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Environnement Canada

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June 29th 2012

Our File: 4702 011

Richard Edjericon,
Chairperson
Mackenzie Valley Environmental Impact Review Board
P.O. Box 938,
Yellowknife, NT X1A 2N7

By Email

Re: Tyhee NWT Corp. – Yellowknife Gold Project – Information Requests and Ongoing Modifications to Proposed Project Details

Attached please find the remainder of Environment Canada's (EC) Information Requests (IRs) for the Yellowknife Gold Project. These IRs identify specific details pertaining to water quality and management which are needed for our review of this environmental assessment (EA).

EC would also like to identify an overarching concern with the ongoing changes to the proposed development. Over the course of this EA there have been significant changes to the proposed operations which are not reflected in the technical material presented in support of the EA.

Tyhee NWT Corp. submitted their Developers Assessment Report to the Mackenzie Valley Environmental Impact Review Board (the Board) in May 2011. The development description included mining of the Ormsby deposit and the Nicholas Lake deposit with all milling and tailings disposal to be done at the Ormsby site.

Following the Board's IRs, Tyhee submitted information March 28th and May 31st 2012 which provided an updated site water balance and geochemical predictions, along with a revised tailings and waste rock configuration. This information clearly stated that it was based on mining of the Ormsby deposit only, and that concerns with high arsenic levels would be alleviated because the Nicholas Lake deposit would not be mined. Predictions were made for site water quality to Year 12 of the mine life, based on mining only the Ormsby deposit.

On June 15th 2012 Tyhee sent a letter to the Board which states:

> "With respect to YKDFN comments on the mine plan and in particular Nicholas Lake, this resource remains a component of the YGP as originally proposed in the Project Description Report and subsequent DAR and as such remains a part of the EA. During the Feasibility Study review and the findings that indicated elevated Arsenic levels in the Nicholas Lake ore, the following strategy has been developed to address the concerns with theses elevated levels:

- Processing of the Nicholas Lake ore will be carried out later in the overall project schedule which, at this time, we expect in about year 4 from the Ormsby deposit start up.
- Further metallurgical testwork will be undertaken on the Nicholas Lake ore to determine the speciation of arsenic present as well as where in the waste streams these concentrations occur and how best to handle them. Tyhee sees this exercise as part of the overall monitoring program which would outline the treatment processes (if needed) and the MVLWB would incorporate these findings in the projects Surveillance Network Program, (SNP) appended to the YGPs water licence, issued following the Regulatory Phase."

EC has concerns with the quality and consistency of information which has been provided to date. The Proponent has not adequately evaluated the effects of mining Nicholas Lake ore from Year 4 onward; nor included this activity in the revised water balance and the tailings configuration through the operating life of the mine and for closure. If this is the mine plan which is to be assessed, EC requests that the Proponent provide a consolidated revised DAR with all water and waste management plans updated to reflect the mining of additional Ormsby ore plus the Nicholas Lake ore.

Yours truly,

Susanne Forbrich
Manager, Environmental Assessment and Marine Programs
Environmental Protection Operations
Prairie and Northern Region

cc: Cheryl Baraniecki (Regional Director, EPOD)
Carey Ogilvie (Head, Environmental Assessment - North, Environment Canada, Yellowknife)
Anne Wilson (Head, Water Quality, Environment Canada, Edmonton)
Sarah-Lacey McMillan (Environmental Assessment Coordinator, EA-North)

IR Number: EC–1-08
Source: Environment Canada
Issue: Tailings Containment Area construction
Reference: Site Wide Water Balance and Geochemistry Report; Section 2.5.3

Background:
Section 2.5.3 describes the tailings containment area (TCA) design, and states that the northern and southern embankments would be constructed with low permeability cores to limit leakage. Any effluent that leaks through would be collected and pumped back to the TCA or to a treatment system.

Request(s):
1. Please advise why impermeable construction has not been designed for the northern and southern embankments.
2. Please explain how this will affect closure?

IR Number: EC-1-09
Source: Environment Canada
Issue: TCA Water Quality Predictions - Evaluation of full suite of parameters
Reference: Site Wide Water Balance and Geochemistry Report; Section 5.1; Table 5.1

Background:
Section 5 of the report discusses Tailings Containment Area (TCA) water quality predictions and states that concentrations in the TCA are a function of concentrations in the flotation supernatant, the detoxified leach supernatant, reclaim withdrawals and amount of makeup water. Calculations were done for six parameters which are regulated under the MMER and estimates provided for Years 1, 4, 8 and 12. No information is provided as to how these estimates were derived. To be credible, modeling should be done which not only takes into account source contributions of contaminants from the process plant, but includes outflows and inputs from other sources (e.g. collection ponds, seepage, runoff, camp wastewater and precipitation) which affect TCA supernatant quality.

Further, there are other parameters of concern which should be evaluated. These include (at a minimum) cyanide, ammonia, nitrate, phosphorus, sulphate, major ions, selenium, cadmium, aluminum, chromium, iron, mercury, molybdenum and any other parameters which are indicated by the geology and/or process reagents.

Request(s):
Estimated TCA concentrations only include the MMER parameters.
1. Please provide estimated concentrations of metals in the TCA over the life of the facility with a rationale for parameters which are included for evaluation.

IR Number: EC-1-10
Source: Environment Canada
Issue: Narrow Lake Water Quality
Reference: Site Wide Water Balance and Geochemistry Report Section 5.2; Table 5.2

Background:
The report makes predictions for "equilibrium" concentrations of six parameters in Narrow Lake based on an assumed volume of 100.000 m3 of effluent being released over a 30 day period. Complete mixing of the lake is assumed and effluent concentrations are predicted to be below MMER levels. There is considerable uncertainty as to the timing and volume of discharge and actual concentrations in the receiving environment could be affected by seasonal considerations.

Changes to the receiving environment may be caused by a range of parameters which can be associated with mining effluents, and the evaluation of effects on Narrow Lake and downstream waters should not be limited to the six parameters presented. EC has concerns with increases in the full suite of metals with increases in major ions and with nutrient loading. To properly evaluate the effects of this project on receiving water bodies, modeling of these parameters should be done for downstream waters over the life of the mine including closure.

Water quality objectives in the receiving environment should be identified and predicted concentrations assessed against the objectives for each parameter of concern.

Request(s):
1. EC requests that credible modeling be done of the concentrations of metals, major ions (including sulphate), physical parameters, and nutrients in the downstream receiving environment.
2. Please identify water quality objectives for the protection of receiving waters.
3. Please identify nutrient loading associated with all sources of nitrogen and phosphorus, and evaluate effects on lake productivity over the life of the project.

IR Number: EC-1-11
Source: Environment Canada
Issue: TCA Water Management and Effluent Quality
Reference: Proponent's Response to IR 1-1-1, Estimated TCA Concentrations
Site Wide Water Balance and Geochemistry Report Section 3; Figure 5.1

Background:
In IR 1-1-1, the Mackenzie Valley Environmental Impact Review Board (MVEIRB) requested that the Proponent provide an explanation for how the "required TCA concentrations" will be achieved for all six elements.

Proponent's May 31st 2012 response was as follows:

> *As no makeup water is expected during the first four years of operation, the solute concentrations reach a maximum after the fourth year of operation. To show how the concentrations may evolve during the operation of the facility, estimates of the concentration of arsenic, copper, cyanide, nickel, lead and zinc in the TCA were calculated for the end of years 1, 4, 8, and 12. The results are presented below:*

Estimated TCA Concentrations

Parameter	MMER (µg/L)	CCME (µg/L)	Year 1 (µg/L)	Year 4 (µg/L)	Year 8 (µg/L)	Year 12 (µg/L)
As	500	5.0	10	59	15	8
Cu	300	2 - 4	50	208	75	35
CN	1000	5.0	100	144	100	50
Ni	500	25 - 150	0.8	3.3	1.2	0.5
Pb	200	1 - 7	3	14	4	2
Zn	500	30	0.7	2.9	1	0.8

The Proponent has estimated that the TCA concentrations will be reduced throughout operations after year 4, when makeup water will be drawn from Giauque Lake and directed to the process plant via the process pond. Although freshwater will be added to the system, concentrations coming out of the process plant will continue, and it is not clear that loadings over time have been taken into account. Although there will be nominal precipitation inputs into the TCA, it may be expected that concentrations will increase over time, given inputs from mine water, waste rock pile seepage, seepage from the leach concentrate tailings, and noting the net evaporative loss.

Request:

1. Please provide a greater level of detail on the inflows to the TCA and predicted concentrations of a range of parameters, on an annual basis.

IR Number: EC-1-12
Source: Environment Canada
Issue: Cyanide
Reference: Site Wide Water Balance and Geochemistry Report; Section 4.3

Background:
Section 4.3 presents the cyanide destruction results. Bench testing of the INCO air/SO2 process was done on composite samples of tailings. Total CN was as high as 6.43 mg/L in DT-2, with WAD CN at 4.9 for this sample. If there are fluctuations in treatment process efficiency, there may be times when the concentrations of cyanide trend to the higher end of the range.

Request(s):

1. Please confirm whether predictions for the TCA supernatant quality have taken into account the possibility of variable CN levels?
2. Please clarify what contingencies are available to optimize treatment to reduce cyanide concentrations?

IR Number: EC-1-13
Source: Environment Canada
Issue: Ammonia
Reference: Proponent's Response to IR Number 1-1-2 Request 3

Background:
The Proponent was asked to evaluate the toxicity and concentrations of cyanide breakdown products. It was concluded that at 10 C and pH of 8, and 1.0 mg/L ammonia there would be no risk. It is not clear that ammonia concentrations from cyanide degradation have been accurately estimated, nor that all sources of ammonia in the TCA have been considered. In addition to ammonia as a degradation product of CN, there will be contributions from blasting residuals and camp waste water.

Contributions from blasting agents can be significant depending on the types of explosives used, how wet the areas being blasted are, and the handling practices which affect loss rates.

Request(s):
1. Please provide a detailed mass balance for cyanide use and breakdown products.
2. EC requests that ammonia predicted concentrations in the TCA be provided which consider all sources.
3. With respect to blasting agents, please explain how will source control be practiced? Please also provide information on explosives management and predicted loss rates.

IR Number: EC-1-14
Source: Environment Canada
Issue: Discharge from the TCA to Narrow Lake
Reference: Reference: Proponent's Response to IR 1-1-1, Impact on Narrow Lake

Background:
In IR 1-1-1, the MVEIRB requested that the Proponent provide an explanation for how the "required TCA concentrations" will be achieved for all six elements.

Proponent's May 31st 2012 response was as follows:

> *As previously mentioned, the new water balance indicates that no discharge from the TCA to the downstream environment is expected during operation. Tyhee plans on discharging TCA supernatant to the downstream environment during the expected term of the initial water license and therefore would expect this option to be included in any water license issued following the Regulatory Phase under the MVLWB.*
> *…*
> *Any discharge would only occur between May and October, however; the majority of water discharged is expected to occur in May and June. An evaluation of the attenuation potential of Narrow Lake for a 30 day discharge at a rate of 140 m3/hr produced the following expected concentrations in Narrow Lake.*

The Proponent wants to maintain the contingency to discharge supernatant, although the revised water balance states that they expect there will be no need to discharge to the downstream environment during operations.

Request:
1. Please provide clarification regarding the conditions under which the TCA would require discharge into Narrow Lake, including a set of criteria which will be used

to determine if discharge is necessary and conditions under which discharge would take place.

IR Number: EC-1-15
Source: Environment Canada
Issue: Effluent Quality Criteria for Discharge from the TCA to Narrow Lake
Reference: Proponent's Response to IR 1-1-3, Tyhee NWT Corp. Response (Revised May 31, 2012)

Background:
The Proponent states the following in the introduction to their response to IR 1-1-3:

> *Should a discharge be needed, the first step would be to evaluate the concentrations of key parameters in the TCA. If the criteria are not met, then the water can be held in the TCA pending further evaluation.*

The Proponent does not provide sufficient detail regarding what is meant by 'further evaluation' in order for EC to assess whether or not proposed activities pose risks to the receiving environment. EC requests that the Proponent identify target criteria for end of pipe effluent quality and identify best practical technology that can be used to achieve optimum effluent quality.

Current effluent concentrations are predicted to result in changes to water quality in Narrow Lake. The equilibrium concentration table demonstrates the estimated contaminant concentrations from Years 1 – 12:

Equilibrium Concentration in Narrow Lake

			Year			
Parameter	MMER (µg/L)	CCME (µg/L)	1 (µg/L)	4 (µg/L)	8 (µg/L)	12 (µg/L)
As	500	5.0	0.8	4.8	1.2	0.6
Cu	300	2 - 4	4	17	6	2.8
CN	1000	5.0	8	11.5	8	4
Ni	500	25 - 150	*	*	*	*
Pb	200	1 - 7	0.2	1.1	0.3	0.2
Zn	500	30	*	*	*	*

The concentrations for arsenic, copper and cyanide calculated for the end of Years 1, 4, 8, and 12 all exceed CCME recommended concentrations. The Proponent has not explained what further actions will be taken to reduce these exceedences, nor provided predicted concentrations for other parameters.

Request:
1. Please provide a detailed description of target effluent criteria which will be used to evaluate if the effluent is suitable for discharge.
2. Please provide a detailed description of what 'further evaluation' will consist of. This should include but is not limited to additional treatment options which will be implemented.

3. Please describe best management practices which will be implemented to ensure discharge quality is optimized.
4. Please explain how the concentrations for arsenic, copper and cyanide will be reduced so as not to exceed CCME guidelines in the receiving environment as a result of any discharges from the TCA.
5. EC requests predicted concentrations for TCA effluent and thresholds which will trigger treatment options being implemented.
6. Please provide details on the model used to derive equilibrium concentrations over the full time period predicted.

IR Number: EC-1-16
Source: Environment Canada
Issue: Effluent Quality and Adaptive Management
Reference: Proponent's Response to IR 1-1-4

Background:
As part of their response to IR, Request #2, the Proponent stated the following on May 31st 2012:

> *If the water quality of the discharge (from the TCA) 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.*

The Proponent does not elaborate on which indicators (chemical, mechanical, visual, etc.) will be put in place to signal a need to recycle wastewater if recycling were selected as an adaptive management strategy. In addition no information is provided as to how long recycling will take place.

> *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.*

It is unclear as to whether or not construction of holding tanks, wetlands or evaporation ponds will be included as part of the scope of this project. It is important that the Proponent establish a clear plan as to which adaptive management strategies will be implemented during the design phase of the project.

Regardless of which adaptive management strategy will be implemented, it is imperative that the Proponent makes plans to improve wastewater quality in the event that discharge may take place at a later date and to minimize closure liability.

Request:

1. Please provide a detailed description as to which indicators (chemical, mechanical, visual, etc.) will be put in place for wastewater recycling and identify how long recycling could take place.

2. Please provide a detailed description as to what adaptive management strategy(ies) will be implemented and whether or not construction of holding tanks, wetlands or evaporation ponds will be included as part of the scope of this project.

3. Please describe any life cycle environmental costs associated with the various holding or treatment options which may be used.

4. Please provide details regarding how each of the potential options could affect timing of site closure, decommissioning activities and require possible remedial actions.

IR Number: EC-1-17
Source: Environment Canada
Issue: Effluent Treatment
Reference: Proponent's Response to IR 1-1-3

Background:

In IR 1-1-3, the last three requests from the MVEIRB include the following:

a) the Proponent provide a concise description of treatment options available for cyanide and other elements identified in the DAR;
b) the Proponent identify under which conditions treatment options would be implemented, including an outline of how they would be implemented; and
c) the Proponent submit contingency plans for how they will ensure no significant adverse impacts on the environment are likely and CCME guidelines are met at all times, while treatment options are being implemented.

The Proponent's March 28th 2012 response to request (a) was as follows:

As previously discussed (IR 1-1-2), the cyanide will first be treated by the INCO (SO2-Air) process which oxidizes the free cyanide and cyanide complexes. The process occurs at a pH typically between 8 and 11, which is sustained through the addition of lime. Testing of tailings produced from processing Ormsby ores shows that effluent cyanide concentrations below 1 mg/L can be achieved using this process. Should additional treatment, beyond the natural attenuation previously discussed, be needed, biological oxidation could be utilized either through the addition of phosphate to promote biological activity in the TCA or through biological reaction tanks. These biological reactions can achieve low-level effluent cyanide concentrations. Empirical testing would be needed to evaluate the efficacy of this method. If additional treatment is necessary to meet the metal concentrations in the MMER discharge criteria, a single or double step precipitation and coagulation treatment approach could be used. Conditions (pH, Oxidation Reduction Potential [ORP], and zeta potential) are varied in each step of a multi-step process to remove metals. Provisions will be made for sludge handling if this water treatment option is found to be necessary. Empirical testing would be performed before implementing this treatment option to determine the best process conditions to meet MMER standards.

Additional removal of heavy metals is possible by the injection of sulfides during the second stage of precipitation/coagulation. The sulfide reacts with the metals to form metal sulfides. The degree of additional removal can only be determined through empirical testing; however, the process is usually capable of producing extremely low-metal effluent concentrations. Several ion exchange resins are available that selectively remove transitional, heavy, and alkaline earth metals. The process is usually capable of producing extremely low-metal effluent concentrations.

The Proponent's May 31st 2012 response to request (b) was as follows:

As previously mentioned, no discharge is expected from the TCA during the operation; however, Tyhee expects that the operations water license, issued following the Regulatory Phase will have terms and conditions within that water license that will allow TCA discharge if and when needed. The adaptive management process and the process for determining if treatment options are needed are described in IR 1.1.4.
The implementation of discharge and treatment options would be done in consultation with the MVLWB and Water Resources Officer.
Request:

The Proponent's May 31st 2012 response to request (c) was as follows:

Tyhee approach to preventing significant adverse impacts on the environment is to minimize the amount of water, and hence solutes, discharge from the site in general and the TCA in particular. Based in revised water balance indicating that discharge from the TCA during operation is unlikely and estimates of solute concentration in the TCA showing them to be below MMER discharge criteria, no treatment options are currently under consideration for normal TCA operations. Tyhee would, during the operation, monitor the TCA water quality and undertake any studies that would confirm that the TCA contents could be discharged to the downstream environment OR if treatment is expected to be required, the appropriate treatment system would be installed to ensure compliance with MMER discharge criteria. Any treatment system put in place, will be maintained and managed per vendor specifications.

In all three responses the Proponent fails to provide sufficient details as was originally requested.

Request:
Further to the information provided by the Proponent, the following **additional** information is needed in order to properly evaluate whether or not the proposed facility poses risks to the receiving water and surrounding environment:

a) Please provide a detailed analysis of treatment options for each contaminant of potential concern. Treatment options should include a list of advantages and disadvantages associated with each treatment option.
b) Once identified, please provide detailed rationale for the preferred treatment option (or combination thereof) and why these options are best suited for this particular operation.

IR Number: EC–1-18
Source: Environment Canada
Issue: Toxicity Testing
Reference: Site Wide Water Balance and Geochemistry Report; Section 4.6, 4.7, and Appendix C

Background:
Two toxicity tests were conducted by "Aqua-Tox Inc.'s" using fathead minnows and daphnia for the bioassays. Section 4.6, states that a sample of the master composite float tailings supernatant, which had been left in contact with the tailings for 6 weeks to better approximate the conditions in the TCA, was subjected to whole effluent testing.

It is not clear which supernatant sources were included in this composite sample, nor what the associated water chemistry comprises for each of these sources. Therefore its unclear whether this composite sample is indeed representative of the supernatant generated from various components of the plant.

It is noted that in the first section of the report for the test completed on 04-30-2012, a 90% survival rate for daphnia magna is reported for 100% dilution, yet later in the survival data a survival rate of 100% is reported. Correction / clarification is needed.

Request(s):

1. Please indicate whether the test methodology (*LC 50, 48 hours, static, renewal, moderately hard fresh synthetic dilution* wate)r as stated in the report) was done in accordance with EC Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna* (EPS1/RM/14).
2. Please indicate what the composite sample is representative of and provide justification as to how this sample is representative of predicted supernatant quality.
3. Please clarify if the survival rate for daphnia magna in the first tests (completed on 04-30-2012) is 100% or 90% for daphnia magna.

IR Number: EC-1-19
Source: Environment Canada
Issue: Water Balance
Reference: DAR Section 4.13.1; Site Wide Water Balance and Geochemistry Report; Figure 5.1 and Section 3

Background:
The revised water site balance provided May 31st appears simplistic and does not take into account all inputs. Section 3 of the *Site Wide Water Balance and Geochemistry Report* outlines the volumes of water which are anticipated to be collected from several facilities within the project area (including the ROM facility, stockpile facility, WRFs, and the Ormsby open pit). In addition to the sources outlined, there should be camp water, camp wastewater dust suppression withdrawals, groundwater inflows and sedimentation pond inputs. Use of average annual precipitation does not take into consideration some of the extremes which may occur given the more variable weather events being experienced in recent years. EC therefore considers this water balance incomplete.

Figure 5.1, titled (General Operational Water Balance Schematic) illustrated the directional process flows for the tailings, reclaim water, raw water and contact water associated with the plant operations. However Figure 5.1 does not include the anticipated volumes (as outlined in section 3) over life of mine.

Request(s):

1. Please revise the site water balance to add any unaccounted water and wastewater inputs into the water balance and revise the estimated flows predicted to be sent to the TCA from these facilities. This includes but is not limited to water required for camp operation, wastewater generated from the camp, water used for dust suppression, etc.

2. In addition to the information provided in Figure 5.1, please include the anticipated volumes (of water, wastewater and tailings) and contaminant concentration of water, wastewater and tailings anticipated to be generated from plant operations. Revisions to Figure 5.1 should also include the addition of unaccounted water and wastewater inputs into the water balance with volumes and contaminant concentrations (as outlined above) with flow charts provided for life of mining operations and closure.
3. Modeling of ongoing water balance should take climate change into account.

IR Number: EC-1-20
Source: Environment Canada
Issue: Groundwater
Reference:
DAR Section 2.10.9; Table 2.10-2; Section 4.13-1; Section 6.2.2.1; Site Wide Water Balance and Geochemistry (SWWBG) Section 5.1.1

Background:
The DAR notes that shallow groundwater is likely contained in both overburden sediments and shallow bedrock fractures, while deeper groundwater is contained solely within deep fractures. Groundwater wells which were installed in 2009 were not successful in sampling below 20 m depth at Ormsby and there is limited information on groundwater quality and flow rates (I well at 20 m).

Section 4-13 of the DAR states that: ‘‘Natural groundwater inflow and outflow for the Winter Lake tailings containment area were not considered in this water balance because of insufficient data.”

The “SWWBG” Report discounts groundwater outflow from the TCA other than seepage. However, it does not appear that sufficient geotechnical work has been conducted to know definitively whether groundwater outflow or recharge occurs in the Winter Lake basin and in the footprint of the TCA. Groundwater inputs could also contribute contaminants of concern to the TCA and influence effluent quality.

Request(s):

1. In the absence of groundwater measurements, Please explain how groundwater contributions have been factored in to the predictions for water quality in the TCA?
2. Please explain how estimates were derived for the water balance?

IR Number: EC-1-21
Source: Environment Canada
Issue: Water Management Plan

Reference: Site Wide Water Balance and Geochemistry Report; Section 3

Background:
Section 3 states that storm water, captured in the ROM facility, stockpile facility, WRFs, and the Ormsby Open Pit will be collected in impoundments designed to handle average flows plus the 100-year/24-hour storm volume. However the Proponent does not provide a water management plan outlining **how** site-wide water (including surface runoff, inflows, etc.) will be diverted and directed to appropriate locations for treatment and storage.

Request(s):
1. Please provide a water management plan which includes detailed descriptions of **how** site-wide water will be diverted and directed to appropriate locations for treatment and storage, and how each source of wastewater will be managed. This could include but is not limited to diversion and drainage mechanisms anticipated to be used and contingency tools in the event of greater then anticipated volumes.

IR Number: EC-1-22
Source: Environment Canada
Issue: Missing Figure 2.1
Reference:
Site Wide Water Balance and Geochemistry Report

Request(s):
Please provide Figure 2.1 for our reference.

IR Number: EC-1-23
Source: Environment Canada
Issue: Water Quality Monitoring – Study design
Reference: Proponent's Response to IR 1-1-4

Background:
In IR 1-1-4, the MVEIRB requested that the Proponent provide, at minimum, a conceptual monitoring plan including likely monitoring locations, sampling frequencies and methods and elements monitored.

Proponent's May 31st 2012 response was as follows:

> *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 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.
<u>Tailings Containment Area:</u> 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.

There is little information provided as to where these monitoring locations, including discharge point(s), effluent exposure areas, seepage areas, waste dumps, pit sumps and downstream water bodies, will be located relative to one another and site infrastructure. To better conceptualize how sampling will take place at this facility, the Proponent should illustrate these locations on a site map with details such as, but not limited to, sampling location, type of sample being collected, surrounding environment and infrastructure.

In order to be confident that the Proponent will have the ability to detect change and implement management response, it is necessary to understand the measures which will be used to detect and quantify changes in the aquatic environment. Further details on the study design and an assessment of the adequacy of baseline data are necessary.

Request:

1. Please provide a site map with details such as, but not limited to, sampling location, type of sample being collected, surrounding environment and infrastructure.
2. Please outline sampling frequencies and identify how the range of natural variability will be characterized.
3. Please outline the study design and statistical analyses that are proposed.
4. Please provide a summary and evaluation of the baseline dataset for water bodies which may be affected by the project.

IR Number: EC-1-24
Source: Environment Canada
Issue: Aquatic monitoring – reference site selection
Reference: Proponent's Response to IR 1-1-4

Background:
The Proponent states that Brien Lake will be used as a control site. Brien Lake is adjacent to the project site, approximately 1 km to the NW of the open pit and accordingly will be subject to dustfall and mining emissions.

Request(s):

1. Please identify a reference lake which is outside the zone of influence of the mining operations. Please also explain how will the appropriate data be collected to characterise a reference lake?

IR Number: EC-1-25
Source: Environment Canada
Issue: Closure of the TCA
Reference: DAR Section 11.2.5.2

Background:
The DAR states:

> *Closure Strategy*
> *For closure and reclamation, it is the intent to reclaim the facility to a near natural state, to minimize the oxidation of the tailings and to mitigate any potential negative effects to the downstream receiving environment. Surface drainage from the TCA area will be directed to the Ormsby pit.*
> *Ongoing water quality monitoring will be conducted following the completion of decommissioning activities to ensure that acceptable downstream water quality can be passively maintained.*
> *Reclamation Plan*
> *Closure of the tailings containment area will be carried out following decommissioning of the plant site. All water/mill refuse distribution infrastructure, seepage control, and water reclaim infrastructure will be removed from the facility and salvaged where possible.*
> *Soil will primarily be used as the cover material. An additional synthetic material cap may be used to cover the tailings if sufficient natural materials are not available. The synthetic material may also be used to augment the stability of the natural material.*
> *The post-closure monitoring period, estimated to be 2-3 years, would include annual inspection of the TCA and other reclaimed areas to confirm that closure predictions are in compliance with the YGP's closure plan and associated permits/licenses. The monitoring will be conducted and reported under the direction of Tyhee NWT Corp.*

The revisions to the tailings disposal facility and removal of Nicholas Lake will affect closure of the TCA. Section 11.2.5.3 states that flows to Narrow Lake may be maintained by directing water from Round Lake.

Request(s):

1. Please provide detailed closure information for the TCA, including final cover, water management, capture of seepage, water and seepage quality at closure, isolation of the tailings, and surface trafficability following closure.
2. Please expain how the use of Round Lake for waste rock disposal affect the maintenance of flows to the Narrow Lake at closure?

IR Number: EC-1-26
Source: Environment Canada
Issue: Closure of the open pit
Reference: DAR Section 11.2.2.1

Background:
The DAR states:

> *Closure Strategy*
> *The Ormsby open pit will remain operational until the completion of the closure activities for the underground development. Once this has been completed, the pit will be partially backfilled with waste rock and flooded. A suitable fence will be erected around the perimeter of the excavation.*
> *Reclamation Plan*
> *Upon completion of underground closure activities, pumping and dewatering activities in and around the pit will cease and groundwater will be allowed to recharge into the pit to the pre-disturbance level. Waste rock material may be used to partially backfill the open pit, with priority placed on use of PAG material.*

Details have not been provided on the time for refilling, the quality of water in the open pit, nor any outflow from the pit lake which may affect surface waters.

Request(s):
Please provide a detailed description of the closure of the open pit, including but not limited to:

1. Refilling rates, including volumes and depths;
2. Pit lake water quality at closure, including the potential for meromixis;
3. Ouflows from the pit, including volumes, and identifying pathways.

IR Number: EC-1-27
Source: Environment Canada
Issue: Acid Base Accounting
Reference: Site Wide Water Balance and Geochemistry Report; Response to IR 1-1-1 Acid Base Accounting Generating Potential

Background:
IR Response 1-1-1 states:

> *Acid Base Accounting results for the Ormsby only tailings indicate that four of six composite flotation tailings samples are non-PAG and two are uncertain acid generating. NAG pH confirmed the non-PAG acid generating potential of four of the six composite flotation tailings samples. The two samples (OM-Master and Bruce Zone composite flotation tailings) that were uncertain acid generating by the ABA analyses reported a NAG pH of 7.8 and 8.4, respectively, which is considered non-acid generating. So, the flotation tailings produced from the Ormsby only ore will be non-acid generating.*

Net acid generation (NAG) testing determines the balance between the acid producing and acid consuming components of tailings/waste rock samples. NAG results provide the acid rock drainage characteristics based on the complete oxidation of the sample's sulfide content as well as ferrous iron from siderite dissolution. Acid that is produced by oxidation is consumed by carbonates and/or other acid consuming components of the material. The pH of the solution is measured (NAG pH). The acid remaining after the reaction is titrated with standardized NaOH to determine the net acid generated.

Samples that have high sulfide content may need more than a single aliquot of hydrogen peroxide to ensure complete oxidation of all the sulfides present. At the end of each stage, the sample is filtered to separate the solids from the NAG solution. The NAG solution is then assayed for pH and acidity, while the solids are recovered for repeat oxidation using another aliquot of hydrogen peroxide. The total NAG capacity of the sample is determined by summing the individual acid capacities from each stage.

The ABA is the balance between acid production (AP) (sulphides) and acid consumption materials (NP) (CaCo3 and others) in the rock. Given that the ABA has classified the samples as uncertain, the test results should be treated as such regardless of the NAG pH determination.

Request(s):

1. Please undertake more rigorous testing of the materials needed based on the uncertainty. The proponent should explain how they plan to implement ongoing characterization of the tailings as they are produced to ensure that the predicted characteristics are unchanged.