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Kugluktuk

Bathurst Inlet
Kingaok

Bay Chimo
Umingmaktok

Cambridge Bay
Ikaluktutiak

Gjoa Haven
Okhoktok

Taloyoak

Kugaaruk

Phyllis Beaulieu
Manager of Licencing
Nunavut Water Board
P.O. Box 119
Gjoa Haven, NU, X0B1J0

September 18th, 2015

Re: TMAC Resources Inc. Amendment Application No. 1 of Project Certificate No.003 and Water Licence 2AM-DOH1323 for the Doris North Project.

Dear Phyllis Beaulieu, KIA has completed its review of the *TMAC Resources Inc. Amendment Application No.* of Project Certificate No. 003 and Water Licence AM-DOH1323 for the Doris North Project.

Overall, the information presented in the submission was clear and comprehensive. The project description and potential effects benefit from a generally thorough understanding of baseline aquatic resources in the study area. In the application letter, TMAC states that they are of the view that the Project Amendments will not cause any significant adverse environmental effects, and that any predicted Project effects can be offset through mitigation measures and best management practices.

However, based upon our review of the information presented, and considering the changes in the mine plan, the KIA believes that there are some significant data gaps that do not support a full effects assessment at this time. In particular, the lack of understanding of the effects of the changes in water level in Doris Lake, as well as potential water quality effects and loss of fish habitat in Roberts Bay, require more data to provide more robust effects assessment. Although monitoring plans are proposed, these not sufficiently developed at this time to review in any great detail, and until the potential effects are properly understand, it seems vague and premature to suggest effective mitigation measures.

Specifically, our review identified the following areas where further clarification or assessment may be required in order to strengthen the project proposal:

Mine the entire Doris Deposit through the Doris North Mine Portal and extend mine life to 6 years;

"Mining all ore zones that are accessible via the existing Doris Portal in addition to the Doris North deposit will extend the life of the Doris Mine to approximately

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6 years. TMAC has conducted geochemical analysis to characterize the additional material expected to be mined and the results of these analyses confirms that the waste rock can be managed via existing site controls. Procedures for waste rock management on surface have been updated for operational efficiency."

- How will TMAC handle the additional waste rock?
- How will the extended mine life impact the water balance and water management requirements?

Increased milling rate to 2,000 tpd over time;

"TMAC anticipates an initial mining and milling rate of 1,000 tonnes per day (tpd; daily average ore mining rate). This rate will ultimately increase up to 2,000 tpd."

- Will this increased milling rate result in a greater volume of effluent?

Expanded and revised laydown area, camp and activities;

"The Doris Camp will be enlarged to a capacity of 280 personnel; no additional domestic water supply is anticipated."

- This will need to be validated in the water balance.
- How will the expanded laydown area, camp and activities impact the zone of influence on wildlife?

"Expanded mining activities will result in additional materials shipped to site as well as ore that will require storage, therefore laydown areas and temporary ore storage areas will be expanded."

- Will these changes result in a need for additional water management structures?
- Are the proposed water management plans sufficient to prevent interactions between contact and non-contact water?

"Despite expanded mining activities, TMAC will maximize water recycle for milling, and as such, no additional surface water withdrawal beyond that current permitted withdrawal rate is required from Doris Lake."

- This statement will need to be validated in the mine plan and within the water balance.

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"Materials from existing Windy Road quarries A, B, D and 3 will be used for general construction. Quarry 3 material will be used primarily for south dam, interim dike and access road construction."

- What is the acid generating potential of this material?
- Are they safe for use as long term construction materials?

"A non-hazardous waste landfill will be located in Quarry 3, to contain both operational and closure non-hazardous waste. This location was chosen because the area is already permitted, the quarry will be exploited early in the mine life, and it is located upstream of the TIA. All wastes permanently on site will now be co-located within in the same drainage area."

- Does the TIA have sufficient capacity to hold the additional drainage associated with the larger project footprint, particularly Quarry 3?

Change from subaqueous tailings to sub-aerial tailings and underground backfill and placing more tailings in TIA;

"Tailings from the mill process will be discharged to the Tailings Impoundment Area (TIA) but, because of the additional tonnes to be mined, tailings will now be deposited sub-aerially (placed on the land), instead of sub-aqueously (under water). Approximately 94% of the tailings, known as flotation tailings, will be disposed of sub-aerially in the TIA, placing the tailings in a beach in the south end of the TIA, behind a dike designed to retain solids. The remaining 6%, the cyanide leach tailings, will be deposited underground as backfill following destruction of residual cyanide, and in conjunction with waste rock. This approach maximizes use of capacity within the tailings area, isolates leach tailings and promotes water reuse."

- Is TMAC using proven technology to destroy the residual cyanide prior to using it as backfill?
- What challenges does sub-aerial disposal pose for the project and how has TMAC mitigated the associated risks?
- What are the impacts to caribou migration over the covered tailings facility?

Revised volume and timing of saline talik groundwater during mining that will be collected and piped to Roberts Bay; and

"The mine plan now includes Doris North, Doris Central and Doris Connector. Doris North is located in permafrost while the other zones are located beneath Doris Lake in an unfrozen zone, a talik. TMAC anticipates that groundwater encountered in the talik under Doris Lake will be saline. Any groundwater encountered during mining will be

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reused within the mine to the extent possible, with the remainder directed to the marine outfall in Roberts Bay through an overland pipeline."

- How will TMAC handle inflows of groundwater?
- Does discharge pose a risk to surface freshwater?

"Using conservative assumptions of hydrogeological characteristics, conventional mine water control technology and dynamic modelling techniques, the maximum groundwater inflow encountered at full mine development under Doris Lake is expected to be 3,000 m3 /day. The modelling indicates a risk that some of the water entering the mine will originate in Doris Lake and could infiltrate at a rate that could cause reductions in Doris Lake water levels. Based on modelling and review of baseline data, the changes to Doris Lake are considered to be mostly within the natural variation of flows in the system. Should changes occur outside of natural variation, TMAC will offset for any negative effects to fisheries."

- This rate of inflow will create a significant water management challenge. Has TMAC sufficiently demonstrated that changes to water levels in Doris Lake are within the natural variation?
- Fisheries offsetting may need to be addressed by TMAC Resources Inc.

Direct discharge to Roberts Bay and no water discharge into Doris Creek.

"As in previous plans, TMAC will use the water in the TIA as process water in the mill. Excess water will be discharged directly to Roberts Bay via pipeline and a diffuser to be located on the ocean floor, rather than to Doris Creek as had been previously planned and permitted. All regulatory parameters, including those listed in the Type A Water Licence and in the Metal Mining Effluent Regulations [(MMER)], will be met prior to discharge. The process water may be mixed with the saline groundwater and treated, if needed, prior to discharge. Footprint impacts will be minimal, as the majority of the on-land portion of the discharge pipeline will follow the existing all-weather road to Roberts Bay."

- Is the existing aquatic baseline adequate to characterize the new discharge location?
- Has TMAC evaluated the potential environmental risks associated with this discharge method and location?
- How will TMAC meet MMER and the Type A Water Licence discharge criteria?
- Has TMAC characterized the mixing zone in Roberts Bay?
- What impact will discharge to Roberts Bay have on the formation of ice?

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"An additional 550 m of road and pipe length will extend to the northwest of the existing jetty and laydown area, terminating at a point on shore where the pipe will enter the marine environment, armoured by riprap. The pipeline will run approximately 2 km from shore to the 40 m bathymetric contour."

- Has TMAC adequately characterized the discharge location?
- Is the bathymetry sufficiently detailed?
- Is the pipeline designed to withstand environmental stressors?
- What emergency response capacity exists should failure of the marine discharge infrastructure occur?

"TMAC is introducing additional treatment measures in the mill to destroy cyanide in the tailings slurry (which was not a measure proposed by Miramar). Cyanide will be reduced to 0.5 mg/L which will fall below management thresholds set out in the International Cyanide Management Code for the Gold Mining Industry and will meet all applicable Canadian regulatory standards."

- Is TMAC using proven technology to destroy the residual cyanide and meet the management thresholds set out in the International Cyanide Management Code?

"The revisions that TMAC is requesting to TIA water management (which include treatment, if needed) will ensure that discharge meets required criteria and as such, the on-site laboratory previously proposed by Miramar Hope Bay and described in the Project Certificate is no longer necessary."

- Do the proposed changes to the project limit the need for more direct Tailings management, negating the need for an on-site laboratory?

Other specific observations made on the amendment packages are presented as follows with some recommendations.

1. Between the Packages (P) of information, there are some inconsistencies in statements of the predicted effects. P1, pg.1 states that 'there is a possibility that the water level in Doris Lake could change temporarily, during mining; however any changes are expected to be similar to the changes that occur naturally throughout the seasons. If changes are greater than expected, TMAC will offset impacts to fisheries.' P2, pg v states something similar that changes are mostly considered to natural, but TMAC will offset for any negative effects to fisheries. However, P4, pg i, states that the cumulative

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water losses from Doris Lake are predicted to result in serious harm to fisheries and an Offset Plan and DFO Authorization will be obtained. Further, P4, p 2-26 identifies data gaps in fish habitat information for the lake, and that should it be identified that important habitats will be impacted, an offsetting plan will be developed in accordance with the Fisheries Act (1985).

Recommendation: Review statements and confirm consistent finding and update as required. Also note that the Fisheries Act was amended in 2013 and the reference to the Act should be updated accordingly.

2. TMAC is proposing to amend the Aquatic Effects Monitoring Program (AEMP) throughout 2015 to address changes associated with the TIA effluent discharge location to Roberts Bay. The monitoring program study design as presented in P2 and P4 seems scientifically-sound and includes water quality, phytoplankton and benthic communities. However, it is not clear whether monitoring of fish presence, health, or behaviour is part of this AEMP. There is the potential to affect fish through both water quality and changes in lower trophic levels, as well as more directly through potential changes in fish habitat or fish behaviour (including avoidance) at the location of the diffuser, pipeline and marine berm. If changes are found as a result of the discharge of the TIA water, TMAC will review possible adaptive management measures to address the situation.

   Recommendation: It is recommended that the KIA review the draft of the AEMP and have input to trigger levels and management actions that would be outlined in an adaptive management plan. Please provide further information on fish monitoring as part of the AEMP.

3. The Doris Connector Vent Raise will be connected to the Float Plane Dock Access Road by a spur road. In P2 it states that the spur road will cross a potentially fish-bearing creek with two 0.5m diameter CSP culverts. A Fisheries Self-Assessment will be conducted in the open-water 2015 season to confirm the expectation that the watercourse is non-sport fish bearing and therefore would not result in serious harm.

   Recommendation: Please note that even if the watercourse contains non-sport fish bearing species that the Fisheries Act will still apply, and should still be assessed for potential serious harm to fish, particularly for those fish that are part or, or support, Commercial, Recreational or Aboriginal fisheries.

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Suggest change wording to reflect this and recommend that the NIRB & NWB review the self-assessment and results of the fisheries survey once available.

4. As stated in P2 and shown on drawing P6-1, the Doris Central Access Road will not require a 'stream crossing' but it will cross a defined surface water drainage feature and a double culvert will be installed to allow surface water to drain into Doris Lake.

   Recommendation: Please confirm that this water feature does not provide fish habitat (including seasonal), and as the water drains to Doris Lake, appropriate mitigation and protection measures should still be in place during construction and operation.

5. In P2 it states that limited drilling and blasting will be required to anchor the vent raise fan to the vent raise, but is not clear if there are potential effects to fish and fish habitat. This activity is not included in the effects assessment.

   Recommendation: Please provide confirmation that blasting activities will occur away from fish habitat and therefore no mitigation measures are required.

6. Table 1 of Environmental Impacts in P3-1 provides a good summary of potential impacts and all impacts for Freshwater and Marine Aquatic Organisms and Fish and Fish Habitat are classified as 'M – Negative and Mitigatable'. Considering that there are some data gaps in baseline fish habitat (including for culvert crossings, Roberts Bay shoreline, and spawning shoals in Doris Lake), it may be premature to classify impacts as 'Mitigatable' until assessments are complete. In P4 it is stated that no residual effects are anticipated on fish habitat through stream crossings, but then notes that if operational statements and best management practices cannot be followed and will result in serious harm, then TMAC will develop offsetting plans. It is also noted in P4 that 'Serious Harm' to fish in Doris Lake is likely due to reductions in water levels, which suggests that impacts cannot be mitigated. Impacts to vegetation through the construction of infrastructure and project footprint is classified as 'N- Negative and non-mitigatable'. It is not clear why loss of aquatic habitat though project infrastructure (culverts, pipeline, marine berm) would not also be classified as 'N'.

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Recommendation: Please provide rationale behind this identification of environmental impacts, or revisit potential effects once additional fisheries assessments are complete.

7. P4 provides a good overview of aquatic baseline conditions. On pg2-16 it is stated that metal concentrations in tissue from Lake Trout, Lake Whitefish and Ninespine Stickleback remained relatively consistent from 1995 to 2010. However it is not clear at what levels or implications for fish health.

   Recommendation: Please provide clarification on this baseline data.

8. The hydrological assessment in P4 concludes that under the proposed scenario, the lake level will decrease by 0.23m during winter. Potential effects include exposing Lake Trout eggs to desiccation, if spawning shoals are within 0.23m of the ice bottom. The report acknowledges that additional data should be collected to verify locations and depths of Lake Trout spawning habitat so that they can be protected in the future. The baseline information also shows that Lake Whitefish and Cisco are also present in Doris Lake, both of which also spawn in the Fall, also with a preference for shoreline or shoal habitat. After egg incubation over the winter, young-of–year Whitefish and Lake Trout remain in the spawning area for weeks to months before moving into deeper areas.

   Recommendation: Agree with the need to collect more specific baseline on spawning shoals in Doris Lake, but would recommend that this be expanded to other species as appropriate (for example Lake Whitefish), and that the effects assessment is expanded to include young-of-year and juveniles, as well as eggs. Further information on potential protection measures should also be provided and perhaps an adaptive management plan if appropriate as well. Please also provide information on potential effects of this reduction over the life of the mine, and post-closure. It will be important to determine any potential long-term effects on fisheries, particularly if viable spawning habitat is reduced.

9. There will be a reduction in flow (discharge) in Doris Outflow and Doris Creek throughout the open water season resulting from a decrease in Doris Lake available volume. To ensure a conservative approach, potential effects to fish habitat in an extreme year result in a total decrease of 24 flow days in the Outfall and the Creek. This represents a reduction in available rearing habitat used by Arctic charr, Lake Trout, and Ninespine Stickleback by an

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average of 11% and up to a maximum of 18% during mining. Mean annual discharge will also be reduced, resulting in a reduction in wetted stream width and therefore available habitat. It is not clear what this reduction means for the local fish population nor fisheries productivity and whether this results in 'Serious Harm' (as defined by the Fisheries Act). It is noted that additional modeling and characterization of Doris Lake Outflow and Creek are required.

Recommendation: Agree that further work is required to help determine potential effects on fisheries. The Approach to Freshwater Fisheries Offsetting Memo in P4 Appendix B offers a reasonable approach to address this. Recommend that KIA are involved in the process as stated, and review documents as available. Further recommend that the effects assessment is re-addressed once this further information is available.

10. P4 includes analysis that there will be a reduction in total number of flow days in Little Roberts Outflow, and also that the reduction in stream wetted widths will be negligible. The maximum reduction of 10.8% reduction in mean annual lake discharge may be just over the upper limit of DFO's recommendation of 10% to mitigating water discharge reduction, but it is not clear what effect this would have on the fish population at a local level.

    Recommendation: Suggest some more site-specific assessment to provide guidance on potential effects on fisheries would be useful.

11. There appears to be a generally good understanding of marine fish and fish habitat in Roberts Bay. It is noted that the installation and decommissioning of the subsea pipeline and diffuser system has the potential to affect fish habitat. From P3, Table 2, it seems as though the marine pipeline would be left in place, therefore the activities (and potential effects) from pipeline decommissioning are unclear. It is noted that concrete blocks are used for counter buoyancy weights every 5m along the pipeline, but it is unclear if there are long term effects from these as this deteriorate over time.

    Recommendation: Please provide further clarification on the activities associated with pipeline decommissioning, as well as potential fish and fish habitat effects.

12. There is no mention of potential entrapment of fish at the diffuser or at end of pipe. Although detailed engineering is not yet available, it is not clear if this

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is a potential effect or not (noting that it may depend on the final design). During construction and operation of the pipe and diffuser, there are also no potential effects noted on acoustics/sound pressure and fish mortality or behaviour.

Recommendation: Please provide comment on these potential effects and whether mitigation through design is possible.

13. It is noted in P4 that a fisheries self-assessment will be completed in advance of construction once detailed engineering is available. A preliminary self-assessment has however already been completed and is outlined, so this could proceed to DFO Project Review as it is clear that there is some loss of habitat from the marine berm and pipeline installation. However, it is not clear what type of fish habitat, nor potential effects on fisheries and P3 Table 1 states that the effects are 'Mitigatable'. It was noted in P3 Table 2, that the shoreline crossing of the pipeline has been designed to avoid disturbing sensitive shoreline fish habitat, but no information seems to have been provided on what type of habitat.

    Recommendation: Please provide clarification on the avoidance and protection measures implemented for fish and fish habitat by the proposed marine pipeline and berm. Please also provide further assessment on loss of habitat, effect on fisheries, and the effects assessment.

KIA's information requests are attached with this letter in the format required by NIRB. These information requests are to supplement the general questions and recommendations on the submission presented above.

Yours Truly

John Roesch

John Roesch, P.Eng.
Senior Hope Bay Project Officer
Department of Lands and Environment
Kitikmeot Inuit Association

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Information Requests for Amendment to Project Certificate 003 and Water Licence 2AM-DOH1323 for Doris North Mine Site.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 1
Request to:	TMAC Resources Inc.
Reviewer:	Zoetica Wildlife Research Services
Subject:	Consideration of eskers and cliffs as special landscape features
Reference:	Section 3.3.1, Table 3.3-1, Page 3-4.
Issue/Concern:	TMAC does not include eskers and cliff habitat in their special landscape features.
Information Request:	Please provide rationale for not including esker and cliff habitats in this section, given their importance for mammal dens and nesting raptors. Related to this comment, "special landscape features" may not be an appropriate title for the ecosystem assemblages listed in Table 3.3-1 unless all special landscape features are included.

Source:	Kitikmeot Inuit Association
IR Number:	KIA -2
Request to:	TMAC Resources Inc.
Reviewer:	Zoetica Wildlife Research Services
Subject:	Many of the conclusions about anticipated impacts to wildlife, or a lack thereof, rely on anticipated use of sites that assume current migration patterns persist and that avoidance will prevent site attraction by wildlife.
Reference:	Section 3.4.3, pages 3-13 to 3-15
Issue/Concern:	The rationale for a lack of predicted impacts to wildlife relies on the assumption that wildlife will not use or be drawn to the area. However, some wildlife may still obtain rewards at site, despite mitigation and noxious stimuli, Attraction may be a risk to grizzly bears, which frequently travel along Roberts Bay and may find more Arctic ground squirrel and other small mammals, which use mine buildings/infrastructure for shelter, food rewards, heat and predator avoidance. Raptors may also feed on small mammals drawn to the area. Small mammals, may, in turn, be feeding on vegetation impacted by the sub-aerial tailing dust. Finally, caribou herds are known to alter their calving, post-calving areas and migration paths over time, and they may be attracted to sub-aerial tailings due to the present of salts in boils.
Information Request:	Please provide rationale for not including an assessment of attractants or a toxicological risk assessment (or screening) for wildlife due to the increase in dust deposition from the sub-aerial tailings. Please also provide information on new monitoring and adaptive management protocols to allow for the detection of animals attracted to new infrastructure associated with the updated mine, and ways in which those monitoring data will lead to adaptive management decisions.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 3

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Request to:	TMAC Resources Inc.
Reviewer:	Zoetica Wildlife Research Services
Subject:	Updated Wildlife Mitigation and Monitoring Program not supplied.
Reference:	Management Plans, Pk 5, Pt 1-6.
Issue/Concern:	Many of the proposed changes for the mine plan are potentially significant, and should require additional mitigation and monitoring locations and/or techniques. There are not supplied.
Information Request:	Please provide updated Wildlife Effects Mitigation and Monitoring Plan with changes to address project updates.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 4
Request to:	TMAC Resources Inc.
Reviewer:	Zoetica Wildlife Research Services
Subject:	TMAC plans on increasing camp personnel, increasing milling rates, using more equipment, increasing olfactory disturbances, and continuing previously temporary measures (over-winter fuel barges and vessels in ice).
Reference:	Section 3.4.2, page 3-10
Issue/Concern:	These project changes can impact wildlife by increasing both noxious/repelling and attracting stimuli, but these were not screened into the project amendments requiring re-assessment. These factors may be of importance to species that frequent or move along Roberts Bay (e.g. grizzly bears) that may experience a threshold effect at a certain level of noxious stimuli where after they alter their movement patterns. There is currently insufficient information provided to determine how the changes to the mine plan will potentially increase the zone of influence in terms of stimuli that attract and deter wildlife from the area.
Information Request:	Please provide scientific rationale for not considering the impacts of these project changes on wildlife. Further, please provide information on how the existing wildlife mitigation and monitoring requirements for the project will enable identification of these potential impacts and adaptive management responses.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 5
Request to:	TMAC Resources Inc.
Reviewer:	Zoetica Wildlife Research Services
Subject:	Effect of potential caribou migration over or near tailings facilities.
Reference:	Rykaart, M and Hockley, D. 2009. Mine Waste Covers in Cold Regions. MEND Report 1.61.5a.
Issue/Concern:	According to Rykaart and Hockley (2009), when discussing sub-aerial tailings in northern environments, two wildlife related concerns are noted: 1. the potential effect of caribou migration over or near tailings facilities can result in substantial erosion or local liquifaction and boils of covered tailings (i.e. migration of fines appearing through the covers), and 2 animals can be attracted to waste areas due to

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	the increased presence of salts. These potential issues are not discussed in the re-evaluation of the mine plan, even though the tailings plan has changed from subaqueous deposition to sub-aerial. There is a potential for the Ahiak Caribou or Dolphin and Union herd to move across the TIA in large numbers in the future, and these potential impacts should be addressed.
Information Request:	Please provide information on how the wildlife related issues noted above (boiling related to movement of wildlife across sub-aerial tailings and attraction to salt in tailings) have been considered, and show how the tailings design a closure plan will prevent these risks into the far future (e.g. how will the 0.3 m thick cover protect against boils and local liquifaction/attraction in the context of this northern environment).

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 6
Request to:	TMAC Resources Inc.
Reviewer:	Zoetica Wildlife Research Services
Subject:	No information presented to contextualize statistical result that concludes no impact.
Reference:	Section 4.4.3.2, Page 4-43; "Seabird densities calculated during periods of low marine traffic (i.e., August 2009 and July 2010) were not statistically different than those calculated during periods of high marine traffic (i.e., August 2010). These results suggest that the increase in marine traffic did not have a detectable effect on seabird densities in Roberts Bay."
Issue/Concern:	TMAC presents statistical conclusions with no information on a) the statistical tests used, b) the P value obtained and alpha value used, and c) post-hoc power calculation.
Information Request:	Please provide information about the test used, P value and test statistic obtains, and include a post-hoc power value. The latter is particularly important for evaluating the potential that this result is a Type II error (false negative).

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 7
Request to:	TMAC Resources Inc.
Reviewer:	Zoetica Wildlife Research Services
Subject:	Marine mammal data not displayed spatially
Reference:	Section 4.4.4.1, Table 4.4-6, Page 4-46, and 4.4.4.2, Page 4-47.
Issue/Concern:	Data presented in Table 4.4-6 not presented spatially. Survey path also not shown, making it difficult to evaluate effort versus observations.
Information Request:	Please provide a map showing the distribution of a) area surveyed, and b) the spatial locations of seals observed.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 8

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Request to:	TMAC Resources Inc.
Reviewer:	Zoetica Wildlife Research Services
Subject:	References supporting conclusions about construction-related effects not provided.
Reference:	Section 4.5.2, Page 4-48
Issue/Concern:	TMAC concludes that, during construction, construction of the pipeline/anchoring in water will cause temporary increases in suspended solids that would quickly return to baseline levels within days after the activity ceases. No references for similar construction activities and observed duration and spatial extent of construction-related impacts on suspended sediments and metals are provided, nor is information on the likely geographic extent of this effect.
Information Request:	Please provide information and references from other studies and/or monitoring programs from other relevant projects that report on impacts of similar construction-related activities in marine habitat on the duration and spatial extend of suspended sediment and associated metal disturbance, as well as any other construction-related impacts noted.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 9
Request to:	TMAC Resources Inc.
Reviewer:	Zoetica Wildlife Research Services
Subject:	Model assumptions for groundwater/TIA discharge into Roberts Bay.
Reference:	Section 4.5.2.2, Page 4-52. TMAC states that the discharge models assume that effluent will be discharged at a constant rate of 80 L/s during the summer months (June-Sept), and 35L/s for the remainder of the year over a 6 year period.
Issue/Concern:	The assumptions of the evenness of discharge assumptions are unclear.
Information Request:	Please discuss the likelihood of being able to achieve a relatively even discharge rate during these periods. If exceedences in rates are likely to occur, please provide information on the anticipated maximum rates of discharge during each season modelled, and the consequences of needing to use that maximum discharge rate (on both metal concentrations and water temperature/ice formation). As Figures 4.5-1 to 4.5-3 show that, particularly in years 2-6, peak level will approach CCME guidelines, it will be important to identify realistic factors that could cause exceedences.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 10
Request to:	TMAC Resources Inc.
Reviewer:	Zoetica Wildlife Research Services
Subject:	Effect of increased temperature on ice thickness.
Reference:	Section 4.5.4, P 4-58.
Issue/Concern:	TMAC has not discussed the potential for the introduction of warmer water from the subsea diffuser in Roberts Bay to affect ice bowing. In the Arctic, ridges up to 10-20 m thick can form when thick ice deforms and forms in a way that encourages deformity;

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	as this could affect caribou movement and migration, this topic requires further discussion. TMAC has only considered that the diffuser will warm a 20 m thick ice layer by 0.01 C; however, this may not fully depict the reality of the situation, as ice of this thickness does not form immediately, and thinner, preceding ice layers may be impacted more by heating effects. We expect Roberts Bay, during calm ocean conditions to form ice from frazil ice to grease ice, to nilas, to rafts, to congleation ice, and then finally to sheet ice of growing thickness. It appears from the impact assessment done that TMAC considered only heating impacts to the final layer of sheet ice of maximum thickness. In rough sea conditions, we would expect different ice growth processes, with the potential for rafting and ridging to increase. None of these ice growth processes are considered alongside the heat that will be introduced by the TIA/groundwater diffuser into Roberts Bay. This consideration is important to ensure that Dolphin and Union caribou herd, a species of Special Concern under Schedule 1 of the *SARA,* can still migrates across sea ice in this location (if/when needed), wolverine and other large mammals can hunt for seals, and for non-project-related human safety and travel is not impaired. TMAC has also not addressed whether in ice fuel barges and vessels, are now being proposed on more than a temporarily basis, act as visual deterrents to wildlife use the ice.
Information Request:	Please provide information about whether the TIA/groundwater discharge could cause an increase in ice bowing/ridging by considering how the introduced heat will affect ice as it grows and forms at different thicknesses. Please provide a discussion of the potential for heat to impact ice deformation and ridge height, including considerations of the complex nature of the sea ice formation processes, and the ways in which ice subject to rafting and ridging due to heat introduction at various thicknesses during its formation and growth. Please also comment on whether any scientific studies or monitoring programs have examined or uncovered any impacts of over-wintering fuel barges and vessels on the use of ice adjacent or nearby ice by wildlife.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 11
Request to:	TMAC Resources Inc.
Reviewer:	Zoetica Wildlife Research Services
Subject:	A lot of the lack of anticipated impacts to wildlife rely on current use sites.
Reference:	Section 3.4.3, pages 3-13 to 3-15
Issue/Concern:	Rationale for lack of impact to wildlife heavily relies on the assumption that wildlife will not use or be drawn to the area. Wildlife may still obtain rewards at site despite mitigation, due to the expanded footprint, which may be a particular risk of grizzly bears, which frequently travel along Roberts Bay and which may find a greater abundance of Arctic ground squirrel and other small mammals, which use mine sites and buildings for shelter, food rewards, heat and predator avoidance. Raptors may also feed on small mammals drawn to the area. Small mammals, may, in turn, be feeding on vegetation impacted by the sub-aerial tailing dust. Finally, caribou herds

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	are known to alter their calving, post-calving areas and migration paths over time.
Information Request:	Please provide rationale for not including a toxicological risk assessment for wildlife due to the increase in dust deposition from the sub-aerial tailings, and some discussion on the possibility that some species may feed in the area impacted by tailing dust, and the likely toxicological impacts.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 12
Request to:	TMAC Resources Inc.
Reviewer:	Zoetica Wildlife Research Services
Subject:	TMAC plans on increasing camp personnel, increasing milling rates, using more equipment, increasing olfactory disturbances, and continuance of previously temporary measures (over-winter fuel barges and vessels in ice).
Reference:	Section 3.4.2, page 3-10
Issue/Concern:	These project changes can impact wildlife by increasing noxious and attracting stimuli, but were not screened into the project amendments requiring re-assessment as potential interactions between the project and wildlife. These factors may be of particular importance for grizzly bears that frequent or move along Roberts Bay, and which may experience a threshold effect at a certain level of noxious stimuli whereby they alter their movement patterns.
Information Request:	Please provide scientific rationale for not considering the impacts of these changes on wildlife. Further, please provide information on how the existing wildlife mitigation and monitoring requirements for the project will enable identification of these potential impacts and adaptive management responses.

Source:	Kitikmeot Inuit Association
IR Number:	KIA -13
Request to:	TMAC Resources Inc.
Reviewer:	Zoetica Wildlife Research Services
Subject:	Effect of new above ground pipeline to Roberts Bay on movement of caribou and other large mammal VECs.
Reference:	Revisions to TMAC Resources Inc. Amendment Application No. 1 of Project Certificate 003 and Water Licence 2AM-DOH1323
Issue/Concern:	The new above ground pipeline to Roberts Bay may act as a potential barrier to movement of mammalian VECs that resist crossing pipelines at particular heights. An impact assessment on effects of above ground pipelines on movement of potentially affected wildlife VECs seem warranted, particularly as oil and gas projects are starting to show that above ground pipelines can affect movement patterns of woodland caribou (particularly fast movements).
Information Request:	Please provide information on: 1) scientific considerations of the potential for the pipeline to impact movement of large mammals, 2) proposed mitigation to prevent the pipeline from acting as a semi-permeable barrier, and 3) the ways in which the

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	monitoring program will monitor the effectiveness of mitigation and enable adaptive management if a residual impact is detected.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 14
Request to:	TMAC Resources Inc.
Reviewer:	Palmer Environmental Consulting Group Inc.
Subject:	Fish and Fish Habitat – Inconsistencies in predicted effects.
Reference:	Package (P) 1, pg. 1; P2, pg.v; P4, pg I; P4 p2-26
Issue/Concern:	Between the Packages (P) of information, there are some inconsistencies in statements of the predicted effects. P1, pg.1 states that 'there is a possibility that the water level in Doris Lake could change temporarily, during mining; however any changes are expected to be similar to the changes that occur naturally throughout the seasons. If changes are greater than expected, TMAC will offset impacts to fisheries.' P2, pg v states something similar that changes are mostly considered to natural, but TMAC will offset for any negative effects to fisheries. However, P4, pg i, states that the cumulative water losses from Doris Lake are predicted to result in serious harm to fisheries and an Offset Plan and DFO Authorization will be obtained. Further, P4, p 2-26 identifies datagaps in fish habitat information for the lake, and that should it be identified that important habitats will be impacted, an offsetting plan will be developed in accordance with the *Fisheries Act* (1985).
Information Request:	Review statements and confirm consistent finding and update as required. Also note that the *Fisheries Act* was amended in 2013 and the reference to the *Act* should be updated accordingly.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 15
Request to:	TMAC Resources Inc.
Reviewer:	Palmer Environmental Consulting Group Inc.
Subject:	Fish and Fish Habitat – Amendment to AEMP.
Reference:	P4, section 4.5.8, pg 4-65
Issue/Concern:	TMAC is proposing to amend the Aquatic Effects Monitoring Program (AEMP) throughout 2015 to address changes associated with the TIA effluent discharge location to Roberts Bay. The monitoring program study design as presented in P2 and P4 seems scientifically-sound and includes water quality, phytoplankton and benthic communities. However, it is not clear whether monitoring of fish presence, health, or behaviour is part of this AEMP. There is the potential to affect fish through both water quality and changes in lower trophic levels, as well as more directly through potential changes in fish habitat or fish behaviour (including avoidance) at the location of the diffuser, pipeline and marine berm. If changes are found as a result of the discharge of the TIA water, TMAC will review possible adaptive management measures to address the situation.
Information	Please provide further details on the components of the proposed-AEMP that will

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Request:	monitor fish and fisheries in Roberts Bay.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 16
Request to:	TMAC Resources Inc.
Reviewer:	Palmer Environmental Consulting Group Inc.
Subject:	Fish and Fish Habitat – Spur road connecting vent raise and float plane dock.
Reference:	P2, section 3.8.1, pg 23
Issue/Concern:	The Doris Connector Vent Raise will be connected to the Float Plane Dock Access Road by a spur road. In P2 it states that the spur road will cross a potentially fish-bearing creek with two 0.5m diameter CSP culverts. A Fisheries Self-Assessment will be conducted in the open-water 2015 season to confirm the expectation that the watercourse is non-sport fish bearing and therefore would not result in serious harm.
Information Request:	Please note that even if the watercourse contains non-sport fish bearing species that the Fisheries Act will still apply, and should still be assessed for potential serious harm to fish, particularly for those fish that are part or, or support, Commercial, Recreational or Aboriginal fisheries. Suggest change wording to reflect this and recommend that the KIA review the self-assessment and results of the fisheries survey once available. Update effects assessment and mitigation measures once site-specific fisheries information is confirmed.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 17
Request to:	TMAC Resources Inc.
Reviewer:	Palmer Environmental Consulting Group Inc.
Subject:	Fish and Fish Habitat – Culvert crossing on Doris central access road.
Reference:	P2, section 3.8.2, pg 24
Issue/Concern:	As stated in P2 and shown on drawing P6-1, the Doris Central Access Road will not require a 'stream crossing' but it will cross a defined surface water drainage feature and a double culvert will be installed to allow surface water to drain into Doris Lake.
Information Request:	Please confirm that this water feature does not provide fish habitat (including seasonal), and as the water drains to Doris Lake, appropriate mitigation and protection measures should still be in place during construction and operation.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 18
Request to:	TMAC Resources Inc.
Reviewer:	Palmer Environmental Consulting Group Inc.
Subject:	Fish and Fish Habitat – Drilling and blasting to anchor vent raise fan.
Reference:	P2, section 3.8 pg 23-24
Issue/Concern:	Limited drilling and blasting are proposed to anchor the vent raise fan to the vent

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	raise, but is not clear if there are potential effects to fish and fish habitat. This activity is not included in the effects assessment.
Information Request:	Please provide confirmation that blasting activities will occur at a suitable distance away from fish habitat and no impacts are therefore anticipated.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 19
Request to:	TMAC Resources Inc.
Reviewer:	Palmer Environmental Consulting Group Inc.
Subject:	Fish and Fish Habitat – Data gaps in fish habitat.
Reference:	P3-1, Table 1
Issue/Concern:	Table 1 of Environmental Impacts provides a good summary of potential impacts and all impacts for Freshwater and Marine Aquatic Organisms and Fish and Fish Habitat are classified as 'M – Negative and Mitigatable'. Considering that there are some data gaps in baseline fish habitat (including for culvert crossings, Roberts Bay shoreline, and spawning shoals in Doris Lake), it may be premature to classify impacts as 'Mitigatable' until assessments are complete. In P4 it is stated that no residual effects are anticipated on fish habitat through stream crossings, but then notes that if operational statements and best management practices cannot be followed and will result in serious harm, then TMAC will develop offsetting plans. It is also noted in P4 that 'Serious Harm' to fish in Doris Lake is likely due to reductions in water levels, which suggests that impacts cannot be mitigated. Impacts to vegetation through the construction of infrastructure and project footprint is classified as 'N- Negative and non-mitigatable'. It is not clear why loss of aquatic habitat though project infrastructure (culverts, pipeline, marine berm) would not also be classified as 'N'.
Information Request:	Please provide more robust supporting evidence and analysis on the fisheries effects assessment. Please also provide justification for loss of vegetation through project infrastructure being classed as 'N- Negative and non-mitigatable' while loss of fish habitat is 'M'.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 20
Request to:	TMAC Resources Inc.
Reviewer:	Palmer Environmental Consulting Group Inc.
Subject:	Fish and Fish Habitat – Aquatic baseline conditions.
Reference:	P4, pg2-16
Issue/Concern:	P4 provides a good overview of aquatic baseline conditions. On pg2-16 it is stated that metal concentrations in tissue from Lake Trout, Lake Whitefish and Ninespine Stickleback remained relatively consistent from 1995 to 2010. However it is not clear at what levels or implications for fish health.
Information Request:	Please provide additional detail on this baseline data, including tissue concentration values for the data set noted.

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Source:	Kitikmeot Inuit Association
IR Number:	KIA - 21
Request to:	TMAC Resources Inc.
Reviewer:	Palmer Environmental Consulting Group Inc.
Subject:	Fish and Fish Habitat – Hydrological assessment.
Reference:	P4, section 2.5.3
Issue/Concern:	The hydrological assessment concludes that under the proposed scenario, the lake level will decrease by 0.23m during winter. Potential effects include exposing Lake Trout eggs to desiccation, if spawning shoals are within 0.23m of the ice bottom. The report acknowledges that additional data should be collected to verify locations and depths of Lake Trout spawning habitat so that they can be protected in the future. The baseline information also shows that Lake Whitefish and Cisco are also present in Doris Lake, both of which also spawn in the Fall, also with a preference for shoreline or shoal habitat. After egg incubation over the winter, young-of–year Whitefish and Lake Trout remain in the spawning area for weeks to months before moving into deeper areas.
Information Request:	Please provide information on the proposed surveys to identify spawning shoals in Doris Lake. Please comment on why the effects assessments focuses on Lake Trout egg incubation, and recommend that the baseline and effects assessment are expanded to other relevant species and life stages. Please provide supporting evidence on the potential effects to fisheries over the life of the mine, and post-closure, based on the assessment of the viable spawning habitat that is affected. Please provide details on suitable protection and mitigation measures for this habitat and fisheries.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 22
Request to:	TMAC Resources Inc.
Reviewer:	Palmer Environmental Consulting Group Inc.
Subject:	Fish and Fish Habitat – Reduction in discharge from Doris Lake.
Reference:	P4, section 2.5.3
Issue/Concern:	There will be a reduction in flow (discharge) in Doris Outflow and Doris Creek throughout the open water season resulting from a decrease in Doris Lake available volume. To ensure a conservative approach, potential effects to fish habitat in an extreme year result in a total decrease of 24 flow days in the Outfall and the Creek. This represents a reduction in available rearing habitat used by Arctic charr, Lake Trout, and Ninespine Stickleback by an average of 11% and up to a maximum of 18% during mining. Mean annual discharge will also be reduced, resulting in a reduction in wetted stream width and therefore available habitat. It is not clear what this reduction means for the local fish population nor fisheries productivity and whether this results in 'Serious Harm' (as defined by the Fisheries Act). It is noted that additional modeling and characterization of Doris Lake Outflow and Creek are required.
Information	Please provide further details on this additional modeling and characterization, as well

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Request:	as review of final data and report when available. Please update effects assessment once this information is available.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 23
Request to:	TMAC Resources Inc.
Reviewer:	Palmer Environmental Consulting Group Inc.
Subject:	Fish and Fish Habitat – Reduction in outflow from Little Roberts Lake.
Reference:	P4, section 2.5.3
Issue/Concern:	P4 includes analysis that there will be a reduction in total number of flow days in Little Roberts Outflow, and also that the reduction in stream wetted widths will be negligible. The maximum reduction of 10.8% reduction in mean annual lake discharge may be just over the upper limit of DFO's recommendation of 10% to mitigating water discharge reduction, but it is not clear what effect this would have on the fish population at a local level.
Information Request:	Please provide justification for applying DFO's recommendation at this site. Please also provide more site-specific information on potential effects (and suitable mitigation) on fisheries.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 24
Request to:	TMAC Resources Inc.
Reviewer:	Palmer Environmental Consulting Group Inc.
Subject:	Fish and Fish Habitat – Roberts Bay pipeline and diffuser decommissioning.
Reference:	P3, Table 2. P4, section 4.5.5.2
Issue/Concern:	There appears to be a generally good understanding of marine fish and fish habitat in Roberts Bay. It is noted that the installation and decommissioning of the subsea pipeline and diffuser system has the potential to affect fish habitat. From P3, Table 2, it seems as though the marine pipeline would be left in place, therefore the activities (and potential effects) from pipeline decommissioning are unclear. It is noted that concrete blocks are used for counter buoyancy weights every 5m along the pipeline, but it is unclear if there are long term effects from these as this deteriorate over time.
Information Request:	Please provide further clarification on the activities associated with pipeline decommissioning, as well as potential fish and fish habitat effects, including from infrastructure left in place.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 25
Request to:	TMAC Resources Inc.
Reviewer:	Palmer Environmental Consulting Group Inc.
Subject:	Fish and Fish Habitat – Diffuser impact on marine fish.
Reference:	P4, section 4.5.5

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Issue/Concern:	There is no mention of potential entrapment of fish at the diffuser or at end of pipe. Although detailed engineering is not yet available, it is not clear if this is a potential effect or not (noting that it may depend on the final design). During construction and operation of the pipe and diffuser, there are also no potential effects noted on acoustics/sound pressure and fish mortality or behaviour.
Information Request:	Please provide comment on these potential effects and provide suitable mitigation measures (if required).

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 26
Request to:	TMAC Resources Inc.
Reviewer:	Palmer Environmental Consulting Group Inc.
Subject:	Fish and Fish Habitat – Pipeline and diffuser self-assessment.
Reference:	P3, Table 2, P4 section 4.5.5.2
Issue/Concern:	It is noted in P4 that a fisheries self-assessment will be completed in advance of construction once detailed engineering is available. A preliminary self-assessment has however already been completed and is outlined, so this could proceed to DFO Project Review. P3 Table 1 states that the effects are 'Mitigatable'. It was noted in P3 Table 2, that the shoreline crossing of the pipeline has been designed to avoid disturbing sensitive shoreline fish habitat, but no information seems to have been provided on what type of habitat.
Information Request:	Please provide clarification on the avoidance and protection measures implemented for fish and fish habitat by the proposed marine pipeline and berm. Please also provide further assessment on the potential effect of fisheries.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 27
Request to:	TMAC Resources Inc.
Reviewer:	Hutchinson Environmental Sciences Ltd.
Subject:	TIA expansion capacity
Reference:	Package 1, Section 1.7.1; Package 6-13, Appendix B
Issue/Concern:	TMAC states *"The Doris North Project and the Madrid/Boston (Phase 2) Hope Bay Belt Project are separate but related neighboring projects…To minimize overall project footprint and potential for impact, and to maximize the existing investment TMAC has designed the Madrid/Boston project to use facilities that already exist at Doris to the extent possible. However, it is important to note that the revisions to Doris facilities listed in this Amendment Application are in support of the Doris Mine itself. Additional changes will later be required to support the Madrid/Boston project, but any such changes will be outlined and permitted separately as part of the Part 5 review of the Madrid/Boston (Phase 2) Hope Bay Belt Project."* The current Tailings Impoundment Area (TIA) plan has been re-scoped in the amendment to use sub-aerial deposition designed to accommodate a greater volume

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	of tailings than the originally permitted sub-aqueous deposition would have been able to hold within the current project footprint. It is unclear if this new shift to sub-aerial deposition would eventually require an even larger project footprint at the time of the Madrid and Boston (phase 2) project permitting. Does proceeding with this updated deposition strategy allow for the accommodation of the tailings generated from the expanded project? For example, alternative #5 presented in the Tailings Management Strategies Alternatives Assessment has the reported benefit of permitting a larger "volume of tailings within a smaller footprint, [generating] an overall more stable landform unit". A smaller footprint would provide more space for future expansion.
Information Request:	Will the proposed sub-aerial TIA need further expansion if TMAC proceeds with phase 2? Can TMAC provide a discussion on the TIA's capacity to handle additional tailings from Doris North (if additional resources are discovered), and the other proposed projects in the Hope Bay Belt (Madrid and Boston)? What will this expansion, if built, eventually mean to the final build out of the tailings disposal facility? Does it enhance or jeopardize the need for any further expansion?

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 28
Request to:	TMAC Resources Inc.
Reviewer:	Hutchinson Environmental Sciences Ltd.
Subject:	Cyanide destruction through SO2-Air Process
Reference:	Package 2, Section 3.5, Package 6-13
Issue/Concern:	TMAC states *"Cyanide destruction will be performed using the SO2-Air Process, a process that has been successfully tested. Test work confirmed previous findings that the concentration of Weak Acid Dissociable (WAD) cyanide could be reduced to less than 0.5 mg/L. At a concentration of less than 0.5 mg/L the subsequent tailings filtration and handling for backfill will not be classified as Cyanide Facilities by the International Cyanide Management Institute (ICMI)."* The declassification of the cyanide facilities relies on the successful application of the SO2-Air Process as does ensuring excess tailings reclaim water meets all Canadian cyanide discharge requirements.
Information Request:	Please provide test results for the site demonstrating the effectiveness of the SO2-Air Process and include documentation of the test conditions. Please also provide examples where the SO2-Air Process has been successfully applied. This discussion should include geographically relevant examples which have been exposed to similar climate conditions to those expected at the Project site.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 29
Request to:	TMAC Resources Inc.
Reviewer:	Hutchinson Environmental Sciences Ltd.
Subject:	Mixing zone delineation

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Reference:	Package 2, Section 3.6.2, Package 6-6 Section 5
Issue/Concern:	TMAC states: *"The proposed discharge criteria for the water from the TIA will be MMER limits in the discharge system and CCME Guidelines within Roberts Bay. Water quality modelling results show that the TIA discharge water quality would be in compliance with these criteria under a wide range of conditions without the need for additional water treatment."* The distance designated as the "mixing zone" is not outlined. TMAC only states the *"end of pipe discharged water quality for all three scenarios was determined to be below MMER limits (MMER 2015)... [and] To meet the CCME water quality guidelines within the marine environment mixing zone, a 20:1 dilution (i.e. 20 parts seawater to 1 part discharge water) would need to be achieved."*
Information Request:	What is the distance from the diffuser at which CCME water quality guidelines will be met in Roberts Bay (i.e.: what is the size of the mixing zone)? Please demonstrate how the 20:1 dilution will be achieved. Please provide modeling results for all three discharge scenarios (groundwater only, groundwater and TIA, TIA only) in both the open water season when full exchange with Melville Sound is expected and under ice when the water exchange is negligible. We note these seasonal differences specifically as they were highlighted by TMAC in Package 2.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 30
Request to:	TMAC Resources Inc.
Reviewer:	Hutchinson Environmental Sciences Ltd.
Subject:	Robustness of discharge infrastructure
Reference:	Package 2, Section 3.6.3, Package 6-7; Package 6-8
Issue/Concern:	TMAC states: *"A critical component of the outfall involves the crossing of the foreshore zone adjacent to Roberts Bay to a point below the expected depth of freezing (approximately the 4 m bathymetric contour). The pipeline will thus consist of both armoured and exposed sections. Construction of the Marine Outfall Berm to the 4 m bathymetric contour protects the pipeline from ice scouring and displacement."* We accept that armouring will extend below the level of ice cover (up to 2m), but are concerned with the capacity of the discharge infrastructure to withstand damage from environmental factors such as the storm that damaged the Roberts Bay Jetty.
Information Request:	Please provide an evaluation of the discharge infrastructure's capacity to withstand a range of environmental stressors. This should be accompanied with evidence such as side-scan sonar surveys demonstrating ice scouring is not an issue of concern below 4m in the vicinity of the discharge infrastructure. In the event of extended (longer than for standard maintenance) infrastructure failure, please provide the framework for an emergency response plan and contingency for storage of effluent. If this discussion requires consideration of alternate discharge locations (e.g.: those presented in Package 6-7), it should be

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	accompanied with: • An assessment of the mixing zone, • The dilution ratio of effluent to receiving environment water needed to meet CCME guidelines at the edge of the required mixing zone, and • The sensitivity of the receiving environment within the mixing zone. The mixing zone under failure of the discharge system will vary based upon the season (ice free versus ice cover) and the location of the failure (shoreline versus subsurface) and will be dissimilar to that of the planned mixing zone due to the shallow depth and the absence of a diffusor. Explain in the emergency response plan how this type of failure will be managed and mitigated.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 31
Request to:	TMAC Resources Inc.
Reviewer:	Hutchinson Environmental Sciences Ltd.
Subject:	Potential interaction with freshwater environment
Reference:	Package 2, Section 3.6.2; Package 3; Package 4, Section 2.5.1, Section 3.4.1; Package 5-3, Section 4; Package 6-10, Section 2.2, Section 7
Issue/Concern:	TMAC provides the following potential interactions with the freshwater aquatic environment resulting from the proposed Project changes: • *"Potential alteration of Doris Lake outflow;* • *Changes in surface water quality from runoff water from proposed expanded laydown area and ore storage pad;* • *Reduction in or alteration of habitat (changes in flow) through water losses; and* • *Removal or alteration of aquatic habitat for infrastructure, including culvert construction."* We note several additional potential interactions the project may have with the freshwater environment: 1) Saline groundwater will be a significant water quality and quantity management issue under the proposed changes to the project; peak groundwater inflow has been modelled at 3000 m3/day and the proposed disposal method is ocean discharge. However, little discussion of how TMAC will handle saline groundwater in the event of prolonged diffuser and/or related infrastructure failure is provided. TMAC only indicates that *"intercepted groundwater inflows will be stored in the underground sumps and pumped to the Pollution Control Ponds for Temporary Management or to the TIA."* 2) The impact of fugitive dust to surface water quality has not been assessed as a

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	potential impact to water quality. *"Sub-aerial tailings have the potential to generate fugitive dust emissions..."* as does vehicular traffic. While we acknowledge *"there are proven mitigation measures that will be incorporated in tailings management to reduce emissions from the tailings"* we still stress the importance of this pathway as a potential influence to the freshwater environment. We also acknowledge that magnitude of this pathway is reduced as compared with open pit mining. 3) The freshwater environment will also continue to be directly influenced by water from the TIA "in 2015 and 2016 (Years -2 and -1)" as well as after the North Dam has been breached and the natural flow from Tail Lake has been re-established.
Information Request:	1a) Please provide an analysis of alternatives for disposal of saline groundwater and a contingency plan should problems arise with the diffuser, marine outfall mixing box, or water transport infrastructure (pipeline) preventing ocean disposal of saline groundwater and please provide volume estimates of short term storage availability in the event of a failure. If TMAC has insufficient short term storage capacity or treatment capacity, if required, for saline groundwater in the pollution control ponds or TIA and needs to discharge excess water to the freshwater environment or to the near shore marine environment, an evaluation of environmental impacts to freshwater quality or the near-shore marine environment associated with the proposed saline water management should be addressed. 1b) Please provide an assessment of variance in the range of volume and concentrations of saline groundwater to be managed. 2) Please include an assessment of the impacts on water quality of fugitive dust stemming from the nearby transportation routes and sub-aerial tailings deposition. 3) Please provide an assessment of the impacts water from the TIA will have on Doris Lake and Doris Creek when an intentional connection has been established from the water body (i.e.: prior to operations and after the North Dam has been breached). Please also see KIA-36.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 32
Request to:	TMAC Resources Inc.
Reviewer:	Hutchinson Environmental Sciences Ltd.
Subject:	Saline discharges to Roberts Bay
Reference:	Package 4, Section 4.3.3, Table 4.3-1, Figure 4.3-3, Figure 4.3-4, Figure 4.5-1
Issue/Concern:	TMAC indicates that the winter ice cover shelters Roberts Bay from the wind, the primary mixing force for waters between the bay and Melville Sound. When under-ice, *"currents were generally very weak, with mean horizontal current velocities between 1 and 2 cm/s. Deep currents, which were driven either by density gradients formed through episodic ice formation/brine release or advection of waters from Melville Sound, had slightly stronger velocities. Tidal flows are weak and likely have*

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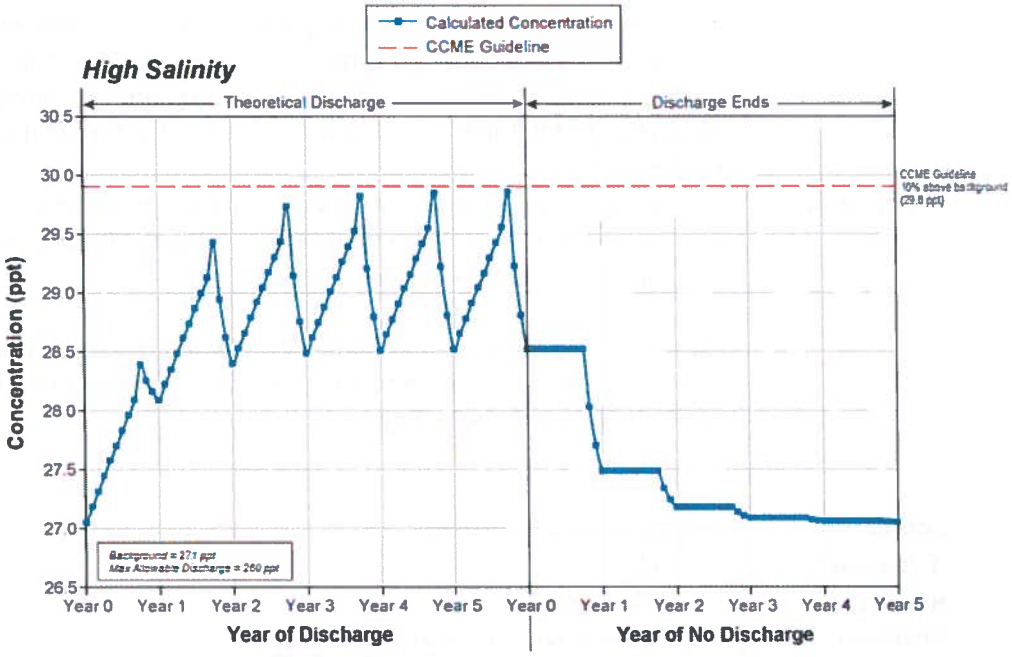
	little effect on exchange between Roberts Bay and Melville Sound." This may result in the pooling of discharged effluent while under ice, especially if it contains substantial amounts of saline groundwater. Salinity measured near the outfall as part of the baseline studies found salinity to naturally fluctuate between 15.4 – 27.6 ppt with a median value of 26.8 ppt. The CCME marine water quality guideline for salinity is provided as a narrative requiring that anthropogenic activities not vary the natural level of salinity at a given depth by more than 10%3 at the edge of the mixing zone. This would imply that salinity should not fluctuate by more than 2.68 ppt from a background of 26.8 ppt. However, Figure 4.5-1 (below) indicates the background salinity is 27.1 ppt, which would permit an anthropogenic generated fluctuation of 2.71 ppt. As this figure further indicates that salinity will be close to the CCME guideline for at least one month each year, it is important to clarify what concentration will be used as the background and how that number was derived.  Note: Allowable Effluent Concentrations are based on continuous 80 L/s of discharge during open-water season and 35 L/s during ice-covered season
Information Request:	Please provide the following clarifications for salinity discharges to Roberts Bay: 1) How and where was the background concentration of 27.1 ppt arrived at? 2) What inputs were used to generate Figure 4.5-1 in Package 4? See KIA - 31, above for concerns with expected salinity and volume of saline groundwater to be managed. 3) Please clarify why salinity increases during the first two years of operation to a new base of 28.5 % and remains steady as the new base until discharge ceases despite

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	reported annual "full exchange with Melville Sound"? Does full exchange not occur at the proposed discharge point? This concern also applies to other contaminants of potential concern discharged to Roberts Bay such as those indicated in KIA-33. 4) Please characterize the vertical structure of the water column at the discharge point.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 33
Request to:	TMAC Resources Inc.
Reviewer:	Hutchinson Environmental Sciences Ltd.
Subject:	Increasing contaminants of potential concern concentrations in Roberts Bay
Reference:	Package 4, Figure 4.5-1, 4.5-2, 4.5-3
Issue/Concern:	All parameters of potential concern in the referenced figures show increasing concentrations in Roberts Bay year over year due to effluent discharge. TMAC indicated that water in Roberts Bay was totally exchanged with Melville Sound during the open water months. We further note that all of these parameters (nitrate-N, salinity arsenic, cadmium, chromium, mercury) are very close to or above their respective CCME WQG after 6 years of production for what appears to be up to a month.
Information Request:	Please provide a discussion of why concentrations are increasing year over year despite annual full exchange with Melville Sound. Please clarify maximum concentrations that are expected after 6 years. Please provide a discussion of how CCME water quality criteria in Roberts Bay will be met if TMAC proceeds with Phase 2 of the project given that effluent will continue to be discharged to Roberts Bay.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 34
Request to:	TMAC Resources Inc.
Reviewer:	Hutchinson Environmental Sciences Ltd.
Subject:	Fugitive dust monitoring
Reference:	Package 5-1, Section 3.3, Figure 3-1
Issue/Concern:	It does not appear that dust fall originating along the road has been included in the Air Quality Management Plan. Similarly, TMAC has not included proposed dust fall monitoring locations around the tailings facility. They state that *"An update to this program will be included in the next iteration of [the Air Quality Monitoring] plan".* Proposed locations should be included in this iteration of the plan as sub-aerial tailings deposition carries with it a greater risk to generate fugitive dust than sub-aqueous deposition as originally permitted. Similarly, vehicular travel along the road leading to the marine discharge infrastructure will be an additional source of fugitive dust at the project site.

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	The proposed application of chemical suppressants, while likely effective, does not supersede the need for documented monitoring.
Information Request:	Please include proposed locations and specific approaches for the air quality monitoring around the amended project footprint in this iteration of the application for review.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 35
Request to:	TMAC Resources Inc.
Reviewer:	Hutchinson Environmental Sciences Ltd.
Subject:	NPAG tailings cover depth
Reference:	Package 5-2 Section 3.7; Package 6-10, Section 4.2.6
Issue/Concern:	TMAC indicates *"At the end of operations the tailings area in the TIA will be closed by construction of an isolation cover, consisting of a single layer of non-acid generating quarry rock. Most of the contaminated water retained in the Reclaim Pond will be pumped through the Roberts Bay Discharge System for undersea discharge. The pond will then be allowed to re-flood naturally to pre-disturbance levels (elevation 28.3 masl). The North Dam will then be breached to re-establish the natural drainage path through an engineered spillway structure."* The *"single layer"* is later defined as"0.3 m of quarry rock." However, no rationale as to why 0.3 m of quarry rock is sufficient to cap the tailings beach is provided and 0.3 m is not sufficient depth to allow the establishment of a stable permafrost cap.
Information Request:	Please provide an assessment as to why 0.3 m of quarry rock is an acceptable depth of cover for the sub-aerial tailings area and beach given other mines in Nunavut have used up to 3 m of non-acid generating rock (NAG) to cover their tailings.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 36
Request to:	TMAC Resources Inc.
Reviewer:	Hutchinson Environmental Sciences Ltd.
Subject:	Elevated parameters of potential concern in the TIA post closure
Reference:	Package 5-2, Section 6, Section 10.1; Package 6-10 Table 6-2, Appendix B
Issue/Concern:	*"Water quality in the TIA Reclaim Pond is arguably the biggest uncertainty identified to date, with potentially the largest impact on the closure cost and schedule. The water quality model will be updated and refined, as site water quality data becomes available."* Modelling for different project phases have been summarized in Package 6-10 Table 6-2 providing mean and maximum concentrations of water quality parameters in the TIA until the end of the modelling period in 2035. The modeled monthly values are then graphed in Package 6-10 Appendix B which indicates chloride, arsenic aluminum, copper and iron will be elevated above the CCME WQG and above background concentrations at TL-2, the outlet from Tail Lake into Doris

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	Lake.in the TIA until the end of the modelling period in 2035. The modeled monthly values are then graphed in Package 6-10 Appendix B which indicates chloride, arsenic aluminum, copper and iron will be elevated above the CCME WQG and above background concentrations at TL-2, the outlet from Tail Lake into Doris Lake. While we agree *"The comparison [between TIA water quality and CCME guidelines] is for reference purposes only as the CCME guidelines apply to natural watercourses, whereas the TIA is a designated tailings impoundment facility"*, once the North Dam is breached, water from the TIA will be in direct contact with the freshwater environment. At that point, CCME criteria would be a valid comparison. TMAC provides a contingency stating, *"In the case where water quality standards cannot be met by the end of the post-closure period specified in the water management plan, the monitoring time may be extended as required. Alternatively, water treatment options could be explored once the cause of the delay is known and quantified."* However, TMAC has neither discussed how elevated parameters in the TIA will impact Doris Lake, or Doris Creek during post closure, nor what treatment options are proposed or feasible if water quality standards are not met.
Information Request:	Please include a discussion on the impacts elevated parameters in the TIA may have on freshwater quality once the North Dam has been breached, and what treatment options can be applied if water quality standards are not met and when they would be applied. The latter is particularly important, as no treatment has currently been proposed for the Project and we note that treatment of a high concentration waste stream at the time of generation is more feasible than treatment of tailings water at lower concentrations at a later date. Please model the TIA discharge water quality assuming that process waters were treated prior to discharge to the TIA and how this would influence water quality at closure.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 37
Request to:	TMAC Resources Inc.
Reviewer:	Hutchinson Environmental Sciences Ltd.
Subject:	Alternative explosives for use under wet conditions
Reference:	Package 5-4 Section 2.3
Issue/Concern:	TMAC states *"If the hole cannot be dewatered, or if it is seeping water, the hole will be loaded with an alternative explosive that is effective under wet conditions."* Potential alternative explosives have not been outlined in the amendment application. Alternatives should be presented to ensure the suite of monitored parameters would be able to identify water that has come into contact with residue from the alternative explosives.

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Information Request:	What are the alternative explosives and what are the environmental risks, if any, associated with them? Are the currently proposed suite of parameters and their concentrations sufficient to characterize water containing explosives residue? Will these tend to impact the receiving waters in Roberts Bay by accumulating there? Please review alternative methods for "dry" blasting, such as lining blast holes, as has been successfully implemented at the Diavik project.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 38
Request to:	TMAC Resources Inc.
Reviewer:	Hutchinson Environmental Sciences Ltd.
Subject:	Hydraulic connection between Tail Lake and Doris Lake
Reference:	Package 6-3, Package 6-13
Issue/Concern:	Saline groundwater will be a significant water quality and quantity management issue under the proposed changes to the project; peak groundwater inflow has been modelled at 3000 m3/day and the proposed disposal method is ocean discharge. TMAC provides ample discussion of the interaction between groundwater, the underground mining operations and Doris Lake. However, no discussion is provided regarding the potential subsurface hydraulic connection between Tail Lake (the TIA) and Doris Lake. A hydraulic connection could provide a potential pathway between tailings contact water and a freshwater or marine receiving environment. TMAC should provide evidence that no hydraulic connection exists between the TIA and Doris Lake.
Information Request:	Please provide evidence indicating the absence of a hydraulic connection between the TIA and Doris Lake. This evidence should include data from piezometers and thermistors strategically located between the two water bodies including relevant geochemical tracers used for the TIA water.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 39
Request to:	TMAC Resources Inc.
Reviewer:	BGC Engineering Inc.
Subject:	Hydrogeological Modeling of the Proposed Doris North Project, Hope Bay, Nunavut
Reference:	Report Statement: Section 1.1, P1
Issue/Concern:	Water quality sampling has confirmed that the groundwater has high salinity and high concentrations of dissolved chloride, ammonia, boron, cadmium and manganese and therefore careful management of the ground water is required.
Information Request:	Given the statement above, is there a ground water collection and treatment plan associated with the project?

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 40

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Request to:	TMAC Resources Inc.
Reviewer:	BGC Engineering Inc.
Subject:	Hydrogeological Modeling of the Proposed Doris North Project, Hope Bay, Nunavut
Reference:	Report Statement: Section 2.3.3.1, P8
Issue/Concern:	Average thickness of soft lake bed sediments = 17 m
Information Request:	Given the significant thickness of soft lakebed sediments, what is the expected settlement of the intermediate dike or can dike stability be assured? What happens if Intermediate Dike fails?

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 41
Request to:	TMAC Resources Inc.
Reviewer:	BGC Engineering Inc.
Subject:	Hydrogeological Modeling of the Proposed Doris North Project, Hope Bay, Nunavut
Reference:	Report Statement: Section 5, P36
Issue/Concern:	70% of the mine inflow is associated with water from Doris Lake, with the remainder coming from deep groundwater.
Information Request:	Given the amount of inflow water expected from Doris Lake, what is the expected impact on the water level in the lake from these losses?

Source:	Kitikmeot Inuit Association
IR Number:	Report Statement: Section 5, P36
Request to:	TMAC Resources Inc.
Reviewer:	BGC Engineering Inc.
Subject:	Hydrogeological Modeling of the Proposed Doris North Project, Hope Bay, Nunavut
Reference:	KIA - 42
Issue/Concern:	The water encountered during mining, at least initially, will be saline, and dominated by chloride.
Information Request:	Given the above statement on water quality, will the mine inflows require treatment prior to disposal?

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 43
Request to:	TMAC Resources Inc.
Reviewer:	BGC Engineering Inc.
Subject:	Water and Load Balance Report
Reference:	Report Statement: P40, Section 6.3.1
Issue/Concern:	Mercury and selenium have been excluded due to high detection limits in the mill effluent water quality dataset, which could result in artificially elevated predictions, which could result in artificially elevated predictions.
Information	Given the exclusion of these parameters in the study, are they accommodated in

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Request:	water quality predictions in another way?

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 44
Request to:	TMAC Resources Inc.
Reviewer:	BGC Engineering Inc.
Subject:	Water and Load Balance Report
Reference:	Report Statement: P46, Section 7
Issue/Concern:	The majority of predicted concentrations in the TIA are expected to be below the CCME guidelines once the TIA refills with the exception of aluminum, copper and iron.
Information Request:	Given the water quality exceedances noted above, is there a plan for water treatment?

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 45
Request to:	TMAC Resources Inc.
Reviewer:	BGC Engineering Inc.
Subject:	Expanded Laydown Area (Pad U)
Reference:	Report Statement: P5, Section 4.5
Issue/Concern:	Comprehensive geotechnical investigations have been carried out at the Hope Bay Site.
Information Request:	Have boreholes been drilled under the U Pad?

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 46
Request to:	TMAC Resources Inc.
Reviewer:	BGC Engineering Inc.
Subject:	Expanded Laydown Area (Pad U)
Reference:	Report Statement: P5, Section 4.5
Issue/Concern:	Typical Detail 1 - Drawing DN-WRE-03 Sections and Details 1 of 2
Information Request:	BGC Comment is with respect to liner location.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 47
Request to:	TMAC Resources Inc.
Reviewer:	BGC Engineering Inc.
Subject:	Doris North Pad U Ore Stockpile Stability Analysis
Reference:	Report Statement: Table 1, P1, Section 1

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Issue/Concern:	Marine Silt and Clay Foundation unfrozen friction angle = 40 degrees, frozen apparent cohesion = 112 kPa.
Information Request:	Confirm the basis for the parameters used.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 48
Request to:	TMAC Resources Inc.
Reviewer:	BGC Engineering Inc.
Subject:	Tailings Management Strategies Alternatives Assessment
Reference:	Report Statement: P3, Section 3.1
Issue/Concern:	At that time, it was acknowledged that expansion of the facility would require the tailings deposition strategy to change from subaqueous deposition to sub-aerial, unless perpetual water retaining dams were deemed acceptable.
Information Request:	Since the sub-aerial tailings will take a significant amount of time to freeze back post closure, the dam will retain saturated tailings for a significant period of time following closure. How is this accommodated in the design and closure of the facility? The GCL liner only at the South Dam will be potentially leaky until beach is fully developed.

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 49
Request to:	TMAC Resources Inc.
Reviewer:	BGC Engineering Inc.
Subject:	Tailings Management Strategies Alternatives Assessment
Reference:	Report Statement: P3, Section 3.3
Issue/Concern:	The foundation conditions at the site beneath the North and South Dams (SRK 2007) are however such that the use of conventional non-frozen dam construction methods would be technically challenging.
Information Request:	What is the contingency plan should the North Dam be required to stay in service longer than expected? When does the foundation start to thaw?

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 50
Request to:	TMAC Resources Inc.
Reviewer:	BGC Engineering Inc.
Subject:	Tailings Management Strategies Alternatives Assessment
Reference:	Report Statement: P4, Section 3.3
Issue/Concern:	The North and South Dams can be constructed and operated as frozen core dams since at closure they will only retain tailings solids, which in the long term is expected to be unsaturated and frozen.
Information	What are the impacts on the thermal state of the dam if the tailings take a significant

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Request:	amount of time to freeze back? If the tailings covers are only terrestrial covers, then infiltration will occur into the tailings until they freeze. Does the freeze back rate include increasing moisture content in the tailings?

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 51
Request to:	TMAC Resources Inc.
Reviewer:	BGC Engineering Inc.
Subject:	Tailings Management Strategies Alternatives Assessment
Reference:	Report Statement: P4, Section 3.3
Issue/Concern:	Drawbacks of this strategy includes high initial capital cost for the filter process, increased operational cost for transportation and compaction of the tailings and a requirement to manage fugitive tailings dust until such times as the closure cover is in place.
Information Request:	Have temporary measures such as surficial cover material been considered to control dusting? In addition, high capital costs for these measures are offset by the lack of dam construction dry stack may be overall cheaper upon full life cycle assessment. Comments?

Source:	Kitikmeot Inuit Association
IR Number:	KIA - 52
Request to:	TMAC Resources Inc.
Reviewer:	BGC Engineering Inc.
Subject:	Tailings Management Strategies Alternatives Assessment
Reference:	Report Statement: P5, Section 3.3
Issue/Concern:	To maximize the benefits of this alternative, the area where dry stack tailings are to be placed within the TIA footprint will have to be drained prior to deposition.
Information Request:	Have alternative locations for the dry stack be evaluated?