MELIADINE GOLD MINE

Groundwater Management Plan

MARCH 2024
VERSION 11

ᐊᐅᓚᑦᑎᔨᓂᖕᒫᖅᑐᑦ ᓇᐃᓈᖅᓯᔪᑦ

ᑎᑎᖅᖃᐅᑎᒦᑦᑐᑦ ᓄᑖᖑᖅᑎᖅᓯᒪᔪᑦ ᐅᖃᓕᒫᒐᐃᑦ ᒪᓂᕋᕐᒥᑦ ᐃᒪᕐᒥᑦ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᑎᑎᕋᐅᑎᒥᑦ ᑲᑎᑦᑎᓂᕐᒧᑦ, ᐱᓕᕆᐊᖑᓂᖏᓐᓄᑦ, ᑐᖅᑯᖅᑕᐅᓂᖏᓐᓄᑦ, ᐊᒻᒪᓗ ᑯᕕᑎᑕᐅᓂᖏᓐᓄᑦ ᑕᕆᐅᓕᒃ ᒪᓂᕋᕐᒥᑦ ᐃᒪᖅ ᒪᓕᒃᓱᒥᑦ ᓄᓇᕗᒻᒥ ᐃᒪᓕᕆᔾᑯᓐᓂᑦ ᐋᖅᑭᒋᐊᖅᓯᒪᔪᖅ ᐃᒪᕐᒧᑦ ᓚᐃᓴᓐᓯ ᓈᓴᐅᑎ 2AM-MEL1631.

ᐊᒡᓃᑯ ᐄᒍ ᐅᔭᕋᒃᑕᕆᐊᓕᕆᔾᒃᑯᑦ (ᐊᒡᓃᑯᒃᑯᑦ) ᐊᐅᓛᖅᑎᑦᑎᖃᑦᑕᖅᑐᑦ ᑕᓯᕐᔪᐊᕐᒥᑦ ᒌᓗᒧᑦ ᐅᔭᕋᒃᑕᕆᐊᕐᒥᑦ (ᐅᔭᕋᒃᑕᕆᐊᖅ), 25 ᑭᓛᒥᑕᕐᓗᐊᓂᒃ ᐅᖓᓯᒃᑎᒋᔪᖅ ᐅᐊᖕᓇᖓᓂᑦ ᑲᖏᖅᖠᓂᐅᑉ, ᐊᒻᒪᓗ 80 ᑭᓛᒥᑕᓂᒃ ᐅᖓᓯᒃᑎᒋᔪᖅ ᓂᒋᖅᐸᓯᐊᓂᑦ ᐱᖓᙵᖅᐸᓯᐊᓂᑦ ᐃᒡᓗᓕᒑᕐᔫᑉ ᑭᕙᓪᓕᕐᒥᑦ ᓄᓇᕗᒻᒥᑦ. ᐅᔭᕋᒃᑕᕆᐊᕐᒧᑦ ᐸᕐᓇᐅᑎ ᐅᔭᕋᒃᑕᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᖅᑲᕈᓯᒪᔪᑦ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖓᔪᒥᑦ ᐊᒻᒪᓗ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᓂᒃ ᐱᕙᓪᓕᐊᓗᒍ ᑎᕆᒐᓂᐊᖅ ᒎᓗᑕᓕᒃ, ᒪᕐᕉᖕᓂᒃ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖓᔪᓂᑦ (ᑎᕆᒐᓂᐊᖅ 1 ᐊᒻᒪᓗ ᑎᕆᒐᓂᐊᖅ 2) ᐊᒻᒪᓗ ᐊᑕᐅᓯᖅ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔭᕋᒃᑕᕐᓂᖅ.

ᑎᕆᒐᓂᐊᖅ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔭᕋᒃᑕᕐᓂᖅ ᐊᑦᑎᒃᓯᒋᐊᖅᑕᐅᒃᑲᓐᓂᕐᓂᐅᔭᖅᑐᖅ 700 ᒦᑕᓂᒃ ᓄᓇᐅᑉ ᖄᖓᑕ ᐊᑖᓄᑦ; ᑕᐃᒪᓐᓇᒧᑦ, ᐃᓚᖓ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔭᕋᒃᑕᕆᐊᖅ ᐊᐅᓛᕐᓂᐊᖅᑐᖅ ᑭᒡᓕᕆᔭᐅᔪᖅ ᕐᑯᐊᖑᐃᓐᓇᐅᔭᖅᑑᑉ ᐊᑖᓂᑦ. ᓄᓇᐃᔭᐃᓂᖅ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐃᒻᒥᖅᑐᕐᓂᐊᖅᑐᖅ ᑯᕕᔪᒥᒃ ᐃᒪᕐᒥᒃ ᐊᐅᓛᖅᑎᑦᑎᓂᐅᑎᓪᓗᒍ, ᐃᒪᖅ ᑯᕕᑕᐅᓗᓂ ᐅᔭᕋᕐᒧᑦ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔭᕋᒃᑕᕆᐊᕐᒥᑦ ᐱᓕᕆᕝᕕᐅᔪᒥᑦ ᕐᑯᐊᖑᐃᓐᓇᐅᔭᖅᑑᑉ ᐊᑖᓄᑦ ᐅᔭᕋᒃᑕᕆᐊᖅ ᓯᕗᓪᓗᒃᓯᒪᓕᖅᑎᓪᓗᒍ.

ᑕᕆᐅᓕᒃ ᐃᒪᖅ ᑎᕆᒐᓂᐊᕐᒥᑦ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔭᕋᒃᑕᕆᐊᕐᒥᑦ ᑲᑎᑕᐅᓂᐊᖅᑐᖅ ᓄᓇᐅᑉ ᐃᓗᐊᓃᑦᑐᓂᑦ ᐃᒪᐃᔭᐃᔾᔪᑎᓄᑦ, ᐊᔾᔭᖅᑕᐅᓗᓂ ᐃᒪᓕᕆᔾᔪᑎᒧᑦ, ᐊᒻᒪᓗ ᐊᑐᖅᑕᐅᒃᑲᓐᓂᖅᑐᓕᐊᖑᓗᓂ ᐊᔾᔨᖕᒋᑦᑐᓂᑦ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐊᐅᓛᖅᑎᑦᑎᓂᕐᓄᑦ ᐊᑐᕐᓂᐊᕐᓗᒍ ᓵᕐᓗ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐃᑰᑕᐃᓂᕐᓄᑦ. ᐊᒥᐊᒃᑰᔪᖅ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᑕᕆᐅᓕᒃ ᐊᒃᑐᖅᑕᐅᓯᒪᔪᖅ ᐃᒪᖅ ᑯᕕᑕᐅᓗᓂ ᓄᓇᐅᑉ ᖄᖓᓄᑦ ᐱᓕᕆᐊᖑᓂᐊᕐᓗᓂ ᐊᒻᒪᓗ ᑎᕆᒐᓂᐊᖅ ᓄᓇᒥᑦ ᐃᓗᑦᑐᖅᓯᒪᔪᖅ 2-ᒧᐊᖅᑕᐅᓗᓂ ᑕᐃᑲᓃᖏᓐᓇᕐᓗᓂ ᑭᓯᐊᓂ ᑯᕕᑕᐅᔪᖕᓇᖅᓯᒃᐸᑦ ᐃᑎᕝᕙᓄᑦ ᓈᓪᒪᒋᔭᐅᓯᒪᔪᖅ ᐃᒪᕐᒧᑦ ᓱᐸᓗᓕᒃᑯᑦ, ᓂᕆᐅᒋᔭᐅᔪᖅ 2025-ᒥᑦ.

EXECUTIVE SUMMARY

This document presents an updated version of the Groundwater Management Plan for the collection, treatment, storage, and discharge of saline groundwater in accordance with the Nunavut Water Board (NWB) Amended Water Licence No. 2AM-MEL1631.

Agnico Eagle Mines Limited (Agnico Eagle) operates 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 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.

Tiriganiaq Underground Mine is planned to extend to approximately 700 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.

Saline water from the Tiriganiaq underground mine will be collected in underground sumps, transported to a clarification system, and subsequently recirculated for use in various underground operations such as make-up water for underground drilling. The remaining underground saline contact water will be pumped to surface to be managed and stored in Tiriganiaq Pit 2 until it can be discharged to Itivia Harbour via the approved Waterline, expected in 2025.

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AGNICO EAGLE

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	February 2018	All		In compliance with Agnico Eagle's Type A Water Licence 2AM-MEL1631, Part E, Item 14	Golder Associates Ltd. on behalf of Agnico Eagle Mines Limited
2	June 2018	4		In compliance with ECCC comments from 16 March 2018	Golder Associates Ltd. on behalf of Agnico Eagle Mines Limited
3.	December 2018	All		In compliance with Agnico Eagle's Type A Water Licence 2AM-MEL1631, Part E, Item 11	Agnico Eagle Mines Ltd.
		Exec Summary		Updated dates and quantities	
		2.4		Revised mine development plan bullets	
		3.3		Updated saline GW quality	
		3.4		Updated groundwater management strategies	
		4.1		Updated GW monitoring program quantity and quality data	
		4.4		Expanded table 5 monitoring to include SWTP	
4.	March 2019	All		In compliance with Agnico Eagle's amended No. 006 Project Certificate, Condition No. 25	Agnico Eagle Mines Ltd.
		Exec Summary		Updated to include discharge to sea approval	
		1	1-2	Update to include requirements of No. 006 Project Certificate Condition No. 25	
		2.4	5	Addition of SWTP and discharge to sea	
		3.1	6-7	Section revision	
		3.1.1	7-8	Addition of inflow model assumptions/uncertainties	
		3.2	8-9	Updated with discharge to sea	
		3.3	9-10	Interpretation added and table Aug-18 results corrected	
		3.4	11-15	Addition of discharge to sea and update of SWTP performance	
		3.6	16-18	Addition of mitigation measures under greater than expected inflows	
		4.2	19	Addition of second pumping line from UG	
		4.3	21-23	Addition of discharge to sea related sampling/monitoring	

Version	Date	Section	Page	Revision	Author
5.	March 2020	All		In compliance with Agnico Eagle's amended No. 006 Project Certificate, Condition No. 25	Agnico Eagle Mines Ltd.
		Exec Summary		General update to reflect updated Plan	
		2.4	15	Update high level mine plan, schedule, addition of SETP and RO	
		3.1	16-17	General section update, and updated groundwater inflow rates included	
		3.2	18-19	Updated saline water control structures	
		3.3	19-20	General section update/revision; moved water quality table to Appendix C	
		3.4	20-24	Section update to reflect changes to saline water management strategy	
		3.5	24	Section revision/update to include SP4, timeline details	
		3.6	-	Former Section 3.6 was updated and moved into other sections	
		4.1	25-27	General section revision/update, QAQC portion moved to Water Quality and Flow Monitoring Plan and can be found in QAQC plan	
6.	January 2021	All		In compliance with Commitment #5 from Technical Meeting held on November 30, 2020 for Amendment Application to the Water Licence No: 2AM-MEL1631	Agnico Eagle Mines Ltd.
		Exec Summary		General update to reflect updated Plan	
		3.1	17-21	Updated with further details, and relocated data reporting to the 2020	
		3.2	21-22	Annual Report Section update focussed on saline water control structures and pond storage	
		3.3	23-31	capacities Section update to reflect current saline water management strategy and to include grouting strategy and effectiveness, and viability discussion management strategies. Addresses Commitment 5 and 6 from the	
		3.5	32	Type A Water Licence Amendment Section revision/update to reflect current	
		4.1	34	schedule	
		Appx B	-	Removed SWTP water quality monitoring Simplified Underground Water	
		Appx C	-	Management Flow Sheet Diagram	

Version	Date	Section	Page	Revision	Author
		Appx C	-	Removed groundwater quality data reporting appendix. This information will be provided in the 2020 Annual Report. Added Grouting and Groundwater Storage information as per 2AM-MEL1631 Technical Meeting Commitment 6	
7	August 2021	All		Updated as per Part B, Item 13 of the Amended Water Licence	Agnico Eagle Mines Ltd.
		2.4	16	Updated Mine Development Plan	
		3.2	20	Updated section to reflect P-Area decommissioning	
		3.3	20	Moved viability discussion on the management strategies to subsection 3.3.4, included Tiriganiaq Pit 2 as current storage	
		3.3.2.4	23	Updated section to include the definition of significant variations in inflow rates which would indicate the need to recalibrate the model	
		4.1.2	29	Updated section and Table 6 to include flowmeter driven inflow calculation, underground to surface pipe sampling point, Tiriganiaq Pit 2	
		Appendix C	-	Removed Appendix C (Grouting effectiveness)	
8_NIRB	February 2022	All		Submitted to NIRB as part of the Meliadine Extension Final Environmental Impact Statement	Agnico Eagle Mines Limited
8_NWB	December 2022	All		Submitted to NWB as part of the Meliadine Extension Water Licence Amendment	Agnico Eagle Mines Limited
9	March 2023	3.1		Text edits on the Predicted Groundwater Volumes section	Agnico Eagle Mines Limited
		3.2		Update of current levels in Table 2	
		3.3.2.2		Text edits on section Saline Effluent Treatment, Storage and Haulage	
		3.3.2.4		Text edits on the section Medium-Term Mitigation Measures – Groundwater Monitoring and Grouting	
		3.3.3		Rephrasing	
		3.3.4		Text edits and number updates to Table 3	
		3.5		Updates to Table 4 Discharge Schedule	
10_NWB	January 2024	All		Submitted with the Meliadine Mine Water Licence Amendment (As of March 2024, the Water Licence Amendment was undergoing the application review.)	Agnico Eagle Mines Limited

Version	Date	Section	Page	Revision	Author
11	March 2024	All		General clarity, wording, and formatting.	Agnico Eagle Mines Limited
		2. (old)		Removed background section and added referral to Water Management Plan.	
		2		Added definitions of three water sources.	
		2.1		Added January 2024 groundwater model updated results.	
		2.1.1		Added reference for linearly reduced conductivity at depth statement.	
		2.2		Revised wording describing saline ponds.	
		2.3.1, 2.3.2, 2.3.3		Removed mitigation measures from each section (added to standalone section 2.3.4).	
		2.3.4		Combined mitigation measures.	
		3.3		Added thermal monitoring discussion. Added borehole instrumentation monitoring.	
		Figures		Removed outdated P&ID. Added simplified schematic of dewatering system.	

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
CP	Collection Pond
DDH	Diamond Drillhole(s)
EMPP	Environment Management and Protection Plan
EPZ	Enhanced Permeability Zone
EWTP	Effluent Water Treatment Plant
FEIS	Final Environmental Impact Statement
Licence	Type A Water Licence 2AM-MEL1631
GWMP	Groundwater Management Plan
MDMER	Metal and Diamond Mining Effluent Regulations
NIRB	Nunavut Impact Review Board
NPC	Nunavut Planning Commission
NWB	Nunavut Water Board
Mine	Meliadine Gold Mine
QA	Quality Assurance
QC	Quality Control
RO	Reverse Osmosis
SD	Support Document
SETP	Saline Effluent Treatment Plant
SP	Saline Pond
SSWQO	Site Specific Water Quality Objectives
SWTP	Saltwater Treatment Plant
TDS	Total Dissolved Solids
TSS	Total Suspended Solids
WMP	Water Management Plan
WRSF	Waste Rock Storage Facility

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) operates 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 the amended Project Certificate (No. 006) issued on March 2nd, 2022 by the Nunavut Impact Review Board (NIRB) in accordance with the Nunavut Agreement Article 12.5.12 and Nunavut Water Board (NWB) Type A Amended Water Licence (No. 2AM-MEL1631, 2016) issued by the NWB on May 13, 2021 and approved by the Minister of Northern Affairs on June 23rd, 2021.

Tiriganiaq Underground Mine is currently planned to extend to approximately 700 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.

Saline water from the Tiriganiaq underground mine will be collected in underground sumps, transported to a clarification system, and subsequently recirculated for use in various underground operations such as make-up water for underground drilling (Figure 1). The remaining underground saline contact water will be pumped to surface to be managed and stored in TIR02 until the approved Waterline is commissioned (expected 2025). Saline contact water will then be treated by the Saline Effluent Treatment Plant in the Water Treatment Complex (SETP-WTC) prior to discharge to Itivia Harbour via the Waterline.

1.1 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);
- Description of groundwater inflow forecasts and management strategies (SECTION 2); and
- Description of the groundwater monitoring program (SECTION 3).

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.

1.2 Background

The Meliadine site conditions, local hydrology and hydrogeology, as well as the mine development plan are presented in the Water Management Plan.

SECTION 2. GROUNDWATER MANAGEMENT

There are three major sources of water at the Mine requiring management under the Mine water management system: freshwater pumped from Meliadine Lake, natural runoff from precipitation, and natural groundwater inflow to the Underground Mine. For the purpose of clarity and consistency, terminology and definitions are applied to these three main sources as follows below.

- **Freshwater:** Water contained within natural water bodies (e.g., Meliadine Lake) which has not come into contact with mine infrastructure.
- **Surface Contact Water:** Rain and snowmelt that has come into contact with mine infrastructure.
- **Saline Contact Water:** Naturally occurring saline groundwater which has flowed into the underground mine and come into contact with underground mine infrastructure.

2.1 Predicted Groundwater Volumes

Planning and mitigations for management of groundwater relies upon predictions of groundwater that may report to the underground workings and then require further storage and management on surface. This section provides a summary of modelling work that has been completed to predict groundwater volumes.

In 2020, an environmental and socio-economic assessment was completed for a proposed increase of the discharge of treated groundwater effluent from the underground mine of the Tiriganiaq deposit into the marine environment near Rankin Inlet, by routing the treated groundwater effluent through waterlines. As a requirement of the Project Certificate No.006 T&C 25, Agnico Eagle provided a saline water management plan to address the potential for higher-than-predicted volumes of saline water inflows into the underground mine. The Groundwater Management Plan (Version 5) was issued on April 2020 using the 2019 groundwater inflow predictions and submitted under the 2020 FEIS Addendum for the “Saline Effluent Discharge to Marine Environment” project. The addendum was approved on January 31, 2022. Versions 6 and 7 of the Groundwater Management Plan were then submitted in compliance with Commitment #5 from the Technical Meeting held on November 30, 2020 for the Amendment Application to the Water Licence No: 2AM-MEL1631, and as per Part B, Item 13 of the Amended Water Licence, respectively. Nonetheless, the 2019 groundwater predicted inflows were still presented in these two versions.

Since 2019, additional data has been collected in support of the environmental review to document existing conditions and to provide the foundation for a qualitative and quantitative assessment of the operations and mine development. This additional data, documented in the Updated Summary of Hydrogeology Existing Conditions Report (WSP, 2024b), was used to update the numerical groundwater model.

Supplemental hydrogeological data was collected to enhance the understanding of hydrogeological conditions. This additional data is documented in the Updated Summary of Hydrogeology Existing Conditions Reports (WSP 2024b).

The numerical groundwater model was updated in January 2024 to include inflow results under an updated mine plan scenario and included a limited calibration based on groundwater inflow monitoring over previous years (WSP, 2024d).

A summary of the predicted groundwater inflow to the Tiriganiaq underground developments during operations for the base case, along with predicted TDS is presented in Table 1. Groundwater inflow to the Tiriganiaq Underground are predicted to increase from 450 m^3/day in 2024 to a peak inflow of 475 m^3/day between 2026 and 2031, with the exception of 2028.

The predictions presented in Table 1 represent the best estimate of groundwater inflow and groundwater TDS based on the measured data and the results of the limited model calibration. Since the groundwater inflows are being mitigated by active grouting, the predicted groundwater inflows incorporate the effects of grouting as grouting of the underground development is assumed to continue as part of future inflow predictions.

Table 1: Predicted Groundwater Inflow and TDS to the Underground Mine (2017 to 2033)

Year	Predicted Groundwater Inflow (m^3/day)	Predicted TDS (mg/L)
2023	300	57,500
2024	450	57,000
2025	450	57,000
2026	475	56,500
2027	475	56,500
2028	450	56,500
2029	475	54,000
2030	475	53,500
2031	475	53,500
2032	450	53,500
2033	450	53,500

2.1.1 Groundwater Inflow Predictions – Assumptions and Uncertainties

The shallow bedrock at the site is primarily within the frozen permafrost except in areas of taliks underlying lakes. The deeper competent bedrock has been subdivided into two separate units: Mafic Volcanic Rock formations and Sedimentary Rock formations. The Mafic Volcanic Rock formations are present between the Lower Fault and Pyke Fault and are inferred to transition to Sedimentary Rock formations to the east. Sedimentary Rock formations are present to the North of the Lower Fault, and

South of Pyke Fault. Synthesis of the hydraulic testing results up to the end of 2021, indicates that the Mafic Volcanic Rocks have lower hydraulic conductivity at depth. The supplemental data, however, show that the shallow and intermediate bedrock zones may be more permeable than the deeper bedrock (WSP 2024c).

In crystalline rocks, fault zones may act as groundwater flow conduits, barriers, or a combination of the two in different regions of the fault depending on the direction of groundwater flow and the fault zone architecture (Gleeson and Novakowski 2009). Within the mine area, three regional faults (North, Lower and Pyke) are present. In addition, ongoing monitoring of geological structures has led to the identification of 17 faults (i.e., KMS corridor, RM-175) that have been incorporated into the conceptual hydostratigraphy near the underground development. Each of these faults have been assumed to have enhanced permeability relative to the surrounding competent bedrock. The additional structures are generally located between the Lower Fault and Pyke Fault within the Mafic Volcanic Rock formations and range in thickness from 2 to 6 m. An exception is the KMS Fault corridor, located in the sedimentary rock formations to the north of the Lower Fault at the Tiriganiaq Underground. This corridor is a wider zone of rock located between the KMS Fault and Lower Fault that is associated with poor rock quality (WSP 2024c).

The hydraulic conductivity of the competent bedrock and faults is assumed to be linearly reduced by an order of magnitude between the top of the cryopeg and base of permafrost (zero-degree isotherm) (WSP 2024c). This assumption reflects that this portion of the permafrost, which will contain partially unfrozen groundwater due to freezing point depression, is expected to have reduced hydraulic conductivity relative to the unfrozen bedrock reflecting the presence of isolated pockets of frozen groundwater within this zone. These frozen zones will result in a decrease in the hydraulic conductivity of the rock compared to that of the entirely unfrozen rock (WSP 2024c).

In support of mine development, 2D thermal modelling was completed to update the predicted depth to the base of permafrost in the study area, to assess the extent of lake taliks and to determine whether continued mine development will remain within the permafrost limits (WSP 2024a). Results of the thermal modelling indicated:

- Open taliks were interpreted to be present beneath portions of each of the following lakes near the proposed open pits and undergrounds: Lake B4, Lake B5, Lake B7, Lake A6, Lake A8, and Lake CH6.
- Closed talik was interpreted below Lake D4 based on the 0-degree isotherm, however the lake is interpreted to potentially be connected to the regional groundwater flow system through the cryopeg zone. The depth of the base of permafrost was interpreted to be between 320 and 490 m depth, with the interpreted depth dependent on the proximity to nearby lakes. Shallower depths are from locations near to lakes both with and without open taliks.

It was conservatively assumed that the surface water/groundwater interaction at all lakes is not impeded by lower-permeability lakebed sediments that may exist on the bottom of some of these lakes (WSP 2024c).

Combined, the assumptions discussed above result in the following sources of uncertainty in the groundwater inflow model:

1. The properties of the faults assumed in the model are considered to be conservative based on supplemental testing in 2021 and their lateral extents and depths. The faults were also assumed to have enhanced permeability up to 2.5 kms away from the underground developments, and the width of the Lower Fault was increased to between 15 to 20 m to account for potential additional low RQD corridors along its length. These assumptions are considered conservative since the permeability and width of a fault zone can be heterogeneous along strike (Gleeson and Novakowski 2009) resulting potentially in zones of greater hydraulic conductivity along strike over short distances; whereas over longer distances the presence of zones infilled with fault gouge will act to decrease hydraulic connectivity along strike (WSP 2024c).
2. An increase in bedrock hydraulic conductivity by a factor of 2 can result in an increase of total saline groundwater inflow by approximately 54%. Overall, groundwater inflow for Tiriganiaq is the largest contributor of saline groundwater inflow to the underground, and uncertainty in these inflows will have the largest effect on water management planning (WSP 2024c).

2.2 Groundwater Management Control Structures

The Tiriganiaq underground workings will be operated below the base of continuous permafrost. The underground excavations act as a sink for groundwater flow during mining, with water induced to flow through the bedrock to the Underground Mine workings below the base of the permafrost and within the cryopeg.

The underground water management system is designed to prevent water from affecting the workings or production. The system contains a series of sumps (generally one at the access of each level) designed to capture groundwater inflows and runoff from mining operations (i.e., drilling), a clarification system, and a pumping system to redistribute the clarified saline contact water.

Saline water from the Tiriganiaq underground mine is collected in underground sumps, transported to a clarification system, and subsequently recirculated for use in various underground operations such as make-up water for underground drilling. The remaining underground saline contact water is pumped to surface to be managed and stored in TIR02 open pit until it can be discharge to sea via the approved Waterline following treatment by the SETP-WTC.

Other groundwater management infrastructure includes Saline Pond 1 (SP1) and Saline Pond 3 (SP3). SP1 was constructed in 2016 and was designed to manage excess saline water from the underground. However, due to its small volume in relation to Tiriganiaq Pit 2 (TIRI02), it no longer operates as a strict saline water storage pond. SP1 is instead used as a buffer pond for the feedwater of the Reverse Osmosis Plant (RO). More details regarding the RO can be found in the Water Management Plan. SP3 was constructed in 2019 and was designed to collect treated saline water from the Saline Effluent Treatment Plant (SETP) (a separate treatment facility from the SETP-WTC) prior to transfer via tanker trucks to the saline effluent discharge system at Itivia Harbour. This method of treatment and discharge is described in section 2.3.2.

A schematic of the underground dewatering system is provided in Appendix A. Pond capacities for storage of saline water and year of available storage are presented in Table 2.

Table 2: Saline Pond Storage Capacity at the Mine

SP/Sump	Maximum Water Capacity (m^3)	Occupied Capacity (Oct 2023) (m^3)
TIR02	1,616,554	613,378
SP1	32,686	4,151
SP3	7,985	0

2.3 Groundwater Management Strategies and Mitigations

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

- Short-term Strategy: Store saline contact water on site (Section 2.3.1)
- Medium-term Strategy: Treat saline groundwater for discharge to receiving environment in Melvin Bay via trucking (Section 2.3.2)
- Long-term Strategy: Treat saline groundwater for discharge to receiving environment in Melvin Bay via waterline (Section 2.3.3).

2.3.1 Short-Term Management Strategy

On-Site Groundwater Storage

This alternative was considered as part of the Type A Water Licence Application (2015) and has been implemented on site as part of the short-term management of groundwater inflows. It involves storing all excess groundwater in temporarily inactive underground developments and in dedicated surface saline water ponds at the Mine. TIRI02 is currently in use for storage of saline contact water on Site (Table 2) and will continue to be used for storage until it can be dewatered to Itivia Harbour following commissioning of the Waterline.

2.3.2 Medium-Term Management Strategy

Saline Effluent Treatment, Storage and Haulage

In August 2019, Agnico Eagle began discharge of treated effluent from the Saline Effluent Treatment Plant (SETP) to sea at Melvin Bay as per the NIRB Project Certificate 006 Amendment 001, issued in February 2019. In September 2020, the daily rate of discharge to Melvin Bay was elevated from 800 m^3/day to 1600 m^3/day.

Saline contact water in the underground mine is first treated for total suspended solids (TSS) underground through a Mudwizard system including decanting basins. Saline contact water from underground is then pumped to surface and stored in the surface saline ponds. From there, the saline contact water as well as other contact water is pumped to the SETP (a separate treatment facility from the SETP-WTC) for ammonia and TSS treatment. The SETP is designed to treat 1,600 m^3/day of saline water for TSS and ammonia. More details are available in Agnico Eagle (2020a). Following treatment, saline water is pumped to SP3 for storage prior to discharge.

Treated saline water stored in SP3 is hauled by tanker trucks to Itivia. Truck loads are up to 36 m^3 per truck and are unloaded using a flexible 4” HDPE suction pipe. The truck discharge pump transfers the treated effluent into the 6’’ discharge HDPE pipeline and through the diffuser.

Hauling operations were suspended in 2022 following approval of the waterline (section 2.3.3) under the Amendment 002 of the NIRB Project Certificate No. 006 issued on March 2nd, 2022 and sufficient saline storage capacity on site forecasted until 2026. The cessation of hauling operations also aims to minimize traffic, reduce dust emissions alongside the AWAR and mitigate trucking impacts to community.

Water treated by the SETP and discharged to the environment through either the waterline or punctual hauling operations, if required, will meet MDMER end-of-pipe discharge criteria and be non-acutely and non-chronically toxic as per regulated toxicity testing per the MDMER.

Pumping and Diffusion Plan

The discharge facility includes a 778 m pipeline extending to an engineered diffuser located 20 m below surface in Melvin Bay to ensure proper mixing and prevent interference with traditional activities. The saline effluent will be discharged in a controlled manner through the diffuser to allow for maximum diffusion and minimum environmental impact to the marine environment. Environmental monitoring is discussed in the Ocean Discharge Monitoring Plan.

2.3.3 Long-Term Management Strategy

Treated Groundwater Discharge to Melvin Bay at Itivia Harbour via a Waterline

Based on the current inventory of saline water storage capacity on site (Table 2), and forecasted groundwater inflows (Section 2.1), the proposed long-term strategy of discharging to Melvin Bay via a waterline will allow a more robust and flexible groundwater management system.

Specifically, the objective of the long-term strategy is to remove the need for permanent storage of water on site as a management strategy by providing discharge capacity to drain the saline ponds each year. Storage under the long-term strategy would only be required on a temporary basis to store winter accumulation of groundwater inflows to the Underground Mine. Application for the long-term strategy was submitted to the appropriate authorities in 2020 and approved under Project Certificate (No. 006) Amendment 002 issued on March 2nd, 2022 by the NIRB.

The discharge through the waterlines will follow the Adaptive Management Plan.

2.3.4 Groundwater Management Mitigations

Storage Increase

Upon the occurrence of greater than expected groundwater inflows to the underground mine, or delay in the implementation of the long-term management strategy (waterline discharge; Section 2.3.3), Agnico Eagle will consider expanding saline pond storage capacity until inflows can be reduced or treatment/discharge can manage inflows. Specifically, the mine plan as it relates to open pits can be adapted to provide additional storage.

Storage thresholds to trigger this adaptive management strategy have been set to allow ample time to make adjustments to the mine plan and to proceed through any applicable regulatory processes, if required. The following triggers are in place regarding increasing on-site storage as adaptive management:

- Occupied saline contact water storage capacity on site reaches 80% of total available saline contact water storage capacity; or
- Available saline contact water storage volume on site is expected to reach capacity within two (2) years.

When applying the collective short-, medium-, and long-term strategies together, it is not expected that either threshold will be reached.

Hydraulic Monitoring

As a strategy to support groundwater inflow modelling and monitor groundwater responses to mining, vibrating wire piezometers are currently installed in the rock mass surrounding the Underground Mine. These piezometers are currently and will continue to be applied to assess response of the groundwater pressure (pressure head) to groundwater inflows, and as calibration data for the groundwater inflow model (Section 2.1). The predictive capability of a groundwater inflow model enables additional mitigations measures to be implemented if predictions result in groundwater quantity or quality risks. The groundwater inflow model is also a key input to the global water balance model, which is used to guide infrastructure design for future project developments. An integrated approach using hydraulic monitoring information is also taken when assessing changes to the mine plan to ensure adequate storage capacity is available for groundwater inflows to the mine. This ensures groundwater within the system can be appropriately managed prior to treatment and discharge to sea.

Groundwater Quantity and Quality Monitoring

The groundwater monitoring program allows ongoing comparison of modelled water quantity/quality to realized trends. Details pertaining to the groundwater monitoring program are found in Section 3.

Non-contact groundwater samples as part of the groundwater monitoring program are used as tracers to identify trends and improve predictions regarding groundwater inflow chemistry. If non-contact groundwater samples collected indicate that TDS concentrations are more than 20% higher than the estimated 55,000 mg/L (Section 2.4), then water quality predictions for underground will be reviewed and updated, if required.

Similarly, observed groundwater inflow rates are compared to model predictions (Table 1) on a quarterly basis. If significant variations from model predictions are observed, revision of the assumptions/inputs behind the model will be considered and the model updated, if required.

Based on monthly averages over a window of six consecutive months, if observed variations between actual groundwater inflows and predicted values are 30% or higher, a recalibration of the model or an update of the inflow analysis will be performed. In addition, updates to the groundwater model may be required based on operational changes as the Underground Mine advances.

Fractured Bedrock Grouting

A refined grouting approach began in 2019 based on the premise of preventative grouting (cementing) having greater effectiveness over reactionary grouting, which in previous years would be triggered by intersecting water bearing fractures when carrying out drilling (production and exploratory) and blasting activities.

In developing underground workings, exploratory DDHs in areas of planned development are cemented prior to the advancement of the development. Furthermore, “Jumbo” holes (holes drilled by a Jumbo Drill) are drilled ahead of development and cemented specifically for the purpose of pre-development grouting. Combined, these grouting efforts act to reduce the potential for intersecting inflows with the increased surface area of the excavated heading. Where possible, residual inflows are then plugged on an as-needed basis in these areas. Inflows in blasted stopes and diffuse seeps are generally not able to be grouted and thus remain as active inflows to the underground workings.

The potential for intersecting water-bearing fractures is increased in production long holes (stopes), due to the increased surface area of the excavation and the proximity of the excavation to known water bearing structures. As such, during the drilling phase of stope production, a “grout curtain” is set in and around the stope to minimize the potential for inflows after blasting.

2.4 Groundwater Quality

The salinity of deep groundwater samples collected to date from the Meliadine Mine area are at the high end of what has been observed at other sites in the Canadian Shield at corresponding depths (Frape and Fritz 1987; Holden et al. 2009; Dominion 2014b). Water quality in deep groundwater samplings suggest the salinity remains consistent with depth following the transition from near surface freshwater. Salinity concentrations in deep groundwater at Meliadine are approximately 1.5 times that of sea water (35 g/L) (WSP 2024b).

Data collected from the underground diamond drill holes at Tiriganiaq are collected from depths between 230 and 475 mbgs, which are inferred to be located above the zero-degree isotherm (base of permafrost) based on thermal modelling, and therefore within the cryopeg. TDS within the cryopeg may be elevated relative to groundwater in unfrozen rock at similar elevations due the preferential freezing of ‘fresher’ water and is similar to the assumed TDS below the regional permafrost (approximately 55 g/L) (WSP 2024b).

SECTION 3. GROUNDWATER MONITORING PROGRAM

3.1 Water Quality and Quantity Monitoring

Water quantity and quality monitoring is an important part of the groundwater management strategy to verify the predicted water quantity and quality trends and conduct adaptive management should differing trends be observed.

The groundwater monitoring plan, summarized in Table 3, will be further defined as the Mine advances and will be conducted in agreement with the WMP for the Meliadine Mine. The locations of the monitoring points in relation to the underground dewatering system can be found in Figure 1.

Table 3: Groundwater Quantity and Quality Monitoring Plan

Monitoring Type	Monitoring Location	Purpose	Frequency
Verification	Underground Seeps	Quantity – Underground water balance approach to calculate groundwater inflow rate	Daily
Verification	Underground to surface pipe	Quality – Monitor quality of saline contact water entering saline storage	Monthly
Verification	SP1, Tiriganiaq Pit 02	Quality – Monitor quality of surface saline storage ponds	Monthly during saline discharge
Verification	Underground seeps/DDHs	Quality – Verify quality of groundwater flowing into underground mine	Quarterly

3.1.1 Water Quantity

Groundwater inflow rates to the Underground Mine are estimated by balancing flowmeter measured volumes of water pumped out of the underground mine with changes in total water storage underground. Additionally, estimations for smaller inflows and outflows such as rock haulage moisture content, backfill paste water bleed, and surface to underground inflows are applied to improve calculated inflow accuracy.

Excess underground saline contact water volumes transferred from the Underground Mine to storage ponds on surface are recorded at a flow meter located after the main pumping station from underground to surface. Furthermore, water volumes in storage ponds are tracked via water elevation surveys applied to volume-elevation curves.

Observed groundwater inflow rates are compared to model predictions (***Table 2***Table 1) on a quarterly basis. If significant variations from model predictions are observed, revision of the assumptions/inputs behind the model will be considered and the model updated, if required. Variations that would be considered significant and would indicate the need to consider recalibrating the model and updating the inflow analysis would correspond to when groundwater inflows to the mine, based on a monthly average of inflow over six consecutive months, is 30% higher than the predicted groundwater inflows.

3.1.2 Water Quality

Underground Contact Water

Underground saline contact water is sampled on a monthly basis at the locations identified in Table 3. All underground saline contact water sampling locations are analyzed for the following parameters: conventional parameters (specific conductivity, TDS, TSS, pH, hardness, alkalinity, total and dissolved organic carbon, turbidity), oil and grease, major ions, total and free cyanide, radium 226, dissolved and total metals (including mercury), nutrients (nitrate and nitrite, ammonia, Kjeldahl nitrogen, total phosphorus, orthophosphate) and volatile organic compounds (i.e., benzene, xylene, ethylbenzene, toluene, F2-F4 petroleum hydrocarbons). An additional sampling location was installed in 2021, located on surface and in-line of the underground to surface pumping line. This sampling location provides final representative water quality of underground saline contact water entering surface saline storage before it interacts with previously existing saline contact water on surface and any precipitation runoff inflows.

Underground saline contact water monitoring 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.

Non-contact Groundwater

Non-contact groundwater quality is monitored at mine seeps and/or DDH water intersects to verify the quality of groundwater flowing into the mine prior to contact. Flushing and sampling techniques used to ensure samples are taken without contamination are described in Section 2.2.3 of the Quality Assurance/Quality Control Plan. Samples are collected quarterly at a minimum but actual sampling frequency may be greater depending on rate of progress, frequency of water intersects, and observed trends in groundwater quality with time. DDH intersect water samples are analyzed for the following parameters: conventional parameters (specific conductivity, TDS, TSS, pH, hardness, alkalinity, total and dissolved organic carbon, turbidity), major ions, nutrients (nitrate and nitrite, ammonia, Kjeldahl nitrogen, total phosphorus, orthophosphate), radium 226, dissolved and total metals (including mercury). Non-contact groundwater quality data is provided in the Annual Report.

Non-contact groundwater samples as part of the groundwater monitoring program are used to identify trends and improve predictions regarding groundwater inflow chemistry. If non-contact groundwater samples collected indicate that TDS concentrations are greater or less than 20% than the estimated 55 g/L (Section 2.4), then water quality predictions for underground will be reviewed and updated, if required.

3.2 Hydraulic Monitoring

As a strategy to support groundwater inflow modelling and monitor groundwater responses to mining, vibrating wire piezometers are currently installed in the rock mass surrounding the Underground Mine. These piezometers are currently and will continue to be applied to assess response of the groundwater pressure (pressure head) to groundwater inflows, and as calibration data for the groundwater inflow model (Section 2.1).

3.3 Permafrost Terrain Monitoring

Agnico Eagle considers that existing T&C 12 of Project Certificate No.006 is sufficient to protect, mitigate, and monitor the permafrost terrain. Nonetheless, as the primary source of data for calibration and verification of thermal model results for permafrost characterization are temperature measurement from thermistor strings, the following monitoring activities will continue:

- Thermistors will continue to be installed when possible in exploration boreholes, especially boreholes close to planned underground development or beneath large lakes to confirm permafrost depth and talik characteristics.
- Data from a deep thermistor recently installed in an area farther away from lakes (to provide information about regional permafrost depth in areas not influenced by lakes) will continue to be collected and analyzed to assess thermal stability.
- Data from existing thermistors will continue to be collected and analyzed to assess thermal stability of the permafrost terrain.

Existing monitoring and follow-ups that have been implemented during construction and operation will continue to be carried forward through the life of mine.

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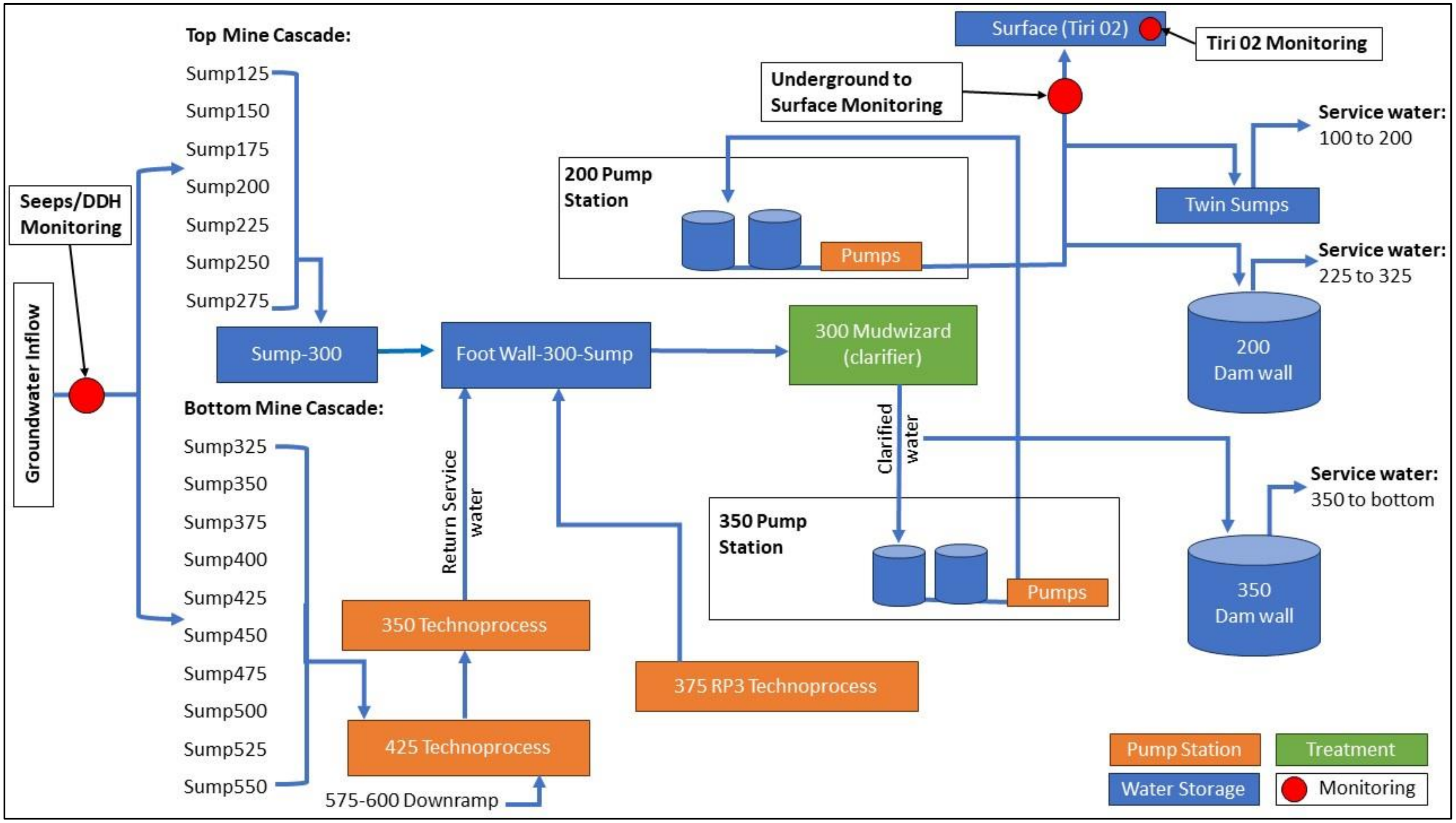
FIGURES

Figure 1: Simplified underground water management flow sheet diagram.



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