



Crown-Indigenous Relations  
and Northern Affairs Canada

Relations Couronne-Autochtones  
et Affaires du Nord Canada

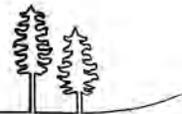
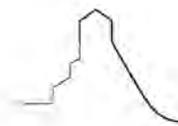


# **Giant Mine Remediation Project**

## **Response to Pre-engagement Reviewer Comments**

Version 1.0

January 2019



### 1 PREAMBLE

During the pre-engagement period, the Giant Mine Remediation Project (GMRP) received written comments on the draft Closure and Reclamation Plan, the Effluent Quality Criteria document and various management and monitoring plans. This document presents the Project’s responses.

The GMRP received comments on the Closure and Reclamation Plan from the following affected parties:

- Giant Mine Oversight Board
- Alternatives North
- Bill Slater (Technical Advisor to the Giant Mine Working Group)
- Yellowknives Dene First Nation (YKDFN)
- Trailmark Consulting (Independent Advisor to YKDFN)

The GMRP’s Responses are provided in Table 1.

The GMRP received written comments on the draft Effluent Quality Criteria from the following affected parties:

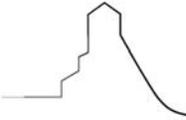
- Giant Mine Oversight Board
- Alternatives North
- Bill Slater (Technical Advisor to the Giant Mine Working Group)
- Government of Northwest Territories

The GMRP’s responses are provided in Table 2.

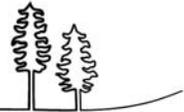
During the pre-engagement period, the Giant Mine Remediation Project (GMRP) received written comments on a number of management and monitoring plans from various technical divisions of the Government of the Northwest Territories Environment and Natural Resources Department (GNWT-ENR) (Table 3). The Giant Mine Oversight Board also provided written comments on the two Aquatic Effects Monitoring Design Plans.

**Table 3: Summary of Management and Monitoring Plan Reviews During Pre-engagement Period**

Document	Reviewer(s)
Water Management and Monitoring Plan	• GNWT-ENR-Water Resource Division
Waste Management and Monitoring Plan	• GNWT-ENR-Environment Division
Aquatic Effects Monitoring Program Design Plan – Baker Creek	• GNWT-ENR-Water Resource Division • Giant Mine Oversight Board
Aquatic Effects Monitoring Program Design Plan – Yellowknife Bay	• GNWT-ENR-Water Resource Division • Giant Mine Oversight Board
Erosion and Sediment Management and Monitoring Plan	• GNWT-ENR-Water Resource Division
Spill Contingency Plan	• GNWT-ENR-Environment Division
Wildlife and Wildlife Habitat Management and Monitoring Plan	• GNWT-ENR-Wildlife Division

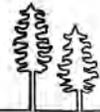
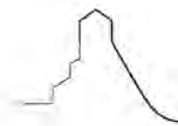


# Giant Mine Remediation Project



## Response to Pre-engagement Reviewer Comments – Closure and Reclamation Plan

The GMRP has compiled responses to these reviewer comments received during the pre-engagement period; these comments and responses are contained in Table 4. The GNWT-ENR-Air Quality Division reviewed the Dust Management and Monitoring Plan and the associated Air Quality Monitoring Program (AQMP) Design Plan. Feedback was provided informally and incorporated into the Dust Management and Monitoring Plan, where possible. Comments related to the AEMP Design Plan will be considered when the AQMP is reevaluated in the future. Formal written comments from the GNWT-ENR-Air Quality division are forthcoming and the project response to these will be included in the final submission to the Mackenzie Valley Land and Water Board on April 1, 2019.



**Table 1**

**Response to Pre-engagement Reviewer Comments**

**Closure and Reclamation Plan**

**Giant Mine Oversight Board (GMOB) Comments CRP June 2018 Draft**

Submitted to the GMRP on October 28, 2018

Comment #	Reviewer	Topic	Comment	Proponent Response
<b>CROSS CUTTING THEMES</b>				
1	GMOB	Permanence	<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>	<p>It is agreed that permanent solutions with no further care and maintenance efforts are desirable, and this has been directly embedded in the GMRP as one of the six principles used to guide the selection of objectives ("minimizing long-term active care"), and this has been considered in the selection of options, balanced with other factors such as practicality, community input, and considerations of reversibility.</p> <p>Measure 1 is understood to explicitly address the GMRP as a whole. There is no indication in the wording of the Measure 1 that it only applies to the freeze. In the Report of EA preamble for Measure 1, several lines of evidence address non-freeze aspects of the project. The preamble to Measure 1 devotes considerable attention to the conceptual and practical difficulties associated with design for perpetuity for non-freeze aspects including Baker Creek, water treatment and other engineered structures.</p> <p>Ongoing care and maintenance of the entire site over the 100 year project life is an integral part of the GMRP as presented in the CRP. Note that several of the non permanent components are standard mine closure practice, including water treatment and maintenance and monitoring of engineered structures such as tailings covers. Together with the ongoing research and formal review of the CRP at 20 years intervals, the CRP addresses the requirements of Measures 1, 2, 3 and 4.</p> <p>Further clarity on the rationale and selection of options has been provided through a series of figures for each mine component in the CRP. The CRP does not explicitly describe the rationale for selecting any remediation measures that are not permanent but addresses the issues, measures, and suggestions that will mitigate environmental impacts and public concern.</p>
2	GMOB	Perpetual Care Plan	<p>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 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.</p> <p>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.</p>	<p>Article 4, Item 4.2(b) of the Environmental Agreement specified that the Co-Proponents shall provide GMOB with an initial draft of the Perpetual Care Plan no later than five years after the Effective Date on the Environmental Agreement. As such, CIRNAC and GNWT are currently developing a draft of the Perpetual Care Plan and will provide an initial draft for review no later than June 2020. The GMRP will engage with affected parties on the aspects of this plan in advance of completing the initial draft.</p>
3	GMOB	Option Selection Process	<p>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.</p> <p>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.</p> <p>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.</p>	<p>Further clarity on the rationale and selection of options has been provided through a series of figures for each mine component in the CRP. Further detail on the option selection process, for example on weightings / criteria, is provided in the relevant Appendices to the CRP.</p>

Comment #	Reviewer	Topic	Comment	Proponent Response
4	GMOB	Temporal Scope and Design Life	<p>The CRP states:</p> <p>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).</p> <p>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.</p> <p>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.</p>	<p>Management and monitoring plans have been developed for critical site infrastructure, which will be monitored and maintained to function and meet closure objectives. The reference in the extract from the CRP to a 100 year time frame is intended to capture the scope of this CRP, in accordance with Measure 1, and not to imply that the functional life of any component be specifically limited to this time frame. Explicit design lives have not been developed for individual remedial components.</p>
5	GMOB	Off-Site Contamination	<p>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.</p> <p>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.</p>	<p>Off-site legacy contamination is outside of the scope of the remediation, as outlined by the Environmental Assessment. The GMRP continues to work with relevant territorial and federal agencies to share information.</p>
<b>CONTAMINATED SOILS</b>				
6	GMOB	Project Changes: Undisturbed Areas	<p>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).</p> <p>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).</p> <p>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.</p> <p>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).</p>	<p>A Preliminary Screening document has been developed that outlines the reasons for the changes from the DAR and provides a rationale for why additional screening is not recommended.</p> <p>The risks associated with the proposed activities in the CRP were quantified in the Human Health and Ecological Risk Assessment (HHERA) completed by Canada North and finalized in January 2018. This assessment incorporated extensive data collected since the DAR, including the sampling of soils outside the disturbed areas. Given the exhaustive nature of the engagement and risk assessment completed in the HHERA, the proponent does not believe that additional assessment of incremental changes in the risk profile since the DAR is warranted or would provide useful information.</p>
7	GMOB	Project Changes: Fencing	<p>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).</p> <p>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.</p> <p>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.</p> <p>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).</p>	<p>Additions to the CRP have been made in Section 5.4 to provide further rationale for a larger fenceline. A Preliminary Screening document has been developed that outlines the changes from the DAR and provides a rationale for why additional screening is not required.</p>

Comment #	Reviewer	Topic	Comment	Proponent Response
8	GMOB	Criteria for Fencing	<p>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.</p> <p>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.).</p>	<p>Section 5.4 of the CRP has been updated to provide additional technical information to support the location of the fence boundary. It is noted that although the fence boundary in general correlates to 3,000 mg/kg, multiple lines of evidence were used to assess the distribution of arsenic and locate the fence boundary. This includes forensic mineralogy, detailed terrain mapping and comparison with other case studies to determine the extent of primary roaster stack deposition. This exposure scenario resulted in low to very low risks to human health and is documented in the HHERA.</p>
9	GMOB	Spatial Extent of Fencing	<p>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.</p> <p>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.</p> <p>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).</p> <p>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.</p>	<p>See response to GMOB Comments 7 and 8; again it is noted that multiple lines of evidence were used to locate the fence boundary. It is recognized that there are isolated locations outside the proposed fence alignment where concentrations exceed 3,000 mg/kg, however these locations were assessed in the HHERA, which concluded that the associated risks to human health were low. Additional engineering work is planned to further refine the location of the fence line, however the GMRP does not anticipate that the fence will need to be expanded significantly from what is currently assumed based on the forensic mineralogy and the concentration of impacts to soil within 1 km of the former Roaster stack.</p>
10	GMOB	Permanence of Fencing	<p>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.</p> <p>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 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.</p> <p>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.</p>	<p>See above response regarding permanence and Measure 1. Institutional care has always been a requirement for the GMRP given the lack of a walk-away solution. Institutional care, including the long-term maintenance of a fenced area, was included in the DAR, although this was a smaller area than what is proposed in the CRP. Elements requiring institutional care include the freeze systems, the water treatment plant and outfall, and the non-hazardous waste landfill. All of these project components, along with the fence will be managed for the 100 year temporal scope of the project.</p> <p>Following SDE, extensive engagement between 2015 and 2017 on the risks associated with leaving contamination in place and fencing the central area of the site was completed as part of the HHERA.</p> <p>Given the exhaustive nature of the engagement and risk assessment completed in the HHERA, coupled with the requirement for a fence and institutional care of central areas of the site, the GMRP does not plan to complete additional assessment of incremental risks associated with no fence.</p>
11	GMOB	Clean-Up Criteria	<p>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.</p> <p>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.</p> <p>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).</p> <p>We recommend that the CRP provide additional details to further clarify the rationale behind the points noted above.</p>	<p>The GMRP has provided further clarity on the rationale and selection of options in Section 5.4 of the CRP. There are different technological challenges to cleaning up disturbed area soils versus soils in bedrock crevices/wetland and forest areas. In relation to the soil criteria, SDE and technical feasibility were key drivers for selection of options for soils. During SDE stakeholder preferred options that included an industrial soil quality standard in the developed areas and some stakeholders also supported a residential criteria in the southern shoreline areas of the site, including the Townsite and Marina.</p>

Comment #	Reviewer	Topic	Comment	Proponent Response
12	GMOB	Community Engagement	<p>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."</p> <p>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 20X above the residential criterion for Yellowknife). As a result, the preferences of some participants may have been reached without sufficient information.</p> <p>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.</p>	<p>During SDE, at the Options Definition Workshop (June 17 and 18, 2015) a presentation was made on the level of contamination in the bedrock / forest / wetland areas of the site. This included presenting all available sampling locations and identifying those that were marginally arsenic affected (340 to 3000 mg/kg) or heavily affected (&gt;3000 mg/kg). At the time, additional sampling was required to determine if contaminated soils in these areas presented significant human health or ecological risks. The additional soils data was incorporated into the HHERA and the data and associated risks were presented to stakeholders as part of multiple engagement sessions during engagement on the HHERA throughout 2016 and 2017.</p> <p>The proponent notes that although there was no consensus on whether land should be made available for future use during SDE, there was agreement that site soils and sediments should be remediated in a manner that addresses human health and environmental risks. No input received during SDE was unanimous, however the GMRP believes the selected option is consistent with the input received during SDE and that the residual risks were communicated through the subsequent engagement on the results of the HHERA. The project decisions on soil and the fence were discussed extensively at the QRA workshops and raised during the September public technical sessions. The project will continue to work with its federal, territorial and municipal counterparts to clearly communicate risks.</p>
13	GMOB	Distinguishing Between Mineralized Fill and Contaminated Soils	<p>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.</p> <p>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.</p> <p>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.</p>	<p>Samples collected from the granular fill material consisted of the fine grained matrix (i.e., sands, silts, gravels) rather than the mineralized rock matrix (i.e., cobbles and boulders). As a result, the arsenic concentrations reported are representative of the fine grained matrix, which is why the industrial soil quality criteria of 340 mg/kg has been selected as the remediation criteria for this material. The fine-grained and coarse material is mixed and it is too complex/challenging to segregate this material; therefore the material will be left co-mingled for practicality. Text in Table 5.4-1 has been updated in the CRP to provide further clarification. Note that tailings are addressed separately and tailings material is being put behind dams and covered, regardless of arsenic concentration.</p>
14	GMOB	Arsenic Form and Bioavailability	<p>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.</p> <p>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.</p> <p>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.</p>	<p>The bioavailability of arsenic and the risks associated with exposure was considered through the HHERA. A further discussion of arsenic speciation and how forensic mineralogy was considered in option selection has been added to Section 5.4 of the CRP.</p>
15	GMOB	Spatial Averaging of Arsenic Concentrations	<p>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.</p> <p>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.</p> <p>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.</p>	<p>The CRP has accounted for spatial averaging through various heat maps developed for the Site. Additional clarification on remedial decisions has been included in Section 5.4 of the CRP.</p>

Comment #	Reviewer	Topic	Comment	Proponent Response
16	GMOB	Remediation Methods	<p>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 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."</p> <p>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.</p> <p>Based on the above, we 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.</p>	<p>In-situ methods, including the potential construction of soil covers, as an effective "barrier", was evaluated for the bedrock terrain areas. Although in-situ strategies were considered, they would result in reduced future land use flexibility in the bedrock terrain in the Townsite/Shoreline area. In addition, if these strategies were implemented, long term maintenance and monitoring costs would be incurred. These management/in-situ alternatives were therefore screened out and not advanced further in evaluation of options for these areas.</p>
17	GMOB	Hydrocarbon Impacted Soils	<p>The CRP indicates that hydrocarbon impacted soils will be disposed in the tailings containment areas (TCAs).</p> <p>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.</p>	<p>Clarification on hydrocarbons and why no pre-treatment is proposed prior to disposing in the TCAs has been provided in the CRP in Section 5.4.6.4</p>
18	GMOB	Delayed risk identification	<p>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.</p> <p>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 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.</p> <p>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.</p>	<p>Noted, the GMRP is constantly improving data collection on site. The GMRP is confident that the closure activities presented in the CRP are the best solution for the site and is proceeding with submission to the MVLWB accordingly.</p>
<b>SEDIMENTS</b>				
19	GMOB	Risk Drivers for Great Slave Lake Shoreline Sediment Remediation	<p>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.</p> <p>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.</p> <p>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).</p> <p>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.</p>	<p>The GMRP has provided further clarity in the CRP with respect to the rationale for the selection of options.</p> <p>SDE was a key driver in the decision to remediate the Townsite/Marina and Shoreline Lands to residential standards. The Shoreline Lands were identified by some affected parties during the SDE process as potentially suitable for remediation to residential soil quality criteria, which would allow for flexible future land use. It was recognized that any remediation of the Shoreline Lands would also require the remediation of the nearshore sediment due to the risks identified within the HHERA associated with direct human contact through wading or swimming.</p> <p>Based on the feedback provided in SDE, multiple remedial options for the Shoreline Lands were considered. Remedial scenarios which included the removal of contaminated soil within the Shoreline Lands and the dredging and/or capping of the nearshore sediment scored more favorably. As a result, at the completion of the decision analysis process, the remediation of the Shoreline Lands to residential criteria and capping of the adjacent nearshore sediment was the selected remedial strategy.</p>

Comment #	Reviewer	Topic	Comment	Proponent Response
20	GMOB	Mixing Zone Interaction	<p>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.</p> <p>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).</p> <p>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.</p> <p>We suggest that the CRP clarify whether the potential concerns noted above are relevant.</p>	<p>Please note that the GMRP will meet EQC at the end of the outfall pipe, the Site-Specific Water Quality Objectives will be met at the edge of the mixing zone. The theoretical potential for loading of arsenic from Baker Creek to sediment in Yellowknife Bay shoreline cover exists. This is presumed to be low risk given the very low total suspended solids concentrations in Baker Creek and the speed of mixing between Baker Creek and Yellowknife Bay. The mixing was calculated with a 3D hydrodynamic model (see the EQC report appendices) and there is confidence mixing occurs quickly. Monitoring of water and sediment in this area is planned in the SNP and AEMP. The project expects outfall and freshwater intake areas will be demarked (e.g., flotation buoys or signage), the specifics of which are still under discussion with affected parties.</p>
21	GMOB	Other Contaminated Sediments	<p>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.</p> <p>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.</p> <p>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.</p>	<p>The remediation of sediments in Great Slave Lake is outside the scope of the GMRP as outlined in the Reasons For Decision on Scope (MVEIRB, December 19, 2008, <a href="http://reviewboard.ca/upload/project_document/EA0809-001_Reasons_for_Decision_on_Scope.pdf">http://reviewboard.ca/upload/project_document/EA0809-001_Reasons_for_Decision_on_Scope.pdf</a>). The GMRP continues to cooperate with relevant territorial and federal agencies to share information.</p>
22	GMOB	Project Changes: Shoreline Remediation	<p>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.</p> <p>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.</p>	<p>A Preliminary Screening document has been developed that outlines the changes from the DAR and provides a rationale for why additional screening is not required and information on impacts and mitigations. Note that a Fisheries Act Authorization for the sediment cover is required and further work with DFO and affected parties is underway.</p>

Comment #	Reviewer	Topic	Comment	Proponent Response
<b>COVERS</b>				
23	GMOB	Covers: Vegetation	<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>	<p>The GMRP notes that many affected parties have continued to voice concerns about vegetated covers, both during the Environmental Assessment process and during subsequent engagements, including SDE. In particular, the YKDFN have expressed ongoing preference for covering and managing the tailings in a manner that ensures risks are communicated. In a letter to the GMRP dated November 30, 2018 on the draft CRP, the YKDFN have continued to voice concerns about the tailings.</p> <p>The GMRP acknowledges that vegetated covers can be successful, and a variety of vegetated covers were included in the initial range of options evaluated (see Appendix 5.6B,C and D of the CRP). Input from the SDE process was an important part of the selection methodology, and a key factor in a selection of the non-vegetated cover. The non-vegetated cover selected is technically equal or superior to any of the vegetated options considered, and directly incorporated relevant input from the SDE process. Technical experts who were involved in the development of the Cold Regions Cover System Design Technical Guidance Document (2012) cited by GMOB were involved in the GMRP design workshops that resulted in the selection of the non-vegetated cover, and supported the design decision.</p> <p>The GMRP has concluded that the selected option will be highly effective in isolating the tailings and will successfully meet the closure objectives. It is also noted that non-vegetated covers have been successfully implemented at several sites in the North, including other former mine sites managed by CIRNAC.</p> <p>Additional detail has been included on the CRP on the rationale for the selection of the non-vegetated tailings cover.</p>
24	GMOB	Covers: Geomembrane and Alternatives	<p>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.</p> <p>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 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.</p> <p>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.</p> <p>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.</p>	<p>Please see the response to the GMOB Comment 23. Note also that all covers – either vegetated or with geomembrane – require ongoing care and maintenance, and the care and maintenance requirements are often greater for vegetated covers.</p>
25	GMOB	Use of Tailings as Pit Fill	<p>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.</p> <p>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.</p> <p>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.</p>	<p>An assessment of options for filling the pits, including the use of tailings as pit fill material, was completed and outlined in the CRP Appendices for Section 5.3 (Open Pits), Section 5.4 (Contaminated Soils and Sediments) and Section 5.6 (Tailings Containment Areas - Appendix 5.6C).</p> <p>For C1 and A2 pits, the use of contaminated material and tailings was not selected, due to geotechnical issues of placing the material in C1 Pit (i.e., underground voids would require extensive stabilization) and due to the proximity of A2 pit to Yellowknife Bay. During subsequent technical evaluations of the material balance and final disposal locations, contaminated soils was selected above tailings for placement in the remaining larger pits as there would be little reduction in the overall tailings footprint (the full volume of tailings does not fit in the pits); therefore, there was little benefit to handling and transporting tailings across the site (i.e., worker health is a factor in not moving tailings on site; additional information on effects to workers who work tailings is provided in Section 4 of the CRP). In addition, the contaminated granular fill has superior geotechnical properties as a fill material compared to tailings, requiring less stabilization and constructability issues. Consolidating in the Central and North ponds was the preferred solution for these reasons.</p>

Comment #	Reviewer	Topic	Comment	Proponent Response
26	GMOB	Technical Basis for South Tailings Pond Re-location	<p>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.</p> <p>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.</p> <p>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.</p> <p>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 whether this is the case and/or provide additional quantitative technical justification to support the Project Team's decision.</p> <p>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.</p>	<p>Relocation of the South Pond serves a number of functions. It reduces the tailings footprint, in accordance with community desire consistent with SDE input. While the comment is correct that this is only a 1% reduction in the area covered by tailings on the total site, it is relevant to consider that tailings only cover 9% of the site under current conditions. A more relevant reference number might be that the reduction of tailings footprint in the original TCA area something more on the order of 15%. It will also result in the removal of tailings completely from a watershed, restoration of natural flow patterns in the former tailings area, and removal of an otherwise permanent dam in that watershed.</p> <p>The GMRP is aware of accounts that debris was disposed of in the South Pond area. Proactive attempts to locate and quantify this debris have been ongoing, including recent drilling and review of historic drilling records. Targeted geophysical surveys have also been carried out, searching for magnetic anomalies that could be indicative of debris deposits. To date, no debris has been identified. However, the presence of debris in the tailings continues to be factored into design considerations and will be part of any planning for excavations.</p>
<b>PITS AND BORROW</b>				
27	GMOB	Flood Risk	<p>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.</p> <p>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.</p> <p>GMOB suggests that the CRP should be modified to explicitly clarify whether pit filling is required to address potential flood risks.</p>	<p>As presented in Section 5.5 of the CRP, the re-alignment of Baker Creek onsite will allow the passage of the PMF and significantly reduce the flood risk, however there still exists a flood risk near erodable features and lowest pit elevation. The GMRP has provided further clarity in the CRP (Section 5.3 and 5.5) with respect to the rationale for the selection of options and the GMRP is confident that Measure 11 is addressed in the CRP.</p>
28	GMOB	Physical Risk	<p>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).</p> <p>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.</p>	<p>The GMRP has provided further clarity in Section 5.3.4 of the CRP with respect to the rationale for filling pits. During the EA, concerns were raised on the proposed approach in the DAR to address risks of pits by fencing. The Report of EA included Suggestion 13 to explore options for filling the pits. The decision to fill pits was made based on multiple factors as summarized in the CRP:</p> <ul style="list-style-type: none"> <li>- Many affected parties preferred filling pits as documented in the Report of EA (Suggestion 13) and during SDE.</li> <li>- Appropriate placement of fill in pits will significantly reduce the physical hazards.</li> <li>- Pit fill can be placed in such a manner as to create additional controls to prevent a potential Baker Creek flood from entering the underground and support meeting Measure 11.</li> </ul>

Comment #	Reviewer	Topic	Comment	Proponent Response
29	GMOB	Community Preferences & Decision Justification	<p>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."</p> <p>We note that the public's desire to protect the underground from flooding is proposed to be addressed by realignment of Baker Creek.</p> <p>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.</p> <p>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.</p> <p>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.</p>	The GMRP has provided further clarity in Section 5.3.4 of the CRP with respect to the rationale for filling pits. See response to GMOB Comment 28.
30	GMOB	Fill Material / Borrow Source	<p>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<sup>3</sup> of coarse granular and 50 thousand m<sup>3</sup> of fine material. Most of this material will need to come from new borrow sources.</p> <p>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).</p> <p>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 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.</p> <p>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.</p> <p>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).</p>	An analysis of various pit fill materials was completed and documented in the open pits CRP Appendix 5.3B as well as the tailings CRP Appendix 5.6C. See responses to GMOB Comments 25 and 28 on rationale for filling pits and pit fill materials. The GMRP has committed to further engagement with affected parties on the management of borrow areas. The CRP and the proposed Water Licence have also been updated noting a forthcoming Borrow Materials and Explosives Management and Monitoring Plan where details would be included and which will be submitted to the MVLWB for approval.
31	GMOB	Underground Stabilization	<p>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.</p> <p>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.</p> <p>GMOB will look to gain a better understanding of these requirements through future meetings or documentation.</p>	More information can be found in the CRP Appendix 5.3B "Open Pit Closure Options Analysis".
32	GMOB	Borrow Material Characterization	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.	Agreed, this geochemical testing is underway. Geochemical verification for borrow sources will be submitted to the MVLWB when available in 2019.
33	GMOB	Borrow from North Pond Spillway	Current designs include the excavation of approximately 1 million m <sup>3</sup> 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.	The GMRP has provided further clarity on this in the CRP, including changes to Table 5.7-2 Planned Borrow Sources.

Comment #	Reviewer	Topic	Comment	Proponent Response
<b>FREEZE</b>				
34	GMOB	Temporal Scope	<p>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:</p> <p>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.</p> <p>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.</p> <p>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.</p>	The GMRP has provided further clarity on this in the CRP, and has concluded that the freeze program is suitable for the 100 year timeframe.
35	GMOB	Freeze Justification as an Interim Solution	<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>	Evaluation of alternative remedial options for the arsenic trioxide dust are summarized in Section 6.2 in the DAR, and it is noted that the freeze program had the lowest risk of arsenic release and worker safety.
36	GMOB	Public Support or Opposition	<p>During the process used to assess arsenic trioxide management alternatives, freezing the material in place was referred to as the "in-situ alternative".</p> <p>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."</p> <p>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.</p>	CRP text has been updated to reflect similar wording to the DAR.

Comment #	Reviewer	Topic	Comment	Proponent Response
<b>GROUNDWATER MANAGEMENT</b>				
37	GMOB	Pumping Contingency	<p>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.</p> <p>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).</p> <p>We suggest the CRP be expanded to include descriptions of potential water management failure scenarios and any associated mitigations.</p>	<p>The CRP has been updated and a Water Management and Monitoring Plan has been developed and contains further details on contingencies.</p> <p>The maximum flow into the new WTP based on the short-term peak wet year flow is estimated to be 34 L/s; and the long-term average flow is estimated at 17 L/s. The short-term design flow will be accommodated by two parallel trains designed for 17 L/s each. Therefore, in the long-term, the WTP will have fully redundant pumping and treatment capacity.</p>
38	GMOB	Mine Water Storage Capacity	<p>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).</p>	<p>The GMRP has provided clarity on this in the CRP, the Water Management and Monitoring Plan, and the EQC report.</p>
39	GMOB	Segregation of Arsenic Trioxide Seepage	<p>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.</p> <p>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.</p>	<p>One of the reasons for the installation of the high-test line was to protect workers from exposure to highly contaminated water. The underground foot print will be reduced post-closure and there will no longer be a requirement to access the underground. Furthermore, the freeze system will freeze the water exiting the chambers and it will not enter the mine pool once freeze criteria are met. For these reasons it has been determined that there is no requirement to maintain the high test system in the long-term.</p>
<b>ARSENIC IMPACTED WASTE DISPOSAL</b>				
40	GMOB	Reversibility	<p>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.</p> <p>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."</p> <p>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.</p> <p>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.</p> <p>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.</p>	<p>Reversibility is being considered in the detailed design that will finalize where (B1 pit and/or Chamber 15) and how to place the arsenic-impacted wastes in the freeze zone. The CRP has been updated to reflect this.</p>
<b>BAKER CREEK</b>				
41	GMOB	Measure 12 Interpretation	<p>With regard to discharges from Baker Creek, the EA Decision requires the following:</p> <p>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.</p> <p>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.</p>	<p>The EQC Report outlines how Measure 12 will be met and no other interpretations were considered. The site-specific water quality objectives that apply at the mixing zone boundary, and used to calculate EQC (Table 5-5 in the EQC Report), represent the more stringent of the aquatic life and Health Canada Drinking Water Guidelines (typically lower than recreational values).</p>

Comment #	Reviewer	Topic	Comment	Proponent Response
42	GMOB	Water Quality Improvements	<p>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."</p> <p>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.</p> <p>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.</p>	<p>The CRP refers the reader to the EQC Report where the arsenic loading model and calculations are presented.</p>
43	GMOB	Naturalization	<p>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.</p> <p>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).</p>	<p>DFO has a mandate to protect fish habitat and administers the requirements under the federal Fisheries Act. Baker Creek is a regulated fishery under the federal Fisheries Act, and since 2012 the creek has been closed to fishing between mid-April to mid-June under the NWT Fisheries Regulations. The purpose of this spring closure is to protect the spring spawning species, particularly Arctic Grayling (<i>Thymallus arcticus</i>) and Walleye (<i>Sander vitreus</i>). Prior to DFO amending the NWT Fisheries Regulations, the changes were discussed at length with the GNWT-ENR and CIRNAC. DFO also sought and received a letter of support from the YKDFN, who were identified as the main affected group. DFO worked with the YKDFN on Baker Creek monitoring between 2007 and 2011, and YKDFN formally support the proposed closure times. The proposed closure of Baker Creek was discussed at a public sport fishery meeting in Yellowknife in the fall of 2009, and has been brought before the Great Slave Lake Advisory Committee. This committee was established by the Minister of DFO to provide advice and recommendations regarding the fisheries of Great Slave Lake, of which Baker Creek is a tributary. The committee reports to DFO and is comprised of members of the three First Nations and the Métis group on the lake. It also has members from the commercial fishing sector, sport fishing, as well as lodges and outfitters. In both cases, the need for the closure was fully recognized to protect the new growth in fish population. During consultations in 2009, it was noted by the Fly Kid Foundation that they would have liked to see an investment in conservation education instead of any closure, but overall they were supportive of the closure during spawning season. DFO worked with the Fly Kid Foundation to develop and install interpretive signs along the trail and creek to better educate the public about the importance of the fish resource and the work being done to protect it.</p> <p>The GMRP will work with DFO, the YKDFN, and other affected parties to further engage on habitat compensation as required under the legislation, prior to finalizing the design of Baker Creek and obtaining the necessary Fisheries Authorization(s).</p>

Notes: GMRP = Giant Mine Remediation Project; MVLWB = Mackenzie Valley Land and Water Board; MVEIRB = Mackenzie Valley Environmental Impact Review Board; CRP = Closure and Reclamation Plan (CIRNAC and GNWT 2019a); Report of EA = Report of Environmental Assessment and Reasons for Decision (MVEIRB 2013); DAR = Developer's Assessment Report (INAC and GNWT 2010); HHERA = Human Health and Ecological Risk Assessment (CanNorth 2018); Preliminary Screening Document (CIRNAC and GNWT 2019b); EQC Report (CIRNAC and GNWT 2018); DFO = Fisheries and Oceans Canada; YKDFN = Yellowknives Dene First Nation.

**Alternatives North Comments on CRP June 2018 Draft**

Submitted to the GMRP on October 26, 2018

Comment #	Reviewer	Topic	Reference	Comment	Project Response
Alternatives North (AN) has reviewed the draft closure and reclamation plan and are prepared to offer recommendations for improving the plan, suggestions to address areas of uncertainty, and identifying areas where greater legibility would aide readers and impacted people to understand the proposed remediation.					
1	Todd Slack	General	N/A	Our first, overarching recommendation is for the project to compile a change log between the draft currently being reviewed and the final version submitted to the Land and Water Board. We can appreciate that this is something of a laborious request, but given the limited resources of the reviewers, we believe that this would represent a net positive for the entire process – allowing us to understand what changes have been made and limiting the scope of our review.	The GMRP is responding to all written comments received from affected parties and this document will identify changes made between the CRP issued in June 2018 and the final version submitted to the MVLWB.
2	Todd Slack	Closure Objectives and Criteria	Section 5.0-5.10 & Appendix 5.0A	Alternatives North has separately made a series of comments on both the Closure Objectives and Criteria. We expect these to be incorporated as part of the review effort. We understand that the project is not yet prepared to establish criteria for a large number of objectives.  AN's position is that any within a <i>final</i> closure plan, there should essentially no unestablished criteria at this point. Any unknowns need to be linked, and addressed, through a research reclamation plan. If this cannot be done, then the project should consider whether this project is prepared to move into the licensing stage – particularly so given the large number of changes between the plan that scoped at EA and the one currently being reviewed.	The Objectives and Criteria in the CRP (Ver 1.0) have been updated to clearly outline what is final and what items need additional Engineering Work or Research, as well as associated conditions to submit and approve at a later date. This includes criteria that have been identified as draft, and will be submitted in Design and Construction Plans together with final design, construction, and monitoring details for the specific closure activity, for MVLWB approval, once a water licence has been issued.
3	Todd Slack	General	N/A	Similar to comments on the Objectives and Criteria, we have made comments in water license workshops and other forums. This is intended to supplement those and we acknowledge that there is likely a fair amount of overlap. To date we've tried to improve the plan, and we trust the project with the difficult task of interpreting and combining these different sources to improve the final closure plan.	The GMRP acknowledges the input from Alternatives North received in various forums and appreciates the large efforts made by its members to improve the CRP.
4	Todd Slack	Socio-economic	Section 5.2	As these review comments are being submitted, the Socio-Economic Plans referenced under section 5-2 have not yet been submitted – either within the MVLWB process or otherwise. We understand this to be coming mid-November, but hope that this can be updated/clarified so that those items aimed at addressing the economic well being of those impacted by Giant Mine are able to be assessed at the same time where we begin to consider the operational and residual risks of the project.	The GRMP's Approach for Delivering Socio-Economic Benefits was released in November 2018 and reviewed with the Giant Mine Working Group on November 8, 2018.
5	Todd Slack	Site-wide Closure Objectives and Criteria	Section 5.0 and Appendix 5.0A	Table 5.0-1 holds the site wide closure objectives. As noted, we have made comments on both the objectives and criteria elsewhere. Beyond those comments, during the Water License workshop, we noted that there has been no work to date to address 'communication with future generations', an important part of the Review Board process. This should rest under SW4.  We would like to shine a light on this matter, despite the fact that this matter is well into the future, the framework for its establishment must be within this closure plan. This is one area where a Research Reclamation Plan is acceptable.	Criteria have been revised to further clarify how the project will ensure Site Wide Objective #4 (i.e., residual risks are identified, and local residents have been, and continue to be, informed of residual hazards post-remediation) has been met. Additional clarification has also been added to Section 1.5 in the CRP regarding land management. The Perpetual Care Plan will outline further information on long term risk identification and communication.
6	Todd Slack	Regulatory Process	Section 1 & 5.12	AN has significant concerns with the regulatory 'approach' that the project is proposing to use. We believe that the regulatory approach being employed will result in an increase in workload for all parties and the project. Should the project wish to continue with this, we believe that there should be a strong set of contingencies built in to address the looming issues associated with the workloads.  a. The project suggests that this is standard board practice. Our experience is that this is not the case. Using annual or irregular submissions for significant changes only started at Ekati in recent years when new consultants took over. This resulted in a much increased burden on the reviewers.  We see the current proposal bringing a haphazard approach where almost every submission - construction plans, reports, annual progress reports – can serve as another opportunity for the project to seek significant modifications and changes to the license/permit. If the project can make significant changes at every one of these steps, a great deal of care will need to be involved in following the files, attempting to track and understand the changes, and then addressing the proposed changes. This level of focus will place a great burden on reviewers.  Our (Strong) preference would feature a more traditional major review every 3 years, ideally cycling around the EA report and the AEMP report. Changes to plans and submissions considered more 'minor' in nature should have a defined and limited nature to them (ex. If the construction needs to make a very minor change – moving the location of a sampling spot a few meters or some such). This will allow reviewers to treat minor documents as informational, not requiring significant analysis or comparison.	The GMRP recognizes this concern and has committed to on-going engagement with affected parties; the proposed engagement approach is outlined in the Engagement Plan (CIRNAC and GNWT 2019e) submitted as part of the Post-EA Information Package.  Some updates to the proposed regulatory process have been made to reduce the number of documents through which new information can be submitted; this process is outlined in Section 5.0.4 of the CRP (CIRNAC and GNWT 2019a). Ultimately the GMRP will implement the regulatory process as defined by the MVLWB, which allows for changes to occur as a project progresses, but maintains points of review and approval. Final direction on the regulatory approach and frequency of project updates will come from the MVLWB and water licence conditions.

Comment #	Reviewer	Topic	Reference	Comment	Project Response
7	Todd Slack	General	N/A	Throughout the document, there seems to be conflation of monitoring and management, culminating in 'adaptive management monitoring'. We strongly encourage the project to refocus their approach to these different tasks.	The GMRP has provided in the water licence application package a series of management and monitoring plans, which include adaptive management components that will be determined based on monitoring results.
8	Todd Slack	Climate Change	Section 5.0	At the Water License workshop, AN expressed strong concern with the nature and history of climate change projections. We would encourage the project to discuss and include a review of past climate change predictions and the subsequent real world observations that have come since. This type of review would help place the current predictions into context.  AN's experience is that past climate change predictions have shown to be under predictive and the predictive value should be viewed with healthy skepticism. While we hope that the current predictions are conservative, recent history suggests that won't prove to be the case. With this in mind, we hope to see stronger contingency planning associated with the freeze (in the same way that the risk assessments used values beyond the predicted flood returns for Baker Creek).	Yes, additional qualitative information is provided in Sections 3 and 5 of the CRP. Section 5.2 (Freeze) includes information and a closure criteria that addresses climate change. Detailed quantitative material was not added.
9	Todd Slack	Closure Criteria	Section 5.0 to 5.10 & Appendix 5.0A	Just as an example of what we think would be 'easy' criteria that could have been established: a. Clarity on the proposed mine water level 750 +/- ?m b. Backfill and paste has part of the operations in recent years. As part of the SSP, there were criteria established to help define success.	Yes, efforts were made to make closure criteria more specific and numeric.
10	Todd Slack	General	N/A	Throughout the plan, there are uncertainties listed at the end of sections. Given the lack of clarity on many issues (else there would be criteria established to define successful closure) we would have expected to see greater disclosure in these sections.	The GMRP revised the closure criteria to outline where criteria are still in development and are not final due to uncertainties related to outstanding engineering works or reclamation research.
11	Todd Slack	General	N/A	There are a number of inconsistencies between objectives/criteria and the text. At this point, the project should be driving towards clarity and the inconsistencies particularly occur where there are alternatives still being considered (See UG1 as an example). This also occurs when the project utilizes language that, on one hand promotes flexibility, but on the other introduces uncertainty.  When the project uses phrases like 'extent practicable' or 'thresholds' they must provide clear language to explain what those constraints are, else it serves to increase uncertainty. Similarly, when the project uses terms describing when events or actions can be (come) 'unpracticable', then some context needs to be provided.	Yes, language to explain constraints have been added, where possible, particularly into the closure tables
In addition to these general comments, AN has a number of suggestions to improve clarity. We are not suggesting that our comments need to be applied comprehensively, but that the many things could be done in a more consistent manner to allow better review.					
12	Todd Slack	Underground	Section 5.1	Underground Activities: - What's the difference/threshold for backfilling (bullet 2) choices – selected will be done to the extent practicable, while Baker Creek will be done to the extent required. Where is the guidance on what the intended results will be – how will it be established if successful or not? - How will the openings be plugged or filled to prevent solids release? Is the backfill just to allow freezing? What conditions will be required to understand whether thermosyphons will need to be drilled near the stop openings (bullet 3 it says 'should it be required') - This text states that the openings to surfaces in pits will be backfilled and the openings MAY be plugged or capped, but would allow drainage. Objective P1 suggests that hydraulic connectivity will be reduced. Secondly, this optional condition is inconsistent with the objectives (UG1) - Bullet 4 suggests that the openings to the surface outside of pits MAY be closed by an engineered cap or alternate design. What would be the trigger, and how is this consistent with the objective UG1, which indicates a cap?	Yes, text was added to Section 5.1, where possible, for clarity: - Text edited for consistency, as per Alternatives North Comment 10; where possible, language to explain constraints have been added. - Objective P1 was refined. - Text has been edited to clarify treatment of openings to surface in pits.  Also refer to response to Alternatives North Comment #15 below.
13	Todd Slack	Underground	Section 5.1	Section 5.1.5.5: "As noted in section 5.1.4, the mine water will not be raised to the 425L until freezing is complete" This section says water will stay at 750L.	Agreed, edit was made in CRP.
14	Todd Slack	Underground	Section 5.1	The text notes that the backfilling must be: a) self supporting and; b) will prevent movement of stope or drift fills. These should be addressed through criteria – either within the text, setting minimum strengths/slumping values, or as a closure criteria.	Yes, added criteria for strength and depth of fill.

Comment #	Reviewer	Topic	Reference	Comment	Project Response
15	Todd Slack	Underground	Section 5.1	<p>Within 5.1.6:</p> <ul style="list-style-type: none"> <li>- B1 – it's not clear which voids will be filled (or what the triggers would be to do it)</li> <li>- B3 – If the non-pit caps are optional, what openings will be covered (with what)? What factors figure into the decision making</li> <li>- B7 – water level will remain at 750 until a license amendment will be obtained?</li> </ul>	<p>Bullet 1 (B1) - 'It is noted that this is described in CRP Section 5.1.5 Engineering work (including appendices and references). Section 5.1.6 is an overall summary.</p> <p>Bullet 3 (B3) With regards to the pit covers, the CRP text was edited to note that "caps will be" installed. All openings to surface outside of pits will be capped.</p> <p>Bullet 7 (B7) - A reclamation research plan is proposed to investigate a possible minewater elevation raise. the minewater level will remain at approximately 750 Level with seasonal fluctuations. Should reclamation research show that a rise in minewater levels is possible, this information will be presented to affected parties and the Board. Should the Board approve a minewater elevation change, then the GMRP may raise levels. Edits to the UG1 Objective on minewater level were made to make this more clear.</p>
16	Todd Slack	Underground	Section 5.1	<p>As an example of using language that promotes uncertainty but not recognizing that an uncertainty exists for the project, section 5.1.7 could feature the unknowns described above. For example – b3 where the caps MAY be constructed should discuss the uncertainty around the drivers governing whether it will be done or not.</p>	<p>Yes, attempts were made to address this in the CRP. For example, underground void filling is dependant on void geometry - there is no one size fits all numeric criteria.</p>
17	Todd Slack	Underground	Section 5.1	<p>5-34 row 3 – discusses a potential planned mine water raise. The mine water raise has not been fully assessed and is contrary to existing commitments. It is unlinked to criteria either directly or through objectives and a research reclamation plan.</p>	<p>The planned minewater level raise is a Reclamation Research Plan. Please refer to this plan for step by step process to review the possibility of a minewater level raise. This was directly linked to the closure criterion for minewater level for keeping the mine stable (UG1).</p>
18		Underground	Section 5.1	<p>Table 5.0A-3 – Freeze Objectives and Criteria</p> <ul style="list-style-type: none"> <li>- Define long term/short term: This definition issue extends back to the Environmental Assessment.</li> <li>- There is a bit of an issue with regard to the short term 10 m freeze and the long term 5 m freeze. To explain – if the freeze is 10 m at the end of the short term, but is moving towards 5 m, should the adaptive management/response thresholds be set long before it reaches 5 m as there is clearly a degradation of the frozen shell and an increase in risk? [This issue was discussed at some length during the WL workshop]</li> <li>- Modelling does not demonstrate, it only predicts. If this is a criteria, provide further clarity on the action – is this different than the modelling already done? At what point will this occur? What changes are to be considered.</li> <li>- In general, there needs to be improved links between the criteria and the monitoring. In this case FR2, please explain how this monitoring shows the criteria is achieved.</li> <li>- What aspects, specifications or particular details will the qualified professional review to ensure that any future excavation can be completed in a way that will be easier than simply creating new works?</li> <li>- Please provide clarity on the minimum depth of the frozen shell versus the planned raising of the water level? P5-38 notes that the water level may be allowed to rebound – how will the introduction of warmer water affect the frozen shell.</li> <li>- Paragraph 3 notes the extensive thermal modelling done. Provide clarity on whether this was completed with a flooded mine.</li> <li>- The project should include a thermal profile of the minewater pool (for both 'flooded' and current prediction)</li> <li>- Which risk assessments looked at the consequences of raising the minewater to interact with the frozen shell? At present, this has not been a matter of focus within the QRA.</li> </ul>	<p>(a) Objective and Criteria tables updated. The CRP has one containment criteria; discussed within text section of 5.2</p> <p>(b) Acknowledged. The forthcoming Arsenic Trioxide Frozen Shell Management and Monitoring Plan will include thresholds and responses.</p> <p>(c) The table has been edited to address this comment. Modelling has been moved into monitoring / Inspection column</p> <p>(d) Added to Closure Objectives table, where possible</p> <p>(e) The design will not make it more difficult to access any future removal of arsenic dust from the underground. Criteria text updated.</p> <p>(f) A future minewater level raise, should it occur will be the subject of study including the lower limit of the toe of the freeze.</p> <p>(g) Future Engineering work, not included in CRP at this time.</p> <p>(h) Will review requirement in future Engineering work, not included in CRP at this time.</p> <p>(i) The RRP Task 6 - Studies to confirm minewater raise management to maintain the freeze criterion - This will propose studies that may be required to consider possible effects of minewater level raise on the frozen shell should it be considered at a future date.</p>
19	Todd Slack	Freeze	Section 5.2	<p>Section 5.2.4: "Site target for a maximum arsenic release of less than 2000 kg/year". Overall, the aversion to numeric values/criteria continues here. This seems like an excellent criterion that could apply site wide (or be employed on a per component basis), particularly as it was a matter of focus since the project assumed control of the site.</p>	<p>The text re: maximum arsenic release of less than 2,000 kg/year has been deleted as the GMRP has a more refined EQC and runoff criteria to meet the measures of the Report of EA.</p>
20	Todd Slack	Freeze	Section 5.2	<p>5.2.5.1 – Passive System Design: It's hard to reconcile that the project knows exactly how many thermosyphons of different types are required on one hand (not to mention 12990 m of monitoring cable), while on the other, they cannot provide certainty on something as simple as closing the entrances to the underground.</p> <p>Obviously, this is a project driven by the frozen block method rather than an effective closure planning process, but as this is the final closure plan, its astonishing to see that the thinking on the other components haven't begun to catch up to a stage where the project can clearly state what will be done.</p>	<p>Acknowledged, no changes made to CRP.</p>
21	Todd Slack	Freeze	Section 5.2	<p>5.2.6 Final site condition: "in some cases" thermosyphons will be installed above or inside the chamber. Which cases? If unsure, what conditions will cause this to be done?</p>	<p>Re: the comment 'in some cases' for thermosyphons - this is more applicable below the larger stopes, to achieve containment criteria and freeze times consistent with other stopes and chambers. This engineering work is ongoing and will be completed in detailed design.</p>

Comment #	Reviewer	Topic	Reference	Comment	Project Response
22	Todd Slack	Freeze	Section 5.2	Table 5.2-3 Uncertainty: Again, the table is quite limited in its 'uncertainties'. For example, there is insufficient discussion around the exposure of the frozen block to water. In another example, Table 5.5-6 doesn't have uncertainties around the RRP's?	The simple heat transfer model shows sufficient heat can be removed from the groundwater by the thermosyphons (Refer to Round 1, Information Request, Review Board #2, May 31 2011, response 5). A possible future minewater raise will be studied and the numerous uncertainties related to this are described in the RRP.
23	Todd Slack	Freeze & Pits	Appendix 5.0A	Table 5.0A-4 Pits: Bullet 4: In what situations will pit B2 receive contaminated wastes. Is there contingency for this pit to be frozen/covered as well, should this be the case? What other actions will be considered if contaminated wastes need to be placed in the pit	Heavily contaminated granular fill will not be placed in the B2 Pit; therefore, it will not require freezing.
24	Todd Slack	Pits	Section 5.3	P5-62 Pit Risks: The QRA has not discussed the "risk-based trade-offs that are needed to determine whether underground stabilization methods are needed".	Wording in the CRP has been improved for clarity.
25	Todd Slack	Pits	Section 5.3	5.3.5.2 – Surface openings within Pits: The promotional of drainage through the pit openings is not discussed within the closure objectives and criteria. The objective states that the infiltration will be reduced, while the activities, criteria and monitoring is silent on this. Please provide clarity and metrics on what is intended.  Please explain how the fills will promote drainage and what monitoring/metrics will be used to establish that the drainage is being promoted and occurring as expected.	The Objectives and Criteria tables in the CRP were updated to provide more clarity. For example P2-1 Pits will not permanently retain ponded water. Engineering work is underway to design the open pit closure and the openings to surface. It is envisioned that the openings to surface in the floor of the pits are closed but that a proper drain to the underground is installed so any infiltration/runoff entering the pit area can be directed underground in a controlled manner and to a controlled area of the underground for future treatment. Drainage will also be controlled around the pits to divert non-contact water away from the pits.
26	Todd Slack	Pits	Section 5.3	Section 5.3.5.4 Pit Filling: "The remaining 0.8 million m <sup>3</sup> will be disposed of within A1 and B1 pits". B1 is being frozen and covered, but are any such provisions in place should the A1 pit be used in a similar manner should the contingency be required? [We think this was mentioned at the WL Workshop]	No, the A1 Pit will receive contaminated material, but not heavily contaminated granular fill of the type that requires freezing. More information on waste strategies was added to the CRP. The Waste Management and Monitoring Plan also has additional detail.
27	Todd Slack	Pits	Section 5.3	Section 5.3.5.5 Pit Covering: "Pit covers may be needed" lacks clarity (especially as P5-117 indicates that pit covers will be used). In what conditions would a cover be utilized? Similarly, there are contingencies for infiltration reduction as a reason for the cover. Again, in what cases would this be done and what are the linkages to the criteria and monitoring.	Additional information was added to the CRP to clarify fill, cap and cover of pits. Pits may be filled partially or fully and have diversions/berms installed in or near them to prevent water from Baker Creek entering the underground. A cap will be installed over any pit fill to prevent dust generation. An engineered cover will be installed in addition to or instead of the cap if there is a risk to the underground water quantity or quality. The detailed design for each cap/cover will be determined in future engineering work and will be based on achieving project Objectives and Criteria.
28	Todd Slack	Pits	Section 5.3	5.3.6 Final Site Conditions: B1 - What criteria/monitoring will be used to assess if the openings to surface are closed in a manner that does not allow movement of material, enhances drainage, and keeps pore pressure low? - B2/B3/B4: When the project uses the phrase "unacceptable hazard" and "excessive settlement" and "reduces long-term settlement", can they point to further context and measurable specifics that will allow all reviewers to see that these matters have been achieved. - B5: Under what conditions would water diversion berms be constructed? - B6: It's not clear under what condition Pits will be covered and what sized material will be used. Section 5.3 doesn't seem to discuss the matter – so please provide the triggers when they would be utilized, what the particulars of the cover will be, and what purpose they will achieve within the objectives and criteria.	B1/B2/B3/B4: Objectives and Criteria table updated to include the forthcoming Monitoring and Management Plans.  B5: Updated in CRP, including the Objective and Criteria Tables  B6: Engineering work is underway to design the covers and is not included in CRP at this time. Also see response to Alternatives North Comment 25.
29	Todd Slack	Contaminated Soils and Sediments	Section 5.4	5.4 Contaminated Soils: P5-69: Can details of the volumes in the bulleted list be provided to help align and better understand table 5.4-1.	Added to Section 5.4 of CRP.
30	Todd Slack	Contaminated Soils and Sediments	Section 5.4	5.4.6.1 Developed Areas - Why is excavation of the calcine pond not 'possible'?	Addressed in CRP. Text adjusted in text to clarify the depth of excavation required and resultant volume of fill needed.
31	Todd Slack	Baker Creek and Surface Water Drainage	Section 5.5	The goals and objectives within the DAR states that the project will "Restore Baker Creek to a condition that is as productive as possible, given the constraints of hydrology and climate". However, the current goals and objectives fall far short of that level of commitment – they don't address the outcome insofar as it may occur as a result of the actions that they propose. AN cares little about how the project hopes to achieve an endpoint, so long as that successful end is meant.  Given that the remediation plan around this component has not undergone significant changes, there seems to be no reason for the proposed goals and objectives to come up significantly short. Most significantly, the 'active' or outcome-based nature is lost, including any outcomes around productivity of Baker Creek.	The project includes Baker Creek staying on site with a new alignment. The new objectives BC4 and BC5 are practically achievable and measureable. Further consultation for the <i>Fisheries Act</i> Authorization required for the habitat losses and gains in Baker Creek will contribute to measureable criteria around productivity including species, life stages, and types of habitat. The GMRP believes the current objectives with future work on the <i>Fisheries Act</i> Authorization will meet the original goal of the DAR.
32	Todd Slack	General	N/A	As mentioned in other venues, AN's evaluation of the closure criteria has noted that there are some significant limitations. In particular, we don't understand why can't the key design specifications be used as closure criteria? AN is deeply uncomfortable with leaving the criteria to unknown engineers outside of a public process. Thus the approach would see: - Project engineer establishing the specifications - Project engineer evaluating if they're completed - Project engineer indicating that the closure criteria is met  This puts far too much authority for defining success wholly within the project and their paid consultants. The definition of successful closure must be one where all parties are involved.	The GMRP will file Design and Construction Plans to the MVLWB for approval, which makes it a measured and controlled criterion. The design specifications and approvals will not be done outside of a public process. The project is happy to have further discussion on the terms Qualified Professional vs project engineer. The term Qualified Professional is the industry norm and this was outlined further in Section 5.0 of the CRP.

Comment #	Reviewer	Topic	Reference	Comment	Project Response
33	Todd Slack	General	N/A	Alternatives North would strongly encourage the project to consider the nature of As-Builts and Final inspections and how they should be used within the closure planning. Neither of these are really 'monitoring' tools. They can be used in specific circumstances to demonstrate successfully meeting closure objectives, but the project uses this approach rather broadly.	The revised version of the CRP reduces the usage to more targeted instances. However, the GMRP will continue to propose a clear, measurable criterion, to be used either in conjunction with other criteria, or on its own, where it is an appropriate tool to demonstrate the achievement of a set endpoint after public process review.
34	Todd Slack	Baker Creek and Surface Water Drainage	Section 5.5	When the project discusses returns to natural patterns, they should provide the reference for what 'natural' is - this site that has been altered so much over the last 70 years that natural is a bit of a mystery.	Acknowledged. Text has been clarified to indicate that this is done 'typically to pre-disturbance conditions'. Air photo analysis and Traditional Knowledge offer some indication of what pre-disturbance is for small watersheds in the region and attempts will be made to incorporate this into the design. The air photos do not have great resolution so Alternatives North is correct that there is some uncertainty here.
35	Todd Slack	Baker Creek and Surface Water Drainage	Section 5.5	Treated water from the polishing pond (and other recycled water) may be used for dust suppression. While treated, this water will be of uncertain quality and deposited onto the land – potentially in areas where the runoff is not controlled. Is this consistent with the direction of the Boards and the objectives of the project?	This is current practice approved under the Site Stabilization Plan Water Licence MV2012L8-0010. The GMRP plans to improve this practice once a freshwater intake and/or the new water treatment plant is installed and water for dust suppression can come from those two sources of cleaner water.
36	Todd Slack	Baker Creek and Surface Water Drainage	Section 5.5	5.5.5.1 – Final Hydrology: The project is presuming that the research reclamation plan will result in a large constructed wetland. Why is the default assumption in the positive (e.g. that it will happen) and what is the contingency should it not come to be? - Again, the linkages between the Criteria and the RRP are not well established. - Figure 5.5-7: Have the results of the ETP monitoring from 2018 supported the modeling that there is a trend towards declining concentrations of Arsenic, Antimony and TDS?	The CRP was edited to be more clear that portions of Baker Pond become a floodplain to allow conveyance of a Probable Maximum Flood. The Passive and Semi-Passive Treatment RRP work will continue to understand the efficacy (cost and function) of wetland treatment in low flow areas to reduce arsenic loading to the environment. It is not a foregone conclusion that constructed wetlands will be installed, but early indications are positive (see the RRP for more details).  Figure 5.5.7 (June 2018 Draft CRP) shows modeled and monitoring results at the mouth of Baker Creek (SNP 43-5). Figure 5.5.7 has been updated with 2018 data in the revised CRP (Figure 5.5-11 in January 2019 CRP). Agreement between modelled and monitoring data remain consistent in 2018 compared to other years.
37	Todd Slack	Baker Creek and Surface Water Drainage	Section 5.5	37. On p 5-124 the project notes that DFO and affected parties are reviewing the specifics around fish habitat and compensation. It's not clear how far this has progressed, nor who has been involved. When should we expect this review to be complete? When can we expect further detail to inform and improve the proposed criteria?	The GMRP and DFO met in July 2018 during which GMRP provided an update to DFO on the CRP and DFO provided an update to GMRP on current interpretation of legislation and potential changes to the Fisheries Act. GMRP and DFO are planning to meet again in winter 2019. Further consultation and engagement with affected parties and DFO is also needed in 2019. Further detail on specifics of closure criteria would not be expected until late in 2019. The closure objectives and criteria table was edited to provide more connection to the DFO process.
38	Todd Slack	Baker Creek and Surface Water Drainage	Section 5.5	Surface drainage quality is expected to be improved. Improved from the current state is the assumption, but it would be useful to have the comparisons handy. Criteria that consider what the current state is versus the goal would be useful.	Chapter 2 of the CRP outlines the runoff quality from site. The EQC Report predicts future water quality in Baker Creek. The GMRP is measuring the achievement of improved water quality in Baker Creek and runoff to Baker Creek via meeting the site-specific water quality objectives. The EQC Report outlines how site-specific water quality objectives at the edge of the mixing zone will be met. The AEMP Design Plan for Yellowknife Bay is currently conceptual, however the subsequent versions will include monitoring details.
39	Todd Slack	Tailings	Section 5.6	Neither the CRP nor appendix 5.6A make it clear what the intent of the cover is. Can the project indicate what the objectives are, and what criteria will indicate success (T4 only discusses contouring and topography)?	The key objective is T1. This outlines the role of the tailings cover: reduce arsenic loading to the environment; SW1 is also related to the tailings cover - improved air quality at post-closure. In other words, the presence of the cover reduces the contact between the cover and the environment. This includes verifying that incidental precipitation and runoff from the TCAs does not have a water quality that is influenced by the arsenic in the tailings, and is suitable for discharge to the environment. (see criterion T1-2).
40	Todd Slack	Tailings	Section 5.6	5.6.6.4 Placement of Tailings: There's discussion surrounding water content (pore & frozen) as a condition for placement, but no information regarding acceptable limits or constraints for placement. Similarly: - After placement, what are the acceptable monitoring standards for the tailings settlement (subsidence)? - What's the time period between moving the Tailings, then monitoring, then placement of the geosynthetic and further capping?	Acceptable differential settlement will depend on the final design of the cover and the type of geosynthetic selected during the design process.  The time period between movement of the tailings and placement of the cap will depend on a number of factors that are not yet fully defined, including the timing of both tailings relocation and the timing of excavation and placement of other waste materials in the TCAs. Observations during excavation and placement of the tailings will inform refinement of the timing.
41	Todd Slack	Tailings	Section 5.6	5.6.7 Foreshore Tailings: It feels like there are lessons to be learned from the tailings cover that was emplaced in 2004. We assume that the project has incorporated this, but if so, it's not well laid out within the text.  - After INAC received the site, there was a tailings cover placed on the foreshore area. At the time, what were the design objectives and the planned lake levels? How has this performed in the short time period to date – both in relation to the environment it is in and the engineering aspects? - How have recent lake levels compared to the average return periods – if 1 in 50 year has an elevation of 156.1 masl – what have the recent water levels been? - Risk of foreshore tailings – its not clear what the design specifications are? Not been incorporated within closure criteria.	The ongoing design work for the foreshore tailings includes an updated design approach, which includes stabilization and isolation of subsurface tailings. As part of this updated design, the full available record of water levels has been reviewed and statistically evaluated. Details presented in closure plan are limited as the design work is currently ongoing. Water level data is updated in the revised CRP, but the majority of the design information for the foreshore cover, including characterization of historic data will be in the design report.

Comment #	Reviewer	Topic	Reference	Comment	Project Response
42	Todd Slack	Infrastructure	Section 5.9	5.9.2.3 Roads – There are 30 km of roads, but it's not clear what they will look like after closure. What's the endpoint and how can it be outlined/determined? Explain the scarification and regrading efforts	Chapter 3 has a figure of post-closure roads. Text edited for regrading to match surface drainage plans & future design work; See 5.9.5 Engineering Work.
43	Todd Slack	Infrastructure	Section 5.9	Buildings – generally closure plans features building foundations reduced below the final grade. It doesn't seem like that this the case here – if not, why not?	See Section 5.9.5.3 of the CRP. The GMRP will remove buildings down to foundations and then backfill the area to grade, which is inline with the mine closure guidelines.
44	Todd Slack	Non-hazardous Waste Landfill	Section 5.10	5.9.5.5 Current Non-Hazardous Waste Dump – No special concerns are noted here. Not being aware of the runoff or leaching characterization, it just seems like there may/?should? be further requirements to fully close the site. At a minimum, the project should provide background why this isn't likely to be an issue.	As documented in the Waste Management and Monitoring Plan, the following guidelines will be followed for waste management so that non-hazardous wastes are placed in the facility: - Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories (GNWT 2003) - Solid Waste Management for Northern and Remote Communities – Planning and Technical Guidance Document (ECCC 2017) - Guideline for Hazardous Waste Management (GNWT 2017)  Water management and monitoring will be done at the non-hazardous waste landfill as per the Water Management and Monitoring Plan.
45	Todd Slack	Non-hazardous Waste Landfill	Section 5.10	Table 5-10-1 Landfill: There's a lack of information on how the active cells will be managed and closed within the criteria. For example, the text notes that there will be covers and graded aspects to reduce infiltration, but doesn't address how much or what the minimum reduction needed/desired will be. Additional cover construction and goals are listed in the text (1 m thick, geomembrane, positive drainage away, grades will blend with the surrounding environment) a. Is the surrounding/receiving environment anticipated to be the core industrial area, or the broader site in general?	Yes. The grading will be done to blend with immediate surroundings in the core industrial area.  The Objectives and Criteria table has been edited.
46	Todd Slack	Non-hazardous Waste Landfill	Section 5.10	As noted at the workshop, the project should indicate which federal and territorial guidelines have been reviewed and if the regulators have indicated that the proposal conforms to the guidance provided. For example, does the proposal fit within ENR's ongoing Waste Resource Management Strategy?	Yes, the CRP has been edited to add the following guidelines to Section 5.10 and noted in the Objective and Criteria Tables: - Guidelines for the Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories (GNWT 2003) - Solid Waste Management for Northern and Remote Communities – Planning and Technical Guidance Document (ECCC 2017) - Guideline for Hazardous Waste Management (GNWT 2017)

Notes: GMRP = Giant Mine Remediation Project; MVLWB = Mackenzie Valley Land and Water Board; CRP = Closure and Reclamation Plan (CIRNAC and GNWT 2019a); Report of EA = Report of Environmental Assessment and Reasons for Decision (MVEIRB 2013); DAR = Developer's Assessment Report (INAC and GNWT 2010); EQC Report (CIRNAC and GNWT 2018); Golder 2019); Water Management and Monitoring Plan (CIRNAC and GNWT 2019c); Engagement Plan (CIRNAC and GNWT 2019e); DFO = Fisheries and Oceans Canada; YKDFN = Yellowknives Dene First Nation.

**Bill Slater- Technical Advisor to Working Group Comments on CRP June 2018 Draft**

Submitted to the GMRP on October 27, 2018

Comment #	Reviewer	Topic	Comment	Response
1	Bill Slater	General	I am encouraged to see a comprehensive CRP to support a water licence application for remediation of the site. The draft CRP addresses many of the key measures from the 2013 Report of Environmental Assessment and also incorporates input received during various discussions over the past several years. When compared to the plan presented for the environmental assessment, this plan is based on a more thorough understanding of environmental conditions, and a lot of additional engineering and design work. It also reflects a lot of effort aimed at understanding people's key issues and concerns about the site and its past, current and potential future effects.	The GMRP appreciates this acknowledgement.
2	Bill Slater	Contaminated Soils	<p>The CRP would benefit from some additional clarity about plans for addressing contaminated soils. My understanding of the proposed plan for contaminated soils is as follows.</p> <p>The plan identifies two overarching types of contaminated soils that must be addressed:</p> <ul style="list-style-type: none"> <li>· Contaminated soils occurring in developed areas (i.e., disturbed by past or current mine-related activities), and</li> <li>· Contaminated soils occurring in bedrock/forest/wetland terrain.</li> </ul> <p>The CRP proposes that remediation (i.e., removal or covering) of contaminated soils will be undertaken for developed areas, either to industrial (340 mg/kg As) or residential (160 mg/kg As) standards, depending on the location. With two exceptions, the CRP does not propose remediation of contaminated soils in bedrock/forest/wetland terrain. The exceptions include the Shoreline Lands (shore of Yellowknife Bay from the Townsite to the Foreshore Tailings) that will be remediated to residential standards and Downgradient of Dam 3 (tailings spill area) that will be remediated to industrial standards.</p> <p>The remaining contamination in bedrock/forest/wetland terrain will form the basis for the second major categorization of contaminated soils.</p> <ul style="list-style-type: none"> <li>· Unremediated areas with arsenic concentrations greater than 3,000 mg/kg will be fenced to restrict public access.</li> <li>· Unremediated areas with concentrations up to 3,000 mg/kg will remain outside the fenced area and rely on administrative controls to restrict the types of activities that people do in these areas. As shown in Figure 5.4-3, these areas may be quite extensive. They also likely extend beyond the site boundary that is shown on the figure.</li> </ul> <p>As currently described, it is difficult to figure out exactly what is proposed for the contaminated soils. The CRP needs additional clarity about the two different categorizations of contaminated soils and how these related to each other both in physical location, and for decision-making.</p>	Section 5.4 of the CRP has been updated to provide further clarification the rationale for selection of options in both the developed areas and the bedrock/forest/wetland terrain. It is noted that although the fence boundary in general correlates to 3,000 mg/kg, multiple lines of evidence were used to assess the distribution of arsenic and locate the fence boundary. This includes forensic mineralogy, detailed terrain mapping and comparison with other case studies to determine the extent of primary roaster stack deposition.
3	Bill Slater	Contaminated Soils	<p>Leaving large areas of unremediated contaminated soils is a substantial difference from the closure and reclamation plan proposed in the Developers Assessment Report (DAR), which envisioned remediation of all soil across to site to industrial standards. Soil sampling completed since the DAR has identified much more extensive contamination, including contamination in the bedrock/forest/wetland areas. The contamination in soils is now known to extend across the site and beyond the site boundaries. The DAR estimated the volume of contaminated soils requiring remediation as approximately 328,000 m<sup>3</sup>, while the current estimate is almost four times larger at 1,281,000 m<sup>3</sup>. There is no doubt that the remaining contaminated soils will leave a long-term negative legacy for future generations. However, remediation of this much larger volume of soil spread over larger areas including forests and wetlands is likely not currently practical or feasible. The cleanup of these soils would cause extensive additional disturbance and the volumes of soil requiring long-term storage facilities would overwhelm available storage locations at the site.</p>	The GMRP agrees that remediation of large areas of bedrock, forest and wetlands is not feasible. A Preliminary Screening document has been developed that outlines the changes from the DAR and provides a rationale for why the GMRP is recommending that additional screening is not required.
4	Bill Slater	Contaminated Soils	The decision to leave unremediated soils with arsenic concentrations up to 3,000 mg/kg in areas that are physically accessible to the public and outside of the core industrial area creates challenges for long-term management of human activities. The Human Health Risk Assessment concluded that the risks are acceptable provided that people only use the site casually for short periods of time (detailed scenarios are provided in the Human Health and Ecological Risk Assessment Report [HHERA]). The high arsenic concentrations greatly exceed both industrial and residential standards, suggesting that more active human use of the area would create unacceptable risks. Therefore it will be critical to permanently minimize future human use of the area. The CRP proposes measures like signage to advise people about risks. Effective long-term management of human activities in this area will likely require much more aggressive approaches, for example defined restrictions on land use in land registries, ongoing public awareness campaigns, and other measures that can endure future administrative changes. The CRP should describe how human use of areas with elevated concentrations of arsenic will be managed in the long-term future – who will be responsible, what measures will they take, how can this provide certainty?	Criteria have been revised to further clarify how the project will ensure Site Wide Objective #4 (i.e., residual risks are identified, and local residents have been, and continue to be, informed of residual hazards post-remediation) has been met. Additional clarification has also been added to Section 1.5 in the CRP regarding land management. The forthcoming Perpetual Care Plan will outline further information on long term risk identification and communication.

Comment #	Reviewer	Topic	Comment	Response
5	Bill Slater	Covers and Caps	The CRP proposes covers and caps for various facilities and materials, for example Tailings Containment Areas (TCAs) and some contaminated soils. Detailed designs for covers and caps have not been completed and the Project Team proposes that these can be addressed through future review and approval processes. Deferring detailed design is not unreasonable. However, the covers and caps are one of the primary mitigation measures for some important issues and concerns related to contamination, for example wildlife contact with arsenic wastes, infiltration of water, human contact with wastes, and messaging to future generations. Even if designs are not provided, the CRP should identify the intended purpose(s) for each cover and demonstrate that the cover concepts can achieve the intended purpose(s). For example, the CRP proposes engineered covers for some deep pockets of contaminated soils in the developed areas. The CRP states that the design is currently being developed (Section 5.4.7.1) but does not identify what objectives the covers are intended to address or what the design criteria for the covers will be. Similar uncertainty exists for proposed covers for lakeshore sediments and Foreshore Tailings (and possibly others). Note that the Appendix 5.6A of the CRP is a Conceptual Tailings Cover Design and Section 4.0 of that design does identify cover objectives.	Additional clarity has been provided throughout the CRP on objectives and criteria for covers including the addition of "criteria in development", where applicable.
6		Covers and Caps	The Conceptual Tailings Cover Design cites feedback received during the Surface Design Engagement process, specifically that: "First Nations feedback included a desire to avoid promoting vegetation growth, such that the site would have the appearance of an abandoned site, helping to communicate risks to future generations" (Appendix 5.6A, p.4). I agree that this is an important conclusion from the Surface Design Engagement. This concept has been reflected in the proposed design with the top layer being coarse rockfill. The communication to future generations should be identified as an objective for the tailings covers (along with the protection of water quality and avoidance of physical contact that are currently identified as objectives in Section 4.0) and likely other covers (e.g., pits). Identification of the communication component as an objective will influence the design and implementation for the covers, especially long-term measures that will be needed to maintain the barren surface and its associated communication role (e.g., vegetation removal). The final site conditions currently described in the CRP (Section 5.6.8) do not address the requirement to maintain a barren rock surface. The need to maintain this messaging should be specifically identified as part of the design, and then further addressed in long-term operating and monitoring plans when those are prepared. Otherwise, this important objective may be forgotten while addressing the more typical objectives of mine waste covers.	Additional detail has been provided in the CRP in the form of an expansion of criterion for Site-Wide Objective #4 related to communication of risk to future generations. The Tailings Management and Monitoring Plan provides further information on long-term monitoring and maintenance. The forthcoming Perpetual Care Plan will address communication in the long-term.
7	Bill Slater	Covers and Caps	The cover profile proposed in the Conceptual Tailings Cover Design entails a non-vegetated layer of coarse rockfill at surface (approximately 0.7 m thick), underlain by a protective bedding layer, and a low permeability geosynthetic material. This profile was selected in a trade-off study with input and review from the Project Team and the Independent Peer Review Panel (Appendix 5.6A, p.3). There was no direct engagement with the Working Group about the cover profile. However, the report does indicate that results from the Surface Design Engagement were considered during the trade-off study. This appears to be the only engagement with external groups about the cover profile. Measure 22 of the Environmental Assessment Report requires consultation with Environment Canada and responsible regulators about the depth of the tailings cover, but the reports do not describe whether such consultation occurred, and if so what input was received and how it was considered/incorporated.	Measure 22 applied to a vegetated cover (specifically the depth of the cover due to concerns on root penetration) as described in the Report of EA and does not apply to the cover profile proposed in the CRP (i.e., non-vegetated coarse rock). The options analysis (Appendix 5.6A of the CRP) outlines the extensive engagement completed and how this was considered in the selection of the cover.
8	Bill Slater	Covers and Caps	The Conceptual Tailings Cover Design envisions final grades on the cover surface that may be as flat as 0.5% (Appendix 5.6A, p. 15). Slopes this flat will likely present challenges for maintaining grades and water flows as planned, especially where the covers are constructed over recently disturbed or relocated materials, or loose materials (testing suggests that tailings materials are loose and may still be consolidating at the site, Appendix 5.6A, Section 2.7). Monitoring and maintenance of these covers will be required to confirm that water is not ponding on the surface of geosynthetics or flowing in unexpected directions. Ponding may be difficult to detect because the geosynthetic layers will have coarse rockfill over them.	Maintaining grades as flat as 0.5% can be challenging on tailings. These flat grades are proposed only for very limited portions of the cover, over areas where tailings are coarsest and least susceptible to settlement. Where site geometry constraints do not make it impractical, the target grade is 2%.  A Tailings Management and Monitoring Plan has been developed, which outlines the monitoring and maintenance of the covers.
9	Bill Slater	Covers and Caps	The CRP proposes covering of nearshore sediments in the Shoreline Lands – along the Yellowknife Bay shoreline from the Townsite to (and including) the Foreshore Tailings. The cover on sediments and tailings is intended to be a long-term solution that will limit direct human contact with arsenic-containing waste. Lakeshores are dynamic areas and even robust designs will likely deteriorate over time. Any covers for lakeshore sediments will require long-term monitoring and maintenance programs, for as long as the materials present risks from arsenic contamination. The CRP proposes that monitoring will include visual monitoring for settlement, erosion, vegetation growth or deposition of sediment (Table 5.12-6).  It is likely that more robust monitoring methods will be required to fully understand the condition of the cover. Also, finding mechanisms to make sure that monitoring and maintenance happens in the long-term will be challenging because the Shoreline Lands will be outside of areas that are subject to substantive administrative controls – the area is to be remediated to residential standards so that people using the area will not be subject to unacceptable health risks. It would be useful for the CRP to describe how the proposed monitoring will specifically address the ongoing status of the covers and the extent of maintenance that will be required. It should also describe what types of administrative measures may be required to ensure that nobody disturbs these areas in the long-term, and who will be responsible for making sure this happens.	Acknowledged. Additional details on the proposed monitoring will be included in the associated Design and Construction Plans.
10	Bill Slater	Covers and Caps	Covering of arsenic rich sediments can lead to increased migration of arsenic into the water column under low oxygen conditions at the water-sediment interface. This is unlikely to be an issue for the Shoreline Lands and Foreshore Tailings because they are located close to the lake surface in areas where oxygen depletion is unlikely in the current conditions. However, future human activities could lead to low oxygen conditions if some action is taken that may increase oxygen demand in the water column (e.g., sewage discharge). Avoidance of future actions that could lead to depletion of oxygen concentrations in the water column in the area should be considered when establishing administrative controls for future activities.	Acknowledged, further details regarding necessary controls or monitoring will be included in Design and Construction Plans

Comment #	Reviewer	Topic	Comment	Response
16	Bill Slater	Other Issues and Comments	The CRP proposes a reclamation research plan to study constructed wetland treatment as a method to reduce loading of arsenic in the aquatic environment. Wetland treatment is currently the only method identified to potentially reduce contaminant loading from off-site areas – e.g., arsenic contained in upstream water in Baker Creek. Suggestion 10 of the Environmental Assessment Report recommends investigation of wetland treatment. Once the remediation activities at the site are complete, modelling predicts that upstream sources of arsenic will be a major contributor to the remaining contamination in Baker Creek. While the Human Health and Ecological Risk Assessment did not identify unacceptable risks from the upstream loading, there is still benefit in reducing all arsenic loading, especially mine-related loading. Scientific studies indicate that much of the upstream loading is likely part of the legacy of arsenic release from mining activities. The reclamation research plan for wetland treatment is a good idea and should be pursued with a strong intention of finding and implementing an effective treatment approach for incoming loads from upstream Baker Creek, and possibly other ongoing loads following remediation. Implementation of this type of treatment would not only reduce overall loading, but would reduce risks that off-site contamination could adversely affect the remediated areas.	Acknowledged and more detailed information is provided in the CRP in Appendix 5.5B Reclamation Research Plan - Passive and Semi-Passive Treatment Systems.
17	Bill Slater	Other Issues and Comments	Sampling programs have identified elevated sediment arsenic concentrations in Trapper Creek (Appendix 5.5A, Section 3.2.1). While Trapper creek is located outside of the site boundary, there may be value in considering remediation of sediment as part of the Baker Creek sediment remediation.	The Trapper Creek area will be reviewed as part of Reclamation Research Plan - Passive and Semi-Passive Treatment Systems (Appendix 5.5B of the CRP). If a wetland is installed in this area, areas of contaminated sediment could potentially be removed.
18	Bill Slater	Other Issues and Comments	A water management plan that describes proposed approaches for management of contaminated, clean and sediment-laden water is an important part of the CRP. While the CRP identifies the need for conceptual-level water management plan as part of the water licence application, that plan has not yet been provided for review.	A Water Management and Monitoring Plan has been prepared and is part of the water licence application package for review.
19	Bill Slater	Other Issues and Comments	<p>The CRP proposes a final Baker Creek Channel passing through the site, with an active channel and a floodplain. The CRP refers to a 2012 preliminary design and provides a typical cross-section (Figure 5.5-4) but does not include the design. The design capacity of the active channel is not specified and would be subject to damage in events that exceed the design capacity. The CRP proposes that the floodplain will have capacity to convey the Probable Maximum Flood (PMF). The typical cross section indicates that the floodplain will have a width of approximately 40 m and the CRP states that this part of the channel will consist of a 0.6 m layer of cobbles and small boulders.</p> <p>Figure 5.3-3 shows the extent of inundation that would occur from a PMF in the current site conditions, and includes inundation of all major pits. Once pits are filled, this is not likely to be the case, but the CRP does not include any characterization of the expected inundation area for the PMF once the remediation project is complete. Appendix 5.5A (Section 1.2.4) indicates that some backfilled pit areas may fall within the inundation zone and would require erosion resistant cover materials.</p> <p>The CRP should be revised to provide some additional conceptual design information for the Baker Creek channel. This should include identification of the design capacity for the proposed active channel. It should also include delineation of the extent of disturbance that will be required to construct the floodplain channel. This has not been included in estimates of disturbance areas and could influence other aspects of the CRP, including the design of pit backfills and associated covers.</p>	The CRP has been revised to provide additional conceptual design information on the extent of the PMF relative to the pits and other vulnerable features. The extent of the floodplain was further noted in the appendices to Section 5.5 of the CRP. Figure 5.5-8 and Figure 5.5-9 in the CRP show the extent of inundation.
20	Bill Slater	Other Issues and Comments	The CRP proposes two different criteria for confirming performance of the proposed freezing of the arsenic chambers. In Appendix 5.2, the Freeze Design Basis Report, these criteria are referred to as containment and immobilization criteria. In the CRP however, they are referred to as criteria for different time periods (Active Remediation/Adaptive Management periods vs. Post-Closure Monitoring period). Discussion at the Closure Workshops left some confusion about how these criteria would be applied. The CRP should be revised to provide additional clarification.	The proponent has provided clarification in the CRP. There is now one containment criteria, Closure Criteria F1-1 "The dust will be considered contained when a 5 m wide frozen shell at -5°C or colder exists in the bedrock or fill around each arsenic containing chamber, stope, drift or fill in pit".
21	Bill Slater	Other Issues and Comments	The CRP proposes disposal of water treatment plant sludge from the new water treatment plant on site in a specific cell of the new landfill. There has been no specific characterization of sludge produced by the proposed water treatment process. Characterization to-date has all been based on two samples of sludge from the existing effluent treatment plant. These samples were collected from the Settling Pond in March 2012 and may provide some initial estimates of characteristics, but the sludge was stored in different conditions and produced by a different treatment system. Additional sludge characterization should be conducted during treatment plant design, using sludges produced during test work to confirm that the proposed storage methods are appropriate for maintaining long-term stability. This was recommended by AECOM in a 2012 preliminary design for the water treatment plant but has not yet been completed.	Additional sludge characterization is planned for 2019 to confirm current data. Absorptive (ion exchange) media from pilot plant testing was completed in 2018 and analysis is underway.

Notes: GMRP = Giant Mine Remediation Project; CRP = Closure and Reclamation Plan (CIRNAC and GNWT 2019a); DAR = Developer's Assessment Report (INAC and GNWT 2010); HHERA = Human Health and Ecological Risk Assessment (CanNorth 2018); Preliminary Screening Document (CIRNAC and GNWT 2019b); EQC Report (CIRNAC and GNWT 2018); Water Management and Monitoring Plan (CIRNAC and GNWT 2019c); Tailings Management and Monitoring Plan (CIRNAC and GNWT 2019d). MDMER = Metal and Diamond Mines Effluent Regulations

**Trailmark Consulting - Advisor to YKDFN Comments on CRP June 2018 Draft**

Submitted to the GMRP on November 29, 2018

Comment #	Reviewer	Topic	Comment	Request	Project Response
1	Trailmark	1.2. Goal of the closure and reclamation plan: fourth closure principle, "minimizing long-term active care requirements"	Active care requirements seem to be based on environmental footprint and focus on minimizing efforts that are required for active care.	Balance active care requirements with not only minimizing effects on the environment but also social, economic, and cultural effects on local people.	The GMRP submits that minimizing active-care in the long term addresses financial, socio-economic, environment and health considerations. For example reducing active care reduces the following: costs to Canadian taxpayers, risk introduced by operational failures, disturbances to wildlife and land users, and air emissions. During Surface Design Engagement (SDE), guiding principles were identified that apply to all possible surface remediation plans, as well as principles and objectives that help to identify preferred remediation options. SDE and the CRP principles focus on those that impact project decisions for the selection of closure activities, however the project has incorporated the broader input from SDE that applies to all remediation options and addresses the objectives for social, economic, and cultural impacts through other documents. Examples of this include the Giant Mine Remediation Project's Approach for Delivering Socio-Economic Benefits (released in November 2018), the forthcoming Quantitative Risk Assessment that is evaluating environmental, social, health, TK/TLU and financial consequences, and the forthcoming Stress Study.
2	Trailmark	1.2. Goal of the closure and reclamation plan: fifth closure principle, "incorporation of input from affected parties"	As it stands the social, economic, and cultural values of YKDFN do not seem to be reflected in this document.	Additional consultation and engagement with YKDFN to fully understand their values is needed. The Giant TK report can be referred to guide subsequent drafts of the CRP.	The Engagement Plan includes an objective to facilitate the exchange of and understanding of Traditional Knowledge and the link to technical information regarding the GMRP and Site.
3	Trailmark	1.2. Goal of the closure and reclamation plan: sixth closure principle, "effective risk communications for future generations"	We are concerned with the level of engagement of future generations in the GMRP process.	There is a need to support and stimulate interest in youth participation and engagement, perhaps by re-establishing the Future Generations Working Group (Section 1.4.1.1.).	The GMRP will engage on the development of a Perpetual Care Plan with affected parties in 2019. Input and advice on ways to engage youth is welcomed by the Project.
4	Trailmark	1.4.1. Engagement methods	YKDFN members still report issues with and barriers to their involvement in this process (see Giant TK Report). Communications are effective to YKDFN-appointed members and representatives, but efforts to engage the community at large are needed. Community members are still unaware of how they can participate in engagement activities and discussions. Support for capacity is needed for communications to and among YKDFN community members.	Support for capacity is needed for communications to and among YKDFN community members, as well as youth (future generations). See Giant TK Report for more on this issue.	The Engagement Plan has been revised to include additional details on communication tools for the community. The GMRP notes that support for the YKDFN is provided through annual Contribution Agreements and discussions on potential funding can incorporate recommendations from the Trailmark report.
5	Trailmark	Table 1.4-1; communication methods for the Giant Mine remediation	Timing and frequency of community engagement activities is not sufficient.	If possible, more than 1–2 year community forums should be held per year to actively engage community members.	As documented in the Engagement Log, extensive engagement on the CRP and preliminary design has been completed to date with the community. Moving forward, the Engagement Plan outlines proposed engagement activities and frequency, which will include ongoing monthly meetings with the Giant Mine Working Group and the YKDFN Giant Mine Advisory Committee. The GMRP has committed to an annual public forum for the YKDFN, and is open to additional meetings on request.
6	Trailmark	1.4.3. Ongoing engagement; "accordingly, CRP decisions have been made on the basis of engineering, Traditional Knowledge and science making use of the best available information and technology. The GMRP intends to work with affected parties to gather updated Traditional Knowledge to help support detailed engineering and to help design monitoring activities (e.g., archaeology or wildlife surveys, location of borrow pits)."	This section indicates that Traditional Knowledge was considered in CRP decisions, yet the way the CRP itself is presented later in the document seems technical.	Further clarification on when Traditional Knowledge was included in CRP components is needed. Clearly indicating when and how Traditional Knowledge was included under each of the CRP components in Section 5 would be helpful.	Traditional Knowledge is addressed in the CRP in Chapter 1 related to the Archaeological Impact Assessment, Chapter 2 related to existing conditions and in Chapters 3 and 5 related to pre-mining conditions.
7	Trailmark	1.4.1.2. Communications	It is unclear how communications will be maintained after the license process, or what strategies are in place.	Create a two-way communication strategy, providing opportunities for YKDFN members (at the community member level) to report to the GMRP team. Within the YKDFN community, communications on experiences, relationships with, and perceptions of the Giant Mine have been maintained across generations through sharing of Traditional Knowledge (see Giant TK report). Supporting ways to preserve and share Traditional Knowledge could allow information on and awareness of the Giant Mine to persist.	The Engagement Plan outlines how communications will be maintained after the licensing process. The GMRP is open to further discussions on communication strategies with YKDFN members and will incorporate recommendations from the forthcoming Trailmark Traditional Knowledge Report where feasible.
8	Trailmark	Table 1.5-3: Anticipated federal, territorial, and municipal authorizations applicable to the Giant Mine Remediation Project; modification and re-alignment of Baker Creek	This table indicates that this activity "may require fish habitat offsetting" and requires clarification.	Please provide more information on the realignment and if habitat offsetting will be required, and the implications of this activity.	DFO has a mandate to protect fish habitat and administers the requirements under the federal Fisheries Act, and it is the agency that determines if habitat offsetting is required. The project will work with DFO, the YKDFN and other affected parties to further engage on habitat compensation as required under the legislation, prior to finalizing the design of habitat in Baker Creek and obtaining the necessary Fisheries Authorization(s). The CRP has been updated to reflect this in the closure objectives / criteria and in Section 5.5.

Comment #	Reviewer	Topic	Comment	Request	Project Response
9	Trailmark	Table 1.5-3: Anticipated federal, territorial, and municipal authorizations applicable to the Giant Mine Remediation Project; Quarry permit	This should also be submitted to YKDFN Lands and Environment with a review period.	Please also submit the record of borrow volumes and sources to YKDFN. Where borrow removal will occur and how this will impact not only ecological but culturally important areas for YKDFN should be clear.	The GMRP has committed to ongoing engagement with the YKDFN and other affected parties on the potential borrow sources, including locations for sourcing of borrow material.  An Archaeological Impact Assessment (AIA) was completed by Golder on behalf of CIRNAC in 2018 on areas of potential interest based on input from members of the YKDFN and other affected parties. This assessment identified traditional use areas and included the proposed high-wall areas and other potential borrow source areas. Recommendations from this work will inform borrow locations and associated closure activities and management. The CRP has been updated to reflect this.  A Borrow and Explosives Management and Monitoring Plan will be developed and submitted to the MVLWB for approval a minimum of 90 days prior to commencement of reclamation activities. The GMRP will engage with the YKDFN and other affected parties on the development of this plan, which will include details on borrow source locations (maps), volumes and methods for quarrying.
10	Trailmark	2.1.6. Air quality	Weekly monitoring reports are sent directly to communities on the distribution list. Are communities aware of how they might be able to access results and what the implications of the results (especially if they are quantitative) are? Are there thresholds for action for these data and, if so, what is the process in responding to them?	More clarification is needed, especially on how communities and their values might be included, considered, and/or affected.	Detail is provided in the Dust Management and Monitoring Plan and the Air Quality Monitoring Program, including information on thresholds and response procedures. Weekly air reports are sent to those on the GMRP distribution list and to YKDFN staff directly. The GNWT has a detailed air quality monitoring website that outlines stations, data and contact information and the identification of thresholds and response required. The GMRP's engagement team will continue to explore more effective communication tools with YKDFN staff and GMAC.
11	Trailmark	2.2. Physical; monitoring	How are site-specific risk-based action limits determined and, once an action level has been achieved, there is no mention of how responses will include local community members.	A discussion on how local community members may be affected when monitoring data achieve thresholds that initiate responses is needed, as well as how local community members and their values will be considered in determining these limits.	Monitoring requirements for all CRP components will be presented in Design and Construction Plans, which will be made available for public review through the MVLWB process. The monitoring requirements will be rolled into the GMRP's Environmental, Health and Safety, and Community Management System.
12	Trailmark	2.2.3. Surficial geology	How might increasing precipitation and air temperature (based on climate data presented in the previous section) impact the site, if the lands are poorly drained? For example, how might flooding impact the CRP?	Request for further clarification.	The climate change information in Sections 5.0 and 5.5 has been updated in the CRP.
13	Trailmark	2.2.5. Seismicity	While low seismicity is reported here (and updated information will be included during the Quantitative Risk Assessment), YKDFN members raised concerns over impacts of earthquakes to the area throughout their participation in the Quantitative Risk Assessment. This suggests YKDFN members may be unaware of the likelihood of these risks.	Request reporting back to YKDFN members on any research and data collected on their environment (through active engagement) may support YKDFN members to better evaluate levels of perceived environmental risks (alongside their Traditional Knowledge) and the impacts to them.	The GMRP is committed to continue to engage with the YKDFN and other affected parties throughout the life of the project. The QRA process will continue in 2019 and will include reporting back to the community on results of the risk assessment based on community input. The Engagement Plan outlines the commitment to engagement, including the dissemination of results from monitoring, research and other activities. The GMRP engagement team will continue to work with the YKDFN staff to support information sharing on a broader community level.
14	Trailmark	2.4.1. Fragmentation, and invasive and artificially supported species	The first paragraph illustrates the boundaries of the site that likely isolate the site from surrounding forest through limited connectivity and small habitat patch size, and presumes wildlife re-establishment or use and travel through the area is difficult. YKDFN members have reported wildlife moving from the site to other areas, which suggests some connectivity and travel from this area (see Giant Mine TK report).	This assumption is weak without empirical (e.g., monitoring) data in addition to presence/absence data reported below. This prediction should be tested with follow-up monitoring.	A Wildlife and Wildlife Habitat Management and Monitoring Plan has been developed. This plan outlines wildlife monitoring planned.
15	Trailmark	2.4. Terrestrial environment	The relationship between fish, wildlife, and vegetation to local communities is lacking in this section. These relationships could provide context to how communities' traditional land use and rights are linked and/or considered.	Highlighting the fish, wildlife, and vegetation that are used and/or valued by local communities in this area could enhance this section. How the CRP will fund and support monitoring is also unclear and should be mentioned, especially where data seem to be lacking (e.g., only one project and/or year of data reported in some cases).	The GMRP has committed to engaging on a Community-Based Monitoring program and have had preliminary discussions with YKDFN staff and will continue to advance the development of that work.
16	Trailmark	2.4. Terrestrial environment	It is unclear how identifying in the species at the mine site is relevant to the CRP.	It should be made more explicit how species relate to the mine site, using examples to illustrate relationships. This section includes abundance counts and presence of species but could be improved with actual data and/or a review of research on historical impacts of the mine to local species in the area, and perhaps changes in community composition and/or abundance as a result. Traditional Knowledge could also provide insight into impacts of the mine site on species.	The DAR conducted a full assessment on the effects to wildlife. A Wildlife and Wildlife Habitat Management and Monitoring Plan has been developed. The GMRP is open to including Traditional Knowledge into future monitoring plans where possible.
17	Trailmark	Table 2.4-2: Plant communities at Giant Mine	Arsenic uptake potential of these species should be considered and explored.	Conduct and include a literature review of these plant species to understand arsenic uptake potential and create a list of food chain relationships to identify possible risks (e.g., of species use by YKDFN) and corresponding planting and mitigation strategies.	As part of the Human Health and Ecological Risk Assessment (HERA), a Voluntary Country Food Sampling Program was carried out to determine risk levels associated with exposure to arsenic and other contaminants of concern. This was done by analyzing the concentrations in plants and other country foods, and dietary habits of consumers. The YKDFN provided 100 country food samples. A vegetation sampling program on site was also carried out to assess risk levels as a component of the ecological risk assessment. Results indicated that although there would be an improvement, there were potential effects to small mammals on site, that will be monitored
18	Trailmark	Table 2.4-2: Plant communities at Giant Mine	Tree form <i>Juniperus</i> species are known to uptake arsenic. In one study it was concluded that <i>Juniperus virginiana</i> (eastern red cedar) and pitch pine needles had higher levels of arsenic by an order of magnitude. It is presumed this is because the needles are not dropped regularly as were the leaves of deciduous trees that were tested in this study. It is also worth noting that in relation to testing that was done on plant materials around Giant Mine, this study showed high variability between results from samples taken from the same specimen. (Cheng et al., 2007. Arsenic in tree rings at a highly contaminated site. Science of the Total Environment, 376 [1-3]:324-334.)	A literature review of arsenic uptake potential is needed.	See response to Trailmark Comment #17.

Comment #	Reviewer	Topic	Comment	Request	Project Response
19	Trailmark	Table 2.4-2: Plant communities at Giant Mine	A study showed a correlation between arsenic polluted waters and arsenic in nearby alders. Arsenic is taken up into the twigs. Do ruminants or other species commonly browse green alder? (Brook et al. 1982. Pollution by arsenic in a gold-mining district in Nova Scotia. Environmental Pollution Series B, Chemical and Physical, 4 [2]:109-117.)	A literature review of arsenic uptake potential is needed.	See response to Trailmark Comment #17.
20	Trailmark	2.4.4. Terrestrial wildlife	This section indicates "local ecosystem is likely affected not only by the Site, but by the highway, landfill and city, and the boundary with Yellowknife Bay". From this section alone it is unclear how the local ecosystem and wildlife are affected by the site. The link between presence of wildlife species and the site is unclear. Data is limited (only on 2016).	More information on wildlife in the area is needed, specifically in relation to the mine. Multiple years of data are needed (to detect or illustrate changes). Implications for monitoring are discussed in other sections describing the project environment; this section could be improved by including how monitoring may or may not be relevant. Impacts to wildlife could also impact YKDFN land use and should be considered.	A Wildlife and Wildlife Habitat Management and Monitoring Plan has been developed. This plan outlines wildlife monitoring planned.
21	Trailmark	2.4.5. Birds	Information on impacts of the site to birds is very limited.	More information is needed. YKDFN could be consulted to provide information (e.g., Traditional Knowledge) of specific impacts and/or undertake monitoring.	A Wildlife and Wildlife Habitat Management and Monitoring Plan has been developed. This plan outlines wildlife monitoring planned.
22	Trailmark	2.5.2. Benthic invertebrate community	This section is a bit technical. What is the Bray-Curtis Index and why is it used?	Section could be improved with some clarification on methods. Perhaps provide a summary of invertebrate composition in the area and changes over time, and the methods used to determine these trends.	The CRP has been modified to clarify methods and further information on the Bray-Curtis can be found in the Aquatic Effect Monitoring Plan that has been developed for approval. Additional information, including a summary of invertebrate composition in the area and changes over time, can be found in the Phases 1 through 5 Environmental Effects Monitoring Program Study Designs and Final Interpretative Reports, which have been submitted to ECCC to meet MDMER requirements. The Bray-Curtis Index is a required endpoint under the MDMER that must be included in the analyses of benthic invertebrate community composition.
23	Trailmark	2.5.4. Human health and ecological risk assessment	Human health risks seem to be determined quantitatively (e.g., how much country food is eaten and where from, and arsenic concentrations in sampled country food). Local perceptions of health risk are not included.	YKDFN perceptions of health risk and methods of assessment need to be included in this section.	The GMRP has begun to engage on the development of a Stress Study, led by Ketan Shankardass. This study will look at these issues and this work will continue in 2019.
24	Trailmark	3.1. Location and access	Site is closed for safety reasons but our interviews with previous security staff at the site (Giant Mine TK report) indicate that the public is still able to trespass and access the site and continue to do so because they are unaware of the history and risks associated with the site.	Increased public engagement and awareness of the risks associated with accessing the site and efforts (e.g., security staff) to ensure access to the area is restricted are needed.	Criteria have been revised to further clarify how the project will ensure Site Wide Objective #4 (i.e., residual risks are identified, and local residents have been, and continue to be, informed of residual hazards post-remediation) has been met. Additional clarification has also been added to Section 1.5 in the CRP regarding land management. The Perpetual Care Plan will outline further information on long term risk identification and communication.
25	Trailmark	3.2. Main project elements	Abbreviations	Reminding readers what abbreviations mean would be helpful given the length of this report.	All technical documents, including the CRP, include a table outlining all acronyms, abbreviations, units and symbols at the front of the document.
26	Trailmark	3.3.1. Pre-mining land use; "The YKDFN has requested that the information presented in the report not be split up or taken out of context. To avoid that possibility, the information on traditional land use expressed in the report is not presented here. The reader is encouraged to review the entire Traditional Knowledge Report."	Re: that YKDFN request traditional knowledge from the 2005 Traditional Knowledge report not be included in part or in summary in the CRP?	Include a relevant review and summary of the 2005 Traditional Knowledge report (as well as other traditional knowledge on Giant Mine), while cautioning that the information was originally documented in a different context.	This has been included in Section 2 of the CRP.
27	Trailmark	3.3.4.1. Arsenic fume management	A discussion of local occupational health concerns that led to action in the past (e.g., control of arsenic emissions) is needed.	Including how local community needs triggered action and what was needed for this process can provide lessons learned to move forward. A review of historical barriers and challenges could set an example for how to manage (or improve management of) forthcoming concerns and triggers for action within the CRP as it is implemented.	CRP Table 3.3-1 Summary of Project History and Key Activities does highlight the history and specific changes in management. Monitoring and management plans include adaptive management considerations.
28	Trailmark	3.3.4.2. Arsenic trioxide dust disposal	It seems the receding permafrost and movement of groundwater in the 1970s was unanticipated. A discussion on what the process for responding to unanticipated events and impacts to the environment and local people is needed.	Again, a historical review of how concerns resulted into action could provide insight into how we can mitigate or improve communications strategies moving forward.	See response to Trailmark Comment #27.
29	Trailmark	4.1.2. Underground stabilization	Several YKDFN members still express concern over this option instead of removing arsenic altogether.	A clear discussion on how this option was considered over others explicitly stating whether and/or how YKDFN input was included, and proper engagement and communications with all community members so that they understand how CRP methods were determined (and when or when they were not consulted) is needed.	Section 5 of the CRP summarizes the rationale for selection of options for each mine component. The CRP has been updated to further clarity on the rationale and selection of options through a series of figures for each mine component in the CRP. Appendix C of the Engagement Plan includes further details on the History of Engagement, including the decisions made on the freeze option.
30	Trailmark	General comments	Not all community members may be able to fully understand and read this document as it currently stands; language is very technical in most areas.	Describing the CRP in simple terms to community members can support local engagement and understanding. Additional methods such as interactive videos and maps to illustrate the CRP would be helpful.	A Plain Language Summary has been included in the CRP.
31	Trailmark	General comments	The CRP is lacking in a discussion of how each component will impact local communities in ways other than physical health.	An inclusion of how the CRP might impact communities socially, economically, and culturally is needed. For example, a clear indication of areas where there are potential impacts to traditional land use and rights and the processes that are in place to monitor and assess these impacts, and respond to them.	The QRA will address risks posed to communities by the remediated site, including environmental, social, health, financial and Traditional Knowledge/Traditional Land Use consequences. This input will be incorporated into design and engineering work and subsequent Management and Monitoring Programs.

Comment #	Reviewer	Topic	Comment	Request	Project Response
32	Trailmark	Table 5.0-1: Site-wide closure objectives and criteria	Unclear if criteria (e.g., "approved criteria") reflect conventional standards or YKDFN values (e.g., impacts to them).	Clarification is needed on how these criteria will impact or correspond to YKDFN needs, and how monitoring parameters will be linked to YKDFN needs.	Closure Criteria and Objectives were developed following guidance issued by the MVLWB and engagement to incorporate input from affected parties was completed through SDE, the Giant Mine Working Group and the YKDFN Giant Mine Advisory Committee. Details of monitoring parameters can be found in the various monitoring plans submitted.
33	Trailmark	5.0.3. Phases of CRP development, implementation, and monitoring	Unclear if closure criteria and site objectives might shift over the 100-year term and how that might be accounted for.	Include a description of when processes for updating and "re-setting" closure criteria might be warranted and how they will occur.	The GMRP will follow the processes of the MVLWB for the Water Licence. It is anticipated that Design and Construction Plans will incorporate updates to closure criteria.
34	Trailmark	Figure 5.0-2: Advancement of closure plan through regulatory processes	Opportunities for YKDFN involvement and inclusion are not clear in this diagram.	Include areas where YKDFN feedback and inclusion take place in regulatory processes, for example, indicating if this can occur through management and monitoring. Ensure capacity for YKDFN engagement and use of the Board's Online Review System.	This has been incorporated into the Engagement Plan.
35	Trailmark	5.1.2. Pre-disturbance and existing site conditions; arsenic and non-arsenic stopes and chambers	Unclear how stability issues and related risks evaluated based on standard industry practice relate to YKDFN standards and impacts.	Identify opportunities to link risks back to community impacts and needs.	The GMRP has incorporated extensive input from the YKDFN and other affected parties on risks and impacts into the CRP. Engagement on risks and community impacts occurred as part of the HHERA (CanNorth 2018) and will continue in 2019 as part of the QRA.
36	Trailmark	Table 5.1-2: Underground mine workings closure objectives, activities and criteria	Restricting access by humans could be ensured by raising awareness among and educating public and YKDFN community members.	Enhance efforts to create public education and awareness programs of the risks and dangers associated with the mine site.	The Engagement Plan includes in the communications section further detail on community-focused communication tools. Criteria have been revised to further clarify how the project will ensure Site Wide Objective #4 (i.e., residual risks are identified, and local residents have been, and continue to be, informed of residual hazards post-remediation) has been met. Additional clarification has also been added to Section 1.5 in the CRP regarding land management. The forthcoming Perpetual Care Plan will outline further information on long term risk identification and communication.
37	Trailmark	Table 5.1-2: Underground mine workings closure objectives, activities and criteria	Communications to YKDFN of monitoring outputs, especially if they fail to meet criteria, are unclear.	Include how monitoring outputs will be communicated to YKDFN community members.	Refer to the Engagement Plan trigger table on the details of the dissemination of monitoring outputs. As per the annual reporting water licence conditions, monitoring outputs and results, including exceedances, will be captured.
38	Trailmark	Selected closure activities for underground	Where removed hazardous material will be stored, discharged, and/or destroyed is not indicated.	Include a description of where hazardous material will be stored, discharged, and/or destroyed.	Further details on this can be found in Section 5.10 of the CRP (non-hazardous waste landfill) and the Waste Management and Monitoring Plan.
39	Trailmark	5.1.5.1. Underground hazard and risk assessments	Inclusion of public and YKDFN communities in risk assessments is needed.	Include public and YKDFN perceptions of risk, thresholds, and corresponding responses.	The QRA has identified risk scenarios of concern for the YKDFN and other affected parties. The outcome of this work will result in modifications detailed design of the project and subsequent versions of Management and Monitoring Plans. The HHERA (CanNorth 2018) also incorporated extensive input from affected parties on risk and exposure scenarios.
40	Trailmark	5.1.5.4. Storing contaminated material in frozen zone	No description of what approaches to reducing materials that need to be frozen or finding areas planned to be frozen for contingency planning.	Provide examples of what some of these approaches are.	The CRP has been updated to further clarify what areas require disposal in the frozen zones.
41	Trailmark	5.1.5.5. Incorporation of mine water level changes in underground design work	Unclear of how mine water level changes will impact the environment, public and YKDFN.	Include a description of projected impacts to YKDFN community members.	Potential impacts will be addressed in the Planned Mine Water Level Raise Reclamation Research Plan. Results of this work will be discussed with YKDFN and other affected parties when available.
42	Trailmark	5.1.6. Final site conditions	Local fencing and signage is only present in areas that are not reliably stabilized.	Fencing and signage should include history or description of pre-CRP conditions as a reminder of the history of the site, what is stored there, human and environmental risks, and why.	Criteria have been revised to further clarify how the project will ensure Site Wide Objective #4 (i.e., residual risks are identified, and local residents have been, and continue to be, informed of residual hazards post-remediation) has been met. Additional clarification has also been added to Section 1.5 in the CRP regarding land management. The forthcoming Perpetual Care Plan will outline further information on long term risk identification and communication.
43	Trailmark	Table 5.1-5: Underground mine workings uncertainties	YKDFN responses to these uncertainties is not included.	Seek input and guidance from YKDFN and include YKDFN in monitoring as an approach to addressing uncertainties.	The results of the QRA will be incorporated into contingency planning and subsequent versions of Management and Monitoring Plans. Monitoring required for the underground will be included in the Underground Design and Construction Plan and will be available for public comment through the MVLWB process.
44	Trailmark	5.2.4. Consideration of closure options and selection of closure activities	Given the number of YKDFN community members that still prefer to see the arsenic removed (see Giant Mine TK Report), an explicit description of how this method was chosen after consultation and among other options is needed.	It appears that the discussion of risks in selecting closure options did not include YKDFN consultation in this process. Efforts are needed to communicate this process and how it took place to community members so that they can understand the risks associated with ex situ approaches.	Clarity on the rationale and selection of options has been provided through a series of figures for each mine component in the CRP. Further detail on how the YKDFN were consulted and why the freeze was selected can be found in the DAR. The Engagement Plan includes further details in Appendix C on the decision to select the freeze option.
45	Trailmark	5.2. Freeze program; post-closure monitoring criterion	Responses to criteria that are not met are needed.	Should monitoring activities indicate that freezing criteria are not achieved, mitigation measures and how YKDFN will be notified and/or included are needed.	The CRP has been updated. Monitoring requirements will be included in the Freeze Design and Construction Plan and this will be available for public comment through the MVLWB process.
46	Trailmark	Table 5.2-2: Freeze program closure objectives, activities and criteria	YKDFN community members still seek alternatives to underground storage of arsenic when and if they become available (see Giant Mine TK Report).	Include a research plan and approaches to incorporate alternatives as new technology becomes available. There is considerable uncertainty around this aspect of Giant closure and reclamation among YKDFN members. More detailed information and commitments on the future research program and YKDFN participation in it is requested.	The Giant Mine Oversight Board (GMOB) has the mandate to carry out research on alternatives to underground storage of arsenic trioxide. This concern will be communicated to GMOB.

Comment #	Reviewer	Topic	Comment	Request	Project Response
47	Trailmark	5.12. Monitoring and management	Environmental monitoring does not appear to be implemented with YKDFN involvement, or YKDFN-driven and YKDFN-based approaches.	Environmental monitoring needs to include YKDFN as foundations for monitoring programs, active participants and collaborators in data collection, analysis, reporting, and compliance. This should occur both in the general monitoring programs and in separate community-based monitoring programs.	Environmental monitoring programs regulated by the MVLWB are the Surveillance Network Program (SNP) and the Aquatic Effects Monitoring Program (AEMP). The Environmental Effects Monitoring (EEM) program is regulated by ECCC. The design of the SNP and AEMP are available for public review and comment and any changes to these programs will undergo public review and comment as per the MVLWB process. The GMRP plans to engage with GMAC on the Yellowknife Bay AEMP in 2019. The GMRP is open to cooperating with the YDFKN in designing these and other monitoring programs, while remaining consistent with the various acts and regulations that define regulated monitoring programs. The GMRP has also committed to engaging on Community-Based Monitoring and have had preliminary discussions with YKDFN staff and will continue to advance the development of that work
48	Trailmark	5.12. Monitoring and management	LTMP monitoring components do not include monitoring social, cultural, and economic impacts to YKDFN. In addition, how monitoring results (e.g., quantitative data) will be interpreted in such a way that informs impacts and/or relates to YKDFN is unclear.	Social, cultural, and economic impacts to YKDFN need to be monitored. Monitoring data needs to be linked back to impacts to YKDFN.	The GMRP will monitor Key Performance Indicators as they relate to Northern Indigenous employment contracting/procurement opportunities and training. Additionally, the Project is funding an Economic Development officer with the YKDFN. The GMRP is also funding a Stress Study and an on-going Health Effects Monitoring Program, both of which include YKDFN members.
49	Trailmark	5.12. Monitoring and management; "updates to monitoring programs associated with remediation components will also be required. Any changes will be submitted for review and approval prior to implementation."	It is unclear how and under what circumstances updates to monitoring programs will be made. In addition, it is unclear who will review and approve changes to monitoring.	YKDFN should be included in initiating, designing, and leading monitoring programs, as well as reviewing and approving monitoring plans. The technical review committee and long-term monitoring program representative should include and/or actively engage with YKDFN, as well as support separate community-based monitoring initiatives.	See response to Trailmark Comment #47
50	Trailmark	7. Post-closure site assessment	Monitoring seems to focus on environmental effects, more than social, economic and cultural impacts.	Each monitoring type should include an approach of relating outcomes to impacts to YKDFN. Reporting should occur in such a way that is relevant to community needs. For example, engagement and communications and report structures that correspond to YKDFN needs may require face-to-face interactions, meetings, interactive media (videos, photographs), etc. instead of written reports.	See response to Trailmark Comment #48. The Engagement Plan has also been updated to reflect this recommendation.
51	Trailmark	7. Post-closure site assessment	There is no monitoring or assessment focusing on impacts to YKDFN.	22	See response to Trailmark Comment #48.
52	Trailmark	General comments	There was some confusion at the Qualitative Risk Assessment session in August regarding the permitting process and YKDFN members expressed frustration over incongruent permitting processes and requirements between YKDFN/De'ton Cho and GMRP.	Ensure a process is in place to protect culturally important sites and cultural keystone species habitat from impacts. Work to assess aesthetic impacts is needed.	Please note, as a point of clarification, QRA stands for Quantitative Risk Assessment. The GMRP has committed to ongoing engagement with the YKDFN and other affected parties on the potential borrow sources, including discussion of aesthetic impacts.  An Archaeological Impact Assessment (AIA) was completed in 2018 on areas of potential interest based on input from members of the YKDFN and other affected parties. This assessment identified traditional use areas and included the proposed high-wall areas and other potential borrow source areas. Recommendations from this work will inform potential borrow locations and associated closure activities and management.  A Borrow and Explosives Management and Monitoring Plan will be submitted to the MVLWB for approval a minimum of 90 days prior to commencement of reclamation activities. The GMRP will engage with the YKDFN and other affected parties on the development of this plan, which will include details on borrow source locations (maps), volumes and methods for quarrying.
53	Trailmark	General comments	Final site description and whole landscape discussion.	The crp is very fragmented and does not appear to have incorporated a vision for the whole landscape / final site conditions. YKDFN requests additional information.	Final site conditions are summarized in Figure 3.4-1 of the CRP and documented in Section 5 of the CRP for each mine component. The GMRP incorporated feedback from Surface Design Engagement on final site conditions and the various visions of affected parties for the site. This includes selecting a tailings cover to be grey and unvegetated. Further engagement on borrow and site visualization will be completed in 2019.
54	Trailmark	General comments	Lack of robust Visual Effects discussion.	Visual effects are an important component of remediation and reclamation. Despite frequent references to visual fields in the crp, it is difficult to ascertain whether a visual effects assessment was undertaken for the crp. YKDFN requests additional information on this.	An assessment of aesthetics was completed in the DAR. The GMRP has committed to further engagement with the YKDFN and other affected parties on the management of borrow areas, including visualization of the site in the long-term.

Notes: GMRP = Giant Mine Remediation Project; MVLWB = Mackenzie Valley Land and Water Board; CRP = Closure and Reclamation Plan (CIRNAC and GNWT 2019a); Engagement Plan (CIRNAC and GNWT 2019e); Engagement Log (CIRNAC and GNWT 2019f); Dust Management and Monitoring Plan (CIRNAC and GNWT 2019g); Air Quality Monitoring Program (AECOM 2019); Wildlife and Wildlife Habitat Management and Monitoring Plan (CIRNAC and GNWT 2019h); DAR = Developer's Assessment Report (INAC and GNWT 2010); HHERA = Human Health and Ecological Risk Assessment (CanNorth 2018); DFO = Fisheries and Oceans Canada; YKDFN = Yellowknives Dene First Nation; MDMER = Metal and Diamond Mine Effluent Regulations; ECCC = Environment and Climate Change Canada; QRA = Quantitative Risk Assessment; AIA = Archeological Impact Assessment (Golder, 2018); Approach to Delivering Socio-Economic Benefits (CIRNAC and GNWT, 2018)

**Yellowknife Dene First Nation (YKDFN) Comments CRP June 2018 Draft**

Submitted to the GMRP on November 30, 2018

Comment #	Reviewer	Topic	Comment	Project Response
1	YKDFN	Tailings Ponds Security & Chemical Composition	<p>It is noted that the four (perhaps soon to be three) tailings ponds on site will not be included in the 'core area' of the Giant Mine site. This is of great concern to the YKDFN, as it is our understanding this means the tailings ponds will be outside of the active security monitoring and could potentially be disturbed by trespassers. We cannot allow any of the tailings to be disturbed.</p> <p>The YKDFN stress the importance of ensuring these poisonous tailings ponds are not disturbed. We take great comfort in knowing that security is actively patrolling the tailings areas. If this plan is unaltered and security patrolling ceases; then we need absolute certainty there will be active approaches to ensuring the tailings are not disturbed.</p> <p>It has been stated in the past that large boulders may be used alongside large sized gravel to discourage trespassers. These tactics need to be explored further with the YKDFN. There may be further tactics we can identify that will assist in keeping the tailings ponds undisturbed. There could be ways in which the Community Based Monitoring (CBM) program can assist in mitigating our concerns.</p> <p>It is our understanding there has been no work to date to understand what the true chemical makeup is of the tailings ponds. We are concerned that the Project is making plans on a variable that is not fully understood and this needs to be done before decisions are made on what the tailings cover will look like.</p> <p>Understanding what the tailings ponds are made of is especially important if the tailings are to be moved from south pond to central pond. There could be mitigative measures that should be in place and that otherwise would have not been taken into consideration</p> <p>The YKDFN must be confident and aware of the materials beings stored within the tailings ponds. We are requesting for a comprehensive sampling program of all four tailings ponds that would identify the exact chemicals present. This would include core sampling as well as other forms of testing. For us to have an informed decision and continue planning the closure of the ponds we must know what we are storing in perpetuity.</p> <p>The tailings ponds of Giant Mine are one of the largest surface components of the Project. They have been and will continue to be greatly unsettling to the YKDFN community.</p>	<p>The GMRP acknowledges the concerns of the YKDFN with respect to the tailings and notes the Closure and Reclamation Plan (CRP) incorporates several recommendations from the community on tailings closure options, including the design of a rock cover to discourage future use of the tailings areas.</p> <p>Once closure activities are complete, the tailings will be covered to prevent any humans or animals from contacting the tailings. An objective for tailings has been included (see Tailings Objective #6) to discourage access to tailings cover areas. The tailings cover will be designed to reduce ATV traffic and further discourage use of the tailings. Criteria have been revised to further clarify how the GMRP will ensure Site Wide Objective #4 (i.e., residual risks are identified, and local residents have been, and continue to be, informed of residual hazards post-remediation) has been met. Additional clarification has also been added to Section 1.5 in the CRP regarding land management. The Perpetual Care Plan will outline further information on long term risk identification and communication.</p> <p>Extensive work has been completed to date to characterize the chemical make up of the tailings, including geochemical analysis, drilling investigations and geophysical surveys of the tailings. Details of the tailings make-up can be found in Appendix 5.6C of the CRP (Geotechnical and Geochemical Investigations Factual Report, Golder 2017) and in Supporting Documents to the Developer's Assessment Report (Tailings Backfill in the Giant Mine, SRK 2002 and Tailings and Settling Pond Field Investigations, SRK 2007). This extensive assessment work was used to select a tailings cover that will be highly effective in isolating the tailings from humans and the environment.</p> <p>Access to the tailings areas will be discouraged through the design and land use restrictions will be in place and managed by the GNWT. Monitoring will ensure the integrity of the tailings cover is maintained and to confirm tailings continue to be contained, and public and wildlife exposure do not occur. Further detail on the tailings monitoring can be found in the Tailings Management and Monitoring Plan.</p>
2	YKDFN	Blasting and Quarrying	<p>The YKDFN notes the massive volume of aggregate required for the Project. However, we require a clear understanding of where the aggregate will be sourced from. Specifically, from within the boundary of the Giant Mine lease.</p> <p>From past discussions there have been indications that there would be flattening of certain rock walls and cliffs on the Giant Mine site to assist in sourcing aggregate. This is concerning to the YKDFN as certain areas on site may have traditional and spiritual significance.</p> <p>Blasting and destroying rock on site is irreversible. Therefore, we must be very particular on exactly where the aggregate is being sourced from. To reiterate our concern: before major landscape changes happen, we must be consulted with on this to support the process of our informed consent.</p>	<p>The GMRP has committed to ongoing engagement with the YKDFN and other affected parties on the proposed borrow sources.</p> <p>An Archaeological Impact Assessment (AIA) was completed in 2018 on areas of potential interest based on input from members of the YKDFN and other affected parties. This assessment identified traditional use areas and included the proposed high-wall areas and other potential borrow source areas. Recommendations from this work will inform borrow locations and associated closure activities and management.</p> <p>A Borrow and Explosives Management and Monitoring Plan will be submitted to the MVLWB for approval a minimum of 90 days prior to commencement of reclamation activities. The GMRP will engage with the YKDFN and other affected parties on the development of this plan, which will include details on the borrow source <u>locations (maps), volumes and methods for quarrying.</u></p>
3	YKDFN	Landscape Design and Future Communication Design	<p>The YKDFN requests that a landscape architectural and future generations communication design team assist YKDFN in developing a long-term vision for the site beyond the remediation time period. This will influence the current remediation process and will be done to effectively address the long-term care, maintenance, and needs with the end users in mind.</p> <p>This request will allow the YKDFN to address the visualization requirements of its membership but also those of the general community for educational and awareness purposes. This will lead to meaningfully addressing the legacy issues, remediation processes and lessons learned to be considered for resource extraction development in the future.</p> <p>This visualization planning is important for the YKDFN to share its future vision for the site. Without this component we feel our people are not being adequately accommodated in terms of visualization and communication for the long-term future.</p>	<p>The GMRP has committed to further engagement with the YKDFN and other affected parties on the management of borrow areas, including visualization of the site in the long-term.</p>
4	YKDFN	Long Term Environmental Monitoring	<p>The YKDFN is apprehensive of the Project's approach to the Long Term Environmental Monitoring (LTEM) stewardship required for the Project.</p> <p>After generations of living with this project we have a vested interest that is absent in other organizations. Our membership often stress that the monitoring of Giant is not handled appropriately.</p> <p>It is our view that the LTEM of Giant Mine should be conducted by the YKDFN. This will provide conciliation to our membership. Thereby, we are requesting a formal commitment for YKDFN to be included as a partner in the Long Term Monitoring of Giant Mine.</p>	<p>The GMRP acknowledges this concern and will continue to engage with the YKDFN on the development of a community-based monitoring program and with the YKDFN in the long-term monitoring of the site. The GMRP will engage with the YKDFN on ways the Project can support the YKDFN to achieve this long-term goal as part of the development of the Perpetual Care Plan in 2019.</p>

Notes: GMRP = Giant Mine Remediation Project; CRP = Closure and Reclamation Plan (CIRNAC and GNWT 2019a); DAR = Developer's Assessment Report (INAC and GNWT 2010); Tailings Management and Monitoring Plan (CIRNAC and GNWT 2019d); YKDFN = Yellowknives Dene First Nation; GNWT = Government of the Northwest Territories. AIA = Giant Mine Remediation Project Archeological Impact Assessment (Golder, 2018).

## References

AECOM (AECOM Canada Ltd.). 2019. Giant Mine Remediation Project - Air Quality Monitoring Program.

BCMOE (British Columbia Ministry of Environment). 2017. Water Quality Guidelines (Criteria) Reports. Available at: [http://www.env.gov.bc.ca/wat/wq/wq\\_guidelines.html#working](http://www.env.gov.bc.ca/wat/wq/wq_guidelines.html#working). Accessed 20 December 2017.

BC ENV (British Columbia Ministry of Environment). 2018. British Columbia Approved Water Quality Guidelines Aquatic Life, Wildlife and Agriculture Summary Report. Water Protection and Sustainability Branch. Ministry of Environment and Climate Change Strategy. March 2018

CanNorth (Canada North Environmental Services). 2018. Giant Mine Human Health and Ecological Risk Assessment, Prepared for Public Services and Procurement Canada – Western Region, Environmental Services and Contaminated Sites Management. Edmonton, AB, Canada.

CIRNAC and GNWT (Crown-Indigenous Relations and Northern Affairs Canada and Government of the Northwest Territories). 2018. Effluent Quality Criteria Report for Giant Mine. Prepared for The Mackenzie Valley Land and Water Board, Yellowknife, NT, Canada. December 2018.

CIRNAC and GNWT. 2019a. Giant Mine Remediation Project - Closure and Reclamation Plan.

CIRNAC and GNWT. 2019b. Giant Mine Remediation Project - Preliminary Screening Document.

CIRNAC and GNWT. 2019c. Giant Mine Remediation Project - Water Management and Monitoring Plan.

CIRNAC and GNWT. 2019d. Giant Mine Remediation Project - Tailings Management and Monitoring Plan.

CIRNAC and GNWT. 2019e. Giant Mine Remediation Project - Engagement Plan.

CIRNAC and GNWT. 2019f. Giant Mine Remediation Project - Engagement Log.

CIRNAC and GNWT. 2019g. Giant Mine Remediation Project - Dust Management and Monitoring Plan.

CIRNAC and GNWT. 2019h. Giant Mine Remediation Project - Wildlife and Wildlife Habitat Management and Monitoring Plan.

CIRNAC and GNWT. 2018. Giant Mine Remediation Project - Approach to Delivering Socio-Economic Benefits

ECCC (Environment and Climate Change Canada). 2017. Solid Waste Management for Northern and Remote Communities, March 2017

GNWT (Government of the Northwest Territories). 2003. Guidelines for Planning, Design, Operations and Maintenance of Modified Solid Waste Sites in the NWT, 2003.

GNWT. 2017. Guideline for Hazardous Waste Management. Revised October 2017. Available at: [http://www.enr.gov.nt.ca/sites/enr/files/resources/128-hazardous\\_waste-interactive\\_web.pdf](http://www.enr.gov.nt.ca/sites/enr/files/resources/128-hazardous_waste-interactive_web.pdf). 52 p.

Golder. 2017. Geotechnical and Geochemical Investigation Factual Report – North, Central and South Pond. Prepared for Public Services and Procurement Canada. Golder Doc. No. 1313770115-054-R-Rev0-18000.

Golder. 2018. Giant Mine Remediation Project - Archeological Impact Assessment.

Government of Canada. 2002. Metal Mining Effluent Regulations Part II, Vol 146, No. 6, Published in the Canada Gazette. SOR 2002-222. Includes amendments up to 8 December 2017. <https://laws-lois.justice.gc.ca/eng/regulations/SOR-2002-222/page-1.html>

Health Canada. 2017. Guidelines for Canadian Drinking Water Quality, Summary Table. Available at: [https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt\\_formats/pdf/pubs/water-eau/sum\\_guide-res\\_recom/sum\\_guide-res\\_recom-eng.pdf](https://www.canada.ca/content/dam/hc-sc/migration/hc-sc/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf). Accessed 23 October 2018.

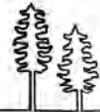
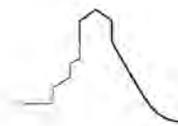
INAC and GNWT (Indian and Northern Affairs Canada and Government of the Northwest Territories). 2010. Giant Mine Remediation Project Developer's Assessment Report. Submitted to the Mackenzie Valley Environmental Impact Review Board, October 2010, 723 p.

MVEIRB (Mackenzie Valley Environmental Impact Review Board). 2013. Report of Environmental Assessment and Reasons for Decision – Giant Mine Remediation Project. EA0809-001. Yellowknife, NWT, Canada. 20 June 2013.

MVEIRB. 2008. Reasons For Decision on Scope - Giant Mine Remediation Project. EA0809-001. Yellowknife, NWT, Canada. 19 December 2008.

SRK. 2007. Tailings and Settling Pond Field Investigations. Prepared for Indian and Northern Affairs Canada. June 2007.

SRK. 2002. Tailings Backfill in the Giant Mine



**Table 2**

**Response to Pre-engagement Reviewer Comments**

**Effluent Quality Criteria Report**

**Water Resource Division, GNWT Comments on the Giant Mine EQC Report June Draft**

Submitted to the GMRP on September 20, 2018

#	Reviewer	Topic	Reference	Comment	Response
1	R. Walbourne, WRD	General	N/A	GMRT may want to consider adding bookmarks to any of their large documents to assist in navigating between sections and appendices.	Noted, complete in the final EQC report
2	R. Walbourne, WRD	MMER	N/A	There are several references to MMER amendments to be finalized in June 2018. These will require updating as MMER was amended to Metal and Diamond Mine Effluent Regulations (MDMER) on June 1, 2018.	Noted, complete in the final EQC report
3	R. Walbourne, WRD	EA Measures	Table 1-2	<p>Table 1-2 references EA measures requiring water quality objectives to be met "in the vicinity of the outlet" of Baker Creek. The measure (15) regarding SSWQOs in Yellowknife Bay specifies that water quality should be protective within 200m of the outfall. As such, the GMRT has applied the 200m distance from Yellowknife Bay to apply to the Baker Creek measure as well, partly as a result of GMRT's suggestion that both discharge areas will be encompassed by a single mixing zone.</p> <p>Has the GMRT confirmed with the Review Board or the MVLWB that a 200m distance from Baker Creek (or the extent of the proposed mixing zone) will conform with the EA Measure?</p> <p>WRD concurs that a single mixing zone may be appropriate to set SSWQOs for both areas and may also facilitate development of other monitoring programs (i.e. AEMP and MDMER). However, this mixing zone still must adhere to the EA measures regarding the distance from the outfall and the Baker Creek "vicinity" (when that is decided). For example, if the "Combined Mixing Zone" displayed in Figure 5-3 is utilized there are areas to the south that are outside of the 200m distance from the outfall. Other options may have to be considered by the GMRT, such as using the convergence point of two mixing zones as the SNP location to measure whether SSWQOs are being met.</p>	The GMRP intends to move forward with a combined mixing zone for Baker Creek and the WTP outfall for the reasons outlined in the EQC Report. The exact locations of the three proposed SNP stations to be situated on the mixing zone boundary have not yet been decided. It would be reasonable to place one of the monitoring stations on the convergence point of the two mixing zones for regulatory purposes.
4	R. Walbourne, WRD	Arsenic	Table 5-2	Can GMRT clarify how predictions for average and 95th percentile arsenic is the same? Is this an error and if so what are the correct concentrations?	Please refer to footnote b on Table 5-2 of the June EQC Report. The average and 95th percentile concentrations are only the same when values were set to the MDMER limit. Arsenic concentrations in the influent to the ETP were predicted to exceed the amended MDMER limit, but the GMRP has committed to meeting the lower, amended MDMER limit of 0.3 mg/L for arsenic. Therefore, for presentation purposes, future concentrations from the existing ETP for arsenic in treated effluent were set to the MDMER limit of 0.3 mg/L prior to discharge to the receiving environment.
5	R. Walbourne, WRD	Effluent Concentrations	Table 5-2	Can GMRT clarify why several parameters in Figure 5-2 indicate that concentrations will be higher with the new plant when compared to the current plant? Will the influent to the treatment plant be of poorer quality than that currently treated?	<p>It is assumed the WRD is referring to Table 5-2, not Figure 5-2. As well, all concentrations in Table 5-3 apply to the existing ETP, not the "new plant" as the comment suggests.</p> <p>Concentrations of lead, nickel, zinc, and Cyanide were predicted to be higher in ETP discharge between 2018 to 2026, compared to 2011 to 2017. The time series calibration figures (D2.5-7 [Pb], D2.5-8 [Ni], D2.5-9 [Zn]) demonstrate that concentrations were over-predicted for those parameters during the calibration timeframe, which resulted in that over-prediction being carried into the future. In general, the calibration focused on parameters that were under-predicted in the model. Parameters for which concentrations were over-predicted were not adjusted.</p> <p>The underground model calibration was revisited for the final version of the EQC report, now incorporating recent data; there was an overall improvement in the calibration since the last model version.</p>
6	R. Walbourne, WRD	Total Dissolved Solids	Page 24	Page 24 notes that TDS has increased from historical levels. Please provide any rationale or reasons why this would be occurring and if TDS is expected to get worse with time. Is there deeper water being discharged or another reason that TDS is increasing?	The source of the increase has not been identified or investigated in detail. Please note that 2018 TDS concentrations were lower than in 2017, so the visual increasing pattern in TDS concentrations did not continue in 2018.
7	R. Walbourne, WRD	Baker Creek Monitoring	Figure 2-12	As per Figure 2-12, there appear to be no sampling stations in Baker Creek. Given that some parameters appear to be increasing through Baker Creek, wouldn't it be appropriate to have stations within the Creek? This would also be valuable to monitor potential improvements of Baker Creek once the discharge is moved. Will stations in Baker Creek be included in the AEMP?	Figure 2-12 reflects historical water quality groupings and stations. Please refer to the proposed SNP and Baker Creek AEMP Design Plan for monitoring plans moving forward. Relevant stations will include treated effluent (SNP 43-1), Baker Creek Exposure Area, Upstream Baker Creek Upstream (SNP 43-11), Baker Creek Reach 1 (SNP 43-23), mouth of Baker Creek (SNP 43-5), and in YK Bay near breakwater (SNP 43-12).
8	R. Walbourne, WRD	Diffuser vs Outfall	N/A	I believe this was discussed or determined during the EA, but further discussion or description should be included as to why the discharge is a straight outfall as opposed to a diffuser? Note, a multi-port diffuser will enhance dilution.	Agree, diffuser structures do promote mixing; however, the direction to use an outfall rather than a diffuser is from the MVEIRB, Measure 14: "The Developer will add an ion exchange process to its proposed water treatment process to produce water treatment plant effluent that at least meets Health Canada drinking water standards (containing no more than 10 µg/L of arsenic), to be released using a near shore outfall immediately offshore of the Giant mine site instead of through the proposed diffuser. The Developer will achieve this concentration without adding lake water to dilute effluent in the treatment plant."
9	R. Walbourne, WRD	Backfilling Pits	Section 2.2.1	Section 2.2.1 mentions backfilling pits. Can GMRT confirm whether this will be water, some other waste type (rock or tailing) or both?	Please refer to the Closure and Reclamation Plan for further details on pits and pit closure activities.
10	R. Walbourne, WRD	Discharge Period	Section 2.3	It is noted that discharge usually begins in July but earlier discharge may be warranted if high water levels exist. However, the document also notes that discharge is to be deferred until after ARGR and LNSC young-of-year have left the creek. Please clarify how earlier discharge would be scheduled against sensitive fisheries periods.	Environment and Climate Change Canada and Fisheries and Oceans Canada requested that treated effluent should not be discharged into Baker Creek until young-of-year fish (Arctic Grayling [Thymallus arcticus] and Longnose Suckers [Catostomus catostomus]) have outmigrated from the creek back into Great Slave Lake, which is typically late June.
11	R. Walbourne, WRD	Figures	Figure 2-5	Figure 2-5 is a little confusing/misleading with the varying y-axis but I understand it is required because of the high variance in range between the seasons. Is there another way that this may be displayed more clearly? For example, could a larger graph (full-page) be displayed which contained all years on the same graph? Also, depending on when the report is finalized, GMRT may want to include 2018 data if possible as it is a higher water year.	Noted. Figure 2-5 revised in the final EQC report.
12	R. Walbourne, WRD	Figures	Figure 2-13 and 2-16	Figure 2-13 and 2-16 are hard to interpret, especially for Baker Creek Mouth and Yellowknife River.	Acknowledged. The intention of the plot is to provide a general comparison between concentrations in treated effluent Baker Creek and Yellowknife Bay (i.e., general decrease with mixing through the system), rather than detailed differences between Baker Creek mouth, Yellowknife River, and Yellowknife Bay. Summary statistics are provided in data tables in Appendix B to assist with more detailed comparisons.
13	R. Walbourne, WRD	Figures	Figure 5-3	In Figure 5-3, it is not clear what is "capped". This specific item is outlined in the legend.	This area represents the engineered cover over shoreline in post-closure. Please refer to the Closure and Reclamation Plan for more information.

#	Reviewer	Topic	Reference	Comment	Response
14	R. Walbourne, WRD	Chronic Effects	Page 20	There is mention of chronic effects to algae and fleas. The WRD recalls that there were effects to slimy sculpin (SLSC) few years ago as well. Can you confirm if there were any SLSC effects observed during the latest EEM cycle.	Statistically significant differences in two endpoints were observed in Slimy Sculpin captured in Baker Creek compared to reference areas during the Phase 4 EEM fish survey: 1) The condition of male and female Slimy Sculpin was significantly lower for the exposure area compared to sculpin from the reference areas; and, 2) male and female Slimy Sculpin from Baker Creek had significantly increased relative liver size compared to the reference areas. Refer to Golder (2017) for more information.  <i>Golder Associates Ltd. 2017. Phase 5 Environmental Effects Monitoring. Giant Mine Investigation of Cause. Prepared for Public Services and Procurement Canada. Edmonton, AB, Canada.</i>
15	R. Walbourne, WRD	Phosphorus	Page 58	More information should be provided on phosphorus. How low are the concentrations that are referenced? More information should be included on the lab error or interference that may have affected the phosphorus concentrations.	Further information provided in Section 5.2.2 of the December 2018 version of the EQC Report.
16	R. Walbourne, WRD	Potassium	N/A	Can GMRT confirm how the potassium SSWQO for Ekati (specifically Leslie Lake and beyond) applies here? Is GMRT relying on hardness adjustments? The WRD recently provided comments and recommendations to the WLWB about an increase in the phosphorus EQC and SSWQO at Ekati. Those comments and recommendations are valid for the Giant Water Licence as well.	The Ekati SSWQO for potassium was used as in the POPC screening because there are no CCME or BCMOE guidelines available for potassium. The Ekati SSWQO was not validated for Giant because the concentrations were near background by the mixing zone, and much lower than the approved Ekati SSWQO. Predicted effluent concentrations (~14 mg/L) were compared to the long-term SSWQO of 41 mg/L (Rescan 2012) in the first step of the screening. That SSWQO was later updated to be 70 mg/L, but to Golder's knowledge, that increase was not approved, per the WRD comment. The lower, approved value of 41 mg/L for screening, and predicted potassium concentrations were well below the chronic SSWQO in the effluent.  Predicted effluent concentrations: 7-10 mg/L Background concentration in the YK Bay: 1.1 mg/L Predicted concentrations at the mixing zone boundary: 1.2 mg/L  <i>Rescan (Rescan Environmental Services Ltd.). 2012. EKATI Diamond Mine: Site-Specific Water Quality Objective for Potassium. Prepared for BHP Billiton Canada Inc. Yellowknife, NT, Canada.</i>
17	R. Walbourne, WRD	SSWQOs	Appendix F, Page 51	SSWQOs using the CCME SSD derivation protocols that include lower effect concentrations (EC10, EC20, IC10, etc.) would produce a better SSWQOs than that derived using safety factors. When there is limited information safety factors are applied to ensure the most sensitive species during their most sensitive life stage are protected. When sufficient information is available to produce Type A SSD, this is the recommended approach.  SSWQOs should use approved test methods and duration, assessment endpoints, water hardness, etc. This data should be included if it has not. Also, can the GMRT confirm the factors that were used to pool data?	CCME (2007) standard protocols were followed in SSD derivation protocols as described in Appendix F, Section F-2. Toxicity datasets for all parameters were screened following CCME (2007) protocols for guideline derivation data gathering and evaluation, and used studies that met criteria for primary or secondary toxicity test data (and approved test methods).  In some cases, toxicity data were pooled where multiple effect concentrations were available for a particular species. As described in Section F-2.1.3, following CCME (2007) guidance, it is appropriate to combine effect concentrations using a geometric mean, provided that the pooled values are for comparable endpoint types and statistical endpoints. The data tables in Appendix F indicate which values were pooled and which were maintained as distinct results. Guidance provided by Chapman (2015) was followed for cases where endpoint data were sufficiently similar in terms of endpoint type or magnitude to warrant aggregation using a geometric mean. We did not present all of the details of the studies in Appendix F, but in the review of comparability of studies we did consider factors such as the protocol details, water quality characteristics, endpoint type and magnitude, etc.  <i>CCME. 2007. A protocol for the derivation of water quality guidelines for the protection of aquatic life 2007. In: Canadian environmental quality guidelines, Canadian Council of Ministers of the Environment. Winnipeg, MB, Canada. ceqgrcqe.ccme.ca/download/en/220.</i>  <i>Chapman PM. 2015. Including or excluding toxicity test data for development of geometric mean. Environmental Toxicology and Chemistry 24(8):1691–1692.</i>
18	R. Walbourne, WRD	Copper SSWQO	Appendix F	The WRD requests more information or description on how toxicity data was normalized? Was the normalization only done for copper?  GMRT should clarify the pH, DOC and hardness values that were used in the model that resulted in the proposed copper guideline. Please describe how these concentrations relate to that in Yellowknife Bay.	As described in Section F-2.2 of the June version of the EQC Report: "in cases where modifying factors were known to alter toxicity, and sufficient data were available to evaluate the modifying effect, toxicity data were normalized for modifying factors using a scientifically-validated modelling tool (e.g., multiple linear regression or biotic ligand model [BLM]) or by developing an equation to normalize toxicity data to permit comparison of effect concentrations between different tests and species. This is consistent with CCME (2007) guidance, which states that quantifying the influence of the most pertinent modifying factors "can be done through either the use of simple equations and/or matrices or the use of complex equations or models (e.g., Biotic Ligand Model)". Normalized toxicity data were then used in the SSD (Section F-2.3)."  Normalization of SSWQOs in Appendix F was conducted for aluminum (pH, hardness and DOC), cobalt (hardness) and copper (pH, hardness and DOC). Descriptions of the normalization method used for each SSWQO can be found in their derivation sections.
19	R. Walbourne, WRD	Aluminum SSWQO	Appendix F	A new SSWQO for aluminum was developed because aluminum was higher than CCME in treated effluent. Note SSWQOs only needs to be met at the edge of the mixing zone. Some chronic effects are permissible within a mixing zone.  Page 8 of Appendix F references that aluminum is in Figure F-4, it should be Figure F-3.	Please refer to CIRNAC and GNWT (2019) for updated WTP effluent and Yellowknife Bay predictions. Aluminum was not identified as a parameter of potential concern in WTP effluent. However, aluminum concentrations in Yellowknife Bay were predicted to occasionally exceed the generic water quality guideline, regardless of the influence WTP effluent. A SSWQO was developed for future comparisons of aluminum concentrations at the mixing zone boundary to an appropriate water quality objective because (Appendix F, Table F-1, CIRNAC and GNWT 2019): <ul style="list-style-type: none"> <li>Background concentrations of aluminum throughout Yellowknife Bay have been occasionally higher than the generic 100 µg/L CCME (1999) WQG for the protection of aquatic life</li> <li>The 95th concentration of aluminum in the Yellowknife River (310 µg/L), which has a major influence water quality in Yellowknife Bay, was above the CCME (1999) WQG (Appendix B)</li> <li>Predicted future 95th percentile concentrations in Yellowknife Bay (October 2026 to 2040) in the mixing zone (i.e., grid cell [1, 63] = 140 µg/L; grid cell [2, 63] = 160 µg/L) were also predicted to be above the generic guideline.</li> </ul> Reference: CIRNAC and GNWT. 2019. Effluent Quality Criteria Report for Giant Mine. Prepared for the Mackenzie Valley Land and Water Board, Yellowknife, NT, Canada. 2019.

#	Reviewer	Topic	Reference	Comment	Response
20	R. Walbourne, WRD	Antimony SSWQO	Appendix F, Table F5	Table F5 contains a lot of older data for antimony. Can GMRT confirm that there isn't newer data or research on antimony? How were species selected for the SSWQO? Are there any other species or test results available?	<p>A review of aquatic toxicity literature for antimony was conducted to confirm that recent and relevant studies beyond what is represented in Appendix F for antimony are not readily available. The data selected for inclusion in the SSWQO were screened according to the protocols outlined by the CCME (2007) as described in Section F-2.1. We concur that most of the studies were older, but these records were not used preferentially over more recent data such as Borgmann et al. 2005. Our experience has been that some of the older studies (particularly those of Birge et al.) can yield anomalously low toxicity endpoints; this can yield more conservative SSWQOs. For less common COPCs like antimony, these older tests tend not to be updated until required for a specific project, as has occurred for strontium, molybdenum, and other trace metals.</p> <p>In terms of species selection, the antimony derivation was similar to other SSWQOs, in that surrogate species were retained for inclusion in the SSWQO, where such had broad relevance to the regional aquatic communities. The use of salmonids, minnows, macrophytes, green algae, and crustaceans in the SSD is common to assessment of northern lakes and streams, where toxicity test data for high-latitude species are rare. Two additional data points were excluded from the SSD as described in Appendix F: "additional toxicity results for the amphipod <i>Hyalella azteca</i> (Borgmann et al. 2005) and the narrow mouthed toad (<i>Gastrophryne carolinensis</i>) (Birge 1978) were available." These toxicity results were eliminated on the basis of CCME decision rules for lethality endpoints, but were included in a bounding analysis.</p> <p><i>Birge WJ. 1978. Aquatic toxicology of trace elements of coal and fly ash. In Thorp JH, Gibbons JW, editors. Energy and environmental stress in aquatic systems: selected papers from a symposium held at Augusta, Georgia, November 2-4, 1977. Department of Energy Symposium Series 48:219-240.</i></p> <p><i>Borgmann U, Couillard Y, Doyle P, Dixon DG. 2005. Toxicity of sixty three metals and metalloids to <i>Hyalella azteca</i> at two levels of water hardness. Environmental Toxicology and Chemistry 24:641-652.</i></p> <p><i>CCME. 2007. A protocol for the derivation of water quality guidelines for the protection of aquatic life 2007. In: Canadian environmental quality guidelines, Canadian Council of Ministers of the Environment. Winnipeg, MB, Canada. <a href="http://ceqgrcqe.ccme.ca/download/en/220/">ceqgrcqe.ccme.ca/download/en/220/</a>.</i></p>
21	R. Walbourne, WRD	Arsenic SSWQO	Appendix F	<p>WRD supports using the drinking water guideline for arsenic as an SSWQO. You can still present the SSWQO derivation data to support going over CCME. De Beers has similar examples for fluoride at Snap and Gahcho Kue.</p> <p>There was inclusion of an EC50 because there was "inconsistency in the concentration-response relationships and high variability for these endpoints precluded the adoption of the lower effect concentrations as reliable lower ECx." Can GMRT provide more detail on the inclusion of this data? Is this the case for all algal species in Table 5-8 that used EC50?</p>	<p>The SSWQO derivation was included for arsenic (Section F-3.3) but the drinking water quality guideline was selected as the SSWQO.</p> <p>On the latter, that one referenced study is a special case, and not something that applied to all algal species.</p>
22	R. Walbourne, WRD	Cobalt SSWQO	Appendix F	<p>Does normalized hardness of 100 mg/L underestimate cobalt toxicity at lower hardness concentrations? What is the hardness at the edge of the mixing zone? The report states that YK Bay hardness ranges from 21-59 mg/L. What value would be calculated if the SSD was produced using only low hardness results?</p> <p>Current predictions for cobalt are less than CCME at edge of mixing zone. It is not clear why GMRT is not using CCME as opposed to producing a SSD using toxicity results with higher hardness test waters.</p>	<p>The SSWQO for cobalt was not prescribed for a hardness of 100 mg/L. Rather, the normalization is simply a means of standardizing the data to a common hardness condition prior to fitting the SSD model; the selection of 100 mg/L is somewhat arbitrary as a different value could have been used without affecting the results.</p> <p>The procedure is stepwise: (1) Effect concentrations used to derive the SSD were normalized to a hardness of 100 mg/L (as CaCO<sub>3</sub>), except for test concentrations conducted as hardness values less than 52 mg/L, which were normalized to a lower bound of 52 mg/L; (2) The hardness-normalized effect concentrations were then used to develop an SSD using curve fitting; (3) A hardness-dependent equation used to calculate the SSWQO was then derived using the long-term cobalt HC5 from the SSD (normalized to 100 mg/L hardness), and the pooled slope of species sensitivity to cobalt under a range of hardness conditions; (4) This equation including pooled slope was used to calculate the SSWQO for cobalt under site-specific hardness conditions in Yellowknife Bay.</p> <p>The methods followed the same approach as ECCC (2017) and calculated the SSWQO using the lower bound of the hardness-dependent equation used in model calibration (52 mg/L as CaCO<sub>3</sub>). Applying the equation outside of the validated hardness range is not recommended because the toxicity of cobalt outside of this range is uncertain.</p> <p>With respect to the predictions at the edge of the mixing zone, we agree that development of an SSWQO is not strictly necessary in this case, given that the predictions in the mixing zone fall just slightly below the minimum FWQG for cobalt (range of 0.78 µg/L and 1.80 µg/L). However, a SSWQO was developed for cobalt was developed because background concentrations in Yellowknife Bay were uncertain due to high detection limits, and predicted 95th percentile concentrations at the mixing zone boundary (0.77 µg/L) approached the minimum federal chronic WQG of 0.78 µg/L (Section F-3.5.3 of the December 2018 version of the EQC Report). As well, during ice-cover conditions, the predicted 95th percentile concentration at the mixing zone boundary (0.87 µg/L) was predicted to exceed federal chronic WQG of 0.78 µg/L, but not the SSWQO of 1.41 µg/L. The minor modifications of the cobalt SSWQO relative to the ECCC (2017) derivation provide additional confidence that chronic effects are not expected.</p> <p><i>ECCC. 2017. Screening Assessment: Cobalt and Cobalt-Containing Substances. Environment and Climate Change Canada, Health Canada. May 2017. <a href="https://www.ec.gc.ca/ese-ees/DCEB359C-245F-4A06-B2E5-62887D47C806/EN_Cobalt%20FSAR%20FINAL%20mai%2025%202017%20.pdf">https://www.ec.gc.ca/ese-ees/DCEB359C-245F-4A06-B2E5-62887D47C806/EN_Cobalt%20FSAR%20FINAL%20mai%2025%202017%20.pdf</a></i></p>
23	R. Walbourne, WRD	Editorial	N/A	<p>Also, a couple of edits that were flagged:</p> <ul style="list-style-type: none"> <li>Section 2.2.1 – typo in last paragraph – "will" should be "with"</li> <li>Attachment D11 seems to be missing</li> <li>Page 38 of F: 95th percentile noted as Bay (1.0 µg/L) and that this exceeded the background 95th percentile concentration in Yellowknife Bay (1.5 µg/L). This sentence cannot be correct. Note, a previous bullet says the concentration in Yellowknife Bay is 1.45. This paragraph should be reviewed and corrected as required.</li> </ul>	<p>Noted, typos corrected in the final EQC report. Attachment D11 will be provided electronically.</p>

**GMOB Comments on the Giant Mine EQC Report June Draft**

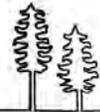
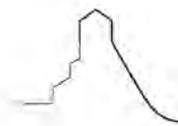
Submitted to the GMRP on October 31, 2018

Comment	Response
<p><b>With respect to EQC for the Existing Effluent Treatment Plant (ETP):</b></p> <p>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 (sic)</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>oIn 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.</p>	<p>Refer to Section 5.1 of the EQC Report. In revised version of EQC report, the MDMER discharge limits were used as a starting point for proposing EQC for the existing ETP. For parameters with historical and predicted concentrations well below the MDMER limits in ETP, the proposed EQC were lowered below the MDMER limits (minimization approach) based on a comparison of concentrations in the ETP influent and effluent since 2011. The proposed EQC reflect present-day treatment capabilities at the ETP, yet allow for flexibility to continue closure activities.</p> <p>A formal EQC screening and calculation process was not completed for the ETP. The GMRP is requesting that discharge concentrations similar to present-day from the ETP, be permitted through the Water Licence process until the new WTP is commissioned. The existing ETP and its associated infrastructure cannot undergo major upgrades. The design is limited and the infrastructure supporting the ETP is nearing the end of its design life, and cannot be retrofitted to meet substantially lower limits. Instead, investment into design and operation of new WTP is being made.</p>
<p><b>With respect to EQC for the New Water Treatment Plant (WTP):</b></p>	
<p>o 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.</p>	<p>The water quality objectives that apply at the mixing zone boundary, and used to calculate EQC (Table 5-5 in the EQC Report), represent the more stringent of the aquatic life and Health Canada Drinking water guidelines (typically lower than recreational values). The selection of the mixing zone was selected through engagement discussions.</p>
<p>o 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.</p>	<p>Recent Board practice regarding management of TDS and ions has been on a project-by-project basis. The advantages and disadvantages of regulating ions through EQC have been discussed extensively in recent years through the Board process for Water Licence applications for upcoming and operating diamond mines and sites in closure. The approach has been based on site-specific conditions in both the effluent and the receiving environment. For Giant Mine, the rationale for not developing EQC for chloride and sulphate are provided in Section 5.2.2.3 and remain valid for the Giant Mine site (i.e., concentrations of chloride below the acute guideline, low discharge volume, high assimilative capacity of the receiving environment, concentrations at the mixing zone boundary well below chronic guidelines for chloride and sulphate, and no viable option for salt removal or treatment).</p>
<p>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.</p>	<p>We agree that the GMRP will need to demonstrate that the planned design for the WTP will meet the EQC proposed for the WTP, and therefore an evaluation of the proposed EQC for the WTP against the selected design is required; we do not believe a re-evaluation of the EQC is required, as the EQC selected are both protective of the environment and believed to be technologically achievable, as per standard Board policy for development of EQC. A condition has been included in Part G of the proposed Water Licence requiring the GMRP to submit a report which demonstrates how the selected design for the new WTP will satisfy the proposed EQC, and Approved EA Measures 14 and 15. We believe such evaluations of the approved EQC against the design will demonstrate that the selected EQC are achievable.</p>

**Bill Slater - Technical Advisor to GMRP Working Group - Comments on Water Quality Objectives and Effluent Quality Standards**

Bill Slater - from Closure and Reclamation Plan Comments

Comment	Response
<p>1. Surface runoff from the site may contain contamination as a result of coming into contact with waste materials and contaminated soils. The CRP proposes management of runoff using the water treatment facilities until the runoff meets runoff quality criteria. The specific criteria are to be identified in the water licence application, but have not yet been provided for review.</p>	<p>The runoff criteria are provided in the Water Management and Monitoring Plan (CIRNAC and GNWT 2018).  <i>CIRNAC and GNWT (Crown Indigenous Relations and Northern Affairs Canada and Government of the Northwest Territories). 2018. Water Management and Monitoring Plan. Prepared for The Mackenzie Valley Land and Water Board, Yellowknife, NT, Canada.</i></p>
<p>2. The CRP proposes effluent standards that are back calculated to meet water quality objectives at the edge of a combined mixing zone at the mouth of Baker Creek. The combined mixing zone considers loading from both Baker Creek and the new water treatment plant outfall. Measures 12 and 13 related to water quality in the vicinity of Baker Creek and Measure 15 related to water quality in the vicinity of the outfall are all relevant to the combined mixing zone and the calculation of effluent quality standards. The CRP states that Measure 15 is intended to protect water uses 200 m from the outfall. However, with respect to water quality, Measure 15 proposes a non-degradation objective, not a use-protection objective: <i>"There is no increase in arsenic levels in Yellowknife Bay water or sediments beyond 200 metres of the outfall."</i> The proposed water quality objectives in the CRP are use-protection objectives and therefore would potentially allow increases in arsenic concentrations at the edge of the mixing zone. It appears that this would not achieve the requirements of Measure 15. The CRP should describe how the proposed water quality objectives and effluent quality standards fulfill the requirements of Measure 15.</p>	<p>Measure 15, Part 2(d) is specific only to arsenic concentrations in Yellowknife Bay water: "There is no increase in arsenic levels in Yellowknife Bay water at 200 metres of the outfall". The water quality objective selected for arsenic at the mixing zone boundary was 0.01 mg/L, consistent with the Health Canada (2017) drinking water guideline. Also per Measure 15, Part 1 and Section 5.2.6 of the EQC Report, arsenic concentrations in the WTP effluent will also meet 0.01 mg/L, requiring substantial waste minimization mitigation measures (i.e., a new WTP) to achieve a concentration that low. Arsenic concentrations are not predicted to increase in Yellowknife Bay at a discharge concentration of 0.01 mg/L (Figure E2.3-35 of the December 2018 version of the EQC Report).</p> <p>Measure 15, 2(e) is specific only to arsenic concentrations in Yellowknife Bay sediment: "There is no increase in arsenic levels in Yellowknife Bay water 500 metres of the outfall." The potential for the effluent discharge to increase arsenic levels in sediments in Yellowknife Bay at 500 m from the outfall, either through effluent related inputs or the physical re-suspension of sediment, will be reduced by implementation of the following mitigation measures at or close to the point of discharge to the bay.</p> <ul style="list-style-type: none"> <li>•The effluent will be treated to meet drinking water standards for arsenic (i.e., 0.01 mg/L) at the point of discharge</li> <li>•Positioning of a sediment cover over a defined area around the outfall to limit sediment resuspension due to the discharge of effluent and sediment accumulation within that area.</li> </ul>
<p>3. Table 5.8-1 proposes effluent quality standards for the existing Effluent Treatment Plant (ETP). The proposed standards are primarily limited to parameters and standards that are specified in the <i>Metal and Diamond Mining Effluent Regulations</i> (MDMER), the recent replacement for the <i>Metal Mining Effluent Regulations</i> (MMER). As shown in the table, several of the proposed standards far exceed the expected and past performance of the ETP. More stringent standards appear to be easily achievable with the currently available facilities and technology. Effluent quality standards for the ETP should be refined to take into consideration the achievable effluent characteristics. This would be consistent with Mackenzie Valley Land and Water Board Policy that aims to minimize pollution by establishing standards that consider the performance of the proposed treatment technology.</p>	<p>Refer to Section 5.1 of the final version of the EQC Report. The MDMER discharge limits were used as a starting point for proposing EQC for the existing ETP. For parameters with historical and predicted concentrations well below the MDMER limits in ETP, the proposed EQC were lowered below the MDMER limits (minimization approach) based on a comparison of concentrations in the ETP influent and effluent since 2011. The proposed EQC reflect present-day treatment capabilities at the ETP, yet allow for flexibility to continue closure activities.</p>
<p>4. For both the existing ETP and the new WTP (Tables 5.8-1 and 5.8-10 respectively), the CRP should define appropriate effluent quality standards for all parameters identified as contaminants of potential concern in surface water for the HHERA (Figures 2.28 and 2.29 of the HHERA, Canada North Environmental Services, 2018). The HHERA included a systematic process for identifying parameters for which the mine may lead to increased concentrations. On the other hand, the screening procedure applied in the Effluent Quality Criteria Report only identifies parameters of concern if they are predicted to exceed the 95<sup>th</sup> percentile of current conditions in Yellowknife Bay. In addition, the predictions that form the basis for the decisions rely on assumptions about performance of the new water treatment plant that are based on results from the existing plant. In my view, this approach relies on a lot of confidence in the prediction model whereas the approach used in the HHERA is more conservative and will result in a more robust monitoring and water quality management program.</p>	<p>The screening process outlined in Figure 5-5 is also similar to the process used to select constituents of potential concern in the HHERA (CanNorth 2018). In the HHERA, constituents in surface water were eliminated if: 1) 90% of the data collected were non-detectable, 2) 95th percentile measured concentrations were below screening criteria; and 3) 95th percentile measured concentrations were below background. Each of those steps from HHERA screening process were included in EQC process (Figure 5-5). Key differences include:</p> <ul style="list-style-type: none"> <li>- the list of water quality objectives in this EQC report reflects new guidelines and toxicity information available since the issuance of the HHERA</li> <li>- the dataset used to characterize concentrations in Yellowknife Bay has been updated to include recent data (2017 and 2018), with many parameters analyzed at lower detection limits</li> <li>- for guidelines that vary with hardness, the average hardness was used in HHERA; in the EQC screening process, the 5th percentile was used resulting in a more conservative comparison (lower guidelines).</li> <li>- only historical data were used in the HHERA screening process; there was no consideration of future concentrations.</li> </ul> <p>CanNorth (2018) identified only arsenic (human health and ecological), antimony (ecological), and barium (ecological) as constituents of potential concern for surface water in Yellowknife Bay (Appendix D, Section D.5 of CanNorth [2018]). Barium was identified in the HHERA because no toxicity data were available. However, there is an aquatic life guideline from BC ENV (2018) and a Health Canada drinking water guideline for barium. Barium concentrations in WTP effluent and in Yellowknife Bay are predicted to be well below both of those guidelines.</p> <p><i>CanNorth (Canada North Environmental Services). 2018. Giant Mine Human Health and Ecological Risk Assessment. Prepared for Public Services and Procurement Canada – Western Region, Environmental Services and Contaminated Sites Management. Edmonton, AB, Canada.</i></p>
<p>The CRP proposes a site-specific water quality objective for Copper. Section F-3.5.1 of the Effluent Criteria Report provides a rationale for deriving a site-specific objective – including that the 95<sup>th</sup> percentile of predicted concentration at the mixing zone boundary in Yellowknife Bay exceeds the 95<sup>th</sup> percentile of current conditions. The numbers presented do not support this conclusion. If copper does not meet the criteria for a site-specific water quality objective, the CCME guideline should apply.</p>	<p>Copper was identified as a parameter of potential concern in the December 2018 version of the EQC Report, based on following:</p> <ul style="list-style-type: none"> <li>- The 95th percentile predicted concentration in WTP effluent (20 µg/L) exceeded the background 95th percentile concentration in Yellowknife Bay (1.5 µg/L).</li> <li>- The 95th percentile predicted concentration in WTP effluent (20 µg/L) exceeded 2 µg/L CCME (1999) chronic WQG for the protection of aquatic life.</li> <li>- The 95th percentile predicted concentration in the mixing zone boundary in Yellowknife Bay (1.9 µg/L) exceeded the background 95th percentile concentration in Yellowknife Bay (1.5 µg/L).</li> </ul> <p>A SSWQO for copper was developed because predicted 95th percentile concentrations at the mixing zone boundary (1.9 µg/L) were predicted to approach the minimum WQG of 2 µg/L (Section F-3.5.3). During ice-cover conditions, the predicted 95th percentile concentration (2.1 µg/L) at the mixing zone boundary was predicted to just exceed the minimum WQG of 2 µg/L. The SSWQO provides an appropriate value for developing the proposed copper EQC for the Water Licence.</p>



**Table 4**

**Response to Pre-engagement Reviewer Comments**

**Management and Monitoring Plans**

Government of the Northwest Territories - Environment and Natural Resources - Water Resources Division - Comments on the Conceptual Aquatic Effects Monitoring Program Design Plan for Yellowknife  
Submitted to the Giant Mine Remediation Project on September 10, 2018

Reviewer	Topic	Reference	Comment	Response
Water Resources Division	Sediment	Table 3-1	It is noted that sediments near the outfall will be removed or covered. What is the area and volume of the material removed or the material to be placed? How will the removal or placement of material occur such that elevated suspended sediments are mitigated to protect aquatic life in the area? Has this specific area that will be impacted been delineated and finalized?	Please refer to the CRP for further details on the outfall area.
Water Resources Division	Outfall Monitoring	Table 3-1	It is stated that visual monitoring at the outfall will occur for sediment suspension. Note actual sampling of TSS will be required in order to ensure levels are adequate to protect aquatic life. Consideration should be given to turbidity monitoring in the field with confirmatory TSS sampling conducted to confirm levels are protective.	Section 8 of the Yellowknife Bay AEMP includes monitoring of TSS and turbidity at the edge of the mixing zone. As well, appropriate EQC for TSS were proposed for the WTP in the EQC Report. Closure activity-specific TSS and turbidity monitoring is discussed in the CRP and will be finalized as part of specific construction plans for the project.
Water Resources Division	Grayling fishery	Table 4-1	The table indicates that "there is a possession limit for Arctic Grayling in the creek and within 100 m of the creek." Note ARGR fishery at Baker Creek is catch and release and the possession limit is 0. Please refer to page 16-17 of the sport fishing guide <a href="https://www.enr.gov.nt.ca/sites/enr/files/resources/nwt_sport_fishing_guide_2018_2019_english.pdf">https://www.enr.gov.nt.ca/sites/enr/files/resources/nwt_sport_fishing_guide_2018_2019_english.pdf</a>	Noted. The relevant text has been revised.
Water Resources Division	Phosphorus	Section 4.6	The document notes that detection limit for phosphorus is above the oligotrophic/mesotrophic boundary. CCME boundary for oligo/meso is 10 micrograms/l or 0.01 mg/L. WRD notes that this level is a SSWQO for several of the mines and that sampling and analysis occurs to detect phosphorus at this level. I conferred with the monitoring section in WRD and they informed me that the detection limit for Total Phosphorus at Taiga Lab is 0.002 mg/L. Ortho-Phosphate and Dissolved Phosphorus analyzed by ALS has a detection limit of 0.001 mg/L. Please clarify.	The data on which that statement was based is from Stantec 2012/2013. New information has been collected in 2017/2018 through the background characterization program for Yellowknife Bay. However, as discussed in the revision to Section 4.6 of the Yellowknife Bay AEMP, phosphorus concentrations in source waters, within Baker Creek, and in Yellowknife Bay close to the breakwater, still have uncertainty due to elevated detection limits reported by the analytical laboratories as a result of arsenic interference. The lower detection limits quoted by WRD from Taiga only apply if arsenic concentrations in the sample are low. GMRP continues to engage analytical laboratories and consultants in addressing this ongoing analytical issue.
Water Resources Division	Arsenic Levels	Section 4.6	There is a discussion on arsenic levels near the breakwater being above CCME. Additional detail should be provided outlining the timing and magnitude of these exceedances as well as a comparison to drinking water guidelines to give more context to arsenic levels in this area.	Section 4.6 of the Yellowknife Bay AEMP has been revised to include more detail regarding the comparison of reported arsenic concentrations in Yellowknife Bay to applicable aquatic life and drinking water guidelines. The text references a synthesis of the available data in graphical form including comparison to applicable water quality guidelines is provided in the detailed Baker Creek AEMP Design Plan.
Water Resources Division	Fish tissue	Section 4.10	It is noted that fish tissue from LKWH were sampled from mouth of Baker and YK Bay. Within a January 31, 2011 Golder report (attached) it was noted that LKWH from Baker Pond (Reach 6) were archived. Were these samples ever processed? If so, what were the results?	Yes, the archived fish tissue samples were analyzed and the data were reported in the Baker Creek 2011 Assessment Report (finalized in 2013). Concentrations of some metals including arsenic were elevated in Lake Whitefish tissues collected from Baker Pond (Reach 6).
Water Resources Division	Sediment Exposure	Figure 7.1/Section 7.5	Regarding sediment exposure pathways, there is only mention of invertebrates and small-bodied fish species being exposed to sediment. Is there also a potential that large-bodied fish species could be exposed during early life stages such as egg exposure in the sediment and/or as larval fish? This should be included in the exposure pathways description.	Yes, this is correct. The relevant text has been revised.
Water Resources Division	Measure 17	Section 8.1	Section 8.1 outlines the value statements derived to reflect the main purpose of the AEMP which includes reference to EA Measures 12, 13 and 15. Measure 17 is also relevant to sampling locations and meeting water quality. Why is this not mentioned? How has Measure 17 been considered in the AEMP design and any response plan for the monitoring program?	The relevant footnote in Table 8-1 has been revised to more clearly indicate how the AEMP addresses Measure 17.
Water Resources Division	Plankton	Section 8.1	WRD notes that plankton are absent from the proposed AEMP. AEMPs should include monitoring of water quality, sediment, plankton, benthics and fish. The frequency and design of these monitoring components could be specific to the program at large. The sensitivity of plankton make it an ideal parameter for early warning when changes or spikes in water quality or other metrics are detected as part of the AEMP. GMRT should consider including plankton somehow in the AEMP.  Note EA Measure 15 specifically mentions plankton abundance and diversity however it is not carried forward as a core component of the program. Instead it is proposed that toxicity be used as a surrogate. GMRT should further explain how toxicity information will be in conformance with EA Measure 15. Chronic toxicity alone may provide some insight on abundance but not the degree of change in abundance or change in plankton diversity. Further, potentially large changes in abundance and diversity could occur even though there is an absence of chronic toxicity.	Plankton communities in Yellowknife Bay were most recently characterized by Stantec (2014) as summarized in Section 4.9 of the Yellowknife Bay AEMP. Plankton abundance has been shown to be inherently variable in many freshwater lakes, both spatially and over time. This inherent variability has often rendered plankton a less robust monitoring tool than benthic invertebrate communities in assessing potential impacts to freshwater lake biota unless a very extensive plankton program is planned and implemented. With respect to Yellowknife Bay, the ability to detect an effluent-related impact on plankton is further confounded by the potential influence of other stressors such as the marina, house boats, stormwater discharges, and the landfill. Furthermore, monitoring of the effluent discharge to date in Baker Creek has indicated that observed effects on aquatic life are consistent with a toxicity response pattern rather than a nutrient enrichment response pattern.  Measure 15 a) states that "Water quality changes due to effluent discharge will not reduce benthic invertebrate and plankton abundance or diversity beyond 200 m of the outfall." Given the greater concern regarding toxicity-related effects in Yellowknife Bay, the GMRP is of the opinion this measure is best addressed through the proposed two-pronged approach: <ul style="list-style-type: none"> <li>the development of site-specific water quality objectives protective of aquatic life that will be met in Yellowknife Bay after remediation activities are complete and</li> <li>confirmatory toxicity testing in the receiving environment at a distance of 200 m from the outfall to confirm no adverse effects on plankton.</li> </ul> The combined approach of site-specific water quality objectives development and toxicity testing in the receiving environment will more definitively determine the potential for effluent-related effects on plankton. The text in Table 3-1 has been revised to provide more clarification as to how plankton are considered in the AEMP specifically in relation to Measure 15.  Should water quality monitoring 200 m from the outfall indicate that the discharge has resulted in increased nutrient concentrations sufficient to trigger concern regarding a potential enrichment response pattern, then the proposed approach for inclusion of plankton in the AEMP will be reconsidered.
Water Resources Division	Sampling Locations	Section 8.4	Sampling locations for water are noted for three areas: edge of mixing zone, within exposure area and at a far-field location. WRD notes that EA Measure 17 discusses monitoring locations near Ndilo, in Back Bay, and in Yellowknife Bay. It is unclear how this measure has been incorporated into the sampling locations of the AEMP Design.	The proposed water quality monitoring program for the Yellowknife Bay AEMP will include monitoring at stations located near Ndilo, in Back Bay, and in Yellowknife Bay, thus meeting Measure 17. Relevant text in Section 8.4 has been revised to more clearly reflect this.
Water Resources Division	Fish Program	N/A	It is noted that large-bodied fish are being excluded from the AEMP, however, there is a separate community-based fisheries program being developed. This should be mentioned in the AEMP and large bodied fish should be included in that program as community members will want to see the conditions of fish they eat and rely upon.	The Community Based Monitoring program had been added to the Baker Creek AEMP as part of the Yellowknife Bay Special Study (refer to Section 7.8.1.6). The intent of the GMRP is to evaluate the health of large-bodied fish in Yellowknife Bay through a Community Based Monitoring Program. The CBM will require coordination and engagement with affected parties and may require some time to get underway. Therefore, the GMRP is beginning to improve the existing data on large bodied fish in Yellowknife Bay through the proposed Special Study, so that the CBM has a data-set to draw on and build upon once it is implemented.

Reviewer	Topic	Reference	Comment	Response
Water Resources Division	Sediment	Table 8-2	The AEMP Design has only included sediment as supporting benthic results and in Table 8-2 regarding which EA measures are related to sediment it is designated "N/A". WRD notes that EA Measure 15 (there is no increase in arsenic levels in Yellowknife Bay sediments at 500m from the outfall) and EA Measure 17 (the monitoring program needs to be able to identify arsenic accumulation in sediment over time) relate to sediment concentrations and should be included appropriately in the AEMP Design to ensure EA Measures are met.	<p>The potential for the proposed effluent discharge to increase arsenic levels in sediments in Yellowknife Bay at 500 m from the outfall, either through effluent related inputs or the physical re-suspension of sediment, will be reduced by implementation of the following mitigation measures at or close to the point of discharge to the bay.</p> <ul style="list-style-type: none"> <li>• The effluent will be treated to meet drinking water standards for arsenic (i.e., 10 µg/L) at the point of discharge and have a low TSS discharge limit from a new water treatment plant</li> <li>• Positioning of a sediment cover over a defined area around the outfall to limit sediment resuspension due to the discharge of effluent and sediment accumulation within that area.</li> </ul> <p>As described in the Yellowknife Bay AEMP Design Plan sediment quality will be monitored at the edge of the combined mixing zone with Baker Creek. It is, however, acknowledged that sediment monitoring is confounded in this area by existing arsenic sediment concentrations, in addition to the propensity of arsenic to undergo diagenesis. Given the complexities associated with using sediment monitoring to determine if the effluent outfall has resulted in increased arsenic concentrations in Yellowknife Bay, the GMRP believes Measures 15 and 17 would be more effectively met through implementation of mitigation measures in the outfall design, combined with sediment monitoring as described in the AEMP for Yellowknife Bay</p>
Water Resources Division	Response Framework	Section 8.5	WRD notes that the response framework is yet to be developed as the document is a conceptual plan and will not be required until several years (i.e. once the new treatment plant and outfall is constructed). WRD is interested in providing input/feedback on that component as it develops.	Noted

Notes: WRD = Water Resources Division; CRP = Closure and Reclamation Plan (CIRNAC and GNWT 2019a); Yellowknife Bay AEMP = Conceptual Aquatic Effects Monitoring Program Design Plan for Yellowknife Bay (CIRNAC and GNWT 2019b); Baker Creek AEMP = Aquatic Effects Monitoring Program Design Plan for Baker Creek (CIRNAC and GNWT 2019c); EQC Report (CIRNAC and GNWT 2018); Baker Creek 2011 Assessment Report (Golder 2013).

(a) This plan was reviewed in draft prior to GMRP finalizing for public review and MVLWB submission

Government of the Northwest Territories - Environment and Natural Resources - Water Resources Division - Comments on the Aquatic Effects Monitoring Program Design Plan for Baker Creek  
Submitted to the Giant Mine Remediation Project on September 20, 2018

#	Reviewer	Topic	Reference	Comment	Response
1	R. Walbourne, WRD	Methodology	N/A	WRD understands that the Baker Creek AEMP will follow the currently approved EEM program and schedule. As such we have not provided comments on methodology.	Noted
2	R. Walbourne, WRD	EEM Harmonization	N/A	GMRT wishes to harmonize field work and reporting of EEM with AEMP; for example, the current EEM field schedule is 2019, 2022 and 2025. While 2019 is outside the scope of this AEMP Design (as it won't be finalized in time), it will be summarized and incorporated for the next sample season. According to the EEM cycle, this won't be until 2022. WRD questions why AEMP monitoring will not occur annually, even if the AEMP program is a subset of the EEM program? Note, AEMPs are required on an annual basis.	Please refer reviewer to Table 6-3 in the AEMP for Baker Creek. AEMP sampling and reporting will occur on an annual basis.
3	R. Walbourne, WRD	Overwintering Habitat	Section 2.2	It is stated in the AEMP that it is unknown whether Baker Creek provides overwintering habitat for fish. WRD notes that Golder did some winter sampling in December 2010 which resulted in fish (mostly lake whitefish) found in Baker Pond (Reach 6). The report dated January 31, 2011 from Golder to the Giant team titled "Final Update on Baker Creek Aquatic Studies - Fish and Fish Habitat Project" notes that "Sixteen fish were captured in Reach 6 in December, confirming overwintering habitat in this reach of Baker Creek." At the time, DFO staff confirmed sufficient dissolved oxygen in the area later that winter. Also, personal communications with former DFO staff indicates that there was a report in 2005/06 of the capture of Northern Pike during the winter when emergency work was being done on the B pit dam, upstream of Reaches 4 and 5. Is the GMRT aware of these reports and their findings?	The GMRP is aware of this report. Recent field work in 2018 has confirmed overwintering habitat in Baker Pond is likely unsuitable for fish: water depth <0.5 m and dissolved oxygen <2 mg/L. It is suspected the low water levels in recent years in the Yellowknife area have contributed to this. Going forward, overwintering on site will not be encouraged given the effluent will be removed and the stream will return to its natural seasonal pattern. Also, keeping water ponded above the Site and arsenic chambers is not advised and Baker Pond will be backfilled.
4	R. Walbourne, WRD	AEMP Objectives	Section 2.4	This section makes reference to closure objectives being met or confirmed by the AEMP but there is no reference to any EA measures being met or confirmed by the AEMP. This should be required by the Baker Creek AEMP, where applicable.	The AEMP for Baker Creek applies to the remediation phase as described in Section 2.4. EA Measures are to be met at end of remediation.
5	R. Walbourne, WRD	Baker Creek Sediment	Section 2.4 (page 15)	The Plan outlines the main activities that will occur within the scope of the AEMP Design Phase which includes removal of contaminated sediments from Baker Pond and Baker Creek. It is our understanding that sediment dredging would not occur during the time of the Baker Creek AEMP and would only occur once effluent discharge into Baker Creek had ceased. Can GMRT clarify the anticipated timing for the excavation of sediments from Baker Creek and how it relates to the timing of the AEMP Design and Monitoring? Note some sort of monitoring should occur during these activities.	No, that is not correct. Sediment removal in Baker Creek will occur in a staged manner starting above Baker Pond. This will take a number of years, allowing monitoring in Reach 0 of Baker Creek to proceed.
6	R. Walbourne, WRD	Fish Species	Section 4.4	References to fish monitoring is focused on Reach 0 and Reach 1. Most species seem to be covered but as per a previous comment above there has been overwintering populations in Reach 6 (lake whitefish and cisco). Inclusion of these species may be relevant to discussions in the AEMP as overwintering resident large-bodied species may have different exposure pathways and mechanisms than small-bodied species or seasonal spawners. Can GMRT clarify if these receptors/exposure pathways would be covered within the current AEMP Design?	No, the current AEMP design for Baker Creek will not cover these pathways. Given the latest data from 2018 on Baker Pond, overwintering is unlikely and it is not planned to be included in monitoring as these fish are not relevant to treated effluent discharge. Northern Pike are present for three seasons in Baker Creek, but given sportfishing pressure on this species, they were not chosen as a sentinel fish species. Instead, the focus is on a year-round resident that will form the worst case for fish health, prior to the creek sediments being removed and the effluent being redirected to YK Bay.
7	R. Walbourne, WRD	Sediment Exposure	Section 4.5	Regarding sediment exposure pathways, there is only mention of invertebrates and small-bodied fish species being exposed to sediment. Is there also a potential that large-bodied fish species could be exposed via egg exposure in the sediment and/or during the larval stage?	Yes, the text in Section 4.5 has been revised
8	R. Walbourne, WRD	SNP Nomenclature	Section 5.1	It is anticipated by GMRT that SNP names will change with the new WL. WRD suggests that GMRT request the Board keep the names of existing SNP stations, where possible, to allow for consistency and comparability of results between historical sampling programs and sampling programs established under the new Water Licence.	Noted. The GMRP will give this consideration, and if necessary, a comparison table will be provided in AEMP reports.
9	R. Walbourne, WRD	Reference locations	Section 5.1	A list of EEM monitoring areas is outlined but the referenced figure has an additional sampling area that is not included in the list (Tartan Rapids). This should be explained more clearly in the text.	Tartan Rapids is located on Yellowknife River. Text has been added for clarity.
10	R. Walbourne, WRD	Benthic Invertebrates	Section 5.5	Regarding hypotheses for benthos effects, was there no hypothesis related to historic contamination of Baker Creek? Hypothesis 1 almost speaks to that but it only references effluent, not sediment. Can GMRT confirm if this hypothesis takes into account sediment exposure or contamination as well?	Text added to Hypothesis 1 to communicate that metals from historic sediment contamination may also be a factor with respect to effects in benthos observed in the EEM studies.
11	R. Walbourne, WRD	Arsenic in YOY	Section 5.6.2	The section makes reference to uptake of arsenic related to YOY ARGR but it doesn't mention anything about arsenic in this fish species. The section states that YOY are submitted as whole body samples but there is no indication that they are showing elevated arsenic. However, there is a conclusion that these fish must uptake arsenic from Baker Creek. This should be clarified.	Sentence added to the report to clarify. Yes, the young-of-year Arctic Grayling contain elevated arsenic concentrations, but its unknown if this is from eating bottom sediments (i.e., in their stomachs only) or if it is in their tissue itself.
12	R. Walbourne, WRD	Archived Fish	Section 5.6.2	It is noted that fish tissue from LKWH were sampled from mouth of Baker and YK Bay. The referenced report in comments above (January 2011) notes that LKWH from Baker Pond (Reach 6) were archived. Is the GMRT aware of these fish and have they ever been processed?	Yes, these Lake Whitefish have been processed and reported in previous reports and the data used in DFO publication.
13	R. Walbourne, WRD	Grayling fishery	Section 5.6.3	It is noted that "there is a possession limit for Arctic Grayling in the creek and within 100 m of the creek." ARGR fishery at Baker Creek is catch and release and possession limit is 0. Please refer to page 16-17 of the sport fishing guide. <a href="https://www.enr.gov.nt.ca/sites/enr/files/resources/nwt_sport_fishing_guide_2018_2019_english.pdf">https://www.enr.gov.nt.ca/sites/enr/files/resources/nwt_sport_fishing_guide_2018_2019_english.pdf</a>	Text has been clarified.

#	Reviewer	Topic	Reference	Comment	Response
14	R. Walbourne, WRD	Sediment	Section 6.1	<p>There is a comment regarding sediment in that it will not be a separate component of the AEMP as remedial decisions have already been made to dredge. However, information will be collected to assess benthic invertebrates. It is not clear why sediment sampling will not be clear as it is not clear that all the sediment will be removed. Where is it expected that sediment would be removed? Benthic samples are in Reach 0-1 so will these sediments be removed?</p> <p>Note, if excavation is not planned for some areas of Baker Creek, it may be valid to include a sediment component in the AEMP. Could GMRT provide additional rationale on the exclusion of sediment monitoring if certain areas are not to be excavated?</p>	<p>Sediment quality has not been proposed as an AEMP component because the AEMP has been designed for a closure remediation project that involves sediment removal. Sediment from each reach of Baker Creek will be removed in sequence as outlined in the CRP. Sediment quality in the creek has been characterized as described in Section 5.4 based on the findings of the Baker Creek 2011 Assessment Report (finalized in 2013) and the Phase 5 IOC-EEM Study (Golder 2017).</p> <p>Monitoring data in Reaches 0 and 1 has followed the EEM approach where sediment quality monitoring is undertaken to support the benthic invertebrate component. The AEMP for Baker Creek AEMP proposes to continue this approach as the remediation work is undertaken and before the discharge is moved over to the new outfall in the bay in the vicinity of the Baker Creek. The EA Measures related to Baker Creek do not apply until active remediation of the Site is complete.</p>
15	R. Walbourne, WRD	Study Areas	Section 6.3.1	Has any consideration been giving to study areas within the Creek itself? Would it not be assumed that higher concentrations would be found upstream in the creek and benthos and fish would be more highly impacted? This may have been discussed already during the EEM design.	Year-round resident fish are present in Reaches 0 and 1, but are not present in Reaches 2 to 5, which are downstream of the effluent discharge, but upstream of Reaches 0 and 1. Given the limited dilution capacity of Baker Creek during the summer discharge period, effluent concentrations at the mouth in Baker Creek approximate 90% of end-of-pipe concentrations. Therefore, effluent exposure conditions in Reaches 0 and 1 are expected to represent those present in Reaches 2 to 5.
16	R. Walbourne, WRD	Fish Components	Figure 7-1	Figure 7-1 has symbols for fish components in reference areas but not exposure areas. Is this an oversight or intentional?	The exposure area for both fish and benthos is represented by a square symbol.
17	R. Walbourne, WRD	Treated Effluent	Figure 7-1	Figure 7-1 has symbol for treated effluent (diamond) but it is not designated on the map. Given the scope of the figure (Water, tox and benthic inverts) it would be assumed that this would be designated?	The symbol for treated effluent (diamond) is located next to the inset box.
18	R. Walbourne, WRD	Chronic Toxicity	Section 7.3.2	It is noted the effluent grab samples for chronic toxicity will be quarterly however discharge will only be seasonal. Can GMRT clarify when these samples will be taken and how many toxicity tests would occur for a seasonal discharge.	The discharge for the existing ETP will be seasonal, generally occurring between July and September. Thus one set of chronic toxicity tests will be conducted per year during the discharge period as described in Section 7.3. This sampling effort exceeds that required by the MDMER which only requires that the most sensitive species be tested to assess the potential for chronic toxicity in the effluent.
19	R. Walbourne, WRD	Fish sampling	Section 7.5.4.2	NNST sample size discusses only YOY but the fish collection section below discusses YOY, juvenile and adult. Can GMRT clarify which life stages of NNST are being targeted? If only YOY, why?	Non-lethal program targets all life stages of Ninespine Stickleback; however, sample sizes based on need in a certain number of young-of-year Ninespine Stickleback as per EEM guidance (EC 2012).
20	R. Walbourne, WRD	Plankton	N/A	<p>WRD notes that plankton are absent from the proposed AEMP. It is noted that the area is widely used by the public and as such the results of a sensitive monitoring parameter such as plankton may be inconclusive. WRD notes that these activities have the same potential to influence results of other monitoring parameters but that rationale is not sufficient to exclude parameters or metrics from the AEMP. The sensitivity of plankton makes it an ideal parameter for early warning and the GMRT should include plankton monitoring in the AEMP. We are open to discussing this further with the GMRT.</p> <p>Additionally, Measure 14 of the Report of EA states that discharge from Baker Creek will not reduce plankton abundance and diversity. How will GMRT ensure that this measure is met without a plankton component of the AEMP?</p>	<p>As discussed in Section 4.4, plankton communities are present in the creek, but have not been the focus of monitoring studies because the stream represents a lotic environment and is seasonal in nature.</p> <p>Monitoring of the effluent discharge to date in Baker Creek has indicated that observed effects on aquatic life are consistent with a toxicity response pattern rather than a nutrient enrichment response pattern (Golder 2017). Potential toxicity-related effects to plankton have been indirectly assessed through toxicity testing.</p> <p>Once accumulated by these primary producers, contaminants are subject to transfer up the food chain to secondary producers, such as benthic invertebrates. Monitoring to date in Baker Creek has focused on benthic invertebrates consistent with the EEM approach. The AEMP for Baker Creek AEMP proposes to continue this approach as the remediation work is undertaken and before the discharge is moved over to the new outfall in the bay. The EA Measures related to Baker Creek do not apply until active remediation of the Site is complete as conditions in the creek are expected to improve over time after remediation.</p>
21	R. Walbourne, WRD	Sampling Locations	Section 7.8.1.1	There is mention of "proposed City of Yellowknife in lake water intake." Can you clarify the location? YK does have an emergency intake in the bay, that might be the location referenced. Can you confirm?	We are referring to the proposed location in South Yellowknife Bay. The text has been revised to further clarify the referenced location.
22	R. Walbourne, WRD	Special Study	Section 7.8.1	Is the special study discussed in this section a one-time event to provide baseline that will help inform the design and/or interpretation of the Yellowknife Bay AEMP?	The study will occur over several years while the ETP is in operation (before the YAEMP for Yellowknife Bay applies); frequency and duration depends on component. Yes, the purpose of the study is to characterize existing conditions and thus further inform development of the study design for the detailed AEMP Design Plan for Yellowknife Bay.
23	R. Walbourne, WRD	Special Study	Section 7.8.1	Will final plan and details (e.g. sampling locations) on the special study be provided for review prior to implementation? The results of this study will be beneficial in establishing a more robust yet focused AEMP. This could reduce long term costs.	Data collection to support implementation of this Special Study is currently underway. The 2017 water quality results were presented in the 2017 Surface Water Quantity and Quality Monitoring Results at Gaint Mine, 2017. The 2018 data will be summarized in the 2018 Report (due early 2019). Information from these sampling events will help inform on-going implementation of the Yellowknife Bay Special Study.
24	R. Walbourne, WRD	Weight of Evidence	Section 7.9	When will rankings for WOE be determined? Will this be a part of the final report interpretation? How will WOE inform adaptive management or management response? Note sometimes an individual metric requires a response even though the WOE suggests that the issue may be isolated.	<p>The rankings will be developed as outlined in Section 7.9 and visually depicted in Figure 7-3. The rankings are expected to be determined following collection of the first year of data under the AEMP.</p> <p>As described in Section 7.9.3.4, the WOE assessment describes potential linkages from exposure to observed biological differences and changes in Baker Creek, and actively supports decision-making in the AEMP Response Framework, which sets specific levels of acceptable/unacceptable effects or effects with respect to the ecological function of Baker Creek. Therefore, the WOE informs adaptive management or management response through the AEMP response framework.</p>
25	R. Walbourne, WRD	Action Levels	Section 8.3.1	WRD agrees that the project site is already significantly different than reference as per the EEM results noted throughout the report. However, we are concerned about linking action levels for water quality to 5-year average water quality data. This may be appropriate or it may not depending on the nature of activities and the variability in results in the 5-year period selected for the comparison. Can the GMRT further rationalize this approach? Have any alternate approaches been considered such as statistical differences between years (e.g. last year to this year, percentile comparisons, etc.)?	Yes, other approaches were considered in the development of the Baker Creek AEMP; however, a comparison to a longer term dataset was preferred over year-to-year comparisons. Regional influences can cause short-term differences in water quality, so the intent was to trigger if the results were different than average conditions.

#	Reviewer	Topic	Reference	Comment	Response
26	R. Walbourne, WRD	Action Levels	Sections 8.3.2 and 8.2.3	Table 8-1 notes that fish and benthic will be compared to reference areas. Is there a potential that these are already different as a result of contamination observed as part of the EEM? Could these differences be the result of natural variability versus directly the result of contamination? Similar to the above, have alternate approaches been considered to compare or assess the fish or benthic data?	The Phase 5 IOC-EEM Study concluded that contaminants present in the exposure area were likely responsible for the observed effects on fish and benthos in the previous EEM cycles. However, habitat differences between reference and exposure areas could not be ruled out as a potential confounding factor.  Alternative approaches have been considered and artificial substrates for benthos were incorporated into the program. Other monitoring approaches such as mesocosms (on site laboratory studies) were previously considered to detect the effects of effluent, but at that time the logistics and security at the Site precluded implementation.
27	R. Walbourne, WRD	Actions	Table 8-1	One of the response actions is listed as "set water quality objectives." WRD notes that SSWQOs have already been proposed in the EQC Report and will be approved by the Board when determining EQCs. This should be revised. Perhaps reassessing WQOs is something that could be triggered but again the EQC will likely be set to ensure existing SSWQOs are maintained.	Noted, this has been removed as an action from Table 8-1.
28	R. Walbourne, WRD	Arsenic levels in effluent	Table A-2	Arsenic levels in the table outlining historic monitoring data are very close to new MDMER limit of 0.3 mg/L. Is there any potential that MDMER will not be met for arsenic?	The GMRP meets the limit of 0.5 mg/L arsenic in the MDMER that is currently applicable to the ETP. The GMRP will be required to meet the MDMER limit of 0.3 mg/L arsenic when the water licence comes into effect, otherwise the GMRP will have to meet 0.3 mg/L in 2021 according to the MDMER.
29	R. Walbourne, WRD	Chronic Toxicity	Figures A31-24	These figures are confusing. It looks like 20-30% effluent is often having IC50 effects for all species? Can GMRT confirm or elaborate on these results? Perhaps it is in the text but we are not following.	Reviewer interpretation is correct - sublethal effects have been observed on the treated effluent dilution series.
30	R. Walbourne, WRD	Fish Program	N/A	Large-bodied fish are being excluded from the AEMP, but we understand that there is a separate community-based fisheries program being developed. It would be worth mentioning this in your design section with some additional information. Or if design is not final, note that it will be designed through engagement with locals IGOs. GMRT should include an estimated time of commencement and other information that may be relevant.	Text added to the Yellowknife Bay Special Study section clarifying this.
31	R. Walbourne, WRD	Editorial	N/A	5.6.1.4 - open parenthesis starting with Tartan Rapids but does not close. 7.2.5 - open parenthesis in Line 5	Addressed.

Notes: WRD = Water Resources Division; CRP = Closure and Reclamation Plan (CIRNAC and GNWT 2019a); Yellowknife Bay AEMP = Conceptual Aquatic Effects Monitoring Program Design Plan for Yellowknife Bay (CIRNAC and GNWT 2019b); Baker Creek AEMP = Aquatic Effects Monitoring Program Design Plan for Baker Creek (CIRNAC and GNWT 2019c); EQC Report (CIRNAC and GNWT 2018); Baker Creek 2011 Assessment Report (Golder 2013); Phase 5 IOC-EEM = Phase 5 Investigation of Cause Environmental Effects Monitoring Study (Golder 2017); ETP = existing Effluent Treatment Plant.

(a) This plan was reviewed in draft prior to GMRP finalizing for public review and MVLWB submission.

January 31, 2011 from Golder to the Giant team titled "Final Update on Baker Creek Aquatic Studies - Fish and Fish Habitat Project"

Giant Mine Oversight Board - Comments on the Aquatic Effects Monitoring Program Design Plans for Baker Creek and Yellowknife Bay  
Submitted to the GMRP on October 28, 2018

Comment #	Reviewer	Topic	Reference	Comment	Response
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					
1	GMOB	General	N/A	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.	Text has been added to Section 7.8.1.6 (Yellowknife Bay Special Study) of the AEMP for Baker Creek describing a large-bodied fish study to be included as part of future community-based monitoring.
2	GMOB	General	N/A	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.	This plan will be reviewed based on the outcomes of the QRA process to incorporate information as applicable.
3	GMOB	General	N/A	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?	The Measures related to Baker Creek do not apply until active remediation of the Site is complete. That is the most appropriate time period to consider significance thresholds within the context of the AEMP for Baker Creek because conditions in the creek are expected to improve over time after remediation.  The AEMP places emphasis on effects being "linked to the GMRP" because the AEMP monitoring objectives are linked to the GMRP. The main purpose of the AEMPs for Baker Creek and Yellowknife Bay are to monitor for effects related to the GMRP that can then be controlled and addressed by the GMRP.  The nutrient enrichment hypothesis has been retained to allow for assessment of effects in relation to potential borrow.
4	GMOB	General	N/A	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.	Noted. Relevant text in the following the AEMP has been revised to provide some differentiation between these closure AEMP designs and other non-closure AEMP designs that have been more commonly reviewed by regulators, First Nations, and other stakeholder groups.

Notes: Yellowknife Bay AEMP = Conceptual Aquatic Effects Monitoring Program Design Plan for Yellowknife Bay (CIRNAC and GNWT 2019b); Baker Creek AEMP = Aquatic Effects Monitoring Program Design Plan for Baker Creek (CIRNAC and GNWT 2019c); QRA = Quantitative Risk Assessment.

(a) This plan was reviewed in draft prior to GMRP finalizing for public review and MVLWB submission.

Government of the Northwest Territories - Environment and Natural Resources - Water Resources Division - Comments on the Draft Water Management and Monitoring Plan<sup>(a)</sup>  
Submitted to the GMRP on January 25, 2019

Comment #	Reviewer	Topic	Reference	Comment	Response
1	Rick Walbourne, WMMD	Groundwater	1.2	The Plan differentiates surface water, groundwater and mine water. How is mine water different from groundwater in an underground mine? Does minewater capture both surface and groundwater? Please explain and clarify the text in this section.	The Giant Mine acts as a groundwater sink. The Project has differentiated between minewater, which is water that has infiltrated into the mine workings and collects in the mine pool, and groundwater, which is considered all water below ground surface outside of the mine workings.
2	Rick Walbourne, WMMD	GNWT Input	2.1.2	The Plan states that ENR staff provided input on air, wildlife and water. The GMRT should confirm that technical review was provided for air and wildlife for this plan. If not, reference should be corrected.	GNWT has provided input to many different management and monitoring plans including dust, air quality, wildlife, water, aquatic effects monitoring, waste and spill contingency. Clarification is provided in text.
3	Rick Walbourne, WMMD	Closure Objectives	2.3.2	Note: WMMD did not review closure objectives as part of this review.	Noted.
4	Rick Walbourne, WMMD	MDMER	3.1.1	The Plan states that water quality and discharge "do not allow" the mine to be granted "closed mine status". This implies that the mine is unable to apply for "closed mine status". Can GMRT comment as to whether it is in the best interest of the project to remain under MDMER? We are not suggesting an enormous amount of detail, just clarification if there are legal constraints to applying for closed status or not.	Currently, there is not a legal option for the Site to be granted "closed mine status", therefore, the GMRP can only comment that it is in the best interest of the GMRP to remain compliant with the law.
5	Rick Walbourne, WMMD	EQC	3.4.1	The Plan outlines that EQC are "proposed" as they won't be finalized until the Board issues the Water Licence. This is correct however it may be worth noting in the Plan that this section may require updating once the WL is finalized, this is one of the difficulties in finalizing plans before a WL is issued. As the WMMMP will be used as a management plan during operations, it will require the updated EQC once the WL is finalized.	Section regarding required review and updates has been included.
6	Rick Walbourne, WMMD	pH	3.4.1	The current pH EQC is 6.5-9 and the proposed WTP is 6.5-8. Can GMRT confirm this? I believe the MDMER limit is 6 - 9.5 so unclear if there is a reason why GMRT is more conservative?	The EQC Report provides more rationale for EQC than that presented in the Water Management and Monitoring Plan.
7	Rick Walbourne, WMMD	Sedimentation Pond	Table 3.4-4	Can GMRT clarify the locations of Sedimentation Pond as it related to Baker Creek? The design component says "Location" and the Design Criteria says "Before discharging to Baker Creek". These descriptions are not helpful at determining the exact location of the pond.	The exact locations or need of sedimentation ponds will be determined during future design stages, and are unknown at this time. Criteria are preliminary as indicated in the text.
8	Rick Walbourne, WMMD	Northwest Pond	Table 4.1-1	Can GMRT confirm the minimum freeboard at the Northwest Pond? Based on the table, minimum freeboard of 193.4 and operational levels of up to 192.9 indicates a 0.5m freeboard? Water Licences in the NWT typically have a required freeboards of 1.0m for tailings areas or other water/waste storage areas. Specific engineered and or technical rationale is required for requesting a freeboard of lower than 1.0 m.	Freeboard is confirmed. The historical data provided by Det'on Cho/Nuna Joint Venture show a few instances where water levels were within less than 1 m of the dam crest.
9	Rick Walbourne, WMMD	Figures	Figure 4.2-	If possible, should consider updating maps and figures to include new highway alignment similar to Figure 5.1-1 and others.	This can be considered for future versions of the plan.
10	Rick Walbourne, WMMD	Sludge	4.3.2	A by-product of the treatment process is amorphous ferric precipitates which settles out as a sludge in the Settling Pond. Can GMRT clarify how this by-product is handled and disposed? Will there be any changes to the handling of this waste stream with the new ETP?	Sludge remains in the Settling and Polishing ponds. In 2015, an area of the Settling Pond was excavated below a certain elevation, and relocated within the Settling Pond to a higher elevation within the pond.  Sludge generated from the new water treatment plant will be dewatered to ~18% solids and disposed of in the on-site non-hazardous waste landfill. Chemical testing is on-going to confirm the dewatered sludge will meet regulatory requirements for disposal in the on-site non-hazardous waste landfill.
11	Rick Walbourne, WMMD	Settling Pond	4.3.3	The freeboard water level (174.6m) appears to be lower than the historic water levels of the pond (maximum 175.5m). This cannot be the case as the historic water level would overtop the facility. Can GMRT provide additional context or explain?	This is explained in the text in Section 4.3.3: "The current specification is lower than historical specifications due to structural considerations at Dam 1." Freeboard specifications were historically higher than what they are now.
12	Rick Walbourne, WMMD	Baker Pond	Table 5.1.3	Post-Remediation Configuration references a Baker Wetland which was formerly Baker Pond. Can GMRT clarify the extent of work that is being proposed for Baker Pond? 5.5.5.1 references the eastern portion of the Pond, is this limited to the historic tailings that are located there? Previous reports have identified Baker Pond as overwintering habitat for whitefish and cisco so there may be implications of converting this pond into a wetland. Has this been discussed/described further under the closure plan?	The contaminated sediment in Baker Pond will be removed and the pond will be backfilled; however, the final remediated state of this area is still under design. A wetland is one option. The final design of remediated Baker Creek including Baker Pond will require authorization from DFO under the federal Fisheries Act. GMRP has briefed DFO at a conceptual level on the plans to remediate Baker Creek and plans to continue to engage with DFO. The GMRP will also be engaging with other affected parties on the design of Baker Creek including Baker Pond.
13	Rick Walbourne, WMMD	Crossings	General	I haven't seen a lot of references to any work on culverts or bridges such as the Baker Creek culvert at the old highway which I believe needs upgrading. Water course crossings are an important component of water management. Is this work separate from this Plan and/or will it be covered under more detailed plans related to Baker Creek remediation?	Design of surface water management features including culverts and any short-term sedimentation ponds or other temporary water management ponds is underway. Details will be submitted in Design and Construction Plan(s) for MVLWB approval. These Design and Construction Plans will include monitoring requirements.
14	Rick Walbourne, WMMD	Temporary Water Management Pond	5.1.4	Is there any additional information on the referenced water management pond? Would GMRT anticipate that a WL amendment would be required for changes, modifications or locations of the Water Management Pond?	Design of surface water management features including culverts and any short-term sedimentation ponds or other temporary water management ponds is underway. Details will be submitted in Design and Construction Plan(s) for MVLWB approval. These Design and Construction Plans will include monitoring requirements.
15	Rick Walbourne, WMMD	Baker Creek	5.1.5	Water management details for Baker Creek are fairly high level, will specific water management details associated with temporary diversion be finalized at a later date through specific plans. Will other authorizations be required, e.g. <i>Fisheries Act</i> ?	It is anticipated that authorization under the federal Fisheries Act will be required for the work on the Foreshore Tailings Cover, the remediation of nearshore sediments at the Townsite, the installation of the WTP outfall and freshwater intake, and the remediation of Baker Creek.
16	Rick Walbourne, WMMD	AEMP, EQC, SSWQO	General	Note, WMMD did not provide comment on the AEMP or any reference to EQCs, SSWQO and water treatment within this Plan as comments were previously provided specific to those plans.	Noted.
17	Rick Walbourne, WMMD	Non-Hazardous Waste Landfill	5.3	Are there any details on the proposed landfill in any other plans? There will likely be water management and sampling requirements associated with this facility dependent on the size and location.	Water management and monitoring associated with the non-hazardous waste landfill will be presented in the Landfill Design and Construction Plan. The Water Management and Monitoring Plan will be subsequently updated once the Landfill Design and Construction Plan has been approved by the MVLWB.

Comment #	Reviewer	Topic	Reference	Comment	Response
18	Rick Walbourne, WMMD	Water Intake	5.5	Section 5.5 notes that a water intake may be required in Yellowknife Bay. Should this be required at a later date, separate reviews may be required. The GMRT should ensure Yellowknife Bay is included as a water source in the WL application if this is a proposed option, otherwise a WL amendment would be required in the future. Does the GMRT have an idea of where, how and how much water would be potentially sourced from YK Bay?	Please see the proposed Water Licence submitted as part of the Water Licence application package. The GMRP has identified Yellowknife Bay as a source of freshwater and provided estimated volume requirements.
19	Rick Walbourne, WMMD	Water Balance	7	It is noted that the water balance will be included in the plan following finalization of the EQC Report. WRD agrees that water balance information should be included in this plan but then this plan may once again require approval.	Noted.
20	Rick Walbourne, WMMD	Baker Creek Inspections	8.1.2	There is reference to a Baker Creek Monitoring Checklist and Inspection Sheet. It may be worth including this as an appendix for information of reviewers.	The inspection sheet is forthcoming and will be available upon the next re-issuance of the Water Management and Monitoring Plan.
21	Rick Walbourne, WMMD	Water Licence Reporting	10.1	Just a flag that this will have to be updated in future when the requirements of the new WL are finalized.	Noted.
22	Rick Walbourne, WMMD		Figure D-5	Figure D-5 shows polishing pond water directed to Baker Pond and water from the WTP to the YK Bay simultaneously. Can GMRT confirm this scenario is planned for the same time period? I assume this will be a brief window while the new plant is becoming operational? Or is this only a potential occurrence when the current WTP is maintained as a contingency?	The arrow from the polishing pond to Baker Creek in the referenced figure is meant to indicate local runoff from the small catchment area around the Polishing Pond, if any (this transition occurs during the fall 2026 at the start of frozen conditions), prior to initiating remediation of the two ponds in 2027. These drainage patterns are similar to current conditions (i.e. local runoff from the Settling and Polishing Pond drainage areas is conveyed to Baker Creek). The CRP does not include a time-period in which two water treatment plants are discharging to the receiving environment simultaneously.

Notes: CRP = Closure and Reclamation Plan (CIRNAC and GNWT 2019a); EQC Report (CIRNAC and GNWT 2018); DFO = Fisheries and Oceans Canada; WTP = future Water Treatment Plant; MVLWB = Mackenzie Valley Land and Water Board.

(a) This plan was reviewed in draft prior to GMRP finalizing for public review and MVLWB submission.

Government of the Northwest Territories - Environment and Natural Resources - Wildlife Division- Comments on the Draft Wildlife and Wildlife Habitat Management and Monitoring Plan

Submitted to the GMRT on September 21, 2018

Comment #	Reviewer	Topic	Reference	Comment	GMRP response
1	Wildlife Division	Sumps	Section 2.1	It is noted that contaminated water from contact with tailings and pit covers will be collected in sumps. How will wildlife be prevented from coming into contact with sumps? Will there be any physical barriers and/or auditory/visual deterrents? Where will these sumps be located?	Section 3 describes how the HHERA does not indicate that contact with water management ponds is a specific concern. Monitoring is proposed to document wildlife use of the water management areas (which is infrequent) and the water management areas as part of the Operational Monitoring Program (OMP) and Surveillance Network Program (SNP). Potential hazards will be reduced as part of the GMRP implementation.
2	Wildlife Division	Species of Concern	Section 2.8, Table 2	Barren-ground caribou have been assessed by the NWT SARC and COSEWIC as threatened. Although the Bathurst caribou range overlaps with project, they have not been seen in this area in quite some time.	Although barren-ground caribou have been present in the Yellowknife region, the GMRP is not anticipating barren-ground caribou at site. If some do pass through or close to the site, it would be documented in the wildlife log and will be added to Table 2 of the WWHMMP as part of the regular update process.
3	Wildlife Division	Species of Concern	Section 2.8, Table 2	Please add Evening Grosbeak - Special Concern as of 2016.	Added.
4	Wildlife Division	Species of Concern	Section 2.8, Table 2	Please add Harris's Sparrow - Special Concern as of 2017.	Added.
5	Wildlife Division	Exposure to Contaminants	Section 4.3.3, page 4-4	Is there a map or list of Project areas considered to contain elevated levels of arsenic or other substances/contaminants of potential concern?	The CRP describes in detail the areas of site that will be remediated due to elevated levels of arsenic. As well, areas of particular concern are included in the Site Surveillance protocol (Appendix B) of the WWHMMP. This will be updated as part of the regular updating of the WWHMMP.
6	Wildlife Division	Monitoring - Site Surveillance	Section 5, Table 4	What type of Site Surveillance will be done for exposure to contaminants? Can remote cameras be used?	As described above, the HHERA indicated that risk to terrestrial wildlife is limited. Small mammal trapping is planned for 2019/20 to develop a baseline against which future data can be compared. Remote cameras will be considered to support wildlife monitoring on the Site at Giant Mine. Any areas of particular concern will be included in the Site Surveillance protocol (Appendix B of the WWHMMP).
7	Wildlife Division	Monitoring - Site Surveillance	Section 5.2	Please submit wildlife sighting logs and bird nest surveys to ENR's WMIS.	It can be submitted upon request, but ENR should review the data first as it is unlikely to be useful.
8	Wildlife Division	Monitoring - Site Surveillance	Section 5.2.2, Methods	Having Environment Monitors undertake systematic tours of the Project site to record all wildlife observations or recent wildlife signs at pre-determined stations may be insufficient to detect problems reliably. Where there are sites of elevated contamination risk, systematic tours should be supplemented with trail cameras. This will capture wildlife observations during times when no one is around. Camera results should be viewed weekly.	See response to GNWT-ENR-WD Comment #6.
9	Wildlife Division	Monitoring - Site Surveillance	Section 5.2.2, Methods	More information needed here. Provide a detailed list of sites that will be surveyed and map with the locations of the survey sites.	Areas of heightened risk to wildlife to be included in the Site Surveillance will change as the surface remediation progresses. Thus, the methods and list of sites to visit belongs in the associated Protocol (Appendix B of the WWHMMP), where it can be updated as required.
10	Wildlife Division	Pre-Blast Surveys	Section 5.4	Make the rationale section more general to wildlife. It should apply to birds as well, and basically any species protected by territorial and federal legislation. Recognize that smaller wildlife will be hard to see and there's not much that can be done.  The pre-blast survey protocol in Appendix B is appropriate and does not limit the scope to large mammals.	Pre-blast surveys are included here as a precautionary measure, but are not standard practice at other quarries. It is reasonable for environmental monitors to detect and record large mammals at the time of the survey, but it is not reasonable to expect detection of all wildlife (i.e., small mammals) during the survey. It should be noted also that this blasting will be limited in scope and duration, and will be preceded by significant activity (such as the presence of vehicles, excavators and drills), likely deterring wildlife from the area before the blast. Normal blasting procedures will be in place as required by regulations for the safety of workers and staff in the area.
11	Wildlife Division	Wildlife Incident Reporting - Vehicle Collisions	Section 5.5.1 Commitment Table - Traffic management Plan	Vehicle collisions with wildlife need to be reported to ENR and should be added to section 5.5.1.	Wildlife incidents will include any and all instances of wildlife injury, mortality or wildlife in hazardous areas. This includes vehicle collisions. Considering that the speed limit on the Site is 25 km/h or less for the majority of site, vehicle collisions are anticipated to be extremely rare.
12	Wildlife Division	Bear Incident Reporting	Section 5.5.2 and Appendix C	Please review the attached Wildlife Incident Reporting documents and Bear Occurrence Procedures Manual and incorporate them into the WWHMMP as appropriate. Please note that the old Wildlife Act is referenced in these documents but the content is still applicable.  ENR notes that the Wildlife Incident Report form in Appendix B already utilizes (for the most part) the Wildlife Incident Reporting Form being provided.	Noted.
13	Wildlife Division	Reporting	Section 6.1.2	The submission of "observations of recreational, traditional, or non-traditional activities near the Project" should be made more specific to wildlife.	This information is intended as co-variate data to explain any possible trends observed in wildlife presence.
14	Wildlife Division	Reporting	Section 6.1.2	ENR recommends that Annual Reports also provide an update on existing hazards to wildlife that have been removed, remediated, restored, etc. It would provide information on some of the positive outcomes of the remediation activities from the perspective of wildlife.	This information will be provided through the updated CRP and Annual Water Licence reports.
15	Wildlife Division	Commitments - Inputs from TK Holders	Table A-1	Have traditional knowledge holders been invited to review the WMMP?	The draft WWHMMP was posted as part of the public pre-engagement process in July 2018.
16	Wildlife Division	Commitments - Document beaver activity upstream of the Project.	Table A-1	Please provide details on these monitoring locations and survey methods.	Beaver activity will be monitored through the Water Management and Monitoring Plan and logged as part of the WWHMMP.
17	Wildlife Division	Wildlife Sightings Log Protocol	Appendix B	The Wildlife Sightings Log Protocol probably needs to be narrowed down to a list of relevant species to record. If it's too broad people will not know when there is something out of the ordinary that they should report.	It has been decided to leave the list of species to be documented open, as it has been determined it is better to have too many observations than too few because people are not sure what is and what is not reportable. The Wildlife Sighting Log will be reviewed weekly by the environmental monitors, who are in the best position to decide what is out of the ordinary. Based on a regular review of the logs and the findings, the recommendation to narrow down the list of recordable species will be considered.

Comment #	Reviewer	Topic	Reference	Comment	GMRP response
18	Wildlife Division	Site Surveillance Protocol	Appendix B, Section 2.4	Water management ponds would be a good place to install trail cameras to improve site surveillance, as would project locations or areas considered to contain elevated levels of arsenic or other substances/contaminants of potential concern.	See response to GNWT-ENR-WD Comment #6.
19	Wildlife Division	Site Surveillance Protocol	Appendix B, Section 2.5	The reporting section should include a list of the relevant species.	See reponse to GNWT-ENR-WD Comment #17.
20	Wildlife Division	Bird Nest Monitoring Protocol	Appendix B, Section 3.2	The list of avian species at risk should be updated to include Evening Grosbeak and Harris's Sparrow.	GNWT comment has been reflected in the WWHMMP.
21	Wildlife Division	Bird Nest Monitoring Protocol	Appendix B, Section 3.4	Any area where vegetation clearing may occur during the nesting season should be added to the locations for systematic monitoring.	Primary mitigation is to avoid clearing vegetation during the nesting season. If this is unavoidable, GNWT-ENR and ECCC will be contacted to develop a stand-alone plan, which may or may not include adding the area to the list of sites included in the Site Surveillance.
F	Wildlife Division	Bird Nest Monitoring Protocol	Appendix B, Section 3.5	The document states "Any bird nesting observed during the survey should immediately be brought to the attention of Environmental Manager so that appropriate action can be taken." Provide a description of what the appropriate action will be, or if it will be determined on a case-by-case basis, describe who will be contacted to determine the appropriate action (assume it's ENR or CWS), and what action will be taken in the interim until the appropriate action is determined.  For example, the immediate action could be to stop activities within an area around the nest that is sufficiently large enough to prevent flushing adults form the nest.	Further direction for the Environmental Manager has been added to Section 3.2.
23	Wildlife Division	<i>Wildlife Act</i> reference	Appendix B, Section 5	The Wildlife Incident Reporting Protocol references the old Wildlife Act. Please update this reference, and all others, in the Plan to the correct sections of the current <i>Wildlife Act</i> that came into force in 2014.	Correction made.
24	CAM Division	Editorial	Page iii	Change "Ac" to "Act" for the definition of MBCA.	Correction made.
25	CAM Division	Editorial	Page 4-5	Migratory Bird Convention Act should be in italics.	Correction made.

Notes: CRP = Closure and Reclamation Plan (CIRNAC and GNWT 2019a); HHERA = Human Health and Ecological Risk Assessment (CanNorth 2018); Water Management and Monitoring Plan (CIRNAC and GNWT 2019c); WWHMMP = Wildlife and Wildlife Habitat Management and Monitoring Plan (CIRNAC and GNWT 2019d); GNWT-ENR = Government of the Northwest Territories-Environment and Natural Resources; ECCC = Environment and Climate Change Canada.

(a) This plan was reviewed in draft prior to GMRP finalizing for public review and MVLWB submission.

ENR-GNWT Comments on the Giant Mine Remediation Project Draft Erosion and Sediment Management Plan

Submitted to the GMRT on January 25, 2019

Comment #	Reviewer	Topic	Reference	Comment	GMRP Responses
1	Rick Walbourne, WMMD	Editorial	1.2	Extra bullet should be removed.	GNWT comment has been reflected in the Erosion and Sediment Management and Monitoring Plan.
2	Rick Walbourne, WMMD	Phase 1	1.2.1	Is Baker Creek being considered a potential erosion source in its existing condition, e.g. potential erosion during ice jams or storm events? If not, why not?	Baker Creek is being considered as a potential erosion source in its existing condition. The Erosion and Sediment Management and Monitoring Plan has been revised to include activities such as freshet, ice jams and beaver dams. Additional details regarding hydrology monitoring on site can be found in the Water Management and Monitoring Plan (Section 8.2). Baker Creek is monitored regularly throughout the year to identify and quantify surface flows, and operational monitoring of beaver activity (dams) and icing development on Baker Creek to avoid surface and over-ice flooding. Additional details have been included in Section 3.3.1 Inspection, Maintenance, and Repairs of the Erosion and Sediment Management and Monitoring Plan.
3	Rick Walbourne, WMMD	Regulatory Framework	1.5	Please note that the federal <i>NWT Waters Act</i> has been repealed and replaced with the <i>Waters Act</i> which is territorial. However, this Act would not apply in relation to the Giant Mine.	GNWT comment has been reflected in the Erosion and Sediment Management and Monitoring Plan.
4	Rick Walbourne, WMMD	Regulatory Framework	1.5	Line 4 under territorial just says "policy"	GNWT comment has been reflected in the Erosion and Sediment Management and Monitoring Plan.
5	Rick Walbourne, WMMD	Editorial	1.6	All plans are italicized with the exception of the Tailings MMP.	GNWT comment has been reflected in the Erosion and Sediment Management and Monitoring Plan.
6	Rick Walbourne, WMMD	Baker Creek	2.1	There is a reference to a historic peak discharge in Baker Creek in spring which comprised 76% of the annual stream flow in May-June and 8% in October-November. It goes on to say that there has been a recorded shift but there is no information on this shift in this document. I believe this shift was quantified in the Water MMP so if the information exists it should be included here as well.	Section 2.4 of the EQC Report provides additional details regarding the recorded shift in regional stream flow regime related to an increasing trend in September rainfall; <del>and</del> from 1997, the proportion of annual stream flow has changed to 50% in spring and 20% in fall/winter. The Erosion and Sediment Management and Monitoring Plan has been updated to include this information.
7	Rick Walbourne, WMMD	Editorial	2.2	4th paragraph "contaminates" should be "contaminants".	GNWT comment has been reflected in the Erosion and Sediment Management and Monitoring Plan.
8	Rick Walbourne, WMMD	Final Plans	2.2/4.0	It is referenced that detailed investigations on soil, permafrost and moisture content will be used to assist in development of detailed plans. Does GMRT anticipate that these will be made available for review via the regulatory process? These plans should identify specific measures to be implemented as well as locations of any sediment or erosion control measures.	Detailed investigations of soils, permafrost and moisture content will be included in Design and Construction Plans for activity-specific monitoring. Additionally, these Design and Construction Plans will also identify specific measures to be implemented as well as locations of sediment and erosion control measures.
9	Rick Walbourne, WMMD	Land Cover	2.4	First sentence following table 2-1 is grammatically incorrect and should be amended.	GNWT-ENR-WMMD comment has been reflected in the Erosion and Sediment Management and Monitoring Plan.
10	Rick Walbourne, WMMD	Scope of Activities	3	Similar to comments above, is Baker Creek considered as a sediment and erosion risk throughout care and maintenance? The description mentions "activities classified as care and maintenance" but there are risks associated with Baker Creek that are unrelated to "activities" such as freshet, ice jams, beaver dams, etc. It is unclear how these are being considered within this plan.	Baker Creek is being considered as a potential erosion source in its existing condition. The Erosion and Sediment Management and Monitoring Plan has been revised to include activities such as freshet, ice jams and beaver dams. Additional details regarding hydrology monitoring on site can be found in the Water Management and Monitoring Plan (Section 8.2). Baker Creek is monitored regularly throughout the year to identify and quantify surface flows, and operational monitoring of beaver activity (dams) and icing development on Baker Creek to avoid surface and over-ice flooding. Additional details have been included in Section 3.3.1 Inspection, Maintenance, and Repairs of the Erosion and Sediment Management and Monitoring Plan.
11	Rick Walbourne, WMMD	TSS/Turbidity Curves	3.3.1	The section states that TSS/Turbidity curves are completed for all activities. Is there additional information on these curves? How many samples are typically used to create these curves? Are they to be transferred between activities or different time periods? Note these curves are typically time and activity specific.	This section has been developed following TSS-turbidity curve development from Alberta Transportation, which suggests five data points should be obtained with readings below 15 NTU and at least five additional data points below 500 NTU. At least 20 samples (or more if needed) should be used in total to develop the linear relationship within the R <sup>2</sup> correlation coefficient of at least 85%.
12	Rick Walbourne, WMMD	Plan Update	4.1, 4.2.1	It is noted that the Plan will be updated when an erosion potential assessment has been completed. As well, 4.2.1 outlines information gathering that is required to complete the plan. Is there an anticipated timeline associated with these items?	This information will be provided in the first Erosion and Sediment Management and Monitoring Plan update, after completion of the water licensing process.
13	Rick Walbourne, WMMD	GNWT-INF	4.2	Reference to GNWT- DOT which is now named INF.	GNWT-ENR-WMMD comment has been reflected in the Erosion and Sediment Management and Monitoring Plan.
14	Rick Walbourne, WMMD	Communications	4.2	I found Section 4.2 fairly challenging and difficult to decipher based on the way it was organized and presented. As detailed plans will be developed for each activity, they should be clearer and easier to follow.	Noted for subsequent versions of the Erosion and Sediment Management and Monitoring Plan.
15	Rick Walbourne, WMMD	Phase 2 Monitoring	4.3	The list provided are noted as "objectives and criteria" but they appear to be additional activities under the main headings. It is unclear how they relate to "objectives and criteria" and thus what the actual "objectives and criteria" are.	The list provided is in fact closure activities that relate to applicable closure criteria and objectives in the CRP. The Erosion and Sediment Management and Monitoring Plan has been updated to include new wording in this section and also references to the CRP and applicable closure objectives and criteria as they relate to the listed closure activities.
16	Rick Walbourne, WMMD	Post-Closure Monitoring and Maintenance Plan (PCMMP)	5	It is noted that the PCMMP is required to be submitted prior to entering a state of post-closure. PCMMP are typically part of a final closure and reclamation plan. Does GMRT anticipate that the WL would include a "requirement" such as this?	The PCMMP is required to be submitted prior to entering a state of post-closure.

Comment #	Reviewer	Topic	Reference	Comment	GMRP Responses
17	Rick Walbourne, WMMD	Sources of Erosion and Sediment	5.1	Several items listed under "Sources of Erosion and Sediment" appear to be mostly related to pathways for recontamination such as leaching of contaminants into Baker Creek or arsenic loading from Trapper Creek and Upper Baker Creek into lower Baker. To be clear, erosion and leaching are separate processes. Several concerns noted in this section appear to be related to water and contaminant transfer only, not erosional. Changes or edits to this section should occur.	The Erosion and Sediment Management and Monitoring Plan has been revised to exclude these from Section 5.1 as they are captured in greater detail in the Water Management and Monitoring Plan.
18	Rick Walbourne, WMMD	Phase 3 Monitoring	5.2	The details provided in Section 5.2 are overarching as they relate to post-closure monitoring and not specific to sediment and erosion issues. Clear linkages should be included for how general site-wide monitoring will be related to the sediment and erosion plan. Perhaps, the proposed sediment and erosion monitoring will be part of the post-closure monitoring program.	The PCMMP will include site-wide and activity specific monitoring as it related to erosion and sediment management.
19	Rick Walbourne, WMMD	Risk Scenarios	6	It is unclear if beaver dams or ice jams are included here. Please clarify if they will be included in natural events under "Flooding of Baker Creek".	Section 6.0 of the Erosion and Sediment Management and Monitoring Plan has been revised to include additional details regarding contingencies specific to erosion and sediment management and monitoring. Appendix E also includes a table of contingencies specific to sediment and erosion. These scenarios and corresponding action levels and responses are currently in draft form. Updated contingency scenarios will be provided with an updated Erosion and Sediment Management and Monitoring Plan after issuance of the Water Licence.
20	Rick Walbourne, WMMD	References	Section 8 and Appendix C	Both Section 8 and Appendix C are labeled "References", please clarify.	GNWT -ENR-WMMD comment has been reflected in the Erosion and Sediment Management and Monitoring Plan.
21	Rick Walbourne, WMMD	Appendices	-	There are 2 Appendix "C"s, please correct.	GNWT- ENR-WMMD comment has been reflected in the Erosion and Sediment Management and Monitoring Plan.

Notes: CRP = Closure and Reclamation Plan (CIRNAC and GNWT 2019a); HHERA = Human Health and Ecological Risk Assessment (CanNorth 2018); Water Management and Monitoring Plan (CIRNAC and GNWT 2019c); Erosion and Sediment Management and Monitoring Plan (CIRNAC and GNWT 2019e); EQC Report (CIRNAC and GNWT 2018); GWNT-ENR = Government of the Northwest Territories-Environment and Natural Resources; ECCC = Environment and Climate Change Canada.

(a) This plan was reviewed in draft prior to GMRP finalizing for public review and MVLWB submission.

Government of the Northwest Territories - Environment and Natural Resources - Environment Division - Comments on the Draft Waste Management and Monitoring Plan and Draft Spill Contingency Plan<sup>(a)</sup>  
 Submitted to the GMRP on January 25, 2019

Comment #	Reviewer	Topic	Reference	Comment	GMRP Responses
<b>Waste Management and Monitoring Plan</b>					
1	GNWT, Department of Environment and Natural Resources, Environmental Protection and Waste Management Division	Asbestos waste	Collection and disposal of all non-hazardous infrastructure wastes, including double bagged asbestos waste, in the constructed on-site Non-Hazardous Waste Landfill (CRP Section 5.9 and 5.10)	Once all wastes are deposited in the landfill, this section of the landfill will be covered permanently.	Agreed, this is reflected in the Waste Management and Monitoring Plan
2	GNWT, Department of Environment and Natural Resources, Environmental Protection and Waste Management Division	Asbestos waste	Asbestos must be disposed of in a way that conforms to section 3.5 of the Guideline for the Management of Waste Asbestos. Asbestos should be buried in a manner that ensures the bags are not punctured.	Asbestos should be buried immediately when added to the landfill.	Agreed, this is reflected in the Waste Management and Monitoring Plan
<b>Spill Contingency Plan</b>					
3	GNWT, Department of Environment and Natural Resources, Environmental Protection and Waste Management Division	n/a	n/a	No comments at this time.	n/a

(a) These plans was reviewed in draft prior to GMRP finalizing for public review and MVLWB submission.

#### References

- CIRNAC and GNWT (Crown-Indigenous Relations and Northern Affairs Canada and Government of the Northwest Territories). 2018. Effluent Quality Criteria Report for Giant Mine. Prepared for The Mackenzie Valley Land and Water Board, Yellowknife, NT, Canada. December 2018.
- CIRNAC and GNWT. 2019a. Giant Mine Remediation Project - Closure and Reclamation Plan.
- CIRNAC and GNWT. 2019b. Conceptual Aquatic Effects Monitoring Program Design Plan- Yellowknife Bay.
- CIRNAC and GNWT. 2019c. Aquatic Effects Monitoring Design Plan - Baker Creek.
- CIRNAC and GNWT. 2019c. Giant Mine Remediation Project - Water Management and Monitoring Plan.
- CIRNAC and GNWT. 2019d. Giant Mine Remediation Project - Wildlife and Wildlife Habitat Management and Monitoring Plan.
- CIRNAC and GNWT. 2019e. Giant Mine Remediation Project - Erosion and Sediment Management and Monitoring Plan.
- EC. 2012. Metal Mining Technical Guidance for Environmental Effects Monitoring Document. Ottawa, ON, Canada.
- Golder. 2013. Giant Mine Remediation Project (GMRP): 2011 Baker Creek Assessment, Giant Mine, Yellowknife, NWT. Submitted to Public Works and Government Services Canada, Yellowknife, NWT, Canada.
- Golder. 2017a. Giant Mine Environmental Effects Monitoring Phase 5 Final Interpretative Report. Prepared for Indigenous and Northern Affairs Canada – Giant Mine Remediation Project, Yellowknife, NWT, Canada. 108p. + appendices.
- Golder. 2017b. Surface Water Quantity and Quality Monitoring Results at Giant Mine, 2017
- Stantec (Stantec Inc). 2014. Technical Data Report for the Yellowknife Bay Baseline Studies, Volume 1: Aquatics. Final Report. Prepared for Public Works and Government Services Canada, Edmonton, AB, Canada, 641 pp.