



February 5, 2013

Damien Côté
Executive Director
Nunavut Water Board
PO Box 119
Gjoa Haven, NU X0B 1J0

RE: Baffinland Response to Environment Canada's Addendum to Technical Comments submitted to the NWB (January 10, 2013)

Dear Damien,

This submission is in response to the Nunavut Water Board (NWB) Pre Hearing Conference Decision dated January 25th, 2012 (File 2AM-MRY), Appendix C, Commitment # 4 (Monitoring and Management Plans and Measures). Baffinland notes that in responding to Environment Canada's addendum, submitted to the Nunavut Water Board on January 10th, 2013, information pertaining to discussions with Environment Canada on January 17th and January 24th, 2013 are included so as to provide the NWB with progress made and outstanding items.

Excerpts from Environment Canada's numbered submissions are listed below followed by Baffinland's response. The memo is concluded with action items agreed upon between Environment Canada and Baffinland.

Water Quality

Issue 2.1: Sewage discharge limits

Outstanding Recommendation Environment Canada-2.1:

Environment Canada 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, below (updated).

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 (NH ₃ -N)	mg/L	2	2	4	4
Oil and Grease		No visible sheen			
pH		Between 6.0 and 9.5			

Baffinland Response:

The discharge limits suggested by Environment Canada in Table 1-1 are the design basis criteria for the sewage treatment plants (BOD, TSS, ammonia and phosphorus) presented by Baffinland in its Type A Water Licence Application. These are plant performance targets and should not be used as a regulated discharge limits. When setting a design criterion, it implies that during operations, the plant will perform 50% of the time about the design target. This is the reason why a design criterion cannot be used as a discharge limits since the proponent would be in non-compliance 50% of the time.

The regulated discharge limits should account for operational variations and should be related to the assimilative capacity of the receiving environment. In practice, due to variations in operating conditions (flows, temperatures, biological activity, and upsets), it is normal for biological sewage treatment plants to experience variations two to three times the targeted performance design criteria.

On the basis of operational experience, Baffinland suggests that more realistic discharge limits be established as follows:

1) Milne Port and Steensby Port Sewage Treatment Plants – Discharge to Ocean

For treated effluent discharges to the marine environment, BOD, faecal coliforms, phosphorus and ammonia are not a concern, providing the effluent meets the requirement under the Fisheries Act to be non-deleterious. There is no justification for imposing more stringent

discharge limits for the end of pipe effluent quality than are currently used for discharge at Milne Inlet in Baffinland's Type B Licence.

Treated Sewage Effluent Discharge to Marine Waters (Milne Inlet and Steensby Inlet)	
Parameter	Maximum Average Concentration
BOD5	100 mg/L
Total Suspended Solids	120 mg/L
Fecal Coliform	10,000 CFU/100 mL
Oil and Grease	No visible sheen
pH	between 6.0 - 9.5

The discharge limits proposed by Baffinland for discharge to the Marine environment are in line with discharge limits imposed for other mining operations in Nunavut.

The “end of pipe” discharge will have to comply with acute toxicity criteria. On January 24th, 2013 Environment Canada stated that there are no specific concerns with these discharge limits, but recommends inclusion of ammonia on the basis of toxicity concerns.

2) Mary River Sewage Treatment Plants – Discharge to Land or Freshwater Environment

For the Mine Site, the exploration camp sewage treatment plant will continue to discharge to Sheardown Lake while the new construction and operation camp sewage treatment plant will discharge to the Mary River (via a pipeline/outfall). Both treatment plants first discharge to a retention pond. On January 24th, 2013 Baffinland and Environment Canada agreed on the premise that for regulatory purposes (discharge limits), the “end of pipe” discharge should be considered as the discharge from these ponds. The discharge criteria suggested by Baffinland in its Type A application are protective of the receiving environment as supported by the conclusions of the FEIS.

The proposed discharge limits are:

Treated Sewage Effluent Discharge to Freshwater (Mine Site Sewage Treatment Plants)	
Parameter	Maximum Average Concentration
BOD5	30 mg/L
Total Suspended Solids	35 mg/L
Fecal Coliform	1000 CFU/100 mL
Oil and Grease	No visible sheen
pH	between 6.0 - 9.5

Environment Canada recommends that ammonia and phosphorus be added parameters.

- Ammonia

Baffinland's design criteria of the sewage treatment plant are to achieve 2 mg/L of ammonia in the effluent (end of pipe discharge). To account for operational variations (flows, temperature and biological activity), Baffinland suggests that it is prudent to set this discharge limit as follows:

- Maximum Monthly Average Concentration = 4 mg/L (twice the design criteria), and,
- Maximum Concentration in any Grab Samples = 12 mg/L (three times the average)

These are concentrations for "end of pipe" at the discharge of the sewage treatment plant holding pond. The discharge from this pond will be at ambient temperature, during the summer months (roughly 5 degrees C). Baffinland's view is that in terms of potential effects on the receiving environment, one must consider the dilution effect once the effluent is discharged in the Mary River or Sheardown Lake (dilution factor of 15 for the Mary River under low flow conditions). Note that the resulting concentration after allowing for a mixing zone, will result in receiving water quality that are within the CCME guidelines for the protection of aquatic life (receiving water temperature of 5 degree for both Mary River and Sheardown Lake, and pH of 7). Furthermore, Baffinland notes that from site experience with the existing treated sewage effluent pond, that ammonia levels for influent into the pond have an approximate range of 0.5 to 1.5 mg/L while effluent from the pond after retention time is less than 0.1 mg/L. This is most certainly the result of biological activity and aeration during retention in the pond. Environment Canada would like to highlight the application of the *Fisheries Act* at end of pipe, and stress the need to minimize the extent of a mixing zone in which chronic toxicity would occur.

**CCME – Water Quality guidelines for total
ammonia for the protection of aquatic life (mg-L⁻¹ NH₃)**

Temp (°C)	pH							
	6.0	6.5	7.0	7.5	8.0	8.5	9.0	9.5
0	231	73.0	23.1	7.32	2.33	0.749	0.250	0.042
5	153	48.3	15.3	4.84	1.54	0.502	0.172	0.034
10	102	32.4	10.3	3.26	1.04	0.343	0.121	0.029
15	69.7	22.0	6.98	2.22	0.715	0.239	0.089	0.026
20	48.0	15.2	4.82	1.54	0.499	0.171	0.067	0.024
25	33.5	10.6	3.37	1.08	0.354	0.125	0.053	0.022
30	23.7	7.50	2.39	0.767	0.256	0.094	0.043	0.021

Environment Canada acknowledges that 4 mg/L is most likely not a concern for acute toxicity. The proposed Maximum grab concentration of 20 mg/L is too high. However, Environment Canada is concerned that the discharge limit of 4 mg/L may exceed the future limits being considered for the discharge limit in wastewater treatment systems which will eventually be applicable in the North.

For the maximum grab concentration, Baffinland suggests values at three (3) times average concentrations.

- Phosphorus

The design criteria of the sewage treatment plant are to achieve 0.1 mg/L of phosphorus in the effluent. Again, to account for operational variations (flows, temperature, biological activity and plant upset conditions), Baffinland believes that it is prudent to set the discharge limit as follows:

- Maximum Monthly Average Concentration = 4 mg/L
- Maximum Concentration in any Grab Samples = 8 mg/L (twice average concentration)

These are concentrations for “end of pipe” at the discharge of the sewage treatment plant holding pond. In terms of potential effects on the receiving environment, one must consider the dilution effect once the effluent is discharged in the Mary River or Sheardown Lake (dilution factor of 15 for the Mary River under low flow conditions). The effective concentrations in the receiving environment after dilution would be an order of magnitude lower. Environment Canada is concerned with eutrophication effects, particularly in Sheardown Lake.

The AEMP will enable Baffinland to detect potential adverse effects in the receiving environment resulting from this discharge. The phosphorus trigger range suggested in the CCME publication “PHOSPHORUS: CANADIAN GUIDANCE FRAMEWORK FOR THE MANAGEMENT OF

FRESHWATER SYSTEMS, 2004” can be used to establish a more stringent discharge at end of pipe should the AEMP indicate a change in the trophic status of the Mary River or of Sheardown Lake. EC strongly disagrees with this approach, as a change in trophic status means that sufficient loadings may have occurred to result in oxygen depletion during ice-cover periods.

Baffinland transmitted monitoring reports to Environment Canada on phosphorus levels in Sheardown Lake on January 25, 2013, including historic discharge levels from the existing exploration camp at Mary River. Environment Canada will review and formulate response on the proposed phosphorus target for treated effluent discharge.

- Fecal Coliforms

Given that the waters of the Mary River or Sheardown Lake will not be utilized by the Mary River Project for human consumption, Baffinland questions the need to impose a more stringent limit than 1000 CFU/100 mL for faecal coliform. EC notes that this would be in the purview of Territorial health officials, or Health Canada.

Issue 2.2 Oily water wastewater treatment facility discharge limits

Outstanding Recommendation Environment Canada-2.2:

Environment Canada 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).

Baffinland Response: The discharge criteria proposed by Baffinland are protective of the receiving environment. These discharge limits are presented below:

Bulk Fuel Storage Facility Contact Water

Parameter	Maximum Average Concentration (µg/L)
Benzene	370
Toluene	2
Ethyl benzene	90
Lead	1
Oil and Grease	15,000 and no visible sheen

On January 24th, 2013, Environment Canada indicated they have little concern with the above discharge criteria for bulk fuel contact water.

Oily Water Treatment Plant Effluent Discharge Quality Criteria

Parameter	Guidelines : Industrial Waste Discharge in Nunavut (mg/L)	Sampling and Monitoring Frequency
pH	6 – 9.5	
TSS	35	
Aluminum	1	Monthly
Ammonia	10	Monthly
Arsenic	1	Monthly
Benzene	0.370	Monthly
Cadmium	0.1	Monthly
Chromium	0.1	Monthly
Copper	1	Monthly
Ethylbenzene	0.090	
Iron	1	Monthly
Lead	0.05	Monthly
Mercury	0.006	Monthly
Nickel	1	Monthly
Oil and Grease	15 and no visible sheen	Monthly
pH Range	6 – 10.5	Monthly
Phenolic Compounds	0.02	Monthly
Phosphorous	1	Monthly
Toluene	0.002	Monthly
Total Suspended Solids	15	Monthly
Zinc	0.5	Monthly

Baffinland reiterates that discharges from the oily water treatment plant will be sporadic and infrequent. When a discharge occurs, the treated effluent will discharge to the treated effluent holding pond and will thus be mixed with the treated sewage effluent prior to discharge to the Mary River.

Environment Canada is concerned that the “**Guidelines: Industrial Waste Discharge in Nunavut**” should not be used as discharge limits for the oily treatment plant. Environment Canada will suggest discharge criteria. EC notes that these guidelines are intended for discharges to land or into municipal treatment systems, not to the receiving environment. If the discharges are sporadic and limited volumes, it Environment Canada suggests that it may be appropriate to simply have the Inspector approve discharges to the holding pond, upon receipt of the effluent chemistry. Regular toxicity testing would be done of the pond discharge and provide an indication of problems with quality.

Issue 2.4: Mine contact water discharge limits

Outstanding Recommendation Environment Canada-2.4:

Environment Canada 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.

Baffinland Response: The discharge criteria proposed by Baffinland are in line with the MMER Schedule 4 and Schedule 5 and are protective of the receiving environment. These discharge limits are presented below:

Waste Rock and Ore Stockpiles Runoff Water Quality Criteria

Deleterious Substance	Maximum Authorized Monthly Mean Concentration (mg/L)	Maximum Authorized Concentration in Composite Sample (Mg/L)	Maximum Authorized Concentration in Grab Sample (mg/L)
pH			6.0 < pH < 9.0
Ammonia			Non-acutely toxic
Nitrate			Non-acutely toxic
Sulphate*			To be established
Deleterious Substances - mg/L (MMER Schedule 4)			
Arsenic	0.50	0.75	1.00
Copper	0.30	0.45	0.60
Lead	0.20	0.30	0.40
Nickel	0.50	0.75	1.00
Zinc	0.50	0.75	1.00
TSS	15.00	22.50	30.00
Acute toxicity			
Fish species			MMER Schedule 5

On the basis of the EEM required under Schedule 5 of the MMER (which requires a detailed characterization of the effluent and of the receiving environment), Baffinland will be able to validate its prediction of no significant effects on the receiving environment.

On January 24th, 2013 Environment Canada stated that it proposes to undertake a review for each parameter of concern in order to evaluate the adequacy of the proposed discharge limits. Baffinland is of the opinion that MMER are minimum acceptable discharge criteria considering that the discharge must remain acutely non toxic and that Schedule 5 (Environmental Effects Monitoring - EEM) of the MMER is specifically designed to validate if aquatic effects are being detected in the environment.

Additionally, Environment Canada has concern with ammonia in runoff. Baffinland states that the EEM monitoring data collected under the AEMP will provide real world information on mine contact water runoff quality that will inform Baffinland's adaptive management.

Further discussions are required with Environment Canada on this topic to understand the new limits being considered and when or if these limits will apply to operations at the latitude of Mary River.

Issue 2.9: Use of dust suppressants

Outstanding Recommendation Environment Canada-2.9:

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

Baffinland Response: Baffinland agrees with this recommendation.

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

Outstanding Recommendation Environment Canada-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).

Baffinland Response: Baffinland agrees with this recommendation.

Issue 2.13: Closure of Open Pit

Recommendation Environment Canada-2.13:

Environment Canada 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.

Baffinland Response:

a) Accelerated filling of the pit

At the Technical Meeting Baffinland responded to question raised regarding accelerated filling of the pit at Closure.

The maximum Pit fill volume is estimated at 43,400,000 m³. Based on precipitation data the pit is expected to take between 85 – 147 year to fill naturally.

Water to fill the pit could be drawn from Mary Lake (Volume of Mary Lake (main basin): 112,000,000 m³).

Assuming that the annual volume available from Mary Lake for pit filling is 10% (~ 11,200,000 m³) of the lake volume, the pit could be filled in 4 years.

Although this is a feasible option, it is not part of the Mary River Project. Current geochemical characterization work will continue and enable Baffinland to improve the level of confidence in pit water quality for the post closure period.

b) & c) Monitoring parameters

At this early phase of the Project, Baffinland's commitment is to ensure that the pit water quality for the post-closure period will meet water quality parameters established in Schedule 4 and Schedule 5 of the MMER at a minimum. As Baffinland learns more from its AEMP, real world monitoring data will inform the Company on final closure water quality criteria. Mine closure is a process that evolves over the active life of the Project. The on-going geochemical program will enable Baffinland to gain more confidence in the ultimate pit water quality projections for the post closure period. The objectives for pit water quality are consistent with the overall objective of the closure plan. Sampling details for pit water (parameters, frequency) will be incorporated into the "Interim Closure Plan", which will be submitted prior to the mine pre-stripping activities. This Interim Closure Plan will provide an update on the projected pit water quality for the post closure period.

Issue 2.14: Nutrients

Recommendation Environment Canada-2.14:

Environment Canada 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.

Baffinland Response: This recommendation ties in with recommendation 2.1 above.

Item b) - water quality objectives for nutrients, with thresholds for action will be established as part of the AEMP. The objective is to prevent eutrophication of Sheardown Lake.,

Baffinland agrees with items c) and d).

Issue 2.15: Aquatic Effects Monitoring Program

Recommendation Environment Canada-2.15:

Environment Canada 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.

Baffinland Response: Baffinland agrees with this recommendation. The next workshop is scheduled for February 12th, 2013. All parties including Environment Canada have confirmed their availability for participation.

Follow up Actions:

1. Baffinland to transmit to Environment Canada monitoring information for Sheardown Lake regarding phosphorus level – Completed on January 25th, 2013.
2. Environment Canada to review information and provide feedback on acceptable phosphorus discharge criteria (prior to AEMP workshop).
3. Baffinland to circulate notes of teleconference to participants – Complete.
4. Environment Canada to provide feedback on notes of teleconference. Notes of teleconference will be then be sent to the NWB as record of progress made and outstanding items – This Memo - Complete.
5. Environment Canada to review and evaluate proposed discharge parameters for mine contact water. Review and evaluation to be completed prior to Final NWB Hearings.
6. AEMP workshop to be scheduled for early February – Complete – Date set for February 12th, 2013.

I hope this letter serves to provide the NWB with an update as to the status of progress made and outstanding items related to Environment Canada's addendum to technical comments on Baffinland's Type A Water Licence Application. If you have any questions, please contact me at oliver.curran@baffinland.com or 416-814-3195.

Sincerely,

A handwritten signature in black ink, appearing to read 'O. Curran', with a small dot at the end.

Oliver Curran
Director, Sustainable Development

Cc: Anne Wilson (EC)
Mark Dahl (EC)
Ryan Barry (NIRB)