



Mackenzie Valley & Water Board
File NL3-0043
May 1 2012
Application # MV200708-0031
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Prairie & Northern
Environmental Protection Operations
Environment Canada
Room 200, 4999-98th Avenue NW
Edmonton, AB T6B 2X3

April 26, 2012

File: 7834-3-37/M50-2

Adrian Paradis
Acting Manager, Giant Mine Remediation Project
Aboriginal and Northern Development
P.O. Box 1500
Yellowknife, NT, X1A 2R3

Dear Mr. Paradis:

Subject: Metal Mining Effluent Regulations – Review of 4th Environmental Effects Monitoring (EEM) Study Design, Giant Mine, NWT

The review of the Giant Mine EEM Study Design entitled, "Giant Mine Phase 4, Environmental Effects Monitoring (EEM) Magnitude and Geographic Extent of Effects Study Design", received January 17, 2012, has been completed by the Technical Advisory Panel. Appended is a hardcopy of the compiled review comments that were sent to you electronically on April 26, 2012. These review comments should be addressed in the form of an addendum to the Study Design.

If you have any questions concerning the review of your EEM Study Design, please contact me at (780) 951-8754 or shelly.boss@ec.gc.ca.

Sincerely,

Shelly Boss
Regional EEM Coordinator

Attachment

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|-----|-------------------|--|
| cc: | Tim Morton | Environment Canada, Yellowknife |
| | Cheryl Baraniecki | Environment Canada, Edmonton |
| | Paula Siwik | Environment Canada, Edmonton |
| | Lisa Lowman | Environment Canada, Yellowknife |
| | Chris Baron | Fisheries and Oceans Canada, Winnipeg |
| | Robert Jenkins | Aboriginal and Northern Development, Yellowknife |
| | Kathleen Graham | Mackenzie Valley Land and Water Board, Yellowknife |
| | Benny Nordahn | Aboriginal Affairs and Northern Development, Yellowknife |

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**Technical Advisory Panel (TAP) review comments on “Giant Mine Phase 4 Environmental Effects Monitoring (EEM) Magnitude and Geographic Extent of Effects Study Design”,
January 2012 submission**

General Comments

1. The study design for the fourth Environmental Effects Monitoring (EEM) program at Giant Mine was well organized and clear. Additionally, the response to TAP review comments on the third interpretative report for Giant Mine (received electronically, March 1, 2012) addressed most TAP comments on the interpretative report. Any outstanding items regarding the responses are included in this study design review.
2. Effects have been confirmed in the fish population survey and Giant Mine has submitted an EEM study design which includes a description of one or more additional sampling areas within the exposure area to assess the magnitude and extent of fish effects, as required under the MMER. The executive summary (and elsewhere) also indicates that a consistent effect was detected in all three phases in the benthic invertebrate survey for the Bray-Curtis Index (BCI) endpoint. However, the TAP was of the understanding that the BCI endpoint had been interpreted as non-significant in the second EEM phase, and therefore not confirmed (please also see minutes from December 16, 2008 TAP-facility meeting).
 - The study design does not include a description of a study respecting the benthic invertebrate community. If effects have not been confirmed for the benthic invertebrate community, the upcoming field work should include a benthic invertebrate community survey, as was outlined in the TAP review comments on the facility’s most recent interpretative report.
 - If an effect has been confirmed for the benthic survey, the mine should proceed to investigate the magnitude and geographic extent and the cause(s) of the effect, as required under the MMER. If the results of the previous biological monitoring study indicate the magnitude and geographic extent of this effect, the mine can proceed directly to investigating the cause of the effect.
 - Please clarify whether an effect has or has not been confirmed for the benthic invertebrate survey, and append any associated proposed study design information. It is recommended that discussions take place with the TAP if further clarifications are needed.
3. If an effect has been confirmed for the benthic survey and the magnitude and extent was indicated in the previous study, the facility may consider gathering additional information and reviewing existing data related to possible causes of effects during this phase, along with the field assessment of magnitude and extent of confirmed fish effects. This work would contribute to the development of further investigative field and/or laboratory studies in the subsequent phase of EEM. Note that all confirmed effects should be investigated. As multiple effects may have the same cause, overall response patterns should be considered when designing the study.

Summary of Results from Previous EEM Programs

4. P. 13-16. There appear to be some errors in the descriptions of which endpoints were statistically different and in the summaries of confirmed effects. As part of the proposed reassessment of data (p. 17) the TAP recommends the following:

- The metal mining technical guidance document (MMGD 2011) should be consulted for clarification on endpoints used for determining effects for the lethal and non-lethal surveys;
- Previous results should be carefully reviewed and reported to ensure it is clear which endpoints were statistically different and which have been confirmed (i.e., statistical difference in the same endpoint in the same direction in the results of the two previous monitoring studies; significant statistical interactions are considered an effect).

Proposed Phase 4 EEM Study Design

5. P. 17. The TAP supports the proposed reassessment of fish data from previous phases. As part of the reassessment and as recommended in the most recent interpretative report review, the TAP recommends that size at age be analyzed by t-test/ANOVA within age classes to confirm site differences in growth. Similarly, where there is only one age class, such as for male and juvenile sculpin in 2006, differences in size at age can be compared as weight (or length) within the age class using t-test/ANOVA. Also, some endpoints were not analysed in the previous interpretative report due to unequal variance. It is strongly recommended that alternate analytical approaches (e.g., non-parametric tests) be considered in these cases.
6. P. 24. The TAP supports the proposed reconnaissance of the exposure area and appreciates the proponent's commitment to consulting with the TAP during site selection and decisions regarding the fish surveys.
7. P. 27. Two reference areas and two alternate reference areas are proposed in the study design. The study design states that, "additional sampling will be completed in the far-field area and alternate areas, as required" (also p. 25). Please clarify whether sampling will take place in all four reference areas, or what criteria will be used to determine whether sampling in the alternate reference areas takes place. Please clarify what objectives are to be addressed in sampling extra reference areas.
8. P. 27. The two proposed reference areas for slimy sculpin are located within the same river, in similar habitat and in reasonably close proximity. The justification for treating these as separate reference areas is not clear. The TAP recommends that the lower Yellowknife River be treated as a single reference area if adequate sample sizes cannot be obtained for each area separately, as treating them separately could result in an unnecessary reduction in the power of the statistical design to detect differences, should they exist. This was similarly recommended in the Phase 2 interpretative report review. If there are habitat differences between the two reference locations, it may be preferable to use the area which most closely matches that of the exposure area.
9. P. 28, 31. The proponent is to be commended for considering the use of multiple fishing techniques to maximize the success of the fish surveys. Note that sampling procedures should be comparable between reference and exposure areas to prevent any bias related to size selectiveness of gear.
10. P. 28, 31. The study design proposes fishing for sculpin and stickleback beginning in the near-field area. If a sufficient number of fish cannot be collected using reasonable effort, the surveys would be terminated with limited fishing in the far-field and reference areas to determine presence. Should there be inadequate numbers of fish in the near-field, the TAP strongly recommends that the facility proceed with the fish population surveys in the far-field and reference area(s). The far-field data would still provide information on the

objective of assessing geographic extent of effects, and valuable information on relative abundance of fish in the near-field versus the far-field and reference areas.

11. P. 28, 31. Please clarify the mesh size of the seine nets (p. 28) and dip nets (p. 31) to be used, and provide a general estimate of the amount of fishing effort (e.g., approximate time to be spent electrofishing, number of minnow traps, number of seining passes) to be undertaken each day.
12. P. 30. It is proposed that an electronic balance with an accuracy of 0.001 g will be used to weigh sculpin liver and gonad tissue. In the third phase of monitoring, a balance that measures to 0.0001 g was used. Please comment on whether a scale with accuracy of 0.001 g will be sufficient to achieve the level of precision recommended for liver and gonad measurements.
13. P. 30. Please expand upon how the data on liver glycogen and lipids will be used.
14. P. 32. Please specify the number of otoliths that will be removed as a subset of each size class of ninespine stickleback.
15. P. 33. In addition to the listed descriptive statistics, the calculation of the median is also required under the MMER.
16. P. 35. Please refer to the MMGD for clarification on non-lethal endpoints and effect versus supporting endpoints (pages 3-15 to 3-19 and 8-15 to 8-16).
17. P. 35. Two reference areas and two alternate reference areas are proposed in the study design (p. 27). Please clarify whether temperature loggers will be set at all reference areas.
18. P. 35. Please clarify the collection methods and device to be used for surface water samples.
19. P. 35. The study design outlines in general the water quality parameters that will be measured but does not provide a detailed list. Please clarify the water quality parameters to be measured, and indicate the corresponding method detection limits to be used.
20. P. 36. It appears as if a single sediment sub-sample per area is to be analysed. Please confirm and discuss if this will be adequate to characterize the areas.

References

Environment Canada, 2012. Metal Mining EEM Guidance Document.