EcoMetrix
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REVIEW OF "EKATI DIAMOND MINE 2007 AQUATIC EFFECTS MONITORING PROGRAM" REPORT

Report prepared for:

WEK'ÉEZHÌI LAND AND WATER BOARD
#1 4905 48TH Street
Yellowknife, NT
X1A 3S3

Report prepared by:

ECOMETRIX INCORPORATED
6800 Campobello Road
Mississauga, Ontario
L5N 2L8

Ref. 08-1531
June 2008

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Donald R. Hart, Ph.D.
Principal, Project Manager

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1.0 INTRODUCTION

BHP Billiton Diamonds Inc. (BHPB) has submitted its 2007 Aquatic Effects Monitoring Program (AEMP) Annual Report to the Wek'éezhìi Land and Water Board (WLWB) as required under Water Licence MV2003L2-0013, Part 1, Item 6. The 2007 AEMP report (Rescan, 2008a) describes the aquatic effects monitoring completed by BHPB over the year 2007, tabulates the data for the current year, and evaluates the data in conjunction with data from previous years, to determine where environmental effects from mining operations are evident, and the nature of those effects.

The WLWB has requested that EcoMetrix Incorporated (EcoMetrix) review the 2007 AEMP report and provide comments to assist the WLWB in its overall review of the report. Specifically, EcoMetrix was asked to assess the technical/scientific soundness of the report, and whether it fulfills the requirements of Part 1, Item 6 of the Water Licence, and whether conditions 2, 4, 6a and 7 of an 19 April 2007 directive from the WLWB to BHPB have been adequately addressed.

2.0 TECHNICAL AND ADMINISTRATIVE REVIEW

2.1 Technical Review

2.2.1 Overview of Study Approach and Findings

The 2007 AEMP report, dated April 2008, consists of a Summary Report and three appendices, as follows:

- Appendix A: the Evaluation of Effects Report;
- Appendix B: the Data Report; and
- Appendix C: the Statistical Report.

This technical review focuses on the study approach and key findings, as outlined in the Summary Report, with reference to the Appendices as needed to critically evaluate the approach or the findings.

The AEMP is focused on the aquatic environment receiving treated effluent from the Ekati Diamond Mine, specifically on the Koala Watershed and the King-Cujo Watershed. In the Koala Watershed, the Long Lake Containment Facility (LLCF) discharges to Leslie Lake, and effluent is dispersed through Moose, Nema and Slipper lakes into Lac de Gras. In the King-Cujo Watershed, the King Pond Settling Facility (KPSF) discharges to Cujo Lake, and effluent is dispersed through the Christine-Lac du Sauvage stream into Lac du Sauvage.

The aquatic environment monitoring began with baseline studies from 1994-97 in the Koala Watershed, through 2000 in the King-Cujo Watershed. The 2007 AEMP report presents raw data for the 2007 study year (Appendix B) and evaluates trend through time (from 1998) as an indication of mine effects (Appendix A). The detailed statistical results supporting this evaluation are provided in Appendix C.

Three reference lakes are an integral part of the study design: Vulture Lake in the Koala Watershed, and Nanuq Lake and Count Lake in other watersheds. The AEMP is designed to allow comparison of reference lakes (as a group if possible) and exposed lakes (receiving mine effluents) through time. The lakes have associated connecting streams, which are quite different habitats than lakes. Reference streams and exposed streams are also compared through time.

The environmental measurements that are the subject of these comparisons include various water quality parameters (pH, sulphate, total dissolved solids (TDS), chloride, potassium, total ammonia, nitrate, nitrite, ortho-phosphate, total phosphorus, aluminum, arsenic, copper, molybdenum, nickel and zinc); limnology parameters (Secchi depth, winter dissolved oxygen); phytoplankton parameters (chlorophyll *a*, density, diversity); zooplankton parameters (biomass, density, diversity); lake benthos parameters (organism density, dipteran diversity); stream benthos parameters (organism density, dipteran diversity, EPT diversity); lake trout and round whitefish parameters (catch-per-unit-effort (CUPE), length, weight, condition, age, growth rate, residual length at age, sex ratio, percent maturity, egg number, gonadosomatic index (GSI), liver somatic index (LSI), dietary composition, metal concentrations in liver and muscle, chlorinated phenols in liver and muscle, hydrocarbon metabolites in bile, and incidence of deformities, erosions, lesions and tumours (DELT)).

Important changes in the 2007 program, as compared to previous years, included the dropping of shallow water sediment and benthos sampling (mid-depth and deep water stations were retained); addition of slimy sculpin as a fish species (to evaluate its suitability as an alternative to lake trout and whitefish for destructive sampling); evaluation of DELT and parasite incidence in fishes; and detailed taxonomic identification of nematodes in the benthos samples. In addition, the statistical method of identifying effects was changed in 2007 for most environmental parameters (all except fish parameters). Specifically, the time trend in each exposure lake (or stream) was compared to that in the reference lakes (or streams) if the reference sites showed a common trend. This departs from the historical "BACI" approach, where the pre-mine – post-mine difference for each exposure lake (or stream) was compared to that in the reference lakes (or streams). Thus, the 2007 approach involved testing hypotheses about regression coefficients for the time trend, rather than hypotheses about means for groups of lakes and years.

The results indicated that there were measurable effects on water quality in the lakes and streams downstream of the LLCF in the Koala Watershed. The effects were evident as increasing concentrations over time in the following water parameters and locations:

- pH (downstream to Lac de Gras station S2);
- sulphate (downstream to Lac de Gras station S3);
- total dissolved solids (downstream to Lac de Gras station S2);
- chloride (downstream to Lac de Gras station S2);
- potassium (downstream to Lac de Gras station S3);
- total ammonia (possible effect) (in Moose and Slipper lakes);
- nitrate (downstream to Nema Lake);
- total arsenic (downstream to Moose Lake);
- total molybdenum (downstream to Lac de Gras station S3); and
- total nickel (downstream to Slipper-Lac de Gras).

At present, with two exceptions, the lake mean concentrations of these parameters do not approach the CCME water quality guidelines for protection of aquatic life. The exceptions are nitrate and molybdenum. Nitrate means slightly exceed the CCME interim guideline of 2.9 mg/L in Leslie Lake and Moose Lake, but the confidence limits on the mean overlap the guideline, so the hypothesis of equivalence to the guideline cannot be rejected. Molybdenum (Mo) means are slightly below the CCME guideline of 0.073 mg/L in Leslie Lake and Moose Lake, but the upper confidence limit of the mean exceeds the guideline in both cases. An interim site-specific guideline of 16 mg/L (Rescan, 2006a) is cited. Processing of Mo-rich ore from the Misery pit was completed in 2007; therefore, Mo concentrations are expected to decrease in future.

In the King-Cujo Watershed, measurable effects on water quality were identified downstream of the KPSF. The effects were evident as increasing concentrations over time in the following water parameters and locations:

- pH (downstream to Cujo Outflow);
- sulphate (downstream to Christine-Lac du Sauvage);
- total dissolved solids (downstream to Christine-Lac du Sauvage);
- chloride (downstream to Christine-Lac du Sauvage);
- potassium (downstream to Christine-Lac du Sauvage);
- total ammonia (downstream to Cujo Lake);
- total arsenic (downstream to Cujo Lake);
- total molybdenum (downstream to Cujo Outflow); and
- total nickel (downstream to Cujo Outflow).

At present, the lake mean concentrations of all measured parameters do not approach the CCME water quality guidelines in the King-Cujo Watershed.

Possible biological effects observed in the Koala Watershed included reduced zooplankton density over time in Moose Lake. No such effects were observed in Leslie Lake immediately downstream of the LLCF, while increased zooplankton density over time was observed in Kodiak Lake upstream of the LLCF.

In the King-Cujo Watershed, possible biological effects included increased zooplankton density over time in Cujo Lake. Benthos density has followed the same pattern.

Changes in fish parameters were identified for round whitefish and lake trout, in both exposed lakes and reference lakes in both watersheds, and were attributed to sampling mortality over the years. Specifically, catch-per-unit-effort has declined. Possibly related to this, fish size has increased for lake trout in the Koala Watershed, and for both species in the King-Cujo Watershed. Round whitefish in the Koala Watershed are reported to be older but not larger, although the age effect may pertain to lake trout based on appendix results.

Hydrocarbon metabolites in fish bile, measured for the first time in 2007, were found to be higher in Leslie Lake and Moose Lake (in the Koala Watershed) than in Nanuq Lake (reference). The differences were not statistically significant, but the sample sizes were small. Similar effects were not seen in the King-Cujo Watershed. The detection of these metabolites indicates that fish have been exposed to hydrocarbons, but is not necessarily indicative of adverse effects.

The DELT analysis of slimy sculpin indicated a higher incidence of infection by *Liqula intestinalis* (a tapeworm) in Leslie Lake and Moose Lake, than in Nanuk Lake (reference). The same thing was found in Cujo Lake as compared to Nanuk Lake. Since this analysis was undertaken for the first time in 2007, nothing can be said about the time trend of the observed differences.

2.1.2 Specific Review Comments

Overall, the study approach and key findings of the 2007 AEMP, as outlined above, seem reasonable and the findings appear to be supported by the data. EcoMetrix has not attempted to reproduce the statistical analyses, which would require raw data for all years. However, the findings are generally consistent with graphical presentations of the data over the years, and with the time trends that are depicted in the 2007 AEMP report.

Specific comments or questions that arise from our review of the 2007 AEMP report are presented below.

1. Total Ammonia and Nitrate

The water quality effects observed have been quite consistent between the two watersheds, with the exception of ammonia and nitrate. Increasing nitrate has been found downstream of the LLCF, but not downstream of the KPSF.

Possibly related to this, ammonia has been increasing in the LLCF, but has peaked and is now decreasing in the KPSF, where it now appears to be constant though at a higher level than in the LLCF. Notwithstanding the ammonia decrease in the KPSF, ammonia has been increasing in Cujo Lake downstream.

The spatial pattern of ammonia increase downstream of the LLCF is confusing. A statistically significant increase, not seen in reference lakes, was found in Moose Lake and Slipper Lake, but not in Leslie Lake or Nema Lake. Leslie Lake shows a pattern of increase followed by some decrease, and is now at a lower level than Moose Lake downstream. The reasons for this pattern are unclear.

While ammonia is not presently approaching water quality guidelines, it could become more important in future as pH increases. The pH in Leslie Lake and Moose Lake is now in the 7.5 to 8.0 range, which means that the CCME guideline may be as low as 0.5 to 1.0 mg/L at times (the Water Licence criterion is 2.0 mg/L). Nitrate currently exceeds the CCME guideline in Leslie Lake and Moose Lake, but does not approach the guideline in Cujo Lake.

Since ammonia may potentially be important in future, and since it may contribute by degradation to nitrate, which is already important, it would be of interest to understand the dynamics of ammonia and nitrate in the mine receiving waters.

2. Molybdenum

The fact that molybdenum means in Leslie Lake and Moose Lake approach the CCME criterion, and may potentially exceed when the confidence limits on the means are considered, is a matter of some concern, although the concentrations are expected to decline in future. EcoMetrix has not reviewed the derivation of the Rescan (2006a) interim site-specific objective of 16 mg/L, which is far above the CCME criterion of 0.073 mg/L. If the higher level is protective, this would alleviate the concern. Attention to this parameter is warranted to ensure that it declines in future as expected, and does not increase in the mine receiving waters.

3. Chloride and Total Dissolved Solids

The exponential increase in chloride with the LLCF, and similar rates of increase in Leslie Lake and Moose Lake downstream, are matters of concern. BHP Billiton is aware of the concern and has been studying the issue (Rescan, 2008b). Total dissolved solids (TDS) show a similarly rapid increase in the LLCF and in Leslie Lake and Moose Lake, based partly on the chloride contribution.

4. Two-sided Statistical Tests

The statistical tests for water quality changes in exposed lakes, beyond those seen in reference lakes, were conducted as two-sided tests (to detect either increase or decrease relative to reference), and then data plots were examined to see where the changes involved <u>increased</u> concentration trends in the exposed lakes. It would seem more appropriate to conduct tests for water quality changes as one-sided tests, since there is usually only one direction of change that we are concerned about, as noted in the discussion of minimum detectable differences in Appendix A, Section 2.2.3.5. It is somewhat easier to detect a change in the one-sided test.

The choice of two-sided testing will likely only make a qualitative difference in the findings (i.e., which parameters have changed and where) for parameters and locations where the result was not quite significant. In these cases, the non-significant result could be significant in a one-sided test.

5. Minimum Detectable Difference

In order to address the request for information about effect sizes that are detectable in the AEMP program, the 2007 AEMP report calculated minimum detectable differences (MDDs). This was done only for parameters that were evaluated using the regression approach (i.e., not fish parameters). The MDD was calculated as the smallest increase in the true lake mean over the water quality guideline that will "reliably" produce a statistically significant difference between the fitted mean and the guideline. The calculations are described in Appendix A, and presented in detail in Appendix C. The standard error (σ) used in the calculation is the residual error around the trend through time regression line. All calculations were done on the natural scale of measurement.

Our comment pertains to the concept of reliable detection and the interpretation of the MDD. Some of the language in the report seems to suggest that the concentration difference above guideline must exceed the MDD before an exceedance of the guideline can be considered real or meaningful. Perhaps this is not the intention, but it would, in our opinion, be an incorrect interpretation. The MDD has been calculated as σ ($Z_{1-\alpha}$ + $Z_{1-\beta}$). Thus, it is potentially well above the criterion for detection of a statistically significant increase above guideline, which is σ ($Z_{1-\alpha}$) for a lake mean based on a very large data set, or SE ($t_{1-\alpha}$) for a lake mean based on a smaller data set, where SE is the estimated standard error of the mean, and $t_{1-\alpha}$ is the Student's t value.

The inclusion of $Z_{1-\beta}$ in the calculation of the MDD ensures that, if the true mean is really this far above the guideline, the probability of a false negative conclusion about exceedance (Type II error) will be small. The MDD should be considered in situations where there has been a negative conclusion about exceedance. It may suggest that more samples are needed to make detection of an exceedance easier. The MDD does not replace or negate a statistical conclusion that the guideline has been exceeded.

The derivation of the MDD anticipates a statistical comparison of a lake mean to a guideline. We are unsure whether such comparison has any formal place in the decision framework that is part of the proposed Watershed Adaptive Management Plan (Rescan, 2008c). EcoMetrix has not reviewed this document.

In practice, we should be concerned whenever a water quality parameter approaches a guideline closely enough that the upper confidence limit on the mean exceeds the guideline. Before this arises, we should be paying attention to any water quality parameters that show a stronger trend of increasing concentration than the reference lakes or streams. This is consistent with the regression approach taken in the 2007 AEMP to identifying parameters with potential effects.

6. Power Analysis for Fish Parameters

The power analysis completed for the fish survey parameters in the 2007 AEMP report addresses the sample size (e.g., number of fish, or number of net sets for CPUE) needed to reliably detect certain effect sizes, whereas the MDD (see above) addressed the effect size that should be detectable given the existing sample size. Environment Canada (2002) methods are cited for the power analysis of fish parameters.

The overall conclusion from the power analysis was that large sample sizes are needed to detect 10%, 20% or 30% changes in fish parameters relative to baseline average values.

Averaging across lakes, the suggested sample sizes to detect a 30% change were 55 to 77 net sets for CPUE parameters, 11 to 55 fish for body size and age parameters, 3 to 5 fish for condition, and 6 to 69 fish for tissue metal parameters (Appendix A, Tables 3.7-88 to 3.7-90). Sample size requirements are even larger to detect smaller % changes from baseline values. Except for condition, these sample sizes are problematic and would likely produce adverse population effects from sampling mortality.

Based on the information provided, EcoMetrix has been unable to reproduce the sample size calculation. For some parameters, it is difficult to check the calculations, because they were performed using log transformed data (according to the tables), while only untransformed means and standard deviations are shown in the tables. However, the condition data in Table 3.7-89 were not transformed, and focusing on condition, we can only reproduce the first row for each species. We suspect that there are calculation errors in this table, and perhaps in all the sample size tables (Tables 3.7-88 to 3.7-90). Thus, the conclusions about sample size requirements for the fish survey appear to be incorrect.

For power analysis, attention should be given to whether one-tailed or two-tailed tests for difference are contemplated. We cannot find discussion of this in Section 3.7.4 of Appendix A; however, from the few reproducible results in Table 3.7-89, we infer that various $Z_{1-\alpha}$ values have been used, without apparent reason. Environment Canada (2002) recommends a two-tailed test for biological parameters on the theory that changes in either direction are of interest.

Examination of the statistical analyses of fish parameters in Appendix C indicates that various transformations were used, and that the transformations used there do not agree with those used stated in the sample size tables. For example, CPUE was square root transformed, not log transformed as stated in the sample size tables. If the sample size calculations are to have any meaning, they should use the same transformations that are used in the actual analysis of fish parameters.

7. Conclusions About Fish Parameters

The intention of the BACI design for analysis of fish parameters was to identify fish parameters for which there was a significant lake x period interaction, indicating a change in some exposure lakes that was not seen in the reference lakes. The analysis was undertaken for a whole series pairwise exposure lake vs reference lake comparisons. The majority of these comparisons violated the assumption about normality of errors, which was considered to invalidate the analysis (Appendix A). Thus, the conclusions in the summary report are generally based on a few valid pairwise comparisons of lakes. In some cases they are based on no valid pairwise comparisons. For example, the noted CPUE decrease from baseline in the reference lakes of the Koala watershed (summary Figure 3-2) seems to have no supporting test results in Appendix C, except for three comparisons among reference lakes which all failed the Shapiro-Wilks test for normality.

There were three valid tests for CPUE between reference and exposure lakes of the Koala Watershed, all involving Counts Lake as a reference. Results for Leslie Lake were not presented at all, for reasons not readily apparent. Leslie Lake seems to be missing for all of the fish parameters.

The lake x period interaction, which is the main statistical criterion for determining a mine effect on fish parameters, was rarely observed, but it was observed in some instances. In the Koala Watershed, significant interaction was observed in valid comparisons of Nema Lake vs Counts Lake, and Slipper Lake vs Counts Lake (Appendix A). We find no useful discussion of these interactions and how they were interpreted. In the summary report, they are not even mentioned. The fish survey findings as reported in Figures 3-2 and 4-2 of the summary report, only indicate where there were significant period effects without interaction, ie. a difference relative to baseline that was common to both exposed and reference lakes. By definition, the results reported here cannot represent mine effects. We would have expected prominent discussion of the interactions found, in the summary report and the appendices, since these may be the effects the study was designed to find.

The conclusions about age, for round whitefish and lake trout in the Koala Watershed, seem to be reversed as presented in the summary report. In Appendix C, for lake trout age, we find a significant period effect and no significant lake x period interaction in all the valid pairwise lake comparisons. This is consistent with an "increase from baseline" conclusion. For round whitefish age, we generally find that both the period effect and the lake x period interaction are non-significant in valid comparisons. This is consistent with a "no increase from baseline" conclusion. Figure 3-2 indicates opposite results for the two species.

Overall, there seem to be some inconsistencies between the results presented in the statistical appendices and those presented in the summary report. Description and interpretation of the lake x period interactions found is conspicuously absent.

2.2 Administrative Review

2.2.1 Item 6 of the Water Licence

Item 6 of Water Licence MV2003L2-0013 reads:

> "*6. The Licensee shall file as part of the Annual Report the following information:*
>
> a) *A summary of activities conducted under the Aquatic Effects Monitoring Program;*
>
> *b) Tabular summaries of all data and information generated under the Aquatic Effects Monitoring Program in an electronic and printed format acceptable to the Board;*
>
> *c) A scientifically defensible interpretation and discussion of the data, including data collected as part of snow quality surveys;*

d) *An assessment of any identified environmental changes relative to baseline conditions that occurred as a result of the Project;*

e) *An evaluation of the overall effectiveness of the AEMP to date*…..”

The 2007 AEMP report contains a summary of Ekati activities relevant to environmental effects, as well as a summary of sampling and monitoring activities under the program (Item 6a). These items are included in the Summary Report.

The 2007 AEMP also contains many tabular summaries of data generated under the AEMP. Historical summaries in Appendix A describe the quantity of data of each type used in the Evaluation of Effects, while Appendix B presents the 2007 data in detail (Item 6b).

The 2007 AEMP report includes scientifically defensible interpretation and discussion of the data, at a summary level in the Summary Report, and at a more detailed level in Appendix A, Evaluation of Effects (Item 6c). Snow survey data are summarized as percent of total precipitation in the Summary Report, and are presented in detail in Appendix B, including data on snow depth, density and water equivalent.

The interpretation and discussion of the power analysis for the fish survey parameters does not appear to be scientifically defensible, and should be revised following review and correction of the sample size calculations. Transparency should be improved by presentation of all inputs to the calculation, including standard deviations for log-transformed data when these were the data used in the calculation.

The 2007 AEMP report includes assessment of identified changes relative to baseline conditions (Item 6d). For water quality and biology parameters (except fish parameters), the assessment addresses whether time trends (from 1998 to 2007) in exposed lakes and streams differ from those in reference lakes. For increasing water quality parameters, the assessment further identifies whether water quality guidelines were approached or exceeded. For fish parameters, the assessment addresses whether recent values have increased or decreased relative to baseline values.

While we do not find an explicit evaluation of the overall effectiveness of the AEMP to date, changes that were made to the 2007 AEMP to improve effectiveness are described in the 2007 AEMP report (Item 6e). These changes were based on an AEMP Re-evaluation Report (Rescan, 2006b) and consideration of stakeholder comments. The changes are described in the Summary Report and in Appendix A.

2.2.2 Conditions 2, 4, 6(a) and 7 of the 19 April 2007 Directive

With approval of the December 2006 plan for the 2007-2009 AEMP, the WLWB specified a number of conditions in a 19 April 2007 directive to BHPB. Four of the conditions considered in this section. These four conditions are as follows:

2. *Open Water Sampling Schedule: The current schedule of sampling in June, July and august shall be maintained. If BHPB wants to proceed with August only sampling, BHPB needs to submit information demonstrating that August only sampling is superior or at least an equally effective indicator of long term trends (Tracking Numbers 6, 16 and 45).*

4. *DELT analysis: The Board notes that under point 13 on page 2-2 of the plan that Lutsel K'e and the Inuit are the groups that have expressed interest in participating in the DELT analysis. The Board expects BHPB to extend the invitation again to the other affected communities well in advance of the start of the scheduled field season for the DELT analysis.*

6. *….. In addition, BHPB must include the following information in the February 2008 report under the identified sections:*

   a) *Effect Sizes*

      - *the evaluation of effects sizes must include an evaluation of power analysis (Tracking Number 4).*

7. *Flushing times (annual, peak and no discharge periods) are to be provided in the February 2008 Report for Leslie, Moose, Nema and Slipper Lakes (Tracking Number 2).*

The 2007 AEMP report includes water quality and limnological sampling in three different months of the Open Water season: July, August and September (Condition 2). These are the same months that were sampled in the 2006 AEMP. The sampling does not include all months at all locations, but meets the intent to have multiple open water sampling events at each location.

The 2007 AEMP report indicates that traditional knowledge specialists worked with Rescan biologists to record the DELT assessment (Condition 4). As noted in Appendix A, specialists from the Yellowknife Dene First Nation, the North Slave Metis Alliance, Lutsel K'e Dene First Nation, and the Kitikmeot Inuit Association took part in the fish community sampling, DELT and parasite assessment in August and September 2007. We do not find information in the report as to how and when invitations to participate were extended.

The 2007 AEMP report includes an evaluation of effect sizes that can be reliably detected (Condition 6a). For water quality and some biological parameters (not fish parameters), Minimum Detectable Differences (MDD) were estimated. For fish parameters, the number of samples needed to detect 10%, 20% and 30% changes from baseline were estimated using power analysis. As discussed in Section 2.1.2 of this review, there appear to be calculation errors in the power analysis.

The 2007 AEMP report includes an estimation of flushing or residence times for lakes downstream of the LLCF (Condition 7). This evaluation is included in Appendix B.

Residence times were estimated for Leslie, Moose, Nema and Slipper lakes, by month and averaged over the year, for an average year, a 1 in 100 dry year, and a 1 in 100 wet year. The estimates were based on precipitation data, runoff coefficients, watershed areas and lake volumes. The latter were taken from the LLCF Downstream Water Quality Prediction Model.

3.0 CONCLUSIONS AND RECOMMENDATIONS

Based on this review of the 2007 AEMP report, EcoMetrix offers the following conclusions and recommendations:

- the report appears to be technically sound, and conclusions seem reasonable based on the data presented, except as noted below;

- the power analysis for the fish parameters seems to contain errors; we recommend that this analysis should be thoroughly checked and revised, and that the conclusions drawn from this analysis should then be reconsidered;

- there are some inconsistencies between the statistical analyses of fish parameters and the conclusions drawn in the summary, and there is no useful discussion of the lake x period interactions that were found; we recommend that the conclusions should be checked against the results, discrepancies resolved, and significant interactions discussed as to whether they are mine effects;

- the report appropriately highlights water quality parameters that are both increasing relative to reference, and approaching or exceeding water quality guidelines, e.g., nitrate and molybdenum; the exponential increase in chloride in the LLCF and downstream lakes should also be highlighted;

- the reason why some lakes and not others have increasing ammonia downstream of the LLCF is unclear, e.g., Moose Lake but not Leslie Lake; if the dynamics of ammonia and nitrate can be explained in the report, it would be appropriate to do so;

- it is unclear why two-sided tests have been used in identifying water quality parameters that are increasing relative to reference; if there is a reason, it should be explained in the report; otherwise, one-sided tests should be considered;

- it is unclear if the comparison of lake mean to water quality guideline, anticipated in the derivation of the MDD, has a place in the decision framework within the Watershed Adaptive Management Plan; this should be clarified in the AEMP report, or in the Adaptive Management Plan;

- the report generally fulfills the requirements of Part 1, Item 6 of the Water Licence, except for the sections on power analysis of fish parameters, and some discrepancies between statistical results and conclusions about fish, which are not scientifically defensible in the sense of Item 6c; and

- the report adequately addresses the conditions of the 19 April 2007 directive to BHPB, except for Condition 6a where the power analysis should be revised.

4.0 REFERENCES

Environment Canada. 2002. Metal Mining Guidance Document for Aquatic Environmental Effects Monitoring. Environment Canada, Ottawa. June 2002.

Rescan. 2006a. EKATI Diamond Mine: Tier 1 Ecological Risk Assessment for Molybdenum. Report by Rescan Environmental Services Ltd. To BHP Billiton Diamonds Inc., Yellowknife, NWT.

Rescan. 2006b. EKATI Diamond Mine: AEMP Re-Evaluation and Proposed Program for 2007-2009. Report by Rescan Environmental Services Ltd. To BHP Billiton Diamonds Inc., Yellowknife, NWT.

Rescan. 2008a. EKATI Diamond Mine: 2007 Aquatic Effects Monitoring Program. Summary Report. Appendices. Report by Rescan Environmental Services Ltd. to BHP Billiton Diamonds Inc., Yellowknife, NWT.

Rescan. 2008b. EKATI Diamond Mine: Long Lake Containment Facility Water Quality Prediction Model Version 2.0. Report by Rescan Environmental Services Ltd. to BHP Billiton Diamonds Inc., Yellowknife, NWT.

Rescan. 2008c. EKATI Diamond Mine: Watershed Adaptive Management Plan. Report by Rescan Environmental Services Ltd. to BHP Billiton Diamonds Inc., Yellowknife, NWT.