



# **AGNICO EAGLE**

**MELIADINE GOLD PROJECT**

## **Quality Assurance/Quality Control Plan**

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**DECEMBER 2015  
VERSION 2**

[illegible]

**EXECUTIVE SUMMARY**

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This document presents the Meliadine Mine Quality Assurance / Quality Control (QA/QC) Plan. It summarizes the field sampling equipment, and methods, as well as laboratory and data requirements.

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**DOCUMENT CONTROL**

Version	Date	Section	Page	Revision	Author
1	April 2015			This is the first version of this Plan, developed for the Type A Water Licence Application	Golder Associates Ltd.
2	December 2015	2.2.2 2.2.4 4.2 Table A-3 toA-5	5 6 9 to 13 19 to 24	Updated with text to address comments from the Kivalliq Inuit Association during the Water Licensing process related to detection limits	Golder Associates Ltd.

**ACRONYMS**

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AANDC	Aboriginal Affairs and Northern Development Canada <small>(now INAC)</small>
Agnico Eagle	Agnico Eagle Mines Limited
AEMP	Aquatic Effects Monitoring Program
INAC	Indigenous and Northern Affairs Canada
Mine	Proposed Meliadine Gold Mine
MMER	Metal Mining Effluent Regulations
NWB	Nunavut Water Board
Project	Meliadine Gold Project
QA/QC	Quality Assurance and Quality Control
SNP	Surveillance Network Program



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**SECTION 1 • INTRODUCTION**

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Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres north from Rankin Inlet, and 80 kilometres southwest from Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson's Bay, the proposed Project site is located on a peninsula (the Peninsula) between the east, south, and west basins of Meliadine Lake (63°01'23.8"N, 92°13'6.42"W), on Inuit Owned Land.

This report presents the Quality Assurance/Quality Control (QA/QC) Plan for the Project. The Plan was prepared in accordance with the requirements of Type A Water Licence Application and the Supplementary Information Guidelines for Mining and Water Works, issued by Nunavut Water Board (NWB 2010a, b, c). It has been developed in accordance with the Aboriginal Affairs and Northern Development Canada (AANDC) 1996 *'Guidelines for Use by Class "A" Licensees in Meeting SNP Requirements and for Submission of a QA/QC Plan'*, which includes the following definitions:

- Quality Assurance: the system of activities designed to better ensure that quality control is done effectively; and
- Quality Control: the use of established procedures to achieve standards of measurement for the three principal components of quality – precision, accuracy and reliability.

The mine plan proposes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. The proposed mine will produce approximately 12.1 million tonnes (Mt) of ore, 31.8 Mt of waste rock, 7.4 Mt of overburden waste, and 12.1 Mt of tailings. There are four phases to the development of Tiriganiaq: just over 4 years construction (Q4 Year -5 to Year -1), 8 years mine operation (Year 1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

A general location plan of the proposed Mine is shown in Figure A-1.

This Plan, which is part of the Environmental Management System for the proposed Mine, is divided into the following components:

- procedures for field sample collection (Section 2);
- external and internal laboratory requirements (Section 3); and
- data verification procedures and regulatory reporting requirements (Section 4).

The objective of the QA/QC program is to facilitate collection of chemistry data that are representative of the material being sampled, of known quality, properly documented, and scientifically defensible. This is achieved throughout the collection and analysis of samples by using specified standardized procedures and accredited laboratories, and by staffing the program with experienced technical personnel.

This QA/QC Plan sets out standard procedures for surface water and groundwater sample and data collection in support of monitoring programs outlined in the Water Management Plan and the Aquatic Effects Monitoring Program (AEMP) Design Plan.

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## SECTION 2 • FIELD SAMPLING

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Water quality monitoring will be initiated at the pre-development stage and will continue during construction, operations, and closure. Proposed sampling stations, frequency, and parameters are listed Appendix A, Table A-1. Table A-2 provides supporting definitions. The stations and their requirements may be adjusted based on the requirements of the Type A Water Licence and/or any updates to the Mine management plans over the life of the Mine. Proposed sampling stations are shown in Appendix A, Figure A-2.

Aquatic monitoring consists of three forms, as follows:

- Regulated discharge monitoring occurs at monitoring points specified in licences or regulations. It includes discharge limits that must be achieved to maintain compliance with an authorization (i.e., water licence) or regulation (i.e., Metal Mining Effluent Regulations). Enforcement action may be taken if discharge limits are exceeded for a parameter.
- Verification monitoring is carried out for operational and management purposes by Agnico Eagle. This type of monitoring provides data for decision making and builds confidence in the success of processes being used. There is no obligation to report verification monitoring results, although some monitoring locations and these results can be mentioned in environmental management plans (i.e., sampling to verify soil remediation in the landfarm).
- General and aquatic monitoring is commonly included in a water licence specifying what is to be monitored according to a schedule. It covers all types of monitoring (i.e., geotechnical, lake levels, etc.). This monitoring is subject to compliance assessment to confirm sampling was carried out using established protocols, included QA/QC provisions, and addressed identified issues. General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the Nunavut Water Board.

Mine site monitoring can include stations categorized as regulated, verification, and general and aquatic monitoring; AEMP monitoring includes stations categorized as general and aquatic monitoring.

All sampling stations will have defined GPS locations and be landmarked. All stations will be used repeatedly, with qualified personnel using the same techniques to reduce operational error. The following sections outline the standard procedures for collection and handling of surface water and groundwater samples.

### 2.1 Sampling Equipment

New laboratory supplied containers will be used for sample collection. The bottles will be either polyethylene plastic or glass, dependent on the specific parameter being analyzed.

Equipment, such as the Analite NEP 160 Meter (turbidity), Oakton PCS35 Meter (pH and conductivity), and Hanna Multi-Parameter Meter (pH, dissolved oxygen and conductivity) are handheld instruments that can be used to collect field parameters. The YSI 6-series MPS (multiprobe system) can also be used to measure field parameter data (pH, temperature, conductivity, dissolved oxygen, and oxidation reduction potential), as required. The instruments are to be calibrated before each sampling event. Calibration and maintenance procedures will be followed for each instrument as set out by the supplier's operation manual. Equipment and bottles will be selected so that they do not contaminate or alter the concentrations of parameters of interest, according to laboratory standards. Equipment used to collect samples on the mine site will be kept separate from equipment used to collect samples in the receiving environment.

A peristaltic pump with tubing will be used for groundwater sampling, and to collect water samples at depth from lakes. Low Density Polyethylene tubing, filter apparatus, manual pump, and ashless filter paper will be used to filter water for specific analyses (e.g., dissolved metals, chlorophyll *a*) and for depth integrated sampling (e.g., chlorophyll *a*, phytoplankton, or biological oxygen demand).

## **2.2 Sampling Methods and Handling**

### **2.2.1 Sample Identification**

Samples will have a unique sample identification code based on a station identifier, date, and time of collection. For duplicates and field blanks, the sample identification code will be based on an altered station identifier (recorded in the field book), and date and time of sampling.

Sample bottles will be identified with the sample identification code and date of collection. This information will be marked on a label with a water resistant pen and affixed to the sample bottle. Additional information (time of sampling and parameters to analyze) will be included in the analysis request that will be sent to the analytical laboratory.

### **2.2.2 Surface Water Sampling**

Sample bottles will be pre-labelled with the required sample identification code before going to the field. In streams, surface grab samples will be collected by submerging the sample bottle to mid-depth. In sumps, diversion ditches and piped discharge points, samples will be collected below the surface of the water.

Sample bottles will be provided by the analytical laboratory. They will be received pre-rinsed and pre-preserved, or pre-rinsed with vials of preservative to be added in the field. When the sample bottle contains preservative, the bottle will be filled by using another clean bottle (usually the routine bottle); in this case, the routine bottle will be triple-rinsed first and then used to transfer sample water to the pre-preserved bottle. This is done to avoid the release of preservative. In some cases, preservative may be added after filling, as directed by the laboratory; see Section 2.2.4 for

more details on sample preservation. The bottles will be filled as required to allow mixing, preservative addition, and thermal expansion.

Samples analyzed for dissolved metals and chlorophyll *a* will be filtered as soon as possible after collection when the delay before analyses is long; samples for dissolved metals will be filtered through a Millipore 0.45 µm membrane filter. Samples for Chlorophyll *a* will be filtered through a GF/C filter.

Samples must be analyzed to appropriate detection limits (DLs). Recommended DLs for the AEMP are provided in Table A-3. Included with the DLs are the aquatic life and drinking water guidelines that will be used to evaluate the data; more details regarding guidelines and AEMP benchmarks are provided in the AEMP plan. As analytical methods and DLs can change over time, these will be confirmed with the laboratory prior to each annual program. For verification monitoring stations and other stations not part of the AEMP, DLs will be determined based on the laboratory capabilities, costs and the requirements for that station to adequately detect changes in water quality to adaptively manage the mine site.

### 2.2.3 Groundwater Sampling

#### Well Preparation for Sampling

At the time of purging and sampling, if necessary, any heat trace cables will be activated to warm the well pipe. The well is only purged once the well is thawed.

#### Well Purging

Purging is performed by inserting a ¾" Low Density Polyethylene Waterra tube to approximately 20 metres below the water surface and using a compressor to completely dry the well. The wells are purged to remove standing water inside the well and to induce the flow of fresh groundwater from the rock formation. The quality of the purged water is monitored for pH, conductivity, temperature, water clarity, and colour (visual observation) during this activity. Sampling occurs after three well volumes of water (between the in-well packer and bottom of screened interval) have been removed or once the monitored parameters stabilize (values remaining within 10% for three consecutive readings).

#### Groundwater Sampling

Groundwater is sampled immediately after purging by lowering the intake of the Double Valve Pumping tubing to 3 to 5 metres above the screened interval.

Groundwater samples are collected using pre-labelled, laboratory-supplied containers as per the instructions in the previous section. Samples analyzed for dissolved metals are filtered through a 45 micrometre inline filter.

A sub-set of samples are collected in duplicate (see Section 2.2.5) and submitted to an accredited analytical laboratory.

Measurements of groundwater temperature, pH, electrical conductivity, and salinity are obtained in the field during the purging and sampling. Measurements are recorded for future reference and to check against laboratory data.

The following procedures are followed to provide quality assurance of the sample data:

- measuring field parameters at selected intervals until readings stabilize (within 10% of each other);
- minimizing the exposure of the sampled water to the atmosphere;
- using compressed, inert gas (nitrogen) to evacuate water for sample collection;
- measuring sensitive chemical parameters in situ (pH, conductivity, where applicable); and
- abiding by sample preservation methods (refrigeration and use of preservatives where needed); and specified holding times.

#### 2.2.4 Sample Preservation

Preservatives, if required, are added to sample bottles by the laboratory, or by the technician after filling, as directed by the analytical laboratory. Table A-4 summarizes typical minimum sample volumes, preservation, and holding times for selected parameters, but as this information can vary among laboratories and within laboratories over time, the sample volume, preservative, and holding time information will be confirmed with the laboratory.

#### 2.2.5 Field Duplicates and Blanks

One field duplicate, one filter blank, and one field blank will be collected for a) every 10 samples (i.e., duplicate samples are taken for 10% of the samples); b) each sampling event; or c) once per year (Table A-5). Field duplicates and filter blanks will be collected and handled in the same manner as the other samples in the field. Field blanks are samples of laboratory-provided distilled water handled concurrently and in the same manner as the other samples in the field.

The duplicate samples will be given sample identification numbers and included in the sample stream. The indication of the sample as a duplicate is maintained in the data records at site.

#### 2.2.6 Sample Transport

All water samples will be stored upright in coolers with ice packs and preserved as specified by the laboratory. Samples are to be shipped to the external laboratory as soon as possible via Rankin Inlet and dedicated ground transportation to ensure arrival in a safe and timely manner. If the samples cannot be shipped the same day, they are to be stored in a refrigerator at 4°C until shipping.

A Chain of Custody form with the following information is completed for every shipment of samples:

- company name and sampler's name;
- sample identification name;
- time and date of sampling;
- presence and type of preservative and whether the sample was filtered or not;
- requested analytical parameters for each sample;
- time and date of shipping; and
- analytical laboratory address and name of contact person.

One electronic or PDF copy will be sent by email to the laboratory; an electronic copy will be kept at the Mine site for reference.

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**SECTION 3 • LABORATORY ANALYSIS**

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**3.1 External Laboratory**

All chemistry analyses are performed by an accredited analytical laboratory.

In most cases, these analyses will be performed by MultiLab Direct (Multilab), an accredited facility (see Appendix B) located in Val D'Or, Quebec. MultiLab implements a rigorous internal QA/QC process, including the use of spiked samples and duplicate samples. Toxicity tests will be performed by either Maxxam Analytique in Quebec City or Exova in Saint-Augustin-de-Desmaures, Quebec. Testing will be conducted as stipulated by Environment Canada's Biological Test Methods.

Agnico Eagle may also require the services of laboratory, such as Maxxam, ALS Environmental, or SGS, for parameters for which Multilab is not accredited.

**3.2 Internal Laboratory**

The laboratory at the Mine site is not accredited, but will be used periodically to generate "real-time" results for some parameters like pH, total suspended solids, and weak acid dissociable cyanide. These results will be used for observational purposes and are not required to meet the standards of an accredited laboratory.



**SECTION 4 • DATA REQUIREMENTS**

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**4.1 Data Collection**

A database of all water sampling data is to be maintained at the Mine site. The database should be designed based on the sampling and data requirements associated with various discharge limits designated in the Water Licence. Database functionality will include event scheduling, trend analysis, and flagging out-of-compliance samples to enhance the effectiveness of the QA/QC program. The database information will be presented to regulators in the annual report.

The following data will be collected for each sample in the field, and will be entered into the database by the sampler for the corresponding sampling station:

- sample identification name;
- name of sampler;
- date and time of sampling or measurement; and
- physical characteristics (e.g., pH, temperature, conductivity, turbidity), if required.

Upon receipt of sample results from the laboratory, the data will be loaded into the database and matched to the sample identification code. The analysis certificate for each sample from the accredited laboratory will include but will not be limited to:

- analytical methods or techniques used;
- date of analysis;
- name of the person(s) / laboratory that approved the certificate; and
- results of the analysis.

**4.2 Data Screening**

Validation of data collected through a monitoring program is a multiple step process. First, QC data for blank samples are evaluated for potential contamination, and duplicate sample data are evaluated to confirm that within-site variability and field sampling precision are acceptable; second, results for dissolved and total parameters are compared; third, data are reviewed for potential unusual values or outliers.

**4.2.1 Blank Samples**

The field QC program for water quality will include the collection and analysis of blank QC samples. Results from blank samples (travel, field, or filter blanks) will be considered notable if concentrations are greater than five times (5x) the corresponding DL. This threshold is based on the Practical Quantitation Limit defined by the United States Environmental Protection Agency and takes into account the potential for reduced accuracy when concentrations approach or are below DLs (USEPA 2000; AENV 2006).

Once results are received from the laboratory, the blank sample results will be screened to identify any notable results. Results for notable parameters in the blanks will be evaluated to determine if:

- the result is limited to a single blank sample or if it is apparent in corresponding water samples;
- there was a consistent bias in the results for the parameter across all samples; and
- if the notable result was severe enough to warrant invalidating the affected data.

If any results in the blank sample are considered notable, a re-analysis of the affected parameters will be requested. If the re-analysis confirms the original results, the results from all field samples collected during that sampling event will be screened to determine if there is bias in the samples, whether they are potentially contaminated, and if any data should be invalidated. At this point, notable results will be flagged. Invalidation of data, if necessary, will not be completed on samples from a single sampling event, but rather based on the results for all samples collected during the annual program.

#### 4.2.2 Duplicate Samples

The field QC program for water quality will also include the collection and analysis of duplicate QC samples. The threshold of 20% relative percent difference (RPD; defined as the difference in concentrations between duplicates, divided by the mean concentration, times 100) between concentrations in the duplicate samples was selected to identify if results are considered acceptable. For each set of duplicate samples, RPDs will be calculated for each parameter. The RPD value for a given parameter will be considered notable if:

- it is greater than 20%; and
- concentrations in both samples are greater than or equal to 5xDL.

The number of notable parameters will be compared to the total number of parameters analyzed to evaluate analytical precision. Analytical precision will be rated as follows:

- high, if less than 10% of the total number of parameters are notably different from one another;
- moderate, if 10% to 30% of the total number of parameters are notably different from one another; or
- low, if more than 30% of the total number of parameters are notably different from one another.

Identification of notable values will not necessarily result in exclusion of the affected data from analysis. Rather, it will trigger further investigation of data quality through the data validation process.

The general QC procedures to be followed to determine if results meet data quality objectives and precision may be amended over time, but will generally consist of the following steps:

- analytical results will be reviewed upon receipt from the laboratory to identify unusual values; if any values appear unusual, the lab will be contacted to confirm the results;
- laboratory QC data will be reviewed;
- the RPDs between duplicate samples will be calculated to evaluate precision; for parameters with high RPD values, results for other samples collected on the same day or the same sampling event will be evaluated to identify if any results are suspect;
- field notes from the sampling event will be reviewed along with confirmation of sampling methods and/or any deviation from the sampling methods; and
- if necessary, suspect data will be flagged (note: more attention may be paid to parameters indicative of the mine effluent).

The QC procedures for the AEMP would generally consist of the above plus the following steps:

- summary statistics and calculations will be completed both with and without the suspect data; and
- data excluded from the data set to analyze mine related impacts will be documented in the report.

The screening process of duplicate samples will be repeated for each sampling event. Invalidation of data, if necessary, will not be completed on samples from a single sampling event but rather based on the results for all samples collected during the annual program.

#### 4.2.3 Total and Dissolved Comparison for AEMP Data

The AEMP QC screening will also include a comparison of total and dissolved data. Corresponding dissolved and total concentrations will be compared for each parameter (where both are measured) to determine if the dissolved values are greater than the total values. Where dissolved concentration values are more than the corresponding total concentration value, the results will be further evaluated as RPD values for concentrations greater than 5xDL. If the dissolved concentration is more than the total concentration, but the RPD between the dissolved and total concentration is less than or equal to 20%, the result will be accepted as valid. If the dissolved concentration is more than the total concentration, the RPD between the dissolved and total concentration is greater than 20%, and both (total and dissolved) concentrations are greater than 5xDL, the dissolved concentration will be considered notable. This process will be completed for every sampling event, and for all samples collected during a sampling event.

For all notable results, the laboratory will be contacted to confirm both the total and dissolved result; if the results are confirmed by the laboratory, the data will be further reviewed for other causes of the difference between dissolved and total values. In addition, field sampling procedures will be reviewed and, if necessary, corrective measures will be implemented (e.g., equipment cleaning using acid rinse prior to the next sampling event), and additional QC samples will be

collected (e.g., equipment blank, split samples, additional duplicate samples) to further investigate the potential cause(s) of the notable results.

Any dissolved concentrations that are considered notable (i.e., more than 20% higher than the total concentration and more than 5xDL) will be flagged but retained in the database. For all samples, the total concentration will be reported, but if the dissolved concentration is considered notably different from the total concentration, it will not be included in the annual report.

#### 4.2.4 Data Validation

The final data QC step is to evaluate results from all field samples, to identify outliers or unusual results. Water quality data will be collected from within the mine, in Meliadine Lake, and in selected peninsula lakes. The background chemistry at these locations is different, so to evaluate for potential data outliers, data will be grouped accordingly.

##### 4.2.4.1 Mine Site Data

Mine operational water quality data will be reported monthly and annually to the Nunavut Water Board as required under the Type A Water Licence. Results will be screened after each sampling event to determine if a re-analysis is required. Data that are acceptable will be included in the monthly report; data that are suspect may be excluded from the monthly report or be included but with a plan to investigate the reason for the unusual result (e.g., waiting on verification from the lab; waiting on results from subsequent sample).

Once all the data from the annual program is available, a visual review of the data (e.g., scatterplot) will be completed to identify outliers. Any data that were flagged as part of a monthly report will be reviewed again in the context of the annual data. Any steps taken to investigate the flagged data (e.g., additional sampling, review of process) will be included in annual reporting.

##### 4.2.4.2 AEMP Data

For the AEMP, water quality data will be reported annually. The data screening process will be first conducted on results from a single sampling event and then again on all results collected for the annual program. Results must first be screened after each sampling event to determine if a re-analysis is required. The next step will be a visual review of the data to identify unusual or potential outlying data. This is typically done for each parameter using scatterplots to identify outliers from the overall dataset. Once all the data from the annual program is available, a visual and a quantitative approach (e.g., formal outlier analysis) to identify outliers will be completed. Unusually high or low data values will be selected for further investigation. The next step of the process will involve data validation of the selected outlying data. The selected data will be invalidated on a case-by-case basis. Invalidated data will be retained in the database, but will be flagged to indicate that the sample could be contaminated, or results are designated as not correct due to an internal review of the data.

Through evaluation of the various QC samples and the data validation process, it will be determined if single parameters, discrete samples, or entire sampling events need to be eliminated from the analysis and interpretation of the water quality data. Entire samples, or data from entire sampling events, would only be excluded from analysis if the data validation process identifies serious irregularities in sampling and laboratory analysis affecting most or all parameters or samples, and indicates a strong potential for contamination, or inaccurate data being reported. Appropriate QA and QC procedures will be followed during the execution of the sampling events to reduce or eliminate the need to invalidate data, but if it is necessary to invalidate any data, full rationale for the decision will be provided.

For the annual AEMP report, there will be an appendix that summarizes the QC results, steps taken, and reasons for excluding data (if any).

#### **4.3 Exceedance Reporting**

Any measured concentration at a sample station exceeding a regulated discharge limit stipulated in the Water Licence or the Metal Mining Effluent Regulations will be reported to the Nunavut Water Board, Environment Canada, and the INAC water inspector within 30 days of the receipt of the analysis. In addition, results of the response, where required, will be reported and, where necessary, mitigation options identified within 90 days after receipt of the analyses.

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**SECTION 5 • REFERENCES**

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- AANDC (Aboriginal Affairs and Northern Development Canada). 1996. Quality Assurance (QA) and Quality Control (QC) Guidelines for Use by Class “A” Licensees in Meeting SNP Requirements and for Submission of a QA/QC Plan.
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**APPENDIX A • TABLES AND FIGURES**

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Table A-1: Proposed Regulated, Verification, and General and Aquatic Monitoring of Water Quality for the Project during Construction, Operations, and Closure

Monitoring Type	Mine Development Phase	Monitoring Station Number	Station Description	Purpose of Station	UTM Zone 11		Sampling Depth	Sample Type	Number of Samples per Station	Monitoring Parameters/Sampling Group (see Table A-2)
					Easting	Northing				
Verification	Construction (prior to release), Operations, and Closure	MEL_02	Water treatment plant (pre-treatment) coming from CP1 station will be off the pipe and not in the pond	Test quality of water before treatment (required to evaluate treatment efficiency)	TBD (in plant area)		From pipe	Grab	1	1
Regulated	Construction (upon effluent release), Operations, and Closure	MEL_01 <sup>(a)</sup>	Water treatment plant (post-treatment), end of pipe (before offsite release) in the plant before release.	Test quality of final effluent before release	TBD (in plant area)		From pipe	Grab	1	Full Suite, 3 (MMER), flow
General Aquatic	Construction (upon effluent release), Operations, and Closure	MEL_03	Mixing zone in Meliadine lake, station 1; and MMER exposure stations for final discharge point within mixing zone	Test mixing of effluent in the receiving environment; sample at varied distances and directions from pipe; MMER exposure for final discharge point	TBD	TBD	Depends on presence of a vertical conductivity gradient	Discrete	1 (depth of maximum conductivity, or mid-depth if no conductivity gradient is present)	Full Suite
General Aquatic	Construction, Operations, and Closure	MEL_04	Water intake from Meliadine Lake	Quality of intake water	TBD	TBD	Depth Integrated or from Intake Pipe	Composite	1	Full Suite, flow
Verification	Operations, Closure	MEL_05	Local Lake, E3	Confirm no leakage/runoff from Emulsion Plant	-	-	-	Composite	1	2
Verification	Construction, Operations, Closure	MEL_06	Local Lake G2	Possible seepage or dust loadings from site infrastructure Possible seepage or dust loadings	-	-	-	Composite	1	2
Verification	Construction, Operations, Closure	MEL_07	Local Pond, H1		-	-	-	Composite	1	2
Verification	Construction, Operations, Closure	MEL_08	Local Lake, B5		-	-	-	Composite	1	2
Verification	Construction, Operations, Closure	MEL_09	CP2	Collection of natural catchment drainage from the outer berm slopes of the Landfarm and industrial pad	-	-	-	Grab	1	1
Verification	Operations, Closure	MEL_10	CP3	Collection of drainage from dry stacked tailings	-	-	-	Grab	1	1
Verification	Operations, Closure	MEL_11	CP4	Collection of drainage from WRSF1	-	-	-	Grab	1	1
Verification	Construction, Operations, Closure	MEL_12	CP5	Collection of drainage from WRSF1 and WRSF2	-	-	-	Grab	1	1
Verification	Operations, Closure	MEL_13	CP6	Collection of drainage from WRSF3	-	-	-	Grab	1	1
Verification	Construction, Operations, Closure	MEL_14	Landfill	Located between the landfill and Pond H3 to monitor seepage from the landfill	-	-	-	Grab	1	1
Verification	Construction, Operations, Closure	MEL_15	Tankfarm at the Itivia Oil Handling Facility	Located in the secondary containment area of the tankfarm at Itivia to monitor water quality prior to discharge to land	-	-	-	Grab	1	4

Notes: as per Metal Mining Effluent Regulations (MMER), samples for effluent characterization and receiving environment must be collected quarterly, or at least one month apart while effluent is being deposited.

Grey shading indicates that verification monitoring parameters and locations are internal for Agnico Eagle. A systematic approach will be used in communicating inspections results, likely on an annual basis. This will allow Agnico Eagle to inform government, Inuit associations, and the public of inspection outcomes.

<sup>(a)</sup> Sampling may not occur during break-up (June).

CP = collection pond; WRSF = waste rock storage facility; TBD = to be determined



Table A-2: List of Constituents in Each Parameter Group

Parameter Group	Parameters
1	pH, turbidity, hardness, alkalinity, chloride, fluoride, sulphate, total dissolved solids (TDS), total suspended solids (TSS), total cyanide, ammonia nitrogen, nitrate, nitrite, phosphorus, ortho-phosphate, total metals (aluminum, arsenic; barium, cadmium, chromium, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, and zinc).
2	<p><b>Total and dissolved metals:</b> aluminum, antimony, arsenic, barium, beryllium, boron cadmium, chromium, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, titanium, uranium, vanadium, and zinc.</p> <p><b>Nutrients:</b> ammonia-nitrogen, total Kjeldahl nitrogen, nitrate-nitrogen, nitrite-nitrogen, ortho-phosphate, total phosphorus, total organic carbon, dissolved organic carbon, and reactive silica.</p> <p><b>Conventional:</b> bicarbonate alkalinity, chloride, carbonate alkalinity, turbidity, conductivity, hardness, calcium, potassium, magnesium, sodium, sulphate, pH, total alkalinity, TDS, TSS, total cyanide, free cyanide, and weak acid dissociable (WAD) cyanide.</p>
3	<p><b>MMER parameters:</b> total cyanide, arsenic, copper, lead, nickel, zinc, radium-226, TSS, pH, sulphate, turbidity, and aluminum.</p> <p><b>MMER additional requirements:</b> Effluent volumes and flow rate of discharge, acute toxicity (Rainbow Trout and <i>Daphnia magna</i>) and environmental effects monitoring (EEM).</p>
4	Total arsenic, total copper, total lead, total nickel, TSS, ammonia, benzene, toluene, ethylbenzene, xylene, total petroleum hydrocarbons (TPH), and pH.
Full Suite	Group 2, TPH, and turbidity.
Flow	Flow datalogger
Field measurements	Field pH, specific conductivity, dissolved oxygen, and temperature.

MMER = Metal Mining Effluent Regulations

Table A-3: Analytical Detection Limits and Guidelines for the Aquatic Effects Monitoring Program

Water Quality Parameters	Units	Detection Limit <sup>(a)</sup>	Guidelines		
			Acute CWQG <sup>(b)</sup>	Chronic CWQG <sup>(b)</sup>	CDWQG <sup>(c)</sup>
Conventional Parameters					
Alkalinity, Total (as CaCO <sub>3</sub> )	mg/L	2	-	-	-
Conductivity	µS/cm	0.2	-	-	-
Hardness (as CaCO <sub>3</sub> )	mg/L	-	-	-	-
pH	-	0.1	-	6.5 - 9.0	6.5 - 8.5
Total Suspended Solids	mg/L	5	-	-	-
Total Dissolved Solids	mg/L	4	-	-	500
Turbidity?	NTU	0.1	-	-	-
Ions					
Bicarbonate	mg/L	5	-	-	-
Calcium	mg/L	0.5	-	-	-
Carbonate	mg/L	5	-	-	-
Chloride	mg/L	0.5	640	120	250
Fluoride	mg/L	0.02	-	0.12	1.5
Magnesium	mg/L	0.1	-	-	-
Potassium	mg/L	0.1	-	-	-
Sodium	mg/L	1	-	-	200
Sulphate	mg/L	0.05	-	-	500
Nutrients					
Total Organic Carbon	mg/L	0.5	-	-	-
Dissolved Organic Carbon	mg/L	0.5	-	-	-
Total Nitrogen (calculated)	mg-N/L	-	-	-	-
Total Kjeldahl Nitrogen	mg-N/L	0.05	-	-	-
Ammonia, Total	mg-N/L	0.005	-	0.019 <sup>(d)</sup>	-
Nitrate	mg-N/L	0.005	124	2.9	10
Nitrite	mg-N/L	0.001	-	0.06	1
Total Phosphorus	mg-P/L	0.001	-	0.01 <sup>(e)</sup>	-
Dissolved Phosphorus	mg-P/L	0.001	-	-	-
Dissolved Orthophosphate	mg-P/L	0.001	-	-	-
Silica, Reactive (as SiO <sub>2</sub> )	mg/L	0.01	-	-	-
Cyanides (Water)					
Cyanide, Weak Acid Dissociable	mg/L	0.002	-	-	-
Cyanide, Total	mg/L	0.002	-	-	-
Cyanide, Free	mg/L	0.005	-	-	-

Water Quality Parameters	Units	Detection Limit <sup>(a)</sup>	Guidelines		
			Acute CWQG <sup>(b)</sup>	Chronic CWQG <sup>(b)</sup>	CDWQG <sup>(c)</sup>
Total Metals					
Aluminum	µg/L	0.3	-	100 <sup>(f)</sup>	100
Antimony	µg/L	0.02	-	-	6
Arsenic	µg/L	0.02	-	5	10
Barium	µg/L	0.05	-	-	1,000
Beryllium	µg/L	0.01	-	-	-
Bismuth	µg/L	0.01	-	-	-
Boron	µg/L	1	29,000	1,500	5,000
Cadmium	µg/L	0.005	0.39 <sup>(g)</sup>	0.04 <sup>(g)</sup>	5
Chromium	µg/L	0.06	-	1	50
Cobalt	µg/L	0.01	-	-	-
Copper	µg/L	0.1	-	2 <sup>(g)</sup>	1,000
Iron	µg/L	1	-	300	300
Lead	µg/L	0.01	-	1 <sup>(g)</sup>	10
Lithium	µg/L	0.5	-	-	-
Manganese	µg/L	0.05	-	-	50
Mercury	µg/L	0.0005	-	0.026	1
Molybdenum	µg/L	0.05	-	73	-
Nickel	µg/L	0.06	-	25 <sup>(g)</sup>	-
Selenium	µg/L	0.04	-	1	10
Silver	µg/L	0.005	-	0.25	-
Strontium	µg/L	0.05	-	-	-
Thallium	µg/L	0.005	-	0.8	-
Tin	µg/L	0.05	-	-	-
Titanium	µg/L	0.1	-	-	-
Uranium	µg/L	0.01	33	15	20
Vanadium	µg/L	0.05	-	-	-
Zinc	µg/L	0.8	-	30	5,000
Dissolved Metals					
Aluminum	µg/L	0.3	-	-	-
Antimony	µg/L	0.02	-	-	-
Arsenic	µg/L	0.02	-	-	-
Barium	µg/L	0.05	-	-	-
Beryllium	µg/L	0.01	-	-	-
Bismuth	µg/L	0.01	-	-	-

Water Quality Parameters	Units	Detection Limit <sup>(a)</sup>	Guidelines		
			Acute CWQG <sup>(b)</sup>	Chronic CWQG <sup>(b)</sup>	CDWQG <sup>(c)</sup>
Boron	µg/L	1	-	-	-
Cadmium	µg/L	0.005	-	-	-
Chromium	µg/L	0.06	-	-	-
Cobalt	µg/L	0.01	-	-	-
Copper	µg/L	0.1	-	-	-
Iron	µg/L	1	-	-	-
Lead	µg/L	0.01	-	-	-
Lithium	µg/L	0.5	-	-	-
Manganese	µg/L	0.05	-	-	-
Mercury	µg/L	0.0005	-	-	-
Molybdenum	µg/L	0.05	-	-	-
Nickel	µg/L	0.06	-	-	-
Selenium	µg/L	0.04	-	-	-
Silver	µg/L	0.005	-	-	-
Strontium	µg/L	0.05	-	-	-
Thallium	µg/L	0.005	-	-	-
Tin	µg/L	0.05	-	-	-
Titanium	µg/L	0.1	-	-	-
Uranium	µg/L	0.01	-	-	-
Vanadium	µg/L	0.05	-	-	-
Zinc	µg/L	0.8	-	-	-

<sup>(a)</sup> Provided ALS Limited.

<sup>(b)</sup> CCME (1999).

<sup>(c)</sup> Health Canada (2012).

<sup>(d)</sup> CCME (2010). Guideline is for unionized ammonia; convert measured total ammonia to unionized ammonia using equation.

<sup>(e)</sup> Trigger value for oligotrophic status.

<sup>(f)</sup> pH is more than 6.5.

<sup>(g)</sup> Guideline as based on a water hardness of 19 mg CaCO<sub>3</sub>/L.; actual hardness of the sample will be used.

CaCO<sub>3</sub> = calcium carbonate; mg/L = milligrams per litre; µS/cm = microSiemens per centimetre; NTU = nephelometric turbidity units; mg-N/L = milligrams of nitrogen per litre; mg-P/L = milligrams of phosphorus per litre; µg/L = micrograms per litre

Table A-4: Sampling Requirements for Potential Parameters

Parameters	Matrix				Type of Bottle	Preservative	Volume
	Drinking Water	Waste Water	Surface Water	Ground Water (1)			
Conventional Parameters							
Alkalinity, Acidity	14 d	14 d	14 d	14 d	P, T, V	N	250 mL
Colour, Free & total Chlorine	48 h	48 h	48 h	48 h	P, T, V	N	125 mL
Conductivity	28 d	28 d	28 d	28 d	P, T, V	N	250 mL
Total suspended solids & volatile TSS		7 d	7 d	7 d	P. T. V	N	500 mL
Total solids		7 d	7 d	7 d	P. T. V	N	250 mL
Dissolved solids (TDS)		7 d	7 d	7 d	P. T. V	N	250 mL
pH	24 h	24 h	24 h	24 h	P, T, V	N	125 mL
Ions							
Bicarbonates, Carbonates	14 d	14 d	14 d	14 d	P, T, V	N	250 mL
Anions (Cl, F,SO4)	28 d	28 d	28 d	28 d	P, T, V	N	250 mL
Sulphides (H2S) (3)	28 d	28 d	28 d	28 d	P. T. V	E.D.T.A	125 mL
Thiosulfates	48 h	48 h	48 h	48 h	P. T. V	N	125 mL
Nutrients							
Total organic carbon (TOC)	28 d	28 d	28 d	28 d	P, T, V (B)	AC	100 mL
Dissolved organic carbon (DOC)	48 h	48 h	48 h	48 h	P, T, V (B)	N	100 mL
Total inorganic carbon (TIC)	48 h	48 h	48 h	48 h	P, T, V (B)	N	100 mL
Ammonia nitrogen (NH3-NH4)	28 d	28 d	28 d	28 d	P, T, V	AS	125 mL
Kjeldahl ammonia (NTK)		28 d	28 d	28 d	P, T, V	AS	125 mL
NH3 or NH4		24 h	24 h	24 h	P.T.V	N+AS	2 / 125 mL
Nitrites (NO2), Nitrates (NO3), Turbidity	48 h	48 h	48 h	48 h	P, T, V	N	250 mL
Nitrites-Nitrates (NO2-NO3)	28 d	28 d	28 d	28 d	P, T, V	AS	250 mL
Total Phosphorus (P-tot)	28 d	28 d	28 d	28 d	P, T, V	AS	125 mL

Parameters	Matrix				Type of Bottle	Preservative	Volume
	Drinking Water	Waste Water	Surface Water	Ground Water (1)			
O-Phosphates (O-PO4)	48 h	48 h	48 h	48 h	P, T, V	N	500 mL
<b>Cyanides</b>							
Cyanides total/available, Cyanides	14 d	14 d	14 d	14 d	P, T, V	NaOH	250 mL
<b>Total Metals</b>							
Mercury (Hg)	28 d	28 d	28 d	28 d	P, T, V	AN	250 mL
Total/dissolved metals (filtered on field)	180 d	180 d	180 d	180 d	P, T, V	AN	250 mL
Dissolved metals (filtered in the laboratory)	24 h	24 h	24 h	24 h	P, T, V	N	250 mL
<b>Microbiology</b>							
<i>Escherichia coli</i> , total coliforms, A.A.H.B	48 h	48 h	48 h	48 h	PPS	TS, E	250 mL
<i>Enterococcus</i>	48 h	48 h	48 h	48 h	PPS	TS, E	250 mL
Thermo tolerant coliforms (fecal)	48 h	48 h	48 h	48 h	PPS	TS, E	250 mL
<b>Oxygen Demand</b>							
BOD5/Carbonated BOD5 (2)		48 h/4°	48 h/4°		P, T, V	N	250 mL
COD (chemical oxygen demand)		28 d	28 d		P, T, V	AS	125 mL
<b>Radioactive &amp; Organic Chemistry</b>							
Fatty resin acids (S-T)	-	28 d	28 d	-	VA, VT	AS	1 L
Congeners PCB (S-T)	28 d	28 d	28 d	28 d	VA, VT	N	1 L
Chlorobenzene	28 d	28 d	28 d	28 d	2 Vial+1 blank	TSS	2 / 40 mL
Phenolic compound (GC-MS)	28 d	28 d	28 d	28 d	VA, VT	AS	1 L
Glyphosate (S-T)	14 d	14 d	14 d	14 d	P.T	N	500 mL
PAH	28 d	28 d	28 d	28 d	VB	AS	1 L
Oil & greases (total and non-polar)	28 d	28 d	28 d	28 d	VA, VT	AS	1 L
C10-C50 HP and/or Petroleum product identification	28 d	28 d	28 d	28 d	VA, VT	AS	1 L
Phenol index	28 d	28 d	28 d	28 d	VA, VT	AS	500 mL

Parameters	Matrix				Type of Bottle	Preservative	Volume
	Drinking Water	Waste Water	Surface Water	Ground Water (1)			
Radium-226	180 d	180 d	180 d	180 d	P, T. V	AN	1 L
VOC (MAH, CAH, THM, BTEX) (3)	28 d	28 d	28 d	28 d	2 Vial+1 blank	TSS	2 / 40 mL

## Notes:

## Type of Bottle:

- = non-applicable; P.S.V.T. = plastic bottle, bag or glass bottle with Teflon cap; P, T = Plastic bottle or plastic bottle with Teflon cap; P.T.V. = Plastic bottle or glass bottle with plastic or Teflon cap; PPS = Sterile propyl ethylene bottle; VA = Clear or amber glass with aluminum or Teflon seal; VB = Amber glass (or clear glass covered with aluminum paper) aluminum seal of Teflon; VT = Clear or amber glass bottle with Teflon seal

Preservative: ; h = hour; d = day

AC = 0.1mL (100 µl) of HCl per 100 mL of sample; AcZn = 0.2 mL zinc acetate 2 N per 100 mL of sample and NaOH 10 N to pH >9; AN = HNO<sub>3</sub> to pH <2; AS = H<sub>2</sub>SO<sub>4</sub> to pH <2; E = 2.5 ml EDTA 1.5% (p/v) per 100 mL of sample if heavy metals are suspected; ED = 0.1 mL diamine ethylene 45 mg/L per 100 mL of sample; EDTA = 1 mL EDTA 0.25 M per 100 mL of sample; N = No preservative; NaOH = NaOH 10 N to >12; TS = Sodium thiosulfate final concentration in the sample of 0.1% (p/v); TSS = about 40 mg of thiosulfate sodium

Table A-5: Proposed Quality Control Sample Collection Frequency

QC Station Group <sup>(a)</sup>	Stations	Mine Development Phase	Sample Type	Monitoring Parameters/ Sampling Group (Table A-2)	Test Sample Frequency	QC Sample Collection Schedule <sup>(b)</sup>																					
						1-Jun	8-Jun	15-Jun	22-Jun	29-Jun	6-Jul	13-Jul	20-Jul	27-Jul	3-Aug	10-Aug	17-Aug	24-Aug	31-Aug	7-Sep	14-Sep	21-Sep	28-Sep	5-Oct	12-Oct	19-Oct	26-Oct
A	MEL_01, MEL_02	Construction (upon effluent release), Operations, and Closure	Grab	Full Suite, 3 (MMER)	Prior to discharge and weekly during discharge	FD and FB	-	-	-	-	-	FD and FB	-	-	-	FD and FB	-	-	-	-	FD and FB	-	-	-	-	FD and FB	-
B	MEL_01, MEL_02, MEL_04, MEL_09, MEL_10, MEL_11, MEL_12, MEL_13	Construction, Operations, Closure	Grab	1	Monthly during the open-water period or when water is present	-	-	-	FD and FB	-	-	-	FD and FB	-	-	-	FD and FB	-	-	-	FD and FB	-	-	-	FD and FB	-	-
C	MEL_14, MEL_15	Construction, Operations, Closure	Grab	4	Prior to discharge or transfer of water	As required																					
D	MEL_05, MEL_06, MEL_07, MEL_08	Operations, Closure	Composite	2	Two times per year during the open-water period	-	-	-	-	-	-	-	-	-	-	FD or FB	-	-	-	-	FD or FB	-	-	-	-	-	-
E	MEL_03 (and AEMP stations)	Construction (upon effluent release), Operations, and Closure	Discrete	Full Suite, 3 (MMER)	Monthly during periods of discharge	As described in the AEMP plan																					

<sup>(a)</sup> A - for the stations that are sampled weekly (2 stations), one duplicate and one blank will be collected every 5 weeks (i.e., for every set of 10 test samples).  
B - for the stations that are sampled monthly (8 stations), one duplicate and one blank will be collected every month.  
C - for the stations that are sampled prior to discharge or transfer of water, one duplicate sample will be collected.  
D - for the stations that are sampled two times during the open-water period (4 stations), either a duplicate or a blank will be collected during each sampling event.  
E - for the stations that are part of the AEMP, a separate QC schedule has been developed.

<sup>(b)</sup> Actual dates and weeks are subject to change based on weather conditions/ logistical constraints and are included for planning purposes only.

- = no sample required; FD = field duplicate; FB = field blank





