Executive Summary

INAC has completed an initial review of the Revised Water Licence Application Support Document that was submitted by Miramar Hope Bay Limited in May 2007 for the Doris North Gold Project. INAC has reviewed this based on its mandate under the DIAND, NWNSRT, and TL Acts. Although the jetty is not within the scope of the Water Board licence, INAC had asked the NWB to include the jetty in the technical review to assist INAC in its review under the *Territorial Lands Act*.

INAC has not identified any fundamental technical concerns that would be expected to jeopardize the project or have significant adverse effects on the environment.

INAC has included a series of technical questions to be discussed with the proponent, other interveners, and NWB staff at the Technical Hearing. INAC expects that many or all of the technical questions can be resolved at the Technical Hearing or though the submission of supplementary information by MHBL.

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1. Introduction

Following from completion of the Environmental Assessment process led by the Nunavut Impact Review Board, Miramar Hope Bay Limited (MHBL) submitted a Water Licence Application Support Document in November 2006. At the request of the Nunavut Water Board (NWB), the document was reviewed for completeness by all parties. In December 2006, the NWB deemed the support document to be incomplete and instructed MHBL to submit a Revised Support Document according to a number of specific requirements.

MHBL submitted a Revised Water Licence Application Support Document in May 2007. The NWB conducted an internal concordance review and determined that the Revised Support Document was complete and should undergo a technical review by all parties. A Technical Hearing has been scheduled by the NWB for June 11/12 and a Public Hearing of the NWB has been scheduled for August 13.

As part of the completeness review of the initial Support Document, Indian and Northern Affairs Canada (INAC) Water Resources assembled a technical team to provide technical review comments, which were summarized in a letter to INAC from Gartner Lee Limited dated December 6, 2006. INAC has maintained the same team to conduct a technical review of the Revised Support Document. The technical team consists of professionals from several firms who have specific northern expertise relevant to the project. All of the team members save one previously worked with INAC on the Environmental Assessment of this project and, therefore, provide helpful continuity for the current review. Although each team member has specific expertise, a great deal of helpful cross-communication has taken place that provides for a thorough, well-considered review. The team members, not including INAC staff, are listed in Table 1, with their specific areas of focus for this project highlighted.

Table 1. Technical Team Members

Firm	Lead Individuals	Primary Topic Area
BGC Engineering Inc.	Holger Hartmaier, P.Eng.	Geotechnical Engineering
Brodie Consulting Ltd.	John Brodie, P.Eng.	Reclamation Security
Gartner Lee Limited	Eric Denholm, P.Eng.	Environmental Management
Gartner Lee Limited	Dr. Leslie Gomm, P.Eng.	Water Quality and Modeling
MESH Environmental	Peri Mehling, P.Eng. Lisa Barazzuol	ARD and Mining Specialist Geochemistry
Northwest Hydraulics Inc.	Eugene Yaremko	Climate and Water Quantity

This report provides INAC's initial review of the Revised Water Licence Application Support Document. The purpose of this initial review is to develop a list of technical questions for presentation to the NWB Technical Hearing. We understand that the final technical review will be completed after the Technical Hearing for the NWB Public Hearing.

2. Technical Questions

2.1 Project Description, Section 2.0

2.1.1 TQ 2.0-1

Not all roads are shown on the project description maps and plans (road to quarry#3 and to ventilation raises, for example). These omissions should be addressed in revisions or supplements to the Support Document.

2.2 Jetty, Section 2.4.1

2.2.1 TQ 2.4.1-1

The bearing capacity of the marine sediments is marginal for the support of the jetty and there is a good possibility that the footprint will become enlarged to flatten the slopes due to stability concerns as part of the anticipated maintenance work during operations. Has MHBL considered this in the design of the jetty?

2.2.2 TQ 2.4.1-2

There is no discussion regarding the potential development of a mud wave ahead of the fill due to displacement of the marine sediments by loading of the jetty fill. Dredging may be required to remove displaced materials around the jetty to re-establish the required water depth. This may be an annual maintenance requirement. At the moment, there is nothing to address the dredging and disposal of dredged materials in either application. Has MHBL considered this in the design of the jetty?

2.3 All Weather Access Roads, Section 2.4.2

2.3.1 TQ 2.4.2-1

MHBL has reduced the minimum thickness of road fill from 1.5 m per the FEIS to 1.0 m per the Revised Support Document. Is this adequate to protect against active layer thaw into the orginal ground? What effect will this have on the depth of active layer thaw in the original ground and on any water that may be released as compared to the original specification?

2.4 Construction of Tailings Containment Area, Section 2.4.8

2.4.1 TQ 2.4.8-1

Regarding Supporting Document S4, Engineering Drawings for Tailings Containment Area and Surface Infrastructure Components, Drawing T-08, there are no notes to indicate that the spillway construction may be deferred or not built at all, depending on Tail Lake discharge scenarios. Further, it is unclear whether the spillway would be seated in bedrock or overburden.

2.4.2 TQ 2.4.8-2

a) Regarding storage characteristics, the maximum operating elevation and the invert elevation of the spillway cannot be equal. For the spillway to operate, the water level will rise, depending on the amount of flow and the hydraulic characteristics of the spillway. This is a minor point considering that the level of Tail Lake may never reach elevation 33.5, however it should be included as a design criterion when setting the top of the water retention elements of the dam. For instance, the top of the GCL for the North Dam is set at elevation 35.3 m, giving a freeboard of 1.8 m above "maximum operating level" of 33.5 m. In fact the actual freeboard may be somewhat less than this, if the spillway is actually passing a flood. There is no discussion here regarding the amount of dam core settlement that is expected and how this is allowed for in the freeboard with respect to the top of the core in both dams.

b) Regarding the South Dam, why is the top of the GCL at 35.8 m here and only 35.3 m at the North Dam? Some discussion on the settlement component of the freeboard should be provided here.

c) Regarding Creep Deformation Analysis, MHBL indicated that the design approach was to over-build the crest of the frozen core of the dams to accommodate some, but not all of the predicted settlement over the 25-year design life. The specific amounts and associated rationale should be given here.

d) Regarding Dam Settlement Analysis, there should be some discussion about the dam core. Figure 24 in Appendix B, Thermal design of Tailings Dams shows the predicted settlements for the core crests for both the North and South Dams over a 25 year period. The North Dam is predicted to settle about 1.5 m over that period versus almost 3 m for the South Dam. In the first 2.5 years, both dams are predicted to experience core crest settlements of about 0.25 m. EBA notes that the crests of the cores will reach minimum allowable elevation that satisfies freeboard requirements (el. 34.5) by approximately 8 to 10 years following dam construction. These estimates are based on very conservative assumptions, nevertheless some discussion on the amount of over-build included in the freeboard to accommodate settlement should be provided here. It is also not clear if the settlement amount includes consolidation related deformations due to the presence of the high unfrozen water content. A table that clearly summarizes all the components of the freeboard allowance (settlement components- elastic, creep and consolidation, wave runup and set up, maximum water level) should be provided for each dam. (Note: A partial response to this issue is given in Appendix H, Item 20 a).

2.5 Underground Mine, Section 2.4.6

2.5.1 TQ 2.4.6-1

The underground mine is in close proximity to the Doris Lake talik and it is essential to maintain permafrost in the mine to prevent seepage inflows and to freezing waste material backfill. How will MHBL ensure that permafrost is maintained in the underground mine? For example, have you considered

chilling the ventilation air as has been done at other northern mines or have you considered blocking runoff water from entering the mine via raises and adits?

2.6 Mill (Ore Processing), Section 3.4

2.6.1 TQ 3.4-1

MHBL has proposed a change to the mill process from the FEIS. Cyanide leach residue is now proposed to be disposed underground rather than in Tail Lake as was initially proposed and reviewed by NIRB. INAC believes that this modification is within the scope of the Project Certificate issued by NIRB. However, the NWB should inform NIRB of their decision on this before issuing the Water Licence. Several specific technical questions related to this issue are provided below.

2.7 Geochemical Characterization, Section 3.5

2.7.1 TQ 3.5-1

MESH understands from previous discussions with the proponent that further metallurgical work is underway. Has MHBL conducted cyanide species characterization on the various waste streams, including the leach residue solids from that testwork? This would provide characterization data appropriate to the current mill flow sheet well in advance of operations, which would allow further refinement of current management plans and also demonstrate that target cyanide levels in treated water quality can be achieved.

2.7.2 TQ 3.5-2

Regarding geochemical characterization of the filtered/rinse leach residue (solids), MHBL is asked to respond to each of these comments:

a) Can the proponent provide the rationale for the selected definition of non-acid generating solids (i.e NPR < 3)?
b) Can the proponent expand on the proposed operational monitoring program by identifying the specific analyses to be conducted, the criteria to be used for classification purposes, and the disposal locations of the leach residue should monitoring during operations identify the material as acid generating?
c) In the monitoring program, is the proponent considering evaluating effective NP in the leach residue solids.
d) Are there plans to monitoring any underground water or seepage from the leach residue, should it occur?
e) MESH understands from previous discussions with the proponent that further metallurgical work is underway. Will geochemical characterization be performed on all waste streams, including the leach residue solids? Will the characterization address the issue of effective NP? (Satisfactory results may allow 3) above to be reduced or eliminated).
f) Are the geochemical data from the 2002 PRA metallurgical head sample available for review? These data should be included in the Water License Application, if available.

g) Is the report presenting tailings humidity cell data available? This report should be provided as part of the Water Licence Application.

2.8 Hydroclimatic Parameter Evaluation, Section 3.6.1

2.8.1 TQ 3.6.1-1

The average annual value of 220 mm/year mean annual evaporation adopted by MHBL was based on a single year (1997) of measurement at Boston Camp, which is located south of the Doris North site. We consider this to be a questionable position and support an argument for the adoption of a range of evaporation values in the water balance modeling to determine the sensitivity of results to evaporation.

The computed annual values for evaporation for the years 2004 and 2005 averaged close to the adopted value of 220 mm/year, while the value for 2006 was in the range of 286 to 308 mm/year. MHBL argue that given the average of the three computed values and acknowledging that the evaporation amount established at Lupin should decrease with increasing Latitude, continued use of the adopted value of 220 mm is reasonable. We believe that there is considerable room for error but there is no ability to make a better estimate at this time. This further enhances the need to establish the sensitivity of this parameter in the water balance modeling.

Is MHBL agreeable to adopting a range of evaporation values into the water balance modeling to determine the sensitivity of results to evaporation?

2.9 Final Design of Dams, Section 3.6.4

2.9.1 TQ 3.6.4-1

We understand that a limited geotechnical investigation was carried out in 2006 but was cut short due to weather. What is MHBL's plan and schedule to collect the required information for final design of the dams?

2.9.2 TQ 3.6.4-2

Is MHBL agreeable to using the opportunity during construction to recover undisturbed samples of the foundation soils for laboratory testing purposes of various deformation parameters, including (but not limited to) thaw consolidation, creep tests at various strain rates and temperatures, shear strength and triaxial compression?

2.10 Tailings Water Management Strategy, Section 3.6.5

2.10.1 TQ 3.6.5-1

Is MHBL agreeable to carry out an investigation to delineate the source of the increasing concentrations of selenium in both Tail Lake and Doris Creek prior to the start of operations? It is important to determine

the source prior to operations and document the study to provide backup for MHBL that their operations is not the reason. Further, this information could support a possible future ecological risk assessment in the bay area in Doris Lake. In support of the (future) risk assessment MHBL may want to ensure that during operations that they have adequate baseline data to feed the assessment including water quality, sediment quality and fisheries in the bay area in Doris Lake.

2.10.2 TQ 3.6.5-2

Regarding the QA/QC Plan for the on-site water laboratory, MHBL is asked to respond to each of the following comments:

a. Is MHBL agreeable to submit a revised QA/QC Plan (re. the on-site analytical laboratory) for review and approval prior to the commencement of operations?
b. Is MHBL agreeable to submit as part of the updated QA/QC plan a detailed plan outlining the set up, calibration, operations and maintenance of the laboratory, including contingencies that will be put in place during periods when the on-site laboratory equipment is not operational?
c. Which parameters will be measure onsite and offsite? Also, details on how the results of the off-site analysis will be incorporated in the calculation of the optional ADVR, given the longer turn around time for off-site analysis.
d. Can MHBL provide the method detection limits (MDLs) that will be used for all parameters, analysed both on-site and off-site?

2.10.3 TQ 3.6.5-3

MHBL is asked to outline which changes have been included in the revised water quality model, specifically whether the implications of the revised milling process on water balance have been included in the revised water quality model.

2.10.4 TQ 3.6.5-4

Section 3.6.5 outlines in a general way the proposed protocol of selecting the location of the outlet pipe conveying Tail Lake outflow to Doris Creek. The information provided is acceptable but points out the lack of detail available at this time concerning the characteristics of the creek in the reach downstream of Doris Lake outlet to the falls. It is important that this detail be available so that specific monitoring sites on Doris Lake and Tail Lake flow for water quantity and quality can be included as part of the project water license. Similarly, a fairly detailed conceptual approach to this issue is outlined in Document S10i, Section 4.4, including possible mitigation methods for potential erosion and scour. A detailed assessment could not be made as a specific discharge site has not been established at this time. However, this is a result of there not being detailed characterization of the Doris Creek channel.

When will MHBL obtain this information and establish the discharge point and design erosion and scour prevention measures, at least conceptually. A proper engineering evaluation at this time should be able to develop a stable discharge site.

2.10.5 TQ 3.6.5-5

MHBL was requested to provide comparisons of Tail Lake discharges versus proposed discharge monitoring range. It was indicated that this information would be found in Section 5, Document S6. A review of this section did not find this comparison. Will MHBL be providing this information?

2.10.6 TQ 3.6.5-6

MHBL will be collecting climate and hydrology data as part of the ongoing monitoring programs. MHBL does not specify how the ongoing data collected will be used to compare to and adjust the water balance model as they do for the water quality model. How does MHBL propose to validate and adjust the water balance model on an ongoing basis?

2.11 Tail Lake Shoreline Erosion, Section 3.6.7

2.11.1 TQ 3.6.7-1

The proposed SNP does not include monitoring of total suspended solids (TSS) in Tail Lake, other than in the reclaim water (station TL-1). Monitoring of TSS in other locations throughout the lake would enhance the monitoring and mitigation of shoreline erosion. How does MHBL intend to use TSS data from Tail Lake to monitor and mitigate shoreline erosion?

2.11.2 TQ 3.6.7-2

Thawing of the marine soils around the tailings impoundment is likely to occur. The extent of thawing, deformation and sediment release are very difficult (if not impossible) to predict. Accordingly, the company has proposed to address 40% of the area of concern during the period of dam construction. The proposed method will not prevent thawing or settlement but it may contain the thawed material. This seems like a reasonable starting point for control of this problem. A heavy duty geotextile will be needed in this application. In addition, a contingency is proposed for all of the remaining area in the closure cost estimate. MHBL is asked to respond to each of the following comments:

a) MHBL has not proposed specific criteria (such as total settlement or settlement/month) that would dictate the need for remedial measures, and concepts as to how the thickness/type of cover may be modified pending performance of the initial cover. At a minimum, these should be:
   i. Ensuring that the TSS level in the lake does not exceed 15 mg/l,
   ii. Prevention/reduction of the loss of terrestrial habitat.

b) The proposed contingency of 0.5 m rock cover may not adequately control sloughing and sediment release in some areas. If a scarp develops, the rock cover may have to incorporate a buttress type feature. Offsetting these minor points is that some areas may not require any cover. As suggested in the notes on Drawing T-14, the Water Licence should require that a geotechnical engineer be responsible for the extent and geometry of the stabilizing cover. Overall, the initial approach and the incorporation of a conservative contingency seem reasonable. However, response of the system to heat (water cover) and stabilization (geotextile and rock) may be slow.

The nature of the proposed monitoring should be described. It may be necessary to hold this portion of the closure security for at least several years after the re-establishment of the original lake level.

2.11.3 TQ 3.6.7-3

The Adaptive Management Plan (AdMP) for shoreline erosion in Tail Lake discusses monitoring and mitigative actions to elevation 29.2 m, which is the proposed maximum operating water level. However, the dams will allow retention of water to above 29.2 m on a contingency basis which would flood additional areas of shoreline. How does the AdMP provide for the possibility that the lake level will rise above 29.2 m?

2.12 Waste Rock Management Plan, Section 4.4

2.12.1 TQ 4.4-1

Regarding Supporting Document S7, Geochemical Characterization of Quarry Materials, MHBL is asked to respond to the following comments:

a) Figure 4 appears to be the same as Figure 6.

b) Monitoring and adaptive management of quarry rock states that if a quarry sample is classified as PAG, it will be placed underground as backfill or returned to the quarry (Section 4.3, paragraph 2). *If returned to the quarry, where will it be placed and how will potential ARD be mitigated?*

c) Monitoring of seepage is proposed to be performed at monitoring stations (Section 4.3, paragraph 3). *Seepage flow paths can be ephemeral therefore the monitoring locations should have a level of flexibility to accommodate this fact.*

d) Through monitoring, if seepage is deemed unacceptable, it will be intercepted and transferred to Tail Lake (Section 4.3, paragraph 3). *What criteria will be used to determine if the seepage is unacceptable? How will seepage be collected for transfer?*

2.12.2 TQ 4.4-2

Regarding Supporting Document 10d, Waste Rock Storage Plan, MHBL is asked to respond to the following comments:

a) The Revised Application states that "Percolation of water through the [waste rock] dump is expected to be limited, since freezing in the dump will likely occur rapidly. (Section 4.1, paragraph 4). *Could freezing of the waste rock dump limit the ability of placing waste rock back underground? If so, could this generate a volume larger than put forward in Fill and Stockpile Schedule Doris Hinge (supplementary table)?*

b) Water from the pollution control pond will be monitored during open water season (Section 4.2, paragraph 5). *Is there a commitment to monitor the pond until the stockpiles (waste rock and ore) are non-existent?*

2.13 Explosives Management Plan, Section 4.6

2.13.1 TQ 4.6-1

If there is an unlikely larger spill of AN outside permanent storage facility with risk of transport via precipitation runoff, then temporary silt curtains will be deployed. The silt curtains are designed to retain particulate matter (suspended solids). *How will the spilled materials be recovered from the silt curtains, and how will soluble nitrogen species be prevented from impacting downstream waters?*

2.14 Landfill Management Plan, Section 4.7

2.14.1 TQ 4.7-1

Page 109 of the Revised Water Licence Application (RWLA) addresses the landfill. MHBL is not clear on the design criterion for the landfill regarding permafrost encapsulation. From the text provided in this section, the presence of permafrost is expected to prevent the migration of leachate. However there is no discussion here on whether the cover is intended to maintain permafrost conditions. A cover of clean rock is to be placed over the waste at closure. The company should specify the thickness of the cover.

2.14.2 TQ 4.7-2

MHBL estimates that the total expected waste volume to be generated during construction and operation over the mine life will be less than 1000 m^3 and the landfill will have a capacity of at least 30,000 m^3. Will the landfill be used to store wastes brought in from other sites, such as Windy Camp?

2.15 Landfarm Management Plan, Section 4.8

2.15.1 TQ 4.8-1

MHBL plan to have a discharge to the tundra from the landfarm that meets the outlined discharge criteria but there is no information of the quantity of material that will be discharged. This is the same issue with the discharge from the landfill, camp and mill pad sedimentation pond, fuel transfer station and fuel tank farm. They plan to measure water quality at all these locations but no quantity. Is MHBL agreeable to adding quantity to water monitoring programs such as the SNP? Also, there is some inconsistency between parameters being measured at the various locations that MHBL is asked to clarify.

2.15.2 TQ 4.8-2

In other project documentation, MHBL proposes to relocate hydrocarbon-contaminated soil to the Doris North site for treatment in the landfarm (from Windy Camp or the old Roberts Bay mine, for example). MHBL does not include this into the Revised Support Document for the Doris North project. MHBL should identify the anticipated types of contamination, volumes of soil, transportation procedures and implications for construction, operation and closure of the Doris North site related to any off-site soil brought to the site.

2.16 Tailings Management Plan, Section 4.9 & Supporting Doc 10i:

2.16.1 TQ 4.9-1

The risk of spills associated with pipeline settling and freezing are to be managed by locating emergency dump catch basins strategically [at low topographic locations] along pipeline. These will allow the pipeline to drain by gravity in event of pump stoppage. Emergency dump catch basins outside of Tail Lake watershed have been designed to hold the contents [volume] of the reclaim and tailings pipelines, and the solids are to be collected and transported to Tail Lake. In Tail Lake watershed, the reclaim pipeline will drain by gravity onto tundra that slopes toward Tail Lake, but catch basins will be constructed for tailings pipeline drainage. *Please clarify where process water captured in the emergency dump catch basins outside of the Tail Lake watershed will go?*

2.17 Water Management Plan, Section 4.10

2.17.1 TQ 4.10-1

Regarding the Water Management Plan, MHBL is asked to respond to the following comments:

a) During spring snowmelt, water from the sedimentation pond is to be discharge onto the tundra provided it meets criteria in Table 6.6.. Once pumping starts, discharge from pond will be sampled daily for each day of pump operation. *Proposed permit limits have been reviewed. What is the rationale for the omission of nitrate and nitrite in the monitoring suite? We note that monitoring is to occur daily when discharging onto the tundra (Table 7.2) and that the proponent is proposing to use monthly average concentrations for monitoring purposes (Table 6.6). How will the drainage be managed through monitoring (i.e. discharge to tundra or not) if the water is being pumped prior to receipt of monitoring results? If the criteria are not met (and therefore drainage will not be land applied)), where does the proponent plan on diverting the drainage?*

b) Emergency overflow of the sedimentation pond is a culvert (p. 22, para 5 of Support Document S10j). *How will water quality retention and discharge via emergency overflow be balanced? For example, if water does not meet permit criteria and is being held such that pond capacity is being reached, where will the water go?*

c) At the fuel transfer station, fuel tank farm and landfarm facility, drainage will be treated through an oil adsorption system prior to discharging [land application] on the tundra (p. 24) provided meet certain criteria (Table 6.8). *Did the proponent intend to monitor total ammonia in the treated drainage at the fuel tank farm and fuel transfer station? Table 6.8 in the Revised Water Application denotes total ammonia monitoring at these two fuel facilities but it is not denoted in Support Document 10j or the SNP monitoring plan. We note that monitoring is to occur daily when discharging onto the tundra (Table 7.2) and that the proponent is proposing to use monthly average concentrations for monitoring purposes (Table 6.8). How will the water be managed through monitoring (i.e. discharge to tundra or not) if the water is being pumped prior to receipt of monitoring results? If the criteria are not met (and therefore drainage will not be land applied)), where does the proponent plan on diverting the drainage?*

d) *What is the retention capacity of holding ponds?*

2.18 Mine Closure and Reclamation Plan, Section 4.12

2.18.1 TQ 4.12-1

Water Licences in the north typically require that a Final Detailed Abandonment and Restoration (A&R) Plan be submitted 2-years prior to closure. The A&R Plan submitted with the Revised Support Document is not to a level of detail that we consider meets this standard. Given that the life of the Doris North mine is 2-years, when does MHBL propose to submit a Final Detailed A&R Plan?

2.18.2 TQ 4.12-2

Regarding the Mine Closure and Reclamation Plan, MHBL is asked to respond to each of the following comments:

a) For the final closure measures of the waste rock stockpile, an alternative option that has been put forward by the proponent is for PAG rock to be placed underwater in Tail Lake. *Under what circumstances would PAG rock remain on surface at closure such that it can not be placed back underground (i.e. plan is to backfill all waste rock to the underground workings during operations)?. This option has not been discussed otherwise in the application. What would be the trigger for this option to be used? How would this physically be done?*

b) Noted inconsistency - It is stated that a minimum water cover of 2 m is necessary and that a 3 m water cover has been selected for TCA (p. 99, Water Cover, para 1) but throughout the Revised Application it is stated that a minimum of 3 m is required and that a 4 m water cover will be maintained. *Please clarify the specifications of water cover depths.*

2.18.3 TQ 4.12-3

MHBL proposes to end dump hydrocarbon contaminated soils into the ventilation raises during closure, prior to capping. Experience at other mine sites in the north has shown that the volume of contaminated soils that require disposal during closure typically exceeds the original estimates. In order to minimize the volume of underground space required to store these materials, the soils could be placed into designated areas underground in a controlled way. That way the ventilation raise is maintained until the end and if more contaminated soil is discovered, there will be space available. Has MHBL considered this approach?

2.18.4 TQ 4.12-4

With respect to the underground mine workings, there will be openings left underground. Some of this volume will be backfilled with materials hauled in from the surface (contaminated soils and waste rock). MHBL should comment on the long term stability of the openings that are left at closure.

2.19 Potable Water and Fresh Water Consumption, Sections 5.1 and 5.2

2.19.1 5.1-1

The proposed annual diversion rate for potable water is 30,000 m3. Additionally, make-up water for mill demand is estimated to be 450,000 m3/year. A simple water balance for the lake assuming the combined annual amounts should be provided to quantify the impact on lake levels.

2.20 Tail Lake Discharge Standards, Section 6.1

2.20.1 TQ 6.1-1

Through the Environmental Assessment process, MHBL committed to two levels of water quality criteria as part of their proposed effluent strategy: criteria for water released from Tail Lake, and criteria for water in Doris Creek at the end of the mixing zone. In the application submitted in December, MHBL proposed discharge criteria for end of pipe but only made a general commitment to meeting the CCME guidelines.

In the revised application MHBL has resolved this issue by proposing that the licence contain a two component discharge standard:

- Component 1: End-of-Pipe Compliance Discharge Standard as presented in Table 6.4 based on MMER; and
- Component 2: Compliance Standards in the Receiving Water and the SNP point below the waterfall in Doris Creek presented in Table 6.5.

As part of Component 2, the concentrations of ammonia, nitrate and nitrite are in units of nitrogen equivalency (Table 6.5 subnote 3) and the corresponding receiving water concentration should have the same units. This is not the case for the value for Ammonia – N. In Table 6.5 the value for ammonia-N has incorrectly used the value for total ammonia as mg/L NH_3. (1.54 mg/L). A conversion factor of 0.8 should be applied to is provided to convert mg/L NH_3 to mg/L Ammonia – N with the proposed receiving water concentration for Ammonia – N of 1.27 mg/L. The correct value is used in Table 3.2 of S6 (Water Quality Model) and Table 9.2 of S10j (Water Management Plan).

Also it seems that there is an error in the value reported for the receiving water quality standard for Nitrate-N. In Table 6.5 of the application document, as well as in various supporting documents, the CCME guideline for Nitrate – N is reported as 2.94 mg/L where it should be 2.90 mg/L (CCME 2006 update).

a. MHBL is asked to review and correct the proposed water quality standard in Doris Creek at SNP point below the waterfall for Ammonia – N presented in Table 6.5 as well as the proposed standard for Nitrate-N.

b. The parameters for the end-of-pipe standards general include those parameters listed in the MMER. However, the list provided does not include two MMER parameters: pH and the

requirement that effluent is not acutely toxic. MHBL is asked to add the following parameters to the proposed end-of-pipe discharge standards: pH and not acutely toxic.

2.21 Storm Water Discharge Standards, Section 6.2

2.21.1 TQ 6.2-1

Stormwater discharge from the lined fuel transfer station, fuel tank farm, landfarm facility and camp/mill pad sedimentation pond are being managed through daily monitoring (Table 7.2). If the discharge meets proposed discharge standards (specified for each facility by the proponent) then it can be land applied to the tundra. If criteria are not met, it is not clear at the present time where the drainage would go. The proponent is proposing that storm water management be regulated based on monthly averaged values. These discharges would be better regulated as grab samples than averaged monthly values. How does MHBL propose to manage these discharges on the basis of monthly values versus grab samples?

2.22 Water Monitoring, Section 7.6

2.22.1 TQ 7.6-1

Regarding monitoring the rate of nitrification, MHBL is asked to respond to each of the following comments:

a) Can an assessment of nitrogen species mass balance, and evaluation of apparent nitrification and cyanide degradation rates relative to the model assumptions be conducted annually, based on the proposed monitoring program?
b) Would inclusion of temperature data for these 3 streams in the monitoring program and monitoring of ambient site air temperature data improve the evaluation?

2.22.2 TQ 7.6-2

Given the short, 2-year mine-life before closure is implemented, can the proponent propose an appropriate porewater monitoring program for incorporation into closure plans?

2.22.3 TQ 7.6-3

How does the proponent propose to determine whether the cyanide destruction system is functioning as predicted, such that potential impacts to effluent discharge management can be anticipated?

2.22.4 TQ 7.6-4

Would monitoring of in-situ oxygen levels in Tail Lake assist in testing model assumptions, and allow greater anticipation of potentially required changes to proposed effluent discharge management?

2.23 Waste Rock Characterization Monitoring, Section 7.8

2.23.1 TQ 7.8-1

Regarding quarry rock monitoring, MHBL is asked to respond to each of the following comments:

a) How does the current monitoring plan using pH only address metal leaching? Should ICP metals scans be considered in the monitoring program to confirm the lack of predicted impacts?
b) What is the rationale for use of pH < 5.0 or >8.0 as an indicator of potential impacts?
c) Consideration should be given to the addition of field EC or other indicator parameters to address other potential impacts, and/or more thorough analyses of a subset of seep samples.

2.23.2 TQ 7.8-2

In Supporting Document S7, the issue of effective NP with respect to the quarry rock is appropriately and satisfactorily addressed through mineralogical studies (i.e. QXRD and microprobe analyses) and a subsequent recalculation of effective TIC-NP (defined as $NP_{Ca,Mg}$). Using $NP_{Ca,Mg}$, all samples were re-characterized and had values of NP > 3. Will future quarry rock analyses address effective NP, i.e. will future assessments and comparison to classification criteria include the $NP_{Ca,Mg}$, factor, as developed in Support Document S7?

2.23.3 TQ 7.8-3

Characterization of ore and waste rock to date has not been robust, but was considered acceptable because of the proposed mitigation (placing all waste rock back underground), the assumption of freezing conditions in the underground workings, and the short mine life (2 years). Any significant extension to the mine life would increase the uncertainty associated with potential impacts from materials stored underground. Thus it is considered prudent to link samples that have been analysed for geochemical characteristics with the material they represent and to document their final placement in underground locations. Monitoring of where specific waste rock is permanently placed underground has not been proposed by the proponent. Is MHBL agreeable to developing such a monitoring plan?

2.23.4 TQ 7.8-4

The monitoring plan for the solid-phase milling waste products (i.e. combined tailings stream, and cyanide leach residue) prescribes sampling frequencies but not geochemical parameters or characterization criteria. Previous geochemical testwork of the tailings humidity cell residue confirmed that the presence of siderite, which suggested that the Sobek NP overstates the effective neutralizing potential of the tailings. What monitoring plan does the proponent propose for the tailings solids that are being deposited in Tail Lake, with specific parameters which will address geochemical issues, including effective NP?

2.23.5 TQ 7.8-5

The level of detail for the handling of waste rock provided in the Revised Application is insufficient given the proponent is considering leaving some portion of the waste rock on surface.

a) How it can be determined whether rock is of the same lithology and from the same underground location unless records are kept as to where the waste rock came from in the underground workings, and where it was stockpiled on surface?
b) How will the proponent assess the material with respect to metal leaching potential?
c) Can the proponent demonstrate that an NP:AP > 3 will not generate net acidity, or produce soluble metals or other parameters that may be of long-term concern, assessment of effective NP, and without relevant kinetic test results?

2.24 Closure and Reclamation, Section 8.0

2.24.1 TQ 8.0-1

Water Licences in the north typically require that a Final Detailed Abandonment and Restoration (A&R) Plan be submitted 2-years prior to closure. The A&R Plan submitted with the Revised Support Document is not to a level of detail that we consider meets this standard. Given that the life of the Doris North mine is 2-years, when does MHBL propose to submit a Final Detailed A&R Plan?

2.25 Tailings Management System, Section 8.4

2.25.1 TQ 8.4-1

Has MHBL addressed the long term stability of the breached North Dam, considering that creep deformations will continue indefinitely?

2.26 Post-Closure Monitoring, Section 8.9

2.26.1 TQ 8.9-1

The level of detail provided in the proposed post-closure monitoring plan is not adequate, particularly given the short (2-year) mine life. A more detailed monitoring plan consisting of sampling stations, frequency and parameters is necessary at this stage. This can then be amended if necessary due to the findings of the mine operation monitoring. Is MHBL agreeable to developing a more detailed Monitoring Plan at this time?

2.27 Reclamation Security, Section 8.11

2.27.1 TQ 8.11-1

MHBL is asked to respond to the following comment. Waste rock management is addressed on Page 131 of the Revised Support Document. It appears that no segregation of the rock is proposed, although document S8 suggests that most of this rock will have NPR >3. It is understood that all of the development rock is to be placed underground during operations. However, changes in mining method, or premature closure, or difficulty in re-mining of the frozen stockpile could result in some of this material remaining on surface at the time of mine closure. Mixing of PAG and NPAG rock will require that none be

left on surface after closure. The reclamation security should include a provision to handle some of the stockpile after closure.