February 8, 2018

Dr. Kathleen Racher
Chair
Giant Mine Oversight Board
Box 1602, 5015 - 50th Avenue
YELLOWKNIFE NT X1A 2P2

Dear Dr. Racher:

In the meeting between the Giant Mine Oversight Board (GMOB) and the Giant Mine Remediation Project (GMRP) team held last November 16, 2017, one of the discussion items was related to the Board's review of records of discussion and memorandum from the Independent Peer Review Panel (IPRP) supporting the Giant Mine Project. Specifically, the Project team was asked why it had not acted on the IPRP's recommendation to implement the freeze program as soon as possible, and to provide backup documentation that described the decision making process related to the freeze implementation. This letter is intended to respond to that request.

In reviewing the relevant project documentation, which has been organized into the attached chronology, and speaking with Project team members, our supporting consultants, and the IPRP members, our position is that we are in fact acting on the IPRP's recommendation that "the Freeze Program be installed as expeditiously as possible" *(IPRP Technical Memorandum, March 24, 2015)*. It is important to understand that the recommendations coming from the IPRP do not necessarily take into account all project constraints. The IPRP has regularly acknowledged an understanding of the additional constraints the Project faces as a result of regulatory requirements, funding limitations, and other competing priorities at the site, and so "expeditiously as possible" must be read from this perspective.

Based on the logical progression of work that has taken place since the freeze approach was endorsed by the Report of Environmental Assessment, the Project is confident that the implementation of the freeze program is progressing as efficiently as possible. The complexity of designing a system that will involve the construction, installation, and operation of potentially over 600 thermosyphons is, however, significant. There are numerous design parameters that have to be tested, evaluated, and decided on before the detailed engineering design can be finalized and physical infrastructure installed. This process is being continually managed by a dedicated group within the Project team, with an appropriate level of technical review and expert oversight, and is closely aligned with the process to obtain our regulatory authorization to proceed. The Water License and Land Use Permit applications require sufficiently detailed information that is still being compiled and incorporated into the freeze design.

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As can be seen from the attached chronology, the team has spent considerable time and effort developing the best possible solution for mitigating the risk posed by the arsenic trioxide dust at site, following a sound and structured step-by-step methodology to ensure the best possible outcome. The Project team would be happy to discuss the design process or the attached chronology in further detail should the Board have any questions or need clarification. Please do not hesitate to contact the undersigned at 819-997-0660 or craig.wells@canada.ca, or Natalie Plato at 867-669-2838 or Natalie.plato@canada.ca.

Sincerely,

Craig Wells
Director
Giant Mine Remediation Project
Indigenous and Northern Affairs Canada

c.c.: Ms. Lisa Dyer, Director, Environment Division, Government of Northwest Territories
Natalie Plato, Deputy Director, Giant Mine, Northern Contaminated Sites Branch, Northern Affairs Organization, INAC

Giant Mine Remediation Project – Freeze Program Chronology

March 2003 – Frozen Block Method

The Frozen Block method was endorsed by the Independent Peer Review Panel (IPRP) and subsequently included in the Developer Assessment Report (DAR) as part of the remediation plan submitted to the Mackenzie Valley Land and Water Board for Approval.

2011 – 2015 Freeze Optimization Study

The Freeze Optimization Study (FOS) was commissioned to demonstrate that ground freezing was achievable at the Giant Mine site, and to collect site specific information to optimize full-scale design including material properties, operating efficiencies, as well as construction and operating costs. The study also looked at the calibration of the thermal models in order to better predict performance of the full scale design. Essentially, as part of any sound design process, the FOS was required to support the next steps in the engineering design work, test implementation methods and performance, and to provide input into the project assessments.

The FOS collected data for over four years, which included the monitoring of ground temperature at over 450 different locations.

The results of the study are as follows:

- Confirmed that the ground froze faster than expected
- Confirmed that both active freezing and hybrid freezing systems work well
- Verified performance of the passive thermosyphons
- Provided a good data set for further engineering analyses and design optimization
- Developed calibrated thermal models that are important for predicting the long term performance

The results of the FOS also identified several potential design improvements from questions raised such as:

- “Do we really need to wet the dust?”
- “Can we freeze the dust from the surface only?”
- “Can we freeze the dust using thermosyphons only?”

2013-2014 Trade-off Studies

The results of the information collected during the initial FOS study lead the Project to work on a series of trade-off studies designed to answer the questions noted above, which were also informed by the Environmental Assessment process. These studies looked at the following:

- Wet vs Dry frozen blocks
- Freezing from surface & underground vs. surface only
- Freezing rate
- Methods of active to passive conversion
- Active vs. hybrid vs. passive
- Surface amendments/treatments

As a result of these trade-off studies, it was concluded that the following design attributes would give the Project the best results in containing the dust through the frozen block method:

- dry frozen blocks;
- freezing only required from the surface;
- the larger chambers and stopes could initially be actively frozen and then shift to passive freezing; and
- smaller chambers could be frozen using a passive approach from the outset.

August 14th, 2014 – Decision on the Report of EA that officially endorsed the Frozen Block method for freezing the arsenic chambers

The Review Board concluded that the Developer's design for creating the frozen shell or blocks appears to be sound for the 100 year maximum lifespan of the Project. The Review Board also noted that the FOS had proven a valuable tool for helping to understand and calibrate the functioning of the proposed freeze system. In combination with the additional measures required by the Review Board, this method is likely suitable for the 100 year maximum Project lifespan.

Note: The GMRP considers this date as the official start of implementation of the freeze program.

March 2015 – IPRP Meeting

IPRP recommends that "the Freeze Program be installed as expeditiously as possible".

Feb 2015 –March 2016 Conceptual Design of Freeze Systems (Design Basis Report)

The conceptual design of the freeze systems built on previous work by continuing to develop the design basis report that looked into several details including:

- temperature containment criteria;
- final decisions on passive versus active systems for each area;
- scheduling for implementation;
- long-term monitoring considerations; and
- modeling of the thermal boundaries of the frozen blocks for each stope/chamber.

April 2016 – IPRP Meeting

The IPRP concluded that the Design Basis Report met the intended objectives, the necessary studies of freezing scenarios was completed, and supported proceeding with detailed design. The Freeze Program evaluations and trade-off studies described in the Design Basis Report were determined to have been done adequately and the results achieved deemed appropriate.

April 2016-May 2017

A Freeze Design Gap Analysis report was completed to identify work that was needed to transition from a conceptual design into a detailed design. For example, the review identified a need to update the 2-D thermal modeling of the stopes/chambers as a 3-D model in order to identify all the parameters required for the final design.

June-December 2017

The 3-D modeling was completed and endorsed by the IPRP in the fall of 2017, to advance the detailed design.

September 2017-Present

The Project team engaged AECOM to begin the detailed design of freeze zones in fall 2017, and it is anticipated that detailed design will completed by the Spring of 2019. The Project may be in a position to start drill pad construction and site layout during the summer of 2019. Although not necessarily dependant on the overall Water License, the team anticipates that the Water License will be issued early in 2020, and the drilling and installation of thermosyphons could begin shortly after that.