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6	Sulphate in the effluent and pit lake	Sulphate concentrations in Blackwater Creek and the pit lake The Agency notes in the response to SW(2)-04 and in the Water Addendum (R.3) that the effluent discharge in Blackwater Creek would meet the concentration of 20 mg/L for sulphate. Table W6-3 of the Water Addendum titled "Pit Lake Water Quality" shows that the sulphate concentration in the pit lake would be kept the same (20 mg/L). The Agency notes that the proponent cited a literature study (Ullrich, 2001; Jeremiason et al., 2006) to commit to the concentration of 20 mg/L for sulphate to protect against enhanced methyl mercury production. However, the Agency has learned from experience on Hammond Reef Gold Project (See Section 7.3.2.3 of the Comprehensive Study Report) that sulphate concentrations in excess of 10 mg/L are associated with increased rates of mercury methylation rates. The concentration of sulphate under 10 mg/L appears to be achievable based on the predictions presented by the proponent in the revised EIS. For example, the modelled concentrations of sulphate are below 10 mg/L in the surface water quality modelling results presented in Water Addendum (R.3), Tables W9-1 to W9-3, and Tables W10-1 to W10-3, and the sensitivity analysis presented in Tables W11-1 to W11-10 of the same addendum	Revisit the sulphate concentration limit for the effluent and pit lake water quality after considering the factors outlined -in the Context column.	The proposed sulphate limit of 20 mg/L selected by Treasury Metals in the Round 2 information requests was based on was the lower limit of the concentration range of 20–50 mg/L for enhanced methyl-mercury production identified in peer reviewed published literature study (Ullrich, 2001; Jeremiason et al., 2006), and cited appropriately. Treasury Metals and their consultants have reviewed the Hammond Reef Decision Report document and observed the following about the proposed limits for sulphate: • According to Table 9 in Section 7.3.2.1, the basis for the 10 mg/L limit for sulphate is in fact the Minnesota Pollution Control Agency's standard set in 1973 for the protection of wild rice. This standard is based on field observations of water chemistry completed in the 1930s and early 1940, specifically the observation by Dr. John Moyle who noted that "No large stands of rice occur in water having sulfate content greater than 10 ppm (parts per million)". The Minnesota Pollution Control Agency have been working extensively to update the sulphate standard to reflect the results from recent research, which found that levels up to 2,500 mg/L of sulphate was not toxic to wild rice. However, the Minnesota Pollution Control Agency has yet to establish a new standard for the protection of wild rice. Therefore, the 1973 regulatory criteria of 10 mg/L for sulphate is not supported by peer reviewed literature evidence, is in no way related to enhanced methyl mercury formation, and is currently under technical evaluation. • The Hammond Reef Decision document Report specifically states *that "Although there is no federal or Ontario water quality guideline for sulphate that would apply to those waterbodies, the Agency is aware that the Ontario Ministry of the Environment, Conservation and Parks is of the view that sulphate concentrations within the range of 10 –20 milligrams per litre could increase methylmercury production, under certain conditions."* There is no literature cited in the Comprehensive Study Report for the Hammond Reef Gold Project that identifies how a value of 10 mg/L was associated with enhanced methylmercury formation. It appears that there was a misinterpretation that the Minnesota Pollution Control Agency's proposed 10 mg/L standards for the protection of wild rice was associated with enhanced

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				methylmercury formation. To clarify, this is not the case. Therefore, there does not appear to be any scientific basis for a sulphate limit of 10 mg/L. In addition to reviewing the Hammond Reef Gold Project Comprehensive Study Report, Treasury Metals has revisited the available scientific literature regarding sulphate reduction in aquatic environments and its effect on enhanced methylmercury production. Treasury Metals found that nearly all studies focus on sulphate concentrations in the sediment porewater, rather than the overlying surface water. This is most appropriate as the chemical reactions for sulphate reduction by sulfate reducing bacteria, initiating the methylation of mercury reaction, are anaerobic reactions occurring in the oxygen deprived sediment porewater (Ullrich et al., 2001, Hsu-Kim et al., 2013, Bailey et al., 2017, Benoit et al., 2001, Branfireun et al., 1999, Jeremiason et al., 2006). Therefore, there is inherent uncertainty associated with the application of a surface water criteria protective of a process dependent on sediment porewater, including the 20 mg/L proposed by Treasury Metals. The efficiency of microbial-mediated mercury methylation is a complex biogeochemical process dependent on the activity and structure of the bacterial community, mercury bioavailability in the sediment porewater, the availability of nutrients and other sediment characteristics including temperature and pH, and the abundance and bioavailability of the predominant electron acceptor, sulphate (Ullrich et al., 2001). Nearly all available literature studies measure and report sulphate, sulphide mercury, and methylmercury concentrations at the anoxic zone of high microbiological activity as biotic methylmercury production and sulphate reduction are both anaerobic processes (i.e. not occurring in the overlying oxygen rich surface waters). In doing so, these studies are reporting the sulphate concentration where sulphate is expected to be most depleted, thereby artificially suggesting that low levels of sulphate (i.e. 20 mg/L) may be responsible for enhanced methylmercury production. The study by Jeremiason et al., 2006 applied dissolved sulphate via an irrigation system to a mature black spruce and tamarack wetland, at a concentration of 200 mg/L and found that methylmercury production in the porewater measured increased four-fold relative to the control. Although Treasury Metals has highlighted in this supplemental literature review that more research is required before a surface water criterion protective of enhanced methylmercury

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				production is accepted by regulators, Treasury Metals is assured that the proposed sulphate criteria of 20 mg/L is conservative for the protection of receiving environments. The supplemental literature review provided herein found that general consensus among the scientific community is that at low sulphate and low mercury concentrations in surface water such as those predicted for the Goliath Gold Project, the risk for enhanced methylmercury production is intrinsically low due to the lack of electron donors and acceptors limiting the reactions. Furthermore, the sulphate concentration proposed by Treasury Metals in the surface water of 20 mg/L will result in sulphate concentrations in the porewater of perhaps an order of magnitude less, therefore providing further confidence that the receiving environment is protected. At this time, in the absence of federal or provincial guidelines protective of enhanced methylmercury production and based on its review of available peer-reviewed scientific literature, Treasury Metals has proposed a sulphate concentration in effluent protective of enhanced methylmercury production in the environment based on characteristics specific to the Goliath Gold Project. Treasury Metals is open to working with federal and provincial agencies should they have other peer-reviewed literature indicating a lower (or higher) target for sulphate is scientifically justified. <u>References:</u> Bailey, L. T., Mitchell, C. P., Engstrom, D. R., Berndt, M. E., Wasik, J. K. C., & Johnson, N. W. (2017). Influence of porewater sulfide on methylmercury production and partitioning in sulfate-impacted lake sediments. Science of the Total Environment, 580, 1197-1204. Benoit, J. M., Gilmour, C. C., & Mason, R. P. (2001). Aspects of bioavailability of mercury for methylation in pure cultures of Desulfobulbus propionicus (1pr3). Appl. Environ. Microbiol., 67(1), 51-58. Branfireun, B. A., Roulet, N. T., Kelly, C., & Rudd, J. W. (1999). In situ sulphate stimulation of mercury methylation in a boreal peatland: Toward a link between acid rain and methylmercury contamination in remote environments. *Global Biogeochemical Cycles*, *13*(3), 743-750. Ullrich, S. M., Tanton, T. W., & Abdrashitova, S. A. (2001). Mercury in the aquatic environment: a review of factors

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				affecting methylation. Critical reviews in environmental science and technology, 31(3), 241-293. Hsu-Kim, H., Kucharzyk, K. H., Zhang, T., & Deshusses, M. A. (2013). Mechanisms regulating mercury bioavailability for methylating microorganisms in the aquatic environment: a critical review. Environmental science & technology, 47(6), 2441-2456. Jeremiason, J. D., Engstrom, D. R., Swain, E. B., Nater, E. A., Johnson, B. M., Almendinger, J. E., ... & Kolka, R. K. (2006). Sulfate addition increases methylmercury production in an experimental wetland. *Environmental science & technology*, *40*(12), 3800-3806.
7	Effects of the environment on the Project	<u>Drought scenario during abandonment:</u> The Agency notes that in Appendix JJ, Attachment JJ-1 includes an assessment of 1:100 dry year precipitation and 1:100 dry lake evaporation on the maintenance of water cover in the tailings storage facility. The Agency did not find a similar assessment for water withdrawal from the Tree Nursery ponds, which are identified as baitfishing sites by Indigenous communities. The Agency seeks clarification on how water withdrawal from the Tree Nursery ponds would be adjusted during 1:100 dry year precipitation and 1:100 dry lake evaporation scenarios to mitigate effects on fish and fish habitat, and the use of those ponds by Indigenous communities. Furthermore, the Agency notes in Section W5.3 of the Water Addendum that in both the "degraded liner case" and "no liner case", water would be pumped from the pit lake (which may be at a lower elevation) to tailings storage facility for maintenance of the wet cover. The Agency seeks clarification on how the water from the pit lake would be redirected to the tailings storage facility.	Part I) Provide an assessment for 1:100 dry year precipitation and 1:100 dry lake evaporation for Tree Nursery ponds, and clarify how the water withdrawal from the Tree Nursery ponds would be adjusted to preserve the fish and fish habitat, and the use of those ponds for baitfishing by Indigenous communities. Part II) Clarify how the water from the pit lake would be redirected to the tailings storage facility to maintain the wet cover under the degraded and no-liner scenarios.	<u>Part I:</u> An assessment of expected levels of monthly water withdrawals during average, dry, and wet years was completed as part of the revised EIS (April 2018), with the results of the analysis provided in Table 6.9.2.3-1. To clarify, there are no plans to withdraw freshwater from the tree nursery ponds during either the closure or post-closure phase of the Project (identified by the Agency as the abandonment phase). The tree nursery ponds will not be used as a source of water for the wet cover closure option for the TSF (see Clarification 10). The withdrawal of fresh water from the tree nursery ponds will only occur during operations. The adjustments to the rate of withdrawal were identified in MMC-8.8 of the Goliath Gold Mitigation, Monitoring and Commitments List, which reads as follows: • <u>MMC-8.8 (unchanged):</u> Periodically, fresh water will be required to support Project Operations. Fresh water withdrawals will be taken from two existing ponds on Thunder Lake Tributary 3 (referred to as the tree nursery ponds) and an existing pond on Thunder Lake Tributary 2. Fresh water takings from these ponds will not exceed 5% of the flow entering the ponds. [Mit_059]. To further clarify, regardless of climatic conditions experienced, Treasury Metals plans to limit freshwater takings from the tree nursery ponds to less than 5% of the flow entering the ponds. According to DFO (2013), changes of flows of less than 10% are unlikely to have an effect on fish and fish habitat. Thus by limiting withdrawals from the tree nursery ponds to less than 5% of the inflows, the fish and fish habitat in the tree nursery ponds,

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				and the use of those ponds for baitfishing by Indigenous communities will be preserved. Part II: This issue was specifically addressed during the January 10, 2019 groundwater and geochemistry discussion with the Agency and their technical reviewers. The NRCAN expert pointed out that a wet cover could be readily maintained by pumping water from the pit lake to ensure a wet cover is maintained. The MENDM expert then pointed out that if pumping may be required to maintain a wet cover, funds would need to be identified and set aside to ensure the mechanical pumping using a typical pump and piping could be implemented. This is captured in MMC-2.1 of the Goliath Gold Mitigation, Monitoring and Commitments List, which reads as follows: • MMC-2.1 (unchanged): Treasury Metals will be providing a detailed cover design for the closure of the TSF as part of the MENDM Closure Plan under O.Reg. 240/00. References: Fisheries and Oceans Canada (DFO). 2013. Framework for Assessing the Ecological Flow Requirements to Support Fisheries in Canada. Canadian Science Advisory Secretariat Science Advisory Report 2013/017.
8	Tailings storage facility	Contingency measures for earlier onset of ARD in the tailings storage facility There are no contingency measures proposed in the event that ongoing monitoring of the TSF wet cover shows that ARD onset time is quicker than predicted. This is important to understand as the proponent has acknowledged that there are uncertainties regarding the variability in tailings composition, and because the tailings beaches may be exposed for a longer time and may have preferential deposition, which could lead to elevated sulphides.	Provide contingency measures that would be implemented, in case monitoring results show an earlier onset of ARD than predicted, to ensure that the ARD can be managed before its effects extend into the surrounding environment.	There will only be a potential for tailings beaches to be present during the operations phase of the Project. This topic was discussed during both the December 18, 2018 and January 10, 2019 meetings regarding mine waste with the Agency and their technical reviewers. The following contingency measures regarding the operation of the TSF have been put forward by Treasury Metals in the Goliath Gold Mitigation, Monitoring and Commitments List: • MMC-2.5 (modified): Treasury Metals has committed that during operations a water cover will be maintained over the majority of the TSF with an average water cover depth of 1.2 m. During operations, Treasury Metals will monitor the TSF to ensure the tailings are being deposited evenly. While Treasury Metals realizes that tailings material will not be deposited in a strictly uniform and/or flat manner it is reasonable to assume that 1.2 m of water on top of the bulk of the TSF would be achievable. • MMC-2.13 (unchanged): During Operations, tailings will be maintained in saturated conditions, and a water cover will be

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				maintained over the majority of the TSF to prevent the onset of acidification. [Mit_021]. • MMC-2.28 (modify): Tailings beaches would be kept to a minimum in the TSF by rotating the tailings discharge location using spigotting in order to cover exposed tailings evenly. The TSF will be monitored and tailings deposition will be rotated, as required, to maintain the tailings beaches in a saturated condition. • MMC-2-51 (new): Dust formation from tailings beaches during operation will be minimized by maintaining tailings in a saturated condition. Beach areas within the TSF will be monitored and tailings deposition will be rotated using spigotting, as required, to maintain the tailings beaches in a saturated condition. It is also recognized that there is a potential for the tailings to be exposed to the atmosphere during the closure process and therefore susceptible to drying and the onset of ARD. This issue was discussed during the January 10, 2019 meeting regarding mine waste with the Agency and their technical reviewers. Treasury Metals have incorporated the following contingency measures into the Goliath Gold Mitigation, Monitoring and Commitments List: • MMC-2.2 (modified): Prior to removal of the supernatant water from the TSF, Treasury Metals will consider a layer of material (silt and sand) will be deposited over the tailings surface to physically isolate the tailings. This layer will be deposited utilizing the existing tailings deposition infrastructure. This layer will help maintain the tailings in a saturated condition and prevent ARD during the construction of the closure cover. • MMC-2.4 (modified): Treasury Metals is considering placing a benign layer of tailings in the TSF during the final year or two of Operations to help delay the onset of ARD during closure, if required. There are a number of options for the benign tailings layer, including the addition of lime to the tailings, de-sulphurizing the tailings or mixing a caustic material with the tailings. Final details with regards to the placement of this benign tailings layer will be established as part of the final closure plan process in accordance with MENDM O.Reg. 240/00.
9	Tailings storage facility	Contingency measures if liner degrades	Propose contingency or supplemental measures that would be implemented if the liner degrades, or if it does not perform as intended.	Treasury Metals recognize the importance of the liner to the overall performance of the TSF, and ensuring the receiving

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		It is unclear what contingency measures would be in place if the results of the monitoring program show that the liner in the tailings storage facility is not performing as intended (i.e., has degraded).		environment is adequately protected. The selection of an HDPE liner material was based on the available literature regarding the level of performance expected for HDPE liners. Treasury Metals conservatively assumed that seepage through the liner would be at the upper bound for a properly installed liner. To help ensure the performance of the liner, Treasury Metals has committed to proper installation practices, for example weld testing and confirming the covering the liner with a layer of soil to protect against degradation. The primary causes of accelerated HDPE degradation are exposure to UV and high temperatures as documented in Robert M. Koerner et al. (2011). The paper documents that HDPE geomembranes will have an expected service life in excess of 400 years. Issues related to the expected seepage rates through the liner, and long-term performance of the liner were discussed in both the December 18, 2018 and January 10, 2019 meetings. regarding mine waste with the Agency and their technical reviewers. Treasury Metals have incorporated the following contingency and mitigation measures into the Goliath Gold Mitigation, Monitoring and Commitments List: • MMC-2.52 (new): Treasury Metals intends to line the entire TSF basin with a geosynthetic liner (HDPE or a liner of comparable performance). The estimated seepage rate for the proposed geosynthetic liner for the TSF is 3.13 m³/day. This is based on current industry research presented by Kerry Rowe et al. (2016), which suggests that this rate is an approximate upper bound estimate for a properly installed HDPE geomembrane underlying mine tailings and is independent of the soil characteristics underneath the TSF liner. • MMC-2.53 (new): Treasury Metals commits to acceptable practice of liner installation and protection as per the manufacture specifications. Installation of an HDPE liner requires that a soil cover needs to be placed as soon as possible to prevent wrinkles due to changes in temperature throughout the day resulting in increased leakage. Once there is about 0.5 m of cover (more or less depending on the cover material) the wrinkles should not expand due to changes in normal climate related thermal effects. To address uncertainties with possible future deterioration of the TSF liner, Treasury Metals provided a sensitivity analysis in Section W11 of the Goliath Gold Project Water Addendum where the seepage through the TSF liner was increased by a

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				factor of 10 relative to the upper bound value based on literature. As described in Section W11 of the Goliath Gold Project Water Addendum, the results of the sensitivity modelling show that changes in the TSF seepage rates and closure cover option will affect the predicted concentration in the receiving environment, the number of residual effects, and where those effects occur. The lowest number of residual effects are during operations and post-closure with a wet cover closure option for the TSF, where only thallium is predicted in excess of the PWQO value. It should be noted there were no predicted concentrations in excess of the PWQO value during average or 1:20 wet years, and the PWQO value for thallium that was used in the comparison is more than 2 orders of magnitude lower than the current MECP aquatic protection threshold of 40 µg/L (0.04 mg/L). The predicted residual effects do not exceed the MECP aquatic protection value for thallium, therefore it is not likely that the predicted concentrations of thallium in surface water would result in adverse effects to aquatic receptors within the surface water bodies To capture and to reflect Treasury Metals intention to protect the receiving environment from the deterioration in the TSF liner, the following has been added to the Goliath Gold Mitigation, Monitoring and Commitments List, which reads as follows: • <u>MMC-2.54 (new):</u> Monitoring of the TSF liner installation will be conducted, and in the event that monitoring indicates that the liner installation has not be installed appropriately or installed in such a way that it could result in liner deterioration, Treasury Metals would implement mitigation measures, as required, to ensure that the receiving environment is protected.
10	Tailings storage facility	<u>Treatment of water used to place wet cover over the tailings storage facility:</u> It is stated in Section W5.2 of Water Addendum (March 14, 2019) that "At closure, there will be 320,000 m³ of water available in the minewater pond and collection ponds (Section 3.8.11 of the revised EIS [April 2018]) to be used as water cover for closure of the TSF)". The Agency is unclear whether the water from the minewater pond and collection ponds would be treated prior to its discharge into the tailings storage facility, and if so, which water quality guidelines would be targeted.	Clarify whether water from the minewater pond and the collection ponds intended to replace the water on the tailings storage facility during decommissioning would be treated. If so, describe the water quality guidelines that would be met by the treatment.	Water from the minewater pond and the runoff collection ponds will be used to provide the wet cover for the closure of the TSF. At closure there would be 320,000 m³ of water available in the minewater pond and collection ponds (Section 3.8.11 of the revised EIS [April 2018]) to establish the wet cover for the closure of the TSF. As described in Section 5.2 of the Goliath Gold Project Water Addendum, 300,000 m³ of non-process water is required to establish a wet cover over the TSF. The quality of the water within collection ponds #1, #2A and #2B is expected to be comparable to background water in the Blackwater Creek watershed as it is predominantly non-contact

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				runoff. As a result, no treatment of this water is required prior to use in the water cover (as needed). Collection pond #3 is the segregated pond used to collect the runoff and seepage from the toe of the WRSA. This water may be ARD affected and may not be suitable for direct incorporation into the water management system/use in the water cover. With respect to treating the water from collection pond #3, Treasury Metals has made the following commitment in the Goliath Gold Project Mitigation, Monitoring, and Commitments List: • MMC-9.19 (unchanged) The infiltration into the WRSA that would drain laterally through the WRSA to the perimeter of the WRSA would be captured by the perimeter ditches and directed to a segregated runoff collection pond where it would be monitored, and if required, treated prior to the incorporation of the seepage from the WRSA into the overall water management system. Monitoring of this water would commence at the beginning of Operations, at the start of the construction of the WRSA. The expectation is that batch treatment of the ARD affected water in collection pond #3 would improve the quality of water to a level where it meets PWQO, or background if background is higher than the PWQO. At that point, it could be used as part of the TSF water cover. The water within the minewater pond will be comprised of a number of sources, as described in the response to TMI_951-GW(2)-01B and Section 8.3 of the Goliath Gold Project Water Addendum. The quality of the water in the minewater pond is presented Table W8-3 of the Goliath Gold Project Water Addendum. It is important to highlight that the majority of the water in the minewater pond is groundwater from dewatering activities, thus water quality in the minewater pond is largely a function of groundwater quality. To capture Treasury Metals intention to protect ecological receptors who may be exposed to water in the minewater pond during operations, the following has been added to the Goliath Gold Mitigation, Monitoring and Commitments List, which reads as follows: • MMC-2.55 (new): Monitoring of the water in the minewater pond during operations will be conducted and in the event that monitoring indicates that the water quality may pose risk to mammals and birds, Treasury Metals would consider implementing alternative mitigation measures such as water

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				treatment, bird deterrents, or fencing as required, to ensure that ecological receptors are protected. With respect to water quality for the TSF wet cover following closure, there are no applicable surface water quality criteria. The PWQO are derived for the protection of freshwater aquatic life and there will be no freshwater aquatic life exposed to water in TSF wet cover following closure. Regardless, Treasury Metals does intend to ensure that wildlife is protected from the open water features following closure, and has added the following to the Goliath Gold Mitigation, Monitoring and Commitments List, which reads as follows: • MMC-2.56 (new): Monitoring of water quality of the TSF wet cover following closure will be conducted and in the event that monitoring indicates that the water quality may pose risk to mammals and birds, Treasury Metals would consider implementing alternative mitigation measures such as water treatment, bird deterrents, or fencing as required, to ensure that ecological receptors are protected.
11	Waste rock storage area	Options to avoid ARD The Agency notes that the waste rock storage area is predicted to be acid-generating. The Agency also notes that the primary intent of the cap on the waste rock storage area at decommissioning is to reduce the infiltration of precipitation through the waste rock, and to reduce the quantity of seepage from the waste rock storage area. The Agency, Natural Resources Canada, and Environment and Climate Change Canada are of the opinion that along with implementing measures to reduce the quantity of seepage, it is important to implement measures to reduce the potential for ARD, and prolong the onset time for ARD.	Clarify and explain the measures that would be applied, from construction through abandonment, to minimize the potential for ARD, and prolong the onset time for ARD.	The bulk of the material within the waste rock storage area (WRSA) will come from the excavation of the west pit, which will occur during the first year or two of mining operations. Given the identified time to the onset of ARD would be approximately two years (see response to TMI_902-MW(2)-06), there are few measures available to prevent the onset of ARD as the WSRA will still be under active construction during the expected time to acid onset (except for the continuous covering / expansion of the stockpile itself inherent in stockpiling activities). For this reason, the predicted effects on surface water, fish and fish habitat, as well as the plans for the seepage and runoff from the WRSA are based on the assumption that materials within the WRSA will be acid-generating. Treasury Metals intends to manage the runoff and seepage from the toe of the WRSA as described in MMC-9.19 of the Goliath Gold Project Mitigation, Monitoring, and Commitments List, which reads as follows: • MMC-9.19 (unchanged) The infiltration into the WRSA that would drain laterally through the WRSA to the perimeter of the WRSA would be captured by the perimeter ditches and directed to a segregated runoff collection pond where it would be monitored, and if required, treated prior to the incorporation of the seepage from the WRSA into the overall water management system. Monitoring of this water would

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				commence at the beginning of Operations, at the start of the construction of the WRSA. Treasury Metals recognizes the benefits of mitigating the potential for ARD within the WRSA and will explore practicable methods for delaying the rate of acid onset as part of the formal closure planning process. As part of the closure planning process, Treasury Metals will consider the viability of current practices (e.g., lime addition), and evolving technologies (e.g., application of: bactericides; phosphate; alkaline irrigation; and oxygen-consuming organic covers) . The following commitments have been incorporated into the Goliath Gold Mitigation, Monitoring and Commitments List: • MMC-2.14 (modified): The multi-layer low permeability cover for the WRSA will be constructed according to good engineering practice. The final design for the construction of the closure cover for the WRSA will be done as per the requirement of O.Reg 240/00 and in consultation with Indigenous communities. • MMC-2.48 (new): Treasury Metals will complete a detailed closure plan prior to the start of operations as required by MENDM under the formal closure planning process (Mining Act, O.Reg. 240/00). As part of that process, there will be a requirement for funds to be set aside to ensure the successful implementation of site closure. • MMC-2-57 (new): Treasury Metals will consider a number of options to delay the rate of onset of ARD within the WRSA, these include, but are not limited to: for mitigation of deterioration in cover performance, enhanced design, and/or to extend the functional life of the cover. The final design for the construction of the closure cover for the WRSA will be done as per the requirement of O.Reg 240/00 and in consultation with Indigenous communities.
12	Waste rock storage area	Performance of the waste rock storage area cover Further information is needed regarding contingency measures to address future deterioration in cover performance of the waste rock storage area due to settlement, and alterations due to processes such as freeze thaw, wetting and drying, and root penetration.	Provide contingency measures if the cover on the WRSA does not perform as expected from operations through abandonment (when no active intervention is required i.e. post-closure).	To address uncertainties with possible future deterioration of the multi-layer, low-permeability dry cover over the WRSA Treasury Metals provided a sensitivity analysis in Section W11 of the Goliath Gold Project Water Addendum where the infiltration through the multi-layer, low permeability dry cover over the WRSA was increased to allow fully 50% of the precipitation falling on the WRSA to infiltrate. This was the approach agreed on during the January 10, 2019 meeting with the Agency and their technical reviewers. For context, for the cover to allow 50% of the precipitation to infiltrate it would need

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				to have an effective hydraulic conductivity in the range of 10^{-4} to 10^{-5} m/s. The results of the surface water modelling show that even with the higher seepage rates from the WRSA, the downstream receiving water quality would be effectively unchanged from background conditions, or would meet the PWQO. As detailed in the responses to TMI_909-GW(2)-02 and TMI_951-GW(2)-01B, the vast majority of infiltration into the WRSA will travel laterally to the perimeter of the WRSA. This seepage will be managed as described in MMC-9.19 of the Goliath Gold Mitigation, Monitoring and Commitments List, which reads as follows: • MMC-9.19 (unchanged): The infiltration into the WRSA that would drain laterally through the WRSA to the perimeter of the WRSA would be captured by the perimeter ditches and directed to a segregated runoff collection pond where it would be monitored, and if required, treated prior to the incorporation of the seepage from the WRSA into the overall water management system. Monitoring of this water would commence at the beginning of Operations, at the start of the construction of the WRSA. The response to TMI_909-GW(2)-02 provided a detailed description of the multi-layer low permeability cover for the WRSA. The cover will be constructed according to good engineering practice, and would typically include the following basic layers (from top to bottom): (1) vegetation and rocky soil, (2) water storage/frost protection layer, (3) a hydraulic barrier and (4) material used to separate the waste from the cover and prevent migration of the cover components into the waste. The final design for the construction of the closure cover for the WRSA will be done as part of the formal closure planning process (O.Reg 240/00). To ensure the receiving environment is protected from possible deterioration in cover performance of the WRSA, the response to TMI_909-GW(2)-02 also describes possible mitigation measures that could be implemented in the event the cover performance was less than expected due to factors such as wind, freezing, rain, heat, fire, waste deformation, gravity-induced creep, vegetation, animals, or anthropogenic activity. To capture Treasury Metals intention to protect the receiving environment from the deterioration in the cover performance of

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				the WRSA, the following have been added to the Goliath Gold Mitigation, Monitoring and Commitments List: • MMC-2.14 (modified): The multi-layer low permeability cover for the WRSA will be constructed according to good engineering practice. The final design for the construction of the closure cover for the WRSA will be done as per the requirement of O.Reg 240/00 and in consultation with Indigenous communities. • MMC-2.49 (new): In addition to a multi-layer low permeability cover for the WRSA, Treasury Metals has identified and will consider a number of additional design options for mitigation of deterioration in cover performance, enhanced design, and/or to extend the functional life of the cover. These may include measures to address: the effect of compacted clay liner issues with freeze thaw; decreasing final slope grade and length, as appropriate; frost protection and/or water storage; erosion; seepage management; and burrowing animals and human disturbance. The final design for the construction of the closure cover for the WRSA will be done as per the requirement of O.Reg 240/00 and in consultation with Indigenous communities. • MMC-2.50 (new): Monitoring of the multi-layer low permeability dry cover for the WRSA will be conducted and in the event that monitoring indicates that the cover is deteriorating or not performing as efficiently as accounted, Treasury Metals would consider implementing alternative mitigation measures, as required, to ensure that the receiving environment is protected.
13	Waste rock storage area	Monitoring and collection of seepage from the waste rock storage area Section W7.7 of the Water Addendum (R.3) appears to assume a fully developed and dewatered open pit scenario, which would represent the maximum drawdown force and thus maximum seepage capture rate from the waste rock storage area, which may not be the case. The Agency notes that seepage would be monitored downstream of the waste rock storage area from operations to abandonment.	Provide contingency measures that would be implemented, if monitoring indicates that there is more seepage from the waste rock storage area than predicted, to ensure that seepage is collected and treated before it discharges into the natural environment.	The TMI open pit will be excavated as three isolated pits, starting with the west pit, which will be fully mined within a period of 12 months. In order to mine the west pit, active dewatering activities will need to lower the water table below the elevation of the bottom of the west pit by early within the first year of mining. As the west pit will be located adjacent to the WRSA and will be the primary source of waste rock stored within the WRSA, the groundwater drawdown will be largely established before the completion of the WRSA. As detailed in the response to TMI_909-GW(2)-02, it was assumed that there would be approximately 150 mm/year of seepage from the uncapped WRSA into the underlying bedrock and overburden, which was projected to decrease to 30 mm/year once the multi-layer, low permeability dry cover is

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				placed over the WRSA. However, it is expected that most of the precipitation that infiltrates into the WRSA would actually travel laterally through the WRSA to the perimeter where it would be collected by the perimeter ditch and directed to a segregated collection pond and described in responses to TMI_909-GW(2)-02 and TMI_951-GW(2)-01B. (In fact, 33 times more infiltration is expected to travel laterally to the perimeter of the WRSA than will enter the underlying bedrock and overburden.) The following was added to the Goliath Gold Mitigation, Monitoring and Commitments List as contingency to ensure that this seepage is collected and treated before it discharges into the natural environment: • MMC-9.19 (unchanged): The infiltration into the WRSA that would drain laterally through the WRSA to the perimeter of the WRSA would be captured by the perimeter ditches and directed to a segregated runoff collection pond where it would be monitored, and if required, treated prior to the incorporation of the seepage from the WRSA into the overall water management system. Monitoring of this water would commence at the beginning of Operations, at the start of the construction of the WRSA. An additional sensitivity run was as part of Section W11 where the infiltration rate into the WRSA was increased to 50% of the precipitation falling on the WRSA. This sensitivity run was undertaken to address discussions during both the December 18, 2018, and the January 10, 2019 meetings with the Agency and their technical reviewers regarding the efficacy of the dry cover over the WRSA. The results of the subsequent surface water modelling show that even with the higher seepage rates from the WRSA, there were no predicted residual effects in the receiving environment in exceedance of the PWQO. To help ensure the receiving environment is protected from the effects of seepage from the Project, the following have been added to the Goliath Gold Mitigation, Monitoring and Commitments List: • MMC-9.31 (new): The seepage collection ditches will be constructed according to good engineering practice. The contact water ditches will be lined because the contact runoff water may contain materials that may need to be collected and treated prior to its release to the environment. These ditches will be lined to minimize seepage from the ditches; typical ditch lining could include a geosynthetic liner (HDPE

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				or similar material) and/or slush grout depending on the conditions along the ditch alignment, suitably protected from erosion (such as by stone riprap or geotextile). • MMC-9.32 (new): In addition to the typical ditch configurations, Treasury Metals have identified a series of additional ditch configurations (see TMI_910 GW(2) 04_Attachment_1), which represent a "toolbox of options" that will be used to select the configuration of ditches constructed around the perimeter of the site, based on the actual conditions encountered when constructing the perimeter ditches. The final design for the construction of the perimeter ditches will be done to address specific conditions that are encountered. • MMC-9.33 (new): Monitoring of the seepage collection system will be conducted and in the event that monitoring indicates that more seepage is escaping the site than expected, Treasury Metals would consider implementing alternative seepage collection configurations to ensure the receiving environment is protected.
14	Low-grade ore stockpile and underground workings	Effects of low-grade ore and underground workings on the pit lake water quality: Low-grade ore that is stockpiled for many years may be partially oxidized, and may remain unprocessed if economic conditions become unfavourable. The Agency notes that if the low-grade ore remains unprocessed, it would be placed back into the open pit at decommissioning. The sulphide content of the low-grade ore may be higher than that of the waste rock and as a result, the drainage chemistry and solute release may be higher than that of the waste rock. For underground workings, the proponent has not conceptually identified mitigation measures to attenuate and prevent solute release. This will require consideration of geological and geochemical composition of underground mine walls, the time to onset of ARD, and the composition of materials that will be above the height of flooding. For both low-grade ore and underground workings, the Agency seeks clarity on contingency measures or options that would be available to attenuate and prevent solute releases. The Agency is also seeking information on contingency measures required to ensure that the commitments made to achieve the applicable water quality guidelines in the pit lake are achievable.	Part I Provide mitigation measures to attenuate and prevent solute releases, in case the low-grade ore is not processed and placed into the pit lake. Part II Provide mitigation measures to attenuate and prevent solute release from the underground workings.	Part I: It is expected that all of the ore in the LGO will be processed by the end of operations as it is gold bearing (see response to TMI-947-MW(2)-12). The Goliath Gold Mitigation, Monitoring and Commitments List includes the following specific measure: • MMC-2.9 (unchanged): It is intended that the LGO stockpile will be depleted by the closure phase. Any LGO remaining in the LGO stockpile will be removed and placed at the bottom of the open pit to be submerged by the pit lake. As highlighted by the MENDM expert during the January 10, 2019 groundwater and geochemistry discussion with the Agency and their technical reviewers, the final closure plan for the Project would require that sufficient funds be set aside to ensure the successful closure of the Project, include the removal of any material that remains in the LGO stockpile at the end of operations. The following commitment has been incorporated into the Goliath Gold Mitigation, Monitoring and Commitments List: • MMC-2.48 (new): Treasury Metals will complete a detailed closure plan prior to the start of operations as required by MENDM under the formal closure planning process (Mining Act, O.Reg. 240/00). As part of that process, there will be a

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				requirement for funds to be set aside to ensure the successful implementation of site closure. <u>Part II:</u> At the end of operations, the open pit and underground mine workings will be made ready for decommissioning. The dewatering activities will then cease, and the open pit and underground mine workings will be allowed to fill with water. It is expected that the open pit will take from 6 to 8 years to fully flood, while the underground workings are expected to take from 3 to 4 years to fill with water. It is not expected that there would be significant quantities of seepage from the flooded underground mine workings into the surrounding bedrock. However, Treasury Metals has committed to monitor the groundwater quality throughout the active life of the Project, which would capture the effects of any solute releases from the underground workings. The following monitoring has been described in the Goliath Gold Mitigation, Monitoring and Commitments List: • <u>MMC-9.26 (modified):</u> Groundwater Quality Monitoring: Several existing wells in the proposed groundwater quality monitoring program have been sampled as part of baseline studies with the earliest sampling dating from June 2013. These wells will continue to be sampled as appropriate to allow for comparison in the future. • <u>MMC-9.27 (modified):</u> Groundwater Quality Monitoring: The groundwater quality program sampling frequency will be quarterly when possible excluding freezing conditions, for the pre-construction, site preparation and construction, and operation phases. The pre-construction phase will provide for well installation a year before site preparation and construction so as to provide a year of pre-development data. • <u>MMC-9.28 (modified):</u> Groundwater Quality Monitoring: Treasury Metals will periodically monitor the water quality of private wells off-site (e.g., houses along East Thunder Lake Rd.) to verify that the EA predictions were accurate regarding the water quality of these wells. This monitoring will be dependent on the private well owners' consent of water quality sampling and a reasonable level of access. • <u>MMC-9.29 (modified):</u> Groundwater quality monitoring would be continued in whole or in part, at least until both the

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				TSF and WRSA are capped and/or consistent with the Closure Plan prepared pursuant to the Mining Act. Termination of the program would be expected following a satisfactory review of the monitoring data collected during mine closure. Although there is no identified need to mitigate the effects of solute from the underground workings, any potential effects could be mitigated by pumping treated water from the TSF into the underground workings to reduce the period of flooding to about 1 year. This would help isolate the exposed walls of the underground workings from additional ARD. This alternative mitigation has been included as MMC-9.30 in the Goliath Gold Mitigation, Monitoring and Commitments List: • MMC-9.30 (new): As part of the formal closure process (O.Reg. 240/00), Treasury Metals will consider the use of treated supernatant water from the TSF to rapidly flood the underground workings to mitigate additional ARD effects from exposed walls of the underground mine if justified.
15	Pit lake water quality	Stratification of the pit lake The proponent stated in the revised EIS that the groundwater inflow would continue into the open pit during abandonment, which includes seepage from the waste rock storage area. It is noted in the proponent's response to SW(2)-08 in IR#2 that "Over time it is expected that the water quality of surface inflows will improve, and thus a density difference between surface and water at depth could develop to a point that could maintain permanent stratification". The Agency is uncertain that the pit lake will be able to achieve permanent stratification, as the acidic water from the waste rock storage area would continually seep into the upper layers of the pit lake through the abandonment phase. Furthermore, Environment and Climate Change Canada, Ministry of Environment, Conservation and Parks, and Ministry of Energy, Northern Development and Mines note that the pit lake configuration may not be amenable to establish a permanent stratified condition, as there is a shallow open fetch in the west pit which appears to be oriented parallel with the prevailing wind direction. This could introduce mixing that could prevent stratification. The Agency notes in MMC-7.14 of the R.1 Goliath Gold Project Mitigation, Monitoring and Commitments (March 6, 2019) that "the pit lake will be monitored as it is filling to determine whether batch treatment will be required to ensure the water meets PWQO, or	Provide clear contingency measures that would be implemented in the event that the pit lake is unable to reach permanent stratification during abandonment. Describe how the condition of permanent stratification would be confirmed through monitoring. Clarify the methodology of proposed batch treatments that are proposed in MMC-7.14 in the case that pit lake water quality is degraded as a result of ARD from the underground workings or the low-grade ore put into the pit lake.	The response to Part C of TMI_891-SW(2)-08 indicated that "Although the eastern basin of the pit lake is sufficiently deep that it could become meromictic overtime, the surface water quality predictions have conservatively assumed that discharges from the pit lake to Blackwater Creek would be those associated with a fully mixed pit lake." Therefore, if the pit lake does not stratify, the water quality within the pit lake would be comparable to the numbers presented in Table W6-3 in the Goliath Gold Project Water Addendum. If the pit lake were to permanently stratify, the water quality within the pit lake would be improved relative to the numbers presented in Table W6-3. The Goliath Gold Mitigation, Monitoring and Commitments List includes the following specific measures to help ensure the quality of water released from the pit lake is protective of the receiving environment: • MMC-7.14 (modified): The pit lake will be monitored as it is filling on a quarterly basis to determine whether batch treatment will be required to ensure the water meets PWQO, or background concentrations if background levels are greater than the PWQ, prior to the discharge from the pit lake to a tributary of Blackwater Creek. • MMC-7.15 (modified): Once the pit lake is fully flooded, monitoring of the water quality in the pit lake will continue on

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		background concentrations if background levels are greater than the PWQ, prior to the discharge from the pit lake to a tributary of Blackwater Creek". In consideration of the question raised in Item No. 9 of Annex 2 regarding low-grade ore and underground workings, and a scenario where the pit lake is unable to achieve permanent stratification, the Agency requires clarification on mitigation measures that would be implemented to meet the applicable water quality criteria for the pit lake during abandonment.		an annual basis to support batch treatment if any, until the pit lake meets effluent release limits. In addition, the following contingency measure has been incorporated into the Goliath Gold Project Mitigation, Monitoring and Commitments List: • MMC-7.19 (modified): Should monitoring of water quality within the fully flooded pit lake indicate that batch treatment(s) is not effective at ensuring the water released from the pit lake meets effluent release limits, Treasury Metals will look to mitigate any potential effects on surface water with additional water treatment options. Although the surface water quality modelling presented in Goliath Gold Project Water Addendum does not rely on permanent stratification within the pit lake, the following monitoring has been incorporated into the Goliath Gold Project Mitigation, Monitoring and Commitments List to identify "how the condition of permanent stratification would be confirmed" within the pit lake: • MMC-7.20 (modified): Once the pit lake is fully flooded, Treasury Metals will collect water data at various depths to confirm whether condition of permanent stratification would be form within the pit lake. The data collected would include, at a minimum, temperature, dissolved oxygen, redox potential, pH and dissolved ions. The batch treatment of water within the pit lake will be designed to address degraded water quality that could result from ARD affected waters from WRSA, waste rock disposed of in the open pit, the walls and floors of the open pit, seepage from the TSF, as well as the relatively small amount of seepage from the underground mine workings. In addition, batch treatment would deal with any ore transferred from the LGO stockpile at the end of operations, which is expected to be exhausted by the end of operations (see Clarification 14). There are a number of accepted batch treatment methods for pit lakes. The proposed approach to be used for batch treatment will form part of the Closure Plan prepared pursuant to the Mining Act.
16	Access management plan: Baitfishing	Baitfishing in the Tree Nursery ponds Baitfishing in the Tree Nursery ponds is not currently accounted for within access management plans despite	Provide a description of how baitfishing within the Tree Nursery ponds is accounted for within the access management plans. In particular, clarify whether the access management plans for baitfishing would be the same as that for chanterelle mushrooms and blueberries within the local study area.	Treasury Metals have previously indicated that an access management plan will be established in association with and for each of the Indigenous communities to set out how its members can access areas within the Goliath Gold Project property to practice traditional uses of the lands and resources. This is

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		Métis Nation of Ontario and Wabigoon Lake Ojibway Nation referring to ongoing and future use within these ponds. The Agency notes that there is an access management plan for chanterelle mushrooms and blueberries that are located just into the local study area. The Agency seeks clarification on whether the same access management plan is also applicable for baitfishing in the Tree Nursery ponds.		captured in MMC-20.30 of the Goliath Gold Mitigation, Monitoring and Commitments List, which reads as follows: • MMC-20.30 (unchanged): Treasury Metals will work with Indigenous communities to develop community-specific access management plans consistent with site safety needs, and the sensitive nature of traditional and recreational harvest. Although an access management plan for baitfish harvesting at the tree nursery ponds was not explicitly identified in the Goliath Gold Mitigation, Monitoring and Commitments List, this activity would be covered as part of the community specific access management plans committed to in MMC-20.30. To provide further clarity, treasury Metals has added the following commitment to the Goliath Gold Mitigation, Monitoring and Commitments List: • MMC-20.77: Access and Baitfish Harvesting: For health and safety purposes, access to known baitfish harvesting areas within the former MNRF Tree Nursey will be controlled for the life of the Project. Treasury Metals is committed to developing community-specific access management plans in consultation with the Indigenous communities. Treasury Metals envisions that these plans would detail how community members would be escorted safely through the operations area, and then allowed to safely harvest baitfish in those harvesting areas that are outside of the operations area, unaccompanied. The plan would also detail how Indigenous community members would then be escorted safely back through the operations area, once harvest activities have been completed. Treasury Metals will install gates as needed on Tree Nursery Road to the north and south of the operations area, demarking those areas through which members of Indigenous communities will require an escort for safety reasons.
17	Clarification on data	Habitat loss in upland and wetland habitats In the document titled "Final Round 2 Wildlife Information Requests February 1, 2019", there are two tables that present information on the amount of habitat loss in upland and wetland habitats: TMI_952-WL(2)-07_Table_5 and TMI_870-WL(2)-01_Table_10. The Agency also noted other tables (TMI_871-WL(2)-02_Table_4, TMI_871-WL(2)-02_Table_5, and TMI_871- WL(2)-02_Table_2) that contained information regarding wetland habitat.	Clarify the differences and update the data presented in tables: TMI_952-WL(2)-07_Table_5 and TMI_870-WL(2)-01_Table_10.	Inconsistencies were identified with the numbers presented, and Treasury Metals have provided updated versions of the following tables as attachments: • TMI_952 WL(2) 07_Table_5_(R1) • TMI_870-WL(2)-01_Table_10_(R1) The primary difference between the numbers presented in the two tables is that wetland birds are assumed to use both wetland habitat and open water. A footnote has been added to TMI_870-WL(2)-01_Table_10_(R1) to clarify this point.

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		The data presented in these the tables regarding upland and wetland habitats do not match for a number of parameters. For example, the amount of habitat currently present (baseline), the amount of habitat loss (from both direct and indirect causes), and the amount of habitat to be rehabilitated.		