



Giant Mine Environmental Assessment

IR Response Template

Round One: Information Request - Review Board IR #09

May 31, 2011

INFORMATION REQUEST RESPONSE

EA No: 0809-001

Information Request No: Review Board #09

Date Received:

February 14, 2011

Linkage to Other IRs

Review Board IR #12, 13
Alternatives North IR #20
City of Yellowknife IR #2.3

Date of this Response

May 31, 2011

Request

Preamble:

The stability of containment structures is important to evaluating and managing long-term risks. The DAR does not present an assessment for the long-term (in perpetuity) stability and potential remediation measures that may be required. The risk assessment (DAR s10) does not describe likelihood or severity of failures. The temporal scope defines the activities assessed, not the duration of effects of the project to be considered. The Board assesses what happens because of development activities occurring within that time, not only the effects that happen during that time. Long-term stability of the tailings dam(s) and tailings cover are important aspects of the project.

Question:

1. Please provide an assessment of the long-term performance of the tailings dam, and provide a risk assessment that includes any scenarios under which the tailings dams, tailings cover or both could fail, including a description of the likelihood and severity of failures over the long-term.
2. Please describe whether monitoring of chemical uptake by plants on the tailings cover will extend to include establishment of climax species that will dominate over the long-term, and describe what the Project Team will do if arsenic uptake is observed

Reference to DAR (relevant DAR Sections)

DAR, s. 5.5 Tailings and Sludge Containment Areas, p. 5-41 – 5-47

DAR Table 10.4.1 p10-11 Erosion of tailings cover or perimeter dams release tailings to surface water





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Recent assessments of the tailings dam completed in 2004 showed no immediate safety concerns. “The detailed review identified no immediate safety concerns, but made recommendations to assess dam performance in more detail, and improve operating, maintenance and surveillance procedures.” (DAR, p.5-42)

“To prevent or mitigate reduced cover performance or deterioration (of tailings perimeter dams and tailings cover), the Project Team will require that covers and dams are monitored and maintained within the temporal scope as defined by regulatory authorizations”. (Table 10.4.1 p10-11)

“To prevent or mitigate vegetation penetrating the tailings cover, the Project Team will monitor the revegetation of the tailings and sludge areas, including the chemical uptake of the plants during the temporal scope as defined by the Review Board. (Table 10.4.1 p10-11)

Reference to the EA Terms of Reference

ToR 2.3 Temporal Scope

“(T)he Review Board has set a limit on the duration of **activities** that it can meaningfully assess... For the purposes of this EA, **the development activities** are those occurring within 25 years and extending to any further time required to stabilize the site. This assessment will not consider the **impacts of activities** occurring after that period”. (*emphasis added*)

ToR s. 3.2.4 Development Description, Point 8 “A detailed description of the proposed method(s) and location(s) of tailings disposal and/or containment, including a description of any technologies or materials that may be used, and any temporary or permanent measures to control fugitive dust from tailings disposal areas.”

Response 1 Summary

A 2004 Dam Safety Reviews and subsequent updates classified the dams at Giant Mine and demonstrated their compliance with stability criteria recommended by the Canadian Dam Association.

A risk evaluation or assessment identified a low risk of a failure for the tailings dams on site in the long term / post closure. The risk of a failure of the tailings covers is also low. Further examination of the likelihood and consequences of tailings dam and tailings cover failures are provided in the response to the Review Board’s Information Request #12.

Response 1

All dams at Giant Mine were subjected to a Dam Safety Review in 2004. Dam Safety Reviews are formal processes carried out according to the Canadian Dam Association *Dam Safety Guidelines* (CDA 1999). One of the results of that work was an interim classification of the dams based on the possible consequences of failure.





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- Dams 1, 2 and the B2 Pit Dam were classified as “High” consequence, on the basis that their failure could result in the loss of tailings and fluid into the underground mine and possibly cause fatalities of people working underground.
- Dams 3, 11, 21 and 22 were classified as “Low” consequence. (BGC 2004)

The remaining dams did not fall into the CDA classification system.

- For Dams 8, 9, 10 and 12 the review concluded their basins “are now filled with solids not prone to fluidization under static or earthquake conditions” and they “therefore do not fall under the CDA classification of dams”.
- Dams 3C, 3D, 7, 4, 5, and 6 are “minor water retaining dykes with limited storage used for water and seepage management and not subject to substantial flood flows” and “would not release water or fluidized tailings to the environment if they failed”. (BGC 200)

The *Dam Safety Guidelines* were updated in 2007 (CDA 2007). The revised *Guidelines* included a classification based on environmental damages, under which Dams 3, 11, 21 and 22 could also be classified as “High” consequence on the grounds that their failure could result in damage to significant loss or deterioration of important fish or wildlife habitat.

The revised *Guidelines* also recommended that “High” consequence dams be assessed for stability under “Earthquake Design Ground Motions” equivalent to a 1:2500 year earthquake. Such an evaluation was carried out in 2008 and found that the dams would be stable under the 1:2500 earthquakes recommended by the Canadian Building Code (SRK 2008, Amini & Naesgarrrd 2008).

A risk evaluation or assessment identified a low risk of a failure for the tailings dams on site in the long term / post closure. Thus, as the likelihood of a failure is low, the consequence is also low. The evaluation is based on the closure plans for the tailings management facilities (TMF) which proposes that all of the TMF areas at the mine will be drained. The tailings dams would then act as solid earth embankments that retain dry or drained tailings and the risk of a dam failure and release of tailings in this condition is low.

The risk of a failure of the tailings covers is also low. The final covers would be monitored for several years after the covers are completed during a monitoring phase (part of closure period) and before the post closure (long term) period would start. Thus, before the post closure period starts, settlement under the covers would have occurred and been corrected. The drainage channels would have been monitored for several years and any sites needing added material (ditch protection) would be up graded.

Further examination of the likelihood and consequences of tailings dam and tailings cover failures are provided in the response to the Review Board’s information request #12.

References

BGC Engineering Inc., *Giant Mine: 2004 Dam/Dyke Safety Review*, February 2005.



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Canadian Dam Association (CDA) *Dam Safety Guidelines* (1999).

Canadian Dam Association (CDA) *Dam Safety Guidelines* (2007).

National Research Council of Canada, *National Building Code of Canada 2005*, Ottawa.

SRK Consulting Inc., *Giant Mine Remediation Plan: 2008 Seismic Studies Related to Tailings Dam Safety – FINAL*, Report Prepared for Giant Mine Remediation Project, Department of Indian Affairs and Northern Development, August 2008.

Amini, A., Naesgaard, E., *Giant Mine: Dam/Dyke Site Response and Liquefaction Triggering Assessment*, Report prepared for SRK, March 2008. Giant Mine Remediation Plan: 2008 Seismic Studies Related to Tailings Dam Safety - FINAL Appendix C.

Response 2 Summary

The re-vegetation strategy for covers, as presented in the Developer's Assessment Report (DAR), is conceptual in nature and will be refined through future field studies, consultation and detailed engineering design. This process will include the development of a comprehensive monitoring strategy that is capable of detecting chemical uptake in vegetation species that will dominate over the long term. The approach to addressing the potential for uptake is necessarily one of risk-based adaptive management; selecting pre-defined action levels and actions is not appropriate due the wide variety of variables that could influence ecological exposures. Under this approach, all monitoring data will be evaluated as part of the State of Environment reviews to determine if uptake is occurring and to ascertain associated risks. Depending on the severity of any identified risks, consideration will be given to implementing additional remedial and/or risk management measures.

Response 2

As indicated in Table 2.7.1 of the DAR, the re-vegetation strategy for the site will be determined during the development of detailed designs for the tailings covers and other areas. The decision-making process will include the implementation of additional community consultations (particularly with Aboriginal groups) to determine preferred approaches to re-vegetation, including long-term monitoring and adaptive management.

Studies to select vegetation species and define seeding, planting and fertilization requirements are still needed and are part of ongoing work on the site. A detailed plan for additional re-vegetation studies is being developed. It is envisioned that a mix of non-invasive agronomic and native species will be used but this is subject to change as additional consultations and assessments are conducted.

Regardless of the re-vegetation strategy that is selected, it will be based on an adaptive management approach and will include provisions to report to regulators and potentially affected communities. The process will be guided by the approaches described in the following sections of the DAR: Chapter 13 (Communication and Consultation) Chapter 14 (Monitoring and Evaluation)





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As indicated in Table 10.4.1 of the DAR, to prevent or mitigate vegetation penetrating the tailings cover, the Project Team will monitor the re-vegetation of the tailings and sludge areas. This will include monitoring for chemical uptake in plants.

A key element of the monitoring approach will be to assess uptake of arsenic in species that are culturally important to local residents. Specifically, as stated in Section 13.2.1, there will be long-term monitoring of terrestrial vegetation which will include sampling of vegetation established on the covers. Monitoring is anticipated to focus on plant species such as medicinal plants with cultural significance (e.g., Labrador tea), berries and forage species. There will be opportunistic sampling of edible berries and sampling of plant species such as birch and willow which are known to accumulate inorganic contaminants from contaminated soils in terminal leaves and twigs, and may serve as exposure pathways to browsing wildlife.

As specified in Section 14.1.2, vegetation monitoring will be directed through a specific Environmental Management Plan (EMP). It is currently envisaged that monitoring will commence once successful re-vegetation is reported in remediated areas (tailings areas and contaminated soils areas). Follow-up monitoring would subsequently occur annually for five years or until vegetation is fully established.

With regard to what will be done if arsenic uptake in vegetation is observed, it is not possible to state definitively what actions will be taken. First, criteria for arsenic concentrations in terrestrial vegetation have not been proposed as effects concentrations are species-specific and assessment of the health of biota is most effectively accomplished through field investigations. Second, the approach to addressing the potential for uptake is necessarily one of risk-based adaptive management; selecting pre-defined action levels and actions is not appropriate due the wide variety of variables that could influence ecological exposures. Under this approach, all data will be evaluated as part of the State of Environment (SOE) reviews to determine if uptake is occurring and to ascertain associated risks. Depending on the severity of any identified risks, consideration will be given to implementing additional remedial and/or risk management measures.

