## APPENDIX 1: Comments on the Draft Closure and Reclamation Plan

### General Comments:

- GMOB recognizes that preparing and communicating a CRP for a large and complex site like Giant is extremely challenging. GMOB appreciates the Project Team's efforts to date and hopes that the comments below will be useful in preparing the next draft of the CRP.
- The Project Team has provided a large body of information and reports this year, not all of which GMOB was able to review to date. We acknowledge that some of the questions and comments presented in the following tables may already be included in the supporting documents to the CRP.
- In general, our review identifies questions and concerns at a conceptual level. We have not done a detailed QA/QC review.
- With regards to the draft CRP, our review has focused on identifying areas where we believe additional information will help to fully clarify certain aspects of the plan. In our opinion, this additional information is necessary for GMOB and other parties to properly understand the proposed project and help ensure that comments or opinions expressed during the water licensing process are well-informed.
- For clarity, our feedback on the draft CRP is not exhaustive, nor does it preclude GMOB from providing further and more detailed input during subsequent processes, including the licensing process.
- Comments have been provided on the following topics:
    - Cross-Cutting Themes (Table 1)
    - Contaminated Soils (Table 2)
    - Sediments (Table 3)
    - Tailings (Table 4)
    - Pits and Borrow (Table 5)
    - Freeze Program (Table 6)
    - Groundwater Management (Table 7)
    - Arsenic Impacted Waste Disposal (Table 8)
    - Baker Creek (Table 9)

## Table 1: Cross-Cutting Themes

| TOPIC: CROSS-CUTTING THEMES | | |
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| **#** | **Sub-Topic** | **Comment** |
| **1** | Permanence | 1. A fundamental design principle of modern mine closure legislation and guidance is that closure works should be permanent, wherever feasible. This is typically defined as the ability of a closure method to remain effective over the long-term, without ongoing management.[1]<br>2. In its Reasons for Decision, MVEIRB concluded that freezing arsenic trioxide *in situ* would not be effective (i.e., it would not be permanent) without long-term institutional care. On that basis, the Project was authorized to proceed only on an interim basis, for a maximum of 100 years (Measure 1) and that research should be conducted to identify a more permanent arsenic trioxide management solution (Measures 3 and 4). Through these and other requirements, MVEIRB emphasized that permanence needed to be a fundamental design principle when deciding how to remediate the Giant Mine.<br>3. Notwithstanding MVEIRB's emphasis on permanence, during our review of the CRP, we identified aspects of the Plan that do not appear to meet this fundamental requirement. For example, the proposed approach for the management of contaminated soils (i.e., fencing) will eventually fail if care and maintenance is not performed on a regular basis. Based on the information presented in the CRP, the justification for selecting this and other non-permanent remediation solutions is not apparent.<br>4. To address this gap in understanding, we suggest that the CRP explicitly describe the rationale for selecting any remediation measures that are not permanent. In each instance, the descriptions should clarify whether permanent solutions exist and why they were considered unacceptable. |
| **2** | Perpetual Care Plan | 1. Similar to the remediation plan presented in the DAR, the remedial approaches described in the CRP will require long-term institutional care. This requirement received significant attention throughout the EA process. In general, MVEIRB concluded that the Project Team had focused almost exclusively on the active phase of remediation, and limited information was presented describing how the site |

1. For example, the Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories (CIRNAC / MVLWB, 2013) indicate that closure "will not be successful in the long-term (e.g., 1000 years) unless all physical structures are designed such that they do not pose a hazard to humans, wildlife, aquatic life, or environmental health and safety".

| TOPIC: CROSS-CUTTING THEMES | | |
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| | | would be managed in perpetuity. As such, the DAR failed to communicate the life-cycle of management requirements associated with the remediation plan. According to MVEIRB, this undermined public confidence in the proposed approach.<br>2. MVEIRB's Reasons for Decision included a consolidated list of commitments made by the Project Team to address concerns identified during the EA process. The first commitment on the list indicates the Project Team will prepare a "Comprehensive Perpetual Care Plan". GMOB believes that such a plan is a critically important companion document to the CRP; in combination, the two plans should describe the full life-cycle of risk management at the Giant Mine, from active remediation through to long-term care. However, based on the documents reviewed to date, it is our understanding that the Perpetual Care Plan has yet to be developed. We therefore suggest that the Project Team provide an update on the status of the Perpetual Care Plan. |
| **3** | Option Selection Process | 1. Chapter 5 of the CRP describes the proposed remediation plan on a component-by-component basis. In each case, the document gives an overview of the closure options that were considered and the preferred closure activity is identified.<br>2. Based on our review, there is insufficient information in the CRP for reviewers to understand why options were selected or rejected. For example, there are no tables evaluating the relative performance of the options using pre-defined criteria and weightings. As a consequence, it is difficult to verify how a given option performs relative to the alternatives and which criteria exerted the most influence over the decision-making process.<br>3. GMOB acknowledges that some of this information will likely be presented in supporting documents to the CRP (only some of which are currently available for review). We suggest that summaries of such information be incorporated into the CRP to ensure the document serves as a comprehensive and stand-alone justification of the proposed remediation plan. We would be happy to discuss examples of similar option selection processes, if requested. |
| **4** | Temporal Scope and Design Life | 1. The CRP states:<br>*Any component that remains at the Site should be constructed to be physically stable under natural extreme events or disruptive forces so that closure would be successful for the closure period defined as 100 years as required by Measure 1 of the EA (MVEIRB 2013).* |

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| | | 2. This statement implies a remediation method will be considered successful if it's capable of serving its intended purpose for 100 years. We question the appropriateness of this interpretation. Specifically, based on MVEIRB's Reasons for Decision, we believe the Review Board's recommended temporal scope of 100 years was to be applied only to the freezing of arsenic trioxide. In contrast, there is no suggestion that MVEIRB intended to limit the functional life of other Project components to the same timeframe.<br>3. To avoid confusion on the design intent, GMOB suggests that the CRP clearly indicate the anticipated design life of each major remedial component (water management infrastructure, dams, covers, thermosyphons, fences, etc.). This information will help to inform decisions regarding long-term care of the site including care, maintenance and re-capitalization requirements. |
| **5** | Off-Site Contamination | 1. The Project boundaries used in the CRP are consistent with those used in the DAR and EA process (i.e., the former lease area that was in place during the operational period of the mine). However, contamination attributable to historic operations at the Giant Mine extends well beyond this boundary. This historic contamination continues to cause significant adverse impacts to the terrestrial, aquatic and human environments of the area.<br>2. While GMOB understands that such impacts are not within the scope of the Giant Mine Remediation Project, responsibility for those impacts rests with the co-proponents of the project (i.e., the Federal and Territorial Governments). To be effective, all efforts to remediate the Giant Mine site should be conducted in a fashion that is consistent with efforts to address off-site contamination. On this basis, we suggest that the CRP include a description of the processes the Federal and Territorial Governments are taking to assess and mitigate off-site contamination. |

## Table 2: Contaminated Soils

| TOPIC: CONTAMINATED SOILS | | |
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| **#** | **Sub-Topic** | **Comment** |
| 1 | Project Changes: Undisturbed Areas | 4. The original closure plan presented in the DAR committed to remediate the surface of the site to the industrial land-use guidelines under the *NWT Environmental Protection Act* (i.e., 340 mg/kg). The DAR did not distinguish between disturbed and un-disturbed soils (i.e., the entire site was to be remediated to the industrial criterion).<br>5. The revised plan presented in the CRP indicates that the industrial criterion will be applied only to the disturbed areas of the site. In general, undisturbed soils will not be remediated. Undisturbed soils with arsenic concentrations above 3,000 mg/kg will be fenced and areas below this concentration will be accessible to human and ecological receptors. Receptors will therefore be exposed to arsenic concentrations that are up to 3,000 mg/kg (i.e., 9X the criterion specified in the DAR).<br>6. Intuitively, the change in approach to the management of undisturbed contaminated soils will result in arsenic exposures that are greater than those that were assessed during the EA process.<br>7. To ensure all parties are aware of the implications of this proposed change, GMOB suggests that the incremental risks be quantified and reported in the CRP along with a detailed description of the rationale for the change. We suggest the rationale clearly indicate why the DAR concept is no longer preferred (i.e., why it does not meet the closure objectives). |
| 2 | Project Changes: Fencing | 1. While the DAR indicated that the central core of the site would be fenced to limit access to key infrastructure (e.g., the water treatment plant and thermosyphons) the footprint of the fenced area was relatively small (approximately 20 hectares).<br>2. The CRP proposes to fence a much larger area (several hundred hectares) to prevent access to undisturbed soils arsenic concentrations above 3,000 mg/kg.<br>3. In comparison to the DAR, the change in approach represents a significant reduction in the quantity of land that will be available for future use.<br>4. GMOB suggests that the CRP include a detailed description of the rationale for the change and the rationale clearly indicate why the DAR concept is no longer preferred (i.e., why it does not meet the closure objectives). |

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| **3** | Criteria for Fencing | 1. Based on the documentation reviewed, we have not seen a technical justification for using 3,000 mg/kg as the fencing boundary. As such, we are unable to confirm if the boundary is appropriately protective. It is also unclear which activities will be possible outside of the fenced area without resulting in unacceptably elevated arsenic risks.<br>2. GMOB suggests that the CRP and supporting documentation clearly describe the scientific basis for using 3,000 mg/kg as the fence boundary and identify the land uses and exposure scenarios that could occur outside of the fence without resulting in unacceptable risks to people (types of activities, duration, frequency, etc.). |
| **4** | Spatial Extent of Fencing | 1. The CRP identifies an alignment for the proposed fence but the document also clarifies that modifications are likely to occur as more information becomes available.<br>2. Based on a preliminary review of soil quality data contained in supporting documents, we identified several areas well beyond the currently proposed fence line where arsenic concentrations exceed the 3,000 mg/kg threshold (e.g., to the west of Trapper Lake which is roughly 1.5 km beyond the proposed fence line). Additional elevated results are likely to be identified outside of the current fence line as more characterization data is collected.<br>3. Based on the above, we anticipate that the area requiring fencing will need to be expanded significantly from what is currently assumed. In some instances, areas exceeding the 3,000 mg/kg threshold are likely to extend up to and beyond the Project boundaries (i.e., the former Giant Mine lease).<br>4. The implications of the uncertainties noted above are potentially significant. For example, increasing the size of the fenced area and extending it up to the property line will have a wide range of technical, cost and off-site implications. We therefore suggest that this issue be studied in greater detail on a priority basis. |
| **5** | Permanence of Fencing | 4. In Table 1 we clarify the importance of permanence as a fundamental design requirement for the GMRP. Specifically, remedial options should be capable of performing their intended function for extended periods without institutional care.<br>5. The CRP indicates that several hundred hectares of the site will be fenced to prevent receptors from being exposed to unacceptable risks associated with contaminated soils. The decision to fence a |

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| | | large portion of the site was reached using a transparent Multiple Accounts Analysis (MAA) approach that considered a wide range of relevant factors. Despite the rigor of this approach, we note that fencing would likely fail within several decades in the absence of institutional care. On this basis, the selected remedial option does not meet the fundamental design requirement of permanence. However, we acknowledge that all other options also have deficiencies.<br>6. The decision to leave contamination in place and fence large areas was influenced, in part, by preferences expressed by some individuals during the SDE process. We question whether all participants had a sufficient understanding of the implications associated with this decision. In an effort to inform any future consultations and the water licensing process, we suggest that the Project Team make additional efforts to quantify and communicate the incremental risks associated with not having the fence. |
| **6** | Clean-Up Criteria | 3. The CRP indicates that disturbed soils with arsenic concentrations above 4,500 mg/kg will be: a) excavated; b) placed in a pit under a complex cover with a geomembrane; c) the area will be frozen; d) any leachate from the contaminated soils will be collected/treated prior to discharge; and e) the entire area will be fenced. In contrast, undisturbed soils with arsenic concentrations between 3,000 and 4,500 mg/kg will remain on surface in perpetuity with no controls except a fence. Outside the fence, the public will have free access to areas that have arsenic concentrations up to 3,000 mg/kg. Based on the associated risks, we find it difficult to rationalize the multiple layers of isolation used for disturbed soils within the fence when no actions will be taken to address highly contaminated undisturbed soils outside the fence.<br>4. The CRP commits to cleaning up disturbed contaminated soils to the GNWT industrial arsenic criterion of 340 mg/kg. Based on the remedial approaches that will be used (i.e., excavation and/or cover with clean fill), we assume the same approach could achieve the residential criterion of 160 mg/kg for all disturbed soils without incurring significant additional effort or expense.<br>5. Unlike the rest of the site, the CRP commits to cleaning up the former townsite to the residential criterion. No explanation is provided why this significant and costly exception was made (i.e., the intended purpose of the exception).<br>6. We recommend that the CRP provide additional details to further clarify the rationale behind the points noted above. |

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| **7** | Community Engagement | 1. The CRP provides the following statement from the Surface Design Engagement (SDE) process: "*For parts of the Site where the soil is contaminated by dust only, people were reluctant to destroy the healthy vegetation just to get at the soil. Instead, they recommended sampling and testing with signs or access controls where there might be a risk to people.*"<br>2. We note that this conclusion was not unanimous; some individuals voiced a strong preference for active remediation of undisturbed soils based on the view that the impacts to vegetation would be temporary but the benefits would be permanent. Further, while the SDE process clearly indicated undisturbed soils had elevated arsenic concentrations, information describing the level of contamination was not provided (i.e., that there are large areas with concentrations up to 20 X above the residential criterion for Yellowknife). As a result, the preferences of some participants may have been reached without sufficient information.<br>3. Future engagement activities should clarify that the proposed soil management approach involves leaving highly contaminated soils in place without any form of active remediation. The risks associated with being exposed to the soils should be clearly communicated. |
| **8** | Distinguishing Between Mineralized Fill and Contaminated Soils | 1. Section 2.3.1 states: "*Mining operations created mineralized granular fill material, which was used for development along with regrading and maintenance of the Developed Areas. This fill contains elevated arsenic concentrations exceeding the industrial soil quality guideline for total arsenic of 340 mg/kg.*" Based on these elevated arsenic concentrations, the CRP proposes to remediate this granular fill by applying the same approach that will be used for contaminated soils.<br>2. We question the appropriateness of using soil criteria when deciding whether remediation of mineralized granular fill is necessary. While such fill may have elevated arsenic concentrations, the majority of arsenic is incorporated within the rock matrix. As such, the arsenic is generally less available than arsenic present in fine-grained natural organic soils.<br>3. Based on the above, some remediation projects have distinguished between organic soils and granular materials derived from mining activities. For example, in the case of the Terra Mine Site, a site-specific soil criterion was developed for fine-grained organic soils but the criterion was not applied to granular materials such as tailings and waste rock. A similar approach may be warranted for the current project. |

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| **9** | Arsenic Form and Bioavailability | 1. Related to the previous point, the risks associated with arsenic exposures vary significantly depending on the bioavailability of its various chemical forms. For example, the higher solubility and bioavailability of arsenic trioxide represents a significantly greater biological risk when compared to more "stable" minerals such as arsenopyrite.<br>2. The soil management approach described in the CRP does not appear to distinguish among different arsenic forms. Instead, remediation criteria are based on total arsenic concentrations. While this approach is conservative and more practical to implement, it may have resulted in an exaggeration of site risks.<br>3. We suggest that the Project Team consider the merits of differentiating between the various arsenic forms and bioavailability when making remedial decisions and document the conclusions. |
| **10** | Spatial Averaging of Arsenic Concentrations | 1. The elevated arsenic concentrations in soils at the Giant site are not uniformly distributed and there is a high degree of variability from one location to another. This affects the total risk profile of individuals that use the site.<br>2. Beyond the core industrial area, the most elevated arsenic concentrations are typically found in small deposits of undisturbed "outcrop" soils that are surrounded by barren bedrock. While arsenic concentrations in the outcrop soils are highly elevated, they are not representative of the spatial averages to which human receptors would be exposed while passing through the site. For example, a person walking through these areas would be exposed to two arsenic sources: i) small areas of outcrop soils with elevated arsenic; and ii) large areas of bedrock that are assumed to represent a much lower exposure pathway. The total amount of exposure will be determined by the ratio of these two areas and the time spent in the respective areas.<br>3. Although not stated explicitly, the CRP implies that contaminated soil management decisions will be based on concentration measurements from single points. Using the example noted above, this approach would result in localized actions that may not be required in the context of average soil exposures. If this is the case, we suggest consideration be given to basing remedial decisions on spatial averages instead of elevated results that are highly localized. |
| **11** | Remediation Methods | 1. The CRP states that soil remediation in the former townsite will be achieved using the following approach: "*For the bedrock terrain, soil remediation will be completed using a combination of hand* |

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| | | *tools (i.e., small trowels, narrow shovels, and small brooms), lightweight track mounted equipment, and portable equipment. Portable equipment may include the use of small portable compressors to mobilize soil from bedrock crevasses and hand-held vacuums to collect soil.*"<br>2. We question whether this is the best approach. The dominant exposure pathways for arsenic contaminated soils are dust inhalation and soil ingestion. Both of these pathways can be effectively controlled by leaving the soil *in situ* and placement of granular "intrusion barriers" (e.g., 0.5 m of coarse fill). This method, which was used for contamination attributable to the Con Mine, would effectively isolate the arsenic without incurring the significant effort, cost and occupational exposures associated with the proposed soil removal approach. While *in situ* soils represent a theoretical source of arsenic seepage, we anticipate that the impacts to humans and Great Slave Lake would be negligible.<br>3. Based on the above, se suggest there is merit in the Project Team re-evaluating the methods that could be used to manage contaminated soils *in situ*. If such methods show promise, consideration should be given to remediating undisturbed soils beyond the former townsite. |
| **12** | Hydrocarbon Impacted Soils | 1. The CRP indicates that hydrocarbon impacted soils will be disposed in the tailings containment areas (TCAs).<br>2. We note that some soils contain elevated concentrations of BTEX and F1/F2 fractions. We suggest that the Project Team clarify whether it expects these or any other hydrocarbon impacted soils will require pre-treatment prior to disposal and whether design modifications to the TCAs will be necessary to accommodate the soils. |
| **13** | Delayed risk identification | 1. Beginning in the 1950's, the scientific community was aware that atmospheric dispersion of roaster emissions from the Giant Mine resulted in wide-spread arsenic impacts to water, soils and vegetation. Multiple studies were conducted over the intervening decades to assess impacts that occurred beyond the lease area.<br>2. The first efforts to characterize arsenic impacts to undisturbed soils within the lease area were initiated by university researchers in 2014 (i.e., approximately fifteen years after the Government of Canada became the custodian for the site). That research confirmed that some undisturbed soils are highly contaminated. The Project Team recently expanded on this work and there is now a |

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| | | reasonable understanding of contaminant levels in undisturbed soils on the site. Due to the delay in characterizing undisturbed soils, the previous remediation plan (i.e., the DAR) and associated EA process did not consider the need and the means to mitigate the associated impacts.<br>3. The delay in identifying and characterizing undisturbed soil contamination represents a significant oversight. The root causes and implications of the oversight should be evaluated, documented and addressed. |

## Table 3: Sediments

| TOPIC: SEDIMENTS | | |
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| 1 | Risk Drivers for Great Slave Lake Shoreline Sediment Remediation | 1. The CRP proposes to remediate shoreline sediments in Great Slave Lake that are adjacent to the former townsite. Based on current plans, approximately 1.5 km of shoreline will be remediated through a combination of sediment dredging and capping with an engineered cover.<br>2. The decision to remediate shoreline sediments was informed by the HHERA conclusion that direct human contact through wading or swimming represented an unacceptable risk. In reaching this conclusion, the HHERA assumed that people would wade for two hours a day, seven days a week, 10 weeks a year, every year over a lifetime. Using that scenario, receptors were found to have arsenic exposures that were sufficiently elevated to justify the remediation of the shoreline sediments.<br>3. While this scenario may be used for risk assessments in other jurisdictions, it may not be appropriate in the context of a northern, cold-water environment. In addition, the scenario is inconsistent with assumptions used to evaluate terrestrial exposure risks (e.g., exposures to contaminated soils).<br>4. In addition to scientific considerations, public preferences and perceptions of elevated risk appear to have played an important role when determining whether the sediments should be remediated. For transparency, we recommend that the CRP clearly indicate whether community input served as one of the key drivers in the decision to remediate shoreline sediments. |
| 2 | Mixing Zone Interaction | 1. The CRP indicates that a mixing zone with a radius of 200 m from the mouth of Baker Creek will be required to meet applicable Effluent Quality Criteria for discharges to Great Slave Lake. For some of the contaminants of potential concern, the mixing zone is required to reduce potential contaminants to levels that are deemed protective of people and the environment. In the case of arsenic, the EQC for the new Water Treatment Plant is set at the Health Canada drinking water standard of 10 µg/L, although arsenic levels in the water coming from Baker Creek will be much higher.<br>2. We note that the remediated shoreline sediments overlap with the proposed mixing zone for Baker Creek. On this basis, the remediated sediments may encourage recreational use within the Baker Creek mixing zone where contaminant concentrations in water are elevated above the applicable criteria. Using arsenic as an example, water discharging from Baker Creek is anticipated to have arsenic concentrations of 200 µg/L (i.e., 20 times higher than the drinking water standard). |

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| | | 3. In addition to the potential conflict noted above, we assume that the ongoing contaminant load from Baker Creek may result in the deposition/transfer of contaminants to sediments within the mixing zone. If this occurs, contaminant concentrations in remediated shoreline sediments close to the mouth of Baker Creek may increase with time.<br>4. We suggest that the CRP clarify whether the potential concerns noted above are relevant. |
| **3** | Other Contaminated Sediments | 1. In addition to the shoreline area, more than 100 hectares of Back Bay sediments have arsenic concentrations in excess of 500 mg/kg. This is approximately 85 times above the Canadian interim sediment quality guideline (ISQG) for arsenic.<br>2. In addition to elevated arsenic concentrations, impacts to aquatic receptors such as benthic invertebrates are known to have occurred in this area. Members of the YKDFN and other residents have also stated that they avoid using Back Bay because the sediments are highly contaminated.<br>3. Despite these impacts, the CRP does not evaluate whether remediation of sediments beyond the shoreline area is necessary. While it is possible the impacts of such remediation would outweigh the benefits, we suggest that the issue be evaluated to determine whether action is justified. We suggest that a high-level review of remediation requirements and options for contaminated Great Slave Lake sediments beyond the shoreline be incorporated into the CRP. If the Project Team considers this to be outside their mandate, the CRP should specify which government agency is responsible. |
| **4** | Project Changes: Shoreline Remediation | 1. With the exception of a much smaller area in the vicinity of the foreshore tailings, the DAR did not include remediation of shoreline sediments. As such, the Environmental Assessment process did not consider adverse impacts that might be caused by shoreline remediation activities (e.g., dredging and cover placement resulting in habitat destruction and inadvertent mobilization of contaminated sediments and/or porewater). These potential impacts should be identified and assessed so that they can be mitigated.<br>2. Based on the above, we suggest that a high-level assessment of potential adverse impacts from shoreline remediation be performed. Where necessary, appropriate mitigations should be proposed. The assessment should also evaluate all other new activities that were not assessed during the previous EA process. |

## Table 4: Tailings

| TOPIC: TAILINGS | | |
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| **#** | **Sub-Topic** | **Comment** |
| **1** | Covers: Vegetation | 1. The original tailings management approach described in the DAR included a "store and release" vegetated cover that was predicted to meet all applicable design requirements.<br>2. During the development of the CRP, the Project Team re-assessed the management approach for tailings. This involved preliminary evaluations of a range of non-vegetated and vegetated cover options. However, during the SDE process some participants indicated a preference that the site remain "grey and ugly". This preference was based on the view that the remediated site should discourage future use and serve as a warning to future generations. Based on this input, the Project Team screened out all vegetated cover options and only advanced non-vegetated cover options to detailed technical assessments during a subsequent trade-off study.<br>3. However, GMOB notes that in many contexts, vegetated covers are considered to be the best practice for modern mine closure. Experience from around the world, including the north, has shown that properly designed and constructed vegetated covers can be highly effective in isolating tailings without introducing new risks (contaminant uptake by vegetation, physical damage by vehicles, etc.). The document *Cold Regions Cover System Design Technical Guidance Document* (2012) which was funded by CIRNAC supports this conclusion.<br>4. Prior to making a final decision on the preferred cover option, GMOB suggests that the trade-off study be revisited to assess the technical viability of vegetated covers relative to non-vegetated options. The revised CRP should include all considerations, including vegetated covers, and clearly present the rationale for accepting or rejecting each option. |
| **2** | Covers: Geomembrane and Alternatives | 1. The new tailings management approach described in the CRP includes the placement of a synthetic geomembrane. The design intent of the geomembrane is to limit the quantity of precipitation that comes in contact with the underlying tailings and to reduce infiltration to the mine pool. This may improve the quality of water draining from the tailings management areas and may eliminate the need to treat the water prior to release to the environment.<br>2. There is uncertainty regarding the long-term performance of geomembranes, particularly in cold-weather environments. This performance is influenced by a variety of factors including the chemical stability of the geomembrane and physical stresses that are exerted upon it (e.g., excessive differential settlement/heaving, slope failures and erosion). Despite these uncertainties, it is |

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| | | generally expected that a properly designed and constructed geomembrane would perform effectively for several hundred years. Localized failures could occur earlier but, in the case of the Giant Mine, this would not compromise the overall design intent of the geomembrane.<br>3. Notwithstanding the generally positive performance of geomembranes, they are among the most expensive and technically complex of the cover options. They also require on-going care and maintenance to ensure their continued performance. Based on these limitations and the effective performance of other options such as store and release vegetated covers, the incremental benefits of geomembranes are not always justified.<br>4. While we agree that geomembranes are likely to be effective, there is a potential that vegetated options would perform equally well. As such, the clarification on choice of a tailings cover suggested in the previous comment should also consider the relative performance of a geomembrane to a vegetated cover. |
| **3** | Use of Tailings as Pit Fill | 1. In-pit tailings disposal is a common closure method for mines and, depending on the circumstance, is classified as a best practice. For example, the Meadowbank Mine in Nunavut was recently given approval to switch from managing tailings in surface facilities to in-pit tailings disposal for the following reasons: i) tailings are contained in a low-lying depression, thereby limiting the potential for physical mobilization by gravity, erosion or other forces; ii) the volume of tailings that can be disposed in a pit is far greater than in a surface deposit of similar area; iii) impacted areas are consolidated (i.e., pits and tailings are in the same footprint); iv) requirements to source new borrow to fill pits are reduced, thereby limiting project impacts; and v) long-term care requirements for covers, tailings dams, etc. are significantly reduced.<br>2. Notwithstanding the advantages noted in the above example, the CRP determined that placing tailings in the pits was inappropriate. This decision was influenced by a number of constructability challenges. For instance, the pits have insufficient storage capacity to store all tailings and there were reportedly additional risks associated with underground stability.<br>3. While we acknowledge these and other challenges, based on the documentation reviewed to date, we have insufficient information to support the Project Team's conclusion that the technical challenges of in-pit tailings disposal outweigh the benefits. In addition, we note that community input received during the SDE process supported the use of open pits as a location for the disposal of contaminated materials such as tailings. |

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| **#** | **Sub-Topic** | **Comment** |
| | | 4. Based on the above, we suggest that a high-level quantitative analysis comparing the technical performance of in-pit and surface disposal options for tailings be incorporated into the CRP. |
| **4** | Technical Basis for South Tailings Pond Re-location | 1. During the SDE process, affected parties expressed preferences for options that reduced the footprint of the TCAs as part of the rehabilitation efforts. After evaluating a range of options to address this preference, the Project Team determined that the best re-location option involved transferring the contents of the South Tailings Pond into the Central and North Pond footprints.<br>2. The CRP indicates that eliminating the South Tailings Pond will reduce the total tailings area footprint by 9 hectares which is equivalent to approximately 1% of the total site area. While this appears to be a positive outcome, we anticipate that residual arsenic in the reclaimed area will continue to present environmental challenges for extended periods (e.g., seepage from residual tailings). Significant effort will be required to rehabilitate this area and the final outcome is uncertain. The cost of tailings re-location and environmental impacts during remediation also warrant consideration (dust, water management, etc.). Overall, we question whether the tailings relocation will result in a net environmental benefit.<br>3. In terms of risk reduction, relocating the South Tailings Pond to other tailings areas is difficult to reconcile when compared to the proposed risk management approach for undisturbed soils. Under that approach, hundreds of hectares of soils will be left *in situ* without any form of management or land-use restrictions. On average, those soils have arsenic concentrations that are comparable to those found in tailings but the form of arsenic is arguably more bioavailable and toxic (arsenopyrite in tailings poses a relatively low risk when compared to other forms such as arsenic trioxide). Nonetheless, the CRP proposes to relocate the tailings from one location to another while at the same time taking no action to address undisturbed soils. While we acknowledge such decisions are complicated, there appears to be an inconsistency in how different risks are being handled.<br>4. Based on the information reviewed to date, we are unable to identify the technical rationale for relocating tailings from one area to another. The following statement from the CRP supports this conclusion: "*Covering all tailings in place without footprint reduction is technically attractive*" but also states that doing so "*would not meet the closure objective of footprint reduction.*" On that basis, it appears the preferred management option was selected primarily to address a community preference for tailings consolidation, without a corresponding technical justification. We suggest the CRP clarify |

| TOPIC: TAILINGS | | |
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| **#** | **Sub-Topic** | **Comment** |
| | | whether this is the case and/or provide additional quantitative technical justification to support the Project Team's decision.<br><br>5. As shared with the Project Team previously, former Giant Mine employees informed GMOB that large quantities of debris were disposed in the footprint of the South Pond. The debris was reportedly buried within the tailings. The Project Team has indicated that a variety of investigative techniques have been used to identify buried debris throughout the site (e.g., geophysics surveys). Our understanding is that these investigations have yet to identify any debris deposits in the South Tailings Pond. We recommend that this issue be addressed through further study and/or contingency plans. |

## Table 5: Pits and Borrow

| TOPIC: PITS and BORROW (addressed together due to linkages) | | |
|---|---|---|
| **#** | **Sub-Topic** | **Comment** |
| 1 | Flood Risk | 1. The CRP (Table 5.3-3) indicates that the first Closure Objective for pits is to reduce the potential for flooding of the underground by way of the pits. Based on the management approach described for Baker Creek (Section 5.5), this can be achieved by modifications to the creek and its floodplain. Those modifications will allow for the passage of the Probable Maximum Flood (PMF) through the Baker Creek valley without spilling into the open pits (plus a margin of 20% to account for climate change uncertainty). Following implementation of these modifications the CRP concludes there will be a negligible risk of underground flooding via the pits after required modifications are made to Baker Creek.<br>2. The open pit options assessment presented in the CRP (S.5.3.4.2) states: "*The pits need to be filled in a manner that protects the underground from a Baker Creek flood, though this risk is reduced with the re-aligned creek.*". That statement is inconsistent with the previous point which concludes that there are no requirements to implement additional remedial measures on the pits to mitigate the risk of underground flooding and any such measures would be redundant. During meetings held in Yellowknife (September 2018) the Project Team confirmed that the preferred pit closure option (i.e., filling) is not justified based on the risk of underground flooding.<br>3. GMOB suggests that the CRP should be modified to explicitly clarify whether pit filling is required to address potential flood risks. |
| 2 | Physical Risk | 1. The second Closure Objective for pits requires that physical hazards are mitigated. Examples of such hazards include: falling off steep cliffs, being struck by a rock fall, being caught in a slope failure, falling into open connections to the underground, or being engulfed in a rapid subsidence (crown pillar failure or fill displacement)<br>2. The original remediation plan (as described in the DAR) addressed the physical risks of pits by fencing. In contrast, the current plan intends to address the risks by stabilizing the underground and filling the pits with granular material. Based on the documentation reviewed to date, we have not seen a technical explanation describing why the management approach has changed. We suggest that a technical explanation be provided in subsequent versions of the CRP. |

| TOPIC: PITS and BORROW (addressed together due to linkages) | | |
|---|---|---|
| **#** | **Sub-Topic** | **Comment** |
| **3** | Community Preferences & Decision Justification | 1. In addition to looking at technical risks, the Project Team consulted with interested parties on how the pits should be managed. Those consultations are summarized in S.5.3.4.1 of the CRP which states: "*During SDE, a desire to fill the pits was expressed to improve the visual "look" of the valley by removing large unnatural depressions in the ground, to store contaminated material from site, and to protect the underground from flooding by Baker Creek.*"<br>2. We note that the public's desire to protect the underground from flooding is proposed to be addressed by realignment of Baker Creek.<br>3. With regard to using the pits to store contaminated material, the CRP proposes to fill most of the pits with new borrow. As such, this public preference was not acted on.<br>4. It is unclear whether the public desire to improve the aesthetics of the site by "*removing large unnatural depressions in the ground*" factored into the decision to fill the pits.<br>5. Based on the community preferences noted above, as well as the apparent absence of significant technical risks, we recommend that the CRP explicitly describe the rationale for the decision to fill the pits. |
| **4** | Fill Material / Borrow Source | 1. One of the closure objectives for the project is to minimize any new disturbances caused by borrow/quarry activities (Table 5.7-4). Nonetheless, the decision to fill the pits triggers the need to procure 1.3 million $m^3$ of coarse granular and 50 thousand $m^3$ of fine material. Most of this material will need to come from new borrow sources.<br>2. Based on current plans, the Project Team intends to source the majority of the coarse granular fill by flattening the high walls adjacent to the A1 and A2 pits. These borrow sources will have a combined footprint equivalent to 25 football fields. The borrow sources are on undisturbed lands covered by vegetation and bedrock. The CRP does not include provisions to rehabilitate these borrow areas to their pre-development conditions (e.g., they will not be revegetated).<br>3. The remediation plan described in the DAR did not include pit filling. As a result, the new borrow sources noted above were not required and the associated environmental impacts were not assessed during the EA process. Such impacts include noise and air emissions from blasting, as well as the permanent loss of habitat and vegetation. We therefore recommend that a high-level assessment of potential adverse impacts associated with these new and significant borrow sources |

| TOPIC: PITS and BORROW (addressed together due to linkages) | | |
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| **#** | **Sub-Topic** | **Comment** |
| | | be performed. Where necessary, appropriate mitigations should be proposed either in the CRP or in related management plans that will be required in the water licence.<br>4. During public consultation on pit management options (e.g., the SDE process), participants were not informed that filling the pits would trigger the negative environmental impacts associated with developing these or other new borrow sources. This may have played a factor in community preferences to fill the pits. Any future consultations on this topic should clearly describe any adverse impacts associated with pit filling.<br>5. Instead of developing new borrow areas, tailings could be used to fill the pits. In addition to eliminating requirements for new borrow, this would provide an effective management solution for tailings. While we acknowledge there would be challenges associated with this approach, based on the documentation reviewed to date, we have insufficient information to support the Project Team's conclusion that the challenges of in-pit tailings disposal outweigh the benefits. As such, we suggest that the CRP include a high-level analysis comparing the technical advantages and disadvantages associated with using tailings or new borrow as pit fill and include the environmental impacts of the two alternatives, as well as any ancillary benefits (e.g., tailings disposal). |
| **5** | Underground Stabilization | 1. The CRP concludes that underground stabilization is required in specific areas under some pits prior to pit filling to reduce the potential for sinkholes to harm workers, the public, and wildlife and to minimize damage to pit covers.<br>2. Based on our review of the CRP, we have yet to develop a full understanding of pit stabilization requirements. For example, it is unclear whether stabilization would be necessary if the pits are not filled. Further, while some pits clearly warrant stabilization (e.g., B1 Pit) the failure modes and hazards that would trigger the need for underground stabilization of other pits is less clear.<br>3. GMOB will look to gain a better understanding of these requirements through future meetings or documentation. |
| **6** | Borrow Material Characterization | 1. Table 5.7-6 of the CRP indicates there is uncertainty regarding the geochemical properties of proposed borrow sources. This has the potential to affect the viability of the proposed sources and, by extension, could affect the remedial strategy. This represents an important uncertainty/risk to the current plan; further geochemical testing should occur on a priority basis. |

| TOPIC: PITS and BORROW (addressed together due to linkages) | | |
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| **#** | **Sub-Topic** | **Comment** |
| 7 | Borrow from North Pond Spillway | 1. Current designs include the excavation of approximately 1 million $m^3$ of rock to construct a new spillway from the North Pond. Based on the very large volume of the cut, we assume the excavation is intended to serve the dual purposes of borrow source and spillway. The CRP should confirm if this is the case. |

## Table 6: Freeze Program

| TOPIC: FREEZE PROGRAM | | |
|---|---|---|
| **#** | **Sub-Topic** | **Comment** |
| **1** | Temporal Scope | 1. In its EA decision, MVEIRB authorized the remediation project to proceed, subject to a number of conditions. Of particular importance to the Freeze Program, MVEIRB restricted the temporal scope of the project as follows:<br><br>*Measure 1: To prevent the significant adverse impacts on the environment and the significant public concern from the proposed perpetual timeframe, the Project will proceed only as an interim solution, for a maximum of 100 years.*<br><br>The measure was issued primarily to address technical and public concerns related to the permanence of freezing arsenic trioxide *in situ*. Further, the EA decision made it clear that an alternate, more permanent solution needed to be identified, assessed and implemented within the 100-year time frame.<br><br>2. The CRP does not address this temporal limitation and there is no evidence to suggest the freeze program has been designed as an interim solution. Previous documentation (e.g., the DAR) presented detailed information supporting the Project Team's conclusion that the Freeze Program was the best alternative for *permanent management* of arsenic trioxide. However, the CRP does not provide a similar rationale for why the Freeze Program is the *best interim solution* for the same material. We suggest that the such a rationale be incorporated into the CRP. The document could also identify any design changes that were made in response to the change of temporal scope. |
| **2** | Freeze Justification as an Interim Solution | 1. As indicated in Table 5.2-2, the primary Closure Objective for arsenic trioxide management is to ensure the waste "*is not and will not become a source of contamination to the environment.*" There are two fundamental mechanisms by which arsenic trioxide stored underground could be a source of environmental contamination: 1) through a physical release of arsenic dust; and/or 2) arsenic dissolution into water that subsequently leaves the site.<br><br>2. With regard to a physical release, the Project Team has undertaken and plans to undertake actions intended to address such risks. In particular, the Site Stabilization Program (SSP) is reinforcing structures in the mine that are vulnerable to physical failure. It is our understanding that these actions are intended to significantly reduce the probability that major physical failures will occur, thereby reducing the chances that arsenic will be released on surface or migrate deeper into the mine. |

| TOPIC: FREEZE PROGRAM | | |
|---|---|---|
| **#** | **Sub-Topic** | **Comment** |
| | | 3. In terms of arsenic solubilization, the Project Team asserts that realignment of Baker Creek will effectively eliminate the risk that the arsenic trioxide vaults/chambers will be exposed to large quantities of water, reducing the potential for arsenic solubilization. In addition, any arsenic that is released to the groundwater system will be contained within the drawdown cone and treated to drinking water standards prior to discharge to the environment.<br>4. Once fully implemented, the actions noted above should make a major contribution in efforts to achieve the primary Closure Objective. If the site continues to be under institutional control (e.g., the water management system continues to function), we are unaware of any mechanisms by which the arsenic trioxide stored underground could become a significant source of environmental contamination. This is aside from the proposed Freeze Program which, as we understand it, is intended as an additional layer of defense against potential arsenic discharges. If that is the case, it should be explicitly stated in the CRP. Alternatively, if there are other justifications for implementing the Freeze Program, they should be described in detail.<br>5. With respect to site stabilization, the Project Team has stated that the Freeze Program will physically stabilize the area surrounding the arsenic trioxide, thereby limiting the potential for structural failures and arsenic releases. Based on our current understanding of the problem, we fail to understand how freezing the rock, bulkheads and dry dust will mitigate potential physical failures.<br>6. In summary, additional information on the justification of the Freeze Program should be incorporated into the CRP. This information is needed to ensure regulators and stakeholders understand the failure modes and risks the Freeze Program is intended to mitigate. |
| **3** | Public Support or Opposition | 1. During the process used to assess arsenic trioxide management alternatives, freezing the material in place was referred to as the "in-situ alternative".<br>2. The CRP (S.5.2.4) states "*There was no direct (community) opposition to the in-situ alternative.*" This is inconsistent with the following statement from the DAR: "*…direct opposition was limited.*"<br>3. While this inconsistency may appear to be a minor point, we believe the CRP should accurately reflect the range of public opinions that were expressed throughout the process. On that basis, we suggest that the text be modified accordingly. |

## Table 7: Groundwater Management

| TOPIC: GROUNDWATER MANAGEMENT | | |
|---|---|---|
| **#** | **Sub-Topic** | **Comment** |
| **1** | Pumping Contingency | 1. Water collection and pumping infrastructure represents a vital requirement of the proposed water management strategy. Under some circumstances, failures in this system could lead to significant adverse and long-lived impacts.<br>2. Given the importance of this infrastructure, we seek clarification that the Project Team intends to incorporate contingency into the groundwater management system (e.g.,, redundant pumping capacity).<br>3. We suggest the CRP be expanded to include descriptions of potential water management failure scenarios and any associated mitigations. |
| **2** | Mine Water Storage Capacity | 1. Based on the documentation reviewed to date, we have not seen any descriptions of the capacity of the underground workings to store water. We suggest that the CRP include an overview of the estimated underground water storage capacity in the mine. The information should describe the storage requirements under different scenarios (e.g., If the water management system is inoperable there is sufficient water storage in the mine for X months). |
| **3** | Segregation of Arsenic Trioxide Seepage | 1. Current seepage from the arsenic chambers and stopes has highly elevated arsenic concentrations (in the order of 4,000 mg/L). The relatively small volume of seepage is currently collected in a "high test" line.<br>2. Section 4.4 of the CRP states: "*the high test line will be re-routed, via piping, to the mine pool near the new pumping system*". This implies that the concentrated arsenic seepage will be mixed in the mine pool. If this is the case, it is unclear why the Project Team deems it preferable to mix the highly contaminated high-test seepage with the mine pool, as opposed to keeping the two streams separate. We suggest the CRP clarify the intended approach. |

## Table 8: Arsenic-Impacted Waste Disposal

| TOPIC: ARSENIC-IMPACTED WASTE DISPOSAL | | |
|---|---|---|
| **#** | **Sub-Topic** | **Comment** |
| 1 | Reversibility | 1. The remediation project will generate large quantities of arsenic-impacted materials that will need to be managed as hazardous waste. This includes an inventory of segregated, bagged and containerized demolition debris from the Roaster Complex that is currently stored on the Central Tailings Pond.<br>2. The primary concern associated with these wastes is arsenic trioxide and, in many respects, a similar management approach is warranted, including the Closure Objectives that are applied. Specifically, we suggest that the following Closure Objective from Table 5.2-2 be applied to the arsenic-impacted materials: "F2- Reversibility for future technology developments in remediation has been maintained."<br>3. The CRP proposes to dispose of arsenic-impacted materials in a frozen zone, likely within Chamber 15. While a variety of placement methods are under evaluation, consideration is being given to taking the bagged and/or segregated waste and dumping it into Chamber 15 from the surface. The chamber would then be topped with cemented paste backfill and frozen.<br>4. The dumping method described above would fully mix the arsenic impacted wastes that are currently segregated and/or bagged on surface. We anticipate that this mixing process will significantly complicate any future efforts to extract the wastes. As a result, the reversibility requirement noted above would be compromised.<br>5. As the Project Team continues to evaluate management options for arsenic-impact wastes we suggest that a high priority be placed on reversibility. This will help to reduce the risk that otherwise effective future remediation options are not eliminated. |

## Table 9: Baker Creek

| TOPIC: BAKER CREEK | | |
|---|---|---|
| **#** | **Sub-Topic** | **Comment** |
| **1** | Measure 12 Interpretation | 1. With regard to discharges from Baker Creek, the EA Decision requires the following:<br>*Measure 12 - To prevent significant adverse impacts on Great Slave Lake from contaminated surface waters in the existing or former channel of Baker Creek, should it be re-routed to avoid the mine site, the Developer will ensure that water quality at the outlet of Baker Creek channel will meet site-specific water quality objectives based on the CCME Guidance on the Site-Specific Application of Water Quality Guidelines in Canada.*<br>2. Interpreted literally and in isolation, Measure 12 requires compliance at the outlet of Baker Creek. However, based on statements contained in other measures (e.g., #13 and #15), the CRP concludes that the compliance point should be at the edge of a 200-metre mixing zone. This conclusion was presumably influenced by challenges associated with a literal interpretation of Measure 12. We therefore suggest that CRP include a description of such challenges and why an alternate interpretation of Measure 12 is appropriate. |
| **2** | Water Quality Improvements | 1. Section 5.5.5.1 of the CRP states: "*After closure activities are complete and the new WTP is online, water quality in Baker Creek is predicted to be marginally better than existing conditions, but generally similar to that entering the creek from upstream watersheds.*"<br>2. The statement fails to acknowledge the reduction in contaminant loadings to Baker Creek that will be achieved through the implementation of the remediation project, particularly in comparison to a "do nothing" scenario.<br>3. To clarify the benefits that will be achieved, we suggest that the CRP include a section summarizing the anticipated water quality improvements (or load reductions) that the project will achieve and the significant risks that will be mitigated. |
| **3** | Naturalization | 1. The re-naturalization of Baker Creek is a contentious issue that has yet to be resolved. The YKDFN have consistently requested that no actions be taken that will encourage fish or other species to be exposed to contaminants in the Baker Creek watershed. That request is incompatible with environmental protection legislation requiring such as the Federal Fisheries Act administered by DFO. |

| TOPIC: BAKER CREEK | | |
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| **#** | **Sub-Topic** | **Comment** |
| | | 2. This incompatibility has existed for more than a decade but it appears limited progress has been made on its resolution. We suggest that DFO initiate and actively engage in a collaborative process with the YKDFN and other interested parties to resolve this issue. The process should consider a range of mitigations to address fundamental concerns related to environmental quality (e.g., traditional food harvesting studies to verify whether fish and other species are impacted by Baker Creek). |

## APPENDIX 2: Summary of Comments on the Draft Aquatic Effects Monitoring Plans

GMOB has not had the opportunity for a detailed review of the methodology presented in the draft AEMPs for Baker Creek and Yellowknife Bay; however, GMOB was able to offer several general comments or suggestions during the September Technical Sessions that we hope may be useful in any revisions of the plans prior to January 2019. Assuming that details of the discussions were captured in the notes of the September Technical Sessions, we have only summarized some of the main points below:

- Although the AEMP designs seem to be scientifically sound with respect to detecting environmental change, the Project Team may be missing an opportunity to use the AEMPs as a way of communicating environmental quality improvements to the public. For example, the AEMPs do not call for large bodied fish analysis despite constant questions from the community about the safety of the fish to eat. At the September Technical Sessions, the GMRP Team stated that they are now thinking of analyzing large bodied fish as part of a Community-Based Monitoring Program; GMOB strongly supports this idea.
- The AEMPs should be updated to address relevant questions and concerns that were raised during the QRA process. This is especially important given the proximity of the project to several communities.
- With respect to the Response Framework, GMOB notes the following:
    - In the Baker Creek AEMP, it states that because conditions in the creek are expected improve because of remediation, "significance thresholds are not required and have not been defined herein". Has the Project Team considered that Measure 13 might be the equivalent of a significance threshold?
    - It isn't clear how the qualifier of "linked to the GMRP" will be evaluated to see if there is an exceedance of the Low Action Level.
    - Given that several years of EEM data show that the nutrient enrichment is not the cause of biological effects in Baker Creek, why is it still considered in the Action Levels?
- GMOB notes that neither AANDC's 2009 AEMP Guidelines nor the new draft GNWT/MVLWB AEMP Guidelines specifically address AEMPs for closure projects. While the application of these Guidelines continues to be appropriate to use in this case, there are likely considerations in the AEMP planning and design process that are unique in the case of closure and it may be useful to highlight these for reviewers in the draft plans. For example, it might be helpful to discuss further in the text how the Response Framework for a remediation project should be designed around expectations of a certain level or rate of improvement rather than degradation of environmental quality.

## APPENDIX 3: Summary of Comments on the Effluent Quality Criteria Report

GMOB has reviewed the Project Team's June 2018 Effluent Quality Criteria Report (EQC Report) with respect to the overall approach taken in comparison to the policies and common practices of the Mackenzie Valley Land and Water Board (the Board). During the September Technical Sessions, GMOB initiated discussions on the majority of our concerns or questions about the EQC Report and so those issues are not repeated here in detail. Below is a summary of our main comments on the EQC Report, but please refer to the notes taken at the September Technical Sessions for additional detail.

- General:
  - GMOB appreciated the effort that was made to provide sufficient background and contextual information in the EQC Report such that it could be read as a standalone document, without the need to refer to several other documents. Also, it is clear that efforts were made to make the language of the text as plain as possible, which is a difficult task given the subject matter.
- With respect to EQC for the Existing Effluent Treatment Plant (ETP):
  - For the ETP, the Project Team has proposed to adopt the MMER effluent limits as EQC. There is some precedence for this proposal given that the last water licence granted during mine operations adopted MMER limits as EQC; however, that last water licence was granted prior to the implementation of the MVRMA and prior to the establishment of the Board's Water and Effluent Quality Management Policy. The majority of modern Type A water licences have EQC that have been derived site-specifically to meet the two Policy goals of protecting downstream water uses and minimizing the discharge of contaminants. However, it isn't clear that there is sufficient evidence presented to show that the proposal to adopt the MMER limits actually meets these two objectives. For example,
    - It isn't clear in the text whether the While the MMER limits areThe proposal to adopt the MMER limits w
    - Without doing a screening for parameters of potential concern (as was done for the New WTP), there is no evidence that the proposed EQC will protect downstream water uses. For example, we note that antimony concentrations in the current ETP effluent are very high (approximately 250 ug/L); although there is no CCME guideline for the protection of aquatic life for antimony, the effluent quality greatly exceeds the Canadian drinking water standard. With respect to this example, other data in the report show that despite the high effluent levels, antimony concentrations are much reduced by the time the effluent dilutes into Great Slave Lake. Chloride and sulphate are, similarly, at high levels in the ETP effluent and would also likely be screened in as parameters of potential concern. Overall, it would be helpful to show some kind of screening or analysis to show that the proposed EQC include all potential parameters of concern for the ETP.
    - With respect to the Policy objective of minimizing the release of contaminants to the environment, GMOB notes that many of the proposed EQC are significantly higher than the historic or even predicted future treated effluent concentrations (as presented in Table 5-2). In several Type A water licence decisions, the Boards

have chosen EQC that are lower than what is necessary to protect downstream water uses and based the EQC on what a proponent stated was a predicted, achievable concentration for each parameter of potential concern. While the Project Team is free to propose the MMER limits as EQC for the ETP, it should be prepared for questions about lowering EQC to predicted future effluent quality concentrations. If there are any uncertainties about what is achievable in future with respect to EQC for the ETP, GMOB suggests that the Project Team identify and explain them in the final EQC Report.

        - Note that although there is ample evidence about the environmental effects of the current ETP effluent, it is not clear that downstream water uses would be protected if effluent quality from the ETP was equal to the maximum average EQC concentrations being proposed by the Project Team at this time. Although the text of the EQC Report states that "the proposed EQC for the existing ETP (Table 5-2) are not intended to be the concentrations of parameters consistently discharged, but rather the maximum concentrations that may be discharged if necessary to allow the Mine to continue closure activities", by setting these EQC for the Project, the water licence would be allowing discharge to go ahead at those maximum average levels at all times. This would be ok, but only if there was evidence that downstream water uses would be protected in that scenario and it isn't clear that this information is available. GMOB suggests that either additional evidence be provided to support the proposed EQC or that the Project Team consider proposing EQC that are closer to existing effluent quality.
    - In the EQC Report, it is noted that TDS levels are increasing in the ETP effluent but there is no explanation offered. It would be helpful to clarify what, if any, explanation there is for this increase and what the implications would be for predictions of effluent quality going forward.
- With respect to EQC for the New Water Treatment Plant (WTP):
    - It is challenging to have a mixing zone in a populated area. In addition to describing how the concentrations of contaminants of potential concern in the mixing zone are at levels that are below acute thresholds for aquatic life, it would be useful to discuss the safety of wading/swimming in that area.
    - We note that although both chloride and sulphate are identified as contaminants of potential concern for the new WTP, these parameters were not included as EQC. Although some rationale is provided, in general this exclusion is not consistent with the Board's Policy or with recent Board practice. Therefore, the Project Team should provide additional rationale and/or consider EQC for these parameters as well.
    - Given the level of uncertainty regarding future water quality in the underground and the performance of the WTP once it is commissioned, it may be useful to have a clause in the water licence that allows for the reevaluation of the EQC for the new WTP 6 months prior to discharge.

# APPENDIX 4: Summary of Comments on the Draft Water Licence

| Overall | | |
|---|---|---|
| • The Project Team has done a good job of capturing the relevant requirements of Type A water licences that have recently been issued by the MVLWB.<br>• The rationale/notes provided by the GMRPT were very helpful for understanding the intent of each condition.<br>• GMOB has, in the table below, made some suggestions for consideration by the Project Team for the version of the proposed licence that will be included in the January 2019 application package.<br>• As noted at the September 2018 Technical Sessions, it would be very helpful if the Closure Objectives in the Closure and Reclamation Plan reference the relevant plan or condition in the draft water licence that will address either the objective, the criteria, or the proposed monitoring. | | |
| **Proposed WL Condition** | | **Comments or Suggestions** |
| Part A: Scope and Definitions | | |
| n/a | | • In places in the proposed WL, the terms "Active Remediation phase" or "Adaptive Management phase" are used (e.g., proposed Schedule 3, Item 1 and in Schedule 4) – the Project Team may want to consider defining these terms. |
| Part B: General Conditions | | |
| n/a | | • Consider adding what is a standard condition in most modern water licences: "In conducting its activities under this Licence, the Licensee shall make best efforts to consider and incorporate any scientific and Traditional Knowledge that is made available to the Licensee." |
| Part C: Conditions applying to Closure and Reclamation | | |
| C.1 | Closure and Reclamation Plan (CRP) | • The Project Team is saying they want to do a "component by component" review of the CRP in future which could be useful but at this stage it is not clear how the WL conditions allow for that. For example, C.3 just requires the submission of a revised plan upon request. This may be something to discuss with all parties during the WL process. |
| C.5 | Post-Reclamation Monitoring and Maintenance Plan | • The Plan is a good idea, but it would be good to find a way to determine when "completion of Closure Activities" has happened or when it is 6 months prior to that time. Is there a specific trigger to say that activities are complete? If not, it might be useful to put in a date here as a placeholder and then revise the date in future if necessary.<br>• Suggest adding requirement for Action Levels (see explanation under Part G – Overall comments) |
| Part D: Conditions applying to Water Use | | |
| D.2 | Requirement to include potential need for a Water diversion in the Construction Plan for Baker Creek realignment | • Last sentence of condition is cut off, so not sure what it is meant to say.<br>• Note says that the proposed condition is based "on a condition used in 2016 MVLWB reclamation licences where diversion is required for reclamation" – unsure of what WLs are being referenced though.<br>• This may belong in Part E as part of a specific Construction Plan; this can be discussed further with all parties during the WL process. |
| Part E: Conditions applying to Construction | | |

| | | |
|---|---|---|
| E.6 | Construction Plans | • It may be helpful to list the facilities or specific closure activities that may require a discrete Construction Plan. This list could be provided in the CRP. |
| E.7 | Arsenic Trioxide Frozen Shell Construction Plan | • It may be helpful to have Action Levels in this plan to track that the freezing process (which will take several years) is going according to predictions. We note that the associated Schedule 4, Condition 2g) proposes something similar to the intent of Action Levels, but the wording is vague and will be challenging for parties to interpret going forward. (see explanation under Part G – Overall comments) |
| Part F: Conditions applying to Modifications | | |
| | | • No comments |
| Part G: Conditions apply to Water and Waste Management | | |
| Overall – Action Levels | | • The Project Team seems to be proposing to replace the standard MVLWB requirement for Action Levels, with the requirement, in the Schedule, for "a description of maintenance or contingency activities that will be undertaken if monitoring results show that Closure Activities are not meeting closure objectives or are not trending towards meeting closure objectives."<br>• It is important to note that the requirement of Action Levels in management plans was introduced by the MVLWB as a way of simplifying the interpretation of annual monitoring data that is provided in the Annual WL Reports. Typically, quantitative Action Levels are proposed in draft management plans and subject to review and then approval by the Board. The exceedance of pre-defined Action Levels is not a compliance issue; instead it is only meant as an early warning that facilities or activities are not performing as intended and that further inquiry is needed. Conversely, no exceedances of Action Levels (as reported in the Annual WL Report) gives some assurance that further investigations may not be necessary.<br>• The wording proposed by the Project Team suggests that reviewers many need to spend a lot more time every year trying to interpret results and the proponent's interpretation of those results – for example, needing to annually re-evaluate what "not meeting closure objectives" or "not trending towards…" means in order to determine whether further investigation is necessary or not. For this reason, GMOB suggests that the Project Team utilize the standard Action Level terminology and requirements of modern Type A water licences issued by the MVLWB. |
| Overall – Mine reflooding | | • The draft CRP notes that the Project Team will research the feasibility of flooding the mine to a level above 750 but will only proceed with Board approval. It may be useful to capture this intention in a specific water licence condition. |
| G.3 | Water Management and Monitoring Plan | • Suggest adding the requirement for Action Levels in the Schedule as per standard requirements in modern MVLWB Type A water licences. |
| G.5 | Dust Management and Monitoring Plan | • Suggest adding the requirement for Action Levels in the Schedule as per standard requirements in modern MVLWB Type A water licences. In this case, Action Levels can correlate to those limits already set in the Air Quality Monitoring Plan. |
| G.6 | Tailings Management and Monitoring Plan | • Suggest adding the requirement for Action Levels in the Schedule as per standard requirements in modern MVLWB Type A water licences. |

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| G.7 | Geotechnical Stability Management and Monitoring Plan | • Suggest adding the requirement for Action Levels in the Schedule as per standard requirements in modern MVLWB Type A water licences. |
| G.8 | Borrow and Explosives Management and Monitoring Plan | • Suggest adding the requirement for Action Levels in the Schedule as per standard requirements in modern MVLWB Type A water licences. |
| G.9 | Arsenic Trioxide Frozen Shell Management and Monitoring Plan | • Suggest adding the requirement for Action Levels in the Schedule as per standard requirements in modern MVLWB Type A water licences. In this case, Action Levels can be linked to temperature performance limits for example. |
| G.22 | EQC for Existing Water Treatment Plant | • |
| G.23 | EQC for New Water Treatment Plant | • It may be helpful to include a condition to re-evaluate the EQC for the new WTP prior to commissioning or during pilot studies. The reason is that a lot of assumptions have had to be made regarding the final water quality of the minewater that will be treated and of the WTP performance. A requirement could be added to the licence to require an EQC re-evaluation report to either confirm that the existing EQC are reasonable/achievable or to recommend changes. Note that there is a similar condition in the Gahcho Kue Diamond Mine water licence. |
| Part H: Conditions applying to Contingency Planning | | |
| n/a | | • Depending on the QRA results, specific contingency plans could be added here if necessary. |
| Part I: Conditions applying to Aquatic Effects Monitoring | | |
| I.2 | requirement to adhere to the AEMP submitted with the application until a new plan is in place | • In the Draft Water Licence Application Package, the Project Team submitted two AEMP Designs – one for Baker Creek and one for Yellowknife Bay. We understand that the Project Team is planning on implementing the former immediately and then the latter plan after the new water treatment plant is commissioned.<br>• The language of this water licence condition only refers to one Design Plan – it would be helpful to specify whether there will be two distinct plans or just one that is submitted with the final application. |
| I.4 | AEMP Design Plan | • Current proposed condition refers to the AANDC AEMP Guidelines which is consistent with was specified in Measure 17; however, it may make sense for the Board to specify the new joint GNWT/MVLWB AEMP Guidelines that will likely be approved by early 2019. |
| I.10 – I.12 | AEMP Response Plan | • Note that the latest draft version of the GNWT/MVLWB AEMP Guidelines require that Low, Moderate, and High Action Levels to be set in the initial design plan. These new guidelines may be approved by early 2019. |