TMI_865-AM(2)-01

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response	
TMI_865-AM(2)-01	AM(2)-01	1	CEA Agency	**Reference to EIS Guidelines:**	Part 2, Section 7.1.2
				Reference to EIS / Appendix	Section 4
				Cross-reference to Round 1 IRs	TMI_243-AM(1)-01
				Context and Rationale: • In the event of spills and releases on and off-site, the proponent has stated that rehabilitation of the environment would occur as necessary. However, the requirements for rehabilitation are unclear.	
				Specific Question / Request for Information: A. Describe the conditions under which clean-up or rehabilitation would be considered necessary in the case of spills and releases on or off-site. Include relevant legislated requirements that may apply. B. Identify the extent to which the affected environment will need to be restored and any specific guidelines that would need to be followed.	
				Response: Part A. In the event of a spill, on-site or off-site, Treasury Metals would follow the requirements for spill reporting and clean up under Part X of the *Environmental Protection Act* as well as O.Reg. 675/98. As stated in Section 12 of the revised EIS (April 2018), an Emergency and Spill Response Management Plan will be developed to help avoid spills and leaks, as well as actions to identify, report on and remediate spills and leaks should they occur. The plan will also describe the actions to be carried out in the event of an accident or malfunction to meet the standards of the Environmental Emergency Regulations (SOR/2003-307, Environment Canada 2003) under the *Canadian Environmental Protection Act*. Contact details will be provided within the Emergency and Spill Response Management Plan for the Spill Action Centre and all other parties required by legislation or agreement in the event that notification of a spill is required. In the event of a reportable spill, as defined under O.Reg. 675/98, the Ministry of the Environment, Conservation and Parks would oversee the response to the spill to ensure that the spilled material is clean-up and remediated in a timely manner. Records of the spill event would be kept and reported as part of the annual reporting for the site.	

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				Specific clean-up and rehabilitation procedures for a spill is dependent on the material spilled, and the quantity of the material spilled. If the spill is determined to be of sufficient quantity or the material is such that the spill could result in adverse environmental effects, the source of the spill would be controlled, the spilled material would be contained, the material would be cleaned up as per the Material Safety Data Sheet specific to that material and the area affected by the spill would be remediated. Part B. As stated in Part A of response to TMI_865-AM(2)-01, in the event of a spill, Treasury Metals would be required to follow the spill reporting and cleanup under the *Environmental Protection Act*, as well as the requirements of O.Reg. 675/98. Generally, as part of the clean-up procedure for a spill, the spilled material would be removed along with any contaminated vegetation or soil that was in contact with the spill. If a hydrocarbon spill were to occur within water, cleanup would include containing and skim the hydrocarbons from the surface of the water along with soils being removed from the shore of the waterbody.
				Agency Comment on Draft Response None Received
				Specific Response to Agency Comments Not required. Agency accepted Draft Response.
				FINAL RESPONSE: Part A. In the event of a spill, on-site or off-site, Treasury Metals would follow the requirements for spill reporting and clean up under Part X of the *Environmental Protection Act* as well as O.Reg. 675/98. As stated in Section 12 of the revised EIS (April 2018), an Emergency and Spill Response Management Plan will be developed to help avoid spills and leaks, as well as actions to identify, report on and remediate spills and leaks should they occur. The plan will also describe the actions to be carried out in the event of an accident or malfunction to meet the standards of the Environmental Emergency Regulations (SOR/2003-307, Environment Canada 2003) under the *Canadian Environmental Protection Act*. Contact details will be provided within the Emergency and Spill Response Management Plan for the Spill Action Centre and all other parties required by legislation or agreement in the event that notification of a spill is required. In the event of a reportable spill, as defined under O.Reg. 675/98, the Ministry of the Environment, Conservation and Parks would oversee the response to the spill to ensure that the spilled material is clean-up and remediated in a timely manner. Records of the spill event would be kept and reported as part of the annual reporting for the site. Specific clean-up and rehabilitation procedures for a spill is dependent on the material spilled, and the quantity of the material spilled. If the spill is determined to be of sufficient quantity or the material is such that the spill could result in adverse environmental effects, the source of the spill would be controlled, the spilled material would be contained, the material would be cleaned up as per the Material Safety Data Sheet specific to that material and the area affected by the spill would be remediated.

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				Part B. As stated in Part A of response to TMI_865-AM(2)-01, in the event of a spill, Treasury Metals would be required to follow the spill reporting and cleanup under the *Environmental Protection Act*, as well as the requirements of O.Reg. 675/98. Generally, as part of the clean-up procedure for a spill, the spilled material would be removed along with any contaminated vegetation or soil that was in contact with the spill. If a hydrocarbon spill were to occur within water, cleanup would include containing and skim the hydrocarbons from the surface of the water along with soils being removed from the shore of the waterbody.

TMI_866-AM(2)-02

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response	
TMI_866-AM(2)-02	AM(2)-02	1	CEA Agency	**Reference to EIS Guidelines:**	Part 2, Section 7.1.2
				Reference to EIS / Appendix	Section 4
				Cross-reference to Round 1 IRs	TMI_245-AM(1)-03
				Context and Rationale: • The response to IR# AM(1)-03 does not describe the potential environmental effects of a burst pipeline. Only the emergency response measures are described, which state that "any system failure will result in the shutdown of operations to ensure the safety of not only infrastructure but all applicable environmental criteria, inclusive of TKLU aspects." • However, environmental effects should be described without the application of the response system or mitigation measures in order to understand the worst case scenario.	
				Specific Question / Request for Information: C. Describe the potential environmental effects from the failure of the tailings or effluent pipeline.	
				Response: Part A. The potential environmental effects from the failure of the tailings pipeline differ from those associated with the potential failure of the effluent pipeline, as discussed below: • **Tailings Pipeline Failure** — The tailings pipeline runs between the processing facility and the tailings storage facility. Therefore, the tailings pipeline is fully contained within the operations area, which is enclosed by a perimeter ditch and seepage collection system. In the event of the tailings pipeline failure, an emergency shutdown of the process plant would be initiated to limit the quantity of tailings from the ruptured pipeline. The process plant would remain shutdown until the section of ruptured pipeline had been repaired or replaced as necessary. As the length of the tailings pipeline will be contained entirely within the operations area enclosed by perimeter ditching, no tailings solids or liquids would escape the operations area into the surrounding environment. Once it is safe to do so, the spilled tailings solids would be removed from the area surrounding the tailings pipeline	

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				failure point and would be deposited in the TSF along with any contaminated soil that the tailings had come in contact with. Any runoff from the tailing liquids would be captured within the perimeter ditching and would either be reused in the process, or treated to meet PWQO, or background if background is greater than the PWQO, prior to discharge into Blackwater Creek. This clean up would be completed as soon as practicable by Treasury Metals. There are no predicted environmental residual effects as a result of the tailings pipeline failure. • **Effluent Pipeline Failure** — The effluent pipeline runs through the operations area from the water treatment plant to the point closest to the ultimate discharge point, an engineered structure within Blackwater Creek. In the event of the effluent pipeline failure, an emergency shutdown of the water treatment plant would occur to limit the quantity of effluent released from the ruptured pipeline. The water treatment system would remain shutdown until the section of ruptured pipeline had been repaired or replaced, as necessary. There are two potential scenarios for an effluent pipeline failure event. The first is if the pipeline were to rupture within the operations area between the water treatment plant and the perimeter ditch surrounding the operations area. In this scenario, the treated effluent would be captured by the site ditching and directed through the water management system into the Minewater Pond. From the Minewater Pond, the water would either be used in the process or be treated to meet PWQO, or background if background is greater than the PWQO, prior to discharge into Blackwater Creek. None of the treated effluent spilled within the operations area would leave the site. The second scenario is where the effluent pipeline ruptures outside of the operations area between the perimeter ditch and the discharge point on Blackwater Creek. In this scenario, the treated effluent, which has been treated to either meet PWQO, or background if background is greater than the PWQO, would be released onto the ground around the pipeline and would flow down gradient into Blackwater Creek, the effluent intended destination. Therefore, there would be no adverse environmental effects as a result of the effluent pipeline failure.
				Agency Comment on Draft Response None Received
				Specific Response to Agency Comments Not required. Agency accepted Draft Response.
				FINAL RESPONSE: Part A. The potential environmental effects from the failure of the tailings pipeline differ from those associated with the potential failure of the effluent pipeline, as discussed below: • **Tailings Pipeline Failure** — The tailings pipeline runs between the processing facility and the tailings storage facility. Therefore, the tailings pipeline is fully contained within the operations area, which is enclosed by a perimeter ditch and seepage collection system. In the event of the tailings pipeline failure, an emergency shutdown of the process plant would be initiated to limit the quantity of tailings from the ruptured pipeline. The process plant would remain shutdown until the section of ruptured pipeline had been repaired or replaced as

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				necessary. As the length of the tailings pipeline will be contained entirely within the operations area enclosed by perimeter ditching, no tailings solids or liquids would escape the operations area into the surrounding environment. Once it is safe to do so, the spilled tailings solids would be removed from the area surrounding the tailings pipeline failure point and would be deposited in the TSF along with any contaminated soil that the tailings had come in contact with. Any runoff from the tailing liquids would be captured within the perimeter ditching and would either be reused in the process, or treated to meet PWQO, or background if background is greater than the PWQO, prior to discharge into Blackwater Creek. This clean up would be completed as soon as practicable by Treasury Metals. There are no predicted environmental residual effects as a result of the tailings pipeline failure. • **Effluent Pipeline Failure —** The effluent pipeline runs through the operations area from the water treatment plant to the point closest to the ultimate discharge point, an engineered structure within Blackwater Creek. In the event of the effluent pipeline failure, an emergency shutdown of the water treatment plant would occur to limit the quantity of effluent released from the ruptured pipeline. The water treatment system would remain shutdown until the section of ruptured pipeline had been repaired or replaced, as necessary. There are two potential scenarios for an effluent pipeline failure event. The first is if the pipeline were to rupture within the operations area between the water treatment plant and the perimeter ditch surrounding the operations area. In this scenario, the treated effluent would be captured by the site ditching and directed through the water management system into the Minewater Pond. From the Minewater Pond, the water would either be used in the process or be treated to meet PWQO, or background if background is greater than the PWQO, prior to discharge into Blackwater Creek. None of the treated effluent spilled within the operations area would leave the site. The second scenario is where the effluent pipeline ruptures outside of the operations area between the perimeter ditch and the discharge point on Blackwater Creek. In this scenario, the treated effluent, which has been treated to either meet PWQO, or background if background is greater than the PWQO, would be released onto the ground around the pipeline and would flow down gradient into Blackwater Creek, the effluent intended destination. Therefore, there would be no adverse environmental effects as a result of the effluent pipeline failure.

TMI_867-AM(2)-03

Unique Identifier	Agency IR #	Annex	Agency / Group / Stakeholder	Cross Reference / Comment / Information Request / Response	
TMI_867-AM(2)-03	AM(2)-03	1	CEA Agency	**Reference to EIS Guidelines:**	Part 2, Section 7.1.2
				Reference to EIS / Appendix	Section 4
				Cross-reference to Round 1 IRs	TMI_246-AM(1)-04
				Context and Rationale: • The proponent's assessment of potential effects of a tailings storage facility (TSF) failure does not describe the effects and their duration if particulate materials remobilize with heavy rainfall or spring freshet in Blackwater Creek. • Further, there is no discussion of contingency measures to avoid or mitigate effects due to a TSF failure to fish and fish habitat, specifically the spawning habitat in Thunder Creek, the fish sanctuary near Christie's Island and the important fishing location in Bonny Bay (both in Wabigoon Lake).	
				Specific Question / Request for Information: A. Describe the effects and their duration if particulate materials remobilize with every heavy rainfall or spring freshet in Blackwater Creek following a failure of the tailings storage facility; B. Describe any additional measures required to avoid or mitigate effects associated with the remobilization of particulate material, if necessary; C. Provide a discussion of the response procedures and contingency measures to avoid or mitigate effects due to a tailings storage facility failure to fish and fish habitat on Christie's Island, at Thunder Creek and in Bonny Bay.	
				Draft Response: PART A To clarify what was stated in the context and rationale, the responses to the Round 1 information request did include a description of "the effects and their duration if particulate materials remobilize with heavy rainfall or spring freshet in Blackwater Creek". This information was explicitly provided to the Agency and reviewers in TMI_246-AM(1)-04_Addendum_1. As stated in TMI_246-AM(1)-04 and in Section 4.3.2.5 of the revised EIS (April	

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				2018), and expanded on in TMI_246-AM(1)-04_Addendum_1, the majority of the tailings solids would deposit on land between the TSF and Blackwater Creek in the highly unlikely event of a TSF failure. It was also stated that some tailings solids could be deposited within Blackwater Creek. As described in TMI_246-AM(1)-04_Addendum_1, tailings could be deposited over approximately 1.1 km of the 10.4 km of total creek length in the highly unlikely event of a TSF failure. The section where tailings could be deposited in the unlikely event of the TSF failure is classified as low gradient stream habitat with a sinuous channel and a substrate of primarily fine silt and clay. Additionally, a review of the baseline total suspended solids (TSS) data collected in Blackwater Creek shows that sediments are currently resuspended due to natural episodic events (e.g., storms and spring freshets), and that some of the tailings deposited in Blackwater Creek in the unlikely event of the TSF failure could also be re-suspended and transported downstream. Given baseline characteristics of sediment within Blackwater Creek (i.e., fine silt and clay substrate) and the distance between the TSF and Wabigoon Lake, it is unlikely that TSS concentrations entering Wabigoon Lake will change measurably from background conditions due to the re-suspension of tailings deposited within Blackwater Creek in the unlikely event of the TSF failure. The chemical properties of the re-suspended tailings would however be different from the baseline TSS. Based on the description of potential effects on sediments in Wabigoon Lake from the release of water during a TSF failure (described in TMI_246-AM(1)-04_Addendum_1), the resuspension of tailings deposited in Blackwater Creek would have minimal effects on sediment quality, in the range of an order of magnitude less than the predicted changes in sediment immediately following a TSF failure. Although the tailings deposited in Blackwater Creek in the highly unlikely event of a TSF failure could theoretically be, in an extreme case, re-suspended and transported downstream to Wabigoon Lake during heavy rainfall or spring freshet events, this would only occur if Treasury Metals did not implement any containment measures, or undertake any remediation following a TSF failure. As stated in Section 4.3.2.5 of the revised EIS (April 2018), and expanded on in the response to TMI_246-AM(1)-04 and in TMI_246-AM(1)-04_Addendum_1, any solids released in the unlikely event of a TSF failure would be contained as set out in the Emergency and Spill Response Management Plan and remediated as soon as safe and practicable. While the specific details of the tailings remediation would be dependent on the extent and nature of the release, a general strategy would involve remediating the tailings spilled on land between the TSF and the creek as soon as the TSF could be stabilized and repaired sufficiently to receive the spilled tailings and any affected material. Tailings that reach Blackwater Creek would need to be contained with sediment traps and would then be remediated when appropriate. Given the physiography of Blackwater Creek and the proximity to Tree Nursery Road, it is possible that limited manual remediation activities could proceed immediately following discussions with the Department of Fisheries and Oceans (DFO), other parties as required by legislation or agreement. The bulk of the remediation activities would likely require the use of heavy equipment and may occur during the first winter, when the ground bordering the creek is frozen for improved access, and when creek flows are predictably low. Therefore, the re-suspension of tailings deposited in Blackwater Creek in the highly unlikely event of a TSF failure would only be an issue until the remediation activities requiring the use of heavy equipment could occur. For the months prior to the first winter, Treasury Metals would deploy appropriate silt fencing and sediment traps to contain tailings and prevent their re-mobilization and transport downstream.

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				It is therefore assumed that there would be no residual environmental effects from the re-suspension of tailings solids in Blackwater Creek. Appropriate mitigation, including silt fencing placed in Blackwater Creek, would contain the sediments and prevent transport downstream until access to the creek is available to remove any deposited tailings. The tailings would be present in Blackwater Creek for a relatively short period of time. PART B No additional mitigation measures, beyond those already set out, are required to control the possible re-mobilization of tailings solids deposited in the highly unlikely event of a TSF failure and a natural episodic event. As stated in Section 4.3.2.5 of the revised EIS (April 2018), and expanded on in the response to TMI_246-AM(1)-04 and in TMI_246-AM(1)-04_Addendum_1, any solids released in the unlikely event of a TSF failure would be contained as set out in the Emergency and Spill Response Management Plan and remediated as soon as practicable. While the specific details of the tailings remediation would be dependent on the extent and nature of the release, a general strategy would involve remediating the tailings spilled on land between the TSF and the creek as soon as the TSF could be stabilized and repaired sufficiently to receive the spilled tailings. Tailings that reach Blackwater Creek would need to be contained with sediment traps and would then be remediated when safe and practicable to do so. Given the physiography of Blackwater Creek and the proximity to Tree Nursery Road, it is possible that limited manual remediation activities could proceed immediately following discussions with DFO and other parties required through legislation or agreement. The bulk of the remediation activities would likely require the use of heavy equipment and could occur during the first winter, when the ground bordering the creek is frozen for improved access, and when creek flows are predictably low. Silt fencing will be established to prevent the tailings solids from migrating downstream in Blackwater Creek. There are no additional measures required to avoid or mitigate the potential effects of the remobilization of particulate material aside from the silt fencing and the cleaning up of the tailings solids as soon as safe and practicable. Part C. First and foremost, Treasury Metals have incorporated contingencies into the design of the tailings storage facility (TSF) to avoid the potential for a failure to occur. The TSF will be designed and constructed using sound engineering principles and accepted standards to ensure protection of the environment during all phases of the Project, as well as reviewed by the Engineer of Record. Designs will be in accordance with the latest version of the Canadian Dam Association (CDA) Dam Safety Guidelines (2007), the MNRF Best Management Practices (2011) and the Provincial Lakes and Rivers Improvement Act, as applicable. The TSF will be designed for operational and storm water management based on hydrological modelling using historical climatic data. Operational pond levels will be established and an allowance to hold the volume of water resulting from the Environmental Design Storm (EDS) will be developed. The spillway will be designed to route flows resulting from the Inflow Design Floods (IDF) as prescribed by the Hazard Potential Classification (HPC) of the dam. The embankment heights will also be designed with the required freeboard allowances, for normal and minimum freeboard, as prescribed by the guidelines listed above. The embankments will be designed with zoned earth fill raises and meet the standards set forth by the applicable guidelines. The embankments will be designed to be stable and meet the required minimum Factors of Safety under the required conditions.

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				A Dam Safety Management Plan will be developed and finalized prior to the start of the dam construction on site. A further description of the Dam Safety Management Plan is provided in Section 12.14 of the revised EIS, and will consist of the following: • At least daily visual inspection during operational processes of all embankments and berms, pipelines, pumps, culverts and spillways to identify any visible problems such as pipeline damage, blockage, embankment seepage, and slope instabilities. • A more detailed inspection of these same facilities and others, will be conducted on a monthly basis to look for any less obvious signs of potential problems. • During, when safe to do so, and following any high potential events and spring melt, a more detailed inspection will be conducted to ensure the integrity of the TSF and related structures. • The facility will be inspected by a qualified third party geotechnical engineer on an annual basis (Dam Safety Inspection) to verify that the embankments are performing as designed. The inspections will likely be carried out during or shortly after the spring melt under snow free conditions. • A full Dam Safety Review will be completed by the Engineer of Record (external qualified geotechnical engineer) at the prescribed time intervals, but most likely on a 5 year basis. • Ground movement sensors will be installed on the TSF to detect any early movement on embankments, berms and dams. • If any stability-related issues are identified during dam inspections or during other site reviews, an external qualified geotechnical engineer will be brought to site to assess the issue and provide guidance on the appropriate path forward including remedial actions if appropriate. The perimeter seepage collection ditches will be designed to contain the potential volume of water from seepage through the embankment and upstream runoff. All seepage will be collected and routed to a collection point to allow for pumping and return to the TSF containment area. The ditches will also be designed with sufficient freeboard to ensure that water overflows do not occur. The ditches will be lined with a low permeability material (such as geotextile) to ensure that seepage is contained within the ditch and that erosion damage does not occur. A compliance monitoring program will be developed, and included in the Dam Safety Management Plan, prior to construction to assess the performance of the TSF and associated seepage collection. Surface and groundwater monitoring programs will also be included and used to ensure that seepage is not impacting groundwater offsite. In the highly unlikely event that a TSF failure were to occur, Section 4.3.2.3 of the revised EIS (April 2018) provides a conservative assessment of what the water quality at Christie's Island, the mouth of Thunder Creek and Bonny Bay could be. The maximum instantaneous concentrations were presented in Table 4.3.2.3-3 of the revised EIS (April 2018), and have been replicated in Table 1. Table 1 also lists the corresponding PWQO (the level that affords protection for long-term chronic exposures) and the acute toxicity values used by the U.S. EPA. As shown in Table 1, the absolute maximum concentrations were only predicted to exceed the PWQO (the level for long-term chronic protection) for nine (9) constituents at Christie's Island, four (4) constituents at the mouth of Thunder Creek and five (5) constituents in Bonny Bay. As shown in Table 4.3.2.3-4 of the revised EIS (April 2018),

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the parameters were only predicted to exceed the PWQO for a few days. As the PWQO were selected to be protective against long-term chronic exposures, it is unlikely that relatively short-term excursions would have a noticeable effect on fish health, especially for higher trophic level species (e.g., walleye and pike) or would accumulate elevated levels of metals from the water column compared to background conditions as a result of a TSF failure.

In the highly unlikely event of a TSF failure, Treasury Metals would complete an assessment of the fish in Christie's Island, Thunder Creek, and Bonny Bay to ensure fish quality does not change from background conditions. More importantly, Table 1 shows that in the unlikely event of a TSF failure, the maximum concentrations at Christie Island, the mouth of Thunder Creek and Bonny Bay would be well below the levels identified as being acutely toxic to fish.

Table 1: Maximum Predicted Concentrations in Wabigoon lake in the Highly Unlikely Event of a TSF Failure

Parameter	Provincial Water Quality Objectives (PWQO)	Acute Mortality (3)	Christie's Island	Thunder Creek	Bonny
Al	0.075	0.16	0.0734	0.0042	0.010
Cd	0.0002	3.698	0.0004 (2)	0.0000	0.000
Co	0.0006	3.4	0.0011	0.0001	0.000
Cu	0.005	0.63	0.0241	0.0014	0.003
Fe	0.3	2.25	0.1268	0.0072	0.017
Pb	0.005	1.32	0.1127	0.0064	0.015
Hg	0.0002	0.33	0.0047	0.0003	0.000
Se	0.1	1	0.4347	0.0247	0.059
Ag	0.0001	0.0081	0.0001	0.0000	0.000
Tl	0.0003	14	0.1402	0.0080	0.019
U	0.005	6.2	0.0043	0.0002	0.000
Cyanide (4)	0.005	0.3	0.0749	0.0043	0.010

Notes:

(1) The maximum concentrations are as presented in Table 4.3.2.3-3 of the revised EIS (April 2018).

(2) The results highlighted with grey shading indicates where the predicted maximum concentrations exceed the corresponding PWQO. The P represent levels that provide protection against long-term chronic exposures.

(3) The results highlighted with **grey shading and bold-faced, italic type** indicates where the predicted maximum concentrations exceed the acute toxicity thresholds (LC50) from the U.S. EPA ECOTOX database.

(4) Total cyanide

References:

- Treasury Metals Inc. 2018. Goliath Gold Project, Dryden Ontario: Environmental Impact Statement. April 2018.
- U.S. EPA (U.S. Environmental Protection Agency) 1988-2013. National Recommended Water Quality Criteria - Aquatic Life Criteria Table. https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table. Accessed 2018.
- U.S. EPA (U.S. Environmental Protection Agency) Comtox Database. Accessed 2018, Hazards, ECOTOX Values for Acute Mortality. https://comptox.epa.gov/dashboard

Agency Comment on Draft Response:

C) Indicate what parameters would be assessed during the fish and fish habitat assessment at Christie's Island, at Thunder Creek, and in Bonny Bay in the event of a TSF failure.

An acceptable answer should identify the contaminants predicted to increase from baseline, and in particular those that would exceed PWQOs.

Note that DFO looks forward to reviewing the Emergency and Spill Response Management plan once it is finalized.

Specific Response to Agency Comment:

As shown in Table 1, the only compounds that are predicted to exceed the Provincial Water Quality Objectives (PWQO) for the protection of aquatic life are cadmium, cobalt copper, cyanide, lead, mercury, selenium, and thallium. Table 2 provides a comparison the predicted absolute maximum concentrations Christie's Island, Thunder Creek, and Bonny Bay to the measured baseline predictions.

Table 2: Comparison of Baseline to Maximum Predicted Concentrations in Wabigoon Lake in the Highly Unlikely Event of a TSF Failure

Compound	Overflow Release Quality (mg/L) [Appendix GG2]	Baseline Water Quality Data (2010-2013) in Wabigoon Lake		Maximum Predicted Concentration (mg/L)		
		75th%-ile	100th%-ile	Christie's Island (fish sanctuary)	Thunder Creek (spawning habitat)	Bonny Bay (fishing camp)
Al	0.19855	0.69150	0.81600	0.07346	0.00417	0.01013
Sb	0.00191	0.00060	0.00500	0.00071	0.00004	0.00010
As	0.00953	0.00100	0.00100	**0.00353**	0.00020	0.00049
Ba	0.00439	0.01250	0.02100	0.00162	0.00009	0.00022
Be	0.0004	0.00100	0.00100	0.00015	0.00001	0.00002
Bi	0.0004	0.00100	0.00100	0.00015	0.00001	0.00002
B	0.02075	0.05000	0.05000	0.00768	0.00044	0.00106
Cd	0.00099	0.00009	0.00010	**0.00037**	0.00002	0.00005
Cr	0.02881	0.00115	0.00150	**0.01066**	0.00061	0.00147
Co	0.00304	0.00050	0.00313	0.00112	0.00006	0.00016
Cu	0.06525	0.00205	0.00430	**0.02414**	0.00137	0.00333
Fe	0.34283	0.90400	4.01000	0.12685	0.00720	0.01748

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Pb	0.30458	0.00100	0.00100	**0.11269**	**0.00640**	**0.01553**
Li	0.02	0.10000	0.10000	0.00740	0.00042	0.00102
Mg	1.9599	5.87000	7.62000	0.72516	0.04116	0.09995
Mn	0.0501	0.10600	0.60500	0.01854	0.00105	0.00256
Mo	0.00001	0.00100	0.00100	0.00000	0.00000	0.00000
Hg	0.0126	0.00010	0.00010	**0.00466**	**0.00026**	**0.00064**
Ni	0.00409	0.00200	0.00210	0.00151	0.00009	0.00021
P	0.04	0.03115	0.10400	0.01480	0.00084	0.00204
K	0.842	1.50000	1.90000	0.31154	0.01768	0.04294
Se	1.17477	0.00500	0.00500	**0.43466**	**0.02467**	**0.05991**
Si	0.0353	4.61000	6.35000	0.01306	0.00074	0.00180
Ag	0.00041	0.00010	0.00010	**0.00015**	0.00001	0.00002
Sr	0.96	0.04015	0.06140	**0.35520**	0.02016	0.04896
Tl	0.37888	0.00030	0.00030	**0.14019**	**0.00796**	**0.01932**
Sn	0	0.00100	0.00100	0.00000	0.00000	0.00000
Ti	0.0004	0.02335	0.02960	0.00015	0.00001	0.00002
U	0.01153	0.00500	0.00500	0.00427	0.00024	0.00059
V	0.00329	0.00135	0.00230	0.00122	0.00007	0.00017
Zn	0.0406	0.00360	0.03820	0.01502	0.00085	0.00207
Cyanide (1)	0.20254	0.00200	0.00300	**0.07494**	**0.00425**	**0.01033**

Notes:

Bold and shaded	This indicates where the predicted maximum concentrations exceed the 75th percentile of the available monitoring data (2010–2013) for Wabigoon Lake.
Shaded	This indicates where the predicted maximum concentrations exceed the 75th percentile of the available monitoring data (2010–2013) for Wabigoon Lake.

(1) Total cyanide.

In the unlikely event of a TSF failure, fish tissue samples would be collected from Wabigoon Lake in the vicinity of Christie's Island, Thunder Creek, and Bonny Bay. To the extent possible, tissue will be collected from various trophic levels of fish but would ensure upper trophic levels were included in the samples. The tissue samples would be analyzed by an accredited laboratory for a full suite of metals via ICP-MS using the US EPA method 200.3. This suite would include all of those parameters that are predicted to exceed the PWQO in the unlikely event of a TSF failure, with the exception of cyanide. Analysis for cyanide in fish tissue using a colourimetric method will completed by an accredited laboratory. The fish tissue would also include lipids in tissue and moisture in tissue analyses.

As part of the assessment of the fish in Christie's Island, Thunder Creek, and Bonny Bay following a TSF failure, monitoring would also be completed for water and sediment at each of the locations. The same suite of metals would be sampled in water as was sampled in fish tissue; however, both total and dissolved metals would be analyzed for. The water analysis would also include cyanide, alkalinity, dissolved organic carbon, hardness, pH, ammonia, total phosphorus, total dissolved solids, suspended solids, and total organic carbon. The sediments would be analyzed for the same suite of metals as was sampled in fish tissue, and would also be analyzed for cyanide, methyl mercury, pH, total organic carbon and fraction of organic carbon.

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				FINAL RESPONSE: PART A To clarify what was stated in the context and rationale, the responses to the Round 1 information request did include a description of "the effects and their duration if particulate materials remobilize with heavy rainfall or spring freshet in Blackwater Creek". This information was explicitly provided to the Agency and reviewers in TMI_246-AM(1)-04_Addendum_1. As stated in TMI_246-AM(1)-04 and in Section 4.3.2.5 of the revised EIS (April 2018), and expanded on in TMI_246-AM(1)-04_Addendum_1, the majority of the tailings solids would deposit on land between the TSF and Blackwater Creek in the highly unlikely event of a TSF failure. It was also stated that some tailings solids could be deposited within Blackwater Creek. As described in TMI_246-AM(1)-04_Addendum_1, tailings could be deposited over approximately 1.1 km of the 10.4 km of total creek length in the highly unlikely event of a TSF failure. The section where tailings could be deposited in the unlikely event of the TSF failure is classified as low gradient stream habitat with a sinuous channel and a substrate of primarily fine silt and clay. Additionally, a review of the baseline total suspended solids (TSS) data collected in Blackwater Creek shows that sediments are currently resuspended due to natural episodic events (e.g., storms and spring freshets), and that some of the tailings deposited in Blackwater Creek in the unlikely event of the TSF failure could also be re-suspended and transported downstream. Given baseline characteristics of sediment within Blackwater Creek (i.e., fine silt and clay substrate) and the distance between the TSF and Wabigoon Lake, it is unlikely that TSS concentrations entering Wabigoon Lake will change measurably from background conditions due to the re-suspension of tailings deposited within Blackwater Creek in the unlikely event of the TSF failure. The chemical properties of the re-suspended tailings would however be different from the baseline TSS. Based on the description of potential effects on sediments in Wabigoon Lake from the release of water during a TSF failure (described in TMI_246-AM(1)-04_Addendum_1), the resuspension of tailings deposited in Blackwater Creek would have minimal effects on sediment quality, in the range of an order of magnitude less than the predicted changes in sediment immediately following a TSF failure. Although the tailings deposited in Blackwater Creek in the highly unlikely event of a TSF failure could theoretically be, in an extreme case, re-suspended and transported downstream to Wabigoon Lake during heavy rainfall or spring freshet events, this would only occur if Treasury Metals did not implement any containment measures, or undertake any remediation following a TSF failure. As stated in Section 4.3.2.5 of the revised EIS (April 2018), and expanded on in the response to TMI_246-AM(1)-04 and in TMI_246-AM(1)-04_Addendum_1, any solids released in the unlikely event of a TSF failure would be contained as set out in the Emergency and Spill Response Management Plan and remediated as soon as safe and practicable. While the specific details of the tailings remediation would be dependent on the extent and nature of the release, a general strategy would involve remediating the tailings spilled on land between the TSF and the creek as soon as the TSF could be stabilized and repaired sufficiently to receive the spilled tailings and any affected material. Tailings that reach Blackwater Creek would need to be contained with sediment traps and would then be remediated when appropriate. Given the physiography of Blackwater Creek and the proximity to Tree Nursery Road, it is possible that limited manual remediation activities could proceed immediately following discussions with the Department of Fisheries and Oceans (DFO), other parties as required by legislation or agreement. The bulk of the remediation activities would

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				likely require the use of heavy equipment and may occur during the first winter, when the ground bordering the creek is frozen for improved access, and when creek flows are predictably low. Therefore, the re-suspension of tailings deposited in Blackwater Creek in the highly unlikely event of a TSF failure would only be an issue until the remediation activities requiring the use of heavy equipment could occur. For the months prior to the first winter, Treasury Metals would deploy appropriate silt fencing and sediment traps to contain tailings and prevent their re-mobilization and transport downstream. Since the removal of tailings released in the highly unlikely event of a TSF failure would be completed within the first 12 month, there would be no potential for the onset of ARD. It is therefore assumed that there would be no residual environmental effects from the re-suspension of tailings solids in Blackwater Creek. Appropriate mitigation, including silt fencing placed in Blackwater Creek, would contain the sediments and prevent transport downstream until access to the creek is available to remove any deposited tailings. The tailings would be present in Blackwater Creek for a relatively short period of time. <u>PART B</u> No additional mitigation measures, beyond those already set out, are required to control the possible re-mobilization of tailings solids deposited in the highly unlikely event of a TSF failure and a natural episodic event. As stated in Section 4.3.2.5 of the revised EIS (April 2018), and expanded on in the response to TMI_246-AM(1)-04 and in TMI_246-AM(1)-04_Addendum_1, any solids released in the unlikely event of a TSF failure would be contained as set out in the Emergency and Spill Response Management Plan and remediated as soon as practicable. While the specific details of the tailings remediation would be dependent on the extent and nature of the release, a general strategy would involve remediating the tailings spilled on land between the TSF and the creek as soon as the TSF could be stabilized and repaired sufficiently to receive the spilled tailings. Tailings that reach Blackwater Creek would need to be contained with sediment traps and would then be remediated when safe and practicable to do so. Given the physiography of Blackwater Creek and the proximity to Tree Nursery Road, it is possible that limited manual remediation activities could proceed immediately following discussions with DFO and other parties required through legislation or agreement. The bulk of the remediation activities would likely require the use of heavy equipment and could occur during the first winter, when the ground bordering the creek is frozen for improved access, and when creek flows are predictably low. Silt fencing will be established to prevent the tailings solids from migrating downstream in Blackwater Creek. There are no additional measures required to avoid or mitigate the potential effects of the remobilization of particulate material aside from the silt fencing and the cleaning up of the tailings solids as soon as safe and practicable. <u>Part C.</u> First and foremost, Treasury Metals have incorporated contingencies into the design of the tailings storage facility (TSF) to avoid the potential for a failure to occur. The TSF will be designed and constructed using sound engineering principles and accepted standards to ensure protection of the environment during all phases of the Project, as well as reviewed by the Engineer of Record. Designs will be in accordance with the latest version of the Canadian Dam Association (CDA) Dam Safety Guidelines (2007), the MNRF Best Management Practices (2011) and the Provincial

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				Lakes and Rivers Improvement Act, as applicable. The TSF will be designed for operational and storm water management based on hydrological modelling using historical climatic data. Operational pond levels will be established and an allowance to hold the volume of water resulting from the Environmental Design Storm (EDS) will be developed. The spillway will be designed to route flows resulting from the Inflow Design Floods (IDF) as prescribed by the Hazard Potential Classification (HPC) of the dam. The embankment heights will also be designed with the required freeboard allowances, for normal and minimum freeboard, as prescribed by the guidelines listed above. The embankments will be designed with zoned earth fill raises and meet the standards set forth by the applicable guidelines. The embankments will be designed to be stable and meet the required minimum Factors of Safety under the required conditions. A Dam Safety Management Plan will be developed and finalized prior to the start of the dam construction on site. A further description of the Dam Safety Management Plan is provided in Section 12.14 of the revised EIS, and will consist of the following: • At least daily visual inspection during operational processes of all embankments and berms, pipelines, pumps, culverts and spillways to identify any visible problems such as pipeline damage, blockage, embankment seepage, and slope instabilities. • A more detailed inspection of these same facilities and others, will be conducted on a monthly basis to look for any less obvious signs of potential problems. • During, when safe to do so, and following any high potential events and spring melt, a more detailed inspection will be conducted to ensure the integrity of the TSF and related structures. • The facility will be inspected by a qualified third party geotechnical engineer on an annual basis (Dam Safety Inspection) to verify that the embankments are performing as designed. The inspections will likely be carried out during or shortly after the spring melt under snow free conditions. • A full Dam Safety Review will be completed by the Engineer of Record (external qualified geotechnical engineer) at the prescribed time intervals, but most likely on a 5-year basis. • Ground movement sensors will be installed on the TSF to detect any early movement on embankments, berms and dams. • If any stability-related issues are identified during dam inspections or during other site reviews, an external qualified geotechnical engineer will be brought to site to assess the issue and provide guidance on the appropriate path forward including remedial actions if appropriate. The perimeter seepage collection ditches will be designed to contain the potential volume of water from seepage through the embankment and upstream runoff. All seepage will be collected and routed to a collection point to allow for pumping and return to the TSF containment area. The ditches will also be designed with sufficient freeboard to ensure that water overflows do not occur. The ditches will be lined with a low permeability material (such as geotextile) to ensure that seepage is contained within the ditch and that erosion damage does not occur.

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A compliance monitoring program will be developed, and included in the Dam Safety Management Plan, prior to construction to assess the performance of the TSF and associated seepage collection. Surface and groundwater monitoring programs will also be included and used to ensure that seepage is not impacting groundwater offsite.

In the highly unlikely event that a TSF failure were to occur, Section 4.3.2.3 of the revised EIS (April 2018) provides a conservative assessment of what the water quality at Christie's Island, the mouth of Thunder Creek and Bonny Bay could be. The maximum instantaneous concentrations were presented in Table 4.3.2.3-3 of the revised EIS (April 2018), and have been replicated in Table 1. Table 1 also lists the corresponding PWQO (the level that affords protection for long-term chronic exposures) and the acute toxicity values used by the U.S. EPA for the protection of freshwater aquatic life. As shown in Table 1, the absolute maximum concentrations were only predicted to exceed the PWQO (the level for long-term chronic protection) for nine (9) constituents at Christie's Island, four (4) constituents at the mouth of Thunder Creek and five (5) constituents in Bonny Bay. As shown in Table 4.3.2.3-4 of the revised EIS (April 2018), the parameters were only predicted to exceed the PWQO for a few days. As the PWQO were selected to be protective against long-term chronic exposures, it is unlikely that relatively short-term excursions would have a noticeable effect on fish health, especially for higher trophic level species (e.g., walleye and pike) or would accumulate elevated levels of metals from the water column compared to background conditions as a result of a TSF failure. Additionally, none of the predicted absolute maximum concentrations in at Christie Island, the mouth of Thunder Creek, and Bonny Bay, the unlikely event of a TSF failure, exceed the acute toxicity values used by the U.S. EPA for the protection of freshwater aquatic life.

Table 1: Maximum Predicted Concentrations in Wabigoon lake in the Highly Unlikely Event of a TSF Failure

Parameter	Provincial Water Quality Objectives (PWQO)	Acute Mortality [3]	Christie's Island	Thunder Creek	Bonny Bay
Al	0.075	0.16	0.0734	0.0042	0.0101
Cd	0.0002	3.698	0.0004 [2]	0.0000	0.0001
Co	0.0006	3.4	0.0011	0.0001	0.0002
Cu	0.005	0.63	0.0241	0.0014	0.0033
Fe	0.3	2.25	0.1268	0.0072	0.0175
Pb	0.005	1.32	0.1127	0.0064	0.0155
Hg	0.0002	0.33	0.0047	0.0003	0.0006
Se	0.1	1	0.4347	0.0247	0.0599
Ag	0.0001	0.0081	0.0001	0.0000	0.0000
Tl	0.0003	14	0.1402	0.0080	0.0193

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U	0.005	6.2	0.0043	0.0002	0.0006
Cyanide (4)	0.005	0.3	0.0749	0.0043	0.0103

Notes:

(1) The maximum concentrations are as presented in Table 4.3.2.3-3 of the revised EIS (April 2018).

(2) The results highlighted with grey shading indicates where the predicted maximum concentrations exceed the corresponding PWQO. The PWQO represent levels that provide protection against long-term chronic exposures.

(3) The results highlighted with **blue shading and bold-faced, italic type** indicates where the predicted maximum concentrations exceed the U.S. EPA acute toxicity thresholds (LC50) from the U.S. EPA ECOTOX database. There were no situations predicted where the predicted maximum concentrations exceed the U.S. EPA acute toxicity thresholds.

(4) Total cyanide

Table 2 provides a comparison the predicted absolute maximum concentrations Christie's Island, Thunder Creek, and Bonny Bay to the measured baseline predictions.

Table 2: Comparison of Baseline to Maximum Predicted Concentrations in Wabigoon Lake in the Highly Unlikely Event of a TSF Failure

Compound	Overflow Release Quality (mg/L) [Appendix GG2]	Baseline Water Quality Data (2010-2013) in Wabigoon Lake		Maximum Predicted Concentration (mg/L)		
		75th%-ile	100th%-ile	Christie's Island (fish sanctuary)	Thunder Creek (spawning habitat)	Bonny Bay (fishing camp)
Al	0.19855	0.69150	0.81600	0.07346	0.00417	0.01013
Sb	0.00191	0.00060	0.00500	0.00071	0.00004	0.00010
As	0.00953	0.00100	0.00100	**0.00353**	0.00020	0.00049
Ba	0.00439	0.01250	0.02100	0.00162	0.00009	0.00022
Be	0.0004	0.00100	0.00100	0.00015	0.00001	0.00002
Bi	0.0004	0.00100	0.00100	0.00015	0.00001	0.00002
B	0.02075	0.05000	0.05000	0.00768	0.00044	0.00106
Cd	0.00099	0.00009	0.00010	**0.00037**	0.00002	0.00005
Cr	0.02881	0.00115	0.00150	**0.01066**	0.00061	0.00147
Co	0.00304	0.00050	0.00313	0.00112	0.00006	0.00016
Cu	0.06525	0.00205	0.00430	**0.02414**	0.00137	0.00333
Fe	0.34283	0.90400	4.01000	0.12685	0.00720	0.01748
Pb	0.30458	0.00100	0.00100	**0.11269**	**0.00640**	**0.01553**
Li	0.02	0.10000	0.10000	0.00740	0.00042	0.00102
Mg	1.9599	5.87000	7.62000	0.72516	0.04116	0.09995
Mn	0.0501	0.10600	0.60500	0.01854	0.00105	0.00256
Mo	0.00001	0.00100	0.00100	0.00000	0.00000	0.00000
Hg	0.0126	0.00010	0.00010	**0.00466**	**0.00026**	**0.00064**
Ni	0.00409	0.00200	0.00210	0.00151	0.00009	0.00021
P	0.04	0.03115	0.10400	0.01480	0.00084	0.00204
K	0.842	1.50000	1.90000	0.31154	0.01768	0.04294
Se	1.17477	0.00500	0.00500	**0.43466**	**0.02467**	**0.05991**

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Si	0.0353	4.61000	6.35000	0.01306	0.00074	0.00180
Ag	0.00041	0.00010	0.00010	**0.00015**	0.00001	0.00002
Sr	0.96	0.04015	0.06140	**0.35520**	0.02016	0.04896
Tl	0.37888	0.00030	0.00030	**0.14019**	**0.00796**	**0.01932**
Sn	0	0.00100	0.00100	0.00000	0.00000	0.00000
Ti	0.0004	0.02335	0.02960	0.00015	0.00001	0.00002
U	0.01153	0.00500	0.00500	0.00427	0.00024	0.00059
V	0.00329	0.00135	0.00230	0.00122	0.00007	0.00017
Zn	0.0406	0.00360	0.03820	0.01502	0.00085	0.00207
Cyanide (1)	0.20254	0.00200	0.00300	**0.07494**	**0.00425**	**0.01033**

Notes:

Bold and shaded This indicates where the predicted maximum concentrations exceed the 100th percentile of the available monitoring data (2010–2013) for Wabigoon Lake.

Shaded This indicates where the predicted maximum concentrations exceed the 75th percentile of the available monitoring data (2010–2013) for Wabigoon Lake.

(1) Total cyanide.

In the highly unlikely event of a TSF failure, Treasury Metals would complete an assessment of the fish in Christie's Island, Thunder Creek, and Bonny Bay. As shown in Table 1, the only compounds that are predicted to exceed the Provincial Water Quality Objectives (PWQO) for the protection of aquatic life are cadmium, cobalt copper, cyanide, lead, mercury, selenium, and thallium. As shown in Table 2, arsenic, cadmium, chromium, copper, lead, mercury, selenium, silver, strontium, thallium and cyanide are only compounds where the predicted absolute maximum concentrations in the highly unlikely event of a TSF failure are outside the range of baseline conditions.

In the unlikely event of a TSF failure, fish tissue samples would be collected from Wabigoon Lake in the vicinity of Christie's Island, Thunder Creek, and Bonny Bay. To the extent possible, tissue will be collected from various trophic levels of fish but would ensure upper trophic levels were included in the samples. The tissue samples would be analyzed by an accredited laboratory for a full suite of metals via ICP-MS using the US EPA method 200.3. This suite would include all of those parameters that are predicted to exceed the PWQO in the unlikely event of a TSF failure, with the exception of cyanide. Analysis for cyanide in fish tissue using a colourimetric method will also be completed by an accredited laboratory. The fish tissue would also include lipids in tissue and moisture in tissue analyses.

As part of the assessment of the fish in Christie's Island, Thunder Creek, and Bonny Bay following a TSF failure, monitoring would also be completed for water and sediment at each of the locations. The same suite of metals would be sampled in water as was sampled in fish tissue; however, both total and dissolved metals would be analyzed for. The water analysis would also include cyanide, alkalinity, dissolved organic carbon, hardness, pH, ammonia, total phosphorus, total dissolved solids, suspended solids, and total organic carbon. The sediments would be analyzed for the same suite of metals as was sampled in fish tissue, and would also be analyzed for cyanide, methyl mercury, pH, total organic carbon and fraction of organic carbon.

References:

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				Treasury Metals Inc. 2018. Goliath Gold Project, Dryden Ontario: Environmental Impact Statement. April 2018. U.S. EPA (U.S. Environmental Protection Agency) 1988-2013. National Recommended Water Quality Criteria - Aquatic Life Criteria Table. https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table. Accessed 2018. U.S. EPA (U.S. Environmental Protection Agency) Comtox Database. Accessed 2018, Hazards, ECOTOX Values for Acute Mortality. https://comptox.epa.gov/dashboard