



AGNICO EAGLE

MELIADINE GOLD MINE

Quality Assurance/Quality Control Plan

**NOVEMBER 2021
VERSION 4_NIRB**

EXECUTIVE SUMMARY

This document presents the Meliadine Mine Quality Assurance / Quality Control (QA/QC) Plan, a requirement of the Meliadine Type A Water Licence No. 2AM-MEL1631, specified under Part I, Condition 17 and 18:

17. The Licensee shall implement the Quality Assurance / Quality Control (QA/QC) Plan as accepted by the Board under Part B, Item 12. This Plan shall be maintained in accordance with current Standard Methods and the 1996 Quality Assurance (QA) and Quality Control (QC) Guidelines for Use by Class "A" Licensees in Meeting SNP Requirements (INAC).

18. The Licensee shall annually review the approved QA/QC Plan and modify the Plan as necessary. Proposed changes shall be submitted to an accredited laboratory for acceptance.

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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	March 2018	All	All	-Updated revision date	Meliadine Environment Department
		2.1	3	-Changed Hanna multi-meter to Eureka Manta II	
		2.2.4	6	-Laboratory name change: MultiLab to H2Lab	
		Table A-2	Appendix 12	-Updated table of analytical parameters (removed Group listing)	
		Figure A-2		-Removed figure heading for site sampling location – no figure was included with the heading	
		Figure A-1	Appendix 16	-Added General Site Plan figure to existing heading	
3	March 2019			Reviewed internally (added changes that the construction phase brought and review of the grammatical tense)	Meliadine Environment Department
		Executive Summary	ii	Additional INAC information added to executive summary	
		Table A-1	A-2, A-3	Updated GPS Coordinates	
		Figure A-1	A-5	Updated Site Map	
4_NIRB	November 2021			Updated for submission to NIRB for the review and approval of Meliadine Extension application	Permitting Department

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
AEMP	Aquatic Effects Monitoring Program
CALA	Canadian Laboratory Accreditation
CIRNAC	Crown-Indigenous Relations and Northern Affairs
Mine	Meliadine Gold Mine
MDMER	Metal and Diamond Mining Effluent Regulations
NWB	Nunavut Water Board
QA/QC	Quality Assurance and Quality Control
SNP	Surveillance Network Program

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) operates the Meliadine Gold Mine (the Mine or Meliadine Mine) site approximately 25 kilometres north from Rankin Inlet, and 80 kilometres southwest from Chesterfield Inlet in the Kivalliq Region of Nunavut.

The Quality Assurance/Quality Control (QA/QC) Plan was 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 approved mine uses an 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. As part of Meliadine Extension, the operation of several other pits and underground mines will extend the life of mine until 2043, as well as the addition of a windfarm consisting of 11 turbines, and the alternative of an on-site airstrip.

This Plan, which is part of the Environmental Management System for the 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 assure that the chemical data collected are representative of the material being sampled, are of known quality, are properly documented, and are scientifically defensible. Data quality is assured throughout the collection and analysis of samples using specified standardized procedures, by the employment of accredited laboratories, and by staffing the program with experienced technicians.

This QA/QC Plan sets out standard procedures for sample and data collection with respect to surface water and groundwater sampling in support of monitoring programs outlined in the Water Management Plan, Groundwater Management Plan, Ocean Discharge Monitoring Plan, Water Quality and Flow Management Plan, and the Aquatic Effects Monitoring Program (AEMP) Design Plan.

SECTION 2 • FIELD SAMPLING

Water quality monitoring was initiated at the pre-development stage and will continue during construction, operations, and closure. Sampling stations, frequency, parameters, and definitions are provided in the Type A Water Licence 2AM-MEL1631. 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.

There are three categories of aquatic monitoring at Meliadine:

- **Regulated 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 and Diamond 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 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 addresses identified issues. General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the Water Board.

All sampling stations are clearly identified; their GPS coordinates collected and stored. All sampling is conducted by qualified personnel, at the same location, using the same techniques to reduce operational error. The following sections outline the standard procedures for collection and handling of all surface water and groundwater samples.

2.1 Sampling Equipment

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

Equipment, such as the HACH test kit – 2100 Q Portal Turbidimeter (turbidity), Oakton PCS35 Meter (pH and conductivity), and Eureka Manta II (pH, dissolved oxygen and conductivity) are handheld instruments that are used to collect, as required, field parameters. The instruments are calibrated before each sample event to ensure optimal performance and record of the calibration are kept in a calibration log, and maintenance procedures will be followed as set out by the supplier's operation

manual. Equipment and bottles are selected so that they do not contaminate or alter the concentrations of parameters of interest according to laboratory standards.

To collect water samples at depth from the surrounding lake receiving environments, a pump with tubing is used. Low Density Polyethylene tubing, filter apparatus, manual or electric pump, and ashless filter paper are used to filter water for specific analyses (e.g., dissolved metals, chlorophyll *a*) and/or for depth integrated sampling (e.g., chlorophyll *a*, phytoplankton, or biological oxygen demand).

2.2 Sampling Methods and Handling

2.2.1 Sampling Identification

All samples have a unique sample identification name based on a station identifier, date, and time of collection. For duplicates and field blanks, the sample identification follows the naming convention *year* and *sampling number* by following the Environment QAQC table (e.g., 2018-0001)

All sample bottles are identified with the sample identification and date of collection. This information is marked on a label with a water resistant pen or using a label printer and affixed to the sample bottle. Additional information (time of sampling and parameters to analyze) is included in the analysis request (Chain of Custody) that is sent to the Canadian Laboratory Accredited laboratory (CALA).

2.2.2 Surface Water Sampling

Bottles are pre-labeled with the required sample identification before going to the field. Surface grab samples are collected by submerging the sample bottle to half depth of the stream. For sumps, diversion ditches and piped discharge points, samples are collected below the surface of the water.

Samples bottles are provided by the accredited laboratory. All bottles from the lab are pre-rinsed and pre-preserved or pre-rinsed with vials of preservative to that are added in the field by qualified technicians; in the case that bottles are not pre-preserved; bottles are rinsed three times with sample water before filling. When the sampling bottles contains preservative, the bottles are filled by using another clean bottle to avoid any release of preservative. Sometimes, a preservative is added after filling as directed by the laboratory; see Section 2.2.4 for more details on preservation. The bottles are filled properly to allow mixing, preservative addition, and thermal expansion.

Samples analyzed for dissolved metals and chlorophyll *a* are filtered through ash less filter paper at the time of collection when the delay before analyses is long. However, when the delay before analyses is short, the accredited laboratory filters the sample before analyses. In some cases, when the analysis delay is long, the sample will be frozen to prevent parameter degradation.

2.2.3 Groundwater Sampling

Water samples taken from sumps within the underground mine follow the procedures outlined in Section 2.2.2.

Samples representing non-contact groundwater are collected via Diamond Drill Holes (DDHs) intersecting the fracture network. To ensure samples are unaffected by substances and materials used during the drilling process, DDHs are flushed thoroughly prior to collecting. The duration of a flush is based on the length of the DDH and rate of groundwater flow measured at its collar. These values are matched to flush-duration curves provided by Golder Associates.

Groundwater samples are collected in clean 4L and 1L containers. To minimize the impact of potential contamination from the atmospheric conditions in the underground mine, the 4L sample is transferred to bottles of smaller volume any additional parameters to be analyzed once brought to surface. This is done in a clean laboratory environment where the risk of sample contamination is greatly decreased. Samples are processed and preserved in an appropriate timeframe after collection.

2.2.4 Preservation

Preservatives, if required, are added to sample bottles by the laboratory or added by the technician after filling, as directed by the analytical laboratory. Table 1 summarizes the minimum sample volumes, preservation, and holding times for select parameters.

Table 1: Summary of Sampling Requirements

Parameters	Matrix				Type of Bottle	Preservative	Volume
	Drinking Water	Waste Water	Surface Water	Ground Water (1)			
Microbiology							
<i>Escherichia coli</i> , total coliforms, A.A.H.B	48h	48h	48h	48h	PPS	TS, E	250ml
Enterococcus	48h	48h	48h	48h	PPS	TS, E	250ml
Thermo tolerant coliforms (fecal)	48h	48h	48h	48h	PPS	TS, E	250ml
Inorganic Chemistry							
Absorbance UV, Transmittance UV				24h	P, T, V	N	125ml
Alkalinity, Acidity, Bicarbonates, Carbonates	14d	14d	14d	14d	P, T, V	N	250ml
Ammonia nitrogen (NH ₃ -NH ₄)	28d	28d	28d	28d	P, T, V	AS	125ml
Kjeldahl ammonia (NTK)		28d	28d	28d	P, T, V	AS	125ml
Anions (Cl, F, SO ₄)	28d	28d	28d	28d	P, T, V	N	250ml
Color, Free & total Chlorine	48h	48h	48h	48h	P, T, V	N	125ml
Conductivity	28d	28d	28d	28d	P, T, V	N	250ml
Cyanides total/available, Cyanides	14d	14d	14d	14d	P, T, V	NaOH	250ml
BOD ₅ /Carbonated BOD ₅ (2)		48h/4°	48h/4°		P, T, V	N	250ml
COD (chemical oxygen demand)		28d	28d		P, T, V	AS	125ml
Mercury (Hg)	28d	28d	28d	28d	P, T, V	AN	250ml
Total/dissolved metals (filtered on field)	180d	180d	180d	180d	P, T, V	AN	250ml
Dissolved Metals (filtered in the laboratory)	24h	24h	24h	24h	P, T, V	N	250ml
Total suspended solids & Volatile TSS		7d	7d	7d	P, T, V	N	500ml
NH ₃ or NH ₄		24h	24h	24h	P.T.V	N+AS	2/125ml
Nitrites (NO ₂), Nitrates (NO ₃), Turbidity	48h	48h	48h	48h	P, T, V	N	250ml
Nitrites-Nitrates (NO ₂ -NO ₃)	28d	28d	28d	28d	P, T, V	AS	250ml
O-Phosphates (O-PO ₄)	48h	48h	48h	48h	P, T, V	N	500ml
pH	24h	24h	24h	24h	P, T, V	N	125ml

Parameters	Matrix				Type of Bottle	Preservative	Volume
	Drinking Water	Waste Water	Surface Water	Ground Water (1)			
Total Phosphorus (P-tot)	28d	28d	28d	28d	P, T, V	AS	125ml
Dissolved solids (TDS)		7d	7d	7d	P, T, V	N	250ml
Total solids		7d	7d	7d	P, T, V	N	250ml
Sulphides (H ₂ S) (3)	28d	28d	28d	28d	P, T, V	AcZn + NaOH	125ml
Thiosulfates	48h	48h	48h	48h	P, T, V	N	125ml
Radioactive & Organic Chemistry							
Fatty resin acids (S-T)	--	28d	28d	--	VA, VT	AS	1L
Congeners PCB (S-T)	28d	28d	28d	28d	VA, VT	N	1L
Chlorobenzene	28d	28d	28d	28d	2 Vial+1 blank	TSS	2/40ml
Total Organic Carbon (TOC)	28d	28d	28d	28d	P, T, V (B)	AC	100ml
Dissolved Organic Carbon (DOC)	48h	48h	48h	48h	P, T, V (B)	N	100ml
Total Inorganic Carbon (CIT)	48h	48h	48h	48h	P, T, V (B)	N	100ml
Phenolic compound (GC-MS)	28d	28d	28d	28d	VA, VT	AS	1L
Glyphosate (S-T)	14d	14d	14d	14d	P.T	N	500ml
PAH	28d	28d	28d	28d	VB	AS	1L
Oil & Greases (total and non-polar)	28d	28d	28d	28d	VA, VT	AS	1L
C10-C50 HP and/or Petroleum Product Identification	28d	28d	28d	28d	VA, VT	AS	1L
Phenol index	28d	28d	28d	28d	VA, VT	AS	500ml
Radium-226	180d	180d	180d	180d	P, T, V	AN	1L
VOC (MAH, CAH, THM, BTEX) (3)	28d	28d	28d	28d	2 Vial+1 blank	TSS	2/40ml

Type of bottle:

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 aluminium or Teflon seal

VB: Amber glass (or clear glass covered with aluminium paper) aluminium seal of Teflon

VT: Clear or amber glass bottle with Teflon seal

Preservative:

AC: 0.1ml (100µl) of HCl per 100ml of sample

AcZn: 0.2ml zinc acetate 2N per 100ml of sample and NaOH 10N to pH >9

AN: HNO₃ to pH <2

AS: H₂SO₄ to pH <2

E: 2.5ml EDTA 1.5% (p/v) per 100ml of sample if heavy metals are suspected

ED: 0.1ml diamine ethylene 45 mg/l per 100 ml of sample

EDTA: 1ml EDTA 0.25M per 100ml of sample

N: No preservative

NaOH: NaOH 10N to >12

TS: Sodium thiosulfate final concentration in the sample of 0.1% (p/v)

2.2.5 Field Duplicates and Blanks

One field duplicate and one field blank are collected for approximately every 10 samples as shown in Table 2. Field duplicates are collected and handled in the same manner as the other samples in the field. Field blanks are samples of deionized water handled concurrently and in the same manner as the other samples in the field.

Table 2: Quality Control Sample Frequency

Sampling Site	QA/QC Sampling Frequency
Compliance Monitoring Program	
Regulated Monitoring	1 field duplicate and 1 field blank per 10 samples
Verification Monitoring	1 field duplicate and 1 field blank per 10 samples
General Aquatic Monitoring	1 field duplicate and 1 field blank per 10 samples
Event Monitoring Program	
Each event	1 field duplicate and 1 field blank per 10 samples

2.2.6 Sample Transport

All water samples are 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 Nolinor Charter flight and dedicated ground transportation to ensure arrival in a safe and timely manner. If the sample (sediments, soil, and water) cannot be shipped the same day, they are to be stored in a refrigerator at approximately 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 bottle;
- Time and date of shipping; and
- Analytical laboratory address and 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.

SECTION 3 • LABORATORY ANALYSIS

3.1 External Laboratory

All analytical chemistry analyses are performed by a CALA accredited laboratory.

In most cases, these analyses are performed by Maxxam, an accredited facility (see Appendix A) located in Ottawa, Ontario. All data from Maxxam undergoes a rigorous internal QA/QC process, including the use of spiked samples and duplicate samples. Toxicity tests will be performed by Aquatox in Nova Scotia. 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 in Edmonton, AB, SGS in Lakefield, ON and H2Lab in Val d'Or, QC. Agnico Eagle may also use the services of ALS Global for some of the AEMP water quality analysis.

3.2 Internal Laboratory

The assay lab at the Mine site is not an accredited laboratory but will be used periodically for "real-time" results for some parameters like pH, total suspended solids, and Weak Acid Dissociable Cyanide. These results are for observational purposes and do not meet the standards of an accredited laboratory.

SECTION 4 • DATA REQUIREMENTS

4.1 Data Collection

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

The following data is collected for each sample in the field and is 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 (pH, temperature, etc.), if required.

The sample results from the laboratory are input into the database and matched to the sample identification name. The analysis certificate for each sample from the accredited laboratory includes but is not limited to:

- Analytical methods or techniques used;
- Date of analysis;
- Detection limit
- Name of the person(s) / laboratory that approved the certificate; and
- Results of any analysis.

4.2 Data Verification

Upon receipt of analytical results, the field blank and duplicate analyses are verified for potential contamination and accuracy, respectively. Results are interpreted and recommended actions are taken if necessary.

4.3 Exceedance Reporting

Any measured concentration at a sample station exceeding a regulated discharge criterion stipulated in the Water License or the MDMER are reported to the Nunavut Water Board, Environment Canada and Climate Change, and CIRNAC water inspector within 30 days of the receipt of the analysis. In addition, results of the action plan, where required, is reported and, where necessary, mitigation options identified within 90 days after receipt of the analyses.

SECTION 5 • REFERENCES

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.

APPENDIX A • LAB ACCREDITATION

Figure A-1: Maxxam Ottawa Lab Accreditation

