AGNICO EAGLE

MELIADINE GOLD MINE

Groundwater Management Plan

FEBRUARY 2018
VERSION 1

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Mine (the Mine), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut.

The Mine Plan proposes 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. Based on the current Mine Plan, the 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 (Agnico Eagle 2017). There are four phases to the development of the Mine; just over 4 years of construction (Q4 2015 to 2019), 8 years of Mine operation (2020 to 2027), 3 years of closure (2028 to 2030), and post-closure (2031 forwards).

Tiriganiaq Underground Mine is planned to extend to approximately 625 m below the ground surface; therefore, part of the Underground Mine will operate below the base of the continuous permafrost. The underground excavations will act as a sink for groundwater flow during operation, with water induced to flow through the bedrock to the Underground Mine workings once the Mine has advanced below the base of the permafrost.

This document presents the Groundwater Management Plan (GWMP) for the discharge of saline groundwater in compliance with Agnico Eagle's Type A Water Licence 2AM-MEL1631, Part E, Item 14.

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ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
ANFO	Ammonium Nitrate/Fuel Oil
CP	Collection Pond
DDH	Diamond Drillhole(s)
EMPP	Environment Management and Protection Plan
EWTP	Effluent Water Treatment Plant
FEIS	Final Environmental Impact Statement
GWMP	Groundwater Management Plan
MMER	Metal Mining Effluent Regulations
NWB	Nunavut Water Board
Mine	Meliadine Gold Mine
QA	Quality Assurance
QC	Quality Control
RO	Reverse Osmosis
SD	Support Document
SSWQO	Site Specific Water Quality Objectives
SWTP	Saltwater Treatment Plant
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
WMP	Water Management Plan

UNITS

%	percent
°C	degrees Celsius
°C/m	degrees Celsius per metre
ha	hectare(s)
mg/L	milligram(s) per litre
km	kilometer(s)
km^2	kilo square meter(s)
m	metre(s)
m/day	metre(s) per day
mm	millimetre(s)
m^3	cubic metre(s)
m^3/day	cubic metre(s) per day
m^3/s	cubic metre(s) per second
m^3/hour	cubic metre(s) per hour
m^3/year	cubic metre(s) per year
Mm^3/year	million cubic metre(s) per year
Mm^3	million cubic metre(s)
t	tonne(s)
tpd	tonne(s) per day
Mt	million tonne(s)

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Mine (Mine), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The Mine is subject to the terms and conditions of both the Mine Certificate (No. 006) issued in accordance with the Nunavut Agreement Article 12.5.12 on February 26, 2015 and Nunavut Water Board Type A Water Licence (No. 2AM-MEL1631, 2016) issued by the Nunavut Water Board (NWB) on April 1, 2016.

This document presents the Groundwater Management Plan (GWMP) for the discharge of saline groundwater in compliance with the Type A Water Licence 2AM-MEL1631 (Licence). Overall water management for the life of the Mine and post-closure is described in the Agnico Eagle Meliadine Gold Mine Water Management Plan, dated March 2017 (6513-MPS-11) (WMP). The WMP provides descriptions of the Mine water control structures and associated design criteria. The WMP will be updated in March 2018 to reflect the groundwater management strategy presented in this document.

1.1 Concordance

The Mine is subject to the land and resource management processes established by the Nunavut Agreement and other Federal laws and regulations. Agnico Eagle submitted a Licence Application for a Mining and Milling Undertaking (Application) required to use water and to deposit waste in development of the Mine, in accordance with the *Nunavut Waters and Nunavut Surface Rights Tribunal Act* and Nunavut Water Regulations.

The Licence was issued on April 1, 2016 and signed by the Minister on May 19, 2016. The GWMP reflects the commitments made with respect to submissions provided during the technical review of the Application, as well as final submissions and issues raised during the Public Hearing Process, where applicable, to comply with Part B Section 13, and Part E Section 14 of the Licence.

1.2 Objectives

The objective of the GWMP is to provide consolidated information on groundwater management for the Meliadine Gold Mine. The GWMP is divided into the following components:

- Introductory section (Section 1);
- A brief summary of the physical setting at the mine site and the mine development plan (Section 2);
- A description of groundwater management strategies (Section 3); and
- A description of the groundwater monitoring program (Section 4).

The GWMP will be updated as required to reflect any changes in operations or economic feasibility that occurs, and to incorporate new information and latest technology, where appropriate, to comply with Part B Section 15 of the Licence.

SECTION 2 • BACKGROUND

2.1 Site Conditions

The Mine is located in an area of poorly drained lowlands near the northwest coast of Hudson Bay. The dominant terrain in the Mine area consists of glacial landforms such as drumlins (glacial till), eskers (gravel and sand), and many small lakes. The topography is gently rolling with a mean elevation of 65 metres above sea level (masl) and a maximum relief of 20 metres (m).

The local overburden consists of a thin layer of topsoil overlying silty gravelly sand glacial till. Cobbles and boulders are present throughout the region at various depths. Bedrock at the mine site area consists of a stratigraphic sequence of clastic sediments, oxide iron formation, siltstones, graphitic argillite and mafic volcanic flows (Snowden 2008; Golder 2009).

The climate is extreme in the area, with long cold winters and short cool summers, and mean air temperatures of 12 °C in July and -31 °C in January. The mean annual air temperature at the Mine site is approximately -10.4 °C (Golder 2012a). Strong winds blow from the north and north-northwest direction more than 30 percent of the time.

The mean annual precipitation in the area is approximately 412 mm and is typically equally split between rainfall and snowfall.

Late-winter ice thicknesses on freshwater lakes in the mine site area were recorded from 1998 to 2000. The measured data indicated that ice thickness ranges from 1.0 to 2.3 m with an average thickness of 1.7 m. Ice covers usually appear by the end of October and are completely formed in early November. The spring ice melt typically begins in mid-June and is complete by early July (Golder 2012b).

2.2 Local Hydrology

The Mine is located within the Meliadine Lake watershed. Meliadine Lake has a surface water area of approximately 107 square kilometres (km^2), a maximum length of 31 km, features a highly convoluted shoreline of 465 km and has over 200 islands. Unlike most lakes, it has 2 outflows that drain into Hudson Bay through two separate river systems. It has a drainage area of 560 km^2 from its' two outflows. Most drainage occurs via the Meliadine River, which originates at the south west end of the lake. The Meliadine River flows for a total stream distance of 39 km. The Meliadine River flows through a series of waterbodies, until it reaches Little Meliadine Lake and then continues into Hudson Bay. A second, smaller outflow from the west basin of Meliadine Lake drains into Peter Lake, which discharges into Hudson Bay through the Diana River system (a stream distance of 70 km). At its mouth, the Diana River has a drainage area of 1,460 km^2.

Watersheds in the Mine area are comprised of an extensive network of waterbodies, and interconnecting streams. The hydrology of these watersheds is dominated by lake storage and evaporation.

2.3 Hydrogeology

The Mine is located in an area of continuous permafrost. Based on thermal studies and measurements of ground temperatures, the depth of permafrost at the mine site is estimated to be in the order of 360 to 495 m. The depth of the active layer ranges from about 1 m in areas with shallow overburden, up to about 3 m adjacent to the lakes. The depth of the permafrost and active layer varies depending on proximity to the lakes, overburden thickness, vegetation, climate conditions, and slope direction (Golder 2012b). The typical permafrost ground temperatures at the depths of zero annual amplitude are in the range of -5.0 to -7.5 °C in the areas away from lakes and streams. The geothermal gradient ranges from 0.012 to 0.02 °C/m (Golder 2012c).

Groundwater characteristics at the Mine are detailed in Final Environmental Impact Statement (FEIS) Volume 7, Section 7.2 Hydrogeology and Groundwater, and in an updated hydrogeological assessment completed for the Mine (Golder 2016). The groundwater characteristics for the Mine are briefly summarized herein.

Two groundwater flow regimes in areas of continuous permafrost are generally present:

- a deep groundwater flow regime beneath the base of the permafrost; and
- a shallow flow regime located in an active (seasonally thawed) layer near the ground surface.

From late spring to early autumn, when temperatures are above 0 ˚C, the active layer thaws. Within the active layer, the water table is expected to be a subdued replica of topography, and is expected to parallel the topographic surface. Mine area groundwater in the active layer flows to local depressions and ponds that drain to larger lakes.

Taliks exist beneath waterbodies that have sufficient depth such that they do not freeze to the bottom over the winter. Beneath small waterbodies that do not freeze to the bottom over the winter, a talik bulb that is not connected to the deep groundwater flow regime will form (a closed talik). Elongated waterbodies with terraces (where the depth is within the range of winter ice thickness), a central pool(s) (where the depth is greater than the range of winter ice thickness), and a width of 340 to 460 m or greater are expected to have open taliks extending to the deep groundwater flow regime at the Mine site. A review of bathymetric data, ice thickness data, and results of thermal modelling suggests that Meliadine Lake and Lake B7 are likely to have open taliks connected to the deep groundwater flow regime (Golder 2012a).

Tiriganiaq Underground Mine is planned to extend to approximately 625 m below the ground surface; therefore, part of the underground mine will be operated below the base of the frozen permafrost (top of the cryopeg). The underground excavations will act as a sink for groundwater flow during operation, with water induced to flow through the bedrock to the underground mine workings once the mine has advanced below the base of the frozen permafrost.

Both Tiriganiaq Pit 1 and Tiriganiaq Pit 2 will be mined within the frozen permafrost, therefore, groundwater inflows to the open pits is expected to be negligible and were not considered in the WMP.

2.4 Mine Development Plan

The Mine Plan proposes 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. Based on the current Mine Plan, the 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 (Agnico Eagle 2017). The following phased approach is proposed for the development of the Tiriganiaq gold deposit:

- Phase 1: 4 years for Mine Construction. Construction began in 2015 and is estimated to be complete in 2019;
- Phase 2: 8 years for Mine Operations, beginning in 2017 and ending in 2027;
- Phase 3: 3 years Mine Closure, from 2028 to 2030; and
- Phase 4: Post-closure (2031 forwards).

Mine facilities on surface include a plant site and accommodation buildings, three ore stockpiles, a temporary overburden stockpile, a tailings storage facility, three waste rock storage facilities, a water management system that includes containment ponds, water diversion channels, retention dikes/berms, and a final Effluent Water Treatment Plant (EWTP). The general location and site layout of the Mine are shown in Figure 1 of Appendix A.

SECTION 3 • GROUNDWATER MANAGEMENT STRATEGY

3.1 Groundwater Volumes

In the WMP of the water licence application (Agnico Eagle 2015a) it was stated that supplemental hydrogeological investigations were to be undertaken to provide additional information on potential volumes and quality of the saline groundwater to be managed. These investigations were undertaken in 2015 and 2016 and are summarized in Golder (2016). They included the completion of 24 packer tests, two pumping tests, two injection tests, 11 groundwater samples, and seven surface water samples. The work plan for the field work was developed in consultation with two independent technical advisors, Dr. Shaun K. Frape and Dr. Walter A. Illman (both of the University of Waterloo).

The additional hydraulic conductivity measurements, in combination with the updated Mine geologic model, resulted in a refined interpretation on the variability of hydraulic conductivity between geological formations and data on the storage properties of the bedrock. A summary of predicted groundwater inflows between 2017 and 2032, based on this refined interpretation and updated predictions of groundwater inflow using the developed numerical (Golder 2017), are provided in Table 1.

Table 1: Predicted Groundwater Inflow to Underground Mine (2017 to 2032)

Period	Predicted Groundwater Inflow (m^3/day)
2017	230
2018	300
2019	280
2020	300
2021	340
2022	340
2023-2024	420
2025-2026	380
2027-2028	390
2029-2030	380
2031-2032	360

Source: Updated Predictions of Groundwater Inflow to Tiriganiaq Underground Mine (Golder 2017).

The groundwater inflow predictions presented in Table 1 do not account for grouting currently being conducted as a mitigation to reduce groundwater inflows to the underground development, or potential losses through the ventilation system. Both mechanisms reduce the actual groundwater inflows to the Underground Mine relative to that which was predicted. As such, these predicted inflows to the underground development represent unmitigated estimates.

3.2 Existing Groundwater Management Control Structures

Contact water in the Underground Mine is contained within underground sumps. A proportion of the underground water will be recirculated as make-up water for underground drilling. The drilling water will report to the underground sumps for recirculation; however, the need for up to 3% treated water make-up has been assumed to compensate for losses of drilling water due to evaporation or capture within the mined waste rock that is transferred to surface. Calcium chloride is currently not added to the underground water but has been used in the past and potentially again in the future to increase salinity and reduce water freezing during drilling.

Groundwater inflows to the Underground Mine since 2015 have not been discharged to the environment and are being stored underground, in the Saline Pond, in the P-Area, Collection Pond 5 (CP5) or actively evaporated during the open water season (Agnico Eagle 2017). Details of the underground dewatering system are provided in the Mine Plan (Agnico Eagle 2015a) and details of the pond are provided in the WMP (Agnico Eagle 2017).

The pond capacities and maximum water elevation for storage of the saline water are presented in Table 2. The locations of the ponds are shown on Figure 1 of Appendix A. The estimated volume of groundwater inputs to surface storage for management are expected to range from approximately a minimum of 0.11 million cubic metre(s) per year (Mm^3/year) to a maximum of 0.18 Mm^3/year, dependent on year of Mine life (Agnico Eagle 2017).

Table 2: Salt Water Storage Capacity at the Mine for Groundwater and Water Primarily Influenced by Underground Workings

Surface Pond	Capacity (m^3)	Maximum Water Elevation (m)
CP5	46,674	66.0
Saline Pond	32,686	62.9
P1	20,781	68.5
P2	6,828	66.5
P3	18,432	67.0

Source: Agnico Eagle (2017).

3.3 Groundwater Quality

Groundwater investigations undertaken indicate that total dissolved solids (TDS) concentrations are relatively consistent below the permafrost at approximately 64,000 mg/L (Golder 2016). Recent groundwater quality data from the Underground Mine collected by Agnico Eagle in 2016 and 2017 from diamond drillholes (DDHs), indicates mostly stable concentrations for several parameters

(Table 3) and suggest that TDS concentrations may be less at approximately 50,000 to 55,000 mg/L, on average, and the assumption of TDS at 64,000 mg/L may represent a more conservative estimate. It should also be noted that mining operations include drill-and-blast excavation for the development of the Underground Mine, which results in certain parameters in groundwater to be influenced by explosives (particularly ammonia and nitrate due to ammonium nitrate, fuel oil [ANFO] and emulsion explosives).

Table 3: Average Underground Saline Water Quality

Representative Months (average per month)		Aug 2016	Sep 2016	Oct 2016	Nov 2016	Dec 2016	Jan 2017	Feb 2017	Mar 2017	Apr 2017	May 2017	Jun 2017	Jul 2017	Aug 2017	Sep 2017
Parameters (total metal)	**Units**														
pH	pH	7.09	7.09	7.34	7.99	7.17	7.08	6.87	7.11	7.32	7.38	7.27	8.27	7.45	7.33
Alkalinity	mg/L	65	69	56	72.6	64	57	61.7	51	64.5	68	68	75	68.2	64
Conductivity	µmhos/cm	53320	70323	77750	79800	56000	77000	76500	77000	79000	79000	76308	74385	72200	72667
Total Hardness (as $CaCO_3$)	mg/L	14923	14644	13125	13260	13700	13200	18267	12700	18400	12433	12623	12500	12583	11700
Turbidity	NTU	82.85	93.00	56.25	27.56	74.00	123.75	69.00	88.00	90.00	51.00	75.00	61.00	47.02	104.33
Total Dissolved Solids (TDS)	mg/L	39663	50765	58600	60600	55000	54350	66433	54900	57500	57300	55123	57815	57520	54567
Total Suspended Solids (TSS)	mg/L	41	68.5	61	108.6	29	45	75.7	63	248.5	102.7	102.2	156	86	102
Aluminum (Al)	mg/L	0.56	8.72	0.075	0.32	0.06	0.21	0.10	6.02	1.29	0.51	1.45	0.73	0.97	1.75
Ammonia Nitrogen (NH_3-NH_4)	mg/L	4.66	4.20	5.93	5.98	3.50	4.13	105.3	4.50	4.95	5.20	5.51	11.1	4.87	4.43
Arsenic (As)	mg/L	0.0012	0.32	0.005	0.005	0.002	0.003	0.005	0.01	0.008	0.004	0.016	0.016	0.102	0.013
Barium (Ba)	mg/L	0.05	0.19	0.09	0.10	0.05	0.06	0.61	0.10	0.27	0.07	0.09	0.25	0.10	0.07
Beryllium (Be)	mg/L	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.01	0.002	0.002	0.005	0.008	0.01	0.01
Boron (B)	mg/L	1.4	1.7	1.5	1.5	1.8	1.6	4.98	5.0	4.9	1.5	2.7	3.97	5.0	2.5
Total Organic Carbon (TOC)	mg/L	4.95	2.65	3.68	4.28	2.00	2.23	11.67	2.10	2.95	2.63	3.20	5.30	2.57	2.50
Dissolved Organic Carbon	mg/L	2.60	2.35	3.45	3.74	1.90	1.90	10.17	1.70	2.30	2.37	2.70	4.90	2.32	2.10
Calcium (Ca)	mg/L	1899	1955	1965	1816	1800	1710	3777	1650	3737	1593	1608	1771	1610	1565
Cadmium (Cd)	mg/L	0.00002	0.0002	0.0002	0.0013	0.0002	0.0003	0.0002	0.001	0.0003	0.0002	0.0005	0.001	0.001	0.002
Chloride (Cl - dissolved)	mg/L	—	33500	31000	32800	34000	31250	38000	31000	31500	32000	31385	31538	32800	29333
Chromium (Cr)	mg/L	0.01	0.015	0.018	0.014	0.02	0.025	0.017	0.01	0.02	0.017	0.05	0.075	0.1	0.88
Copper (Cu)	mg/L	0.26	0.44	0.009	0.009	0.01	0.01	0.008	0.05	0.01	0.01	0.02	0.04	0.05	0.03
Cyanide (CN)	mg/L	0.005	0.006	0.008	0.017	0.005	0.005	0.19	0.005	0.028	0.005	0.006	0.01	0.005	0.008
Iron (Fe)	mg/L	9.68	40.28	6.48	5.23	4.31	4.76	8.96	3.60	8.78	6.19	9.81	6.33	8.24	4.10
Lead (Pb)	mg/L	0.002	0.002	0.004	0.005	0.004	0.005	0.005	0.02	0.004	0.003	0.009	0.015	0.02	0.018
Magnesium (Mg)	mg/L	2475	2170	2053	2118	2230	2168	2150	2080	2200	2050	2092	1962	2105	1975
Mercury (Hg)	mg/L	0.0002	0.01	0.00001	0.00002	0.00001	0.00001	0.00001	0.00001	0.000001	0.00001	0.00001	0.00001	0.00001	0.00001
Molybdenum (Mo)	mg/L	0.01	0.015	0.04	0.013	0.02	0.025	0.055	0.01	0.25	0.026	0.047	0.075	0.1	0.17
Nickel (Ni)	mg/L	0.05	0.04	0.02	0.01	0.02	0.025	0.04	0.1	0.07	0.017	0.05	0.08	0.1	0.35
Nitrate (NO_3) as N	mg/L	0.15	0.168	0.88	0.57	0.1	0.5	116.39	0.1	2.58	0.23	0.89	4.35	0.17	0.34
Nitrite (NO_2) as N	mg/L	0.02	0.04	0.089	0.072	0.05	0.05	8.01	0.1	0.125	0.086	0.14	0.391	0.042	0.027
Total Kjeldahl Nitrogen (TKN)	mg/L	4.49	3.65	6.95	7.58	5.90	3.78	112.47	4.60	5.20	7.83	7.40	12.0	72.02	4.50
Phosphorous (P)	mg/L	0.05	0.14	0.05	0.05	0.04	0.07	0.14	0.04	0.13	0.12	0.08	0.09	0.1	—
Potassium (K)	mg/L	512	504.5	460.5	493.6	454	496	595	407	609	433	463	518	488	763
Radium-226 (Ra 226)	mg/L	—	—	—	1.9	1.7	0.49	0.33	0.3	1.2	1.95	1.8	1.9	2.2	0.29
Selenium (Se)	mg/L	0.23	0.006	0.0018	0.0033	0.002	0.003	0.002	0.01	0.002	0.002	0.005	0.0075	0.01	0.007
Silver (Ag)	mg/L	0.002	0.003	0.0004	0.0005	0.0004	0.001	0.0003	0.002	0.0009	0.0004	0.0012	0.0018	0.0002	0.018
Sodium (Na)	mg/L	16379	16000	14100	14600	15100	14625	14700	13400	15400	13900	14369	14654	14417	9433
Strontium (Sr)	mg/L	39.8	39.4	44.7	40.9	40.1	43.1	171	38.4	136	40	39	43.5	36.5	23.6
Sulphate (SO_4 – dissolved)	mg/L	—	3350	3125	3260	3200	3125	2700	3100	3100	3233	3169	2969	3120	3067
Thallium (Tl)	mg/L	0.0009	0.0008	0.0009	0.0006	0.001	0.001	0.001	0.001	0.0002	0.0002	0.0005	0.001	0.001	0.002
Uranium (U)	mg/L	0.002	0.003	0.002	0.002	0.002	0.003	0.002	0.01	0.006	0.002	0.005	0.008	0.01	0.09
Vanadium (V)	mg/L	0.05	0.08	0.09	0.06	0.1	0.13	0.08	0.5	0.1	0.08	0.23	0.38	0.5	0.33
Zinc (Zn)	mg/L	0.06	0.08	0.36	0.1	0.1	0.125	0.1	0.5	0.12	0.08	0.23	0.38	0.5	0.34

Source: Groundwater quality data from DDH sample location (Agnico Eagle, October 2017)

3.4 Groundwater Management Strategy and Associated Control Structures

Based on the Type A Water Licence 2AM-MEL1631 Terms and Conditions, Part E: Conditions Applying to Water Use and Management, No. 14, Agnico Eagle has reviewed the Mine alternatives to apply to the GWMP. Condition No. 14 specifically states:

> *"The Licensee shall submit a Groundwater Management Plan to the Board for approval in writing, at least six (6) months prior to the discharge of any Groundwater. The Plan shall take into consideration all comments raised and commitments made with respect to submissions received during the technical review of the Application as well as final submissions and issues raised during the Public Hearing Process, where applicable."*

Groundwater management alternatives were considered for the Mine based on the potential range of groundwater flows and quality that could be generated (refer to Appendix F of the WMP; Agnico Eagle 2015a). The option selection has been driven by the expected quality and quantity of the water.

Based on the groundwater inflow volume, the following options were considered and form part of the short and long term management of groundwater inflows to the Underground Mine:

- Short-term Strategy: treat saline groundwater and store/use the brine from the treatment process on-site (Section 3.4.1)
- Current Long-term Strategy: treated discharge to receiving environment in Meliadine Lake in combination with treated surface contact water (Section 3.4.2)
- Potential Future Long-term Strategy: ocean disposal (see Section 3.4.3)

The short and long-term groundwater management strategies are described below. At this time, Agnico Eagle is requesting approval from the NWB for the short-term strategy and the current long-term strategy to discharge to Meliadine Lake. The potential future long-term strategy of ocean disposal is still under assessment and provided for information purposes.

3.4.1 Short-Term Management Strategy - Treat and Store/Use Groundwater On-site

This alternative was considered as part of the Type A Water Licence Application and is currently being implemented on-Site as part of the short-term management of groundwater inflow. It involves storing all excess groundwater in underground sumps and in surface water ponds at the Mine. As outlined in the WMP (Agnico Eagle 2017), a total of nine water containment ponds are planned on-site at the Mine surface (CP1, CP3, CP4, CP5 and CP6, the P-Area [P1, P2, and P3], and the Saline Pond), and associated water retention dykes, water diversion berms, channels, and culverts, to manage surface water and underground water (Figure 1).

Evaporators have been in-use on site since mid-2017 at P1 to reduce groundwater volumes stored in surface water ponds. A single evaporator is estimated to remove approximately 500 m^3/day when operated for 24 hours with ideal wind and relative humidity conditions. While evaporators have been used with some success, the combined volumes of groundwater with anticipated surface water volumes influenced by underground waste rock to be managed is greater than the available long-term storage at the Mine, and therefore, discharge to environment is required.

These short-term storage and treatment options are being implemented at the Mine pending regulatory approvals for the long-term groundwater management option.

3.4.2 Current Long-Term Management Strategy - Treated Groundwater Discharge to Meliadine Lake

Effluent discharge to Meliadine Lake was assessed as part of the FEIS and modelled as part of the Water Licence Application (Agnico Eagle 2014, 2015a) and discharge criteria have been defined in the Licence. Provided the discharge criteria can be met following commissioning of the treatment system, this option represents the immediate long-term management strategy to be implemented at the Site in 2018. Approval of this plan will be required, prior to discharge, as per the Term and Condition Part E, No. 14 of the Licence. Total discharge to Meliadine Lake, including the treated groundwater, will remain within the permitted daily volume and meet the discharge criteria defined in the Licence.

Hatch (2013) investigated groundwater treatment options for the site and concluded that a combination chemical reverse osmosis (RO) and mechanical vapour compression evaporator plant would be the most efficient method of treating excess groundwater for discharge. Agnico Eagle has also undertaken a pilot test of a SaltMaker combined with a Chemical-RO post-treatment system and based on the results of this testing decided to proceed with this technology.

The groundwater will flow through a Saltwater Treatment Plant (SWTP), comprised of a set of SaltMakers, and will be treated to remove excessive total suspended solids (TSS), calcium chloride ($CaCl_2$), sodium chloride (NaCl), metals, phosphorous (P), and nitrogen compounds. The salt generated by the water treatment unit will be stored at the Mine, where it will be re-used for underground operations and/or disposed of at an appropriate disposal location. Given the predicted groundwater volumes, a maximum of three SaltMakers are proposed to be built at the Mine, forming the SWTP, to treat the groundwater for discharge to the environment. Two SaltMaker's have been procured and are anticipated to be in operation between Q3 2018 and Q1 2019. Additional SaltMakers could be built at the Mine to meet the discharge volumes required. This need will be evaluated based on the effectiveness of the short-term management strategies and observed operational capacities of the SaltMakers, which are anticipated to be 120 m^3/day. The saline effluent temperature from the SWTP is expected to be approximately 35 °C, with an approximate pH of 7.5 (Saltworks 2017). The SWTP effluent largely meets the required Water Quality Output requirements defined in Agnico Eagle's Desalination Water Treatment Plan Design Criteria and passes completed toxicity tests (Saltworks 2017). Treated effluent quality (of the groundwater) through the SWTP indicates that TDS concentrations would be approximately 158 mg/L (condensed water after treatment; Saltworks 2017).

Post-treatment options, such as the RO post-treatment system, are being considered if required, to meet applicable effluent quality criteria for Meliadine Lake. The permeate resultant from the Chemical-RO post-treatment system meets all the required Site Specific Water Quality Objectives (SSWQO) and passes completed toxicity tests. Saline effluent quality after secondary treatment through the SWTP indicates that TDS concentration would be considerably reduced, at approximately 55 mg/L after RO post-treatment (Saltworks 2017). Pilot testing of the SaltMaker condensed water and RO permeate quality results are presented in the SaltMaker Pilot Final Report document (Saltworks 2017). The results indicate that values will meet SSWQO for water management, which also comply with MMER.

3.4.3 Potential Future Long-Term Management Strategy - Treated Groundwater Discharge to Melvin Bay at Itivia Harbour

Based on the potential volumes of groundwater, it is anticipated that a second discharge location will be required for long-term groundwater management. Agnico Eagle is proposing to treat groundwater and discharge it as saline effluent to the ocean, either as a direct discharge and/or after temporary on-site storage in one or more of the water containment ponds at the Mine. Ocean discharge is currently not permitted and requires appropriate regulatory licenses and approvals, which are currently being assessed and applications prepared. An updated GWMP will be submitted if appropriate licenses and approvals are obtained prior to discharge.

For the ocean discharge option, the saline effluent would be trucked from the Mine and discharged in Melvin Bay at Itivia Harbour. The discharge facility will include an unheated saline water storage tank at the Itivia Fuel Storage Facility and a pipeline extending to an engineered diffuser located in Melvin Bay during the open water season from 2019 to 2035. The saline effluent will be discharged in a controlled manner through the diffuser in compliance with the required discharge criteria to allow for maximum dilution and minimum environmental impact to the marine environment. Saline effluent quality will be required to meet the Canadian federal end-of-pipe discharge criteria (Metal Mining Effluent Regulations – or MMER), including the amended MMER (GC 2017; anticipated to come into effect in 2018), and Canadian Surface Water Quality Guidelines (Canadian Council of Ministers of the Environment Guidelines for the Protection of Aquatic Life [CCME 2003]) or Site-Specific Water Quality Objectives at the edge of the mixing zone for the diffuser discharge into Melvin Bay. It is recognized that further discussions are required with relevant stakeholders to confirm that this approach meets the amended MMER (GC 2017).

3.5 Discharge Schedule

Table 4 outlines the timeline for key activities on the Mine related to the management of saline groundwater, including tasks and facilities for the current short-term and long-term management strategies for discharge to Meliadine Lake (Section 3.4.1 and 3.4.2). A detailed Mine schedule for the overall Mine Water Management (e.g., building of culverts, berms and containment ponds) are presented in the 2017 WMP, which will be updated in March 2018.

Table 4: High Level Mine Schedule

Activity	Timeline	Notes
On-site water storage	Ongoing	—
Groundwater Management Plan (Current Document)	Six months prior to discharge	Type A Water Licence 2AM-MEL1631 requirement
Commissioning of Salt Water Treatment Plants (SaltMaker #1 and #2)	Q3-2018 to Q1-2019	—
Earliest first Discharge of treated saline groundwater to Meliadine Lake	Q3-2018	
Commissioning of additional SaltMaker unit(s) if required	2019	—
Active Discharge to Meliadine lake	Annually May thru October to 2032	—
Operation of Salt Water Treatment Plant	24 h a day / 7 days a week, May thru Oct	In-service as required
Inactive Discharge	Annually November thru April to 2032	Water will be stored underground and in surface containment ponds during the winter
Final Saline Effluent Discharge to Meliadine Lake	End of Mine life 2032	—

Source: Agnico Eagle (2017).

SECTION 4 • GROUNDWATER MONITORING PROGRAM

4.1 Water Quality and Quantity Monitoring

Water quality monitoring is an important part of the Mine water management to verify the predicted water quality and quantity trends and conduct adaptive management should differing trends be observed. Water quality and quantity monitoring has been initiated and will continue during construction, operations, closure and post-closure. Monitoring will occur at three levels:

- Regulated discharge monitoring that occurs at monitoring points specified in the Licence or regulations.
- Verification monitoring that is carried out for operational and water management purposes by Agnico Eagle. This monitoring data will not be reported to the Regulators in the Annual Water License Report, but can be provided upon request by the Regulators.
- General monitoring that is included in the Licence requirements and is subject to compliance assessment to confirm sampling was carried out using established protocols, including quality assurance/quality control provisions, and addressing identified issues. General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the NWB.

All three types of monitoring will be used at the Mine. The WMP presents the conceptual water quality monitoring plan during construction, operations and closures and more detailed information on monitoring programs and is described in the Environment Management and Protection Plan (EMPP) (Agnico Eagle 2015b).

The groundwater quality monitoring plan, which will be further defined as the Mine advances and will be conducted in agreement with the WMP for the Mine (Agnico Eagle 2017). Required monitoring and frequency for pre- and post- treatment (i.e., monitoring above ground) is presented in the WMP (Agnico Eagle 2017).

4.2 Water Quantity

The volume of groundwater inflow being collected and transferred to surface water management systems with be measured using a flow meter installed at the Portal Water Sump Stope L75 surface water pond. This data will be supplemented by periodic seepage surveys which will record visually observed groundwater inflows in the Underground Mine.

Measured groundwater inflow rates will be compared to model predictions on an annual basis. If significant variations from model predictions are observed, the assumptions behind the analysis will be reviewed and the analysis updated if required. In addition, updates to the groundwater model may be required based on operational changes as the Underground Mine advances.

If the measured groundwater quantity represents a significant difference from the model predictions, a re-calibration of the model will be considered. If model re-calibration is deemed necessary, future groundwater inflow quantity would be predicted using this re-calibrated model and results considered as part of the adaptive management of the groundwater quantity contribution to the WMP.

4.3 Water Quality

Groundwater quality will be monitored opportunistically from DDHs to assess and verify the quality of groundwater flowing into the Underground Mine. Water samples will be analyzed for the following parameters: conductivity, TDS, pH, temperature, major anions, radium 226, dissolved and total metals and toxicity testing.

To understand and plan for treatment requirements at surface, water accumulating in sumps underground will also be sampled on a monthly basis at the Sump 125, which is the main collection sump prior to recirculation for underground use. Sump water samples will be analyzed for the following parameters: conductivity, TDS, pH, temperature, oil and grease, major anions, radium 226, dissolved and total metals, nitrate and nitrite, volatile organic compounds (i.e., benzene, xylene, ethylene, and toluene).

Water quality results are compared to MMER and SSWQO guidelines and will be compliant prior to discharging to Meliadine Lake.

SECTION 5 • QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Quality Assurance (QA) refers to plans or programs that encompass a wide range of internal and external management and technical practices designed to ensure the collection of data of known quality that matches the intended use of the data. Quality Control (QC) is a specific aspect of QA that refers to the internal techniques used to measure and assess data quality. Specific QA and QC procedures that will be followed during sampling performed for the Groundwater Monitoring Program are described in Section 5.1 and 5.2.

5.1 Quality Assurance

Quality assurance protocols will be diligently followed so data are of known, acceptable, and defensible quality. There are three areas of internal and external management, which are described in the following three sections.

5.1.1 Field Staff Training and Operations

To make certain that field data collected are of known, acceptable, and defensible quality, field staff will be trained to be proficient in standardized field groundwater sampling procedures, data recording, and equipment operations applicable to the Groundwater Monitoring Program. All field work will be completed according to specified instructions and established technical procedures for standard sample collection, preservation, handling, storage, and shipping protocols.

5.1.2 Laboratory

To make sure that high quality data are generated, accredited laboratories that will be selected for sample analysis. Accreditation programs are utilised by the laboratories so that performance evaluation assessments are conducted routinely for laboratory procedures, methods, and internal quality control.

5.1.3 Office Operations

A data management system will be utilized so that an organized consistent system of data control, data analysis, and filing will be applied to the Groundwater Monitoring Program. Relevant elements will include, but are not limited to the following:

- all required samples are collected;
- chain-of-custody and analytical request forms are completed and correct;
- proper labelling and documentation procedures are followed, and samples will be delivered to the appropriate locations in a timely manner;
- laboratory data will be promptly reviewed once they are received to validate data quality;
- sample data entered into a Mine-specific groundwater quality database will be compared to final laboratory reports to confirm data accuracy; and

- appropriate logic checks will be completed to ensure the accuracy of the calculations.

5.2 Quality Control

The QC component will consist of applicable field and sample handling procedures, and the preparation and submission of two types of QC samples to the various laboratories involved in the program. The QC samples include blanks (e.g., travel, field, equipment) and duplicate/split samples.

Sample bottle preparation, field measurement and sampling handling QC procedures include the following:

- Sample bottles will be kept in a clean environment, capped at all times, and stored in clean shipping containers. Samplers will keep their hands clean, wear gloves, and refrain from eating or smoking while sampling.
- Where sampling equipment must be reused at multiple sampling locations, sampling equipment will be cleaned appropriately between locations.
- Temperature, pH, and specific conductivity will be measured in the field using hand held meters.
- Samples will be cooled to between 4 °C and 10˚C as soon as possible after collection. Care will be taken in when packaging samples for transport to the laboratory to maintain the appropriate temperature (between 4°C and 10˚C) and minimize the possibility of rupture. Where appropriate, samples will be treated with preservatives to minimize physical, chemical, biological processes that may alter the chemistry of the sample between sample collection and analysis.
- Samples will be shipped to the laboratory as soon as reasonably possible to minimize sample hold times. If for any reason, samples do not reach the laboratory within the maximum sample hold time for individual parameters, the results of the specific parameters will be qualified, or the samples will not be analysed for the specific parameters.
- Chain of custody sample submission forms will be completed by field sampling staff and will be submitted with the samples to the laboratory.
- Only staff with the appropriate training in the applicable sampling techniques will conduct water sampling.

Quality control procedures implemented will consist of the preparation and submission of QA/QC samples, such as field blanks, trip blanks, and duplicate water samples. These are defined as follows:

- Field Blank: A sample will be prepared in the field using laboratory-provided deionized water to fill a set of sample containers, which will then be submitted to the laboratory for the same analysis as the field water samples. Field blanks will be used to detect potential sample contamination during collection, shipping and analysis.

- Travel Blank: A sample will be prepared and preserved at the analytical laboratory prior to the sampling trip using laboratory-provided deionized water. The sample will remain unopened throughout the duration of the sampling trip. Travel blanks will be used to detect potential sample contamination during transport and storage.
- Duplicate Sample: Two samples will be collected from a sampling location using identical sampling procedures. They will be labelled, preserved individually and submitted for identical analyses. Duplicate samples will be used to assess variability in water quality at the sampling site. Duplicate will be collected and submitted for analyses at approximately, 10% of sampling locations. For smaller batches of samples (less than 10), at least one duplicate will be collected and submitted for analysis.

Additional QA/QC procedures that will be applied to the seepage survey component of the Groundwater Monitoring Program will include:

- Location – Universal Transverse Mercator (UTM) coordinates of seepage will be defined through the use of a hand-held Global Positioning System (GPS) unit.
- Sample Labels – appropriate sample nomenclature will be assigned to the sample labels that will define sample locations, sample type, year, and designation (numerical from 01 sequentially upwards) (e.g., SEEP-13-01 for seepage; 5034PIT-13-02 for pit sump).

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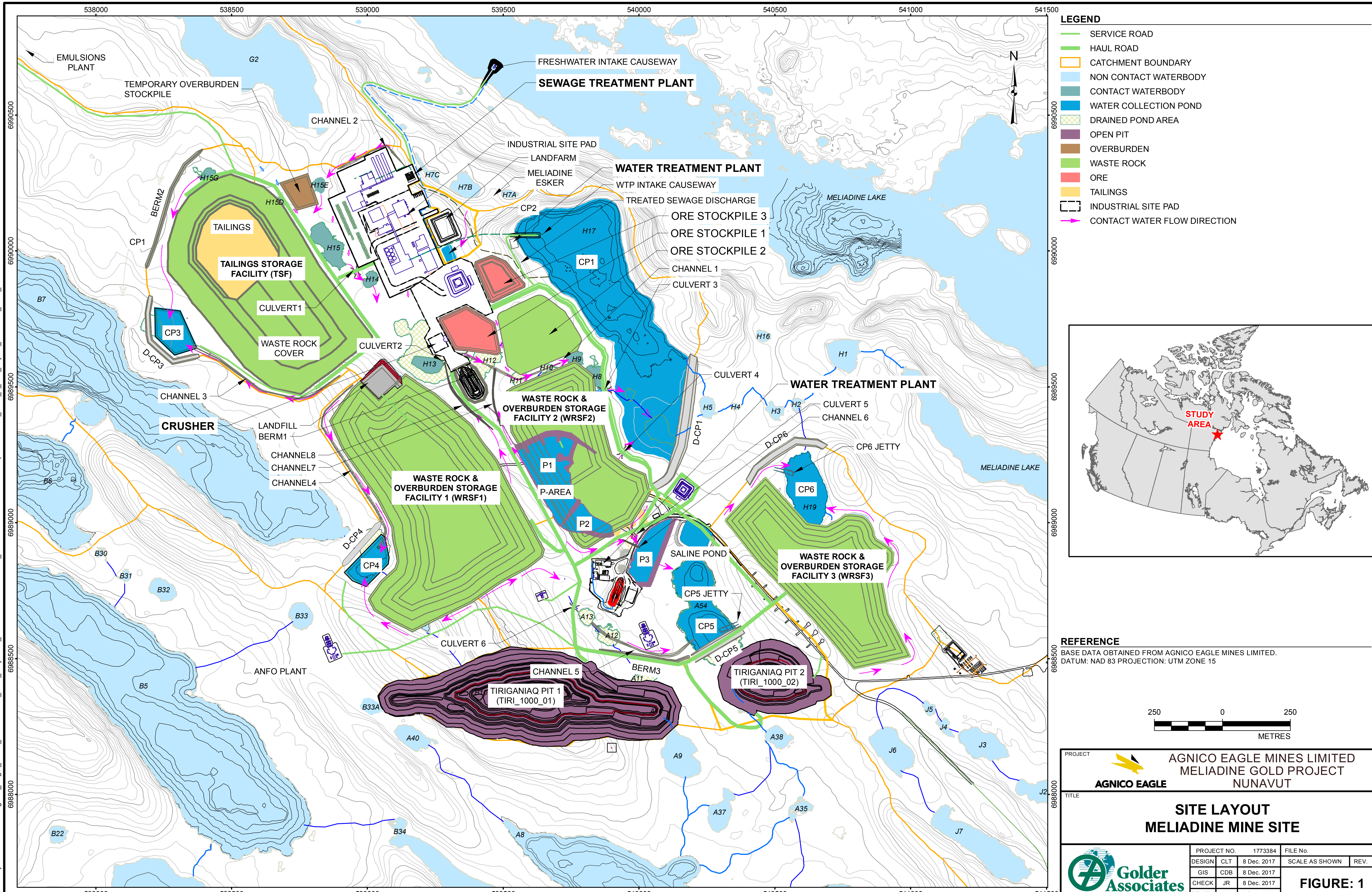
APPENDIX A • FIGURES

Figure 1 General Mine Site Location Plan



LEGEND

- SERVICE ROAD
- HAUL ROAD
- CATCHMENT BOUNDARY
- NON CONTACT WATERBODY
- CONTACT WATERBODY
- WATER COLLECTION POND
- DRAINED POND AREA
- OPEN PIT
- OVERBURDEN
- WASTE ROCK
- ORE
- TAILINGS
- INDUSTRIAL SITE PAD
- CONTACT WATER FLOW DIRECTION

REFERENCE

BASE DATA OBTAINED FROM AGNICO EAGLE MINES LIMITED.
DATUM: NAD 83 PROJECTION: UTM ZONE 15

PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
SITE LAYOUT
MELIADINE MINE SITE

PROJECT NO.		1773384	FILE No.
DESIGN	CLT	8 Dec. 2017	SCALE AS SHOWN REV. 0
GIS	CDB	8 Dec. 2017	
CHECK	JR	8 Dec. 2017	FIGURE: 1
REVIEW	LY	8 Dec. 2017	

Golder Associates

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