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January 24, 2007

Mr. Philippe di Pizzo
Executive Director
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU, X0B 1J0
Phone: (867) 360-6338

Dear Philippe,

Re: Meeting Notes from January 3 and 4, 2007 meeting between NWB and MHBL

VIA EMAIL AND XPRESS POST

On December 28, 2006, Miramar Hope Bay Ltd.("MHBL") received a letter via email from the Nunavut Water Board ("NWB") entitled "Additional Guidelines for the Doris North Water License Application". Afterward, a meeting between the NWB technical reviewers and the MHBL technical team was organized for January 3rd and 4th, 2007 in Edmonton. The purpose of the meeting was to give MHBL a chance to further discuss the additional guidelines and requirements with NWB, thereby enabling MHBL to move forward in the water licensing process in the most appropriate manner.

I am forwarding the notes that I took during that meeting with this letter. I apologize for the delay in sending, but I wanted to ensure that all members of the MHBL team were able to review my notes and agree that I had correctly copied down the exchanges, and some of those people had been traveling and unavailable until recently.

I have included the original text from the previously mentioned NWB letter in black text, with comments on each additional guideline item directly following in red (NWB) and blue (MHBL) text. These notes are not meant to be an exact transcript of the meeting, but simply to document the general discourse between the parties and to record agreement on the steps to address each item. The MHBL technical team will use these notes as a starting point when preparing our resubmission. Please review the attached, and notify me if you find items that need further clarification or if there is discrepancy between this account of the discussions and your recollections.

Yours truly,

Terri L. Maloof
Manager, Environmental Auditing and Permitting
Miramar Hope Bay Ltd.

cc: Joe Murdock

January 3 and 4, 2007

Meeting between NWB technical staff and Miramar Hope Bay Ltd. technical staff on the Conformity of Doris North Water License Application Document

Attendees:

Philippe DiPizzo, NWB
Joe Murdock, NWB
Zhong Liu, NWB
Jamie Van Gulk, consultant for NWB
Matthew Hamp, consultant for NWB
Ramli Halim, by phone, consultant for NWB

David Long, Miramar
Terri Maloof, Miramar
Larry Connell, Miramar
Gary Ash, Golder for Miramar
Nathan Schmidt, Golder for Miramar
Maritz Rykaart, SRK for Miramar
John Chapman, SRK for Miramar
Steve Day, by phone SRK for Miramar
Dylan MacGregor, by phone SRK for Miramar

The following is excerpted from the Additional Guidelines issued by the NWB on December 27, 2006 (in black text), with notes from the face to face meeting between NWB technical team and Miramar technical team on January 3 and 4, 2007. The comments from NWB team are denoted by initials, in red text, and comments from MHBL in blue text.

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.

JM- MHBL should respond to these within the document rewrite except the one from INAC on change in the milling process

LC- in the water licence we can address the consequences of the process change, but as to whether we should have made the change is an issue we will address in a separate letter to INAC and copy NWB

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.

PD- depending on whether we properly provide the information requested in the revised document, it could take 2 weeks for the conformity review, then likely a 60 day hearing notice

LC- we will only print the clean copy of the changed document; but the redline document will be given electronically with every document, plus the guiding document

TM- procedurally, the NWB will receive a Clean and Stamped Revised Application Doc, a Guiding Document, and CD's with the clean version and the redline version. Interveners will be asked if they would like the revised document in print or just electronically.

JM- we can do blackline or whatever we like, but we have to clearly indicate where changes have made and have a clear guiding document

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?

MR – the only thing we see as AM is shoreline erosion; what does he see as AM?

RH- says the words Adaptive Management Plan are not mentioned in the plan anywhere, content is there, it is just the concept mentioned in the screening is not in the TCA report;

MR- if we were to say there is a component of Adaptive Management which is shoreline erosion and then discuss the shoreline erosion as AM, is that ok

JM-says there have been changes since the FEIS; if we are relying on aspects of the FEIS then we need to properly reference them; problem is that there is turnover in people and so the document has to be stand alone; if we reference the FEIS it has to be very clear

MR-there is no change here, and this is not a reference issue?

JM- if we are referencing the FEIS docs we have to then appendizise that document and properly reference it

RH- keeps saying that our choice in words is different this time and he wants to see the words Adaptive Management Plan

LC- asks Joe if he's indicating that we are not to just reference the Prelim Tailing Dam Des Rpt, but to include it as appendix; indicates that it would lead to a lot of duplication

JM-he is saying we are just presenting it and not adequately referencing the specific change

LC-application covers current game plan and references FEIS

MR-what we have done is to refer to the Prel Tail Des Rep and only put in the parameters that are relevant to changes made

JM-needs to point to the exact place in the document, on this page, in this section; don't need to repeat info if it is adequately referenced

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.

RH –we just need to say that the Boston data is more long term and that we needed more long term 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?

This is a referencing issue

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?

MR-Our general practice is to refer the reader to the detailed appendix and not duplicate the data

RH-we just need to make the proper reference, not duplicate

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)

JC-The probability of annual exceedance assumed by Mr Halim is not correct; the probability is much much lower, this probability is the design event assuming that the dam is a full capacity; the FSL will not be reached under normal operating conditions

JM-we need to reference the WQ report.

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?

JC-assumes Ramli did not see WQ report b/c in no case will MMER water quality be exceeded. Scenarios 1 and 2 that were modeled reflect water quality for the case where the facility is allowed to fill and then overtop through the spillway and basically show that the water quality will be much better than MMER at that time – These cases basically represent the event where overtopping would occur

RH-can we add a sentence to the TCA design report to say that

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?

Same as above

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?**

Covered; same discussion as was indicated for point 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 m3, compared to a tailings volume requirement of about 400,000 m3". The referenced Drawing T-01 for the TCA Storage Stage Curve may provide a different storag capacity than above (shown as closer to 9 million m3). The NWB assumes that the 400,000 m3 tailings is based on 2 years of tailings production at a solids production rate of 544 m3/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 m3 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.

MR- correct, there is an inconsistency that we can and should repair;

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?

MR- yes they are critical to the function of the dam and they will be put in;

RH- he wants us to state in the body of the report that we need the thermosyphons to keep the dam frozen, and it is clear in the Appendix and the info is there, but we just need to include the statement in the main body of the 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?

RH- says he got the information from the drawing and it is not clearly stated what the diff between the 4 and 5.5 years;

MR- so we clarify what we mean, but not problem with the process

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?

MR- There is no detailed procedure in this document and so we will provide one in the TC des rep in the operations and management portion

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?

MR- what is not covered is a monitoring program and we will have to add that to our monitoring program; we also need to properly reference our water cover thickness design memo, and MR feels we have adequately covered the ice thickness there; the 2.2 is an unrealistic worst case scenario; MR says that we do need to more adequately describe where that 1.9 to 2.2 m comes from, it is not a one time sampling event, it comes from regional data;

RH- wants us to give some support the give more confidence in the data we are using;

MR- we did present this data before the EIS hearing and we have to reference that

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?

MR- the EBA report was done and recommended before Prel Des Report, the recommended geotech field work from EBA was done before NIRB process and that is clearly documented;

RH- we just need to have all information to have confidence in the design

MR- we committed to review the design and consider additional designs; we did the drilling as a good will measure, because EBA said it was not necessary; the drilling did not work; we looked at that work and proceeded with the detailed design; the info is included in a appendix

RH- this question was raised during the screening and it seemed they were waiting for additional information; they want to ensure our design has enough data to support it

JM and RH- we need a CLEAR statement that we feel that we have all the info we need and we are very confident in this design and we have done everything we can to get data

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?

MR- We did not discuss the data b/c we did not feel this data is valuable data;

RH-we need to make a statement to that effect.

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.

RH- Knows that we have already come to an agreement on how we got to this number; we need to include that in the main report

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 - 10°C".* The NWB requests clarification on the required air temperatures for construction.

MR- agreed this is an inconsistency

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?

MR- make a clear statement that we are professionally satisfied that the design is adequate

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?

MR- He is correct that it refers to the post and we need to make the appropriate ref on the dwg

RH- is not sure of applicability of Thermosyphon drawings

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.

MR- We will provide appropriate reference to document and section

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?

MR- we think we are grossly overestimating settlement; pointed out the very conservative assumptions and that is why it was not quantified; is it adequate that we have provided our expert opinion or do we need to quantify parameters

JM- said that we should just make those statements that this dam has to be kept frozen, but the secondary consideration of creep and thaw is after breach; but we also did have some contradictory statements…

MR- the fact that we did consolidation data was not b/c we were concerned about consolidation settlement or thaw to be of concern b/c this will be a frozen core dam but b/c we just wanted all the info we could get to classify the materials

RH- we just need to make statements to that effect

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?

MR- thinks the answer from above applied to this as well; thermosyphons is not in question for the life of the dam b/c creep will move laterally, not up and down

RH- we should write up a clearer explanation of the processes and talk about the risk of the thermosyphons breaking and being non functional and have an AM plan to mitigate that risk

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?

MR- state this more clearly and state the risks

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?

MR- one is to give better clarification of the level of risk and then two to put in an AM plan as to how this will be dealt with

RH- we need to put in a statement about the qualifications of the people who will do the monitoring

MR- the 5 year statement is a typo (where is that?)

RH- how long do we need the thermosyphons to work?

MR-what we need to answer is an explanation of the philosophy behind the design; we should need the thermosyphons for the principal of the design; as long as the dam is a water retaining structure the thermosyphons are needed

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.

MR- Would you like to see a discussion of this? Are you doubting confidence of new model vs old model?
RH- no, you do use a different system of modeling and we need to put this in perspective;
MR- we did use two models that use very different approaches that give us the same result; we use the GEOTHERM model b/c EBA and INAC have confidence in that model; We just need to mention that in the report.

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.

LC- we can ensure that this visual and thermal monitoring is referenced in the monitoring plan in S10m;
MR- to clarify, is there adequate info in S2, but not in S10m;
JV- there is some missing information in S2 as well…; we need to put the info in S10m and then reference it is S2; S2 will have location and S10m will have locations and frequencies and S2 will refer them to S10m for freq

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?
LC- yes, if it is in the drawings or reports, then we have committed to this. Will say this in the main application text

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.
LC- items b and c will be addressed the same as number one

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.
MR- this was presented in the Tailings Design report; we just need to reference where that can be found

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?
MR- this is an error in the wording

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.**

MR- change the technical memorandum into a final design memo and put in the appropriate statements; but is there something they can point out if there is a disconnect between analysis and design;

JV- just clear up the flow of info from original analysis to final design

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?

JV- wants us to provide a justification for the methodology we used or why we didn't use the CFE Manual

JM- was it considered, yes or no, and if it wasn't comment on reason

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

JV- statements as to what the design criteria is; bring it forward to have it on record our decision making process for the design

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?

MR- says we can provide statements same as above

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?

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?

MR- these questions are being asked to understand the analysis and understand the criteria, not that there is an error in the 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:

MR- essence of this is the same and item 5

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.

MR- yes the reason they are in the doc is b/c that is the product we intend to use; the reason it is called typical is that it allows us to use a different manufacturer
JM- yes you could say as specified in S3

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.
MR- again more info on assumptions and design approach
JM- they are assuming this is an AM strategy and so if there was a strategy in place they would interpret that as adaptive management

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?
MR- unlikely that we can get the guarantee; Miramar can't commit to that; we have to qualify that statement that we will endeavor to get a guarantee

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.
JM- Miramar needs to document what they are going to do; need to put a reference in the S2 document back to the main document and add more info to the main doc by revisiting the impact assessment done previously;
LC- we won't repeat what we did in the EA, but will just refer to it

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.
MR- again, what were our assumptions and what led to these conclusions
LC- we have to detail what decision markers are in place
MR- the reasoning behind that is that MHBL has committed that we would use one size of culvert versus 10 different sizes
JM- if we are just installing one size of culvert then say why, and how we have ensured that it is sized correctly

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?
MR- we designed this to ensure the abutments remained frozen and to prevent any fore-settlement and that was cross referenced according to the DFO guidelines as to the height of the bank and width of the deck as to navigable waters
JM- again just state our design criteria
NS- one thing that is not there is a design flood; we are confident that it is above that level but we have not expressed that
LC- recurring theme that Miramar has not installed confidence for our decisions and we need to bring that forward

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?
NS- there were some surveys done and so that is better than a DFO op statment

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?
NS and MR- we can clarify and demonstrate this

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, crosssection, and results of the laboratory testing are requested. If not, why not?
MR- yes they have but the appropriate reference is missing

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?
MR- no, deemed unnecessary to make those calculations and so we will make a statement as to the rational of why we have not done that

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?
MR- again explain the logic

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.**
Same as above

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?
MR- yes, and it was done by the bridge design company; that info is not in the package and can be included in the package

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.

MR- easy answer is yes, we want to use Quarry 1, bigger question is AM; does the board want to see a single AM document

LC- maybe the best way to deal with this specific issue regarding possible use of Quarry 1 as a laydown area, i.e MHBL plans to build a specified laydown area along the road near the jetty (Quarry 1 was just a possible area that could have been used as a laydown area):, is just not to say it

Fuel transfer station:

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

MR- are they saying the doc is not adequate

JM- he is confused about who is signing off on it, the contractor or an engineer; MHBL just needs to make it clear that SRK will sign off on the contractors work and HOW it is going to be done...what does MBL have in place for an evaluation of a liner lay down?

MR- might not be explicitly stated, but there will be a full time resident engineer on site

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.

MR- again explain the logic, and are the specs for that product compatible with the loads

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".We don't know where this comes from.* 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"?*

MR- Board just wants us to say how we selected the material and the design criteria and are the specs compatible

LJC- Will remove reference to an allowable liner leakage rate. Will discuss how liner will be inspected and signed off as constructed as per the design by a qualified professional

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.

MR- discussed above on 13

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.

MR- discussed above on 13

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?

MR- will fix that and add the design criteria

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?

MR- constructed as a dam b/c it is a pond and it could overflow and be a human health and safety concern

JM- not a firm understanding of what is happening at that facility

MR- explained that it is contained and confirmed to be clean

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.

MR- additional clarification on design criteria and applicability to meeting the design requirement

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?

LC- this is a commitment in S10m and this should be noted in the Main Doc. Will correct

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?

NS- the snow fall data from EC is not necessarily snow water equivalent

JM-maybe we reference the EC data in the table and add a paragraph to explain the apparent inconsistency

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?

NS- undercatch is not as important as how much water there is to run off in the spring time, so that is another

gap between snowfall and runoff; not using the undercatch does not affect our monitoring b/c we do snow course surveys to show how much snow is there

MH- put in an explanation for that, not a tutorial but an explanation of the decision making criteria

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.

NS- 220 was selected as the number and there was consensus at the hearings; he will reword the paragraph to explain how it was selected

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?

NS- just a clarification

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"?*

NS-yes, agreed

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]**

MR- bullet point 2 was an omission and it will be included

NS- bullet point 4, recommended using the low flow yields, this was actually modeled as the last 3 case studies;

MR-what may be confusing is that SRK has to correct NS evap numbers to reflect lake evap numbers

NS- this can be addressed as a footnote S1 appendix F table 6,

- Bullet point 4 of **[S5]** is not fully addressed in Table 6 Appendix F of **[S1]**

NS- bullet point 4, recommended using the low flow yields, this was actually modeled as the last 3 case studies;

MR- what may be confusing is that SRK has to correct NS evap numbers to reflect lake evap numbers

NS- this can be addressed as a footnote S1 appendix F table 6,

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?

NS- this was imposed upon us by EC; NS-we have to add words to that effect;

NS- we also need to ref in this doc the location of the sensitivity runs in the other doc

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."

JC- the net effect of changing the background water quality would be marginal, and the 1000pages that would come out would not be justified; what it does is it would change the amount of water you could discharge; the net value we would get out of rerunning would be small; so we opted to demonstrate that there would not be a significant difference between the assumed values and the actual water quality results for the period in

question; the way of getting around that would be to do one run to reflect the additional baseline and add that to the report; we need to come up with some agreement as to what parameters would be rerun

JM- they (NWB technical advisors) are not here to model or design so it is difficult for them to give us (MHBL) parameters; so we (MHBL) need to have our opinion clearly stated

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?

JC- Yes, in fact the results would be conservative. The expectation is that the changes in the milling process will benefit (improve) the WQ in the TCA b/c of a few factors combined; SRK actually did a run to illustrate that; the results are presented on page 73 of the WQ modeling report; 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?

TM- we don't believe it will influence the water quality model and so we should clearly state that and state the assumptions as to why in both the WQ doc and the Main doc; also make it clear that the backfill will be dry and will freeze and so no water pumped back to Tail lake

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?

JC- 690 is the expected maximum production rate and 669 is the average for the operational period. The modeling was done on 668 and that will be qualified in the report.

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.

JC- these are mass based calculations and they are explained in the text

JC- will fix the inconsistency in the flow rates; change in prod rate due to milling process change will be clearly stated so there will be no confusion

MR- there is a clear misunderstanding as to how the change in the milling process affect the wq model and we will have to state that

JM- MHBL can make reference to where it can be found if it is already there

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.

LC- we gave John the values of 10% and it is bound by the metallurgical test work, and same with the barren bleed, it is more conservative that we use the 60%; so we will just change the Main document to reflect that

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?

JC- we don't discuss the water in Tail Lake for a number of reasons, most significantly the net loading from the background water are insignificant in comparison to loadings from tailings deposition. The load diagrams provided in the appendices for each run illustrates this. The background water qulatiy data are contained in the appendices; we will clarify that and provide a reference

JC- the table does not contain the data for October b/c we do not intend to discharge and so the wq will be background and so will add a footnote to the table

JC- Al and Cr are the next closest to CCME guidelines next to Cu for effect on wq and constraints on discharge; that is the rational for that; we just need a statement to clarify

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?
JC- referencing

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.

JM- will discuss this later in management plans

LC – sewage treatment package details are provided in the main text of the water license application – reference to this can be provided

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

JC- all ammonia, nitrate and nitrite are in units of –N equivalency - this is consistent throughout and we just need to say it

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?

JC- already in table 4.1.7 and we can reference that in the conformity table

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?

JC- the model does not address the oxidation of nitrite to nitrate in the stream; expectation is that as soon as it is aerated in the water fall very little nitrite would remain in Doris Creek; if nitrite concentrations increase significantly above predicted concentrations then it could become the controlling parameter for discharge; this is not an AM strategy according to MR, it is the WM strategy; this is spelled out in the water management strategy. Our WM strategy is always the same, the only thing that may change is which the controlling or limiting parameter is. The way the comment is worded creates the impression that the strategy is conceptual and it is not. It is a firm WM strategy.

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?

JC- that is an AM strategy; we anticipate that it will not be necessary to add phosphorous since some P will be contained in the sewage effluent. However with the holding time available to us we have the flexibility in place that we can manage the water without a problem; In the event that it becomes necessary to add P it would be done as a liquid fertilizer that would be dispersed in the propeller wash of a boat criss-crossing the water body. The concentration would be in the order of parts per billion so that there is no excess build-up of P in the water. The addition would be infrequent on an 'as needed' baiss. We will provide the details of the strategy in the wq doc.

12. Section 4.5 (S6) - Erosion control has been proposed as a means to reduce (this has to be reworded to say improve wq) 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.

JV- referring to shoreline erosion and processes in place

MR- we just need the appropriate cross-referencing

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

MR- another reference

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 ^{m3} per year) calculated?

JC- on p57 of the wq report it refers to scenarios 1 and 2 that have no active discharge—in these scenarios once tailings deposition ceases the remaining volume of water that can be accommodated remains the same therefore the net dilution prior to reaching the full supply level does not change--this is independent of flow conditions – flow conditions only affect the time to reach the full supply level; we will just reword that and quote the numbers; the calculation of the maximum discharge rate for the low flow conditions (550,000 m3) is calculated bases on the copper limitation, i.e. same as for the base case calculations – with the low flow conditions copper concentrations are initially more elevated, and in conjunction with lower flows in Doris Creek, the volume that can be discharged is lower than in the base case assessment - for the second question we'll have to make an introductory statement

15. Section 4.5.3 (S6) - The units for ammonia, nitrite and nitrate used in the report are mg NH3-N/L, mg $NO2^-$-N /L and mg $NO3^-$-N /L, respectively; however, CCME guidelines for these parameters adopt units of mg NH3/L, mg $NO2^-$/L and mg $NO3^-$/L, respectively. The NWB understands that - MHBL may have converted the CCME guideline limits to mg NH3-N/L, mg $NO2^-$-N /L and mg NO3-N /L to compare the maximum nutrient concentrations in **Table 4.1- Page 50, Table 4.2- Page**

JC- we will add a note to reference this appropriately

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.

JC- as noted before, this will be done

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 NH3-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?

JC- we can provide an explanation in the text as to the calculation – it is based on the maximum temperature and pH in Doris Creek (22.9 deg C and pH of about 7.2)

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?