

Baffinland Responses on AEMP - Environment and Climate Change Canada Technical Comments - 160122 ECCC Outstanding 2014 Comments - AEMP

Topic	Comment	Recommendation	Baffinland Response
Review history	On Nov. 2014 ECCC staff provided comments on the 2014 AEMP submission (main document and supporting appendices) for the Baffinland Mary River project. The AEMP was again circulated for review in May 2015, at that time ECCC noted that the 2015 version did not contain any revisions or updates. Baffinland advised ECCC that a revised version would be submitted following licence issuance and that the new version would consider the comments that had been received to date (email, Oliver Curran to ECCC May 11, 2015). The updated AEMP was submitted on Oct. 30th, 2015 and was circulated by the NWB for review in November 2015. This version does include several updates, primarily around monitoring stations and the new licence. It was not apparent in the updated AEMP that ECCC's comments or concerns were included. The outstanding concerns from the previous review can be found in the attached Excel table and additional comments on the EEM section of the AEMP are provided below.	Provide a response to comments and concerns raised in Nov. 2014 review.	Refer to Sheet 2 for Baffinland's responses to the outstanding comments from the November 2014 review..
Additional data collection and evaluation in 2014	The Sediment Quality Study Design section notes that additional pre-mining sediment sampling was needed to improve baseline data for future comparisons, and to include depositional areas. The additional work was to be done in 2014, with appropriate new stations to be identified.	Provide a summary of 2014 field investigations and an update of the study design based on the new data.	As discussed in the CREMP Sediment Quality Study Design, additional pre-mining sediment sampling was conducted in 2014. The 2014 AEMP Report along with its appendices was supplied to EC in March 2015. The 2014 AEMP Report includes a summary of the 2014 sediment quality monitoring as well as discusses how the final sediment quality benchmarks were derived in Sections 2.3.2 and 2.3.3, respectively. Additional more in depth details are provided in Appendix C for the Sediment Quality Monitoring performed and in Appendix D for the proposed Final Sediment Quality Benchmarks. Also based off of the 2015 AEMP Report CREMP and field studies, Minnow Environmental Inc. (Minnow) contracted to assist Baffinland in completing the field work and reporting requirements of several of the AEMP component studies, has proposed several amendments to the Sediment Quality Study Design detailed in their Letter of Recommendations attached with the Cover Letter of this submission .
EEM Requirements	<p>The EEM submission outline was included in the AEMP. The EEM study design for this facility is still outstanding. The objective of the EEM program is to evaluate the effects of mine effluent on fish, fish habitat and the use of fisheries resources. Section 7 of the MMER obligates the mine to conduct EEM studies, submit reports within prescribed timelines and use generally accepted standards of good scientific practice to conduct studies and interpret results. Section 23 of the MMER instructs mines to submit their data to Environment Canada (now ECCC) electronically where a format is provided, or in writing if no such format is provided. Schedule 5 of the MMER presents the specific EEM requirements and is divided into 2 parts, Effluent and Water Quality Monitoring and Biological Monitoring. The main MMER biological monitoring study components have been included in the AEMP but elements of the effluent and water quality monitoring studies appear to be missing. ECCC supports further discussion on how the current effluent and water quality monitoring program outlined in the AEMP could support the information required under the MMER. The facility should include sublethal monitoring in their sampling schedule as per MMER requirements. Annual Effluent and Water Quality Monitoring Studies The components of effluent and water quality monitoring studies are effluent characterization, sublethal toxicity testing, and water quality monitoring. Schedule 5, Sections 4 - 7 of the MMER outline the required parameters and frequency of monitoring for these components. Note that effluent and water quality monitoring must be conducted 4 times per calendar year not less than one month apart and sublethal toxicity testing must be conducted twice per year (for the first three years, then once per year thereafter) not less than 1 month apart. Note that the first effluent characterization, sublethal toxicity testing and water quality monitoring must be conducted not later than six months after the day on which the Mine became subject to the MMER. Under Schedule 5, Part 1, Section 8, mines must submit not later than March 31st, a report on the effluent and water quality monitoring studies conducted during the previous calendar year. Refer to Schedule 5, Section 8 of the MMER for details on effluent and water quality monitoring reporting requirements. Effluent characterization, water quality, and sublethal toxicity testing information should be reported electronically through the Regulatory Information Submission System (RISS) https://www.rissitdr.ec.gc.ca/riss/Global/Index.aspx. Information that cannot be reported in RISS must be provided in a hard copy report, including:</p> <ul style="list-style-type: none"> ☐ Quality Assurance/Quality Control (QA/QC) measures, methodologies, and detection limits for chemical parameters ☐ QA/QC measures and methodologies for sublethal toxicity testing. <p>The hard copy submission should be made to the Authorization Officer. In addition, the inclusion of laboratory sheets/certificates of chemical parameter results within the hard copy submission would be appreciated to facilitate our verification of submitted RISS data.</p>	ECCC recommends that Baffinland's AEMP outline how and when the requirements described above will be met.	<p>The Mary River Project became subject to the MMER on July 10, 2015. During the 2015 open water season Baffinland completed the required effluent characterization and water quality monitoring outlined in Schedule 5 of the MMER, including acute and sublethal toxicity testing. Additionally, all effluent and water quality data collected during 2015 has been submitted to Environment Canada electronically using the Regulatory Information Submission System (RISS). Attached is the annual MMER report submitted to Environment Canada on March 31, 2016.</p> <p>The current anticipated timeline for milestones associated with the MMER requirements is provided below:</p> <p>July 10, 2015 - Mine became subject to MMERs (effluent discharge reached 50 m³/day)</p> <p>September 9, 2015 - Submission of Identifying Information & Final Discharge Points to Environment Canada</p> <p>July 10, 2016 - Submission of Cycle One Study Design to Environment Canada</p> <p>August - September, 2017 - Conduct Cycle One Biological Monitoring Study</p> <p>January 10, 2018 - Submission of Cycle One Interpretive Report to Environment Canada</p>

EEM Cycle One Study design	<p>ECCC conducted a high level review of this draft EEM Study Design and has the following comments:</p> <ul style="list-style-type: none"> - facilities are only required to do biological sampling downstream of one FDP, typically from the FDP with the most adverse environmental impact. - Total and dissolved aluminum are very high in CLT-Ref 3 and CLT-Ref 4. Account for this and its potential to confound future sampling programs. - This facility may have the data required to conduct a BACI analysis as part of its EEM program. - It does not appear that the fish sampling program is designed to address any of the endpoints around reproduction. As these are required to be assessed under the MMER further discussion may be required. - Consider looking at YOY surveys in the lakes independently of the adult fish data in the rivers. 	ECCC requests further development of the fish sampling program to address reproduction endpoints and also requests that the study design be updated to address the elevated aluminum levels at reference sites.	An updated EEM Cycle One Study Design will be submitted to Environment Canada for review before July 10, 2016. The updated study design will address Environment Canada's comments regarding high levels of aluminum in reference streams and reproduction endpoints in the fish sampling program.
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Baffinland Responses on AEMP - ECCO Outstanding June 2014 Comments

Topic	Comment	Recommendation	Baffinland Response
Site Map	There is no map included in the report that depicts the entire site including mine and both ports.	EC recommends the inclusion of a map or figure that includes the entire site footprint, including both ports, in order to gain a more thorough understanding of the site infrastructure.	Baffinland has updated the AEMP (Rev. 2) to include a site map (Figure 2.1) showing the location of each Project site as well as three maps showing the footprint and infrastructure layouts of each Project site including, the Mine Site (Figure 3.2), Milne Port (Figure 3.3) and Steensby Port (Figure 3.4).
Table 2.1 Run of mine ore stockpile water and ore stockpile contact water	Blasting residue could also be an issue in the water quality coming off of the ore stockpiles, as similarly noted for the waste rock pile runoff. Ammonia is noted with blasting residues, and nitrate would also be of concern.	EC recommends that blasting residue also be included as a key issue	Blasting residue (ammonia, nitrate) has been added Table 2.1 of the latest AEMP revision (Rev. 2)
Table 2.1 Duplication of cells	The continuation of Table 2.1 on page 12 includes a duplication of the first 10 cells in the table.	EC recommends that the duplication be deleted.	Baffinland has deleted the duplicated/repeated rows in Table 2.1 in the latest AEMP revision (Rev. 2).
Section 3.4.2 - Effluent Quantity and Quality	The report states that the water license requires the reporting of monthly and annual volumes of effluents and wastes discharged by the project. These will provide loading information for the various receiving environments	EC recommends that future AEMP reports include the quantities of effluent for each discharge location, along with characterization.	Effluent discharge locations, volume quantities and characterization (water chemistry) are provided in the NWB and NIRB Annual Report.
Table 4.1 EEM and SNP Sampling Stations	The sampling stations for EEM and the SNP are provided in different units. For clarity, both should be expressed in using the same system. Currently EEM sampling stations are listed in latitude and longitude while the SNP sampling stations are in UTM.	EC recommends standardization of EEM and the SNP location coordinates.	Coordinates in Table 4.1 have been converted to UTM format in the latest AEMP revision (Rev. 2).
Figure 4.2 - Candidate Reference Areas	Several of the candidate reference areas are in close proximity to the tote road and the proposed railway alignment. Water bodies in close proximity to the road and railway could be impacted by mine activities, affecting their use for reference comparisons. As noted in Appendix B Table 2.1 Reference Lakes are to be determined, with further work done in 2014 to be evaluated. Appendix F notes differences between the current candidate reference lakes, and has identified several alternatives to be investigated further.	EC recommends that there be further discussion and qualification on the use of reference sites once the 2014 data for the additional candidate reference lakes have been evaluated.	<p>The 2014 Reference Lake Evaluation report written by North South Consultants after the 2014 CREMP field program is included as Appendix F in the latest AEMP revision (Rev. 2).</p> <p>In 2015, Reference Lake 3 was established as the CREMP reference lake for future studies.</p> <p>Baffinland believes that current candidate reference areas for the EEM study are adequate for the infrastructure associated with the Early Revenue Phase (ERP).</p>

Section 4.1.5 Summary and Schedule Fish in Exposure/Reference	Baseline monitoring of fish population data between the reference and exposure areas show significant differences within and between all groups. Baffinland suggests further data analysis may be performed.	EC supports the suggestion of further evaluations and discussions on suitable reference areas for the fish component of EEM.	An updated EEM Cycle One Study Design will be submitted to Environment Canada for review before July 10, 2016. The updated study design will address Environment Canada's comments regarding the differences in fish populations between exposure and reference areas.
Section 4.2.2 Sampling Frequencies	Although the proposed sampling frequencies are listed there is a lack of clarity in the actual frequency of sampling events. The report states that lakes will have "three sampling events in each available season" while streams will have "four samples (one set of seasonal samples) per year". Appendix B Section B.3.3 recommends "three yearly samples" for lakes. This raises questions of timing (notably for the fourth stream sample) and how data will be analysed.	EC requests that sampling frequency and handling of seasonal data be clarified.	<p>The latest AEMP revision (Rev. 2) has reworded sections discussing the sampling frequency and schedule of the CREMP water quality program.</p> <p>Water quality stations are monitored three (3) times per year. Stream water quality will be monitored during the spring, summer and fall, whereas, lake water quality monitoring will take place during the winter (late April), summer and fall.</p>

Section 5.3.2 - Water Quality Benchmarks	The report states that "all samples that were non-detect were assumed to equal the detection limit for statistical calculations. Where detection limits were elevated compared to later sampling events, they were substituted with lower detection limits." Use of the MDL will bias the mean concentrations upwards, while standardizing detection limits downwards will bias the mean concentrations downwards. This will not affect use of the 97.5th percentile, which is a rank-based estimate, unless there are greater than 97% of non-detects in the data; in this case anything less than 5% does not have percentiles calculated.	Baffinland has taken a reasonable approach in their handling of below-detection data points and variable detection limits, for the proposed analyses and use of defined thresholds. EC notes that any statistical test of change from baseline should be reviewed in the context of baseline concentrations being overstated, acknowledging this will not affect absolute concentrations and action thresholds.	Baffinland will ensure that any statistical test of change from baseline water quality will be reviewed in the context of baseline concentrations being overstated.
Section 5.3.3 Sediment Quality Benchmarks	Sheardown Lake sediment quality may be exhibiting upward trends in Cr, Cu and Ni, although this has not been confirmed statistically. The statement is made that influenced data would be removed from final AEMP benchmark calculations.	Please clarify how "influenced data" would be defined, and how trends could be evaluated for sediment chemistry results.	As discussed in the CREMP Sediment Quality Study Design, additional pre-mining sediment sampling was conducted in 2014. The 2014 AEMP Report includes a summary of the 2014 sediment quality monitoring as well as discusses how the final sediment quality benchmarks were derived in Sections 2.3.2 and 2.3.3, respectively. Additional details on the development of final sediment quality benchmarks are also provided in Appendix C and Appendix D.
Table 5.3 - Sediment Quality Benchmarks	Pending further data collection in 2014, sediment benchmarks are considered interim. As noted in Appendix C, while lab methods were consistent, collection methods and locations varied. The dataset was screened for substrate composition in selecting what would be included in the baseline chemistry dataset. The benchmarks were developed without inclusion of the Sheardown tributaries, as those data differed for most parameters.	EC supports the further development of sediment benchmarks with additional 2014 and forward sampling data. Consideration should be given to developing separate benchmarks for the tributary sites, given that there will be effluent exposure.	As discussed in the CREMP Sediment Quality Study Design, additional pre-mining sediment sampling was conducted in 2014. The 2014 AEMP Report includes a summary of the 2014 sediment quality monitoring as well as discusses how the final sediment quality benchmarks were derived in Sections 2.3.2 and 2.3.3, respectively. Additional detail is also provided in Appendix C and Appendix D. In 2015, Minnow Environmental Inc. (Minnow) was contracted to assist Baffinland in completing the field work and reporting requirements of several of the AEMP component studies, including the CREMP. After completing the CREMP in 2015, Minnow proposed several modifications to the CREMP to provide greater efficiencies to the program and improve the program's ability to achieve its objectives (i.e. to evaluate short and long term effects of the Project on aquatic ecosystems). Included in their list of proposed modifications to the CREMP, Minnow recommended that the CREMP sediment monitoring program focus solely on depositional lake environments and that CREMP sediment monitoring stations in streams and rivers be discontinued in future CREMP studies. This recommendation was based on the observation that the majority of streams and rivers in the Mary River Project local study area (LSA) contain very limited depositional habitat suitable for the collection of fine sediments. As observed during the 2015 CREMP and baseline studies (KP, 2015), the general absence of any substantial accumulation of fine sediments within these watercourses preclude any meaningful assessment of potential mine-related influences on sediment quality within, along and/or between watercourses. As a result, all sediment quality stations in streams and rivers near the Mine Site have been removed from future CREMP studies.
Table 5.3 - Sediment Quality Benchmarks	It is not clearly identified in the table what Benchmark Method A, B and C are for "Benchmark Methods" in the last row of Table 5.3. These methods should be defined below the table in order to increase clarity for the reader. The reader can infer how methods A and B were arrived at but method C is less clear.	EC recommends that the benchmark methods be defined in the legend below the table .	Table 5.3 has been updated in the latest revision of the AEMP (Rev. 2) to reflect the final sediment quality benchmarks established in 2015. Additional foot notes have been added to clarify the different methods (A, B, C) used in developing the benchmarks.

Section 5.3.5 Benthic Macroinvertebrate Indicators and Benchmarks	A number of BMI metrics are listed for inclusion in the CREMP, including: abundance, composition, Shannon's Evenness, Simpson's Diversity Index, and Richness. If maintaining consistency with the EEM program, the Bray Curtis Index would be another metric that could be incorporated into the statistical tests.	EC recommends that the Bray Curtis Index be added as an indicator for benthic macroinvertebrates.	The Bray Curtis Index has been added to the list of BMI metrics used to assess CREMP benthic invertebrate data in the latest AEMP revision (Rev. 2). Additionally, the Bray Curtis Index was used in the most recent 2015 CREMP Report to analyze and test 2015 BMI data.
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