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?

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"*?

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.

LC – yes we will provide this detail

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

LC – all these issues will be addressed as part of the management plan:

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?
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.

LC – we will make sure there is appropriate follow up in the referencing

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.

LC – this is an incorrect statement and we will correct it

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

LC – we will spell out what we will be monitoring for in more detail

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.

LC – we will clarify if they are diesel hydrocarbons or not
MR – will provide more detail on this in S2

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.
LC – we will specify where in the closure plan this was incorporated; intent is that the land farm is totally removed from the quarry and we will make this more clear

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:
LC – we will correct inconsistencies

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?
LC – any usable material here will be opportunistic and we will put those words in

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?
LC – will give more detail

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?
LC – we will make sure we have these

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.
LC – will include this in S2 and remove it from S10h

S10i- Tailings Management Plan

LC – not intended to be a design doc in any way or an O and A manual, but its intent was as a tool to the operators as to the spirit if the plan to make sure the commitments are being carried forward; we will add an intent statement to each of those documents

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?

JC- could be addressed through a ref to the wq model

Currently, the NWB understands that the management plan uses MMER limits to control how much water is decanted from Tail Lake.**JC- MMER is just a yes / no decision.** 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 **JC – not in part, in full.** 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.

JM - this needs to be firmed up in more clear statements

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.

LC – Design info will be moved to Tlgs Design Report which will be stamped by SRK. Management Plan will include authorship and professional credentials of the author

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.**

JC- important to denote that the development of the strategy is in S6 the WQ model; as well we will put in a statement as the purpose of this document

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).

JC – this is already there and so we just need to clarify this

JM – NIRB has been through this process, and therefore the NIRB might understand why, but is the mandate of the NWB to understand this reasoning and so we need to explain how we chose this point thoroughly to the NWB

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?

JC- same as discussed yesterday and in point a above

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?

JC- the strategy is that we will not discharge if we do not meet CCME and so there are no contingencies required b/c as soon as we have a problem we stop the discharge – The contingency management strategies are described in Section 5.3 of S6. The contingency is to hold the water – the water balance modeling has shown that this is possible. The water quality modeling will then be revised to assess potential future concentrations and to determine if it will be safe and practical to discharge at a later date. If the modeling shows this will not be the case then water treatment would be implemented – this is stated in the adaptive management plan for the water management

JM- put it on the record

LC – The contingency measures are addressed both in the WQ Model report and in the main application

document. We will provide the appropriate cross referencing

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?

JC – These are the applicable CCME parameters for which numeric values are available - we will list those parameters

LC- The intended process as described by John Chapman uses all Water License parameters to calculate the ADVR and based on the calculation selects which parameter controls the acceptable rate of discharge. This will be stated in the re-write

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?

JC – just to make it clear that we can meet CCME, with the possible exception of nitrite - the predicted levels are only marginally above CCME values and will occur for only a very short duration. Only if the actual concentrations significantly exceed the predicted values will nitrite be considered as a controlling parameter for the calculation of the ADVR and TDR; parameter list same as point a above

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"?*

JC – Yes, if is found to pose a significant rishk to freshwater aquatic life forms downstream of the waterfall in Doris Creek

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.

JC – this is described in S6 and so we will cross reference

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?

JC- this answer not clear at the moment – the frequency will depend on the rate of change of water quality in Doris Creek (background), Tail Lake and Doris Creek (downstream). The TDR and the ADVR calculation would be completed for each set of water quality data and adjusted as necessary

JC- we will add a paragraph to describe the scenario in S6

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?

MR-design criteria for the pipeline will be revised in S2 to meet the lower flow

JC- second part of the question will be added to S6

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.

JC- these details will be described in S1

NS- we will reference that we have looked at possible degradation downstream

JC- will put more details also into S6 and in the monitoring plan
JV- there will be TSS as a part already, but also put any site inspection into the monitoring plan

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?**
JC- Discharge will always be proportional to background flow and increase flows by no more than about 5 % of background flows
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?
JC- Yes, considered small

c. What monitoring measures are in place to assess erosion and bank stability along Doris Creek during controlled discharge?
JC- Visual observations will be made whenever the effluent is monitored; TSS in Doris Creek downstream of the water fall will also provide an early indication of erosion. Will be added to the monitoring plan

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?
MR- this falls into the category of true adaptive management strategy and we will deal with it in that sense

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.
JC- these locations will be at the intake; this is already denoted in the monitoring plan

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?**
JC- the 2 weeks is to provide certainty in the water quality prior to commencing discharge - will explain the 2 weeks better in the monitoring plan

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.**
JC- yes will provide appropriate reference

d. What criteria will be used to benchmark if the dynamics of the system are understood to establish a reduction in monitoring frequency?
JC- The approach would be simply to plot the results against time – the rate of change can then be determined and compared to its water quality objective and the operational or actual ADVR. For example if the rate of change of copper concentration is less than 2 ppb per month in Tail Lake, and an dilution of about 20 to 1, the rate of change in the receiving environment would translate to a net incremental increase of 0.1 ppb in the receiving environment over a 1 month period at the proposed fixed ADVR. Sampling and analysis every second day is not likely to be meaningful – a frequency of once a week would be more reasonable if only to confirm that concentrations are not changing rapidly.

JC-The water quality modelling indicates that the rate of change is likely to be very small – in the order of about 0.5 ppb per month during operations. Based on the above example, the anticipated change over a one month period

would be well within analytical error and could not reliably be detected. (This further illustrates the level of conservatism that has been adopted in the proposed management strategy!!!)

JC- The rate of change would be determined for all critical before a decision would be made to reduce the sampling and analytical frequency. It may be that frequent sampling will be undertaken for selected parameters only if it is shown that others are not changing rapidly with time.
JC- will explain this in greater detail

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.
JC: Repeat – see above 9 a – add to table 1

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?
JC - It is a legal requirement to achieve MMER criteria prior to discharge; while end of pipe cannot be achieved, CCME in Doris Ck d/s of the waterfall are selected to ensure that the receiving environment will be protected
LC- the answers to this is in 9a as well and will be in the plan

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?
LC- we will be doing it monthly, how often it is reported is up the Board, but we should propose something in the Tail Management Plan and the Water monitoring plan Will include a proposed frequency and reporting method in the revised SD

b. What is the frequency of assessing the accuracy of the model?
Same as above

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?
Same as above; do the model comparison with the observed data
JC- The water quality modeling was undertaken with the explicit purpose of establishing the limitations on the potential for discharging water from the TCA. Therefore measured water quality will be compared to the predicted water quality. The parameters will include MMER criteria as well as the CCME parameters of concern and would include the nutrients. If the predictions over-estimate actual concentrations no additional assessment will be undertaken. In the event that actual concentrations significantly exceed predicted concentrations, the source streams will be analysed and compared to the assumptions that were adopted in the water quality model. The source loadings would accordingly be adjusted in the water quality model to assess future constraints on the discharge strategy. If the modelling shows that there will be no significant impacts on the discharge strategy the progress of water quality will be tracked to ensure that the conclusion holds. In the event that the predictions show a significant constraint on achieving the water management strategy, then measures to contain or limit that source will be investigated. Should it not be possible to control the source then the implications with respect to the discharge strategy/holding time will be assessed. It may then be possible through adaptive management to revised the discharge strategy. In the event that the discharge strategy cannot be revised to accommodate the changes in water quality, water treatment requirements will be established. Because of the long holding time available, it will be possible to design and implement a suitable water treatment system to continue to meet the project objectives

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?
JC- will be rewritten in S6 to be more clear and referenced in S10 - The model would be rerun if there is a more than 20 % deviation above the predicted concentrations for any of the critical or significant parameters (MMER, CCME). S6

b. What criteria will be used to benchmark if calibration of the model to site conditions is necessary?
JC- this can go in S6 and a summary brought across to the monitoring plan

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?
JC- we will reference where it is in the document
JM- want an expression of our confidence
MR- this will go in S6 but not in S10

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?
Same as above

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?
JC- Model calibration would be required only if the model significantly underestimates solute concentrations in Tail Lake AND it is shown to potentially significantly impact in the water management strategy. The study will be done in a timely fashion when we envision the breach can happen
LC- we just need to properly reference where it is in the closure plan

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?
JC- the water treatment is part of the AM plan and we can't provide details at this stage b/c for that we need to know what parameters need to be treated and what the concentrations are; putting forward a treatment strategy would be speculative
LC- We will add a cross reference in the revised main doc to the contingent measure presented in the WQ Model report
JV- We need to clearly outline what the triggers are, e.g., volumes in Tail Lake
MR- This is covered in S6 and so we will reference that

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?
LC- we have taken this off the table and we will revise the text and tables to reflect removal of site specific criteria

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?

JC- this is provided in MMER and we will provide those details in the monintoring plan and in section 6.3 of the main text- Use MMER – NT definitions

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?**

JC- first part of question disappears b/c we are going to revamp the table

XL- questions what is the flow rate of Doris Creek? Also, he wants to know what is a reasonable hydrograph because MHBL only has 4 yrs

LC- we have 4 yrs of actual data which have been correlated to the long term regional data

XL- in our current data we have up to 16 times that factor, but if you had a dry year our 10x would not stand

JC- no, the discharge flow rate is always proportional to the flow in Doris Creek so there is no variation in the dilution factor – it is determined from the ADVR

LC- to remove the confusion we will remove the old discussion of dilution rates and take out the site specific refs

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).**

LC- revise site water management plan to reflect division of watersheds, flow of water, where water will be collected, where it is transferred, proposed SNP points and put in JC's predicted concentrations from the loading points at the mill so that we have trigger points; basically revise the plan to address the spirit in the set of comments

JM- fill in the black box of where flows are moving and where things are going on site

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.

LC- will make the commitment for proper engineering process, but the detailed engineering will be done later; the package plant supplier will have start up processes and all that and we will have to commit to that

JV- when will the design be done

LC- unknown, but it won't be designed as such, but will go out for bid from a package plant supplier; we will commit that SNC will do that on our behalf and get all the parameters, but this will be done in the main doc and not in this section

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?

LC- we need to make this more clear in section 2.4.12 in the main text

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)**

   LC- will correct the referencing
   - *"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).**

   Discussed
   - Active discharge period **(Section 3.1, Page 2).**

   Discussed
   - Documented internal quality control program **(Section 3.2.3.1, Page 5).**

   Discuss in QA QC
   - Other key parameters for the calculation of the ADVR **(Section 3.2.7, Page 8).**

   LC- will be in S6
   - The approximate discharge location in **Dwg G-02** (SRK 2006a) **(Section 3.2.8, Page 8),** and what is SRK 2006a?

   LC- we will make sure this same location is shown on the monitoring site plan in the mon section

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?

LC- Miramar never proposed the addition of nutrients. This reference refers to allowances included in the WQ model for nutrient addition to Tail Lake that will occur with the transfer of treated sewage water to Tail Lake and in runoff from blast rock used in roadways and from the stockpiles. Will clarify this apparent confusion in the revised text. Erosion control refers to the AM plan for Tail Lake erosion Mgmt.

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.

LC- Due dilligence samples are outside SNP program and will use same QA/QC procedures; this type of sampling will vary depending on what is going on at the site and are a tool used by the site's env mgr to

verify performance or identify potential problem areas.
LC- will make the distinction that these are discretionary and not really due dilligence and will make the commitment to use same QA/QC procedures

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.
LC- agreed and we will fix

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?
LC- we can't put in detailed QA/QC until we get staff on site putting the lab in place, but we can discuss it generically
JM- It would be a good idea for us to contact the interveners that brought this up as an issue and make sure they are on the same page

4. What standard methods are being used to complete the desired water quality testing?
LC- not sure what you mean?
XL- Diff monitoring techniques will give us trouble for estimating input parameters
JM- state what our methods were
LC- we have already committed to do the ICPMS for Cu
XL- but that is only one
LC- that is always an ongoing change b/c the standard for detecting CCME is always evolving to lower detection limits
JV- this will come in the on-site lab QA/QC discussion
LC- we anticipate that all our monitoring will have to be done by an outside commercial lab; our lab is only an internal control lab which will attempt to be certified over time

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?
GA- will address this in this plan

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:
JM- feels that everything here should be also addressed in the other documents and so not much good going over these points
LC- we need to go back through and make sure statements are consistent and we do cross refs and perhaps not repeat everything but refer people back to other doc
JM- agreed
LC- informing them that there are ongoing discussions with KIA and now INAC on what should be in the bond and what shouldn't

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.

S10I 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 **S10I.** 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 (S10I) – Water Quality and Aquatic Resources: **S10I** 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.

JM- this should have been covered in the discussion of the other docs
LC- the issue on the WMMP; we had already discussed with you to leave this as an outside issue
JM- just reference it

S11- Site-Specific Water Quality Objective for Copper

LC- This will now be removed totally

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 (LC50) 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 $_{LA50}$. The NWB understands that the value for $_{LA50}$ was consistently 0.041 nmol/g wet for each model simulation, regardless of model input values. Are the $_{LA50}$ values reported in **Tables 1** to **4** presented correctly? For purposes in adding to the application record, if the $_{LA50}$ values are presented correctly in **Tables 1** to **4,** additional detail is requested into how the calculated WQVs can vary for the same LA50.

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.
GA- this is a preliminary doc; there are specific rules for how you follow the process when the time comes
JM- they will send us the comments when the consultant gets them back to them
GA- the development of an EEM program is clearly defined in the Environment Canada process; so even if you send us comments we do not plan to revise the document until the EEM process unfolds

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)