Figure	Species	ANCOVA Model			Sex	R^2 Value
		Dependent	Factor	Covariate		
7-2	FHSC	$\log_{10}$ Total Weight	Sex	$\log_{10}$ Total Length	n/a	0.942
7-4	FHSC	Total Length	Year	Age	Female	0.777
					Male	0.579
7-5	FHSC	$\log_{10}$ Total Weight	Year	$\log_{10}$ Total Length	Female	0.959
					Male	0.911
7-6	FHSC	Liver Weight	Year	Total Weight	Female	0.829
					Male	0.608
7-7	FHSC	$\log_{10}$ Gonad Weight	Year	$\log_{10}$ Total Weight	Female	0.812
					Male	0.596
7-11	HTAR	$\log_{10}$ Total Weight	Year	$\log_{10}$ Total Length	n/a	0.514
7-12	ARCH	$\log_{10}$ Mercury	Year	$\log_{10}$ Total Length	n/a	0.060[a]
		$\log_{10}$ Selenium	Year	$\log_{10}$ Total Length	n/a	0.267
7-13	FHSC	$\log_{10}$ Mercury	Year	$\log_{10}$ Total Length	n/a	0.631
		$\log_{10}$ Selenium	Year	$\log_{10}$ Total Length	n/a	0.426

[a] Mercury concentrations in ARCH did not differ significantly among sampling years (*P*-value = 0.199). See Section 7.4.2.1 in MEEMP 2021 Report.

ANCOVA = Analysis of Covariance; FHSC = Fourhorn Sculpin (*Myoxocephalus quadricornis*); HTAR = Wrinkled Rock-Borer (*Hiatella arctica*); ARCH = Arctic Char (*Salvelinus alpinus*); $\log_{10}$ = $\log_{10}$-transformed; n/a = not applicable.

Comment No.:	QIA-41
Section Reference:	Appendix 7A, pp. 813 and 816
Comment:	

RE: "Due to equipment malfunction in the field, no weights were recorded from fish collected from the Tugaat River Estuary." (p. 816)

1. How will this problem be avoided in the future reconnaissance surveys?

RE: “The Tugaat River area is not recommended for use as a fish health reference area based on data

collected during the 2021 reconnaissance survey." (p. 816)

2. What other alternatives are being considered?

Baffinland Response:

1) To avoid potential issues related to malfunctioning equipment, additional scales will be provided to the field crew during future sampling events to provide redundancy.

2) In 2022, additional sampling will be conducted north of Tugaat estuary (further north of the previously sampled reference site in 2020) and in Koluktoo Bay to identify a suitable reference site that offers similar habitat conditions as Milne Port and supports similar species assemblages including both indicator species for the fish health program (i.e., Fourhorn sculpin, *Hiatella arctia*).

Comment No.:	QIA-42
Section Reference:	8.1.1 Objectives, p. 923 of 1047
Comment:	

The AIS/NIS objectives listed are reactive rather than proactive, in that they do not address prevention of NIS/AIS introductions, rather identify whether introductions have occurred. Once NIS/AIS have been introduced they are typically very difficult to eradicate and can have significant ecological and economic consequences. This is an ongoing concern with Project shipping.

- Discussions have been held with DFO regarding a risk-based assessment of biota carried to Milne Port in the ballast water and on the hulls of Project shipping. When will these studies be implemented?

Baffinland Response:

The program referenced by QIA is being led by DFO (as per the relevant commitment for Phase 2), thus timing and implementation of the program will be determined by DFO. Again, Baffinland would like to emphasize that its current approach to managing ballast water introductions – mandating both exchange AND treatment for vessels that are currently fitted with onboard treatment systems – exceeds Transport Canada regulations.

Comment No.:	QIA-43
Section Reference:	8.2.1 Modifications to the program in 2021, p. 926 of 1047
Comment:	

RE: "Zooplankton sampling was removed from the program in 2021 and replaced with monitoring for recruitment." Monitoring of settlement plates and baskets for NIS/AIS focuses on fouling species and may miss other species that arrive as plankton.

1. Are there sufficient settlement plates and baskets to detect NIS/AIS in a timely manner?
2. Why were there no settlement plates and baskets deployed at the existing ore dock?

3. Will biological sampling of the ballast water be used in 2022 to identify which live taxa in the ballast water may pose a risk if released, including zooplankton and phytoplankton?

Baffinland Response:

1. Settlement substrates have been deployed in 23 locations in Milne Port and Ragged Island, with an additional 9 deployments near the Freight Dock. Locations were selected to provide an even distribution throughout the Milne Port area. Deployments have been set up to monitor for short term (annual) and medium term (3 years) recruitment. This is considered adequate to detect NIS/AIS in a timely manner.

2. Settlement substrates were deployed at the ore dock in 2016-2018. However, when attempts were made to recover them the next season, the deployed settlement substrates were determined to be lost or damaged, presumably due to interactions with ships during seasonal berthing activities. It was determined there was no safe location along the ore dock where substrates could be deployed where they could be reliably retrieved on an annual basis.

3. Ballast water sampling for plankton is a DFO-led project; hence details regarding the implementation of this program in 2022 would be determined by DFO.

Comment No.:	QIA-44
Section Reference:	8.3.3.1 Taxonomic identification and literature review, p. Figure 8-5, p. 934 of 1047

Comment:

Golder has highlighted the fact that ArcOD has few datasets on marine species from the Canadian Arctic relative to other areas of the circumpolar Arctic (Figure 8-5, p. 934).

- Golder and Baffinland have a remarkable dataset of Arctic marine species from Milne Inlet. Will the dataset be made available on ArcOD and, if so, when?

Baffinland Response:

Baffinland will explore the option of making the Milne Inlet taxonomic inventory available on ArcOD and report back to the MEWG during future MEWG meeting(s).

Comment No.:	QIA-45
Section Reference:	8.4.1.1 Benthic infauna, p. 935 of 1047, and 8.5.3.2.1 *Diastyloides biplicatus*, p. 965

Comment:

Diastyloides biplicatus was flagged for review as part of the QA/QC procedures following a transcription error in the lab data.

- QIA acknowledges this precautionary response to the data error.

Baffinland Response:

N/A

Comment No.:	QIA-46
Section Reference:	8.4.1.2 Macroflora and Benthic epifauna, p. 938 of 1047
Comment:	

RE: “A literature review was performed for all new taxa identified in quadrat surveys...”

- These references were not cited but might be useful for future discussions of benthic macroflora:
  - Mathieson, A.C., Pederson, J.R., Neefus, C.D., Dawes, C.J., and Bray, T.L. 2008. Multiple assessments of introduced seaweeds in the Northwest Atlantic. – ICES Journal of Marine Science, 65: 730–741.
  - Mathieson, A.C., Moore, G.E., and Short, F.T. 2010. A floristic comparison of seaweeds from James Bay and three contiguous northeastern Canadian Arctic sites. Rhodora 112(952): 396-434. DOI: http://dx.doi.org/10.3119/09-12.1
  - Goldsmit, J., Schlegel, R.W., Filbee-Dexter, K., MacGregor, K.A., Johnson, L.E., Mundy, C.J., Savoie, A.M., McKindsey, C.W., Howland, K.L., and Archambault, P. 2021. Kelp in the Eastern Canadian Arctic: Current and Future Predictions of Habitat Suitability and Cover. Front. Mar. Sci. 18:742209. doi: 10.3389/fmars.2021.742209

Baffinland Response:

We thank QIA for providing these additional references. These have been added to our database of relevant literature.

Comment No.:	QIA-47
Section Reference:	8.4.1.3 Settlement substrates, p. 940 of 1047
Comment:	

Casas-Monroy et al. (2014) provided a summary of species in ballast water, not biofouling which may be the more likely source of species fouling the rocks and plates. This recent paper discusses some fouling species of concern:

- Goldsmit J, McKindsey CW, Stewart DB and Howland KL (2021) Screening for High-Risk Marine Invaders in the Hudson Bay Region, Canadian Arctic. Front. Ecol. Evol. 9:627497. doi: 10.3389/fevo.2021.627497

Baffinland Response:

We thank QIA for providing this additional reference. This has been added to our database of relevant literature.

Comment No.:	QIA-48
Section Reference:	8.4.1.3 Settlement substrates, p. 940 of 1047
Comment:	

The three watchlist species found on settlement substrates in close proximity to the ore dock raise questions regarding their origins.

- Biological sampling of the ballast water and hull fouling is needed to assess whether these species are present in the vessels' ballast water or as biofouling on their hulls.

Baffinland Response:

Baffinland will continue to work with DFO to implement the ballast water sampling program and to discuss options for hull biofouling monitoring.

Comment No.:	QIA-49
Section Reference:	8.5.2.3 Settlement substrates, p. 953 of 1047.
Comment:	

RE: "in 2021, settlement substrates were deployed in nineteen locations..."

- Weren't these settlement substrates deployed in 2020 and recovered in 2021? Were new settlement plates deployed to replace those recovered in 2021? If not, QIA recommends this be considered given the high loss rates and value of longer soak times for species identification.

Baffinland Response:

Settlement substrates were deployed at ten locations in 2020; however due to limited supplies of settlement baskets, full sets were not placed at each location. In 2021, additional substrates were added to the existing deployments where they were required, and an additional thirteen deployments were added at new locations (for a total of 23 monitoring locations, plus nine along the Freight Dock). All substrates recovered in 2021 were replaced.

The program design allows for short- and medium-term soak times. Each sample year, two sets of substrates will be collected from each location. One set will be an annual set (representing annual recruitment, or short term) and one set that has soaked for three years (representing medium term recruitment). Based on the original deployment times, substrates collected in 2022 will have soaked for one or two years, with the first three-year substrates anticipated to be collected in 2023.