Environment Canada Environnement Canada

Addendum to:

ENVIRONMENT CANADA'S INTERVENTION

WITH RESPECT TO

BAFFINLAND IRON MINES CORPORATION WATER LICENCE APPLICATION

FOR THE

MARY RIVER PROJECT

JAN. 10, 2013

Canada

Preface

Environment Canada would like to provide an update to our Water Licence Intervention submitted June 22, 2012. Since that submission, there have been further information and commitments provided by the Proponent, Baffinland Iron Mines Corp. This addendum focuses on the water quality section of the original intervention, and has three purposes:

1. to identify issues which have been resolved by the Proponent's response and/or commitments (Issues 2.3, 2.5, 2.6, 2.7, 2.8, 2.11, and 2.12,);
2. to flag previously identified issues which are partially resolved (Issues 2.2, 2.9, and 2.10) or unresolved (Issues 2.1 and 2.4) and present outstanding concerns and recommendations;
3. to raise new issues (Issues 2.13, 2.14, and 2.15) which were not in the original intervention, and to provide recommendations.

EC would like to acknowledge the collaborative approach to working through issues which has been fostered by the Board and taken by the Proponent, and we look forward to addressing our outstanding concerns.

2.0 Water Quality

Issue 2.1: Sewage discharge limits

Reference:

- Design Basis – Sewage Treatment Plant, Table 4-4
- Appendix 10D-2, p. 43
- Appendix 10D-3, Table 5-2, p.30-31
- Appendix 10D-12, Table 4-6, p. 26-27
- Water license 2BB-MRY1114
- Baffinland Response to Technical Review Comments October 12, 2012
- Draft Aquatic Effects Monitoring Program Framework Schedule 4, Table 2

Proponent's Response:

"The Environmental Monitoring Plan lists the 'Treated Sewage Effluent Discharge to Freshwater and Marine water Quality Standards' in Table 4-6. These describe monthly average maximum concentrations for environmental discharge and are based on the original discharge limits for the site as imposed in the 2BBMRY0710 water licence. The 2BB-MRY0710 water licence has since been amended and in the most recent licence these same limits were used but the licence stipulated these to be the maximum allowable concentration of any grab sample. As such, Baffinland proposes to likewise update the Environmental Monitoring Plan to indicate that these limits are for max. concentration of any grab sample." (See Appendix B for Type B limits)

EC's Conclusion(s):

EC does not support the use of the limits in the Type B licence for the Type A licence. We note that there will be considerably higher wastewater volumes associated with the construction and operational activities, and that loadings as well as concentrations may be of concern. As previously stated, EC supports use of the limits for BOD_5, TSS and

faecal coliforms suggested in the sewage treatment plant design basis and encourages Baffinland to adopt these limits as the maximum authorized average monthly concentrations, with allowance made for plant commissioning and reaching treatment system operating equilibrium. The Type B licence and Table 4-6 do not include ammonia and phosphorus, which are of concern from a toxicological standpoint for ammonia, and freshwater eutrophication for both nitrogen and phosphorus. Recommended limits are provided in Table 1-1. In addition, EC agrees that sewage sampling on a monthly basis is adequate for regulatory purposes, but notes that until the system is up and running with stable performance at higher volumes, it would be appropriate to conduct much more frequent sampling (daily to weekly).

Table 1-1: Suggested sewage discharge limits

Parameter	Units	Maximum Average Monthly Concentration (mg/L)		Maximum Concentration of Any Grab Sample (mg/L)	
		Mary River/ Sheardown Lake	Milne Inlet/ Steensby Port	Mary River/ Sheardown Lake	Milne Inlet/ Steensby Port
BOD_5	mg/L	10	20	25	50
TSS	mg/L	10	20	25	50
Faecal coliforms	cfu/100 mL	200	200	500	500
Total-Phosphorus	mg/L	0.2	NA	1	NA
Ammonia (NH3-N)	mg/L	2	2	4	4
Oil and Grease		No visible sheen			
pH		Between 6.0 and 9.5			

Outstanding Recommendation EC-2.1:

EC recommends that:

a. Baffinland establish maximum monthly average concentrations and maximum grab sample concentrations for discharge limits for sewage effluent as per Table 1-1, above (updated).

Issue 2.2 Oily water wastewater treatment facility discharge limits

Reference:

- Design Basis – Wastewater Treatment (Oily Water), Table 4-6
- Appendix 10D-3, Table 6-1, p.19, p.32
- Appendix 10D-12, Table 4-7, p. 28
- Baffinland Response to Technical Review Comments October 12, 2012

Proponent's Response:

"Please refer to Volume 3, Appendix 3B, Attachment 5 (Environmental Monitoring Plan), Table 4-3 (Bulk Fuel Storage Contact Water) [1] and Table 4-7 (Vehicle Maintenance Shop Facility Effluent Criteria)." [2]

In a follow-up email, Baffinland advised that excess wash water would only be discharged in upset conditions, and any oily water would be treated and combined with the treated sewage effluent. For the bulk fuel facilities, any oily water from the storage faclilties would be treated with an oily water treatment unit. For Milne Port, this would be discharged into the ditch with treated sewage and runoff, and drain into Milne Inlet.[3]

[1] Limits are proposed for benzene, toluene, ethyl benzene, lead (taken from the CCME Guidelines for the Protection of Freshwater Aquatic Life), and oil and grease (15 mg/L / no visible sheen).
[2] Discharge limits proposed are from the document titled *Guideline: Industrial Waste Discharges in Nunavu*t, Schedule 2, Standards for non-point source discharges.
[3] Email from Fernand Beaulac to Oliver Curran and Anne Wilson dated 03/01/2013.

EC's Conclusion(s):
EC reminds the Proponent that discharges of treated effluent to surface waters be non-deleterious. The discharge quality standards proposed in the NU guidelines would not necessarily achieve this if applied to discharges to receiving waters.

It should be noted that under the NU guidelines, Figure 1 does not contemplate discharge of the treated effluent directly to surface waters; rather, it is to a sewer or ditch. Therefore, EC does not support use of the Schedule 2 standards for direct discharge to surface waters.

EC agrees that modeling would not be necessary for the small quantities predicted.

Outstanding Recommendation EC-2.2:
EC recommends that the water licence include discharge limits for any treated wastewater that will be released into surface waters, such that criteria are protective of the receiving aquatic environment (both freshwater and marine).

Issue 2.3: Location of sampling points for sewage and treated oily water discharges

Reference:
- Appendix 10D-3, p. 30-31
- Baffinland Response to Technical Review Comments October 12, 2012

Addressed by Proponent's response.

Issue 2.4: Mine contact water discharge limits

Reference:
- FEIS, Volume 7, Section 3.0, Tables 7-3.16 to 7-3.22
- Appendix 10D-2, Table 9-2, p. 40
- Appendix 10D-12, Table 4-8, p. 28
- Baffinland Response to Technical Review Comments October 12, 2012

Proponent's Response:

Baffinland has proposed that mine contact water be monitored to ensure that discharge meets criteria based upon Metal Mining Effluent Regulations (MMER) regulations (see Appendix C for criteria).

EC's Conclusion(s):
Although the mine's effluent will be regulated under the MMER, the MMER limits should be viewed as a minimum national standard which is applied to all metal mines, in a range of environmental settings. The sensitive Northern ecosystem would be best protected by .the establishment of lower discharge limits for the MMER-regulated parameters, such that changes to receiving water chemistry are minimized to the extent possible.

Outstanding Recommendation EC-2.4:
EC recommends that discharge limits for mine contact water from the east pond, west pond, pit and ore stockpiles be established that are commensurate with the predicted water quality for these sources, as provided in Volume 7 of the FEIS and take into account the sensitivity of the receiving environment.

Issue 2.5: Reference site selection

Reference:
- Appendix 10D-14, BIMC correspondence to NIRB, May 15, 2012
- Appendix 10D-12, Table 4-9
- Appendix 10D-13, Appendix 2, Tables 1-4

Addressed by Proponent's response and commitments.

Issue 2.6: Statistical Design

Reference:
- Appendix 10D-13, Appendix 1, Tables 1, 5; Appendix 3, Tables 4, 5

Addressed by Proponent's commitments and work in progress.

Issue 2.7: Quarry setback from water courses along railway

Reference:
- FEIS, Volume 7, Section 3.4.2.1, SQSW-5, p. 131-133

Addressed by Proponent's response.

Issue 2.8: Sediment sampling

Reference:
- Volume 7, Section 3.4.4.2, p. 175

Addressed by Proponent's response.

Issue 2.9: Use of dust suppressants

Reference:

- Appendix 10D-3, p. 21

Partially addressed by Proponent's response and commitment.

Proponent's Response:
"Baffinland will consider numerous available suppressants and choose a dust suppressant that best meets environmental and economic concerns. In the event that DL-10 or calcium chloride is chosen the implementation a 30m buffer zone will be considered."

EC's Conclusion(s):
EC acknowledges the Proponent's response, but seeks a commitment to ensure environmental effects associated with the use of dust suppressants are minimized. To ensure practices are effective, an additional recommendation is made for monitoring.

Outstanding Recommendation EC-2.9:
EC recommends implementation of a buffer zone adjacent to water bodies when applying hydrocarbon-based or salt dust suppressants, in conjunction with proper application rates and practices.

Further, EC recommends periodic monitoring of the areas adjacent to the roadway be carried out to assess if product migration is an issue"

Issue 2.10: Criteria for treated landfarm soil to permit its use outside the landfarm

Reference:

- Appendix 10D-2, p. 18, 20, 27
- Design Basis – Waste Management Facilities p. 6

Partially addressed by Proponent's response and commitment.

Proponent's Response:
"Objectives included in the 2010 Government of Nunavut's Environmental Guideline for Site Remediation. Industrial criteria are suitable if the treated soils are to remain in place until the landfarm is decommissioned or the term of the commercial lease expires."

EC's Conclusion(s):
EC concurs with the use of appropriate guidelines for remediation objectives, and notes that testing will be required to monitor soil quality.

Outstanding Recommendation EC-2.10:
Future iterations of the landfarming section of the waste management plan should identify the number of soil samples taken per unit volume of soil to verify its compliance with the criteria (as determined based on end use).

Issue 2.11: Toxicity testing of emulsion plant residue

Reference:

- Appendix 10D-3, p. 21

Addressed by Proponent's response.

Issue 2.12: Method detection limits for metals in seawater

Reference:

- Volume 8

Addressed by Proponent's response.

Issue 2.13: Closure of Open Pit

Reference:

- Appendix 10G Preliminary Mine Closure and Reclamation Plan Sections 8.2, 9 and 11
- FEIS Table 7.3-22

Proponent's Conclusions:

"Conceptual modelling of the pit water quality will be presented in the FEIS. Predictions of pit water quality will be updated throughout the life of the Project as more information comes available on the geochemistry of the waste rock and the pit wall."

"The Final Mine Closure and Reclamation Plan will present a time frame for the potential development of ARD conditions and discuss the impact of ARD release on final closure identifying the need for ongoing monitoring, treatment, and, potential mitigations."

"It is anticipated that the open pit will take an estimated 85 to 150 years to passively fill with water from natural sources such as seepage into the pit, direct precipitation and surface runoff (KP 2008). Once the open pit fills to the point of overflow, pit drainage will enter the natural environment through the spillway and natural drainage from the southeast corner of the open pit (KP 2008). It is currently anticipated that the discharge from the open pit will not require treatment (AMEC 2010). However, if treatment is required several effective technologies are currently available to manage ARD. If ARD/ML drainage were to develop, batch treatments will be carried out over several decades to adjust the pH and/or metal concentrations of the water in the pit so that it meets discharge requirements before overflow to the environment."

"Ongoing monitoring and management of ARD and ML (if necessary) is required until such time as it can be demonstrated that site drainage does not pose a threat to downstream receiving waters. This includes an assessment of long-term water quality of the pit lake."

"Monitoring of site aspects such as water quality is expected to continue until such time that the monitoring is no longer required."

With respect to monitoring of pit water quality:
"The parameters represented in Table 8-1 may change as the Project develops through detailed design, construction and operations. Discharges from the Mine Site, Milne Port and Steensby Port are expected to be consistent with the Mining Metal Effluent Regulations (MMER)."

Proposed parameters include:
pH, Total Suspended Solids, Total Dissolved Solids, Conductivity, Alkalinity, Acidity, Hardness, Total Ammonia, Ammonium, Calcium, Sulphate, Arsenic, Aluminum, Cadmium, Copper, Iron, Lead, Molybdenum, Nickel, Zinc

Closure criteria described in Section 11 (p. 39) include the statement "Meet water quality objectives for any discharge from pit."

Table 7.3-22 in the FEIS describes post-closure water quality for the Mary River, using predictions for pit water quality at Year 21, and includes water quality objectives based on CCME and USEPA guidelines.

EC's Conclusion(s):
EC acknowledges that the closure plan is of necessity preliminary in nature, and will be informed and shaped with data collected during the life of mine. However, EC has concerns with the use of the passive filling approach due to the time frame and the uncertainty around future water quality, and recommends that the Proponent review other options and present alternatives for accelerating filling and closure.

Closure criteria for pit water quality should be based on protection for aquatic life and consider receiving environment characteristics. Objectives should be developed and may be based on those presented in Table 7-3.22 as a starting point. This table also identifies some parameters of concern (Hazard Quotients above 1) although this may be attributable in part to the proportion of observations below detection limits affecting calculations. In any case, the post-closure monitoring should include a full suite of analytical parameters, at least for the initial period. To refine predictions and increase confidence, monitoring of minewater over the period leading up to closure and into post-closure should be done using low analytical detection limits.

Recommendation EC-2.13:
EC recommends that the water licence include conditions for closure which include:

a) development of filling alternatives, which includes consideration of environmental benefits and costs;
b) a full list of monitoring parameters and frequency/duration; and
c) objectives for pit water quality at closure, which will ensure that receiving environment quality is protected.

Issue 2.14: Nutrients

Reference:

- FEIS Volume 7, Section 3; Tables 7-3.5, 7-3.6 and 7-3.9; Table 7-3.23
- Appendix 10D-12, Environmental Monitoring Plan Section 4.3, Table 4-6, p. 26-27
- Appendix 10D-3, Table 5-2, p.30-31
- Draft AEMP Framework Schedule 4, Table 2

Proponent's Conclusions:
Lakes in the study area are nutrient poor, with low productivity. Nutrients were listed as a key indicator for water and sediment quality (Table 7-3.9). The FEIS states that all of the freshwater receiving environments are relatively sensitive to nutrient inputs, and monitoring and adaptive management will be used to limit the magnitude of residual effects. Sheardown Lake will receive treated camp wastewater for the life of the project, and will experience increases in nutrient concentrations in the area of the outfall.

Discharge of treated sewage effluent to Sheardown Lake will occur during the open water season, for about 80 days each year. The volumes will be from a 150 man camp, at an estimated rate of 300 L per person per day, would be approximately 16,425 m^3 per year.

Mary River will receive approximately 120,000 m^3 of treated sewage over a 90 day period during the open water season, which will be held in a polishing pond over winter.

EC's Conclusion(s):
Wastewater discharges to Mary River and Sheardown Lake will increase phosphorus concentrations in the water and sediments, and may result in eutrophication effects. Given the added nitrogen sources from wastewater and blasting residue contributions, algal blooms and a shift in trophic status could occur.

Of particular concern is the potential for phosphorus to affect Sheardown Lake, which supports a char population and includes spawning areas. Phosphorus loadings over time will accumulate in the sediments, and can be released during winter conditions, contributing to algal growth. Seasonal increases in phytoplankton can occur, and as algae die off, organic matter accumulates on the sediment surface (with phosphorus temporarily bound up). The decomposition of this material will result in decreased dissolved oxygen in the water at the lake bottom, followed by release of phosphorus. Arctic lakes are naturally prone to low dissolved oxygen concentrations due to the extended period of darkness, greater thickness and duration of ice cover so project related stressors should be minimized. Sheardown Lake should be monitored to identify increases in biological productivity, and downward trends in winter dissolved oxygen.

Recommendation EC-2.14:
EC recommends that:

a) any wastewater discharges to Sheardown Lake and Mary River are treated to the design specifications provided for nitrogen compounds and phosphorus;
b) water quality objectives be set for nutrients, with thresholds for action identified;
c) biological productivity be monitored during the open water season; and

d) for Sheardown Lake, under-ice monitoring of dissolved oxygen concentrations be done regularly, with contingency plans in place to address decreasing dissolved oxygen if downward trends in concentration are seen.

Issue 2.15: Aquatic Effects Monitoring Program

Reference:

- Draft Aquatic Effects Monitoring Program Framework
- AEMP Presentation and Meeting Notes Nov. 13, 2012

Proponent's Conclusions:
Baffinland has drafted an Aquatic Effects Monitoring Program (AEMP) Framework in consultation with stakeholders/regulators. The framework is designed to meet the requirements of monitoring under regulatory instruments including the water licence, Metal Mining Effluent Regulations Environmental Effects Monitoring (EEM) program, Fisheries Authorization monitoring, and any targeted studies which may arise.

The Draft AEMP Framework applies to inland waters only; however the marine monitoring is listed in Schedule 7.

EC's Conclusion(s):
EC appreciates the proactive approach taken by Baffinland to develop the draft framework. By including the various requirements under one umbrella framework, there will be improved interpretation of data, as well as avoiding duplication or inconsistencies in sampling sites and methods.

The draft Framework incorporates discussions at the Nov. 13th AEMP workshop, and addresses aspects that will inform and strengthen the program, such as the data inventory and study design reviews.

EC has completed an initial review of the technical details of the completed sections of the Framework, and looks forward to further discussion on the program, including where the marine components will be addressed.

Recommendation EC-2.15:
EC recommends that a technical workshop be held once the remaining sections of the Draft AEMP Framework are completed, and once reference sites have been identified.

Appendix B. Licence 2BB-MRY1114 conditions:

PART D: <u>CONDITIONS APPLYING TO WASTE DISPOSAL</u>

Mary River:
13. All Sewage Effluent discharged from the Waste Water Treatment Facility, at Monitoring Stations MRY-4 and MRY-4a shall not exceed the following Effluent quality limits:

Parameter	Maximum Concentration of Any Grab Sample (mg/L)
BOD5	30 mg/L
Total Suspended Solids	35 mg/L
Faecal Coliform	1000 CFU/100 mL
Oil and Grease	No visible sheen
pH	Between 6.0 and 9.5

Milne Inlet:
14. All Sewage discharged from the Waste Water Treatment Facility at Monitoring Station MRY-5 and MRY-5a shall not exceed the following Effluent quality limits:

Parameter	Maximum Concentration of Any Grab Sample (mg/L)
BOD5	100 mg/L
Total Suspended Solids	120 mg/L
Faecal Coliform	10,000 CFU/100 mL
Oil and Grease	No visible sheen
pH	Between 6.0 and 9.5

PART I: <u>CONDITIONS APPLYING TO THE MONITORING PROGRAM</u>
4. The Licensee shall sample at Monitoring Program Stations MRY-4 and MRY-5 every four (4) weeks during discharge and at Monitoring Stations MRY-4a and MRY-5a, once prior to discharge and every four (4) weeks thereafter. Samples shall be analyzed for the following parameters:
Biochemical Oxygen Demand - BOD
Total Suspended Solids
pH
Faecal Coliforms
Oil and Grease (visual)

5. The Licensee shall conduct toxicity testing on treated sewage effluent at the final discharge points at the Monitoring Station(s) MRY-4 and/or MRY-4a; and MRY-5 and/or MRY-5a, once annually during open water season in accordance with the following test procedures:

a. Acute lethality to Rainbow Trout, *Oncorhynchus mykiss* (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/13); and

b. Acute lethality to *Daphnia magna* (as per Environment Canada's Environmental Protection Series Biological Test Method EPS/1/RM/14).

Appendix C. MMER Limits

SCHEDULE 4

(Section 3, paragraph 4(1)(a), subsections 12(1) and (3), section 13, subsections 15(1), 19.1(1) and 20(1), paragraphs 21(2)(b) and (f), 24(1)(a) and 34(1)(b), subsection 34(3), paragraphs 34(4)(a) and (5)(a) and (b), 35(2)(b), 36(d) and 37(1)(a) and Schedules 5 and 7)

AUTHORIZED LIMITS OF DELETERIOUS SUBSTANCES

	Column 1	Column 2	Column 3	Column 4
Item	Deleterious Substance	Maximum Authorized Monthly Mean Concentration	Maximum Authorized Concentration in a Composite Sample	Maximum Authorized Concentration in a Grab Sample
1.	Arsenic	0.50 mg/L	0.75 mg/L	1.00 mg/L
2.	Copper	0.30 mg/L	0.45 mg/L	0.60 mg/L
3.	Cyanide	1.00 mg/L	1.50 mg/L	2.00 mg/L
4.	Lead	0.20 mg/L	0.30 mg/L	0.40 mg/L
5.	Nickel	0.50 mg/L	0.75 mg/L	1.00 mg/L
6.	Zinc	0.50 mg/L	0.75 mg/L	1.00 mg/L
7.	Total Suspended Solids	15.00 mg/L	22.50 mg/L	30.00 mg/L
8.	Radium 226	0.37 Bq/L	0.74 Bq/L	1.11 Bq/L

NOTE: All concentrations are total values.

SOR/2006-239, s. 25.