Review Comment Table

Board:	MVLWB
Review Item:	DIAND-GIANT - Management Plans Group 2 (Water) â€“ MV2019X0007 and MV2007L8-0031 (6 of 7)
File(s):	MV2007L8-0031 MV2019X0007
Proponent:	DIAND - GIANT
Document(s):	Aquatic Effects Monitoring Program Design Plan - Baker Creek (9.11 MB) Effluent Quality Criteria Report (45.33 MB) Effluent Quality Criteria Report - Attachments (1.96 MB) Standard Operating Procedures for Effluent and Water Sampling - Part 1 (2.86 MB) Standard Operating Procedures for Effluent and Water Sampling - Part 2 (13.12 MB) Water Management and Monitoring Plan (12.57 MB) Conceptual Aquatic Effects Monitoring Program Design Plan - YK Bay (4.36 MB) Technical Session Presentations (20 MB) Technical Session Agenda (5 MB) Technical Session Agenda Update (5 MB)
Item For Review Distributed On:	Apr 10 at 13:35 Distribution List
Reviewer Comments Due By:	May 30, 2019
Proponent Responses Due By:	June 25, 2019
Item Description:	This is Review item number 6 of 7 associated with the Giant Mine Remediation Project. On April 8, 2019, an e-mail was distributed to the Giant Mine distribution list which provided a detailed explanation of the Online Review System (ORS) plan for the Giant Mine Remediation Project. If you did not receive an e-mail or require additional information, please contact Board staff identified below. **Instructions** The Giant Mine Remediation Team (GMRT) submitted Version 1.0 of the following plans: Water

	Management and Monitoring Plan, Aquatic Effects Monitoring Program Design Plan – Baker Creek, Conceptual Aquatic Effects and Monitoring Design Plan – Yellowknife Bay, Effluent Quality Criteria Report, and Standard Operating Procedures for Effluent and Water Sampling as part of its Post-EA Information Package on April 1, 2019. Reviewers are invited to submit comments, and recommendations using the Online Review System (ORS) by the review comment deadline specified below. If reviewers seek clarification on the submission, they are encouraged to correspond directly with the proponent prior to submitting comments and recommendations. Reviewers may also wish to consider providing an overarching recommendation regarding whether the Board should approve the submission, to provide context for the comments and recommendations and assist the Board with its decision. Please provide comments and recommendations on the following components of the Post-EA Information Package including: • Water Management and Monitoring Plan; • Aquatic Effects Monitoring Program Design Plan – Baker Creek; • Conceptual Aquatic Effects and Monitoring Design Plan – Yellowknife Bay; • Effluent Quality Criteria Report; and • Standard Operating Procedures for Effluent and Water Sampling. When providing comments on a specific Plan, Program, or Report, please identify the document and the Section (if applicable) in the 'Topic' line. Board staff would also like to note that further supporting documentation can be found in ORS reviews: • DIAND-GIANT - Land Use Permit Application – MV2019X0007 (1 of 7) • DIAND-GIANT - Water Licence Post-EA Information Package – MV2007L8-0031 (2 of 7) • DIAND-GIANT - Management Plans Group 1 (Standard) – MV2019X0007 and MV2007L8-0031 (3 of 7) • DIAND-GIANT - Preliminary Screening Information – MV2019X0007 and MV2007L8-0031 (4 of 7)

	• DIAND-GIANT - Closure and Reclamation Plan – MV2019X0007 and MV2007L8-0031 (5 of 7) • DIAND-GIANT - Management Plans Group 3 (Other) – MV2019X0007 and MV2007L8-0031 (7 of 7) The documents that have been uploaded to this review are also available on our public Registry. If you have any questions or comments about the ORS or this review, please contact Board staff identified below: Shannon Allerston 867-766-7465 sallerston@mvlwb.com Tyree Mullaney 867-766-7464 tyree@mvlwb.com Kimberley Murray 867-766-7458 kmurray@mvlwb.com
General Reviewer Information:	The following organization has received this review by fax: NWT Metis Nation Tim Heron NWTMN IMA Coordinator (867) 872-3586
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Comment Summary

DIAND - GIANT (Proponent)				
ID	**Topic**	**Reviewer Comment/Recommendation**	**Proponent Response**	**Board Staff Response**
1	General File	**Comment** (doc) ORS 6 - Attachment 1 - Supplemental Information Responding to ECCC #26 **Recommendation**		
2	General File	**Comment** (doc) ORS 6 - Attachment 2 - Supplemental Information		

		Responding to ECCC #29 **Recommendation**		
3	General File	**Comment** (doc) ORS 6 - Attachment 3 - Giant Mine Reference Area Memo - GMOB 47 **Recommendation**		
4	General File	**Comment** (doc) ORS 6 - Attachment 4 - Calculation of Effluent Quality Criteria - MVLWB 35 **Recommendation**		
5	General File	**Comment** (doc) ORS 6 - Attachment 5 - GMRP Climate Change Review Memo **Recommendation**		
City of Yellowknife: Kerry Penney				
ID	**Topic**	**Reviewer Comment/Recommendation**	**Proponent Response**	**Board Staff Response**
1	Management and Monitoring Plans - Water, AEMP for Baker Creek and Yellowknife Bay, ECQ Report, SOP for Sampling	**Comment** The City has reviewed the comments from GMOB and the WG technical coordinator. The City supports their inclusion in the licensing process and looks forward to reviewing the responses **Recommendation** The City will review responses and consider the outcomes during the technical sessions. We ask the board to help ensure that the approach used is sufficiently protective of the environment to avoid degradation, that the sampling and monitoring is of the highest standard,	**June 25:** The GMRP is confident that the proposed EQC, AEMPs, and sampling programs are of the highest quality. These are thorough, well researched and documented reports and plans that have been revised based on Working Group comments and pre-engagement activities.	

		and the response framework is appropriately compelling to guarantee prompt action to any unpredicted or upset conditions		
Environment and Climate Change Canada: Eva Walker				
ID	**Topic**	**Reviewer Comment/Recommendation**	**Proponent Response**	**Board Staff Response**
1	General File	**Comment** (doc) ECCC Cover Letter **Recommendation**		
2	Baker Creek Effluent Quality Criteria Report 4.1.3 Model Assumptions (pdf page 52) Baker Creek Appendix C Table of Project Assumptions for Modelling (pdf page 188)	**Comment** The site water quality model does not account for loadings to Baker Creek from the contaminated sediments or loadings from sediment porewater flux from Baker Creek sediments to water downstream. However, it does mention the removal of sediments from Reaches 0 to 6 and replacement with clean granular fill. It is not clear, if this means sediments are considered to be free of contaminants for the purposes of the model, and/or if a pulse of contaminants associated with removal and stabilization has been considered. **Recommendation** Environment and Climate Change Canada (ECCC) recommends that the Giant Mine Remediation Team (the Proponent) provide a discussion of the effects of any contaminant mobilization associated with the sediment removal and to quantify any potential current	**June 25:** The GMRP did not calculate sediment loading, because the decision to remove sediments was not based on loading to surface water, but rather on sediment chemistry and toxicity to benthos and fish as well as surface design engagement. During remediation, sediments are proposed to be removed at times when water flow is low or absent in the creek (late fall, early winter) and no sediment contaminated loading to Baker Creek is expected. This is monitored Sediment and Erosion Control and construction monitoring plans.	

		sediment contaminant contributions if they are mobilized. ECCC also recommends that the Proponent provide a rationale for not including contaminant loadings from Baker Creek sediments, including from excavation of the sediments.		
3	Effluent Treatment and Testing Effluent Quality Criteria Report 6. Uncertainties Table 6-1 (pdf page 113)	**Comment** Variability in effluent treatment can be caused by variable water quality in the mine pool influent, and there is some uncertainty associated with this. The plans to address uncertainty state that "Testing will be conducted to further understand toxicity of ions at a range of concentrations." The Proponent should provide a discussion on which parameters testing will focus on, and how results will be used to manage the effluent treatment. **Recommendation** ECCC recommends that the Proponent provide details on proposed toxicity testing for major ions, including the purpose for including each of the ions in the testing.	**June 25:** Please refer to the response for MVLWB: Shannon Allerston #31.	
4	Yellowknife Bay Giant Mine Remediation Project - Conceptual Aquatic Effects	**Comment** On Page 10, Table 3-1 of the Conceptual Aquatic Effects Monitoring Program (AEMP) Design the interpretation of Environmental Assessment Measure 15 indicates arsenic in water and sediment will not	**June 25:** Present-day sediment concentrations near the proposed outfall will be updated through relevant available, recent sources including: a) Yellowknife Bay Baseline Special Study in the Baker	

	Monitoring Program (AEMP) Design Plan â€“ Yellowknife Bay January 2019	increase from "present day" concentrations as a result of Water Treatment Plant discharge. However, there is no discussion of how the "present day" concentrations of arsenic are to be quantified (i.e., which data are used for defining the benchmark for present day conditions). **Recommendation** ECCC recommends that the Proponent clarify how the sediment quality benchmark for Ã¢Â€Âœpresent dayÃ¢Â€Â conditions will be defined for the purpose of Measure 15.vii) e).	AEMP; b) Design engineering investigations for the outfall including sediment cores, geophysics on the sediment thickness; and c) Sediment data collected in 2016 in the near-shore area as part of planning for sediment covers. It is generally thought that data from the last 8 years would be included (see for example YK Bay AEMP, Section 4.3.2). It is possible additional data from studies being conducted external to the Project (e.g. Environment Canada and Climate Change and GNWT CIMP) would be considered.	
5	Harmonization of AEMP and EEM Giant Mine Remediation Project - Conceptual AEMP Design Plan â€“ Yellowknife Bay January 2019	**Comment** Minimal sampling detail was provided in the conceptual AEMP Design Plan as the report is quite general and it is intended as a conceptual design document. The document states that "This plan will be replaced by a detailed, final AEMP for approval before the new water treatment plant starts releasing treated effluent." ECCC notes that there are several areas, which may not be consistent with the requirements for Environmental Effects Monitoring (EEM), which are set out in the Metal and Diamond Mining Effluent Regulations (MDMER). Harmonization of the two programs would provide consistency and	**June 25:** The GMRP has attempted to align the requirements from the MVLWB (AEMP) and ECCC (MDMER/EEM). The GMRP has a Working Group, of which ECCC is a member, and encourages discussion on this topic in that venue.	

		efficiency of sampling efforts. **Recommendation** ECCC recommends that the Proponent incorporate harmonization of the MDMER EEM program with the AEMP, with consideration being given to setting up a working group for study design development.		
6	Harmonization of AEMP and EEM Giant Mine Remediation Project - Conceptual AEMP Design Plan â€“ Yellowknife Bay January 2019 p. 40: Table 8-1.	**Comment** The MDMER require water quality monitoring in the reference and exposure area four times per calendar year and at least one month apart on the samples of water collected, while the mine is depositing effluent and at the same time that the biological monitoring studies are conducted (Schedule 5, Section 7(2)). These requirements are not clear in the report or the sampling frequency table. **Recommendation** ECCC Recommends that in order to align the AEMP with the requirements of the MDMER EEM program the Proponent clearly state the requirements of the MDMER water quality monitoring sampling frequency in Table 8-1.	**June 25:** The detailed AEMP for Yellowknife Bay will include a table similar to Table 8-1 that will confirm that the proposed AEMP water quality program will align with the MDMER water quality monitoring sampling frequency requirements (Schedule 5, Section 7(2)). The Yellowknife Bay will apply once the new WTP is in place; therefore, there is adequate time to finalize sampling requirements.	
7	Harmonization of AEMP and EEM Giant Mine Remediation Project - Conceptual AEMP	**Comment** MDMER require sublethal toxicity tests be conducted once per calendar quarter on the species whose results produce the lowest geometric mean, taking into account the inhibition concentration that produces	**June 25:** Table 8-1 does not include the regulated effluent discharge. Sub-lethal effluent monitoring is covered under the first bullet in Section 8.4, which is as follows: Effluent monitoring and characterization at the	

	Design Plan â€“ Yellowknife Bay January 2019 p. 41: Table 8	a 25% effect or an effective concentration of 25% (Schedule 5, S. 6(3)). These requirements are not reflected in the report or Table 8-1. **Recommendation** ECCC Recommends that in order to align the AEMP with the requirements of the MDMER EEM program the Proponent clearly state the requirements of the MDMER water sublethal toxicity tests in Table 8-1.	final point of discharge from the outfall will follow MDMER and SNP sampling, and will be incorporated in the AEMP as supporting information. For clarity, the bullet should be modified to include toxicity.	
8	Aquatic Effect Monitoring Plan Giant Mine Remediation Project - Conceptual AEMP Design Plan â€“ Yellowknife Bay January 2019 p. 41: Table 8-2	**Comment** For the benthic invertebrate community survey, five stations are proposed for the exposure area and five "samples" in the reference area. The proponent should ensure standardized terminology is used and that equal sampling effort is conducted in the exposure and reference areas. For the EEM program, five replicate stations with at least three invertebrate field sub-samples would be recommended in Yellowknife Bay (please refer to Chapter 4.3 of the Metal Mining Technical Guidance for Environmental Effects Monitoring, EC 2012). **Recommendation** ECCC recommends that the Proponent ensure that there is standardized terminology used in the Conceptual AEMP Design Plan and that equal sampling effort is conducted in the exposure and reference areas.	**June 25:** The table should read '5 stations' for the reference area not '5 samples' - to reflect equal sampling effort for the exposure and reference areas. A correction to 5 stations is also consistent with information provided for benthic invertebrates in the other columns of the table. This adjustment will be made in the future AEMP for Yellowknife Bay.	

9	General Comment Giant Mine Remediation Project â€“ Aquatic Effects Monitoring Program (AEMP) Design Plan â€“ Baker Creek January 2019 - p. ii. Plain language summary:	**Comment** The AEMP indicates that artificial substrates will be used as part of the benthic invertebrate community survey to "eliminate any differences that may be caused by contaminated sediment in the creek, as opposed to treated effluent". ECCC notes that it would be more accurate to indicate how this methodology will help minimize or differentiate (not eliminate) effects from historical contamination in sediments and current effluent. Note that ECCC is currently reviewing if it is appropriate to continue to define effects based on Hester-Dendy sample plates (as opposed to in situ). **Recommendation** ECCC providing general comments only. No recommendation.	**June 25:** Thank you and noted.	
10	Baker Creak Giant Mine Remediation Project â€“ Aquatic Effects Monitoring Program (AEMP) Design Plan â€“ Baker Creek January 2019: p. 12. Closure Planning and Engagement:	**Comment** The first closure objective indicates water quality and sediment quality in Baker Lake are to be "improved"; however, it is unclear how "improvement" will be quantitatively assessed within the AEMP framework. **Recommendation** ECCC recommends that the Proponent clarify how water quality and sediment quality in Baker Lake will be quantitatively assessed within the AEMP framework.	**June 25:** With respect to Baker Pond, sediment in Baker Pond and the nearby Jo-Jo Tailings area will be removed as part of the remediation project. Please refer to Chapter 5.4 and 5.5 of the Closure and Remediation Plan for further details on sediment removal and realignment of Baker Creek. Baker Pond will not be a habitat feature in the future; to accommodate the probable maximum flood and ice in the channel, a channel with wide floodplain and possible wetland are proposed in the	

			Closure and Remediation Plan. In general, it is noted that the AEMP is not planned to be used as monitoring tool to articulate improvement and expected performance of the remediation activities. As stated in Section 2.4 (Closure Planning and Engagement), "the Baker Creek AEMP Design Plan considers these objectives (see Section 6.2) while acknowledging they cannot be met during the Active Remediation and Adaptive Management Phase because in-stream works will overlap with the time period of this Design Plan...This AEMP Design Plan is intended to cover the Project Definition Phase (Phase 1) and the starting years of the Active Remediation Phase (Phase 2) before the new WTP is commissioned." A series of additional plans are proposed to document remediation improvements; i.e., a performance monitoring report, construction monitoring plans, Fisheries Act Authorization habitat compensation monitoring, etc. Documentation of the recovery of Baker Creek post-remediation will be included in the Fisheries Act Authorization habitat compensation monitoring. This is expected to be a multi-year program, comparing the	

			habitat use before and after remediation, and the recovery of the ecosystem once the creek is realigned and substrate replaced. It is expected there will be a lag time for recovery and specific, focused, monitoring will be needed to asses this. This specific type of focused monitoring is not appropriate for inclusion in an AEMP. Construction activities and water quality in Baker Creek are proposed to be monitored through SNP and construction monitoring, as well as the Sediment and Erosion Control Plans. These programs/plans require much more frequent monitoring and reporting than the AEMP. Furthermore, mitigations proposed in the Sediment and Erosion Control Plan and construction plans should prevent runoff from remediation entering Baker Creek (it will instead be captured). The intent of the AEMP is to determine the effects of project, if additional mitigations are needed, provide early warning for aquatic effects through a response framework, etc. As such, the focus of the Response Framework is around the potential for negative changes/effects and not positive improvement.	
11	Baker Creek Giant Mine Remediation	**Comment** It is not clear why a nutrient enrichment hypothesis is proposed.	**June 25:** Although the Phase 5 IOC EEM study concluded it was unlikely	

	Project â€“ Aquatic Effects Monitoring Program (AEMP) Design Plan â€“ Baker Creek January 2019 p. 22. Impact Hypotheses:	Mining activities are not expected to cause enrichment, nor was enrichment associated with the cause of previous confirmed EEM effects. Additionally, it is unclear what the implications to the response framework will be if improvements to water quality and sediment quality due to remediation activities create similar response patterns as enrichment (e.g., increased benthos density, increased fish condition from present). **Recommendation** ECCC recommends that the Proponent clarify under which circumstances (e.g., remediation activities, blasting due to moving Baker Creek) increased nutrients would be expected. Additionally, ECCC recommends the Proponent clarify how the response framework outlined in Section 8 will differentiate these responses (e.g., nutrient enrichment and ecological recovery).	that nutrient enrichment was responsible for confirmed effects on benthic invertebrates in the EEM Phase 3 (2009) and Phase 4 (2012) studies, it is still appropriate to include a nutrient enrichment hypothesis in the Baker Creek Design Plan. As communicated in the Conceptual Site Model that identified relevant exposure pathways (Figure 4-1), benthic invertebrates in the exposure area could potentially be exposed to nutrients via seasonal effluent release, seepage, and/or run-off from the Giant Mine Site. With mitigations in place, the reviewer is correct, the GMRP does not expect nutrient enrichment. However, given that potential nutrient exposure cannot be ruled out, it is appropriate to retain the nutrient enrichment hypothesis for the Baker Creek AEMP Design Plan. Within the response framework, benthic invertebrate results will be interpreted in consideration of supporting water quality, sediment quality, and habitat data, which will facilitate the differentiation of response patterns and the identification of stressors that may have contributed to the observed response patterns.	
12	Baker Creek Giant Mine Remediation Project â€“	**Comment** An arsenic speciation study in sediment porewater was discussed in the report (Stantec 2015). It appears	**June 25:** Section 5.4 (Sediment Quality) of the Baker Creek AEMP cited three studies that evaluated	

	Aquatic Effects Monitoring Program (AEMP) Design Plan â€“ Baker Creek January 2019 - p. 31. Sediment Quality Studies	the study was conducted under ice during low oxygen conditions. It would be appropriate to measure and assess during open water season when water oxygen concentrations are higher. If available, related data from the open water season should be included in the discussion. **Recommendation** ECCC recommends that the Proponent provide data for, and discuss arsenic speciation in sediment porewater during open water season, if available.	arsenic speciation in either surface water and/or porewaters; i.e., Andrade (2006); Stantec (2015) and Chételat (2015). As discussed in Section 5.4, all three studies "noted that arsenic speciation and mobility within the sediment profile are influenced by a range of geochemical and biological factors such as sulphate, bacterial uptake and transformation, sediment oxygen conditions, redox conditions, effect of seasonality, organic matter content, and the presence of iron and manganese oxides. These factors are inherently variable spatially and over time, and so contribute to the observed variability and complexity of arsenic exposure to fish and benthos within the exposure areas." Additional information was sourced from Stantec (2015), given it was the most recent study that evaluated arsenic speciation in porewaters. Chetelat (2015) studied arsenic speciation only in surface waters. It is acknowledged that Stantec (2015) only sampled in winter which does not align with the EEM benthic and sediment sampling events. Two academic studies (Andrade [2006] and Fawcett [2009]) did study arsenic speciation during the open water season in August 2003 and July 2006. A summary of conclusions relevant to	

			Baker Creek from these studies is provided below. In general, the conclusion are broadly consistent with the findings of the Stantec (2015) study: Arsenic speciation in pore-waters from behind the breakwater in Baker Creek was variable and complex. Both As(III) and As(V) dominated in porewaters depending on sediment depth (Fawcett 2009); As(III) tended to dominate under anoxic conditions while As(v) tended to dominate in oxic conditions in most porewaters sampled by Andrade (2006); Both studies concluded that microbes were likely mediating at least part of the arsenic reduction in Baker Creek. Arsenic-reducing bacteria and sulfate-reducing bacteria have been identified in this creek; and the attenuating efficiency of the oxic zone at the sediment-water interface is an important factor in influencing arsenic cycling and mobility. There is no study to date that has evaluated arsenic speciation in both seasons in Baker Creek. Andrade (2006) sampled in both seasons in Yellowknife Bay. It is not necessary to continue to study porewater speciation in relation to the AEMP because the sediments are being removed during remediation, and the AEMP assumes that benthos will	

			be exposed to As(III). Reference: Andrade C. 2006. Arsenic Cycling and Speciation in Mining-Impacted Sediments and Pore-Waters from Yellowknife Bay, Great Slave Lake, NWT. MSc Thesis, Queens University, Kingston, ON, Canada. Reference: Fawcett S. E. 2009. Speciation and mobility of antimony and arsenic in mine waste and the aqueous environment in the region of the Giant Mine, Yellowknife, Canada. Doctoral dissertation, Queens University, Kingston, ON, Canada.	
13	Baker Creek Giant Mine Remediation Project â€“ Aquatic Effects Monitoring Program (AEMP) Design Plan â€“ Baker Creek January 2019 - p. 32. EEM Benthic Invertebrate Community Surveys	**Comment** The AEMP report does not clearly indicate in Section 5.5.1 that confirmed benthic invertebrate effects could be partially attributed to current effluent effects, determined as a possible cause during the Phase 5 Investigation of Cause (IOC, see section 5.5.3 hypothesis four). **Recommendation** ECCC recommends that Section 5.5 of the AEMP be revised to clearly indicate that confirmed benthic invertebrate effects could be partially attributed to current effluent effects.	**June 25:** The conclusions of the EEM IOC study are summarized in Section 5.5.3 where it is stated that contaminants in the effluent were likely responsible for differences in benthic community composition between reference and exposure areas, specifically the potential effects of increasing conductivity on mayflies in Baker Creek. It was also acknowledged that metals from historical sediment contamination may have contributed to the confirmed effects on benthos and therefore historical sediment metal exposure could not necessarily be ruled out. Hypothesis 1: It is likely that exposure to contaminants has contributed to the effects in benthos observed in the EEM	

			studies (high confidence). Response: Elevated and increasing conductivity due to TDS in effluent, and, therefore, in Baker Creek stream water, was likely responsible for the reduced presence of mayflies in the mouth of Baker Creek compared to the reference areas and Yellowknife Bay near the breakwater. However, metals from historical sediment contamination may have been a factor as well with respect to effects on benthos observed in the EEM studies. (Section 5.5.3, Baker Creek AEMP Design Plan). Section 5.5 in the AEMP Design Plan reflected the level of clarity provided in the conclusions of the EEM IOC based on the lines of evidence evaluated.	
14	Baker Creek Giant Mine Remediation Project â€“ Aquatic Effects Monitoring Program (AEMP) Design Plan â€“ Baker Creek January 2019 - p. 43. Assessment and Measurement endpoints	**Comment** The first assessment endpoint of the AEMP indicates water quality and sediment quality will be maintained to current levels (as determined from current monitoring and reporting). Monitoring of water and sediment quality will occur during remediation and construction activities that may degrade water and sediment quality in the short term; it is not clear how the timing of various activities could affect meeting this assessment endpoint. It is not clear how the "preservation of ecological function", as stated in assessment endpoint two,	**June 25:** The AEMP Design Plan is intended to cover the Project Definition Phase from Water Licence issuance until the first remediation activity commences and the starting years of the Active Remediation Phase before the new WTP is commissioned. Thus, some in-stream remediation works will overlap with the time period of this Design Plan but these activities will also be subject to remediation-specific monitoring through a series of additional plans proposed to document remediation improvements (e.g., a performance	

		will be measured/assessed. It is also not clear if maintaining water quality and sediment quality will meet the closure objective to "improve water quality and sediment quality in Baker Creek" (as stated on pg. 12). **Recommendation** ECCC recommends that the Proponent clarify if remediation activities will be conducted in the AEMP timeframe that would be expected to improve (or temporarily worsen) conditions of water and sediment quality. ECCC also recommends that the Proponent clarify: - how preservation of ecological function will be measured/assessed; and, - How the maintenance of water and sediment quality will improve water quality.	monitoring report, construction monitoring plans, Fisheries Act Authorization offset monitoring, etc.). The intent of the AEMP is to determine the effects of project, if additional mitigations are needed, provide early warning for aquatic effects through a response framework, etc. The main purpose of the AEMP is communicated through two assessment endpoints: 1) Maintain water and sediment quality in Baker Creek downstream of the Site at, or close to, present levels reported by recent monitoring programs and 2) Preserve the ecological function of Baker Creek including fish health and community. Maintenance of a functioning ecosystem in lower Baker Creek will continue to allow fish to keep using the lower reaches of Baker Creek (e.g., the presence of habitat and the benthic invertebrate food source). The first assessment endpoint communicates the intent to maintain water and sediment quality in Baker Creek downstream of the Site at, or close to, present levels. The time period for this would be up to when the new WTP is commissioned and the effluent discharge is moved to Yellowknife Bay. The AEMP is not planned to be used as monitoring tool to articulate improvement and	

			expected performance of the remediation activities; other plans specific to remediations activities and captured under the Closure and Remediation Plan will fulfill that role as outlined in CIRNAC's response to ECCC #10. Therefore, maintenance of water and sediment quality is appropriate as an AEMP assessment endpoint. The second assessment endpoint is focused on maintenance of a functioning ecosystem in lower Baker Creek that will continue to allow fish to keep using the lower reaches of Baker Creek (e.g., the presence of habitat and the benthic invertebrate food source). Densities and types of invertebrates that belong to the benthic community in Lower Baker Creek can be used to characterize the invertebrate food source available to the fish using Baker Creek. The measurement endpoints provide information in that regard.	
15	Harmonization of AEMP and EEM Giant Mine Remediation Project - AEMP Design Plan â€“ Baker Creek January 2019 - p.	**Comment** For the IOC of the fish community study, confirmed age-related effects for slimy sculpin (age and growth/weight-at-age) were not included in the summary of confirmed fish effects and were not assessed in the IOC report, due to uncertainty in aging data. The MDMER require the cause of confirmed effects to be	**June 25:** This will be completed when the AEMP is submitted for final approval. In general, confirmed effects for fish age should be added to the summary described in Section 5.6.4. Significant differences were detected for fish age in two of three EEM fish surveys. However, as described in the Phase 3 and Phase 4 EEM	

	39. Phase 5 IOC for fish	determined (MDMER Schedule 5 paragraph 21(2)); this has been noted by ECCC in the Phase 5 IOC review and further information has been requested as an addendum to the IOC report. **Recommendation** ECCC recommends that when and if this information is available the Proponent provide it as an addendum to the AEMP to align the AEMP with the requirements of the MDMER and EEM monitoring.	Interpretative Reports, there is low confidence in this conclusion, given the challenges identified in ageing Slimy Sculpin using otoliths.	
16	Environmental Effects Giant Mine Remediation Project - AEMP Design Plan â€“ Baker Creek January 2019 - p. 40. Phase 5 IOC Hypothesis 1	**Comment** It has not been empirically tested to what degree metal toxicity from current effluent, compared to historical sediment contamination, could be affecting fish population health. Given this uncertainty, current effluent could be contributing to observed fish effects. **Recommendation** ECCC recommends that the Proponent consider how, current effluent could be contributing to observed fish population health effects.	**June 25:** A detailed assessment of how contaminants from effluent could be contributing to observed fish population health effects was completed as part of the EEM Phase 5 Investigation of Cause Study (Golder 2013). The relevant conclusions from this report were summarized in Section 5.6.4 of the Baker Creek AEMP Design Plan. Reference: Golder. 2013. Giant Mine Environmental Effects Monitoring, Phase 4, Final Interpretative Report. Prepared for Aboriginal Affairs and Northern Development Canada, Yellowknife, NT, Canada.	
17	Harmonization of AEMP and EEM Giant Mine Remediation	**Comment** Fish age and growth (total body weight-at-age) are MDMER effect endpoints required to be assessed in a fish population study,	**June 25:** Fish age will be added to the growth endpoints assessed and included as measurement endpoints in Table 6-1 and Section 7-5. Slimy	

	Project - AEMP Design Plan â€“ Baker Creek January 2019 - p. 43. Table 6-1	when possible (MDMER Schedule 5, ss. 15(a)). **Recommendation** ECCC recommends that fish age and growth endpoints be assessed, if possible, and included as Ã¢Â€ÂœMeasurement EndpointsÃ¢Â€Â in Table 6-1 and Section 7.5 (Fish Health) for the slimy sculpin lethal fish survey to align the AEMP with the requirements of the MDMER and EEM monitoring.	Sculpin ageing will be completed using otoliths. Should the otolith ageing results be unreliable, then analyses for age endpoints will be performed using length-frequency analysis. This is similar to what was done for the Phase 4 EEM (Golder 2013) and is in line with guidance provided in the EEM Technical Guidance Document that indicates that if is ageing is not possible, age distribution information can be obtained using size-frequency distributions (Environment Canada 2012). References: Environment Canada. 2012. Metal Mining Technical Guidance for Environmental Effects Monitoring Document. Ottawa, ON, Canada; Golder. 2013. Giant Mine Environmental Effects Monitoring, Phase 4, Final Interpretative Report. Prepared for Aboriginal Affairs and Northern Development Canada, Yellowknife, NT, Canada.	
18	Harmonization of AEMP and EEM Giant Mine Remediation Project - AEMP Design Plan â€“ Baker Creek January 2019 - p. 49. Table 6-2	**Comment** The next EEM interpretive report is due June 2020, and the next EEM study design anticipated late 2018/early 2019. It is not clear why an AEMP design plan and re-evaluation report is not included in Table 6-2 to coincide with these reports. **Recommendation** ECCC recommends that a rationale be provided for not coordinating the EEM and AEMP and,	**June 25:** The EEM and AEMP processes are coordinated in Table 6-2. While 2018 and 2019 are not part of the Water Licence, and therefore not part of the AEMP, an AEMP Design Plan in 2019 and an AEMP Annual Report for 2020 are both included in Table 6-2 to align with the EEM Phase 6 program. The first AEMP re-evaluation report would cover a four-	

		if possible ECCC recommends that these processes be coordinated.	year sampling period to include data collected as part of the EEM program (i.e., 2019), and from the AEMP from 2020 to 2022.	
19	Harmonization of AEMP and EEM Giant Mine Remediation Project - AEMP Design Plan â€“ Baker Creek January 2019 p. 50: Table 6-3	**Comment** Table 6-3: Water quality monitoring to support fish and benthos studies indicates that monitoring will be conducted "once every three years"; however, several months are listed in the timing of sampling. Water quality monitoring should be conducted concurrently to each study component (i.e., every month that is listed in the table for the various components, at the time of biological monitoring). **Recommendation** ECCC recommends that the Proponent revise the Design Plan so that water quality monitoring is conducted concurrently to each study component.	**June 25:** It is proposed that supporting water quality be conducted concurrently with the biological monitoring programs. As indicated in Table 6-3, supporting water quality for the benthic invertebrate program will be completed as follows: June/July - concurrent with the artificial substrate deployment; August - concurrent with the check on artificial substrates; and September - concurrent with the artificial substrate retrieval and depositional sampling. Supporting water quality for fish will be completed as follows: July - during the Ninespine Stickleback non-lethal fish health program; and September - concurrent with the Slimy Sculpin lethal fish health program.	
20	Harmonization of AEMP and EEM Giant Mine Remediation Project - AEMP Design Plan â€“ Baker Creek January 2019 - p. 51: Table 6-3	**Comment** The MDMER require sublethal toxicity tests be conducted once per calendar quarter on the test species whose results produce the lowest geometric mean, taking into account the inhibition concentration that produces a 25% effect or an effective concentration of 25% (Schedule 5, S. 6(3)). These	**June 25:** Sampling of the effluent occurs under the SNP, but is presented in the AEMP for completeness as it is used as a supporting variable. The frequency of sublethal testing for toxicity in Table 6-3 could be updated for a seasonal discharge per Part 5 Section 5 of the MDMER.	

		requirements are not reflected in Table 6-3, or in Section 7.3.4. **Recommendation** ECCC recommends that the Proponent revise Table 6-3, and Section 7.3.4 to reflect the sublethal toxicity requirements of MDMER to align the AEMP with the requirements of the MDMER and EEM monitoring.		
21	EEM Sampling Giant Mine Remediation Project - AEMP Design Plan â€“ Baker Creek January 2019 - p. 51: Table 6-3.	**Comment** Similar to the possible sampling frequency noted for fish surveys, the benthic invertebrate community survey could also be conducted every 6 years according to the MDMER. Community surveys can be conducted every 6 years if the results of two consecutive biological monitoring studies indicate no effect on the benthic invertebrate community for all effect indicators with no assigned critical effect size. Studies should find no effect on the benthic invertebrate community or an effect on the benthic invertebrate community the absolute value of the magnitude of which is less than the absolute value of its assigned critical effect size for all effect indicators with an assigned critical effect size (see MDMER Schedule 5 ss. 9(b)). **Recommendation** ECCC recommends that the Proponent revise Table 6-3, and Section 7.3.4 to reflect benthic	**June 25:** In general, the GMRP does not expect to move to a 6-year biological monitoring schedule. Given that an EEM benthic invertebrate field survey will be undertaken in 2019, it is suggested that the final frequency of AEMP monitoring be determined following analysis of the 2019 EEM benthic data. The benthic invertebrate sampling frequency outlined in Schedule 5 ss. 9(b) of the MDMER would be considered in the determination of final frequency for the AEMP benthic invertebrate component.	

		invertebrate sampling frequency outlined in Schedule 5 ss. 9(b) of the MDMER.		
22	Baker Creek Giant Mine Remediation Project - AEMP Design Plan â€“ Baker Creek January 2019 - p. 52. Table 6-3	**Comment** Slimy sculpin are proposed for fish tissue studies, every 3 to 6 years. Sculpin is chosen because it is the most conservative (would likely show highest metal concentrations in tissue). For EEM, fish species chosen are often most relevant to human consumption (large bodied, sport fish). **Recommendation** ECCC recommends that the proponent provide clarification on whether large bodied, sport fish species relevant to human consumption were considered for the AEMP.	**June 25:** Large-bodied fish relevant to human consumption were considered for the AEMP. It was decided that small-bodied fish be used as valid surrogates for sampling of large-bodied fish relevant to human consumption in Baker Creek for the following reasons: as described in Section 7.6.1, large-bodied fish are not year-round residents of Baker Creek and are not in the reaches of the creek where effluent exposure is highest, and as such would not be representative of exposure to treated effluent discharge from the ETP into Baker Creek; lethal sampling of large-bodied fish for tissue chemistry was not a desired monitoring endpoint due to the effects this may have on the fish population (i.e., Arctic Grayling); and small-bodied fish are year-round residents in Baker Creek and have longer-term exposure to effluent.	
23	Baker Creek Giant Mine Remediation Project - AEMP Design Plan â€“ Baker Creek January 2019 p.	**Comment** In order to align the AEMP and EEM studies for the Project further detail should be provided describing the habitat characteristic data to be collected (e.g., types of aquatic vegetation cover, how substrate	**June 25:** As per the approved Phase 6 EEM study design, habitat data will include both a visual assessment of the sediment (for texture, colour, odour, and organic content, and an estimate of particle size breakdown) as well as	

	55. Habitat Characteristics	characteristics will be defined, etc.). **Recommendation** ECCC recommends that the Proponent provide additional details regarding data that will be collected on habitat characteristics to provide better alignment between the AEMP and EEM studies.	submission of sediment samples for particle size analysis. Percentage of aquatic vegetation cover will be recorded, and the dominant aquatic vegetation will be identified to the extent possible. Photographs of the Site, vegetation, and substrates will be taken. In situ water quality, water depth and velocity, and any other relevant observations will be measured and documented for each sampling area.	
24	Baker Creek Giant Mine Remediation Project - AEMP Design Plan â€“ Baker Creek January 2019 p. 69. Sediment Quality Analysis.	**Comment** The report indicates samples for sediment quality will be collected using an Ekman grab. However, methodology is not provided to describe how the top 5 to 10 cm will be accurately sampled. ECCC notes that core sampling typically allows for more accurate sampling at defined sediment depths. **Recommendation** ECCC recommends that the Proponent provide the methodology that describes how the top 5 to 10 cm will be sampled using the Ekman grab and to identify whether core sampling was considered for sediment quality data collection.	**June 25:** Consistent with the Metal Mining Technical Guidance Document (Environment Canada 2012), grab sampling was adopted as the sediment sampling method for the Giant Mine EEM program. Grab sampling is also commonly adopted for both EEM and AEMP programs in Northern Canada. To provide continuity in sampling methods for the Baker Creek AEMP, grab sampling rather than core sampling was selected. The top 5 to 10 cm will be sampled using the Ekman grab as follows, with the preference to sample the top 5 cm: A clean stainless steel spoon will be used to scoop out the surface sediment (top 5 cm) from each Ekman grab and place in a clean stainless steel bowl to create a composite sample. Avoid using	

			sediment that has touched the sides of the Ekman.	
25	Baker Creek Giant Mine Remediation Project - AEMP Design Plan â€“ Baker Creek January 2019 p. 72. Benthos statistical analysis:	**Comment** The report indicates benthic invertebrate abundance data will be transformed to satisfy the requirements of normality for parametric analysis. Transformation of data should only be applied if it is necessary to aid in statistical analyses (Chapter 4 and 8 of the Metal Mining Technical Guidance Document for Environmental Effects Monitoring, EC 2012). **Recommendation** ECCC recommends that the Proponent consult Chapter 4 and 8 of the Metal Mining Technical Guidance Document for Environmental Effects Monitoring (EC 2012) for the statistical analysis of the data and only transform data if it is appropriate for the statistical analyses.	**June 25:** Testing for normality will be completed prior to analysis, and transformations of data will only be applied if necessary, to meet the assumptions of a parametric test. The Metal Mining EEM Technical Guidance Document (Environment Canada 2012) will be referred to as appropriate for further guidance during AEMP reporting.	
26	Baker Creek Giant Mine Remediation Project - AEMP Design Plan â€“ Baker Creek January 2019 - p. 78. Fish Survey sample size	**Comment** Post-hoc power analysis from previous lethal slimy sculpin survey(s) should be provided to ensure target sample sizes for the slimy sculpin lethal survey (30 adult male, 30 adult female, and 30 juvenile) are adequate. **Recommendation** ECCC recommends that the Proponent conduct a Post-hoc power analysis from previous lethal slimy sculpin survey(s) and provide the results.	**June 25:** For the Giant Mine Phase 4 EEM (Golder 2013), post-hoc power analyses were completed for all endpoints where significant differences were not detected to determine the power achieved for the analyses. In addition, the sample sizes (n) required to detect a difference for a number of possible effect sizes were calculated as an a priori consideration for future EEM programs. The results are presented as a modified power curve,	

			where, for a given power (0.90), the effect size that can be achieved is shown in relation to the required sample size. The average standard deviation (SD) term within the five sample areas provided the estimate of variability for each fish variable. For most Slimy Sculpin endpoints, an overall significant difference was detected and therefore post-hoc power analysis was not required. The two endpoints that were found to be not significant were male liver weight and gonad weight. There was insufficient power achieved for male liver weight (29%) and male gonad weight (43%). The power curve produced for each of the endpoint that shows the percent (%) decrease that could be detected for a given sample size (See Figure 1 in ORS 6 - Attachment 1 - Supplemental Information Responding to ECCC #26). This curve demonstrates that the improvement in % decrease in a given variable that can be detected becomes progressively smaller as the sample size increases. Both liver and gonad weight require a similar sample size to detect a given % decrease. For example, a sample size of 30 to 31 fish per area would be required to detect a 25% decrease in liver and gonad weight. Therefore, based on the Phase	

			4 EEM post-hoc power analysis, a sample size of 30 fish should be adequate to achieve adequate power for fish health endpoints. Reference: Golder (Golder Associates Ltd.). 2013. Giant Mine Environmental Effects Monitoring, Phase 4, Final Interpretative Report. Prepared for Aboriginal Affairs and Northern Development Canada, Yellowknife, NT, Canada.	
27	Baker Creek Giant Mine Remediation Project - AEMP Design Plan â€“ Baker Creek January 2019 - p. 79. Fish processing.	**Comment** It is not clear how slimy sculpin will be aged. MDMER requires differences in age and growth (weight-at-age) be assessed when possible. **Recommendation** ECCC recommends that the Proponent clarify how slimy sculpin will be aged.	**June 25:** Please refer to the response to Environment and Climate Change Canada: Eva Walker #17.	
28	Baker Creek Giant Mine Remediation Project - AEMP Design Plan â€“ Baker Creek January 2019 - p. 81. Fish aging	**Comment** It is unclear how the subset size will be determined for lethally sampling Ninespine Stickleback for the purposes of aging and verifying age classes determined by length-frequency distributions. **Recommendation** ECCC recommends that the Proponent clarify how the subset for the lethal samples of Ninespine Stickleback will be determined.	**June 25:** A total of ten to fifteen otoliths will be removed from each size class of Ninespine Stickleback (maximum of 40 otoliths per area) for age verification. The Ninespine Stickleback size classes are based on previous EEM results and are as follows: YOY = fork length <25 mm; juvenile = fork length 25 to <35 mm; and adult = fork length =35 mm.	
29	Baker Creek Giant Mine Remediation	**Comment** Length-frequency distribution is an effect endpoint for	**June 25:** Table 7-7 will be updated as per ORS 6 - Attachment 2 -	

	Project - AEMP Design Plan â€“ Baker Creek January 2019 - p. 85. Table 7-7	EEM non-lethal surveys and it should be clarified in Table 7-7. If sufficient young of the year (YOY) are captured during the non-lethal survey to enable statistical analysis, length of YOY (age 0) at end of growth period and weight of YOY (age 0) at end of growth period are effect endpoints for assessing growth, and relative abundance of YOY are an effect endpoint for assessing reproduction. It is not clear why these effect endpoints are not included in the AEMP study plan. Chapter 3 (EC 2012) gives further guidance on effect and supporting endpoint analysis for EEM non-lethal surveys. **Recommendation** ECCC recommends that the Proponent clarify the endpoints for non-lethal surveys in Table 7-7 and the AEMP Study Plan.	Supplemental Information Responding to ECCC #29.	
30	Baker Creek Giant Mine Remediation Project - AEMP Design Plan â€“ Baker Creek January 2019 - p. 92.	**Comment** The rating responses for the weight-of-evidence (WOE) reference analysis of "trends" and comparison of AEMP findings to "prediction or benchmarks". It is not clear where or how these are specifically defined in the AEMP framework. More clarity would be useful in defining biological effects that would be deemed "minor" or "moderate". **Recommendation** ECCC recommends that the Proponent clarify the	**June 25:** The GMRP agrees that the term benchmark and predictions require refinement and this will be revised in the final version of the AEMP. Water quality benchmarks will not be set for Baker Creek during remediation. Water quality in the current condition exceeds relevant benchmarks which is one of the reasons for remediation and construction of a new WTP. It was assumed further discussion with	

		prediction benchmarks and indicate where they are located in the AEMP framework.	reviewers would inform the WOE outlined in Section 7.9. It is plausible that a WOE in the pre-remediated case would not be relevant.	
31	Baker Creek Giant Mine Remediation Project - AEMP Design Plan â€“ Baker Creek January 2019 - Response Framework The Action Levels p. 98.	**Comment** The action levels for benthos are restricted to density and richness with the rationale that these effect indicators are "directly linked to identifiable response patterns". ECCC notes that the EEM program specifically chose four effect indicators to assess changes in the benthos community because they can be assessed independently. Assessing indices gives valuable information about benthos communities that could go unnoticed if only looking at density and richness. **Recommendation** ECCC recommends that the Proponent consider including additional effects indicators for the benthic communities, such as the indices reported for the EEM program.	**June 25:** The AEMP will calculate and evaluate the four standard EEM effect indicators (density, richness, evenness [SDI] and Bray-Curtis Index [BCI]). Information provided by the four indicators will be included in the evaluation of benthic invertebrate data and the effect indicators will be assessed independently. In addition to the benthic invertebrate assessment, results for density and richness that are directly linked to identifiable response patterns, will be considered further in the Aquatic Effects Monitoring Program Response Framework as described in Table 8-1. This approach is consistent with a number of AEMPs currently being implemented in Northern Canada.	
32	Baker Creek Giant Mine Remediation Project - AEMP Design Plan â€“ Baker Creek January 2019 - Response Framework	**Comment** The report indicates the magnitude of benthic invertebrate statistical results will be assessed according to critical effect sizes (CES) defined in the MDMER, and only effects exceeding CES will be considered "biologically significant". The similarity index (i.e., Bray Curtis index) does not have a CES defined	**June 25:** Previous clarification was sought from ECCC regarding the application of the Bray Curtis Index in the MDMER EEM framework. The following clarification was provided by ECCC (Wilson, pers.comm): "In the application of Schedule 5, Section 9 of the MDMER, a similar effect ("significant difference") measured in	

	Benthos statistical analysis p. 72	under the MDMER; it is unclear if/how a significant Bray-Curtis effect will trigger the response framework. **Recommendation** ECCC recommends that the Proponent clarify how biological significance will be determined for the Bray Curtis Index (BCI) and how a significant effect for the BCI will trigger the response framework.	the previous two biological monitoring studies for an effect indicator, such as the Bray Curtis Index, that does not have an assigned critical effect size triggers the requirement to determine the cause of this effect." This direction provided by ECCC in response to our enquiry will be followed in the implementation of the Baker Creek AEMP Design Plan. Reference: Wilson, Lindsey, Environmental Effects Monitoring coordinator, ECCC. E-mail to Elaine Irving, 12 December 2018.	
33	Baker Creek Giant Mine Remediation Project - AEMP Design Plan â€“ Baker Creek January 2019-Response Framework Action levels - Fish p. 98.	**Comment** The report indicates action levels for fish will be assessed according to critical effect sizes (CES) defined in the MDMER. With the exception of condition, non-lethal EEM effect endpoints do not have an assigned CES. It is not clear if the non-lethal Ninespine Stickleback surveys will trigger action levels in the response framework. **Recommendation** ECCC recommends that the proponent clarify if and how the non-lethal surveys of Ninespine Stickleback will trigger action levels in the response framework.	**June 25:** The EEM CES for fish are as follows: weight (total weight or carcass weight) = ±25%; relative gonad size = ±25%; relative liver size = ±25%; condition = ±10%. As part of the non-lethal Ninespine Stickleback program, both weight and condition are collected, and have defined CES. As indicated in Table 8-1, size will be used as an effect indicator. As such, if either Ninespine Stickleback weight or condition are found to be statistically significantly different from mean of the reference areas, with an effect size equal to or above the CES, and that are indicative of an impairment to fish health and linked to the GMRP, a low Action Level will be triggered under the proposed Response Framework.	

Giant Mine Oversight Board: GMOB Giant Mine Oversight Board				
ID	**Topic**	**Reviewer Comment/Recommendation**	**Proponent Response**	**Board Staff Response**
1	General File	**Comment** (doc) GMOB Comments Cover Letter **Recommendation**		
2	EQC Report - General Comment - Modelling	**Comment** The receiving water quality predictions and EQC recommendations are based upon a series of linked models. Each of these models includes a number of assumptions and there are uncertainties associated with all of these assumptions. These uncertainties carry through to the model results. This is reflected in statements made throughout the modelling report such as "Given the inherent uncertainties, the results of a model should be used as a tool in project planning, and to outline potential risks, rather than to indicate absolute concentrations." As such, it will be important to regularly compare monitoring results against model predictions as the remediation progresses. Adapative management trigger levels (i.e., Action Levels) should be developed that would require a review and update of the water quality modelling. **Recommendation** GMOB recommends that Action Levels be developed for key water quality	**June 25:** Action levels within the WMMP for influent water to the WTP could be considered, however in general influent quality is best managed and monitored through the SNP/OMP programs and by the operating procedures of the WTP.	

		monitoring stations with the goal of detecting important deviations from assumptions/predictions of the water quality models. For example, an Action Level could be set for minewater quality based on assumptions/predictions from the water quality models; exceedance of this Action Level would provide an early warning that the predicted influent quality to the ETP or WTP is incorrect and that water treatment may not perform as expected. Depending on the severity of the deviation of predicted and measured concentrations, the water quality models may need to be updated or treatment adjusted etc. The choice of which monitoring stations should have Action Levels may be guided by a sensitivity analysis of the models to identify key points of uncertainty. Action Levels should be described in the Water Management and Monitoring Plan and exceedances/actions taken reported in the Annual Water Licence Report.		
3	EQC Report - General Comment - Effluent Quality and EA Measures	**Comment** EA Measures 12 to 15 relate to the quality of effluent discharged from the project and the resulting water quality in Yellowknife Bay. The EQC report proposes both Maximum Average and Maximum Grab concentrations; for arsenic, the	**June 25:** The GMRP interprets Measure 14 as the new WTP will achieve a monthly average arsenic concentration of 0.01 mg/L (Table 1-2 of the EQC Report). As such, the WTP will be designed to achieve 0.01 mg/L. The purpose of the maximum grab	

		proposed Maximum Average concentration is 0.01 ug/L and the Maximum Grab concentration is 0.02 ug/L. The Health Canada guideline for arsenic in drinking water is 0.01 ug/L. GMOB notes that setting the Maximum Grab concentratin to 0.02 ug/L would mean that water containing this concentration of arsenic could be discharged from the new water treatment plant and be in compliance with the Water Licence. However, the EA measures explicitly reference 0.01 ug/L for arsenic at the outfall location, and refers to Health Canada Guidelines for other parameters. Modelling suggests that parameters will meet Health Canada Guidelines at the edge of a mixng zone. GMOB is concerned that the proposed project aligns with Health Canada policy and practice in regards to meeting drinking water quality, and whether meeting Health Canada Guidelines at the edge of a mixing zone meets Health Canada's requirements. **Recommendation** GMOB recommends that the GMRP consult with Health Canada regarding whether the proposed effluent quality meets the intent of the Health Canada guidelines referenced during the EA process. The results of these discussions should be	concentration is only to account for a potential upset condition, and these should not occur frequently. Typically, the monthly average will represent the 95th percentile performance (AEP 1991). As a general practice, the maximum grab concentration is typically set to two times the maximum average concentration. The GMRP considers the reference to the Canadian Drinking Water Quality Guidelines to refer to the numerical guideline for Arsenic only. The GMRP does not interpret the Measure to indicate that the GMRP effluent meet the intent of the Health Canada Drinking Water Quality Guidelines. These guidelines "set out the basic parameters that every water system should strive to achieve in order to provide the cleanest, safest, and most reliable drinking water possible." (CDWG). There is no intent to build a WTP that produces potable water at the GMRP. References: AEP (Alberta Environmental Protection). 1995. Water Quality Based Effluent Limits Procedures Manual. Edmonton, AB, Canada. (https://www.canada.ca/en/health-canada/services/environmental-workplace-health/water-	

		posted on the public registry so as to become part of this licencing process.	quality/drinking-water/canadian-drinking-water-guidelines.html)	
4	EQC Report - General Comment - Nutrients.	**Comment** The EQC report acknowledges uncertainty around concentrations of nutrients such as phosphorous and nitrogen compounds that will be discharged from the project. Section 5.2.2.1 describes how analytical interference between arsenic and phosphorous means that there is limited information on current phosphorous concentrations in site waters, and therefore no modelled data on future concentrations of phosphorous in site discharges. The report also identifies in several locations that blasting associated with on-site quarrying will introduce nitrogen compounds into site waters. The GMRP is reportedly in discussion with the laboratory regarding developing a method that will provide more accurate phosphorous data, and has indicated that total phosphorous may be reconsidered once more reliable phosphorous data becomes available. GMOB notes that discharging nutrients can cause unwanted changes in aquatic receiving environments and that this can be particularly the case for northern waters which are often low productivity (i.e. naturally low nutrient	**June 25:** The GMRP is continuing to work with laboratories to develop an appropriate analytical method for phosphorus and progress will be reported in Annual Water Licence Reports. The Borrow Materials and Explosives Management Plan will contain details of how the GMRP will manage its explosives use in a safe and efficient manner that will reduce the risk of explosives and consequently nitrogen reaching the receiving environment. Completing the proposed estimate is premature until further details on volumes, agents, and mitigations are determined.	

		contents). The question of phosphorous inputs from the project site should be reviewed when better data becomes available. Depending upon the results, mitigations measures may need to be developed and implemented. Similar to phosphorous, nitrogen compounds such as ammonia and nitrate can also lead to nutrient enrichment in the receiving environment. A large quantity of fill and cover material will be required to complete the planned remediation of the Giant Site, and much of this material will be generated from on site quarries. These activities will involve blasting, which is often the primary source of nitrogen compounds at northern mine sites. Although the GMRP has proposed an EQC for un-ionized ammonia to account for potential toxic effects, no limits on nitrogen loads in relation to potential nutrient enrichment have been proposed. Additional information on the potential concentrations and loadings of nitrogen compounds in site discharges will be requried to determine whether mitigations are required. **Recommendation** GMOB recommends that additional work on potential nutrient loadings to Yellowknife Bay as a result of the		

		project should be completed. For phosphorous, this may need to wait until an appropriate analytical method has been developed, however progress on method development and timelines for completion of this additional evaluation should be regularly reported to the Board. An evaluation of whether nitrogen may potentially become an issue could be completed earlier, as information is currently available regarding current concentrations in site discharges. The GMRP should already have estimates of tonnages of quarry material needed to implement its proposed remediation strategy, therefore it should be possible to estimate potential loadings of nitrogen to the environment. If necessary, a limit on nitrogen loading to Great Slave Lake should be developed with the goal of avoiding eutrophication effects.		
5	EQC Report - Section 2.4 - TDS Trends in Baker Creek	**Comment** Section 2.4 identifies that concentrations of TDS in Baker Creek have been increasing in recent years. Increases in sulphate and chloride are identified as the reason for the TDS increase, but a reason for the increasing sulphate and chloride trends is not provided. It is not clear from the data plotted in Figure 2.13 whether the increasing trend is continuing or	**June 25:** Please refer to the response to MVLWB: Shannon Allerston #10.	

		levelling off. High concentrations of TDS constituents, such as chloride and sulphate, can lead to undesirable changes in the receiving environment so additional discussion on the reason for this increase as well as potential maximum concentrations should be discussed. **Recommendation** GMOB recommends that the GMRP provide a discussion regarding the observed increasing TDS trend in Baker Creek. The discussion should identify whether the GMRP believes this trend is levelling off or continuing, and how this assumption has been incorporated into the modelling exercise. It may be necessary to have EQC for the main TDS constituents, chloride and sulphate, even if set at the current concentrations in the effluent, if there is a potential for unacceptable increases in these parameter concentrations in Baker Creek or Yellowknife Bay.		
6	EQC Report - Section 3 - High Test System	**Comment** Current underground water management includes a network of ditches, channels, and sumps with piping and meters, designed to isolate infiltration containing high concentrations of arsenic from mixing with the mine pool, referred to as the "High Test System". The GMRP is	**June 25:** Currently the existing piping leads high test water down the C shaft, down the B Ramp and from 575 level to 750 level near Supercrest Pump Station. On the 750 level a horizontal pipe collects all three vertical pipes and transfers the high test water to the Akaitcho high lift sump, where it flows	

		proposing to discontinue maintaining this system once minewater pumping is moved to the C-Shaft. In some circumstances, there are advantages to isolating and managing highly contaminated effluents separately from other streams. In previous comments to the GMRP, GMOB requested clarification on why it was preferable to mix highly contaminated seepage with the mine pool instead of managing the streams separately. GMRP responded that one of the reasons for establishing the high test system was to minimize worker exposure, and that there will be no need to access the underground once remediation starts. GMRP also noted that water leaving the chambers will not enter the mine pool once freezing criteria have been met. GMOB accepts that worker exposure will be reduced once remediation has begun, but notes that the GMRP response did not address other potential advantages to to keeping highly contaminated waters separate such as potentially improved treatment efficiencies, increased operational flexibility, or potential future opportunities for alternative management strategies. **Recommendation** GMOB recommends that GMRP provide	toward the Akaitcho submersible pumps and is conveyed to the NWTP for storage, treatment and discharge. (Please reference Section 4.2.2.2 of the WMMP.) It is estimated that 90% of the high test water reports to the Akaitcho submersible pumps with limited mixing with the mine pool water. This offers the advantage of substantially preventing the dilution of the high test line waters into the mine pool and of limiting the arsenic loading to the mine pool. Maintenance of the high test line is the only reason access to certain areas of the mine is maintained. This requires that power be maintained underground and that personnel be potentially exposed to high arsenic concentrations and to physical injury risks in order to: maintain primary and secondary egress anywhere access is required; maintain sump pumps at various locations and levels; and maintain piping at various locations and levels. Once the system is decommissioned, access to the North portion of the underground will no longer be required. The level of effort required to decommission the system is low and the process is straightforward: the vertical pipes can be cut free of the horizontal pipe; and power to various sump pumps would be disconnected.	

		information on the level of effort that will be required to decommission the High Test System compared to the level of maintenance effort required to retain the system in place or other challenges that make it more beneficial to decommission the High Test System.	Upon decommissioning, high test water from C shaft area will then flow into the mine pool at or near C Shaft; high test water from B Ramp will flow to mine pool at or near B ramp; and 575 level water will flow to the mine pool in vicinity of the Akaitcho shaft and Akaitcho submersible pumps. If the system is decommissioned before the new WTP is commissioned, a significant fraction of the high test water would mix with the mine pool (C-shaft and B-ramp). Once the new WTP is operational, a smaller fraction of the high test water would mix with the mine pool (575 level water flowing to Akaitcho shaft.) A short-term advantage to maintaining the system in place is that it helps limit the dilution of the high arsenic concentrations into the mine pool. This will no longer be the case once the mine water intakes are installed near C-shaft to feed the new WTP. That being said, the mine remains a hydraulic "sink" that captures the high test water regardless of its discharge location underground. Upon decommissioning of the high test system, once the mine water intakes are installed near C-shaft, most of the high test water will be drawn into the WTP system after some mixing. A portion of it will still flow toward the	

			North end of the mine via gravity before being drawn back toward the C-shaft area after entering the mine pool. This mixing of the high test waters into the mine pool in the vicinity of the mine water intake is anticipated to provide the advantage of averaging out the contaminant concentration in the water being delivered to the water treatment plant. An underlying assumption of the EQC models is that the high test line would be decommissioned and that this water would report to the mine pool until the arsenic stopes are frozen. The decommissioning of the high test system will result in water with high concentrations of arsenic originating from the areas of the arsenic stopes reporting to the mine pool. The freeze of the arsenic stopes will stop the flow of high test water. During active remediation and the adaptive management phase, as well as post-closure, the freeze program will monitor the temperature of the rock and fill surrounding the arsenic chambers and the water treatment program will monitor the arsenic concentrations at intake. This will enable the verification of the assumptions made during design. The GMRP will work towards assisting the	

			Board in gathering evidence to support specific project details that can be finalized during the term of the water license. The GMRP acknowledges the request and looks forward to more discussion during the technical session.	
7	EQC Report - Table 3.1 - Water Quality Objectives	**Comment** Table 3.1 includes the statement: "Water quality objectives to be met at the edge of the mixing zone at the end of remediation." GMOB's understanding is that water quality objectives will be met at least by the time the new water treatment plant is contructed in 2026. **Recommendation** GMOB recommends the GMRP clarify when it anticipates that Water Quality Objectives will be met within Yellowknife Bay.	**June 25:** Please refer to the response to MVLWB: Shannon Allerston #8.	
8	EQC Report - Section 4.1.3 - Dust Control and Baker Creek	**Comment** The water quality model assumes that, during construction, dust and closure related run-off does not enter Baker Creek. Quarrying, potentially extensive, will be required as part of the closure works however GMOB understands that the full extent of this requirement is not currently known by the GMRP. Quarrying can be a significant source of dust and while the GMRP will implement dust control, it is unlikely that any such program will be 100% effective. It is	**June 25:** The support for the assumption that negligible dust will enter Baker Creek during construction activities is based on the Dust Management Plan. It is not known what level of dust would influence Baker Creek water chemistry. Air monitoring will occur during construction activities and Baker Creek water quality will be monitored. It is unlikely that EQC would change based on dust deposition given the extensive dust mitigations proposed.	

		not clear to GMOB that there is a clear basis for assuming that no dust will enter Baker Creek as a result of closure activities such as quarrying. **Recommendation** GMOB recommends that the GMRP provide support for the assumption that no dust will enter Baker Creek during construction activities. This should include information on what level of dust generation would be sufficient to influence Baker Creek water quality and the model predictions.		
9	EQC Report - Section 4.1.3 - Sediment Loading from Baker Creek	**Comment** The model does not incorporate a loading contribution from sediments in Baker Creek as these materials will be removed as part of the remediation program. GMOB agrees that removal of the sediments will address the issue of loading contributions in the short term. However GMOB expects that, over time, sediments within Baker Creek will become re-contaminated with arsenic. This material will cycle in the receiving environment, and may contribute an additional arsenic load into Baker Creek on a seasonal basis. This could impact the GMRP's ability to meet EA measures in the future. **Recommendation** GMOB recommends that the GMRP provide an assesssment of the likelihood that	**June 25:** A formal sediment recontamination assessment has not been done. Overall the risk of recontamination of the new Baker Creek sediments is possible, but estimated as low, based on the minimal suspended solid concentrations from upstream sources. The median TSS in upper Baker Creek entering site from July 2011 to August 2018 was 1 mg/L and the 95% percentile was 3.5 mg/L (Appendix B, Table B2, EQC report). For context, the Yellowknife RivF110er has a median of <3 mg/L and a 95th percentile of 33 mg/L. The GMRP does not believe this would affect the Project's ability to meet the EA Measures; sediment removal meets measure 11b. Further, the Project is still examining the use of passive/semi-	

		sediments in Baker Creek become re-contaminated with arsenic, how sediment arsenic will cycle seasonally in Baker Creek, and whether these interactions could be a source of sufficient arsenic to impact compliance with the EA measures.	passive treatment (e.g., wetlands) to reduce contamination from upstream sources by targeting areas of high concentrations/low flow (e.g. Pocket Lake or Trapper Creek). Also see - MVLWB: Shannon Allerston #12. The preliminary design for the Baker Creek channel was presented in the original Baker Creek Preliminary Design Report (PDR; Golder 2012), where channel substrates were described as "granular" and that "typical channel substrates in stream reaches frequented by fish will be primarily cobble to gravel sized, with some fines as well as larger boulder-sized material." The channel substrates were described as being graded with a D15 of 75 mm, a D50 of 120 mm and a D85 of 150 mm. This specification will be re-evaluated during advanced design after engagement with Fisheries and Oceans Canada and stakeholders. The intent of the channel substrate is to provide a stable channel lining that provides fish habitat value; as has been observed at the remediated Baker Creek Reach 4. Fines (silts and clays) will not be placed to mitigate turbidity concerns.	
10	EQC Report - Section 4.1.3 - Cover Infiltration	**Comment** The model assumes that infiltration through the TCA's will be reduced by 98% once covers are installed. This is a significant	**June 25:** The 98% reduction is a representative assumption used for the water balance model. Sensitivity runs in the future will consider a range of	

		reduction, that will affect both parameter loadings to the treatment system as well as treatment volumes. There will be imperfections in the newly constructed covers, and failures (even localized) through time that will affect the amount of infiltration through the covers. GMOB is uncertain whether this rate of reduction will be achievable and for what time period, and also how sensitive the treatment process and water quality modelling results are to increased rates of infiltration through the TCA. **Recommendation** GMOB recommends that the GMRP provide additional support for the expected reduction in infiltration rates. This could included references to case studies demonstrating cover performance both with regard to how much infiltration is reduced as well as for how long the initial rate of reduction is maintained.	appropriate infiltration rates. Intact geomembranes offer extremely low transmission rates, and a reasonable lower bound to consider in a water balance exercise would be over 99.9% based on an intact geomembrane. As the reviewer correctly points out, newly constructed covers are expected to contain imperfections or areas of damage, that will result in some increase to the effective permeability of the cover. Defects in geomembranes and their effect on leakage are an area that has been extensively studied in the literature, and procedures for their estimation in the design stage are well established. Based on a series of conservative assumptions (including a statistically improbable 5 holes in the cover per hectare and standing head of 0.7 m of water somehow maintained on the cover year round), the upper end of infiltration through the cover to be considered in future sensitivity analysis would be in the order of 1 mm per year. Bituminous geomembrane (BGM) covers are amongst the most durable and long-lasting low permeability cover materials known. Properly protected (as is the design for Giant), their expected design life is expected to extend well beyond the current 100 year design period, without	

			significant increases in infiltration. As stated in the assumptions of the EQC report (Section D2-2.4), if the infiltration through the cover is greater than assumed, the volume requiring treatment in the long term could be greater than predicted. Similarly, if the reduction is greater, the volume requiring treatment could be less.	
11	EQC Report - Section 4.1.3 - Infiltration From Pits	**Comment** This section indicates that the model assumes that the pits are not covered, and that water in the local pit watershed would infiltrate to the mine pool. Figure D2.2-7 shows a reduction in pit infiltration volumes from approximately 2021 onwards. The GMRP should confirm that the assumptions used across the models are conistent. **Recommendation** GMOB recommends that the GMRP confirm how infiltration from the pits was treated in the modelling.	**June 25:** Infiltration from the open pits was treated consistently in the underground water quality model (Appendix D2 of EQC Report) and the surface water balance model (Appendix D3 of the EQC Report). The models assumed that water in each of the local pit sub-watersheds would infiltrate to the mine pool. The decrease in the pit infiltration volume from approximately 2021 onward was because of diversion of surface waters in sub-watersheds surrounding A1 Pit to Baker Creek as described in the Water Management and Monitoring Plan.	
12	EQC Report - Section 4.3 - New Water Treatment Plant Removal Efficiencies	**Comment** With the exception of parameters that must meet drinking water guidelines, the modelling assumes that the removal efficiencies for the new WTP are the same as for the existing plant. GMOB agrees that this is a conservative assumption for	**June 25:** Removal efficiencies at the WTP have not been established at this time, therefore the GMRP cannot comment on the level of conservatism that has been introduced to the model by assuming the same removal efficiencies as the ETP. Regardless, the	

		the purposes of confirming that the effluent will not cause exceedances of SSWQO in the receiving environment, it may result in setting EQC higher than necessary. One of the objectives contained in the Board's Water and Effluent Quality Management Policy is waste minimization - this is often implemented by not setting EQC higher than necessary and achievable. GMOB appreciates that the GMRP has reduced proposed EQC from the levels originally proposed, but is interested in whether there could be an opportunity to further reduce waste discharge levels once the new Water Treatment Plant is commissioned. **Recommendation** GMOB recommends that the GMRP provide a discussion regarding what removal efficiencies may be expected from the new Water Treatment Plant, and what level of conservatism is introduced by assuming that the new plant will see the same removal efficiencies as the current plant.	GMRP considers the proposed EQC for the WTP achievable and protective of the receiving environment.	
13	EQC Report - Section 5.1 - EQC for Existing Effluent Treatment Plant	**Comment** 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 GMRP support this request with evidence that the	**June 25:** A formal screening process to identify POPC, and back-calculation of EQC was intentionally not completed for the ETP. The GMRP is requesting that operation and discharge from the existing ETP, which was designed to meet MDMER limits, be	

		current effluent is non-acutely toxic, that aquatic life is still reproducing and growing in Baker Creek, and that the ETP cannot undergo major upgrades. Based on this rationale and the fact that the Project will need to meet the MDMER discharge limits, the GMRP has proposed EQC for the ETP that are equal or less than the the MDMER limits. The GMRP did not do any additional EQC screening process for the ETP (e.g., what was done for the WTP in Section 5.2). **Recommendation** While GMOB accepts that current discharge concentrations are an appropriate basis for setting EQC from the ETP, GMOB recommends that the list of regulated parameters more accurately reflect the true parameters of potential concern in the ETP discharge rather than the parameters required by the MDMER based on national (i.e., not site-specific) concerns. In GMOB's view, the selection of EQC parameters should be transparent and consistent. Including parameters that are of no concern at this site (e.g., Radium-226) in the list of EQC may actually cause undue concern from affected parties. Not including parameters that are of potential concern may lessen the attention paid to changes in those	permitted under a Water Licence to allow closure work to begin, including construction of the new WTP. Because the ETP has been operating under the MDMER, the existing MDMER limits were used as a starting point (i.e., a status quo condition). The GMRP will achieve the MDMER discharge limits, or lower. However, it is recognized that both the MDMER and the Type A Water Licence will apply to the Site moving forward. To the extent possible, the GMRP has attempted to align the proposed EQC with requirements under the MDMER. As such, parameters that are not necessarily of concern have proposed EQC. Please also refer to the responses to MVLWB: Shannon Allerston #16 and #17 for more information. The GMRP has been transparent and consistent in its rationale for the proposed ETP EQC. Focus was placed on developing EQC for the WTP. The Board's general process was followed when developing EQC for parameters of potential concern (POPC) for the new WTP effluent.	

		parameter concentrations over time. For these reasons, GMOB suggests that a more consistent method of identifying EQC parameters is to choose those with historic effluent concentrations that exceed SSWQOs. Based on information provided in Appendix B, parameters with 95th percentile concentrations that exceed the appropriate SSWQO include chloride, sulphate, nitrate, antimony, arsenic, cobalt, copper, and nickel. EQC for total suspended sediments, un-ionized ammonia, pH and total petroleum hydrocarbons are also recommended for reasons described in the EQC Report. As noted above, a loading limit for nitrogen may also be appropriate. EQC values for these parameters could be set at levels that are currently achievable at the ETP.		
14	EQC Report - Section 5.2.2 - Screening Process for WTP	**Comment** The notes to Figure 12 suggest that 95th percentile concentrations from water quality stations in Yellowknife Bay are used to establish background concentrations in Yellowknife Bay. Table 5-3 appears to use median concentrations for establishing ambient concentrations in Yellowknife Bay. **Recommendation** GMOB recommends that the GMRP confirm	**June 25:** There is a typographical error in the Figure 5-12 footnotes in the EQC Report. Footnote (b) should refer to Table 5-3. Background concentrations are represented by the lowest median concentration from water quality stations in Yellowknife Bay near proposed outfall and Back Bay (Appendix B) and regional background concentrations presented in CanNorth (2018).	

		how background concentrations in Yellowknife Bay were established.		
15	EQC Report - Section 5.2.2.2 - Screening Process for WTP	**Comment** The proposed selection process for parameters of potential concern (POPC) involves three steps as described in section 5.2.2. The first two steps compare the 95th percentile WTP discharge concentations to background concentrations in Yellowknife Bay and to SSWQOs respectively. The third step eliminates parameters if the predicted future concentrations at the edge of the mixing zone are lower than the 95th percentile of background concentrations in Yellowknife Bay. **Recommendation** GMOB recommends that parameters of potential concern are chosen on the basis of only the first two screening steps proposed in section 5.2.2. Use of the third screening step relies too heavily on predictions from water quality models which contain many assumptions and uncertainties. On this basis, the parameters of potential concern would include chloride, sulphate, antimony, arsenic, cobalt, copper, lead, nickel and zinc.	**June 25:** Please refer to the response to Slater Environmental Consulting: Bill Slater #15	
16	EQC Report - Section 5.2.2.3 - Parameter	**Comment** Although chloride and sulphate were initially screened-in as potential parameters of concern, the	**June 25:** The GMRP proposes not to regulate ions through EQC, but rather through monitoring, tracking, and	

	Screening Summary for the WTP	GMRP decided not to propose EQC for those parameters because 1) the concentrations of these POPC are predicted to be below SSWQOs at the edge of the mixing zone; 2) that the WTP is not currently designed to treat for these ions; and 3) that the only treatment option for these parameters is reverse osmosis which the GMRP does not recommend. **Recommendation** As the concentrations of chloride and sulphate are not predicted to exceed SSWQOs at the edge of the mixing zone, GMOB agrees that switching to a treatment option like reverse osmosis is not necessary for the WTP. However, as with EQC for the ETP, GMOB recommends setting EQC for parameters where the predicted effluent concentration exceeds the SSWQO as those parameters are of potential concern, including chloride and sulphate. Again, there are many additional assumptions and uncertainties built into the mixing zone predictions that will only be verified after the WTP is in operation.	reporting through the SNP/OMP (WTP influent/effluent) and the AEMP (receiving environment). Please refer to the response to Slater Environmental Consulting: Bill Slater #16.	
17	EQC Report - Section 5.2.4 - Effluent Quality Summary for WTP	**Comment** In addition to parameters that "screened in" as parameters of potential concern, the GMRP is proposing EQC for parameters that are regulated by the MDMER (i.e., pH,	**June 25:** EQC proposed for cyanide and radium (an un-ionized ammonia) were set equal to MDMER limits simply to be compliant with federal legislation. Please see the response to	

		total suspended sediments, un-ionized ammonia, cyanide, and radium). **Recommendation** As there is no evidence that cyanide or radium are parameters of potential concern, GMOB recommends that no EQC are needed for those parameters. At this time it is unclear whether an EQC for un-ionized ammonia is needed for the WTP. GMOB recommends EQC for chloride, sulphate, antimony, arsenic, cobalt, copper, lead, nickel, zinc, total suspended sediments, pH, and total petroleum hydrocarbons for the WTP.	Giant Mine Oversight Board #13, regarding alignment of the territorial and federal regulatory frameworks. The remaining list of parameters that GMOB provides is similar to the list presented in the EQC Report, with the exception that the GMRP does not include cobalt, sulphate and chloride. Reasons for excluding cobalt are provided in Slater Environmental Consulting: Bill Slater #15. Reasons for excluding chloride and sulphate are provided in Section 5.2.2.3 of the EQC Report and are discussed in the response to Giant Mine Oversight Board: GMOB #16.	
18	EQC Report - Appendix C - Model Assumptions Table	**Comment** Appendix C includes a table summarizing the assumptions around the EQC modelling. One of these assumpitions is that the water level is at the 750 level without much, if any, flucuation. Section D2-2.4 re-iterates this assumption and notes that if minewater levels are allowed to increase, then predicted water treatment plant influent quality could change. GMOB expects that this could also influence water treatment plant effluent quality, and associated model estimates. The Model Assumption Table also identifies that there will be a future raise in minewater level to the base of the pits where the pits may be	**June 25:** No, the GMRP does not agree that the Water Licence should prescribe modelling and assessment for a possible future minewater level raise. The GMRP has proposed a RRP to do this study/assessment and this provides the results and direction for future work. The RRP is the appropriate location for such work and a specific Water Licence condition is duplicative and unnecessary.	

		filled with tailings, and that this was not modelled. Before any water level raise to higher than the 750L, the model results should be updated to account for changes to water quality associated with such a raise. **Recommendation** GMOB recommends that the water licence should include requirements describing additional assessment and modelling that must be completed before the water level in the underground is allowed to increase higher than the 750L.		
19	EQC Report - Section D2-2.3.1.3 - NW Pond Infiltration	**Comment** Statements in this section, as well as in the surface water balance model identify a discrepancy between the volume of water seeping from the Northwest Pond in the surface models and the volume of water infiltating from the northwest pond in the underground models. Section D3-4 identifies this discrepancy as an overestimation of about 48%. It is not clear to GMOB where this water could be going, and what steps are being taken to identify potential pathways. **Recommendation** GMOB recommends the GMRP provide a discussion regarding where this missing water could be going and a description of any implications for the	**June 25:** Infiltration around the Northwest Pond was an uncertainty during mine operations and early mine closure and this continues. Additional information on infiltration may be supplemented by a Terre-net radionuclide study in and around the Northwest Pond. Infiltration rates from the surface water balance were used as model inputs in the underground water quality model based on the reasons listed in Section D2-2.3.1.3. Using infiltration rates from the surface water balance is a conservative approach for the development of effluent quality criteria (EQC) as it accounts for the potential "missing water". The higher infiltration rates at the Northwest Pond mean that more minewater needs to be	

		site water quality modelling based on the different potential pathways.	treated by the water treatment plant (WTP) and more effluent needs to be discharged to Yellowknife Bay. Because EQC derivation was dependent on the proportion of effluent in Yellowknife Bay, using higher infiltration rates from the surface water balance at the Northwest Pond is considered conservative for the purpose of developing EQC.	
20	EQC Report - Section D2-2.3.2.1 - Upwelling of Connate Water	**Comment** The model does not incorporate upwelling of deep connate water, and only incorporates lateral inflow chemistry. GMOB's understanding of the conceptual underground water model is that there will be water drawn into the system from below as well as from the sides. Water quality in the NWT tends to becomes more saline with depth, and this water has been a cause of concern at other NWT minesites. GMOB is concerned that not incorporating inflow chemistry from water infiltrating upwards into the mine may underpredict the concentrations of salts that will be present in the minewater. This could, in turn, influence the predictions for water quality in Yellowknife Bay. **Recommendation** GMOB recommends that GMRP provide a discussion regarding how using water	**June 25:** Due to the low hydraulic conductivity of the bedrock with depth, groundwater inflow is dominated by the movement of shallower non-connate water to the underground development. The groundwater inflow estimates to the underground used in the EQC model include water flowing from the sides and base of the underground. Of the total estimated inflow to the underground, approximately 30% is estimated to come from depths below the current mine pool elevation and 20% from below the 1200 L, where measured TDS concentrations in the C-Shaft are near their highest (i.e. upwelling). TDS concentrations have been measured in the C-shaft three times between October 2017 and December 2018. Additional monitoring data in the future can be utilized to assess if TDS/chloride concentrations are	

		chemistry from shallower lateral inflows will adequately predict the concentrations of salts in the underground minewater pool.	increasing, which would reflect the influence of continued upwelling.	
21	EQC Report - Section D2-2.5 - Model Calibration	**Comment** This section indicates that: "Median concentrations from the distribution tool were initially tested as water chemistry input concentrations, then the model was calibrated by adjusting the median water chemistry input concentrations:" This statement is followed by three bullets that describe adjustmetns to several inflow concentrations and a reference to a Table D2.2-12. Table D2.2-12 is not in the document. **Recommendation** GMOB recommends that Table D2.2-12 should be included with the EQC report.	**June 25:** Thank-you, the water quality inputs used for the model calibration are provided. The tables number references in the text are correct, but the table numbers for Tables D2.2-7 to D2.2-10 are shifted by two. Table D2.2-7: High Test System Chemistry Profile should be Table D2.2-9; Table D2.2-8: Surface Facility Water Chemistry Profile should be Table D2.2-10; Table D2.2-9: Mine Pool Water Quality, 2017 and 2018 should be Table D2.2-11 and Table D2.2-10: Water Chemistry Inputs Used for Model Calibration should be Table D2.2-12.	
22	EQC Report - Section F-3.3.5.2 - Arsenic SSWQO Derivation	**Comment** The recommended SSWQO for arsenic of 31 ug/L is based on an SSD curve that combines both trivalent and pentavalent arsenic toxicity results. This value is less than would be derived if only pentavalent arsenic toxicity results are used. The GMRP suggests that arsenic in Yellowknife Bay is most likely to be in the pentavalent form due to the presence of oxidizing conditions. GMOB agrees that oxidizing conditions in	**June 25:** SSD curves were developed for pentavalent and trivalent arsenic and pentavalent arsenic only and the SSWQO was selected as the more conservative HC5 value from the two SSD models. The HC5 for pentavalent arsenic only was 35.7 ug/L and for pentavalent and trivalent arsenic combined was 31 ug/L. Therefore, the more conservative (i.e., lower) HC5 of 31 ug/L was selected as the SSWQO. Therefore, the SSWQO for pentavalent	

		Yellowknife Bay are likely during open water periods. However, GMOB is concerned that less oxidizing conditions may be present during under ice periods or in close proximity to the sediment water interface. If, under certain conditions, trivalent arsenic is the dominant arsenic form, then the derived SSWQO may not be sufficiently protective. **Recommendation** GMOB recommends that GMRP provide evidence supporting the assertion that pentavalent arsenic is the most likely form for arsenic in Yellowknife Bay, particularly during under ice periods or in close proximity to the sediment/water interface.	and trivalent arsenic is protective of conditions where either form of arsenic may predominate.	
23	EQC Report - Section F-3.5.5.2 - Copper SSWQO Derivation	**Comment** The copper SSWQO was derived using biotic ligand models. Two different models were used, and each model provided a different result. The Bio-met model produced a value approximately 4 times higher than the Windward model. The recommended SSWQO is the geometric mean of the two model outputs. This method of settling upon an SSWQO, i.e. calculating the geometric mean from two different models, seems somewhat arbitrary. The GMRP provides a comparison of how the two models compare, but is not able to provide a	**June 25:** The Biomet Bioavailability Tool and Windward Biotic Ligand Model provide estimates of the copper SSWQO. A comparison of the two models could not identify any rationale for selection of one model over the other. Therefore, the SSWQO was calculated as the geomean of the output from the two models as a balanced approach that considers the model uncertainties and differences in model assumption that potentially affect the model output. This is considered a reasonable approach because it allows for inclusion of two	

		recommendation on which model more accurately represents the conditions in Yellowknife Bay. The most conservative approach would be to select the lower of the two values and apply that number as the SSWQO for copper in Yellowknife Bay. **Recommendation** GMOB recommends the GMRP discuss whether the lower of the two modelled copper SSWQO (i.e. 2.89 ug/L) could be adopted for use in Yellowknife Bay.	model estimates in calculating the resulting SSWQO. It also provides confidence that the two model types yield results that are broadly consistent (with acknowledgement of variations in model output). Although adoption of the lowest BLM value would provide "the most conservative approach" this additional margin of safety is not necessary given the conservative assumptions already incorporated in the derivation. Specifically, the model output was already appropriately conservative based on application of model inputs for "worst-case" water quality conditions (i.e., lower tail percentiles for pH, DOC, and hardness). The likelihood of simultaneous lower tail conditions of pH, DOC, and hardness occurring in Yellowknife Bay, for the length of time needed to induce chronic toxicity in aquatic organisms, is low. Significant autocorrelation among these water quality variables, which would lead to simultaneous extreme conditions for these parameters, is not expected based on the water quality predictions and measurements, such that convergence of lower tail values for all three parameters would be extremely rare. Therefore, the resulting copper SSWQO was considered	

			adequately protective of aquatic life. Selection of an estimate from the lower of the two model outputs introduces another layer of conservatism into the SSWQO that may be overly conservative (i.e., the objective is to be appropriately conservative, but not excessively so).	
24	EQC Report - Errata - Figure 2-10	**Comment** The figure title refers to copper, but the y-axis lable refers to cobalt. The data in the table appears to be for copper, but it is difficult to confirm given the scale of the figure. If it is copper, the table does not appear to reflect the statement made in Section 2.3 regarding copper concentrations increasing after treatment. **Recommendation** GMOB recommends that the GMRP review the data and headings in Figure 2-10 and make any requried corrections.	**June 25:** Thank-you for identifying this. Figure 2-10 in the EQC Report is a comparison of total cobalt concentrations before and after treatment and should be updated to show the total copper figure provided in Appendix B, Figure B-30.	
25	EQC Report - Errata - Table 5.11	**Comment** The second column heading in this table is "Total Antimony Concentration". This table relates to zinc. **Recommendation** GMOB recommends that the GMRP confirm that the infomration contained within the table relates to the correct parameter.	**June 25:** Thank-you. The column header in Table 5-11 in the EQC Report should read total zinc instead of total antimony.	

26	EQC Report - Errata - Section D2-2.2.1.1 - Figure D.2.2-3	**Comment** Figure D2.2-3 is identified as minewater flow under existing conditions. According to GMOB's understanding or the conceptual model, Figure D2.2-3 represents minewater flow under future conditions. **Recommendation** GMOB recommends the GMRP confirm the accuracy of Figure D.2.2-3.	**June 25:** Figures D2.2-3 and D2.2-4b are in wrong order and should be switched.	
27	Water Management and Monitoring Plan - Section 1.5 - Required Review and Updates	**Comment** In section 1.5 of the draft Water Management and Monitoring Plan, the GMRP requests the approval of Phase 1 of the plan upon issuance and commits to updating Phase 2 of the plan for submission 90 days prior to Phase 2. **Recommendation** Although the content of Phase 1 of this plan will continue to be discussed during the licensing prcess, GMOB supports a phased approval process for this Plan in principle. In our comments on the draft water licence, we have recommended that specific language describing the phased approval process process be included in the water licence.	**June 25:** A phased approval process is requested in order to reflect the change from current operations (Phase I) to remediation (Phase II). This will be discussed during the technical sessions and an updated Appendix B: Conformity Table of Items Requiring Submission will be provided to clarify the requested timing of specific plans and approvals after the second technical session is complete.	
28	Water Management and Monitoring Plan - Section 3.4.2 and	**Comment** The GMRP is proposing to use MDMER monthly average concentrations as the direct discharge criteria for run-off from the site. GMOB agrees that these would be the	**June 25:** The surface runoff criteria are proposed to be at a maximum, the MDMER limits as outlined in the WMMP. The quality of runoff from engineered covers is under review.	

	A-5 - Run-off Water Quality	minimum standards for discharge water quality required under Federal legislation. However, Board policy is to minimize discharge of contaminants, where possible, and the outcome of the EA (lowering arsenic concentrations in treated effluent to the drinking water guideline) indicates a general preference for better discharge water quality. The GMRP does not provide information on the expected ranges of run-off water quality from site sources, or other rationale supporting the need to go to MDMER limits. GMOB also notes that the run-off water quality criteria are not reflected in the draft water licence. **Recommendation** GMOB recommend the GMRP provide a discussion of the likely range of run-off water quality and identify whether lower limits could be proposed. The current draft WMMP implies that these criteria will be need to be finalized for Phase 2 of the remediation; please confirm. GMOB also recommends that the proposed thresholds for when runoff water is acceptable for direct release to the receiving environment be reviewed as discussed in section 7.7 of the Slater Environmental Consulting May 25, 2019 memo to the Giant Mine Working Group. GMOB recommends	Geochemical studies of potential borrow/cover material are currently underway. Further reductions in the runoff criteria is not recommended until additional testing is complete. Runoff criteria are provided in the WMMP. The GMRP would support an addition to the WL Part G Condition 3 Schedule 3 Condition 1.	

		that run-off water quality criteria should be included as a water licence condition.		
29	Water Management and Monitoring Plan - Section 3.4.3 - Water Management Infrastructure - Freeboard	**Comment** The Water Management Infrastructure Design Criteria includes allowance for 0.3 m of freeboard for ditches and storage ponds. A number of factors should be considered when establishing freeboard limits, but information on what was considered for the ditches and storage ponds was not provided. **Recommendation** GMOB recommends the GMRP provide a rationale for selecting 0.3 m as the freeboard for ditches and storage ponds.	**June 25:** Section 3.4.3 of the Water MMP indicates that "these preliminary criteria will be confirmed or refined during detailed design stages, and updated in future versions of the Water MMP as required." A preliminary freeboard value of 0.3 m is based on MTO (2008) highway drainage design standards for roadside ditches. A scope of work for development of a water management design basis is currently in progress and will identify factors considered in establishing freeboard requirements Reference: Ontario Ministry of Transportation (MTO). 2008. Highway Drainage Design Standards, 73 p.	
30	Water Management and Monitoring Plan - Table 4.1.2 - North Pond Freeboard	**Comment** This table provides a summary of the TCA infrastructure and flow pathways. The minimum freeboard for the North Pond is identified as 180.3 m. However, the operational levels are maintained between 173.4 and 175.5 m to maintain the stability of Dam 2. Information is not provided on the nature of the stability issues, or on the potential implictions of allowing the pond to fill to the Freeboard elevation.	**June 25:** During active mining operations, the operator had imposed a limitation that the water elevation differential between the North and Polishing Ponds not exceed 5.5 feet (1.7m) (Golder 1999). This was based on the interpretation that the dam's foundation contained soils susceptible to internal erosion (Golder 1999). GMRP has maintained this limitation during care and maintenance. Recently, the care and maintenance	

		It appears that the required "freeboard" water level may be lower than 180.3 m. **Recommendation** GMOB recommends that the GMRP provide additional information regarding the stability concern with Dam 2 and the resulting limitations on water levels within the North Pond.	contractor has been able to maintain less than the maximum, including during climate events such as the annual spring freshet and higher than typical rainfall events. This has typically kept the water elevation in the North Pond below an elevation of 175 m. Within the OMS Manual, the maximum differential is identified as being the criterion that dictates the water elevation in the North Pond. The minimum freeboard is intended to prevent overtopping of the dam from a low probability climate event.	
31	Water Management and Monitoring Plan - Section 4.2.2.2 - High Test Line	**Comment** This section identifies that approximately 37% of the water being conveyed to surface comes through the High Test System, and appears to suggest that the future of the high test system will be determined through future design work. Information in other documents seems to indicate that the High Test System will be decommissioned. GMOB is interested in the rationale for decommissioning this line. **Recommendation** GMOB recommends the GMRP provide the rationale for decommissioning the high test system.	**June 25:** Currently the existing piping leads high test water down the C shaft, down the B Ramp and from 575 level to 750 level near Supercrest Pump Station. On the 750 level a horizontal pipe collects all three vertical pipes and transfers the high test water to the Akaitcho high lift sump, where it flows toward the Akaitcho submersible pumps and is conveyed to the NWTP for storage, treatment and discharge. (Please refer to Section 4.2.2.2 of the WMMP.) It is estimated that 90% of the high test water reports to the Akaitcho submersible pumps with limited mixing with the mine pool water. This offers the advantage of substantially preventing the dilution of the high test line waters into the mine	

			pool and of limiting the arsenic loading to the mine pool. Maintenance of the high test line is the only reason access to certain areas of the mine is maintained. This requires that power be maintained underground and that personnel be potentially exposed to high arsenic concentrations and to physical injury risks in order to: maintain primary and secondary egress anywhere access is required; maintain sump pumps at various locations and levels; and maintain piping at various locations and levels. Once the system is decommissioned, access to the North portion of the underground will no longer be required. The level of effort required to decommission the system is low and the process is straightforward: the vertical pipes can be cut free of the horizontal pipe; and power to various sump pumps would be disconnected. Upon decommissioning, high test water from C shaft area will then flow into the mine pool at or near C Shaft; high test water from B Ramp will flow to mine pool at or near B ramp; and 575 level water will flow to the mine pool in vicinity of the Akaitcho shaft and Akaitcho submersible pumps. If the system is decommissioned before the new WTP is commissioned, a significant fraction of the high test	

			water would mix with the mine pool (C-shaft and B-ramp). Once the new WTP is operational, a smaller fraction of the high test water would mix with the mine pool (575 level water flowing to Akaitcho shaft.) A short-term advantage to maintaining the system in place is that it helps limit the dilution of the high arsenic concentrations into the mine pool. This will no longer be the case once the mine water intakes are installed near C-shaft to feed the new WTP. That being said, the mine remains a hydraulic "sink" that captures the high test water regardless of its discharge location underground. Upon decommissioning of the high test system, once the mine water intakes are installed near C-shaft, most of the high test water will be drawn into the WTP system after some mixing. A portion of it will still flow toward the North end of the mine via gravity before being drawn back toward the C-shaft area after entering the mine pool. This mixing of the high test waters into the mine pool in the vicinity of the mine water intake is anticipated to provide the advantage of averaging out the contaminant concentration in the water being delivered to the water treatment plant. An underlying assumption of the EQC models is that	

			the high test line would be decommissioned and that this water would report to the mine pool until the arsenic stopes are frozen. The decommissioning of the high test system will result in water with high concentrations of arsenic originating from the areas of the arsenic stopes reporting to the mine pool. The freeze of the arsenic stopes will stop the flow of high test water. During active remediation and the adaptive management phase, as well as post-closure, the freeze program will monitor the temperature of the rock and fill surrounding the arsenic chambers and the water treatment program will monitor the arsenic concentrations at intake. This will enable the verification of the assumptions made during design. The GMRP will work towards assisting the Board in gathering evidence to support specific project details that can be finalized during the term of the Water Licence. The GMRP acknowledges the request and looks forward to more discussion during the technical session.	
32	Water Management and Monitoring Plan - Section 4.2.2.2 - High Test Line	**Comment** This section notes that sewage from the C-Dry building ends up in the high test system. **Recommendation** Has influent/effluent from the ETP been	**June 25:** The GMRP confirms that fecal coliforms are measured at SNP 43-21/21A (Akaitcho Shaft, pumped mine water from underground to Northwest Pond) and at SNP 43-1	

		tested for microbiological parameters? Is it necessary?	(ETP discharge). Continuance of this sampling is not necessary once sewage is disposed of off-site.	
33	Water Management and Monitoring Plan - Section 4.3.2 and Section 5.2.3.4 - Ferric Sulphate	**Comment** Section 4.2.3 identifies that the current ETP uses ferric sulphate in the treatment process, and Section 5.2.3.4 identifes that the new WTP will use same initial pre-treatment step as the current ETP. GMOB assumes this to mean that ferric sulphate will be used in the new plant. Discharge water quality information suggests that sulphate concentrations in the effluent will be relatively high. While sulphate tends to present fewer toxicological issues than other anions, it can have effects at higher concentrations. **Recommendation** GMOB requests the GMRP confirm whether ferric sulphate is used in the new WTP, and discuss whether alternative reagents might be available for consideration.	**June 25:** The design basis for the new WTP is ferric sulphate, due to its effectiveness to remove arsenic. Two other alternatives were considered, ferric chloride and aluminum-based coagulants. Both of these options were rejected, as ferric sulphate was found to be more effective and forms a sludge that is easier to dewater than the alternatives.	
34	Water Management and Monitoring Plan - Section 4.3.3 - Splitter Dyke Stability	**Comment** This section identifies that the water levels in the settling pond are managed as a function of the water levels in the polishing pond in order to maintain the stability of the splitter dyke. This section implies that additional information will become available in the OMS Manual to be produced by Parsons. **Recommendation** GMOB	**June 25:** The Splitter Dyke is an operational structure that facilitates settling of solids within the Settling Pond, but does not contribute to the overall physical stability of the Settling and Polishing Ponds. While managing the stability of the splitter dyke introduces operational constraints, it does not affect overall stability of the system. The Splitter Dyke is used to	

		recommends that the GMRP provide a summary of the issue with the splitter dyke and identify specifically when the OMS Manual will be completed. It will be useful at the Technical Session to discuss the role of the OMS Manual and what overlaps with the WMMP.	retain solids in the Settling Pond that are produced from water treatment. It was originally constructed out of rockfill sourced from mining operations. It was constructed with the intent that water would flow by gravity from the Settling Pond into the Polishing Pond through the void spaces in the dyke fill. Dyke fill would likely have been placed using end dumping on tailings with minimal compaction. Historically, longitudinal cracks have appeared in the splitter dyke crest. These cracks typically appeared at the initiation of water treatment when the head differential across the dyke was at its greatest. Once the differential was reduced below a certain value, no new cracks were observed. To prevent cracking, the maximum difference in water levels between the settling and polishing ponds has been controlled, and in 2015, granular fill was placed to flatten the slopes of the dyke. Since this fill placement and management of the differential, additional observed cracking has been minor. Currently, the GMRP relies upon pumps to maintain the head differential across the dyke below 0.8 m. The approach for managing the stability of the Splitter Dyke via the water differential	

			is described in the OMS Manual. The OMS Manual is maintained by the Main Construction Manager, with input from Professional Engineers. The current OMS was finalized in February 2019 and will be posted on Parsons' website in the near future.	
35	Water Management and Monitoring Plan - Section 5.1-1 - Pit Water Managment	**Comment** GMOB understands that several potential scenarios are being contemplated for the pits, including filling the pits and grading to a spillway for passive discharge, or grading to a collection point which would presumably require pumping to discharge. Water quality modelling for the purposes of EQC development assumed that water would infiltrate through the pits. It is not clear to GMOB when the decision will be made regarding which option is selected for a specific pit. It is also not clear what the implications to the overall site water balance and water quality will be for each pit option. **Recommendation** GMOB recommends the GMRP provide a discussion describing the factors that will be considered when determining the type of pit cover as well as the overall implications for the overall site water balance and water quality.	**June 25:** Open pit design effort is ongoing and the GMRP is assessing which type of cover or cap will be used on a pit-by-pit basis. A cap is synonymous for engineered cover, or implies less engineering than the engineered cover. An engineered cover is a system that may include layers of granular materials such as soil, clay, rockfill, topsoil or geosynthetics designed to achieve objectives that may include: control dust, flow of air and/or water, maintain physical stability or to support the growth of vegetation. A cap can be defined as a layer used to protect the material under it from erosion, to limit exposure of the public and wildlife to the material, to dissuade public access (e.g. by ATV's), and to limit vegetation penetration. An engineered cover can be defined as a layer or system that may include layers of granular materials, such as soil, clay, rockfill, topsoil, or else geosynthetics designed to achieve objectives including control of dust,	

			maintain physical stability, reduce flux of water, air, or oxygen through the material being covered. All contaminated material placed in pits will be covered with a cap consisting of clean granular fill. Some of the considerations when determining whether to incorporate a cover into the design are the nature of the pit fill, dust control, the flood risks, the monitoring and maintenance requirements, the risk of settlement and the durability. If predicted water quality from the pit to the minepool is significantly different from the input assumptions used in the EQC modeling, then revisions to the modelling may be considered. Depending on predicted influence on mine pool water quality and evaluation of the impacts to the WTP design, further examination on type of cover would be completed. Considerations may include an engineered cover to reduce water flow through the pit as needed.	
36	Water Management and Monitoring Plan - Section 5.1.4 - Contingency Water Management Pond	**Comment** This section suggests that a water management pond may be required to provide contingency contact water storage. Information in other documents submitted by the GMRP suggested that a water storage pond would not be used, and that the mine pool would be used to manage	**June 25:** Section 5.1 of the Water MMP addresses water management during the Active Remediation and Adaptive Management phase of the project. Additional storage provided by a water management pond may be required to accommodate runoff from areas under active remediation or those	

		water for treatment. **Recommendation** GMOB recommends that the GMRP provide additional information on a potential water management pond, including size, duration of use, water quality within the structure, and how it would be used in site water management.	where remediation is complete but water quality has not yet been confirmed as acceptable for release to the receiving environment. This is consistent with the statement in Section 5.5.4.4 of the Closure and Reclamation Plan that "A temporary surface water management pond may be required to provide contingency contact water storage. This will be determined during detailed design stages when remediation and water management activities will be refined. The temporary water management pond would be sited in an appropriate location based on topographical constraints and proximity to the new WTP." No water management pond is anticipated to be required during the post-closure phase of the Project.	
37	Water Management and Monitoring Plan - Section 5.2.3.4 - Lab Testing	**Comment** An off-site lab will be used to confirm arsenic concentrations in process waters. **Recommendation** Will the GMRP establish an on-site lab that could complete analyses on a short turn-around for process control purposes?	**June 25:** The establishment of an on-site lab is not within the scope of the project. There are local, off-site labs that currently meet most analytical demands of the GMRP including short turn-around times of certain parameters including arsenic .	
38	Water Management and Monitoring Plan - Section 5.3 - Non-	**Comment** A non-hazardous waste landfill will be maintained to accept non-hazardous building demolition debris and process residuals from the WTP. Surface water retention ponds	**June 25:** As the non-hazardous waste landfill is only planned to contain inert material, leachate quantity and quality monitoring is not being proposed. Contact water during operation of the	

	hazardous Waste Landfill	will be used to collect run-off water once the landfill is capped, but there is no discussion regarding expected volumes or quality of leachate that will be generated during operation. The EQC modelling report identifies that landfill leachate was not incorporated into the model due to the expected small volume. **Recommendation** GMOB recommends the GMRP identify expected landfill leachate volumes, quality and disposal method.	landfill and post closure will be monitored; the GMRP has not estimated leachate volumes at this time. Landfill Cell Volume: The non-hazardous waste cell will be capped with a low-permeability cover after the completion of the building demolition and debris collection program. The low-permeability liner will be graded to promote runoff of precipitation and meltwater, thereby minimizing the volume of water entering the cell. Quality and Disposal Method: The base of the cells will be graded to promote water drainage within the cells to an internal collection sump. During operations the sump will be emptied via a withdrawal pipe and the recovered water will be hauled to the North West Pond for treatment in the ETP. After the new WTP is in operation, all recovered water will be hauled to the WTP for treatment. Access to the sump within the cell will remain in the future as a contingency. Water Treatment Plant Process Residuals Cell Volume: Water loss is not expected from the residuals, as per the CRP, the sludge cake is processed to achieve a concentration of 18% to 22% of total suspended solids by a dedicated thickening, storage, and dewatering unit prior to placement in	

			the cell.Quality and Disposal Method: The base of the cells will be graded to promote water drainage within the cells to an internal collection sump. During operations the sump will be emptied via a withdrawal pipe and the recovered water will be hauled to the WTP for treatment.	
39	Water Management and Monitoring Plan - Section 8 - Monitoring Programs	**Comment** This section describes the different kinds of water-related monitoring being undertaken by the GMRP, referencing the SNP, the AEMPs, and Standard Operating Procedures (SOP) for Effluent and Water Sampling. We note that the SOP has been provided under separate cover from the Water Management and Monitoring Plan. **Recommendation** The similarities and differences between the SOP and the SNP are confusing and it would be useful to discuss the distinctions during the technical sessions. It may help to append the full list of stations for both the SNP and the OMP to this plan. Although it is understood that it is not useful to report all of the operational monitoring to the Board, GMOB recommends that all the collected data should be available upon request.	**June 25:** The SNP is a collection of legal compliance stations with a list of required monitoring parameters. The SNP has a focus on on-site waste and water features. The AEMP is focused on monitoring the receiving environment for potential effects of the GMRP. The Operational Monitoring Plan (OMP) houses remaining operational monitoring required for the on-going management of the site. The SOP is a standard operation procedure on "how" to collect water samples on site and covers required QA/QC methodology for the site. The SOP document includes a list of all sampling locations in the SNP and OMP, as well as under the MDMER and proposed AEMP. The GMRP has and will continue to make monitoring data readily available. Table 8.0-1 in the WMMP is high level and provides the types of samples and monitoring programs that will be conducted, but without details. The GMRP recognized	

			that, especially for water, there was complexity in aligning the sampling under the SNP, OMP, MDMER and AEMP. Tables 3-1 and 3-2 of the SOP present the details of the water sampling programs. Figures, parameters, station identification sheets, and compliance reporting requirements are also provided in the SOP.	
40	Water Management and Monitoring Plan - Section 9 - Contingency Planning	**Comment** This section of the plan seems to indicate that contingencies for water management are still in draft form. Although Action Levels are mentioned in this section, it isn't clear if the GMRP intends to define them or not for this plan. In Appendix G, there are a number of "risk statements" with corresponding "initiation points of contingency" but much more work is needed to define useful quantitative Action Levels. **Recommendation** GMOB recommends that Action Levels be developed for key water management structures as well as water quality/quantity monitoring locations. These Action Levels should be as quantitative as possible to make it clear when an exceedance has occurred. Action Levels also need to be set to serve as an early warning of a potential unacceptable outcome for the receiving	**June 25:** Correct, action levels will be developed in future versions of the Water Management and Monitoring Plan.	

		environment such as an EQC exceedance or an exceedance of surface runoff criteria. For example, Action Levels could be set for water quality in the Polishing Pond (OMP station PL-PO) or Settling Pond (OMP station ST-PO) so that an EQC exceedance, as envisioned in Table 9.0-1 is avoided. Overall, the idea of setting Action Levels in site management plans is to ensure that structures and processes are working as intended. For the Water Management and Monitoring Plan, Action Levels also need to be set with the goal of detecting important deviations from assumptions/predictions of the water quality models. Action Levels should be described in the Water Management and Monitoring Plan and exceedances/actions taken reported in the Annual Water Licence Report.		
41	Water Management and Monitoring Plan - Section 8.4.1 - OMS Manual	**Comment** This section identifies that: "There are specific requirements for TCA water management and treatment, storage capacity of facility ponds, maximum pond water levels and hazard and alert levels (Parsons 2019 forthcoming). The OMS Manual details the surveillance requirements for the TCAs and associated dams and dykes including..." It is not clear when this information will become available.	**June 25:** The current Operation, Maintenance, Surveillance Manual and Emergency Preparedness and Response Plan (OMS Manual) was completed in February 2019 and contains the information as outlined in section 8.4.1 of the Water Management and Monitoring Plan. The OMS manual is updated on an annual basis by the Main Construction Manager (Parsons), with input from annual dam	

		Recommendation GMOB recommends that the GMRP identify when the OMS will be developed, and discuss whether there is information within this plan that should be incorporated into the Water MMP prior to it being approved by the Board.	assessments and detailed designs, as these become available, and is intended to contain more detailed operational information than the Water MMP. The OMS Manual will be made available on-line by the MCM in the near future.	
42	Water Management and Monitoring Plan - Table 9.0-1 - General Contingencies	**Comment** This table identifes that in the event an SNP sample collected at the discharge point is determined to exceed EQC or "is determined acutely toxic", the plant operator will repeat the sample on a rush-order basis. There is no indication whether that the plant will cease discharge until such time as the effluent quality is confirmed to be in compliance. This is particularly important in the event the sample is determined to be acutely toxic. **Recommendation** GMOB recommends the GMRP describe whether stopping discharge would be a contingency, particularly in the event of a failed toxicity test.	**June 25:** Yes, in the event of a failed toxicity sample that is confirmed as acutely toxic, the Site must stop discharge. This is required as per the MDMER. Refer to Table 8-3 in the SOP for actions to be taken in response to toxicity results. Please note that the GMRP has identified an inconsistency between the Water Management and Monitoring Plan (WMMP) and the Standard Operating Procedure (SOP) for Effluent and Water Sampling. The WMMP will be edited to match the SOP.	
43	SOP for Water and Effluent Sampling - General comment	**Comment** There is no requirement for this plan in the draft water licence that was submitted by the GMRP. **Recommendation** GMOB requests clarification on how the GMRP sees this SOP being used in the regulation of the Project.	**June 25:** The GMRP was unclear in terminology in our submission. The SOP for Water and Effluent Sampling is intended to serve two regulatory functions: a) to meet Environment and Climate Change Canada's requirements for a standard operating procedure under the Metal Mining Technical	

			Guidance for Environmental Effects Monitoring and b) compliance with Water Licence QA/QC guidelines. The SOP is intended to be the SNP QA/QC Plan referenced in the draft Water Licence, Annex B: Conformity Table of Items Requiring Submission. The Proposed SNP included in the Water Licence submission package is anticipated to be an annex to the Water Licence once issued, and any modifications to the SNP will be reflected in the SOP.	
44	SOP for Water and Effluent Sampling - Section 3.1.2.2 - Species for sub-lethal toxicity testing.	**Comment** Bullet 3 identifies that: "As per MDMER (Section 39[b] and Schedule 5, Section 6[3]), quarterly sublethal testing is required with the most sensitive species defined as the species with the lowest geometric mean IC25 calculated from the previous three years of data." Bullet 4 then identifies the species selected for sub-lethal toxicity testing as "Fathead Minnow (Pimephales promelas), the water flea Ceriodaphnia dubia, the alga Pseudokirchneriella subcapitata, and the aquatic plant Lemna minor". It appears that the GMRP has the option of using either Fathead Minnow or Rainbow Trout. GMOB is not aware that the rationale for selecting Fathead Minnow over Rainbow Trout has been provided.	**June 25:** The test species were selected based on requirements of the MDMER, consistency of the historical record, and practical logistics. Sublethal testing will be conducted with Pseudokirchneriella subcapitata, Lemna minor, Ceriodaphnia dubia, and Pimephales promelas, which are the test species indicated in Part 5 Section 5 of the MDMER. There is an option under Part 5 Section 5(1) to test with either Fathead Minnow or early-life stage (ELS) Rainbow Trout (Oncorhynchus mykiss). Fathead Minnow were selected because: (1)Fathead Minnow have been included as the fish sublethal test species under the MDMER and MMER toxicity testing programs for the ETP discharge (SNP 43-1). For	

		Recommendation GMOB recommends that the GMRP provide the rationale for choosing which species are used for the sub-lethal toxicity testing.	comparability with historical data, it was recommended that testing proceed with Fathead Minnow. (2) ELS Rainbow Trout testing may be subject to restrictions on when the test can be conducted. Currently, only one laboratory (Nautilus Burnaby) is able to conduct ELS Rainbow Trout testing in Canada. Testing with ELS Rainbow Trout is recommended in the spring and fall. Because the GMRP is proceeding with quarterly testing with the full suite of species, restrictions on the timing of ELS Rainbow Trout testing may not align with the sampling schedule. The ELS Rainbow Trout test for gamete viability can be conducted outside of the spring and fall but there is a greater potential that control validity criteria will not be met because the gametes are not of high quality.	
45	Baker Creek AEMP - General comment	**Comment** Overall, the document is thorough, well written, and covers all of the necessary program design areas. Its content reflects the long history of the Giant Mine Site and abundant detailed information that is available to characterise the site, develop the conceptual model and design the AEMP. The information has been used well, the document provides an appropriate level of detail on methods	**June 25:** The GMRP acknowledges this and appreciates GMOB's comment.	

		for this level of review and has addressed interpretation (i.e Weight of Evidence Approach in Section 7.9) and reporting. **Recommendation** n/a		
46	Baker Creek AEMP - Spatial Focus of AEMP	**Comment** Overall, the AEMP design is overly focussed on compatibility with the ongoing EEM program for the site as it is almost entirely focussed on impacts of effluent discharge from the existing Effluent Treatment Plan (ETP) on aquatic life in the lower reaches of Baker Creek and Yellowknife Bay, with no consideration of ecological impacts in the creek itself. It fails to adequately address the broader scope of the AEMP to extend beyond effluent discharge as the only input. This influences the focus of AEMP, its ability to detect project related impacts and choice of reference areas. The AEMP design is written as if the only ecological values (fish, benthos and sediments) are in the lower reaches of the creek. Section 5.6.3, p. 39 states that Reach 4 supports spawning and recruitment after realignment in 2006 and that fry swim out in June just prior to effluent release and that adults may still be present in the upper reach in June. Reach 1 was documented as a spawning site by large-bodied fish as well as serving as a staging area for	**June 25:** The focus of the AEMP is to detect effects of the Project (the remediation), primarily in relation to treated effluent, and to harmonize with MDMER requirements. Numerous other plans are in place for other aspects of remediation or to evaluate other stressors in Baker Creek, as listed below: a) documentation of the recovery of Baker Creek post-remediation will be included in the Fisheries Act Authorization habitat compensation monitoring. This is expected to be a multi-year program, comparing the habitat use before and after remediation, and the recovery of the ecosystem once the creek is realigned and substrate replaced. It is expected there will be a lag time for recovery and specific, focussed, monitoring will be needed to asses this. This specific type of focussed monitoring is not appropriate for inclusion in an AEMP; b) Construction activities and water quality in Baker Creek are proposed to be monitored through SNP and construction monitoring, as well as the Erosion and	

		migrating species travelling upstream to Reaches 3 and 4. Baker Creek has been divided into eight reaches extending from Reach 7 ("reference" site upstream of the mine site), Reach 6 (Baker Pond, discharge point for the ETP) and downstream reaches 5,4,3 and 2 to Reach 1 (the lower section of the creek to Yellowknife Bay) and Reach 0 (Yellowknife Bay upstream of the berm). The ecological focus of the AEMP is almost entirely on Reaches 0 and 1 and ignores reaches between the point of discharge (Reach 6 and downstream areas). The design summary presented in Table 6.3 proposes water quality measurements only at "Baker Creek Exposure Point" (~ Reach 5, downstream of Baker Pond and ETP discharge) and at Site 43-11 (Reach 7 "control") and no fisheries, benthic or sediment quality measurements above Reach 1. **Recommendation** While it is useful to maintain consistency with Phases 1 to 5 of the EEM program and existing SNP stations, it is also important to track change and recovery in the creek, which is a) the focus of substantial direct remediation activity and b) the potential recipient of impacts and runoff during the remediation and associated construction activities on	Sediment Management and Monitoring Plan. These programs/plans require much more frequent monitoring and reporting than the AEMP. Furthermore, mitigations proposed in the Erosion and Sediment Management and Monitoring Plan and construction plans are intended to prevent runoff from remediation entering Baker Creek (it will instead be captured); c) It is not appropriate to expand the scope of the AEMP into upper Baker Creek. Most fish use the reaches of Baker Creek on site in spring, prior to discharge or activities on site. The fish then out-migrate (See CRP Section 2, Baker Ecosystem Report). By monitoring Baker Creek where most of the fish are (Reach 1 and Reach 0), the effects from water quality stressors on Site are captured. Baker Creek is seasonal and water volume in the lower reaches is artificially sustained by seasonal inputs of treated effluent. Surface water at the mouth of Baker Creek is estimated to consist of 90% effluent during low flow conditions, and therefore is representative of upstream effluent exposure. The fish and benthos have been studied and effects of historical mining were documented. The creek is affected and needs remediation. An extensive study was done on fish and	

		the mine site. The AEMP design is written in the context that the ETP discharge is the only stressor to Baker Creek. The combination of ecological values, site stressors and ongoing activities means that the AEMP should increase its spatial scope beyond the previous focus of the EEM and ETP discharge to include the upper reaches of Baker Creek .	benthos and plants in 2011 to confirm this. Further study on these organisms in all reaches of Baker Creek does not provide new information to inform closure activities or act within an AEMP.	
47	Baker Creek AEMP - Reference Areas	**Comment** The influence of atmospheric fallout from the Giant Mine roaster is well documented and extends 20-30 km away from the site itself (Jamieson et al. 2017, in Table 2.1) yet the regional impact has not been addressed in the selection of reference sites for the AEMP. The Baker Creek reference is in Reach 7 (just off the mine property upstream of Baker Pond) and would be expected to be contaminated from roaster emissions. Fisheries and benthic reference sites are at the mouth of the Yellowknife River where ample dilution means that waterborne contaminants are not likely a concern, but sediment contaminants have not been addressed. Selection of reference sites is based solely on MDMER/EEM assumptions that effluent is the only source of contaminants - that is clearly not the case here. The Horseshoe	**June 25:** The Yellowknife River and Yellowknife Bay were chosen as the reference areas for the EEM programs. The areas were chosen in consultation with a Technical Advisory Panel for Giant Mine whose membership included Environment and Climate Change Canada (ECCC), Fisheries and Oceans Canada (DFO), and other invitees such as Mackenzie Valley Land and Water Board staff. The biological study designs were reviewed and approved every three years by ECCC in conjunction with feedback from the Technical Advisory Panel. These reference areas match the majority of characteristics of the Baker Creek exposure area. However, the Yellowknife River is a larger watercourse with deeper and faster flowing water and a different temperature regime (see Golder 2016). Baker Creek warms quickly in spring	

		Island Bay reference site is reported to have As- enriched sediments (p. 45). The draft AEMP makes reference to a "Reference Area Reconnaissance Special Study" proposed for 2022 and 2025. The history of contamination of the Yellowknife area means that a detailed reference area study and understanding would usefully inform the AEMP design. Review of the Yellowknife Bay AEMP design confirms that this special study is meant to inform interpretation of the discharge to Yellowknife Bay that starts in 2026. **Recommendation** The Ã¢Â€ÂœReference Area Reconnaissance Special StudyÃ¢Â€Â, or a similar one for the Baker Creek AEMP could usefully inform development of the Baker Creek AEMP. We appreciate the problems associated with finding reference sites in the Yellowknife area and perhaps a reference condition approach (as opposed to the proposed Control-Impact approach) should be considered. A Ã¢Â€ÂœReference Area Reconnaissance Special StudyÃ¢Â€Â for Baker Creek should be completed as early as possible and the results used to inform	and acts as a refugia, and then cools off in the fall once air temperatures drop, whereas the Yellowknife River warms slowly, but then holds a stable water temperature in fall. Steps have been taken as part of previous study designs to help confirm that habitat characteristics between the exposure area (Baker Creek) and its reference areas are as similar as possible (Please see ORS 6 - Attachment 3 - Giant Mine Reference Area Memo) and as such no further effort to address or minimize habitat differences are proposed for the Baker Creek AEMP. An RCA approach would only apply for the benthic invertebrate component of the AEMP. Given the extensive historical dataset available for the benthos reference areas, and the desire to harmonize the EEM and AEMP programs, switching the Baker Creek AEMP to an RCA approach for benthic invertebrates would not be appropriate or useful at this time. Reference: Golder Associates Ltd. 2016. Giant Mine Phase 5 Environmental Effects Monitoring (EEM) Investigation of Cause Study Design. Prepared for Aboriginal Affairs and Northern Development Canada. Yellowknife, NT	

		the selection of reference areas for the Baker Creek AEMP .		
48	Baker Creek AEMP - Yellowknife Bay Special Study	**Comment** The purpose of the Yellowknife Bay Special Study is "to update information related to physical and biological conditions in the bay prior to operation of the new WTP and outfall [2026] to support the understanding of current conditions. This project is well worth doing but the proposed plan does not go far enough. The proposed plan provides good coverage for water quality by sampling: near the breakwater, near the proposed outfall location, near the edge of the proposed future mixing zone in Yellowknife Bay, beyond the edge of the mixing zone in Yellowknife Bay, in Back Bay, near Ndilo, near the proposed City of Yellowknife in lake water intake in South Yellowknife Bay, and near Dettah. Unfortunately sediments, benthos and small fish surveys are confined to areas near the proposed WTP outfall and plume. This may address concerns over effluent dispersion but does not address current conditions of receptors in the bay and provides a very limited scope to the intent "to update information related to physical and biological conditions in the bay" and thus track the expected	**June 25:** The GMRP agrees that these are important components for understanding the receptors in Yellowknife Bay and as such have included them in the Yellowknife Bay Special Study; however, expanding the sampling range for these components is not the purpose of the Yellowknife Bay Special Study. The purpose of the Yellowknife Bay Special Study is to update information related to physical and biological conditions in the bay prior to the operation of the new WTP and outfall to support the understanding of current conditions. This information will be used in the Yellowknife Bay AEMP to understand the effects of operating the new WTP and outfall in Yellowknife Bay. The aquatic components evaluated as part of the AEMP must be useful for interpreting effects from the WTP discharge, as opposed to legacy contamination effects, which is what would be measured should the special study be moved out further than the area to be affected by the new WTP and outfall. As proposed in GMOB-49, this can be discussed further during the technical session.	

		improvements in all VECs as the effluent limit for arsenic is dropped to 0.01 mg/L and non-point sources from the Giant Site are remediated. Yellowknife Bay is a focus centre of community interest and activities for Yellowknife, Ndilo and Dettah and so a larger suite of aquatic health indicators should be addressed in the Special Study. The study goes part way to this goal by the proposal to include a large fish survey in support of the Community Based Monitoring Plan (Sect. 7.8.1.6, p. 90). **Recommendation** The Yellowknife Bay Special Study should be expanded to include small fish, sediment and benthos studies in the same areas sampled for water quality and that community input inform the study design		
49	Baker Creek AEMP - Yellowknife Bay Special Study	**Comment** The exact requirements of the Special Study may depend on the design of the eventual Yellowknife Bay AEMP. **Recommendation** It may be helpful to discuss the Yellowknife Bay Conceptual AEMP design further at the technical sessions to ensure that the right indicators will be measured in the Special Study.	**June 25:** The GMRP agrees with this comment.	

50	Baker Creek AEMP - Response Framework	**Comment** Section 8.2, p. 96 states "Given that the Site is a federal contaminated site that will be undergoing remediation and conditions in Baker Creek are expected to improve throughout the course of the AEMP, significance thresholds are not required and have not been defined herein". While we note that this is a remediation project and conditions are expected to improve, a Response Framework can still be used to manage expected improvements in environmental quality at least as well as to monitor prevention of degradation. As such, it isn't clear that the nature of the project provides a defensible rationale for not defining a significance threshold. **Recommendation** A significant effect and Action Levels could be defined and interpreted on the basis of a lack of evidence showing the expected improvements in the receiver over the time frame of the AEMP and/or failure to meet EA measures. This would be useful to discuss at the Technical Session.	**June 25:** In general, it is noted that the AEMP is not planned to be used as monitoring tool to articulate improvement and expected performance of the remediation activities. A series of additional plans are proposed to document remediation improvements: a performance monitoring report, construction monitoring plans, Fisheries Act Authorization habitat compensation monitoring, etc. The intent of the AEMP is to determine the effects of project, if additional mitigations are needed, provide early warning for aquatic effects, etc. The AEMP includes a Response Framework but the significance threshold itself would not be identified. In discussions with various parties during pre-engagement, it was felt the significance threshold was already exceeded (i.e. in the 1970's fish and benthos in Baker Creek were absent and could not survive) and the GMRP was working backwards from the threshold. In that context, input was that it would be confusing to the framework to have the threshold.	
51	Baker Creek AEMP - Response Framework	**Comment** p. 97 8.3.1 states that a low action level "..would be triggered if the average concentration from the exposure area station." and also "Biological monitoring will determine	**June 25:** Please refer to the responses to Giant Mine Oversite Board: GMOB #46 and Giant Mine Oversite Board: GMOB #50.	

		if effects are occurring on aquatic organisms, with the magnitude of effects classified according to the action levels defined for biological endpoints." The AEMP does not, however, propose biological sampling upstream of Reach 1 upstream, including "The Baker Exposure Point" in Reach 5 where water quality is sampled. There is not therefore, any means of determining if any effects on aquatic organisms are associated with an Action Level upstream of Reach 1. **Recommendation** The AEMP design and Response Framework should include water chemistry, sediment and benthic sampling between the Ã¢Â€ÂœThe Baker Exposure PointÃ¢Â€Â and Reach 1 and associated Action Levels		
52	Baker Creek AEMP - Response Framework	**Comment** The Low Action Level for water quality requires a 25% increase from the 5 year pre-remediation mean AND a trend. **Recommendation** The Response Framework needs to define how they will determine a trend, for example, how many years of data are required?	**June 25:** This action level is set at SNP 43-5, which is sampled two times per month (bi-weekly) during the open-water season. The action level would be triggered if the concentration from one sampling event is greater than 25% of the 5-year average concentration measured during the care and maintenance period (i.e., 2013 to 2020). If the 25% trigger is exceeded, then trend analysis will determine if this represents a significant increase or is related to a single outlier caused by	

			analytical error, contamination of the sample, or other unidentified source. It is proposed that trends would be confirmed (at 95% confidence) using standard statistical tests (e.g., Mann-Kendall or equivalent) and data from the previous five open water seasons. This timeframe will provide sufficient data in cases where the 25% increase is observed early in the open water season. It also limits the risk of not identifying a trend over a longer time period (i.e., 5 or more years of relatively low concentrations followed by several high-concentration samples, which may not result in detection of a significant upward trend). If a significant increase is detected, the trend will also be evaluated in the context of the longer-term dataset and will be monitored and reassessed as per the adaptive management framework for the GMRP.	
53	Baker Creek AEMP - Methods	**Comment** n/a **Recommendation** Given the role of historic arsenic deposition, of sediment, and the importance of redox sensitivity to arsenic toxicity, the AEMP should address speciation of arsenic in water and sediment quality monitoring to help interpret any toxicological responses.	**June 25:** A comprehensive study on sediments and aquatic biota along the length of Baker Creek was undertaken in 2011. From this study and other subsequent focussed studies referenced in the Baker Creek AEMP Design Plan, it is known that: the sediment is contaminated with arsenic; arsenic speciation within sediment porewater varies both spatially and over time,	

			depending on pH, oxygen, and other physiochemical and biological factors; and the sediment is toxic to organisms in some areas of the creek but that it doesn't necessarily align with the sediment chemistry data. Sediments will be removed during remediation and so further detailed evaluations of sediment and porewater chemistry are not planned.	
54	Baker Creek AEMP - Methods	**Comment** Table 6.3 and p. 55 describe the proposed plume delineation studies in Yellowknife Bay but are missing some detail and contain some contradictions. **Recommendation** What is lateral placement of sites for plume delineation, how many points will be sampled and where Ã¢Â€Â“ is a gradient design anticipated? Table 6.3 shows that the effluent plume in Yellowknife Bay will be tracked monthly at 1m profiles but p. 55 says Ã¢Â€ÂœTransects will be focused at depths that can be accessed by wadingÃ¢Â€Â□. This will limit any profiling to depths of <1m. Further detail is warranted.	**June 25:** The GMRP confirms the plume study will be completed in a radial gradient out from Reach 0 of Baker Creek. Note, that measurements will be collected vertically at 1 m intervals through the water column from surface to bottom, not at 1 m intervals in a horizontal gradient. The measurements are therefore taken in shallow and deep areas.	
55	Yellowknife Bay Conceptual AEMP - General Comment	**Comment** As with the Baker Creek AEMP, the Yellowknife Bay Conceptual Plan benefits from a substantial amount of existing	**June 25:** The GMRP notes that no response is required.	

		information on the status and quality of Yellowknife Bay and the AEMP design can be finalized using updated results from the Yellowknife Bay Special Study (but see comments above). The background of contamination of the area means selection of a suitable reference site for the AEMP will be a challenge but this can be addressed in the proposed Reference Area Reconnaisance Study. The background studies on zooplankton communities and toxicity testing usefully inform the means to address EA Measure 15 "Water quality changes due to effluent discharge will not reduce benthic invertebrate and plankton abundance or diversity beyond 200 m of the outfall. **Recommendation** n/a		
56	Yellowknife Bay Conceptual AEMP - Scope	**Comment** The new outfall location is proposed for the Foreshore Tailings Area. Page 6 states that contaminated sediments near the outfall location will be removed/covered to reduce sediment scour and remobilization of metals. The Project description also suggested that these sediments may remain in place and a modelling study used to assess the risk of their resuspension. The sediments may confound interpretation of the AEMP and so their fate should be clarified so	**June 25:** Legacy effects of Giant Mine are not within the scope of the Water License application nor specifically the AEMP. However, it is noted that some contaminated sediment in the Baker Creek outfall area that is not covered/dredged could affect aquatic biota. Forthcoming information on the design of the sediment cover in this area, as well as the Yellowknife Bay special study, will provide additional information with which to design the detailed AEMP for Yellowknife Bay.	

		they can be considered in the AEMP design. This is addressed further in Section 7.2 (p.32). Historic sediment contamination may confound interpretation of effects of effluent discharge from the new outfall and from Baker Creek but the document says that legacy effects are the subject of outside study and are "excluded from this AEMP." This is a problem because Fig. 8.1 shows that the new outfall is located in the foreshore tailings area. This is acknowledged on p. 39 as "It is anticipated that mesocosm studies or other alternative monitoring approaches may be required should confounding factors or sampling considerations preclude direct monitoring of the exposure area, as per EEM technical guidance (EC 2012). The Yellowknife Bay Special Study will be completed in advance of finalization of the detailed AEMP Design Plan, and the findings of the existing conditions study will inform the approach to be taken for the detailed plan." **Recommendation** Legacy effects of contaminated sediments should not be Ã¢Â€Âœexcluded from this AEMPÃ¢Â€Â but need to be fully investigated so that any factors	Note: the outfall will be located near the outlet of Baker Creek and not in the foreshore tailings area (see yellow triangle on Figure 8-1). Some sediments in this area (the area marked as pale green in Figure 8-1) will be dredged/covered before the outfall is placed on top (i.e., armouring on the sediment before the outfall pipe is installed over top). Sediment resuspension should be prevented by the combination of this cover, the depth of the outfall pipe (below maximum ice thickness but away from the bottom of the lake), and the low flow rate. The CRP includes mitigation as a more permanent solution to prevent re-suspension rather than modelling.	

		confounding interpretation of results can be addressed in the AEMP design.		
57	Yellowknife Bay Conceptual AEMP - Scope	**Comment** Section 2.0 of the plan discusses the role of this AEMP in the context of the closure plan activities. It states that "this AEMP Design Plan is intended to cover the middle years of the Active Remediation and Adaptive Management Phase (phase 2) when the new WTP is commissioned." **Recommendation** GMOB's understanding is that this AEMP will be established in Phase 2 but continue through Phase 3 of the Project as the results will confirm the success of several aspects of the closure plan. Please confirm.	**June 25:** Yes, that is correct. However, the AEMP will be subject to the normal MVLWB process of review and update every three to four years. As such, there are a number of opportunities to adjust the study design depending on the status of project activities at the time.	
58	Yellowknife Bay Conceptual AEMP - Engagement	**Comment** Section 6 of the plan acknowledges the need for further engagement "once the new water treatment plant design and construction plan is approved". **Recommendation** It is not clear why further engagement needs to wait for the WTP design and construction plan to be approved. There doesn't seem to be any reason why engagement couldn't start immediately after licence issuance - or even before if the affected parties are ready. Doing so would be consistent with the MVLWB's 2019 Guidelines for Aquatic Effects	**June 25:** The GMRP agrees that affected party input to the AEMP is important; engagement on some specifics of the WTP outfall may occur before the Water License is issued. Further studies of the outfall area (e.g. geophysics for sediment thickness, depth to bedrock) will also further inform the AEMP Study Design on the types of organisms that could be expected based on sediment type and other variables. Despite this, the AEMP is not planned to be used as monitoring tool to articulate improvement and expected	

		Monitoring Programs (the Guidelines) and would help to ensure that the design of the Yellowknife Bay Special Study will be sufficient to meet the needs of the eventual AEMP (i.e., having the right baseline data for what is eventually measured in the AEMP). In GMOB's view, public input on the design of the AEMP is crucial for ensuring that the AEMP will answer the questions that people are most concerned about; otherwise, we run the risk of spending huge amounts of money on a monitoring program that, in the end, doesn't help people accept that remediation has been successful.	performance of the remediation activities. A series of additional plans are proposed to document remediation improvements: a performance monitoring report, construction monitoring plans, Fisheries Act Authorization habitat and compensation monitoring. The intent of the AEMP is to determine the effects of Project, if additional mitigations are needed, and provide early warning for aquatic effects through a response framework.	
59	Yellowknife Bay Conceptual AEMP - Response Framework	**Comment** n/a **Recommendation** The Response Framework (Section 9) will need to focus its Action Levels on evidence of stability or improvement in the receiving environment as the proposed effluent limits are not likely to cause further degradation.	**June 25:** As noted above, the AEMP Is not intended to be used to explicitly track improvements/stability in effluent chemistry over time, even though it will collect the data to make such a determination. The intent of the AEMP is to determine the effects of the Project, if additional mitigations are needed, provide early warning for aquatic effects, etc. As such, the focus of the Response Framework is around the potential for negative changes/effects and not positive improvement.	
60	Baker Creek AEMP and	**Comment** The GMRP has proposed to transition from the Baker Creek AEMP	**June 25:** The intent of providing the Baker Creek AEMP and the	

	Yellowknife Bay Conceptual AEMP	to the Yellowknife Bay AEMP in 2026, when the new WTP will be operational. In GMOB's view, this proposal is based on the GMRP's EEM-focused assumptions about what an AEMP is about. As noted in other comments, there are more inputs of waste to the receiving environment than effluent alone (e.g., site runoff, seepage, Foreshore Tailings). As well, the AEMP(s) will also provide the long-term evidence that many of the closure objectives and criteria have been met. For example, the GMRP has listed the AEMP as one of the monitoring components for objectives SW2, CS1, BC4, WTP1, and WTP2; GMOB would argue that the AEMP will also aide in determining the success of objectives T1, P3, BC5, SW4 and SW5. The Yellowknife Bay AEMP does not acknowledge its role in evaluating the success of any closure objectives. The Baker Creek AEMP acknowledges its link to two objectives (BC4 and BC5) but notes that neither objective will be satisfied during the time period of that AEMP (i.e., before 2026); we note that the conceptual Yellowknife Bay AEMP proposes only to monitor the mouth of Baker Creek so it is unclear how we will understand if the rest of the creek	Conceptual AEMP for Yellowknife Bay was to illustrate how the AEMPs are expected to evolve over time once a new WTP is commissioned and discharges to a new location. As proposed in draft Water License condition I(4), the GMRP will submit a YK Bay AEMP for approval six months in advance of discharge from the new WTP. Until the new WTP is commissioned, the GMRP proposes to focus the AEMP on Baker Creek with special studies to inform the study design for Yellowknife Bay. The AEMP will include traditional and local knowledge, where available and appropriate. The GMRP does not support expanding the scope of the YK Bay AEMP to the wider receiving environment beyond what is already proposed for water quality; legacy effects are not in the scope of project. A community-based monitoring program led by interested affected parties is proposed to evaluate the areas not in the current Project scope.	

		has been restored in the long-term or not. **Recommendation** While it makes sense for the GMRP to continue their current EEM program focused on effluent effects to Baker Creek, GMOB recommends that a single, comprehensive AEMP that includes effects to Baker Creek and Yellowknife Bay be designed and implemented as soon as possible. If needed, aspects of the Yellowknife Bay Special Study could be incorporated into that AEMP as a way of acquiring the necessary baseline information for the bay. This AEMP should, at a minimum, be designed to: 1) evaluate all project effects on the wider receiving environment; 2) ensure that the results will verify the success of relevant closure objectives and criteria; 3) address issues and concerns raised by local residents directly and through the Quantitative Risk Assessment process; and 4) integrate relevant information from Traditional Knowledge Studies.		
MVLWB: Shannon Allerston				
ID	**Topic**	**Reviewer Comment/Recommendation**	**Proponent Response**	**Board Staff Response**
1	Final Approved Wording of	**Comment** The final approved wording for Measure 15 (Minister of DIAND,	**June 25:** The wording of Measure 15 in all documents should be the	

	Modified Measures: Measure 15, EQC	Final Decision and Modified Measures for EA0809-001, August 11, 2014) includes: 2. The following water quality objectives in the receiving environment are met: a) Water quality changes due to effluent discharge will not reduce benthic invertebrate and plankton abundance or diversity at 200 metres from the outfall; and d) There is no increase in arsenic levels in Yellowknife Bay water at 200 metres from the outfall. In GMRP's Summary of EA Measures and Suggestions in the Updated Project Description for Measure 15 for 2. a) it states that "Water quality changes due to effluent discharge will not reduce benthic invertebrate and plankton abundance or diversity beyond 200 metres of the outfall"; for 2. d) it states that "There is no increase in arsenic levels in Yellowknife Bay water or sediments beyond 200 metres of the outfall". In CRP Section 5.8 (p 5-219) and 5.8.5.3 (p 5-242) and EQC Report (p61) it also describes Measure 15 2 a) as being "beyond 200 m of the outfall" instead of at 200 m from the outfall. **Recommendation** Please discuss if using the original wording from Measure 15 (MVEIRB, Report of Environmnetal Assessment 0809-001, June 20, 2013) instead of the approved	approved wording (Minister of AANDC, 2014). The difference in wording in different documents is a typographical error and does not influence the interpretation of the mixing zone boundary in Yellowknife Bay and consequently calculated EQCs.	

		wording (Minister of DIAND, 2014) for 2 a) in the CRP, EQC Report could have implications for the interpretation of the mixing zone boundary in Yellowknife Bay and consequently calculated EQCs.		
2	Water Management and Monitoring Plan	**Comment** Section 3.4.2 notes that Surface Runoff Criteria will apply to runoff from engineering structures. **Recommendation** Will the Surface Runoff Criteria apply to non-engineered, but contaminated, areas on site, i.e. areas within the Core Industrial Area that will be blocked from access via physical barriers?	**June 25:** The proposed Surface Runoff Criteria are only proposed to be applied to engineered structures and therefore would not apply to contaminated areas on site that have not been remediated.	
3	None	**Comment** Section 4.1.1 lists the surface water loses to the receiving environment. **Recommendation** Does the GMRP understand the groundwater loses to the receiving environment from the project? And have those loses been considered in the YK Bay model and EQC Report?	**June 25:** The groundwater losses to the environment have been considered in the underground water quality model, surface water model, Yellowknife Bay model and EQC Report. Two types of groundwater losses were considered: lateral groundwater inflows to the underground mine workings at Giant Mine and shallow groundwater seepages to Baker Creek and Yellowknife Bay. The minewater elevation at Giant Mine is maintained at the 750L. As a result, the underground mine workings serve as a hydraulic sink and lateral groundwater on the Giant Mine Site reports to the	

			mine pool. This lateral groundwater inflow was considered as a model input to the underground water quality model (Appendix D2) and detailed discussions are presented in Section D2-2.3.1.2 of Appendix D2 of the EQC Report. Shallow groundwater seepages were considered in the surface water balance model (Appendix D3) and include infiltration from Mill Pond to Baker Creek and infiltrations from South Pond, Central Pond, and North Pond to Yellowknife Bay. The shallow groundwater seepage from Mill Pond to Baker Creek was considered in the surface water quality model (Appendix D2, Section D1-2.5.1) and shallow groundwater seepages to Yellowknife Bay were considered as model inputs to the Yellowknife Bay model (Appendix D3, Table E2.3-5).	
4	None	**Comment** Section 4.2.1 notes "that Hydrogeological investigations conducted at the Site were used to develop a numerical model to evaluate groundwater flow conditions near the Site (SRK 2005b). This model supported the interpretation that the underground mine presently acts as a hydraulic sink, containing the movement of arsenic-affected water in the underground mine workings. This	**June 25:** The 3-D hydrogeological model is under independent review which is expected to be finalized in June 2019. The information from the 3-D hydrogeological model was used in the underground water quality model (Appendix D2 of the EQC Report) to support the derivation of EQC, including void volumes, lateral groundwater inflow and surface infiltrations from Baker Creek, the	

		model is presently being updated based on data collected from the monitoring network since the completion of the DAR." **Recommendation** When will the updated groundwater model be completed? Does the groundwater model significantly influence the models required to support the proposed effluent quality criteria and site specific water quality objectives? Will the groundwater model updates inturn require an update to the effluent quality report?	Settling Pond and Polishing Pond). Once finalized, predictions from the 3-D hydrogeological model will be compared to inputs used in the EQC model to evaluate whether a model update is required. It is unlikely that UG model updates alone would trigger changes to the EQC report. If there is substantial divergence in the major inputs to the EQC assumptions (e.g, mine pool volume, surface water volumes, WTP efficiencies, remediation schedule, in-lake mixing) then the possibility of a revised EQC report would need to be evaluated.	
5	None	**Comment** Board Staff note that while the GMRP has presented evidence and a proposal for EQC for the ETP and WTP, that there are still aspects of the project that are yet to be determined that may affect water quality and flow on site. **Recommendation** How concrete are the assumptions applied to the models used to proposed the EQC for the ETP and WTP, given that there are still some unknowns with remediation plans and the resulting change to water flow and quality on site?	**June 25:** A detailed list of overall project assumptions is presented in Appendix C of the EQC Report. Reasonable, yet conservative, input assumptions were used in the EQC models, so predictions are considered conservative. Where applicable, scenarios were run to bound uncertainty, and plans to address uncertainty are provided in Table 6-1 of the EQC Report. As the GMRP further advances, the EQC model assumptions will be re-visited when substantive design work is near completion (e.g., changes in the schedule or sequences of remediation plans). Refer to the response to MVLWB: Shannon Allerston #6 for	

			frequency of model comparisons and updates.	
6	None	**Comment** None **Recommendation** On what freqnecy does the GMRP anticipate updating the various models applying to water management on site?	**June 25:** The GMRP proposes that model assumptions and inputs be revisited: Near the completion of substantive design (anticipated to be 2021) ; At least one year before the water treatment plant (WTP) is constructed, (2025). At those milestones, a model update would be completed if design details notably differ from the assumptions listed in Appendix C of the Effluent Quality Criteria Report. Once WTP discharge to Yellowknife Bay commences, predictions for extent of plume will be verified through a focussed plume delineation study. Thereafter, monitoring data will be compared to Yellowknife Bay model predictions on an annual basis. The need for a model update will be assessed if there is a major change in the remediation plan.	
7	Effluent Quality Criteria (EQC) Report, Section 1.3, p.9; Table 1-2	**Comment** Table 1-2, notes that the predicted antimony concentrations in the new WTP effluent exceed the Health Canada Guidelines for Canadian Drinking Water Quality (DWG), but meets the DWG at the edge of the mixing zone. However, Measure 15 states that water quality at the "outfall" will meet the DWL. It is	**June 25:** The GMRP interprets Measure 14's reference to Health Canada drinking water standards to be specific and limited to arsenic concentrations in the WTP effluent. GMRP bases this assumption on 1) The preamble in the Report of Environmental Assessment (EA) demonstrates that the evidence	

		unclear if Measure 15 has been met with respect to antimony in the EQC Report. **Recommendation** The GMRP is requested to explain why the predicted antimony WTP effluent concentrations can not achieve the DWG at the outfall, and if there are waste management strategies that can be put in place so that antimony effluent concentrations meet the DWG for antimony at the outfall, as per Measure 15.	presented during the EA proceedings with respect to achievable discharge concentrations was specific to arsenic; 2) The Report of EA specifically states, for clarity, this measure (Measure 14) is intended to replace the proposed water treatment effluent of 100-200 ug/l of arsenic; and 3) Measure 14 includes a bracketed statement specifying 10 ug/L for Arsenic. The GMRP interprets Measure 15 to refer to water quality objectives at the edge of the mixing zone. This interpretation is based on 1) Measure 15 does not specifically address the effluent unlike Measure 14. Measure 15 refers to the outfall and specifies a mixing zone size; and 2) The preamble to Measure 15 in the Report of EA notes that "even with Measure 14, the effluent dispersal has not been examined..the potential exists for gradual arsenic loading in Back Bay.the measure is partly intended to ensure that this does not occur over time." Given the GMRP's interpretation of Measure 15, the GMRP considers the EQC and WQO for antimony to be appropriate and does not consider additional waste management strategies necessary.	

8	EQC Report, Section 1.3, p.9; Table 1-2	**Comment** Table 1-2, notes that the SSWQOs for arsenic and other POPCs will be met 200 m from the WTP outfall after remediation activities are complete. It is unclear if the completed remediation activities are referring to the commissioning of the new WTP or the completion of sediment remediation has been completed at Baker Creek. **Recommendation** The GMRP is requested to clarify at what phase of the remediation activities the SSWQOs will be met at the edge of mixing zone.	**June 25:** Water quality objectives (WQOs) for arsenic and other parameters of potential concern will be met at the mixing zone boundary after remediation activities are complete (Table 1-2 of the EQC Report). The GMRP considers this to be during the adaptive management phase of the remediation project (2033-2040), once key remediation activities are complete, including Baker Creek sediments remediated, the creek is stabilized, pits are filled, tailings containment areas (TCAs) are covered and the WTP is commissioned and discharging to Yellowknife Bay.	
9	EQC Report, Section 2.3, p.20	**Comment** This section notes that adverse effects to algae, duckweed and water fleas have been consistently identified in sublethal toxicity testing of ETP treated effluent since 2003. **Recommendation** The GMRP is requested to explain what is likely causing the observed adverse effects to these organisms, and the types of waste management strategies that have been considered and implemented to prevent/mitigate sublethal effects to aquatic life in the receiving environment.	**June 25:** Toxicity testing results on the ETP effluent have been reported annually in the MMER/MDMER reports and laboratory effects to these species were observed. Effects to the laboratory organisms was used in weight-of evidence review of effluent effects in the receiving environment and it is thought these were due in early years to ammonia and metals in the effluent and in more recent years to metals and possibly salts. Substantial mitigation has occurred since 2003, including cessation of operations and blasting, reduction in volume of effluent discharge, change in timing of discharge (i.e. July to Sept, avoiding	

			spring when spring spawning fish and their young are in the creek) and water treatment plant improvements. The GMRP is applying for Water Licence to further implement waste and water management strategies as outlined in the CRP.	
10	EQC Report, Section 2.4, p.25	**Comment** This section notes that TDS concentrations associated with sulphate and chloride, in the effluent and Baker Creek have generally increased in recent years. It is unclear what is causing the increase in chloride and sulphate concentrations in the effluent. **Recommendation** The GMRP is requested to give a reason as to why the chloride and sulphate concentrations in the ETP effluent have increased in recent years, and if strategies have been put in place to address the increasing chloride and sulphate concentrations for the ETP effluent.	**June 25:** The factors influencing the increase in TDS are not fully understood and likely from multiple contributors on site. Potential contributors include recent regional dry conditions (areas of TCA ponds drying and then re-wetting), dust suppressant, and the addition of ferric sulphate during effluent treatment. Concentrations of TDS, chloride and sulphate in ETP discharge were lower in 2018, which was a higher precipitation year compared to recent years (Figures B-4, B-8, and B-14 of the EQC Report), demonstrating the potential effects of site and regional/climate conditions on TDS and ion concentrations. Monitoring of the ETP discharge will continue, and the pattern in TDS and ion concentrations will be evaluated. The GMRP is reviewing alternative dust suppressants to calcium chloride, which has been used for a number of years on the road network. Additionally, GMRP has reviewed	

			potential alternatives to ferric sulphate, which is used in the ETP. Another comparable coagulant is ferric chloride. However, to date, no appropriate alternative has been identified that would not contribute to either chloride or sulphate loading.	
11	EQC Report, Section 2.5, p.29	**Comment** This section notes that there is currently stratification in Yellowknife Bay during ice-cover and open-water, with spring and fall turnover events. It is unclear if the stratification is chemical (chemocline) thermal (thermocline), or both, and its extent is unclear. **Recommendation** The GMRP is requested to clarify the type of stratification that occurs in Yellowknife Bay, and its extent.	**June 25:** Seasonal stratification of Yellowknife Bay is driven by temperature, with warming of surface water in the summer from solar radiation and cooling in the winter at the atmosphere-ice interface. Model calibration data from 2012 and 2013 (Stantec 2014) show that winter temperatures are generally close to 0°C in surface waters and then increase with depth. In the early summer, thermal stratification develops in Yellowknife Bay in areas with water depths greater than 7 m. In these areas, a distinct thermocline forms, separating warmer (lighter) surface waters from colder (denser) water at depth. The thermocline weakens later in the summer, with a deeper warm layer and less distinct change in temperature with depth. Complete thermal mixing of the water column, or turnover, occurs in late summer/fall. Water chemistry variables, such as conductivity and total dissolved solids (TDS), follow the thermally driven	

			changes described above. Cold, dense water has higher ionic strength, and therefore, higher conductivity and TDS concentrations. For this reason, conductivity profiles generally follow the inverse pattern to temperature (e.g., TDS is higher below the spring thermocline as water temperature decreases). Reference: Stantec. 2014. Technical Data Report for the Yellowknife Bay Baseline Studies Volume 1: Aquatics Final Report. Baseline Data Collection and Hydrodynamic Modelling in Yellowknife Bay for the Giant Mine Remediation Project. Prepared for Public Works and Government Services Canada, Edmonton, AB, Canada.	
12	EQC Report, Section 2.6, p.33; Table 2-2,	**Comment** Table 2-2 notes that the Upper Baker Creek Watershed (i.e. outlet of Lower Martin Lake and Reaches 7 to 11 of Baker Creek) is one of the largest sources of total arsenic to Baker Creek. It is unclear if remediation of the sediments in Baker Creek will also extend to the Upper Creek Watershed. **Recommendation** The GMRP is requested to clarify if there is a remediation plan for the Upper Baker Creek Watershed such that total arsenic loads from this watershed do	**June 25:** No, there is no remediation plan for Upper Baker Creek because it is off-site. It is possible that wetland/passive treatment options could be installed in the west side of the site (Pocket and Trapper Lakes) to target areas of high concentration/low flow areas and reduce overall loadings to Baker Creek, the feasibility of which is being addressed through the associated RRP. It is acknowledged that there is an on-going source of loadings from upstream areas. However, arsenic concentrations from	

		not re-contaminate the creek following sediment removal/remediation in reaches 0 to 6.	Lower Martin Lake and the upper reaches of Baker Creek are relatively low, but flows are elevated compared to other sources to Baker Creek from the mine. Because contaminant loading is calculated by multiplying the respective flow rate by the source concentration, upper Baker Creek watershed is one of the largest sources to Baker Creek. As another example, the Yellowknife River provides significant loadings to Yellowknife Bay, even though arsenic concentrations in the Yellowknife River are low.	
13	EQC Report, Section 2.6, p.33; Table 2-2,	**Comment** The total Baker Creek load to Yellowknife Bay does not appear to add up. It appears that the total load should range between 322 and 1251. **Recommendation** The GMRP is requested to check if the correct total Baker Creek load to Yellowknife Bay is reported in Table 2-2.	**June 25:** The total Baker Creek arsenic loads to Yellowknife Bay in Table 2-2 are correct. As described in footnote (a), Table 2-2 presents the range of total arsenic loads (minimum annual total load and maximum annual total load) from each source from 2011 to 2018. The minimum and maximum annual total loads from each source cannot be added up to produce the total minimum annual load and total maximum annual load from Baker Creek to Yellowknife Bay because the minimum and maximum loads from each source did not always occur in the same year.	

14	EQC Report, Section 4.4, p.47; Figure 5-1	**Comment** It is noted that a step change decrease in arsenic concentration in Baker Creek is expected (in 2019), corresponding to when the MDMER limit for arsenic will be met by the existing ETP. It is unclear what is expected to happen in the ETP, or in the influent, to achieve this new limit (0.3 mg/L). **Recommendation** The GMRP is requested to clarify what is expected to happen in the ETP, or in the influent, to achieve the new limit for arsenic in 2019.	**June 25:** The ETP currently meets the 0.3 mg/L arsenic MDMER maximum monthly average limit. Monthly mean concentrations for 2018 were 0.29 mg/L (August), 0.23 mg/L (September), and 0.23 mg/L (October). The GMRP expects that the ETP will continue to meet MDMER. Figure 5-1 shows measured and predicted arsenic concentrations in the ETP discharge, whereas the statement regarding concentrations on page 47 is specific to Baker Creek. The predicted reduction in arsenic concentrations at the ETP and in Baker Creek are attributable to a number of variables, including moving to new interim Akaitcho pumps, and a return to more normal hydrologic conditions from a drier period in 2016 and 2017. As well, daily predicted arsenic concentrations were "capped" at 0.3 mg/L in the model. Reference: Golder Associates Ltd. 2019. 2018 MDMER/EEM Annual Report. Prepared for Crown Indigenous and Northern Affairs Canada by Golder Associates Ltd., Yellowknife, NWT, Canada. (Table 5)	
15	EQC Report, Section 5.1, Table 5-2, p.52; Fig 5-3	**Comment** The proposed EQCs for lead at the ETP (0.003 and 0.006 mg/L, average and grab) are 20 to 30 times higher than the predicted future	**June 25:** The proposed EQC for lead for the ETP are 0.003 (maximum average concentration; MAC) and 0.006 mg/L (maximum grab	

		treated effluent concentrations at the ETP (0.00015 and 0.00018 mg/L, average and 95th percentile). It is unclear why the EQC for lead at the ETP needs to be as high as proposed. In Figure 5-3 the proposed EQCs for lead are shown to be 0.001 and 0.002 mg/L (average and grab). **Recommendation** The GMRP is requested to clarify what EQCs are proposed for lead at the ETP, and if the proposed values are really more that 10 times what is predicted, to explain why this is necessary, considering the NWT policy of waste minimization.	concentration; MGC). The MAC and MGC are incorrectly plotted on Figure 5-3 of the EQC Report. The ETP was designed to meet MMER requirements and the GMRP has committed to meet the new MDMER discharge limits, which are lower for some parameters, including lead. As such, 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 for the ETP were lowered below the MDMER limits, which is in-line with the NWT waste minimization approach. For lead, the limits were reduced from 0.1 and 0.2 mg/L (MDMER) to 0.003 and 0.006 mg/L, which is greater than an order of magnitude decrease. It is deemed necessary to have this EQC above the current discharge quality to allow operational flexibility for an old plant and aging infrastructure under changing site conditions.	
16	EQC Report, Section 5.1, Table 5-2, p.52; Fig 5-3	**Comment** The proposed EQCs for unionized ammonia at the ETP (0.5 and 1.0 mg/L, average and grab), while taken from the MDMER, are at least 20 to 30 times higher than the predicted future treated effluent concentrations at the ETP (0.025 and	**June 25:** EQC were derived such that they meet both federal and territorial legislation (Section 1.3 of the EQC Report). For un-ionized ammonia, yes, the proposed EQC were the MDMER limits of 0.5 and 1.0 mg/L, which are higher than recent concentrations in the	

		0.03 mg/L from predicted total ammonia in Table 4-2 (0.11 and 0.13 mg/L) at pH 9.0 and toxicity test temperature). It is unclear why the EQCs for unionized ammonia at the ETP need to be as high as proposed. The proposed grab EQC of 1.0 mg/L would likely be acutely toxic to fish (US EPA, 2013, Figure M.1). **Recommendation** The GMRP is requested to clarify why the EQCs proposed for unionized ammonia at the ETP need to be as high as proposed, considering the NWT policy of waste minimization.	ETP discharge. The EQC were not reduced, and further reductions in the discharge limits are not recommended for the interim operation of the existing ETP. Water quality pumped from the underground has remained relatively stable over the last few years, and are predicted to remain broadly stable once the pumps are moved to Interim Akaitcho. However, activities such as blasting may result in short-term changes influent chemistry to the ETP, including ammonia concentrations. The water quality models do not simulate this short-term variability. As such, the proposed limits provide the flexibility required to allow closure work to be undertaken while the new WTP is being constructed.	
17	EQC Report, Section 5.2, p.60; Figure 5-7	**Comment** The Board's general process for setting EQCs is to (1) derive water quality-based EQCs, and then (2) to consider whether (a) the EQCs are reasonably achievable, and (b) if the EQCs could be made more stringent based on what is technologically feasible for the site. An EQC driven by the 2nd step is called technology based, and serves the waste minimization policy. However, in the EQC report, for the WTP, the "technology based" EQCs are often simply adopted from MDMER, and	**June 25:** The Board's general process was followed when developing EQCs for parameters of potential concern (POPC) for the new WTP effluent. However, both the MDMER and the Type A Water Licence will apply to the Site moving forward. To the extent possible, the GMRP has attempted to align the proposed EQC with requirements under the MDMER. That is, the GMRP will achieve the MDMER discharge limits, or lower. For parameters not modelled, or not identified as POPC through the	

		have not been shown to be consistent with waste minimization policy (EQCs for TSS, unionized ammonia, Ra-226 and cyanide). In the case of unionized ammonia, the proposed grab EQC of 1.0 mg/L would likely be acutely toxic to fish (US EPA, 2013, Figure M.1). In the case of cyanide, if it's free or dissociable, both average and grab (0.5 and 1 mg/L) could be acutely toxic. [Lower EQCs for cyanide were proposed for the ETP]. **Recommendation** The GMRP is requested to clarify why the EQCs for the WTP that are adopted from MDMER need to be so high, and to discuss whether they could be reduced.	process, but do have MDMER limits (i.e., un-ionized ammonia, total cyanide and radium-226), the proposed MAC and MGC EQC were set to MDMER limits. For these parameters, there was no basis for further lowering the EQC, so the proposed EQC were set to the MDMER limits simply to be compliant with federal legislation. Also, please refer to ECCC comments outlining the interest in harmonization the MDMER with the Water License requirements.	
18	EQC Report, Section 5.2.1, p. 61; Figure 5-9	**Comment** In defining the extent of the mixing zone, the GMRP interpreted a 200m radius from the WTP outfall, based on Measure 15, and assumed the same radius from the outlet of Baker Creek at the breakwater. However, Measure 12 states that water quality at the "outlet of Baker Creek channel" will meet water quality objectives. The GMRP further defined a combined mixing zone for the two discharges together, which extends about 350m south from the WTP outfall, and about 400m north from the outlet of Baker Creek channel. The proposed mixing zone seems to be less stringent than	**June 25:** Measure 15 refers to a mixing zone of 200 m. At the selected location of the WTP outfall, which is at a different location than assessed in the EA, the mixing areas from Baker Creek and the WTP overlap. The inflow from Baker Creek will influence concentrations in the 200 m WTP mixing zone. While the size of the combined mixing zone may be interpreted as less stringent spatially, including loadings from Baker Creek when calculating EQC results in more stringent limits for the WTP. Effluent quality criteria were lower than what they would have been if no other	

		what was intended in the EA Measures. **Recommendation** The GMRP is requested to explain why a combined mixing zone of the proposed size is needed, and why separate smaller mixing zones for the Baker Creek outlet and the WTP outfall, more consistent with the EA Measures, are not feasible.	inputs were contributing to the mixing zone area (i.e., less assimilative capacity in the receiving environment), or if the influence of Baker Creek were ignored. A combined mixing zone therefore allows for cumulative impacts of the Site to be measured and assessed in one area. Measures 12 and 13 require water quality objectives protective of Yellowknife Bay to be met in the vicinity of the outlet of Baker Creek. The GMRP believes the combined mixing zone, as defined in the EQC Report, meets those measures. As outlined in the response to Pre-engagement Reviewer Comment GNWT#3, the exact locations of monitoring stations on the mixing zone boundary have not yet been decided. However, it would be reasonable to place one of the monitoring stations on the convergence point of the two mixing zones for the regulatory process. The GMRP engaged specifically on the location of the outfall with stakeholders and the location of the WTP outfall as proposed by the GMRP reflects stakeholder preference.	
19	EQC Report, Section 5.2.2, p.68-69	**Comment** On page 68 it is noted that lithium was removed as a POI because aquatic toxicity data were not available. However, on page 69,	**June 25:** Lithium is not a POI for the mine and should not have been included in the bullet list on page 69 of the EQC Report. As such, lithium was	

		lithium is said to be carried forward in the remaining steps of the POPC screening process. It is unclear if lithium is a POI for the mine, because aquatic toxicity data do exist for lithium. In addition, silver was not listed as a POI on page 68, despite silver being carried through the screening process (Tables 5-3 and 5-4). **Recommendation** The GMRP is requested to clarify if lithium is a POI, and if so to complete the screening process, and to confirm that silver is a POI for total metals.	excluded from the screening process and not presented in Tables 5-3 to 5-7.	
20	EQC Report, Section 5.2.2.2, p. 71; Figure 5-12; Table 5-3; Table 5-7	**Comment** In Step 3 of the screening to identify POPCs (Figure 5-12), it is asked if the predicted 95th percentile for the mixing zone in YK Bay (1st or 2nd cell near WTP outfall) exceeds the background for YK Bay. It seems obvious that a model with WTP input must predict either above or equal to a background without effluent input. However, for zinc, both median and 95th percentile model predictions are below YK Bay background (Table 5-7). The background comes from Table 5-3 and is the lowest of HHERA regional average, and Back Bay/YK Bay median without ETP discharge. It is unclear how the model 95th percentile can be below this central YK Bay background value.	**June 25:** The predicted 95th percentile concentration for total zinc (0.002 mg/L) was less than the background concentration (0.003 mg/L from CanNorth 2018) because of detection limits and low concentrations the two largest inflows to Yellowknife Bay, the Yellowknife River and the inflow from Great Slave Lake. Most of the monitoring data from the Yellowknife River and from Great Slave Lake have total zinc concentrations less than the detection limit of 0.004 mg/L. Concentrations that were less than detection limits in the inflows to Yellowknife Bay were converted to one-half the detection limit. Therefore, for total zinc, most of the Yellowknife River inflow concentrations and all the	

		Recommendation The GMRP is requested to explain why the model 95th percentile for zinc, with WTP discharge, is below the central YK Bay background value without effluent input.	Great Slave Lake inflow concentrations were set equal to 0.002 mg/L, which is less than the Yellowknife Bay background concentration.	
21	EQC Report, Section 5.2.2, p.72	**Comment** On page 72 it is noted that recent surface water samples from Yellowknife Bay near the proposed outfall and Back Bay (2011 to 2018) were considered representative of current background concentrations, but that surface water data from early spring 2011 was excluded because of the occurrence of the sediment release from the Jo-Jo tailings downstream to Yellowknife Bay. It is unclear if the release of sediment from the Jo-Jo tailings has impacted the surface water quality in Yellowknife from summer 2011 to present. **Recommendation** The GMRP is requested to clarify whether the surface water quality used as background in Yellowknife Bay, has been affected by historical sediments in the Bay, or by impacts from Bakers Creek.	**June 25:** The intention of that statement was to clarify that data during the release of tailings to Yellowknife Bay was excluded from a dataset considered representative of background conditions of surface water. It is standard practice to exclude 'spill' data from background conditions.	
22	EQC Report, Section 5.2.2, Table 5-3 (p.73) , Table 5-4 (p.75)	**Comment** For cadmium, the non-detect value from the Back Bay/YK Bay data is below the HHERA regional background, and has been used as the background value for	**June 25:** Thank-you for identifying this inconsistency for silver and vanadium. The background concentration used for thallium in the screening is correct. The inconsistency	

		screening. However, for silver, thallium and vanadium, in the same situation, the higher HHERA value has been used. This seems to be inconsistent. **Recommendation** The GMRP is requested to justify the use of the higher background value, or to revise the COPC selection using the lower background value.	for silver and vanadium has no effect on the screening or the list of POPCs identified for developing EQC.	
23	EQC Report, Section 5.2.2, Table 5-5, p.78	**Comment** In Table 5-5, it is unclear why the DWG of 1.5 mg/L for fluoride was selected as the water quality objective to be applied at the mixing zone boundary instead of the Federal Guideline of 0.12 mg/L for fluoride, which is a lower value. **Recommendation** The GMRP is requested to explain why the DWG of 1.5 mg/L for fluoride was selected as the water quality objective to be applied at the mixing zone boundary instead of the Federal Guideline of 0.12 mg/L for fluoride.	**June 25:** The CCME guideline for fluoride is an interim guideline from 2002 and has remained interim because insufficient toxicity data were available in 2002 to derive a full water quality guideline (CCME 2002). Available fluoride toxicity data were reviewed in 2014, and a generic chronic effects benchmark for freshwaters was developed (McPherson et al. 2014). The fluoride benchmark from the 2014 study was 1.94 mg/L, which is less stringent than the Health Canada DWG of 1.5 mg/L; therefore, the DWG was selected as the water quality objective. The proposed water quality objectives in Table 5-5 represent the most relevant and appropriate values given the information available at the time of preparing the EQC report. Guidelines or benchmarks that incorporate site-specific conditions and toxicity	

			modifying factors were generally preferred (e.g., BC MOE guidelines and SSWQOs developed and approved in other northern environments). For parameters with both an aquatic life WQO and a drinking water guideline, the more stringent of the two was selected.	
24	EQC Report, Section 5.2.2, Table 5-5, p.78	**Comment** In Table 5-5, the Federal Guideline for total cadmium should range between 0.00006 and 0.0001 mg/L instead of 0.0006 and 0.0001 mg/. **Recommendation** The GMRP is requested to correct the range for total cadmium, or clarify.	**June 25:** Thank-you for identifying this unit error in the report table. The screening was completed using the correct guideline values.	
25	EQC Report, Section 5.2.2, Table 5-5, p.78	**Comment** In Table 5-5, the DWGs for total cadmium and total chromium are reported incorrectly. The DWG for total cadmium should be 0.005 mg/L, while the DWG for total chromium should be 0.05 mg/L **Recommendation** The GMRP is requested to correct or clarify if the correct DWG for total cadmium and total chromium are reported in Table 5-5.	**June 25:** Thank-you for identifying this unit error in the report table; it has no effect on the screening process as the lower aquatic life guidelines for cadmium and chromium were used.	
26	EQC Report, Section 5.2.2, Table 5-5, p.79	**Comment** In Table 5-5, the Federal Guideline for total zinc (CCME, 2018) appears to be incorrect. **Recommendation** Can the GMRP	**June 25:** The guideline range presented in Table 5-5 is correct, and is based on the new CCME aquatic life WQG for dissolved zinc (CCME 2018). However, the DOC range in	

		clarify if the correct Federal Guideline for total zinc is reported in Table 5-5.	footnote (b) should read (4.4 to 5.6 mg/L).	
27	EQC Report, Section 5.2.2, Table 5-8, p.85	**Comment** Silver appears to be missing from Table 5-8. **Recommendation** The GMRP is requested to confirm that silver was considered in the screening and removed at Step 2, so is not a POPC.	**June 25:** Silver was included in the screening process and is not a POPC.	
28	EQC Report, Section 5.2.2.3, Table 5-8; p. 85	**Comment** Table 5-8 indicates that no EQC is proposed for the POPCs chloride and sulphate; however, the type of EQC is shown as "narrative". On p. 84 it is mentioned that EQCs are not proposed for the WTP for chloride and sulphate because they are predicted to be below 10 mg/L and 20 mg/L, respectively, at the edge of the mixing zone, well below water quality objectives. Predicted concentrations for the 1st and 2nd cell from the outfall (Table 5-7) show this. It is unclear what "narrative" signifies in Table 5-8. **Recommendation** The GMRP is requested to explain the word "narrative" under EQC type for chloride and sulphate in Table 5-8.	**June 25:** EQC are not proposed for chloride and sulphate, indicated by "No" in the "Propose EQC?" column of Table 5-8. However, the GMRP understands how using the term "narrative" could be misleading because the MVLWB does occasionally issue narrative EQCs (e.g., no visible sheen for oil and grease). In Table 5-8, the term "narrative" is meant to refer to the text in Section 5.2.2.3 outlining why EQC were not proposed for chloride and sulphate.	
29	EQC Report, Section 5.2.3, Table 5-9; p.88	**Comment** The CCME (2018) equation used to calculate the acute WQO for zinc is valid for a water hardness between 13.8 and 250.5 mg CaCO3/L. A hardness range of 385 to 1,037 mg CaCO3/L was used to estimate the	**June 25:** Thank-you for identifying the upper hardness cut-off for the new dissolved zinc guideline. The acute WQO for dissolved zinc is 0.248 mg/L, calculated by reducing the hardness to 250.5 mg/L. The proposed	

		acute WQO for zinc in Table 5-9, which is outside the hardness range reported by the CCME (2018). **Recommendation** The GMRP is requested to correct the acute WQOs for zinc in Table 5-9 using hardness concentrations that are within the range of the CCME(2018) equation, or to explain why the acute WQOs for zinc in Table 5-9 are acceptable despite the hardness concentrations being out of range for use in the CCME(2018) equation.	EQC for total zinc (0.08 mg/L MAC, 0.16 mg/L MGC) remain below the acute WQO.	
30	EQC Report, Section 5.2.4.7; p.98-99	**Comment** A MAC and MGC EQC of 3 and 5 mg/L, respectively, have been proposed for total petroleum hydrocarbons (TPH). These values are higher than the CCME's (2008) water quality benchmarks for petroleum hydrocarbon subfractions for F1 and F2 based on a critical body residue approach assuming a narcosis-type endpoint. **Recommendation** The GMRP is requested to explain why the proposed MAC EQC and MGC EQC are protective of aquatic life in the receiving environment.	**June 25:** The proposed effluent quality criteria (EQC) for total petroleum (TPH) were not proposed based on a toxicological effect assessment. The values of 3 mg/L (maximum average concentration [MAC]) and 5 mg/L (maximum grab concentration) were based on reasonable source control and are consistent with EQC for TPH approved for other mining or industrial operations licensed in the Northwest Territories. The same EQC have been approved in Water Licences for Ekati, Diavik, and Gahcho Kué mines (WLWB 2019, 2015, MVLWB 2018, respectively) and the Normal Wells Operations (SLWB 2015), with the exception of the Gahcho Kué Water Licence which only lists a maximum grab of 5 mg/L (i.e., no MAC)	

			(MVLWB 2018). References: MVLWB (Mackenzie Valley Land and Water Board). 2018. Mackenzie Valley Land and Water Board Type A Water Licence #MV2005L2-0015. Issued to De Beers Canada Inc. Amendment November 7, 2018. Yellowknife, NT, Canada. SLWB (Sahtu Land and Water Board). 2015. Sahtu Land and Water Board Type A Water Licence S13L1-007. Issues to Imperial Oil Resources N.W.T. Limited Norma Wells Operations. March 5, 2015. WLWB (Wek'èezhìi Land and Water Board). 2019. Wek'èezhìi Land and Water Board Type A Water Licence #W2012L2-0001. Issued to Dominion Diamond Mines ULC. April 24, 2019. Yellowknife, NT, Canada. WLWB. 2015. Wek'èezhìi Land and Water Board Type A Water Licence W2015L2-0001. Issued to Diavik Diamond Mines (2012) Inc. October 19, 2015. Yellowknife, NT, Canada.	
31	EQC Report, Section 6, p.101; Table 6-1	**Comment** Table 6-1 identifies an uncertainty regarding influent water quality to the ETP and the WTP. The plan to address this uncertainty includes monitoring of source waters, further investigation of water treatment contingencies, and testing to further understand toxicity of ions. It is unclear which ions or toxicity tests are	**June 25:** While the ETP is operational, whole effluent toxicity testing of effluent prior to, and during discharge, will continue as per the proposed SOP and SNP. There will be a transition period while the new WTP is tested and the existing ETP will remain functional as backup. During the transition, toxicity testing will be	

		planned. **Recommendation** The GMRP is requested to explain the plan for further toxicity testing of ions.	completed to confirm the effluent is non-acutely lethal prior to discharge. More detailed investigation or site-specific testing may occur based on those results, but only if warranted.	
32	EQC Report, Appendix E, p.29; Attachment EIII.	**Comment** The water quality model for Yellowknife Bay has an input for the diffusive flux of arsenic from foreshore tailings, but seems to have no input for diffusive flux of arsenic from the sediments in Yellowknife Bay. It is unclear whether this would represent a significant influence on water quality in Yellowknife Bay. Nor is it clear how well the simulated concentrations of arsenic in Yellowknife Bay match observed concentrations, because calibration plots for arsenic are lacking from Attachment EIII. **Recommendation** The GMRP is requested to clarify whether arsenic flux from the sediments of Yellowknife Bay is included in the model, and if not included, to provide rationale based on its importance, relative to other inputs. The GMRP is also requested to provide model calibration plots for arsenic.	**June 25:** A diffusive flux of total arsenic from the foreshore tailings of 0.0002 grams per square metre per day (g/m2/day) was added to the Yellowknife Bay model assuming that the foreshore tailings cover an area of 124,000 square metres (m2) (Golder 2004). The model assumed that the foreshore tailings would be covered and the flux of arsenic to Yellowknife Bay would end by 1 January 2026. The flux of arsenic from the foreshore tailings is predicted to be a minor source of arsenic to Yellowknife Bay (Table 2-3 in the EQC Report). The model was able to match observed total arsenic concentrations in Yellowknife Bay, which suggests that a major source of total arsenic is not missing from the model. The calibration results for total arsenic in Yellowknife Bay are presented in Figure E2.3-27 of Appendix E of the EQC Report. Attachment EIII only includes parameters not discussed in Appendix E. Reference: Golder (2004). Draft Report on Environmental Assessment. Yellowknife Bay	

			Tailings. Giant Mine Yellowknife, NT. Prepared for Miramar Giant Mine Limited, Yellowknife, NT, Canada. January 2004.	
33	EQC Report, Appendix F, F-3.4; p.31-32	**Comment** ECCC (2017) derived a water quality guideline for cobalt using EC10 no-effect data. In GMRP's derivation of the SSWQO for cobalt, the EC10s for six species were identified to be below NOEC values measured in the same study. In this case, the GMRP selected the next appropriate EC value of EC20, even though this was also below the NOEC in four cases. The CCME (2007) identifies EC10 as the most preferred endpoint, without consideration of whether it is above or below the NOEC. It is unclear, in instances where the EC20 fell below the NOEC, why the EC10 value was not adopted given that more weight is given to the EC10 data by the CCME (2007) in the derivation of a Type A guideline. **Recommendation** The GMRP is requested to demonstrate how the HC5 would change if EC10 was used for the six studies where the GMRP selected EC20.	**June 25:** The CCME (2007) guidance on preference ranking for toxicity endpoints assigns the highest rank to "the most appropriate ECx/ICx value representing a no-effects threshold." This requires judgement on the part of the risk assessor in terms of consideration of statistical and ecological significance, in addition to the effect size observed. Whereas an EC10 is often an appropriate ECx/ICx , it is not always the most appropriate . In the case of selection of endpoints for the cobalt SSWQO, selection of the EC20 values represented the most appropriate no effects threshold. For the six studies where the EC20 and EC10 values both fell below the NOEC, the EC20 values were preferentially selected for the following reasons: a) an effect level of 10% or less (i.e., EC10) is generally considered to be indistinguishable from background variability or the response of control organisms (Environment Canada 2005); b) lower effect sizes are generally not reliable estimates because as "x" becomes smaller, the confidence limits on ECx	

			increase, and the precision of the point estimate decreases; c) in the case of four of the six studies the EC20 values represented no-effect thresholds because the endpoint fell below the NOEC. To address MVLWB's recommendation, a bounding analysis was run under the assumption that the EC10 values are selected over the EC20 values for the six studies in question. In these instances, the EC10 values are higher than endpoints reported for the two most sensitive species Lemna minor and Hyalella azteca included in the species sensitivity distribution. Inclusion of the EC10 values for the six studies would result in an HC5 value similar to the value derived by ECCC (2017) as part of the Federal Water Quality Guideline. Based on the rationale outlined above, the derived HC5 (1.85 µg/L) for the cobalt SSWQO was considered adequately protective of aquatic life. References: Environment Canada. 2005. Guidance document of statistical methods for environmental toxicology tests. Method Development and Applications Section, Environmental Technology Centre, Environment Canada, Ottawa, Ontario.	

34	EQC Report, Appendix G, G-5; p.6	**Comment** The GMRP states that the methods used to calculate EQCs and described in Sections 2, 3 and 4 of the EQC Report, were not used to calculate the EQCs for total antimony and zinc because the EQCs calculated using these methods "were not initially anticipated to be reasonable and consistently achieve for the Mine". The values of EQCs for total antimony and total zinc using the methods described in Sections 2, 3 and 4 of the EQC Report were not provided to support the GMRP's statement. **Recommendation** The GMRP is requested to provide a comparison of the EQCs for total antimony and total zinc using the methods described in Section 2, 3 and 4 of the EQC report, against the EQCs described in Section 5, to support the statement that the EQCs calculated using the methods described in Sections 2, 3 and 4 of the EQC Report "were not initially anticipated to be reasonable and consistently achieve for the Mine."	**June 25:** Using the methods described in Sections 2, 3, and 4 of the EQC Report, the maximum average concentration (MAC) and maximum grab concentration (MGC) effluent quality criteria (EQC) for total antimony were calculated to be: 0.03 mg/L and 0.04 mg/L, respectively (see Figure 5-14 in the EQC Report for predicted total antimony concentrations from the water treatment plant [WTP]). For zinc, the MAC and MGC EQC for total zinc were: 0.022 mg/L and 0.038 mg/L, respectively (see Figure 5-20 in the EQC Report for predicted total zinc concentrations from the WTP) using the methods described in Sections 2, 3, and 4 of the EQC Report. Using the methods described in Section 5 of the EQC Report, the MAC and MGC EQC for total zinc and antimony were: 0.08 mg/L and 0.16 mg/L (zinc), 0.2 mg/L and 0.3 mg/L (antimony), respectively. The reasons for the conservative nature of the EQC calculations are provided in Appendix G of the EQC Report.	
35	EQC Report, Appendix G; p.4	**Comment** Equations 1 to 3 contain parameters that appear to represent the flow and concentration properties of a combined WTP and Baker Creek discharge. The Q parameter seems to be a sum of flows for these two	**June 25:** The CWTP/BC is the waste load allocation, which represents the maximum concentration of a parameter that can be discharged to Yellowknife Bay while maintaining parameter concentrations in Yellowknife Bay	

		streams (QWTP+BC). It is unclear what the C parameter represents (CWTP/BC). Perhaps a flow-weighted average concentration? In addition, the EQC calculations cannot be verified since the input parameter values are missing. **Recommendation** The GMRP is requested to provide clarification as to the meaning of these combined flow and concentration parameters, and should also provide a spreadsheet showing the calculation of all proposed EQC values, in accordance with Equations 1 to 9, and showing all the relevant input parameters.	below water quality objectives. The waste load allocation concentration was calculated using the combined flows from Baker Creek and the new water treatment plant (WTP), but the waste load allocation concentration was only assigned to the WTP flow. Please see ORS 6 - Attachment 4 - Calculation of Effluent Quality Criteria.	
36	General: Level of design provided in the Closure Reclamation Plan (CRP).	**Comment** Many of the Closure Reclamation Plan measures have been developed to a conceptual stage. Detailed engineering and other studies are still required to develop the CRP fully and to ensure reclamation performs as planned. Examples include: engineered cover over pits when needed to protect underground water quality; foreshore tailings cover design not finalized. **Recommendation** Can the GMRP clarify if they intent to submit the annual CRP reports for review by stakeholders to ensure that the proposed measures are designed and	**June 25:** In lieu of submitting our updated design and performance within an annual Closure and Reclamation Plan (CRP) update, the GMRP is proposing to submit Design and Construction Plans to the Board for approval for all Engineered Components outlined in the Closure and Reclamation Plan. This will take into consideration any new information available through reclamation research. Design and Construction Plans will include an implementation schedule, the final detailed design, final closure criteria, and activity-specific monitoring and mitigations to be followed during activity	

		performing as planned, and if not, explain why.	implementation (i.e., construction) and adaptive management (i.e., confirmation of performance). These plans will also propose a timeline for performance assessment of the implemented closure activity, once completed. Annually, the GRMP has proposed that the CRP will be updated to reflect the changes approved through the Design and Closure Plans. The GMRP does not anticipate changes to the CRP would be proposed through this submission it would be simply an administrative update to ensure that the CRP is kept up to date. Wherever possible Design and Construction Plans will be submitted together to minimize the number of review processes.	
37	Appendix 5.0A-Closure Objectives, F1, p.3; Table 5.0A-3	**Comment** It is understood that the freeze-immobilization criteria were evaluated against a long-term performance target of a 6.1° C increase in the global mean annual air temperature (MAAT). This was used to model the MAAT for Yellowknife as 1.8° C (from a baseline of -4.3° C at the Yellowknife airport from 1974 to 2012), to reflect the predicted upper range global temperature increase from multi-century stabilizations published by the International Panel on Climate Change (IPCC 2004). Under this	**June 25:** In line with recent climate change findings by Environment and Climate Change Canada, Canadian Centre for Climate Modelling and Analysis (CCCMA) and the IPCC 2014, the GMRP has recently reevaluated its climate change assumptions and made revisions to those reported in the CRP. The CRP specified a MAAT of 6.1oC based on IPCC 2007 projections. In 2014, the IPCC released its Fifth Assessment Report, and used Representative Concentration Pathway (RCP)	

		scenario the planned closure measures were modelled to be sufficient to keep the arsenic trioxide dust freeze-immobilized at -5° C or lower . More recent projections have been published by IPCC (2014). It would be useful to evaluate performance against the more recent projections, as well as to determine at what level of warming the freeze block method will not be effective. **Recommendation** The GMRP is requested to provide an evaluation of the performance of the freeze block method for managing arsenic trioxide dust against 2018 IPCC upper range MAAT projections, and the corresponding upper range projections for the Yellowknife area, as these projections may be higher than the global average. It is also requested that winter projections be provided, as winter temperatures will have the most effect on the success of the proposed remediation plan. As well, the maximum Yellowknife MAAT for which the freeze block method will function effectively should be estimated through the same modelling approach.	scenarios to depict a range of possible future concentrations of atmospheric greenhouse gases, air pollutants and land use scenarios. Baseline scenarios, which do not include any mitigation effort to constrain greenhouse gas emissions result in pathways that fall between RCP 6.0 and RCP 8.5. As such, the RCP 8.5 scenario reflects a worst case scenario and is now used as the basis for the scenario to evaluate long term thermosyphon performance at Giant Mine. The 6th edition of the IPCC has not projections is yet to be released. In support of the IPCC assessments, detailed temperature projections specific to Canadian regions were issued in 2016 through the Canadian Centre for Climate Modelling and Analysis (CCCMA). The Government of the Northwest Territories website regarding climate change (www.nwtclimatechange.ca), states that the rate of warming in the Northwest Territories is anticipated to be four to five times faster than the global rate. Their website links to a tool developed by SNAP (Scenarios Network for Alaska + Arctic Planning). The SNAP tool uses model outputs that form the basis for the IPCC's Fifth Assessment Report 2014 and the data is presented on a monthly	

			basis, allowing for the differentiation between summer and winter warming trends. The developers of the SNAP tool were asked by the Government of the Northwest Territories to estimate climate change trends beyond the IPCC 5th report bounds for specific mines in and around, but excluding Giant Mine. Current MAAT climate data at Giant best matched that of the nearby NICO Mine. Using the highest and lowest MAAT projections out to 2130 for the NICO Mine, the change in MAAT between 2010 and 2130 is estimated to be +7.3°C with winter air temperatures increasing +9.0°C over 120 years, while the summer air temperatures only increase by +5.5°C. This is compared to a MAAT of 6.1oC specified in the CRP based on IPCC 2007 projections. In terms of specifying a minimum number of thermosyphon operating days per year, this is not a relevant factor because it is both days of operation and temperature of operation that affect the heat extraction. The current design accounts for both these factors. Annual updates to the model will not be done; however, the long term monitoring plan will allow for early detection of ground temperature trending that is outside an expected range and there	

			will be multiple years of response time to manage any change in operating strategy, including a potential retrofit of thermosyphons (which can be done without additional drilling of more holes). There is no maximum MAAT at which the freeze will not function. If actual temperature readings and model results show undesirable future trending magnitudes, conversion of passive units to hybrid units would occur. Further details can be found in ORS 6 - Attachment 5 - GMRP Climate Change Review Memo.	
38	Appendix 5.0A-Closure Objectives, T6, p.9; Table 5.0A-7	**Comment** The proposed measures (rough covers and boulders in access areas) may not be sufficient to prevent site access. **Recommendation** The GMRP is requested to explain if any public education program is being considered or proposed to explain the importance of covers and to reduce potential for damage to covers.	**June 25:** No, a public education program is not currently planned specifically for the tailings covers. Measure 24 requires the project to prevent vehicle access to the tailings cap, so this physical barrier in itself will act as a direct communication tool.	
39	Appendix 5.0A-Closure Objectives, WTP3, p.11; Table 5.0A-9	**Comment** It is noted that, in Section 5.8.4.3 of the CRP, further testing of sludge and ion exchange media is to be carried out to verify it is suitable for disposal in the on-site landfill. At present, existing ETP waste characteristics have been assumed as a surrogate. The leaching characteristics	**June 25:** Investigations in 2012 and 2019 have been completed to predict WTP waste residual disposal characteristics. Based on the testing completed, both the waste sludge and waste ion exchange media streams will be classified as non-hazardous waste. The classification is based on the	

		of the spent ion exchange media are not presently known. **Recommendation** The GMRP is requested to clarify if there is a commitment and timeline for presentation of the further testing of representative sludge and spent ion exchange media.	comparison of analytical waste classification data to NWT waste disposal standards. The waste classification sampling included the determination of leachable metals using the toxicity characteristic leaching procedure (TCLP, SW-846 EPA test method 1311). This EPA test method is the standard procedure for determining the mobility of organic and inorganic parameters in liquid and solid waste. For arsenic, the limit set per the NWT Guideline for Hazardous Waste Management is 2.5 mg/L of leachate following the TCLP. Based on the analytical results the waste is deemed to be chemically stable and is not required to be disposed of in a hazardous waste disposal facility. Toxicity characteristic leaching procedure (TCLP) testing of samples of sludge from the ETP's settling pond conducted in 2012 yielded arsenic concentration results of 0.23 and <0.20 mg/L. TCLP testing of samples of three brands of spent ion adsorption media from a pilot plant conducted in 2018 yielded arsenic concentration results of 0.355, 0.211 and 0.102 mg/L. Five additional samples of sludge were collected from the Settling Pond on March 16, 2019 and were subjected to TCLP tests. The tests	

			yielded four non-detectable concentrations of arsenic (less than 0.20 mg/L) and one concentration of 0.37 mg/L. During the initial operations of the new WTP (in 2026) sludge and spent media samples will be collected and tested to confirm that these waste streams remain not leachable. Groundwater monitoring will be completed prior to landfill construction as well as during landfill operations. (Please reference Section 4.3 of the Waste Management and Monitoring Plan). Analytical data obtained from the monitoring will be evaluated to identify and monitor potential changes in groundwater quality. In the long-term, the WTP residuals cells of the non-hazardous waste landfill will be covered using an impervious membrane. This will limit infiltration of precipitation into the cells and will further prevent the formation of leachate. Post-closure monitoring and maintenance will be further developed at the GMRP nears the end of the Active Remediation and Adaptive Management Phase. (Please reference Section 5 of the Waste Management and Monitoring Plan). Analytical data from the monitoring program will be evaluated to identify changes in groundwater quality.	

40	Water Management and Monitoring Plan, pg. 4-28 and 4-29	**Comment** The water management and monitoring plan identifies the settling pond and polishing pond as key components associated with the ETP operation. The plan identifies the operating levels of the polishing and settling ponds, and proposes new minimum freeboard in water levels that are lower than historical operating levels in the ponds. If the maximum water levels will be lower as a result of the minimum freeboard requirements, the volumes in the polishing and settling ponds will be smaller than they were historically. This implies that the hydraulic residence times in the ponds will be smaller than those historically. This raises the question of whether the smaller hydraulic residence times will have negative effects on the settling of treatment solids (sludge) from the ETP during operations up to 2026. **Recommendation** The GMRP is requested to clarify whether these changes in freeboard levels in polishing and settling ponds will have effects on the quality of final discharge water from the polishing pond, and to provide rationale.	**June 25:** At times in the past, the GMRP has operated the polishing pond at lower elevations than that of the minimum freeboard water level currently specified in the OMS Manual. (Please refer to Section 4.3.3 of the WMMP.) Treated effluent is not discharged until it is confirmed that water quality in the polishing pond meets discharge criteria and is not acutely toxic to fish. (Please refer to Section 4.3.4 of the WMMP.) The GMRP will continue to operate the ETP and the settling and polishing ponds so as to meet discharge criteria. The GMRP team is currently in the process of analyzing and modelling Dam 1 in order to develop conceptual designs to raise the height of Dam 1 and the resulting water levels of the polishing and settling ponds. This assessment is underway.	
41	Aquatic Effects Monitoring Program Design	**Comment** It is noted that the Baker Creek AEMP Design Plan is intended to cover the Project Definition Phase (Phase 1) and Active Remediation	**June 25:** The focus of the AEMP is to detect effects of the Project (the remediation), primarily in relation to treated effluent, and to harmonize with	

	Plan- Baker Creek, p.13-14	Phase (Phase 2). It is unclear why the Baker Creek AEMP (presumably a revised AEMP) and associated monitoring does not extend into the long term, (i.e. Phase 3-Post-closure Monitoring and Maintenance) to assess the performance of the proposed rehabilitation activities and the recovery of the system. **Recommendation** The GMRP is requested to clarify and explain why an AEMP for Baker Creek is not being planned for the post-closure and monitoring phase (Phase 3).	MDMER requirements. Numerous other plans are in place for other aspects of remediation or to evaluate other stressors in Baker Creek, as listed: a) Documentation of the recovery of Baker Creek post-remediation will be included in the Fisheries Act Authorization habitat compensation monitoring. This is expected to be a multi-year program, comparing the habitat use before and after remediation, and the recovery of the ecosystem once the creek is realigned and substrate replaced. It is expected there will be a lag time for recovery and specific, focused, monitoring will be needed to asses this. This specific type of focused monitoring is not appropriate for inclusion in an AEMP; b) Construction activities and water quality in Baker Creek are proposed to be monitored through SNP and construction monitoring, as well as the Erosion and Sediment Management and Monitoring Plan. These programs/plans require much more frequent monitoring and reporting than the AEMP. Furthermore, mitigations proposed in the Erosion and Sediment Management and Monitoring Plan and construction plans are intended to prevent runoff from remediation entering Baker Creek	

			(it will instead be captured). Given the above, an AEMP in Baker Creek post-remediation is not planned.	
42	Aquatic Effects Monitoring Program Design Plan- Baker Creek, General Comment	**Comment** The Baker Creek AEMP is presented as an interim monitoring program to fill the time gap between now and when the new WTP is constructed. There is some reference to monitoring in Baker Creek following construction of the new WTP, and reference to subsequent AEMP designs (e.g. Section 4.3); however, it is unclear how the AEMP will change over time in response to changes in the configuration/operation of the site. It is assumed that there will continue to be a Baker Creek AEMP following construction of the new WTP but the focus of the program will change - the revised AEMP will become the performance monitoring program from which data will be used to assess the success of the proposed rehabilitation activities and the recovery of the system. It is unclear if the proponent has committed to revise the plan in this manner, or if there will be a subsequent iteration of the Baker Creek AEMP that will focus on closure performance monitoring. If there is a plan to revise the Baker Creek AEMP to monitor closure performance, it is unclear what the timeframe would be	**June 25:** The GMRP committed to preparing an Aquatic Effects Monitoring Program Re-evaluation Report every three to four years (Section 9.2.3 of the Baker Creek AEMP Design Plan). As part of the re-evaluation report, recommendations for changes to aspects of the AEMP design will be made, along with rationale for these recommendations; however, the focus of these changes will not be on post-closure activity monitoring performance for the reasons outlined in MVLWB: Shannon Allerston #41. A review of the timelines for preparing AEMP revisions and whether this commitment should be a condition of the Water Licence is a good topic for the technical session.	

		for this revision. It is also unclear if this commitment should be worked into the Water Licence, with an appropriate review period in advance of the commissioning of the WTP. **Recommendation** The GMRP is requested to clarify and explain if they will commit to revising the Baker Creek AEMP over time in response to changes in the configuration/operation of the site, with a focus on closure activity performance monitoring. The explanation should address the timeframe for submission of AEMP revisions to the Board, and whether this commitment should be a condition of the Water Licence, with an appropriate review period in advance of the commissioning of the WTP.		
43	Aquatic Effects Monitoring Program (AEMP) Design Plan-Baker Creek, Section 2.4, p.12	**Comment** The report identifies two specific closure objectives (BC4, BC5) that explicitly refer to aquatic community health in Baker Creek. There are a number of other closure objectives listed in Appendix 5.0A of the Closure and Reclamation Plan (e.g., SW2, CS1, BC1, BC2, BC3) that will affect the aquatic community habitat, and an assessment of impacts on the habitat from these activities seems to be missing. **Recommendation** The GMRP is requested to clarify and explain, with	**June 25:** Yes, alterations to Baker Creek will result in impacts to fish habitat and this was addressed in the DAR. It is expected that Fisheries Act Authorization habitat compensation monitoring will address the monitoring of the aquatic habitat, not the AEMP (see above MVLWB: Shannon Allerston #41 for further detail).	

		rationale, if additional closure objectives (and associated activities) listed in Appendix 5.0A of the Closure and Reclamation Plan (e.g., SW2, CS1, BC1, BC2, BC3) will affect the aquatic community habitat, and how the assessment of these impacts will be conducted.		
44	AEMP Design Plan- Baker Creek, Section 2.4, p.13	**Comment** The report indicates that the closure objectives will not be met over the life of the Baker Creek AEMP. It is unclear if this situation only refers to the initial iteration of the Baker Creek AEMP, and if the AEMP will evolve as needed in recognition of changes in site conditions and operations. **Recommendation** The GMRP is requested to clarify if the closure objectives not being met over the life of the Baker Creek AEMP is in reference to the initial iteration of the Baker Creek AEMP, and if later iterations of the AEMP will assess whether closure objectives are being met.	**June 25:** The AEMP is referring to closure objectives not being met until remediation is complete which is estimated to be after approximately 10 years of remediation (Phase 2). Based on the MVLWB standard board cycle of revising the AEMP study design every three to four years, it is expected that one or two more versions of the Baker Creek AEMP will occur prior to transitioning to the Yellowknife Bay AEMP. The Yellowknife Bay AEMP is expected to be revised as estimated two times prior to achieving closure objectives. The GMRP agrees that monitoring and management plans and how they connect with the closure plan and Water License conditions can be discussed at the technical sessions.	
45	AEMP Design Plan- Baker Creek, Section 4.1, p.17; Section 6.3.1, p.44-45; Figure 6-	**Comment** The AEMP Design Plan focusses on the lower section of Baker Creek (Reach 0 and lower Reach 1) as the exposure area, in deference to previous EEM program monitoring	**June 25:** The focus of the AEMP is to detect effects of the Project (the remediation), primarily treated effluent to harmonize with MDMER requirements. Numerous other plans	

	1; Section 7.4.2, p.66	that has been completed. For the AEMP, it is unclear why areas further upstream of Baker Creek are not being considered given the presence there of fish habitat and both resident and seasonally resident fish species (e.g. Table 2.5-1 in the Closure and Reclamation Report). **Recommendation** The GMRP is requested to provide a rationale as to why the upstream reaches beyond Reach 0 and lower Reach 1 of Baker Creek were not considered in the Baker Creek AEMP, given the presence there of fish habitat and both resident and seasonally resident fish species in these areas.	are in place to monitor other aspects of remediation or stressors in Baker Creek: a) documentation of the recovery of Baker Creek post-remediation will be included in the Fisheries Act Authorization habitat compensation monitoring. This is expected to be a multiyear program comparing the habitat use before and after remediation and the recovery of the ecosystem once the creek is realigned and substrate is replaced. It is expected that there will be a lag time for recovery and specific, focused monitoring will be needed to asses this, which is not appropriate to an AEMP; b) Construction activities and water quality in Baker Creek are proposed to be monitored through the SNP and construction monitoring and Erosion and Sediment Management and Monitoring Plan. These require much more frequent monitoring and reporting than the AEMP. In general, the mitigations involved in the Erosion and Sediment Management and Monitoring Plan and construction plans should mean runoff from remediation is captured and does not enter Baker Creek; c) it is not appropriate to expand the scope of the AEMP into upper Baker Creek. Most fish use the reaches of Baker Creek on	

			site in spring, prior to discharge or activities on site and then out-migrate (See CRP Section 2, Baker Ecosystem Report). By monitoring Baker Creek where most of the fish are (Reach 1 and Reach 0), the effects from water quality stressors on Site are captured. The fish and benthos have been studied and effects of historical mining were documented. The creek is affected and needs remediation. An extensive study was done on fish and benthos and plants in 2011 to confirm this. Further study on these organisms in all reaches of Baker Creek does not provide new information to inform closure activities or act within an AEMP.	
46	AEMP Design Plan- Baker Creek, Section 6.3.1, p.44-45; Figure 6-1	**Comment** The Baker Creek AEMP includes the discharge area in Yellowknife Bay behind the break wall (Reach 0) but does not extend further into Yellowknife Bay. The conceptual AEMP for Yellowknife Bay is focused on the area of discharge from the WTP after commissioning in 2026. There seems to be no monitoring proposed for effects beyond the break wall in Yellowknife Bay from 2019 through 2026, in an area and timeframe when substantial effluent exposure is expected (Figure 6-1). **Recommendation** The GMRP is requested to provide a rationale as to	**June 25:** Water quality monitoring as well as plume monitoring will be done in Yellowknife Bay past the breakwater as part of the Baker Creek AEMP. In general, the plume of effluent disperses very quickly once past the mouth of Baker Creek and effects beyond the mouth of the creek are not easily assessed for fish or benthos (i.e., public use of the dock and the marina are confounding effects as are the extensive ice and wave action in this area).	

		why no monitoring is proposed in Yellowknife Bay beyond the break wall during the timeframe of the Baker Creek AEMP when substantial effluent exposure from the Baker Creek discharge is expected in this area.		
47	AEMP Design Plan- Baker Creek, Section 4.2, p.19	**Comment** Two stressors have been highlighted in the report: (1) effluent; and (2) contaminated sediment. The Closure and Reclamation Plan identifies other stressors that may also be worthy of consideration within the development of AEMP. These would include shallow seepage associated with site aspects (e.g., tailings facilities) and site runoff. Consideration of these stressors might be expected influence the AEMP design. The rationale for not considering these other potential contaminant inputs to the system is unclear. It is noted that the EEM Investigation of Cause (IOC) study completed by Golder indicated that water quality was the likely cause of the measured effects as the result of effluent discharged into Baker Creek, as well as contaminated sediments. It is unclear if the IOC considered contributions from other stressors, such as those noted above. **Recommendation** The GMRP is requested to provide a rationale as to	**June 25:** As shown in Figure 4-1, seepage and run-off are noted as stressors. Seepage from tailings facilities is largely captured in sumps and monitored in the operational monitoring and SNP programs. Seepage is pumped back to TCAs and there is limited risk to Baker Creek from this stressor. However, contaminated runoff is included in studies of water quality overall in the AEMP. This is done through sampling water quality at SNP 43-5, which includes all site runoff and effluent from site, regardless of source. Seepage and site run-off were not explicitly explored as stressors in the IOC, they are included in exposure stressors and evaluated through sampling water quality at SNP-45, and fish and benthos in the same area.	

		why the shallow seepage associated with site aspects (e.g., tailings facilities) and site runoff were not considered in the AEMP as potential stressors to Baker Creek. The GMRP is also requested to clarify if contributions from the shallow seepage associated with site aspects (e.g., tailings facilities), site runoff, or other stressors, were considered as part of the IOC study completed by Golder.		
48	AEMP Design Plan- Baker Creek, Section 6.1, p.42	**Comment** It is unclear if the overall objective of the AEMP Design Plan- "to determine the short- and long-term effects of the GMRP on the aquatic receiving environment" will be achieved, considering that the AEMP only addresses Reach 0 and 1, and covers the period before the new WTP is commissioned (2026), which may be too short to capture long-term effects. **Recommendation** The GMRP is requested to explain how the overall objective of the AEMP stated in this section will be achieved by the AEMP as proposed, given that the AEMP only addresses Reach 0/1 and covers the timeframe prior to the new WTP being commissioned.	**June 25:** Please refer to the response to MVLWB: Shannon Allerston #45 for details	
49	AEMP Design Plan- Baker Creek,	**Comment** The first assessment endpoint in Table 6-1 does not mention sediment quality, although the	**June 25:** Thank you for identifying this. The noted assessment endpoint in Table 6-1 should read 'Maintain water	

	Section 6.2, p.43; Table 6-1	measurement endpoints include sediment monitoring. **Recommendation** The GMRP is requested to clarify the assessment endpoint to resolve the discrepancy.	and sediment quality in lower Baker Creek at or close to concentrations reported by monitoring programs in the last five years.', consistent with assessment endpoint #1 described in the paragraphs before Table 6-1.	
50	AEMP Design Plan- Baker Creek, Section 6.2, p.43; Table 6-1	**Comment** The second assessment endpoint in Table 6-1 is focused on benthic community ability to support fish, however the measurement endpoints seem focused on benthic community health. **Recommendation** The GMRP is requested to clarify the assessment endpoint to resolve the discrepancy.	**June 25:** The second assessment endpoint is focussed on maintenance of a functioning ecosystem in lower Baker Creek that will continue to allow fish to keep using the lower reaches of Baker Creek (e.g., the presence of habitat and the benthic invertebrate food source). Densities and types of invertebrates that belong to the benthic community in Lower Baker Creek can be used to characterize the invertebrate food source available to the fish using Baker Creek. The measurement endpoints provide that information.	
51	AEMP Design Plan- Baker Creek, Section 7.4.1, p.66	**Comment** The stated objective, to assess effluent effects, is consistent with the design as proposed; however, it is not clear that this objective meets the full requirements of an AEMP, which are broader than those of the EEM program. **Recommendation** The GMRP is requested to clarify and explain how the objectives stated in this section meet the requirements of an AEMP.	**June 25:** The GMRP believes that the intent of an AEMP as defined in the AEMP guidance has been met in the design plan, understanding that this is a contaminated site with an existing condition that is already impacted. The key objective of an AEMP is to monitor project-related effects on the aquatic ecosystem. As described in Section 4.2, there are two main project-related stressors of potential concern: treated effluent and	

			contaminated sediment. The focus of this AEMP is to monitor project-related effects largely related to treated effluent since remediation will remove the contaminated sediments and improve the effluent quality. The AEMP is also designed to meet the other objectives as outlined by the recent AEMP guidance document (MVLWB/GNWT 2019) again with the constraint that Baker Creek is already contaminated and studies of historic stressors are complete (see CRP Chapter 2) and the conclusion is that action must be taken and the creek must be remediated: testing predictions from regulatory process (primarily water quality for this study design); providing data that can be used in cumulative effects assessments/predictions (focus on water quality given the discharge to Baker Creek for the first few years and starting a Yellowknife Bay Special Study with a broader scale for water quality); assessing effectiveness of mitigation (operation of the current ETP and water management systems until other remediation activities have begun and a new WTP is installed); and provide an early warning system to prevent adverse impacts (water quality, toxicity, benthos and fish components	

			can provide this, recognizing water quality and toxicity will provide data in real time so are the 'fastest' at providing a warning of potential changes). Please refer to the response to MVLWB: Shannon Allerston #47 for information on additional contributing stressors.	
52	AEMP Design Plan- Baker Creek, Section 7.4.3.2, p.68	**Comment** Individual sub-samples will be analyzed separately for one sample in each area to assess within station variability. It is unclear how the data will be used, because the statistical procedures that will be used to the compare areas do not consider within station variability. **Recommendation** The GMRP is requested to clarify how the individual sub-samples data, and the resulting within station variability, will be used in the benthic invertebrate community assessment.	**June 25:** To characterize within-station variability, total density and richness values for the five discrete grab samples collected at one station, will be visually assessed and percent standard error of the mean (%SE) calculated for density and richness. The results of this assessment will be used to evaluate whether the observed within-station variability is within the range expected for benthic invertebrate communities due to natural variability. For the purpose of calculating AEMP community variables, benthic data for the five discrete grab samples will be electronically pooled into one composite sample for that station.	
53	AEMP Design Plan- Baker Creek, Section 7.4.5.3, p.71-72	**Comment** Guidance is available that describes revised methodology for analysing the Bray-Curtis data (Borcard and Legendre, 2013; Borcard, 2014). The methodology review was commissioned by Environment Canada, and is being recommended for	**June 25:** The Third National EEM Assessment communicates the intention of ECCC to recommend the use of revised methodology in forthcoming EEM technical guidance. "Borcard and Legendre suggested a revised methodology for testing the	

		use in EEM studies. **Recommendation** The GMRP is requested to explain if this new guidance is being considered for the project, and why or why not.	significance of differences in BCI data. ECCC will recommend the use of this revised methodology in EEM technical guidance going forward." Technical guidance from ECCC will be considered in implementation of the AEMP and it is expected the forthcoming revised ECCC technical guidance document will have been issued by the time the AEMP is available for final MVLWB approval.	
54	AEMP Design Plan- Baker Creek, Section 7.5.3.2, p.78; Section 7.5.4.2, p.80	**Comment** Thirty male, 30 female and 30 juvenile sculpin will be targeted for collection for the fish health survey. Generic collection targets are provided for Ninespine Stickleback for the fish health survey. Historical EEM fish data are available for both fish species, therefore power analyses can be completed to determine the number of fish of each gender in the case of scuplin, and the number of fish in the case of the stickleback, that are needed to be able to detect the indicated effect sizes for the various fish health endpoints to be measured at a power of 90%. Required sample sizes may be higher or lower using site specific data than the generic recommendations provided in the EEM TDG. **Recommendation** The GMRP is requested to explain if they will be performing any power analyses to	**June 25:** As described in Section 7.5.6.5 of the Baker Creek AEMP Design Plan, a post hoc power analyses will be conducted on any fish health endpoints that are not statistically significant to determine whether the sample size was sufficient to detect an effect of specified magnitude. In the Phase 4 EEM Program, no statistical analyses of Ninespine Stickleback data were completed due to the uneven sample sizes among areas, and the lack of adult fish in the exposure area (Golder 2013). Therefore, a post hoc power analysis for the Ninespine Stickleback Survey was not performed. However, a post hoc power analysis will be completed as part of the upcoming Phase 6 EEM program, and following this analysis, the sample sizes for the non-lethal fish health survey can be updated for the AEMP,	

		ensure that the power objectives are met for the fish health survey.	if required. Reference: Golder Associates Ltd. 2013. Giant Mine Environmental Effects Monitoring, Phase 4, Final Interpretative Report. Prepared for Aboriginal Affairs and Northern Development Canada, Yellowknife, NT, Canada. Reference: Golder Associates Ltd. 2013. Giant Mine Environmental Effects Monitoring, Phase 4, Final Interpretative Report. Prepared for Aboriginal Affairs and Northern Development Canada, Yellowknife, NT, Canada.	
55	AEMP Design Plan- Baker Creek, Section 7.5.4.3, p.81	**Comment** Multiple fish collection methods are proposed in this section. It is unclear if size selectivity among the different collection methods is an issue. **Recommendation** The GMRP is requested to explain if there is the potential for bias in the fish size data based on the different fish collection methods, and if so, how will this bias be dealt with in the AEMP.	**June 25:** Slimy Sculpin will be captured primarily by backpack electrofishing. Ninespine Stickleback will be captured primarily by seine netting. Given that both fish programs will primarily rely on one fish collection method, size bias as a result of fish collection gear is not a concern. To standardize for size bias based on habitat, both programs will fish in areas that are similar in habitat (e.g., water depth, substrate type) to control for any habitat-related size bias differences.	
56	AEMP Design Plan- Baker Creek, Section 7.5.5.1, p.81	**Comment** It is unclear what percentage of sticklebacks will be subsampled for ageing and gonad histology.	**June 25:** A subset of a total of ten to fifteen otoliths will be removed from each size class of Ninespine Stickleback (maximum of 40 otoliths	

		Recommendation The GMRP is requested to provide the percentage of sticklebacks that will be subsampled for ageing and gonad histology.	per area) to verify size classes. The Ninespine Stickleback size classes are based on previous EEM results and are as follows: YOY = fork length <25; Juvenile = fork length 25 to <35; Adult = fork length > 35 mm. As the Ninespine Stickleback is a non-lethal program, Ninespine Stickleback gonads are not proposed to be sampled and submitted for gonad histology.	
57	AEMP Design Plan- Baker Creek, Section 7.6.1, p.86	**Comment** The narrative at the beginning of this section includes a discussion of fish edibility. Tissue concentrations in small bodied fish seem to be a poor surrogate for tissue concentrations in large bodied fish. There are large bodied fish in Baker Creek, at least seasonally, which could be used. **Recommendation** The GMRP is requested to explain how the small fish (Slimy Sculpin) whole body tissue data will be useful in addressing the issue of fish edibility in the AEMP.	**June 25:** Small-bodied fish are valid surrogates for addressing the issue of fish usability in Baker Creek for the following reasons: As described in Section 7.6.1, large-bodied fish are not year-round residents of Baker Creek and are not in the reaches of the creek where effluent exposure is highest, and as such would not be representative of exposure to treated effluent discharge from the ETP into Baker Creek; Lethal sampling of large-bodied fish for tissue chemistry was not a desired monitoring endpoint due to the effects this may have on the fish population (i.e., Arctic Grayling); and Small-bodied fish are year-round residents in Baker Creek and have longer-term exposure to effluent. The results of the Slimy Sculpin tissue analysis paired with a fish health survey will be paired to give a worst-case assessment of what would happen to fish during year-	

			round residency exposed to effluent and contaminated sediment in Baker Creek. It is assumed that large-bodied fish tissue chemistry will be required post-remediation.	
58	AEMP Design Plan- Baker Creek, Section 7.7, p.88; Section 7.8,p.88;	**Comment** It is unclear how the traditional knowledge study and the Yellowknife Bay special study (mentioned in Section 7.0 of the Baker Creek report) have been or will be used in the design of the Baker Creek AEMP. Perhaps the Yellowknife Bay special study information should be moved to the Yellowknife Bay Conceptual AEMP Design Plan. **Recommendation** The GMRP is requested to explain how the traditional knowledge study and Yellowknife Bay special study has been or will be considered in the design of the Baker Creek AEMP.	**June 25:** A Traditional Knowledge Study has been completed by Trailmark Systems for the YKDFN. The YKDFN are the holders of that information and will be encouraged to provide specific traditional knowledge input where they see relevant. The GMRP keeps the YKDFN current on the Project through GMRP Working Group and GMAC meets as described in the Engagement Plan. The Yellowknife Bay Special Study will be used to inform the Yellowknife Bay AEMP, and is not proposed to be incorporated into the design of the Baker Creek AEMP; however, it will be reported in the Baker Creek Annual AEMP Report because the field program will be operating during the years that the Baker Creek AEMP is in place. It is anticipated that the Traditional Knowledge will inform some monitoring components and will be more applicable to the Yellowknife Bay AEMP which is in the conceptual stages, as opposed to the Baker Creek AEMP.	

59	AEMP Design Plan - Baker Creek, Table 8-1	**Comment** The inference of toxicological impairment when benthic density and richness are reduced, and nutrient enrichment when density and richness are increased seems to be overly simplistic, and unnecessary. For example, a common response to enrichment is increased density with reduced species richness as tolerant species become dominant. The EEM program considers any statistically significant change as an effect, and does not make a distinction between toxic and nutrient effects based on benthic community response. **Recommendation** The GMRP is requested to explain the need for the proposed classification of benthic community effects, and to provide rationale for the suggested classification criteria.	**June 25:** In the interpretation of the AEMP data all nutrient enrichment response patterns will be considered, as appropriate. The low action level proposed in Table 8-1 for benthic invertebrates under the nutrient enrichment hypothesis focused on a mild-enrichment response pattern consistent with a low-action level. As outlined below, the response pattern described in the review comment relates to a moderate enrichment response. The following typical nutrient enrichment response patterns are described by the Metal Mining EEM Technical Guidance Document (EC 2012):Mild enrichment: characterized by an increase in invertebrate density and taxa richness compared to a reference area; Moderate enrichment: taxa richness decreases as the structure of the community starts to shift but density might still increase; Severe enrichment: taxa richness is substantially lower compared to the reference area, but densities might still be greater than the reference area.	
60	AEMP Design Plan - Baker Creek, Table 8-1, Section 8.3.	**Comment** The actions and the time required for action in response to exceeding a low action level is unclear. The action is described in Table 8-1 as "Investigation of Cause/Response	**June 25:** If an Action Level is triggered, a Response Plan will be submitted to the MVLWB in the timeframe that is dictated by the conditions of the Water Licence and	

		Plan" and "Initiate follow-up studies as required.", "Set Moderate Action Level" and "Identify mitigation options". Section 8.3 indicates that "Depending on the number of variables affected.. and the magnitude of effect, confirmation of the effect could occur in the subsequent year, or during the next scheduled AEMP monitoring program." According to the EEM TDG, following a finding of statistical significance for benthic invertebrates or fish health, the next study (3 years hence) will confirm the effect, the next (after 3 more years) will assess its magnitude and extent, and the next (after 3 more years) will determine the cause. It seems that it may be a decade or more before any mitigative action could occur. This timeframe seems inconsistent with the intent of the Draft Guidelines for Adaptive Management (Racher et al., 2011) where a measured biological effect comprises a moderate action level exceedance, and the corresponding action is to "implement mitigation to stop or slow the trend". **Recommendation** The GMRP is requested to clarify the timeframe, following the finding of a statistically significant effect on benthic invertebrates or fish, for submission of a Response Plan, Investigation/Follow-	based on the time required to confirm the action level exceedance. In practice, this usually means an exceedance is detected once data has been received from taxonomists and statistical analyses are completed and confirmed. Assuming fall sampling of benthos and two to three months for taxonomist analysis, and up to two months of desktop analysis, this usually means that an action level exceedance is reported to the MVLWB approximately four to five months after a field program. This is considered a timely response given that nature and constraints of this type of program and is much quicker than the timeframe described in the EEM program.	

		up study, and implementation of mitigation. The GMRP is also requested to justify the timeframe as a timely response to a measured biological effect.		
61	Conceptual AEMP Design Plan - Yellowknife Bay, Plain Language Summary, page iii and Section 8.4	**Comment** There is an apparent discrepancy in the report as it concerns large bodied fish. The plain language summary indicates that ". monitoring of metals in fish tissue of large fish will also be done to update the information about fish tissue in large fish found in Yellowknife Bay." No such monitoring is proposed as part of the preliminary sampling design plan (Section 8.4). It is unclear if large bodied fish tissue monitoring will be included as a component of the Yellowknife Bay Conceptual AEMP. **Recommendation** The GMRP is requested to clarify if large bodied fish tissue monitoring will be a component of the AEMP for Yellowknife Bay.	**June 25:** Large-bodied fish tissue sampling to get up to date information on fish tissue will be completed as part of the Yellowknife Bay Special Study, under the Baker Creek AEMP; data sharing with the recent GNWT and ECCC study will also be considered (i.e. collections from 2014) such that overall mortality to fish is reduced. The study will involve tissue collection from large-bodied fish in Yellowknife Bay to continue to establish existing conditions. At this time, it is not proposed that large-bodied fish tissue monitoring be a component of the AEMP; however, this will be revisited once information from the Yellowknife Bay Special Study is available, and when the detailed Yellowknife Bay AEMP Design Plan is developed.	
62	Conceptual AEMP Design Plan - Yellowknife Bay, Section 8.1, p.35	**Comment** It is stated that, for the first iteration of the Yellowknife Bay AEMP, toxicity will be used as a surrogate for plankton monitoring. It is unclear why "toxicity" is an appropriate surrogate for plankton monitoring.	**June 25:** Plankton communities in Yellowknife Bay were most recently characterized by Stantec (2014) as summarized in Section 4.9 of the Yellowknife Bay AEMP Design Plan. Plankton abundance has been shown to be inherently variable in many	

		Recommendation The GMRP is requested to explain why Ã¢Â€Âœtoxicityà¢Â€Â is an appropriate surrogate for plankton monitoring.	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. 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, this measure is best addressed through the proposed two-pronged approach: the development of SSWQOs protective of aquatic life that will be met in Yellowknife Bay after remediation activities are complete;	

			and confirmatory toxicity testing in the receiving environment at a distance of 200 m from the outfall to confirm no adverse effects on plankton. The combined approach of SSWQO development and toxicity testing in the receiving environment will more definitively determine the potential for effluent-related effects on plankton. 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. Reference: Stantec (Stantec Consulting Ltd.). 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.	
63	Conceptual AEMP Design Plan - Yellowknife Bay, Section 8.2.1, p.35	**Comment** The "exposure area" is defined as the area between the point of WTP discharge and the edge of the 1% effluent plume. According to EEM Guidance, the near-field area should be as near as possible to the zone of turbulent mixing. It is unclear where, within the 1% zone, the near-field and	**June 25:** This will be defined based on a percentage of effluent from modelling and plume measurements, and habitat and species presence. The details will be done as part of the as part of the next Yellowknife Bay AEMP Design Plan.	

		far-field exposure areas for the AEMP will be located. **Recommendation** The GMRP is requested to clarify how the near-field and far-field exposure areas will be defined for the Yellowknife Bay AEMP.		
64	Conceptual AEMP Design Plan - Yellowknife Bay, p.40; Table 8-1	**Comment** It is unclear in Table 8-1 (Initial 3 Years of Monitoring: Water Quality and Toxicity) why a "maximum of 5" stations are proposed for some locations (e.g. 1% effluent dilution boundary), how the number of stations in general will be determined for the different locations, and when this will be determined. **Recommendation** The GMRP is requested to clarify how the number of stations to be sampled in each location described in Table 8-1 will be determined, and the timeline for the determination.	**June 25:** Plume modelling and measurement will inform these stations as well as the final design of the outfall. It is assumed further review with affected parties to define stations might be required and as such, the exact locations were not prescribed herein.	
65	Conceptual AEMP Design Plan - Yellowknife Bay, p.40; Table 8-1	**Comment** The report indicates that the effluent will sink to the bottom of the water column. However, the EQC report Appendix E, Section E-2.2.4.1 indicates that the plume is not always on the bottom. It is unclear how the AEMP will monitor the stratification of the plume in Yellowknife Bay. It may be appropriate to sample the top, middle and bottom of the water	**June 25:** The plume sampling will include sampling throughout the water column at depth intervals of 1m, such that the extent of plume throughout the column can be understood.	

		column to understand the full spatial distribution of contaminants that may be influenced by the WTP effluent discharge. **Recommendation** The GMRP is requested to explain their strategy for monitoring stratification of the plume in Yellowknife Bay to understand the full spatial distribution of contaminants that may be influenced by the WTP effluent discharge.		
North Slave Metis Alliance: Jess Hurtubise				
ID	**Topic**	**Reviewer Comment/Recommendation**	**Proponent Response**	**Board Staff Response**
5	General File	**Comment** (doc) NSMA comments refer to the analysis done by Slater Environmental (2019) - "Review of Post-EA Information Package Giant Mine Remediation Project" **Recommendation**		
1	AEMP - Section 6.3 - Aquatic Effects Monitoring Program Study Areas	**Comment** Section 6.3 lists three areas that are included in the AEMP Study Design, including Baker Creek and two reference areas. Only Reaches 0 and 1 of Baker Creek are included in the Baker Creek Area for the AEMP. Aquatic habitat extends upstream in Baker Creek throughout the site. It is unclear why the AEMP does not address the upstream reaches that are closer to mine-related impacts (Slater Environmental, 2019).	**June 25:** Please refer to the responses for MVLWB: Shannon Allerston #45 and Giant Mine Oversight Board: GMOB #46.	

		Recommendation NSMA recommends addressing the upstream reaches that are closer to the mine-related impacts, or state why they were not included.		
2	Water MMP - Section 3.4.2 Surface Runoff Quality Criteria	**Comment** Section 3.4.2 Surface Runoff Quality Criteria states: "Surface Runoff Quality Criteria will apply to runoff from engineered structures (these include TCAs, remediated pits and the landfill)." It is not clear whether the areas subject to contaminated soil removal or remediation (e.g., covering) would be considered engineered structures that would be subject to runoff quality criteria. It does seem clear that the GMRP proposes that no criteria would apply to areas that are not specifically disturbed as part of the remediation activities. Given the extent of contamination at the site, both undisturbed areas and areas subject to contaminated soil remediation could contribute loading through surface runoff. Given the risks associated with contamination (e.g., total suspended solids) from any disturbed area including areas of contaminated soil removal/remediation, runoff quality criteria should be applied to these areas (Slater Environmental, 2019). **Recommendation** NSMA	**June 25:** Under existing conditions, water in contact with developed areas is collected in sumps, temporarily stored in the Mill Pond and TCAs and conveyed to the ETP for treatment (Please see WMMP Section 4.0). Some pit water is conveyed directly to the underground. There is an existing non-contact water management system comprising ditches and pipelines that diverts runoff around the pits on the west side of Baker Creek (please see WMMP Section 4.1.3). A runoff monitoring program is operational and described in the Standard Operating Procedures (SOP) submitted as part of the GMRP Water Licence Application package. This program, in addition to the SNP program and other operational monitoring, has been used to develop the arsenic loading model for the site (presented in the EQC Report, Section 2.5) and will remain operational during remediation to continue to support the understanding of the overall loadings to Baker Creek from the different sub-drainage basins within the watershed. During active remediation, the same	

		recommends clarifying the applicability of Surface Runoff Quality Criteria and considering using monitoring results as a basis for application of criteria.	water management system will be employed. Diversion systems will remain in place to convey runoff not in contact from developed areas or actively remediated areas to Baker Creek. Runoff from areas undergoing active remediation and/or all areas within the existing contact water management system will be collected and treated. The Townsite and Marina areas are currently outside of the existing management system. Current analysis is underway to resolve water management during active remediation in these areas. Runoff from areas that are not actively remediated will continue to follow existing flow paths to Baker Creek. Design and Construction plans will include details for water management within their areas of remediation and will include detailed sediment and erosion control measures that will be in place during active remediation to further minimize risks from TSS-related contaminants. Once contaminated soils areas are excavated and backfilled and sediment, and erosion control is no longer necessary, these areas will be graded to connect with natural drainage patterns. Runoff water quality criteria are not proposed to be applied. This is in keeping with standard practice for	

			contaminated soil remediation projects. The runoff monitoring program will continue but may require some adjustments to align with changes in grading, ditches or culverts.Engineered structures, such as TCA covers and the landfill, will have temporary storage and collection points so that runoff may be sampled easily. The Surveillance Network Program (SNP) includes proposed surface runoff monitoring stations (details provided in Table 3-1 of the SOP). Surface runoff monitoring stations at discharge points from engineered structures are included as placeholders and will be added to the SNP to measure the quality of runoff off engineered structures. In keeping with the goal of reducing long term maintenance requirements, the GMRP is proposing that once runoff from engineered structures consistently meets runoff water quality criteria (WMMP Section 3.4.2), the runoff from these areas should be permitted to report to Baker Creek without treatment. These SNP stations will be sampled weekly during freshet on an annual basis. Freshet will be the critical time period for surface runoff, so seasonality is considered. The monitoring program, surface runoff water quality criteria, and the	

			suggested decision-basis for initial release to the receiving environment that are presented in the WMPP are therefore appropriate. Once the runoff is deemed appropriate for release to Baker Creek, the SNP stations will remain in place to continue monitoring. There will be a time period during which the GMRP maintains the infrastructure to convey runoff to treatment as a contingency. The objective would be to dismantle this infrastructure when the GMRP transitions from Adaptive Management to Long-Term Monitoring and Maintenance. The surface runoff water quality criteria proposed under this Water Licence application are described in Section 3.4.2 and listed in Table 3.4-2 of the Water Management and Monitoring Plan. These are proposed to be at a maximum the MDMER limits. The anticipated water quality of runoff from engineered covers is under review. To this end, geochemical studies of potential cover material are currently underway. Further reductions in the runoff water quality criteria are not recommended until additional testing has been completed.	

3	Water MMP - Section 3.4.2 Surface Runoff Quality Criteria	**Comment** For monitoring surface runoff, Section 3.4.2 states: "An annual average will be calculated based on the weekly or monthly samples. Water will be considered acceptable for release to the receiving environment when: The annual average from one year of sampling is below the surface runoff criteria in Table 3.4-2; and upon return in year 2, runoff water quality from the first month of sampling is below the surface runoff criteria." Annual average may not be a good indicator for whether water quality is compliant on a seasonal basis or during severe events. There could be significant non-compliance under certain flow or weather conditions, while still achieving annual average conditions that are compliant with the runoff quality criteria (Slater Environmental, 2019). **Recommendation** NSMA believes the threshold should be revised to address any potential seasonal differences in water quality. The decision about discharge from each facility or location should not be a one-time decision. As such, the confirmation of suitable water quality in the second year should not be assumed to apply for all subsequent years. NSMA recommends that a robust monitoring and response	**June 25:** Please refer to the response for North Slave Metis Alliance: Jess Hurtubise #2	

		program should be in place to manage discharge of runoff so that discharge can be discontinued if water quality is non-compliant. Water management infrastructure should remain in place for a contingency period (likely several years) and monitoring should be used to confirm that effluent continues to meet surface water runoff criteria.		
4	Water MMP - Section 4.1 Existing Surface Water Infrastructure and Management	**Comment** Section 4.1.1 and Table 4.1-2 of the Water MMP describe a number of collection and pumping systems that currently capture water in pits and convey it to the underground. The post-reclamation water management described in Section 5 appears to eliminate all of these capture and pumping requirements. Nonetheless the Water MMP indicates that pits will not fill with water and that all water that flows into pits will continue to flow to the underground (Slater Environmental, 2019). **Recommendation** NSMA believes the Water MMP would benefit from some additional explanation about how the water from each pit will get to the underground throughout the post-closure phase, without the pumping and conveyance mechanisms that are required to achieve this outcome in current conditions.	**June 25:** Pit closure design is ongoing, and the design has not been finalized. Should the final design exclude the use of covers, runoff associated with the open pit areas will drain to the underground. The pits will be filled with coarse free draining material, and connections to the underground workings will be installed in the bottom of the pit. Water reporting to the underground will be pumped to the surface water treatment plant.	

Slater Environmental Consulting: Bill Slater				
ID	**Topic**	**Reviewer Comment/Recommendation**	**Proponent Response**	**Board Staff Response**
1	1. AEMP Design Plan, Baker Creek	**Comment** In the AEMP Design Plan - Baker Creek, the development of assessment endpoints for the aquatic ecosystem for Baker Creek is based on the following value statements: 1. Maintain water and sediment quality in Baker Creek downstream of the Site at, or close to, present levels reported by recent monitoring programs. 2. Preserve the ecological function of Baker Creek including fish health and community. Maintenance of a functioning ecosystem in lower Baker Creek will continue to allow fish to keep using the lower reaches of Baker Creek (e.g., the presence of habitat and the benthic invertebrate food source). (AEMP Design Plan - Baker Creek, Section 6.2) These are appropriate overall goals for Baker Creek prior to remediation of stream sediments, and while the existing Effluent Treatment Plant (ETP) is still operating and discharging effluent to Baker Creek. See Slater Environmental Report, Section 7.1. **Recommendation** The goals and the assessment endpoints should be updated as part of planning and	**June 25:** Please refer to the responses to Giant Mine Oversite Board #46 and Giant Mine Oversite Board: GMOB #50.	

		implementation of the Baker Creek remediation to establish goals and endpoints that define a positive trajectory for environmental conditions.		
2	2. AEMP Design Plan, Baker Creek	**Comment** Section 6.3 lists three areas that are included in the AEMP Study Design, including Baker Creek and two reference areas. Only Reaches 0 and 1 of Baker Creek are included in the Baker Creek Area for the AEMP. Aquatic habitat extends upstream in Baker Creek throughout the site. As such, it is unclear why the AEMP does not address the upstream reaches that are closer to mine-related impacts. See Slater Environmental Report, Section 7.1. **Recommendation** The co-proponents should incorporate all on-site Baker Creek reaches into the AEMP or provide rationale for why all reaches are not included.	**June 25:** Please refer to the responses for MVLWB: Shannon Allerston #45 and Giant Mine Oversite Board: GMOB #46.	
3	3. AEMP Design Plan, Baker Creek	**Comment** Table 8-1 lists the proposed Low Action Level thresholds for Baker Creek. For water quality, the Plan proposes a threshold with three tests that must all be met before any action would be taken: 1. Concentration greater than 25% of the mean five-year care and maintenance period concentration (i.e., 2013 to 2018) AND	**June 25:** The GMRP believes that triggering on threshold 1 (sample greater than 25% 5-year mean) alone is too conservative. The intent of the second threshold (existence of trend) is to prevent triggering in cases of a related to a single outlier caused by analytical error, contamination of the sample, or other unidentified source.	

		2. Supported by an increasing temporal trend AND 3. Linked to the GMRP. The decision to require both a specific concentration threshold AND an increasing trend is not conservative and proactive. Important water quality changes could occur as trends, but they could also occur as step functions resulting from specific events or failures. See Slater Environmental Report, Section 7.1. **Recommendation** It would be preferable if response action was triggered by either type of event individually. For example, proposed threshold 1 should be sufficient to trigger a response on its own. For trends, it would be beneficial to consider proactive thresholds that are tied to the same 25% increased concentration threshold. For example, a threshold could trigger action based on an increasing trend in concentration that is predicted (based on a defined statistical analysis method) to exceed the 25% increased concentration threshold within a certain period of time (e.g., less than one year).	Please refer to the response for Giant Mine Oversite Board: GMOB #52 for further information.	
4	4. Conceptual AEMP Design Plan, Yellowknife Bay	**Comment** The GMRP proposes that the AEMP for Yellowknife Bay would apply after the new Water Treatment Plant (WTP) is operational. The Giant Mine site is currently contributing	**June 25:** The Baker Creek AEMP includes provision to begin collection of background data on Yellowknife Bay. However, effects from the effluent are not expected to occur	

		loading to Yellowknife Bay through the Baker Creek discharge from the existing ETP, and also from Baker Creek sediments, site runoff, and loading from Foreshore Tailings and Sediments. See Slater Environmental Report, Section 7.2. **Recommendation** Given the current impacts in Yellowknife Bay, an AEMP for Yellowknife Bay should be initiated now because it may help to provide guidance through implementation of the closure activities.	further into Yellowknife Bay (see Phase 4 EEM study) and further monitoring of the un-remediated areas in Yellowknife Bay is not informative for the purposes of the Baker Creek AEMP.	
5	5. Conceptual AEMP Design Plan, Yellowknife Bay	**Comment** The scope of the Impact Hypotheses described in Section 7.6 of the Conceptual AEMP Design Plan - Yellowknife Bay are currently limited to effects of loading from Baker Creek and the proposed WTP outfall. See Slater Environmental Report, Section 7.2. **Recommendation** The scope should be expanded to include other potential sources of loading from the site, including Foreshore Tailings and site runoff that is entering Yellowknife Bay. The scope issue should be addressed for both phases of the AEMP Ã¢Â€Â“ before and after the new WTP is operational.	**June 25:** Please refer to the response for Giant Mine Oversight Board: GMOB #60.	

6	6. Conceptual AEMP Design Plan, Yellowknife Bay	**Comment** Section 8.2.3 describes the extent of the effluent plume from the proposed WTP outfall, stating that the Conceptual AEMP Design Plan assumes that the effluent plume will reach 1% dilution at a distance more than 250 m from the outfall, and that the farthest predicted extent of plume is approximately 600 m. These assumptions do not appear consistent with the modelling results described in Appendix E of the Effluent Criteria Report. Table E2.2-4 provides results of modelling, predicting that the largest extent of the 1% effluent plume is less than 200 m from the outfall. See Slater Environmental Report, Section 7.2. **Recommendation** The AEMP should be designed to evaluate performance of the outfall as compared with the predicted conditions.	**June 25:** Thank-you for identifying this inconsistency. The near-field modelling results in the EQC Report provide the extent of plume (Section E-2.2.4.2). A plume study will be conducted to determine the extent and mixing of the plume against predictions.	
7	7. Water Management and Monitoring Plan	**Comment** Section 2.4.2 of the Water MMP identifies closure objectives that are related to the management of water on Site. Some important site-wide objectives that are relevant to water management are not included in this list, including SW2, Site-wide loading of contaminants to the environment is reduced to the extent practicable; and SW5, Remediated areas are stabilized and protected from erosion in final	**June 25:** Future revisions of the Water MMP will include SW2.	

		configuration. Other site-wide objectives may also be generally relevant. **Recommendation** The Water MMP should be revised to consider relevant site-wide objectives.		
8	8. Water Management and Monitoring Plan	**Comment** Section 3.4.1 of the Water MMP lists the EQCs for the existing ETP and the proposed WTP. These same EQCs are included in the Proposed Type A Water Licence. Section 3.4.2 provides surface runoff quality criteria that are the same as the standards specified in the Metal and Diamond Mining Effluent Regulations (MDMER) under the Fisheries Act. The Proposed Type A Water Licence does not include any runoff quality criteria, and it appears that the GMRP proposes that these criteria not be regulated by under the MVRMA - instead relying only on the Fisheries Act prohibitions for deposit of deleterious substances. **Recommendation** To support an effective compliance monitoring and enforcement regime, it would make sense for the runoff quality criteria to be defined in the water licence, along with the locations that they would apply.	**June 25:** Please refer to North Slave Metis Alliance: Jess Hurtubise #2. Runoff criteria are provided in the WMMP. The GMRP would support an addition to the Water Licence Part G Condition 3 Schedule 3 Condition 1.	

9	9. Water Management and Monitoring Plan	**Comment** The Water MMP proposes that the surface runoff criteria would not apply generally to runoff from the site, but instead only to runoff from engineered structures, specifically Tailings Containment Areas (TCAs), remediated pits and the landfill. It is not clear whether the areas subject to contaminated soil removal or remediation (e.g., covering) would be considered engineered structures that would be subject to runoff quality criteria. It does seem clear that the GMRP proposes that no criteria would apply to areas that are not specifically disturbed as part of the remediation activities. Given the extent of contamination at the site, both undisturbed areas and areas subject to contaminated soil remediation could contribute loading through surface runoff. **Recommendation** Given the risks associated with contamination (e.g., total suspended solids) from any disturbed area including areas of contaminated soil removal/remediation, runoff quality criteria should be applied to these areas. For other areas, decisions about application of criteria warrant further consideration, potentially based on monitoring results.	**June 25:** Please refer to the response to North Slave Metis Alliance: Jess Hurtubise #2.	

10	10. Water Management and Monitoring Plan	**Comment** The Water MMP proposes a two-part threshold for identifying when surface runoff can be released directly to the receiving environment: 1. The annual average from one year of sampling is below the surface runoff criteria for all parameters. 2. Upon return in the second year, runoff water quality from the first month of sampling is below the surface runoff criteria for all parameters. Annual average may not be a good indicator for whether water quality is compliant on a seasonal basis or during severe events. There could be significant non-compliance under certain flow or weather conditions, while still achieving annual average conditions that are compliant with the runoff quality criteria. **Recommendation** The threshold should be revised to address any potential seasonal differences in water quality. Also, a robust monitoring and response program should be in place to manage discharge of runoff so that discharge can be discontinued if water quality is non-compliant. The decision about discharge from each facility or location should not be a one-time decision. As such, the confirmation of suitable water quality in the second year should not be assumed to apply	**June 25:** Please refer to the response to North Slave Metis Alliance: Jess Hurtubise #2.	

		for all subsequent years. Water management infrastructure should remain in place for a contingency period (likely several years) and monitoring should be used to confirm that effluent continues to meet surface water runoff criteria.		
11	11. Water Management and Monitoring Plan	**Comment** Section 3.4.3 of the Water MMP proposes that sedimentation ponds be designed to settle sand-sized particles (0.06 to 2 mm) for events up to the 10-year 24-hour event. British Columbia has prepared guidance on the design of sediment ponds for mining (Assessing the Design, Size, and Operation of Sediment Ponds Used in Mining, BC Ministry of Environment, December 2015) which recommends that "sediment ponds be designed to capture at least a 10 micron [0.01 mm] soil particle for the 10-year, 24-hour runoff event." This minimum recommendation for capturing medium sized silt particles is more likely to address concerns about release of TSS from the Giant Mine site. **Recommendation** More robust design criteria for sediment ponds effectiveness for sediment removal should be considered.	**June 25:** Section 3.4.3 indicates that the design criteria presented therein are preliminary and will be confirmed or refined during future stages of design; development of a design basis for Surface Drainage design is currently in progress. This design criteria will be revisited during the current design effort and capture of 10 micron size particles will be considered for runoff released to natural waterbodies. Note that most areas of active remediation will have runoff diverted to the mine water management system; the design criteria for sedimentation ponds associated with such water may be less stringent than that released to natural waterbodies.	

12	12. Water Management and Monitoring Plan	**Comment** Section 4.1.1 and Table 4.1-2 of the Water MMP describe a number of collection and pumping systems that currently capture water in pits and convey it to the underground. The post-reclamation water management described in Section 5 appears to eliminate all of these capture and pumping requirements. Nonetheless the Water MMP indicates that pits will not fill with water and that all water that flows into pits will continue to flow to the underground. **Recommendation** The Water MMP would benefit from some additional explanation about how the water from each pit will get to the underground throughout the post-closure phase, without the pumping and conveyance mechanisms that are required to achieve this outcome in current conditions.	**June 25:** Pit closure design is ongoing, and the design has not been finalized. Should the final design exclude the use of covers, runoff associated with the open pit areas will drain to the underground. The pits will be filled with coarse free draining material, and connections to the underground workings will be installed in the bottom of the pit. Water reporting to the underground will be pumped to the surface water treatment plant.	
13	13. Water Management and Monitoring Plan	**Comment** Section 4.1.1. identifies several potential seepage pathways for loading from the site to reach the aquatic environment, including lateral seepage from various facilities. **Recommendation** The monitoring program should include components that are aimed at characterizing the loading Ã¢Â€Â“ whether in Baker Creek, Trapper Creek, or other potentially affected waterbodies.	**June 25:** Our assumption is that the reference made in the comment is to the "General surface water losses to the receiving environment at the Site" on p. 4-2 of the WMMP, as follows: lateral seepage from the Mill Pond to Baker Creek; lateral seepage from the South Pond, Central Pond and North Pond towards Yellowknife Bay; and lateral seepage from the Northwest Pond to Trapper Creek. Please refer to	

			Section 3.3 of the Standard Operating Procedures for Effluent and Water Sampling. Current and proposed shallow monitoring wells are listed in Table 3-5 of the SOP.	
14	14. Water Management and Monitoring Plan	**Comment** Section 5.1.4 identifies a potential need for a temporary water management pond for contingency storage of contact water. No details are provided about the location, size or proposed design of a pond. **Recommendation** Either additional details should be provided about the proposed pond, or the water licence should include conditions requiring submission of details prior to construction.	**June 25:** Acknowledged. As stated in Section 5.1.4, the location, sizing and design of a potential, temporary water storage pond will be determined during detailed design and the details will be submitted for review as part of Design and Construction Plans.	
15	15. Effluent Quality Criteria Report	**Comment** The process for selection of Parameters of Potential Concern (POPCs) is described in Section 5.2.2 of the Effluent Quality Criteria Report. The process includes a pre-screening step followed by three specific water quality comparisons. The pre-screening step identifies a long list of parameters that will be considered in the water quality comparison steps because they are typically associated with mining activities and other activities that are occurring at the Giant Mine. Once the pre-screening is complete, the following water quality	**June 25:** Years of monitoring data are available to support rapid mixing in Yellowknife Bay. Therefore, the GMRP believes that the 3rd step of the screening step is appropriate. As well, the final comparison was completed using median/average background values from Table 5-3, not 95th percentile background concentration so is precautionary (footnote "b" under Figure 5-12 should be updated to refer to Table 5-3). The GMRP discussed the POPC screening process with the Working Group during the January 18, 2018 meeting. In response to the	

		comparisons are part of the POPC selection process used by the GMRP: 1. Compare 95th percentile WTP discharge concentrations with the 95th percentile of background concentrations in Yellowknife Bay. Are the peak concentrations in the WTP effluent higher than the peak concentrations that currently occur in Yellowknife Bay? If so, the WTP has potential to increase concentrations of the parameter in Yellowknife Bay. 2. Compare 95th percentile WTP discharge concentrations with Water Quality Objectives (WQOs) that are applicable in receiving waters of Yellowknife Bay. Are the peak concentrations in the WTP effluent higher than WQOs established to protect water uses in Yellowknife Bay? If so, the WTP effluent has potential to cause exceedances of WQOs in Yellowknife Bay. 3. Compare 95th percentile of predicted future concentrations in Yellowknife Bay (at the edge of the mixing zone) with 95th percentile of background concentrations in Yellowknife Bay. Does the modelling predict that peak concentrations in effluent discharge from the Site will increase concentrations in Yellowknife Bay at the edge of the mixing zone so that	feedback received (CIRNAC 2018), the Project revised the screening process to: (1) Use both the first and second grid cells in the screening process this was Completed and more, conservative approach adopted (see Table 5-7 of the EQC Report) ; (2) Use background concentrations in Step 3, rather than water quality objectives to be applied at the mixing zone boundary, this was completed, and the more conservative approach adopted. (3) Aimed to be consistent with processes used to identify POPC for other licences issued in the NWT by the MVLWB. This was also completed and the process used for Giant is the same as that used for the Gahcho Kué Mine and Jay Project. (4) Align with the HHERA. This was completed, regional background calculated by the HHERA used and comparison to HHERA list of POPC provided in Section 5.2.2 of the EQC report. Fewer POPC were identified in the HHERA report; differences are discussed in Section. Regardless, as the reviewer indicates, only cobalt was removed in Step 3 of the screening process. Zinc has an MDMER limit, so was retained, and a water-quality based EQC was developed for zinc. For the reasons listed above, it was appropriate to	

		they are above the peak concentrations that currently occur in Yellowknife Bay? See Slater Environmental Report, Section 9.0. **Recommendation** Slater Environmental Consulting (SEC) recommends that the selection of POPCs for which EQCs should be established should be based on the pre-screening step and the first two comparisons (subject to comments below about the WQOs used in the second comparison). The first two comparisons identify parameters for which the project will increase loading to the receiving environment (comparison No. 1) at concentrations that could affect water uses, for example use by aquatic life (comparison No. 2). The third comparison eliminates parameters because the modelling does not predict that the Project will cause concentrations in Yellowknife Bay to exceed the peak background concentrations. A proactive approach to water quality management should leave these parameters on the Ã¢Â€Âœwatch listÃ¢Â€Â by establishing appropriate WQOs and EQCs. These are parameters that the project expects to influence in the receiving environment. There is	remove cobalt from the POPC list requiring an EQC. Monitoring will occur in the effluent and at the mixing zone boundary and results will be subject to the AEMP Response Framework, which is an appropriate alternative for a "watch list" of parameters. Reference: CIRNAC. 2018. Giant Mine Remediation Project. Giant Mine Working Group Meeting Summary. January 23, 2018 Version. YELLOWKN#845716-v1.	

		substantial uncertainty in the modelling predictions. Removing parameters because the uncertain modelling does not predict that the project will lead to exceedance of peak background concentrations (i.e., 95th percentile) at the edge of the mixing zone in the receiving environment is not precautionary. SEC recommends that this comparison should be removed from the process for selecting POPCs. In the end, the third comparison results in removal of zinc and cobalt from the list of parameters that require EQCs, but the GMRP adds zinc back into the list because it is required under the MDMER.		
16	15. Effluent Quality Criteria Report	**Comment** The pre-screening step of the process did not identify Total Dissolved Solids (TDS) as parameter for evaluation through the water quality comparisons, based on the following statement: "Until further information is available on potential changes in ionic composition of TDS, ions that have a WQG (i.e., sulphate, chloride, nitrate, fluoride, potassium) were screened individually" (Effluent Quality Criteria Report, Section 5.2.2.1). This is not an unreasonable approach given that the CCME Water Quality Guidelines for the Protection of Aquatic Life do not include a	**June 25:** In terms of "tracking performance", the GMRP intends to monitor and report TDS and its constituent ion concentrations through the SNP and AEMP (refer to the SOP for details). Comparisons will be made to model predictions annually. 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	

		guideline for TDS and key constituents of TDS for the Giant Mine (e.g., sulphate) appear to be addressed in the list of specific ions that are included after the pre-screening. All of the ions identified during the screening step of the POPC process were carried through after the first comparison because concentrations in the WTP effluent are expected to exceed the concentrations in Yellowknife Bay background. Fluoride, potassium and nitrate were removed from further consideration after the second water quality comparison because concentrations in the WTP effluent are not expect to exceed the WQOs, which appears to be a reasonable conclusion. The concentrations of chloride and sulphate in WTP effluent are both expected to substantially exceed the WQOs, and they were carried through to the third comparison. For both parameters, the modelling predicts that the effluent discharge will lead to exceedance of the 95th percentile of background concentrations at the edge of the mixing zone, meaning they should be included on the list of POPCs. For these two parameters however, the GMRP adds an additional screening test that it uses to determine that EQCs are not necessary. The additional test is	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).	

		a water quality comparison between the predicted concentrations of contaminants at the edge of the mixing zone with the WQOs. Since the predicted concentrations at the edge of the mixing zone are well below the WQOs, the GMRP concludes that there is no potential for these parameters to cause effects and EQCs are therefore not required. The GMRP also argues that its proposed water treatment process is not intended to treat ions and will not be effective for this purpose. The EQC Report describes potential implications of choosing to use reverse osmosis treatment technology to reduce ion concentrations. See Slater Environmental Report, Section 9.0. **Recommendation** Given the predicted concentrations, it appears that treatment would not be necessary and that adverse effects are unlikely to occur even within a fairly short distance of the outfall. As a result, the proponentsÃ¢Â€Â™ concerns about the ineffectiveness of the proposed WTP to treat ions and the implications of alternative treatment technologies are not relevant to the determination of whether a parameter is a POPC. The GMRP will contribute loading of these contaminants to the environment, and		

		the changes from background will likely be measurable. Establishing EQCs, and tracking performance of the project with respect to the predicted performance makes sense for these parameters. This seems particularly relevant since the concentrations of TDS and chloride in treated effluent have increased since 2011 (CRP, Section 2.3.3.4).		
17	16. Effluent Quality Criteria Report	**Comment** One further concern about the process for selecting POPCs relates to the selection of WQOs for comparison with effluent water quality (Comparison 2). The WQOs used for this comparison are a mix of generic water quality guidelines (e.g., CCME and BCMOE) and site-specific water quality objectives (SSWQOs). The development of SSWQOs is described in Appendix F of the EQC Report - "Site-Specific Water Quality Objectives." See Slater Environmental Report, Section 9.0. **Recommendation** Any decision to develop SSWQOs should begin with determination of POPCs, a step that appears to have been missed for this project. Generally, EQCs can be derived from WQOs by carrying out a calculation of available dilution and mixing. EQCs should be calculated for all POPCs and the WQOs used for the	**June 25:** The GMRP disagrees that SSWQOs should only be used or developed if background conditions exceed generic guidelines or the project might lead to exceedance of generic guidelines. Those conditions could be reasons to develop SSWQOs, but other factors may also be relevant (e.g., new toxicity data available, relevance to northern environments). Guidelines or benchmarks that incorporate site-specific conditions and toxicity modifying factors were generally preferred, consistent with recently approved WQOs and EQC. The GMRP believes that the process for identifying POPC and calculating EQC in the EQC Report follows the guidance in Schedule 5 of the Post-EA Package provided by the MVLWB.	

		calculation can be either SSWQOs or WQOs that are equal to generic water quality guidelines (e.g., CCME Water Quality Guidelines for the Protection of Aquatic Life). Usually, the decision about whether to develop SSWQOs is based on consideration of several factors related to the site-specific conditions, including whether background conditions exceed generic guidelines or the project might lead to exceedance of generic guidelines. This evaluation would be conducted for each POPC after completing a screening process (similar to the one described in the EQC Report) to identify the POPCs. In all cases, the decision about whether SSWQOs are warranted starts with selection of POPCs.		
18	17. Effluent Quality Criteria Report	**Comment** The GMRP did not consider any identification of POPCs before deciding the parameters for which it would develop SSWQOs. The SSWQO Report does not provide any rationale for its decisions to develop SSWQOs - simply stating that the GMRP developed SSWQOs "to support the screening process" for POPCs in the EQC Report, and that the SSWQOs were "developed as the basis for parameter screening and deriving EQCs." In some cases it appears that	**June 25:** As outlined in Slater Environmental Consulting: Bill Slater #17, the GMRP believes that the process for identifying POPCs and calculating EQC in the EQC Report follows the guidance in Schedule 5 of the Post-EA Package. POPCs are to be determined based on an appropriate set of WQOs that should take into account site-specific conditions. Rationale for the selection of WQOs for use at Giant Mine is provided in Table 5-5 and Appendix F of the EQC Report.	

		the GMRP proposes SSWQOs simply because they have been developed for other sites - something that seems counterintuitive for objectives that should be defined for site-specific conditions (including the site-specific decision about whether SSWQOs are needed). From SEC's perspective, this is a major flaw with the overall EQC development for this project. The selection of POPCs has been made based on SSWQOs - when the decision to develop SSWQOs should have been made only after POPCs had been identified. Generic guidelines should have formed the basis for comparisons used in the selection of POPCs. Once the list of POPCs was developed, there should have been WQOs and EQCs defined for each of these POPCs. An early step in the development of WQOs should have been the determination of which parameters warranted the development of SSWQOs and which could rely on WQOs based on the generic guidelines. See Slater Environmental Report, Section 9.0. **Recommendation** The GMRP failed to complete the initial step of identifying POPCs before developing SSWQOs, that it then used to develop the list of POPCs. The implications of		

		this logic failure in the process are unclear but could affect the list of POPCs, or the values of the subsequent WQOs and EQCs. The co-proponents should provide additional information about the reasons for developing site-specific water quality objectives, including how the process identified and considered POPCs before deciding on the need for site-specific objectives.		