INFORMATION REQUEST RESPONSE

EA No: 0809-001 **Information Request No: AltNrth #10**

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Linkage to Other IRs:

Date of this Response:

May 20, 2011

Request

Preamble:
Few details could be located in the DAR on maintenance and replacement of the thermosyphons that would be required in perpetuity as the passive freezing system for the frozen block method.

Question 1:
Please provide the anticipated maintenance and replacement requirements for the thermosyphons along with justification for the same.

Question 2:
Please provide details on the monitoring and inspection regime to keep the thermosyphons functioning properly including indicators and triggers for maintenance and replacement, public reporting on performance, expected costs for maintenance and replacement, ease of maintenance and locating replacement materials (including any additional tools, equipment and specialized skills required).

Reference to DAR (relevant DAR Sections):

S. 6.2.7.2 Maintaining the Frozen Block
S.14.2.1 Frozen Ground Monitoring

Reference to the EA Terms of Reference:

S. 3.3.1(e)

Question 1 – Summary

No codes or standards have been identified for the design of thermosyphons. Maintenance would include periodic recharging of the carbon dioxide operating fluid and repairing of leaks either owing to failure of the pipe, fittings, or vandalism. Replacement will depend on the performance of the thermosyphon remaining relatively constant. If the performance declines over time, a decision will need to be made to repair or replace the thermosyphon.

Question 1 – Response

Thermosyphons have been used for over 40 years in Alaska and northern Canada. No codes or standards for the design of thermosyphons have been identified. Current design preference is to charge thermosyphons with carbon dioxide as the operating fluid. Failures of thermosyphons have been reported with ammonia as the operating fluid but not with carbon dioxide as the operating fluid. Other failures (leaks) have been reported owing to defects in the welded pipe and/or charging valves, or to vandalism.

A percentage of construction costs will be carried in the cost estimate for thermosyphon maintenance each year. Over time, this amount may be changed as actual maintenance data and operating life data is collected. Maintenance will include ensuring that the carbon dioxide charge in the tube is appropriate for operation and the radiator surfaces are not damaged. Replacement will likely be based on whether the thermosyphons continue to operate as designed. If a thermosyphon exhibits reduced performance, a decision will need to be made to repair or replace it.

Question 2 – Summary

Thermosyphons installed to maintain the frozen blocks at Giant Mine will be monitored and performance will be evaluated through instrumentation and long term monitoring. A maintenance plan will be developed to scope and execute the required repair work.

Question 2 – Response

A monitoring and inspection program will be developed as part of the detailed design and construction phases of the freeze program. In general, temperature sensors will be used to monitor performance of thermosyphons. Temperature probes below grade will indicate performance of the evaporator sections and temperature probes above grade will indicate performance of the radiator sections. Not all thermosyphons will be instrumented and monitored as part of the freeze program. Data will be retained and long term trends monitored and examined for indications of change in performance.

Non-performing thermosyphons will be inspected and repaired as required. One common cause of degraded performance is loss of carbon dioxide. Records will be kept showing performance of thermosyphons to track performance issues. When maintenance costs exceed replacement cost, consideration will be given to replacement.

Expected maintenance costs are based on an allowance of a small percentage of construction cost to be set aside each year for maintenance. Replacement costs will include thermosyphon fabrication, shipment to Giant Mine, removal of the non-performing thermosyphon, and installation of the new thermosyphon. The total estimated replacement cost per thermosyphon will depend on the number of thermosyphons that need to be replaced at one time. Sufficient time will be available to develop a replacement plan to optimize replacement costs.

The ongoing design of the freeze pads and the layout of the mechanical, electrical, and instrumentation systems will allow vehicle (equipment, support vehicles, cranes) access to the individual freeze pipes to aid in ongoing maintenance and replacement activities as required in the future.

At this time, thermosyphon materials are not considered difficult materials to source. Maintenance and replacement of thermosyphons could be included in future service contracts for the freeze program. Workers employed to maintain and replace the thermosyphons will be expected to meet quality control and safety requirements.

Performance of the freeze system will be reviewed and reported at least annually.