**INFORMATION REQUEST RESPONSE**

**EA No: 0809-001** **Information Request No: Review Board #20**

**Date Received: February 9, 2011**

**Linkage to Other IRs**

Review Board IR #3
Review Board IR #12

**Date of this Response:**

May 31, 2011

**Request**

***Preamble:***
This project is proposed for perpetuity, but is not engineered for perpetuity. For example, important components such as the Baker Creek channel wall above the pits are only expected to withstand up to a one in 370 year flood event. Although infrequent, a major earthquake can be reasonably foreseen over the long term. A project intended for perpetuity must be engineered to withstand infrequent high consequence events.

Long-term impacts of climate trends on temperature and precipitation have not been considered beyond the initial 25 years. The temporal scope of 25 years 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. Stability of the project considering long-term climate projections is an important aspect of the project.

***Question:***
1. Please describe how INAC can model long term climate change (including changes in temperature and precipitation, and systemic effects on groundwater), and for how long INAC can reasonably guarantee that the system and its components work.
2. Please provide scenarios and describe the implications in terms of 1) effectiveness of passive freezing over the long term and 2) water management, with management options, funding implications and related risks.
3. Please describe the limits of project systems with respect to increased precipitation extremes. For example, suppose the pumping or water treatment systems fail during an extreme precipitation event, and that the same event causes increased surface water volume, increased groundwater and a channel wall failure above the C1 pit causing the creek to enter the pit. How long would it take for the water storage pond, underground water storage and pits to fill before contaminated water is released to the surrounding environment?

4. Please explain why INAC expects the project to last for perpetuity when it appears to be designed to shorter term tolerances.

**Reference to DAR:**

DAR s.6.9.1 Key Concerns
DAR s.9.2.2. Evaluation of Potential Effects of the Environment on the Project

In the event of a storm greater than 1 in 500 year event, channel wall failure alongside A2, B1 or C1 pits would likely cause Baker Creek to flow into a pit, causing uncontrolled flooding of the mine (p6-75). 1 in 370 year event would overtop A2 pit (p9-6). Ice and debris jamming could make this worse. The predicted high winter temperature increase is 4.8°C (p9-5) and the predicted general precipitation increase is a maximum 13% (p9-6) for the25 year period of initial development activity. Groundwater flow rates may increase as freezing shuts off other areas (p6-32).

DAR s.7.2.2.7
"Understanding of seismicity in the stable shield or core regions of continents has led to revised seismic values… This increased understanding has led to the assumption that a large earthquake could occur anywhere in the Canadian Shield, albeit rarely. The probabilistic hazard values correspond to a… 2% probability of exceedence in 50 years".

DAR s. 9.2.2.2
Temporal scope of climate change considered predicted climate changes over 25 years "for the 2050s period (2041-2070)".

**Reference to the EA Terms of Reference**

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".

3.1.2 Assessing the Impacts of the Environment on the Development
"Consideration should be given to the impact of the environment, such as the impact of extreme weather events or climate change, on the development in each of the sections of 3.2, where applicable.

3.3 (10) An account of how climate change predictions and observations affect the risk level in the long-term based on "best estimate" and "high estimate" scenarios, including discussion of risks in light of the current climate predictions as set out in the Fourth Assessment Report of the Intergovernmental Panel on Climate Change

**Summary**

Long term climate change, passive freezing, and water management risks are discussed in other responses.

Some of the items proposed in the Giant Mine Remediation Plan (Remediation Plan) will require monitoring, inspections, maintenance, repair and even complete replacement. But INAC is committed to meeting those requirements. That commitment means that the project as a whole is designed for the long term.

**Response 1**
The Giant Mine Remediation Project (Remediation Project) has not attempted to model long-term climate change in general. In assessing the viability of maintaining the frozen blocks with passive freezing, the effects of climate change were considered by adopting the long-term temperatures predicted by the Intergovernmental Panel on Climate Change. Further details can be found in the response to the Review Board's Information Request #3.

The Remediation Plan as a whole attempts to maximize the use of methods and materials that require a minimum of long-term maintenance. Certainly, there will be components that do require maintenance and even complete replacement. The water treatment system, for example, will include pumps that require routine maintenance and periodic re-build or replacement. But larger components, such as the frozen blocks and the tailings covers, are intended to require very little maintenance. Nonetheless, even those components are expected to be monitored and inspected, and maintenance will be undertaken as needed. The cost estimate for long-term operation of the frozen block system, for example, includes an allowance for occasional replacement of thermosyphons.

**Response 2**
The long-term effectiveness of the passive freezing system was discussed at length in the Developer's Assessment Report (DAR) Sections 6.2.7 and 6.2.8. The response to the Review Board's information request #3 provides further discussion.

Risks associated with long-term water management are discussed in the response to the Review Board's Information Request #12.

**Response 3**
During normal operations, the water management system will not be sensitive to changes in precipitation. The large volume of storage available in the underground mine will provide a buffer against fluctuations in normal inflows.

Extreme floods do pose a risk to the water management system if they lead to water levels high enough to overtop the banks of Baker Creek and then flood the underground mine. The remediation plan for Baker Creek recognizes that risk, and in fact minimizing the risk of bank overtopping is the primary objective of the plan. The risks associated with flooding the mine are discussed in the response to the Review Board's Information Request #12.

**Response 4**

Long-term stability of the Giant Mine site has been a central objective of the remediation planning since day one. Some of the items proposed in the Remediation Plan certainly will require monitoring, inspections, maintenance, repair and in some cases even complete replacement in order to continue functioning over the very long term. But INAC is committed to meeting those requirements. That commitment means that the project as a whole is designed for the long term.

There appears to be some confusion about the significance of the design return periods that are selected and used in the engineering design process. In general, design return periods are selected to (a) reduce risks to acceptable levels (b) provide a reasonable balance between initial construction cost and future repair costs, and (c) be consistent with other design objectives. For example, if every swale or channel over the tailings cover were designed only for the flow rates that occurs every two years, the cover would be at least lightly damaged every two years (on average). Furthermore, the swales, channels and cover would probably suffer very significant damage in larger floods, such as might occur once every ten years. The frequent light damage and periodic significant damage would expose tailings, probably leading to an increased risk of arsenic dispersion and surface water contamination, and certainly leading to very high maintenance costs. On the other hand, designing every swale and channel to survive a 1000-year flood would result in armored channels that would not fit into the landscape, and significantly increased construction costs. In all likelihood, of course, the tailings cover swales and channels will be designed for something between the 2-year flood and the 1000-year flood. The key point for the current discussion is that the selection of design return periods for each item would be based on a careful balancing of risk, maintenance costs, construction costs and other design objectives (such as fitting in with the surrounding landscape).

The choice of design return period emphatically does not mean that ditches or swales will be irreversibly destroyed after *X* years. There will be requirements for inspection, maintenance and repair after events exceeding the design. As noted above, it is the Project Team's commitment to meeting those requirements that really ensures the long term performance of the project.