



Giant Mine Environmental Assessment

IR Response

Round One: Information Request: City of Yellowknife IR #05

May 31, 2011

INFORMATION REQUEST RESPONSE

EA No: 0809-001

Information Request No: City of Yellowknife #05

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Linkage to Other IRs:

YKDFN IR #21

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May 31, 2011

Request

Preamble

This section discusses the historical loading and sediment quality of Yellowknife Bay as well as the possible threat the arsenic contained in the sediment may pose. The last sentence, first paragraph on page 7-18 specifically states....."The arsenic in.....is considered to occur in a stable form provided.....conditions are maintained".

Question:

1. Have any studies or scenarios been generated to determine and/or predict how or what could change these conditions and what would happen if the conditions did change? Has any consideration been given how potential final uses of this area would affect the existing conditions and were any mitigating measures proposed to help ensure the current conditions continue?
2. Given the complexity and potential threat of the issue shouldn't other options including encapsulation been explored under this section or given due consideration?

Reference to DAR (relevant DAR Sections):

S.7.1.4.1 Local Study Area

Reference to the EA Terms of Reference

S.3.5.2 Fish and Aquatic Habitat

Response 1 Summary

The key factor that will determine the long-term stability of arsenic in the sediments of North Yellowknife Bay is the ongoing presence of oxidizing conditions within the water column. There are no





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circumstances under which current oxidizing conditions are likely to change in the future for those reasons provided in the answer below.

Response 1

The geochemical characteristics of the sediments in Baker Creek and Yellowknife Bay have been investigated on several occasions as discussed in Section 7.1.4 of the Developer's Assessment Report (DAR). Investigations carried out in North Yellowknife Bay (Golder 2005a) demonstrated that arsenic levels in sediments are elevated due to historic activities. However, sediment core test results and sequential extraction test data on sediment samples collected in 2005 and subsequent research (Andrade *et al.* 2010) indicated that the arsenic occurs in a stable form and will not be released into the water column as long as oxidizing conditions persist and the sediments remain submerged. Current conditions in the lake favour an "oxic layer" at the sediment water interface.

Preservation of the oxic layer in the upper horizon of the sediments in Yellowknife Bay is largely dependent on there being oxygen in the overlying water column year round. In large lakes such as Great Slave Lake situated in a northern setting, it is extremely unlikely that anoxic (oxygen deficient) conditions would develop for several reasons: i) the cold water temperatures experienced most of the year are not conducive to high rates of oxygen consumption; ii) the short summer season means the lake stratifies for only a short period of time; iii) the productivity of the lake is low hence the organic load that deposits on the sediment is low. Furthermore, in the case of Yellowknife Bay there are no significant sources of organic or nutrient input to the bay. The only real source of nutrients is sewage from the City of Yellowknife, which is treated and discharged to Great Slave Lake via a series of small lakes that flow southward and drain into south Yellowknife Bay well removed from the Giant Mine site and the area in Yellowknife Bay with elevated arsenic levels.

The discharge of treated minewater to the bay will have minimal effect on oxidizing conditions, as it contains very low levels of oxygen demanding substances. Additionally, it is not anticipated that the water level in Great Slave Lake will change substantially, even considering the long term effects of climate change.

As noted above, arsenic present in the sediments of Yellowknife Bay is anticipated to remain in a stable form as long as oxidizing conditions persist. The same conclusion applies to any future projects that result in the introduction of oxygen demanding matter (e.g., a fish processing plant), primarily because the magnitude of such changes would be insufficient to affect the overall oxidizing condition of North Yellowknife Bay.

In summary, there are no circumstances under which potential future uses of Yellowknife Bay would affect the current stability of arsenic in sediments. Furthermore, the Remediation Project is anticipated to result in indirect positive effects on the sediments of Great Slave Lake. Specifically, as shown in Table 8.4.3 of the DAR, a variety of measures will achieve a marked decrease in arsenic loadings to Yellowknife Bay relative to current conditions. Over time, the decrease in loading is anticipated to result in a gradual reduction of arsenic concentrations in surface sediments.

Notwithstanding the above conclusion, it is important to note that future projects (projects meaning those will require their own regulatory review, not recreational uses) will undergo an appropriate level of EA as part of regulatory approval processes. Depending on the nature of any interactions with the environment, those assessments will include an evaluation of sediment effects. It is reasonable to





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expect that mitigation requirements would also be put in place to ensure that the future projects do not cause significant residual effects.

Response 2 Summary

Activities to directly remediate sediments beyond the Site Study Area are not within the scope of the Remediation Project. However, the effects of historic activities on arsenic levels in Great Slave Lake sediments have been evaluated through field studies and the Human Health and Ecological Risk Assessment.

Response 2

The Site Study Area (SSA) represents the limits of the area in which historic contamination will be addressed by the Remediation Project. Therefore, consideration has not been given to actively remediating sediments within Great Slave Lake. Nonetheless, the effects of historic activities on arsenic levels in all environmental media throughout the SSA and Yellowknife Bay (which is in the Local Study Area (LSA)) were taken into consideration in assessing risks of exposure to both people and animals in all facets of the remediation investigations.

With regard to potential effects on the aquatic environment that might be associated with sediments in Yellowknife Bay, field studies have shown that the diversity and abundance of benthic communities has been impaired in some areas. However, data gathered on fish species has not shown an adverse effect on fish health or arsenic levels in fish tissue. Similarly, Human Health and Ecological Risk Assessments have determined that sediments in Great Slave Lake do not pose an unacceptable risk and that remediation of lake sediments is not warranted (as per Section 8.9 of the DAR and Supporting Document N1 in Appendix B of the DAR).

