



# **Goliath Gold Project Follow-Up Program Addendum**

Goliath Gold Project  
Treasury Metals Inc.

Prepared for:

**Treasury Metals Inc.**

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## **FUP1. GOLIATH GOLD PROJECT FOLLOW-UP PROGRAM ADDENDUM**

A number of Round 2 Information Requests asked that the Follow-Up Program submitted as Section 13 of the EIS (April 2018) be revised. The Goliath Gold Follow-Up Addendum has been provided in support of the Round 2 Information Request Process and delivers a comprehensive and consolidated answer to all Round 2 Information Requests related to the Follow-Up Program (and monitoring in support of the Follow-Up Program). A draft version of the Goliath Gold Project Addendum was submitted to the Agency, their reviews and the Indigenous Stakeholders for review in September 2018. This final Goliath Gold Follow Up Addendum incorporated all requested updates as part of the Round 2 process, and supersedes all previous versions of the follow up program. The Goliath Gold Preliminary Regulatory Monitoring Addendum has also been provided in Response to the Round 2 Information Requests, however differs from the Follow-Up Addendum in that its purpose is specific to provide an outline of anticipated future regulatory monitoring requirements (to be defined with the applicable regulatory agencies during the permitting phase).

A number of the Round 2 Information Requests provided to Treasury Metals as Annex 4, requested that Treasury Metals describe how Indigenous communities will be consulted in the development and implementation of the Follow-Up Program. As stated in Section 12.22 of the revised EIS (April 2018), to ensure that Indigenous communities most affected by the Project have input into the effectiveness of the Environmental Management Plans, Follow-up Programs and Monitoring Programs, Treasury Metals proposes to form an Environmental Management Committee. This committee would be made up of members from Indigenous communities and would meet with representatives from Treasury Metals on a to-be-determined basis, possibly quarterly or semi-annually. Treasury Metals would present any reportable information on the management plans as well as the results of the Follow-up and Monitoring Programs. If exceedances or issues arise that show mitigation measures have not been as effective as expected, the potential for further actions would be discussed with the committee. The Environmental Management Committee would also provide a forum for discussing other environmental matters with the potentially affected Indigenous communities such as upcoming permits, additional traditional knowledge that might have been collected since completion of the Environmental Assessment process, and any other environmental matters of relevance to the committee including financial support for operation of the committee. Treasury Metals encourages and welcomes participation by members of all Indigenous Communities as part of the proposed Environmental Management Committee so that requests raised as part of the Round 2 Information Request process may be appropriately considered and completed.

### **FUP1.1 Introduction**

In accordance with CEAA 2012, a Follow-Up Program (FUP) is procedural methodology for “verifying the accuracy of the environmental assessment of a designated project”, and for “determining the effectiveness of any mitigation measures”, that are implemented to mitigate the adverse effects of the Project. In accordance with the EIS Guidelines, the follow-up program is to be described in “sufficient detail to allow independent judgment as to the likelihood that it will deliver the type, quantity and quality of information required to reliably verify predicted effects (or absence of them), and to confirm both the assumptions and the effectiveness of mitigation”. The follow-up program will also include:

- Specific commitments that clearly describe how the proponent intends to implement them;

- Any contingency procedures/plans or other adaptive management provisions as a means of addressing unforeseen effects or for correcting exceedances as required to comply or to conform to benchmarks, regulatory standards or guidelines; and
- Monitor the implementation of mitigation measures resulting from Indigenous consultation.

Environmental monitoring is a key part of the follow-up program, and is one of the tools used to help verify that realized environmental effects during Project development and operation are in line with predictions made in the EIS effects analysis. Many aspects of the environmental monitoring program are expected to be prescribed in the various Provincial and Federal approvals that will be needed for mine operations.

Principal components of the Project follow-up program are the following:

- EA prediction (including an overview of follow-up program and monitoring objectives);
- Rationale for inclusion in the follow-up program;
- Proposed monitoring program (verification / assessment methods);
- Current mitigation measures;
- Criteria for considering adaptive management and potential adaptive measures;
- Applicable regulatory instruments and associated government agencies;
- Program responsibilities; and
- Reporting requirements.

At the EIS stage, the follow-up program is typically presented at a framework level of detail, recognizing that further details will be developed at a later stage, following completion of the EIS, in conjunction with the mine permitting phase. The level of detail presented at the EIS stage must, nevertheless, be sufficient to provide confidence in the overall program, and its ability to confirm, track and respond to environmental performance.

The follow-up program for the Project is structured on a discipline basis as per the CEA Agency request. The follow-up program elements that do not lend themselves to division by discipline such as those involving tailings dam performance, health and safety, and traffic are considered separately.

The follow-up program is designed to be adaptive to account for any environmental effects that were not expected, new information that becomes available, or mitigation measures that are found to not to be effective. Therefore, the follow-up program is subject to change as the Project is further developed, and as input is received from government agencies, Indigenous groups, and stakeholders. This inclusive process will allow for all parties involved to have input into the final follow-up program.

The follow-up program provided in this section of the EIS takes into consideration input from the Round 1 information requests made by government agencies, Indigenous peoples and stakeholders, to incorporate concerns made throughout Project engagement.

As the primary goals of the follow-up program are to “verifying the accuracy of the environmental assessment of a designated project”, and to “determining the effectiveness of any mitigation measures”, the monitoring programs presented herein are designed to cease once these goals are met.

## **FUP1.2 Terrain and Soils**

### **FUP1.2.1 EA Prediction and Overview of Follow-up Program and Monitoring Objectives 1.2.1**

The predicted effects from the Project on terrain and soils are presented in Section 6.2 of the revised EIS. The single predicted residual effect to the natural landscape is that related to potential visibility of the WRSA. Through avoidance (Section 6.2.3) and mitigation measures (Section 6.2.5), Treasury Metals is confident that the WRSA will not dramatically alter the natural landscape when viewed from Thunder Lake, the only location where modelling indicates the WRSA will be visible. Once it has been vegetated, it may be difficult to discern the WRSA from the surrounding area. To confirm this, Treasury Metals will record the viewsapes from Thunder Lake over the life of the Project to show how noticeable the WRSA is. The proposed terrain and soils follow-up program will begin once waste rock has begun being deposited in the designated WRSA, and will end in the closure phase when the WRSA will be covered and vegetated.

### **FUP1.2.2 Rationale for Inclusion in the Follow-up Program**

Aesthetics have been defined as a potential concern for the Project, and in particular the potential for viewscape changes to diminish the experience of being on the land, while undertaking traditional and recreational pursuits. The WRSA is expected to be developed to an approximate 25 to 30 m height above ground and will be the tallest Project related feature on the landscape.

The only point of public access where the WRSA would be visible is from Thunder Lake. Viewscape analysis indicates that with the retention of tree screens, the WRSA will not be visible from the eastern portion of the lake, but the upper part of the feature will be visible from the western side of the lake. Other features on the site (i.e., overburden stockpile and LGO stockpile) are not expected to be visible because of their lower profiles.

### **FUP1.2.3 Proposed Monitoring Program**

The proposed terrain and soils monitoring will include:

- Survey the elevation of the top of the WRSA.
  - Use survey equipment to periodically record the elevation of the top of the WRSA.
- Record photographic viewsapes of the WRSA from set locations on Thunder Lake.

- Establish set locations for recording photographic record of the WRSA (same locations as used in pre-construction visualization).
- Annually photograph the WRSA from the set locations on Thunder Lake until the WRSA is at its maximum height, prior to vegetation of the WRSA.
- Once the WRSA is vegetated, an annual photograph the WRSA will be taken in the mid-summer from the set locations on Thunder Lake until the end of the closure phase.

#### **FUP1.2.4 Current Mitigation Measures**

The following design features and procedures will be implemented as part of the Project to minimize or avoid the effects of the Project on viewscape changes to the natural terrain:

- Reduce the overall height of the constructed features to the extent possible [Mit\_001];
- Construct WRSA and overburden stockpiles with an overall a 3:1 (horizontal to vertical) side slope to maintain a more natural appearance [Mit\_002];
- Vegetate the western facing side of the WRSA as soon as practicable [Mit\_004]; and
- The WRSA will be capped with a low permeability cover, then a layer of overburden, then vegetated during closure [Mit\_018].

In addition to these measures, Treasury Metals will regularly review their procedures and processes during the life of the Project to identify opportunities where practices can be modified, and new procedures put in place to further reduce and mitigate the potential effects of the Project.

#### **FUP1.2.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures**

In the event that viewscape changes during operations are identified as problematic members of Indigenous communities and local stakeholders, Treasury Metals will consider accelerating the efforts to revegetate the western portion of the WRSA. Additionally, Treasury Metals would review the feasibility of accelerating the closure and reclamation of the WRSA, which would include the placement of a low permeability cover to isolate PAG waste rock and reduce the potential for ARD. However, accelerated closure cannot proceed until all of the materials to be placed in the WRSA are in place.

#### **FUP1.2.6 Program Responsibilities**

Treasury Metals will be responsible for carrying out the follow-up program. The CEA Agency is responsible for ensuring the follow-up program is carried out.

#### **FUP1.2.7 Reporting**

Treasury Metals intends to provide confirmation in an annual follow-up program report that the terrain and soils avoidance and mitigation measures have been implemented and are effectively minimizing

aesthetic effects of the WRSA. This report will be provided to government agencies, Indigenous peoples and stakeholders. As a minimum, the annual report on the follow-up program will provide a compendium of annual photographs taken from the Thunder Lake reference locations, together with a brief summary of any previous public complaints and follow-up.

If new public complaints were received during the reporting year, regarding Project view, the annual follow-up program report would include a summary of any such public complaints, including:

- □ Investigation and identification of the noticeable site feature;
- □ Actions taken to address the complaint; and
- □ Actions taken to mitigate the source of the complaint, if related to the Project.

### **FUP1.3      Geology and Geochemistry**

#### **FUP1.3.1      EA Prediction and Overview of Follow-up Program and Monitoring Objectives**

The predicted effects relating to geology and geochemistry are summarized in Section 6.3 of the revised EIS. A single residual adverse effect on the pit lake water quality VC was identified in the post-closure phase. There were no residual effects predicted during the site preparation and construction, operations, and closure phases. The geochemical follow-up program outlined herein provides information to help demonstrate the validity of the EIS predictions and confirm the effectiveness of the mitigation measures proposed. Monitoring of the pit lake water quality as the pit lake is filling will be used to advise Treasury Metals on whether pit lake discharge into Blackwater Creek will meet PWQO, or if further treatment is required prior to the pit lake filling with water. Additionally, it is expected that a comprehensive water quality monitoring program specific to the pit lake will be required as part of the certified closure plan to be developed, filed with MNM prior to the start of construction. Additionally, a regulatory permitting process (i.e., Environmental Compliance Approval [ECA] under the *Environmental Protection Act* (MOECC 1990)) may be required for the releases from the pit lake, before Treasury Metals will be able to release water from the pit lake. The ECA monitoring program will be developed following the closure activities, during the period when the pit lake is filling with water. It is expected that regulatory monitoring would apply to discharges from the pit lake into Blackwater Creek Tributary 1.

Parts of this proposed geochemical monitoring program may need to be modified to reflect the requirements of the subsequent regulatory permitting process. Such changes would aim to harmonize both the regulatory monitoring requirements (i.e., the ECA process) and monitoring to confirm the EIS findings. The proposed monitoring for pit lake water quality would begin in the closure phase, once the dewatering activities cease and the open pit begins to fill with water. It is expected that monitoring of pit lake water quality would continue into the post-closure period until the regulators are satisfied the closure landscape is functioning as intended, at which time they would instruct Treasury Metals that the monitoring can cease.

As part of the process to respond to the Round 1 information requests, Treasury Metals re-evaluated the geochemistry of the rock to be mined at the Project and took a more conservative approach to the time for the onset of acidification as well as the quality of seepage likely to result from the WRSA and the TSF.

In recognition of the conservative nature of the revised assessment, additional geochemical monitoring and analyses were recommended to confirm the conservative nature of the analysis presented in Section 6.3, and to better characterize the expected long-term geochemical conditions expected for the Project.

### **FUP1.3.2 Rationale for Inclusion in the Follow-up Program**

At mine closure, all drainage from the site, including from the TSF and the WRSA, will be routed to the open pit which will gradually fill with water to the point where a passive overflow will occur to the environment. It is important to monitor the quality of this passive overflow, and geochemical factors which could influence the quality of this outflow.

### **FUP1.3.3 Proposed Monitoring Programs**

#### **Pit Lake Monitoring**

- Pit lake water samples will be taken from a safe location on the ramp leading down into the pit using standard surface water sampling procedures.
- Pit lake monitoring will be conducted following the cessation of groundwater pumping until the open pit is flooded or until released from monitoring by regulatory agencies.
- Samples will be analyzed for:
  - Metals (dissolved).
  - Major anions and cations.
  - In-situ field parameters (temperature, reduction-oxidation potential, pH, dissolved oxygen).
- Data analysis will include long-term tracking of seasonal and annual trends, together with applicable climate and hydrological data necessary to calculate trends in loading criteria.
- Use the results of the monitoring, along with additional geochemical data collected during the life of the Project to update the pit lake model.

#### **Pit Lake Discharge Monitoring**

- Water samples will be taken from the discharge location from the pit lake into Blackwater Creek Tributary 1.
- Samples will be analyzed for:
  - Metals (total and dissolved).
  - Major anions and cations.
  - In-situ field parameters (temperature, reduction-oxidation potential, pH, dissolved oxygen).

## Geochemical Monitoring

On-going geochemical studies are expected to be integral with mine planning for tailings and waste rock management to reduce risk, and potentially lower water treatment costs during operations and optimize future mine closure options. A number of additional studies are planned or being evaluated to be executed with on-going further detailed mine planning.

- □ Conduct supplemental ML/ARD static testing analysis to assess the potential influence of aged (2009 and 2010) drill core on previous ML/ARD investigations and more completely assess mercury and selenium as contaminants of potential concern, as well as chloride and phosphorus. Mercury, selenium, chloride and phosphorous will be routinely included in any additional follow-up geochemical testing and monitoring programs.
- □ With the support of project geologists, review the potential value (and execute as appropriate) an expanded geological study and static ML/ARD testing program to identify whether there is potential geological zonation of neutralization potential within the future open pit that could result in the ability to segregate rapid and delayed acid onset PAG waste rock that would potentially reduce water treatment requirements. To the extent possible with available sample materials, assess whether waste rock grain-size is likely to exert an influence on ML/ARD for Goliath rock.
- □ Review underground mine-plan and geology when available and conduct a targeted analysis of representative samples of ore, waste rock and tailings as required.
- □ With the support of geology and mining teams review the range in ore characteristics expected over the life of mine and assess potential variability in ore through supplemental ML/ARD characterization of selected ore samples and low grade ore samples as appropriate.
- □ Continue operation of existing field cells (one for each lithology) and consider initiation of a supplemental program using crushed drill core or early blasted rock as available to more closely simulate field leaching conditions for major lithologies
- □ Initiate a supplemental kinetic testing program for low grade ore, waste rock and tailings to address gaps in the current program. The specific details of this program would be informed by additional studies and testing described above.
  - □ A focus of this program will be to better understand acid onset times of low grade ore, waste rock and tailings and the evolution of acidic drainage to support updated water quality modelling for the project.
  - □ Execution of column tests (e.g. trickle leach or subaqueous) on selected representative waste rock or tailings materials will be considered where such additional water quality assessment is warranted.



- Materials for tailings kinetic test work would originate from metallurgical test work and include analysis of tailings supernatant as an assessment of future mill process water. The work would include analysis suitable to assess the concentration of thiosalts present (if any).
- All kinetic test work would be guided, executed and continued to appropriate termination in accordance with MEND 2009 guidance. Humidity cell closeout analysis will be completed in accordance with MEND 2009.
- Mineralogical analysis by petrographic microscopy and Rietveld X-ray diffraction will be completed on selected samples to aid in understanding acid drainage and metal leaching. As a value-added item, detailed mineralogical studies such as QEMScan or MLA may be considered if they are deemed to provide value in understanding and managing future drainage quality from waste rock and tailings.
- Develop a program to identify suitable construction rock for the Project that could target previously unsampled regions of the open pits, other potentially low sulphide on-site rock or identification of an off-site source.
- Continue to update mine rock management planning for all aspects of the Project including underground operations, based on the further and continuing geochemical studies.
- Explore mitigation options and possibly further studies on waste rock and tailings covers to support detailed planning and design to minimize the risk of ARD development and to lower potential water treatment costs during operations and work toward eliminating a need for water treatment in the closure and post-closure phases of the Project.
- Develop a pit lake model to predict pit lake water quality during the pit filling and post-closure periods, with such model to identify applicable short-term and long-term water management and treatment requirements. The pit lake model may be periodically updated as new information becomes available.

#### **FUP1.3.4 Current Mitigation Measures**

Measures listed below will be employed as part of the Project to limit or avoid the effects on geology and geochemistry. These measures are primarily focused on controlling potentials for ML/ARD development in water that would report to the open pit.

- Waste rock will be evaluated and segregated between PAG and NAG rock, if feasible. [Mit\_019].
- The PAG waste rock would be placed in the mined out areas of the open pit, to the extent practical. [Mit\_020].
- During operations, tailings will be maintained in saturated conditions, and a water cover will be maintained over the majority of the TSF to prevent the onset of acidification. [Mit\_021].

- The WRSA will be capped with a low permeability cover, then a layer of overburden, then vegetated during closure. [Mit\_018].
- The open pit will be allowed to flood at closure [Mit\_022].
- Tailings within the TSF will be isolated using either a low permeability dry cover, or a wet cover of non-process water or process water that has been treated to meet PWQO. The preferred option for limiting environmental effects is a wet cover. [Mit\_023].
- 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 background if background levels exceed the PWQO, prior to the discharge from the pit lake to a tributary of Blackwater Creek. [Mit\_024].
- Once the pit lake is fully flooded, it is expected that the monitoring of the water quality in the pit lake will continue for a period of time to determine whether additional batch treatment may be required to ensure the water released from the pit lake meets effluent release limits. [Mit\_124].

### **FUP1.3.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures**

If monitoring and geochemical data indicate that the pit lake outflow is not likely to be suitably protective of Blackwater Creek, then further measures will be evaluated as to their potential to improve pit lake discharge water quality. Potentially applicable adaptive measures could include:

- Improving TSF and WRSA cover designs to better limit ML/ARD at source;
- Proactively developing the pit lake in a manner that better facilitates chemical stratification, as a means of keeping metals in a precipitated state as sulphides;
- Adjusting the pit lake water pH, using lime or other reagents to facilitate improved metals precipitation; and
- Optimizing the growth of algal and zooplankton populations, such as with periodic nutrient addition, as a means of permanently sequestering metals from the upper waters (epilimnion) of the pit lake water column.

### **FUP1.3.6 Program Responsibilities**

Treasury Metals would be responsible for carrying out commitments made in the EIS regarding pit lake water management, and for implementing Closure Plan measures, and all monitoring relating to EIS commitments and to the Closure Plan, and the ECA if applicable. The CEA Agency would be responsible for ensuring that the follow-up program is carried out, and MNDM and MECP would be responsible for ensuring that any actions on the part of the Proponent are carried out in relation to Closure Plan and ECA requirements.

### FUP1.3.7 Reporting

Treasury Metals intends to provide the pit lake water quality monitoring results as part of an annual follow-up program report provided to government agencies, Indigenous peoples and stakeholders on an annual basis following the cessation of groundwater pumping until the open pit has filled or until released from monitoring by regulatory agencies. This will include the status of applied mitigation measures and their success. In the event that the quality of the water as the pit lake was filling with water is likely to exceed PWQO, thus indicating the potential requirement for batch treatment, the annual follow-up program report will also include the following:

- Timing and nature of any additional adaptive water management or treatment measures undertaken to improve pit lake water quality;
- Confirmation that that application of any such adaptive measures have improved pit lake water quality; and
- Any updates on pit lake modeling results.

### FUP1.4 Noise and Vibration

#### FUP1.4.1 EA Prediction and Overview of Follow-up Program and Monitoring Objectives

The predicted effects of the Project on noise and vibration were presented in Section 6.4 of the revised EIS (April 2018). The predicted effects of the Project on noise and vibration were used to predict the effects of the Project on Fish and Fish Habitat in Section 6.14 of the revised EIS (April 2018). The noise predictions show that, even with the implementation of mitigation measures presented in Section 6.4.5, there will be residual adverse effects of the Project on noise. However, the results of the conservative noise modelling indicate that residual noise levels would meet the relevant criteria established by MECP, and thus there would likely be no directly identifiable need for noise monitoring under the regulatory approval process for noise in Ontario (i.e., an ECA under the *Environmental Protection Act*). Additionally, the predicted residual effects of noise and vibration associated with blasting activities are below the precautionary limits identifying the need for noise and vibration monitoring in NPC-119 (MOECC 1978). Therefore, no noise and vibration monitoring for blasting activities is anticipated to be needed from a regulatory perspective. That stated, it is possible that the MECP could require Treasury Metals to implement a regulatory noise monitoring program as part of the ECA approval process for the Project.

As part of the Round 2 Information Request Process, TMI\_882-AE(2)-06 requested that additional consideration be given on the potential effects of blasting (noise and vibration) on fish and fish habitat. In accordance with the DFO guidance (Wright and Hopky, 1998) the focus is on any waterbody within 500 m of blasting activities, where fish may be located and fish spawning would be expected to occur. Blasting will only occur in the open pit, or the underground mine located beneath the open pit. The only known fish habitat within 500 m of the perimeter of the open pit is in Blackwater Creek Tributary 1 (please refer to TMI\_882-AE(2)-06\_Figure\_1). The resident small-bodied fish that are currently present in Blackwater Creek Tributary 1 are not aggregate spawners; they will spawn throughout the creek, including in beaver ponds. Therefore, no specific locations are considered to be more sensitive than others.

However, the upstream portion of Blackwater Creek Tributary 1 will be enclosed within the operations area and, following fish relocation, will be drained so that it will not contain fish during either the site preparation and construction, or the operations phases of the Project. Accordingly, there will be no fish present in these locations during the periods when blasting could. Further, the removal of the upstream portion of Blackwater Creek Tributary 1 and associated drainage area, means that the portion of Blackwater Creek Tributary 1 that is immediately downstream from the operations area is expected to be dry and, therefore, it is not expected to contain fish. Follow-up monitoring is therefore not appropriate.

A review of TMI\_882-AE(2)-06\_Figure\_1 shows that a portion of the main stem of Blackwater Creek is close to 500 m perimeter of the open pit, and is therefore potentially affected by the proposed blasting activities. The resident small-bodied fish that currently comprise the majority of the fish present in Blackwater Creek are not aggregate spawners and will spawn throughout the creek, including in beaver ponds. There is some evidence of migratory fish (white suckers) periodically using these portions of Blackwater Creek to spawn, however, a focussed program in the spring of 2018 did not identify any fish that were not resident year-round. Based on this review, a focussed monitoring program to confirm the blasting (noise and vibration) predictions on fish and fish habitat will be completed at the following location:

- On Blackwater Creek, main stem, at the location closest to the open pit.

Treasury Metals have identified that the follow-up program for noise would be supported by three monitoring programs (Ambient Noise, Wildlife Noise, and Blasting Noise and Vibration) that will be implemented to help demonstrate the validity of the EIS predictions and confirm the effectiveness of the mitigation measures proposed. This follow-up program will also consider one of the locations used to predict the effects of blasting on fish and fish habitat to confirm the results provided in TMI\_882-AE(2)-06 submitted as part of the Round 2 Information Request Process. Additionally, the follow-up program will provide information to help address potential complaints from members of Indigenous communities, land users and adjacent residents, should they occur.

The noise and vibration follow-up program, outlined below, would begin during the site preparation and construction phase. If blasting is not required until the operations phase, that component of the follow-up program would not start until the operations phase. Monitoring of blasting noise and vibration would cease at the end of operations, while the other monitoring would continue through the closure phase. There would be no need for noise and vibration monitoring during the post-closure phase as there would be no sources of noise at the site.

#### **FUP1.4.2 Rationale for Inclusion in the Follow-up program**

While modeling indicates that follow-up noise and vibration is unlikely to be required in accordance with MECP needs, Treasury Metals recognizes that concerns have been expressed during conduct of the EA regarding possible interference with the enjoyment of their properties by local residents, and the experience of being out on the land by members of Indigenous communities. In deference to these concerns, Treasury Metals feels that it is important to carry-out monitoring as part of the follow-up program for potential noise and vibration effects.

### FUP1.4.3 Proposed Monitoring Programs

#### Ambient Noise

- Ambient noise monitoring at selected sensitive receptors, including at selected receptors along East Thunder Lake Road and along Tree Nursery Road.
- The frequency of ambient noise monitoring will be conducted as follows, or in accordance with Provincial approvals if applicable:
  - A summer campaign during site preparation and construction activities.
  - A summer campaign during operations.
  - A summer campaign during closure activities.
  - If complaints are received, additional campaigns may be considered, as appropriate.
- During the program, noise will be recorded in the following manner:
  - Hourly, A-weighted equivalent noise levels ( $L_{eq}$ , in dBA).
  - 72-hours of monitoring at each location.

#### Wildlife Noise

- A summer campaign to identify the extent of the 50-dBA noise contour to identify and confirm areas where noise might affect wildlife.
- Wildlife noise monitoring will be conducted as follows:
  - Once during site preparation and construction activities.
  - Once during operations.
- Although wildlife may not respond in the same manner as humans, the available literature relies on noise thresholds based on A-weighted measurements. During the program, noise will be recorded in the following manner:
  - Hourly, A-weighted equivalent noise levels ( $L_{eq}$ , in dBA); and
  - A series of measurements at varying distance and locations around, and outside the operations area that will be used to develop a spatial distribution of 1-hour equivalent noise readings.

#### Blasting Noise and Vibration

- Noise and vibration monitoring during blasting at selected sensitive receptors along East Thunder Lake Road;

- □ Blasting vibration on the main stem of Blackwater Creek, at the location closest to the open pit.
- □ Blasting noise and vibration monitoring will be conducted as follows:
  - A campaign during operations when open pit mining activities are in pit 1 (western most pit) and relatively close to the surface.
  - If complaints are received, additional campaigns may be considered, as appropriate.
- □ During the program, vibration/noise will be recorded in the following manner:
  - Peak sound pressure (in dBA); and
  - Peak particle velocity (cm/s).

#### FUP1.4.4 Current Mitigation Measures

The Project will employ best practices that will help reduce and mitigate noise effects, including the following:

- □ Implement a modern blasting program that minimizes the blast area, the overall amount of explosives required, and through detonating procedures, minimize the amount of explosives per delay. [Mit\_029].
- □ Adjust blasting practices if effects of vibration to spawning shoals is identified [Mit\_030].
- □ Endeavor to schedule noise causing events, such as blasting, to reduce disruption to residents. [Mit\_026]
- □ Advise nearby residents of significant noise-causing activities, such as blasting. [Mit\_027]
- □ Heavy equipment activity will be conducted between the hours of 07:00 and 22:00, if feasible [Mit\_025].
- □ Material will be loaded into haul trucks in a manner that minimizes the drop height from the loader or excavator bucket to the bed of the truck [Mit\_031].
- □ All internal combustion engines will be fitted with appropriate muffler systems [Mit\_028].

#### FUP1.4.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures

Addition adaptive management measures would be considered if MECP □P□-300□ □d□□□□□ are exceeded at nearby residences, □M□ □□□ □□5□□□□□□□□50 dBA noise threshold is consistently exceeded at areas beyond those predicted in the EIS (see Figure 6.4.6-1).

Potential adaptive management measures to further reduce noise levels include the following:

- Possible rubber bedding material currently being investigated.
- Employing white noise backup alarms for surface equipment to reduce the tonal noise compared to traditional backup alarms. It should be noted that backup alarms are not included in the noise that is regulated in Ontario due to their importance for ensuring worker health and safety.
- In the event that complaints lead to the identification of specific sources of concern, source-specific abatement such as noise walls, berms, or operational restrictions will be employed, as appropriate. [Mit\_033].

#### **FUP1.4.6 Program Responsibilities**

Treasury Metals would be responsible for carrying out commitments made in the EIS regarding noise and vibration follow-up, and the CEA Agency would be responsible for ensuring that the follow-up program is carried out. MECP would be responsible for ensuring that any monitoring requirements defined in ECA for air and noise are carried out by the Proponent.

#### **FUP1.4.7 Reporting**

Treasury Metals intends to provide the noise and vibration monitoring results (ambient noise, wildlife noise, blasting noise and vibration) as part of the annual follow-up program report provided to government agencies, Indigenous peoples and stakeholders. In addition, a summary of noise complaints received by Treasury Metals, if any, will also be documented along with steps taken to confirm the reason and or validity of the complaint. For valid complaints, the annual follow-up program report will include the following:

- Results of the investigation to identify the cause of the elevated noise levels;
- Summary of the actions taken by Treasury Metals to mitigate or resolve the elevated noises, if associated with the Project; and
- Confirmation that the remedial actions were successful in addressing the issues.

### **FUP1.5 Light**

#### **FUP1.5.1 EA Prediction and Overview of Follow-up program and Monitoring Objectives**

The predicted light effects from the Project are presented in Section 6.5. The light intrusion modelling determined that with the avoidance (Section 6.4.3) and mitigation (Section 6.4.5) measures, light trespass from the Project would not exceed 0 lux outside the operations area during all phases of the Project.

Currently there are no regulatory frameworks that would apply for light and light trespass, therefore, it is not expected there would be any regulatory monitoring requirements for monitoring light.

Treasury Metals has identified a focused light follow-up program that will be implemented to help demonstrate the validity of the EIS predictions and confirm the effectiveness of the mitigation measures

proposed. As there will be no permanent lighting during the site preparation and construction phases, the program would not start until the operations phase, when the processing facility and associated infrastructure are fully developed. There will be no permanent lighting sources during the closure and post-closure phases, so there would be no monitoring after operations stop.

### **FUP1.5.2 Rationale for Inclusion in the Follow-up Program**

Light trespass caused by artificial lighting can be regarded as a nuisance by adjacent property owners and residents, and has the potential to interfere with the behaviour of some species of wildlife, either positively or negatively.

### **FUP1.5.3 Proposed Monitoring Program**

#### **Light Trespass**

- □ Following the commissioning of the process plant and associated infrastructure, the configuration of the lighting will be used to confirm the lighting system was installed with consideration for the effects avoidance (Section 6.5.3) and mitigation (Section 6.5.5) measures relied on in the assessment. This is to be completed once, following the initial installation of the light system.
- □ A focused monitoring campaign to record light trespass levels associated with the commissioned process plant will be conducted once following the completion of major site building infrastructure (i.e. process plant).
- □ Document complaints from local residents regarding light trespass from the Project and determine the source of the trespass.

### **FUP1.5.4 Current Mitigation Measures**

The following elements built into the design of the lighting layout and the configuration of the Project will help avoid potential effects of the Project on light:

- □ Activities during the site preparation and construction phase will generally occur during the daytime. If there are times when lighting is required to ensure the safety of the workers, portable lighting will be used in required areas only. [Mit\_034].
- □ Portable lighting will be directed downward. [Mit\_035].
- □ The higher Lux illumination levels (>80) will be placed within the process plant and mine infrastructure buildings, which contains the process and electrical equipment. [Mit\_036].
- □ All externally mounted luminaires and their associated lamps will be designed to meet the requirements and recommendations of the Canadian Electrical Code (CEC), and the Building Code of Ontario. [Mit\_037].
- □ External light fixtures will be installed at a tilt angle of 45°. [Mit\_038].



- Cut off angles for external lightings will be designed to minimize the off-site light trespass. [Mit\_039].
- Permanent nighttime illumination will not be provided at the tailings storage facility (TSF). Temporary portable lighting will be implemented when necessary for operations or to ensure the safety of the workers. [Mit\_040<sup>1</sup>].
- Nighttime illumination will only be provided in the open pit when required. Portable lighting will be used in these situations. [Mit\_041].
- Activities during the closure phase will generally occur during the daytime. If there are times when lighting is required to ensure the safety of the workers, portable lighting will be used in required areas only. [Mit\_042].

### **FUP1.5.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures**

No measurable threshold criteria are proposed in relation to lighting. However, if complaints regarding Project area lighting are received from local residents or land users, the merits of the complaints will be considered, within the context of the nature of the complaint, and the need to ensure safe working conditions at the site.

Potential adaptive measures could include:

- Adjustments to lighting arrangements or angles; and
- Changes to lighting intensity.

### **FUP1.5.6 Program Responsibilities**

Treasury Metals will be responsible for carrying out the follow-up program. The CEA Agency is responsible for ensuring the follow-up program is carried out.

### **FUP1.5.7 Reporting**

Treasury Metals intends to provide confirmation in the annual follow-up program reports following the year that the light avoidance and mitigation measures have been implemented. Additionally, the annual follow-up program report would provide a brief summary of any public complaints regarding light intrusion. This report will be provided annually to government agencies, Indigenous peoples and stakeholders.

## **FUP1.6 Air Quality**

### **FUP1.6.1 EA Prediction and Overview of Follow-up Program and Monitoring Objectives**

The predicted effects of the Project on air quality, taking into account the avoidance measures incorporated into the Project (Section 6.6.3), are presented in Section 6.6.4. With the consideration of air

mitigation measures (Section 6.6.5), residual adverse air quality effects are predicted to remain (Section 6.6.6). These effects would be most notable in the vicinity of the operations area, but will extend into areas where traditional uses of the land could occur, and could extend beyond the property line.

Although there were predicted residual adverse effects on ambient air quality, it was also demonstrated that the Project would be able to achieve compliance with the O.Reg 419/05 point of impingement criteria at the property boundary, which would be required in order to support the regulatory permitting process to obtain an ECA under the EPA in Ontario (see Appendix J-3). Although compliance is demonstrated, regulatory air monitoring requirements could be required by the MECP as part of the Provincial permitting process. The details of a regulatory monitoring program, would therefore be developed as part of the permitting process. This process would also include the development of a Best Management Practices Plan for Dust (a draft Best Management Practices Plan for Dust is provided in Appendix J-4).

Treasury Metals has committed to consult with Indigenous communities regarding the placement of dustfall monitoring jars to target areas of potential impact that overlap with areas where traditional land and resource occurs (this information will be shared confidentially by the community in the formal Traditional Knowledge studies completed, underway or expected in the future).

Notwithstanding the potential regulatory monitoring requirements, Treasury Metals has identified an air quality follow-up program as part of the EIS that will be implemented to help demonstrate the validity of the EIS predictions and confirm the effectiveness of the mitigation measures proposed. The follow-up program will include a monitoring component that will provide information to help address potential complaints from adjacent residents, should they occur. This proposed EIS air quality monitoring program outlined in the following section is subject to change pending input from the MECP during the permitting process.

The proposed air quality Follow-up program will begin prior to site preparation and construction and would cease once heavy equipment operations cease in the closure phase.

### **FUP1.6.2 Rationale for Inclusion in the Follow-up Program**

Air quality is an important component of the environment, and while nuisance dust is a primary concern, a number of the air quality standards which are applicable to the Project are health-based. Consistency with Ontario air quality standards is therefore a key Project environmental objective. Having said this, much of the dust associated with mining projects is from blasting and from haul truck use along haul roads. The Goliath Gold Project is a comparatively small scale operation with a very compact site, with corresponding short haul roads. The potential for exceeding air quality standards is therefore very low.

### **FUP1.6.3 Proposed Monitoring Program**

The proposed air monitoring to support the Follow-Up Program for the Goliath Gold Project would include commissioning a monitoring station equipped with a combination of periodic samplers (e.g., high volume samplers for TSP, and one of PM<sub>10</sub> or PM<sub>2.5</sub>), passive samplers (e.g., dustfall), and if warranted, continuous monitors (e.g., samplers for NO<sub>2</sub>). As the objective of monitoring to support the follow-up program is to confirm the findings of the EIS and the efficacy of the mitigation measures, configuring continuous monitors (if warranted) to provide real time data is not considered justified. Any continuous monitors at the station (if warranted) would only be configured to provide real-time air sampling results if

deemed appropriate to provide supplemental information to support the development and implementation of the mitigation strategies, which is outside the scope of the monitoring to support the follow-up program. It is expected that the monitoring station to support the follow-up program would be decommissioned once the objective of confirming the findings of the EIS and efficacy of the mitigation measures is achieved.

Air quality monitoring will be conducted in the following manner:

- An air monitoring station will be installed.
  - The station will possibly include analyzers to measure the following: total suspended particulate matter (TSP); one of either particulate matter nominally smaller than 10  $\mu\text{m}$  ( $\text{PM}_{10}$ ) or particulate matter nominally smaller than 2.5  $\mu\text{m}$  ( $\text{PM}_{2.5}$ ); and nitrogen dioxide ( $\text{NO}_2$ ).
- Passive sampling of  $\text{NO}_2$  and  $\text{SO}_2$  would monitor average concentrations over 30-day periods through the year.
- Particulate matter will be collected passively over a 30-day period using dust fall jars. These collected samples will be submitted for analysis of total dustfall, as well as for the metals content within the collected particulates.
- A meteorological station will be installed in the operations area to record continuous meteorological data. This data will be used in conjunction with the air quality data to determine trends, and will provide support information for ongoing Project engineering.
- Treasury Metals will record any complaints received regarding air quality associated with the Project.

#### **FUP1.6.4 Current Mitigation Measures**

The Project will employ best practices that will help reduce and mitigate air quality effects, including the following:

- Implement a modern blasting program that minimizes the blast area, the overall amount of explosives required, and through detonating procedures, minimize the amount of explosives per delay. [Mit\_029].
- Blasting will likely be restricted to once per day, and only a few days per week. [Mit\_043].
- Material will be loaded into haul trucks in a manner that minimizes the drop height from the loader or excavator bucket to the bed of the truck [Mit\_031].
- All internal combustion engines will be properly maintained and all emission control systems (e.g., diesel particulate filters) will be kept in good working order. [Mit\_044].
- Water and chemical suppressants will be used for dust control on the haul roads at the mine site when temperatures are above freezing. [Mit\_045].

- Best management practices plan for dust control will be implemented on the site during site preparation and construction, operations and closure. [Mit\_046].

### **FUP1.6.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures**

If monitoring shows that sites operations are not in compliance with the O.Reg 419/05 point of impingement criteria at the property boundary, or if nuisance dust is perceived to be of greater concern than predicted, the monitoring program may be adjusted and additional mitigation measures may be implemented to further address the concerns or issues. These measures would likely focus on improved measures for dust control, if and as required.

### **FUP1.6.6 Program Responsibilities**

Treasury Metals would be responsible for carrying out commitments made in the EIS regarding air quality monitoring.

### **FUP1.6.7 Reporting**

Treasury Metals intends to provide a summary of the air quality monitoring results for all the measured parameters as part of the annual follow-up program report provided to government agencies, Indigenous peoples and stakeholders on an annual basis. The annual follow-up program report would also summarize any public complaints regarding air quality, including:

- Investigation and identification of the sources of emission;
- Actions taken to address the complaint;
- Actions taken to mitigate the source of the complaint, if related to the Project; and
- Summary of annual air quality complaints.

## **FUP1.7 Climate**

### **FUP1.7.1 EA Prediction and Overview of Follow-up Program and Monitoring Objectives**

The predicted effects of the Project on climate were presented in Section 6.7, and it was identified that the expected total GHG emissions from the Project during the site preparation and construction phase, the operations phase, and the closure phase, will exceed the 10,000 t/year, based primarily on fuel consumption for the Project. The emissions from stationary sources would be restricted to the natural gas heating required when mining underground. The total GHG emissions for the Project exceed the regulatory reporting threshold outlined in Section 46 of the *Canadian Environmental Protection Act*, which includes emissions from mobile and stationary sources. However, the Project does not meet the Provincial regulatory reporting requirements for the Ontario Cap and Trade Program Regulation 144/16, which also has a 10,000 t/year reporting threshold, but which is applicable to stationary sources only. The proposed

monitoring program for climate is consistent with the regulatory reporting requirements for GHG emissions.

### **FUP1.7.2 Rationale for Inclusion in the Follow-up Program**

Climate change is a high priority for both the Federal and Provincial governments, both of which have committed to the tracking and long-term reduction of GHGs.

### **FUP1.7.3 Proposed Monitoring Program**

The climate monitoring program would focus on the requirements under Section 46 of the *Canadian Environmental Protection Act*, and would include:

Record the annual fuel usage, as described in the Greenhouse Gas Management Plan (Section 12.8); and

Use the calculation stipulated in the Technical Guidance Document on Reporting Greenhouse Gas Emissions, as set out in the Greenhouse Gas Management Plan (Section 12.8) to calculate the annual Project GHG emissions.

### **FUP1.7.4 Current Mitigation Measures**

The following measures will be incorporated into the Project to mitigate and avoid GHG emissions:

- The Project will utilize the 115 kV transmission line adjacent to the Project. [Mit\_047].
- The WRSA will be located immediately to the north of the open pit. [Mit\_048].
- Placing the overburden storage area immediately to the south of the open pit to reduce the haul distances. [Mit\_049].
- Project design incorporates a compact footprint. [Mit\_050].
- Investigation and implementation of battery powered mining equipment where possible.

### **FUP1.7.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures**

Treasury Metals has done everything reasonably possible to design and operate the Project in an energy efficient manner. No other potential adaptive management measures are envisioned for the Project.

### **FUP1.7.6 Program Responsibilities**

Treasury Metals would be responsible for determining and reporting annual GHG emissions to the CEA Agency. The Agency would be responsible for ensuring that the Follow-up program is carried out.

## **FUP1.7.7 Reporting**

Treasury Metals intends to provide the GHG calculation results as part of the annual follow-up program report provided to government agencies, Indigenous peoples and stakeholders.

## **FUP1.8 Surface Water Quality**

### **FUP1.8.1 EA Prediction and Overview of Follow-up program and Monitoring Objectives**

The predicted effects to surface water quality from the Project are summarized in Section 6.8.4 of the revised EIS. Even with the avoidance measures described in Section 6.8.3, and mitigation measures outlined in Section 6.8.5, residual adverse effects from the Project on surface water quality will remain. However, the water quality modelling has determined that the resulting water quality in the receiving environment will be equivalent to existing conditions, or will meet PWQO. The proposed surface water quality follow-up program will help confirm the findings of the EIS and confirm the effectiveness of the mitigation measures. The proposed EIS mentoring program is described in Section FUP1.8.3).

In addition to the EIS monitoring, it is expected there will be a comprehensive regulatory surface water quality monitoring program developed in cooperation with government agencies, as part of the Project permitting process (under the ECA process governed by the MECP and under Schedule 5, Part 1 of the MMER). This regulatory program would include requirements for monitoring effluent and water quality of the receiving waterbodies. These monitoring programs will incorporate all surface water quality monitoring that will be required during the life of the Project from a regulatory perspective. The surface water monitoring program outlined below in Section FUP1.8.3 as a part of the EA process is subject to change upon finalization of the regulatory monitoring program designated by applicable government agencies to allow for a single, harmonized monitoring program that encompasses all surface water quality monitoring.

For consistency with the available data, and the assessment of effects, the proposed program would use receiving water stations used during the baseline monitoring (Figure FUP1.8.3-1). The focus of the program will be on those watercourses where potential effects to surface water quality could be seen as a result of the Project. The surface water quality monitoring program, developed for the EIS, will begin prior to the site preparation and construction phase of the Project, and will cease once Treasury Metals is released from monitoring by regulatory agencies.

### **FUP1.8.2 Rationale**

Local Indigenous community members and other area residents have continually expressed that water quality protection is the most critical environmental aspect relating to the Project. Wabigoon Lake, in particular, which will ultimately receive treated effluent via Blackwater Creek, is a large system which is critical to a number of resource users including members from several Indigenous communities.

### FUP1.8.3 Proposed Monitoring Program

A total of 12 proposed monitoring locations are shown in Figure FUP1.8.3-1 that are associated with off-site locations and 2 locations are shown on Figure FUP.1.8.3-1 that are associated with the Blackwater Creek Tributary 2 diversion channel. The total number of monitoring stations will be identified in consultation with MECP. The stations identified in this report are considered preliminary possible options that may be used in the monitoring to support the follow-up program. The majority of the preliminary sample locations correspond to the locations used to collect baseline results. Treasury Metals intends to carry some of these locations forward for their surface water quality monitoring program. The frequency of monitoring each location is proposed and is subject to change with consultation with MECP and site conditions. Each sample location may be analyzed for relevant parameter suites, as per Table FUP1.8.3-1 and may be altered due to site conditions and safety considerations:

**Table FUP1.8.3-1: Summary of Surface Water Quality Follow-up Programs**

Sampling Location	Parameter Group						
	Group A (1)	Group B (2)	Group C (3)	Group D (4)	Group E (5)	Group F (6)	Group G (7)
SW-TL1A, SW-JCT, SW-2, SW TL3, SW-4, SW-7, SW-8, SW-9, TSF Supernatant Water	Monthly	Monthly	Monthly	—	—	—	
SW-10, SW-11	Monthly	Monthly		—	—	—	
SW-5, SW-6	Annually	Annually	Annually	—	—	—	
BW-T2-UP, BW-T2_DN	Quarterly	Quarterly					Quarterly (download)
Effluent Discharge	—	Monthly	—	Thrice Weekly	Weekly	Monthly	
Minewater pond	Quarterly	Quarterly	—	—	—	—	
Pit Lake	Quarterly	Quarterly	—	—	—	—	

Notes:

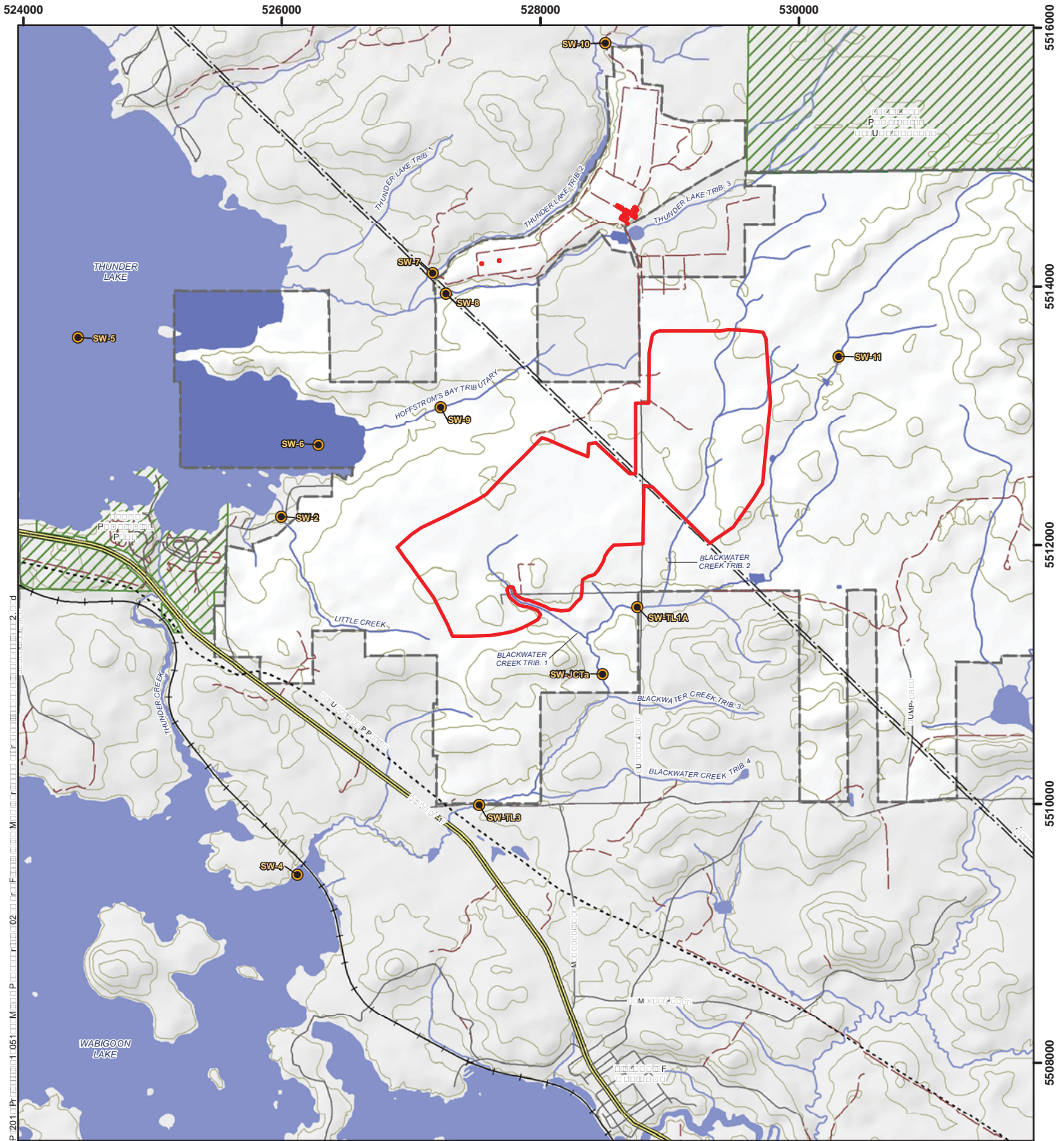
- (1) **Group A:** pH, acidity, alkalinity, dissolved oxygen, chloride, conductivity, dissolved and total organic carbon, hardness, nitrate, nitrite, phosphate, sulphate, temperature (field), total and un-ionized ammonia, total dissolved solids, total suspended solids, turbidity.
- (2) **Group B:** Total ICP metals scan. Total chromium and hexavalent chromium will be reported.
- (3) **Group C:** free cyanide, total cyanide, weak acid dissociable cyanide.
- (4) **Group D:** pH, total cyanide, total suspended solids
- (5) **Group E:** copper, lead, nickel, zinc, arsenic
- (6) **Group F:** Acute toxicity testing (Rainbow Trout and *Daphnia magna*)
- (7) **Group G:** Temperature (continuous)

Relevant parameter suites may include inorganics including metals, sulphate and organics including methyl-mercury. Given the intrinsically low water solubility of methylmercury in surface water, it does not need to be measured in surface water at the same frequency as Group B. Instead a frequency of methylmercury measurement in surface water will be determined in consultation with the MECP and Indigenous Stakeholders. As per Information Request SW(2)-02 and SW(2)-02B, the effluent discharge sampling location may also be monitored for ammonia and hydrocarbons in the form of oil and grease on a basis with Group B parameters. Residual hydrocarbons from the use of ANFO as well as hydrocarbons in the form of oil and grease derived from vehicle and generator use on site are expected to be present at

low concentrations in the influent water to the treatment plant. Pre-filtration or pre-treatment technologies are an integral consideration as part of the design of reverse osmosis treatment systems to protect the membranes from excess levels of compounds such as hydrocarbons in the influent water. The normal low-levels of oil and grease in influent concentrations for comparable mine sites are not expected to result detectable levels of hydrocarbons in the final effluent from the treatment plant.

In-situ field parameters (temperature, reduction-oxidation potential, pH, dissolved oxygen) will also be sampled for at receiving water stations.



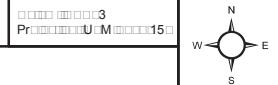


**LEGEND**

- Surface Water Quality Sampling Locations
- Operations Area
- Railway
- Hydro Line
- Natural Gas Pipeline
- Highway
- Local Street
- Resource / Recreation Trail
- Provincial Park
- Watercourse
- Waterbody
- Contours (10 m interval)
- Property Boundary of Claims and Dispositions
- Area Beyond Property Boundary



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**GOLIATH GOLD PROJECT**

**Surface Water Quality Sampling Locations**

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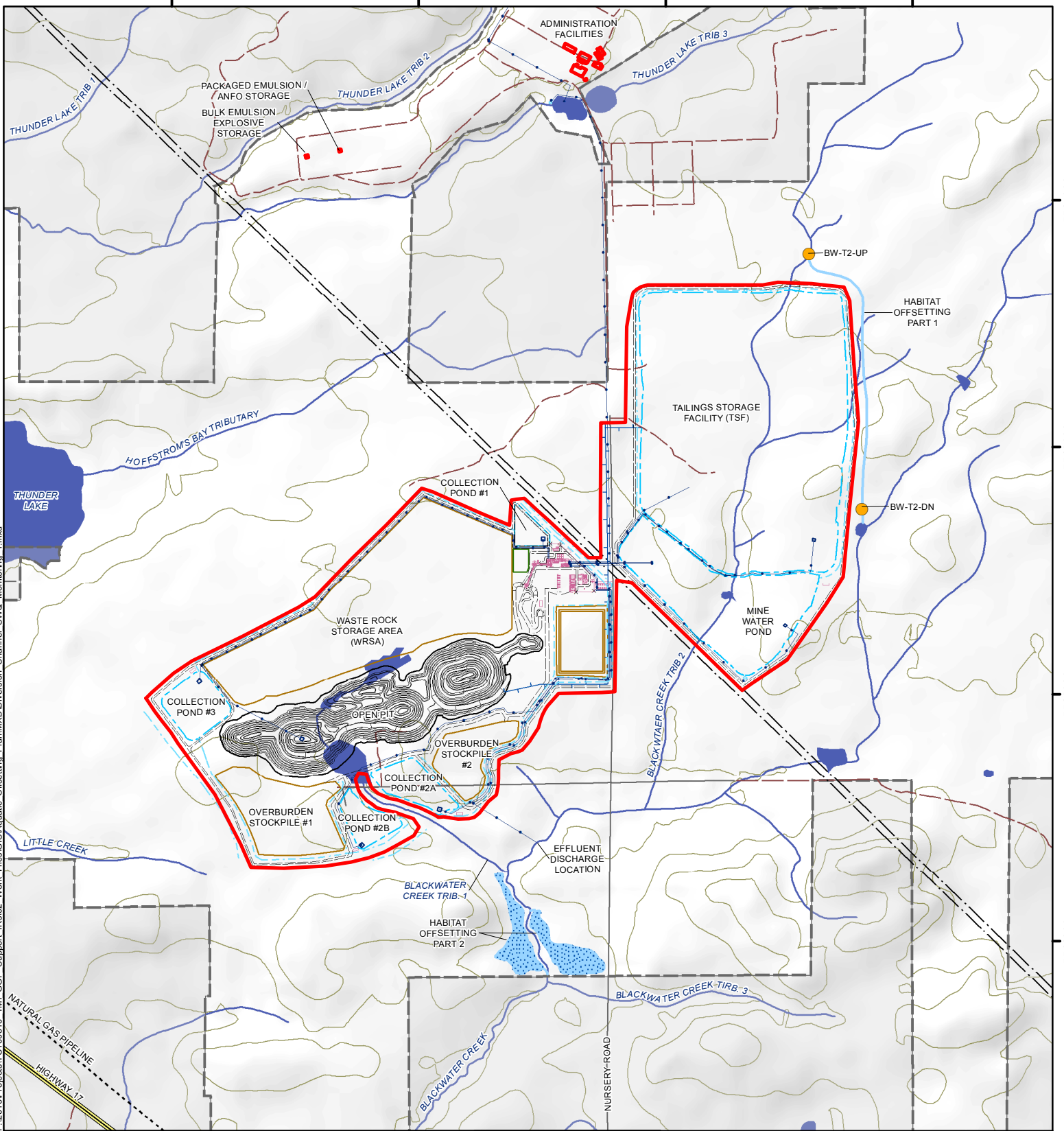
**FIGURE: FUP1.8.3-1**  
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**LEGEND**

--- Hydro Line	● Diversion Channel Surface Water Quality Sampling / Monitoring Locations
--- Natural Gas Pipeline	<b>Site Infrastructure</b>
== Highway	— Operations Area
— Local Street	— Access Haul Roads
--- Resource / Recreation Trail	— Pipeline
— Watercourse	— Ditching
■ Waterbody	— Emergency Spillway
— Contours (10 m interval)	<b>Habitat Offsetting Options</b>
□ Property Boundary of Claims and Dispositions	— Part 1: Blackwater Creek Tributary 2 Diversion (0.3 ha)
□ Area Beyond Property Boundary	■ Part 2: Potential New Pond / Basin Along Blackwater Creek (6 ha)
	— Processing Plant and Ancillary Facilities
	— Security Fence
	— Stockpile

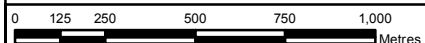
**NOTES:**  
 - Watercourses represent pre-development conditions based on LIO database, as modified by KBM.

Datum: NAD83  
 Projection: UTM Zone 15N

**GOLIATH GOLD PROJECT**

**Diversion Channel Surface Water Quality Sampling / Monitoring Locations**

PROJECT N <sup>o</sup> : TC160516	FUP1.8.3-2
SCALE: 1:21,000	DATE: November 2018



## FUP1.8.4 Current Mitigation Measures

The Project will employ best practices that will assist in a reduction and mitigate surface water quality effects, which are outlined below:

- Site preparation and construction phase
  - Progressively construct a perimeter ditch and seepage collection system around the operations area to capture and direct all runoff from the site to the water management system. [Mit\_008].
  - Industry standard erosion and sediment controls, such as sediment traps within ditches, will be implemented during the site preparations and construction phase. [Mit\_054].
  
- Operations phase
  - Progressively construct a perimeter ditch and seepage collection system around the operations area to capture and direct all runoff from the site to the water management system. [Mit\_008].
  - Effectively manage water collected on-site using constructed storage facilities, reducing the need for fresh water withdrawals and discharges of treated water. [Mit\_057].
  - Excess water not required in the process will be treated to concentrations that meet Provincial Water Quality Objectives (PWQO) or Canadian Water Quality Guidelines (CWQG) for the protection of aquatic life, or background if background levels exceed the PWQO, prior to discharging to Blackwater Creek. In the case of mercury, effluent will be treated to meet the background concentrations in Blackwater Creek. [Mit\_053].
  - The floor of the TSF will be a low-permeability layer capable of achieving seepage rates that ensure receiving surface water quality is equivalent to baseline, or meet PWQO. The liner would be comprised of natural material, or if necessary, an HDPE liner laid over a prepared basin of sand or comparable material. [Mit\_062].
  - Perimeter runoff and seepage collection systems will be constructed around the TSF. [Mit\_051].
  - The drawdown zone of the dewatering process will capture all seepage that bypasses the seepage collection systems and will report to the open pit. [Mit\_052].
  - The process will employ a thickener to help recover cyanide solution from the tailings for reuse in processing. The resulting tailings will then be treated using the SO<sub>2</sub>-air process to reduce cyanide in the tailings directed to the TSF so as to meet MMER requirements over a long-term basis. [Mit\_061].
  
- Closure phase
  - During closure, the site will be graded such that runoff from the operations area will be directed to the open pit during closure and post-closure phases. [Mit\_056].

- 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 background if background levels exceed the PWQO, prior to the discharge from the pit lake to a tributary of Blackwater Creek. [Mit\_024].
  - The drawdown zone of the dewatering process will capture all seepage that bypasses the seepage collection systems and will report to the open pit. [Mit\_052].
  - There will be no discharges to surface water during the closure phase. [Mit\_055].
- Post-closure phase
- Tailings within the TSF will be isolated using either a low permeability dry cover, or a wet cover of non-process water or process water that has been treated to meet PWQO. The preferred option for limiting environmental effects is a wet cover. [Mit\_023].
  - 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 background if background levels exceed the PWQO, prior to the discharge from the pit lake to a tributary of Blackwater Creek. [Mit\_024].
  - Once the pit lake is fully flooded, it is expected that the monitoring of the water quality in the pit lake will continue for a period of time to determine whether additional batch treatment may be required to ensure the water released from the pit lake meets effluent release limits. [Mit\_124].

### **FUP1.8.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures**

A commitment has been made to treat effluent release from the site to Provincial Water Quality Objectives (PWQO) or background concentrations if background levels are above the PWQO. Where there is no PWQO for a parameter, the commitment will be to meet the Canadian Water Quality Guidelines (CWQG). For total mercury, the commitment will be that effluent discharged to Blackwater Creek will meet background concentrations for that watercourse. If monitoring data should indicate that this commitment is not being fulfilled, Treasury Metals would review and implement further treatment measures and/or optimizations to achieve this commitment. It should be noted in this context that Treasury Metals are proposing the use of in-plant cyanide destruction prior to discharge to the TSF, and the use of reverse osmosis for final effluent treatment prior to discharge to Blackwater Creek.

### **FUP1.8.6 Program Responsibilities**

Treasury Metals would be responsible for carrying out commitments made in the EIS regarding surface water monitoring. The CEA Agency would be responsible for ensuring that the Follow-up program is carried out.

### **FUP1.8.7 Reporting**

Treasury Metals intends to provide the surface water quality monitoring results as part of the annual follow-up program report provided to government agencies, members of Indigenous communities and

stakeholders. For any surface water quality monitoring that exceeded the management triggers (see Section 12.3), the annual follow-up program report will include the following:

- Results of the investigation to identify the cause of the elevated readings;
- Summary of the actions taken by Treasury Metals to mitigate or resolve the elevated readings, if associated with the Project; and
- Confirmation that the remedial actions were successful in addressing the identified issues.

## **FUP1.9 Surface Water Quantity**

### **FUP1.9.1 EA Prediction and Overview of Follow-up program and Monitoring Objectives**

The predicted effects of the Project on surface water quantity are summarized in Section 6.9.4 of the revised EIS. The predictions show that even with the mitigation measures outlined in Section 6.9.5, there will be residual adverse effects to surface water quantity during the operations phase, and through into post-closure. As the Project will need to obtain permits to take water as part of the mine dewatering activities, as well as for fresh water withdrawals, it is also likely that some form of regulatory monitoring to confirm surface flow patterns will be required.

The proposed surface water quantity follow-up program is designed to validate the predicted effects in the EIS, and confirm the effectiveness of the mitigation measures. To do this, the watercourses potentially affected by the Project will be included in flow monitoring. This program will utilize the monitoring locations previously used to establish baseline surface water quantities (see Figure FUP1.9.1-1), and correspond with the effects predictions, to allow for a more efficient follow-up and monitoring program. Monitoring will begin prior to site preparation and construction and will continue into post-closure. It is likely the monitoring post-closure will be continued until the regulators are satisfied that the closure landscape is functioning as planned, and Treasury Metals can discontinue monitoring. Treasury Metals will determine what equipment will be used to measure flow rates in the watercourses closer the commencement of monitoring to ensure that industry standard equipment is used.

### **FUP1.9.2 Rationale for Inclusion in the Follow-up program**

Facility development has the potential to alter flows in the creeks in the Project vicinity. The potential changes in flow could represent increases or decreases from the current conditions depending on the location, climatic conditions and time of year. These creeks provide habitat for aquatic life, such that meaningful alterations to system flows could affect the availability of aquatic habitat utilized by aquatic life.

### **FUP1.9.3 Proposed Monitoring Program**

The proposed monitoring program in support of the Follow-Up Program presented herein will rely on a subset of the data presented as part of the proposed monitoring program for regulatory monitoring as detailed in the Goliath Gold Regulatory Monitoring Addendum. The predictions made with respect to surface water quality in the EIS relied on total metals, and therefore the measurement of total metals is

the appropriate measurement endpoint for the Follow-Up Program described for verifying the prediction made in the EIS and for determining the effectiveness of the mitigation measures described. The Goliath Gold Regulatory Monitoring Addendum includes monitoring for both dissolved and total metals according to the appropriate regulatory requirements.

### **Blackwater Creek**

The following monitoring of Blackwater Creek is proposed to support the follow-up program:

- Discrete flow monitoring would be conducted upstream (SW-TL1a) and downstream (SW\_JCTa) of the proposed discharge point in Blackwater Creek (see Figure FUP1.9.1-1);
- Periodic (at least annual) inspection of the Blackwater Creek system for any evidence of undue erosion related to Project discharges, with satellite imagery of the downstream portion of the creek to be obtained once every three years; and
- Volume of effluent discharged into Blackwater Creek on a daily basis, per O.Reg 560/90, 561/94, Clean Water Regulation.

### **Thunder Lake Tributaries 2 and 3**

The following monitoring of Thunder Lake Tributaries 2 and 3 is proposed to support the follow-up program:

- Two discrete flow measurement stations downstream of the Project area, one on Thunder Lake Tributary 2 (SW-7) and one on Thunder Lake Tributary 3 (SW-8), as shown on Figure FUP1.9.1-1.
- In addition, continuous flows will be recorded as water flows into the irrigation ponds on Thunder Lake Tributaries 2 and 3. These readings will be used to demonstrate that the withdrawals from the irrigation ponds were in accordance with the committed upper bound of 5% of the inflow.

### **Little Creek and Hoffstrom's Bay Tributary**

The following monitoring of Little Creek and Hoffstrom's Bay Tributary is proposed to support the follow-up program:

- Flow readings will be taken periodically in both Little Creek (SW-2) and Hoffstrom's Bay Tributary (SW-9), shown on Figure 12.8.2-1.

## **FUP1.9.4 Current Mitigation Measures**

The Project will employ best practices that will assist in a reduction and mitigate surface water quantity effects, which are outlined below for each of the four Project phases.

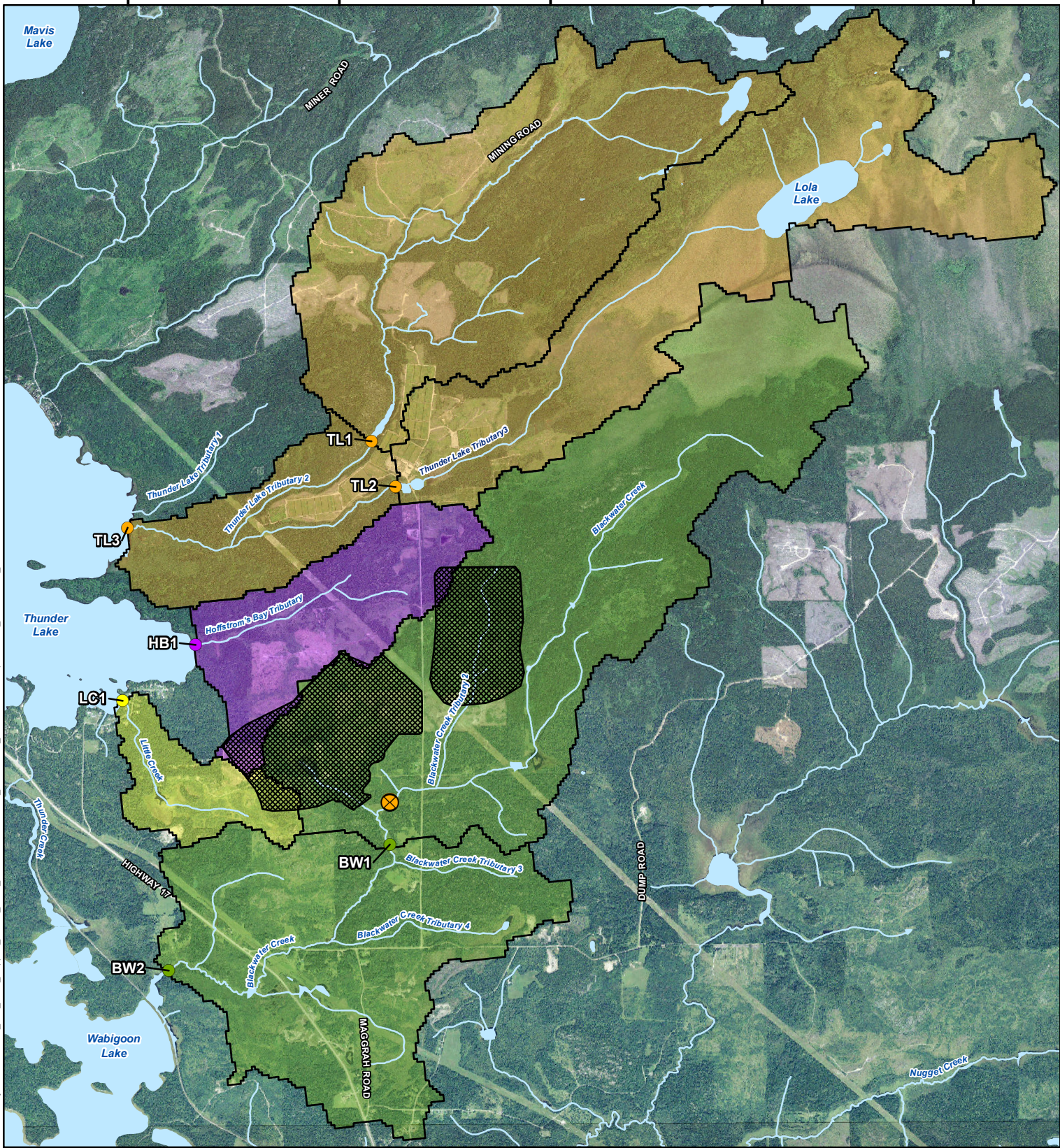
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**LEGEND**

- |  |  |
|--|--|
|  Operations Area           |  Effluent Discharge Location    |
| <b>Sub-Watershed Outlet Locations</b>  | <b>Sub-Watershed</b>   |
|  Blackwater Creek          |  Blackwater Creek               |
|  Hoffstrom's Bay Tributary |  Hoffstrom's Bay Tributary      |
|  Little Creek              |  Little Creek                   |
|  Thunder Lake Tributary 2  |  Thunder Lake Tributary 2 and 3 |

**NOTES:**  
 - Topographic data extracted from Land Information Ontario, MNRF.  
 - Imagery extracted from Agriculture Information Atlas, OMAFRA.



**GOLIATH GOLD PROJECT**

**Proposed Surface Water Flow Monitoring Locations**

Datum: NAD83  
 Projection: UTM Zone 15N

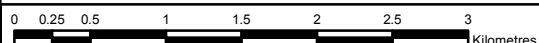


PROJECT N<sup>o</sup>: TC160516

FIGURE: FUP1.9.1-1

SCALE: 1:50,000

DATE: January 2019



- Site preparation and construction phase

- Progressively construct a perimeter ditch and seepage collection system around the operations area to capture and direct all runoff from the site to the water management system. [Mit\_008].
- Industry standard erosion and sediment controls, such as sediment traps within ditches, will be implemented during the site preparations and construction phase. [Mit\_054].
- Prior to overburden removal, any beaver dams within the Project footprint will be removed and the impoundments will be allowed to draw down. [Mit\_077].
- Prior to construction activities, Treasury Metals will engage with the local trapping council, Indigenous communities and the MNRF to prepare a plan for the removal of nuisance wildlife (i.e., beaver) within the Blackwater Creek watershed. [Mit\_126].

- Operations Phase

- Progressively construct a perimeter ditch and seepage collection system around the operations area to capture and direct all runoff from the site to the water management system. [Mit\_008].
- The operations area will be minimized to the extent possible to reduce the amount of runoff re-directed from the Little Creek and Hoffstrom's Bay watersheds. [Mit\_050].
- Effectively manage water collected on-site using constructed storage facilities, reducing the need for fresh water withdrawals and discharges of treated water. [Mit\_057].
- Prior to overburden removal, any beaver dams within the operations area will be removed and the impoundments will be allowed to draw down. [Mit\_077].
- Prior to construction activities, Treasury Metals will engage with the local trapping council, Indigenous communities and the MNRF to prepare a plan for the removal of nuisance wildlife (i.e., beaver) within the Blackwater Creek watershed. [Mit\_126].
- An engineered structure, designed to dissipate flows and avoid erosion, will be constructed to discharge effluent during operations into Blackwater Creek. [Mit\_058].
- Fresh water takings from tree nursery irrigation ponds on Thunder Lake Tributaries 2 and 3 will not exceed 5% of the flow entering the ponds. [Mit\_059].

- Closure Phase

- Progressively construct a perimeter ditch and seepage collection system around the operations area to capture and direct all runoff from the site to the water management system. [Mit\_008].
- There will be no discharges to surface water during the closure phase. [Mit\_055].



- Post-closure Phase
  - During closure, the site will be graded such that runoff from the operations area will be directed to the open pit during closure and post-closure phases. [Mit\_056].
  - Once the open pit has been filled, excess water from the open pit will be passively released through an engineered spillway into the existing channel of Blackwater Creek Tributary 1. [Mit\_060].

### **FUP1.9.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures**

In the event that water quality monitoring identifies enhanced erosion (e.g., TSS levels downstream of the effluent discharge are statistically higher than the upstream readings) Treasury Metals would implement additional mitigation measures that could include:

- Reducing the rate of discharge (the Project has the capability of managing water onsite and temporarily reducing its discharge rate);
- Modifying the discharge structure to reduce the potential for erosion; and
- Fortifying the channel downstream of the discharge location to enhance the resistance to erosion.

Also, in the event the flow monitoring identifies conditions that are likely to result in enhanced erosion (e.g., downstream flows that are more than 30% higher than upstream flows or upstream flows that are at 90% of the stream capacity) Treasury Metals would implement mitigation measures by reducing the rate of discharge (the Project has the capability of managing water onsite and temporarily reducing its discharge rate) until conditions in Blackwater Creek allow for discharges to return to normal.

Additionally, if inspections of the downstream Blackwater Creek system, or if periodic satellite images of the Blackwater Creek system, indicate that undue erosion is occurring, or is likely to occur, due to Project related effects, then Treasury Metals would implement additional adaptive measures to reduce the risk of erosion.

Criteria for adaptive management in relation to potential water quantity effects are also expected to be developed within the *Fisheries Act* authorization.

### **FUP1.9.6 Program Responsibilities**

Treasury Metals would be responsible for carrying out commitments made in the EIS regarding surface water quantity monitoring. The CEA Agency would be responsible for ensuring that the follow-up program is carried out.

### **FUP1.9.7 Reporting**

Treasury Metals intends to provide the surface water quantity monitoring results as part of the annual follow-up program report provided to government agencies, Indigenous peoples and stakeholders.

## **FUP1.10 Groundwater Quality**

### **FUP1.10.1 EA Prediction and Overview of Follow-up program and Monitoring Objectives**

The predicted effects of the Project on groundwater quality are summarized in Section 6.10.4 of the revised EIS. Groundwater quality predictions indicate that with the mitigation measures outlined in Section 6.10.5, no residual effects would remain during the life of the Project. During the operations phase, seepage from the onsite facilities would not leave the site due to the drawdown effect from dewatering activities capturing seepage. Although seepage would report to surface watercourse during post-closure, after the cessation of dewatering activities and after the groundwater levels return to near pre-development levels. This was assessed as an effect to surface water quality and presented in Section 6.8. Additionally, extensive groundwater modelling has determined that it is unlikely that seepage in the post-closure would affect drinking water well quality of any of the private wells in the area.

As part of the baseline groundwater quality data collection, Treasury Metals installed a number of groundwater monitoring wells and developed a groundwater quality monitoring program. The EA monitoring program for groundwater quality is more detailed than many of the other monitoring programs due to the complexity and logistics of developing a groundwater well monitoring network for both groundwater quality and groundwater levels, along with the need to fully understand and model the dewatering zone of the Project. Additional wells will be installed as outlined in the following sections prior to the commencement of Project operations. The groundwater Follow-up program will continue from prior to site preparation and construction into the post-closure phase, stopping when regulators confirm that the closure landscape is functioning as planned and Treasury Metals can stop monitoring.

The groundwater quality monitoring program presented in the following sections will be included as both EA and regulatory monitoring programs. It is subject to change following review and input from applicable government agencies. That stated, Treasury Metals is comfortable that the plan provided below will effectively capture all groundwater quality effects from the Project.

### **FUP1.10.2 Rationale for Inclusion in the Follow-up program**

The groundwater system ultimately connects with the surface water system, and there is the potential for long-term groundwater quality changes depending on the success ARD prevention measures over the longer-term. It is therefore important to effectively model, monitor and understand how groundwater moves through the system, especially following closure when the local groundwater table is restored once the open pit is flooded.

Treasury Metals recognize that there is uncertainty in the inputs used in the groundwater model relied on for the prediction described in the revised EIS (April 2018). As part of the Round 2 process, Treasury Metals committed to a comprehensive groundwater monitoring program to confirm all assumptions relied upon in the groundwater model, including the kinematic porosities and other factors that could influence transport times. To provide confidence in the post-closure predictions, Treasury Metals propose to update the groundwater model on a regular basis (i.e. every three (3) years) to incorporate the actual monitoring results that reflect the data gathered. Review in this manner provides the opportunity to reassess and update the hydrogeological conceptual model and the groundwater flow and transport predictions made

for the impacts of the mine. The subsequent details outline the groundwater monitoring as it related to groundwater quality monitoring.

### FUP1.10.3 Proposed Monitoring Program

#### Groundwater Monitoring Wells

Groundwater monitoring wells will be either for groundwater sampling or groundwater level recording, with some wells serving both purposes. The primary horizon for groundwater flow is the shallow bedrock (SBR) horizon and, when present, the basal sand (BS) aquifer that occurs at the base of the fine-grained, clay dominated glaciolacustrine deposits (the dominant overburden of the Project area). Most monitoring wells will be screened within either the SBR or BS, or possibly both depending on ground conditions encountered during drilling. In the vicinity of the TSF, a sand-clay/silt-sand sequence occurs. In this location, wells will be nested to sample the surficial sand (SS) and BS if the sand-clay/silt-sand sequence is encountered (i.e., similar to the existing BH3A Shallow and BH3A Deep). The well screen in the SS will monitor the performance of the seepage collection ditches in collecting shallow horizontal groundwater flow out of the TSF, whereas the well screen in the BS will provide monitoring for vertical seepage out of the base of the TSF.

#### Groundwater Monitoring Installations

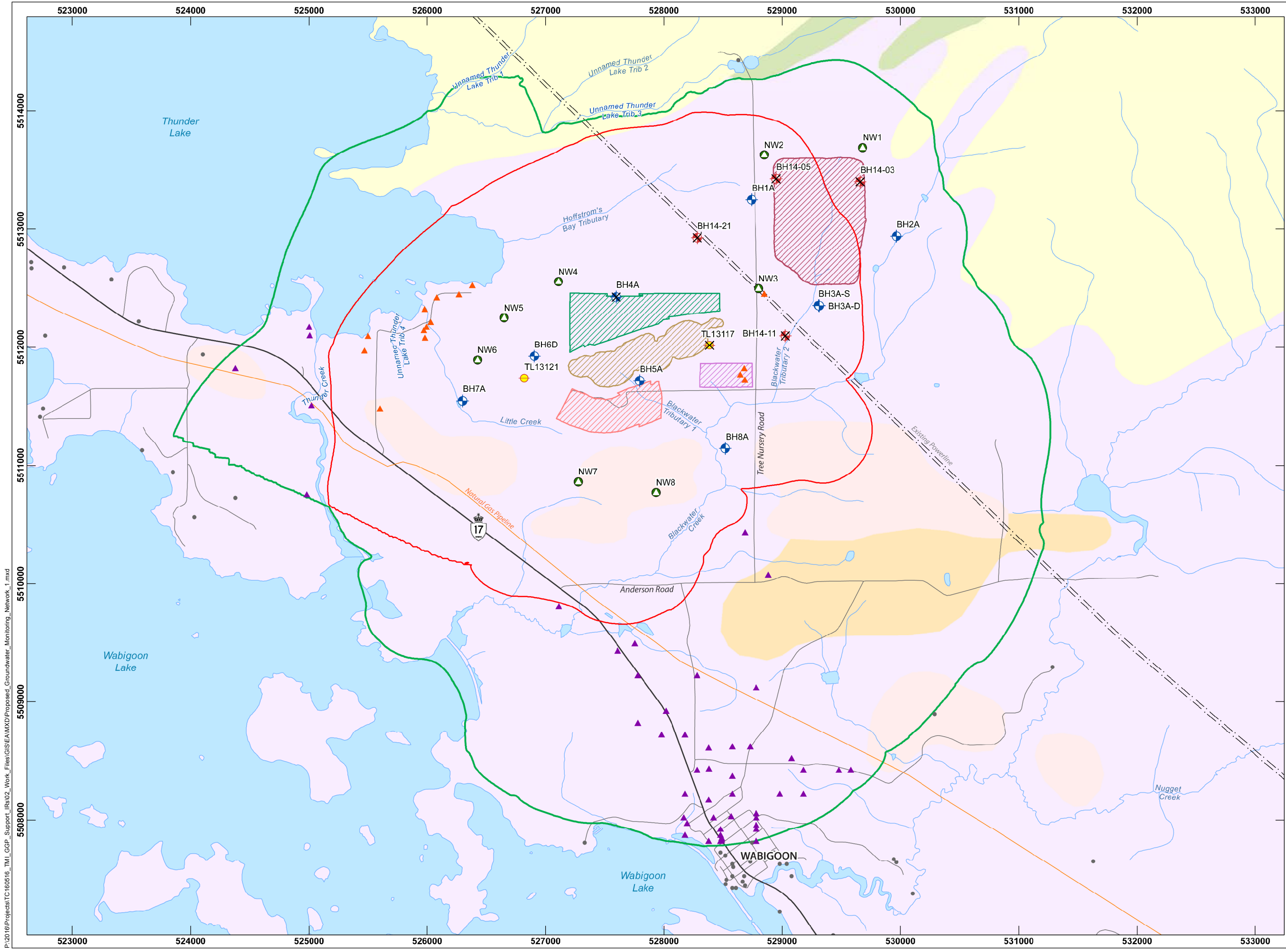
It is expected that a total of eight well / piezometers (six single-screen wells, one nested well and one nested vibrating wire piezometer [VWP]) of the current groundwater monitoring installations will be used for the future groundwater monitoring network. The locations of the monitoring wells in the proposed network are provided in Figure FUP1.10.3.2-1. The proposed monitoring wells are described below, and summarized in Table FUP1.10.3.2-1:

- The east-west striking mineralized zone is expected to have elevated bedrock hydraulic conductivities, which could influence the extension of the drawdown cone towards the west. The western VWP nest (TL131121) lies in a strategic location for measuring the groundwater pressure during dewatering around the mineralized zone to the west of open pit.
- Three of the wells are located around the TSF (BH1A, BH2A and BH3A) and one well close to the WRSA (BH6D) which are suitable for groundwater quality monitoring. BH2A is in an up-gradient location and would provide background groundwater quality data during operation of the TSF.

An additional eight monitoring locations will be installed, as per Figure FUP1.10.3.2-1 (proposed new wells for GWM network) to expand coverage of the groundwater quality monitoring network. These will include:

- Three wells (NW1, NW2 and NW3) are close to the perimeter of the TSF for groundwater quality monitoring. These will be nested with a screen in the SS and the BS/SBR (i.e., top and bottom of sand-clay/silt-sand sequence).
- Three wells (NW4, NW5 and NW6) with single screens in BS/SBR to the west of the open pit in distal locations to monitor groundwater levels between Thunder Lake and the perimeter of the Treasury property. Two of these will also be used for groundwater quality monitoring of the WRSA (NW4 and NW5).

- Two wells (NW7 and NW8) with single screens in BS/SBR are required to the south of the open pit in distal locations to monitor groundwater levels along the perimeter of the Treasury property in the direction of Wabigoon.
- All the installations of the groundwater monitoring network will be constructed and/or modified where necessary to include protective casings and markings and, if required, a barricade to prevent damage by heavy equipment during mine construction and operation.



GOLIATH GOLD PROJECT  
 DRYDEN, ONTARIO, CANADA

Figure: FUP1.10.3.2-1  
 PROPOSED GROUNDWATER  
 MONITORING NETWORK

**Legend**

- 2013 Monitoring Well
- 2014 Geotechnical Hole
- Exploration Borehole with Vibrating Wire Piezometer
- MOE Well Outside ZOI
- MOE Well Within 5m ZOI
- MOE Well Within ZOI
- Proposed New Well for GWM Network
- Base Case 5m Drawdown
- Zone of Influence (ZOI)
- Stage 4 TSF Boundary
- Ultimate Pit Shell (Phase III)
- Low-Grade Stockpile
- Overburden Storage
- Waste Rock Storage
- Hydro Line
- Natural Gas Pipeline
- Highway 17
- Local Roadway
- Waterbody
- Watercourse

**Landform**

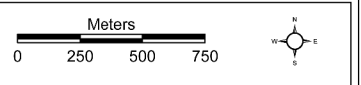
- GK: Kame
- GO: Glaciofluvial Outwash
- LP: Glaciolacustrine Plain
- OT: Organics
- RN: Bedrock Knob

Indicates well not proposed for future groundwater monitoring network

**NOTES:**

1. UTM Zone 15N, NAD83
2. Base Data Source: OBM
3. 1:30 000 scale
4. Well and Modelling Data by AMEC

DATE: October, 2014  
 DRAWN BY: AT  
 CHECKED BY: AT  
 REVISION: 00



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**Table FUP1.10.3.2-1: Location and Type of Groundwater Quality Monitoring**

Well ID	Location	Type	Screened Units	Monitoring Objective
BH1A	West of TSF, Nursery Road	Quality and level	BS/SBR	Down-gradient water quality of TSF
BH2A	East of TSF, Blackwater Creek	Quality and level	BS/SBR	Upstream of TSF – background groundwater quality in basal sand/shallow bedrock
BH3A-S BH3A-D	South of TSF, Blackwater Tributary 2	Quality and level	SS BS	Down-gradient water quality of TSF in shallow sand Down-gradient water quality of TSF in basal sand
BH6D	West of Open Pit and WRSA, proximal	Quality and level	BS	Water level proximal to open pit and down-gradient of WRSA
BH7A	South of Open Pit, distal	Level (only)	BS	Water levels distal to open pit, east of Thunder Lake
BH8A	West of Open Pit, proximal	Level (only)	BS	Water levels distal to open pit, north of Wabigoon.
TL13121-S TL13121-D	West of Open Pit, proximal	VWP	IBR – 64 mbg IBR – 223 mbg	Pressure response to dewatering in open pit in intermediate bedrock along mineralized zone
New well (NW) 1 (nested)	North of TSF	Quality	SS and BS/SBR	Northern edge of TSF – nested piezometer assuming presence of Sand-Clay/Silt-Sand sequence
NW2 (nested)	North-west of TSF, Nursery Road	Quality	SS and BS/SBR	Down-gradient water quality – nested piezometer assuming presence of Sand-Clay/Silt-Sand sequence
NW 3 (nested)	South-west of TSF, Nursery Road	Quality	SS and BS/SBR	Down-gradient water quality – nested piezometer assuming presence of sand-clay/silt-sand sequence
NW 4	North-west of Open Pit and WRSA	Quality and level	BS/SBR	Down-gradient water quality of WRSA and water levels distal to open pit, east of Thunder Lake
NW 5	West of Open Pit and WRSA	Quality and level	BS/SBR	Down-gradient water quality of WRSA and water levels distal to open pit, east of Thunder Lake
NW 6	West of Open Pit, distal	Quality and level	BS/SBR	Down-gradient water quality of WRSA and water levels distal to open pit, east of Thunder Lake
NW 7	South of Open Pit, distal	Level (only)	BS/SBR	Water levels distal to open pit, east of Thunder Lake
NW 8	South of Open Pit, distal	Level (only)	BS/SBR	Water levels distal to open pit, north of Wabigoon.

## Groundwater Quality Monitoring

There are four single screen and four nested well locations in the groundwater quality monitoring program providing a total of 12 monitoring well screens. These wells are to be screened in the SBR and/or BS with the nested well locations having an additional screen in the SS where sand-clay/silt-sand sequence is present. Groundwater quality wells will be sampled at a frequency of four times per year. Water levels will be taken prior to sampling. Samples will be analyzed for the following parameters suites:

- Metals (dissolved);
- Cyanide in monitoring wells around TSF (total, free and weak acid dissociable (WAD) for first year, then total and WAD thereafter);
- Major anions and cations; and
- In-situ field parameters (temperature, reduction-oxidation potential, pH, dissolved oxygen).

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 mentioned above, the groundwater quality program sampling frequency will be quarterly when possible allowing for 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 baseline data.

In addition to the groundwater monitoring of on-site wells, 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.

## Post-Closure

Groundwater quality monitoring would be continued at least until both the TSF and WRSA are capped. Termination of the program would be expected following a satisfactory review of the monitoring data collected during mine closure.

## FUP1.10.4 Current Mitigation Measures

The following measures have been incorporated into the Project to avoid or minimize the effects of the Project on groundwater quality have been considered in the modelling:

- Progressively construct a perimeter ditch and seepage collection system around the operations area to capture and direct all runoff from the site to the water management system. [Mit\_008].
- Waste rock will be evaluated and segregated between PAG and NAG rock, if feasible. [Mit\_019].

- The WRSA will be capped with a low permeability cover, then a layer of overburden, then vegetated during closure. [Mit\_018].
- The PAG waste rock would be placed in the mined out areas of the open pit, to the extent practical. [Mit\_020].
- The open pit will be allowed to flood at closure. [Mit\_022].
- The floor of the TSF will be a low-permeability layer capable of achieving seepage rates that ensure receiving surface water quality is equivalent to baseline, or meet PWQO. The liner would be comprised of natural material, or if necessary, an HDPE liner laid over a prepared basin of sand or comparable material. [Mit\_062].
- Perimeter runoff and seepage collection systems will be constructed around the TSF. [Mit\_051].
- During operations, tailings will be maintained in saturated conditions, and a water cover will be maintained over the majority of the TSF to prevent the onset of acidification. [Mit\_021].
- Tailings within the TSF will be isolated using either a low permeability dry cover, or a wet cover of non-process water or process water that has been treated to meet PWQO. The preferred option for limiting environmental effects is a wet cover. [Mit\_023].
- The drawdown zone of the dewatering process will capture all seepage that bypasses the seepage collection systems and will report to the open pit. [Mit\_052].

### **FUP1.10.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures**

In the event that significant degradation of groundwater quality is recorded from the groundwater monitoring network, this may trigger investigations, which may comprise of the following:

- Recalibration of the groundwater model and update of predictions incorporating any changes to the mine plan. With the respect to groundwater quality this may include an assessment of post-closure conditions when the open pit no longer acts to capture groundwater.
- Installation of new monitoring wells and/or increase of frequency of monitoring (e.g., installation.
- Other investigations.

If the investigation determines a mine-related cause, mitigation measures to be completed, may include the following:

- Suitable replacement of private water supply until groundwater level recovery has occurred on completion of mining depending on location and requirements (e.g., deepening of existing water wells, drilling of new water wells, installation of cistern and supply of potable water).
- Containment measures if significant post closure adverse groundwater quality is predicted.



## **FUP1.10.6 Program Responsibilities**

Treasury Metals would be responsible for carrying out commitments made in the EIS regarding groundwater monitoring, and updates to groundwater and geochemical modeling. The Agency would be responsible for ensuring that the follow-up program is carried out.

## **FUP1.10.7 Reporting**

Treasury Metals also intends to provide the groundwater quality monitoring results as part of the Annual Follow-up program report provided to government agencies, Indigenous peoples and stakeholders. For any groundwater quality monitoring results that exceed management triggers, the Annual Follow-up program report will include the following:

- Results of the investigation to identify the cause of the elevated readings;
- Summary of the actions taken by Treasury Metals to mitigate or resolve the elevated readings, if associated with the Project;
- Confirmation that the remedial actions were successful in addressing the issues; and
- Implication of groundwater and geochemistry model updates to groundwater quality predictions; and
- Any planned actions to respond to changes in groundwater and geochemistry model updates.

The Annual Follow-up program report will also include a summary of any public complaints regarding groundwater quality, including:

- Private groundwater well quality complaints;
- Actions taken to address the complaint; and
- Actions taken to mitigate the source of the complaint, if related to the Project.

## **FUP1.11 Groundwater Quantity**

### **FUP1.11.1 EA Prediction and Overview of Follow-up program and Monitoring Objectives**

The predicted effects of the Project on groundwater quantity were summarized in Section 6.11.4 of the revised EIS. After implementation of the mitigation measures outlined in Section 6.11.5, a single remaining residual adverse effect is anticipated: decreased flows in three surface watercourses, specifically, Blackwater Creek, Thunder Lake Tributary 2 and Thunder Lake Tributary 3. This residual effect would occur gradually as the dewatering activities at the site get underway, and the drawdown zone created by the dewatering expands to its maximum extent. Once the dewatering stops, the effects will diminish gradually as the groundwater slowly returns to near pre-development levels during the post-closure phase. This residual effect to groundwater quantity on surface water flows would be captured as part of the monitoring as part of the surface water quantity follow-up program outlined in Section FUP1.9.

A comprehensive groundwater quantity monitoring program will be developed as part of the permitting and approvals process under the MECP to obtain a permit to take water (PTTW) for open pit dewatering. The PTTW will include details on monitoring groundwater levels in the drawdown zone. In addition, Treasury Metals will conduct groundwater level monitoring in the wells installed for baseline measurements to confirm the predicted location of the drawdown zone from dewatering activities. Section FUP1.10.3 describes the groundwater monitoring well network that will be used. The groundwater quantity follow-up program will begin prior to the start of dewatering activities, and will cease once the groundwater levels return to near pre-development levels in the post-closure phase.

### **FUP1.11.2 Rationale for Inclusion in the Follow-up program**

Unlike other creek systems associated with the Project site area, which are underlain by low permeability sediments, the upper reaches of Blackwater Creek and Thunder Lake Tributaries 2 and 3 are underlain by coarser glaciofluvial deposits. Changes in the groundwater regime due to open pit dewatering have the potential to affect baseflows in Blackwater Creek, Thunder Lake Tributary 2 and Thunder Lake Tributary 3, as well as the associated fish habitat in these watercourses Sections 6.9 (surface water quantity) and 6.14 (fish and fish habitat).

Treasury Metals recognize that there is uncertainty in the inputs used in the groundwater model relied on for the prediction described in the revised EIS (April 2018). As part of the Round 2 process, Treasury Metals committed to a comprehensive groundwater monitoring program to confirm all assumptions relied upon in the groundwater model, including the kinematic porosities and other factors that could influence transport times. To provide confidence in the post-closure predictions, Treasury Metals propose to update the groundwater model on a regular basis (i.e. every three (3) years) to incorporate the actual monitoring results that reflect the data gathered. Review in this manner provides the opportunity to reassess and update the hydrogeological conceptual model and the groundwater flow and transport predictions made for the impacts of the mine. The subsequent details outline the groundwater monitoring as it related to groundwater quantity monitoring.

### **FUP1.11.3 Proposed Monitoring Program**

#### **Groundwater Monitoring Wells**

For information on groundwater monitoring network, please see Section FUP1.10.3. The locations of the proposed groundwater wells are shown on Figure FUP1.10.3.2-1, and a description of the monitoring wells provided in Table FUP1.10.3.2-1:

#### **Groundwater Level Monitoring**

There are 9 single screen monitoring wells and one nested VWP in the groundwater level monitoring program with a total of 11 monitoring well screen and piezometers. These are generally completed in the SBR and/or BS where the most drawdown is expected to be observed.

Manual water level measurements will be re-initiated on a monthly basis in the existing wells once a decision to proceed to development is made (Figure FUP1.10.3.2.1-1, Table FUP1.10.3.2.1-1), until the Project advances to a point where the installation of continuous loggers is warranted. Prior to pit

dewatering, new wells will be installed, and wells will be equipped with pressure transducers set to record water levels at least once per day, and downloaded on a quarterly basis. Two of the wells will be equipped with a barologger to allow data correction for barometric effects. A data logger will be obtained for the VWP nested piezometer and a similar recording and downloading frequency will be undertaken for this installation. Installation of new wells and pressure transducers/loggers will be done a year prior to mine construction.

#### **FUP1.11.4 Current Mitigation Measures**

In the event that unexpected adverse groundwater level drawdown is recorded from the groundwater monitoring network, this may trigger investigations, which may comprise of the following:

- Recalibration of the groundwater model and update of predictions incorporating any changes to the mine plan. With the respect to groundwater quality this may include an assessment of post-closure conditions when the open pit no longer acts to capture groundwater;
- Installation of new monitoring wells and/or increase of frequency of monitoring (e.g., installation; and
- Other investigations.

If the investigation determines a mine-related cause, mitigation measures to be completed, may include the following:

- Suitable replacement of private water supply until groundwater level recovery has occurred on completion of mining depending on location and requirements (e.g., deepening of existing water wells, drilling of new water wells, installation of cistern and supply of potable water).

With respect to the effects on surface water flows, should unexpected reductions in flows be observed as part of the surface water quantity follow-up program (Section FUP1.9), the effects would need to be mitigated through the program to compensate and offset for the loss or alteration of fish habitat.

#### **FUP1.11.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures**

In the event that groundwater drawdown affects the ability of existing wells to supply the required volumes of water, Treasury Metals would:

- Develop suitable replacement of private water supply until groundwater level recovery has occurred on completion of mining depending on location and requirements (e.g., deepening of existing water wells, drilling of new water wells, installation of cistern and supply of potable water).

In the event that groundwater drawdown results show unexpected reductions in flows in Blackwater Creek, Thunder Lake Tributary 2, Hoffstrom's Bay Tributary or Thunder Lake Tributary 3, further adaptive management measures would need to be considered, specifically with respect to the potential effects of reduced flows on fish and fish habitat.

### **FUP1.11.6 Program Responsibilities**

Treasury Metals would be responsible for carrying out commitments made in the EIS regarding groundwater quantity monitoring.

### **FUP1.11.7 Reporting**

Treasury Metals intends to provide the groundwater quantity monitoring results as part of the Annual Follow-up program report provided to government agencies, Indigenous peoples and stakeholders. In addition, for any groundwater quantity monitoring that exceed management triggers (see Section 12.3), the annual follow-up program report will include the following:

- Results of the investigation to identify the cause of the altered readings;
- Summary of the actions taken by Treasury Metals to mitigate or resolve the altered readings, if associated with the Project; and
- Confirmation that the remedial actions were successful in addressing the issues.

The Annual Follow-up program report will also include a summary of any public complaints regarding groundwater quantity, including:

- Private groundwater well level complaints;
- Actions taken to address the complaint; and
- Actions taken to mitigate the source of the complaint, if related to the Project.

## **FUP1.12 Wildlife and Wildlife Habitat**

### **FUP1.12.1 Overview of Follow-up Program and Monitoring Objectives**

The predicted effects of the Project on wildlife and wildlife habitat are summarized in Section 6.12.4 of the revised EIS. The predicted effects to wildlife indicate that even with the mitigation measures outlined in Section 6.12.5, residual effects would remain in terms of the loss of habitat, habitat alteration, and the potential for mortality during the site preparation and construction, operations, and closure phases of the Project. Additionally, in the context of the CEAA, 2012, the offsetting of habitat for SAR species required under the ESA and SARA would be considered mitigation that would offset and mitigate the adverse effects of the Project on these indicators. Therefore, following offsetting there are no residual adverse effects due to the Project related to habitat loss for SAR species. Refer to Table 6.12.9-1 for predicted effects to each VC during each phase of the Project.

A wildlife and wildlife habitat follow-up program will be implemented for the Project to ensure that effects to wildlife are as predicted in the EIS and that these effects are properly mitigated throughout the Project life. All associated wildlife monitoring will be based on standard, acceptable survey protocols. Where appropriate, these protocols will be the same as those used during the baseline data collection efforts, so

changes in species abundance can be detected. The overriding objectives of the Follow-up program are as follows:

- Confirm the amount of direct loss of habitat resulting from Project activities;
- Identify unanticipated reductions in habitat suitability (applicable to areas outside of direct habitat loss areas), for species resulting from Project activities such as increased noise levels or levels of artificial light; and
- Identify whether there is use of alternate habitat with the LSA/RSA by SAR and other species.

As part of the Round 2 Information Request process, TMI\_874-WL(2)-05 was received asking Treasury Metals to describe the monitoring program for snapping turtle, including objectives and any monitoring measures that will be implemented, to verify presence of snapping turtles, effectiveness of mitigation measure. Presently, there are no documented observations of Snapping Turtles within the LSA, although the “recent” observation from the Ontario Reptile and Amphibian Atlas were nearby. Snapping Turtles are listed as “Special Concern” in Ontario, and as such are not afforded additional protection beyond the standard environmental protection regulations. Monitoring for Snapping Turtles will be conducted passively through the course of other monitoring activities (e.g., incidental observations during wildlife, wetlands and ground water monitoring); no targeted monitoring will be undertaken for this species. However, a Snapping Turtle education and response plan has been prepared, included in TMI\_874-WL(2)-05\_Appendix 1. All Project personnel will receive an orientation on Snapping Turtle biology and habitat requirements, and instructed on what to do if an individual or nest is observed within the Project area.

Also received as part of the Round 2 Information Request process was TMI\_952-WL(2)-07, which requested that Treasury Metals, describe the monitoring program for each SAR, including objectives and any monitoring measures that will be implemented, to verify presence and effectiveness of mitigation measures. Presently there are no plans for a monitoring program specifically for SAR. As a group, SAR tend to be scarce, occurring within the operations area, and regional landscape in low densities. As such, they are difficult to detect during field surveys and make poor targets for monitoring. Treasury Metals intends to pursue a community-based wildlife monitoring plan, using changes in wildlife community composition as an indicator of Project effects and habitat condition. A detailed discussion of Treasury Metals’ intended Follow-Up and Monitoring programs for wildlife and wildlife habitat are presented herein. Monitoring requirements for wildlife from a regulatory perspective will be required under the SARA and ESA and will only assess SAR species and habitat. Additionally, Treasury Metals will implement a wildlife and wildlife habitat Follow-up program to verify the accuracy of the EIS, as well as to verify that the mitigation measures outlined in Section 6.12.5 are effective. This monitoring program will include all VCs presented in Table 6.12.9-1 of the revised EIS (April 2018).

## **FUP1.12.2 Rationale for Inclusion in the Follow-up program**

Wildlife are a critical resource to Indigenous peoples and possess intrinsic value. SAR and SAR habitat are particularly important especially for those SAR species that are currently identified as being either Threatened or Endangered. Four SAR species listed as being Threatened or Endangered Federally or Provincially have been identified as occurring in the LSA, namely Common Nighthawk, Barn Swallow, Northern Myotis and Little Brown Myotis.

### FUP1.12.3 Proposed Monitoring Program

As discussed in section 5.11.3.2, Barn Swallow were observed throughout the property during baseline data collection surveys and were generally associated with anthropomorphic structures. Treasury Metals has submitted an Information Gathering Form and an Alternatives Assessment Form for Barn Swallow and Northern Myotis/Little Brown Myotis, which is currently being review by the Dryden district OMNRF. It is anticipated that an Overall Benefit Permit, likely requiring the construction of replacement nesting structures, will be required if some of the structures are dismantled within the footprint which have previously hosted nesting Barn Swallow. Mandatory monitoring and follow-up reporting will be a condition of the Overall Benefit Permit.

#### Wildlife and Wildlife Habitat

- Monitor wildlife species composition and abundance
  - Using the same protocols as used in baseline data collection so changes in species relative abundance can be detected.
  - To be completed every five years.
  - To be completed for the LSA (specific to the species for the study).
- Utilization of offset habitat for SAR species, if required.
  - In the case of Barn Swallow replacement nesting structures are required as partial fulfillment of an Overall Benefit Permit:
    - ◆ Compensation nesting structures (e.g., nesting kiosks) will follow standard designs approved by the MNRF
    - ◆ Nesting structures will be established adjacent to the existing nesting habitat (i.e., human dwelling) prior to decommissioning activities.
    - ◆ Decommissioning activities will take place outside of the migratory bird breeding window.
    - ◆ Nesting structures will be routinely (annually, at a minimum) monitored for signs of use (e.g., active nests, scat or nest scars)
    - ◆ To be completed 1 year following the offset habitat construction and bi-annually or as required thereafter.
    - ◆ Annual reports will be submitted to the MNRF presenting the dates of monitoring activities and findings.
    - ◆ If Barn Swallows do not appear to be using the nesting structures within three (3) years of their construction, the MNRF will be consulted regarding nesting habitat enhancement strategies.

- Utilization of operations area habitat following closure
  - Using the same protocols as used in the baseline data collection to determine if species are utilizing the rehabilitated operations area.
  - To be completed 5 and 10 years following closure.
- Keep log of large wildlife collisions (e.g., moose, deer, etc.) to determine effectiveness of speed limits and to identify areas of high wildlife collision potential in order to apply additional mitigation, and will include the following:
  - Date
  - Time
  - Location
  - Species

#### **FUP1.12.4 Current Mitigation Measures**

The following mitigation measures will be implemented as part of the Project to help avoid potential effects on wildlife and wildlife habitat:

- Project design incorporates a compact footprint. [Mit\_050]
- Minimized the amount of habitat clearing required for the Project by siting Project infrastructure, to the extent practicable, in previously disturbed areas and optimizing the use of existing roadways. [Mit\_065]
- Develop slope dependent vegetated buffers along rivers creeks and wetlands in conjunction with the MNRF. Buffers should be 120 m, wherever feasible. [Mit\_066].
- Timber clearing will be conducted outside the breeding bird window (May 1 to August 15). [Mit\_067].
- The WRSA will be capped with a low permeability cover, then a layer of overburden, then vegetated during closure. [Mit\_018].
- Closure activities should include revegetation with species suitable for the development of habitats capable of supporting a diversity of wildlife species. [Mit\_068].
  - The Agency has requested an additional Follow-up Monitoring Program specifically to assess the effectiveness of Mit\_068. It is assumed that all native vegetation communities can support a diversity of wildlife species. To this end, Treasury will establish a series of permanent sample plots (PSPs) within the PSA. The total number of PSPs will be determined with the guidance of MNRF

- PSPs will consist of 10 m x 10 m square plots, and two (2) 1m x 1m square plots nested within. All three plots will be marked with permanent stakes (centers or corners, yet to be determined).
    - ◆ All vegetation species will be identified within the 10 m x 10 m plot (presence/absence)
    - ◆ Vegetation species densities will be surveyed within the two (2) 1 m x 1 m plots (relative density)
  - PSPs will be surveyed once prior to the Construction Phase of the Project to document these specific vegetation communities. PSPs will then be monitored every 3 years following closure of the Project and remediation, reclamation and revegetation activities.
  - Changes in vegetation community will be monitored to ensure native species are establishing themselves. The detection of high invasive or weedy species densities may trigger adaptive management strategies, with the guidance of the MNRF
- Enforcement of speed limits within the Project area. [Mit\_069].
  - Minimize disturbing areas with suitable bird breeding habitat, where practicable. [Mit\_070].
  - Wildlife awareness training for all staff will be provided including SAR identification/ legislation and education regarding seasonal changes in animal behaviour and their presence. [Mit\_071].
  - Disposal of food waste generated on site will be done in an appropriate manner. [Mit\_072].
  - Clearing of potential terrestrial reptile and amphibian breeding habitats will be restricted to periods outside the breeding season as directed by MNRF. [Mit\_073].
  - Implementation of noise abatement strategies to limit the negative effects of sound on wildlife. [Mit\_025, Mit\_028, Mit\_029, Mit\_031].
  - Develop a wetland clearing strategy with the local MNRF to reduce the effects to overwintering frogs (i.e. draining wetlands to discourage hibernation). [Mit\_074].
  - Where feasible, direct anthropogenic lighting to reduce excess production of light into the surrounding environment. [Mit\_034, Mit\_035, Mit\_036, Mit\_037, Mit\_038, Mit\_039, Mit\_040, Mit\_041, Mit\_042].
  - Progressively construct a perimeter ditch and seepage collection system around the operations area to capture and direct all runoff from the site to the water management system. [Mit\_008].
  - Industry standard erosion and sediment controls, such as sediment traps within ditches, will be implemented during the site preparations and construction phase. [Mit\_054].
  - If habitat destruction / damage cannot be avoided, alternate nesting habitat will be provided as a provision of compensatory habitat for species protected under the ESA. [Mit\_075].



- Acceptable buffers will be provided around all raptor nests identified throughout all Project phases. [Mit\_076].

### **FUP1.12.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures**

It is anticipated that potential adverse effects to wildlife and wildlife habitat will be limited, and can be addressed through mitigation measures listed above, including the recognition that the Goliath Gold Project is a relatively small mining project, and that it is being developed on a site that has been, to a large extent, previously disturbed. That being said, there are two instances where additional mitigation or adaptive management could potentially be required: if greater than expected effects to SAR were to occur, and responding to the occurrence of raptor nests if encountered. In such instances:

- If habitat destruction / damage cannot be avoided, alternate nesting habitat will be provided as a provision of compensatory habitat for species protected under the ESA. [Mit\_075].
- Acceptable buffers will be provided around all raptor nests identified throughout all Project phases. [Mit\_076].

### **FUP1.12.6 Applicable Regulatory Instruments and Associated Government Agencies**

If meaningful adverse effects to SAR are found to be likely to occur, then an ESA permit would be required to offset any such adverse effects. ESA permits and their conditions are administered by the MNRF. Development restrictions in relation to raptor nest sites are defined by the MNRF Significant Wildlife Habitat Mitigation Support Tool, Version 2014.

### **FUP1.12.7 Program Responsibilities**

Treasury Metals will be responsible for carrying out the wildlife follow-up program, and the CEA Agency will be responsible for ensuring that follow-up program is carried out.

### **FUP1.12.8 Reporting**

Treasury Metals intends to provide the wildlife and wildlife habitat monitoring results, including for SAR, as part of the Annual Follow-up program report provided to government agencies, Indigenous peoples and stakeholders. For any wildlife and wildlife habitat monitoring that exceed the management triggers, the Annual Follow-up program report will also include the following:

- Results of the investigation to identify the cause of the effects to wildlife;
- Summary of the actions taken by Treasury Metals to mitigate or resolve the effects to wildlife, if associated with the Project; and
- Confirmation that the remedial actions were successful in addressing the issues.

If no specific wildlife and wildlife habitat monitoring was completed during a particular year, the Annual Follow-up program report would provide a brief summary of results from the preceding year when monitoring was completed.

### **FUP1.13 Migratory Birds**

The monitoring for migratory birds has been included in the wildlife and wildlife habitat monitoring program described in Section FUP1.12.

### **FUP1.14 Fish and Fish Habitat**

#### **FUP1.14.1 EA Prediction and Overview of Follow-up program and Monitoring Objectives**

The predicted effects from the Project on fish and fish habitat are summarized in Section 6.14 of the revised EIS and integrated the prediction made for other technical disciplines including geology and geochemistry, noise and vibration, climate, surface water quality, surface water quantity, groundwater quality, and groundwater quantity. Therefore, the Follow-Up Program for Fish and Fish Habitat is not intended to be mutually inclusive of the other Follow-Up and Monitoring Programs. Effect predictions indicated that even with the mitigation measures outlined in Section 6.14.5, there would still be a residual effect to fish habitat and potential fish mortality in Blackwater Creek Tributaries 1 and 2, as these tributaries will be permanently removed and overprinted for Project infrastructure. Efforts will be taken to minimize mortality to fish in these tributaries during this time by using best practices to relocate the fish further downstream in Blackwater Creek, but a conservative 50% potential for mortality has been predicted. Additionally, direct loss of fish habitat by overprinting of the Project will need to be offset by the construction of new fish habitat, or by an improvement of fish habitat elsewhere. Because the construction of new fish habitat or improvement of fish habitat elsewhere is expected to more than offset the amount of fish habitat lost as a result of the Project, there is not expected to be a residual adverse effect associated with the loss of habitat that will remain following mitigation.

There would be no releases from the Project to surface waters during either the site preparation and construction phase, or the closure phase. During operations, excess water not required in the process will be treated to concentrations that meet Provincial Water Quality Objectives (PWQO) or Canadian Water Quality Guidelines (CWQG) for the protection of aquatic life, or background if background levels exceed the PWQO, prior to discharging to Blackwater Creek. In the case of mercury, effluent will be treated to meet the background concentrations in Blackwater Creek. [Mit\_053]. There would be no other releases from the Project that would affect surface water quality during operations. Following operations, dewatering activities will cease and the open pit will be allowed to fill with water. 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 background if background levels exceed the PWQO, prior to the discharge from the pit lake to a tributary of Blackwater Creek. [Mit\_024]. Once the pit lake is fully flooded, it is expected that the monitoring of the water quality in the pit lake will continue for a period of time to determine whether additional batch treatment may be required to ensure the water released from the pit lake meets effluent release limits [Mit\_124]. Water from the pit lake would be allowed to passively drain through an engineered spillway into the former channel of Blackwater Creek Tributary 1. Once the dewatering activities stop, the groundwater levels will begin to recover. Once the open pit is flooded and the

groundwater returns to near pre-development levels, a small quantity of seepage from the onsite facilities (i.e., the WRSA and TSF) will leave the site and interact with nearby waterbodies. Modelling of post-closure water quality shows that water quality in the receiving water bodies will be equivalent to baseline conditions or meet the PWQO. As a result, no residual adverse effects on fish and fish habitat were predicted as a result of the changes in water quality due to the releases of deleterious substance into fish bearing waters.

The construction and operation of the Project is predicted to result in changes in flows in several of the surrounding waterbodies. During construction, a perimeter ditch and berm will be constructed around the operations area to ensure all Project affected water is contained, and to isolate the site from non-Project affected runoff. As a result of this activity, a small portion of the catchments of Little Creek and Hoffstrom's Bay Tributary will be enclosed within the operations area and the flows to those watercourses will be reduced. These effects will be permanent. During operations, the open pit and underground mine will need to be dewatered to create a safe working environment. This dewatering will result in a lowering of the water table and the creation of a drawdown zone, which is predicted to affect the baseflow in Blackwater Creek, Thunder Lake Tributary 2, Hoffstrom's Bay Tributary and Thunder Lake Tributary 3, all of which have a portion of their catchments underlain by granular materials. Groundwater modelling has determined that there would be little or no effects on the baseflows in the other watercourse near the Project as these streams are underlain by fine materials. The Project will periodically require fresh water, which will be taken from the former MNRF tree nursery irrigation ponds on Thunder Lake Tributaries 2 and 3. Treasury Metals will not take more than 5% of the flow entering the irrigation ponds. Finally, the excess water at the site will be treated to meet PWQO, CWQG, or background prior to discharge into Blackwater Creek, resulting in increased flows during certain periods. Although the Project will result in flow alterations in several watercourses, the magnitude of the predicted changes is not sufficient to have a measurable impact on fish populations.

As stated previously, the DFO will likely require Treasury Metals to develop a plan to offset the direct loss of fish habitat by overprinting of the Project. Treasury Metals have had preliminary conversations with DFO and believe that a combination of the construction of new fish habitat, and/or the improvement of existing fish habitat elsewhere will be sufficient to offset the direct losses of habitat. In addition, Treasury Metals are aware that an offsetting plan to compensate for the loss of fish habitat may also need to offset for habitat altered by the changes in flows described above.

Because the construction of new fish habitat or improvement of fish habitat elsewhere is expected to more than offset the amount of fish habitat lost as a result of the Project, there is not expected to be a residual adverse effect associated with the loss of habitat or changes in flows.

It is expected that regulatory fish and fish habitat effects monitoring will be completed as a requirement of the MMER under the *Fisheries Act*. This will consist of effluent and water quality monitoring that will be harmonized with the surface water quality monitoring program outlined in Section FUP1.8, as well as biological monitoring studies in the aquatic receiving environment to determine if mine effluent is causing any adverse effects to fish or fish habitat. This fish and fish habitat monitoring program will be developed with the help of a qualified aquatic biologist and submitted to DFO for approval. Additionally, it is expected that monitoring of the fisheries offsetting for the Project will also be required as a condition of the *Fisheries Act* authorization. The nature of this monitoring will be determined when the offsetting measures are finalized.

Notwithstanding anticipated regulatory monitoring requirements, which will be developed with input from ECCC, Treasury Metals have identified fish and fish habitat follow-up program that will be implemented to help demonstrate the validity of the EIS predictions and confirm the effectiveness of the mitigation measures proposed. This program is subject to change pending *Fisheries Act* authorization follow-up and monitoring requirements; and any monitoring requirements that might be defined by the ECA issued by the MECP.

### **FUP1.14.2 Rationale for Inclusion in the Follow-up program**

Creek fish habitat will be overprinted by Project development, and may also potentially be affected by open pit dewatering. Effluent discharged from the site, if it fails to achieve PWQO criteria or background might also adversely affect aquatic life in Blackwater Creek. *Fisheries Act* authorizations also typically require follow-up monitoring and implementation of adaptive management, if and as required.

### **FUP1.14.3 Proposed Monitoring Programs**

Monitoring of fish and fish habitat will have several components –water chemistry, water temperature, fish habitat, benthic invertebrate community and fish community, at each monitoring location. The monitoring of fish for quality for consumption as a country food item is also considered as part of the Follow-Up Program as per Health Canada’s 2018 guidance document entitled “*Guidance for Evaluating Human Health Impacts in Environmental Assessment: Country Foods*”. Briefly, the results of the country foods assessment completed as part of the 2018 HHERA indicated that the level of uncertainty associated with modelling contaminant uptake into fish should be reduced via the determination of site-specific uptake factors (bioconcentration or bioaccumulation factors) for all chemicals considered in the country foods pathway including methyl-mercury as part of the Follow-Up Program. Additional details are provided in Section FUP1.19 of the Goliath Gold Follow-Up and Monitoring Program addendum that are specific to human health and ingestion of fish as a country food pathway of exposure.

The effects of blasting (noise and vibration) on fish and fish habitat will be monitored using the monitoring program described in Section FUP1.4 of the Goliath Gold Follow-Up and Monitoring Program addendum for Noise and Vibration.

Water chemistry will be monitored using the monitoring program described in Section FUP1.8 of the Goliath Gold Follow-Up and Monitoring Program addendum Surface Water Quality. To address the concerns raised in TMI\_984-FFH(2)-03 regarding the water quality within the Blackwater Creek Tributary 2 diversion channel, two (2) additional sampling locations have been added to the Surface Water Quality Follow-up monitoring program in Section FUP1.8. The sampling location upstream of the diversion channel and the one at the downstream section of the diversion channel (Figure 1.8.3-2) will help to verify the predictions of the EIS that the water quality in the diversion channel is not being affected by the Project from background conditions.

Water temperature will be monitored with temperature loggers that include out of water detection (Onset HOBO TidbiT MX Temperature 400' or similar) from June 1 through September 30 each year, with temperature logged at half-hour intervals. Specifically, to address the concerns raised in TMI\_895-FF(2)-04 regarding the potential temperature change in the Blackwater Creek Tributary 2 diversion channel prior to the establishment of riparian vegetation, these temperature loggers will be installed upstream of the diversion channel and at the downstream end of the diversion channel to verify that changes in water

temperatures do not increase substantially. These temperature loggers will be used for the first 4 years that water is flowing down the Blackwater Creek Tributary 2 diversion channel, which corresponds with when the riparian vegetation is anticipated to be fully established. The temperature monitoring locations specific to Blackwater Creek Tributary 2 diversion channel is presented in Figure 1.8.3-2.

Fish habitat will be monitored using the Site Features, Channel Morphology module of the Ontario Stream Assessment Protocol (Point-Transect Sampling for Channel Structure, Substrate and Bank Conditions - S4:M1; Stanfield, L. (editor). 2013. Ontario Stream Assessment Protocol. Version 9.0. Fisheries Policy Section. Ontario Ministry of Natural Resources. Peterborough, Ontario. 505 p.). The primary purpose of the habitat data is to provide context for the fish community. Other monitoring, for example the erosion monitoring, is intended to detect changes in physical habitat that might arise from the project.

The benthic invertebrate community will be assessed following the Ontario Benthic Biomonitoring Network protocol (Jones, C., K.M. Somers, B. Craig and T.B. Reynoldson. 2007. Ontario Benthos Biomonitoring Network: Protocol Manual. Queen's Printer for Ontario, 109p.). Samples will be collected using quantitative sampling methods. Organisms will be identified to lowest practical level. Abundance and standard indices of community composition (diversity, evenness, Hilsenhoff Biotic Index) will be calculated will be calculated and compared in order to assess change or lack thereof.

The fish community will be monitored using the single pass method of the Ontario Stream Assessment Protocol (Section 3 – Module 1). Total and relative abundance of species in the catches will be used to assess change or lack thereof

Monitoring of fish and fish habitat will be undertaken, at a minimum, at the following locations:

- Four representative reaches (2 upstream reference reaches and two potentially impacted reaches) of Blackwater Creek;
- One reach in Blackwater Creek Tributary 1, between the project footprint and Blackwater Creek;
- One reach in the upper catchment of Blackwater Creek Tributary 2;
- One reach in Blackwater Creek Tributary 2 between the project footprint and Blackwater Creek;
- One reach in Little Creek;
- One reach in Hoffstrom's Bay Tributary; and
- One reach in Thunder Lake Tributary 2

Fish and fish habitat Monitoring will commence in 2018 and be conducted annually for a minimum of three years. Subsequently, the monitoring will be conducted on a three-year cycle, to coincide with Environmental Effects Monitoring (EEM) that is required under the Metal Mining Effluent Regulation (MMER) of the *Fisheries Act*. Monitoring will continue until it is demonstrated that there are no unpredicted harmful effects on fish and fish habitat post-closure.

EEM requires biological (fish population health and benthic invertebrate community) monitoring, on a three-year repeating cycle, and the study design for each cycle must be reviewed and approved by

Environment Canada prior to the study taking place (Environment Canada, 2012. Metal mining technical guidance for environmental effects monitoring, ix+539 p.). The established EEM triggers will be used to determine if additional actions (confirmation of effects, determination of cause, elimination of cause) are required. In addition to the field investigations, monitoring of effluent quality and laboratory testing of effluent toxicity is a legal requirement of EEM under the MDMER.

### **Effluent and Water Quality Monitoring**

This monitoring requirement is captured by the surface water quality monitoring program outlined in Section FUP1.8.3.

### **Biological Monitoring**

- Effluent
  - Acute and sub-lethal toxicity sample taken from end of pipe location will be conducted for benthic invertebrate and fish species, as prescribed by O. Reg. 560/94 and the MMER.
  
- Blackwater Creed 
  - Acute and sub-lethal toxicity testing on benthic invertebrate and fish species from a sample taken downstream of the effluent discharge location. This monitoring should be done quarterly, and will supplement the monthly testing done on the effluent from the Project (see Table FUP1.8.3-1).
  - Survey of fish species composition using the same techniques used for baseline studies once every three years.
  - Monitoring of mercury in fish flesh would be undertaken in accordance with MDMER Environmental Effects Monitoring protocols, and appropriate guidance from Health Canada. The MDMER Environmental Effects Monitoring protocols provide for fish flesh monitoring of mercury if the concentration of total mercury in the effluent is equal to or greater than 0.10 µg/L. Based on appropriate guidance, Treasury will undertake tissue analysis using the updated Country Foods guidance from Health Canada which includes sampling of tissue for total mercury (inclusive of methyl mercury) regardless of the defined effluent concentrations.
    - Where tissue sampling is indicated, the species selected for tissue analyses should be, if present, sport, subsistence and/or commercial species (including molluscs and crustaceans) where relevant. The fish species used for the tissue analysis may or may not be the same as the species used in the fish survey. On a site-specific basis, the tissue used for the analysis should be chosen based on the portion of the fish constituting the edible portion locally consumed, including the muscle, liver, eggs, hepatopancreas (crustaceans), bone or any other relevant portion.
  
- Thunder Lake Tributaries 2 and 3
  - Survey of fish species composition using the same techniques used for baseline studies once every three years; and

- An adaptive management strategy will be considered. If changes in surface water quality in Thunder Lake Tributaries 2 and 3 are identified as part of the surface water quality follow-up and monitoring programs (as outlined in Section FUP1.8), then biological monitoring via methods comparable to those outlined for Blackwater Creek will be completed.
- Little Creek and Hoffstrom's Bay Tributary
  - Survey of fish species composition using the same techniques used for baseline studies once every three years; and
  - An adaptive management strategy will be considered. If changes in surface water quality in Little Creek and Hoffstrom's Bay Tributary are identified as part of the surface water quality follow-up and monitoring programs (as outlined in Section FUP1.8), then biological monitoring via methods comparable to those outlined for Blackwater Creek will be completed.
- Control Site
  - Acute and sub-Lethal toxicity testing on benthic invertebrate and fish species, and
  - Survey of fish species composition using the same techniques used for baseline studies once every three years.

### **Fish Habitat Offset Monitoring**

- Fish and fish habitat surveys of habitat offsets will be conducted to determine effectiveness. Specific monitoring methods will be developed through discussions with DFO once the offsets are determined and will be described as one or more conditions of the *Fisheries Act* Authorization for the project.

### **FUP1.14.4 Current Mitigation Measures**

The following mitigation measures are incorporated into the design and planned implementation of the Project to avoid or limit adverse effects to fish and fish habitat:

- Prior to overburden removal, any beaver dams within the Project footprint will be removed and the impoundments will be allowed to draw down. [Mit\_077].
- Activities and the construction of Project components that will impact or overprint watercourses will occur during the fisheries timing window when in-stream work is permitted. [Mit\_078].
- To the extent practicable, fish in the sections of Blackwater Creek Tributary 1 that will be isolated by the construction of the perimeter ditch and overprinted by the removal of overburden from the open pit will be captured and relocated to the same tributary downstream from the operations area, or to the main branch of Blackwater Creek. [Mit\_079].
- To the extent practicable, fish in the sections of Blackwater Creek Tributary 2 that will be isolated by the construction of the perimeter ditch and overprinted by the construction of the TSF and minewater pond will be captured and relocated to the same tributaries downstream from the operations area, or to the main branch of Blackwater Creek. [Mit\_080].

- Project design incorporates a compact footprint. [Mit\_050].
- Progressively construct a perimeter ditch and seepage collection system around the operations area to capture and direct all runoff from the site to the water management system. [Mit\_008].
- Effectively manage water collected on-site using constructed storage facilities, reducing the need for fresh water withdrawals and discharges of treated water. [Mit\_057].
- Fresh water takings from tree nursery irrigation ponds on Thunder Lake Tributaries 2 and 3 will not exceed 5% of the flow entering the ponds. [Mit\_059]
- Pump intakes in the irrigation ponds at the former MNRF tree nursery will be fitted with fish screens to prevent entrainment. [Mit\_081].
- During operations, excess water not required in the process will be treated to concentrations that meet Provincial Water Quality Objectives (PWQO) or Canadian Water Quality Guidelines (CWQG) for the protection of aquatic life, or background if background levels exceed the PWQO, prior to discharging to Blackwater Creek. In the case of mercury, effluent will be treated to meet the background concentrations in Blackwater Creek. [Mit\_053].
- An engineered structure, designed to dissipate flows and avoid erosion, will be constructed to discharge effluent during operations into Blackwater Creek. [Mit\_058].
- 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 background if background levels exceed the PWQO, prior to the discharge from the pit lake to a tributary of Blackwater Creek. [Mit\_024].
- Once the open pit has been filled, excess water from the open pit will be passively released through an engineered spillway into the existing channel of Blackwater Creek Tributary 1. [Mit\_060].
- Provide offsetting of fisheries habitat losses as part of the authorization required under the *Fisheries Act*. [Mit\_083].

In addition, the Project will require a *Fisheries Act* authorization and will likely require Treasury Metals to mitigate the losses of fish habitat that it causes as a condition of that authorization. Typically, the offsetting involves the creation of new habitat or the enhancement of existing habitat that is commensurate with the habitat losses. The *Fisheries Act* authorization, which is issued by DFO, details the offsetting measures to be completed and, typically also specifies monitoring to be conducted. DFO uses a letter of credit to provide a financial assurance mechanism in the event that an offsetting plan is not completed [Mit\_083].

### **FUP1.14.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures**

Criteria for considering adaptive management measures would include the following:



- ❑ Final effluent quality does not meet PWQO or background, such that adverse water quality effects to aquatic life in Blackwater Creek are anticipated, or shown to occur;
- ❑ Baseflow reductions in Project area creeks due to groundwater drawdown effects, linked to open pit dewatering, are greater than anticipated and detrimental to fish habitat;
- ❑ Fish community changes is observed in which a dominant species, defined as a species that comprised more than 20% of the total numbers caught during baseline, does not appear in the catch;
- ❑ Benthic invertebrate community indices fall outside of the normal range for similar habitats; and
- ❑ Fish habitat offset measures fail to perform as intended.

A commitment has been made to treat effluent releases from the Project during operations to Provincial Water Quality Objectives (PWQO), Canadian Water Quality Guidelines (CWQG) or background levels prior to release into Blackwater Creek. If monitoring data should indicate that this commitment is not being fulfilled, Treasury Metals would review and implement further treatment measures and/or optimizations to achieve this commitment. If the changes in flows resulting from Project construction, groundwater drawdown, and operations are greater than anticipated (see Section FUP1.9) and detrimental to fish habitat, or if fish habitat offset measures fail to perform as intended, discussions would be held with DFO as to the potential need for additional fish habitat offsets.

#### **FUP1.14.6 Program Responsibilities**

Treasury Metals will be responsible for carrying out the fish and fish habitat Follow-up program and all associated monitoring programs. The CEA Agency will be responsible for ensuring that the Follow-up program is carried out.

#### **FUP1.14.7 Reporting**

Treasury Metals intends to provide the fish and fish habitat Follow-up program results as part of the annual follow-up program report provided to government agencies, Indigenous peoples and stakeholders. For any fish and fish habitat monitoring that exceeded the management triggers, the annual follow-up program report will include the following:

- ❑ Results of the investigation to identify the cause of the effect to fish and fish habitat or changes in aquatic species composition;
- ❑ Summary of the actions taken by Treasury Metals to mitigate or resolve the effect to fish and fish habitat, if associated with the Project; and
- ❑ Confirmation that the remedial actions were successful in addressing the issues.

## **FUP1.15 Wetlands and Vegetation**

### **FUP1.15.1 EA Prediction and Overview of Follow-up program and Monitoring Objectives**

The predicted effects from the Project on wetlands and vegetation are summarized in Section 6.15.4 of the revised EIS. Effects predictions have identified that even with the mitigation measures outlined in Section 6.15.5, residual adverse effects will remain in the form of natural wetland area loss as well as alterations in vegetation communities and species composition. However, this does not take into consideration the habitat that will be constructed and reclaimed following closure, with parts of the open pit and TSF becoming wetland habitat and native species being planted on the reclaimed site.

Through baseline wetland and vegetation studies, no SAR plant species have been identified within the LSA. Therefore, there is no identifiable need for regulatory monitoring of vegetation or wetlands by Treasury Metals.

As part of the Round 2 Information Request process, TMI\_873-WL(2)-04 specifically requested that Treasury Metals provide details on the monitoring programs that will be used to assess the effectiveness of the mitigation measures in reducing the effects of effluent discharge on wetlands, and conditions that would trigger the reduction or termination of effluent discharge (including wetland water level and flora composition monitoring locations) and also to consider additional wetlands that may be identified as a result of revised wetland mapping [WL(2)-03] that may be affected by alterations to the flow of Blackwater Creek. The Follow-Up Program provided herein has been revised to reflect this request information.

Treasury Metals have nevertheless identified a wetland and vegetation Follow-up program that will be implemented to help demonstrate the validity of the EIS predictions and confirm the effectiveness of the mitigation measures proposed. Because of the compact nature of the Project footprint, most of the vegetation within the operations area will be cleared. Therefore, the Follow-up program will focus on the effects to adjacent wetlands, and the vegetation present in those wetlands.

### **FUP1.15.2 Rationale for Inclusion in the Follow-up program**

Areas and types of vegetation habitat that are removed as a result of Project development require verification relative to EA predictions. Groundwater drawdown resulting from open pit dewatering has the potential adversely affect wetland communities through water level changes. Dust emissions from haul road traffic and mineral waste stockpile operations have the potential to adversely affect plant growth in adjacent areas through dust accumulation on leaves and flowers.

### **FUP1.15.3 Proposed Monitoring Program**

#### **Wetlands**

- □ Wetland extent mapping will be carried out to determine the wetland extent within the LSA, and the 2 m groundwater drawdown zone:
  - Mapping to be conducted every 3 years beginning just prior to the start of operations.

- Mapping will be completed using OWES.
- Water level monitoring will be conducted to ensure no impacts to wetland water levels inside the drawdown zone is occurring:
  - Conducted on wetlands located both outside (reference) and within the drawdown zone.
  - Water level will be collected and downloaded using water level loggers and barometric pressure loggers.

As shown in Figure FUP1.15.3-1 (also provided as TMI\_873-WL(2)-04\_Figure 1), WLD3, WLD5, WLD10, WLD12 (upstream of the diversion channel), WLD 13a and WLD14 (downstream of the irrigation ponds) will be monitored, and floral and faunal communities remain consistent with surrounding wetlands. In addition, songbird monitoring will occur within Lola Lake wetland as per the discussions with Environment Canada. Reference sites, WLD1, WLD9 and several sites within the Lola Lake Reserve (sites to be determined in discussion with the Agency), will also be monitored. The exact locations for monitoring will vary depending on the attribute being monitored but will likely follow previous survey locations for consistency. TMI will coordinate with ECCC and MNRF to develop a wetland monitoring program and mitigation measures that would accurately assess potential effects to wetlands within the LSA and RSA (including the Lola Lake Reserve).

525000

530000

535000

5520000

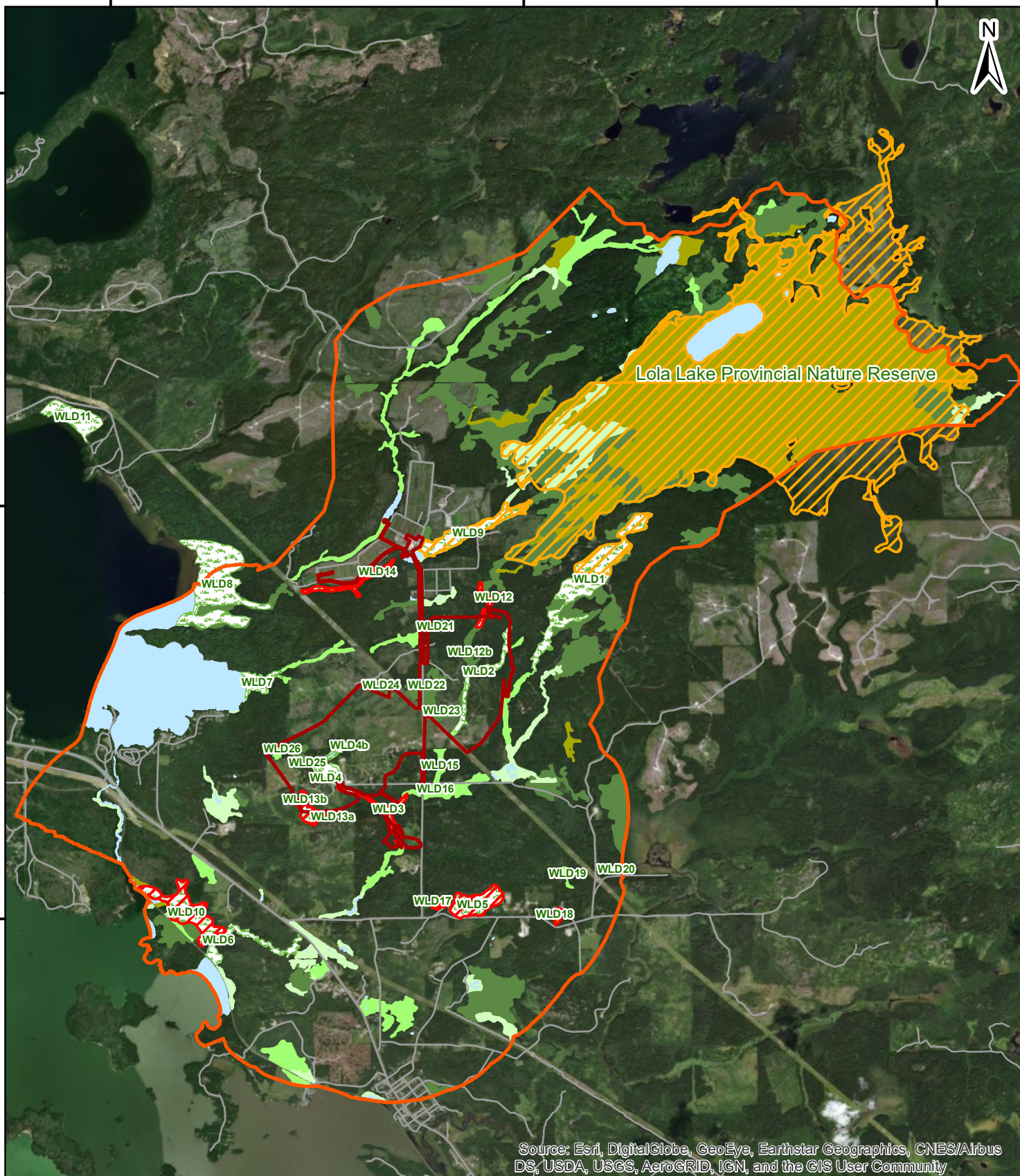
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Lola Lake Provincial Nature Reserve





Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

### FUP1.15.3-1 - Wetlands to be Monitored

Projection: NAD 1983 UTM Zone 15N

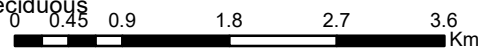
Date created: 2018-11-20

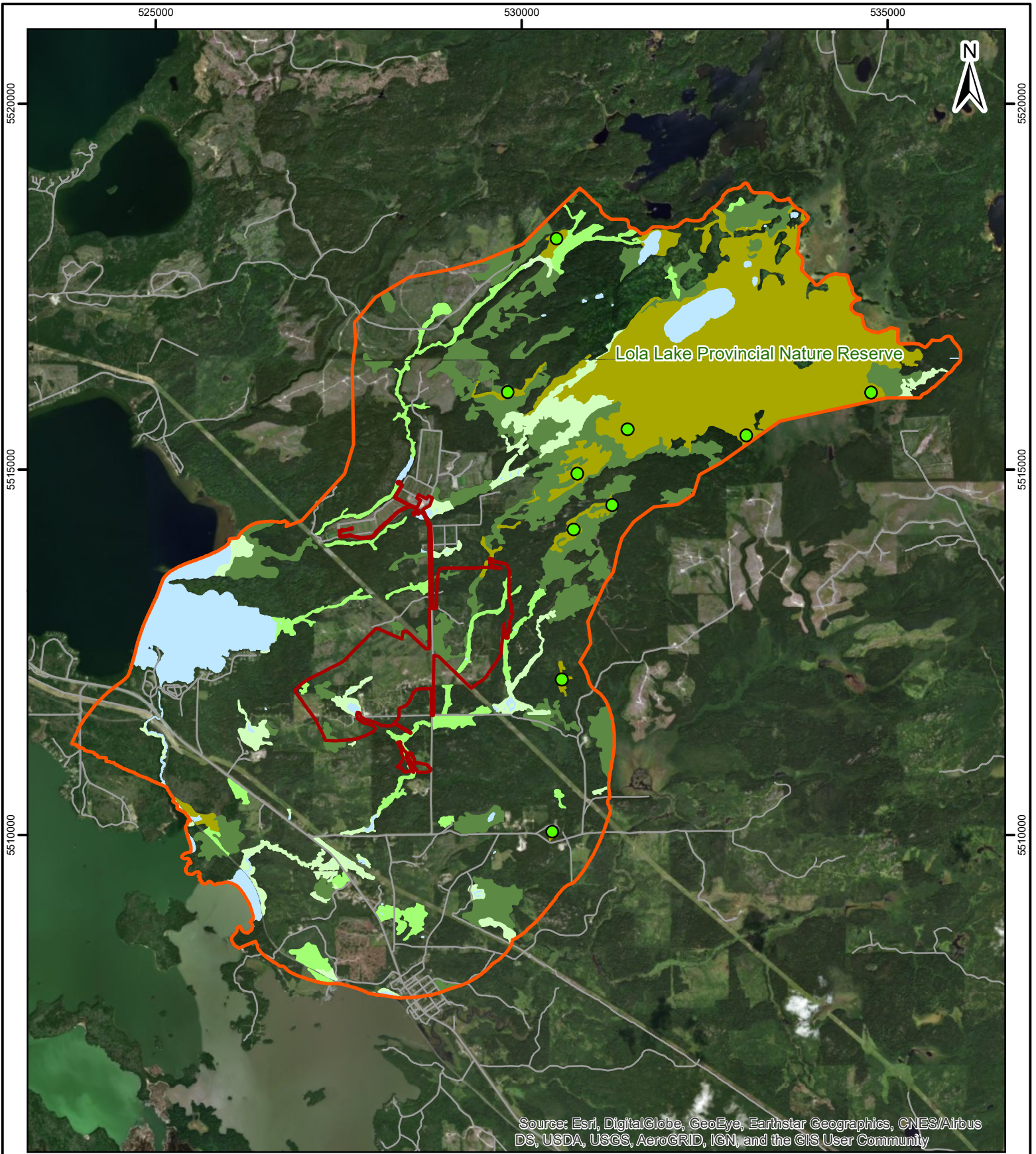
#### Legend

-  PSA
-  LSA
-  Effects Monitoring Wetlands
-  Control Monitoring Wetlands

-  Surveyed Wetlands
-  Waterbody
-  Fen
-  Marsh
-  Swamp - Coniferous
-  Swamp - Deciduous

SCALE: 1:63,360





**Figure FUP1.15.3-2**  
**Potential Songbird Survey Locations**


Projection: NAD 1983 UTM Zone 15N  
 Date created: 2018-11-30

**Legend**

- PSA
- LSA
- Potential Songbird Survey Locations (2019)
- Fen
- Marsh
- Swamp - Coniferous
- Swamp - Deciduous
- Waterbody

SCALE: 1:68,511

0 0.475 0.95 1.9 2.85 3.8 Km



## Vegetation

- Areas and types of vegetation habitat removed as a result of Project development;
- Monitoring of visual signs to dust accumulation on plant surfaces adjacent to roadways and active mining areas;
- Monitor whether the mitigation measures outlined in Section 6.15.5 have been properly implemented; and
- Wetland floral surveys will be conducted to verify that wetland species diversity is maintained:
  - Conducted on wetlands located within the drawdown zone.
  - Survey will be completed every 3 years beginning just prior to the start of operations.
  - Surveys will be completed using the same procedures as done in the wetland baseline study.

### FUP1.15.4 Current Mitigation Measures

The following mitigation measures will be implemented as part of the Project to help avoid potential effects on wetlands and vegetation:

- Project design incorporates a compact footprint. [Mit\_050].
- Minimized the amount of habitat clearing required for the Project by siting Project infrastructure, to the extent practicable, in previously disturbed areas and optimizing the use of existing roadways. [Mit\_065].
- Retention of forested areas wherever feasible. [Mit\_084].
- Identification and protection of known vegetative SAR locations. [Mit\_085].
- Avoid broadcast spraying of herbicides for vegetation management. [Mit\_086].
- As the Project advances, detailed engineering will be completed to ensure that all downstream culverts can support any predicted increases in flows and maintain current levels of fish passage. [Mit\_082].
- Develop slope dependent vegetated buffers along rivers creeks and wetlands in conjunction with the MNR. Buffers should be 120 m, wherever feasible. [Mit\_066].
- Develop sediment and erosion plans which will reduce sedimentation into wetlands and reduce the potential for dust cover on roadside vegetation [Mit\_008, Mit\_046, Mit\_054].
- Closure activities should include revegetation with species suitable for the development of habitats capable of supporting a diversity of wildlife species. [Mit\_068].

- Develop a wetland clearing strategy with the local MNRF to reduce the effects to overwintering frogs (i.e. draining wetlands to discourage hibernation). [Mit\_074].
- Re-vegetation of all slopes after closure with a focus on riparian habitat in the open pit. [Mit\_068, Mit\_087].
- Reclamation and re-vegetation of the mining footprint will be carried out in accordance with O.Reg. 240/00. [Mit\_088].
- Seeding or hydroseeding with native seed mix. [Mit\_089].

In addition, Treasury Metals will:

- Identify and protect the locations of any known SAR or provincially significant plant. [Mit\_085].

### **FUP1.15.5 Criteria for Considering Adaptive Management and Potential Adaptive Measures**

Vegetation community clearing for Project development is a function of overall development plans and is not expected to change other than for minor changes in final design, such as TSF or stockpile slope angle changes needed for improved stability. To prevent unnecessary clearing adjacent to planned structures of facilities, a further adaptive measure that could be implemented would be to mark planned development limits with flagging tape or other similar means.

If monitoring shows that there is excessive dust accumulation on plants bordering haul roads and other work areas, increased watering would be used during dry periods to better manage dust emissions at source.

If wetlands are adversely affected to a level greater than predicted in the EIS, consideration would be given to the development of wetland offsets, if the adverse effects are considered to be significant and there are practical means of developing new wetlands without adversely affecting other environmental functions. This could include developing additional impoundments along watercourses, similar to those resulting naturally from beaver activity.

### **FUP1.15.6 Program Responsibilities**

Treasury Metals is responsible for carrying out the Follow-up program and implementing the filed closure plan as part of mine permitting. The CEA Agency is responsible for ensuring that the Follow-up program is carried out.

### **FUP1.15.7 Reporting**

Treasury Metals intends to provide all noted wetlands and vegetation monitoring results as part of the Annual Follow-up program report provided to government agencies, Indigenous peoples and stakeholders on an annual basis for the years in which the monitoring occurs. For any wetland and vegetation monitoring that exceeded the management triggers, the Annual Follow-up program report will include the following:

- Results of the investigation to identify the cause of the effects to wetlands and vegetation;
- Summary of the actions taken by Treasury Metals to mitigate or resolve the effects to wetlands and vegetation, if associated with the Project; and
- Results of the remedial actions taken to addressing the issues.

If no specific wetland or vegetation monitoring was completed during a particular year, the Annual Follow-up program report would provide a brief summary of results from the previous monitoring efforts.

## **FUP1.16 Land Use**

### **FUP1.16.1 EA prediction and Overview of Follow-up program and Monitoring Objectives**

The predicted effects of the Project on land use were presented in Section 6.16.4 of the revised EIS. The predictions show that, even with the mitigation measures presented in Section 6.16.5, a number of residual adverse effects to land use remained. However, the majority of these changes relate to biophysical aspects listed immediately below, which are captured within Follow-up program related to these aspects, and are captured elsewhere in Section 13 of the revised EIS.

These include:

- Noise and Vibration follow-up (see Section FUP1.4);
- Light follow-up (see Section FUP1.5);
- Air Quality follow-up (see Section FUP1.6);
- Surface Water Quality follow-up (see Section FUP1.8);
- Groundwater Quality follow-up (see Section FUP1.10);
- Wildlife follow-up (see Section FUP1.12); and
- Social follow-up (see Section FUP1.17).

The only exception is traditional land and resource use (TLRU), where such use can be influenced by matters which extend beyond the strictly biophysical environment. These matters can include more abstract aspects of land and resource use such as confidence in environmental monitoring results, changing markets and product supplies, changes to income and employment status, and potentially other factors relating to changing cultural awareness and practices. Insight in these aspects can only be gained through ongoing dialogue with potentially affected Indigenous community members to determine if their current TLRU in the Project area are changing over time, and whether or not these changes are linked to Project effects, or to other causes. In Sections 6.21 (Aboriginal peoples) and 6.22 (traditional land and resource use by Indigenous communities) of the revised EIS, it was determined that TLRU in the general Project Area is unlikely to be meaningfully altered as a direct result of Project development.



### **FUP1.16.2 Rationale for Inclusion within the Follow-up program**

Traditional land and resource use (TLRU) has been identified as a critical aspect of the lifestyles of local Indigenous community members. To a large extent continued TLRU is a function of the health of the general environment and its overall productivity, which is captured elsewhere in Section FUP1. However, as per the above, there are many other factors that can also affect TLRU that go beyond these biophysical aspects.

### **FUP1.16.3 Current Mitigation Measures**

Current mitigation measures are directed at minimizing adverse effects to the biophysical environment, so as to not meaningfully alter the potential use of the land by Indigenous community members. The adjunct to this is continued dialogue with potentially affected Indigenous communities to better understand their continuing use of the land and its resources in relation to Project development and operations. Treasury Metals hopes to achieve this end through ongoing community meetings, and through development of an Environmental Management Committee (EMC), or similar body, whereby environmental concerns and insights can be brought forward in a constructive manner, that will allow effective dialogue and resolution of outstanding matters.

### **FUP1.16.4 Criteria for Considering Adaptive Management and Potential Adaptive Measures**

Criteria for considering adaptive management and potential adaptive measures for strictly biophysical VCs are addressed elsewhere in Section FUP1. Ongoing dialogue with potentially affected Indigenous communities, including through and EMC (or equivalent) is its an adaptive process.

### **FUP1.16.5 Program Responsibilities**

Treasury Metals is responsible for carrying out the Follow-up program and implementing the filed closure plan as part of mine permitting. The CEA Agency is responsible for ensuring that the Follow-up program is carried out.

### **FUP1.16.6 Reporting**

All of the applicable Follow-up program that encompass strictly biophysical land use effects from the Project will be reported on either to government agencies, or within the Annual Follow-up program report that will be provided to government agencies, Indigenous peoples and stakeholders. Follow-up program aspects relating to other more abstract aspects of TLRU will also be reported as part of the Annual Follow-up program report, to the extent that these matters are not considered confidential by the involved Indigenous communities.

## **FUP1.17 Social**

### **FUP1.17.1 EA Prediction and Overview of Follow-up program and Monitoring Objectives**

The predicted effects of the Project on social aspects of the local and regional study areas were presented in Section 6.17.4 of the revised EIS. The predictions show that, even with the implementation of mitigation measures presented in Section 6.17.5, a number of residual effects will remain to the social dynamics of the local and regional communities. However, some of these residual effects to social aspects are expected to be beneficial to communities in the local and regional study areas. Treasury Metals will develop Follow-up programs with input from government agencies, Indigenous peoples and local stakeholders, to verify the effectiveness of the mitigation measures presented in Section 6.17.5, and monitor the extent of the positive and negative residual effects presented in Section 6.17.6. The proposed Follow-up programs for social aspects of the Project, which will be developed with engagement with the aforementioned groups, as appropriate, to address the following aspects:

- In-migration / out-migration of employees;
- Local hiring;
- Training;
- Housing availability;
- Real estate values;
- Crime;
- Emergency services; and
- Traffic accidents related to Project activities.

### **FUP1.17.2 Rationale for Inclusion in the Follow-up program**

The preceding list of social aspects have been raised in comments received from Indigenous communities and other stakeholders, and are aspects which are both important to the overall area social fabric, and which can be reasonably measured and verified.

### **FUP1.17.3 Proposed Monitoring Program**

Several of the preceding list of social aspects can be tracked through Treasury Metals human resource and health and safety records. These include:

- In-migration / out-migration of employees;
- Local hiring;

- Training;
- Use of emergency services; and
- Traffic accidents related to Project activities.

The remaining aspects will require assistance from local governments, or in the case of crime general information from police records.

#### **FUP1.17.4 Current Mitigation Measures**

Currently proposed mitigation measures include:

- Effective communications (ongoing engagement with potentially affected stakeholders and members of Indigenous communities);
- Socio-economic monitoring and management (development of a socio-economic monitoring and management plan designed to address potential Project-related socio-economic effects);
- Local hiring (employment and business practices that give preference to local and regional labour to the extent possible, including to Indigenous communities);
- Workforce development (development of training policies and programs);
- Education enrollments (communicate education requirements needed for employment);
- Support infrastructure and services (work with local and regional governments to minimize the effects of in-migration and out-migration; and
- Promote worker and public safety (site security services; develop safety and work policy guidelines for mine workers, suppliers and contractors).

#### **FUP1.17.5 Criteria for Considering Adaptive management and Potential Adaptive Measures**

For those aspects which are within, or partly within, the ability of Treasury Metals to control (e.g., hiring and training, use of emergency services), Treasury Metals will strive for ongoing improvement); but no specific targets or thresholds have been set to date.

#### **FUP1.17.6 Program Responsibilities**

Treasury Metals is responsible for carrying out the Follow-up program. The Agency is responsible for ensuring that the Follow-up program is carried out.

## **FUP1.17.7 Reporting**

A number of commitments have been made regarding social aspects of the Project in the local and regional study areas, which will require follow-up reporting through the EA process. These include Treasury Metals' commitments such as to hire locally [Cmt\_003], and purchase locally [Cmt\_004]. Notwithstanding, Treasury Metals intends to provide the social monitoring results as part of the Annual Follow-up program report provided to government agencies, Indigenous peoples and stakeholders on an annual basis.

## **FUP1.18 Economic**

### **FUP1.18.1 EA Prediction Overview of Follow-up program and Monitoring Objectives**

The predicted effects of the Project on the economic climate of the local and regional study areas were presented in Section 6.18.4 of the revised EIS. The predictions show that, even with the implementation of mitigation measures presented in Section 6.18.5, a number of residual effects will remain to the economics of the local and regional communities. These residual effects to economic aspects are, for the most part, expected to be beneficial to communities in the local and regional study areas. Treasury Metals will develop Follow-up programs with input from government agencies, Indigenous peoples and local stakeholders, as appropriate, to verify the effectiveness of the mitigation measures presented in Section 6.18.5, and monitor the extent of the positive and negative residual effects presented in Section 6.18.6. To date, there have been five proposed Follow-up programs for the economic effects of the Project, which will be developed following consultation with the aforementioned groups. These proposed programs include:

- Employment;
- Business and contracting opportunities;
- Training courses;
- Worker profile (e.g., local vs in-migrant worker); and
- Economic commitments.

A number of these programs (employment, training, worker profile) overlap with elements of the social follow-up program. The added factor for the economic VC would be estimating dollar values, where appropriate.

### **FUP1.18.2 Rationale for Inclusion in the Follow-up program**

The primary reason that government agencies, Indigenous peoples, local residents and other stakeholders are willing to support projects of this type, are that they bring added prosperity to the local, regional, Provincial and national economies. It is therefore incumbent on Treasury Metals to be able to demonstrate that such benefits have occurred.

### **FUP1.18.3 Proposed Monitoring Program**

The proposed monitoring program will consist of tracking various economic metrics on an annual basis. This will include tracking:

- Numbers of employment positions, including estimates of contracting positions;
- Values of business contracts;
- Training program values;
- Worker and contracting origins / affiliations (Indigenous, local, regional, etc.); and
- General operating expenditures (as per Company annual reports).

### **FUP1.18.4 Current Mitigation Measures**

Current mitigation measures relating to economics include:

- Local hiring (employment and business practices that give preference to local and regional labour to the extent possible, including to Indigenous communities);
- Workforce development (development of training policies and programs); and
- Education enrollments (communicate education requirements needed for employment).

### **FUP1.18.5 Criteria for Considering Adaptive Measures and Potential Adaptive Measures**

The Company will strive for ongoing improvement; but no targets or thresholds have been or will be set at this time.

### **FUP1.18.6 Program Responsibilities**

Treasury Metals is responsible for carrying out the Follow-up program. The CEA Agency is responsible for ensuring that the Follow-up program is carried out.

### **FUP1.18.7 Reporting**

A number of commitments have been made regarding economic aspects of the Project in the local and regional study areas, which will require Follow-up program reporting through the EA process. These include Treasury Metals' commitments to hire locally (Cmt\_003), and purchase locally (Cmt\_004). Notwithstanding, Treasury Metals intends to provide the economic monitoring results as part of the Annual Follow-up program report provided to government agencies, Indigenous peoples and stakeholders on an annual basis.

## FUP1.19 Human Health

### FUP1.19.1 EA Prediction Overview of Follow-up Program and Monitoring Objectives

As part of the Round 2 process, Treasury Metals completed a human health and ecological risk assessment (HHERA) following Health Canada's Detailed Quantitative Risk Assessment Guidance (DQRA) and more recent EA guidance for risk assessment to determine if there was the potential for human or ecological health risks associated with the Goliath Gold Project. The predicted effects of the Project on human health presented in the HHERA supersede those that were presented in Section 6.19 of the revised EIS (April 2018) and those provided in Appendix W of the revised EIS (April 2018).

The HHERA assessed potential risk to human receptors who may be workers, residents, and those who may practice traditional land and resource use. The HHERA assessed potential risk to human receptors within three unique study areas, for three assessment scenarios (Base Case, Project Alone, and Project [Project Alone + Baseline]) and four project phases (Site Preparation and Construction, Operations, Closure, and Post-Closure). The HHERA included an assessment of the inhalation pathway including within the Property Boundary using the 95<sup>th</sup> upper confidence limit of the mean, consideration of additional Project-specific media sources (such as waste rock and TSF supernatant water), a revised contaminant of concern (COC) screening and selection process (including recent updates to federal and provincial guidelines and standards), a revised HHERA problem formulation, a detailed assessment of the country foods pathway, consideration of social determinants of health, and revised exposure and toxicity assessments and risk characterization for the human health risk assessment and the ecological risk assessment. The HHERA underwent three rounds of technical review by Health Canada and the Agency technical experts and in the November and January (Final) Submission was updated to be consistent with the results of the Round 2 information requests from the other various technical disciplines including surface water quality, mine waste, and hydrogeology. The January (Final) HHERA was also updated to reflect the meaningful engagement activities that occurred throughout the review of the draft submissions.

For human health a residual adverse effect is defined when the risk for the Project Assessment Scenario (i.e. Project + Baseline) via the sum of all operable pathways, exceeds the Health Canada acceptable risk benchmark and the estimated potential risk for the Base Case Assessment Scenario. In those cases where the potential risk via the sum of all operable exposure pathways is less than base, then the residual effect would not be adverse. The results of the revised HHERA indicated that there were no residual adverse effects to human health.

The HHERA identified areas of uncertainty that should be addressed as part of the follow-up program for human health. These included uncertainty associated with the use of modelled soil, air, and water data for the Project Alone and Project Assessment scenarios, modelled country foods data for all Assessment Scenarios including the Base Case Assessment Scenario, the use of literature derived uptake factors in the country foods modelling, exclusion of groundwater and sediment data from the quantitative assessment (a qualitative discussion was provided), and the use of literature derived dietary consumption patterns rather than dietary consumption data directly from the Indigenous stakeholders of the Goliath Gold Project. The results of the HHERA have been used to determine the scope of the follow up program for human health (and ecological receptors). Although the follow up program for human health is specific, it

does rely on the follow up programs for various other technical disciplines including geology and geochemistry, air quality, surface water quality, groundwater quality, wildlife and wildlife habitat, fish and fish habitat, wetlands and vegetation, and ongoing engagement with the Indigenous stakeholders. The HHERA identified uncertainties which will be addressed as part of the follow-up program for human health described herein.

### **Project -Specific Media and Human Health**

The 2018 HHERA included a revised assessment of potential risk via exposure to Project-specific media including waste rock, tailing storage facility supernatant water, and pit-lake water via the direct contact and uptake into country foods pathways. The uptake into country foods pathway is discussed in the follow subsection.

No contaminants of concern to human health were identified in the pit-lake following closure of the Project. A number of human health COCs were selected in Project-specific media including TSF supernatant water, and waste rock and assessed for their potential health risk to Project Workers. Project Workers may be exposed to waste rock and TSF supernatant water via direct dermal contact and incidental ingestion during routine Project work during the site preparation and construction, operations and closure phases of the Project. Potential risk was quantified for a Project Worker for these three Project phases for the Project Alone and Project Assessment Scenarios which are equal given that Project-Specific media do not exist in the Base Case Assessment Scenario. As stated above, for safety purposes, access to Study Area No. 1 the operations area will be restricted to only employees of Treasury Metals during the active phases of the Project and no country foods will be harvested from the operations area during these Project phases. Therefore, Project Workers are the only receptors directly exposed to Project-specific media. Where potential risk was identified to a Project Worker via direct dermal contact and incidental exposure to waste rock and TSF supernatant water, the Health and Safety plan including the prescribed use of additional personal protective equipment, is identified as a suitable risk management measure to mitigate any adverse residual effects. With risk management measures in place, no potential risks are identified to Project Workers.

Potential risk to wildlife via exposure to Project specific media was specifically considered in response to TMI\_872-WL(2)-03 (tailing storage facility supernatant water) and TMI\_875-WL(2)-06 (pit-lake water). Wildlife may be consumed as a country food (discussed below). Risk management measures including fencing, and bird deterrent flags will serve as mitigation measures to effectively reduce exposure of wildlife to the TSF supernatant water. With the implementation of these risk management measures and the quality of the TSF supernatant water, an adverse impact on birds and mammals from exposure to TSF supernatant water is not anticipated. There were no potential effects identified for plants or aquatic receptors via exposure to the TSF supernatant water, as exposure of these ecological receptors to the TSF supernatant water, given the quality, is not a viable operable pathway of exposure. No potential risk was identified to human receptors via ingestion of country foods exposed to the TSF supernatant water as a result of the Project. As stated in the revised EIS (April 2018), 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 background if background levels exceed the PWQO, prior to the discharge from the pit lake to a tributary of Blackwater Creek. Batch treatment has been successfully applied in situations similar to the Project to reduce the concentrations to a point where they would be suitable for discharge and would not present a concern to wildlife that may access the pit lake following closure. The treatment of the pit lake during filling was identified in the revised EIS (April 2018) as mitigation reference number Mit\_024.

In the event that monitoring data indicates that surface water quality in the pit lake exceeds the PWQO, or background conditions if background levels exceed the PWQO, additional applications of batch treatment by Treasury Metals would be required. Treasury Metals fully realize that discharges from the pit lake to the receiving environment would first require them to obtain an Environmental Compliance Approval (ECA) from the Ontario Ministry of Environment, Conservation and Parks. Obtaining an ECA would require Treasury Metals to demonstrate that the water they plan to discharge is suitable for release to the environment. Based on past experience on similar mining developments, there is no compelling evidence to suggest that, with appropriate application of batch treatments of the pit lake, that the water quality would not meet the PWQO, or background if the background levels are greater than the PWQO. Therefore, no additional mitigation measures beyond additional batch treatments would be required, as with the planned batch treatment mitigation will be able to achieve and maintain the pit lake water quality at a level where the PWQO will be maintained, and thus there is no need to restrict access to wildlife.

The surface water quality monitoring described in the Follow-Up Program for Surface Water Quality would be relied upon for describing the Follow-Up Program for pit-lake water quality.

### **FUP1.19.2 Rationale for Inclusion in the Follow-up Program**

Risk assessment science is constantly evolving to reflect changes in toxicology, and current scientific consensus regarding contaminant transport and fate. Subsequently, Government agencies including Health Canada and the Ontario Ministry of Environment, Conservation and Parks are updating their risk assessment guidance document and associated risk assessment models, and risk assessments should be completed as per the most up-to date consensus among the risk assessment community. In addition, via ongoing meaningful engagement activities, the site-specific knowledge of the use of the lands surrounding the Project is expected to continually evolve and as a result the exposure scenarios used in the risk assessment should be revised to reflect the more site-specific knowledge. Furthermore, as other follow-up and monitoring programs produce updated chemical concentrations in soil, groundwater, surface water and air, a revised contaminant of concern list may be required including supplemental screening for human health. A follow-up risk assessment would be required to reflect changes in the predictions made as part of the EIS process.

From a regulatory perspective, a risk assessment is not anticipated to be required based on the land use plans of the Project and the conservative risk management measures incorporated as part of the project design.

### **FUP1.19.3 Proposed Monitoring Program**

#### **Proposed Air Quality Monitoring Program for Human Health**

The HHERA included an assessment of potential risk via the inhalation of air (criteria air contaminants, diesel particulate matter and fugitive dust) pathway. Human health impacts associated with the air quality pathway were assessed with consideration given to Health Canada's 2016 guidance document entitled "*Guidance for Evaluating Human Health Impacts in Environmental Assessment: Air Quality*". As stated in the HHERA, there were no exceedances of the ambient criteria, guidelines, or standards where it is appropriate to apply them.



The results of the HHRA screening, identified that three (3) valued components/criteria air contaminants; nitrogen dioxide, and both fractions of particulate matter (NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub>) exceeded their respective ambient air quality criteria inside the Operations Area and only during the active phases of mining, thereby indicating that potential risk to Project Workers via the inhalation pathway may not be considered negligible. At the request of Health Canada and the Agency, diesel particulate matter (DPM) was also included in the health assessment even though there are no federal or provincial criteria available within Canada. It should be noted that air quality is not typically modelled within the Property Boundary as part of the EA process unless sensitive receptors are present, as the federal and provincial criteria are only applicable at the Property Boundary or sensitive receptor locations. There are no sensitive receptors located within the Property Boundary of the Goliath Gold Project, however at the continued request of the Agency and Health Canada, modelling inside the Property Boundary was performed and used to determine the 95<sup>th</sup> UCLM concentrations. A Health and Safety Plan including the prescribed use of personal protective equipment (including but not limited to dust masks and other similar equipment) will be implemented for all Project Workers of the Goliath Gold Project. The Health and Safety Plan will serve as an appropriate risk management/ mitigation measure to mitigate any adverse health effect. With a Health and Safety Plan implemented as a risk management measure, exposure via the inhalation pathway is considered negligible and no residual adverse effects are identified to Project Workers.

Concentrations of all CACs modelled within the LSA (including areas within the Property Boundary) and the Village of Wabigoon were below their criteria protective of human health, and the potential risk associated with exposure to DPM was determined to be essentially negligible. Therefore, health risks to residents or visitors/ harvesters who may practice traditional land and resource use are considered essentially negligible. No residual adverse effects were identified. Although the results of the HHERA do not indicate that risk management or mitigation measures are required during traditional land and resource use, as part of the sign in and access policy, Treasury Metals will offer appropriate personal protective equipment to those who prefer to wear it while within the Property Boundary. Treasury Metals has also committed to consult with Indigenous communities regarding the placement of dustfall monitoring jars to target areas of potential impact that overlap with areas where traditional land and resource occurs (this information will be shared confidentially by the community in the formal Traditional Knowledge studies completed, underway or expected in the future).

The air quality modelling methodology and air quality predictions relied upon in the assessment of effects of the project on air quality (Section 6.6 of the EIS [April 2018]), and in the HHERA are considered to have an acceptable level of uncertainty for use. Furthermore, the proposed mitigation measures are not novel or overly complex and therefore the effectiveness of the mitigation measures also has inherently low uncertainty. Finally, the Project is located in a rural area in North Western Ontario with a population density 2 orders of magnitude lower than the lowest population density used in the epidemiological studies relied upon for the assessment of potential effects on human health for criteria air contaminants such as NO<sub>2</sub>, therefore there a greater potential for exposure and health effects does not exist. The Follow-Up Program for verifying the accuracy of the environmental assessment and determining the effectiveness of mitigation measures described in The Goliath Gold Follow-Up Program Addendum for Air Quality, will be relied upon for determining the Follow-Up Program for the implications of changes of air quality to human health.

The proposed air monitoring to support the Follow-Up Program for the Goliath Gold Project would include commissioning a monitoring station equipped with a combination of periodic samplers (e.g., high volume samplers for TSP, and PM<sub>2.5</sub>), passive samplers (e.g., dustfall), and if warranted, continuous

monitors (e.g., samplers for NO<sub>2</sub>). As the objective of monitoring to support the follow-up program is to confirm the findings of the EIS and the efficacy of the mitigation measures, configuring continuous monitors (if warranted) to provide real time data is not considered justified. Any continuous monitors at the station (if warranted) would only be configured to provide real-time air sampling results if deemed appropriate to provide supplemental information to support the development and implementation of the mitigation strategies, which is outside the scope of the monitoring to support the follow-up program. It is expected that the monitoring station to support the follow-up program would be decommissioned once the objective of confirming the findings of the EIS and efficacy of the mitigation measures is achieved.

Air quality monitoring will be conducted in the following manner:

- □ An air monitoring station will be installed.
  - The station will possibly include analyzers to measure the following: total suspended particulate matter (TSP); particulate matter nominally smaller than 2.5 µm (PM<sub>2.5</sub>); and nitrogen dioxide (NO<sub>2</sub>).
- □ Passive sampling of NO<sub>2</sub> and SO<sub>2</sub> would monitor average concentrations over 30-day periods through the year.
- □ Particulate matter will be collected passively over a 30-day period using dust fall jars. These collected samples will be submitted for analysis of total dustfall, as well as for the metals content within the collected particulates.
- □ A meteorological station will be installed in the operations area to record continuous meteorological data. This data will be used in conjunction with the air quality data to determine trends, and will provide support information for ongoing Project engineering.
- □ Treasury Metals will record any complaints received regarding air quality associated with the Project.
- □ Treasury Metals will consult with Indigenous communities regarding the placement of dustfall monitoring jars to target areas of potential impact that overlap with areas where traditional land and resource occurs (this information will be shared confidentially by the community in the formal Traditional Knowledge studies completed, underway or expected in the future).

An Occupational Health and Safety Plan was prescribed for Project Workers within the operations area. Monitoring that Project Workers are in compliance to the prescribed Health and Safety Plan will be completed. Treasury Metals recognizes that the perception of risk, safety, and well-being is a concern to members Indigenous communities and has proposed to work with each Indigenous stakeholder community to develop a risk communication plan to help mitigate the perceptions of risk, safety and well-being associated with the Goliath Gold Project.

### **Proposed Surface Water Quality Monitoring Program for Human Health**

The HHERA included an assessment of potential risk via direct dermal contact and ingestion of the surface water pathway. Human health impacts associated with the surface water quality pathway were assessed with consideration given to Health Canada's 2016 guidance document entitled "*Guidance for Evaluating Human Health Impacts in Environmental Assessment: Drinking and Recreational Water Quality*". As part of

the human health risk assessment problem formulation, there were no surface water COCs identified based on health-based human health criteria. As such, no potential risk was identified to human health via the surface water quality pathway.

As stated in the HHERA, aluminum does not currently have surface water criteria specific to human health. Health Canada states that there is no consistent, convincing evidence that aluminum in drinking water causes adverse health effects in humans. Therefore, a health-based guideline or aesthetic objective has not been established for aluminum in drinking water. Aluminum concentrations in surface water should be monitored in the event that a health-based criteria is derived in the future for aluminum.

As part of the Round 2 information requests, multiple submissions of the HHERA were submitted in draft for review. In an early draft version of the HHERA, arsenic and antimony were identified as human health contaminants of concern based on exceedances of the Health Canada drinking water guideline in Blackwater Creek. As part of the Round 2 information requests with respect to surface water quality predictions a number of changes were made to the hydrogeology and geochemistry assumptions and subsequently the surface water quality modelling. Additionally, TMI\_884-SW(2)-01 which was later superseded by TMI\_948-SW(2)-01B noted that the raw data and a summary of baseline water quality results was not provided for the data collected during the 2010/2011 sampling program and requested it be added to the surface water quality modelling. The addition of the 2010/2011 data set resulted in arsenic and antimony concentrations that were statistically lower than with the use of the previous dataset and therefore they no longer exceeded the human health criteria and considered human health contaminants of concern. These changes highlight the importance of a comprehensive baseline data set and suggest that the surface water quality predictions be confirmed as part of the follow up program for surface water described in FUP1.8. In addition to the results from the follow up program described in FUP1.8, the surface water quality program for human health should include contaminant screening to health-based water quality criteria.

A total of 12 proposed monitoring locations are shown in FUP1.8.3-1. The total number of monitoring stations will be identified in consultation with MECP. The stations identified in this report are considered preliminary possible options that may be used in the monitoring to support the follow-up program. These preliminary locations correspond to the locations used to collect baseline results. Treasury Metals intends to carry some of these locations forward for their surface water quality monitoring program. The frequency of monitoring each location is proposed however may change with consultation with MECP and site conditions. Each sample location may be analyzed for relevant parameter suites, as per Table FUP1.8.3-1 and may be altered due to site conditions and safety considerations:

**Table FUP1.8.3-1: Summary of Surface Water Quality Follow-up Programs**

Sampling Location	Parameter Group					
	Group A (1)	Group B (2)	Group C (3)	Group D (4)	Group E (5)	Group F (6)
SW-TL1A, SW-JCT, SW-2, SW TL3, SW-4, SW-7, SW-8, SW-9	Monthly	Monthly	Monthly	—	—	—
SW-10, SW-11	Monthly	Monthly	—	—	—	—
SW-5, SW-6	Annually	Annually	Annually	—	—	—
Effluent Discharge	—	Monthly	—	Thrice Weekly	Weekly	Monthly

Notes:

- (1) **Group A:** pH, acidity, alkalinity, dissolved oxygen, chloride, conductivity, dissolved and total organic carbon, hardness, nitrate, nitrite, phosphate, sulphate, temperature (field), total and un-ionized ammonia, total dissolved solids, total suspended solids, turbidity.
- (2) **Group B:** Total ICP metals scan. Total chromium and hexavalent chromium will be reported.
- (3) **Group C:** free cyanide, total cyanide, weak acid dissociable cyanide.
- (4) **Group D:** pH, total cyanide, total suspended solids
- (5) **Group E:** copper, lead, nickel, zinc, arsenic
- (6) **Group F:** Acute toxicity testing (Rainbow Trout and *Daphnia magna*)

Relevant parameter suites may include inorganics including metals and organics including methyl-mercury. As per Information Request SW(2)-02, the effluent discharge sampling location may also be monitored for hydrocarbons on a basis with Group B parameters. Hydrocarbons may enter the water management system via run-off from equipment on-site or as a byproduct of blasting materials. Concentrations of hydrocarbons in water leaving the effluent discharge sampling location are anticipated to be below detection limits.

In-situ field parameters (temperature, reduction-oxidation potential, pH, dissolved oxygen) will also be sampled for receiving water stations.

### **Proposed Project-Specific Media Monitoring Program**

The 2018 HHRA included an assessment of potential risk via exposure to Project-specific media including waste rock, tailing storage facility supernatant water, and pit-lake water via the direct contact to a Project Worker and uptake into country foods pathways. The results of the HHRA screening identified 14 contaminants of concern/valued components in Project-specific media based on exceedances of their respective criteria/ guidelines/ standards. All 14 were carried forward for a quantitative human health risk assessment and assessment of residual adverse effects, cumulative effects, and significance (where required). The results of the HHRA indicated that there would be no residual adverse effects to a Project Worker exposed to Project specific media with the implementation of a Health and Safety Plan which includes the prescribed use of personal protective equipment such as dust masks/respirator, long pants and sleeves, and gloves when working within the Operations Area of the Project. A detailed follow up program has been designed to address the uncertainties associated with the HHRA, however at this time, potential risks to human receptors that may live or practice traditional land and resource use in areas surrounding the Goliath Gold Project are anticipated to be essentially negligible.

The results of the ERA identified residual adverse effects for six (6) of the valued components; aluminum, antimony, arsenic, lead, thallium, and zinc to select mammals and birds, but only within the Operations Area of the Project. There were no residual adverse effects identified to any ecological receptor in the local study area or the Village of Wabigoon. This result indicates that the Goliath Gold Project is unlikely to change the ability of Indigenous community members to practice their traditional land and resource use as the Project is not predicted to have a meaningful effect on the health of ecological receptors on those locations. The ERA was conducted based on a single line of evidence approach and, in all cases modelled or predicted data. As per the Federal Contaminated Sites Action Plan (FCSAP) Guidance for completing an ERA, a multiple line of evidence approach should be applied prior to accepting the results of an ERA and implementing risk management measures. As such, as part of the follow up programs for wildlife, migratory birds, and species at risk, exposure of mammals and birds to the onsite structures (waste rock storage area, TSF supernatant water, pit lake) should be confirmed prior to requirement to

implement risk management measures. Should the follow up monitoring indicate exposure at a frequency that may pose ecological effects, then risk management measures including fencing, and bird deterrent flags will serve as appropriate mitigation measures to effectively reduce exposure and subsequently potential risk if required. At this time, no potential risk to mammals and birds via exposure to chemicals in Project-Specific media within the Operations Area is anticipated. The incremental risks associated with the Project relate to the exposure of ecological receptors to the media present within the operations area (e.g., TSF supernatant water and waste rock during the active phases of the Project). The ecological receptors affected by these Project media are restricted to the local study area and are unlikely to be exposed to contaminants from other Projects. Therefore, cumulative effects associated with the identified residual adverse effects of the Project on ecological receptors are not likely to occur.

As part of the Round 2 process, a number of revisions were requested to the follow-up programs to geology and geochemistry and hydrogeology as described in section FUP1.3 and FUP1.10, respectively. The results of the follow-up monitoring for these technical disciplines involve confirming the onset of ARD and metal concentrations in the waste rock and tailings storage facility which in turn may impact seepage and surface water quality. Metal analysis would include a full suite of metals via ICP-MS. Methyl-mercury would be analyzed in at least 10% of the samples collected to support the human health follow-up program and the methylation rate determined in each of the Project-specific media. The measured metal concentrations in project-specific media including waste rock, TSF supernatant water, pit-lake water quality, and the TSF cover (wet or dry) at closure will be compared to health-based soil and water criteria and used to assess potential risk via the direct contact pathway to potential human receptors. The measured concentrations will then be used to update the modelling predictions of chemical concentrations in country foods and used to derive site-specific uptake factors which would reduce the uncertainty associated with the use of literature derived uptake factors (refer to the proposed country foods monitoring program for human health below).

The follow-up programs for wildlife and wildlife habitat, migratory birds, vegetation and wetlands, and fish and fish habitat described in FUP 1.12, FUP1.13, FUP1.14, and FUP1.15, respectively will be relied on to confirm biota exposure to Project-specific media. If biota are confirmed to be exposed to project-specific media, and the chemical concentrations in those media are sufficiently high to classify them as contaminants of concern, then these species would become the target of dietary consumption surveys to quantify the proportion of country foods ingestion that these country food items represent. For those biota that are exposed to project-specific media and not considered a species at risk (SAR), then tissue sampling may be considered to confirm chemical concentrations in the tissue.

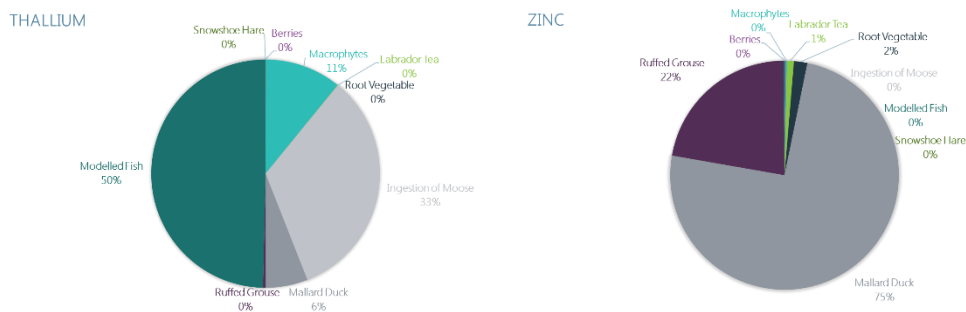
If the chemical concentrations in Project-specific media exceed the health-based criteria for the protection of human health or ecological receptors, then additional mitigation or risk management measures for the protection of human health and ecological receptors may be considered. These additional risk management/mitigation measures to restrict access (i.e. exposure) to Project-specific media including the TSF and the pit-lake. This might include fencing and/or bird and mammal deterrent flags or noise deterrents. The effectiveness of these risk management/mitigation measures may be monitored and site-specific receptor characteristics with respect to frequency of exposure (i.e. number of time per day an ecological receptor visits the media source) determined. Finally, as detailed by the Government of Canada in their Federal Contaminated Sites Action Plan guidance for completing an Ecological Risk Assessment, a weight of evidence approach may be considered to the assessment of potential risk to ecological receptors. The weight-of-evidence approach would dictate that population surveys and community profiles be considered in addition to the calculation of chemical exposure and associated potential risk.

Together, the site-specific exposure values with risk management/mitigation measures in place may be used to revise the HHERA, and if required, calculate site-specific risk -based target levels for Project-specific media. The development of site-specific target levels for project-specific media would be performed following Health Canada’s 2010 guidance entitled “Part V: Guidance on Human Health Detailed Quantitative Risk Assessment For Chemicals (DQRA<sub>CHEM</sub>)” and the Canadian Council of Ministers of Environment (CCME) 1996 guidance entitled “A protocol for the derivation of Environmental and Human Health Soil Quality Guidelines”, using the most-up to date toxicity reference values for plants, invertebrates, mammals, birds, and human receptors considered.

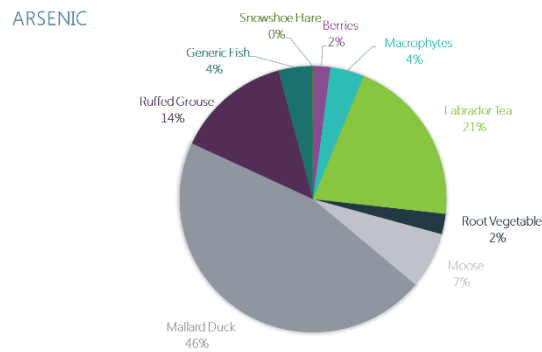
**Proposed Country Foods Monitoring Program**

The 2018 HHERA included an updated assessment of potential risk via the ingestion of country foods pathway. Human health impacts associated with the country foods pathway were assessed with consideration given to Health Canada’s 2018 guidance document entitled “Guidance for Evaluating Human Health Impacts in Environmental Assessment: Country Foods”.

Residual adverse effects for human health were identified to both the resident and visitor/harvester receptors for thallium (non-cancer risk), zinc (non-cancer risk), and arsenic (cancer risk). Ingestion of country foods contributed the highest proportion to the overall characterization of residual adverse effects via the sum of risk from all operable exposure pathways for thallium and zinc. Figures FUP1.19.3-1 and FUP1.19.3-2 below (Figures 4.4.1.3-1 and 4.4.2.3-1 from the Final HHERA (February 2019) demonstrate the relative contributions to Hazard Quotient and Incremental Lifetime Cancer Risk via Ingestion of Country Foods.



**Figure FUP1.19.3-1 Relative Contributions to Hazard Quotient via Ingestion of Country Foods**



**Figure FUP1.19.3-3 Relative Contributions to Incremental Lifetime Cancer Risk via Ingestion of Country Foods**

The Final Goliath Gold Follow Up Addendum provides the country foods monitoring program designed to reflect the findings/uncertainty of the HHERA with explicit plans for specific contaminants to be monitored in environmental and project specific media. Much of the data relied upon in the assessment of potential risk via the country foods pathway, were data modelled from measured baseline data, which subsequently leads to potential risk estimates in exceedance of the Health Canada targets for the Project Alone and Project Assessment Scenarios. Given that the 2018 Health Canada guidance was released after the submission of the EIS, the new guidance should be considered in the design of the Follow-Up Program for human health. Although the current country foods assessment meets the requirements of Appendix A: Country Foods Assessment in Environmental Assessments, the baseline sampling/ receptor specific information gathered in support of the assessment could be improved upon in the Follow-Up Program to reduce uncertainty associated with the modelling assumptions.

As per the 2018 Health Canada country foods guidance document, if concentrations of chemicals in country foods were either not measured or not comprehensive, then it is recommended that they be identified prior to project start. As detailed in the Follow-Up Program Treasury Metals will measure concentrations of COCs in environmental and Project-specific media as well as country foods items. Given that this guidance was only made available following the submission of the EIS (April 2018), in an effort to satisfy the monitoring requirements described by Health Canada with respect to country foods, Treasury Metals will include a reference site (i.e., nearby site with similar environmental conditions, but outside the influence of the Project) to established baseline conditions. This approach is considered acceptable as per the 2018 Health Canada country foods guidance document.

Treasury Metals recognizes that members of Indigenous communities are concerned that there may be socio-economic effects associated with country foods relied on for commercial purposes including wild rice, blueberries, chanterelle mushrooms and fish potentially affected by of the Goliath Gold Project that could arise over the life of the Project. The revised EIS (April 2018) prepared by Treasury Metals, shows that there would be no significant adverse environmental effects of the Project when appropriate mitigation measures are implemented. Therefore, it is reasonable to expect that if the Project, mitigation measures, follow-up program and monitoring plans are functioning as designed, there would not be significant socio-economic effects to Indigenous communities who rely on the lands and resources. As

part of the Round 2 process, the Agency asked that Treasury Metals provide additional commitments with respect to potential socio-economic effects of the Project on those Indigenous communities that have identified commercial interests that may be affected by the Project. Treasury Metals provided six (6) new commitments with respect to the socio-economic impacts associated with country foods to identify, mitigate and manage the potential negative socio-economic effects that may arise over the life of the Project. The follow-up program for country foods as detailed herein, reflects the commitments made by Treasury Metals with respect to socio-economic effects associated with country foods relied on for commercial purposes including wild rice, blueberries, chanterelle mushrooms and fish potentially affected by of the Goliath Gold Project. The following lists provides details of the follow up program for country foods which should be completed for baseline conditions (i.e. prior to site preparation and construction) and then considered as part of the follow-up program during the active phases of the Project. Details on the frequency of the follow-up program for country foods sampling may be determined in consultation with regulators and indigenous stakeholders, however Treasury Metals suggests at a frequency that matches the commitments to update other models such as the Groundwater Model (i.e. every 3 years) is suitable for most country foods, however has committed to the collection, analysis, and reporting for wild rice, blueberries, chanterelle mushrooms, and fish used for commercial purposes, on a an annual basis.

A Follow-Up Program for Human Health including a Country Foods Assessment will include the following with respect to chemical analysis:

- Inclusion of sediment and groundwater sampling as part of their respective follow-up programs.
- Collection of the environmental (soil, water, air, sediment, and groundwater) and Project-specific media (waste rock, tailings supernatant water pit lake water) to confirm the exposure point concentrations relied upon in the HHERA.
  - The samples would be analyzed for a suite of metals via ICP-MS with methyl-mercury being analyzed in at least 10% of the samples to determine the rate of methylation (if any) in each media type.
  - The concentration results from analytical testing would be compared to relevant human health-based criteria as well as criteria for the protection of ecological receptors.
  - The measured concentrations in environmental and Project-specific media would then be used to update the modelling into country food items if and when required.
- Collection of country food items from the terrestrial and aquatic food webs in consultation with the Indigenous communities.
  - Emphasis will be placed on the collection of biota items known to be consumed via ongoing engagement and dietary consumption surveys, and to the biota for which exposure to project-specific media is confirmed via the follow-up programs related to vegetation, fish, wildlife, and birds.
  - Emphasis will also be placed on country foods items for which the Indigenous communities have expressed a commercial interest (wild rice, blueberries, chanterelle mushrooms and fish)

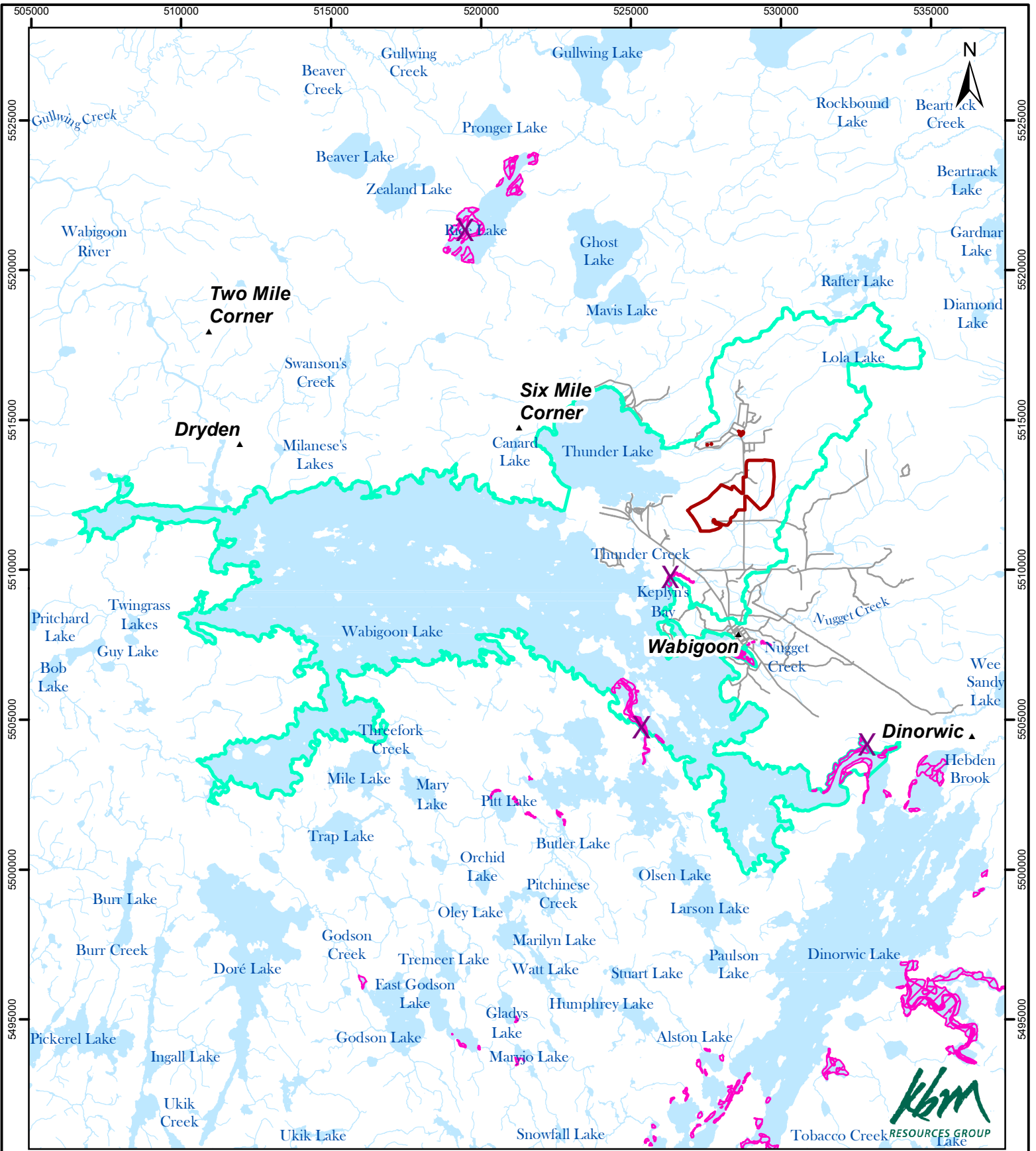


- All country food items will be analyzed for a suite of metals via ICP-MS with methylmercury being analyzed in at least 10% of the samples to determine the rate of methylation (if any) in each media type.
- The measured concentrations in country foods can be used to determine the site-specific uptake factors into each biota type which can then be used to update the modelling for other country foods items that have not been sampled (for example species at risk), if required. This would alleviate the uncertainty associated with the use of literature derived uptake factors.
- For non-mobile country food items (i.e. plants including medicinal plants and wild rice, root vegetables, mushrooms, and berries), co-located surface water, sediment, or soil samples will be collected in addition to the country food item and submitted for the same chemical analysis to aid in the derivation of site-specific uptake factors. This would alleviate the uncertainty associated with the use of literature derived uptake factors. Consideration will be given to account for the fact that some species and tissues may have higher concentrations of COPCs due to bioaccumulation and biomagnification, and some plants are known hyperaccumulators
- Collection of fish including fish from different trophic levels and habitat types (i.e. stream resident fish versus lake resident fish) as well as the water and sediment sample from where these fish are collected to allow for determination of site-specific uptake factors and tissue concentrations. All fish will be analyzed for a suite of metals via ICP-MS with methylmercury being analyzed in at least 10% of the samples to determine the rate of methylation. The proportion of methylmercury: total mercury in fish is anticipated to be greater than 95% thus methylmercury analysis of fish tissue samples is unlikely required to continue long term as total mercury concentrations may be assumed to be almost entirely comprised of methylmercury. Collection of fish from different trophic levels and habitat types along with co-located sediment and water samples would allow for the determination of site-specific uptake factors and would alleviate the uncertainty associated with the use of literature derived uptake factors.
- If arsenic is measured in environmental and Project-specific media at concentrations greater than their standard analytical detection limits, then consideration will be given to chemical speciation of arsenic in select food items given that toxicity differs based on chemical speciation. For example, mushrooms and aquatic invertebrates uptake and biotransform arsenic from substrates including in tailings from gold mines to arsenobetaine which is the only non-toxic form of arsenic, therefore using total arsenic concentrations from ICP-MS would overestimate the potential risk to human receptors via the ingestion of mushrooms aquatic invertebrates.
- If arsenic and lead are measured in environmental and Project-specific media at concentrations greater than their standard analytical detection limits, then consideration will be given to performing bioavailability testing using physiologically based extraction test (PBET) on a smaller proportion of the media samples given that lead and arsenic bioaccessibility is known to be decreased by 40-60% in select substrates. Therefore, using total lead and arsenic concentrations from total metal analysis via ICP-MS would overestimate potential uptake and subsequent toxicity/risk.

As part of the Round 2 information request process, TMI\_942-AC(2)-09 asked that Treasury Metals provide a reference site for the collection of additional baseline wild rice data. In an effort to understand the effect, if any, the Goliath Gold Project may have on the concentrations of metals in wild rice, it is important to understand the baseline levels of metals that are present in the wild rice at baseline. Those baseline levels will, arguably, reflect the effects of other industrial activities and historical sources of contamination within Wabigoon Lake. These are the levels against which Treasury Metals would compare the measured concentrations to see if they are contributing to the levels of metal in wild rice. In selecting reference sites for use in follow-up program, those sites should include the same environmental conditions as the wild rice at the mouth of Blackwater Creek (i.e., reflect the effects of other industrial activities and historical sources of contamination within Wabigoon Lake), but be far enough removed to be outside the influence of the Project. Guidance for selecting reference sites is provided by the CCME in their document entitled *"Guidance Manual for Environmental Site Characterization in support of Environmental and Human Health Risk Assessment- Volume 1 Guidance Manual"* dated 2016. As stated by the CCME in the 2016 guidance manual, it is advisable that more than one reference location be chosen. Figure FUP1.19.3-1 (TMI\_942-AC(2)-09\_Figure\_1) shows the proposed sampling for rice, and includes the following:

- The wild rice at the mouth of Blackwater Creek—to confirm the predictions regarding the effects of the Project;
- The wild rice stand on the south shore of Wabigoon Lake, adjacent to the Butler Lake Nature Reserve—a reference site within Wabigoon Lake, in close proximity to the Project but outside the predicted influence of the Project based on the finite element modelling of Wabigoon Lake (Appendix GG of the revised EIS [April 2018]);
- The wild rice stand in the channel connecting Dinorwic Lake and Wabigoon Lake— a reference site upstream of Wabigoon Lake, and well outside the influence of the Project; and
- The south end of Rice Lake—a background site, free of the effects of other industrial activities and historical sources of contamination within Wabigoon Lake.

However, the location for the sampling site will be finalized prior to the start of the Project through input received from the Indigenous communities who currently harvest wild rice in these areas.



**Figure: FUP1.19.3-1  
Potential Reference Sites  
for Wild Rice Sampling**

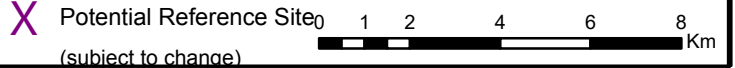
Projection: NAD 1983 UTM Zone 15N

Date: January 209

**Legend**

- Wild Rice LSA
- Operations Area
- Road
- Waterbody
- Stream
- Wild Rice Stand
- X Potential Reference Site

SCALE: 1:166,984



(subject to change)

**KRM**  
RESOURCES GROUP

In addition to collection of samples for chemical analysis, Treasury Metals has stated to all Indigenous communities who wish to take part, that they will work with the communities to collect dietary consumption data as part of ongoing engagement activities. The dietary consumption data collection will target the collection of the following on a community, or household specific basis:

- Receptor characteristics (i.e., age, gender, cultural affiliation, etc.), including receptors with atypical consumption patterns due to occupational, recreational, and cultural activities relevant to country food consumption (e.g., hunters, trappers, fishers);
- A list of the country foods consumed, including common and scientific names of species.
- The source of country foods (i.e., where the food is typically harvested and how it is obtained—hunted, fished, gathered, etc.).
- Specific tissues (skin, fatty flesh, muscular flesh or organs) or parts of plants (roots, leaves, flowers, berries, seeds, etc.) that are consumed.
- The typical portion size for each tissue or part of plants consumed, using standard measures such as measuring cups or spoons, or weights.
- The frequency of country foods consumption (i.e., the number of servings per week or month or season, and the typical method of preparation: skin on/off, washing, peeling, cooking (raw, fried, baked, etc.), drying, fermenting, and any other preparation methods that may affect the COPC concentration of the foods consumed.
- The frequency of foods consumed that have been purchased from a grocery store or supermarket and Determination of exposure to chemicals through market food ingestion, as certain contaminants of concern associated with the proposed project may be present in commercially available foods, are naturally occurring (e.g., metals) or are associated with other anthropogenic processes unrelated to the proposed project.
- Additional traditional knowledge (i.e., species consumed, when the foods are consumed, their residence times, and times of increased consumption of specific foods such as, seasonal patterns or migration periods).

The HHERA was completed using the most conservative assumptions regarding contaminant uptake, exposure frequency and duration, and country foods ingestion and therefore represents the maximum risk anticipated for each operable pathway of exposure and residual adverse effects via the sum of all pathways. The application of the most conservative assumptions may result in the overestimation of potential risk and a level of uncertainty that hinders the ability of regulators to apply the findings in making management decisions. Although no residual adverse human health effects are predicted as a result of the Goliath Gold Project, the follow up program for country foods, project-specific media, surface water quality, and air should be relied upon to reduce the level of conservatism associated with the reliance on modelled predictions. Once the uncertainty associated with the risk assessment inputs is reduced, then the HHERA model should be employed to re-calculate the results of the country foods assessment or residual adverse effects. If requested, this could be done on a community-specific or household specific basis. The collection of these data as part of the follow up program for human health

will provide Treasury Metals a meaningful tool for communicating the effects of the Project on human health relative to the current baseline conditions.

#### **FUP1.19.4 Current Mitigation Measures**

Current Mitigation Measures for each of the technical disciplines including terrain and soils, geology and geochemistry, noise and vibration, light, air quality, climate, surface water quality, surface water quantity, groundwater quality, groundwater quantity, wildlife and wildlife habitat, fish and fish habitat, wetlands and vegetation, land use, as well as the human environment disciplines including social, economic, and heritage resources remain valid. This section is specific mitigation for the protection of human health based on the results of the 2018 HHERA Report completed in support of the Round 2 Information Request process.

A residual adverse effect was also identified for the carcinogenic endpoint via arsenic exposure to a Project Worker as identified by Offset Scenario 1 (Study Area 1), residential exposure (Table 4.6.3.1-2). Under good health and safety practices, an occupational Health and Safety Plan would be in place for Project Workers and serve as an appropriate risk management/ mitigation measure. A Health and Safety plan including the prescribed use of additional personal protective equipment, is a suitable risk management measure to mitigate any adverse residual effect. With a Health and Safety Plan implemented as a risk management measures, the predicted residual adverse effects are eliminated, and no potential risks are identified to Project Workers.

There were no other risk management measures or mitigation measures identified as being required for the protection of human health.

#### **FUP1.19.5 Criteria for Considering Adaptive Measures and Potential Adaptive Measures**

Criteria for Considering Adaptive Measures and Potential Adaptive Measures for each of the technical disciplines including terrain and soils, geology and geochemistry, noise and vibration, light, air quality, climate, surface water quality, surface water quantity, groundwater quality, groundwater quantity, wildlife and wildlife habitat, fish and fish habitat, wetlands and vegetation, land use, as well as the human environment disciplines including social, economic, and heritage resources remain valid, and may trigger the need for a follow-up HHERA. Specific criteria for considering adaptive measured for human health would include:

- Statistically significant higher chemical concentrations in soils, sediment, air, water, groundwater, surface water and country foods items than predicted including new exceedances of relevant health-based criteria; and
- The results of ongoing engagement activities suggest that exposure and receptor characteristics A are meaningfully different than those relied upon in the HHERA. This may include that the dietary intake of country foods items in areas surrounding the Goliath Gold Project where the revised EIS (April 2018) predicted an effect are higher or lower than those in the HHERA.

Treasury Metals will strive for ongoing improvement. In the event a follow-up risk assessment is required and the results identify the potential risk for one or more pathways specifically as a result of the Goliath

Gold Project, than Treasury Metals can implement additional risk management measures including administrative controls regarding access or health and safety protocols, engineering protocols such as fencing or mammal and bird deterrents, and also consider including in the scope of the HHERA the derivation of project/site-specific target levels which are essentially project/site specific criteria protective of human and ecological receptors for the Goliath Gold Project. All site-specific target levels would be derived following Health Canada DQRA guidance.

### **FUP1.19.6 Applicable Regulatory Instruments and Associated Government Agencies**

Applicable regulatory instruments and government agencies would be those pertaining to health and the environment including Health Canada, Environment and Climate Change Canada, Department of Oceans and Fisheries, and provincially by the Ontario ministry of the Environment, Conservation and Parks, and the Ontario Ministry of Energy, Northern Development and Mines.

### **FUP1.19.7 Program Responsibilities**

Treasury Metals is responsible for carrying out the Follow-Up Program. The CEA Agency is responsible for ensuring that the Follow-Up Program is carried out.

### **FUP1.19.8 Reporting**

A number of commitments have been made regarding environmental and health related aspects of the Project in the local and regional Study Areas, which will require Follow-Up Program reporting through the EA process. From a regulatory perspective, a formal risk assessment is not anticipated to be required as part of the active phases of the Project based on the land use plans of the Project and the conservative risk management measures incorporated as part of the project design. Thus, the frequency of an updated HHERA Report cannot be determined at this time however it is likely that the follow up program will be reported on, at a frequency comparable with the other technical disciplines where a model is relied upon (i.e groundwater of every 3 years).

### **FUP1.20 Heritage Resources**

The archeological assessment (Appendix U to the revised EIS) did not identify the need for follow-up monitoring for archaeological sites. In addition, it was the recommendation of the assessment that the development area did not “exhibit archaeological potential therefore it is recommended that the location does not require further archaeological assessment”. That stated, Archeological and Cultural Heritage Resources Management Plan has been developed for the Project (see Section 12.11) that will provide specific policies, procedures, and contact information in the event any heritage resource is uncovered during any phase of the Project.

### **FUP1.21 Aboriginal Peoples**

The predicted effects of the Project on Aboriginal peoples who are members of an Indigenous community were presented in Section 6.21.4 of the revised EIS. The predictions show that, even with the implementation of mitigation measures presented in Section 6.21.5, a number of residual effects will

remain to Aboriginal peoples. However, some of these residual effects are expected to be beneficial to Aboriginal peoples in the local and regional study areas. The Follow-up program of some of the effects to Aboriginal peoples as a result of the Project is effectively captured within other Follow-up programs outlined in Section 13 of the revised EIS. These include:

- Noise and Vibration follow-up (see Section FUP1.4);
- Light follow-up (see Section FUP1.5);
- Air Quality follow-up (see Section FUP1.6);
- Surface Water Quality follow-up (see Section FUP1.8);
- Groundwater Quality follow-up (see Section FUP1.10);
- Wildlife follow-up (see Section FUP1.12);
- Fish and Fish Habitat follow-up (see Section FUP1.14)
- Land Use follow-up (see Section FUP1.16); and
- Social follow-up (see Section FUP1.17).
- Human Health (see Section FUP1.19)

Additionally, specific Follow-up programs have been proposed to verify the effectiveness of the mitigation measures presented in Section 6.21.5, and determine the extent of positive and negative residual effects to Indigenous peoples presented in Section 6.21.6. To date, there have been three proposed Follow-up programs for the economic effects of the Project, which will be developed following consultation with Indigenous communities. These proposed programs include:

- Indigenous employment during site preparations and construction, operations, and closure phases of the Project, as well as any employment during the care and control phase of the post-closure phase; and
- Indigenous business opportunities during site preparations and construction, operations, and closure phases of the Project.

### **FUP1.21.1 Reporting**

All of the applicable Follow-up programs that encompass effects to Indigenous peoples from the Project will be reported either to required government agencies as part of regulatory reporting, or within the Annual Follow-up program report that will be provided to government agencies, Indigenous peoples and stakeholders.

## **FUP1.22 Summary**

A summary monitoring table has been provided below that summarizes monitoring elements of the Follow-up programs (Table FUP1.22-1). These monitoring programs have been developed to help verify the effects assessment of the EIS and confirm the effectiveness of the avoidance and mitigation measures proposed. It should be noted that Treasury Metals is aware that regulatory monitoring will be required by government agencies upon EA approval (i.e. ECA monitoring); however, these monitoring programs have not yet been developed and are not included in the summary of EIS monitoring table.