



Giant Mine Environmental Assessment

IR Response

Round One: Information Request - Yellowknives Dene First Nation #10

June 17, 2011

INFORMATION REQUEST RESPONSE

EA No: 0809-001

Information Request No: YKDFN #10

Date Received

February 28, 2011

Linkage to Other IRs

Alternatives North IR #14 (Question 1)

Date of this Draft

June 17, 2011

Request

Preamble:

The storage of contaminated water in the underground working was outlined as the preferred option. The storage of contaminated water as a management option will require the flooding of the undermine workings. *Section 6.8.3 Underground Water Ground Management* indicates that during the freezing process the mine will be flooded to a safe distance below the bottom of the lowest arsenic stope. Once the freezing system is deemed to be complete it is planned that the mine will be flooded further, to a maximum level just below the bottom of the lowest pit. It should be noted that if the initial freezing of the arsenic dust does not perform as indicated, the volume of contaminated water required for storage could exceed the allowable storage capacity of the underground workings. No contingency measures are outlined for the storage of contaminated water if the freezing system does not perform as planned and the anticipated storage capacity of the underground system is exceeded.

It was indicated that flooding of the mine workings is expected to generate poor quality water due to the release of arsenic from underground materials including tailings, waste rock, backfill contained in the mined out stopes and the mine wall rocks. It was indicated that the minewater treatment system will be designed to accommodate the short duration of higher concentration that are anticipated to occur after the mine has been flooded. It should be noted that it is unclear in the DAR if the minewater treatment system that is being referenced is the existing water treatment system or the proposed water treatment system. It was indicated in the DAR that minewater quality will continued to be monitored; however no performance guidelines are provided about the expected minewater quality for the existing water treatment system and the anticipated new water treatment system. No contingency plans are outlined for the treatment of contaminated water if the minewater quality is measured to be higher than the intended design criteria of the existing or proposed water treatment system.





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Question:

1. It is recommended that a contingency plan is outlined for the storage of contaminated water if the initial freezing of arsenic dust does not perform as designed and the storage capacity of the underground works is exceeded.
2. It is requested that performance criteria for minewater quality are established for water treatment of the existing and proposed water treatment system. It is requested that contingency actions are detailed for the condition of minewater quality being in exceedance of the performance criteria.

Reference to DAR (relevant DAR Sections)

s. 6.8.3 Underground Water Management

CLARIFICATION TO QUESTION #1

It is unclear in the DAR what type of mine water treatment system (existing or new proposed system) will be in place during the various planned stages of reflooding the underground mine workings. It is requested that clarification be provided on what type of mine water treatment system will be operational during the planned stages of reflooding the underground mine workings.

CLARIFICATION TO QUESTION #2

As stated the reflooding of the mine workings is expected to generate poor water quality, specifically with arsenic. It was stated in the DAR that water treatment system will be designed to accommodate the short duration of higher contamination that will occur during the reflooding of the underground mine workings. YKDFN notes that the reflooding of the mine could result in arsenic loadings that exceed the capabilities of the water treatment system that is in place at that time. Exceedance of the water treatment system capabilities will most likely result in poor effluent water arsenic quality and failure to meet designated discharge criteria. The DAR states that as a contingency measure effluent water that fails to meet the discharge criteria will be recycled through the water treatment plant or returned to underground storage. YKDFN notes that the arsenic loading values that result from reflooding the mine workings could be so high such that contingency measure of recycling effluent water through the treatment plan or returning it to underground storage will not be adequate.

It is requested that the proponent indicate threshold minewater loading values to the operational water treatment system during reflooding and detail corresponding contingency activities if the threshold values are exceeded. It is requested that contingency activities in addition to recycling effluent water or returning it to underground storage are provided.





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Response 1 Summary

A water treatment plant will be in service during the freezing process. The new Water Treatment Plant (WTP) will be designed with extra capacity and room to expand if necessary. Maintaining an existing surface pond for flow balancing is being considered in preliminary design.

Response 1

The concern regarding the storage of contaminated water identified in this question is accounted for by the following.

The current flooded elevation is just below the 750 level and will remain at this point until the new water treatment plant is commissioned, the surface ponds are dewatered and the underground storage capacity is quantified. Maintaining this level in the short term maximizes underground storage capacity in the early higher inflow years.

The existing Akaitcho pumping station, existing effluent treatment plant, Northwest, North and South ponds will remain in use until the new WTP is fully functional and until a decision is reached to dewater the surface ponds. As a result, there will always be a water treatment plant in service during the freezing process and, for the initial years, both plants will be operational. Furthermore, the new WTP will be designed with extra capacity, and will have the ability to expand in the future, if required.

It is understood that the underground storage capacity has yet to be fully quantified and will not be fully realized until the Northwest Pond is dewatered. All surface balancing storage will be lost once the surface ponds are dewatered unless one pond is maintained to provide balancing storage. As a result, maintaining one of the surface ponds as a back-up for flow balancing until the freezing program illustrates promising results is being evaluated in preliminary design.

Response 2 Summary

The minimum performance criteria for both systems are the former Giant Mine license requirements. Both treatment systems incorporate storage and recycle processes that effectively re-treat the water that does not meet the required performance criteria prior to discharge to the environment.

The proposed water treatment process will consist of oxidation, a high density sludge conventional treatment process and multimedia filtration. Storage will also be included to provide balancing should process upsets cause license exceedance.

Preliminary information gathered from water treatment equipment manufacturers indicates that the threshold value for arsenic is 3000 mg/L. However, pilot testing during preliminary design would identify the value. A recycle process will also be evaluated during preliminary design. It should be noted that design criteria for mine flooding is to initially hold the mine water at the 750 level. Recycling high





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arsenic water for temporary storage underground can be done while the mine water level is maintained at the 750 level.

Response 2

The following table summarizes the water quality from the existing effluent treatment plant between 2009 and 2010, and the predicted water quality from the proposed new WTP. For comparison purposes, Giant Mine's former Water Licence (N1L2-0043) is shown in the table.

Parameter	Unit	Existing License Maximum Average Concentration ^(a)	Existing License Maximum Concentration of Any Grab Sample	Existing Treatment Plant Effluent (2009- 2010 data)	New Treatment Plant Effluent (Predicted)
Ammonia	mg/L	12	N/A	0.005 – 0.067	No change
Arsenic (total)	mg/L	0.5	1.0	0.205 – 0.418	0.2 target
Total Suspended Solids	mg/L	15	30	<1.0 - 14	<5 (target)
Nickel	mg/L	0.5	1.0	0.0234 – 0.0687	No change
Cyanide	mg/L	0.8	1.6	<0.002 – 0.0145	No change
Copper	mg/L	0.3	0.6	0.0054 – 0.0162	No change
Lead	mg/L	0.2	0.4	<0.0001 - <0.00025	No change
pH	units	6.0-9.5	6.0-9.5	6.24 – 8.96	7.5 – 8.0 (target)
Zinc	mg/L	0.2	0.4	0.0028 – 0.0713	No change
Oil & Grease	mg/L	5	5.0	0.005 - <2.0	No change

(a) Maximum rolling average of four consecutive results

It should be noted that the former Water License (N1L2-0043) limits are more stringent than the Metal Mining Effluent Regulation (MMER) for cyanide and zinc.

The design of the new WTP will be based on the best available technology, which will produce high quality effluent better than the maximum average concentration values as shown in the table. It is expected that the new water treatment process will be able to treat the influent contaminated water to the quality described in the response to Alternatives North Information Request #14, Question 1.

The average arsenic concentration in water found at the bulkhead sampling points between 2007 and 2010 was 2300 mg/L. The maximum arsenic concentration obtained at these locations during this sample period was 7300 mg/L. It is understood that these arsenic concentrations are mixed with general mine water, prior to it being pumped to the Northwest pond. Contaminated water pumped to the Northwest pond is sampled and data obtained between 2001 and 2010 indicates that total arsenic



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concentration ranges from 5 mg/L to 280 mg/L. Since arsenic is the primary contaminant of concern, the design of the new water treatment plant has assumed that the arsenic concentrations found in the water being pumped to the Northwest pond (5 mg/l to 280 mg/l) is representative of the concentrations that will be found in the future. Preliminary information on applicable treatment equipment for arsenic removal states that the new water treatment process will be capable of handling influent arsenic concentrations up to 3000 mg/L of total arsenic, while meeting the 0.2 mg/L of total arsenic treatment objective. Pilot testing will determine the threshold values for the treatment equipment; however, given the uncertainty associated with the predicted arsenic concentrations, a recycle or return process will remain as part of the preliminary design.

The existing treatment system's contingency plan is to pump the water in the polishing pond to the start of the treatment process when the effluent criteria are exceeded. If the arsenic loading is higher than the plant's threshold value, the influent is diluted with water from the North Pond.

The proposed new WTP will incorporate a two cell effluent storage area with a total storage volume of 1.7 million litres. This equates to approximately 18 hours of storage based on the short term peak flows and provides ample opportunity to capture, retain, and re-treat non-compliant effluent. Similar to the existing plant, the contents of the storage cells will be recycled to the start of the treatment system if the effluent criteria are exceeded and effluent will not be discharged into the environment until effluent criteria is met.

Additional contingencies include providing sufficient space within the new WTP building to add treatment capacity should reflooding of the mine identify the need to treat more water.

