Magino Gold Project

Construction Phase Environmental Compliance Approval Application:

Surface Water Monitoring Plan

TC180502

Prepared for:

Prodigy Gold Inc.

Box 209, 3 Dree Road. Dubreuilville, Ontario, P0S 1B0

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1.0 Introduction

Prodigy Gold Inc. (Prodigy), a wholly-owned subsidiary of Argonaut Gold Inc., is proposing the construction, operation, decommissioning and closure of the Magino Gold Mine Project (the Project), situated at a past-producing mine site. A draft application package for an Environmental Compliance Approval (ECA) focused on activities to take place during the Construction Phase of the Project has been prepared by Wood Environment & Infrastructure Solutions (Wood), and was submitted to the Ministry of Environment, Conservation and Parks (MECP) on August 20, 2019 for a pre-submission review and discussion.

The Magino Project site ('Site') is a brownfield, past producing mine site. The most recent mining was completed in 1992, when the site was placed in care and maintenance. The site is accessed via Goudreau Road from Dubreuilville. Prodigy proposes the Project to include the construction, operation and closure of an open pit gold mine, with approximately 150 million tonnes (Mt) of ore and approximately 430 Mt of mine rock and associated infrastructure, to be developed on the historic mine footprint. The Project was designed to utilize the brownfield site area and infrastructure already in place at the site as practical, in order to minimize new environmental disturbance.

The Project will include an Open Pit, milling and processing complex, roads and pipelines, ore processing plant, a tailings management facility (TMF) and mine rock management facility, and stockpiles for the storage of overburden and waste rock.

Prodigy has completed a standard Environmental Assessment (EA) under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). As assessed in the EA, during Construction, the historic Tailings Pond and Polishing Pond associated with the former underground mine operations are available for water management; discharges from the construction treatment works will be to Spring Lake (the receiver) via Lovell Lake, the existing Tailings and Polishing Ponds, and via Waterbody 3. The existing Tailings and Polishing Ponds will comprise internal effluent treatment works, and Lovell Lake and Waterbody 3 will comprise final effluent compliance waterbodies. During the Operations Phase, water will be discharged seasonally to Otto Lake, which is within the Herman-Otto lake watershed.

Consultation and engagement was conducted during preparation of the Environmental Impact Statement Report with a wide range of stakeholders and Indigenous groups through various methods to gather feedback on the Magino Gold Project and the preliminary environmental assessment findings. Comments received during the draft Environmental Impact Statement Report reviews were responded to and as zfederal Minister of Environment and Climate Change issued a positive decision on the EA, determining that the Project was not likely to cause significant adverse environmental effects as per CEAA (2012).

In consultation with the Province of Ontario, the Ministry of Natural Resources and Forestry (MNRF) Class EA for Resource Stewardship and Facility Development Projects (RSFD) was applied to the project since the Magino site is a former mine site. Prodigy submitted a revised project description to MNRF in November 2016. On March 13, 2019 the MNRF issued the Approval of the Statement of Completion (Category B Project).

2.0 Hydrology

2.1 Goals and Objectives

The objectives of the hydrology monitoring program are as follows:

- Document amount of effluent discharged from Lovell Lake and Waterbody 3 as per the Construction ECA requirements;
- Document flow and water level conditions in the Construction Phase receiver as well as surrounding reference stations; and
- Continue to monitor the flow and water level conditions in receivers for the Operations phase of the project.

It is important to note that flow monitoring is not required to confirm effluent mixing in the receiver for the Construction Phase, as the protection for aquatic life is met at the outlets of Lovell Lake and Waterbody 3 under all flow conditions.

2.2 Methods

Continuous water level and temperature data had previously been collected using OTT Orpheus Mini water level loggers. For stations to be carried forward into the Project Construction Phase, it was determined that unresponsive loggers and damaged staff gauges should be replaced. Going forward, continuous water level measurements will be completed using Solinst Levelvents. The Levelvent is a pressure transducer and datalogger vented to atmospheric conditions recording continuous water level and temperature data, similar to the Orpheus Mini. Water level monitoring will be completed using the following methods:

- All existing OTT Orpheus Mini water level loggers will be replaced with Solinst Levelvents if required (i.e. existing logger from baseline program is no longer functional).
- Levelvent instruments are fixed to a plate weight and installed at stream or lake bed.
- The Levelvent will record water level readings every 15 minutes.
- During the open flow manual measurement period, a physical measurement will be made to verify the depth sensor data as well as to provide another data point on the site-specific rating curve.
- All staff gauges will be Water Survey of Canada (WSC) type staff gauges.

Manual flow measurements are required during the period of open water conditions in order to generate a rating curve. A Sontek FlowTracker Acoustic Doppler Velocimeter (ADV) or equivalent will be used to complete manual open water flow measurements. This meter is a handheld instrument intended for wading measurements. All manual flow measurements will be completed as per Water Survey of Canada standards:

- Hydrometric Field Manual – Measurement of Streamflow (qSOP-NA007-01).

- WSC Procedures for Conducting Discharge Measurements With Sontek FlowTracker Acoustic Doppler Velocimeters (qSOP-NA022-02).

A topographic survey will be completed relative to the site benchmarks following each manual flow measurement for use in rating curve development.

Discharges are typically computed from water level data using a rating curve. A rating curve is produced by fitting a curve through a plot of the discharge measurement (Q) and water level (H) data. The rating curve reflects the hydraulic characteristics of the channel at the hydrometric station sites. The plot of water level versus discharge measurement data points typically shows some scatter, since for a natural channel the discharge for a specific water level is not unique and can vary depending on a number of factors.

For a new station, the initial rating curve is generally considered somewhat tentative since it is typically based on a limited number of data points, until such time as a more substantive database can be developed to provide a more robust rating curve (approximately 10 manual flow measurements). Attempts will be made to salvage previous rating curves, however initial flow measurements completed in 2019 indicated that new manual flow measurements were off the previously established curves (not surprising given the previous curves were developed between 2011 and 2013).

The rating curves can change over time if the channel characteristics change due to erosion, deposition, and debris accumulation, especially in smaller system. Two successive manual flow measurements which are off the established curve will indicate the need for a curve shift. Prodigy will work with the MECP throughout the hydrological monitoring program to ensure that rating curves are maintained and updated appropriately.

When ice forms in the channel and an ice cover develops, the hydraulic properties experience ongoing change through the winter and the open water rating curve is not applicable. It is proposed to measure discharge once a year when ice conditions are present (assuming it is safe to do so). The ice measurement will provide a more robust data set and give insight into flow conditions of the receiver during the winter. The need for ice measurements will be re-evaluated as the project is developed.

The daily effluent discharged from Waterbody 3 will be obtained from mine operations pumping records during construction.

2.3 Frequency

Sample collection timing (start of sampling) and frequency (sample collection intervals) are shown in Table 2-1. The frequency of measurement is summarized below:

- Solinst Levelvent instruments were set to record a water level every 15 minutes.
- Solinst Levelvent instruments will be downloaded quarterly.
- Staff gauges will be recorded quarterly.
- Manual flow measurements will be completed monthly until sufficient points are developed for rating curve.

2.4 Monitoring Locations

Hydrometric monitoring locations are listed in Table 2-1 and shown in Figure 2-1. The rationale for the locations of the stations is described below:

- The Otto Lake inflow and outflow stations (Sites 14 and 10) are related to the Project Operations Phase effluent release which is anticipated to be within the Herman-Otto Lake watershed.
- Monitoring of flows associated with the existing Tailings Pond (Site 1) relates to current ECA requirements and to the Project Construction Phase effluent release.
- The Spring Lake inflow station (Site 2) is also related to the Project Construction Phase effluent discharge.
- Dreany Lake (Site 7) and Mountain Lake (Site 9) are reference lakes for Otto and Herman Lakes.
- The Goudreau Lake (Site 15) and Goudreau Creek (Site 6) stations are background stations.

2.5 Quality Assurance / Quality Control

Quality assurance and quality control of hydrometric data for the dataset will be applied at two levels: first in the field during data collection, and again in the office when data are checked. The following quality assurance and quality controls checks will be completed:

- A complete set of field notes will be maintained for each water level measurement and discharge measurement. All data entries will be completed in entirety while in the field. All levelling notes will be computed and checked on site and determined to be correct and acceptable before leaving the station site. Remaining computations will be completed and checked by the end of each day of monitoring.
- The above protocol ensures that related discharge measurements will be computed in the field, and the results (total discharge, flow area, mean velocity) recorded in a dedicated field book.
- All field notes will be checked for completeness and legibility, and all computations checked in detail prior to filing. All such checks will be done by staff other than the originator, and by those who have an understanding of both hydrometric work and the site conditions.
- Subsequently, the discharge measurement data from the field notes will be entered into an Excel template and the results compared to the field note results.
- All other data computations and analyses will be checked and reviewed in accordance with the WSC Manual of Hydrometric Data Review Procedures.
- All field data forms, calculations, reports or other project hydrometric documents will be reviewed according to the above protocols, complete with date and signature of checkers / reviewers.

2.6 Trigger Criteria

There are no trigger criteria associated with the Construction Phase hydrology monitoring program. Criteria were proposed relating to downstream flows for the McVeigh Creek system in the August 5, 2020 Wood response to comments received from the Ministry on July 24, 2020. These criteria will be applicable to the Operations Phase Surface Water Monitoring Plan to be developed at a later date as part of the ECA Operations Phase permit application.

2.7 Mitigation and Contingency Measures

Contingency measures are not applicable to the Construction Phase hydrology monitoring program. Contingency measures will be developed at a later date as part of the ECA Operations Phase permit application.

2.8 Data Analysis and Reporting

As part of the Environmental Compliance Approval annual monitoring report, an assessment of the hydrometric program will be included following each calendar year of station operation. The annual report will include the following:

- Project background and reporting period activities summary;
- Summary of data collection methods;
- Quality assurance and control outcomes;
- Operating problems and corrective actions;
- Summary of final effluent discharge volumes (Lovell Lake and Waterbody 3);
- Water Level data and hydrographs for the period of review; and
- Dates of manual flow and level measurements.

Additionally, the frequency of manual measurements will be evaluated as the discharge dataset becomes more robust. Any proposed changes to the monitoring regime will be brought forth for consultation with the District Manager. The annual report will also summarize final effluent discharge volumes.

Table 2-1: Magino Hydrometric Monitoring

Site ID	Station Name	Data Collected	Date Installed	Data Available	Current Status	Installation Type	UTM Coordinates
1	Existing Tailings Pond	Level, Flow	Oct. 2011	Oct. 2011-Aug. 2016	reactivated Aug 2019	Solinst Levelvent + staff gauge	5351747N, 688875E
8	Herman Lake Outlet	Level, Flow	June 2013	June 2013-Aug. 2016	reactivated Aug 2019	Solinst Levelvent + staff gauge	5353196N, 683684E
10	Herman Lake, Outflow from Otto Lake	Level, Flow	Oct. 2012	Oct. 2012-Aug. 2016	reactivated Aug 2019	Solinst Levelvent + staff gauge	5352143N, 684347E
14	Inflow to Otto Lake from Unnamed Waterbody 8	Level, Flow	June 2013	June 2013-Aug. 2016	to be reactivated	Solinst Levelvent + staff gauge	5352781N, 686260E
6	Goudreau Creek	Level, Flow	Oct. 2011	Oct. 2011-Aug. 2016	to be reactivated	OTT Orpheus Mini (to be replaced) + staff gauge	5350212N, 692904E
15	Goudreau Lake	Level	June 2013	June 2013-Aug. 2016	reactivated Aug 2019	Staff gauge	5351175N, 689582E
2	Spring Lake Inflow	Level, Flow	Oct. 2011	Oct. 2011-Aug. 2016	to be reactivated	Solinst Levelvent + staff gauge	5350830N, 687146E
4	McVeigh Creek	Level, Flow	Oct. 2011	Oct. 2011-Aug. 2016	to be reactivated	Solinst Levelvent + staff gauge	5349278N, 683779E
7	Dreany Lake	Level	Oct. 2011	Oct. 2011-Aug. 2016	to be installed	Staff gauge	5355690N, 685266E
9	Mountain Lake	Level	Oct. 2012	Oct. 2012-Aug. 2016	to be installed	Staff gauge	5354329N, 687283E

Notes:

Solinst levelvent instruments were fixed to a plate weight and installed at stream or lake bed
Solinst levelvent instruments were set to record a water level every 15 minutes
Solinst levelvent instruments will be downloaded quarterly
Staff gauges will be recorded quarterly
Manual flow measurements will be completed monthly until sufficient points are developed for rating curve
Where monthly manual flow measurements are indicated, these shall be carried out at approximate monthly intervals until a suitable rating curve has been developed, taking into consideration winter safety protocols for working on ice. Once a suitable rating curve has been developed the frequency of manual flow measurements can be amended to that sufficient to maintain an accurate rating curve.

3.0 Surface Water Quality

3.1 Construction Phase On-site Water Monitoring Plan

3.1.1 Goals and Objectives

The goal of the Construction Phase surface water quality monitoring plan is to demonstrate that water collected onsite will be directed and discharged appropriately based on water quantity and quality considerations. The objectives of the surface water monitoring program are to demonstrate through monitoring that:

- Non-contact water and contact water is directed appropriately;
- The effluent discharged from compliance points is of acceptable quality; and that
- All discharges are adequately controlled to prevent erosion / scouring and any unnecessary pooling / channelization of water.

3.1.2 Methods

Final effluent and surface water monitoring methods will include:

- Regular collection and analysis of water samples from:
  - Final effluent compliance points (representative samples from the final discharge point).
  - Upstream portions of effluent treatment works (representative samples from waters being pumped to or draining from these works).
  - Clean (non-contact) water discharge sumps (representative samples from pipeline discharges at splash pad receivers).
- Visual inspections of clean (non-contact) water splashpad discharges to check for undue erosion (during construction).

If filter bags are used as contingency treatment measures for non-contact water discharges, samples will be collected as filter bag filtrate.

The methods and protocols for sampling, analysis and recording of final effluent samples shall conform, in order of precedence, to the methods and protocols specified in the following:

- The Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater Version 2.0" (January 2016), PIBS 2724e02, as amended from time to time by more recently published editions.
- The publication "Standard Methods for the Examination of Water and Wastewater", as amended from time to time by more recently published editions.

- The Environment Canada publications "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout" (EPS 1/RM/13 Second Edition - December 2000) and "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna* " (EPS 1/RM/14 Second Edition - December 2000), as amended from time to time by more recently published editions.

- In respect of any parameters not mentioned in documents (a) to (c) above, the written approval of the District Manager shall be obtained prior to sampling.

In the case of samples collected from upstream portions of effluent treatment works sample detection limits will be a minimum of 5 times lower than treatment works final effluent criteria.

3.1.3 Timing and Frequency

Sample collection timing (start of sampling) and frequency (sample collection intervals) are shown in Table 3-1 for the Construction Phase.

3.1.4 Parameters

Water quality sampling parameters are listed in Table 3-1 for Construction Phase.

3.1.5 Monitoring Locations

Water sampling locations for the Construction Phase are listed in Table 3-1 and shown in Figure 3-1.

3.1.6 Quality Assurance / Quality Control

Quality assurance and control measures for final effluent samples will be consistent with the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater Version 2.0" (January 2016), PIBS 2724e02, as amended from time to time by more recently published editions.

Quality assurance and control measures will include:

- Staff training in:
  - Safety protocols.
  - Sample collection and preservation techniques.
  - Instrument use and calibration for probe use.
  - Shipping procedures.
  - Record keeping.
- Use of:
  - Field blanks (1 per monthly sampling round).

  - Trip spikes (1 per monthly sampling round).
  - Duplicate samples (10%).

- Laboratories, as third parties, will be responsible for their own in-house quality assurance and control programs, as per Canadian Association for Laboratory Accreditation (CALA) requirements.

Trip spikes will be limited to total ammonia, total phosphorus, anions, and total and dissolved metals.

No specific quality assurance and control measures are proposed for upstream treatment works samples, or for clean water sump samples (during the Construction Phase), as these samples will be collected for assessing general system operation efficiencies and are not required for either direct compliance assessment, or for comparison with protection of aquatic life criteria.

3.1.7 Trigger Criteria

For final effluent compliance, mitigation / contingency measures would be implemented if three consecutive final effluent sampling results, for any parameter, exceed 85 percent of the monthly average effluent limit.

For splash pad discharges proposed during the Construction Phase, mitigation / contingency measures would be implemented if:

- Visual inspection for any splash pad arrangement shows evidence of undue erosion, scouring, or the unnecessary pooling or channelization of water; or
- TSS concentrations in the Non-contact Sump – NSC discharge exceed 15 mg/L as a monthly average, or 30 mg/L as a daily value.

For final effluent discharge points (Lovell Lake and Waterbody 3) mitigation / contingency measures would be implemented if:

- Visual inspection for any splash pad arrangement shows evidence of undue erosion, scouring, or the unnecessary pooling or channelization of water.

3.1.8 Mitigation and Contingency Measures

Mitigation / contingency measures proposed as part of the Construction Phase effluent treatment works include the use of flocculants, coagulants and silt curtains to assist with TSS and associated metals removal, if and as required to achieve final effluent compliance.

Contingency measures that will be employed in the event that undue erosion, scouring, or the unnecessary pooling or channelization of water is observed, or is likely to occur, in association with splash pad discharges include:

- Extending discharge pipes further downstream to flatter terrain;

- Constructing downstream rock-check berms to slow the rate of downstream discharge along the flow path; or
- In the case of the Waterbody 1 Clean Water discharge, extending the discharge line to Existing Tailings Pond or to the existing Polishing Pond.

A requirement for downstream ditching is not expected, but would be implemented as an adaptive management measure if other contingency measures are not successful.

In the event that elevated TSS concentrations are observed in association with the non-contact water discharge from the NSC catchment pump station, implementation of one or more of the following contingency measures would be implemented:

- Reconfiguring the pump station to better exclude higher TSS containing waters;
- Utilizing flocculants, coagulants and silt curtains to assist with TSS removal; or
- Re-directing the discharge to the Waterbody 3, or Lovell Lake, treatment works if implementation of the contingencies listed immediately above fails to achieve the desired result, and if the monthly average TSS value of 15 mg/L has been exceeded in two of months in a given year.

3.1.9 Data Analysis and Reporting

Data analysis will include the following (will be provided in appendices):

- Results of all weekly and monthly compliance monitoring results including:
  - Minimum, maximum, average and 75th percentile values.
  - Comparison with final effluent daily and monthly average effluent limits.
  - Documentation of exceedance (if any) of effluent limits.
- Separate results of thrice weekly compliance monitoring results for pH and TSS including:
  - Minimum, maximum, average and 75th percentile values.
  - Comparison with final effluent daily and monthly average effluent limits.
  - Documentation of exceedance (if any) of effluent limits.
- Summary of final effluent discharge volumes.

Reporting will include:

- Project background and reporting period activities summary;
- Description of water management facilities and their operation;

- Summary of data collection methods and analytical procedures;
- Summary of monitoring data and comparisons to final effluent limits and protection of aquatic life criteria, as applicable;
- Water quality assurance and control outcomes;
- Operating problems and corrective actions;
- Maintenance conducted on treatment works and water management facilities;
- Calibration and maintenance activities;
- Implementation of contingency and mitigation measures; and
- Laboratory certificates of analysis (will be provided in appendices).

The above data analysis and reporting activities will be provided as part of the Environmental Compliance Approval annual compliance report.

3.2 Surface Water Monitoring Plan

3.2.1 Goals and Objectives

The goal of the surface water quality monitoring plan is to demonstrate that aquatic life in the effluent receiving environmentand downstream waterbodies will be protected under all receiver flow and effluent discharge conditions, and that during operations aquatic life in waterbodies peripheral to the mine site (Spring Lake, Waterbodies 6, 8 and 9, Goudreau Lake and Goudreau Creek) is protected from potential adverse seepage effects.

Objectives of the surface water quality monitoring program are to demonstrate through monitoring that:

- Protection of aquatic life criteria (or background water quality) are being maintained in watercourses / waterbodies downstream and adjacent to the Project.

3.2.2 Methods

Except where otherwise documented, receiving water and downstream waterbodies, and peripheral waterbody and control lake samples (and water quality measurements using probes or meters such as for dissolved oxygen or pH) will be collected in accordance with the federal "Protocols Manual for Water Quality Sampling in Canada" (Canadian Council of the Ministers of the Environment [CCME] 2011).

In the case of water samples collected from receiving water and downstream waterbodies, and peripheral waterbodies and control lakes, the method detection limits will be a minimum of 5 to 10 times lower than the identified protection of aquatic life criterion, in accordance with CCME (2011) protocols.

Where monthly surface water grab samples are collected from lakes, the samples are to be collected from the lake outlets. Top (epilimnion) and bottom (hypolimnion) samples collected from lakes, for quarterly

profile sampling, are to be collected from the deepest area of each waterbody. Quarterly lake profile sampling should also include in-situ measures of temperature and dissolved oxygen, with meter readings conducted a 1 m intervals.

3.2.3 Timing and Frequency

Sample collection timing (start of sampling) and frequency (sample collection intervals) are shown in Table 3-2. All surface water stations are to be sampled at monthly intervals with the exception of top and bottom lake profile samples, which are to be sampled quarterly

3.2.4 Parameters

Water quality sampling parameters are listed in Table 3-2. Metals analysis is to be performed on unfiltered and filtered samples to assist with data interpretations.

Total and Methyl Mercury

In addition to the parameters and sampling frequencies listed in Table 3-2. Total and methyl mercury samples shall be collected from all surface water sampling stations on a quarterly basis for ultra-trace analysis, with method detection limits set at 0.1 ng/L for total mercury and 0.02 ng/L for methyl mercury. Analysis of total mercury and methyl mercury will be carried out for both filtered and unfiltered samples. Ultra-trace analysis method detection limits may be amended from time to time with the written permission of the District Manager.

3.2.5 Monitoring Locations

Surface water sampling locations are listed in Table 3-2 and shown in Figure 3-2.

3.2.6 Quality Assurance / Quality Control

Quality assurance and control measures will include:

- Staff training in:
  - Safety protocols.
  - Sample collection and preservation techniques.
  - Instrument use and calibration for probe use.
  - Shipping procedures.
  - Record keeping.
- Use of:
  - Field blanks (1 per monthly sampling round).

  - Trip spikes (1 per monthly sampling round).
  - Duplicate samples (10%).
- Laboratories, as third parties, will be responsible for their own in-house quality assurance and control programs, as per Canadian Association for Laboratory Accreditation (CALA) requirements.

Trip spikes will be limited to total ammonia, total phosphorus, anions, and total and dissolved metals.

3.2.7 Trigger Criteria

A root cause investigation will be undertaken in the event that:

- Protection of aquatic life, or background water quality values are exceeded on a consistent basis; or
- Where a data trend is shown to be developing which is likely to result in protection of aquatic life criteria being exceeded in the longer-term, unrelated to background conditions.

3.2.8 Mitigation and Contingency Measures

Mitigation / contingency measures proposed as part of the surface water monitoring program include:

- A root cause analysis of any observations or developing trends as per Section 3.2.7; and
- Improvements to effluent treatment and/or management pursuant to the findings of the root cause analysis, to be developed in consultation with the District Manager.

3.2.9 Data Analysis and Reporting

An annual report is to be prepared as part of annual ECA reporting, with such data and analysis to consist of:

- Results of receiving water, mine site peripheral water (during operations), and control lake and creek water quality sampling, including:
  - Minimum, maximum, average and 75th percentile values.
  - Comparison with protection of aquatic life criteria, and background values.
  - Documentation of excursions (if any) from protection of aquatic life and/or background values.
  - Documentation of any data trends which are likely to result in protection of aquatic life criteria being exceeded in the longer-term, unrelated to background conditions.
- Documentation of any root cause analysis undertaken during the reporting period.
- Documentation of contingency and mitigation measures implemented during the reporting period, or planned in future.
- Laboratory certificates of analysis.

Table 3-1: Construction Phase On-site Water Quality Monitoring

Location	Type and Purpose	Timing	Frequency	Parameters
Lovell Lake Outlet	Final Compliance	2 months prior to construction start	Thrice Weekly	pH, TSS
			Weekly	As, Cd, Cu, Pb, Hg, Ni, Zn, TP, BOD5, total and un-ionized ammonia, nitrate, temperature,
			Monthly	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite, temperature, oil and grease Acute toxicity testing for Rainbow Trout and *Daphnia magna*. Chronic toxicity testing of Fathead Minnow and *Ceriodaphnia dubia* as per section 28 of O. Reg. 560/94
Waterbody 3 Outlet	Final Compliance	2 months prior to construction start	Thrice Weekly	pH, TSS
			Weekly	As, Cd, Cu, Pb, Hg, Ni, Zn, TP, BOD5, total and un-ionized ammonia, nitrate, temperature,
			Monthly	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite, temperature, oil and grease Acute toxicity testing for Rainbow Trout and *Daphnia magna*. Chronic toxicity testing of Fathead Minnow and *Ceriodaphnia dubia* as per section 28 of O. Reg. 560/94
Historic Tailings Pond	Upstream Treatment Works[2]	2 months prior to construction start	Weekly	pH, TSS, As, Cu, Ni, Pb, Zn, SO_4, total and un-ionized ammonia, nitrate, temperature
Historic Polishing Pond	Upstream Treatment Works[2]	2 months prior to construction start	Monthly	pH, TSS, As, Cu, Ni, Pb, Zn, SO_4, total and free cyanide, total and free cyanide, total and un-ionized ammonia, nitrate, temperature
Open Pit Sump	Upstream Treatment Works[2]	Start of sump operation	Weekly	pH, TSS, As, Cu, Ni, Pb, Zn, SO_4, total and un-ionized ammonia, nitrate, temperature

Location	Type and Purpose	Timing	Frequency	Parameters
Contact Sump – NWSC	Upstream Treatment Works[2]	Start of sump operation	Weekly	TSS
			Monthly	pH, TSS, As, Cu, Ni, Pb, Zn, SO_4, total and free cyanide, total and un-ionized ammonia, nitrate, temperature
Contact Sump – WSC	Upstream Treatment Works[2]	Start of sump operation	Weekly	TSS
			Monthly	pH, TSS, As, Cu, Ni, Pb, Zn, SO_4, total and free cyanide, total and un-ionized ammonia, nitrate, temperature
Contact Sump – SWSC	Upstream Treatment Works[2]	Start of sump operation	Weekly	TSS
			Monthly	pH, TSS, As, Cu, Ni, Pb, Zn, SO_4, total and free cyanide, total and un-ionized ammonia, nitrate, temperature
Contact Sump - SSC	Upstream Treatment Works[2]	Start of sump operation	Weekly	TSS
			Monthly	pH, TSS, As, Cu, Ni, Pb, Zn, SO_4, total and free cyanide, total and un-ionized ammonia, nitrate, temperature
Contact Sump – MRMF	Upstream Treatment Works[2]	Start of sump operation	Weekly	TSS
			Monthly	pH, TSS, As, Cu, Ni, Pb, Zn, SO_4, total and free cyanide, total and free cyanide, total and un-ionized ammonia, nitrate, temperature
Contact Sump - Water Quality Control Pond	Upstream Treatment Works[2]	Start of sump operation	Weekly	TSS
			Monthly	pH, TSS, As, Cu, Ni, Pb, Zn, SO_4, total and free cyanide, total and un-ionized ammonia, nitrate, temperature
Non-contact Sump – NSC	Clean Water Sump[2]	Start of sump operation	Weekly	TSS
			Monthly	pH, TSS, As, Cu, Ni, Pb, Zn, SO_4, total and free cyanide, total and un-ionized ammonia, nitrate, temperature
Non-contact Sump - SESC	Clean Water Sump[2]	Start of sump operation	Weekly	TSS
			Monthly	pH, TSS, As, Cu, Ni, Pb, Zn, SO_4, total and free cyanide, total and un-ionized ammonia, nitrate, temperature
Non-contact Sump - ESC	Clean Water Sump[2]	Start of sump operation	Weekly	TSS
			Monthly	pH, TSS, As, Cu, Ni, Pb, Zn, SO_4, total and free cyanide, total and un-ionized ammonia, nitrate, temperature

Notes:

1 – ICP-MS metals will include: Al, Sb, As, Ba, Be, B, Bi, Cd, Ca, Cr, Co, Cu, Fe, Pb, Li, Mg, Mn, Hg, Mo, Ni, P, K, Se, Si, Ag, Na, Sr, S, Te, Th, Sn, Ti, W, U, V, Zn and Zr

2 – Sampling of Upstream Treatment Works and Clean Water Sumps is to provide information on overall Treatment Works efficiencies

DS – downstream

Table 3-2: Surface Water Quality Monitoring

Location	Type and Purpose	Timing	Frequency	Parameters
Spring Lake – (SL-B) (outlet)	Receiving Water	2 months prior to construction start	Weekly (during Construction Phase)	As, Cd, Cu, Pb, Hg, Ni, Zn, TP, BOD5, total and un-ionized ammonia, nitrate, temperature
			Monthly	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite and temperature
McVeigh Creek – McV4	DS Receiving Water	2 months prior to construction start	Monthly	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite and temperature
McVeigh Creek – McV0	DS Receiving Water	2 months prior to construction start	Monthly	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite and temperature
Otto Lake (OL-B) (mid basin sample)	Receiving Water (DS of final effluent discharge – near-field)	Switch from quarterly to monthly sampling following construction start-up	Monthly	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite, and temperature
Herman Lake (HL-B-IN) (Otto Lake outlet to Herman Lake)	Receiving Water (mid-field); Top and bottom sampling[3]	Ongoing	Monthly[3]	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite, and temperature
Herman Lake (HL-B) (lake outlet)	Receiving Water (far-field); Top and bottom sampling[3]	Ongoing	Monthly[3]	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite, and temperature

Location	Type and Purpose	Timing	Frequency	Parameters
Herman Creek (HL-Outlet 2)	Receiving Water (far-field)	Switch from quarterly to monthly sampling following construction start-up	Monthly	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite, and temperature
Waterbody 6 (UL6-B) (lake outlet)	Peripheral Water	Monthly sampling following construction start-up	Monthly	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite, and temperature
Waterbody 8 (UL8-B) (lake outlet)	Peripheral Water	Switch from quarterly to monthly sampling following construction start-up	Monthly	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite, and temperature
	Top and bottom sampling[3]	Ongoing	Quarterly	Same as above
Waterbody 9 (UL9-B) (lake outlet)	Peripheral Water	Switch from quarterly to monthly sampling following construction start-up	Monthly	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite, and temperature
	Top and bottom sampling[3]	Ongoing	Quarterly	Same as above
Waterbody 10 (UL10-B) (lake outlet)	Peripheral Water	Switch from quarterly to monthly sampling following construction start-up	Monthly	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite, and temperature
	Top and bottom sampling[3]	Ongoing	Quarterly	Same as above
Smithy Lake (SML-REF) (lake outlet)	Reference Lake	2 months prior to construction start	Monthly	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite, and temperature

Location	Type and Purpose	Timing	Frequency	Parameters
	Top and bottom sampling[3]	Ongoing	Quarterly	Same as above
Herman Lake (HL-REF) (southeast location within lake, upstream of mine influence)	Reference Lake	2 months prior to construction start	Monthly	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite, and temperature
	Top and bottom sampling[3]	Ongoing	Quarterly	Same as above
Smithy Creek (SMC-REF) (DS Smithy Lake)	Reference Creek	2 months prior to construction start	Monthly	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite, and temperature
Mountain Lake (ML-B) (lake outlet)	Reference Lake	Switch from quarterly to monthly sampling following construction start-up	Monthly	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite, and temperature
	Top and bottom sampling[3]	Ongoing	Quarterly	Same as above
Webb Lake (WL-A)	Peripheral Water	2 months prior to construction start	Monthly	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite, and temperature
	Top and bottom sampling[3]	2 months prior to construction start	Quarterly	Same as above
Goudreau Lake (GL-B) (lake outlet)	Peripheral Water	Ongoing from Construction Phase	Monthly	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite, and temperature
	Top and bottom sampling[3]	Ongoing	Quarterly	Same as above

Location	Type and Purpose	Timing	Frequency	Parameters
Goudreau Lake South (GLS-B) (lake outlet)	Peripheral Water	2 months prior to construction start	Monthly	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite, and temperature
	Top and bottom sampling[3]	2 months prior to construction start	Quarterly	Same as above
Goudreau Creek (GC1)	Peripheral Water	Ongoing from Construction Phase	Monthly	ICP-MS metals (filtered and unfiltered)[1], pH, TSS, TDS, Cl, F, SO_4, BOD5, DO, DOC, TP, total and free cyanide, acidity, hardness, alkalinity, conductivity, turbidity, total and un-ionized ammonia, nitrate, nitrite, and temperature

Notes:

1 – ICP-MS metals will include: Al, Sb, As, Ba, Be, B, Bi, Cd, Ca, Cr, Co, Cu, Fe, Pb, Li, Mg, Mn, Hg, Mo, Ni, P, K, Se, Si, Ag, Na, Sr, S, Te, Th, Sn, Ti, W, U, V, Zn and Zr

2 – All lake regular sampling is to occur at the lake outlet

3 – Quarterly top and bottom sampling is to occur in the deepest section of the lake and is to provide information on stratification effects

DS – downstream

4.0 Sediment and Benthos

4.1 Goals and Objectives

The goal of the sediment quality and benthic invertebrate community (BIC) monitoring plan is to demonstrate that sediment quality and aquatic life living in and near the sediment of the receiving waterbodies will be protected under all receiver flow, seepage and effluent discharge conditions.

Objectives of the sediment quality and BIC monitoring program are to demonstrate through monitoring that:

- Sediment quality is not substantively degraded from existing; and
- Changes in the receiving waterbodies BIC metrics do not show adverse effects associated with development and mining activities.

4.2 Methods

Sediment quality and BIC samples will be collected concurrent with and from the same sampling locations shown on Figure 4-1 as follows.

- Sediment quality sampling from each location will consist of a composite of three petite-Ponar grabs; and
- Benthic invertebrate community sampling from each location will consist of five petite-Ponar grabs consistent with the federal Metal and Diamond Mining Environmental Effects Monitoring (MDM EEM) protocols.

4.3 Timing and Frequency

Initial sediment quality and BIC sampling will be conducted in the late summer or fall of 2021 to provide an updated existing condition for the program; with subsequent sampling to be conducted one year after start of construction and every three years (at the same time of year) thereafter, until the start of the Closure Phase or cessation of mining activity.

4.4 Parameters and BIC Metrics

The sediment quality sampling parameters and the BIC metrics are listed in Table 4-1.

4.5 Monitoring Locations

The sediment quality and BIC sampling locations are listed in Table 4-1 and shown on Figure 4-1. The proposed reference area sample locations (southeast location in Herman Lake, Mountain Lake, Smithy Lake and Smithy Creek) will be assessed to confirm they represent appropriate reference condition for comparison to the peripheral waterbodies and receiving environment, as applicable. Alternate reference areas may be selected that better match the peripheral waterbodies and receiving environment conditions if required.

4.6 Quality Assurance and Control

Quality assurance and control measures for sediment quality and BIC samples will be consistent with the MDMER EEM protocols including:

- Staff training in:
  - Safety protocols.
  - Sample collection and preservation techniques including:
    - All sediment samples will be stored in a chilled cooler or refrigerator (at ~4°C) until delivered to the laboratory for analysis
    - Sample identification, location, date and other pertinent information will be recorded in a field logbook / log sheet, on the sample container and on a laboratory provided Chain of Custody form.
    - Field staff will wear a new pair of gloves (e.g., nitrile, powder-free) during sampling and changed between each sample location.
  - Shipping procedures.
  - Record keeping.
- Use of:
  - Duplicate samples (10%) – sediment quality samples only.
- Laboratories, as third parties, will be responsible for their own in-house quality assurance and control programs, as per Canadian Association for Laboratory Accreditation (CALA) requirements.
- The BIC taxonomic laboratory quality assurance and control measures including taxonomic identification to lowest practical level, compilation of a voucher specimen collection, reporting sorting efficiency and subsample precision will be consistent with the MDM EEM protocol.

4.7 Trigger Criteria

Statistical differences confirming effects to the BIC observed in two subsequent monitoring periods as per the MDM EEM protocol would require additional sampling to confirm the observed effect.

4.8 Mitigation and Contingency Measures

Mitigation / contingency measures proposed as part of the sediment quality and BIC monitoring program would follow the MDM EEM protocol if confirmed effects to the BIC are observed in two subsequent monitoring programs. This difference would then require development of an investigation of cause (IOC) study design if effects were confirmed following the additional "trigger" sampling. The IOC study results are meant to identify source(s) of the effects and appropriate, site-specific mitigation would be applied as needed.

4.9 Data Analysis and Reporting

Data analysis will include the following (will be provided in appendices):

- Results of sediment quality monitoring including:
  - Minimum, maximum, average and 75th percentile values.
  - Comparison with Provincial Sediment Quality Guidelines (PSQG) and CCME Canadian Sediment Quality Guidelines (CSQG).
  - Documentation of exceedance (if any) of applicable guidelines.

The PSGQ are longstanding guidelines which promote the protection of aquatic life and are based on sound scientific information. The PSQG provide criteria defined as the Lowest Effect Level (LEL) and the Severe Effect Level (SEL), described as follows:

- **LEL** – Lowest Effect Level indicating concentration in the sediment that can be tolerated by the majority of benthic organisms; and
- **SEL** – Severe Effect Level indicating a concentration in the sediment at which pronounced disturbance of the sediment-dwelling community can be expected.

The CSQG provide scientific benchmarks, or reference points, for evaluating the potential for observing adverse biological effects in aquatic systems. The guidelines are derived from the available toxicological information according to the formal protocol established by the CCME. The probable effect level (PEL), defines the level above which adverse effects are expected to occur frequently.

Sediment quality summary tables will list the station name, date of sampling event, season, parameter concentration, minimum detection level, provincial guideline value, federal guideline value, indicate any exceedances of guidelines and be constructed in such a way as to provide ease of geographical and temporal comparisons. Conclusions will be based on observed trends in the data, both between stations and monitoring periods (e.g., pre-construction and during-construction).

Reporting will include:

- Project background and reporting period activities summary;
- Summary of data collection methods and analytical procedures;
- Summary of monitoring data and comparisons to quality guideline values for the protection of aquatic life, as applicable;
- Sediment and BIC quality assurance and control outcomes;
- Implementation of contingency and mitigation measures; and
- Laboratory certificates of analysis (will be provided in appendices)

The above data analysis and reporting activities will be provided as part of the Environmental Compliance Approval annual compliance report (during the sediment quality and BIC monitoring period, as applicable).

Table 4-1: Sediment and Benthos Monitoring

Location	Type and Purpose	Timing	Frequency	Parameters
Peripheral Waterbodies Spring Lake: (also receiving water during Construction Phase) - SL-B-1 to SL-B-5 McVeigh Creek - McV4-1 to McV4-5 Unnamed Lake 6 - UL6-B-1 to UL6-B-5 Unnamed Lake 8 - UL8-B-1 to UL8-B-5 Unnamed Lake 9 - UL9-B-1 to UL9-B-5 Unnamed Lake 10 – UL10-B-1 to UL10-B-5 Goudreau Lake - GL-B-1 to GL-B-5 Goudreau Lake South – GLS-B-1 to GLS-B-5 **Reference Areas** Mountain Lake - ML-B-1 to ML-B-5 Smithy Lake - SML-REF-1 to SML-REF-5 Herman Lake – HL-REF-1 to HL-REF-5	Periodic Compliance Monitoring	1-year after construction start (late summer, early fall)	Every three years until the Closure Phase or cessation of mining activity.	Sediment quality: • total metals • total organic carbon (TOC) • pH • moisture content; • total Kjeldahl nitrogen (TKN) • orthophosphate; • particle size analysis as per the Wentworth Classification 1922. BIC metrics as per MDMER: • Total invertebrate density; • Taxon richness; and • Simpson's evenness Index.
Receiving Water Herman Lake - HL-B-1 to ML-B-5 Otto Lake - OL-B-1 to OL-B-5	MDMER EEM Compliance	1-year after the day on which the mine becomes subject to section 7 of the MDMER*	Every three years until the Closure Phase or cessation of mining activity.	Sediment quality: • total metals • total organic carbon (TOC) • pH • moisture content; • total Kjeldahl nitrogen (TKN) • orthophosphate; • particle size analysis as per the Wentworth Classification 1922. BIC metrics as per MDMER: • Total invertebrate density; • Taxon richness; and • Simpson's evenness Index.

Location	Type and Purpose	Timing	Frequency	Parameters
Reference Water Herman Lake – HL-REF-1 to HL-REF-5	MDMER EEM Compliance	1-year after the day on which the mine becomes subject to section 7 of the MDMER*	Every three years until the Closure Phase or cessation of mining activity.	Sediment quality: • total metals • total organic carbon (TOC) • pH • moisture content; • total Kjeldahl nitrogen (TKN) • orthophosphate; • particle size analysis as per the Wentworth Classification 1922. BIC metrics as per MDMER: • Total invertebrate density; • Taxon richness; and • Simpson's evenness Index.

Notes:

* The first MDMER EEM biological study design shall be submitted to ECCC not later than 12 months after the day on which the mine becomes subject to section 7 of the Regulations and the first EEM Interpretive Report is due to ECCC not later than 36 months after the day on which the mine becomes subject to section 7 of the Regulations.

€ MDMER EEM reference area subject to change pending in-field confirmation of suitable habitat conditions that represent Otto Lake.

5.0 Aquatic Resources

5.1 Goals and Objectives

The goal of the aquatic resources monitoring plan is to demonstrate that the fish community of the receiving waterbodies will be protected under all receiver flow, seepage and effluent discharge conditions.

Objectives of the aquatic resources monitoring program are to demonstrate through monitoring that:

- Changes in the fish community and catch-per-unit-effort (CPUE) metrics do not show adverse effects; and
- Changes in total mercury, methylmercury, lead, arsenic and cobalt concentrations in fish tissue associated with development and mining activities are not shown.

5.2 Methods

Aquatic resources sampling, specifically fish community surveys will utilize gillnets, seine netting, minnow traps and electrofishing within nearshore littoral (<2 m deep) and offshore pelagic (>2 m deep) habitat (if/where applicable), concurrent with the sediment quality and BIC monitoring program as follows:

- Minnow traps (600 trap hours);
- Seine netting (5 x 15 metre hauls);
- Electrofishing (3,000 seconds); and
- Gill nets of various stretched mesh sizes from 38 to 102 mm (6 overnight sets [minimum 12 hours] of standard gill nets and/or Riverine Index Nets).

Effort to be spread equally among habitat types as able.

Fish tissue and species-specific aging structure sampling will also be conducted concurrent with the sediment quality and BIC monitoring program as follows:

- Sport fish (large bodied) sentinel species, sampling of 20 adult fish of the same species per waterbody (as/if available); and
- Forage fish (small bodied) sentinel species, sampling of 25 adult fish of the same species per waterbody (as/if available).

Target fish species within each sampled waterbody will be sampled during each monitoring period; however, different fish species may be utilized within each waterbody in accordance with the local fish community and species abundance. The proposed waterbody-specific large and small bodied target fish species for contaminants in tissue monitoring are provided in Table 5-1.

5.3 Timing and Frequency

Initial aquatic resource sampling will be conducted in the late summer or fall of 2021 to provide an updated baseline condition for the program; with subsequent sampling to be conducted one year after start of construction and every three years (at the same time of year) thereafter, until the start of the Closure Phase or cessation of mining activity.

5.4 Parameters and Metrics

The aquatic resources metrics are listed in Table 5-2.

5.5 Monitoring Locations

The aquatic resources community sampling locations are listed in Table 5-2. The proposed reference area sample locations (southeast location in Herman Lake, Mountain Lake, Smithy Lake and Smithy Creek) will be assessed to confirm they represent appropriate reference condition with similar fish species assemblages for comparison to the peripheral waterbodies and receiving environment, as applicable. Alternate reference areas may be selected that better match the peripheral waterbodies and receiving environment conditions and fish species assemblages if required.

5.6 Quality Assurance and Control

Quality assurance and control measures for aquatic resources community monitoring will include:

- Staff training in:
  - Safety protocols.
  - Gear-specific use and techniques including:
    - Sample identification, location, date and other pertinent information will be recorded in a field logbook / log sheet.
    - Field staff will process gear-specific catches discretely to allow data comparison among gear types.
  - Decontamination procedures.
  - Record keeping.

5.7 Trigger Criteria

Trigger criteria are listed in Table 5-3.

5.8 Mitigation and Contingency Measures

Mitigation / contingency measures are listed in Table 5-3.

5.9 Data Analysis and Reporting

Data analysis will include the following (provided in appendices):

- Results of aquatic resources monitoring including:
  - Fish abundance expressed as gear-specific CPUE values.
  - Species richness.
  - Length-frequency data for sufficiently abundant species.
  - Total mercury concertation in fish tissue (sentinel species).
  - Total body weight at age (sentinel species).
  - Comparison with pre-construction data.
  - Documentation of exceedance (if any) of applicable guidelines.

Reporting will include:

- Project background and reporting period activities summary;
- Summary of data collection methods;
- Summary of monitoring data and comparisons to pre-construction data; and
- Implementation of contingency and mitigation measures.

The above data analysis and reporting activities will be provided as part of the Environmental Compliance Approval annual compliance report (during the aquatic resources monitoring period, as applicable).

Table 5-1: Proposed Target Fish Species for Contaminants in Fish Tissue Monitoring

Location	Proposed Fish Species (Large-bodied, Small-bodied)
Peripheral Waterbodies	
Spring Lake - SL-B-1 to SL-B-5	Northern Pike (*Esox lucius*), Common Shiner (*Luxilus cornutus*)
McVeigh Creek - McV4-1 to McV4-5	Northern Pearl Dace (*Margariscus nachtriebi*), Northern Redbelly Dace *(Chrosomus eos*) *
Unnamed Lake 6 - UL6-B-1 to UL6-B-5	Finescale Dace (*Chrosomus neogaeus*), Fathead Minnow (*Pimephales promelas*)*
Unnamed Lake 8 - UL8-B-1 to UL8-B-5	Northern Pike, Yellow Perch (*Perca flavescens*) [young-of-the-year]
Unnamed Lake 9 - UL9-B-1 to UL9-B-5	White Sucker, Yellow Perch [young-of-the-year]
Unnamed Lake 10 – UL10-B-1 to UL10-B-5	Finescale Dace, Northern Redbelly Dace
Goudreau Lake - GL-B-1 to GL-B-5	Northern Pike, Lake Chub (*Couesis plumbeus*)
Goudreau Lake South – GLS-B-1 to GLS-B-5	Northern Pike, Lake Chub
Reference Areas	
Mountain Lake - ML-B-1 to ML-B-5	Northern Pike, Yellow Perch [young-of-the-year]
Smithy Lake - SML-REF-1 to SML-REF-5	Northern Pike, Yellow Perch [young-of-the-year]
Herman Lake – HL-REF-1 to HL-REF-5 (possibly only small bodied species sampled to represent reference condition at this location due to mobility of large bodied species within Herman Lake)	Walleye (*Sander vitreus*) [from south basin], Common Shiner Lake Chub [*Alternate small bodied species if Walleye are deemed unsuitable*] ^
Receiving Water	
Herman Lake - HL-B-1 to ML-B-5	Walleye [from north basin], Common Shiner Lake Chub [*Alternate small bodied species if Walleye are deemed unsuitable*] ^
Otto Lake - OL-B-1 to OL-B-5	White Sucker, Common Shiner
Reference Water	
Herman Lake – HL-REF-1 to HL-REF-5 (possibly only small bodied species sampled to represent reference condition at this location due to mobility of large bodied species within Herman Lake)	Walleye [from south basin], Common Shiner Lake Chub [*Alternate small bodied species if Walleye are deemed unsuitable*] ^

Note:

All waterbodies presented in the above table are considered candidate waterbodies where the potential for Indigenous use can be expected.

* No large-bodied species are present within the waterbody; therefore, two small-bodied species have been proposed for monitoring.

^ Large bodied species are able to access several monitoring areas and may not be suitable for measurement of change; therefore, a secondary small bodied species has been proposed in lieu of the large bodied species.

Reasonable effort will be made to capture enough of each target species within each lake; however, the proposed target species are subject to change pending availability at time of sampling. Alternate species may be utilized if sufficient numbers of the proposed target species are not caught to support the monitoring program.

Table 5-2: Aquatic Resources Monitoring

Location	Type and Purpose	Timing	Frequency	Parameters
Peripheral Waterbodies Spring Lake: (also receiving water during Construction Phase) - SL-B-1 to SL-B-5 McVeigh Creek - McV4-1 to McV4-5 Unnamed Lake 6 - UL6-B-1 to UL6-B-5 Unnamed Lake 8 - UL8-B-1 to UL8-B-5 Unnamed Lake 9 - UL9-B-1 to UL9-B-5 Unnamed Lake 10 – UL10-B-1 to UL10-B-5 Goudreau Lake - GL-B-1 to GL-B-5 Goudreau Lake South – GLS-B-1 to GLS-B-5 **Reference Areas** Mountain Lake - ML-B-1 to ML-B-5 Smithy Lake - SML-REF-1 to SML-REF-5 Herman Lake – HL-REF-1 to HL-REF-5 (possibly only small bodied species sampled to represent reference condition at this location due to mobility of large bodied species within Herman Lake)	Periodic Compliance Monitoring	1-year after construction start (late summer, early fall)	Every three years during construction	• Fish abundance will be sampled across gear types and habitat types as CPUE such that the values can be compared between periods; • Species richness (number of individual species) will be measured to determine if species presence is maintained; • Length frequency distributions will be calculated and graphed, with the understanding that the results will show any large discrepancies in year class. The analysis will be done by species, with the understanding that species with low abundance may not be appropriate for this analysis; and • Total mercury, methylmercury, lead, arsenic and cobalt in fish tissue: ○ Dorsal fillet (large bodied fish) ○ Composite whole body sample with minimum 5 fish per sample (small bodied fish)
Receiving Water Herman Lake - HL-B-1 to ML-B-5 Otto Lake - OL-B-1 to OL-B-5	MDMER EEM Compliance	1-year after the day on which the mine becomes subject to section 7 of the MDMER*	Every three years until the Closure Phase or cessation of mining activity.	
Reference Water Herman Lake – HL-REF-1 to HL-REF-5 (possibly only small bodied species sampled to represent reference condition at this location due to mobility of large bodied species within Herman Lake)	MDMER EEM Compliance	1-year after the day on which the mine becomes subject to section 7 of the MDMER*	Every three years until the Closure Phase or cessation of mining activity.	

Notes:

* The first MDMER EEM biological study design shall be submitted to ECCC not later than 12 months after the day on which the mine becomes subject to section 7 of the Regulations and the first EEM Interpretive Report is due to ECCC not later than 36 months after the day on which the mine becomes subject to section 7 of the Regulations.

€ MDMER EEM reference area subject to change pending in-field confirmation of suitable habitat conditions that represent Otto Lake.

Table 5-3: Aquatic Resources Trigger Criteria, Mitigation and Contingency Measures

Trigger	Mitigation / Contingency
Fish Community Metrics	
General agreement between sample area for metrics (CPUE [3 of 4 gear types], richness, and age class representation); 70% or greater consistency in metric values.	No contingency required and prediction of no harm confirmed.
Moderate agreement between areas (consistency of 40 to 70% in metric values).	Review results of multiple years to identify trends and or confirm results. Discuss findings with MECP.
Difference in metrics noted in the higher flow reduction area (less than 40% consistency in metric values).	Review results of multiple years to confirm difference. Based on discussion with MECP develop a mitigation plan, or offset measure if required.
Fish Tissue Metric	
Fish tissue mercury, methylmercury, lead, arsenic, and cobalt are not statistically different from and higher than the concentration of total mercury, methylmercury, lead, arsenic, and cobalt in fish tissue that is taken in the reference area (if applicable) and/or baseline condition.	No contingency required and prediction of no harm confirmed.
Fish tissue mercury, methylmercury, lead, arsenic, and cobalt are statistically different from and higher than the concentration of total mercury, methylmercury, lead, arsenic, and cobalt in fish tissue that is taken in the reference area (if applicable) and/or baseline condition.	Review results of multiple years to confirm difference. Based on discussion with MECP develop a mitigation plan, or offset measure if required.

680000 682500 685000 687500 690000 692500 695000

5357500 5355000 5352500 5350000

Dubreuilville
Green Lake
Willigar Lake
Big Ben Lake
Smithy Lake
Square Lake
Iris Lake
Alexandra Lake
Herman Creek
Mud Lake
Troupe Lake
Sherman Lake
Herman Lake
Otto Lake
Summit Lake
Goudreau (Abandoned)
McVeigh Creek
Wysor Lake
Nicho Lake
Dobbs Lake
Teare Lake
Goudreau Lake South
Cradle Lakes
Goudreau Creek
Goudreau Lake
Dreany Lake
Tavis Lake
Mountain Lake
Maskinonge Lake
Miller Lake
Waterbody 9
Waterbody 8
Herman - Otto Lake Watershed
Spring - Lovell Lake Watershed
Spring Lake
Lovell Lake
Webb Lake
Bearpaw Lake
Pine Lake
Tuff Lake
Horgon Lake
Cline Lake
End Lake

SITE 1
SITE 2
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LEGEND

Hydrometric Stations (By Type)
- Water Level and Flow
- Water Level
- Flow
- Historical - Inactive

- Property Boundary
- Name Local Watersheds
- Contours (10 m interval)
- Railway
- Local Road
- Resource / Recreation Road
- Watercourse
- Waterbody
- Flow Direction

NOTES:
- Property boundary based on land tenure provided by Prodigy, October 2020.
- Local watershed boundaries provided by SLR.
- Contours, watercourses and waterbodies provided by Minnow.

Datum: NAD83
Projection: UTM Zone 16N

0 1 2 4 6 8 10 Kilometres

N W E S

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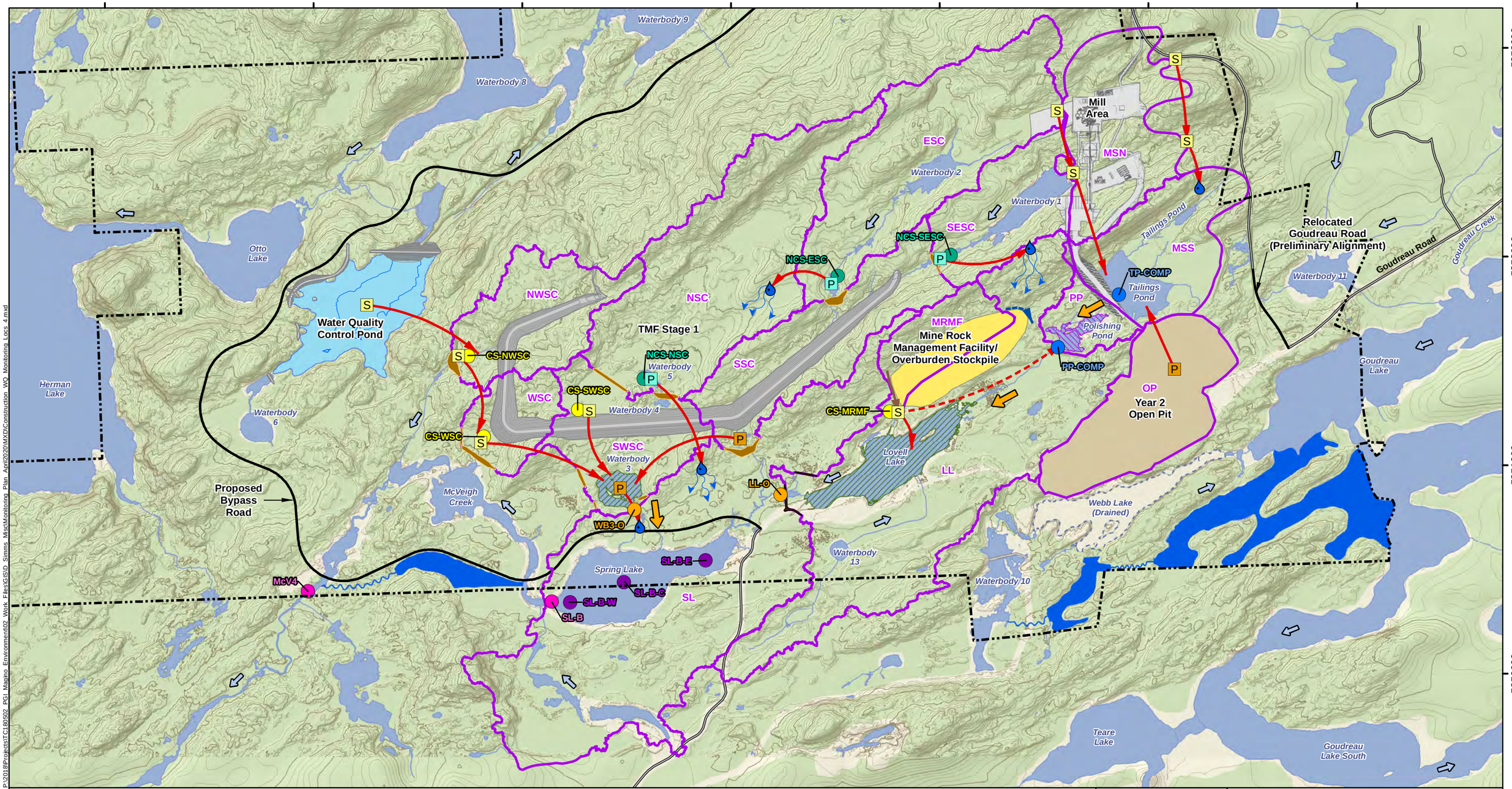
wood.

MAGINO GOLD PROJECT

Hydrometric Stations

PROJECT N^{o}: TC180502 | **FIGURE: 2-1**

SCALE: 1:47,000 | DATE: November 2020



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LEGEND

- Property Boundary
- Existing Roads
- Major Contours
- Minor Contours
- Watercourse
- Waterbody
- Flow Direction

Proposed Site Features

- Mill Area
- Open Pit - Quarry
- Pond
- Dam
- Mine Rock Management Facility
- Diversion Channels and Habitat Compensation/Offsetting Areas
- Road Realignment
- Impoundment / Berm
- Control Structure

Proposed Water Management Features

- Splash Pad
- Overland Flow
- P — Clean Non-contact Water Pump
- P — Contact Water Pump
- S — Contact Water Sump
- Pumping Direction
- Alternative Flow Path
- Watershed
- Schedule 2 Treatment Works Waterbody
- Section 35 Treatment Works Waterbody
- Berm/Ditch
- Ditch
- Effluent Flow

Surface Water Monitoring Locations (By Type)

- Contact Water Sump
- Final Effluent
- Non-Contact Water Sump
- Receiving Water
- Upstream Treatment Works
- Sediment / Benthic

NOTES:
- Contours derived from 2013 LiDAR survey and LIO provincial digital elevation model.
- Property boundary based on land tenure provided by Prodigy, October 2020.
- Waterbodies and watercourses provided by Minnow.

0 0.5 1 2 3 4 5 Kilometres

Datum: NAD83
Projection: UTM Zone 16N

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MAGINO GOLD PROJECT

Construction Phase On-Site Water Quality Monitoring

PROJECT N°: TC180502

FIGURE: 3-1

SCALE: 1:17,500

DATE: November 2020

680000 682000 684000 686000 688000 690000 692000 694000

5356000 5354000 5352000 5350000

Big Ben Lake
HL-Outlet 2
Dreany Lake
Smithy Lake
SML
SMC
Square Lake
Iris Lake
Herman Creek
Mountain Lake
ML-B
Maskinonge Lake
Horgon Lake
Pine Lake
Alexandra Lake
Mud Lake
Miller Lake
Tuff Lake
HL-B
UL9-B
Waterbody 9
Waterbody 8
Powder Magazine
Site Manufactured Emulsion Facility
Mill Area
Crusher Stockpile
Goudreau Road
Bearpaw Lake
UL8-B
OL-B
Northwest Fill Area Overburden and Soil Stockpile
Relocated Goudreau Road (Preliminary Alignment)
Low Grade Ore Stockpile
Waterbody 11
Troupe Lake
Herman Lake
HL-B-IN
Otto Lake
Water Quality Control Pond
Tailings Management Facility
Goudreau Lake
Sherman Lake
UL6-B
Waterbody 6
Mine Rock Management Facility
Southeast Fill Area
Open Pit
GL-B
HL-REF
WL-A
Proposed Bypass Road
Southwest Fill Area Overburden and Soil Stockpile
West Goudreau Pond
GLS
McV4
Spring Lake
SL-B
UL10-B
GC1
Teare Lake
Goudreau Lake South
McVeigh Creek
Dobbs Lake
Nicho Lake
McV0
Summit Lake
Wysor Lake
Cradle Lakes

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LEGEND

- Property Boundary
- Existing Roads
- Railway
- Watercourse
- Waterbody
- Contours (10 m interval)

Water Quality Monitoring Stations (By Type)

- Peripheral Waterbody
- Receiving Water
- Reference Waterbody

Proposed Site Features

- Open Pit
- Mill Area
- Pond
- Tailings Management Facility
- Dam
- Mine Rock Management Facility
- Southeast Fill Area
- Overburden and Soil Stockpile
- Low Grade Ore Stockpile
- Explosives Facility
- Diversion Channels and Habitat Compensation/Offsetting Areas
- Surface Water Drainage
- Road Realignment
- Access Road

0 0.5 1 2 3 4 5 Kilometres

NOTES:
- Contours derived from 2013 LiDAR survey and LIO provincial digital elevation model.
- Property boundary based on land tenure provided by Prodigy, October 2020.
- Waterbodies and watercourses provided by Minnow.

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MAGINO GOLD PROJECT

Surface Water Quality Monitoring Stations

Datum: NAD83
Projection: UTM Zone 16N

N W E S

PROJECT N°: TC180502 | **FIGURE: 3-2**

SCALE: 1:38,000 | DATE: December 2020

682000 684000 686000 688000 690000 692000

5356000 5354000 5352000 5350000

Big Ben Lake
Dreany Lake
Smithy Lake
Dreany Creek
Square Lake
Iris Lake
Mountain Lake
Maskinonge Lake
Herman Creek
Alexandra Lake
Mud Lake
Miller Lake
Waterbody 9
Waterbody 8
Powder Magazine
Site Manufactured Emulsion (SME) Facility
Mill Area
Crusher Stockpile
Goudreau Road
Bearpaw Lake
Pine Lake
Goudreau Creek
Relocated Goudreau Road (Preliminary Alignment)
Low Grade Ore Stockpile
Waterbody 11
Goudreau Lake
Troupe Lake
Sherman Lake
Herman Lake
Otto Lake
Northwest Fill Area Overburden and Soil Stockpile
North Surface Channel
Water Quality Control Pond
Tailings Management Facility
Open Pit
Southeast Fill Area
Mine Rock Management Facility
Waterbody 6
Proposed Bypass Road
Southwest Fill Area Overburden and Soil Stockpile
South Surface Channel
Spring Lake
Waterbody 10
Goudreau Lake South
McVeigh Creek

SML-REF-1
SML-REF-2
SML-REF-3
SML-REF-4
SML-REF-5
SMC-REF-1
SMC-REF-2
SMC-REF-3
SMC-REF-4
SMC-REF-5
ML-B-1
ML-B-2
ML-B-3
ML-B-4
ML-B-5
UL8-B-1
UL8-B-2
UL8-B-3
UL8-B-4
UL8-B-5
UL9-B-1
UL9-B-2
UL9-B-3
UL9-B-4
UL9-B-5
HL-B-1
HL-B-2
HL-B-3
HL-B-4
HL-B-5
OL-B-1
OL-B-2
OL-B-3
OL-B-4
OL-B-5
HL-REF-1
HL-REF-2
HL-REF-3
HL-REF-4
HL-REF-5
UL6-B-1
UL6-B-2
UL6-B-3
UL6-B-4
UL6-B-5
McV4-1
McV4-2
McV4-3
McV4-4
McV4-5
SL-B-1
SL-B-2
SL-B-3
SL-B-4
SL-B-5
UL10-B-1
UL10-B-2
UL10-B-3
UL10-B-4
UL10-B-5
GL-B-1
GL-B-2
GL-B-3
GL-B-4
GL-B-5
GLS-B-1
GLS-B-2
GLS-B-3
GLS-B-4
GLS-B-5

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LEGEND

- Property Boundary
- Existing Roads
- Railway
- Watercourse
- Waterbody
- Contours (10 m interval)
- Fish Community and Tissue Sampling Location

Sediment and Benthic Monitoring Stations (By Type)

- Peripheral Waterbody
- Receiving Waterbody
- Reference Waterbody

Proposed Site Features

- Open Pit
- Mill Area
- Pond
- Tailings Management Facility
- Dam
- Mine Rock Management Facility
- Southeast Fill Area
- Overburden and Soil Stockpile
- Low Grade Ore Stockpile
- Explosives Facility
- Diversion Channels and Habitat Compensation/Offsetting Areas
- Surface Water Drainage
- Road Realignment
- Access Road

0 0.5 1 2 3 4 5 Kilometres

NOTES:
- Contours derived from 2013 LiDAR survey and LIO provincial digital elevation model.
- Property boundary based on land tenure provided by Prodigy, October 2020.
- Waterbodies and watercourses provided by Minnow.

Datum: NAD83
Projection: UTM Zone 16N

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Sediment, Benthos and Aquatic Resources Monitoring Stations

PROJECT N°: TC180502

FIGURE: 4-1

SCALE: 1:31,000

DATE: December 2020