



Giant Mine Environmental Assessment

IR Response

Round One: Information Request - Environment Canada #16

May 31, 2011

INFORMATION REQUEST RESPONSE

EA No: 0809-001

Information Request No: Environment Canada #16

Date Received:

February 28, 2011

Linkage to Other IRs:

Alternatives North IR #14
Review Board IR #24

Date of this Response:

May 31, 2011

Request:

Preamble:

Year-round discharge of treated effluent into Yellowknife Bay is proposed, and three potential discharge locations have been identified. The DAR states that "Further investigation of alternative diffuser locations...is still required".

Two factors that need to be included in further studies are the effects of the diffuser under varying ice thicknesses and sediment disturbance due to turbulence associated with the diffuser. Ice thickness would be a factor in reducing the dilution at trapping depth, and it did not appear that this was taken into account. With respect to the sediment disturbance, we note that two of the locations (1 and 3) are within the area that was contaminated by historic tailings, with arsenic concentrations greater than 1000 mg/kg, and Location 2 appears to be outside the submerged historic tailings.

Question:

Please outline what factors will be considered in the investigation, and how they will be weighted in the decision-making process. How will the proponent ensure that there will not be issues with varying ice thickness, and mobilization of contaminants through disturbance of existing sediments? What is the timeline for finalizing the diffuser location and design?

Reference to DAR (relevant DAR Sections):

S. 6.8.6 Outfall and Diffuser





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Reference to the EA Terms of Reference:

S.3.2.3.6

S.3.2.4.9

Summary

Effluent mixing in Yellowknife Bay will be modeled for several scenarios encompassing the characteristics of the effluent and ambient waters, and will include ice thickness as a factor reducing mixing depth. Effects of the effluent on ice thickness and bottom sediment will be addressed.

Response

Effluent mixing in Yellowknife Bay will be dependent on the characteristics of the effluent (density, chemistry, discharge velocity, volume of discharge) and ambient waters (depth, current velocity, density, chemistry). These characteristics are considered in the mixing model used for the project (CORMIX). Observed site conditions will be utilized to develop several scenarios to describe and bracket the range of possible depths and current velocities in Yellowknife Bay. The CORMIX model will be implemented for these scenarios to predict effluent dilution in the near field. Several diffuser configurations will be tested. The diffuser configuration selected for design will be one that meets the required water quality criteria within the mixing zone under all design scenarios, while minimizing the size of the mixing zone.

Other considerations for the design of the diffuser are as follows:

- Guidelines and strategies on effluent quality criteria proposed in the Water and Effluent Quality Management Policy by the Mackenzie Valley Land and Water Board (MVLWB 2011);
- A conservative ice thickness, obtained from observations in the Bay (*i.e.*, 1.5 m), will be considered for at least one of the design scenarios developed for the site to determine the performance of the diffuser under the reduced mixing depths (due to ice) during the winter;
- Preliminary thermal modelling using CORMIX will be conducted to determine the effects of the discharge on ice thickness. It is expected that the effects on ice thickness will be minimal primarily due to the low temperature of the effluent during the winter months; and
- The diffuser exit ports will be located above the bottom of the bay (1 to 1.5 m above) to minimize sediment entrainment.

A draft of the preliminary diffuser design is expected in the fall of 2011. Analyses will be conducted during the detailed design stage to confirm the optimum diffuser port geometry (*i.e.*, number of ports, diameter, port angle and height above the bottom of the bay) that meets water quality guidelines and minimizes impacts on the ice cover and bottom sediments.

Mackenzie Valley Land and Water Board (MVLWB). 2011. Water and Effluent Quality Management Policy. MVLWB, Yellowknife.