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Cambridge Bay
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Richard Dwyer
Manager of Licensing
Nunavut Water Board
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X0B 1J0

Sent by e-mail: richard.dwyer@nwb-oen.ca

March 24th, 2025

RE: Review of Aquatic Effects Management Plan for Back River Project

Dear Richard Dwyer, KIA has completed its review of the updated Water Management Plan for the Back River Project.

The AEMP was designed to meet Metal and Diamond Mining Effluent Regulations (MDMER) and associate Environmental Effects Monitoring (EEM) requirements; it covers water quality, sediment quality, benthic invertebrates, and fish. The AEMP has been revised 4 times since it was first presented as part of the draft Environmental Impact Statement (EIS) in 2013. According to the proponent, the latest version of the AEMP (Dec. 2024) was created to accommodate all comments and commitments made during the regulatory review of the Water Licence application.

KIA's review comments and recommendations are provided to the NWB as follows in this memorandum.

Thank you.

John Roesch, P.Eng.

Senior Hope Bay Project Officer
Kitikmeot Inuit Association, Department of Lands and Environment

Cc Wynter Kuliktana, Director, KIA, Department of Lands and Environment

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Review Comment Number	KIA-NWB-01.
Subject/Topic	Umwelt Lake/Umwelt Reservoir
References	Sections 2.2, 2.3, 3.2, 3.5, etc.; Figure 4.2-1
Summary	The location of Umwelt Lake/Reservoir is not specified.
Detailed Review Comment	Umwelt Lake/Umwelt Reservoir is referenced several times throughout the AEMP document, but its location is not clear from the map.
Recommendation/ Request	The map should include Umwelt Lake and/or Umwelt Reservoir.
Importance	Low

Review Comment Number	KIA-NWB-02
Subject/Topic	Baseline Data
References	Section 4.2.1
Summary	The quantity of baseline data is unclear.
Detailed Review Comment	Baseline data is described/discussed but it is not clear exactly how much baseline data exists for each site and AEMP component.
Recommendation/ Request	Please include a table that summarizes the baseline data (# samples per site per parameter/AEMP component, years sampled, etc.).
Importance	High

Review Comment Number	KIA- NWB-03
Subject/Topic	Terminology

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References	Sections 4.2.1, 4.2.3, 5.1.4, 5.2.4, 5.3.4, 5.4.5.7, 6.4
Summary	The term "normal range(s)" is used throughout the document but is undefined.
Detailed Review Comment	The term "normal range(s)" is used 46 times in the document. It is stated that the compiled baseline data are sufficient to support normal range calculations and that normal ranges will be used to evaluate project effects. However, the term is not defined. It is not a standard term in the field of statistics or of water-quality science.
Recommendation/ Request	Please include a precise definition of "normal range".
Importance	Low

Review Comment Number	KIA- NWB-04
Subject/Topic	Water quality sampling
References	Section 4.2.4
Summary	Stream sampling is being dropped from the AEMP with little justification/discussion.
Detailed Review Comment	On page 4-9 It is stated that: Previous versions of the AEMP included water quality monitoring at lake outlets in early spring (June; one to two weeks after freshet) and August. Stream sampling was removed from this version of the AEMP according to the following rationale: Water quality monitoring in lakes is sufficient to track changes in water quality due to the Project, and to characterize water quality entering downstream waterbodies. This implies that water quality in August is representative of the entire year. However, if the deep areas of the lakes stratify, the chemistry of the epilimnia may differ from that of the (fully mixed) water column in June (which would correspond to that of lake-outflow samples). Furthermore, runoff is much higher in

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	June which could also influence water quality. Overall, it seems that information on the effects of stratification and runoff (i.e., of seasonality) on water quality is being lost by not sampling the outflows in June as well as the central lake stations in August.
Recommendation/ Request	Considering seasonality in runoff and water-column stratification, please discuss whether sampling only in August is in fact sufficient to characterize lake water quality. If not, continuation of the June sampling event is recommended.
Importance	High

Review Comment Number	KIA- NWB-05
Subject/Topic	Use of parametric statistics
References	Section 5.1.4
Summary	The use of parametric statistics is problematic because water quality data generally do not conform to a normal distribution.
Detailed Review Comment	It is stated that *"If parameter concentrations naturally exceeded water quality guidelines under baseline conditions, then the AEMP benchmark will be based on the baseline mean plus two standard deviations."* This approach is problematic because water quality data is often skewed. For instance, for an example random sample (n=50) of data with Avg.=10 and SD=5, swapping a single datum with an extreme value of 100 results in an approximate doubling of the benchmark from ~20 to ~40 because of the greatly increased standard deviation (SD). The mean plus 2 SDs is approximately equal to the 95th percentile of the data; therefore, an upper percentile such as the 90th or 95th (depending on the quantity of baseline data) could be used as a benchmark that would not be appreciably influenced by a small number of extreme values (and no outlier removal would be needed). Furthermore, it is stated that *"Parameters with mean/median values that exceed the normal range will be identified as "parameters of interest" and further evaluated in the BACI*

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	statistical analysis." The mean and median values may differ appreciably if (as is probable) the data are not normally distributed; in this case, it is not clear whether the mean or median would be compared to the "normal range".
Recommendation/ Request	The use of a non-parametric approach is recommended. Alternatively, provide justification for the proposed use of parametric statistics (means, standard deviations) in defining benchmarks and comparing data to normal ranges.
Importance	High

Review Comment Number	KIA- NWB-06
Subject/Topic	Statistical tests
References	Section 4.2.3; Section 5.1.4; Section 5.3.4; Section 5.4.5
Summary	Insufficient detail and/or rationale is provided regarding analysis and statistical testing of differences between exposure and reference sites.
Detailed Review Comment	In the description of the statistical design there are references to "the BACI test" and in the data analysis section it is stated that "[a] BACI statistical analysis will be used to analyze the water quality data further to compare exposure and reference areas". However, BACI (before-after-control-impact) is a sampling design not a statistical test; no details are provided on how the significance of differences in water quality between exposure and reference will be determined. For the ordination of the benthic invertebrate data – why is log-transformation proposed for use of a non-parametric method (NMDS)? For testing differences in fish metrics, ANOVA is proposed but it is not clear to this reviewer what the groups in the test would be – reference vs. exposure is only 2 groups which would suggest

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	that a t-test (or non-parametric alternative) should be used.
Recommendation/ Request	Please provide clarification on statistical methods: (1) state the test that will be used to assess the significance of differences in water quality between exposure and reference areas; (2) Provide a rationale for log-transforming the benthic data prior to use of NMDS, and (3) explain the groups that will be compared by ANOVA in analysis of fish metrics.
Importance	Moderate