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NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI
OFFICE DES EAUX DU NUNAVUT

File: 2AM-MRY1325

December 6, 2022

Lou Kamermans
Senior Director, Sustainable Development
Baffinland Iron Mines Corporation
Suite 300 – 2275 Upper Middle Road East
Oakville, Ontario, Canada L6H 0C3

Email: lou.kamermans@baffinland.com

RE: Licence No: 2AM-MRY1325 Type "A"; Mary River Project, Baffinland Iron Mines Corporation; 2021 Annual Report Review

Dear Lou Kamermans:

The Nunavut Water Board (NWB or Board) has completed the technical review of the 2021 Annual Report (Report) for Type "A" Water Licence 2AM-MRY1325 (Licence). The Report was received on March 31, 2022 from Baffinland Iron Mines Corporation (Baffinland or Licensee), submitted as a requirement under Part B of the Licence.

Copies of all documents received during Report review can be accessed through the NWB's Public Registry and FTP site using the following links:

ftp://ftp.nwb-oen.ca/registry/2_MINING_MILLING/2A/2AM_-_Mining/2AM-MRY1325_BIMC/3_TECH/1_GENERAL_(B)/2_ANNUAL_RPT/2021/

On April 4, 2022, the NWB distributed the Report for public review with the deadline set for June 4, 2022. On May 10, 2022, the NWB extended the deadline for submission of the comments to June 20, 2022 at the request from the Qikiqtani Inuit Association (QIA). On June 17, 2022, Crown-Indigenous Relations and Northern Affairs (CIRNA) requested to extend the deadline further to July 22, 2022, which the Board satisfied.

On June 20, 2022, the Qikiqtani Inuit Association (QIA) and Environment and Climate Change Canada (ECCC) provided their feedback regarding the Report. On July 18, 2022, CIRNA submitted its comments.

The table below provides a brief summary of issues found outstanding during the Report review period. Only the issues pertaining to the NWB's mandate and the scope of the Licence were

included in the table. The table also provides deadlines for the Licensee to respond to respective recommendations and concerns. For the intervenors' discussion of these items, please refer to the comment submissions referenced above.

No.	Intervener Recommendation / Concern	Deadline to Respond by and Notes
Qikiqtani Inuit Association (QIA)		
GC#6	Update the reference to "Photo 13" in Appendix E.8.2	March 31, 2023
GC#7	Provide the memo on the evaluation of contaminate mobility in the substrate adjacent to the landfill as committed to ECCC.	March 31, 2023 (see ECCC's comment 5)
GC#8	Include the method detection limit for total ammonia and un-ionized ammonia concentrations for submissions for: • MS-06 collected on 2021/06/01, 2021/06/15, 2021/07/08, 2021/08/08, 2021/09/10, 2021/08/04, and 2021/09/01 • MS-07 on 2021/07/08 and 2021/08/17 • MS-08 on 2021/06/23, 2021/07/08, 2021/08/03 and 2021/08/08	March 31, 2023
SPL#2	Provide the list of measures limiting procedural errors that lead to spills.	March 31, 2023
SPL#3	Clarify the status of the Long-Term Water Management Plan (LTWMP) in an addendum to the 2021 Annual Report that also provides a summary of what the LTWMP includes and identifies where it can be accessed.	March 31, 2023
SPL#4	Confirm what steps Baffinland plans to include in design and mitigation of water retention structures given the number that have had seepage events.	March 31, 2023
WU#1	What actions aside from using water as a dust suppressant can be taken to reduce the potential for water usage exceedances, given the ongoing concerns with dust? Clarify how the proposed signage will limit exceedances in comparison to the signage and logs established in 2021.	March 31, 2023
WU#3	Clarify what triggers will be used to determine when dredging of the pond is required to ensure the design capacity is maintained.	March 31, 2023
WU#4	It is recommended in Appendix E.9.3 that Baffinland commit to the recommendation to improve hydrometric monitoring.	March 31, 2023
WQ#1	QIA requests Baffinland provide, as an addendum to the 2021 Annual Report, a summary of bacterial counts measured in the Milne Port PWSP to inform decisions on whether to discharge effluent.	March 31, 2023
WQ#2	It is recommended that Baffinland note the exceedance for total lead in the stormwater discharge on July 1, 2021 and compare it to other results from 2021 and 2022. Baffinland is also requested to identify whether it followed up with the laboratory requesting a reanalysis of the sample.	March 31, 2023

WQ#3	Provide an explanation for how the data and sampling regime as described in Tables 5.3 and 7.2.6 respectively were used to determine that the water from station MP-04A was compliant with applicable discharge criteria.	March 31, 2023
WQ#4	Baffinland to clarify what mitigation measures were implemented to manage the Total Suspended Solids (TSS) exceedance noted at MS-MRY-09 on June 10, 2021. Further, it is recommended that Baffinland identify what mitigations are being pursued or implemented to avoid future TSS exceedances from Deposit No. 1 during freshet in the coming years.	March 31, 2023
WQ#5	QIA recommends that Baffinland sample representative road sediment to assess the potential risk to fish in Tote Road streams from chemicals released by rubber particulates worn from the tires of vehicles traveling the Tote Road.	March 31, 2023
WQ#6	QIA requests an update on the success of the new snow stockpile sampling locations to enable collection of water quality samples that are representative of snow stockpile runoff to downstream receiving water systems.	March 31, 2023
WQ#7	When discussing TSS exceedances, the QIA recommends that Baffinland describe the length of time TSS concentrations were elevated and the size of the TSS plume to provide reviewers with additional context to evaluate potential impacts to the aquatic environment. This may be achieved by referencing the spill reports and associated follow up reports as appropriate. In addition, it is recommended the Baffinland describe preventative efforts being implemented at locations where repeat exceedances have been observed.	March 31, 2023
WQ#8	It is recommended that Baffinland confirm that snow runoff exceeding TSS criteria is not reaching fish bearing habitat. Please add a characterization of the extent of runoff (i.e., how close it gets to fish bearing habitat) to freshet monitoring and reporting requirements and discuss as part of annual reports moving forward.	March 31, 2023
WQ#10	It is recommended that Baffinland review their Freshet Action Plan in their Surface Water and Aquatic Ecosystems Management Plan and take more preventative measures to reduce the number of exceedances of TSS during freshet.	March 31, 2023
WQ#11	It is recommended that if Baffinland is not able to complete monitoring or testing requirements as laid out in their Type A water licence that they provide an explanation as to why these monitoring requirements were not met and outline specific corrective actions that have been taken to prevent future noncompliance with licence requirements.	March 31, 2023
WQ#14	The Freshet Monitoring Report should also include a	March 31, 2023

	discussion of the spot monitoring that is detailed in the Environmental Protection Plan that is conducted. Results should be provided in the Freshet Monitoring Report.	
WQ#15	To provide a figure showing the Milne Port Freshet monitoring locations.	March 31, 2023
WQ#16	It would be beneficial to the reader if a summary of the monitoring program findings was provided as part of this report. If freshet monitoring is conducted, then it should be included in the freshet monitoring report.	March 31, 2023
WQ#17	Column 2 heading in Table 1 of Appendix E.11 should read Maximum Monthly Average Concentration (mg/L).	Generally
WQ#18	Confirm if the long-term surface water management plan was completed prior to the 2022 freshet and what the long-term surface water management plan involved.	March 31, 2023
GI#1	The QIA requests an update on Baffinland's plan to design and reconstruct the P-SWD-3 ditch and the timeline for this to be completed. The QIA requests specifics on how Baffinland will develop a more frequent maintenance program to limit eroded sides of ditches.	March 31, 2023
GI#2	The QIA requests confirmation on what work on culverts was completed in between the two geotechnical inspections that led to a change in recommendation considering the need of a Tote Road Adjustment Notice for certain adjustments.	March 31, 2023
FH#1	The QIA requests Baffinland clarify: 1) Whether any action was taken to mitigate perched culverts in 2021 and, if not, whether it will be taken early enough in 2022 to enable upstream fish passage; 2) How many of the streams did not allow upstream fish passage in 2021; and 3) When the plans to complete permanent corrective actions at the culvert crossings will be released and implemented.	March 31, 2023
FH#2	The QIA requests Baffinland provide the report on the electrofishing and hoopnetting program.	March 31, 2023
AEMP#1	It is recommended that Baffinland re-evaluate their current reference locations for both lentic and lotic programs and determine if they are influenced from the impacts of mine related fugitive dust.	March 31, 2023
AEMP#2	Describe what new and additional measures will be taken to reduce dust production from crushing and screening operations that are planned for the Milne Port.	March 31, 2023
AEMP#3	Provide an update on the status of the Initial Stream Diversion Monitoring Program including whether any results have been generated to date and through what methodology. If results are available, QIA requests an interim data report.	

AEMP#4	Update the key issues associated with dustfall to include metal parameters of concern such as iron, aluminum, copper, lead and zinc.	March 31, 2023
AEMP#5	Update note 5 under table 3.2 in Appendix E.5.3 to reflect the most up to date information available.	March 31, 2023
AEMP#6	Evaluate how the benchmark reflects both baseline and reference lake data, the QIA requests that Baffinland include 97.5th percentile concentrations for the reference lake in Table 3.3 in Appendix E.5.3.	March 31, 2023
AEMP#7	Provide clarification regarding the fish ageing study, is this completed for the Core Receiving Environment Monitoring Program (CREMP) or Environmental Effects Monitoring (EEM) study? What determines if Quality Assurance/Quality Control (QA/QC) for fish aging is required for CREMP?	March 31, 2023
AEMP#8	Include alterations to water quantity as a key pathway that could affect phytoplankton and include consideration thereof in the evaluation of results in future reporting cycles.	March 31, 2023
AEMP#9	Complete trend analysis for all water and sediment quality parameters on an annual basis for all mine impacted stations, as well as reference stations. Comparisons between trends identified at mine impacted and reference stations would provide further evidence if the trends observed were from the mine or a regional change.	March 31, 2023
CREMP#1	Provide a reference for the employed methodology for sampling sediment with a stainless-steel spoon and include a discussion on the appropriateness of this method of sediment collection where the primary contaminants of concern are metals. Further, Baffinland should provide a detailed sediment collection methodology including the final quantity of sediment collected for analysis.	March 31, 2023
CREMP#2	Clarify if Stations CLT-REF4 and MRY-REF2 are part of the CREMP. If so, please provide rationale for why the stations were not sampled as part of the 2021 annual monitoring program. A table outlining sampling stations and identifying what study or studies they are part of (i.e., EEM, Targeted studies, Annual monitoring) would be helpful to the reader..	March 31, 2023
CREMP#3	1) Where benthic invertebrate sampling stations were not the same in 2021 compared to previous years, were these changes noted in the report and reasons why locations were moved or adjusted provided? 2) Were the new stations similar in habitat and therefore comparisons are appropriate? 3) Will these be the new stations moving forward?	March 31, 2023
CREMP#4	On PDF p. 3315, Baffinland states that a non-lethal survey was completed for the 2021 annual monitoring, however there is mention of 10% of the targeted	March 31, 2023

	number of Arctic Char captured that were sacrificed for collection of age structures. Please confirm whether this part of the EEM study or the 2021 annual monitoring program. If part of the 2021 annual monitoring, this would be considered a lethal survey. Requirements for a non-lethal survey are provided in Table 3-3 of the Environment Canada Metal Mining Technical Guidance for Environmental Effects Monitoring. Please provide clarification or further details on why 10% of the targeted number of Arctic Char captured that were sacrificed for collection of age structures.	
CREMP#5	The QIA recommends that Baffinland evaluate chemical, physical, and biological monitoring data collectively as part of a Low Action Response to help determine the potential cause of the change in phytoplankton and if it is mine related.	March 31, 2023
CREMP#6	Clarify what 'Level 2' refers to in Figure 2.6 of Appendix E.9.1	March 31, 2023
CREMP#7	The note under Table 3.2 of Appendix E.9.1 is either not finished or was cut off, please provide full details of note in relation to Table 3.2	March 31, 2023
CREMP#8	What studies or analysis were completed to determine that the aqueous iron concentrations were not biologically available?	March 31, 2023
CREMP#9	As outlined in Figure 2.6 of the Aquatic Effects Monitoring Plan (AEMP) and Table 5.1 Trigger Action Response Plans for Aquatic Effects Monitoring, an exceedance of an AEMP benchmark that is related to the mine requires a moderate action response. It is recommended that Baffinland follow through with their management response commitments and discuss potential mitigations, complete a trend analysis to determine if implementation of the mitigations plans is necessary and develop a High Action response threshold.	March 31, 2023
CREMP#10	Clarify the total number of fish species captured in Camp Lake. Based on Appendix E.9.1, only one species, Arctic char, was captured in Camp Lake and not two. If additional species were found in Camp Lake, please provide the associated reporting for those species.	March 31, 2023
CREMP#11	Baffinland provides no further discussion as to why YOY were not captured in Camp Lake. Is this the first time YOY have not been captured in Camp Lake? Ninespine Stickleback were not captured in Camp Lake during the 2021 program. Were there issues with the methodology for capturing small-bodied fish?	March 31, 2023
CREMP#12	Larger, healthier fish were also noted at Sheardown Lake and Mary Lake in comparison to the Reference Lake 3. Please provide a discussion for the high productivity observed in the three mine exposure lakes compared to the reference lake. Are Arctic char from all study lakes including the Reference Lake	March 31, 2023

	anadromous or are they landlocked?	
CREMP#13	Exceedances of iron, manganese, nickel, and phosphorus all took place at JL0-14. While exceedances of iron, manganese and phosphorus took place at JL0-17. Since these exceedances are not being further investigated, as sediment data in lakes is combined and averaged, a greater understanding on these two sites in Camp Lake would help the reviewer determine if exceedances were natural or mine related. QIA requests a description of the attributes at these two stations that may cause the increase in metals concentrations that are not observed elsewhere.	March 31, 2023
CREMP#14	It is recommended that Baffinland follow through with the recommendations outlined in the 2021 CREMP to harmonize lake sediment quality and benthic invertebrate monitoring stations. As noted in the 2021 CREMP arsenic, copper, iron, manganese, nickel, and phosphorus concentrations in sediment were above respective benchmarks at individual stations. Biota sampling must be implemented at sediment monitoring stations to evaluate if metal concentrations in sediment have had a deleterious effect on local biota.	March 31, 2023
CREMP#15	Provide further details on how the conclusion that metals are not biologically available was made. Was the benthic invertebrate data reviewed in association with the water quality data – dissolved vs total metals – to determine what was biologically available and look at the metal burden on the biota including phytoplankton and benthic invertebrates? Please provide other lines of evidence to substantiate the conclusion that the metals were not biologically available.	March 31, 2023
CREMP#16	Confirm if investigations were conducted to determine if a physical habitat alteration related to sedimentation had occurred, what the reasoning was and if it was related to mining activities.	March 31, 2023
CREMP#17	Confirm if stream velocities were collected at each of the lotic benthic invertebrate sampling stations.	March 31, 2023
CREMP#18	Confirm if any follow up investigations were completed to identify the source of sedimentation thereby substantiating the conclusion that the observed sedimentation was not mine related.	March 31, 2023
CREMP#19	The QIA recommends that Baffinland commit to the recommendation outlined above and continue collecting water quality data for SDLT12.	March 31, 2023
CREMP#20	Given the increasing trend in sulphate and dissolved uranium in both surface and groundwater, it is recommended that Baffinland establish AEMP benchmarks for these parameters. It is also recommended that Baffinland follow through with a moderate action response since parameter concentrations are increasing and the connection to mining activity cannot be ruled out at this point: • Complete risk assessment/weight of evidence	March 31, 2023

	evaluation; • Evaluate need for increased monitoring and, if needed, clarify what the increased monitoring would entail; • Define potential mitigation options if trend analysis suggests concentrations are continuing to increase (so complete trend analysis), and • Develop High Action response threshold for the next annual report.	
CREMP#21	It is recommended that Baffinland discuss the potential source of elevated manganese, molybdenum, nitrate, sulphate, and uranium such as, effluent, landfill influenced shallow groundwater, fugitive dust or mine infrastructure. This discussion will support a determination of whether the mine is a potential source and what potential mitigation measures may be appropriate.	March 31, 2023
CREMP#22	The QIA recommends that monitoring for nitrates and their impacts to aquatic biota continue at CLT1 in 2022 (and future CREMP studies) and measures be considered to reduce nitrate concentrations in the water management site and treatment facility discharges.	March 31, 2023
CREMP#23	It is recommended that Baffinland maintain the current lake-specific sediment AEMP benchmarks for chromium, iron, manganese, and nickel for Sheardown Lake SE as they already take naturally high concentrations of these metals into consideration as they are calculated with baseline data. If benchmarks were to be adapted to include Reference Lake 3 data a BACI analysis would need to be completed to determine if there has been a shift in refence site conditions and Baffinland would need to prove that the shift was not due to fugitive dust from the mine.	March 31, 2023
CREMP#24	Confirm that harmonizing lake sediment quality and benthic invertebrate community monitoring stations will be implemented in the 2022 monitoring program.	March 31, 2023
LSMP#1	Considering that the Project area experiences a short ice-free season and that low availability of organic material results in slow annual sediment accumulation rates, how does the anthropogenic factor affect the rate of sedimentation in comparison to natural sedimentation? How are natural rates of lake sedimentation accounted for in the study area? Please provide rationale for why a control/reference lake was not included in the study.	March 31, 2023
LSMP#2	Confirm if any studies were completed to compare the old methodology to the new methodology – that in 2018 samples were collected using the old methodology and the new methodology. This would demonstrate whether the data collected pre-2018 is comparable with data collected using the new method.	March 31, 2023

LSMP#3	Provide details for why open water data was not collected at SL SHAL1 in 2020.	March 31, 2023
LSMP#4	The closest sampling station is located 150 m from the SDLT1 inlet – please explain why a site was not located closer to the inlet to quantify the sediment contribution from SDLT1.	March 31, 2023
LSMP#5	It is recommended that Baffinland complete a trend analysis for the lake sedimentation data for Sheardown Lake.	March 31, 2023
LSMP#6	How would this statistical analysis differ if under-ice data was available? Was each year at each station compared using ANOVA for temporal comparison?	March 31, 2023
LSMP#7	The QIA recommends that exceedance of the moderate threshold trigger a study by Baffinland to properly validate Actions Thresholds for the effects of Project-generated sediment on Arctic Char egg survival.	March 31, 2023
LSMP#8	The QIA requests that Baffinland describe the measures it has implemented to prevent sample losses in the future by the Lake Sedimentation Monitoring Program and other research programs.	March 31, 2023
LSMP#9	What data is the historical ratio of sediment based on – is that baseline data or operational data? What is the annual variability of that data? It is not clear how the ratio for ice cover vs open water sedimentation is being calculated? How reliable is the estimation that has been calculated for the 2020-2021 under ice sedimentation? Please provide rationale for why an estimation was needed and how much confidence is there in that value?	March 31, 2023
LSMP#10	Why was sedimentation similar between littoral and profundal areas in 2021 compared to previous years. What are the potential reasons for this observation e.g., equipment issues, location, methodology?	March 31, 2023
Crown-Indigenous Relations and Northern Affairs (CIRNA)		
R-01	Implement the approved Mine Site Water Management Plan to limit future sediment laden water discharges to the project area streams.	Subsequent annual reports
R-02	a) Investigate the root cause of water quality exceedances for Total Suspended Solids and total lead. b) Ensure that proper sampling procedures in the field and analytical procedures in the laboratory are being followed to help reduce the number of observed exceedances resulting from error.	a) March 31, 2023 b) Subsequent annual reports
R-03	Results of settlement monitoring of the swale at the KM106 Run of Mine Stockpile and Sedimentation Pond to be provided for review.	March 31, 2023
R-04	Include both the Tote Road to Milne Inlet and the Mine Haul Road from Mary River Mine to the pit in all future bi-annual inspections so as to address all	Subsequent geotechnical inspections

	potential erosion, permafrost degradation, slope and structural concerns along these routes.	
R-05	Provide the report that summarizes and interprets the thermal data collected at the Project in 2021 for review.	March 31, 2023
R-06	a) Integrate the results of individually monitored but related aquatic monitoring programs under the Aquatic Effects Monitoring Plan (AEMP). b) Include comparisons to impact predictions made in the Final Environmental Impact Statement within the AEMP and other monitoring documents in order to confirm their accuracy, and to aid with the ongoing assessment of environmental conditions and trends at the Project.	March 31, 2023
R-07	a) Provide a copy of the Action Plan that was implemented to address historic borrow sources along the Tote Road (i.e., not just a list of priorities as provided in Appendix C.4 but a more comprehensive list referencing back to the original Table 1 of the 2019 Tetra Tech report). b) Provide an update of the actions, including the items completed and dates for when this work was completed with references provided to how the rehabilitation work was inspected to confirm completeness. c) Provide an overall action plan for all disturbed areas (including any new areas identified as part of Baffinland inspections of the respective roadways since the time of the 2019 Tetra Tech inspection) identified at the existing and historic borrow areas along Tote Road and for the Mine Haul Road.	March 31, 2023
R-08	a) Provide operational details and figures on waste rock placement (e.g. how and where, etc.) to allow for comparison of actual activities verses requirements of the Waste Rock Management Plan. b) Provide cumulative information on waste rock stored to date. c) Provide additional supporting information for Baffinland's conclusion that 17% of seepage samples from the WRF being acidic is not an issue for concern.	March 31, 2023
R-09	Develop a register for tracking inspection findings, recommendations and final disposition / actions on a category and site feature basis to allow for easier tracking of issues, concerns and resolution actions.	Subsequent annual reports
Environment and Climate Change Canada (ECCC)		
1	Identify the conditions which will trigger geotechnical and/or hydrogeological investigations. Subsequent annual reports to include a section explicitly reporting thermal investigation results and any updates to the	Subsequent annual reports

	waste rock management approach for closure.	
2	Confirm whether installation of the monitoring wells is proceeding.	March 31, 2023
3	Clarify whether MS-LF-GW-REF1 (2021) is a reference sample or should be designated MS-LF-GW1, noting that the location corresponds exactly to MS-LF-GW1-18, which is a down-gradient sample from 2018. Provide the updated figures which show where the 2021 MSLF-GW-REF1 and MS-LF-GW1 sites are located.	March 31, 2023
4	Assess the potential for impacts on Sheardown Lake if trends continue to show increasing concentrations of parameters in groundwater. This may include tracking concentrations in Sheardown Lake in 2022 and conducting trend analyses for sulphate and dissolved uranium, as well as flagging any increases in water quality parameters that may be correlated to groundwater inputs. ECCC recommends using lower detection limits to analyse silver in groundwater (i.e. below guidelines levels of 0.00025 mg/L).	March 31, 2023
5	In Appendix E.14, Baffinland states: "Baffinland has retained a consultant to review existing groundwater data and prepare a memo to evaluate contaminate mobility in the substrate adjacent to the landfill. The analysis is ongoing and Baffinland will submit this memo to the NWB and ECCC by April 30, 2022." ECCC has not seen this memo yet, and looks forward to reviewing the analysis.	March 31, 2023
6	Update Tables 3.1 and 3.2 of the *Aquatic Effects Monitoring Plan* dated March 2022 to include baseline data for the 3 sites. Notes under both tables should be updated and corrected for clarity. A rationale or discussion should be provided on the change to Cr3 from Cr6 and use of the associated less conservative benchmark. Abbreviations should be defined for Table 3.3.	March 31, 2023
7	Provide the initial stack test results of new incinerator at the 380-person camp at Milne Port and details on why the new incinerator unit did not meet emission standards.	March 31, 2023
8	Since recent incinerator stack tests appear to exceed the CWS, ECCC recommends Baffinland: a) Provide results from all incinerator stack tests that have been conducted on the Mine Site and Milne Port incinerators. b) Provide rationale for any stack test results that exceed the CWS, as well as actions that can be taken to minimize the likelihood of future exceedances. c) Update the Waste Management Plan to require annual stack testing for dioxins and furans, and	March 31, 2023

		mercury for all incinerator units incinerating more than 26 tonnes of waste per year, consistent with the CWS for dioxins and furans, and mercury.	

If you have any questions, please contact the undersigned at assol.kubeisinova@nwb-oen.ca or (867) 360 6338 (ext. 31).

Best regards,

Assol Kubeisinova
Nunavut Water Board
Technical Advisor

Enclosure: Comments – QIA, CIRNA, ECCC

Cc: Distribution List – Mary River