

In accordance with the Terms of Reference, which instructed the developer to provide a comprehensive analysis of the key line inquiry, Tyhee should put more emphasis on the questions related to the key line of inquiry. To facilitate this, the information requests in part one contain short descriptions of the information gaps that the Review Board identified in the DAR.

IR Number: 1-1-4

Source: Mackenzie Valley Review Board
To: Tyhee
Issue: Water Quality Monitoring and Adaptive Management

Background

The Terms of Reference included a line item for “a comprehensive plan for water quality monitoring, evaluation and management that indicates how the developer will meet water quality objectives prior to discharge”. In the DAR Tyhee refers to monitoring on various occasions but does not provide a lot of information. For example the proposed effluent and water quality monitoring does not include monitoring for cyanide, copper, and arsenic, which are important effluent constituents to monitor. The DAR contains a section on adaptive management but Tyhee does not identify management options the developer has at its disposal.

Request

- 1. Please provide, at minimum, a conceptual monitoring plan including likely monitoring locations, sampling frequencies and methods, and elements monitored.*
- 2. Please provide more information on how the adaptive management plan will serve to both detect and prevent a potential significant adverse impact. At minimum, include a conceptual description of the management options at Tyhee’s disposal and the criteria that will be used to decide when action is required.*

Tyhee NWT Corp Response (Revised May 31, 2012)

Request

- 1. Please provide, at minimum, a conceptual monitoring plan including likely monitoring locations, sampling frequencies and methods, and elements monitored.*

Currently, no discharge is expected from the TCA during its operation, however; Tyhee would expect that discharge criteria and conditions would be included in the operations water license to be issued by the MVLWB following the Regulatory Phase. As such, and should a discharge occur, MMER requires effluent concentrations of specific constituents to be below the suggested limits listed in Schedule 4 of MMER. These include Total concentrations for arsenic, copper, cyanide, lead, nickel, zinc, total suspended solids, and radium 226. If needed, sampling will be conducted at several monitoring locations at the site including: effluent discharge point(s), effluent exposure areas, seepage areas, waste dumps, pit sumps, and downstream water bodies. The frequencies, methods, and elements monitored as part of regular effluent testing will adhere to the requirements of the MMER

and the Terms and Conditions placed in the operations water license issued by the MVLWB . The monitoring program, finalized in the water license would begin upon mine startup.

Generally, such monitoring will include:

- Deleterious substance and pH testing according to the MMER sampling schedule (MMER Part 2, Division 2, Sections 12 and 13);
- Acute lethality testing, as prescribed in the MMER Part 2, Division 2, Sections 14-16; and
- *Daphnia magna* monitoring tests (MMER, Part 2, Division 2, Section 17).

In addition, Environmental Effects Monitoring studies will be undertaken at select locations according the prescribed schedules of the MMER. Specifically, these testing programs will include:

- Effluent characterization, involving sampling for: hardness, alkalinity, aluminum, cadmium, iron, mercury, molybdenum, ammonia, and nitrate (MMER Schedule 5, Part 1, Section 4);
- Sub lethal toxicity testing, involving the testing of survival in aliquots of effluent of a fish species, an invertebrate species, a plant species, and an algal species (MMER Schedule 5, Part 1, Section 5);

The following is a brief description of the potential monitoring locations proposed, the exact schedule of analysis and sampling will be considered in increasing detail upon finalization of water balances and tailings analysis.

Ormsby Pit

Grab samples will be obtained from the Ormsby Pit mine water.

Receiving waters and Control

Monthly water samples will be collected from Narrow Lake which will be the receiving water body for the effluent from the TCA. Samples will also be taken from Brien Lake which will be used as a control site, not under the influence of the mine activities. Monthly samples will be taken from Giauque Lake to evaluate if mining activities are impacting that water body.

Tailings Containment Area

Grab samples will be obtained directly from any active discharge point(s) on a monthly basis should discharge operations be conducted. Water from natural and constructed seepage ponds will be sampled monthly during open water conditions.

Waste Rock Facilities

Monitoring wells will be installed down gradient of each waste dump to monitor groundwater quality. Seepage from waste rock will be collected and monitored.

Request

2. *Please provide more information on how the adaptive management plan will serve to both detect and prevent a potential significant adverse impact. At minimum, include a conceptual description of the management options at Tyhee's disposal and the criteria that will be used to decide when action is required."*

Based on the current water balance, no continuous discharge is anticipated. However, Tyhee expects there will be a limited seasonal discharge. Prior to the discharging any water from the TCA the Surveillance Network Plan (SNP) data that has been collected from mine startup will be analyzed to determine if the discharge from the TCA would be in compliance with the MMER requirements. Additional monitoring would be conducted to confirm the initial finding. If the water quality of the discharge does not meet the MMER criteria, adaptive management strategies will be implemented. These options include recycling of discharge back to the TCA, use of holding ponds to contain water until seasonal conditions are suitable for discharge, and/or treatment before discharge.

Recycle

One option for management of elevated constituent concentrations is to recycle the discharge effluent by retuning it back to the TCA.

Holding Ponds

Holding ponds may be utilized to store and then treat effluent that does meet the MMER criteria. Storing the effluent would allow for a controlled discharge flow rate when receiving water bodies are low in volume or flow due to seasonal conditions.

Treatment

Another option for management of effluent is to treat it using a passive or chemical treatment process before discharge. Passive treatment options could include wetlands or evaporation ponds. Other treatment options include chemical additions such as lime to increase the pH of acidic effluent and addition of flocculent to treat discharge high in suspended solids. Treatment options will be evaluated as needed when it is determined that effluent requires treatment prior to discharge.