P.O. BOX 119
GJOA HAVEN, NU X0B 1J0
TEL: (867) 360-6338
FAX: (867) 360-6369

NUNAVUT WATER BOARD
NUNAVUT IMALIRIYIN KATIMAYINGI

December 27th, 2006

File: 2AM-DOH
Email: lconnell@miramarmining.com
Fax: 604.980.0731

Larry Connell, P.Eng
General Manager, Environment
Miramar Mining Corporation
899 Harbourside Drive, Suite 300
North Vancouver, BC, V7P 3S1

**Subject: Additional Guidelines for the Doris North Water Licence Application**

Dear Mr. Connell,

The Nunavut Water Board (NWB) has had an opportunity to technically review and give consideration to intervention statements filed for the Doris North water licence application received November 7th, 2006. Interveners were given a thirty (30) day notice to provide comments to the application submission on November 10th, 2006. After an evaluation of the application materials and Intervener comments the NWB has determined that the application is incomplete and will require a full application resubmission. The NWB is unable to appropriately evaluate the qualitative and quantitative effects of the use or deposit on waters as the application materials presented are deficient. As per **Section 48(2)** of the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* (*NWANSRTA*) the NWB requires additional information and studies to be provided. The application information provided has been deemed ambiguous, inconsistent, and convoluted and will need to be adjusted prior to the initiation of a public hearing notice outlined under **Section 55(2)** of *NWANSRTA*. The **Nunavut Water Board Preliminary Guidelines for Applicant** (hereafter referred to as the "*Guidelines*") issued to MHBL on October 30th, 2006 provided specific commentary and direction on water licensing requirements. Prior to issuance of the *Guidelines* MHBL had also met in person with the NWB on two occasions to discuss the requirements of the water licence application. These discussions echoed the *Guidelines*. As per **Page 5** of the *Guidelines*,

"*The NWB will not process an application that it deems to be incomplete and/or when supporting documents have been submitted. The NWB will give the required hearing notice of no less than sixty days after it deems the application to be complete. MHBL shall understand that the water licence application must be a stand-alone document.*"

As detailed in this letter document there are numerous instances where the *Guidelines* issued were not followed. The NWB invites MHBL to review the *Guidelines* issued by the NWB when MHBL chooses to resubmit application materials. The NWB would like to remind MHBL that the water licence application is not an extension of the items submitted during the Environmental Assessment (EA) but rather a set of independent designs and plans that may reference or annex the items submitted during the Nunavut Impact Review Board's (NIRB) EA. As identified by Interveners, contents within the water licence application may differ from what was presented at NIRB's EA stage (as identified by DIAND, EC, GN-DOE, and DFO Interventions).

The following is a list of the global concerns the NWB has identified through its evaluation of the water licence application:

**i. Decision Making Criteria, Adaptive Management (AM), and Conceptual Design**

As detailed through **Page 8** of the *Guidelines* and reiterated through our face to face discussions, MHBL shall consider AM when a final design can not be presented. MHBL was unable to provide adaptive management strategies in instances where management and design commitments were not made in the Doris North application. DIAND's Intervention, filed December 8th, 2006, had also reported that AM had not been identified in the application documents. The NWB, and also supported through GN DOE's Intervention (filed December 4th, 2006), have determined that the application designs and plans presented, without an AM strategy, have not been developed beyond the conceptual stage.

**ii. Appropriate Referencing, Inconsistencies, and Interconnectivity**

The NWB had stressed, through face to face discussions and the *Guidelines*, the need to appropriately reference (document, section, and page) as it is essential to present application information to the NWB and respective Interveners. As shown through the content of this letter document interconnectivity was not demonstrated and absent in many instances. The NWB has also identified numerous items within the application that are contradictory and inconsistent. Regulators, including the NWB, require MHBL to direct them through the water licence application through consistent and fluid presentation absent of contradictory discussion. As stated in the *Guidelines* information management is the responsibility of MHBL.

**iii. Appropriate Delineation and a Stand-Alone Document**

MHBL shall understand that the water licence application is a communication tool where elements of water and waste management and design are sufficiently detailed. The NWB once again encourages MHBL to provide materials that effectively communicate and eliminate the ambiguity outlined in this letter document. The NWB would like to reiterate (previously discussed during NWB-MHBL face-to-face meetings and the *Guidelines*) that the information presented in individual technical reports should be stand-alone. The NWB expects the resubmission to include all information so its individual designs and plans may be considered independent and stand-alone (with appropriate annexing and referencing where applicable).

**iv. The Absence of Professional Qualifications and Authorship on Report Documents**

In many instances design reports were not appropriately qualified (through professional seal) and in most instances documents were not signed by the document author. As aforementioned, supplementary application documents are to be stand-alone and as this is the case shall be qualified and signed accordingly. The NWB requests a CV (curriculum vita) for each signing professional as well as any other representative that intends to participate at a Public Hearing. This CV collection shall companion the water licence resubmission.

**v. Intervention Comments**

The NWB has annexed Intervener comments to this letter document. The NWB requests a formal response to all Intervener comments not addressed in this NWB letter document.

**vi. Guidelines for Resubmission**

MHBL will be required to provide a complete resubmission of the water licence application. In the resubmission MHBL will be required to outline through red text and a text strikethrough any deletion made from the November 7th, 2006 licence submission

and will be required to outline through blue text any addition made after the November 7th, 2006 licence submission. MHBL will also be required to provide a guiding document that will accompany the water licence application resubmission. This guiding document will point Regulators and the NWB to where any alteration from the November 7th, 2006 has been made. The NWB would like to restate that information management is the responsibility of MHBL.

---

After a review of the Doris North Water Licence application, received November 7th, 2006, it has been determined that additional information and clarity is required. The NWB requests additional information to address the following listed items:

**S1- Tailings Containment Area**

1. The NWB understands that the *Preliminary Tailings Dam Design* report, which was submitted as part of the environmental screening process, provided the major framework as well as background information to the TCA Design report. Consequently, should this document be referenced where applicable and included as an appendix to the TCA design report? Furthermore, in **Section 4.1.2** of the *Preliminary Tailings Dam Design Report*, MHBL indicated that an Adaptive Management Plan would be prepared as part of the final dam design. Given that the TCA Design report has been submitted to the NWB as a final design, why has the Adaptive Management Plan, noted above, not been included in the report?

2. **Section 3 (S1)**– The main report does not mention the wind data collected from the closer Doris Lake, nor any discussion that Boston camp data is more appropriate. Was the Doris Lake data not considered and if so how so? Is the Boston camp data considered more representative of the conditions within the TCA? For record purposes the NWB requests detailed discussion on the reasoning on the use of the selected wind data.

3. **Section 3.2.2 to Section 3.2.4 (S1)**– No other assumptions or criteria, as presented in the *Preliminary Tailings Dam Design* report, such as design capacity, design freeboard, assumptions for the climatic changes, or other upset conditions are presented. Does MHBL believe that these assumptions should be included in this report given the need for stand-alone reporting?

4. **Section 3.2.4 (S1)** - No reference was made to **Appendix B** (*Thermal Design of Tailings Dam*) on the discussion of stability. Does MHBL believe that information presented in **Appendix B** compliments stability? If so should not the contents of **Appendix B** be incorporated into the discussion of stability?

5. **Section 3.2.3 (S1)** – The report states that the Spillway has been designed to pass a 24-hour, 500 year return period flood event (annual exceedance probability of 0.05). Has consideration been given to the quality of the water that will pass over the spillway, and into the receiving environment, during such an event? If not can MHBL please comment on its reasoning in not considering water quality in this instance?

6. MHBL has not provided an analysis to provide understanding and ensure that water quality will not exceed MMER guidelines during discharge over the Spillway during a design flood event. In the event that water quality is predicted to exceed MMER guidelines, has MHBL considered and developed contingencies to address any mitigative measures that could be employed under this instance?

7. **Section 3.2.4 (S1)** – The NWB understands that detailed information related to **Section 3.2.4** is presented in **Appendix B** (**Sections 4.3, 5.2** and **6.2** for thermal, creep deformation and stability criteria, respectively). Does MHBL agree that this information should be presented/discussed/referenced in **Section 3.2.4**?

8. **Section 5.2 (S1)** – MHBL states that *"The storage capacity of the entire TCA at elevation 33.5 m is about 7.4 million $m^3$, compared to a tailings volume requirement of about 400,000 $m^3$".* The referenced **Drawing T-01** for the TCA Storage Stage Curve may provide a different storage

capacity than above (shown as closer to 9 million $m^3$). The NWB assumes that the 400,000 $m^3$ tailings is based on 2 years of tailings production at a solids production rate of 544 $m^3$/day (or 1727 total tailings feed/day). The NWB requests clarification on the above. The assumed final tailings elevation applied in the above quoted estimate may be at el. 24.3 m. However, the same TCA Storage Stage Curve appears to show less than 400,000 $m^3$ for the 24.3 m elevation. Furthermore, the planned maximum operating water level shown on the TCA Storage Stage Curve is 29.4m, while the planned maximum operating water level shown on the Water Balance Conditions for TCA chart appears to be 29.2m. The NWB requests clarification on the statements listed under this bullet.

9. **Section 5.5.3 (S1)** – In the third paragraph of this section MHBL states that *"Beneath the frozen core, permafrost temperatures are predicted to progressively cool with time over the first ten years or so due to the thermal influence from the thermosyphons but then become warmer because of long-term climate warming".* The main report does not indicate or mention that the thermosyphons will be an important part of the dam design, as presented in **Appendix B**? Does MHBL believe that the thermosyphons are critical in maintaining the frozen foundation of the dam, particularly during the first ten years of operation? If so, does MHBL agree that the above discussion, included in **Appendix B,** should be included and further discussed in the main report?

10. **Section 7.5 and Section 8.5.2 (S1)** – In the last sentence of **Section 7.5** MHBL states that *"Details regarding the predicted timing of spillway construction are presented on Dwg. T-01."* Further, in the first sentence of **Section 8.5.2** MHBL states *"As has been described previously, there is a real possibility that the spillway may never be put to use, and certainly, for at least 5 ½ years, the spillway will not be required."* However, the NWB understands that the Water Balance Conditions depicted in the TCA chart on **Drawing T-01** indicate that the implementation of spillway construction may be in Year 4. Why has an estimated duration of construction for the Spillway not been presented in **Section 7.5** of the TCA Design Main Report?

11. **Section 7.1 (S1)** – The report provides a procedure for evacuating tailings from the pipeline and temporary storage in the emergency dump catch basins. Is there a procedure for removal of the evacuated tailings from the emergency dump catch basins? How will the slurry be completely removed from the basins without incurring damage to the liner or displacement of the cover soil? What, if any, repair will be required to the catch basins as a result of removing the slurry, and what additional equipment and supplies will be required on site to pump the slurry into Tail Lake?

12. **Appendix C**, **Section 3.4 (S1)** - It was suggested that determination of the lake ice thickness on Tail Lake has not been carried out. However, the report also indicates that selected ice thickness measurement taken during the water sampling and drilling programs reveal maximum thicknesses between 1.9 and 2.2 m. The NWB understands that it is suggested that the minimum water level depth, to ensure lake bed stability, is dominated by the ice entrainment process. Will ice thickness be monitored at Tail Lake to ensure that it is less than the predicted 2.2 m? If so, at what frequency to this monitoring is MHBL committing to? If the ice thickness is greater than 2.2 m, what actions will be implemented to minimize ice entrainment potential? How often and how will tailings levels in Tail Lake be monitored?

13. **Appendix D, Section 1.2 (S1)** - The NWB understands that 2 drill holes were only completed during the 2006 geotechnical field investigation program and due to unseasonable warm conditions these two drill holes were located at the South Dam area. The NWB understands that boreholes were not drilled on the North Dam area in 2006. An EBA letter report dated February 28, 2005, **Re: Review of Alternative Dam Design, Hope Bay Doris North Project**, suggested that additional drilling consisting of at least three boreholes is recommended in the North Dam area. The NWB understands that these holes were intended to supplement the subsurface conditions and to reduce uncertainties at the site. No discussion was provided in the Main Report regarding the impact the unsuccessful drilling program in Winter 2006 had on the analyses and design of the dams. Was the limited data overcome with more rigorous analyses, including sensitivity analyses that resulted in high confidence in the various analyses to support or confirm the frozen dam scheme for the North Dam? What uncertainty exists as a result of the additional drilling not being completed? Are there plans to complete the desired drilling before dam construction?

14. **Appendix D (S1)** - This report indicates that Ground Penetrating Radar (GPR) was useful in mapping shallow bedrock, within 5 to 10 m penetration. **Appendix 1** shows the results of the field survey along the perimeter of Tail Lake. The NWB understands that the GPR was utilized along the perimeter of Tail Lake and the results may provide information for the characterization of the potential for shoreline erosion. There is no analysis or summary of results presented in the Winter 2006 investigation report on the GPR survey. How are the results presented in **Appendix 1** of the AMCL report utilized to help characterize the perimeter conditions of Tail Lake? Have the existing boreholes in the perimeter area been included in the analysis of the GPR survey?

15. **Appendix D (S1)** – The NWB understands that this section reports that the maximum hydraulic freeboard required to prevent overtopping of the dam is 0.29 m. The NWB requests sufficient details of the waste run-up calculations used to determine the freeboard height of the dam.

16. **Section 8.5.1** (**S1**) - Engineering Drawings **T-02**, **T-04**, and **T-05** stated that "*The dam construction may only proceed at temperature below 15 degrees Celsius*"; however, in **S1** it was stated that "*Placement of the dam material will require an ambient air temperature of at least -10ºC*". The NWB requests clarification on the required air temperatures for construction.

17. Engineering Drawings **T-03**, **T-04**, and **T-06** – The NWB understands that the cut-off trench, as shown, is 2 m in depth. In the North dam drawings (**T-03** and **T-04**) a typical additional trench excavation is shown to remove peat materials. The EBA letter report dated February 28, 2005, **Re: Review of Alternative Dam Design, Hope Bay Doris North Project**, indicated that the depth of the cut-off trench for the North Dam should be increased from 2 to 3.5 m. This letter also suggested that an additional drilling program, consisting of at least 3 holes, be carried out to supplement the geotechnical data and reduce uncertainties in the stratigraphy of the North Dam. Does MHBL believe there is adequate data and analysis to confidently support the implementation of a 2 m cut-off trench under the North Dam? If trench depth is altered in the field during construction, what impact would this have on the installation and performance of the thermosyphons?

18. **Tailings Drawing T-07** - There is no reference to the two details provided in **Drawing T-07**. What is the significance of these thermosyphon details?

19. The NWB understands that the TCA design report contains a limited scope of in-depth discussions, compared to the Preliminary Tailings Dam Design submitted as part of the FEIS document in 2005, and appeared to be tailored for providing additional information obtained after the FEIS submission. The NWB also understands that additional studies and analyses have been carried out since the submission of the preliminary design report. Does MHBL agree that if MHBL's intention is to complement the TCA design report with the preliminary design document, then references to the preliminary design report should be made in this document and the preliminary design report should be included as an appendix? Sections of the preliminary design report that have been modified, revised or changed should be indicated for clarification. Additional cross-referencing and detail are requested to address this concern.

20. The NWB understands that the creep/deformation analyses provide estimates of vertical and lateral deformation along the dam foundation. The NWB also understands that MHBL indicates that settlements due to consolidation of the marine clay and silt foundation soils are less of a concern than those predicted to result from creep and thaw. The NWB understands that the North Dam is expected to have larger differential settlement than the South Dam; however, the South Dam will have large settlements. The NWB also understands that creep and thaw settlements are expected to be high along the upstream and downstream foundation sections of the dam, but low beneath the core. **Figure 24** of the TCA Design report provides predicted settlement over time under the crest of the core.

    a. The NWB understands that **Figure 24** may be based only on creep deformation. The NWB requests additional information on the predicted total settlement including contributions from other mechanisms (such as thaw and consolidation)? Has this total settlement been estimated?

b. The NWB understands that there may be variation in settlement across the dam, including where the thermosyphon's evaporator pipes will be located within the foundation of the dam. How will the estimated settlements affect the performance of the thermosyphon? Will the evaporator pipes be able to tolerate settlement/ deformation along the foundation without rupture or damage?

c. **Figure 24** shows only settlement under the crest of the core. How large are the settlements along the upstream and downstream sections of the dam?

21. Does MHBL believe that the latest thermal modeling generally confirms that the thermosyphon will be required to keep the dam foundation frozen? If so,

    a. Is there precedent for installation of thermosyphon in dam foundations with complex stratigraphy and expected foundation deformation/settlement on the same order as that for the North and South Dams?

    b. What is the expected behavior of the evaporator pipes subjected to high total and differential settlements?

    c. Does MHBL agree that the thermal modeling report indicates that the contribution of the thermosyphons in the first ten years of operation is critical to keeping the dam foundation frozen? From the Technical Specifications the NWB understands that that the thermosyphon will have a five year manufacturer's warranty against loss of heat transfer. How is this discrepancy resolved?

    d. What kind of installation measures, if any, to accommodate total and differential settlements will need to be implemented to ensure that the thermosyphon will function as required, in view of the complex dam foundation at the site?

    e. Will the thermosyphons function in at least the first ten years? Does MHBL believe this is critical to keep the dam frozen?

    f. In the event that the installed thermosyphon stops functioning as required, what alternative options can be implemented? Does MHBL plan to install additional thermosyphons after the dam is constructed?

    g. Have thermal analyses been carried out to include short term application of the thermosyphon (i.e. thermosyphon that will only function in the first few years of the dam operation)? Does MHBL believe that this type of analysis may provide information on the critical time period at which the thermosyphon will no longer be required? Does MHBL believe this type of analysis should be completed and provided to Regulators? If not, why not?

22. The NWB understands that the finite element thermal modeling analyses that were carried out for the North and South Dams were completed using two different modeling softwares. The initial analyses completed for the FEIS utilized commercially available SVHEAT software, while those carried out for the Water License Application utilized a proprietary EBA's GEOTHERM modeling software. With the GEOTHERM modeling, has MHBL's latest data been used? Are the model results from the two different software packages comparable and complementary to the design of the frozen dam foundation? The NWB requests a detailed discussion outlining this comparison and detailed discussion outlining any new finding discovered through GEOTHERM modeling.

**S2- Design of the Surface Infrastructure Components**

1. **Section 7 (S2) -** Reference was made to visual and thermal monitoring to be conducted for the surface infrastructure components described in **S2**. The NWB understands that cross-referencing to the **Monitoring and Follow-Up Plan** (**S10m**) was not provided in **S2** and is requested. Within **S10m**, with exception of the tailings geotechnical monitoring descriptions, no details or summary of visual and thermal monitoring were provided for the remainder of the surface infrastructure

components described in **S2**. Additional detail regarding monitoring of the other surface infrastructure components, which includes but not limited to parameter(s) to be monitored, location, frequency, and mining phase, is requested to be included within **S10m** report and **Table 1**. Cross-referencing to this information in **S10m** within **S2** is requested.

2. **Section 7.2 (S2) -** It was stated that new thermistors should be installed at the jetty (two strings), fuel transfer station (one string), airstrip (three strings), camp pad (two strings), pollution control pond (one string), sedimentation pond (one string), float plane dock laydown area (one string), roads (five strings), and bridge abutments (two strings) as part of the fill construction.

    a. Is Miramar committing to the installation of these thermistors?

    b. Acknowledging that site specific conditions may alter the exact location of the thermistors, a map detailing the location of all thermistor installation is requested. If this information is provided in the engineered drawings, appropriate cross-referencing is requested.

    c. Additional details pertaining to location, frequency, and mining phase for thermistor monitoring are requested to be included in **S10m** report and **Table 1**. Cross-referencing to **S10m** from **S2** is requested.

3. Detail design of the emergency dump catch basins for draining tailings from the discharge pipe were not provided in the application presented. The NWB requests additional design detail and volume balance calculations.

4. Upon mine discharge stoppage, it was stated that the return water line from Tail Lake to the mill will be drained and allowed to flow directly onto the tundra. The NWB requests additional detail and clarification to understand if the discharged waters are contained within the Tail Lake catchment basin. How will these waters be managed to not negatively impact the environment? How will sediment control be ensured?

**Jetty:**

Through **Section 41** of the *NWANSRTA* the NWB may advise and/or make recommendations to the Government of Canada and/or the Government of Nunavut on issues respecting marine areas. With this in mind, and understanding that adaptive management of the jetty construction was not fully defined in the application, the NWB requests additional information outlined in the bullets within this section.

5. **Appendix C (S2) -** Details pertaining to foundation bearing capacity and settlement for the jetty were provided. It was stated that the "*design is preliminary in nature, and is intended to be used to confirm general feasibly of the concept proposed, and allow for cost estimation to +/- 15% accuracy*". The technical memorandum was dated Sept 14, 2005, which is before the result of the geotechnical investigation and soil laboratory testing was conducted in 2006. Thus, the NWB understands that, the input parameters for the bearing capacity and settlement calculations were based on previous geotechnical testing (e.g. vane shear) and assumed values (e.g., compression index, coefficient of consolidation). Additionally, details for select soil characteristics were not provided in **Appendix C**.

    a. The NWB understands that final design calculations for bearing capacity and settlement calculations for the jetty that considers the site specific soil geotechnical properties measured for the jetty location and the results of the testing completed in 2006 as presented in **Appendix B** were not provided. Why were the new data not included in a final design calculation for bearing capacity and settlement? Will the bearing capacity analysis follow the procedures outlined for embankments on soft ground detailed in the Canadian Foundation Engineering Manual? If not, why not?

    b. What is the acceptable factor of safety against bearing capacity failure of the foundations?

c. **Section 4.0 Appendix B (S2)** stated that the 2006 geotechnical "*investigation confirms that the design parameters used for the proposed jetty design (SRK 2005a) is appropriate*". The NWB requests that MHBL expands on this statement with additional discussion. What specific design parameters are being referred to and what comparisons to the 2006 measured soil parameters can be made?

d. In addition to above, based on the provided bearing capacity and settlement calculations in **Appendix C**. Further clarification is requested to address each of the following:

   i. The NWB requests detailed calculations on how initial effective stress, including pore water pressure, was calculated. Has consideration been given to 5.0 m of water column acting above the marine sediment?

   ii. The NWB requests details on how the live load applied stress was calculated. What area is this load applied over?

   iii. Lateral loads such as ice and wind may not be considered in the analysis. Additionally, lateral loads induced from a docking or docked barge onto rock fill may not be considered in the analysis. What is the expected live lateral load from a barge? What are the details and implications of not including this potentially large lateral live load in the foundation analysis?

6. **Appendix C (S2)** - Preliminary design commentary was provided regarding the use of geogrid reinforcement over the base of the jetty to provide foundation support and reduce differential settlement. It was stated that a multiple layer structure of three or four layers of bi-axial geogrid separated by select rock fill could be used as a configuration. It was further stated that to SRK knowledge, geosynthetic reinforcement in pad construction in an arctic environment has not yet been attempted; however, SRK believes that this application is feasible. Further, the supplier was prepared to guarantee their product for this application in the arctic. The NWB requests addition information on the following:

   a. Select geogrid product specifications were provided in **S3**. The heading on **Table 8.4** stated that the geogrid specifications are for a "*typical product*". The NWB would like to confirm that the geogrid characteristics, as specified in **S3 Table 8.4**, are final design specifications.

   b. The NWB requests detailed design calculations and analysis, with a description of the method of analysis and any assumptions, to detail i) selected geogrid strength and ii) aperture size characteristics, specific to the embankment and foundation characteristics. Details for all soil, geogrid, and soil-geogrid strength parameters used in the analysis, which may include but not limited to: allowable geogrid reinforcement force governed by strength and allowable strain, geogrid stiffness over applicable strain range, and geogrid strength reduction factors, are also requested.

   c. Engineering considerations, with any associated design calculations, on the selection of the proposed layout for the geogrid position of two geogrids bound together and placed off axis to each other, as specified in **S3**, are requested.

   d. Will a guarantee from the supplier for use of the product in this application be obtained?

**Airstrip:**

7. A winter airstrip has been proposed for implementation on Doris Lake. No details of operation and impact on Doris Lake waters were provided. The NWB requests additional detail regarding construction, operations, and maintenance of the winter airstrip, along with mitigative measures to reduce impact on freshwaters.

**Culverts:**

8. **Section 4.4 (S2) -** A 900 mm diameter culvert has been proposed. It was stated that "*hydraulic design suggests that smaller culverts may be used*". There were no hydraulic characteristics of the site or culvert sizing calculations provided to substantiate this statement. The NWB requests MHBL's design calculations that demonstrate the appropriateness of a 900 mm diameter culvert for use. Additional detail into the adaptive management strategy in determining when "*smaller culverts may be used*" is also requested by the NWB.

**Bridge and bridge abutments:**

9. **Section 4.5 (S2) -** It was stated that "*the minimum bridge deck height above Doris Creek will be 4.1 m*".

    a. Clarification is requested if this height is based on normal flow conditions in Doris Creek?

    b. For purposes of adding to the application record, how was the minimum bridge deck height selected as a design constraint?

    c. For purposes of adding to the application record, what is the elevation and width of Doris Creek at the bridge crossing for high water flow conditions and how does this compare to the proposed elevation of the bridge deck and distance between abutments?

10. **Section 4.5 (S2) -** It was stated that the "*stream bank-full width (i.e. the ordinary high water mark) of Doris Creek at the crossing location is about 15 m*".

    a. How was this value determined?

    b. What flow event does "*ordinary high water mark*" refer to?

    c. How will the abutments impact the flow of Doris creek during normal and extreme flow conditions?

    d. What provisions have been made to minimize erosion and scour of the abutments?

11. The NWB understands that details were not provided regarding the geotechnical considerations with respect to the bridge and abutment structure or the foundation conditions at the crossing. Understanding that a bridge failure will result in the deposition of materials in Doris Creek additional detail and clarification are requested to address each of the following:

    a. Has the soil stratigraphy been delineated at the abutment locations along with critical geotechnical laboratory testing of the foundation soils? If so, borehole logs, cross-section, and results of the laboratory testing are requested. If not, why not?

    b. Have appropriate bearing capacity and settlement calculations been completed for the abutments? The NWB requests sufficient discussion on MHBL's reasoning and detailed design calculations along with details for all input parameters used in the analysis. If not, why not?

    c. What is the acceptable amount of settlement that the bridge can accommodate and what is the expected amount of settlement? Will settlement be monitored and how?

    d. Have appropriate slope stability calculations with consideration given to dead and live loadings and retaining wall configuration been completed? If so, detailed design calculations along with details for all input parameters used in the analysis are requested. If not, why not? The NWB requests additional discussion and detail to demonstrate that the slope of the abutment (1.2H:1V, which is about angle of repose of the run of quarry rock) on the facing Doris Creek will be stable under the applied loads and configuration shown in engineered drawing **S-12**.

    e. Have appropriate retaining wall and sill design analysis been completed to ensure the run of quarry material will be retained in the configuration shown in engineering drawing S-12

and sill to be stable under the applied loads? If so, detailed design calculations along with further details for all input parameters used in the analysis are requested. If not, why not?

**Beach laydown area:**

12. **Section 4.6 (S2)-** It was stated that "*following development of Quarry #1, the quarry itself will be considered for use as a laydown area*". The NWB understands that this is contingent if suitable and competent rock is exposed. Final designs are to be submitted as part of this application. The above mentioned statement reflects adaptive management. The criterion decision to use Quarry #1 was provided; however, the design and key characteristics of Quarry #1 laydown area have not been provided. Additional details are requested to complete this adaptive management.

**Fuel transfer station:**

13. The NWB requests additional detail and discussion into how the liner integrity is checked after construction and covered with soils.

14. Design report **S2** did not include any details of how the geomembrane and geotextile product specifications provided in report **S3 Section 8.2.4** were considered in the design of the fuel transfer station. Additional detail and clarification are requested to address how the product specifications of the geosynthetics a) ensure protection of the geomembrane from damage/puncture during construction and operation loadings, and b) considered in the anchor trench design.

**Fuel tank farm:**

15. **Section 2.1 (S10) -** It was stated that bermed and earthworks will be "*constructed and maintained to be liquid tight to a permeability of 25 L/m$^2$/day*". Testing to ensure this quality of construction and assurance of liner permeability was not discussed within the **Landfarm Design and Management Plan** [**S10h**] or the Fuel Tank Farm section within the **Design of Surface Infrastructure Components** [**S2**]. The NWB would like to understand why this testing for liner permeability was not addressed in the design of the landfarm or tank farm. Additionally, what frequency of liner permeability testing will be completed to ensure that the integrity is "*maintained*"?

16. Additional detail and discussion is requested into how the liner integrity is checked after construction and covered with soils? If this information is contained in a separate document, appropriate cross-referencing is requested.

17. The NWB understands that design report **S2** did not include any details of how the geomembrane and geotextile product specifications provided in report **S3 Section 8.2.4** were considered in the design of the fuel tank farm. Additional detail and clarification are requested to address how the product specifications of the geosynthetics a) ensure protection of the geomembrane from damage/puncture during construction and operation loadings, and b) considered in the anchor trench design.

18. The NWB understands that the cover at the base of the tank farm is 0.2 m thick. Are there any "*high traffic areas*" within the tank farm which would require adherence to the minimum 0.3 m thick cover over the liner (as specified in **S3 Section 8.3.1f**)? For purposes of the application record what is the path fuel trucks will take to enter the tank farm and unload?

**Sedimentation pond:**

19. The NWB understands that the camp/mill sedimentation pond has been designed to retain waters draining from the camp and mill, excluding the temporary waste rock pile and ore stockpile. The pond is located down gradient of the camp and banked by the portal access road on one side. The NWB would like to better understand MHBL's rationale for placing a culvert south of the camp and west of the sedimentation pond. Is there potential for water drained from the camp/mill

to be diverted through the culvert onto tundra and by-pass the sedimentation pond? If so, doesn't this defeat the purpose of the sedimentation pond?

20. The NWB understands that the sedimentation pond is bermed on one side adjacent to the portal access road. The berm is comprised of run of quarry material. The NWB requests detailed discussion on how water will be contained within the sedimentation pond and permit a long enough retention time for sediment to settle given, the understood, high hydraulic conductivity of this gravel material.

**S3- Technical Specifications for Tailings Containment Area and Surface Infrastructure Components**

The NWB understands that report **S3** contains technical specifications for the materials used in construction of structures and select operations for construction. Review comments for select information contained in **S3** were addressed within the review of the other application sections and addressed throughout this letter document.

**S4- Engineering Drawings for Tailings Containment Area and Surface Infrastructure Components**

The NWB understands that report **S4** is a summary document to contain engineered drawings. Reviews of drawings were addressed within the review of the other application sections and throughout this letter document.

**S5- Hydroclimatic Parameter Re-evaluation**

1. On **Page 62** of the **Main Application Document**, it was stated that "*it is recommended that climate and hydrology monitoring continue at Doris North, prior to and during operations*". Is MHBL committing to this monitoring program?

2. **Section 2.1.1 (S5) -** In **Table 2.1**, the precipitation in Doris North is the sum of rainfall and snowfall; however, the NWB understands that the precipitations for Cambridge Bay and Kugluktuk are larger than the sum of rainfall and snowfall. Should the calculation for precipitation be the sum of rainfall and snowfall with the correction of undercatch factor? How was total precipitation calculated? Is it correct that Table 2.1 has rainfall in units of mm and snowfall in units of cm?

3. **Section 3.4 (S5)** - Has the validity of the derived undercatch values for Doris North (specified in **Table 3.4**) been confirmed by the post-baseline program 2003-2006? If so, what are the results? If not, should these undercatch values be deduced using the post-baseline data? Does MHBL believe that the post-baseline data will not significantly impact the previously derived undercatch values?

4. **Section 4.3 (S5) -** A value of 235 mm lake evaporation was provided for Doris North in the body text, which is inconsistent with the value of 220 mm provided in **Table 4.3**. What is the correct value for lake evaporation? Clarification is requested to address this inconsistency.

5. **Section 4.5 (S5)-** It was stated that "*four years of data for Doris Lake (1997 and 2004 to 2006) provide a mean annual lake evaporation value of 233 mm*". What is the individual year lake evaporation that was used to calculate the average?

6. **Section 5.4 (S5) -** Does MHBL agree that a more appropriate title for this section would be "*Doris North Post-Baseline Monitoring 2003-2006*"?

7. **Section 6.2 (S5) -** In response to INAC (2006a) comments regarding "*unrealistically high runoff coefficient of 87%...additional water balance sensitivity analysis, beyond the cases previously examined*" were proposed by SRK consulting. Of the four recommended cases:
    - Bullet point 2 of [**S5**] was not addressed in Table 6 Appendix F of [**S1**]
    - Bullet point 4 of [**S5**] is not fully addressed in Table 6 Appendix F of [**S1**]

Why weren't these additional sensitivity analyses provided? What are the results of these additional sensitivity analyses? What are the conclusions regarding the calculated runoff coefficient?

**S6- Water Quality Model**

1. **General Comments**- The NWB understands that MHBL completed a post-baseline monitoring program and is presented in report **S5**. The post-baseline data was not inputted into the water quality model for prediction of water quality and quantity in Tail Lake; rather, the water quality data was used to explain why additional model simulation(s) were not necessary. Within the conclusions of report **S5** additional model simulations were proposed to be completed to reflect the post-baseline hydrologic data; however, this hydrologic data was not considered in the water quality model. These conclusions are similar to those determined by DIAND through their December 8th, 2006 Intervention. As per **NIRB's Project Certificate Condition 14**:

   "*MHBL shall collect additional water quality data for the 2006 field season and incorporate it into a revised water quality model to be submitted to the NWB as part of the water licence application. MHBL will meet discharge criteria on a site specific basis set by the NWB where possible, for the protection of the receiving environment at the point of discharge."*

   As per DIAND's recommendation set out in DIAND's Intervention December 8th, 2006:

   *"INAC's review of this rationale finds it to be inadequate and, as a result, recommends that MHBL update the water quality model as was initially directed by the NIRB, based on the strong recommendations of INAC and other parties. INAC feels that an updated model be required before the application's technical review can proceed."*

   MHBL is to address DIAND's concerns. The NWB also understands that MHBL have revised the milling process and disposal plan for tailings to Tail Lake from that originally assumed in an earlier report outlining the water quality model and that this change in milling may not be reflected in the current water quality model results presented in **S6**. Given the post-baseline dataset and the changes in the milling process, are the results of the model valid and representative of site and operation condition? Should the model be rerun to reflect the changes in the milling process and the post-baseline dataset? What level of confidence does the MHBL have that the model results aid in the management of waters at the Doris North site?

2. **Section 1.2 (S6)** - Of the two milling rates provided (690 TPD-p2 and 668 TPD-p1), which one is used in the water quality model?

3. **Section 2.3 (S6) -** The NWB understands that the description of tailings slurry feed (1727 $m^3$/d=544 $m^3$/d solids +1183 $m^3$/d water) may be inconsistent with the other tailings description (668TPD: the tailings production rate, 2.7: specific gravity of the tailings solids, and 36.1%: the solids ratio). What are the details of the milling process change on tailings slurry quantity and quality?With consideration given to the current proposed milling process was mass balance considered or direct measurement used to assess the tailings slurry feed quality? If mass balance was used, what are the details of this calculation with consideration given, but not limited to, excess water after dewatering, clear bleed solution treated by detoxification system, and frequency for backfilling filtered and washed flotation concentration? If direct measurement of tailings slurry was relied upon, what are the results and were the tailings slurry representative of the current proposed milling process.

4. The NWB understands that there may be an inconsistency between the milling process description in the **Main Application Document** and that provided in the **Water Quality Model (S6)**. Specifically, the main application states 7.5% of the flotation circuit process material will be subjected to chemical treatment, whereas the water quality model states that this amount will be 10%. Additionally, the main document states that 70% of the barren leach solution will be recycled, whereas the water quality model states this to be 60%. Clarification from MHBL is requested to address these inconsistencies.

5. **Section 3.3.2 (S6)** - **Table 3.1** summarizes the monthly average concentration of copper in Doris Lake outflow from June to September. The data from October is absent in the table. What is the October data and why was it not included? Except for the comparisons provided for copper, aluminum and chromium, discussion for other contaminants are absent in this sub-section. What is the rational for focusing the discussion on copper, aluminum and chromium? Are there other constituents that are of concern? If not, why not? Additionally, there was no discussion about the background concentrations of metals and other contaminants in Tail Lake, as was completed for Doris Lake. What are the background concentrations for Tail Lake and basis for selection of the values used in the water quality model?

6. **Section 3.3.2 (S6)** – The NWB understands that the **Selection of Background Water Quality Concentrations** section discusses the difference between the average 2004 to 2006 water quality data and the assumed water quality model inputs based on 2004 data (**Table 3.1**). MHBL states that "*the assumed inputs will result in conservative estimates of allowable discharge rates*", and it is to the understanding of the NWB that MHBL believes no additional model runs are required. In the discussion, reference was made to the flow hydrograph in Doris Lake; however the flow hydrograph was not provided or cross-referenced. What are the details of the flow hydrograph and location within the application?

7. **Section 3.3.6 (S6)** - What kind of package sewage treatment will be used for the Doris North project? Does it include a nutrient (e.g., N and P) removal process? The NWB requests sewage treatment design details and discussion.

8. MHBL is to define the units of ammonia, nitrite and nitrate in **Table 3.5**?

9. **Section 3.3.7 (S6) -** The NWB understands that the bench scale pilot testing completed may be for the original process tailings, not the revised process tailings as described in **Section 1.2**. How does this compare to the revised blended effluent stream proposed and how does this change impact the water quality model predictions?

10. **Section 4.2 (S6)** - It was stated that "*in most cases, total copper concentration was the controlling parameter*", with chromium and selenium elevated in select scenarios. From the model results shown in **Table 4.1** to **4.3**, nitrite discharge may exceed CCME guideline limits in scenarios 1, 3, 4, 7, and 8. If nitrite was also considered as a controlling parameter to determine discharge from Tail Lake, how would this change the expected discharge rates and full-supply level for the TCA? Should nitrite be considered a controlling parameter?

11. **Section 4.5 (S6)** - Nutrient degradation has been proposed to be enhanced within Tail Lake by adding phosphorous. What are the proposed methods, operation, and frequency of phosphorous addition? How does the proposed method of phosphorous addition support the model assumptions of an instantaneous mixed system?

12. **Section 4.5 (S6)** - Erosion control has been proposed as a means to reduce discharge water quality from Tail Lake. What are the proposed methods, operation, and locations where erosion controls are proposed? If any of these details are provided in a separate document, appropriate cross-referencing is requested.

13. **Table 4.5** provides hydrograph data on a monthly basis. What is the reference or source of this data?

14. **Section 4.5.2 (S6)** - MHBL states that "*since the dilution within Tail Lake does not change between the low and base flow conditions, the outcome after Tail Lake overflows is the same irrespective of the flow conditions*". Can MHBL please provide additional detail on the above. How was the maximum possible discharge (550,000 $m^3$ per year) calculated?

15. **Section 4.5.3 (S6)** - The units for ammonia, nitrite and nitrate used in the report are mg $NH_3$-N/L, mg $NO_2^-$-N /L and mg $NO_3^-$-N /L, respectively; however, CCME guidelines for these parameters adopt units of mg $NH_3$/L, mg $NO_2^-$/L and mg $NO_3^-$/L, respectively. The NWB understands that MHBL may have converted the CCME guideline limits to mg $NH_3$-N/L, mg $NO_2^-$-N /L and mg $NO_3^-$-N /L to compare the maximum nutrient concentrations in **Table 4.1- Page 50**, **Table 4.2- Page**

**51** and **Table 4.11- Page 61**. Clear indication, as a table note, that CCME guidelines for ammonia, nitrite, and nitrate units have been converted from the published units are requested in **Tables 4.1, 4.2, and 4.11**.

16. **Section 4.5.3 (S6) -** The total ammonia limit (CCME) in **Table 4.11** (and other tables with a CCME column) is listed as 0.97 mg $NH_3$-N/L. The NWB understands that the CCME guideline for total ammonia is not a specific value, but rather a range of values over various pHs and temperatures. How did MHBL determine the total ammonia limit listed? In addition, how were nutrient concentrations in Doris Creek considered in the selection of nutrient degradation rates and the impact of any assumptions on predicted results?

17. **Section 4.5.6 (S6)** - Is the calculation of free and total cyanide concentration in **Table 4.15** reflective of the current milling process? If not, what is the expected free and total cyanide concentration for the current milling process?

18. **Section 4.5.8 (S6) –** The NWB understands that MHBL has not provided analytical data for the blended tailings slurry following the milling process revision. Has this analysis been completed? Given the change in the blended tailings slurry, how does this impact the management plan to discharge waters?

19. **Section 4.5.8 (S6)** – Does MHBL believe that in **Table 4.17**, the flow for the Float Tails Solution is 46.5 instead of 2.8 $m^3$/h and the flow for the Cyanide Detoxified Solution be 2.8 instead of 46.5 $m^3$/h?

20. A site specific risk-based criterion for copper was provided in **S11** which states that a copper concentration of 4 ppb should be acceptable compared to the CCME limit of 2 ppb. There was no reference to report **S11** within the **Water Quality Model** (**S6**) or **Tailings Management Plan** (**S10i**); however the **Main Application Document** states that the site specific copper concentration of 4 ppm will be used. Clarification is requested on the intent of use of a site specific copper concentration of 4 ppb. If 4 ppb is intended for use as a discharge criterion, what is the impact for not including and incorporating this value into the water quality model or tailings management plan to manage Tail Lake waters?

21. The NWB understands that the water quality model may assume complete mixing of all input solutes instantaneously in Tail Lake. Does MHBL agree that the discharge of the tailings slurry is spatial and a point source at the various discharge pipe location within Tail Lake? The NWB understands that there has been no details provided to demonstrate that a completely and instantaneous mix reactor is appropriate for Tail Lake. Is it conservative to assume a completely mix reactor? What is the basis for assuming an instantaneous mix reactor in Tail Lake? What contingency measures are in place if short circuiting of discharge waters to Tail Lake to the decant location occur?

22. The NWB understands that solute loadings to Tail Lake from non-mill sumps (e.g., fuel farm, landfill, landfarm, etc) may not be considered in the model. What are these expected loadings and concentrations? A table that summarizes all model input source water quality and quantity would alleviate any uncertainty regarding these model inputs. The NWB requests MHBL to provide summary table that summarizes all model inputs.

23. MHBL states that cyanide treatment needs to be 95% efficient for base case modeling to ensure free cyanide concentration at or below CCME guidelines in Doris Creek. Was this value of 95% efficient derived for the original or changed milling process? If the former, what is the required efficiency for the current milling process?

24. The Hydroclimatic Parameter Re-evaluation (**S5**) report supports the use of the "*dry case*" scenario for water balance modeling at Doris North, but believes that "*it would still be prudent to model the 'wet case' scenario to continue to account for existing uncertainty*" (**Page 31 of S5**). Does MHBL agree that it is reasonable to use "*wet case*" for water balance modeling to assess maximum dam elevation? Does MHBL also agree that the "*wet case*" may not be a conservative assumption for water quality modeling due to dilution? Does MHBL agree that hydroclimatic parameters under a "*dry case*" may result in lower flow conditions in lakes and creeks and

therefore lower dilution function of natural water bodies? Does MHBL agree that the assumptions of water quality modeling are critical for the discharge scenario evaluations? Does MHBL believe the "*wet case*" assumption in water quality modeling is conservative from a water quality perspective compared to the "*dry case*"? If not, does MHBL believe that additional model runs based on the "*dry case*" should be completed to characterize the discharge strategy?

**S7- Geochemical Characterization of Quarry Materials**

1. **Report (S7)** was not signed for authorship and professional approval. The NWB requests that this design report be signed and sealed by the responsible professional.

2. On **Page 51** on the **Main Application Document**, it was stated that the quarry rock is non-acid generating and that a program of ARD characterization will be conducted during construction to verify this conclusion. The NWB requests sufficient detail of this program?

3. **Section 2.0 (S7) -** It was stated that "*shake flask leachate indicated that aluminum and copper leached at concentrations exceeding CCME guidelines for the protection of aquatic life*". Further, it was stated that "*shake flask leachate indicate only potential elements of concern, and are not indicative of potential impacts to the receiving environment*". With respect to the shake flask test results, further clarification and detailed discussion is requested on how the measured results are "*not indicative of potential impacts to the receiving environment*".

4. **Section 4.1.4 (S7)-** A correlation was provided to relate $NP_{Ca,Mg}$ to $NP_{IC}$, the NWB requests details on how this relationship was determined.

5. **Section 4.2.3 (S7)** – The NWB understands that shake flask extraction tests indicate the potential for leachate with alkaline pH and elevated concentrations of aluminum. Shake flask extraction test results presented in the AMEC 2005 reported alkaline pH with elevated concentrations of aluminum and copper. The samples of rock tested in **Report S7** and in AMEC 2005 were from near surface.

    a. Why was copper identified as being elevated in the AMEC 2005 testing and not in the **S7 Report**?

    b. It was stated that the "*elevated pH is thought to be an artifact of the test procedure*…[and that these] *conditions will not be present under rock fill placement scenarios where pH is buffered at lower levels by interaction with atmospheric $CO_2$. Significant leachate of aluminum is not expected to occur from placed quarry rock*". The statement above suggests that the test methods may not be representative. The following information is to be clarified:

        i. What field testing will be completed to assess if there is an acceptable leachate composition from the quarry rock?

        ii. If an unacceptable leachate composition is measured in field application, what mitigating measures are in place to control release of potentially contaminated waters and impact freshwaters (as defined by NWANSRTA)?

6. Kinetic humidity cell testing prediction results for sulphide depletion and ARD onset were presented in the **Main Application Document** and used in the **Water Quality Model** [**S6**]. The NWB understands that these results were not presented or discussed within report **S7**.

    a. Why was this data not presented in report **S7**?

    b. What are the results of this testing?

    c. Kinetic humidity cell testing of quarry samples were completed using the siderite correction method for NP (AMEC). Subsequent rock characterization did not measure

any siderite in the rock. What impact does the siderite correction method for NP have on the results if no siderite is present in the rock? Are these results valid?

7. Report **S10m** indicates that ongoing monitoring to verify ABA characterization work on quarried rock materials at a frequency of "*approximately 100 samples spread over construction quarrying*". Cross-referencing between Report **S10m** was not provided in report **S7**. Appropriate cross-referencing is requested where applicable. Additionally, the NWB requests clarification if the approximately 100 samples will be taken from each of the four quarries or from the total amount of rock quarried? From this sampling,

    a. What is the expected turn around time (from sample collection to obtaining results) for ABA characterization? And how has this turn around time been considered in the schedule of quarry development and rock placement?

    b. If ABA results show a change in rock geochemistry that would be susceptible to metal leaching / acid rock drainage compared to originally expected, what is the resulting action plan for future construction and already placed materials?

**S8- Geochemical Characterization of Portal Development**

1. Report **(S8)** was not signed for authorship and professional approval. The NWB requests that this design report be signed and sealed by the responsible professional.

2. Within report **S8**, the NWB understands that results from four boreholes that were drilled along the portal alignment to obtain samples for geochemical characterization were provided. With this in mind,

    a. How confident is the applicant that the four boreholes drilled provides good representation of the total amount of material that will be stockpiled? The NWB requests detailed discussion on MHBL's level of confidence on this issue.

    b. What practices will be completed during mining to validate the geochemical characterization completed within report **S8**?

    c. Within report **S10d**, results of acid generating potential of the waste rock from the underground mine were provided. It appears as if the samples tested are different that that reported in **S8**. The NWB requests MHBL to comment on the following:

        i. Clarification, detail, and comparison (if applicable) to address the interconnectivity between these two documents with respect to geochemical characterization of the portal development rock.

        ii. Why are the geochemical results provided in report **S10d** not provided in report **S8**?

        iii. The geochemical results from report **S8** are the basis for interim waste rock stockpiling. Why is report **S8** not cross-referenced in **S10d**?

3. **Section 4.2.1 (S8) -** As illustrated in **Figure 4**, the majority of the samples tested appear to have NP-TIC:AP ratios to be greater than 3. In report **S8** MHBL states the ratios to be less than 3. Clarification is requested to address this inconsistency.

4. **Section 4.2.2 (S8) -** It was stated that other than copper and zinc, "*median trace element concentrations ranged from <0.1 to 1.6 times crustal average concentrations*". The comparison of median trace elements to crustal average concentrations was not provided to substantiate this claim. A table or reference to appropriate document to validate this comparison is requested.

5. **Section 5 (S8) -** It was stated that "*basalt appears to be strongly net acid consuming. However, the lower 6 m of MHBL06-12 had generally lower NP:AP ratios, and this material could be net*

*acid generating*". For purposes of the application record the NWB requests clarity on the following:

a. What is the estimated mass of potential "*net acid generating*" materials that would be stockpiled and percentage of this material to the total mass stockpiled?

b. Given this uncertainty, are there specific mitigating measures or contingencies for the potentially net acid generating material compared to net acid consuming materials to ensure containment of waste and its by-products? If so, what are the mitigating/contingency details (e.g., blending) and implementation? If not, why not?

**S10- Environmental Protection Plan**

The NWB understands that the **Environmental Protection Plan** (**S10**) includes operations and maintenance; however much of the document is not referenced in the conformity table within the **Main Application Document**. The NWB will only consider **Section 2.7** and **Section 2.13** of the document to gain an understanding for practices in close proximity to waters since only **Section 2.7** and **Section 2.13** were referenced in the conformity table. If additional information contained within **S10** is to be considered by the NWB, appropriate referencing (e.g., sub-document number, page, section title) to subdocuments should be outlined in **S10** and/or within the entire submission. Is MHBL committing to following the mitigating measures and operations outlined in each of the **S10** sub-documents?

**S10a- Emergency Response and Contingency Plans**

1. **General-** Given the layout, organization, and communication of this plan, the NWB would like to reconfirm that the document is intended for "*each member of management and all employees*". Does MHBL believe that the document is clear and concise enough that "*site personnel*" will be able to respond effectively and in a timely manner to an emergency situation with guidance from the plans?

2. **Section 4.6 (S10a)** – This section lists procedures to follow in the event that equipment or people have fallen through ice. Due to ambiguity in the document, additional detail and discussion are requested to address each of the following:

   a. The opening paragraph of this section states that "*if accidents happen the following procedure will be the guide to response.*" Who is responsible for following this procedure?

   b. In the second last bullet point listed in this section, the response to equipment falling through ice is to: "*Ensure that leaks of fuel or engine oils are minimized wherever possible by pumping the fuel from tanks into other containers where this can be safely done without danger of a spill*". How will this be accomplished?

   c. In the last bullet of this section it is stated that "*Where a vehicle has gone completely through the ice and is submerged, contact the appropriate government spills hot line and ask for advice.*" What is the appropriate government spills hotline? Should the contact information for this hotline be also included here, or referenced so a situation of this manner, if were ever to occur, could be handled promptly?

3. **Section 6.2 (S10a) –** In this Section MHBL states that hazards at the Doris North Mine site include "*the release of toxic vapours, fire, spills, and explorations.*" Are explorations a hazard?

4. **Section 6.3 (S10a)** – In the second bullet point of this section one of the principal objectives of the **Spill Response Plan** is to "*promote the safe and effective recovery or disposal of spilled materials*". Is MHBL committing to the safe and effective recovery or disposal of spilled materials?

5. **Section 6.4 (S10a) –** Additional detail and discussion are requested to address each of the following:

a. In **Section 6.4** MHBL provides a list of petroleum products and other chemical substances that may be stored at the Doris North Mine site. Is there a site plan that identifies the location of these substances at the Doris North Mine site? If this plan does exist, MHBL is invited to appropriately reference where this plan may be found. Given that this is an emergency response document, should this site plan be included within this report?

b. The types of petroleum derived materials included in the **Spill Response Plan** are listed in **Section 6.4** in bullet form as "*flammable immiscible liquids*" and "*flammable compressed gasses*". This is followed by **Section 6.4.1** which begins with a general description of "*flammable immiscible liquids*" and then closes with a list of examples of these substances in bullet form. In **Section 6.4.2**, the structure is entirely different, with the characteristics of "*flammable compressed gasses*" listed in bullet form, followed by a list of these gases that are likely to be present on site (in a single bullet). Does MHBL believe that the structure and organization of this section is sufficiently clear to allow easy understanding of the material by management and employees at the Doris North Mine site in an emergency situation?

c. As noted above, a list of types of "*petroleum derived materials*" is provided in **Section 6.4**, followed by more detailed descriptions and examples of each type in **Section 6.4.1** and **Section 6.4.2**. **Section 6.4.3**, however is headed "*Other Products*" which are not "*petroleum derived*". Why was the heading "*Other Products*" not listed in **Section 6.4**?

d. **Section 6.4.3** states in the first paragraph that "*there are chemicals and reagents that are needed for use in the gold abstraction process*" and then goes on to list these "*chemicals and reagents*" in bullet form. The last two bullets listed are "*Domestic sewage*" and "*Tailings*". Aren't these waste products and not "*chemicals and reagents needed for use in the gold abstraction process*"?

e. The final paragraph in **Section 6.4.3** states that the MSDS's will be available on site. Will the MSDS's be made available with this document? Should MSDS's be annexed in order to provide a quick reference in the event of an emergency situation?

6. **Section 6.5 (S10a) –Sections 6.5.1.1** through **6.5.1.5** list the responsibilities of various mine staff in the event of a spill. However, both **Section 6.5.1.2** and **Section 6.5.1.5** are labeled "Mine General Manager". Clarification is requested regarding this apparent duplication.

7. **Section 6.5.1.3 (S10a) –** One of the responsibilities of the "*Spill Clean Up Supervisors*" is to "*Assess whether burning is a viable clean up measure*". Under what circumstances does MHBL believe that this would be a viable clean up measure?

8. **Section 6.7 (S10a)** – Additional detail and discussion are requested to address each of the following:

   a. The first bullet point of **Section 6.7** identifies a "*Spill Response Coordinator*". However, this title is not listed in **Section 6.5.1**, along with the various other mine personnel involved with the spill response. What are the responsibilities of the "*Spill Response Coordinator*"?

   b. The last bullet point in **Section 6.7.1** states that in the event of a spill the "*Mine General Manager will liaise with…Regulatory Agencies and the KIA to keep them informed as to the status of the ongoing operations.*" Who are these "*Regulatory Agencies*"? Will the contact information for these agencies as well as the KIA be referenced here?

9. **Section 9.1.5 (S10a)** – This section describes "*three levels of warning signs or emergency conditions*" for the Doris North tailings dams. What are examples of observations which would indicate an "*obvious emergency*", a "*potential emergency*", or that are "*noted as being unusual*"? Does MHBL agree that a description of typical scenarios or cases for each of these three levels would be beneficial to the Reader and Regulators in providing an understanding to the three levels of warning or emergency conditions?

10. **Section 9.3 (S10a)** – This section describes the **EAP** (Emergency Action Plan) for dams at the Doris North Project site. The NWB requests additional detail and discussion to address each of the following:

    a. This section identifies "*dam failure*" as the case for which an EAP for the Doris North Mine site will be developed. Does MHBL believe that it is appropriate to develop an EAP or a response plan for a break in the tailings delivery line?

    b. In the final paragraph of this section MHBL states that "*the EAP will be developed for potential failure of south and north dams*". The NWB requests clarification in if MBHL considers this document to be the EAP or rather a commitment for MHBL to develop the EAP for this instance. Does MHBL intend to develop EAP's for fuel spills, explosives spills, or chemical spills?

    c. **Section 9.3.1** identifies potential causes of dam failure in bullet form. The third last and second last bullets are listed as "*Upstream dam failure*" and "*Downstream dam failure*". Does MHBL believe that this appears to be a circular statement in that dam failure will cause dam failure or should these statements be built upon?

    d. **Section 9.3.2** states that "*regulatory authorities*" will be notified "*If or when there is a need to reduce the level of water in the dam*". Who are these "*regulatory authorities*"? Does MHBL believe the contact information for the "*regulatory authorities*" should be included or referenced in this section? If not, why not?

    e. **Section 9.3.4** states that "*access to the North and South Dams…will be maintained properly at all times*." The NWB requires additional clarification (to add to the application record) into what are MHBL's standards to which the access routes will be maintained and what measures have been set in place to ensure these standards?

    f. **Section 9.3.6** is headed "*Equipment that may be needed for Emergency Operation and Repair*" and lists in bullet form said equipment. However, the final bullet in the list is "*Machine operators*". What other personnel may be required for emergency operation and repair?

    g. **Section 9.3.7** illustrates the **Notification Process** in the event of an emergency condition with either of the dams at the Doris North site. Do the mine personnel identified in the **Notification Process** also make up the emergency response team? If not, who are the mine personnel that constitute the emergency response team? What are their responsibilities during each of the three levels of emergency conditions noted in **Section 9.1.5**?

11. **Appendix A (S10a)** – The "*Emergency Procedures*" contained in this appendix do not appear to be referenced anywhere in the rest of the document. The NWB requests clarification in where these procedures apply and appropriate referencing where applicable.

12. **Appendix B (S10a)** – This appendix contains "*Spill Procedures for Products on site*" in tabular format. The NWB understands that these tables do not appear to be referenced in the text. Each table indicates spill responses according to whether the spill occurred on land/tundra, snow, ice, or water. The storage, transfer, and disposal methods for petroleum products, explosive substances, and process chemicals present at the Doris North Mine site were also included. What restoration measures may be required in each potential spill event noted? Has this information been provided in the Closure and Reclamation Plan (if so a reference should be included)? Who are the mine personnel involved with the spill responses?

**S10d- Interim Waste Rock Storage Plan**

1. Report **(S10d)** was not signed for authorship and professional approval. The NWB requests that this design report be signed and sealed by the responsible professional.

2. A significant portion of the storage plan involves description of the type of rock to be stored and acid generating potential. The importance of this topic can't be understated; however, report **S8** was solely devoted to describing acid generating potential for the portal rock. As was discussed in the review of report **S8**, and should be addressed in response of **S8** review, was the differences in the geochemistry rock analysis presented between the report **S8** and **S10d**.

    a. It is requested that there be consistency between documents and appropriate cross-referencing. Since the portal rock discussed in report **S8** is temporarily stockpiled and this stockpile is discussed in report **S10d**, how come report **S8** was not referenced?

    b. **Section 1.2 (S10d) –** The results of the ABA analysis were provided in a summary table format in **Appendix 1**. The report states that this material is presented graphically in **Appendix 1**; however, the graphs were not provided. The NWB requests clarification and the inclusion of graphs required to support information presented.

3. Minimal details were provided on the construction, design, and layout of the interim waste rock pile within report **S10d**. In fact, there was no reference to the design drawings **S-07** and **S-08** that depict pile layout plan and critical cross-sections within report **S10d**. Does MHBL agree that appropriate cross-referencing should be provided to include drawing details within report **S10d**? With regards to construction, design, and layout of the interim waste rock pile, additional detail and clarity are requested to address each of the following:

    a. **Executive Summary (S10d) -** It was stated that the "*pile will be constructed within a 0.5 m high perimeter berm designed to contain and direct all runoff from the pile into a dedicated runoff collection pond. The berm will also direct clean runoff away from the waste rock pile*".

        i. **Section F-F'** in engineered drawing **S-08** provides a cross-section of a typical containment berm with a minimum of 1.0 m in height. Technical specification document (**S3**) **Section 10.2.14**, the berm is referenced to be 1.0 m high. The **Main Application Document** (**Section 3.3**) stated that a 0.5 m high berm will be designed. Clarification is requested to address this inconsistency. What is the minimum berm height?

        ii. Will the construction of the berm be completed according to the technical specifications outlined in **Section 7.0** and **9.0** of report **S3**? Clarification and cross-referencing is requested.

        iii. The construction material type was not referenced in report **S10d**. **Section F-F'** in engineered drawing **S-08** depicts the berm to be constructed of run of quarry materials. Technical specifications **S3** (**Section 10.2.14**) stated that the "*berm will be constructed from select subgrade material*". Clarification and cross-referencing is requested to address this inconsistency into what the material type will be used to construct the berm.

        iv. Engineered drawing **S-07** depicts the waste pile and berm layout, surrounding infrastructure, and topographic elevations. Does MHBL believe that this drawing should be cross-referenced in report S10d where applicable? A berm has been proposed along the west and east sides of the waste rock pile. The NWB understands that the south end of the pile allows waters to drain into a pollution control pond. The NWB also understands that the north end of the pile is open to receive any waters draining from the mill, crusher, and ore stockpile areas. What is MHBL's rational for not constructing the berm along the north end of the waste rock pile? Does MHBL intend for waters to drain from the north and enter into the pile location? If reliance is on surface grading of the mill stockpile area to divert waters from entering the temporary waste rock pad, will there be engineering oversight during construction to ensure that waters drain on surface as depicted in **S-08**? If so what is in place?

v. The NWB understands that the function of the berm is to contain and direct water from within the waste rock pile to the pollution control pond and to divert clean runoff away from the waste rock pile. Further the berms appear to be generally positioned perpendicular to surface contours to facilitate diversion of waters. The NWB understands that the berm will be constructed of materials (either select Subgrade or run of mine; see **Bullet iii** above) that have high gravel with some sand contents. With consideration given to, as understood by the NWB, the high hydraulic conductivity of this material, discussion and detail are requested on how berms comprised of this material will contains waters and not permit seepage.

b. The **Executive Summary** in report **S10d** stated that "*only runoff that meets acceptable criteria for discharge will be released onto the tundra*" from the runoff collection pond (pollution control pond). In **Main Application Document Section 2.4.7** it is stated that "*all water contained in this pond is considered contaminated and will be pumped to Tail Lake via the mill circuit*".

i. Clarification is requested on the method of disposal of waters from this collection pond to address this inconsistency.

ii. If waters are pumped to Tail Lake, how will the pollution control pond waters be directed to the mill circuit?

iii. Is there a plan to monitor water quality from the pollution control pond? Appropriate cross-referencing between reports **S10d** and **S10m** is requested where applicable?

c. The NWB understands that engineer drawing **S-07** does not provide access road details into the waste rock pile location for rock placement or removal. No details were provided regarding location of tailings slurry and reclaim water pipelines in the vicinity of the camp location. Does MHBL agree that this detail should be included on the engineered drawing? If not, why not?

d. Report **S2**, **Section 5.5.6** provides discussion on the stability analysis for the waste rock pile. Details were provided that the pile may be classified as Stability Class 1 according to BCMWRPRC 1991 and therefore the "*design can be based on basic reconnaissance and baseline data*" for the site. The NWB understands that there were no details provided in **S10d**, or elsewhere, regarding the pile stability analysis and design. The NWB requests full details regarding the stability analysis method and results with detailed discussion of assumed input parameters completed for the waste rock pile.

4. There were no details pertaining to the construction, stability, erosion control, operation, and containment of waters generated from the ore stockpile within report **S10d**. Does MHBL agree that the ore stockpile may also be considered an "interim" waste rock pile? If not, why not? What plans are in place to manage the ore stockpile? How will waters that come into contact with the ore stockpile be managed?

**S10e- Hazardous Materials Management Plan**

1. **Section 2.2 (S10e)-** It was stated that the hazardous materials management procedures "*will be reviewed by MHBL and revised as required to reflect all implemented and projected changes to the HMMP, to correspond with new information and latest technology*". What is the proposed frequency for review of the procedures and/or what would constituent the review of the procedures? How will any changes be communicated to the Board?

2. **Section 2.4.3 (S10e) -** The plan to dispose of assay lab crucibles includes storage in a drum and on a yearly basis "*disposed of through burial in the tailings solids within Tail Lake*" and "*covered by tailings solids*". What is the rational for disposing of the crucibles in this manner instead of an alternate method? Are these crucibles considered hazardous waste after use?

3. **Section 2.4.4 (S10e)-** It was stated that "*plywood boxes used to contain sodium cyanide bulk bags will be burned at an approved burn site on the property to prevent this wood being used for other purposes*". How will the ash and any other waste from this burn product be managed to ensure there is no impact on waters while minimizing ash from blowing away from the burn site?

4. Select sections of the report (**S10e**) discussed emergency response and contingency plans, storage of fuel and disposal of waste and the landfill and landfarm. A brief description of these reports was provided; however, reference to the appropriate report and section number should have been provided for completeness.

**S10f- Explosive Management Plan**

1. **General** – In the first paragraph of the **Executive Summary** of the **Explosives Management Plan** (**S10f**) MHBL states "*The plan is provided in support of a water licence application by Miramar Hope Bay Limited for gold mine operation*", and further, introductory **Section 1.2** states that "*The explosives management plan will be cross referenced in other plans for mine operation including: training manuals (where appropriate); MHBL Hazardous Materials Management Plan: MHBL Emergency Response and Spill Contingency Plan; mine operating procedures (where appropriate).*" These two statements raise the following questions:

    a. Does MHBL believe that the use and fate of the plan is described clearly enough in this document?

    b. MHBL is invited to provide an explanation on how this plan is "*in support of the water licence application*" as stated in the **Executive Summary**.

    c. Does MHBL intend to make this document available for cross-referencing or does MHBL believe that a reference alone is sufficient?

2. **Section 1.2 (S10f)** – As noted above MHBL states "T*he explosives management plan will be cross referenced in other plans…including: MHBL Emergency response and Spill Contingency Plan*". However, upon review of the **Emergency Response and Spill Contingency Plan**, no such reference was found. Does MHBL intend to include the reference to the **Explosives Management Plan** in the **Emergency Response and Spill Contingency Plan**?

3. **Section 1.4 (S10f) –** Additional detail and discussion are requested to address each of the following:

    a. The temporary explosives storage site will be built directly on the frozen tundra, and as such, will be used during one winter season only "*with all explosives transferred to the permanent site by the end of the first winter season*." In the event that the permanent explosives storage facility is not completed by the end of the first winter, what course of action does MHBL suggest to take to prevent or minimize environmental impact to the tundra (through the definition of '*water*' outlined in the *NWANSRTA*) due to the presence of explosives stored on site? In other words, does MHBL believe that a contingency plan for this possibility is unnecessary?

    b. What contingency is in place in the event that the permanent explosive storage site is not available after the first winter season?

    c. Additional details of the temporary storage facility are requested to demonstrate that waters will not be impacted, which includes, but not limited to a brief site layout plan.

    d. The explosives storage and handling facilities are noted in the text to be shown on **Figures 1** and **2**. However, the drawings provided are numbered **S-04** and **G-02**. Clarification is requested.

e. In **Table 1-1** reference is made to the fuel laydown area, the temporary and permanent explosives area, the fuel farm, and the explosives mixing building. While the meaning of these areas and facilities are understood by the reviewer, consistency in terminology throughout the text, tables, figures, and drawings would facilitate understanding of the document. Does MHBL agree that a defined nomenclature assists Regulators through the assessment of application materials?

4. **Section 2.2.2.2 (S10f) –** Additional detail and discussion are requested to address each of the following:

    a. MHBL states in the first paragraph of this section that "*Although AN '(Ammonium Nitrate)' is classified as a hazardous product, its storage and handling at Doris North is not considered to be a significant risk activity.*" The NWB understands that this statement may imply that handling and storage of AN would not constitute a significant risk either to site personnel or to the surrounding environment. However, report **S10e** outlines safety procedures for the handling of this product. Clarification is requested as to why handling and storage of a "*hazardous product*" is not considered a significant risk to the surrounding environment.

    b. In the second paragraph of this section MHBL states that runoff from the AN storage pad will be absorbed by the pad itself or the surrounding tundra. Does MHBL believe that absorption of AN by the tundra does not represent a significant environmental impact? If so, how and why is this so? Also in the event runoff transports sediment MHBL states that "*temporary silt curtains can be placed in the water path to screen sediment*". Are there circumstances where screening sediment from runoff from the AN storage pad would not be required?

    c. In paragraph four of this section MHBL states that "*empty bags*", of AN, "*will be shaken clean at the point of use*". For purposes of adding to the application record what happens with the AN residue once it is "*shaken*" from the bag?

5. **Section 2.2.6.1(S10f) –** In **Table 2-1,** in the column headed "*Response*", the explosive chemicals spill response is described repeatedly as "*clean up*". How is the cleanup of potentially "*hazardous*" chemicals, which may cause adverse environmental impacts, achieved? To what level will clean up be completed to? Are different methods used for each of the explosive chemicals noted?

6. **Section 2.2.11 (S10f) –** MHBL states in paragraph one of this section that "*the supplier will be consulted on the appropriate handling and disposal*" for explosives identified as deteriorated or damaged. Is there any advantage to discussing appropriate handling and disposal methods with the suppliers of the various explosive materials prior to the arrival of such on-site?

**S10g- Landfill Design and Management Plan**

1. Report **(S10h)** was not signed for authorship and professional approval. The NWB requests that this design report be signed and sealed by the responsible professional.

2. **Section 3.0 (S10g) –** The NWB understands that the landfill will be constructed within a rock quarry and the bedrock will undergo preparation to ensure gradation to facilitate surface water drainage. The NWB requests clarity on the following:

    a. For purposes of adding to the application's record, is the quality of the rock high so that leachate from the waste does not penetrate into the subsurface through fractures?

    b. It was stated within the design report that the surface within the landfill will be "*graded at approximately 1% in the down slope direction*"; however, engineered drawing **S-13** (or **Drawing #2** within **S10g**) depicts a graded slope to 0.5%. Clarification is requested to address this inconsistency.

3. **Section 3.0 (S10g) –** The NWB understands that containment berms will be constructed to divert storm and melt water away from the landfill. Does MHBL agree that if the containment berms will divert surface waters from entering the landfill, they will also serve the function to divert surface waters within the landfill to the pollution control sump? Additional detail and discussion are requested to address each of the following:

    a. Details of the berm cross-section are not visible in engineered drawing **S-14** Typical Landfill **Section A-A'**. Additionally, **Section A-A'** does not contain a berm on the east edge of the landfill as is depicted in engineered drawing **S-13**. The NWB requests comment from MHBL on this issue.

    b. What is the material type(s) used in the berm and dimensions?

    c. If MHBL believes containment berm serves the function of diverting waters from entering and leaving the landfill facility then what berm design features (e.g., liner, low permeability material, etc.) will ensure that this design function, and thus, containment of leachate, will be achieved?

    d. **Report S2, Section 4.16** stated that "*the landfill will be completely hydrologically isolated via a set of containment and barrier berms*". The NWB requests additional information such as a topographic map delineating surface water drainage patterns around the landfill cell along with catchment area(s) and discussion to compliment this topographic map and detail the quoted claim above.

    e. **Report S3 Section 10.2.22** stated a "*1.0 m diversion berm built from Selected Subgrade material will be constructed around the landfill to ensure external surface runoff does not enter the landfill area*". The NWB understands that according to **Drawing G-05**, Select Grade material is comprised of a sandy gravel to gravel with some sand. These details were not provided in the design report **S-10g**. With consideration given to, as the NWB understands, the high hydraulic conductivity of this material, discussion is requested on how berms comprised of this material will hydrologically isolate waters from entering or leaving the landfill cell.

4. **Engineered drawing S-13 or drawing #2 within S10g-** A "*pollution control sump*" is depicted in the engineered drawing; however, the NWB understands that there is no description of the design of the pollution control sump within report **S10g**. What are the engineering characteristics and design limits of the "*pollution control sump*"? Additional information and detail of sump design are requested that include, but not limited to, the following:

    a. The engineered drawing does not provide dimensions of the sump. What are the engineered dimensions of the sump and containment volume?

    b. Details of how the design capacity of the sump was determined are requested. With consideration given to all input water and snow sources that may include: specified storm event(s), snow-melt water, and snow drift and accumulation within the facility, etc., how was the volume of water and melted snow that enter the sump determined?

    c. What are the operations and management procedures MHBL plans to employ to ensure that the sump capacity is not exceeded?

    d. Within the **Monitoring and Follow-up Plan** report (**S10m**), it was stated that the water quality from the landfarm sump will be tested on a monthly basis and prior to any planned discharge during open water season and that "*no water will be discharged onto the tundra until water sampling has demonstrated that water is of sufficient good quality to meet discharge standards as established within the water licence*". Report **S10m** was not referenced in the **S10g**. Clarification and confirmation is requested to address how monitoring and discharge of landfill sump water will occur.

5. The NWB understands that the landfill is to contain non-hazardous wastes. Types of waste were provided in **Section 4.1** of design report **S10g**. Details of an approximate volume balance were not provided and thus details and discussion demonstrating that landfill capacity will contain the estimated amount of waste generated on site are deficient.

    a. Additional detail and discussion is requested to confirm and understand containment and that the proposed size of the landfill is of sufficient size, that includes, but not limited to, the following:

        i. Expected mass of waste to be landfilled on a yearly and cumulative basis with discussion on how these values were determined.

        ii. Estimated volume of waste and cover material with consideration given to estimated bulk (as-placed) density of waste and cover material.

        iii. Calculation of volume capacity of the landfill to contain waste and cover material, with consideration given to ensure stable slopes, placement, construction, winter storage area, access to the landfarm, etc. What are the expected heights for each yearly constructed cell?

        iv. Comparison of the expected required volume of waste and cover material to the volume capacity of the landfill.

    b. What contingency measures are in place to dispose of waste in excess of estimated volumes?

6. Additional detail and discussion is requested to address the following items with respect to landfill cover and related operations:

    a. **Section 4.0 (S10g) -** A graded cover has been specified to be placed before the winter period of snow accumulation. What material will be used as an annual cover?

    b. **Report S2, Section 5.10.1** states that "*at least once every three months, any open cells will be closed by covering them with a nominal layer of surfacing material, and a new cell will be started*". Details of cover application in the design report **S10g** included only the placement of an annual cover. Clarification is requested to address this inconsistency. If surfacing material is used every three months, what material type will be employed?

    c. **Report S2, Section 5.10.1** states that "*winter cells must be kept small such that a minimum amount of snow will be captured when the cell is closed*". Design report **S10g** stated that waste will be temporarily stored in the winter within the landfill area until final placement can proceed in the summer. Clarification is requested to address this inconsistency.

7. **Section 4.4 (S10g) -** It was stated that "*water will be collected within the landfill area*" and "*tested for the presence and absence of oil and grease*". If "*oil and grease are present in the samples, water contained within the landfill will be treated using water/oil filtration system before releasing onto the tundra*". Depending on the characteristics of the oil-water "*filter*" style separator, hydrocarbons may be removed from the waters removed from the landfill. Does MHBL agree that since the source of waste will be derived from a variety of locations, there is potential for the other dissolved contaminants and suspended solids to not be removed to acceptable levels by an oil-water "*filter*" style separator? The NWB requests MHBL discussion on the following:

    a. What are the typical characteristics of an acceptable oil-water "*filter*" style separator that would be appropriate for this application?

    b. Where will the water removed from the landfill be discharged?

c. What water quality criteria will the proposed method of discharge and fluid treatment ensure in this application? Will there be monitoring of the discharge prior to release be completed?

d. **Report S2 Section 4.16** stated that water from the landfill will be pumped out and clean water directed on to the tundra and contaminated water to a tanker and then on to Tail Lake. There remain some inconsistencies between report **S2** and **S10g** (described above) with regards to water collection and disposal operations. Clarification is requested to address each of the following:

i. Will waters collected in the landfill sump be tested before being pumped out?

ii. If so, what are the details of the testing program? If not, why not?

iii. What will be the practice employed to dispose of contaminated waters pumped from the landfill cell? For example, will it pass through an oil-water separator, or will it be collected by a tanker truck and then on to Tail Lake?

8. **Section 5.5 (S10g) -** It is proposed that clean wood and paper will be burned "*well away from the perimeter of the landfill*". What is a safe location and minimal distance from the landfill and landfarm to ensure damage to the geomembrane in the landfarm is not compromised?

9. **Section 5.7 (S10g)-** The NWB understands a final cover of clean rock has been specified to cover the refuse and surface contour the topography to blend into the surrounding terrain and to direct surface drainage away from the site.

a. What are the material specifications/type of the clean rock used for cover?

b. Has slope stability and surface drainage of the final elevations been considered? If so, what are the characteristics for construction of the final elevations that will ensure a stable slope? If not, why not?

c. Is there a minimum amount of final cover that is required to be placed over the waste and what is this amount? If not, why not?

d. What is the engineering design function of the cover material?

10. **Section 5.7 (S10g) -** It was stated that since "*this landfill does not contain any hazardous waste its closure plan does not require infiltration or thermal control*". Reference to the appropriate location within the Closure and Restoration plan is requested that may address the following issues. Additional detail and description is requested to address each of the following:

a. If waters are required to be collected from the landfill during active operation and the cover material does not control infiltration, how will controlled discharge of waters from the landfill be completed after closure?

b. If waters collected from the landfill during active operation are monitored for potential contaminants (e.g., oil and grease), will monitoring of waters from the landfill be completed after closure? If so, what are the long term monitoring plans? If not, why not?

c. Does MHBL agree that a landfill that does not accept hazardous waste still has the potential to generate a leachate that may not be acceptable for release into the environment? Further discussion on why "*infiltration or thermal control*" are not required for this landfill is requested.

11. **Section 2.10 (S10) -** It was stated that drill cutting are to be moved from drill location to an "*approved storage area on the property*". Will these cuttings be placed in the landfill? Clarification is requested on where drill cuttings will be stored.

**S10h- Landfarm Design and Management Plan**

1. **Report (S10h)** was not signed for authorship and professional approval. The NWB requests that this design report be signed and sealed by the responsible professional.

2. **Section 1.0 (S10h) -** It is stated that the "*proposed landfarm is relatively small, consistent with the mine size and underground operations mode, but could be expanded if required*". This statement suggests that consideration has been given to expected volume of soil to be landfarmed and appropriate sizing of the facility to accommodate contaminated soil; however details of a volume balance were not described in the design report. Additional information and detail is requested to address each of the following:

    a. Based on past and current experiences at mine sites and exploration camps, details of a volume balance are requested that includes, but not limited to, the following:

        i. Expected yearly and cumulative volume of contaminated soil entering the facility with details on how these approximate values and soil properties used in the analysis were determined.

        ii. Estimated yearly and cumulative volume of soil remediated within the landfarm and removed from the facility with details on how this approximate value was determined.

        iii. Expected volume of contaminated snow entering the facility with details on how this approximate volume was determined.

        iv. What height of freeboard has been provided in the design of the landfarm to ensure containment?

        v. Calculation of the total containment volume of the landfarm with consideration given to freeboard.

        vi. Calculation of the volume of soil and volume of snow that could be contained within the landfarm.

        vii. What volume of contingency is there in the design capacity of the landfarm to contain soil and contain snow if the estimates of soil and snow volume to be contained are not correct?

        viii. If the volume of soil or snow exceeds containment volume, how will these materials be managed to ensure containment of contaminants?

    b. The statement aforementioned in **Bullet 2** detailed that the landfarm "*could be expanded if required*". Adaptive management of this nature requires a complete understanding of the engineered design limits (e.g., containment volume) of the facility with fully defined alternative contingency scenarios defined with appropriate quantifiable triggers on when a change in original design and management. Additional information is requested to address each of the following:

        i. With consideration given to construction timelines, anticipated site specific conditions, and anticipated receiving volumes of contaminated soil and snow, what quantifiable marker(s) and value(s) will be used to trigger the requirement to expand the landfarm?

        ii. Will expansion of the landfarm remain enclosed within the landfill containment berm area?

        iii. Since the landfarm is located within the landfill containment berm area, how has the potential expansion of the landfarm been considered in the design,

management, and operation of the landfill? This issue was not addressed in the landfarm or landfill design reports.

3. **Section 3.0 (S10h) -** The NWB understands that there may be inconsistency between the submitted documents and engineered drawing (**S-14** or **Drawing #3** within **S10h**). Clarification is requested to address each of the following inconsistencies:

    a. There is no mention of the use of geotextiles to be place on each side of the HDPE liner within report **S10h** as is depicted in the engineered drawing. Will geotextiles be used in design as depicted in the engineered drawing **S-14**?

    b. The terms used to define the soil types, such as "*crushed quarry rock*" and "*fine crushed rock"* used in report **S10h** are not consistent with the terms used in engineered drawing **S-14** or as-specified in report **S3 Section 7.0 Fill Material Specifications**. The NWB requests clarification to clear any potential confusion and ambiguity between documents.

    c. Report **S10h** states "*A pad of crushed quarry rock will be laid down to provide a bermed area for the landfarm. Finer crushed quarry rock will then be placed on the pad to provide a suitable bedding layer for the HDPE impervious liner*". Engineered drawing **S-14 Detail 1** depicts a nominal surfacing layer of ~0.1 m below the geomembrane and overlying the bedrock. What are correct details for material placement below the geomembrane?

    d. Report **S10h** states "*A ramp will be constructed of crushed rock to allow vehicles to enter and exit the landfarm without damaging the containment berm. More fine crushed rock will be placed on top of the liner to protect it from damage from vehicles delivering contaminated soils to the landfarm will be placed by hand so as not to damage the liner. An additional approximate 30 cm of fine crushed rock will be placed with a small crawler or wheeled dozer*".

        i. From above, the NWB understands that total cover thickness over the geomembrane would be 0.45 m. Engineered drawing **S-14 Detail 1** depicts a material thickness above the geomembrane to be 0.2 m. Clarification is requested to address the inconsistencies between the document text and the engineered drawing.

        ii. Reference is given to placement methods for materials above the liner, such as "*by-hand*" and use of a "*small crawler or wheeled dozer*". Are these specifications specific to construction of this facility and in addition to that provided in report **S3 Section 8.3** and **Section 9.0**? Is MHBL committed to placement of this material by hand?

    e. Report **S10h** stated "*Should heavier equipment be required to service the landfarm, additional fine crushed rock or soil will be placed over the HDPE liner prior to use of the area for soil decontamination*". This statement is an adaptive management strategy that requires further clarification of the technical specifications required for additional HDPE protection (e.g., thickness for each material type used), or reference to applicable specification if provide in a separate document.

    f. The access ramp is potentially an area with heavy traffic, clarification is required if Technical Specification **8.3.1(7f)** in report **S3** is applicable for this design? If not why not?

4. **Engineered drawing S-13 or drawing #2 within S10h-** A "*pollution sump*" and "*temporary storage area*" are depicted in the engineered drawing; however, there is no description of the design of the pollution sump or the purpose/design of the temporary storage area within report **S10h**. Clarification is requested to address each of the following:

a. What are the engineering characteristics and design limits of the "*pollution sump*"? Additional information and detail of sump design are requested that include, but not limited to, the following:

    i. The engineered drawing depicts a dimension of 1 m by 1 m area for the sump, but the sump depth is not provided. What are the approximate engineered dimensions of the sump and containment volume?

    ii. How is the sump integrated into the construction of the liner? Additional detail, potentially with an engineered drawing, is requested.

    iii. Details of how the design capacity of the sump was determined are requested as insufficient description and discussion was not included. With consideration given to all input water and snow sources that may include: specified storm event(s), moisture conditioning of the landfarm soils, contaminated snow-melt water, and snow drift and accumulation within the facility, how was the volume of water and melted snow that enter the sump determined?

    iv. How will non-contaminated snow and drifted snow that accumulates within the landfarm be managed?

    v. What are the operations and management procedures to ensure that the sump capacity is not exceeded and saturate the landfarmed soil and alter the design moisture content of the contaminated soils?

b. All details with regards to the purpose, design intent, operations, and management of the temporary storage area are requested.

c. The temporary storage area does not include a sump to remove any accumulated liquid.

    i. The NWB understands that it may be assumed that any water that may accumulate within the temporary storage area will drain through the unlined berm inside the landfarm and enter the pollution sump. The NWB requests MHBL clarification.

    ii. If no to above, how will accumulated fluid be removed from the temporary storage area?

5. Throughout the landfarm design, landfarming experiences brought forward from the Boston (Water Licence **NWB1BOS0106**) and Windy (Water Licence **NWB2HOP0207/B1**) camps have been used to assist in detailing how the Doris North landfill is designed and operated. This is shown through the following:

    - **Executive Summary** and **Section 1.1**- "*The design and proposed management are based on successful landfarms operated at the Boston and Windy exploration camps operated by MHBL*"

    - **Section 3.0** - "*A mixture of ammonium nitrate and corn cobs will be used as a bacterial medium and mixed with contaminated soil as it is placed within the landfarm. This medium has proven to have worked successfully at the nearby Boston and Windy exploration camps over the 2005 and 2006 summer seasons*".

    - **Section 3.0** - "*Any standing water in the landfarm will be passed through an oil-water "filter" style separator prior to release to the environment (a similar unit is in operation than the Boston and Windy Camp landfarm facilities). Normally, water should be adsorbed by landfarm soil*".

    Additionally, within **Section 6.8** of report **S10a** it is stated "*Two approved Land Treatment Area (LTA) are currently in operation on the Belt. One is located at Boston Camp and the*

*other is located at Windy Lake camp. Petroleum contaminated top soil will be removed and placed in these LTA for treatment*"

It is the NWB's understanding that the landfarms at the Windy and Boston exploration camps are unlicensed facilities. The following correspondence has been issued communicating the need to license these facilities:

- Oct 27, 2005 NWB to MHBL (**RE: Acknowledgement Annual Report 2004**)- "*The NWB generally requires that Landfarm facilities be operated under a water licence….the Licensee incorporate the Land Treatment Area (Landfarm) into the current Licence through application for amendment to be submitted as a stand alone amendment or in conjunction with other foreseeable changes required. This application should be submitted at least four (4) months prior to active monitoring in 2006*."

- July 12, 2006 INAC to NWB (**RE: 2BE-HOP –Miramar Hope Bay Ltd. – Hope Bay Project – 2005 Annual Report**)- "*The 2005 Annual Report states that exploratory drilling activities have commenced in the project area and that the Windy Lake Camp has a land treatment area for the remediation of soils contaminated with petroleum hydrocarbons. The project's licence permits water use for domestic purposes only. In light of these water use activities, INAC recommends that the project's licence be revised to incorporate the terms and conditions necessary for the water use and waste disposal activities practiced by the proponent*".

**Currently the NWB has yet to receive a licence application for the above listed landfarms. Through this letter document the NWB is notifying Regulators on references to the Boston and Windy landfarms in the Doris North application and the correspondence provided by the NWB and Regulators to MHBL in the recent past for Regulator advisement and action on the issue.**

6. **Section 3.0 (S10h)-** It is stated that a "*mixture of ammonium nitrate and corn cobs will be used as a bacterial medium and mixed with contaminated soil as it is placed within the landfarm*". With regards to this operation, additional detail and discussion are requested for each of the following:

    a. What are the specifications for ammonium nitrate concentration, application rate, method of application, operator requirements, etc. associated with operation with details on their selection?

    b. What is the required or target mass/volume of corn cobs to be mixed with contaminated soil (i.e., density of corn cobs per unit volume of soil) with details on how this was determined?

    c. Will the required amount of corn cobs always be available for use in this application? If not, what contingency measures are in place and what are the details of this contingency measure?

    d. Drawing upon experience in design and operation from past projects is advantageous. However, without providing fully documented design and operations description or comparisons of similarities and differences between past design and operations to the proposed design and operations, and quantifiable data to justify the term "*successful*", demonstration that the proposed design will be "*successful*" may not be fulfilled. If past experience is relied upon for the proposed design and operations, additional information and detail are needed to detail and demonstrate the applicability.

    e. It was further stated that the "*bioremediation medium will be added as needed during the biodegradation process*".

        i. What are the required application specifications for adding additional bioremediation medium during biodegradation process?

ii. What criteria will be used to benchmark when the bioremediation medium should be applied is required through this adaptive management strategy?

f. It is understood that mixing of the soil is routinely employed to minimize the potential uneven biodegradation with depth in the landfarmed soil.

i. Will soil be mixed to maximize even biodegradation?

ii. How does the penetration depth of the equipment used to mix the soil (i.e., plow or till) compare to the expected thickness of soil landfarmed, which depending on freeboard requirements may be less than the height of the containment berms? Will the method employed ensure a well mixed soil?

iii. If the soil is not to be mixed evenly, how does this impact the proposed density of soil sampling of one composite of ten samples per 25 $m^3$, which was stated to be "*sufficient when soils have been well mixed during the decontamination process*"?

g. Within the **Main Application Document**, it was stated that incinerator ash if uncontaminated "*will be mixed into any soil undergoing remediation within the landfarm*". Details pertaining to this operation were not provided in report **S10h**. Further detail is requested to address this operation process and mixing ratios.

7. **Section 3.0 (S10h) -** Further description and clarification is requested to address each of the following items with regards to landfarm operation:

a. Tilling of the soil was specified to occur when it is dry enough. Is this based on equipment operation constraints? Further clarification on how "*dry enough*" will be determined is requested.

b. Mixing of clean and contaminated soil has been proposed to keep the average hydrocarbon fuel content in the soil below 5%.

i. Does "*clean*" mean soil that has no hydrocarbon content? If so, what is the source of the clean soil? If not, does "*clean*" refer to soil that is currently landfarmed and potentially partly bioremediated?

ii. What testing will be completed to determine the soil hydrocarbon percentage entering the facility? If no testing will be completed, what procedures will be implemented to ensure a mixture of soil will have hydrocarbon content below 5%?

c. Soils will be kept moist to a target soil moisture content of 15 to 30% on a weekly basis during summer months.

i. Will moisture content be measured according to **ASTM D2216** – Water (Moisture Content) in Soil and Rock? If not, what standard will be employed?

ii. What are the method of moisture addition and source of the water used for moisture conditioning?

d. It was stated that "*any standing water in the landfarm will be passed through an oil-water filter style separator prior to discharge to the environment*".

i. What situations would cause standing water to be within the landfarm?

ii. If standing water occurs within the landfarm, what measures are in place to ensure that it is temporary so as to not impact the biodegradation process?

iii. Depending on the characteristics of the oil-water "*filter*" style separator, hydrocarbons may be removed from the waters removed from the landfarm. However, since ammonium nitrate is being applied to the landfarmed soil and the contaminated soil source will be derived from a variety of sources, there may be a potential for the other dissolved contaminants and suspended solids to not be removed to acceptable levels by an oil-water "*filter*" style separator.

1. What are the typical characteristics of an acceptable oil-water "*filter*" style separator that would be appropriate for this application?

2. Where will the water removed from the landfarm (i.e., standing water or collected from the sump) be discharged?

3. How will the proposed method of discharge and fluid treatment minimize impacts to water (as through the definition of '*water*' in *NWANSRTA*)?

iv. Within the **Monitoring and Follow-up Plan** report (**S10m**), it was stated that the water quality from the landfarm sump will be tested on a monthly basis and prior to any planned discharge during open water season and that "*no water will be discharged onto the tundra until water sampling has demonstrated that water is of sufficient good quality to meet discharge standards as established within the water licence*". Report **S10m** was not referenced in the **S10h**. Clarification and confirmation is requested to address how monitoring and discharge of landfill sump water will occur.

e. It was stated that "*ultimate degradation rates are site-specific and cannot be predicted*". Within the **Hazardous Materials Management Plan** (**S10e**) it was stated that "*sampling will be done to assess the effectiveness of the cell under different climatic conditions*". Further details into how "*effectiveness*" will be determined with respect to soil remediation rates and climatic conditions are requested.

8. **Section 4.3 (S10h)-** With regards to environmental monitoring, additional detail and clarity are requested to address each of the following:

a. In the event of an uncontrolled release of water from the landfarm, it was stated that the landfarm is contained within a "*controlled drainage area (Quarry 2) where any accidental release can be captured and treated*".

i. What is the site drainage pattern in the vicinity of the landfarm and the capture point for Quarry 2 catchment area? Reference to the appropriate document and section is requested to clarify this statement.

ii. In the event of water release from the landfarm, what procedures will be implemented to collect and treat the water?

b. It was stated that "*soil samples will be collected and tested for BTEX and **CCME PHA's***." What is the frequency of soil testing?

9. **Section 4.4 (S10h) -** During landfarm closure, it was stated that "*bedding rockfill (below the geomembrane) will be tested for presence of petroleum hydrocarbons…*". What procedures will be employed to ensure a representative sampling of the entire landfarm footprint? Has this information been included in the **Mine Closure and Reclamation Plan (S10l**)? An appropriate reference is required to interconnect these documents.

10. **Section 4.4 (S10h) -** At landfarm closure the facility will be disassembled and the various soil materials contained within the landfarm and comprising of the landfarm structure will be disposed of in the stated locations. The landfarm and landfill are intimately connected through a shared berm. The potential interactions of landfarm closure on landfill performance and closure were not discussed. Additional detail and discussion are requested to address how landfarm decommissioning may impact landfill performance and decommissioning. Has this information

been included in the **Mine Closure and Reclamation Plan (S10l)**? An appropriate reference is required to interconnect these documents.

11. Additional detail and discussion is requested into how the liner integrity is checked following construction?

12. Upon consulting the **Hazardous Waste Management Plan** (**S10e**)**, Section 3.5** there were inconsistencies with the **Landfarm Design and Management Plan** (**S10h**). Further detail and discussion is requested to address the following items:

    a. In report **S10e**, it was stated that the landfarm will be no more than 2 m deep. Drawing **S-14** shows the berm height of the facility to be 1 m. With consideration given to freeboard height, what is the maximum soil depth?

    b. In report **S10e**, it was stated that after the soil is remediated, it "*will be removed and transferred to the landfill*". However in report **S10h**, it was stated that remediated soil will be used for reclamation. What is the end use of remediated soils?

    c. In report **S10e**, it was stated that "*if the harsh climatic conditions at the Doris North Gold Mine site inhibit natural biological activity, special bacteria may be introduced*". There is no mention of applying "*special bacteria*" to the landfarmed soil within report **S10h**. Additional detail and discussion is requested to address this matter. Will "*special bacteria*" be applied, and if so, what are the details of this process?

    d. In report **S10e**, it was stated that the landfarm "*will be operated in accordance with Nunavut government guidelines*". These guidelines were not referenced in the design report **S10h**, why not? What is the complete reference to this guideline?

13. Design report **S10h** did not include any details of how the geomembrane and geotextile product specifications provided in report **S3 Section 8.2.4** were considered in the design of the landfarm. Additional detail and clarification are requested to address how the product specifications of the geosynthetics a) ensure protection of the geomembrane from damage/puncture during construction and operation loadings, and b) considered in the anchor trench design.

**S10i- Tailings Management Plan**

1. The NWB understands that there is interconnectivity between the **Tailings Management Plan** (**S10i**), **Water Quality Model** (**S6**), and **Tailings Containment Area Design** (**S1**). Generally, the NWB understands that the discharge volume into Doris Creek will impact the required volume of Tail Lake water and therefore the elevation of the dams. Does MHBL agree that if there is a change in the management strategy to discharge waters, it will in turn, impact the water quality in Tail Lake and the storage of waters in Tail Lake? Currently, the NWB understands that the management plan uses MMER limits to control how much water is decanted from Tail Lake. The NWB understands that the rate of discharge may be controlled, in part, by ensuring CCME limits are achieved at a location downstream of the effluent end of the decant pipe from Tail Lake and downstream of the Doris Creek waterfall. Does MHBL agree that if the location for CCME limit compliance point is moved from a location downstream of the waterfall in Doris Creek to the point where Tail Lake waters enter Doris Creek, that current management strategy for water discharge and design of the tailings containment area and dams would require re-evaluation to assess adequacy? The NWB requests detailed discussion from MHBL to add to the applications record and address the above.

2. Report **S10i** was not signed for authorship and professional approval. The NWB requests that this design report be signed and sealed by the responsible professional.

3. Minimal details linking the management strategy for discharged water from Tail Lake presented in report **S10i** to the water quality modeling results in report **S6** was provided. The likely intent of the water quality model may be the assessment of appropriate management for discharge of waters from Tail Lake to Doris Creek. However, an empirical method to deduce Tail Lake

discharge rate and Doris Creek concentrations at the monitoring point is presented and suggested for use to manage waters. Additional detail and discussion is requested into how water quality modeling was used to define the planned water management strategy outlined in **S10i**.

4. **Section 4.1 (S10i) -** It was stated that "*Tail Lake water management strategy is to meet CCME guidelines for parameters of concern to protect freshwater aquatic life in Doris Creek, downstream of the waterfall*".

    a. Details and reasoning are requested on how and why MHBL has determined the location of the recommended compliance point to achieve CCME guidelines (which is located downstream of the waterfall in Doris Creek).

    b. Since Tail Lake discharge will occur upstream of the waterfall in Doris Creek and monitoring will be completed downstream of the waterfall, the management strategy may be relying on dilution within Doris Creek to reduce concentrations compared to decant. As a result, there are locations in Doris Creek that may exceed CCME water quality guidelines. Why has MHBL not recommended the end of pipe water quality as the point of compliance for CCME guidelines?

    c. If water quality downstream of the waterfall in Doris Creek does not achieve CCME guidelines what contingency or mitigating measures are in place to control downstream impacts? What contingency and mitigating measures are in place if the predicted concentrations at the downstream monitoring point do not achieve CCME guidelines for water quality?

5. **Section 4.3 (S10i)-** A method to determine discharge rate into Doris Creek from Tail Lake was outlined and may be based, in part, on dilution within Doris Creek and background, discharge, and CCME water quality concentrations.

    a. It was stated that the ADVR (Allowable Discharge Volume Ratio) will be calculated for copper and "*other key parameters*". Clarification is requested into what key parameters will be used to assess minimum ADVR?

    b. The water quality modeling within report **S6** identified that select water discharge scenarios had copper, nitrite, chromium, and selenium exceeding CCME guidelines. Will all of these parameters be included as some of the "*other key parameters*" to calculate ADVR? If not, why not?

    c. It was stated in report **S6** that discharge rates are based on metal concentrations in Doris Creek. Additionally, it was stated that nitrite may exceed CCME guidelines within Doris Creek. Nitrite is not a metal but does MHBL agree that it may impact aquatic environment? Will nitrite be considered as one of the "*other key parameters*"?

    d. A Target Discharge Rate (TDR) may be calculated based on the flow rate in Doris Creek, minimum ADVR, and a 20% reduction which acts as a factor of safety. The NWB requests additional detail on how Doris Creek flow rate will be measured and the location of measurement to ensure representative conditions in Doris Creek.

    e. Additional detail into the planned strategy for discharge duration is requested. For example, will discharge only occur for a set number of hours per day and discharged each day of the month? Specifics are needed to add to the application record.

    f. According to **Table 1** within report **S10m**, water quality will be monitored every two days during discharge. What frequency will the Target Discharge Rate be adjusted during the discharge period?

6. **Section 4.4 (S10i) –** The NWB understands that discharge from Tail Lake will be controlled by a PLC and will be measured over a flow range of 50 to 275 L/s. Does this range of measurable

flow rate encompass all potential discharge scenarios outlined in report **S6**? The NWB requests comparisons of discharge rates from Tail Lake to the measurable range?

7. **Section 4.4 (S10i) -** MHBL stated that the method of discharge "*will not lead to erosion or degradation of the creek bed*". Further clarification is requested on how erosion and degradation of the creek bed will be prevented and what measurements will take place to assess the potential for erosion and degradation of the creek bed at the discharge location.

8. **Section 4.4 (S10i)-** The NWB understands that the addition of waters from Tail Lake to Doris Creek during controlled discharge may impact the regular conditions in Doris Creek downstream of the pipe outlet. Does MHBL agree that depending on the discharge rate from Tail Lake to Doris Creek, the added volume of water conveyed within Doris Creek compared to normal conditions may increase the potential for erosion and bank stability at locations downstream of the discharge point? The NWB requests additional information regarding the following:

    a. How does the expected flow in Doris Creek during discharge compare to the normal and freshet flow rate measured and outlined in **S5**?

    b. With consideration given to the comparison outlined above, what is the potential for erosion and bank instability as a result of controlled discharge from Tail Lake?

    c. What monitoring measures are in place to assess erosion and bank stability along Doris Creek during controlled discharge?

    d. If erosion and bank stability along Doris Creek are impacted by discharge from Tail Lake, what measures will be implemented to mitigate these effects?

9. **Section 4.5 (S10i) -** MHBL stated that "*commencing with the start of tailings deposition, Tail Lake will be monitored an additional two weeks every second day*", and that as the dynamics of the system becomes better understood, "*the frequency of monitoring could be reduced*".

    a. Where is the sample location for Tail Lake water? If this location is not at the intake pipe location of Tail Lake, details are requested on how representative the sample water quality will be to the intake location.

    b. What is being referred to with respect to "*monitoring an additional two weeks*"? How does this frequency compare with **Table 1** in report **S10m**?

    c. Within **Table 1** of report **S10m** it stated that location of water quality monitoring will be at the end of the discharge pipe, as well as, upstream and downstream of the discharge point. All three sample locations will be tested every second day during annual discharge period during operation, closure, and post closure. Clarification is requested to establish if the stated water quality sample location, monitoring, and frequency location in report **S10i** is consistent with report **S10m**.

    d. What criteria will be used to benchmark if the dynamics of the system are understood to establish a reduction in monitoring frequency?

10. **Section 4.5 (S10i) -** MHBL stated discharge from Tail Lake will commence "*only if the water meets MMER criteria*".

    a. Where is the sample location for Tail Lake water? If this location is not at the intake pipe location of Tail Lake, details are requested on how representative the sample water quality will be to the intake location.

    b. What is the basis of the water management decision to achieve MMER criteria in Tail Lake discharge waters, but not achieve CCME guidelines for Tail Lake discharge waters?

11. **Section 4.5 (S10i) -** MHBL stated that the "*actual water quality in Tail Lake will regularly be compared with the predicted water quality to assess the accuracy of the model*".

a. Where will the comparison of predicted and measured concentrations be documented and how will it be submitted to the Board?

b. What is the frequency of assessing the accuracy of the model?

c. Will the comparison of predicted and measured concentrations be used to assess the validity of model assumptions and site specific input parameters? If so, what specific model input parameters and model assumptions are to be checked? If not, why not?

12. **Section 4.5 (S10i) -** It was stated that "*if necessary, the model may be recalibrated to the actual water quality observed in Tail Lake*".

    a. Is this a commitment that the model will be rerun? If so, what will be the basis to decide when to rerun the model?

    b. What criteria will be used to benchmark if calibration of the model to site conditions is necessary?

    c. Given that many of the input parameters applied to the model are estimates (The NWB understands that many are self proclaimed conservative values) and the model assumes, as understood by the NWB, complete mixing in Tail Lake, the latter of which would promote dilution and potentially lower concentrations compared to actual, what degree of confidence is there that the model will accurately predict Tail Lake water?

    d. Does MHBL agree that there is uncertainty in the input data to the model and also uncertainty in the model assumptions? How has this been considered in whether model calibration is needed?

13. On **Page 66** of the **Main Application Document**, it was stated that a human health and ecological risk assessment will be completed to determine if the quality of water contained in Tail Lake is suitable for release in an unregulated fashion. Details of this assessment were not provided in the **Tailing Management Plan (S10i)** or **Water Quality Model (S6)**. What will benchmark when a study will be completed? What parameters are of concern?

14. On **Page 69** of the **Main Application Document**, it was stated that a water treatment plant could be implemented as a contingency if Tail Lake water quality is unacceptable for discharge. Additional details to benchmark when this adaptive management strategy is to be implemented are requested. Additionally, where will the treatment plan be located and will it be capable of treating the required discharge volumes to effectively manage Tail Lake waters?

15. On **Page 87 Section 6.3** of the **Main Application Document**, there is a description of the discharge strategy from Tail Lake that is not discussed in the **Tailings Management Plan (S10i)** or **Water Quality Model** (**S6**) reports. Of particular interests was the management of discharge waters from Tail Lake to Doris Creek, specifically the following:

    a. Site specific copper concentrations are recommended for use as a discharge limit. The NWB understands that this recommendation was not considered in the management plan for water discharge in supporting documents. Why not? What impact does this have on the discharge water management strategy outlined in the supporting documents?

    b. **Table 6.2** provided proposed water licence discharge standards for end of pipe water quality from Tail Lake. Additional detail is requested on how the proposed discharge concentrations were generated. **Table 6.2** provides limits for "*average allowable concentration*". Clarification is requested on how many samples and frequency rate of sampling will be used to calculate the average concentration? How come this information wasn't provided in the supporting documentation?

    c. The NWB understands that MHBL stated that the proposed discharge limits for CN and ammonia were based on a 10x dilution ratio to ensure that CCME guideline values will be

achieved within Doris Creek. How was this dilution ratio determined to be effective? What impact does this ammonia concentration have on nitrate and nitrite concentration in Doris Creek? Nitrite has been identified as a parameter that may exceed CCME limits in discharged waters. What is the rational for no including a discharge limit for this parameter in **Table 6.2**?

**S10j- Water Management Plan**

1. Although MHBL has stated that **S10j** is a "*living document and will be reviewed and updated periodically during the mine life*", the submitted Water Management Plan appears to be incomplete as presented. What is the proposed frequency for review of the document and/or what would constituent the review of the document? How will any changes be communicated to the NWB? The NWB requests detailed discussions involving the management of the fresh water, wastewaters (combined tailing slurry), reclaim water and underground mine discharge water, and the water management of infrastructures such as access roads, camps/mill pads, landfill and landfarm (channels, culverts, sumps, natural depressions) to be included in the **Water Management Plan (S10j)**.

2. Discussions formulated on storm water management, grey water management, and the management for snow melt and storm water collected with in fuel containment are not detailed sufficiently. The NWB invites MHBL to appropriately reference where this information may be found if it is present in another document. The NWB requests further details, including but not limited to, water quantity and quality, operations strategies and practices. The submitted Water Management Plan uses infrastructure water management for the Tail Lake, and water flow management for storm water, grey water and snow melt. However, it fails to identify all the components of the water management system and address each of them clearly. MHBL may find it of use to provide this information (in reasonable detail) in a framework as follows:

| ***Objective*** | ***Minimize the impacts on the receiving waters*** | ***Quantity*** |
|---|---|---|
| | | **Quality** |
| Report Content | Sources | Site structures |
| | Pathways | Water flows |
| | Sinks | Water basins (receiving waters) |
| Report Format | Description | Site descriptor |
| | Visualization | Map delineation |
| | Detail discussion | Major concerns |
| | Brief discussion | Minor concerns |

MHBL is also invited to provide sufficient detail in how the construction and operation phases have been considered in site water management.

3. The design and operation of the waste water treatment plant was not provided in this report. MHBL is invited to appropriately reference where within the application detailed discussion and sufficient specifics to wastewater treatment may be found if they have been provided. The effluent waters and sludge waste from this process may impact water quality on site. The NWB requests a complete design and detailed operations of waste water treatment and sludge management proposed for the Doris North mine site.

4. Additional detail and delineation of the water courses on a site map with an appropriate scale that adequately connects and interlinks sources and receptors drainage (including, but not limited to, water intake, reclaim water, and drainage) is requested of MHBL.
5. Both the effluent and sludge of the sewage treatment will be discharged to the Tail Lake (**Section 3, Page 1**). Does MHBL believe that this is an acceptable sludge management strategy? How will sludge be managed during mine construction, operation, and post-operation stages?

6. Appropriate referencing and connecting to other application reports is requested for the following sections:

- Modular sewage treatment plant and modular packaged biological treatment (plant) (**Section 3, Page 1**)
- Filtration system for removing hydrocarbons of surface run-off from work area of the fuel transfer station and the fuel tank far facility (**Section 4, Page 1 and 2**)
- *"Monitoring results to date suggest that significant changes in the background water quality in Doris Creek occur over periods of weeks rather than days"* (**Section 3.1, Page 2**).
- Active discharge period (**Section 3.1, Page 2**).
- Documented internal quality control program (**Section 3.2.3.1, Page 5**).
- Other key parameters for the calculation of the ADVR (**Section 3.2.7, Page 8**).
- The approximate discharge location in **Dwg G-02** (SRK 2006a) (**Section 3.2.8, Page 8**), and what is SRK 2006a?

7. Tail Lake water management included the option of phosphorous/nutrient addition and erosion control measures. What are the decision criteria details and quantitative benchmark that will be used to assess when phosphorous addition and erosion control will be implemented? What are the details of these operations?

**S10k- QA/QC Plan**

1. It is stated that the procedures are applied to water samples for both the purposes of regulatory compliance monitoring and due diligence (**Page 1**). However, **Section 2.2** (**Sampling Locations and Frequency, Page 3**) only addresses the Surveillance Network Program (SNP) sampling stations. MHBL is requested to provide additional information on the water sampling locations for the purpose of due diligence.

2. The Plan provides two tables showing the sample containers for each analysis (**Table 1, Page 4**) and sample preservation (**Table 2, Page 7**). The parameters to be measured may be inconsistent with the parameters to be analyzed and stated in the **Water Management Plan S10j** (**Table 1 3.1, Page 6**). The NWB requests clarity and discussion on this issue.

3. The Plan is for water sampling protocol only and does not include on-site laboratory QA/QC protocol. Does MHBL agree that the document title should be changed to reflect that it is only for water sampling only?

4. What standard methods are being used to complete the desired water quality testing?

5. Are standard methods being employed for sample collection? If so, what method? What is the rational and impact for not filtering water samples on site before submission to the laboratory for analysis? What is the approximate expected holding time between sample collection and sample testing, and how does this holding time impact the measured results?

**S10l- Mine Closure and Reclamation Plan**

As detailed in the introduction in this letter document, MHBL has not provided the appropriate referencing needed to review individual reports as stand alone. At this time the NWB advises MHBL to include closure and reclamation elements identified in other sections in this letter if they are not present in the **Mine Closure and Reclamation Plan** (**S10l**) or to point the Reader/Reviewer to another document in the application through proper referencing. The NWB can not give global guidance on the **Mine Closure and Reclamation Plan** (**S10l**) until this referencing has been provided by MHBL. The following issues related to **S10l** are to be addressed by MHBL:

1. **Section 3.1.7 (S10l)** – Geochemistry: MHBL states that samples of rock from the Doris North deposit as well as from adjacent areas around the mineralized zone were tested by ABA analysis. It is stated that results of this testing as well as ABA testing on mill tailings material indicate that the majority of the mine waste has a low acid generating potential. MHBL is proposing to use rock from four quarries for use in construction of surface infrastructure such as building pads,

laydown areas, and roads; the Plan states tests on the proposed quarry material "is not likely to be acid generating or a source of metal leaching". However, the Plan does not document nor reference another document that includes the potential representativeness of material samples, the quantity of samples collected and tested, and details of the actual test results. Confirmation that MHBL has adequately characterized the geochemical nature of all future mine waste and construction (quarry rock) materials is critical for evaluating the technical feasibility of proposed reclamation plans for the Project's waste storage facilities and other infrastructure.

2. **Section 4.4 (S10I)** – Waste Rock Management: The Plan states that waste rock will be placed into a temporary stockpile located on surface and then returned into the underground mine as backfill during the mine life. Depending on the reactivity of the waste rock and length of time stored on surface, pockets of waste rock with elevated temperatures could develop and potentially lead to localized thawing of the permafrost surrounding the underground workings. This material, if placed near the active surface layer, could lead to localized settlement and potential development of sinkholes. Has MHBL given consideration to the above? The NWB requests that MHBL formally comment to the above and also provide any required references in their revision under this part interlinking waste rock management to **S10I**.

3. **Section 6.1.7 (S10I)** – Tailings Containment Area: The final closure for the Tail Lake tailings impoundment is a permanent water cover of 4.0 m above the highest tailings elevation in the impoundment. **S10I** states the following:

   "*Research has shown that a minimum stagnant water cover of 0.3 m is sufficient to prevent oxidization of tailings. Tailings, however, can be resuspended due to wave action induced by environmental factors, and therefore the rule of thumb is to design a water cover of at least 1.0 m thick. Based on the orientation of Tail Lake, the predominant wind direction, maximum wind speeds, and the particle size of the tailings, using the most conservative calculation method, and the worst case input variables, the maximum water cover would have to be 3.6 m*."

   **S10I** does not document nor reference another document that describes the method or inputs for calculating the minimum required water cover. In short, the inputs nor methods utilized for developing the Tail Lake tailings impoundment water balance is not included in **S10I**. An insufficient water cover over the tailings in the impoundment could have a negative impact on the quality of water discharging from Tail Lake over the short, medium, and long term. The NWB invites MHBL to appropriately reference all the information in the application that will assist a Reader/Reviewer in understanding the above through stand alone presentation.

4. **Section 6.1.7** (**S10I**) – Tailings Containment Area: In **S10I** MHBL states the tailings surface is expected to be below 24.3 m and thus, the minimum final water elevation in Tail Lake must be at 28.3 m. This corresponds to the pre-mining elevation of Tail Lake. **S10I** states that once the water quality in Tail Lake returns to background concentrations, the North Dam can be breached to allow Tail Lake to return to its pre-miming elevation. **Section 3.1.1** of **S10I** (Climate and Air Quality) states the mean annual precipitation ranges from 94 to 207.3 mm while the annual lake evaporation is estimated to be 220 mm; based on this information, the site experiences a moisture deficit on an annual basis. This brings into the question the sustainability of the elevation of Tail Lake remaining at 28.3 m over the long term; saying this, however, the inflow to Tail Lake from the upstream catchment may be sufficient to maintain this elevation on an annual basis. However, insufficient information and references are provided in **S10I** regarding the hydrology of the site. Has MHBL given consideration to the above? The NWB invites MHBL to appropriately reference all the information in the application that will assist a Reader/Reviewer in understanding the above through stand alone presentation.

5. **Section 6.1.7** (**S10I**) – Tailings Containment Area: **Section 4.1** (Project Summary) of **S10I** states the following:

   "*Tailings deposition will be sub-aqueous, requiring the construction of two water retaining structures: the North and South Dams. The tailings will be contained in Tail Lake by constructing a low permeability frozen core dam across the outlet of Tail Lake to the north and by a similar second dam constructed across a topographic low point at the south end of the lake.*"

No additional information is included in **S10I** regarding the design of the proposed South and North Dam. The final heights of tailings and water that will remain behind the North Dam are not documented in **S10I** nor referenced to a document with this information. In short, there is insufficient information to determine if the proposed North Dam will remain in a stable condition over the long term. MHBL states that the North Dam will be breached by the end of the ninth year following the cessation of mining; however, no details are provided on the actual undertaking of the breach and potential impacts this may have on the long-term stability of the tailings dam. The NWB requests a formal response to the above. Has the breach and potential impacts been considered? The NWB also invites MHBL to appropriately reference all the information in the application that will assist a Reader/Reviewer in understanding the above through stand alone presentation.

6. **Section 6.1.7 (S10I)** – Tailings Containment Area: **S10I** states the following:

   "*Predictive water quality modeling conducted in support of the Doris North environmental impact assessment process suggests that no further water treatment of the tailings containment area supernatant will be required in the post closure time period. The modeling suggests that natural processes (volatilization and dilution with snow melt and precipitation runoff) will within a short time period (three years) following the cessation of mining, allow for the unrestricted volume release of supernatant from the tailings containment area while still meeting water quality objectives in the Doris outflow watershed below Tail Lake*."

   **S10I** does not include nor reference other documents containing a description of the numerical model and inputs used as well as the actual model predictions. It is difficult to determine whether the proposed closure and reclamation plans for the Tail Lake tailings impoundment are technically feasible without reviewing and confirming the technical soundness of the predictive water quality modeling program. Thus an appropriate reference should be provided by MHBL. The NWB also invites MHBL to appropriately reference all the information in the application that will assist a Reader/Reviewer in understanding the above through stand alone presentation.

7. **Section 7.5 (S10I)** – Mine Waste and the Tail Lake Tailings Containment Area: **S10I** states the following:

   ***"****Water level modeling has been conducted to verify that the water cover can be maintained even following successive dry years."*

   **S10I** does not include nor reference other documents containing a description of the numerical or analytical model and inputs used as well as the actual model predictions. It is difficult to determine whether the proposed closure and reclamation plans for the Tail Lake tailings impoundment are technically feasible without reviewing and confirming the technical soundness of the predictive water level modeling program. Thus an appropriate reference should be provided by MHBL. The NWB also invites MHBL to appropriately reference all the information in the application that will assist a Reader/Reviewer in understanding the above through stand alone presentation.

8. **Section 7.5 (S10I)** – Mine Waste and the Tail Lake Tailings Containment Area: **S10I** states the following:

   "*It is assumed that pore water within the tailings will in time be similar to the overlying lake water due to the relatively shallow depth of stored tailings and water within the lake. A small volume of seepage may emanate from the Tail Lake tailings containment area, affecting shallow groundwater quality in the active layer in the immediate area. The effects will be localized to the Tail Lake outflow channel area and should in time be similar in quality to water draining through the spillway in the North Dam.*"

   The "*assumption*" that pore water within the tailings will in time be similar to the overlying lake water may or may not be reasonable. Insufficient information and references are included in **S10I** to back up this assumption.

**S10l** does not include nor reference other documents containing a description of the numerical model and inputs used for predicting the volume of seepage that may emanate from the Tail Lake tailings impoundment. The predicted seepage rates through and under the North Dam are also not included in **S10l**. The NWB requests a formal response to the above. The NWB also invites MHBL to appropriately reference all the information in the application that will assist a Reader/Reviewer in understanding the above through stand alone presentation.

9. **Section 7.6.5 (S10l)** – Water Quality and Aquatic Resources: **S10l** states the following:

   "*Predictive water quality modeling was conducted to predict how the project would affect water quality in the downstream aquatic environment during the mine's operating life. Metal leaching from the tailings has been tested and the data suggests that the tailings left in Tail Lake will not significantly contribute additional metal loadings into the Doris outflow and Little Roberts Lake watersheds in the post-closure period.*"

   As stated previously, the Plan does not include nor reference other documents containing a description of the numerical model and inputs used for predicting the post-closure quality of water in Tail Lake and downstream receptors. The NWB invites MHBL to appropriately reference all the information in the application that will assist a Reader/Reviewer in understanding the above through stand alone presentation.

**S10m- Monitoring and Follow-up Plan**

The NWB understands that the **Monitoring and Follow-Up Plan** (**S10m**) is a summary document that consolidates the monitoring commitments associated with various structures and operation components of the mine. A summary table of monitoring commitments has been provided and is a useful reference tool. The level of detail provided for monitoring requirements and location is minimal. Details pertaining to specific structures and operation components are provided in individual reports (when available). The monitoring programs that are described in depth outside of report **S10m** include: noise monitoring, hydrology monitoring, site water quality monitoring, waste rock characterization, and aquatic effects monitoring. Appropriate cross-referencing between the detailed report and the monitoring plan is requested. Some of the structures or operations that require monitoring do not have a separate detailed report. Thus, the monitoring and follow-up plan is the sole location for any details to be provided. The monitoring programs that are solely described in report **S10m** include: air quality and climate monitoring, tailings geotechnical monitoring, fish monitoring, vegetation and soil quality monitoring, and wildlife monitoring. It is requested that this summary table be updated to include all and any monitoring that will be undertaken on site with appropriate cross-referencing, where applicable, to the individual sections of the submission.

**S11- Site-Specific Water Quality Objective for Copper**

1. Why was a site specific water quality study only completed for copper? The NWB requests detailed discussion from MHBL on this issue.

2. **Section 1.1 (S11) -** What is the source of the data contained in the table? Appropriate referencing is requested.

3. **Section 1.3 (S11)** - What are the aquatic organisms tested in the USEPA biotic ligand models (BLMs)? Are the applications calibrated to suit the northern regions and northern aquatic organisms? The NWB requests detailed discussion from MHBL on these issues.

4. **Section 1.3 (S11) –** MHBL states that the BLM can be run in either "*toxicity*" or "*speciation*" mode. With regard to the outputs ($LC_{50}$) of each mode what are the main identifiable differences? How will a difference be dealt with? How will a site-specific water quality objective be developed?

5. **Section 2.1 and Section 3.1.1 (S11)** - A post-baseline monitoring program was conducted from 2004 to 2006, and the NWB understands that up-to-date monitoring results were not used in the report. Further, in **Section 5.0** the report states that if new information is discovered in future

work, Golder Associates Ltd should be requested to re-evaluate conclusions. Did MHBL use up to date monitoring results in the report? If not the NWB would like to understand why MHBL did not update the report with data obtained during the post-baseline monitoring program?

6. **Section 2.2 (S11)** - There may be duplication in operation between Step 2 and Step 3 of the sensitivity analysis presented. Can MHBL please outline the main differences between Step 2 and Step 3 (line 12 to 16) for purposes of adding to the application record?

7. **Section 2.2 (S11) -** Both the speciation mode and toxicity mode are considered in the sensitivity analysis. Can MHBL please outline which tables or figures show the results of each running mode?

8. **Section 2.3 (S11)** – **Tables 1** to **4** provide results of sensitivity analyses to assess the impact of DOC, temperature, pH, and select inorganic water constituents on $LA_{50}$. The NWB understands that the value for $LA_{50}$ was consistently 0.041 nmol/g wet for each model simulation, regardless of model input values. Are the $LA_{50}$ values reported in **Tables 1** to **4** presented correctly? For purposes in adding to the application record, if the $LA_{50}$ values are presented correctly in **Tables 1** to **4**, additional detail is requested into how the calculated WQVs can vary for the same $LA_{50}$.

9. **Section 3.2 (S11)** - A formula is provided to derive copper site-specific water quality objective using USEPA's current (2002) water hardness-based equation. Can MHBL please outline parameters represented in each item of the equation?

**S12- Aquatic Effects Monitoring Study Plan**

The NWB will issue additional guidelines to the AEMSP in the near future.

**Additional Errata**

**S5- Hydroclimatic Parameter Re-evaluation**

1. **Section 3.6.2 (S5) -** Shall *Table 3.7* replace *Table 3.6* in line 7 and 20?

**S6- Water Quality Model**

2. **Section 3.3.4 (S6)** – Shall *Figure 3.5* replace *Figure 3.6* in line 6?

3. **Section 4.3.2 (S6)** - There seems to be inconsistency between tables and the text description. The water level in Tail Lake is 29.4m (**Page 48**) for **Scenario 3**, but 29.3 m in **Table 4.3** (**Page 52**). The nitrite limit of CCME guideline is listed as 0.02 mg/L in **Table 4.1**, but 0.018 in **Table 4.2**.

**S10a- Emergency Response and Contingency Plans**

4. **Section 9** is referred to here for training details. However, according to the **Table of Contents** and the text, **Section 10** is, in fact, headed "*Training*".

**S10j- Water Management Plan**

5. The **Table of Contents** is inconsistent with the layout of the document.

6. **Table 3.1** notes are inconsistent with the contents of the table.

**S11- Site-Specific Water Quality Objective for Copper**

7. **Section 3.1.1, Page 19**- Figure 7 may contain error.

The NWB is hopeful that the MHBL resubmission will provide the additional information and clarity that will allow the NWB to evaluate the qualitative and quantitative effects of the use of or deposits on waters. As outlined in the *Guidelines* the NWB is available to assist and provide guidance on the additional information required in each design and management plan in the Doris North submission. The NWB has arranged to meet MHBL on January 3rd, 2007 to discuss application materials with MHBL so they may provide a "*pants that fit*" application. MHBL shall understand that if these items are not addressed in the resubmission than there will be a requirement for another revision to the application materials.

The NWB welcomes MHBL's Doris North water licence application resubmission and the opportunity to move forward with MHBL in their efforts to licence the Doris North Mine. The NWB hopes that the resubmission will identify and provide clarity to all concerns addressed through this letter document.

If you have any questions whatsoever please feel free to contact me at telephone number 867.360.6338, mobile number 867.445.3924, or email dirts@nunavutwaterboard.org .

Regards,

Original signed by:

Joe Murdock
Director of Technical Services
Nunavut Water Board

cc. Carl McLean (INAC)
Jim Rogers (INAC)
Spencer Dewar (INAC)
Stephen Harbicht (EC)
Colette Spagnuolo (EC)
Tania Gordanier (DFO)
Earle Baddaloo (GN)
Mike Atkinson (GN)
Geoff Clark (KIA)
Karlette Tunaley (NIRB)
Carolyn Dunn (HC)
John Cowan (TC)