**INFORMATION REQUEST RESPONSE**

**EA No: 0809-001** **Information Request No: CityYK #02**

**Date Received:**

February 28, 2011

**Linkage to Other IRs**

YKDFN IR#4
Environment Canada #02
Alternatives North #02, 20
Review Board #9.2

**Date of this Response:**

May 31, 2011

**Request**

***Preamble:*** The proposed conceptual tailings coverings suggest up to several hundred centimeters of cover potentially with geotextile fabric between tailings and coarse protective layer. The report indicates final design will be based on a cost-benefit analysis. Given the future public use of the site as passive and active recreation, the City has previously requested a sufficient coverage to ensure public health and safety. This was a key issue during the Con Mine Abandonment and Restoration Process and it was determined that Con Miramar (Newmont Mining) will provided specific cover over the tailings ponds. Given the plans to re-establish the tailings as recreation areas, the City is concerned that what is being considered may be insufficient to properly mitigate health and safety risks

***Question:***

1. Please review the design of the Con Mine site and elaborate on the rationale for the depth proposed at Giant Mine site. What factors are considered in the cost-benefit analysis to propose lesser depths then what has been proposed for Con Mine?

2. Please explain what factors should be considered in determining the proper coverings depth and what risks there are of contaminants being exposed based on insufficient coverings.

3. What are the health and safety risks to the public associated with insufficient covering depths or exclusion of geotextile fabric between the contaminants and the coverings?

4. How will the Project Team ensure that the vegetation which is planted will become established? What monitoring program will be in place to ensure the plant material is sustained and will

survive? If plant material dies in first several years will the Project Team provide an assurance that additional material will be planted until all is well-established?

**Reference to DAR:**

DAR s.6.6.6 Tailings Covers
DAR, Table 14.2.1
DAR, Table 15.3.1

**Reference to the EA Terms of Reference**

ToR s. 3.2.4 (8) Development Description

**Summary**

Cover design is site specific.

The depth of each cover layer will be based on their functions. The requirement to support vegetation is expected to be the primary factor in determining the depth of the upper layer. The design of the lower layer is expected to come down to a choice between using run-of-quarry material with a wide range of sizes and using material that has been crushed or sorted to produce more uniform smaller size, with depth requirement arising directly from that decision.

Exposure of tailings is not expected to lead to broad human health and safety risks, but localized exposure could compromise some uses.

Where revegetation is implemented the Giant Mine Remediation Project will establish a monitoring program to assess the success of the reclamation activities on the mine site. Initially, the Project Team will develop a Revegetation Management Plan, as committed in DAR Table 15.3.1. The success of the revegetation objectives will be reported in the Status of the Environment Report (SOE). If any unanticipated impacts exist they will be addressed or, if required, the revegetation design will be changed.

**Response – Question 1**

Some of the design considerations that vary between Con Mine and Giant Mine tailings include:

- The tailings surface areas involved;
- The availability of cover materials;
- Tailings conditions (grain size, salinity, moisture content);
- Proximity to residential areas; and
- Proximity to surface drainage.

These differences would be expected to lead to very different cover designs for the two sites. The Giant Mine covers are designed to meet the objectives to reduce windblown tailings and to isolate tailings from the environment. The cost-benefit analysis will take into account the differences between the two sites and the site specific objectives

It is widely agreed by experts in the field (SRK, 2009) that soil covers need to be designed on a site specific basis, and therefore that there is little value in detailed comparison of cover designs adopted at different sites.

**Response – Question 2**

Section 6.6.6 of the DAR explains the two-layer cover concept proposed for the Giant Mine. The upper layer will act as a clean surface for runoff, support vegetation, reduce infiltration, and support future uses of the area. The bottom layer will act as a robust physical barrier to prevent human or animal contact with tailings in the event that the overlying layer is damaged, minimize upwards wicking of arsenic from the tailings, and restrict the penetration of roots into the tailings.

The depths of each layer will be determined through further design, and may vary across the site.

Of the four functions for the upper layer, the one that is expected to be the most influential in the selection of depth will be the need to support vegetation. Support of vegetation is likely to require a minimum of 30 cm of soil, and more where a natural vegetation succession is the long-term objective. The thickness of the upper layer could vary within that range depending on differences in vegetation type and needs for final grading of the surface. Varying the upper layer depth across the site would also promote vegetation variability over the longer term.

The other functions of the upper layer could in theory be accomplished by thinner depths but their long-term performance will also be tied to vegetation success:

- Providing a surface for clean runoff could be accomplished by an upper layer as thin as practical construction methods would allow (about 15 cm). But long-term performance of that function will require that the soil be protected from erosion, and that will largely be accomplished by the vegetation.
- Reduction of infiltration could also be accomplished by even thin depths of surface layer needed to facilitate surface runoff, as long as there is sufficient vegetation to inhibit erosion. Storage of infiltrating water and subsequent evapotranspiration will also reduce infiltration. The thickness of soil needed to support evapotranspiration depends on the vegetation rooting depth.
- Future uses of the area will also be tied to vegetation. For example, areas designated for recreational walking or skiing would probably need an upper layer thick enough to support native vegetation.

The three functions of the bottom layer could be accomplished by even the minimum practical construction depth. The selection of a design depth in this case is expected to be driven primarily by material availability, construction difficulty, and the associated costs. As discussed in Section 6.6.6 of the DAR, depths ranging from 15 cm to 100 cm are under consideration. The decision will come down to a choice between using run-of-quarry material with a wide range of sizes and using material that has been crushed or sorted to produce more uniform smaller sizes. The run-of-mine material would be less expensive to produce but would need to be placed in lifts that are deeper than the maximum boulder size. The processed material would be more expensive to produce but could be placed in much thinner lifts.

All of the layer depths that are under consideration are sufficient to minimize the risk of the tailings becoming completely exposed. The most aggressive form of erosion that is considered possible on the bulk of the tailings surface is damage from all-terrain vehicles. The use of rock in the lower layer of the cover is intended to prevent even that level of damage from penetrating through to the tailings. The risk of long-term erosion by surface runoff will be managed through the design and long-term maintenance of the water management swales and channels.

**Response – Question 3**

In the event that tailings were to become exposed, public health and safety risks could arise from direct exposure to arsenic in the tailings and from exposure to arsenic-contaminated runoff. Given the large area of covered tailings and the likelihood that tailings exposure would be localized, the public health and safety risks are not expected to be broadly significant.

But some conceivable uses of the area would certainly be compromised. An example from another site is illustrative. Areas of arsenic-containing tailings within the small town of Wells, BC, were covered and converted into a baseball park. However, the cover was either too thin or not sufficient in areal extent, and arsenic containing tailings have become exposed. A recent human health risk assessment predicted some level of risk to frequent recreational users of the park (SNC-L 2011).

The decision of whether to use geotextile fabric will be based on assessment of the physical interaction between the tailings and the lower cover layer. Fine-grained materials such as tailings can be transported upwards into coarser materials by water pressure and/or frost action. These effects will need to be assessed to determine which combinations of tailings properties, coarse layer properties and locations on the Giant Mine tailings could be at risk. An economic trade-off would then be assessed to determine whether to use geotextile or a coarse material with different properties.

**Response – Question 4**

Where revegetation is implemented the Giant Mine Remediation Project will establish a monitoring program to assess the success of the reclamation activities on the mine site. Initially, the Project Team

will develop a Revegetation Management Plan, as committed in DAR Table 15.3.1, which includes studies to select species and define seeding, planting and fertilization requirements. Public consultation will also inform the Revegetation Management Plan

The results of the revegetation monitoring program will be incorporated into an annual report to the Mackenzie Valley Land and Water Board. The annual report will document the status of reclamation efforts on tailings covers and other mine site components. The objectives of the monitoring programs will be to evaluate the success of reclamation over time and to adjust or modify these measures where necessary to ensure the following:

- erosion control and slope stability;
- revegetation and sustainability of disturbed areas;
- site-specific reclamation measures;
- optimum species performance;
- noxious and restricted weed control; and
- re-establishment of habitat.

The success of the revegetation objectives will be reported in the SOE. The SOE is intended to verify Project impact predictions, determine the effectiveness of the mitigation measures and identify any unanticipated impacts that may arise from the Remediation Project. Further information on the SOE can be found in response to Alternatives North Information Request #20. If any unanticipated impacts exist they will be addressed or, if required, the revegetation design will be changed based on feedback from the Project Team's adaptive management program.

***References**:*

*SRK Consulting Inc. 2009. Mine Waste Covers in Cold Regions. Report for Mine Environment Neutral Drainage Program (MEND), February 2009.*

*SNC Lavalin Environment 2011. Progress Update on Wells Tailings Site Investigation and Risk Assessment. Memorandum to District of Wells from SNC Lavalin Environment Division, February 28, 2011.*