Appendix 33 : Management Plans

AGNICO EAGLE

MELIADINE GOLD MINE

Mine Waste Management Plan

MARCH 2021
VERSION 7
6513-MPS-09

ᐃᓈᖅᓯᒪᔪᖅ

ᐊᒡᓃᑯ ᐄᒍ ᐅᔭᕋᒃᑕᕆᐊᓕᕆᔨᒃᑯᑦ (ᐊᒡᓃᑯᒃᑯᑦ) ᒦᓐᓇ ᐊᐅᓛᖅᑎᑦᑎᔪᑦ ᑕᓯᕐᔪᐊᕐᒥᑦ ᒌᓗᒍᑦ ᐅᔭᕋᒃᑕᕆᐊᕐᒥᑦ (ᐅᔭᕋᒃᑕᕆᐊᖅ), 25 ᑭᓛᒥᑕᐃᑦ ᐅᐊᖕᓇᖕᖓᓂᑦ ᑲᖏᖅᖠᓂᕐᒥᑦ ᐅᖓᓯᒃᑎᒋᔪᖅ, ᐊᒻᒪᓗ 80 ᑭᓛᒥᑕᐃᑦ ᓂᒋᖅᐸᓯᐊᓂᑦ ᐱᖓᖕᓇᖅᐸᓯᐊᓂᑦ ᐃᒡᓗᓕᒡᒑᕐᔪᖕᒥᑦ ᐅᖓᓯᒃᑎᒋᔪᖅ ᑭᕙᓪᓕᕐᒥᑦ ᓄᓇᕗᒥᑦ. ᐅᔭᕋᒃᑕᕆᐊᕐᒧᑦ ᐸᕐᓇᐅᑎᒥᑦ ᐃᓚᐅᔪᑦ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖓᔪᖅ ᐊᒻᒪᓗ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔭᕋᒃᑕᕆᐊᑦ ᐱᕙᓪᓕᐊᔭᐅᓂᖓᓄᑦ ᑎᑎᕋᓂᐊᖅ ᒌᓗᑕᓕᒃ, ᒪᕐᑮᖕᓂᒃ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖓᔪᕐᑲᖅᓱᓂ (ᑎᑎᕋᓂᐊᖅ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖓᔪᖅ 1 ᐊᒻᒪᓗ ᑎᑎᕋᓂᐊᖅ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖓᔪᖅ 2) ᐊᒻᒪᓗ ᐊᑕᐅᓯᖅ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔭᕋᒃᑕᕆᐊᖅ.

ᓯᑕᒪᐅᓕᖓᔪᖅ ᐱᕙᓪᓕᐊᔭᐅᓂᖓ ᑎᑎᕋᓂᐊᖅ: 3.5 ᐅᑭᐅᓂᒃ ᓴᓇᔭᐅᓗᓂ (Q4 ᐅᑭᐅᖅ -5-ᒥᑦ Q2 ᐅᑭᐅᖅ -1-ᒧᑦ), 8.5 ᐅᑭᐅᓂᒃ ᐅᔭᕋᒃᑕᕆᐊᖅ ᐊᐅᓛᕐᓗᓂ (Q3 ᐅᑭᐅᖅ -1-ᒥᑦ ᐅᑭᐅᖅ 8-ᒧᑦ), ᐱᖓᓲᑦ ᐅᑭᐅᓄᑦ ᐅᒃᑯᐊᖅᐸᓪᓕᐊᓗᓂ (ᐅᑭᐅᖅ 9-ᒥᑦ ᐅᑭᐅᖅ 11-ᒧᑦ), ᐊᒻᒪᓗ ᐅᒃᑯᐊᖅᓯᒪᓕᖅᑎᓪᓗᒍ (ᐅᑭᐅᖅ 11-ᒥᑦ ᐅᖓᑖᓄᑦ). 15.4 ᒥᓕᔭᓐ ᑕᓐ-ᓗᐊᑦ ᐅᔭᕋᒃᑕᖅᑕᐅᔪᑦ ᐱᔭᐅᓂᐊᖅᑐᑦ. ᐅᔭᕋᒃᑕᖅᑕᐅᔪᑦ ᓱᖃᓪᓕᑎᖅᑕᐅᓗᑎᒃ 8 ᐅᑭᐅᓪᓗᐊᓄᑦ ᐅᔭᕋᒃᑕᕆᐊᖅ ᐊᐅᓛᕐᓂᖓᓂᑦ ᐱᐊᓚᑎᒋᓂᖓ 3,000 ᑕᓐ-ᓗᐊᑦ ᐅᐸᓗᑖᑦ ᐅᑭᐅᖅ 1-ᒥᑦ ᐅᑭᐅᖅ 3-ᒧᑦ ᐊᒻᒪᓗ 5,000 ᑕᓐ-ᓗᐊᑦ ᐅᐸᓗᑖᑦ ᐅᑭᐅᖅ 4-ᒥᑦ ᐅᑭᐅᖅ 8-ᒧᑦ.

ᐊᒃᑯᖅᑕᐅᔪᑦ ᐅᔭᖅᑲᐃᑦ ᐊᒻᒪᓗ ᐅᖓᑕᐅᑦᑎᔪᑦ ᓄᓇᒃᑰᕈᑎᒃᑯᑦ ᐊᓪᔭᖅᑐᖅᑕᐅᕐᑲᑦᑕᕐᓂᐊᖅᑐᑦ ᐊᒃᑯᖅᑕᐅᔪᑦ ᐅᔭᖅᑲᓄᑦ ᑐᖅᑯᖅᓯᓯᒪᕝᕕᖕᓄᑦ ᑭᓯᐊᓂ ᐃᓱᓕᑉᐸᑦ ᐅᔭᕋᒃᑕᕆᐊᑉ ᐊᐅᓛᕐᓂᖓ, ᐊᓪᔭᖅᑐᖅᑕᐅᕐᑲᑦᑕᕐᓗᑎᒃ ᒪᓕᒡᓗᒍ ᐊᐅᓛᕐᓂᕐᒧᑦ ᖃᖓᒃᑰᖓᔪᖅ. ᐱᖓᓲᑦ ᐃᓂᐅᔪᑦ ᐃᓂᐅᓂᐊᖅᑐᑦ ᐊᒃᑯᖅᑕᐅᔪᑦ ᐅᔭᖅᑲᓄᑦ ᑐᖅᑯᖅᓯᓯᒪᕝᕕᐅᓂᖏᓐᓄᑦ. ᐅᒃᑯᐊᕐᓂᖏᑦ ᐊᒃᑯᖅᑕᐅᔪᑦ ᐅᔭᖅᑲᓄᑦ ᑐᖅᑯᖅᓯᓯᒪᕝᕖᑦ ᐱᒋᐊᕐᓂᐊᖅᑐᖅ ᐊᔪᕐᓇᙱᓕᖅᐸᑦ ᐃᓚᒋᔭᐅᓗᓂ ᐅᑎᖅᑎᑎᓇᕙᓪᓕᐊᓂᕐᒧᑦ. ᐊᒃᑯᖅᑕᐅᔪᑦ ᐅᔭᖅᑲᓄᑦ ᑐᖅᑯᖅᓯᓯᒪᕝᕖᑦ ᖃᓕᖅᑕᐅᔾᔮᙱᑦᑐᑦ ᐊᒻᒪᓗ ᐱᕈᖅᑐᒃ ᐃᓪᓕᓇᔭᐅᖏᓪᓗᑎᒃ ᐊᒻᒪᓗ ᐃᓚᓯᓂᕐᒃᑲᓐᓂᔾᔮᙱᑦᑐᑦ ᒪᓕᒡᓗᒍ ᐅᒃᑯᐊᖅᐸᓪᓕᐊᓂᕐᒧᑦ ᐸᕐᓇᐅᑎ. ᐆᓇᕐᓂᕐᒥᒃ ᖃᐅᔨᓴᐃᔾᔪᑏᑦ ᐃᓕᔭᐅᓂᐊᖅᑐᑦ ᐊᒃᑯᖅᑕᐅᔪᑦ ᐅᔭᖅᑲᓄᑦ ᑐᖅᑲᖅᓯᓯᒪᕝᕕᖕᓄᑦ ᖃᐅᔨᓴᕐᓂᐊᕐᓗᒋᑦ ᖁᐊᖑᐃᓐᓇᐅᔭᖅᑐᓕᐅᕐᓃᑦ.

15.4 ᒥᓕᔭᓐ ᑕᓐ ᕿᒪᒃᑎᑦᑐᓂᑦ, 10.9 ᒥᓕᔭᓐ ᑕᓐ-ᓗᐊᑦ ᓴᓗᒪᐃᔭᐃᔾᔪᑎᖃᖅᑐᑦ ᕿᒪᒃᑎᑦᑐᑦ ᐃᓕᔭᐅᓂᐊᖅᑐᑦ ᕿᒪᒃᑎᑦᑐᓄᑦ ᑐᖅᑯᖅᓯᓯᒪᕝᕕᖓᒧᑦ ᐸᓂᖅᓱᑎᒃ ᑲᑎᓯᒪᔪᑦ ᕿᒪᒃᑎᑦᑐᑦ, ᐊᒥᐊᒃᑯᐃᓪᓕ 4.5 ᒥᓕᔭᓐ ᑕᓐ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᑦ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᕿᑯᓕᖅᑕᐅᓗᓂ. ᕿᒪᒃᑎᑦᑐᓄᑦ ᑐᖅᑯᖅᓯᓯᒪᕝᕕᒃ ᒪᕐᑮᖕᓂᕐ ᐃᓂᖃᖅᑐᖅ, ᐊᐅᓛᖅᑎᑕᐅᓂᐊᖅᑐᑦ ᐊᑕᐅᓯᐅᖃᑦᑕᕐᓗᒋᑦ ᐅᒃᑯᐊᖅᐸᓪᓕᐊᓂᐊᕐᓗᓂ ᐅᔭᕋᒃᑕᕆᐊᖅ ᐊᐅᓛᕐᓂᖓᓂᑦ. ᐃᓚᖓ ᖄᓕᒃ ᐅᖓᑕᐅᑦᑎᔪᓂᑦ ᐊᒻᒪᓗ ᐊᒃᑯᖅᑕᐅᔪᑦ ᐅᔭᖅᑲᐃᑦ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᑦ ᕿᒪᒃᑎᑦᑐᓄᑦ ᑐᖅᑯᖅᓯᓯᒪᕝᕕᒃ ᐅᒃᑯᐊᖅᑕᐅᓂᖓᓄᑦ. ᐆᓇᕐᓂᕐᒥᒃ ᖃᐅᔨᓴᐃᔾᔪᑏᑦ ᐃᓕᔭᐅᓂᐊᖅᑐᑦ ᖃᐅᔨᓴᕐᓂᐊᕐᓗᒋᑦ ᖁᐊᒃᑲᓐᓂᖅᑲᑦᑕᕐᓃᑦ ᐊᒻᒪᓗ ᖁᐊᖑᐃᓐᓇᐅᔭᓕᐅᓇᓂᕐᒧᑦ.

ᐊᒃᑯᖅᑕᐅᔪᑦ ᐅᔭᖅᑲᓄᑦ ᑐᖅᑯᖅᓯᓯᒪᕝᕖᑦ ᐊᒻᒪᓗ ᕿᒪᒃᑎᑦᑐᓄᑦ ᑐᖅᑯᖅᓯᓯᒪᕝᕕᒃ ᑰᖅᑭᒃᑕᐅᓯᒪᔪᑦ ᐊᒻᒪᓗ ᐊᐅᓛᖅᑎᑕᐅᓗᑎᒃ ᒥᑭᓛᒃᑯᖅᑎᓐᓂᐊᕐᓗᒋᑦ ᐊᕙᑎᒥᒃ ᐊᒃᑐᖅᓯᓃᑦ ᐊᒻᒪᓗ ᐃᓱᒪᒋᐸᓗᒋᑦ ᓄᓇ ᐊᒻᒪᓗ ᓄᓇᒧᑦ ᐃᓚᒋᔭᐅᔪᑦ ᐊᔪᙱᓐᓂᐊᕐᓂᖏᓐᓄᑦ. ᓄᓇᐅᑉ ᖃᓐᖓᓂ ᑯᕕᔪᖅ ᐊᒻᒪᓗ ᐃᒪᕐᒥᑦ ᑯᕕᓂᐅᔪᖅ ᑐᖅᑯᖅᓯᓯᒪᕝᕕᖕᖓᓂᑦ ᓱᐸᓗᒃᑰᖅᑎᑕᐅᓂᐊᖅᑐᑦ ᐊᒻᒪᓗ ᑲᑎᑕᐅᓗᑎᒃ ᐃᒪᕐᒥᒃ ᑲᑎᖅᓱᐃᓂᕐᒧᑦ ᑕᓯᕋᔭᖕᓂᑦ. ᐃᒪᐅᑉ ᖃᓄᐃᓐᓂᖓ ᑎᑭᐅᑎᙱᑉᐸᑦ ᑯᕕᑎᑦᑎᓂᕐᒧᑦ ᐊᑐᓇᐊᓕᖕᒥᑦ ᒪᓕᒡᓗᒍ Type A ᐃᒪᕐᒧᑦ ᓚᐃᓴᓐᓯ 2AM-MEL1631-ᒥᑦ ᐱᔭᕆᐊᓕᒃ, ᑲᑎᑕᐅᔪᖅ ᐃᒪᖅ ᐱᓕᕆᐊᖑᓂᐊᖅᑐᖅ ᑯᕕᑎᑕᐅᓂᐊᓵᕐᓗᓂ ᓯᓚᒧᑦ.

EXECUTIVE SUMMARY

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

There are four phases to the development of Tiriganiaq: 3.5 years construction (Q4 Year -5 to Q2 Year -1), 8.5 years mine operation (Q3 Year -1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forward). Approximately 15.0 million tonnes (Mt) of ore will be produced. The produced ore will be milled over approximately 8 years of mine life at a rate of approximately 4,550 tonnes per day (tpd) in Year 1 to Year 4 and 5,850 tpd in Year 5 to year 7. In Year 8, the stockpile and remaining ore production will be mined.

Waste rock and overburden will be trucked to the waste rock storage facilities (WRSFs) until the end of mine operation, with distribution according to an operation schedule. Three areas have been identified as the WRSFs. Closure of the WRSFs will begin when practical as part of the progressive reclamation program. The WRSFs will not be covered and vegetated and no additional re-grading activity will be required under the closure plan. Thermistors will be installed within the WRSFs to monitor permafrost development.

Of the 15.0 Mt of tailings produced, about 10.9 Mt of filtered tailings will be placed in the tailings storage facility (TSF) as dry stack tailings, while the remaining 4.0 Mt will be used underground as cemented paste backfill. The TSF consists of two cells, which will be operated one by one to facilitate progressive closure during mine operation. A layer of overburden and waste rock will be used for the TSF closure. Thermistors installed within the facility will monitor freeze-back and permafrost development.

The WRSFs and TSF were designed and will be operated to minimize the impact on the environment and to consider geotechnical and geochemical stability. The surface runoff and seepage water from the storage facilities will be diverted via channels and collected in water collection ponds (CPs). If the water quality does not meet the discharge criteria as per the Type A Water Licence 2AM-MEL1631 requirement, the collected water will be treated accordingly prior to being discharged to the receiving environment.

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Tables in Text

APPENDIX A • FIGURES

DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	April 2015			First draft version of Mine Waste Management Plan as Supporting Document for Type A Water Licence Application, submitted to Nunavut Water Board for review and approval	Tetra Tech EBA Inc.
2	June 2016	1.1, 1.2, 1.3 3.3 5.5, 6.1, 9.1, 9.2	1-2 12-15 22-24 34-35; 37-38	Update to reflect issuance of the Type A Water Licence. Removal of original Section 1.3 as was specifically linked to the application. Update to reflect receipt of Type A Water Licence The Plan updated to comply with Part B Section 13, and Part F Sections 12, and20 of the Type A Water Licence 2AM-MEL1631 and commitments made during the licensing process.	Golder Associates Ltd.
3	March 2018			Minor revisions	Environment, Engineering Departments
4	December 2018	All 1.3 3.1, 3.2 4.1, 4.3, 4.4 4.2 5.2, 5.4 5.5, 5.6 6.1 7 8.2 9.2 Appendix A	All 11,14 20-23 24, 27-28 29 30-32 33-35 36-38 43 46-47 50-52	Plan update in response to approved TSF Design Report (6515-583-163-REP-001) Update of production timeline Update of tailing quantities Update of closure cover material values Inclusion of temporary waste rock stockpile for construction of saline pond 2 (Figure 4.1.1; Tables 4.1.1, 4.1.2, 4.1.3) Update of TSF design, parameters and schedule Update of tailings placement plan dimensions within each cell of TSF Update of Water Management based on TSF design report (6515-583-163-REP-001) and infrastructure updates Minor dust management revision Updates to closure plan based on approved TSF design report (6515-583-163-REP-001) Monitoring program update based on Type A Water Licence 2AM-MEL1631 requirements and TSF design report (6515-583-163-REP-001) Figs 1.2, 5.1, 5.4 updated. Add Figs 5.2, 5.3	Environment Department
5	March 2019	Table 1.1 Table 4.2, 4.3, 5.1		Updated according to current status Update quantities according to the latest mine plan	Environment Department

		6.1.1 and 6.1.3		Catchment ponds name changes	
		4.1 T 4.1.3 8.1	26 31 45	Name Change from MMER to MDMER	
6	March 2020	All	All	Update to reflect Meliadine operational status from Project to Mine; Major revisions throughout	Engineering, Environment Departments
7	March 2021	All	All	Update to reflect Meliadine operational status Update quantities according to latest mine plan	Engineering, Environment Departments

ACRONYMS

ABA	Acid Base Accounting
Agnico Eagle	Agnico Eagle Mines Limited
ARD	Acid Rock Drainage
CP	Collection Pond (or Control Pond or Containment Pond)
CRA	Commercial, Recreational, and Aboriginal
DFO	Department of Fisheries and Oceans Canada
EWTP	Effluent Water Treatment Plant
FEIS	Final Environmental Impact Statement
IFC	In for Construction
MDMER	Metal and Diamond Mining Effluent Regulation
MEND	Mining Environment Neutral Drainage
ML	Metal Leaching
MWMP	Mine Waste Management Plan
NIRB	Nunavut Impact Review Board
NML	Non-Metal Leaching
NPAG	Non-Potential Acid Generating
NPR	Net Potential Ratio
NWB	Nunavut Water Board
PAG	Potential Acid Generating
PGA	Peak Ground Acceleration
Project	Meliadine Gold Mine Project
SFE	Shake Flask Extraction
TSF	Tailings Storage Facility
WRSF	Waste Rock Storage Facility

UNITS

%	percent
°C	degrees Celsius
°C/m	degrees Celsius per meter
cm/s	centimetre per second
ha	hectare
kPa	kilopascal
km	kilometre(s)
L	liter(s)
m	metre
mg	milligram
m/s	metre per second
mm	millimetre
mm/h	millimetre per hour
m^2/year	square metre(s) per year
m^3	cubic metre(s)
Mm^3	million cubic metre(s)
t	tonne
t/m^3	tonne per cubic metre
Mt	million tonne(s)
µm	micrometre

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Ltd. (Agnico Eagle) operates the Meliadine Gold Project (the Mine) located approximately 25 kilometres (km) north of Rankin Inlet (Figure 1.1), Nunavut, 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 amended Project Certificate issued by the Nunavut Impact Review Board (NIRB) in accordance with the Nunavut Land Claims Agreement Article 12.5.12 on February 26, 2019 (NIRB, 2019) and the Type A Water Licence No. 2AM-MEL1631 (the Licence) issued by the Nunavut Water Board (NWB) on April 1, 2016 (NWB, 2016). This report presents an updated version of the Mine Waste Management Plan (MWMP). The purpose of this update is to incorporate changes related to mine waste management at the Mine.

1.1 Waste Management Objectives

The waste management objectives are to minimize potential impacts to the environment during all phases of mining. The purpose of the MWMP is to provide information to applicable mine departments (Environment, Engineering, Mine, Energy and Infrastructure, etc.) for sound mine waste management practices, proposed and existing infrastructure, and provide strategies for water management (runoff), dust control and monitoring programs.

Mine waste management structures (tailings storage, waste and overburden storage) are utilized to contain and manage mine waste from areas affected by mining activities. Measures have been implemented for the Mine Construction and Mine Operation phases.

1.2 Management and Execution of the Mine Waste Management Plan

Revisions of the MWMP can be initiated by changes in the Mine Development Plan (Mine Plan), operational performance, personnel or organizational structure, regulatory or social considerations, and/ or design philosophy. The MWMP will be reviewed annually by Agnico Eagle and updated as necessary.

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 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 meters.

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.

2.1.1 Local Hydrology

The Mine is located within the Meliadine Lake watershed. Meliadine Lake has a water surface 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 two outflows that drain into Hudson Bay through two separate river systems. It has a drainage area of 560 km^2 upstream of its two outflows. Most drainage occurs via the Meliadine River, which originates at the southwest 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.

2.1.2 Ice and Winter Flows

Late-winter ice thicknesses on freshwater lakes in the Mine area range between 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 (freshet) typically begins in mid-June and is complete by early July (Golder, 2012b).

2.1.3 Spring Melt (Freshet) and Freeze-up Conditions

With the exception of the main outlet of Meliadine Lake, which has been observed to flow continuously throughout the year, outlets of waterbodies near the Mine typically start flowing late May or early June, followed by freshet flows in mid-to-late-June. Flows steadily decrease in July and low flows are ongoing from August to the end of October, prior to winter freeze.

2.1.4 Permafrost

The Mine is located in an area of continuous permafrost. The depth of permafrost 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 3 m adjacent to the lakes. The typical permafrost ground temperatures at the depths of zero annual amplitude (typically at the depth of below 15 m) 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, 2012b).

2.1.5 Local Hydrogeology

Groundwater characteristics at areas of continuous permafrost that are generally present in the Mine area include the following flow regimes:

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

From late spring to early autumn, when temperatures are above 0 ˚C, the shallow active layer thaws. Within the active layer, the water table is projected to be a subdued replica of topography. Groundwater in the active layer flows to local depressions and ponds that drain to larger waterbodies. The talik beneath large waterbodies will be open. The open talik will connect to the deep groundwater flow regime beneath the permafrost.

Elongated waterbodies with terraces 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. Meliadine Lake and Lake B7 are likely to have open taliks connected to the deep groundwater flow regime (Golder, 2012a). No impact is expected to Lake B7 by mine activities.

2.1.6 Subsurface Conditions

The general subsurface conditions of the various waste facilities is similar. Typically, a thin veneer of organic material overlays ice-rich silty sand or sandy silt, gravely sand and silt, with traces of clay, shells, cobbles and boulders. The overburden thickness ranges between 1.3 m to 13.6 m. Excess ice and ice layers have been observed in many of the boreholes where recovery was possible.

Soil porewater salinity tests (Tetra Tech EBA, 2013a) indicated that the overburden soils at the mine site may have a porewater salinity of 4 to 12 parts per thousand.

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, 2009a).

2.1.7 Seismic Zone

The mine site is situated in an area of low seismic risk. The peak ground acceleration (PGA) for the area was estimated using seismic hazard calculator from the 2010 National Building Code of Canada website (http://www.earthquakescanada.nrcan.gc.ca/hazard-alea/interpolat/index_2010-eng.php). The estimated PGA is 0.019 g for a 5% in 50-year probability of exceedance (0.001 per annum or 1 in 1,000 year return) and 0.036 g for a 2% in 50-year probability of exceedance (0.000404 per annum or 1 in 2,475 year return) for the area.

SECTION 3 • MINE WASTE DEVELOPMENT

3.1 Mine Development Plan

The Mine Plan and key mine development activities, including water management, are currently used concurrently with the MWMP.

The Mine Plan includes one underground mine (Tiriganiaq Underground Mine) and two open pits (Tiriganiaq Open Pit 1 and Tiriganiaq Open Pit 2) for the development of the Tiriganiaq gold deposit.

The Mine is expected to produce approximately 15.0 million tonnes (Mt) of ore, 32.8 Mt of waste rock, 8.0 Mt of overburden waste, and 15.0 Mt of tailings. The following phased approach is proposed for the development of the Tiriganiaq gold deposit;

- Phase 1: 3.5 years for Mine Construction (Q4 Year -5 to Q2 Year -1);
- Phase 2: 8.5 years for Mine Operations, beginning in 2019 (Q2 Year -1 to Year 8);
- Phase 3: 3 years Mine Closure (Year 9 to Year 11); and;
- Phase 4: Post-Closure (Year 11 forward).

Mining facilities on surface include a plant site and accommodation buildings, ore stockpiles, a temporary overburden stockpile, a tailings storage facility (TSF), three waste rock storage facilities (WRSFs), a water management system that includes containment ponds, water diversion channels, retention dikes/berms, and a series of water treatment plants. The general mine site layout plan is shown on Figure 3.1, while Table 3.1 provides the key mine development activities and sequence.

Table 3.1: Key Mine Development Activities and Sequence

Mine Year	Mine Development Activities and Sequence
Q4 of Yr -5 (2015)	• Started construction of industrial pad • Developed ramp to Tiriganiaq underground mine • Constructed portion of rock pad for stockpiles to store ore from Tiriganiaq underground ramp development
Yr -4 (2016)	• Continued construction of industrial pad • Constructed and operated the temporary landfill • Started temporary storage of waste rock in the future WRSF2 footprint for construction purposes
Yr -3 (2017)	• Constructed and utilized Type A landfarm • Constructed and began operation of Type A landfill • Erected and closed all main buildings except crusher, paste plant and crushed ore storage • Erected incinerator • Erected and operated effluent water treatment plant (EWTP) • Installed fuel tanks 3 ML and 250 kL at Portal1 • Erected fuel tank 13.5 ML in Rankin
Yr -2 (2018)	• Started construction of Ore Storage Pad 2 (OP2) • Erected and closed crusher paste plant and crushed ore storage buildings • Erected fuel tank 20 ML in Rankin • Erected fuel tanks 6 ML and 250 kL at industrial pad • Started process commissioning at end of Q4

Mine Year	Mine Development Activities and Sequence
Yr -1 (2019)	• Completed industrial pad • Completed construction of OP2 • Started to place filtered tailings in Cell 1 of tailings storage facility (TSF) at end of Q1 • Started full capacity ore processing early Q2 • Created temporary waste rock storage area within footprint of Tiriganiaq Pit 2 from construction of Saline Pond 2 (SP2) • Began placement of waste materials from Saline Pond 4 (SP4) in waste rock storage facility 1 (WRSF1)
Yr 1 (2020)	• Place waste rock from temporary storage within footprint of Tiriganiaq Pit 2 to construct haul roads for open pits and to WRSFs • Create temporary waste rock storage area between footprints of Tiriganiaq Pits 1 and 2 from construction of SP4 • Start to mine Tiriganiaq Pit 2 • Begin placement of waste materials from Tiriganiaq Pit 2 within WRSF3
Yr 2 (2021)	• Start to mine Tiriganiaq Pit 1 • Pause mining of Tiriganiaq Pit 2 • Place overburden from Tiriganiaq Pit 1 in WRSF1 • Continue placement of waste materials from Tiriganiaq Pit 2 in WRSF1 • Construct temporary overburden stockpile to store the selected ice-poor overburden that will be used for progressive reclamation of TSF
Yr 3 (2022)	• Continue placement of waste materials from Tiriganiaq Pit 1 in WRSF1 • Begin placement of waste materials from Tiriganiaq Pit 1 into WRSF2
Yr 4 (2023)	• Start to place filtered tailings in Cell 2 of TSF • Stop placement of waste rock in WRSF1 when design capacity reached •
Yr 5 (2024)	• Place final closure cover on top of tailings surface in Cell 1 of TSF • Stop placement of waste rock in WRSF3 when design capacity reached
Yr 6 (2025)	•
Yr 7 (2026)	• Stop mining of Tiriganiaq Pit 1 when the open pit reaches design elevation •
Yr 8 (2027)	• Stop Tiriganiaq underground operation when underground mine reaches design elevation • Stop placing waste materials in WRSF2 when design capacity reached • Process the ore from OP2 until all stored ore is processed • Decommission underground mine surface openings as needed

* Restarting mining activities at Tiriganiaq Pit 2 in year 8 pends necessary approvals of the waterline discharge line to sea. These details are discussed in the Long-Term Management Strategy of the *Groundwater Management Plan*

3.2 Mine Waste Development Plan

3.2.1 Mine Waste Designation and Destination

Three mine waste streams will be produced: waste rock, tailings, and overburden material.

The term "waste rock" designates all fragmented rock mass that has no economic value and needs to be stored separately. Waste rock is also commonly referred to as "mine rock" in the mining industry. Typically, waste rock is produced during the initial stripping and the subsequent development of open pits and underground workings.

The term "overburden" designates all soils above the bedrock that need to be stripped at surface prior to developing the open pits. Generally, the overburden at the site consists of a thin layer of organic material overlying a layer of non-cohesive soil with variable amounts of silt, sand, and gravel.

Tailings are the processed material by-product of the gold recovery process and generally comprise of sand, silt, and clay sized particles.

The overall usage or destination of the three mine waste materials is presented in Table 3.2, while Figure 3.2 provides a graphical representation of the mine waste management flow sheet.

Table 3.2: Summary of Mine Waste Tonnage and Destination

<table>
<tr><th>Mine Waste Stream</th><th colspan="2">Estimated Quantities</th><th>Waste Destination</th></tr>
<tr><td rowspan="3">Overburden</td><td colspan="2" rowspan="3">8.0 Mt</td><td>Temporary storage in the Overburden Stockpile ~ 0.1 Mt for reclamation of TSF</td></tr>
<tr><td>Closure and site reclamation for the TSF</td></tr>
<tr><td>Co-disposed with waste rock within WRSFs</td></tr>
<tr><td rowspan="3">Waste Rock</td><td colspan="2" rowspan="3">32.8 Mt</td><td>Infrastructure construction (surface and underground)</td></tr>
<tr><td>WRSFs</td></tr>
<tr><td>Closure and site reclamation for the TSF</td></tr>
<tr><td rowspan="2">Tailings</td><td rowspan="2">15.0 Mt</td><td>10.9 Mt</td><td>As dry stack tailings placed in the TSF</td></tr>
<tr><td>4.0 Mt</td><td>Used in underground mine as cemented paste backfill</td></tr>
</table>

3.2.2 Tiriganiaq Development Schedule and Quantities

The Tiriganiaq gold deposit will be developed using traditional open-pit and underground mining methods. Two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and an underground mine (Tiriganiaq Underground) will be developed.

The following mining development sequence is planned:

- Tiriganiaq underground will be developed and operated from Year -5 to Year 8;
- Tiriganiaq Pit 2 will be mined from Year 1 to Year 2; and Year 8
- Tiriganiaq Pit 1 will be mined from Year 2 to Year 7.

Table 3.3 summarizes the schedule and quantities of mine waste to be mined from the open pit and underground mining operations.

Table 3.3: Summary of Mine Waste Production Schedule and Bank Quantities (V13_LOM)

Year	Mine Year	Mine Waste and Ore from Underground (t)		Mine Waste and Ore from Tiriganiaq Pit 1 (t)			Mine Waste and Ore from Tiriganiaq Pit 2 (t)		
		Waste Rock	Ore	Overburden	Waste Rock	Ore	Overburden	Waste Rock	Ore
2019	Yr-1	482,736	1,108,666	**334,383*	--	--	77,301	236,219	--
2020	Yr1	608,134	1,293,507	554,830	853,138	--	800,001	2,542,260	109,392
2021	Yr2	752,762	1,419,941	2,509,167	2,183,795	351,724	--	1,277,528	96,845
2022	Yr3	766,881	1,539,406	1,475,910	2,949,025	392,216	--	--	--
2023	Yr4	763,776	1,518,200	2,202,851	2,636,857	214,150	--	--	--
2024	Yr5	738,946	1,567,279	610	5,612,196	453,207	--	--	--
2025	Yr6	641,971	1,441,130	--	5,247,225	865,346	--	--	--
2026	Yr7	486,599	1,448,511	--	2,198,145	727,977	--	--	--
2027	Yr8	--	--	--	--	--	--	1,812,679	444,849
Total (t)		**5,241,805**	**11,336,639**	**7,077,751**	**21,680,382**	**3,004,620**	**877,302**	**5,868,686**	**651,086**

* *Includes approximately 142,446 of overburden from various excavation work constructed 2016-2018 (CP3, CP4, SP2 etc.)*

SECTION 4 • WASTE ROCK AND OVERBURDEN MANAGEMENT

Overburden and waste rock will be co-disposed within the same facilities, with the overburden being encapsulated within the rock to increase overall stability. Geochemically, both materials are similar in that neither requires a means to prevent oxidation. Waste material from underground and the open pits will be trucked to the designated storage facilities, end-dumped and spread into lifts.

4.1 Expected Waste Rock and Overburden Quantities and Distribution

4.1.1 Waste Rock Quantities and Distribution

Approximately 32.8 Mt of waste rock will be mined from the open pits and underground mine operations, with the majority of the waste rock produced (about 24.9 Mt) to be placed and stored within the designated WRSFs. The remaining 7.8 Mt of waste rock will be used for other purposes, including: about 2.6 Mt backfilled to the underground mine, 2.8 Mt of waste rock will be used for construction activities (including thermal protection and aggregate production to support the open pits), and 2.4 Mt of waste rock will be used as TSF closure cover material.

The production schedule, quantities, and distribution of waste rock by year is presented in Table 4.1.

Table 4.1: Schedule, Quantities, and Distribution of Waste Rock by Year

Year	Mine Year	Total Waste Rock from Mine Operation (t)	Utilization of Waste Rock (t)			Waste Rock to be Placed in WRSFs(t)		
			Surface Construction / Thermal Protection	Rockfill for Underground Backfill	TSF Closure Cover	WRSF1	WRSF2	WRSF3
2019	Yr -1	718,955	355,753	90,024	141,154	--	--	--
2020	Yr 1	4,003,532	244,412	316,982	162,246	748,978	--	2,530,915
2021	Yr 2	4,214,085	539,276	331,278	167,514	3,176,018	--	--
2022	Yr 3	3,715,905	332,035	325,422	207,033	2,498,915	352,500	--
2023	Yr 4	3,400,634	615,565	240,982	262,033	131,893	235,000	1,915,161
2024	Yr 5	6,351,142	220,831	330,793	453,041	--	1,841,609	3,504,869
2025	Yr 6	5,889,196	262,505	367,427	290,411	--	4,968,853	--
2026	Yr 7	2,684,745	100,000	242,488	240,339	--	2,101,917	--
2027	Yr 8	1,812,679	100,000	310,783	86,950	--	1,314,946	--
2028	Yr 9	--	50,000	--	386,515	--	(436,515)	--
	Total (t)	**32,790,873**	**2,820,375**	**2,556,180**	**2,397,235**	**6,555,804**	**10,378,311**	**7,950,944**
	Volume (m^3)	**17,441,954**	**1,500,200**	**1,359,670**	**1,275,125**	**3,478,130**	**5,520,378**	**4,229,226**

4.1.2 Overburden Quantities and Distribution

Approximately 8.0 Mt of overburden will be produced, with about 7.9 Mt of overburden being co-disposed within the WRSFs. The remaining, approximately 0.1 Mt, will be stored in a temporary overburden stockpile that will be used as cover material for progressive closure and reclamation of the TSF area. The approximate quantities and proposed placement location of the overburden is presented in Table 4.2.

Table 4.2: Schedule, Quantities, and Distribution of Overburden by Year

Year	Mine Year	Total Overburden from Mine Operation (t)	Overburden Stockpile for TSF Closure Cover (t)	Overburden to be Placed in WRSFs (t)		
				WRSF1	WRSF2	WRSF3
2019	Yr -1	411,683	--	319,821	--	--
2020	Yr 1	1,354,831	--	572,937	--	781,894
2021	Yr 2	2,509,167	--	2,486,015	--	23,152
2022	Yr 3	1,475,910	--	--	1,475,910	--
2023	Yr 4	2,202,851	--	--	2,202,851	--
2024	Yr 5	610	37,163	--	(36,553)	--
2025	Yr 6	--	--	--	--	--
2026	Yr 7	--	--	--	--	--
2027	Yr 8	--	--	--	--	--
2028	Yr 9	--	74,326	--	--	--
Total (t)		**7,955,052**	**111,489**	**3,378,773**	**3,642,208**	**805,046**
Volume (m^3)		**4,910,526**	**3,031,189**	**2,085,662**	**2,248,277**	**496,942**

4.2 Waste Rock Storage Facility Locations

The design locations of the WRSFs took into consideration the environmental, social, economic, and technical aspects of waste rock management, including maintaining minimum distances between the toe of the WRSFs and the open pits, haul and access roads and adjacent lakes.

To achieve the above considerations, three areas were identified for the combined storage of waste rock and overburden material as shown in Figure 3.1. These areas can be described as follows:

- WRSF1: located north of Tiriganiaq Pit 1;
- WRSF2: located south of CP1; and
- WRSF3: located north of Tiriganiaq Pit 2.

In addition to the permanent WRSFs, two temporary waste rock storage pads will be generated in the area around the future open pits: one from construction of Saline Pond 2 (within the Tiriganiaq Pit 2 footprint) and one from construction of Saline Pond 4 (between the Tiriganiaq Pits 1 and 2 footprints). The material from these temporary facilities will be used for construction of haul roads, access roads and thermal protection of the saline ponds and open pits. Details of the temporary facilities are provided in Section 4.2.4 of this plan.

4.2.1 Waste Rock Storage Facility 1

WRSF1 will occupy an area of approximately 30.7 ha and will be located to the north of Tiriganiaq Pit 1. One small shallow pond (Pond A17) is located within the footprint of WRSF1 and will be covered by the facility as shown in Figure 4.3. The pond is less than 2 m deep and freezes to the bottom annually during the winter season. This pond does not provide habitat for fish designated as commercial, recreational, or aboriginal (CRA) fish species (Golder 2015).

A portion of overburden and waste rock from the SP4 excavation (within Tiriganiaq Pit 1 footprint) and waste rock from underground will be placed in WRSF1 in Year -1 and Year 1. The majority of WRSF1 construction however, will occur from Year 2 to Year 4, when the facility will accommodate all of the overburden from Tiriganiaq Pit 1 and a portion of the waste rock. WRSF1 is expected to reach its design capacity in Year 4.

The detailed design report and issued for construction (IFC) construction drawings for WRSF1 (Agnico Eagle, 2019) were approved by the Nunavut Water Board in February 2020. The waste rock volumes in the 2020 MWMP have been updated to reflect the detailed design volumes.

4.2.2 Waste Rock Storage Facility 2

The proposed WRSF2 is located to the south of CP1 (previously Pond H17) with an approximate footprint of 20.2 ha. Five small ponds (Ponds A58, H8, H9, H10, and H11) are located within the footprint of WRSF2 as shown in Figure 4.3. Pond A58 has been used since 2016 as the P-Area and will be fully covered and the other four ponds will be partially covered by waste rock. All five ponds are less than 2.0 m deep and freeze to bottom during the winter. Of the five ponds impacted by WRSF2, only nine-spined stickleback were caught in Ponds A58 and H10. These ponds do not provide habitat for fish designated as CRA fish species and the nine-spine stickleback is not considered to be a species supporting the CRA fisheries (Golder 2015).

WRSF2 will accommodate overburden and waste rock produced from Tiriganiaq Pit 1 from Year 3 to Year 7 and Tiriganiaq Pit 2 in year 8..

Detailed design and construction drawings for WRSF2 will be prepared for submission and approval to the Nunavut Water Board prior to Q4 2021.

4.2.3 Waste Rock Storage Facility 3

WRSF3 is located to the north of Tiriganiaq Pit 2, and will fully cover former Lake H20 and partially cover former Lake H19 with an approximate footprint of 22.7 ha as shown in Figure 4.3. The runoff water from WRSF3 will be collected within Pond CP6 (former Pond H19). Maximum water depths for former Lakes H19 and H20 were 1.4 m and 1.6 m, respectively. No fish species were found in these two lakes and both were partially dewatered in the fall of 2019 to begin permafrost aggradation.

WRSF3 will accommodate all waste material from Tiriganiaq Pit 2 in Years 1, as well as portions of waste rock from Tiriganiaq Pit 1 in Year 4 and Year 5 until capacity is reached.

The detailed design report and IFC construction drawings for WRSF3 (Agnico Eagle, 2020a) were submitted to the Nunavut Water Board for approval in Q1 2020. The waste rock volumes in the 2020 MWMP have been updated to reflect the detailed design volumes.

4.2.4 Temporary Waste Rock Stockpiles (Saline Pond 2 and Saline Pond 4)

As part of the strategy to manage excess groundwater infiltration of saline water within the underground portion of the mine, Agnico Eagle applied to the Nunavut Impact Review Board for approval to discharge saline water to the sea (Melvin Bay, Rankin Inlet). Agnico Eagle received approval from the Minister for the project.

Based on adaptive management strategies, the mine recognized the requirement for additional surface saline water storage ponds in 2019. Saline Pond 2 (SP2) was constructed within the footprint of Tiriganiaq Pit 2 (Figure 4.4) in Q2 2019 with the purpose of accommodating excess saline water from the Underground Mine until treatment and discharge to sea performance was sufficient to dewater surface saline storage. Construction of SP2 required the extraction of approximately 92,320 m^3 (bank volume) of waste rock which was temporarily stored immediately east of SP2, within the Tiriganiaq Pit 2 footprint. Monitoring for seepage and/or runoff from the temporary waste rock stockpile was undertaken in accordance with Type A Water License. The waste rock was sampled and tested during and after the construction process and was indicated to have a low potential for acid generation and metal leaching.

SP2 was decommissioned in Q2 2020 and was replaced by Saline Pond 4 (SP4). The addition of SP4 allows both the mining of Tiriganiaq Pit 2, as well as additional surface saline water storage due to continued groundwater infiltration to the underground workings. Once construction of SP4 was complete, the water contained within SP2 will be transferred to SP4.

Like SP2, SP4 will be temporary in nature and constructed in bedrock within the footprint of Tiriganiaq Pit 1 (Figure 4.4). A bank total of 249,708 m^3 of overburden was removed during construction, with this material being transported and placed within WRSF1. The haul roads to accommodate this phase of SP4 construction, as well as the thermal rockfill covering to protect the overburden excavation, were built using the temporary stockpile of SP2 waste rock. The remainder of the SP2 waste rock stockpile was utilized to construct access to the CP6 and WRSF3 areas, as well as complete the road access from the open pits to the primary crusher.

In addition to overburden, the excavation of SP4 generated approximately 305,393 m^3 (bank volume) of waste rock, a portion of which was temporarily stockpiled between the footprints of Tiriganiaq Pit 1 and Tiriganiaq Pit 2. This material was used as thermal protection of the overburden slopes of Tiriganiaq Pit 2. The remainder of the rock from the SP4 excavation will be placed as overburden protection on WRSF1 during 2021. As with the temporary waste rock stockpile from SP2, the temporary stockpile from SP4 will be monitored for seepage and/or runoff and the excavated waste rock is being sampled and tested for ARD/ML potential.

4.3 Waste Rock Storage Facility Design Parameters

Table 4.3 summarizes some of the key physical parameters used for the design of the WRSFs. These parameters reflect the detailed design for WRSF1 and WRSF3, while the parameters for WRSF2 are from the Final Environmental Impact Statement (FEIS). Each WRSF will be constructed in a similar fashion, with material placed in controlled lifts. The side slopes of each lift of material will be at the angle of repose, while the overall side slopes of each facility will be determined by stepping in each lift of material. Figure 4.1 shows the general evolution over time of WRSF3, while a typical cross section of WRSF1 is provided in Figure 4.2.

Table 4.3: Design Parameters for Waste Rock Storage Facilities

Design Parameters	WRSF1	WRSF2	WRSF3
Maximum height of each overburden and waste rock bench (m)	5	15	5
Side slope of each lift of waste rock	Angle of repose (approximately 1.2H:1V)		
Typical width of the horizontal offset between adjacent waste rock lifts (m)	16.5	15-20	14.5
Average overall side slopes of each WRSFs (from bottom toe of first lift to top crest of final lift)	3(H):1(V)	2.3(H):1(V)	3(H):1(V)
Side slope for each lift of overburden	Angle of repose (approximately 1.8H:1V)		
Typical width of horizontal offset between adjacent overburden lifts (m)	20.5	10.0	NA
Internal overburden setback distance from toe of WRSF for the first lift (m)	40	82	70.8
Maximum crest elevation above the sea level (masl)	112.0	102	97.0
Assumed waste rock in place bulk density (t/m^3)	1.88		
Assumed overburden in place bulk density (t/m^3)	1.62		

Based on the above design criteria, the WRSFs will provide a 5.6 Mm^3, 3.6 Mm^3, and 4.7 Mm^3 design capacity for WRSF1, WRSF2, and WRSF3, respectively.

Due to the upcoming license amendment, storage of any excess waste rock will be accounted for in the license amendment infrastructure. In parallel, Agnico Eagle will utilize an adaptive, performance-based management system of the WRSFs. Opportunities to increase the capacity of the facilities may present themselves dependent on the mining sequence and on-going analysis of the foundation soils.

4.4 Anticipated Design Performance of WRSFs

Updated slope stability analyses for WRSF1 and WRSF3 was conducted during the detailed design of these facilities. Using the geometric parameters presented in Section 4.3, the results of the stability analysis indicates that the calculated minimum factors of safety for the WRSFs meet or exceed the industry and Agnico Eagle acceptable factors of safety.

Thermal analyses were also updated to estimate the thermal regime of the WRSFs and foundations during mine operations and after closure. Although the results for both facilities indicate that material placed in the winter period will likely stay in a frozen condition while the material placed in the summer period will eventually freeze back, the stability of both facilities is closely linked to the temperatures of the underlying ground.

4.5 Waste Rock and Overburden Deposition

The general construction sequence of the WRSFs will be as follows:

- A topographical survey of the original ground will be conducted, and stakes placed to mark the dumping limits;
- Overburden and/or waste rock will be hauled and end-dumped to its designated location. The material will be spread after dumping with a dozer and track-packed. Side slopes of each lift will be the natural angle of repose.

Various strategies to promote freeze-back and permafrost development will be deployed, including:

- Snow/ice removal prior to material placement over either original ground or an existing lift;
- Overburden placement of first couple lifts restricted to 2.5 m maximum height and will only be placed when underlying ground is frozen

Temperatures within the waste and the underlying ground will be closely monitored throughout the operational lifespan of the facilities and will be discussed in further detail in Section 9.0. An adaptive, performance-based management approach will be applied to the WRSFs and opportunities to increase the capacities may present themselves depending on the mining sequence and foundation temperatures.

4.6 Additional Waste Material Placed in WRSFs

Although the WRSFs were designed to accommodate mine waste materials, additional waste matter may also be periodically deposited within the core of the facilities. This additional waste will not affect the freeze-back or stability of the facilities and will be approved for placement by the geotechnical engineer. It is expected that this additional waste will consist of:

- Solid STP material. Agnico Eagle invested in a screw press technology in 2019 to remove approximately 85% of the water from the treated sewage. The remaining semi-solid product will be placed and covered with overburden/waste rock in the WRSFs under Section 3.2 of the Sewage Treatment Plant (STP) Operation and Maintenance Manual (Agnico Eagle, 2017). The volume of sewage material will be recorded on a monthly basis, pursuant to Part I Item 9h of the Type A Water License 2AM-MEL 1631.
- Limited volumes of liquid STP material. During planned and unplanned maintenance on the STP screw press, liquid sludge will be produced. This material will also be placed within the WRSFs as per the bullet above.

SECTION 5 • TAILINGS MANAGEMENT

Tailings generated by mill production at Meliadine will be dewatered by pressure filtration to a solids content of approximately 85% by weight. The filtered tailings will have the consistency of damp, sandy silt and will be transported by haul truck to either the paste plant for use underground as backfill or for placement and storage in the TSF in a process conventionally referred to as “dry stacking”.

5.1 Expected Quantities and Distribution

5.1.1 Tailings Quantities and Distribution

Commissioning of the process plant started near the end of Q4 2018 and actual production commenced in early Q2 2019. Approximately 15.0 Mt of tailings will be produced over an 8.5-year period. Approximately 10.9 Mt or 75% of the tailings will be deposited within the TSF and the remaining 3.7 Mt or 25% will be used as underground cemented paste backfill.

The current production schedule, quantities, and distribution of tailings by year are presented in Table 5.1.

Table 5.1: Schedule, Quantities, and Distribution of Tailings by Year (V13_LOM)

Year	Mine Year	Tailings Solids from Mill (t)	Tailings Solids to be Used as Underground Backfill (t)	Tailings Solids to be Placed in Dry Stacked TSF (t)
2019	Yr -1	976,706*	113,892*	862,814*
2020	Yr 1	1,393,722	301,469	1,092,253
2021	Yr 2	1,709,500	435,000	1,274,500
2022	Yr 3	1,770,250	479,226	1,291,024
2023	Yr 4	1,770,250	506,723	1,263,527
2024	Yr 5	2,013,000	455,671	1,557,329
2025	Yr 6	2,190,000	396,948	1,793,052
2026	Yr 7	2,190,000	525,904	1,664,096
2027	Yr 8	978,918	857,385	121,533
Total (t)		**14,992,346**	**4,072,219**	**10,920,127**

* *As-built Quantities from 2019 updated based on latest available data*

5.1.2 Waste Rock Quantities and Distribution

The expected quantities of waste rock to be placed at the TSF as progressive cover material and yearly distribution are provided in Sections 4.1.1 and 8.2.

5.1.3 Overburden Quantities and Distribution

The expected quantities of overburden to be placed as closure cover and distribution are provided in Sections 4.1.2 and 8.2.

5.2 Tailings Storage Facility Location

The TSF is located on high ground west of the proposed mill and east of Lake B7, as shown in Figure 3.1. The direct distance from the mill to the tailings stack ranges from 400 to 800 m. The minimum setback distance from the edge of Lake B7 is approximately 200 m.

5.3 Tailings Storage Facility Design Parameters

Detailed design of the TSF (Agnico Eagle, 2018) utilizes tailings placement in a two (2)-cell system (Figure 5.1). The two-cell system (Cell 1 and Cell 2) is designed to limit dust generation, control tailings surface erosion, and to facilitate the progressive reclamation and closure of the TSF. As the tailings reach final elevation, the tailings will be progressively encapsulated with either waste rock or a layered combination of waste rock and overburden. A typical cross section is shown in Figure 5.2.

Table 5.2 summarizes some of the key physical parameters used for the design of the TSF.

Table 5.2: Design Parameters for the Tailings Storage Facility

Parameters	Value
Average height of TSF over original ground surface	33 m
Side slope for lower placed tailings (or below elevation 80.2 m)	4H:1V
Side slope for upper placed tailings (or above elevation 80.2 m)	3H:1V
Slope of the final tailings surface at crest	4%
Final top tailings surface area (Cell 1)	46,359 m^2
Final bottom tailings surface area (Cell 1)	179,741 m^2
Final top tailings surface area (Cell 2)	84,655 m^2
Final bottom tailings surface area (Cell 2)	149,632 m^2
Assumed moisture content of tailings to TSF	17.6%
Minimum target dry density of compacted tailings	1.65 t/m^3

Based on the above design criteria, the TSF has a capacity for 6.62 Mm^3 (10.9 Mt) of filtered tailings.

5.4 Anticipated Design Performance of TSF

The TSF is designed to minimize the impact to the environment and the design does not rely on freeze-back of the tailings to meet the design intent of the structure. However, the freeze-back of the TSF and the foundations will provide additional benefits such as increasing stability and minimizing seepage from the TSF during operation and closure of TSF.

The stability analysis of the TSF indicates that the calculated minimum factors of safety meet or exceed the acceptable factors of safety. Thermal analysis predicts that the majority of tailings will be frozen after the closure cover is placed and will remain frozen for many years after mine closure.

5.5 Tailings Deposition

Generally, deposition at the TSF consists of the following sequence:

- Tailings placement started from Cell 1 in the first quarter of Year -1. The filtered tailings are hauled to the TSF Cell 1 with haul trucks, end dumped, and bladed into lifts of maximum height 0.3 m using a dozer. Each tailings lift is then compacted using a vibratory drum roller. This compaction is intended to promote runoff, reduce the potential for oxygen ingress and water infiltration, and maintain geotechnical stability.
- A starter waste rock berm was initially placed along the outside perimeter to contain the initial lifts of the tailings; the berm will become a part of the closure cover. Additional lifts of compacted waste rock (with a maximum lift thickness of 1 m) are placed as the tailings surface is brought up as erosion and thermal protection. Safety berms are placed on each lift of the waste rock that also help to reduce dust generation from the tailings surface.
- Surface water or excess snow/ice is removed from the natural ground within the footprint prior to tailings placement.

Table 5.3 presents the yearly schedule of deposition per cell, as well as the average height of tailings placed in each cell.

Table 5.3: Tailings Placement Schedule and Estimated Tailings Heights (V13)

Year	Mine Year	Tailing Solids to be Placed in Dry Stack TSF (t)		Estimated Avg. Height of Tailings Placed Per Cell (m)		Planned Tailings Placement Period	
		Cell 1	Cell 2	Cell 1	Cell 2	Cell 1	Cell 2
2019	Yr -1	862,814*		3.2*		Jan to Dec	
2020	Yr 1	1,092,253		7.2		Jan to Dec	
2021	Yr 2	1,274,500		11.9		Jan to Dec	
2022	Yr 3	1,291,024		23.1		Jan to Dec	
2023	Yr 4	582,450	681,077	33.0	2.5	Jan to Jul	Aug to Dec
2024	Yr 5		1,557,329		8.2		Jun to Dec
2025	Yr 6		1,793,052		18.1		Jan to Dec
2026	Yr 7		1,664,096		30.1		Jan to Dec
2027	Yr 8		121,533		33.0		Jan to Aug
Total		**5,103,041**	**5,817,086**				

* *As-built Quantities from 2019 updated based on latest available data*

In order to promote freeze-back, the initial lift of tailings over original ground has been placed during winter conditions. An adaptive, performance-based management approach has been used at the TSF to adapt the yearly deposition strategy to actual mill and paste plant production quantities.

Ground temperatures are closely monitored throughout the year to measure freeze-back of the facility. Temperature data indicates that despite an increase in the estimated average yearly height of tailings placed in each cell from design assumptions for the first two years of operations, freeze-back of the facility is occurring and no performance-related issues have been observed to date.

5.6 Additional Waste Materials Placed in TSF

Due to the design specifications regarding placement of the tailings and waste rock at the facility, generally no other waste materials will be placed in the TSF during its operational life. Exceptions must be approved by the geotechnical engineer and include:

- Used filter cloths from the Mill. These cloths are collected from the process plant and brought periodically to the TSF for placement. Each cloth is unrolled and placed flat on the tailings surface before backfilling with tailings material as per specified; and
- Limited volume of STP sludge. A temporary decantation pond was constructed and used for storage of STP sludge in Cell 2 during 2019. This pond was decommissioned in Q2 2020 by covering with waste rock. Tailings placement continued over the decommissioned pond as per the deposition plan.

SECTION 6 • WATER MANAGEMENT ASSOCIATED WITH MINE WASTE MANAGEMENT

The water management objectives for the Project are to minimize potential impacts to the quantity and quality of surface water at the site. Seepage and runoff water from the waste management facilities will be managed with water diversion channels, water retention dikes/berms, and water collection ponds.

Additional details regarding the water management systems and infrastructures can be located in the *Water Management Plan* (Agnico Eagle, 2020b).

6.1 Water Management Associated with WRSFs

As shown in Figure 3.1, WRSF1 straddles three catchment areas (catchment of CP1, catchment of Pond CP5, and catchment of Lake B7). WRSF2 will straddle two catchment areas (catchment of CP1 and catchment of CP5), and WRSF3 will be located within the catchment area of CP6.

Seepage and runoff from the WRSFs during construction and operation phases will be managed using the water management system described below:

- Seepage and runoff from WRSF1 within the catchment of CP1 will be diverted to CP1 via Channels 1, 7 and 8;
- Seepage and runoff from WRSF1 within the catchment of CP5 will be diverted to CP5 via Channel 5;
- Seepage and runoff from WRSF1 within the catchment of Lake B7 will be diverted and collected in CP4 via Channel 4;
- Seepage water and runoff from WRSF2 within the catchment of CP1 will be diverted to CP1 via Channel 1 and Channel 7 or flow directly into CP1;
- Seepage water and runoff from WRSF2 within the catchment of CP5 will potentially be diverted to CP5 via Channel 6 (tentative);
- Seepage and runoff from WRSF3 will directly report to CP6; and
- The water collected in CP4, CP5, and CP6 will be pumped to CP1, where it will be treated by the EWTP prior to discharging to the outside environment.

6.2 Water Management Associated with TSF

The TSF is located within the catchment of Lake B7 with a small portion straddling the water catchment of CP1, as shown in Figure 3.1. Water sources from the TSF during construction and operation will be managed as follows:

- Seepage and runoff from the placed filtered tailings within the CP1 catchment will stream through Culverts 1, 18, 2 and 3 to deposit in CP1;

- Seepage and runoff within the Lake B7 catchment will be collected in Pond CP3 either directly or via Channel 3. CP3 water quality will be monitored; and
- Water within CP3 will be pumped to H13 where it will flow through Culvert 2, Channel 1, and Culvert 3 into CP1.

SECTION 7 • DUST MANAGEMENT ASSOCIATED WITH MINE WASTE MANAGEMENT

The possible sources of dust related to the waste rock, overburden, and filtered tailings management during construction, operation, and closure include:

- Site preparation prior to placement of waste materials i.e., stripping, excavation and/or placement of foundation pad;
- Wind erosion of fine particles from the WRSFs and TSF surface;
- Vehicle traffic dislodging fine particles from the surface of WRSFs and TSF, and associated service and haul roads to WRSFs and TSF;
- Waste rock, overburden, and filtered tailings handling and transfer - loading, hauling, unloading, placement and compaction; and
- Placement of closure and capping layers.

Dust suppression measures, which are considered to be typical of the current mine practices (i.e. Meadowbank Complex) and consistent with best management practices, will be considered through design, operation and closure phases to control the dust.

Minimal site preparation is required for the WRSFs and the TSF during the construction phase. Therefore, dust from this source is not expected to be problematic.

Dust is expected to be a minor issue during the operation of the WRSFs as the waste rock produced at the mine generally comprises large pieces of rock that is not be susceptible to wind erosion. Although overburden contains material that is fine-grained and thus more susceptible to wind erosion, the plan is to store the majority of the overburden materials within the core of the WRSFs. Dust from the overburden materials is therefore not expected to be a concern.

The surface compaction of the filtered tailings lifts and limiting traffic over the compacted surface will significantly reduce the potential for wind erosion of the tailings surface. Dust related to TSF operation during the winter season will be further managed by limiting the exposed surface area of the tailings. Other control measures considered in the design of TSF to minimize dust generation include:

- Placement of waste rock cover over the final perimeter tailings slope surface as soon as possible. Safety berms around the perimeter of the waste rock slopes are expected to both trap dust from leaving the TSF and cut exposure of the tailings surface to wind erosion;
- TSF will be operated by cells to limit the tailings surface area exposed to wind and facilitate progressive closure;
- Consideration of prevailing north-northwest wind direction by development of the southern portion of Cell 1 first and progression northward;
- Tailings surface will be covered progressively once it reaches the design elevation; and
- Flat side slope of 4(H):1(V) for the TSF was adopted to minimize the erosion potential and maintain overall stability of the tailings stack;

- Using snow to cover inactive surface of TSF to reduce exposed tailings surface area;
- Potential usage of approved chemical dust suppressant.

Dust generated from vehicles travelling on the surface of the associated access roads will be controlled principally by spraying water on the traffic area, and potentially by applying an approved chemical dust suppressant to the area which will be carried out regularly by mine services during dry periods in the summer. Watering the haul and access roads is only possible when temperatures are above freezing. When the temperature is below freezing, dust suppression using water or chemicals will pose a safety hazard for travel; therefore, reducing the speed limit will be the principal way of controlling dust during these periods. More details on the dust management for traffic are described in the *Roads Management Plan* (Agnico Eagle, 2020c).

Other control measures considered in design and operation related to dust generation by vehicles travelling include:

- Roads will be designed as narrow and short as possible while maintaining safe construction and operation practices;
- Coarse size rock will be used as much as possible for road construction;
- Roads will be regularly graded to mix the fines found on the road surface with coarser material located deeper in the roadbed; and
- As required, roads and travel areas will be topped with additional aggregate.

Dust from material handling is not expected to be problematic on site. Long end dumps, which can generate significant amounts of dust, will not occur since waste rock, overburden and filtered tailings will be dumped in lifts and spread with a dozer. Where possible, multiple handlings of materials that have the potential to generate dust will be avoided. However, should dust related to material handling occur on site, specific control measures will be evaluated and applied, as required.

At closure, the TSF will be fully covered to prevent further wind erosion of the tailings. The proposed closure cover includes a layer of 0.5 m thick overburden followed by a layer of 2.5 m thick waste rock on the top of the facility. The TSF closure slopes cover includes a 3.7 m to 4.2 m thick waste rock layer depending on the elevation. The overburden will be surrounded by waste rock in the WRSFs; therefore, dusting is not expected to be an issue. The need for dust control at closure will be further evaluated during closure activities.

SECTION 8 • RECLAMATION AND CLOSURE OF THE WRSFs AND TSF

Detailed mine closure and reclamation activities are provided in the Interim Closure and Reclamation Plan (SNC-Lavalin, 2019). The plan was submitted in December 2019 as per the Water License requirement part J item 1. The plan was approved in March 2020.

Key mine development activities during the closure process are summarized in Table 8.1.

Table 8.1: Key Mine Development Activities and Sequence during Closure

Mine Year	Mine Development Activities and Sequence
Yrs 9-11 (2028 to 2030)	• Place final closure cover on top of tailings surface in Cell 2 (Yr 9) • Decommission non-essential mine infrastructure and support buildings (Yrs 9 and 10) • Start monitoring and maintenance (Yr 9)
Post Closure	• Continue monitoring and maintenance until Yr 18 (2037)

Progressive reclamation includes closure activities that take place prior to permanent closure in areas or at facilities that are no longer actively required for current or future mining operations. Reclamation activities can be done during operations with the available equipment and resources to reduce future reclamation costs, minimize the duration of environmental exposure, and enhance environmental protection. Progressive reclamation may shorten the time for achieving reclamation objectives and may provide valuable experience on the effectiveness of certain measures that might be implemented during permanent closure. The WRSFs and TSF will be operated to facilitate progressive reclamation. Closure and reclamation activities of these facilities will use currently accepted management practices and appropriate mine closure techniques that will comply with accepted protocols and standards.

Monitoring will be carried out during all stages of the mine life to demonstrate geotechnical stability and the safe environmental performance of the facilities (Section 9). If any non-compliant conditions are identified, then maintenance and planning for corrective measures will be completed in a timely manner to ensure successful completion of the Mine Closure and Reclamation Plan.

8.1 Closure and Reclamation of WRSFs

Geochemical testing indicates that the waste rock and overburden from the Tiriganiaq area is non-potentially acid generating (NPAG) and non-metal leaching (NML). Kinetic tests completed on all waste rock types and at various scales show that drainage water quality is expected to meet MDMER monthly mean effluent limits, including results for arsenic. Therefore, a closure cover system is not proposed for the WRSFs.

The WRSFs were designed for long-term stability and no additional re-grading will be required at closure. It is anticipated that the native lichen community will naturally re-vegetate the surface of the WRSFs over time.

8.2 Closure and Reclamation of the TSF

Results of geochemical characterization indicates that most of the tailings produced to-date at the mine fall under the "uncertain" category, while ML has not been observed to be an issue. Despite thisclassification, the TSF is not considered to pose an ARD risk due to the placement methodology used, assumption of freeze-back within the facility and progressive reclamation cover placement.

Specifically, the closure plan for the TSF is to progressively place an engineered cover over the tailings surface. The current closure cover design includes the following:

- A minimum thickness of 4.5 m waste rock cover over the lower toe of the final tailings side slopes and a minimum thickness of 4.0 m waste rock cover over the upper side slopes; and
- A minimum thickness of 2.5 m waste rock cover over 0.5 m thick select overburden till fill over the top surface of final tailings. The top closure cover material will be placed when each cell reaches its operational capacity and sloped 4% to discourage ponding and surface infiltration.

Waste rock cover will consist of 600 mm minus NPAG waste rock. Select overburden till will be placed and compacted in an unfrozen condition over the top surface of the tailings. The till material is intended to reduce surface infiltration and will consist of inorganic, sandy silt or silty sand with a fines content of 20% to 60% and maximum particle size of 300 mm.

The expected quantities and schedule of TSF cover materials is presented in Table 8.2.

Table 8.2: Summary of TSF Cover Material Quantities during Mine Operations

Year	Mine Year	Volume of Waste Rock Placed on Side Slopes (m^3)	Volume of Waste Rock Placed on Final Top Surface (m^3)	Total Volume of Waste Rock Placed as Closure Cover (m^3)	Total Volume of Overburden Placed on Top Surface (m^3)
2019	-1	75,082*	--	75,082*	--
2020	1	86,301	--	86,301	--
2021	2	89,103	--	89,103	--
2022	3	110,124	--	110,124	--
2023	4	139,379	--	139,379	--
2024	5	117,037	123,942	240,979	22,940
2025	6	154,474	--	154,474	--
2026	7	127,840	--	127,840	--
2027	8	21,663	--	21,666	--
2028	9	--	230,180	230,180	42,610
Total		**921,003**	**354,122**	**1,275,125**	**65,550**

** As-built Quantities from 2019 updated based on latest available data*

An adaptive closure strategy has been adopted for the Project. The preliminary closure cover design adopted for the TSF at this stage will be further evaluated and updated based on the TSF performance monitoring, water quality monitoring and evaluation, and the overall mine closure plan. The final closure cover design for the TSF will be developed before mine closure.

8.3 Closure and Reclamation of Mine Waste Water Management Systems

The contact water management systems for the WRSFs and TSF will remain in place until mine closure activities are completed and monitoring results demonstrate that water quality conditions are acceptable for the discharge of all contact water to the environment with no further treatment required. Once the water quality meets the discharge criteria established through the water licensing process, the water management infrastructures will be decommissioned to allow the water to naturally flow to the receiving environment.

SECTION 9 • MONITORING PROGRAM

This section presents a summary of the monitoring programs that will be carried out during construction and operation related to mine waste storage management. The monitoring program presented here includes; stability and deformation, ground temperature, and annual inspections per the Type A Water Licence 2AM-MEL1631. The detailed information on monitoring of runoff and seepage from the WRSFs and the TSF is described in the *Water Management Plan* (Agnico Eagle, 2020b). General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the NWB.

9.1 Monitoring Activities for WRSFs

Table 9.1 summarizes the monitoring activities for the WRSFs and incorporates the latest design reports.

Table 9.1: Waste Rock Storage Facilities Monitoring Activities

Monitoring Component		Monitoring Frequency	Reporting
Verification Monitoring	Quantities of waste rock produced	Monthly	Monitoring data will be used by Agnico Eagle internally.
	Routine visual inspections of WRSFs	Daily during active rock placement, Monthly to semi-annually after placement	
	Elevation and geometry survey	Annually	
	Waste rock and overburden sampling	On as-needed basis	
	Seepage collection and monitoring	Monthly over the open water season	
General Monitoring	Quantities of waste rock placed into facilities	Monthly	Monitoring data will be reported to the Regulators in the annual water licence report or annual inspection report
	Geochemical monitoring	Approximately eight samples per 100,000 tonnes of mined material as per MEND (2009) recommendations	
	Thermal and freeze-back monitoring	Monthly during first year; then quarterly	
	Dust monitoring related to WRSFs	Governed by Air Quality Monitoring Plan	
	Geotechnical inspection by qualified Geotechnical Engineer	Annually or more frequent at the request of an Inspector	

9.1.1 Verification Monitoring Program for WRSF

Verification monitoring data will be used by Agnico Eagle for the management of waste rock and overburden. The following verification monitoring data will be collected, compiled, and managed internally:

- Each WRSF was designed to store a specific volume of waste rock and overburden material during mine operations. Monthly quantities of the waste materials produced and placed during mine operation will be recorded.
- During the active development of each WRSF, site staff will carry out daily visual inspections in relation to the performance and condition of each structure as per Mine Act requirements. When placement activity ceases on an interim or seasonal basis, the inspection frequency will shift to monthly. Following the completion of a WRSF, inspections will continue on a semi-annual basis until closure. The purpose of these inspections is to identify and document any potential hazards or risks to the facility, such as deformations, unusual seepage, slumping, local failure, etc.
- The maximum heights of the WRSFs are estimated to be approximately 40 m. During operations, an annual elevation survey of the WRSFs will be performed to estimate the overall volume placed, determine the reclamation progress, and provide input information to the operation plan.
- Surface runoff and seepage from the WRSFs will be monitored during the construction and operation phases by visual inspection during the ice-free season. Additional inspections will be carried out after rainfall events and during the freshet period. The detailed information on the monitoring of surface runoff and seepage from the WRSFs is described in the *Water Management Plan* (Agnico Eagle, 2020).

9.1.2 General Monitoring Program for WRSF

The following general monitoring data will be reported to the NWB through either the Water Licence Annual Report or an Annual Inspection Report:

- Monthly quantities of the waste rock and overburden placed into the WRSFs during mine operation. Samples will be taken as per MEND (2009) recommendations
- The placed waste rock and overburden are expected to freeze-back and permafrost is likely to develop within the WRSFs with time. Thermistors will be installed in each WRSF to monitor the rate of freeze-back and permafrost development progress in the facilities during closure. Temperature readings will be taken monthly during the first year after installation and then quarterly to track permafrost development within the WRSFs.
- Dust related to waste rock and overburden management is not expected to be an issue by employing the dust suppression measures presented in Section 7.0 through design, operation, and closure phases. Air quality at the mine site will be monitored during construction, operation, and closure through air quality monitoring stations and reported annually.
- The performance of the WRSFs will be inspected and assessed during the annual geotechnical site inspection by a geotechnical or civil engineer registered in Nunavut. The visual assessment and recommended actions to be taken related to the WRSFs will be summarized in the Annual Inspection Report. Inspections may occur more frequently at the request of the

Inspector. Records of all inspections will be maintained for the review of the Inspector upon request.

The results from the general monitoring program related to waste rock and overburden management will be reported to the Regulators in the annual water license report or in the annual geotechnical inspection report.

9.2 Monitoring Activities for the TSF

Table 9.2 summarizes the monitoring activities for the TSF. The TSF Detailed Design Report was approved by the Nunavut Water Board in December 2018. A more detailed monitoring plan was included in the report and has been incorporated in the following tables.

Table 9.2: Tailings Storage Facility Monitoring Activities

Monitoring Component		Monitoring Frequency	Reporting
Verification Monitoring	Tailings production rate and solid content	Continuous	Monitoring data will be used by Agnico Eagle internally, and will be reported to the Regulators upon request
	Design verification of placed tailings (moisture content, density, particle size)	Quarterly/Bi-annually	
	Routine visual geotechnical inspections of TSF	Weekly	
	Elevation and geometry survey	Annually	
	Water quality monitoring of CP3	Monthly over the open water season or when water is present	
General Monitoring	Quantities of tailings placed into facilities	Monthly	Monitoring data will be reported to the Regulators in annual water licence report or annual inspection report
	Thermal and freeze-back monitoring	Monthly during first year and quarterly thereafter	
	Dust monitoring related to TSF	Daily during operation phase	
	Geochemical monitoring	Bi-monthly	
	Geotechnical inspection by qualified Geotechnical Engineer	Annually or more frequent at the request of an Inspector	

9.2.1 Verification Monitoring Program for TSF

A summary of the verification monitoring program for the TSF is presented below.

- The tailings production rate at the mill and solid content will be continuously monitored during mine operation.
- Off-site geotechnical testing of tailings properties (density, moisture content and particle size) tailings will be carried out quarterly to ensure that the placed tailings meet the design criteria. Bi-annual testing of in situ density and moisture contents will be conducted by a third party geotechnical firm.

- Visual inspections and monitoring can provide early warning of many conditions that can contribute to structure failures and incidents. Pursuant Part F Item 20 of the Type A Water Licence 2AM-MEL 1631, Agnico Eagle will undertake weekly visual inspections of the TSF and note areas of seepage, unusual settlement or deformation, cracking or other signs of instability. Records of all inspections will be maintained.
- The average final height of the TSF will be approximately 33 m. An annual elevation survey of the TSF will be performed to estimate the overall volume placed, determine the reclamation progress, and provide input information to the operation plan.
- The runoff and seepage monitoring procedures and protocols for the WRSFs during mine operation will also apply to the TSF. Specifically, CP3 water quality will be monitored at a monthly frequency or when water is present in accordance with Part I Items 14 and 15 of the Type A Water Licence 2AM-MEL1631.

9.2.2 General Monitoring Program for TSF

A summary of the general monitoring program for the TSF is presented below.

- The monthly quantities of tailings placed into the TSF will be recorded.
- In accordance with Part I Item 13 of the Type A Water Licence 2AM-MEL1631, a TSF thermal monitoring regime will be implemented. This will include a minimum of eight (8) thermistor cables being installed in the TSF to monitor the permafrost development within the facility during operation and closure. The planned locations of these thermistors is shown in Figure 5.1. The temperature readings will be taken monthly during Year -1 and quarterly (i.e. 4 times per year) thereafter to verify thermal conditions and assumptions. The monitoring schedule will be reviewed and modified as necessary. The measured temperatures within the TSF will also provide the background information for the study of permafrost development.
- Dust related to tailings management is not expected to be an issue by employing the dust suppression measures presented in Section 7 through design, operation, and closure phases. Air quality at the mine site will be monitored during construction, operation, and closure through air quality monitoring stations.
- Filtered tailings samples will be taken from the mill bi-monthly and analyzed for the percentage of sulphur and carbon. The results from these analyses will be used to differentiate NPAG and PAG based on the derived NPR. The collected samples will be sent to an accredited commercial laboratory for ARD and ML using the ABA (the modified Sobek method).
- Pursuant Part I Item 14 of the Type A Water Licence 2AM-MEL 1631, the performance of the TSF will be inspected and assessed during the annual geotechnical site inspection by a geotechnical or civil engineer registered in Nunavut. The visual assessment and recommended actions to be taken related to the TSF will be summarized in the annual inspection report. Inspections may occur more frequently at the request of the Inspector. Records of all inspections will be maintained for the review of the Inspector upon request.

The results from general monitoring program related to tailings management will be reported to the Regulators in the Annual Water License Report or in the Annual Geotechnical Inspection Report.

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APPENDIX A • FIGURES

Figure 1.1 General Mine Site Location Plan

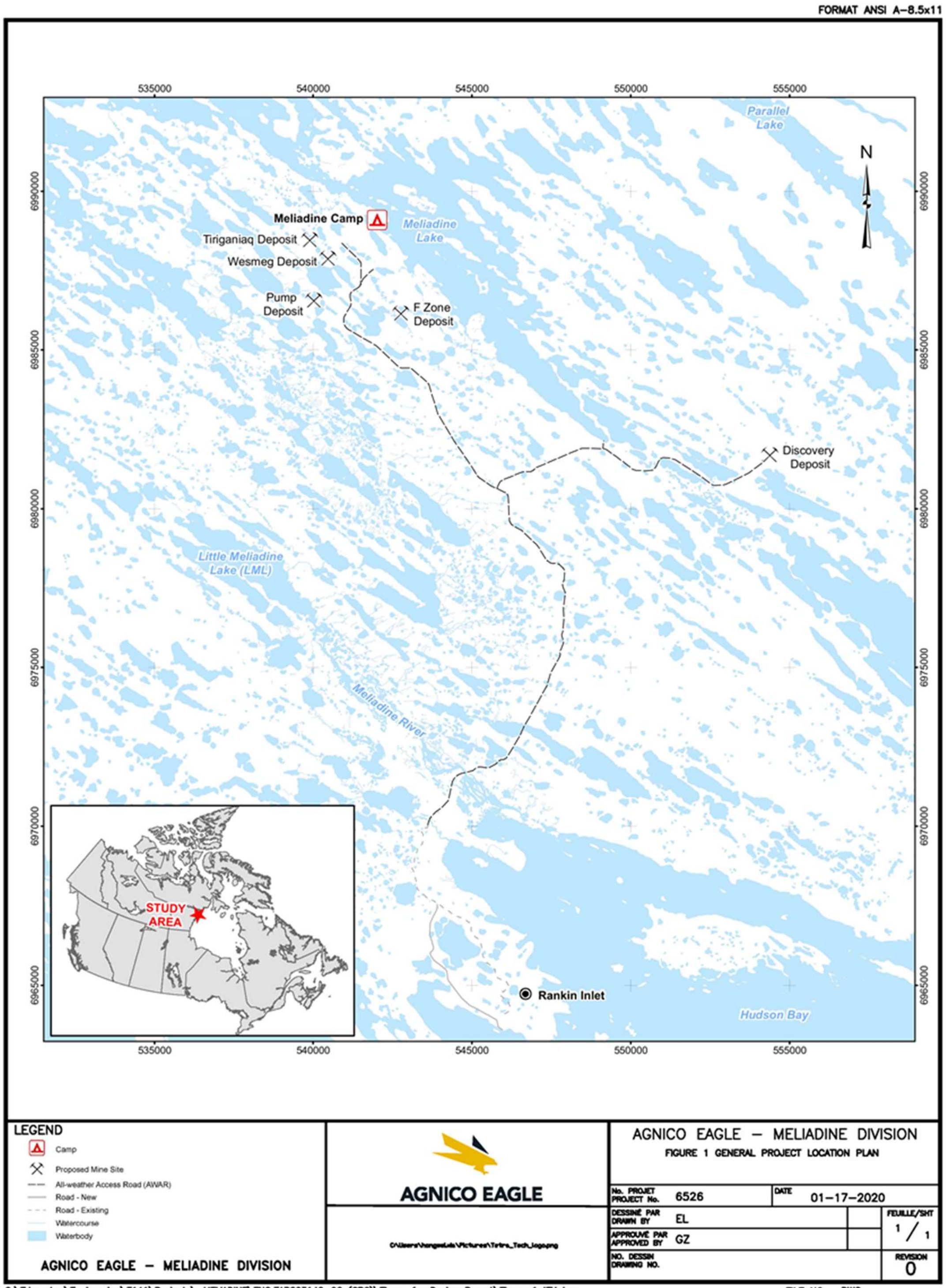


Figure 3.1 General Mine Site Location Plan

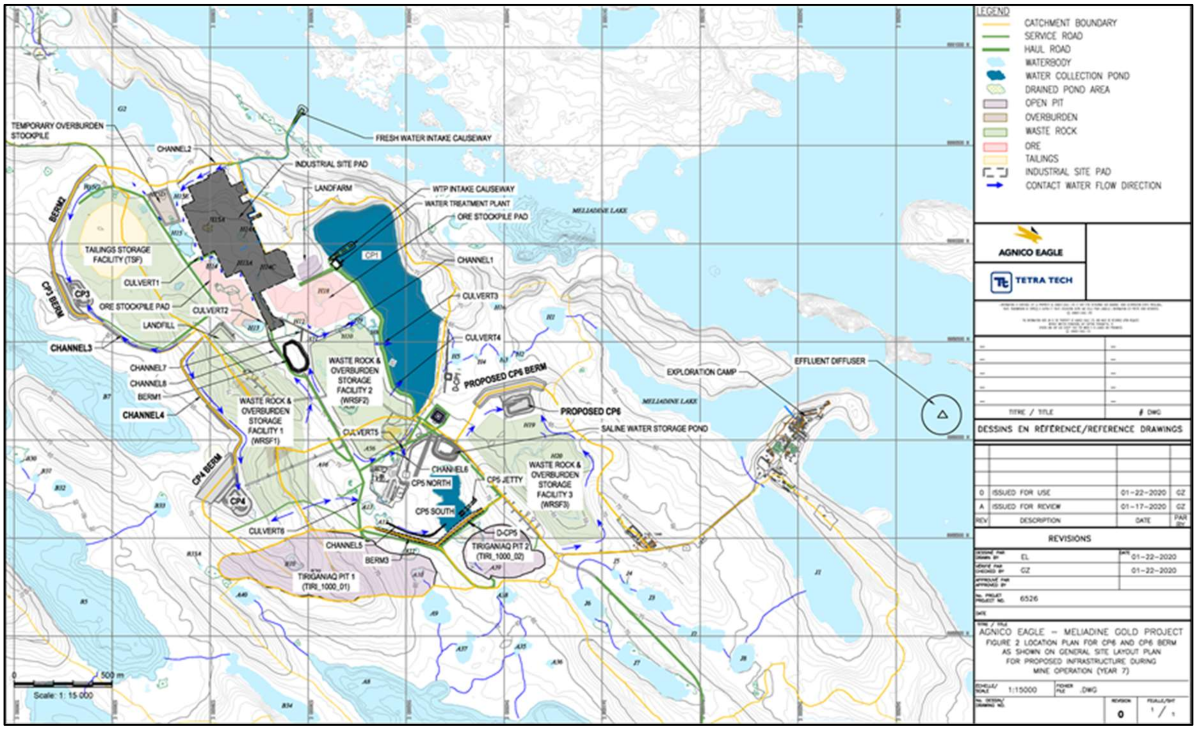


Figure 3.2 Mine Waste Management Flow Diagram

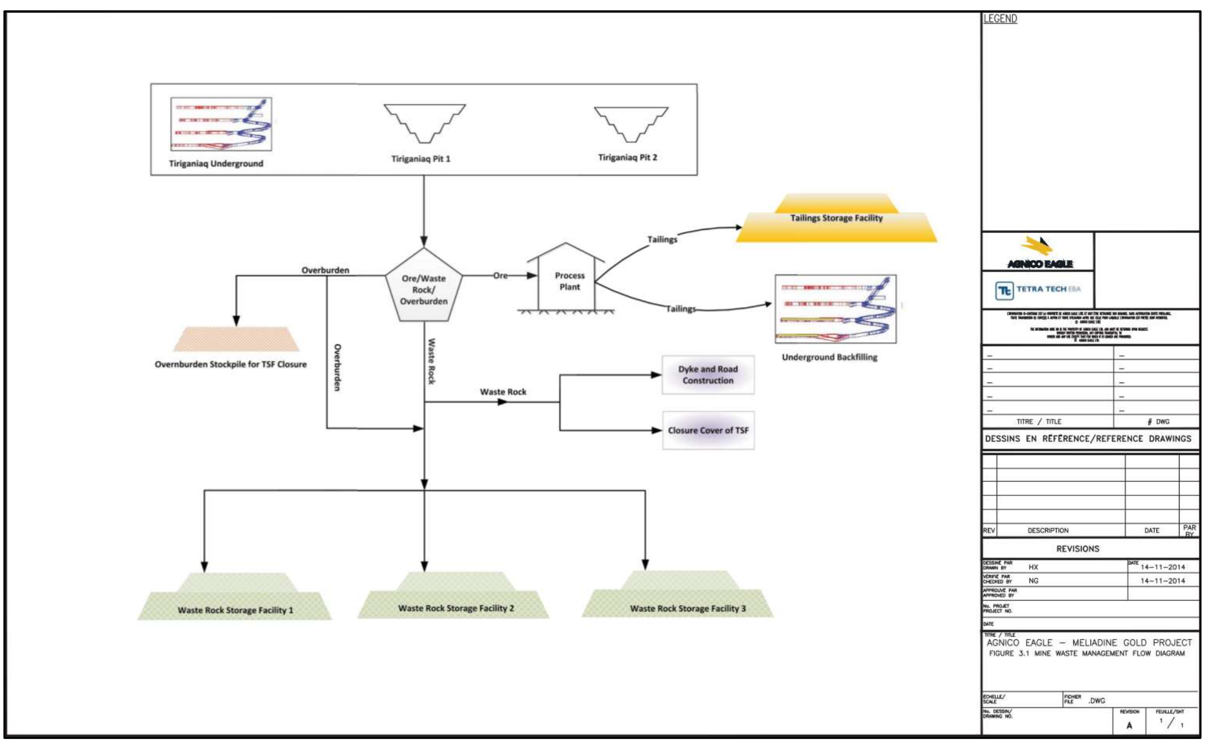


Figure 4.1 WRSF3 Detailed Design Plan View

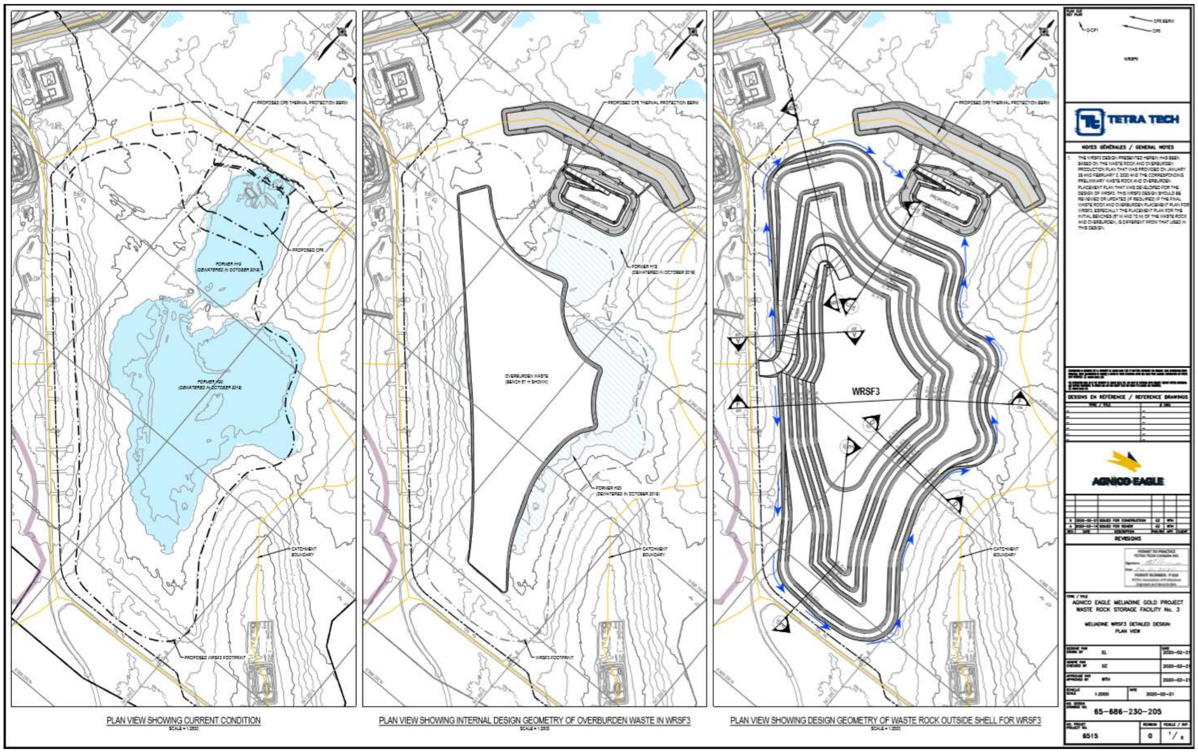


Figure 4.2 WRSF1 Typical Section

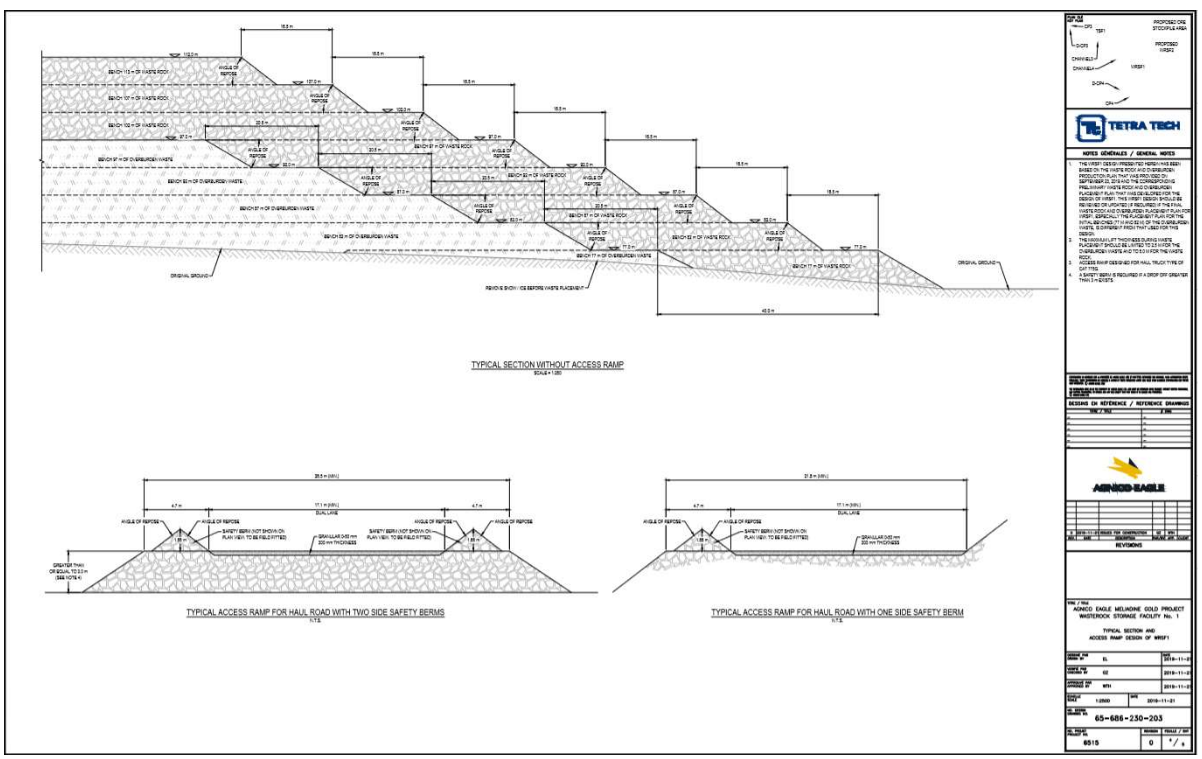


Figure 4.3 Watershed and Waterbodies Affected by Site Infrastructure

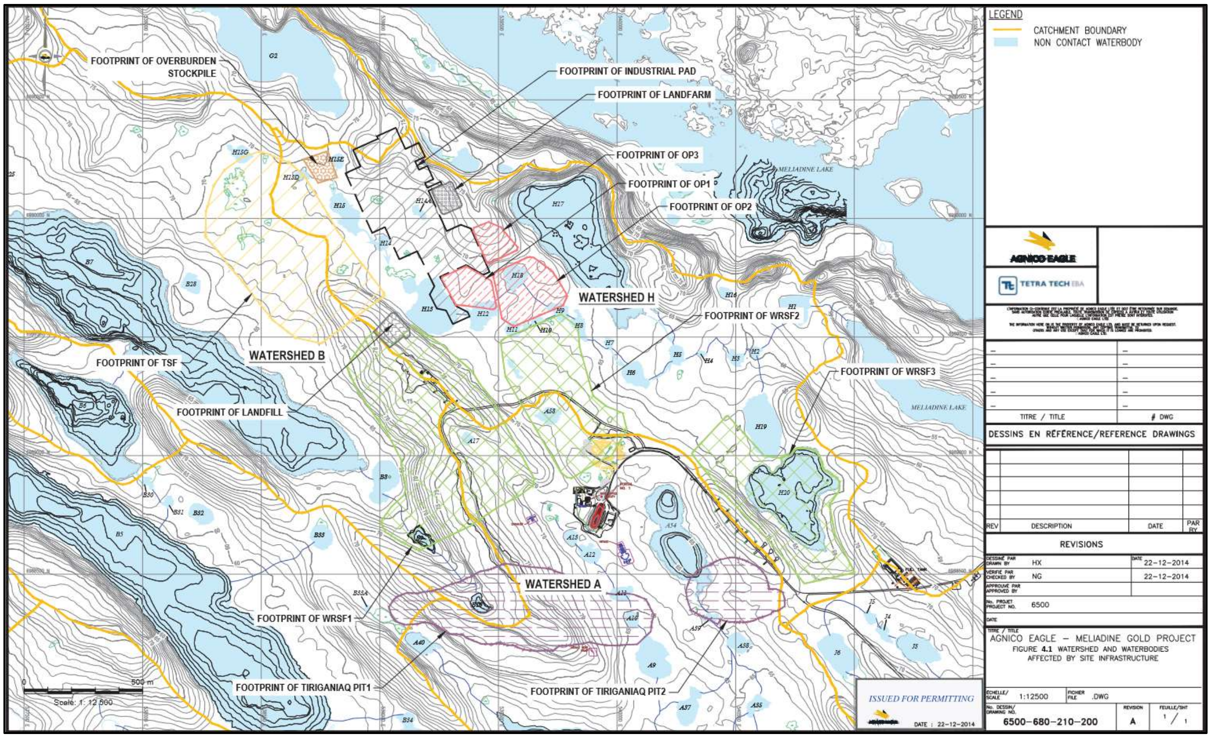


Figure 4.4 Temporary Waste Rock Stockpiles for Saline Pond 2 and Saline Pond 4

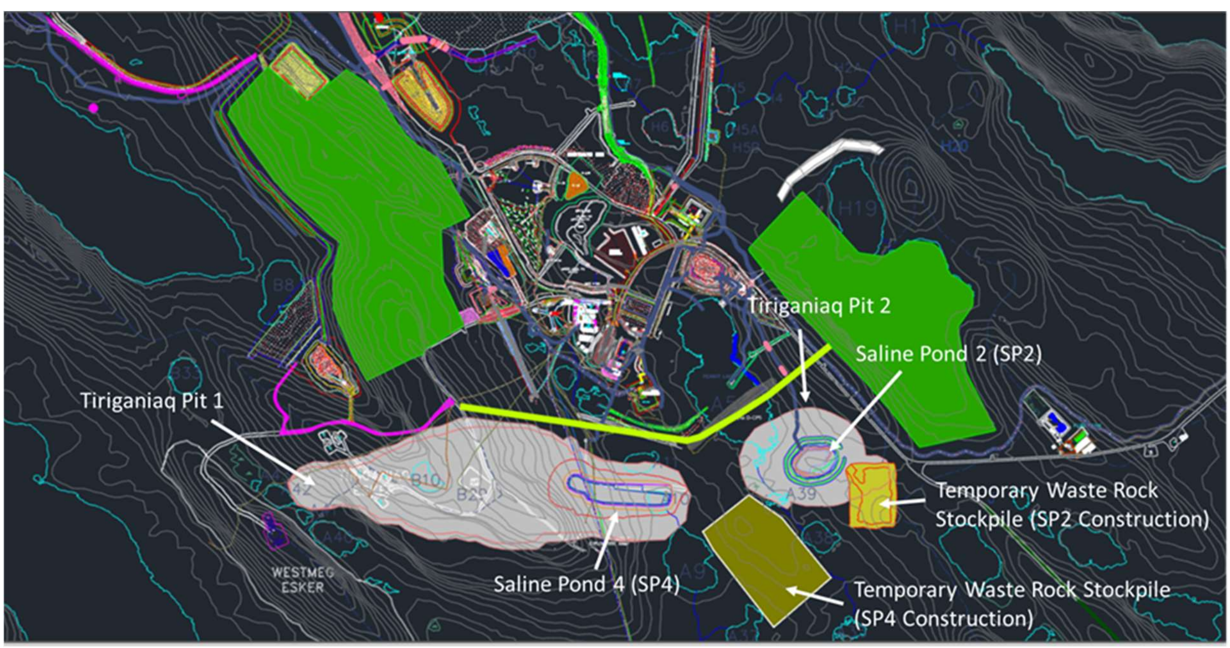


Figure 5.1 Tailings Placement Plan in Cells – Year 2

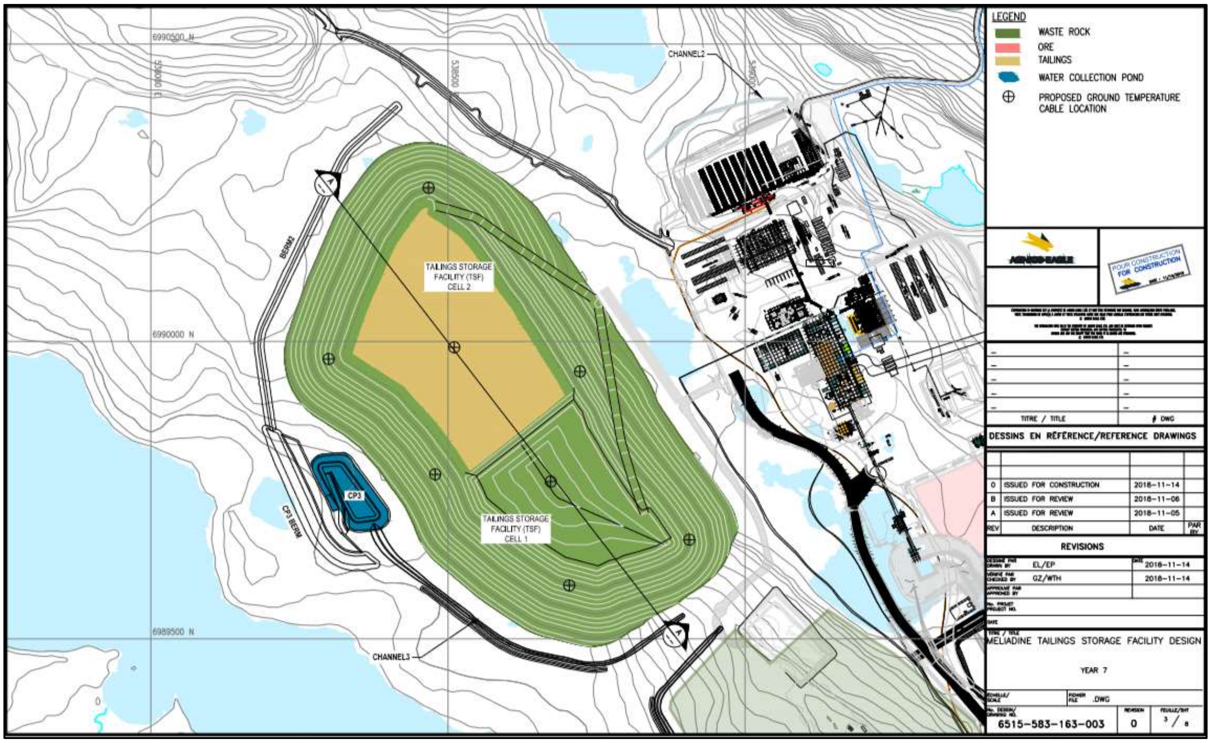
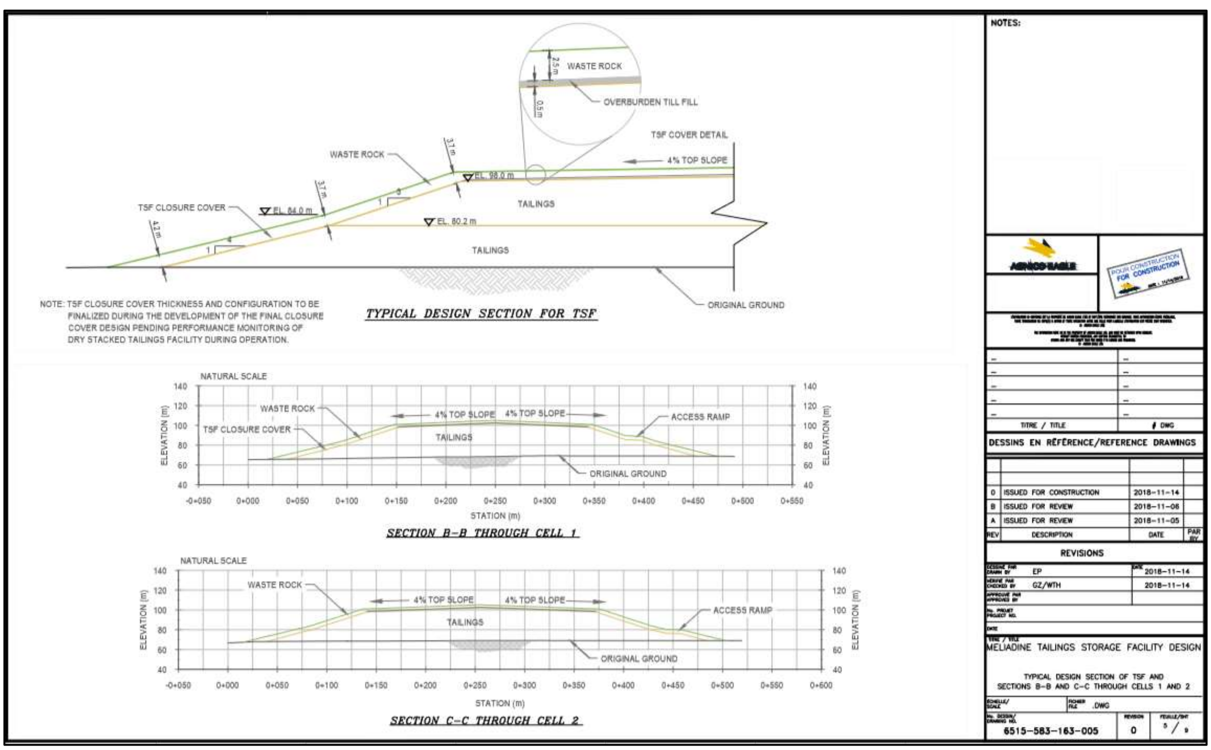


Figure 5.2 Typical Design Cross-Section for TSF



AGNICO EAGLE

MELIADINE GOLD MINE

Ore Storage Management Plan

MARCH 2021
VERSION 3
6513-MPS-08

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ᐊᒡᓃᑯ ᐃᒎ ᐅᔭᕐᑕᕆᐊᓕᕆᔩᒃᑯᑦ (ᐊᒡᓃᑯᒃᑯᑦ) ᒦᓐᓇ ᐊᐅᓛᖅᑎᑦᑎᔪᑦ ᑕᓯᕐᔪᐊᕐᒥᑦ ᒎᑐᒧᑦ ᐅᔭᕐᑕᕆᐊᕐᒥᑦ (ᐅᔭᕐᑕᕆᐊᖅ), 25 ᑭᓛᒥᑕᐃᑦ ᐅᐊᖕᓇᖕᒐᓂᑦ ᑲᖏᖅᓱᓂᕐᒥᑦ ᐅᖕᒐᓯᒃᑎᒋᔪᖅ, ᐊᒻᒪᓗ 80 ᑭᓛᒥᑕᐃᑦ ᓂᒋᖅᐸᓯᐊᓂᑦ ᐱᖕᒐᖕᓇᖅᐸᓯᐊᓂᑦ ᐃᒡᓗᓕᒑᕐᔪᖕᒥᑦ ᐅᖕᒐᓯᒃᑎᒋᔪᖅ ᑭᕙᓪᓕᕐᒥᑦ ᓄᓇᕗᒥᑦ. ᐅᔭᕐᑕᕆᐊᕐᒧᑦ ᐸᕐᓇᐅᑎᒥᑦ ᐃᓚᐅᔪᑦ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖕᒐᔪᖅ ᐊᒻᒪᓗ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔭᕐᑕᕆᐊᑦ ᐱᕙᓪᓕᐊᔭᐅᓂᖕᒐᓄᑦ ᑎᕆᒐᓂᐊᖅ ᒎᑐᑕᓕᒃ, ᒫᕐᐴᖕᓂᒃ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖕᒐᔪᕐᑲᖅᑰᓂ (ᑎᕆᒐᓂᐊᖅ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖕᒐᔪᖅ 1 ᐊᒻᒪᓗ ᑎᕆᒐᓂᐊᖅ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖕᒐᔪᖅ 2) ᐊᒻᒪᓗ ᐊᑕᐅᓯᖅ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔭᕐᑕᕆᐊᖅ.

ᓯᑕᒪᐅᓕᖕᒐᔪᖅ ᐱᕙᓪᓕᐊᔭᐅᓂᖕᒐ ᑎᕆᒐᓂᐊᖅ: 3.5 ᐅᑭᐅᓂᒃ ᓴᓇᔭᐅᓗᓂ (Q4 ᐅᑭᐅᖅ -5-ᒥᑦ Q2 ᐅᑭᐅᖅ -1-ᒧᑦ), 8.5 ᐅᑭᐅᓂᒃ ᐅᔭᕐᑕᕆᐊᖅ ᐊᐅᓛᕐᓗᓂ (Q3 ᐅᑭᐅᖅ -1-ᒥᑦ ᐅᑭᐅᖅ 8-ᒧᑦ), ᐱᖕᒐᓱᑦ ᐅᑭᐅᓄᑦ ᐅᒃᑯᐊᖅᐸᓪᓕᐊᓗᓂ (ᐅᑭᐅᖅ 9-ᒥᑦ ᐅᑭᐅᖅ 11-ᒧᑦ), ᐊᒻᒪᓗ ᐅᒃᑯᐊᖅᓯᒪᓕᖅᑎᓪᓗᒍ (ᐅᑭᐅᖅ 11-ᒥᑦ ᐅᖕᒐᑖᓄᑦ). 15.4 ᒥᓕᔭᓐ ᑕᓐ-ᓗᐊᑦ ᐅᔭᕐᑕᖅᑕᐅᔪᑦ ᐱᔭᐅᓂᐊᖅᑐᑦ. ᐅᔭᕐᑕᖅᑕᐅᔪᑦ ᓯᕐᑲᓪᓕᑎᖅᑕᐅᓗᑎᒃ 8 ᐅᑭᐅᓪᓗᐊᓄᑦ ᐅᔭᕐᑕᕆᐊᖅ ᐊᐅᓛᕐᓂᖕᒐᓂᑦ ᐱᐊᓚᑎᒋᓂᖕᒐ 3,750 ᑕᓐ-ᓗᐊᑦ ᐅᑉᓗᑖᒥᑦ ᐅᑭᐅᖅ 1-ᒥᑦ ᐅᑭᐅᖅ 3-ᒧᑦ ᐊᒻᒪᓗ 5,500 ᑕᓐ-ᓗᐊᑦ ᐅᑉᓗᑖᒥᑦ ᐅᑭᐅᖅ 4-ᒥᑦ ᐅᑭᐅᖅ 8-ᒧᑦ.

ᕿᑦᑎᒃᑐᒥᑦ ᐊᒻᒪᓗ ᕿᑎᐊᓃᖕᒐᔪᖅ ᐱᑦᑕᐅᓂᖕᒐ ᐅᔭᕐᑕᖅᑕᐅᔪᖅ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐊᒻᒪᓗ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖕᒐᔪᓂᑦ ᓄᓇᒃᑰᕈᑎᒃᑯᑦ ᓯᕐᑲᓪᓕᑎᓇᙵᖕᒧᑦ ᐊᒃᔭᐅᕐᑲᑦᑕᕐᓂᐊᖅᑐᑦ ᓂᒋᐊᓂᑦ ᐃᓯᐊᓂᑦ ᐱᓕᐅᓇᕙᓪᓕᐊᙵᐅᑉ. ᓯᕐᑲᓪᓕᑎᒃᓯᒪᔪᖅ ᐅᔭᕐᑕᖅᑕᐅᔪᖅ ᐊᒃᔭᖅᑕᐅᓗᓂ ᐅᔭᕐᑕᖅᑕᐅᔪᑦ ᐆᖕᒋᓐᓄᑦ ᐱᓕᐅᓇᕙᓪᓕᐊᙵᖕᒧᐊᖅᑕᐅᓗᓂ ᖃᓪᓕᖅᓯᒪᔪᒥᒃ ᐊᒃᔭᖅᑐᐃᔾᔪᑎᒃᑯᑦ. ᐊᑦᑎᒃᑐᒦᖕᒐᔪᑦ ᐱᑦᑕᐅᓂᖕᒋᑦ ᐊᒻᒪᓗ ᓈᒻᒪᒃᑐᑦ ᐅᔭᕐᑕᖅᑕᐅᔪᑦ ᑐᖅᑯᖅᑕᐅᓂᐊᖅᑐᑦ ᐅᔭᕐᑕᖅᑕᐅᔪᓄᑦ ᑲᑎᓯᒪᔪᓄᑦ, ᓯᕐᑲᓪᓕᑎᖅᑕᐅᓂᐊᕐᓗᑎᒃ ᑭᖕᒍᓪᓕᖅᐸ̇ᖕᒐᓂᑦ ᐅᑭᐅᕐᒥᑦ ᐅᔭᕐᑕᕆᐊᖅ ᐊᐅᓛᕐᓂᕆᔭᖕᒐᓂᑦ. ᐅᔭᕐᑕᖅᑕᐅᔪᓂᑦ ᐊᒥᐊᒃᑯᑕᕐᑲᔅᔮᙱᑦᑐᖅ ᑲᑎᓯᒪᔪᓂᑦ ᐅᔭᕐᑕᕆᐊᖅ ᐅᒃᑯᐊᖅᑎᓪᓗᒍ.

ᓄᓇᐅᑉ ᖀᖕᒐᓂᑦ ᑯᕕᔪᖅ ᐊᒻᒪᓗ ᑯᕕᓂᐊᔪᖅ ᐃᒪᖅ ᐅᔭᕐᑕᖅᑕᐅᔪᓂᑦ ᑲᑎᓯᒪᔪᓂᑦ ᑯᕕᓂᐊᖅᑐᖅ ᐊᑭᐊᓃᑦᑐᒧᑦ ᑲᑎᖅᓱᐃᕝᕕᒃ ᑕᓯᕋᔭᒃ 1-ᒧᑦ (CP1) ᓱᑉᓗ 1-ᑯᑦ ᐊᒻᒪᓗ 3-ᑯᑦ, ᐱᓕᕆᐊᖒᓗᓂ ᑎᑭᐅᑎᓂᐊᕐᓗᓂ ᐊᑐᖅᑕᐅᔪᒧᑦ ᒪᓕᒃᑯᒍ Type A ᓚᐃᓴᓐᓯ 2AM-MEL1631 ᐱᔭᕆᐊᓕᒃ, ᑯᕕᑎᑕᐅᓂᐊᓖᕐᓗᓂ ᓄᓇᒧᑦ.

EXECUTIVE SUMMARY

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

There are four phases to the development of Tiriganiaq: 3.5 years construction (Q4 Year -5 to Q2 Year -1), 8.5 years mine operation (Q3 Year -1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forward). Approximately 15.0 million tonnes (Mt) of ore will be produced. The produced ore will be milled over approximately 8 years of mine life at a rate of approximately 4,550 tonnes per day (tpd) in Year 1 to Year 4 and 5,850 tpd in Year 5 to year 7. In Year 8, the stockpile and remaining ore production will be mined.

High and mid-grade ore produced from underground and the open pits will be trucked directly to the crusher located at the south end of the process plant. The crushed ore will be transported to the ore bin and then to the process plant via a covered conveyor system. Low grade ore will be stored in stockpiles and milled when needed, and marginal grade will be milled during the last year of operations. There will be no ore stockpiles remaining at mine closure.

Surface runoff and seepage water from the ore stockpiles will flow to the adjacent Collection Pond 1 (CP1) via Channel 1 and Culvert 3, where it will be treated to meet discharge criteria as per the Type A Water Licence 2AM-MEL1631 requirement, prior to being discharged to the receiving environment.

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APPENDIX A • FIGURES

DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	April 2015			First version of Ore Storage Management Plan as Supporting Document for Type A Water Licence Application, submitted to Nunavut Water Board for review and approval	Tetra Tech EBA Inc.
2	April 2020			General review throughout the document	Engineering
3	March 2021			Update Quantities according to latest mine plan	Engineering

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
CP	Collection Pond (or Control Pond or Containment Pond)
CRA	Commercial, Recreational, and Aboriginal
EWTP	Effluent Water Treatment Plant
FEIS	Final Environmental Impact Statement
MEND	Mining Environment Neutral Drainage
MDMER	Metal and Diamond Mining Effluent Regulations
ML	Metal Leaching
NIRB	Nunavut Impact Review Board
NWB	Nunavut Water Board
NWR	Nunavut Water Regulations
Project	Meliadine Gold Mine Project
SP	Saline Pond
TSF	Tailings Storage Facility
WRSF	Waste Rock Storage Facility

UNITS

%	percent
°C	degrees Celsius
°C/m	degrees Celsius per meter
cm/s	centimetre per second
ha	hectare
kPa	kilopascal
km	kilometre(s)
L	liter(s)
m	metre
mg	milligram
m/s	metre per second
mm	millimetre
mm/h	millimetre per hour
m^2/year	square metre(s) per year
m^3	cubic metre(s)
Mm^3	million cubic metre(s)
t	tonne
t/m^3	tonne per cubic metre
Mt	million tonne(s)
µm	micrometre

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Ltd. (Agnico Eagle) operates the Meliadine Gold Mine (the Mine) located approximately 25 kilometres (km) north of Rankin Inlet (Figure 1.1), Nunavut, 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 amended Project Certificate issued by the Nunavut Impact Review Board (NIRB) in accordance with the Nunavut Land Claims Agreement Article 12.5.12 on February 26, 2019 (NIRB, 2019) and the Type A Water Licence No. 2AM-MEL1631 (the Licence) issued by the Nunavut Water Board (NWB) on April 1, 2016 (NWB, 2016). This report presents an updated version of the Ore Storage Management Plan (OSMP). The purpose of this update is to incorporate changes related to ore storage management at the Mine.

1.1 Ore Storage Management Objectives

The ore storage management objectives are to minimize potential impacts to the environment during the mining phase. The purpose of the OSMP is to provide information to applicable mine departments (Environment, Engineering, Mine, Energy and Infrastructure, etc.) for sound management practices, proposed and existing infrastructure, and provide strategies for water management (runoff), dust control and monitoring programs.

1.2 Management and Execution of the Ore Storage Management Plan

Revisions of the OSMP can be initiated by changes in the Mine Development Plan (Mine Plan), operational performance, personnel or organizational structure, regulatory or social considerations, and/ or design philosophy. The OSMP will be reviewed annually by Agnico Eagle and updated as necessary.

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 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 meters.

The local overburden consists of a thin layer of topsoil overlying silty gravelly sandy 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.

2.1.1 Local Hydrology

The Mine is located within the Meliadine Lake watershed. Meliadine Lake has a water surface 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 two outflows that drain into Hudson Bay through two separate river systems. It has a drainage area of 560 km^2 upstream of its two outflows. Most drainage occurs via the Meliadine River, which originates at the southwest 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.

2.1.2 Ice and Winter Flows

Late-winter ice thicknesses on freshwater lakes in the Mine area range between 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 (freshet) typically begins in mid-June and is complete by early July (Golder, 2012b).

2.1.3 Spring Melt (Freshet) and Freeze-up Conditions

With the exception of the main outlet of Meliadine Lake, which has been observed to flow continuously throughout the year, outlets of waterbodies near the Mine typically start flowing late May or early June, followed by freshet flows in mid-to-late-June. Flows steadily decrease in July and low flows are ongoing from August to the end of October, prior to winter freeze.

2.1.4 Permafrost

The Mine is located in an area of continuous permafrost. The depth of permafrost 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 3 m adjacent to the lakes. The typical permafrost ground temperatures at the depths of zero annual amplitude (typically at the depth of below 15 m) 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, 2012b).

2.1.5 Local Hydrogeology

Groundwater characteristics at areas of continuous permafrost that are generally present in the Mine area include the following flow regimes:

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

From late spring to early autumn, when temperatures are above 0˚C, the shallow active layer thaws. Within the active layer, the water table is projected to be a subdued replica of topography. Groundwater in the active layer flows to local depressions and ponds that drain to larger waterbodies. The talik beneath large waterbodies will be open. The open talik will connect to the deep groundwater flow regime beneath the permafrost.

Elongated waterbodies with terraces 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. Meliadine Lake and Lake B7 are likely to have open taliks connected to the deep groundwater flow regime (Golder, 2012a). No impact is expected to Lake B7 by mine activities.

SECTION 3 • ORE STORAGE DEVELOPMENT

3.1 Mine Development Plan

The Mine Plan and key mine development activities, including water management, are currently used concurrently with the OSMP.

The Mine Plan includes one underground mine (Tiriganiaq Underground Mine) and two open pits (Tiriganiaq Open Pit 1 and Tiriganiaq Open Pit 2) for the development of the Tiriganiaq gold deposit.

The Mine is expected to produce approximately 15.0 million tonnes (Mt) of ore, 32.8 Mt of waste rock, 8.0 Mt of overburden waste, and 15.0 Mt of tailings. The following phased approach is proposed for the development of the Tiriganiaq gold deposit:

- Phase 1: 3.5 years for Mine Construction (Q4 Year -5 to Q2 Year -1);
- Phase 2: 8.5 years for Mine Operations, beginning in 2019 (Q2 Year -1 to Year 8);
- Phase 3: 3 years Mine Closure (Year 9 to Year 11); and;
- Phase 4: Post-Closure (Year 11 forward).

Mining facilities on surface will include a plant site and accommodation buildings, ore stockpiles, a temporary overburden stockpile, a tailings storage facility (TSF), three waste rock storage facilities (WRSFs), a water management system that includes containment ponds, water diversion channels, retention dikes/berms, and a series of water treatment plants. The general mine site layout plan is shown on Figure 3.1, while Table 3.1 provides the key mine development activities and sequence.

Table 3.1: Key Mine Development Activities and Sequence

Mine Year	Mine Development Activities and Sequence
Q4 of Yr -5 (2015)	• Started construction of industrial pad • Developed ramp to Tiriganiaq underground mine • Constructed portion of rock pad for stockpiles to store ore from Tiriganiaq underground ramp development
Yr -4 (2016)	• Continued construction of industrial pad • Constructed and operated the temporary landfill • Started temporary storage of waste rock in the future WRSF2 footprint for construction purposes
Yr -3 (2017)	• Constructed and utilized Type A landfarm • Constructed and began operation of Type A landfill • Erected and closed all main buildings except crusher, paste plant and crushed ore storage • Erected incinerator • Erected and operated effluent water treatment plant (EWTP) • Installed fuel tanks 3 ML and 250 kL at Portal1 • Erected fuel tank 13.5 ML in Rankin
Yr -2 (2018)	• Started construction of Ore Storage Pad 2 (OP2) • Erected and closed crusher, paste plant and crushed ore storage buildings • Erected fuel tank 20 ML in Rankin • Erected fuel tanks 6 ML and 250 kL at industrial pad • Started process commissioning at end of Q4

Mine Year	Mine Development Activities and Sequence
Yr -1 (2019)	• Completed industrial pad • Completed construction of OP2 • Started to place filtered tailings in Cell 1 of tailings storage facility (TSF) at end of Q1 • Started full capacity ore processing early Q2 • Created temporary waste rock storage area within footprint of Tiriganiaq Pit 2 from construction of Saline Pond 2 (SP2) • Began placement of waste materials from Saline Pond 4 (SP4) in waste rock storage facility 1 (WRSF1)
Yr 1 (2020)	• Place waste rock from temporary storage within footprint of Tiriganiaq Pit 2 to construct haul roads for open pits and to WRSFs • Create temporary waste rock storage area between footprints of Tiriganiaq Pits 1 and 2 from construction of SP4 • Start to mine Tiriganiaq Pit 2 • Begin placement of waste materials from Tiriganiaq Pit 2 within WRSF3
Yr 2 (2021)	• Start to mine Tiriganiaq Pit 1 • Pause mining of Tiriganiaq Pit 2 • Place overburden from Tiriganiaq Pit 1 in WRSF1 • Continue placement of waste materials from Tiriganiaq Pit 2 in WRSF1 • Construct temporary overburden stockpile to store the selected ice-poor overburden that will be used for progressive reclamation of TSF
Yr 3 (2022)	• Continue placement of waste materials from Tiriganiaq Pit 1 in WRSF1 • Begin placement of waste materials from Tiriganiaq Pit 1 into WRSF2
Yr 4 (2023)	• Start to place filtered tailings in Cell 2 of TSF • Stop placement of waste rock in WRSF1 when design capacity reached •
Yr 5 (2024)	• Place final closure cover on top of tailings surface in Cell 1 of TSF • Stop placement of waste rock in WRSF3 when design capacity reached
Yr 6 (2025)	
Yr 7 (2026)	• Stop mining of Tiriganiaq Pit 1 when the open pit reaches design elevation
Yr 8 (2027)	• Stop Tiriganiaq underground operation when underground mine reaches design elevation • Stop placing waste materials in WRSF2 when design capacity reached • Process the ore from OP2 until all stored ore is processed • Decommission underground mine surface openings as needed

* Restarting mining activities at Tiriganiaq Pit 2 in year 8 pends necessary approvals of the waterline discharge line to sea. These details are discussed in the Long-Term Management Strategy of the *Groundwater Management Plan*

3.2 Ore Development Plan

3.2.1 Tiriganiaq Development Schedule and Quantities

The Tiriganiaq gold deposit will be developed using traditional open-pit and underground mining methods. Two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and an underground mine (Tiriganiaq Underground) will be developed.

The following mining development sequence is planned:

- Tiriganiaq underground will be developed and operated from Year -5 to Year 8;
- Tiriganiaq Pit 2 will be mined from Year 1 to Year 2; and Year 8

Tiriganiaq Pit 1 will be mined from Year 2 to Year 7Approximately 15.0 Mt of Tiriganiaq ore will be mined over the mine life, comprised of approximately 3.6 Mt from the open pits and approximately 11.3 Mt from underground operations. Three grades of ore are identified: high grade, low grade, and marginal grade. The ore will be milled in the process plant during mine operation at a feeding rate of approximately 4,550 tonnes per day (tpd) in Year 1 to Year 4 and 5,850 tpd in Year 5 to year 7. In Year 8, the stockpile and remaining ore production will be mined.

Table 3.2 summarizes the schedule and quantities of ore to be mined from the open pit and underground mining operations.

Table 3.2 Summary of Ore Production Schedule and Bank Quantities (V13_LOM)

Year	Mine Year	Underground	Tiriganiaq Pit #1	Tiriganiaq Pit #2	Total
		Ore (t)	Ore (t)	Ore (t)	Ore (t)
2019	Yr-1	1,108,666	--	--	1,108,666
2020	Yr1	1,293,507	--	109,392	1,402,899
2021	Yr2	1,419,941	351,724	96,845	1,868,510
2022	Yr3	1,539,406	392,216	--	1,931,622
2023	Yr4	1,518,200	214,150	--	1,732,349
2024	Yr5	1,567,279	453,207	--	2,020,486
2025	Yr6	1,441,130	865,346	--	2,306,476
2026	Yr7	1,441,130	727,977	--	2,176,489
2027	Yr8	--	--	444,849	444,849
Total (t)		11,336,639	3,004,620	651,086	14,992,346

SECTION 4 • ORE STORAGE MANAGEMENT

High grade ore produced from underground and open pit operations will be trucked directly to the crusher located at the south end of the process plant. The crushed ore will be transported to the ore bin and then to the process plant via a covered conveyor system. Low grade ore will be stored in stockpiles and milled when needed, and marginal grade will be milled during the last year of operations. There will be no ore stockpiles remaining at mine closure.

4.1 Ore Storage Locations

4.1.1 Ore Storage Pad 2 (OP2)

The originally proposed locations for ore storage at Meliadine (2014 FEIS) were two large pads to the southeast of the Industrial Pad, encompassing numerous waterbodies in watershed H and J. For the 2015 application for the Type A Water License, the locations of the proposed ore storage facilities had moved closer to the Industrial Pad and primary crusher, with three smaller ore storage pads proposed instead of two large pads. The suggested locations of the 2014 and 2015 ore storage pads is shown on Figure 4.1.

Multiple changes were made to the configuration of various infrastructures within the Industrial Pad footprint since the 2015 application as shown in Figure 3.1. The Landfarm and Industrial Site Fuel Farm now occupy much of the area previously identified for use as OP3. The new alignment of the crusher ramp and ancillary crushing infrastructures affected the footprint of the previously planned OP1. As the general location of OP2 did not change, it was decided during detailed design of the facility to expand this originally planned footprint to incorporate the available remaining footprint of the previously planned OP1 and maximize the storage space next to the crusher during detailed design. These changes were described in the Ore Storage Pad 2 (Stage 1) Construction Summary (As-Built) Report (Agnico Eagle, 2020) submitted to the Nunavut Water Board in July 2020.

4.1.2 Temporary Ore Storage

Currently, underground ore recovered from above Level 250 is brought to the surface through Portal 1 and temporarily stored within the footprint of the future waste rock storage facility 2 (WRSF2). The ore is then loaded by surface equipment and moved to OP2 and/or the primary crusher. The location of this ore transfer pad is shown on Figure 4.2.

The practice of temporary ore storage at the WRSF2 transfer facility will cease once construction of WRSF2 commences in 2022 (Year 3).

4.2 Design Parameters

4.2.1 Ore Storage Pad 2

The as-built characteristics of OP2 are presented in the table below.

Table 4.1: Key Design Parameters of Ore Storage Pad 2

Parameter	As-Built Values
Pad thickness (m)	0.35
Maximum elevation (m)	71.7
Grade towards Channel 1 (%)	1.14
Average side slopes for pad (H:V)	2.3:1 (23.4º)
Grade towards channel 1 (%)	1
Surface area (m^2)	103,179
Volume of rockfill (m^3)	107,798

4.2.2 Ore Stockpiles

The ore stockpiles are temporary structures and small compared to the WRSFs. Based on the stability and thermal analyses completed for the WRSFs during detailed design and experience with similar structures at other mine sites (i.e. Meadowbank Mine), the ore stockpiles will have an acceptable factor of safety against potential slope failure. A typical cross section of an ore stockpile is provided in Figure 4.3

Key design parameters for the ore stockpiles are summarized in Table 4.2.

Table 4.2: Design Parameters for Ore Stockpiles

Parameter	Value
Bench width from the crest of the pad to the toe of the first lift of the ore (m)	5
Thickness of first lift of ore (m)	5
Bench width from the crest of the first lift to the toe of the second lift (m)	10
Approximate maximum thickness of the second lift of ore (m)	3
Assumed side slopes for ore (H:V)	1.3:1
Maximum elevation of any ore stockpile above sea level (m)	80
Assumed dry density of ore (t/m^3)	1.88

Following the above design parameters during ore placement, a maximum theoretical volume of 1.75 M tonnes, or 930 150 m^3, of ore can be stored on OP2. Dividing the pad into four stockpiles and maintaining a 15 m distance between the stockpiles provides a sufficient surface area for a total of 1.26 M tonnes, or 672 800 m^3.

4.3 Ore Stockpiling Procedure

Depending on the development schedule of the underground and open pit mining operations, the ore will either be transported directly to the mill and crusher for processing or will be temporally stockpiled at one of the designated ore stockpiles on OP2 for subsequent processing.

Table 4.3 presents the planned evolution of ore stockpiles at OP2, together with their maximum storage tonnages shown in bold text.

Table 4.3: Evolution of Ore Stockpiles at OP2

Year	Mine Year	Underground (t)			Tiriganiaq Pit 1 (t)			Tiriganiaq Pit 2 (t)		
		High	Low	Marginal	High	Low	Marginal	High	Low	Marginal
2019	Yr-1	108,952	23,008	0	0	0	0	0	0	0
2020	Yr1	42,968	45,145	6,643	0	0	0	397	40,034	5,950
2021	Yr2	41,000	51,375	12,031	0	184,166	0	0	0	11,575
2022	Yr3	104,472	316,516	19,372	0	2,522	0	0	0	18,638
2023	Yr4	0	187,977	11,757	20,336	184,941	7,296	0	0	11,312
2024	Yr5	0	167,188	13,805	0	219,066	17,762	0	0	13,282
2025	Yr6	204,446	35,549	8,665	0	268,011	19,876	0	0	11,033
2026	Yr7	163,355	38,049	30,100	0	259,933	26,185	0	0	16,447
2027	Yr8	0	0	0	0	0	0	0	0	0
Maximum of column (t)		**204,446**	**316,516**	**30,100**	**20,336**	**268,011**	**26,185**	**397**	**40,034**	**18,638**
Maximum volume (m3)		108,748	168,359	16,011	10,817	142,559	13,928	211	21,295	9,914

Table 4.3 demonstrates that under the current mine plan and with the distribution of ore into three stockpiles, enough storage is expected to exist on OP2.

SECTION 5 • WATER MANAGEMENT ASSOCIATED WITH ORE STORAGE

The water management objectives for the mine are to minimize potential impacts to the quantity and quality of surface water at the site.

Ore Storage Pad 2 is located within the catchment of CP1, as shown in Figure 3.1. The pad was sloped during construction to direct any contact water towards Channel 1 where it will be diverted into CP1 via the Culvert 3 system. If required, the collected contact water will be treated by the EWTP prior to discharge to the outside environment.

Detailed information on the management of runoff water and seepage from the ore stockpiles and construction of infrastructure associated with ore management are described in the *Water Management Plan* (Agnico Eagle, 2020a).

SECTION 6 • DUST MANAGEMENT ASSOCIATED WITH ORE STORAGE

The potential sources of dust related to ore management during construction, operation and closure include:

- Site preparation prior to placement of waste materials i.e., stripping, excavation and/or placement of storage pad;
- Vehicle traffic dislodging fine particles from the surface of the storage pad and associated haul roads;
- Ore handling and transfer - loading, hauling, unloading and placement; and
- Ore sorting, screening and crushing.

Dust suppression measures, which are considered to be typical of the current mine practices (i.e. Meadowbank Complex) and consistent with best management practices, will be considered through design, operation and closure phases to control the dust.

Minimal site preparation was required for the storage pad during construction. Dust from this source was not observed to be problematic.

Dust generated from vehicles travelling on the surface of the associated access roads will be controlled principally by spraying water on the traffic area, and potentially by applying an approved chemical dust suppressant to the area which will be carried out regularly by mine services during dry periods in the summer. Watering the haul and access roads is only possible when temperatures are above freezing. When the temperature is below freezing, dust suppression using water or chemical will pose a safety hazard for travel; therefore, reducing the speed limit will be the principal way of controlling dust during these periods. More details on the dust management for traffic are described in the Roads Management Plan (Agnico Eagle, 2020b).

Other control measures considered in design and operation related to dust generation by vehicles travelling include:

- Road will be designed as narrow and short as possible while maintaining safe construction and operation practices;
- Coarse size rock will be used as much as possible for road construction;
- Roads will be regularly graded to mix the fines found on the road surface with coarser material located deeper in the roadbed; and
- As required, roads and travel areas will be topped with additional aggregate.

Dust is expected to be a minor issue during construction of the ore stockpiles. The ore stockpiles will be located at suitable locations and with minimal heights and suitable side slopes to minimize the wind erosion effects. Water and/or approved chemical dust suppressions will be sprayed on ore stockpiles, if required.

The crusher plant has been designed to follow best management practices by having the dump station and rock hammer enclosed to minimize the dust generation. The conveyor from the crusher to the process plant is a covered belt system in which the dust can be easily controlled. The covered conveyor system will be equipped with dust collectors and will be maintained regularly during mine operation. The conveyor loads will be kept within designated load limits to minimize the dust generation during operation. Dust collected during operation will be recycled through the mill.

SECTION 7 • RECLAMATION AND CLOSURE OF THE ORE STOCKPILES

The detailed Mine closure and reclamation activities are provided in the Interim Closure and Reclamation Plan, which was approved in March 2020.

Key mine development activities during the closure process are summarized in Table 7.1.

Table 7.1: Key Mine Development Activities and Sequence during Closure

Mine Year	Mine Development Activities and Sequence
Yrs 9-11 (2028 to 2030)	• Place final closure cover on top of tailings surface in Cell 2 (Yr 9) • Decommission non-essential mine infrastructure and support buildings (Yrs 9 and 10) • Start monitoring and maintenance (Yr 9)
Post Closure	• Continue monitoring and maintenance until Yr 18 (2039)

Final closure activities of the ore management facilities will commence at the end of mining operations in 2027 (Year 8). Ore will not remain in the ore stockpiles following the cessation of operations; it will all be processed.

In the event of a short-term temporary closure, the water and dust management strategies for the ore stockpiles will be kept the same as used during active mine operation. In the event of a long-term temporary closure, water control structures will be maintained as required

SECTION 8 • MONITORING PROGRAM

This section presents a summary of the monitoring programs that will be carried out during construction and operation related to ore storage management. The monitoring program presented here includes; stability and deformation, ground temperature, and annual inspections per the Type A Water Licence 2AM-MEL1631. The detailed information on monitoring of runoff and seepage from the ores stockpiles is described in the *Water Management Plan* (Agnico Eagle, 2020a). General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the NWB.

Table 8.1 summarizes the monitoring activities for the ore management.

Table 8.1 Ore Stockpile Monitoring Activities

Monitoring Component		Monitoring Frequency	Reporting
Verification Monitoring	Quantities of ore processed	Continuously	Monitoring data will be used by Agnico Eagle internally.
	Routine visual inspections of ore stockpiles	Daily during active ore placement; monthly after placement	
	Elevation and geometry survey	Annually	
	Seepage collection and monitoring	Monthly over the open water season	
General Monitoring	Quantities of ore placed into stockpiles	Monthly	Monitoring data will be reported to the Regulators in the annual water licence report or annual inspection report
	Dust monitoring related to ore storage	Governed by Air Quality Monitoring Plan	
	Geotechnical inspection by qualified Geotechnical Engineer	Annually or more frequent at the request of an Inspector	

8.1 Verification Monitoring Program

Verification monitoring results will be used by Agnico Eagle in the management of ore stockpiles and production. The following verification monitoring data will be collected, compiled and managed internally:

- The tonnage of ore processed through the mill is monitored and reported internally on a continuous basis. These results are crosschecked with the tailings production rate from the filter press.
- During active development of each stockpile, site staff will carry out daily visual inspections in relation to the performance and condition of each structure. When placement activity ceases on an interim or seasonal basis, the inspection frequency will shift to monthly.
- The maximum heights of the ore stockpiles are estimated to be approximately 15 m above the pad. During operations, an annual elevation survey of the stockpiles will be performed to estimate overall volume placed and provide input to the operation plan.

- Surface runoff and seepage from the ore stockpiles will be monitored during the construction and operation phases monthly over the open water season. Additional inspections will be carried out after rainfall events and during freshet. The detailed information on the monitoring of surface runoff and seepage from the ore stockpiles is described in the *Water Management Plan* (Agnico Eagle, 2020a).

8.2 General Monitoring Program

The following general monitoring data will be reported to the NWB through either the Water License Annual Report or an Annual Inspection Report:

- Monthly quantities of the ore placed into the stockpiles during mine operation.
- Dust related to ore management is not expected to be an issue by employing the dust suppression measures presented in Section 6.0. Air quality at the mine site will be monitored during construction, operation, and closure through air quality monitoring stations and reported annually.
- The performance of the ore stockpiles will be inspected and assessed during the annual geotechnical site inspection by a geotechnical or civil engineer registered in Nunavut. The visual assessment and recommended actions to be taken related to the stockpiles will be summarized in the Annual Inspection Report. Inspections may occur more frequently at the request of the Inspector. Records of all inspections will be maintained for the review of the Inspector upon request.

The results from general monitoring program related to tailings management will be reported to the Regulators in the Annual Water License Report or in the Annual Geotechnical Inspection Report.

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APPENDIX A • FIGURES

Figure 1.1 General Mine Site Location Plan

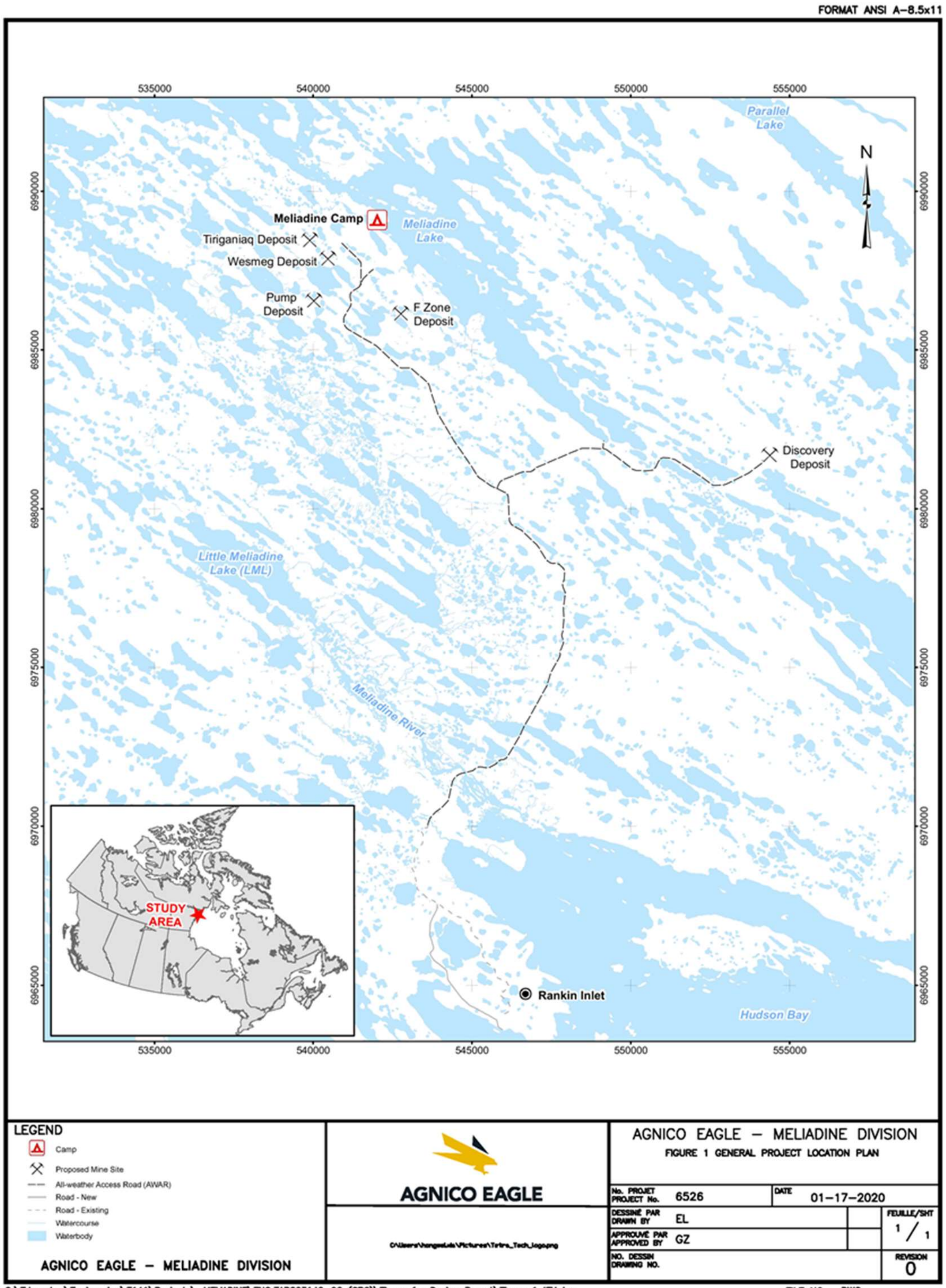


Figure 3.1 General Mine Site Location Plan

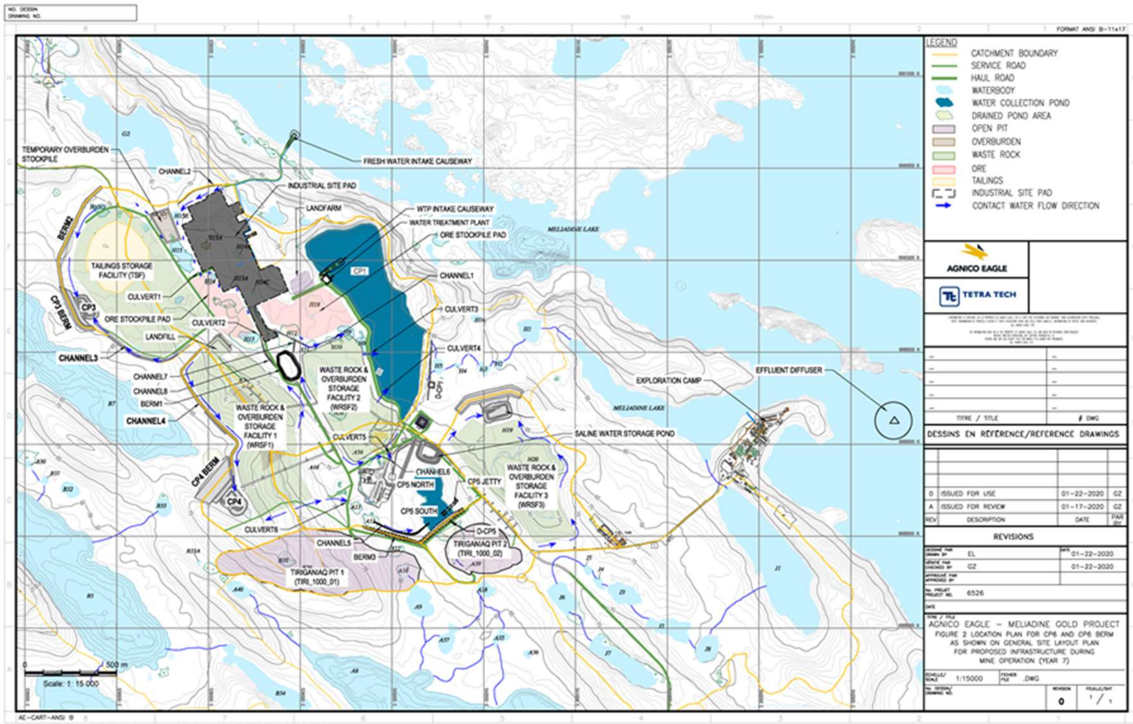


Figure 4.1 Proposed Ore Stockpile Locations (2014 and 2015)

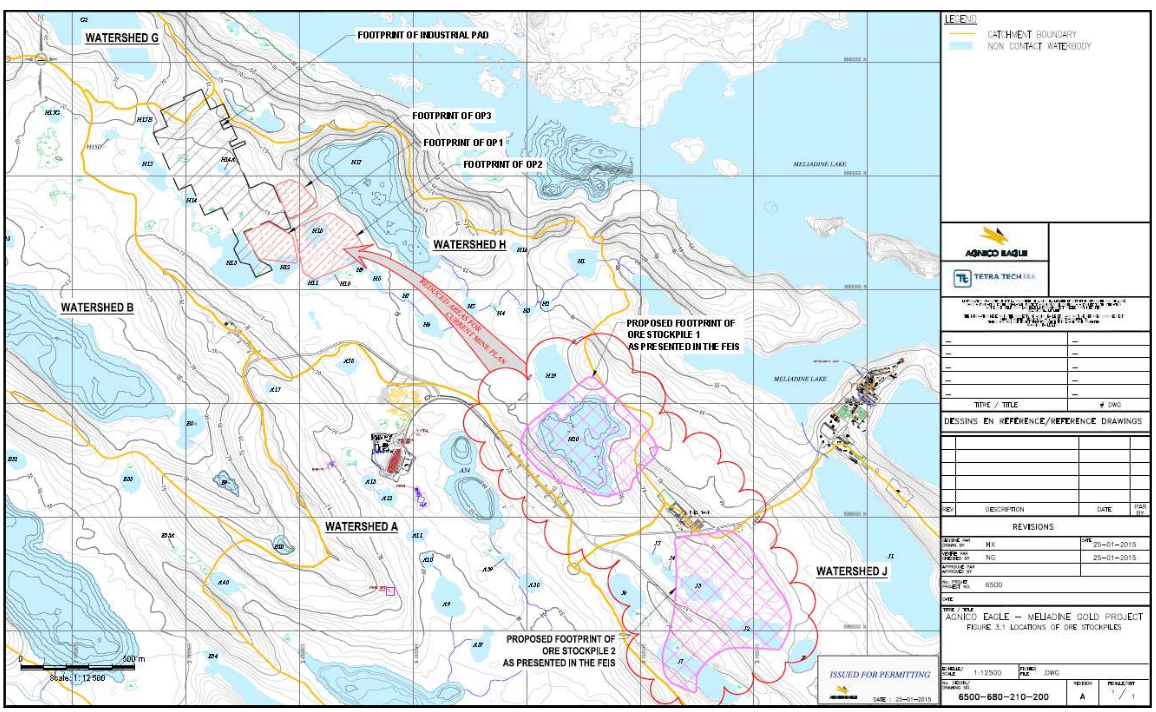


Figure 4.2 Temporary Ore Storage on Future WRSF2 Footprint

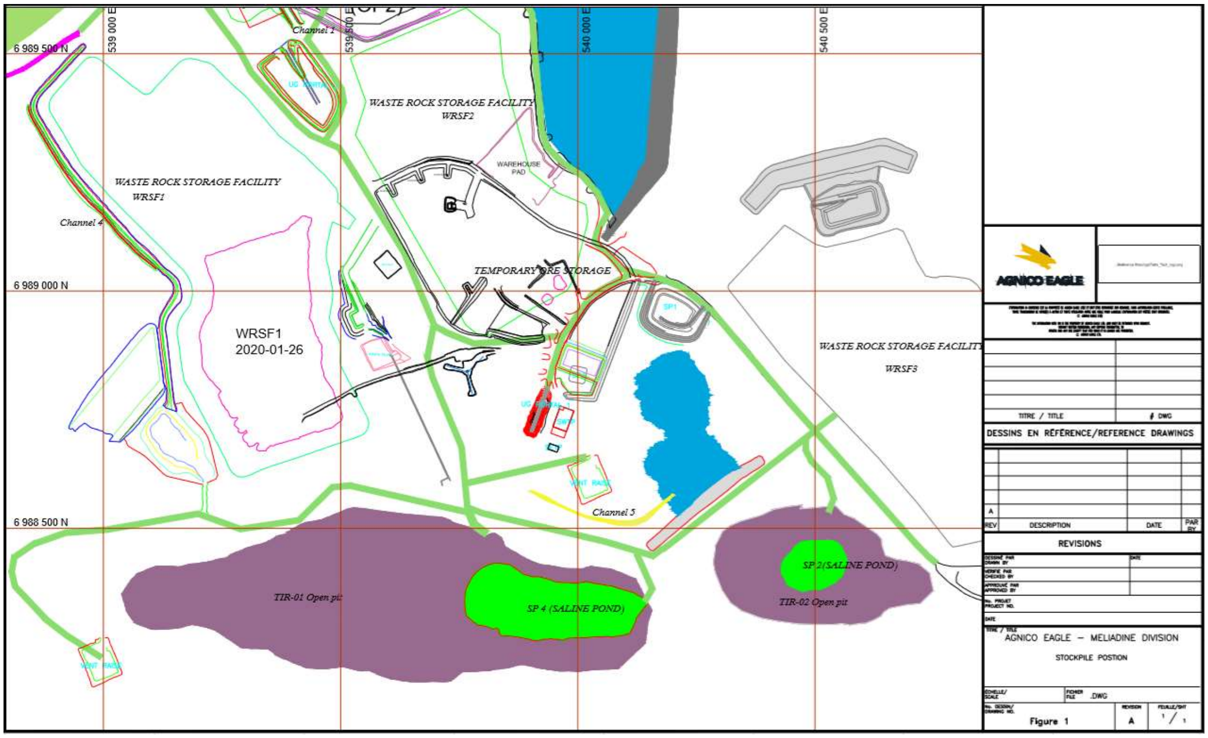


Figure 4.3 Ore Stockpile Typical Section

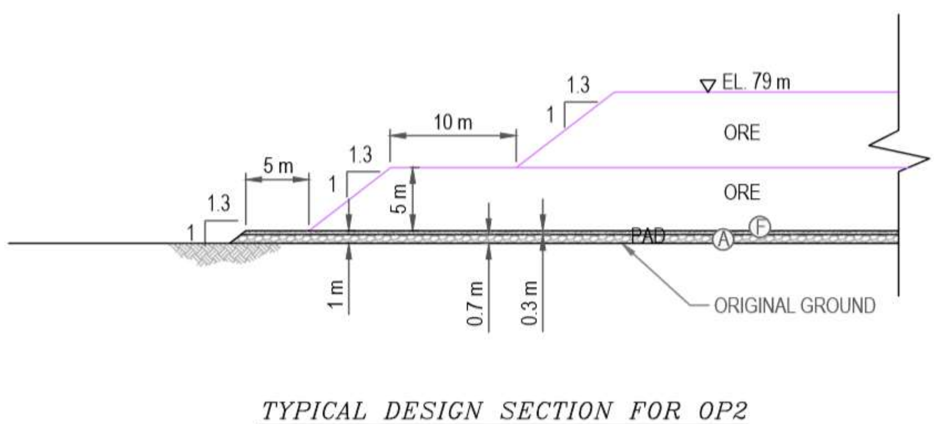
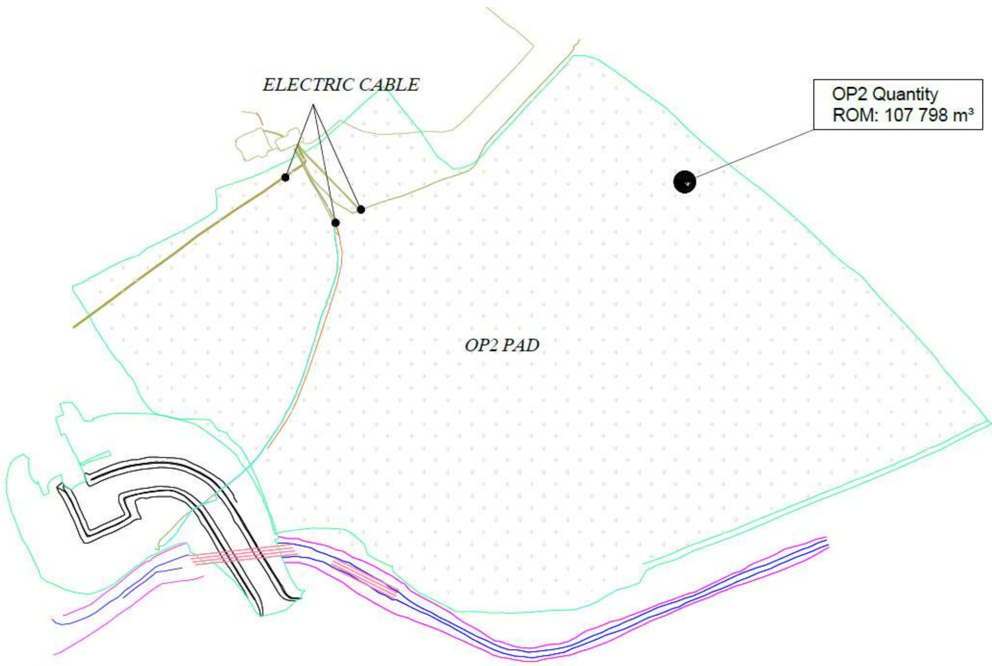


Figure 4.4 OP2 As-Built



AGNICO EAGLE

MELIADINE GOLD MINE

Explosives Management Plan

MARCH 2021
VERSION 7

ᓇᐃᓈᖅᓯᒪᔪᖅ

ᖄᖅᑕᖅᑐᓄᑦ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐸᕐᓇᐅᑎ (ᐸᕐᓇᐅᑎ) ᑐᑭᓯᐅᒪᔾᔪᑎᑕᖃᖅᑐᖅ ᖄᖅᑕᖅᑐᓕᐅᖅᑐᓂᒃ, ᐃᖏᕐᕋᔭᒃᑐᓕᕆᐟᓂᒃ, ᑐᖅᑯᖅᓯᒪᕕᖕᓂᑦ, ᐱᓕᕆᐊᖑᓂᖏᓐᓂᒃ, ᐊᒻᒪ ᐊᑐᖅᑕᐅᓂᖏᑦ ᖄᖅᑕᖅᑐᐃᑦ ᐊᓪᓃᑯᒃᑯᓐᓂᑦ. ᑕᒪᑐᒨᖓ ᐱᔾᔪᑎᖃᖅᑐᑦ ᑕᕆᐅᑯᑦ ᐊᐅᓚᖅᑎᑦᑎᕐᑲᑦᑕᕐᓂᕐᒧᑦ ᐊᒻᒪ ᑕᕆᐅᕐᒥᐅᑕᓂᒃ ᐊᓪᓃᑯᒃᑯᑦ ᐊᐅᓚᖅᑎᑦᑎᕐᑲᑦᑕᕐᓂᕐᒧᑦ ᐊᐅᓚᑦᑎᓂᖅ ᐸᕐᓇᐅᑎ-ᖔᓐᓃᑐᖅ (Agnico Eagle 2018). ᑲᓇᑕᐅᑉ ᐊᒻᒪ ᓄᓇᕗᑦ ᒪᓕᒐᐅᔭᖑᑦ, ᐅᕐᑲᐅᓯᕐᑲᖅᑐᖅ ᐊᐅᓚᑦᑎᓂᕐᒥᒃ ᐊᒻᒪ ᐊᑐᕐᓂᕐᒥᒃ ᖄᖅᑕᖅᑐᓂᒃ ᐅᑯᐊᖑᔪᑦ: ᑲᓇᑕ – *ᖄᖅᑕᖅᑐᓄᑦ ᐱᕐᑯᔭᖅ ᐊᒻᒪ ᒪᓕᒐᐃᕐ; ᐊᖅᔭᖅᑐᐃᓂᖅ ᐅᓗᓇᐊᓇᖅᑐᓂᒃ ᐱᕐᑯᑎᓂᒃ ᐱᕐᑯᔭᖅ ᐊᒻᒪ ᒪᓕᒐᐃᕐ; ᑲᓇᑕᒥᑦ ᐃᑯᐊᓪᓚᒃᑐᓕᕆᓂᕐᒧᑦ ᓇᑐᓇᐃᑯᑕᖅ ᐊᒻᒪ ᑲᓇᑕ; ᓄᓇᕗᑦ – ᖄᖅᑕᖅᑐᓂᒃ ᐊᑐᕐᓂᕐᒧᑦ ᐱᕐᑯᔭᖅ ᐊᒻᒪ ᐊᖅᔭᖅᑐᐃᓂᖅ ᐅᓗᓇᐊᓇᖅᑐᓂᒃ ᐱᕐᑯᑎᓂᒃ ᐱᕐᑯᔭᖅ ᐊᒻᒪ ᒪᓕᒐᐃᕐ; ᐅᔭᕋᖕᓂᐊᕐᕕᖕᒥᑦ ᐋᓐᓂᐊᖅᑕᐃᓕᒪᓂᖅ ᐊᒻᒪ ᐊᑦᑕᓇᖅᑐᒦᑎᑦᑎᑦᑕᐃᓕᒪᓂᕐᒧᑦ ᐱᕐᑯᔭᖅ ᐊᒻᒪ ᒪᓕᒐᐃᕐ; ᐊᒻᒪ ᐊᑦᑕᓇᖅᑐᒦᑎᑦᑎᑦᑕᐃᓕᒪᓂᕐᒧᑦ ᐱᕐᑯᔭᖅ ᐊᒻᒪ ᒪᓕᒐᐃᕐ.*

ᐊᓃᖅᑯᒃᑯᑦ ᐊᑐᕐᑲᑦᑕᖅᑐᑦ ᐊᑯᑉᐸᖅᓯᒪᔪᓂᑦ ᖄᖅᑕᖅᑐᓂᒃ ᐊᐅᓚᑕᐅᔪᓂᒃ ᖄᖅᑎᕆᓂᕐᒧᑦ ᐅᖓᑕᐅᑦᑎᓯᒪᔪᓄᑦ, ᐊᒃᑖᖅᑕᐅᔪᑦ ᐅᔭᖅᑲᓄᑦ, ᐅᔭᕋᒃᑕᖅᑕᐅᔪᓄᑦ, ᓴᓇᕚᓪᓚᐊᓂᕐᒧᑦ ᐊᑐᖅᑕᐅᔪᑦ ᐅᔭᖅᑲᓄᑦ, ᖁᐊᖅᓯᒪᔪᑦ ᐅᔭᕋᒃᑕᖅᑕᐅᔪᑦ ᑲᑎᓯᒪᔪᓄᑦ, ᐊᒻᒪ ᓯᐅᕋᕐᒧᑦ ᓄᓇᐅᑉ ᖃᖓᓂᑦ ᐊᒻᒪ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᓴᓇᔭᕙᓪᓕᐊᑎᓪᓗᒋᑦ ᐊᐅᓛᖅᑎᑦᑎᓂᕐᓄᓪᓗ ᐅᔭᕋᒃᑕᓇᕐᒥᑦ. ᐊᓯᖏᑦ ᖄᖅᑕᖅᑐᐃᑦ ᐊᑐᖅᑕᐅᕐᑲᑦᑕᕈᖕᓇᕐᒥᔪᑦ ᐊᓯᖏᓐᓄᑦ ᐱᓕᕆᐊᕐᓄᑦ.

ᑕᒪᓗᒃᑖᖅᑲᔭᖅ ᐱᕐᑰᑦ ᖄᖅᑎᕆᓂᕐᒧᑦ ᐊᑐᖅᑕᐅᕐᑲᑦᑕᖅᑐᑦ ᐊᐅᓪᓚᖅᑎᑕᐅᕐᑲᑦᑕᖅᑐᑦ ᐅᒥᐊᕐᔪᐊᒃᑯᑦ ᖃᐸᓗᓈᑦ ᓄᓇᖕᖑᓂᑦ ᑲᖏᖅᖠᓂᕐᒧᑦ, ᐅᓯᓕᖅᑐᖅᑕᐅᐸᓗᑎᒃ ᓯᑲᐅᓄᑦ ᐅᒥᐊᕐᔪᐊᑉ ᑭᓴᖅᓯᒪᕗᕕᑦᔭᖑᓂᑦ, ᐊᒡᔭᖅᑕᐅᐸᓗᑎᓪᓗ ᐃᑎᕙᐊᓄᑦ. ᖃᑯᑎᒃᑯᑦ, ᐱᕐᑰᑦ ᑎᖕᒥᓲᒃᑯᑦ ᑎᑭᑎᑕᐅᕐᑲᑦᑕᓇᐊᖅᑲᓱᑦ ᑕᒪᒃᑯᓄᖕᖑ ᐅᓯᖅᑲᑦᑕᖅᑐᒃᑯᑦ ᐸᕐᓇᐅᑕᐅᓯᒪᖕᖏᑦᑐᓄᑦ ᐱᓕᕆᐊᕐᓄᑦ. ᐅᒥᐊᕐᔪᐊᒃᑯᑦ ᑎᑭᑎᑦᔭᐅᔪᑦ ᖄᖅᑕᖅᑐᓄᑦ ᐃᓚᒋᔭᐅᔪᑦ, ᑭᖑᓂᐊᒍᑦ ᓯᑲᐅᑦ ᐅᓯᖏᔭᐃᖅᑳᖅᑎᓪᓗᒋᑦ, ᓰᑳᓐ-ᖑᓂᕋᖅᑕᐅᔪᑦ ᐅᒥᐊᕐᔪᐊᓃᓲᑦ ᐃᓗᓕᕐᑲᖅᓗᑎᒃ ᐱᕐᑯᑎᓂᒃ ᓄᓇᒃᑰᕈᑎᒃᑯᑦ ᐊᒡᔭᖅᑕᐅᓂᐊᕆᖅᓗᑎᒃ ᐅᔭᕋᒃᑕᓇᐊᕐᒧᑦ, ᑐᖅᑯᖅᑕᐅᓯᒪᓪᓚᐅᐱᓪᓚᕐᑲᑦᑕᖅᑐᑦ, ᐃᓚᐅᖏᑦᑐᑑᑉᐸᓗᑎᒃ ᑏᖅᓯᒪᔪᑦ ᖄᖅᑕᖅᑐᐃᑦ, ᖁᑦᑎᒃᓯᕆᐊᕈᑏᑦ, ᐊᒻᒪ ᒪᑐᐃᑦ, ᐊᒡᔭᖅᑕᐅᓂᐊᖅᐸᓗᑎᒡᓗ ᐅᔭᕋᒃᑕᓇᐊᕐᒧᑦ ᐅᓯᖏᔭᖅᑕᐅᕕᓂᒃᐸᑕ ᓯᑲᐅᒥᑦ. ᑕᒪᒃᑯᐊ ᑐᖅᑯᖅᑕᐅᓯᒪᓪᓚᐅᐱᓪᓚᕆᐊᕐᑲᕖᖕᖓᑕ ᑲᖏᖅᖠᓂᕐᒥᑦ, ᖃᐅᔨᓴᖅᑕᐅᖏᓐᓇᕐᑲᑦᑕᖅᑐᑦ ᐊᓃᖅᑯᒃᑯᑦ ᐱᓕᕆᔩᖏᓐᓄᑦ ᑭᓯᐊᓂ ᐊᒡᔭᖅᑕᐅᔪᖕᓇᖅᓯᔭᕖᖔᑕ ᐅᔭᕋᒃᑕᓇᐊᕐᒧᑦ.

ᐅᔭᕋᒃᑕᓇᐊᕐᒥᑦ ᐱᕐᑰᑦ ᐱᔾᔪᑎᖃᖅᑐᑦ ᖄᖅᑕᖅᑐᓄᑦ ᐃᓚᐅᔪᑦ i) ᐊᑯᑉᐸᖅᑎᓇᖖᒃ (ᓄᓇᐅᑉ ᖄᖓᓂᑦ), ii) ᖄᖅᑕᖅᑐᓂᒃ ᐃᓕᓯᕚᑦ ᑐᖅᑯᕐᓂᐊᕐᓗᒋᑦ ᐆᖅᓯᒪᔪᑦ ᖄᖅᑕᖅᑐᐃᑦ,

AGNICO EAGLE

ᐱᕆᐊᕐᑎᑦᑎᔾᔪᑏᑦ ᐃᓚᐅᑉᐳᑎᒃ ᖄᕐᓯᔾᔪᑏᑦ ᐊᒻᒪᓗ ᐊᑯᑉᓚᕐᑐᐃᓂᕐᒧᑦ ᐆᓇᔾᔭᐅᔪᑦ ᐊᒻᒪᓗ iii) ᓄᓇᐅᑉ ᖄᖓᓂᑦ ᑐᕐᑯᕐᓯᓯᒪᕝᕕᒃ ᐊᑐᕐᑕᐅᔪᓄᑦ ᐊᑯᑉᓚᕐᑎᓇᓂᐊᕐᓗᓂ. ᐋᕐᕿᒃᓱᕐᓯᒪᔪᖅ ᐊᑯᑉᓚᕐᑎᓇᕝᕕᒃ ᐊᑐᓚᕐᑎᑕᐅᓚᐅᖅᑐᖅ ᐋᒡᔪᓚᕐᕕᒃ 12, 2017-ᒥᑦ; ᓇᖕᒥᓂᓇᔾᔭᐅᔪᖅ ᐊᒻᒪᓗ ᐊᐅᓚᑕᐅᖃᑦᑕᖅᐳᓂ ᖄᕐᑕᕐᑐᕐᑖᕐᕕᐅᖃᑦᑕᖅᑐᒧᑦ.

ᐃᑲᔪᐃᓂᕐᒧᑦ ᐊᑦᑕᓇᕐᑐᕐᑕᖃᓐᖏᓪᓗᒍ ᑐᕐᑯᕐᑕᐅᓯᒪᑦᑎᐊᕐᓗᑎᒡᓗ ᐅᕐᓱᐊᓗᐃᑦ, ᐅᓗᓇᐊᓇᕐᑐᑦ, ᐊᒻᒪᓗ ᐅᓗᓇᐊᓇᕐᑐᑦ ᐊᒃᑕᑯᐃᑦ, ᖃᓄᐃᖕᖓᓂᖕᖏᓐᓅᖕᖓᔪᑦ ᐱᕐᑯᑏᑦ ᒪᓕᖕᓂᐊᕐᑐᑦ ᐊᔾᔨᒌᖕᖏᑦᑐᓂᒃ ᒪᓕᒃᑕᐅᔪᒃᓴᓂᒃ ᐋᕐᕿᒃᑕᐅᔪᑦ ᒪᓕᒐᓂᒃ ᑲᒪᔾᔭᐅᔪᓄᑦ. ᐊᑯᑉᓚᕐᑎᓇᕝᕕᒃ ᐋᕐᕿᒃᓱᕐᑕᐅᓯᒪᔪᖅ ᐃᓚᓕᐅᑎᔾᔭᐅᓯᒪᑉᐳᓂ ᓇᑎᖕᖓᓂᑦ ᑐᕐᑯᕐᓯᓯᒪᕝᕕᒃ. ᐱᕐᑯᑏᑦ ᖄᕐᑕᕐᑐᓕᖕᖑᐊᕐᑐᑦ ᑐᕐᑯᕐᑕᐅᓯᒪᓂᐊᕐᑐᑦ ᒪᓕᒡᓗᒋᑦ ᒪᓕᒐᐃᑦ. ᑯᕕᔪᖃᕐᐸᑦ, ᑯᕕᔪᓂᒃ ᓂᓇᐅᓇᖖᒋᑦᑐᓕᓇᓂᕐᒧᑦ ᐸᕐᓇᐅᑎ ᐊᑐᓕᕐᑎᑕᐅᓂᐊᕐᑐᖅ ᐊᒻᒪᓗ ᐱᕐᑯᑏᑦ ᑖᑉᑯᓄᖕᖓ ᐊᑐᖅᑕᐅᓗᑎᒃ ᐊᑕᐅᓯᕐᑏᑎᑦᑎᓂᕐᒧᑦ ᑯᕕᔪᓕᓇᔾᔪᑏᑦ. ᖃᓄᐃᓕᑦᑕᐃᓕᒪᑎᑦᑎᓂᒧᒃᑖᑦ ᐊᒻᒪᓗ ᓯᕐᑯᒥᑦᑐᓕᓇᓃᑦ ᐱᓕᓇᐊᖑᓂᐊᖅᑐᑦ ᐊᒻᒪᓗ ᑎᑎᕋᐅᓯᐅᓗᑎᒃ ᒪᓕᒡᓗᒋᑦ ᐊᐅᓛᕐᓂᒧᑦ ᐊᑐᖅᑕᐅᖃᑦᑕᖅᑐᑦ. ᑐᐊᕕᓇᖅᑐᒧᑦ ᐅᐸᓗᐊᓂᒧᑦ ᐸᕐᓇᐅᑎ, ᑐᓂᔾᔭᐅᔪᖅ ᖄᕐᑕᖅᑐᓂᒃ ᐱᕝᕕᐅᖃᑦᑕᖅᑐᓄᑦ ᐊᒻᒪᓗ ᓴᓇᔾᔭᐅᔪᒥᑦ, ᐱᓕᓇᐊᖅᑲᖅᑐᖅ ᐱᐅᖕᒋᓛᒃᑯᑦ ᖃᓄᐃᓕᓂᐅᔪᓂᒃ, ᓲᕐᓗ ᐱᓂᕐᓗᐊᕐᑭᓂᒃᑯᑦ ᖄᖅᑐᖅᑲᖅᐸᑦ, ᑎᑎᖅᑲᖅ ᒪᓂᒪᑎᑕᐅᔪᖅ ᐊᑯᑉᓚᕐᑎᓇᕝᕕᖕᒥᑦ ᑕᑯᔭᐅᓕᐊᖃᑦᑕᖅᓯᓇᖅᓗᓂ.

EXECUTIVE SUMMARY

This Explosives Management Plan (the Plan) provides information on the manufacture, transport, storage, handling, and use of explosives at the Agnico Eagle Mines Limited (Agnico Eagle) Meliadine Gold Mine (Mine). Aspects related to marine shipping and marine mammals are presented in Agnico Eagle's Shipping Management Plan (Agnico Eagle 2018). The main federal and territorial legislation, which cover the control and use of explosives are: Canada - *Explosives Act* and *Regulations; Transport of Dangerous Goods Act and Regulations; National Fire Code of Canada;* Nunavut - *Explosives Use Act* and *Regulations, Transportation of Dangerous Goods Act* and *Regulations*; *Mine Health and Safety Act* and *Regulations*; *Fire Prevention Act* and *Regulations;* and *Safety Act* and *Regulations*.

Agnico Eagle uses emulsion-based explosives for controlled blasting of overburden, waste rock, ore, construction rock, frozen ore stockpile, and granular material on surface and underground during the construction and operation phases of the Mine. Other explosives may be used for specifics projects.

Most products required for blasting activities are shipped by vessel from the south to Rankin Inlet, loaded onto barges at the vessel anchoring location, and transported to Itivia. On occasion, product must be flow up on dedicated cargos for unplanned work. During sealift reception of explosive product, after the barges are unloaded, sea cans holding the raw products will be temporarily stored before being trucked to the mine site, with the only exceptions being packaged explosives, boosters, and caps, which will be transported directly to the mine site after being unloaded from the barge. In the event that these products require temporary storage in Rankin Inlet, they will remain under constant surveillance by Agnico Eagle personnel until transportation to site becomes possible.

Mine infrastructure related to explosives includes an i) Emulsion Plant (surface), ii) Explosive Magazines for storage of packaged explosives, initiation products including detonators and emulsion bins and iii) surface storage of raw materials used in the preparation of emulsion. The modular Emulsion Plant was commissioned in December 12, 2017; it is owned and operated by the Explosive supplier.

To assist in the safe and secure storage of fuels, hazardous materials, and hazardous wastes, design criteria of the infrastructure follows the various guidelines set by regulatory bodies. The Emulsion Plant is modular plant with integrated containment storage in the floor. Products entering the composition of explosives will be stored in accordance with the regulations. In the event of a spill, the Spill Contingency Plan will be put into operation and appropriate equipment will be used to contain spilled materials. All preventive and breakdown maintenance will be carried out and recorded in accordance with standard operating procedures. An Emergency Response Plan, provided by explosive supplier and on-site manufacturer, addresses worst-case scenarios, such as an accidental explosion, this document is made available at the plant for consultation.

TABLE OF CONTENTS

TABLES AND FIGURES

DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	October 2012			First draft of the Explosives Management Plan	Blandine Arseneault, Env. Superintendent, Agnico Eagle Ryan Vanengen, Biologist, Agnico Eagle
2	March 2013			DEIS re-submission	No change; rebranding
3	April 2014	3.3-3.4 3.5	8-9 10	Added details on best practices and types of explosives Reduced instantaneous pressure change from 100 to 50 kPa	Josée Noël, Environmental Coordinator, Agnico Eagle John Witteman, Env. Consultant, Agnico Eagle
4	April 2015			Update of entire document for submission for Type A Water Licence	François Petrucci, Agnico Eagle
5	March 2018			General revision	Stephen David, Engineering Department, Agnico Eagle
6	March 2020			General revision	Vanessa Smith, Projects Coordinator, Agnico Eagle
7	March 2021			General revision	Vanessa Smith, Projects Coordinator, Agnico Eagle

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
ANFO	Ammonium Nitrate / Fuel Oil
CCME	Canadian Council of Ministers of the Environment
MMU	Mobile Manufacturing Unit
NEQ	Net explosive content
NIRB	Nunavut Impact Review Board
NWT	Northwest Territories
Nu	Nunavut
PHC	Petroleum Hydrocarbons
Plan	Explosives Management Plan
PVS	Peak Vector Sum
WHMIS	Workplace Hazardous Materials Information System

SECTION 1 • INTRODUCTION

1.1 Overview

Agnico Eagle Mines Limited (Agnico Eagle) uses explosives for controlled blasting of overburden, waste rock, ore, construction rock, frozen ore stockpile, granular material on surface and underground during the construction and operations phases of the Meliadine Mine.

1.2 Purpose and Scope

This Explosives Management Plan (the Plan) provides information on explosives manufacture, transport, storage, handling, and use at the Project and its conformity with Section 9.4.13 of the *NIRB Guidelines for the Preparation of an Environmental Impact Statement for Agnico Eagle Mines Ltd.'s Meliadine Project (NIRB File No. 11MN034),* and with the Nunavut Water Board's *Mining and Milling: Supplemental Information Guideline for Mine Development*.

1.3 Related Documents

Documents containing information related to this Plan include the following:

- Environmental Management and Protection Plan;
- Risk Management and Emergency Response Plan;
- Spill Contingency Plan;
- Landfill and Waste Management Plan;
- Hazardous Materials Management Plan;
- Borrow Pits and Quarries Management Plan;
- Water Management Plan;
- Meliadine Emergency Response Plan;
- Meliadine Crisis Management Plan;
- Oil Pollution Emergency Plan.

1.4 Applicable Legislation

The control and use of explosives within Canada and Nunavut is covered by existing federal and territorial Acts and Regulations. The Mine has implemented operational policies and procedures, which meet or exceed applicable legislation. Applicable Acts, Regulations, and Guidelines are listed in Table 1-1.

Table 1-1 Applicable Legislation to Explosives Management

Acts	Regulations	Guidelines
Federal		
Canadian Environmental Protection Act (1999 c.33)	*Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations (SOR/2008-197)* *Environmental Emergency Regulations* (SOR/2019-51 *Interprovincial Movement of Hazardous Waste and Hazardous Recyclable Material Regulations* (SOR/2002-301)	*Canadian Council of the Ministers of Environment - Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products* Notice with respect to substances in the National Pollutant Release Inventory Canada-Wide Standards for Petroleum Hydrocarbons (PHC) In Soil
Fisheries Act (R.S.C. c. F-14)	*Metal Diamond Mining Effluent Regulations* (SOR/ 2002-222	Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters
Explosives Act (1985 c.E-17)	*Explosives Regulations* (C.R.C., c. 599) *Ammonium Nitrate and Fuel Oil Order* (C.R.C., c. 598)	Blasting Explosives and Initiation Systems: Storage, Possession, Transportation, Destruction and Sale
National Fire Code of Canada (2010)		
Transport of Dangerous Goods Act (1992, c.34)	*Transportation of Dangerous Goods Regulations* (SOR/2001-286)	
Territorial – Nunavut		
Environmental Protection Act (RSNWT (Nu) 1988, c E-7)	*Spill Contingency Planning and Reporting Regulations* (NWT Reg (Nu) 068-93) *Used Oil and Waste Fuel Management Regulations* (NWT Reg 064-2003)	Guideline for the General Management of Hazardous Waste in Nunavut Guideline for Industrial Waste Discharges in Nunavut Guideline for the Management of Waste
Mine Health And Safety Act (SNWT (Nu) 1994, c 25)	*Mine Health And Safety Regulations* (NWT Reg (Nu) 125-95)	
Explosives Use Act (RSNWT (Nu) 1988, c E-10)	*Explosives Regulations* (RRNWT (Nu) 1990 c E-27)	
Fire Prevention Act (RSNWT (Nu) 1988, c F-6)	*Fire Prevention Regulations* (RRNWT (Nu) 1990 c F-12)	
Safety Act (RSNWT 1988, c.S-1)	*General Safety Regulations* (RRNWT (Nu) 1990 c S-1) *Work Site Hazardous Materials Information System Regulations* (RSNWT 1988, C 81 (Supp))	
Transportation Of Dangerous Goods Act (1990, RSNWT (Nu) 1988, c 81 (Supp))	*Transportation Of Dangerous Goods Regulations* (1991, NWT Reg (Nu) 095-91)	

SECTION 2 • MANUFACTURE OF EXPLOSIVES

2.1 Infrastructure

Construction and production blasting of the Mine requires a combination of emulsion and packaged products. The Emulsion Plant, owned and operated by Dyno Nobel, began manufacturing emulsion explosives on December 12, 2017; the factory license for this operation is included in Appendix A.

General infrastructure for the management of explosives at the mine site includes the following:

- Emulsion Plant;
- Storage of raw materials used in the manufacturing of emulsion; and
- Explosive Magazines for storage of packaged explosives, initiation products including detonators and emulsion bins.

The Emulsion Plant operates 7-days a week on a 24-hour per day basis; a night shift has been added in 2020 to accommodate open pit production. The explosives truck(s) are based at the Emulsion Plant. There is a separate garage building for the maintenance and washing of trucks and equipment used to handle the explosives in the Emulsion Plant footprint. The water used for the manufacturing of emulsion is fresh water supplied by the Mine. Wastewater generated inside the Emulsion Plant will be collected and disposed in an appropriate method (remaining solids will be disposed in the same manner as unusable emulsion as described in Section 3.6).

2.2 Location

The Emulsion Plant, raw material storage, and magazines will be safely located away from vulnerable facilities, as stipulated by the National Standard of Canada CAN/BNQ 2910-510/2015 Explosives – Quantity Distances guidelines.

The Emulsion Plant is located approximately 1.4 kilometers north-west of the mine site as shown on Figure 2-1.

Figure 2-1 Location of Emulsion Plant & Main Mine infrastructures (MSB, Mill, Dorms)

Figure 2-2 Modular Emulsion Plant and Ammonium Nitrate Storage Pad

The Surface Explosive Magazine has been re-localized this past year along a new access road in relative proximity to the emulsion plant, respecting a D4 distance of 360m.

Figure 2-3 New Permanent Surface Magazine Location - the Emulsion Plant Storage

Underground facilities include three Explosive Magazines and three Detonator Magazines located at Levels 200, 300 and 400 with a new set planned for the Level 500. These facilities are constructed following good engineering practice.

2.3 Products

The following products are required for manufacturing emulsion:

- surfactant (highly reacted oil mixture);
- ammonium nitrate (AN);
- sodium nitrate;
- water; and
- microballoons.

The explosive truck (Mobile Manufacturing Unit or MMU) used to deliver emulsion at surface operations will use either water or a mixture of water and glycol during freezing conditions to allow for the pumping of the emulsion into the blastholes.

The following products will be required to achieve blasting activities:

- Bulk or packaged explosives;

- Initiating systems including caps, boosters, detonating cords; and
- Glycol (during freezing conditions).

2.5 Design Criteria

To assist in the safe and secure storage of fuels, hazardous materials, and hazardous wastes, the following is the design basis for the storage areas and facilities related to explosives:

- Design complies with the *National Fire Code*.
- Compliance with the Canadian Council of Ministers of the Environment (CCME), *Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products (2003)*.This CCME code deals with inventory control, inspections, corrosion protection, records, and monitoring. Environment Canada's *Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations* outlines registration and documentation requirements for storage tanks.
- Emulsion Plant area is a restricted area, adequately signed indicating that hazardous materials/wastes are stored therein.
- All storage locations are clearly defined and marked to prevent damage to storage drums and containers in the event they are covered by snow.
- Incompatible materials are segregated by chemical compatibility within the storage area to prevent contact between materials in the event of a release.
- The Emulsion Plant respects the 31 metres required separation distance to surface waters.
- Emulsion Plant is readily accessible for emergency interventions.
- The Emulsion Plant is adequately ventilated to prevent the build-up of noxious or toxic vapors.
- Secondary containment is built into the facility allowing 110% containment of the largest container or tank volume of any chemical within the contained area.
- Adequate spill and emergency response equipment is available at the plant site and in associated storage area (i.e., spill control, fire protection, etc.).

SECTION 3 • HANDLING OF EXPLOSIVES

3.1 Transport

Most products required for blasting activities are shipped by vessel or by dedicated cargo from the south to Rankin Inlet. On occasion, product must be flow up on dedicated cargos for unplanned work. Explosives arriving by sealift are off-loaded at Itivia and transported immediately to site using the bypass road and All-weather Access Road (AWAR). Once arrived on site, explosives and raw materials for manufacturing explosives are stored in their designated storage locations at the mine site. Explosive material travelling through Rankin Inlet adhere to all regulations regarding transportation of dangerous good set forth by Natural Resource Canada (NRCAN) in the Explosives Act (as amended by the Public Safety Act, 2002).

The handling of explosives on-site is carried out by the supplier and by qualified Agnico Eagle staff (blasters and helper-blasters) holding a valid letter of approval or acceptable equivalent screening documents such as FAST cards, NEXUS cards, a Firearms Possession and Acquisition Licence (PAL), and Permis Général issued by the Sûreté du Québec as stipulated by the Explosives Regulation, 2013. Delivery of explosives on site is dependent of the client: underground or surface.

3.1.1 Surface Transport and Equipment

Surface product is pumped into a 10 tonne capacity explosive truck called MMU. The MMU delivers emulsion to the open pit production blast holes.

Figure 3-1 Mobile modular Emulsion Plant and Explosive Truck

3.1.1 Underground Equipment

Underground product is manufactured and stored in 1.2 tonne capacity BIC emulsion totes.

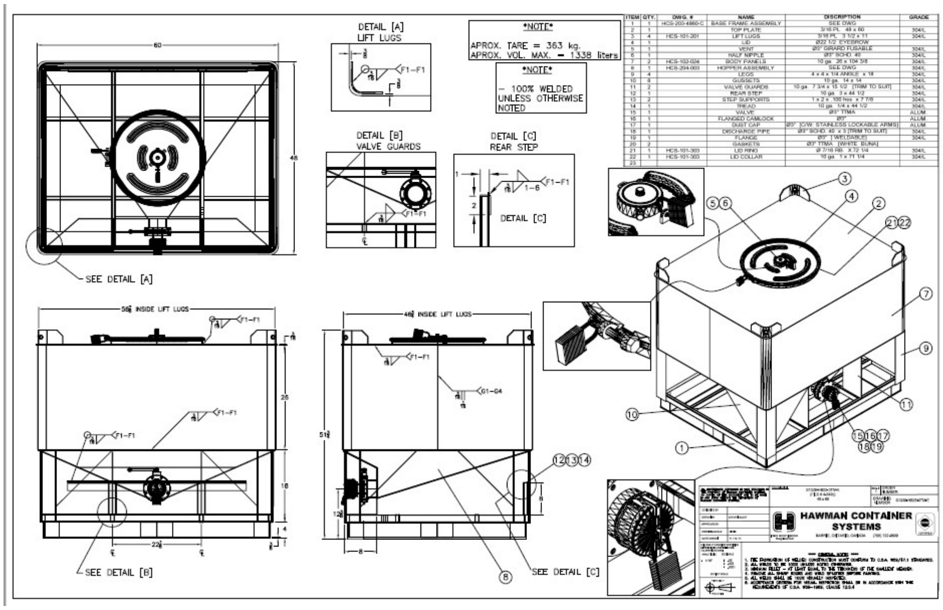


Figure 3-2 Underground Emulsion BIC Storage Bins

These totes are delivered from the Emulsion plant to the underground portal for underground storage. Transportation underground is undertaken by service personnel using a boom truck.

An underground emulsion charger is used to deliver emulsion to the workface. This proprietary mobile unit is the DynoMiner Advance system, supplied and serviced by Dyno Nobel, designed to deliver Dyno Nobel's TITAN 7000 range of water resistant pumpable bulk emulsion explosives to the workface for development mining. This unit is mounted on an EC3 Maclean Carrier. These units are only operated by people having specific training in addition to the required explosive handling requirements.

Figure 3-3 Underground Emulsion Charger – Dyno Loader

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3.2 Storage

After the barges are unloaded, sea cans holding the raw products will be temporarily stored at Itivia before being trucked to the mine site, with the exception of all explosives material including initiation systems which are transported directly to the mine site after being unloaded from the barges. Products which are temporarily stored at Itiva will have the doors of the sea cans placed against each so the sea can doors cannot be opened In the event that these products require temporary storage in Rankin Inlet, they will remain under constant surveillance by Agnico Eagle personnel or qualified contractors until safe transportation to site is available.

3.1.1 Surface Storage

On the mine site, raw materials such as sodium nitrate and ammonium nitrate used in the preparation of emulsion will be contained in 1- tonne tote bags, and stored in sea cans (capacity of approximately 20,000 kilograms each). Raw materials of different and incompatible types will be stored in separate sea cans to prevent their mixing. Raw materials will also be stored away from any other products as required by explosive regulations.

Initiation systems including detonators and product under the same classification will be stored in Detonator Magazines (surface and underground). Packaged explosives including boosters and detonating cord, and bulk explosives will be stored in Explosive Magazine.

Figure 3-4 Surface Explosive Magazines and Berms

The location and positioning of surface magazines are placed based on a total NEQ of 237,000 kg of explosives with a temporary allowance of 310,000 kg. The required separation distance outlined in the National Standard of Canada CAN/BNQ 2910-510/2015 Explosives – Quantity Distances guidelines.

There are currently sfourteen (14) permanent surface explosive storage magazines which store both explosive and initiation products for surface and underground applications. These storages have been relocated late 2020 since they were in the Open pit footprint.

All surface magazines are in the process of being grounded to satisfy the requirements of CSA Standard CAN/CSA M421-93, Use of Electricity in Mines and the Mines Health and Safety Regulations

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article 14.04 Surface Magazines. Electrical, Heating and Lighting. There are 40 m of diamond drill rods that are connected to a grounding ring to ensure an effective ground in the event of a lightning event.

Figure 3-5 Surface Explosive Magazines – Grounding

3.1.1 Underground Storage

There are six underground storage areas; these magazines are managed and permitted according the NU/NWT Mines Health and Safety Regulations. The detailed construction drawings for each excavation type are show below

- *Underground explosive magazines include L200, L300, and L400.*
- *Underground detonator magazines include L200, L300, and L400.*

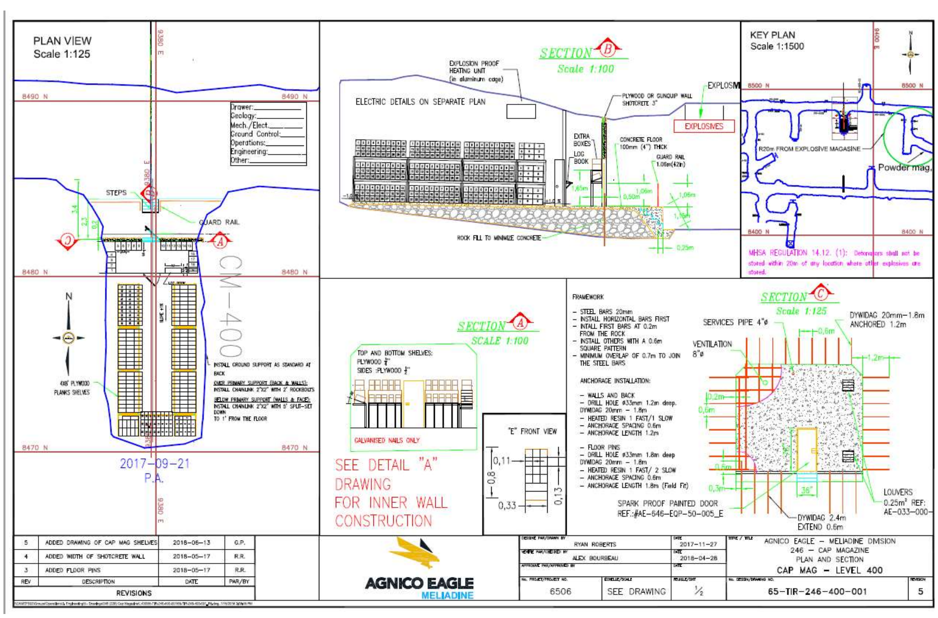

Figure 3-6 Underground Detonator Magazines Design

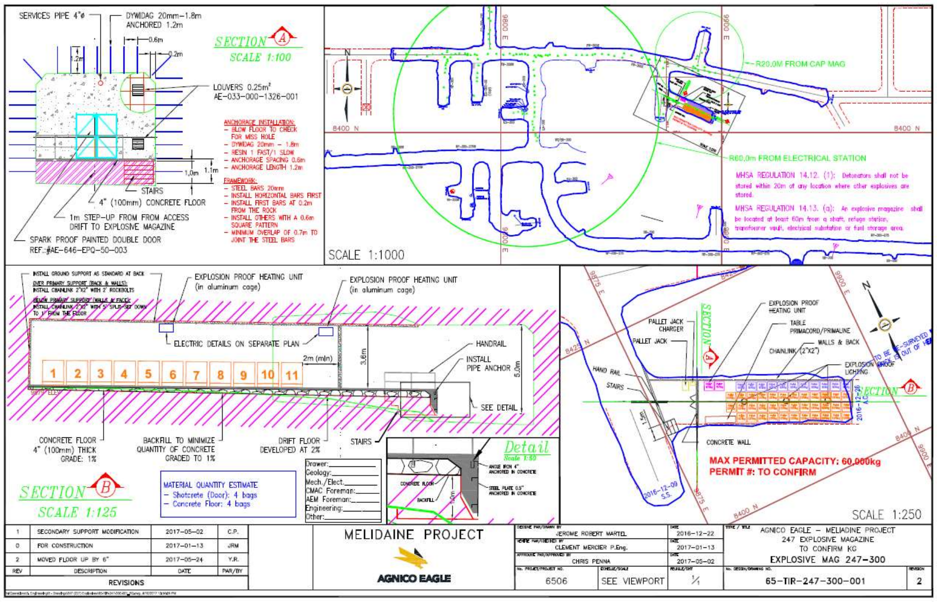

Figure 3-7 Underground Explosive Magazines Design

3.3 Blasting Activities

Blasting occurs at the end of each shift, up to two times per day for both underground and surface blasting. The quarries, and possibly the borrow pits and stockpiles in some instances, may also require the use of explosives. At the end of all blasting activities, unused explosives will be returned to their respective storage magazines without undue delay.

Blasting using electric initiation systems are the general practice for surface and underground operations. The blasting patterns will favor maximal fragmentation, which will reduce energy consumption related to the crushing at the mill. Blasting will be carried out by certified blasters who will follow blasting regulations and safe practices. The responsibility for blasting will be split between appropriately trained mine personnel and the explosives supplier.

For safety, environmental, and economic reasons, blast designs will be optimized and will include measures that favor complete detonation of all explosives. Drill patterns, explosive loads, and initiation methods will be designed and performed by experienced professionals, and will be adaptively managed to make necessary adjustments should any problems be observed. Having a single explosives supplier and trained certified blasters loading the holes and performing blasting activities will ensure the consistency and efficiency of the activity. Blasters who are conscientious and aware can prevent most spills by adjusting their loading practices.

3.4 Type of Explosives

There is a large selection of explosives use for production blasting during surface, underground and construction blasting. The following table summarizes the most common products used at the Mine.

Table 3-1 Type and class of Surface Explosives

Supplier Name	Description	Class	VELOCITY (m/s)	DETONATION PRESSURE (Kbars)	SHELF LIFE
ELECTRIC SUPERSTARTER *(NEQ. 0.0570kg/100)*	Electric Instant Detonator	1.4B	-	-	3 yr
NONEL EZ DET *(NEQ. 0.1125kg/100)*	Nonelectric Blast Initiation System	1.1B	-	-	3 yr
NONEL EZTL *(NEQ. 0.0240kg/100)*	Nonelectric Trunkline Delay Detonators	1.4B	-	-	3 yr
NONEL MS Connectors	Bi-directional units with 46cm shock tube	1.1B	-	-	3 yr
NONEL Lead Line *(NEQ. 0.0044kg/100)*	Nonelectric Shock Tube	1.4S	-	-	3 yr
TROJAN SPARTAN *(450G & 200G)*	Cast Booster	1.1D	7,550	235	5 yr
TITAN 1000G *(SURFACE)*	Unsensitized Gassable Bulk Emulsion Matrix	1.5D	4,500	61	2wks
PRIMACORD 5 *(5.3g/m)*	Detonating Cord	1.1D	-	-	5yr
PRIMALINE 85 *(85g/m)* *(NEQ. 27.2kg/1000ft)*	Detonating Cord	1.1D	6,300	-	5 yr

Table 3-2 Type and class of Underground Explosives

Supplier Name	Description	Class	VELOCITY (m/s)	DETONATION PRESSURE (Kbars)	SHELF LIFE
ELECTRIC SUPERSTARTER *(NEQ. 0.0570kg/100)*	Electric Instant Detonator	1.4B	-	-	3 yr
NONEL LP SERIES	Detonator	1.1B	-	-	3 yr
DIGISHOT PLUS *(NEQ. 0.100kg/100)*	Electric Initiation Sys.	1.4B	-	-	3 yr
TROJAN SPARTAN *(200G, 90G, 20G)*	Cast Booster	1.1D	7,550	235	5 yr
DUPLEX LEAD WIRE	Wire Blasting				
TITAN 7000G *(UNDERGROUND)*	Sensitized Bulk Emulsion	1.5D	5,500	91	3 mo
DYNO AP	Sm. Diam. Detonator Sensitive Emulsion	1.1D	4,700	63	1 yr

3.5 Blast Monitoring for the Protection of Fish

Monitoring to evaluate blast related peak particle velocity and overpressure to protect nearby fish bearing waters will be conducted to ensure blast operations are within the Guidelines for the Use of Explosives In or Near Canadian Waters (Wright and Hopky, 1998) as modified by the DFO for use in the North indicate the following requirements that are applicable to the Mine:

- No explosive is to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous pressure change (i.e. overpressure) greater than 50 kPa in the swim bladder of a fish.
- No explosive is to be detonated that produces, or is likely to produce, a peak particle velocity greater than 13 mm/sec in a spawning bed during the period of egg incubation.

For additional details on blast monitoring, please refer to Agnico Eagle's Blast Monitoring Program, which is revised annually and is in in compliance with Project Certificate No.006 issued by the Nunavut Impact Review Board (NIRB).

3.6 Disposal of Wastes

Disposal of regular waste follow the Landfill and Waste Management Plan for the Project.

Any hazardous material that requires disposal is handled according to the Project's Hazardous Materials Management Plan, submitted as part of the Type A Water Licence application.

Used water generated at the Emulsion Plant is recirculated back into the process or is sent down south for disposal. Remaining solids are disposed in the same manner as unusable emulsion as described below.

Any unusable/unused emulsion waste, as well as other explosive products whose expiry date has passed, are destroyed following site-specific procedures depending on the nature of the product. The most efficient method to destroyed expired product is during open pit blasting in blastholes.

Empty explosive boxes or bags are burned on-site by site service (E&I) trained personnel.

SECTION 4 • SPILLS

4.1 Spill Prevention

The Emulsion Plant is a modular plant with built in-floor spill containment with a 110 % containment capacity of the largest spill. All facilities related to explosives handling on-site will be secured (locked) and regularly inspected by site security.

More details regarding spill preventive methods are provided in Spill Contingency Plan, submitted as part of the Type A Water Licence Application for the Project. The following is a summary of the main aspects:

- All storage tanks containing products that enter the composition of explosives will be in accordance with the provisions of regulations (e.g., National Fire Code, *Environmental Protection Act*).
- In case of a spill, the Spill Contingency Plan will be put into action and appropriate equipment will be used to contain the liquids or solids spilled.
- All preventive and breakdown maintenance will be carried out and recorded in accordance with standard operating procedures.

4.2 Intervention in Case of a Spill

Table 4-1 summarizes procedures to be applied in case of a leak or a spill of a product used in the manufacture of emulsion. Means of disposal of waste are also included. More details regarding hazardous materials and spill management are provided in the Spill Contingency Plan.

Table 4-1 Procedures in Case of Leaks and Spills of Explosive Products[1]

Product	Description	Spill and Leak Procedures	Waste Disposal
Ammonium Nitrate	Odorless, white to light, tan crystalline solid.	Remove source of heat and ignition. Sweep or shovel (non-sparking ie aluminium etc) spill into a clean, non-combustible non metal container. Wash remaining trace residues with water. Wear rubber gloves and safety glasses to prevent contact with skin and eyes.	Dispose of as-is in approved containers. As much as possible, remove, the spilled material as a solid.
Surfactant	Dyed or pale yellow liquid with petroleum odor.	Eliminate any source of ignition. Prevent spills from entering watercourses or drainage systems. Contain with sand or earth. Recover with pump or inert absorbent material, and place in clean container(s). Wear safety glasses and rubber gloves to prevent contact with eyes and skin.	Dispose as specified in the Hazardous Material Management Plan.
Emulsion	Blasting agent.	Remove all sources of heat and ignition. Prevent spills from entering watercourses or drainage systems. If a large amount of emulsion is involved, contain spill with earth or sand. Recover spilled material with a diaphragm pump. Use of a diaphragm pump also requires an air compressor. Limitation of the pump suction is approximately 2.5 metres, pump discharge is approximately 8 metres. Use a screening device on pump suction hose. Out of area spills will require taking two pumps and extra hose. Transfer the product into a tanker trailer or clean 200 litre non-metal drums. If a small amount of emulsion is involved, transfer material into a clean plastic container with a plastic or non-sparking shovel ie aluminum. Label tanker trailer or drums. Wear rubber gloves and rubber boots.	Recycle product, if possible. If not practical, detonate in a blasthole, or if a large amount is involved, demulsify with liquid detergent.
Sodium Nitrate prill	Oxydizing agent, white to light yellow crystals, faint odour.	In the event of a spill or leak, contact the vendor for advice. Wear respirator, protective clothing, and gloves. Vacuuming is the recommended method to clean-up spills. Do not sweep or use compressed air for clean-up. Recover spilled material using non-combustible materials, such as vermiculite. Use non-sparking tools and place in covered containers for disposal. Any recovered material may be used for its intended purpose, depending on contamination.	Waste material will need to be shipped south and disposed at an approved hazardous waste treatment/disposal facility in accordance with the Hazardous Material Management Plan.

[1] *Table will be updated on a regular basis considering the WHMIS sheets.*

SECTION 5 • PERSONNEL TRAINING PROGRAM

Only trained and certified persons will work with explosives or have access to unsupervised explosives. The explosives personnel will undertake formal training and on-the-job training to ensure compliance with legislation. Training requirements will include (but will not be limited to) the following:

- Approval Letter issued by Natural Resource Canada allowing access to a high-hazard explosive (types E, I, and D) or equivalent (Permis Générale (Québec residents), FAST card, NEXUS card, or a Firearms Possession and Acquisition Licence (PAL))
- Specific fire procedures as per the *Federal Explosives Act*;
- First aid;
- Transportation of Dangerous Goods;
- Blasting certificate; and
- Workplace Hazardous Materials Information System (WHMIS).

SECTION 6 • BLASTING SAFETY MEASURES

6.1 Surface

Blasting safety procedures for breaking rock and frozen material are as follows for blasting on the surface :

- Unauthorized person are not allowed inside a posted blast area whether the holes have been loaded or not.
- The blasting supervisor and the blaster are responsible for the safe handling, loading, and connection of a blast.
- The shift supervisor is responsible for the evacuation of all personnel and equipment from the blast area and the guarding of the blast.
- The general supervisor is responsible for notifying the appropriate blast personnel, and other departments and personnel who may be affected by a particular blast.
- Guards will be posted prior to blast time, and must remain guarding until they are told verbally by the shift supervisor that they can leave their position.
- Once guards are posted, the blast area must be inspected by the shift supervisor to ensure that no personnel or equipment remain inside the blast area.
- A blast-warning siren will be sounded for one minute; three minutes after this, the blast will be fired.
- The blaster will only fire the blast when given a direct verbal order to do so by the shift supervisor.
- Before firing a shot, the blaster must ensure the immediate area is clear (i.e., aircraft, etc.).
- The shift supervisor and blaster will inspect the fired shot for indications of any problems, such as misfires or cut-offs.
- Areas in which charged holes are awaiting firing shall be guarded or posted against unauthorized entry.
- Vehicles containing explosives shall not be taken to the repair shop or any other building for any purpose, with the exception of the MMU truck containing unused bulk emulsion. At the end of the shift, the MMU will be parked inside the explosive plant for usage the next day. No open flames or welding are to be used for field repairs unless explosives are first removed.
- All loaded patterns, in addition to being marked with blasting signs, will be clearly delineated to outline the pattern when necessary.
- Redrills shall be marked in an appropriate way and be designated by a member of the blasting crew; the marker shall be firmly implanted in the cuttings of the hole to be redrilled. The marker shall be removed by the driller before drilling and inverted in the hole after drilling for pickup by the blasting crew.
- Where redrills are required on loaded patterns, the drill must be guided by the blasting supervisor or blaster or a responsible person designated by them.

- Service vehicles and fuel trucks are not allowed on a loaded pattern; the drill must pull well clear of the loaded holes before any service or maintenance can be done on it. Where the drill cannot be moved and service is required, it may be done only under the direct supervision of the blast supervisor or designate, and all loaded holes must be covered.

6.2 Underground

Blasting safety procedures for breaking rock are as follows for underground operations:

- Underground blasts will occur at approximately the same time during the day.
- All employees working underground must be back on surface and have removed their badges from the presence board.
- Before blasting, the responsible supervisor makes sure that there are no badges remaining on the presence board.

SECTION 7 • INTERNAL AUDIT AND INSPECTION

Internal audits and inspections of all components related to the Explosives Management Plan will be conducted as required by the regulations. Inspections for physical condition and serviceability will be done on a regular basis by qualified personnel, and the results recorded according to quality and safety standard operating procedures. Qualified personnel will perform regular inspections of the Emulsion Plant.

Underground magazine are inspected weekly as required by Article 14.08. (1) of the Mines Health and Safety Regulations which required that *each magazine shall be operated and maintained (a) in the charge of an authorized person who shall carry out a weekly inspection of the magazine and record the results in a log-book.*

SECTION 8 • EMERGENCY RESPONSE PLAN

A detailed Emergency Response Plan has been developed by the explosives supplier, which addresses potential incidents involving the manufacturing, transport, handling, and storage of explosives and related products. It will prescribe the actions that the supplier and Agnico Eagle employees must take to ensure employee and public safety in the event of an emergency.

The following situations (worst case scenarios) will be addressed relative to explosives in the Emergency Response Plan:

- fire/explosion;
- storage tank failure;
- spills from product delivery trucks;
- spills from raw material delivery trucks;
- process spills;
- shut-down due to weather, floods, lightning, fires, explosions, and other threats to the security and operation of supplier's facilities, equipment and material;
- bomb threats; and
- quantities of spills that are reportable to the supplier and authorities.

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APPENDIX A • FACTORY LICENCE

Natural Resources Canada / Ressources naturelles Canada

Protected B

Factory Licence or Manufacturing Certificate and Terms and Conditions

Name and Address of Holder	Licence/certificate location	Licence/Certficate Number
Pierre St-Georges Dyno Nobel Canada Inc 355 Rue de la Bergerie L'Orignal, Ontario K0B 1K0	Rankin Inlet, Nunavut	F1-076821/E
	Expiry Date 2022-01-31	Amendment Number

As per Section 7(1) of the *Explosives Act*, **the Minister has issued the above certificate/licence. The following terms and conditions (if any) pursuant to Section 7(2), in addition to those prescribed by the *Explosives Regulations, 2013* apply to this licence or certificate.**

1) The mobile process unit(s) (MPU) specified in this licence shall only transport materials which are required for the manufacturing of authorized explosive products listed in the licence.

2) When not at a mine or quarry, the minimum separation distance between the operations of each mobile process unit (MPU) and other activities or sites, shall be calculated based on the maximum net explosive quantity of each MPU, and comply with the following conditions:

a. Within 15 metres of the explosives loading area Only personnel directly involved in the loading of the explosives may be present. The man-limits and all operations shall be documented in the licence.

b. From 15 metres of the explosives loading area to D4 distances (per CAN/BNQ 2910-510/2015): Only personnel directly involved in the project may be present. The man-limits and all operations shall be documented in the licence.

c. From 15 metres of the explosives loading area to D7 distances (per CAN/BNQ 2910-510/2015): A joint emergency response plan (JERP) and letter of understanding (LOU) with all parties performing work, shall be enforced for all

Approved by: David Mohn

Issue Date 2021-01-02 1/2

Canada

AGNICO EAGLE

MELIADINE GOLD MINE

Blast Monitoring Program

MARCH 2021
VERSION 3

ᓇᐃᓈᖅᓯᒪᔪᖅ

ᐊᒡᓂᖅᑯ ᐋᒍ ᐅᔾᔪᒃᑕᕆᐊᓕᕆᔾᒃᑯᑦ - ᐊᐳᖅᑎᓐᓈᖅᑐᒥᑦ (ᐊᒡᓂᖅᑯᒃᑯᑦ) ᓇᒻᒥᓂᖃᖅᑐᑦ ᐊᒻᒪᓗ ᐊᐅᓛᖅᑎᕐᓗᒍ ᑕᓯᕐᔪᐊᕐᒥᑦ ᒎᓗᒧᑦ ᐅᔾᔪᒃᑕᕆᐊᖅ (ᐅᔾᔪᒃᑕᕆᐊᖅ) 25 ᑭᓛᒥᑕᓪᓗᐊᓂᒃ ᐅᖓᓯᒃᑎᒋᔪᖅ ᐅᐊᖕᓇᖕᒐᓂᑦ ᑲᖏᖅᖠᓂᕐᒥᑦ, ᐊᒻᒪᓗ 80 ᑭᓛᒥᑕᓂᒃ ᐅᖓᓯᒃᑎᒋᐸᓗᓂ ᓂᒋᖅᐸᓯᐊᓂᑦ ᐱᖓᖕᓇᖅᐸᓯᐊᓂᑦ ᐃᒡᓗᓕᒫᕐᒧᔪᖕᒥᑦ ᑭᙵᓪᓕᕐᒥᑦ ᓄᓇᕗᒻᒥᑦ. ᐅᔾᔪᒃᑕᕆᐊᕐᒧᑦ ᐸᕐᓇᐅᑎᒥᑦ ᐃᓚᐅᔪᑦ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖕᒐᔪᖅ ᐊᒻᒪᓗ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔾᔪᒃᑕᕆᐊᑦ ᐱᙵᓪᓕᐊᔾᔪᓂᖕᒐᓄᑦ ᑎᑎᒐᓂᐊᖅ ᒎᓗᑕᓕᒃ, ᒪᕐᔫᖕᓂᒃ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖕᒐᔪᖅᑲᖅᓗᓂ (ᑎᑎᒐᓂᐊᖅ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖕᒐᔪᖅ 1 ᐊᒻᒪᓗ ᑎᑎᒐᓂᐊᖅ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖕᒐᔪᖅ 2) ᐊᒻᒪᓗ ᐊᑕᐅᓯᖅ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔾᔪᒃᑕᕆᐊᖅ. ᐅᔾᔪᒃᑕᕆᐊᖅ ᐱᓕᐅᕆᙱᓪᓕᐊᓕᓚᐅᖅᑐᖅ Q1-2019. ᐊᒥᓲᑦ ᐸᕐᓇᐅᑕᐅᓯᒪᔪᑦ ᐊᒻᒪᓗ ᓄᓇᐅᑉ ᖃᖓᓂᑦ ᓴᓇᔾᔭᐅᙱᓪᓕᐊᔪᑦ ᐊᑐᕆᐊᖃᖅᑐᑦ ᖃᖅᑕᖅᑐᓂᒃ ᐃᓚᒋᔾᔭᐅᐸᓗᓂ ᐅᔾᔪᒃᑕᖅᑕᐅᔪᓕᕆᓂᐅᔪᓄᑦ.

ᑎᑎᖅᑲᖅ ᐱᔾᔪᑎᖃᖅᑐᖅ ᖃᖅᑎᕆᓂᕐᒥᒃ ᖃᐅᔨᓴᐃᓂᕐᒧᑦ ᑐᕋᖕᒐᔪᒥᒃ (ᑐᕋᖕᒐᔪᖅ) ᐅᔾᔪᒃᑕᕆᐊᕐᒧᑦ, ᒪᓕᒃᖢᓂ ᐱᓕᕆᐊᕐᒧᑦ ᓇᓗᓇᐃᒃᑯᑕᖅ ᓈᓴᐅᑎ 006-ᒥᑦ ᑐᓂᔭᐅᔪᖅ ᐊᑏᑎᓕᕆᔾᒃᑯᓐᓄᑦ. ᑐᕌᖕᒐᔪᖅ ᑐᒡᓕᖕᒐ ᐋᖅᑭᒋᐊᖅᑕᐅᓯᒪᔪᖅ ᑎᑎᖅᑲᒦᑦᑐᖅ ᐅᖃᐅᓯᖃᖅᑐᖅ ᐊᒡᓂᖅᑯ ᐋᒍ ᐅᔾᔪᒃᑕᕆᐊᓕᕆᔾᒃᑯᑦ (ᐊᒡᓂᖅᑯᒃᑯᑦ) ᖃᓄᖅᑑᕈᑎᒌᓐᓇᖅᑕᖕᒐᓂᒃ ᖃᖅᑎᕆᓂᕐᒥᑦ ᓴᔪᕋᓛᒃᑐᓂᒃ ᖃᐅᔨᓴᐃᓂᕐᒧᑦ ᐃᓚᐅᔪᑦ ᓄᓇᐅᑉ ᖃᖓᓂᑦ, ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐊᒻᒪᓗ ᓴᓇᔾᔭᐅᙱᓪᓕᐊᔪᓂᑦ ᖃᖅᑎᕆᓂᕐᓂᒃ ᑕᓯᕐᔪᐊᕐᒥᑦ ᒎᓗᒧᑦ ᐅᔾᔪᒃᑕᕆᐊᕐᒥᑦ (ᐅᔾᔪᒃᑕᕆᐊᖅ).

ᒪᓕᒃᑕᐅᔪᒃᓴᐃᑦ ᐊᑐᖅᑕᐅᓂᖏᓐᓄᑦ ᖃᖅᑕᖅᑐᐃᑦ ᑕᐃᑲᓂ ᐅᕝᕙᓃᓐᓂᑦ ᖃᓂᑕᖏᓐᓂᑦ ᑲᓇᑕᐅᑉ ᐃᒪᖏᓐᓂᑦ (Wright and Hopky, 1998) ᐋᖅᑭᒋᐊᖅᑕᐅᓂᖓᑐᑦ ᐃᖃᓗᓕᕆᔾᒃᑯᓐᓄᑦ ᐊᑐᕐᓂᐊᕐᓗᓂ ᐅᑭᐅᖅᑕᖅᑐᒥᑦ ᐅᖃᖅᓯᒪᔪᑦ ᐅᑯᐊ ᐱᔭᕆᐊᖃᖅᑐᑦ ᐅᔾᔪᒃᑕᕆᐊᕐᒧᑦ:

- ᖃᖅᑕᖅᑐᒥᑦ ᖃᖅᑎᕆᓂᖅᑕᖃᕐᓂᐊᖏᓚᖅ ᑕᐃᑲᓂ ᐅᕝᕙᓃᓐᓂᑦ ᖃᓂᑕᖏᓐᓂᑦ ᐃᖃᓗᐃᑦ ᐃᒡᓕᖏᓐᓂᑦ, ᐅᕝᕙᓃᓐᓂᑦ ᐃᒡᓕᓕᐅᖅᕘᑐᐃᓐᓇᕆᐊᓕᖕᒥᑦ, ᑕᒡᕙᑦᑕᐃᓐᓇᖅ ᐃᒪᐅᑉ ᓵᙱᓂᖓ ᐊᓯᐊᙳᖅᓗᓂ (ᓱᕐᓗ ᐅᖓᑎᖓᓄᑦ ᓵᙱᓂᖅ) ᐊᖏᓂᖅᓴᐅᔪᒥᑦ 100 kPa-ᓂᒃ ᐃᖃᓘᑉ ᐳᕙᖅᑲᑦᑕᖅᑐᖓᓂᑦ.
- ᖃᖅᑕᖅᑐᒥᑦ ᖃᖅᑎᕆᓂᖅᑕᖃᕐᓂᐊᖏᓚᖅ ᐊᖏᓂᖅᓴᐅᔪᒥᒃ 13 ᒥᓕᒦᑕᓂᒃ ᖃᐅᔨᓴᐅᑎᐅᑉ ᑎᒡᓕᒃᑖᖓᓂᑦ ᐊᖏᓂᖅᓴᐅᔪᒥᒃ ᐃᒡᓕᓂᑦ ᐃᖃᓗᐃᑦ ᒪᓐᓂᖃᖅᑎᓪᓗᒋᑦ.

ᖃᐅᔨᓴᐃᓂᖃᖅᑳᖅᑎᓪᓗᒋᑦ ᐊᒻᒪᓗ ᖃᓄᐃᖓᓂᐅᔪᓂᒃ ᓄᓇᑦᑎᐊᕐᒥᑦ ᓇᓗᓇᐃᖅᓯᔪᑦ ᑭᒡᓕᐅᔪᖅ 100 kPa-ᓂᒃ ᓈᒻᒪᓚᐅᖏᑦᑐᖅ ᒥᐊᓂᕆᓂᐊᕐᓗᒋᑦ ᐃᖃᓗᐃᑦ ᐃᓂᖏᑦ, ᐃᖃᓗᓕᕆᔾᒃᑯᑦ ᐋᖅᑭᒋᐊᖅᓯᓚᐅᖅᑐᑦ ᐊᒻᒪᓗ ᐃᒪᓐᓈᖅᑐᐃᐸᓗᑎᒃ ᐊᒡᓂᖅᑯᒃᑯᑦ ᒪᓕᖕᓂᐊᖅᑕᖏᓐᓂᒃ ᐋᖅᑭᒋᐊᖅᓯᒪᔪᒥᒃ 50 kPa-ᒧᑦ ᑕᒡᕙᑦᑕᐃᓐᓇᖅ ᓵᙱᓂᐅᔪᖅ ᐊᓯᐊᙳᖅᓂᕐᒧᑦ.

ᖃᖅᑎᕆᓂᑦ ᖃᐅᔨᓴᖅᑕᐅᖃᑦᑕᖅᑐᑦ ᖃᐅᔨᓴᐃᓂᕐᒧᑦ ᐊᑐᖅᑕᐅᖃᑦᑕᖅᑐᒧᑦ, ᑕᐃᒪᓐᓇᐃᑦᑐᓕᕆᔾᔪᑎᒧᓪᓘᓐᓂᑦ, ᓴᔪᕋᓛᖅᑐᑦ ᖃᖅᑎᕆᓂᕐᒥᑦ ᐱᔪᑦ ᑐᖔᓐᓂᓐᓂᐊᕐᓗᓂ 13 ᒥᓕᒦᑕᓂᒃ ᖃᐅᔨᓴᐅᑎᐅᑉ ᑎᒡᓕᒃᑖᖓᓂᑦ ᐊᒻᒪᓗ ᐅᖓᑎᖓᓄᑦ ᓵᙱᓂᖅ ᑐᖔᓂᓪᓗᓂ 50 kPa-ᒥᑦ.

ᖄᖅᑎᕆᓃᑦ ᖃᐅᔨᓴᖅᑕᐅᖃᑦᑕᖅᑐᑦ ᐱᖓᓱᑦ ᐃᓂᐅᔪᓄᑦ ᑎᑭᕐᓗᒍ ᐅᔾᕋᒃᑕᕆᐊᕐᒥᑦ; ᓄᓇᐅᑉ ᖄᖓᓂᑦ ᖄᖅᑎᕆᓂᖃᕆᐊᖃᑦᑕᖅᑐᑦ ᐊᒃᑐᖅᓯᓂᕐᒧᑦ ᖃᐅᔩᑎᑦᑎᓂᐊᖅᑐᖅ ᓴᓇᔭᐅᓗᑎᒃ ᒪᕐᑰᒃ ᓄᑖᒃ ᖃᐅᔨᓴᐃᕙᒃᖓᓄᑦ ᐃᓂᐅᔪᓂ. ᓱᓇᑐᐃᓐᓇᓕᐅᕆᔫᒃᑯᑦ 24 ᐃᑲᕐᕋᓂᑦ ᖄᖅᑎᕆᖅᖄᖅᑎᓪᓗᒋᑦ ᖃᐅᔨᓴᐃᖃᑦᑕᕐᓂᐊᖅᑐᑦ ᖃᓄᐃᖓᓂᐅᔪᓂᒃ ᖄᖅᑎᕆᓂᕐᒧᑦ ᖃᐅᔨᓴᐃᓂᓗᒃᑖᓂᑦ. ᑐᑭᓕᐅᖅᑕᐅᓯᒪᔪᑦ ᖃᓄᐃᖓᓂᐅᔪᑦ ᐅᖓᑕᐅᑦᑎᒃᐸᑕ ᒪᓕᒐᕐᖏᓂᒃ, ᖄᖅᑎᕆᓂᕐᒧᑦ ᐊᖏᓗᐊᖏᒋᐊᖅᑎᑦᑎᓂᕐᒥᒃ ᐸᕐᓇᐅᑎᒥᒃ ᐊᑐᓕᖅᑎᑦᑎᑲᐅᑎᒋᓇᔭᖅᑐᑦ; ᒫᓐᓇᒧᑦ ᑎᑭᕐᓗᒍ, ᐊᑕᐅᓯᖅ ᖄᖅᑎᕆᓂᖅ 2019 ᐱᒋᐊᓖᖅᑎᓪᓗᒍ ᐅᖓᑕᐅᑦᑎᓚᐅᖅᑐᖅ ᑮᓕᐅᔪᓂᒃ ᑕᓯᕐᔪᐊᕐᒥᑦ.

EXECUTIVE SUMMARY

Agnico Eagle Mines Limited – Meliadine Division (Agnico Eagle) is the owner and operator of 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 includes open pit and underground mining methods for the development of the Tiriganiaq gold deposit, with two open pits (Tiriganiaq Pit 1 and Tiriganiaq Pit 2) and one underground mine. The Mine entered commercial production in Q2-2019. Many planned and ongoing surface construction projects also require the use of explosives in addition to the mineral development process.

This document presents the Blast Monitoring Program (the Program) for the Mine. The Program is the third revision of this document describing Agnico Eagle Mines Limited's (Agnico Eagle) continued strategy regarding Blast Vibration Monitoring including surface, underground and construction blasting for the Meliadine Gold Mine (Mine).

The Guidelines for the use of Explosives in or Near Canadian Waters (Wright and Hopky, 1998) as modified by the Department of Fisheries and Oceans Canada (DFO) for use in the North mention the following requirements that are applicable to the Mine:

- No explosive is to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous pressure change (i.e. overpressure) greater than 100 kPa in the swim bladder of a fish.

- No explosive is to be detonated that produces, or is likely to produce, a peak particle velocity greater than 13 mm/sec in a spawning bed during the period of egg incubation.

Following testing and monitoring results in the Northwest Territories (NWT) indicating the limit of 100 kPa was insufficient for the protection of the fish habitat, DFO amended and recommend that Agnico Eagle comply with a revised 50 kPa threshold for instantaneous pressure change.

Blasts are monitored with Instantel Blast monitoring equipment, to ensure that vibrations generated by blasting are less than 13 mm/sec and the overpressure is under 50 KPa. The blasts are monitored from up to three permanent locations on the Mine property.

The Engineering department within the 24 hours following the blasting operation systematically analyze the results of all blast monitoring. Should the interpreted results exceed regulations, a blast mitigation plan would be immediately implemented.

TABLE OF CONTENTS

DOCUMENT CONTROL

REVISION	DATE	TRIGGER	AUTHOR
1	March 2017	First version of the Blast Monitoring Program	Vanessa Smith, Mine Engineer
2	March 2020	Revision due to start of underground production stope blasting and open pit operations	Vanessa Smith, Project Coordinator
3	March 2021	Update of the monitoring location and removal of the previous year results (now appendix of the Annual report)	Jawad Haloui, Engineering Superintendent

IMPLEMENTATION SCHEDULE

This Plan has been in effect since April 2017.

DISTRIBUTION LIST

Agnico Eagle – Environment Superintendents
Agnico Eagle – Environmental Coordinators
Agnico Eagle – Engineering Superintendents
Agnico Eagle – Engineering Coordinators

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
ANN	Artificial Neural Network
BGAM	Boosted Generalised Additive Model
DFO	Department of Fisheries and Oceans Canada
GN	Government of Nunavut
IOL	Inuit Owned Lands
NIOSH	Institute of National Occupational Safety and Health
NIRB	Nunavut Impact Review Board
NWT	Northwest Territories
PAO	Peak Air Overpressure
PPV	Peak Particle Velocity
PSP	Peak Sound Pressure
PVS	Peak Vector Sum
Project	Meliadine Gold Mine Project
SD	Scaled Distance
SVM	Support Vector Machine
USBM	United States Bureau of Mines
USGS	United States Geological Survey
WHMIS	Workplace Hazardous Materials Information System

UNITS

km	kilometre
m	metre
t	metric tonnes
Min/sec	Minutes per second
kPa	Kilopascals

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is the owner and operator of 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. Situated on the western shore of Hudson Bay, the proposed Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1’23.8’’ N, 92°13’6.42"W), on Inuit Owned Lands (IOL). The Mine is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

This document presents the Blast Monitoring Program (the Program) for the Mine. The Program is the third revision of this document describing Agnico Eagle Mines Limited’s (Agnico Eagle) continued strategy regarding Blast Vibration Monitoring including surface, underground and construction blasting for the Meliadine Gold Mine (Mine).

Agnico Eagle developed the Program to minimize the effects of blasting on fish and fish habitat, water quality, and wildlife and terrestrial Valued Ecosystem Components (VECs). The Program considers Department of Fisheries and Oceans (DFO) and the Government of Nunavut (GN) regulations including:

1. Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (Wright and Hopky, 1998) as modified by the DFO for use in the North;
2. Guidance provided in the Monitoring Explosive-Based Winter Seismic Exploration in Waterbodies, NWT 2000-2002 (Cott and Hanna, 2005);
3. Include a monitoring and mitigation plan to be developed in consultation with the DFO, and obtain DFO approval of the blasting program prior to the commencement of blasting;
4. Restrict blasting when migrating caribou, or sensitive local carnivores or birds may be negatively affected; and
5. Minimize the use of ammonium nitrate to reduce the effects of blasting on receiving water quality.

The Program is in effect since 2017; the Program will continue to be in effect and revised when conditions warrant doing so.

SECTION 2 • BLASTING STANDARDS AND CRITERIA

Although blasting is one of the most widely used methods for rock fragmentation, it has a major disadvantage in that it causes adjacent ground vibrations. Prediction of blast-induced ground vibration is essential for evaluating and controlling the many adverse consequences of surface blasting including potential harm to nearby fish and fish habitat, water quality, and wildlife and terrestrial VECs.

Peak particle velocity (PPV) is a measure used for ground vibrations; however, accurate prediction of PPV is challenging for blasters and management alike. A study conducted by Nguyen et al (2019) compared the results of three PPV determination tools with respect to prediction accuracy: Boosted generalised additive models (BGAMs), support vector machine (SVM) and artificial neural network (ANN). Results revealed that the elevation difference between the blasting site and monitoring point is one of the predominant parameters governing the PPV predictive models. It is not currently in the mandate of the drill and blast team to predict the PPV value for any blasts but rather monitor and trend collected data. As the mine progresses and larger surface blasts are planned, prediction could be a proactive means to avoid exceeding regulatory limits.

Singh and Vogt (1998) stated that the charge weight could affect the ground vibration only at distances close to the blasts with the effects that diminish quickly with distance. Persson (1994) stated that the magnitude of ground vibrations depended on the quantity of explosives, characteristics of the rock, distance from the blasting site and geology of the deposits.

US Geological Survey (USGS) or National Institute for Occupational Safety and Health (NIOSH), formerly the United States Bureau of Mines (USBM) proposes an empirical vibration predictor equation to calculate the PPV produced by a blast reliant on two factors, namely maximum charge per delay and distance from the blast face. In the USGS model, a scaled distance (SD) factor was calculated based on the following equation:

$$SD = (D/\sqrt{MC}),$$

Where *D* and MC are distance (m) and maximum charge per delay (kg). Accordingly, the PPV is calculated using the following equation:

$$PPV=K\ (SD)^{B}$$

Where *B* and *K* are site constants and PPV is peak particle velocity (mm/s).

Such empirical approaches do not account for other controllable or non-controllable parameters such as burden, spacing, stemming and powder factor and their effect on the PPV.

2.1 Effects on Fish

The detonation of explosives in or near water produces post-detonation compressive shock waves characterized by a rapid rise to a high peak pressure followed by a rapid decay to below ambient hydrostatic pressure. The latter pressure deficit causes most impacts on fish.

The primary site of damage in finfish is the swim bladder, the gas-filled organ that permits most pelagic fish to maintain neutral buoyancy. The kidney, liver, spleen, and sinus venous also may rupture and haemorrhage. Fish eggs and larvae also may be killed or damaged (Wright 1982).

Studies (Wright 1982) show that an overpressure in excess of 100 kPa will result in these effects. The degree of damage is related to type of explosive, size and pattern of the charge(s), method of detonation, distance from the point of detonation, water depth, and species, size and life stage of fish.

Vibrations from the detonation of explosives may cause damage to incubating eggs (Wright 1982, Wright in prep.). Sublethal effects, such as changes in behaviour of fish, have been observed on several occasions as a result of noise produced by explosives. The effects may be intensified in the presence of ice and in areas of hard substrate (Wright 1982, Wright in prep.).

The detonation of explosives may be lethal to marine mammals and may cause auditory damage under certain conditions. The detonation of explosives in the proximity of marine mammals also has been demonstrated to induce changes in behaviour (Wright in prep.).

The number of shellfish and crustaceans killed by the detonation of explosives is believed to be negligible, however, little data is available. Sub lethal effects of explosives on shellfish and crustaceans including behavioural modifications are little known or understood (Wright 1982, Wright in prep.).

2.2 Effects on Fish Habitat

The use of explosives in and near fish habitat may also result in the physical and/or chemical alteration of that habitat. For example, sedimentation resulting from the use of explosives may cover spawning areas or may reduce or eliminate bottom-dwelling life forms that fish use for food. By-products from the detonation of explosives may include ammonia or similar compounds and may be toxic to fish and other aquatic biota (Wright in prep.).

2.3 DFO Amended Threshold

Fish and fish habitat can be damaged through vibrations, shock waves, and physical changes caused by blasting. The Department of Fisheries and Oceans (DFO) has established guidelines for determining setback distances for eliminating blasting effects on fish due to pressure (acoustic) effects as well as peak particle velocity; these guidelines include:

8. No explosive is to be detonated in or near fish habitat that produces, or is likely to produce, an instantaneous pressure change (i.e., overpressure) greater than 100 kPa (14.5 psi) in the swim bladder of a fish.

9. No explosive is to be detonated that produces, or is likely to produce, a peak particle velocity greater than 13 mm•s-1 in a spawning bed during the period of egg incubation.

Following testing and monitoring results in the NWT, the limit of 100 kPa was determined to be insufficient for the protection of the fish habitat, DFO amended and recommend that Agnico Eagle comply with a revised 50 kPa threshold for instantaneous pressure change.

To keep PPV under the 13 mm/sec guideline, Wright and Hopky (1998) suggest the setback distances (m) from the centre of detonation of a confined explosive to spawning habitat to achieve 13 mm/sec guideline criteria for all types of substrate shown in Table 1.

Table 1. Setback distance (m) from centre of detonation of a confined explosive to spawning habitat to achieve 13 mm•sec-1 guideline criteria for all types of substrate.

WEIGHT OF EXPLOSIVE CHARGE (KG)	0.5	1	5	10	25	50	100
SETBACK DISTANCE (m)	10.7	15.1	33.7	47.8	75.5	106.7	150.9

Concerning the instantaneous pressure change (i.e. overpressure); Wright and Hopky (1998) suggest the following setback distances to keep it under the 100 kPa guideline (Table 2).

Table 2. Set back distance (m) from center of detonation of a confined explosive to fish habitat to achieve 100 KPa guideline criteria for various substrate.

Substrate Type	Weight of Explosive Charge (kg)							
	0.5	1	2	5	10	25	50	100
Rock	3.6	5.0	7.1	11.0	15.9	25.0	35.6	50.3
Frozen Soil	3.3	4.7	6.5	10.4	14.7	23.2	32.9	46.5
Ice	3.0	4.2	5.9	9.3	3.2	20.9	29.5	41.8
Saturated Soil	3.0	4.2	5.9	9.3	13.2	20.9	29.5	41.8
Unsaturated Soil	2.0	2.9	4.1	6.5	9.2	14.5	20.5	29.0

The Meliadine Engineering team currently has historical surface data for CP4, SP2, SP4, CP6 TIRI01 and TIRI02 blasting. This data is available in the event special blasting circumstances need to be addressed.

SECTION 3 • INSTRUMENTATION

Every blast is monitored to ensure that vibrations generated by blasting are less than 13 mm/sec and the overpressure is under 50 KPa. The instrument used for blast monitoring is an Instantel Minimate Blaster, or equivalent, which is fully compliant with the international Society of Explosives and Engineers performance specification for blasting seismographs (Instantel, 2005). The instruments used in Meliadine are calibrated regularly following the manufacturer's recommendations and are presented in Table 3.

Table 3. Meliadine Mine Blast Monitoring Hardware

MODEL	SERIAL	TRIGGER LEVEL
Minimate Pro 4 10.75	MP13824	Geo 1.000 mm/s
Minimate Pro 4	MP14133	Geo 1.00 mm/s
Minimate Pro 4 **Level 75**	MP14206	Geo 1.00 mm/s
Minimate Pro 4 **Comm tower**	MP14207	Geo 1.00 mm/s
Minimate Pro 4 **Explo camp**	MP14208	Geo 1.00 mm/s

The Minimate Blaster has three main parts: a monitor, a standard transducer (geophone) and a microphone (Figure 1). The monitor contains the battery and electronic components of the instrument. It also checks the two sensors to be sure that they work properly. The transducer measures ground vibration with a mechanism called a geophone.

Figure 1. Minimate Pro4 components

The transducer has three geophones that measure the ground vibrations in terms of particle velocity. They measure transverse, vertical and longitudinal ground vibrations (Figure 2). Transverse ground vibrations agitate particles in a side-to-side motion. Vertical ground vibrations agitate particles in an up and down motion. Longitudinal ground vibrations agitate particles in a back and forth motion progressing outward from the event site (Instantel, 2016).

The microphone measures the PSP (Peak Sound Pressure) also referred as to the PAO (Peak Air Overpressure). The instrument checks the entire event waveform and displays the largest sound pressure in Pa unit.

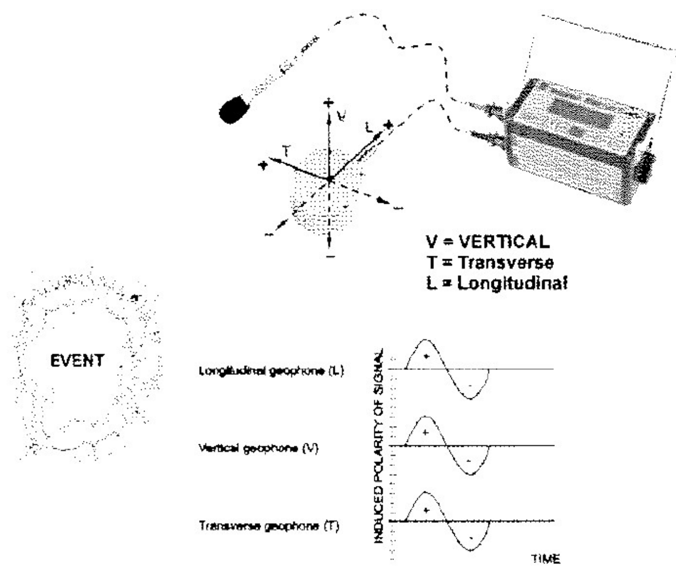


Figure 2. Sensor Orientation (Instantel, 2005)

The Minimate Blaster (Instantel) calculates the PPV for each geophone and calculates the vector sum of the three axes.

The result is the PVS (Peak Vector Sum) and it is the resultant particle velocity magnitude of the event:

$$PVS = \sqrt{(T^2 + V^2 + L^2)}$$

Where:

T = particle velocity along the transverse plane

V = particle velocity along the vertical plane

L = particle velocity along the longitudinal plane

3.1 Instrument Underground Installation

MP13824 is permanently installed underground in the Level 75 electrical bay, Figure 3. The trigger level of the instrument is set to 1 mm/s and the transducer will start recording an event automatically when the ground vibrations are greater than or equal to 1 mm/s. The recording time is 20 seconds, underground blasts typically last 15 seconds, as production increases this window may have to be increased as the UG blast timing increases. This installation requires no additional protection as it is sufficiently removed from underground traffic.

Figure 3. Underground Installation (L75) – (*Date:2019*)

3.2 Instrument Surface Installations

To improve vibration monitoring practices and data accuracy, permanent monitoring installations were commissioned in 2020 which allow the seismograph to be directly anchored into the bedrock via attachment to a steel rod drilled through the tundra. These permanent stations thereafter replaced the temporary locations used earlier in the year and throughout 2019. The L75 Electric Bay station has always been anchored in the bedrock as it is installed underground. The locations were chosen to have the optimal distance between the blasts and the water (fish habitat) and are presented in Table 4 and in Figure 4 to Figure 6.

Table 4. Surface blast monitoring station coordinates

LOCATION	EASTING	NORTHING	
Location 1	539427.536	6988596.942	Temporary location used for TIR02
Location 2	541938.477	6989017.942	Temporary location used for TIR02
Location 3	540262.772	6988922.029	Temporary location used for TIR02
L75 Electrical Bay	539839.028	6988534.308	Permanent location used for TIR01 & TIR02
Exploration Camp	541927.162	6989073.053	Permanent location used for TIR01 & TIR02 (installed 2020-08-20)
Communication Tower P1	539803.785	6988836.212	Permanent location used for TIR01 & TIR02 (installed 2020-08-20)

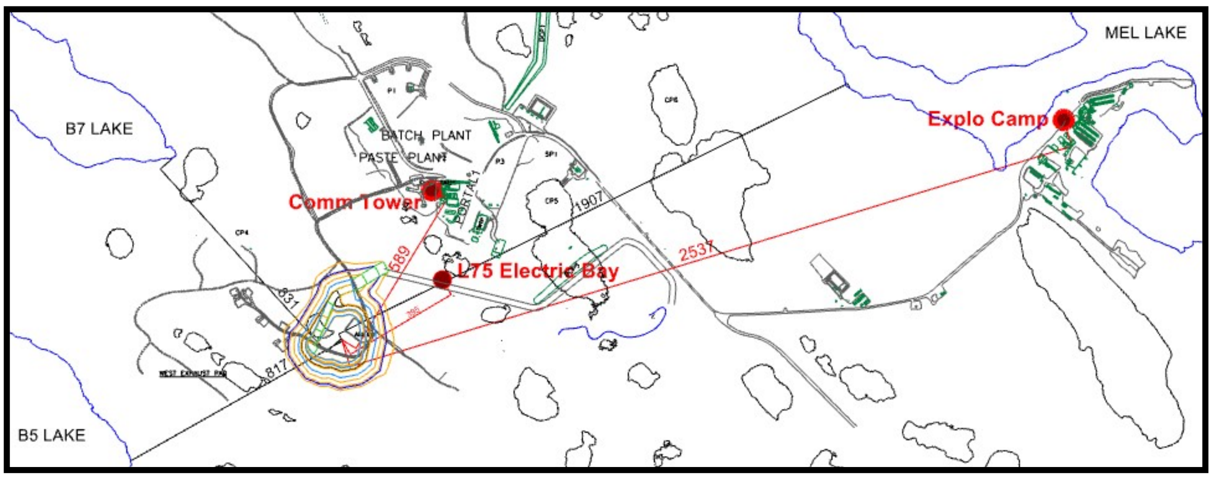


Figure 4. Surface blast monitoring station locations for TIR01 blasts (distances in meters)

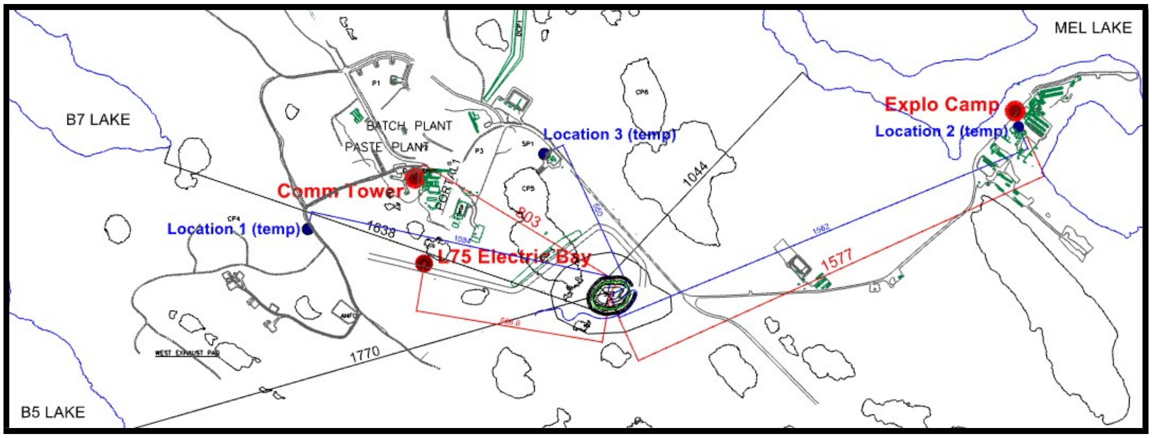
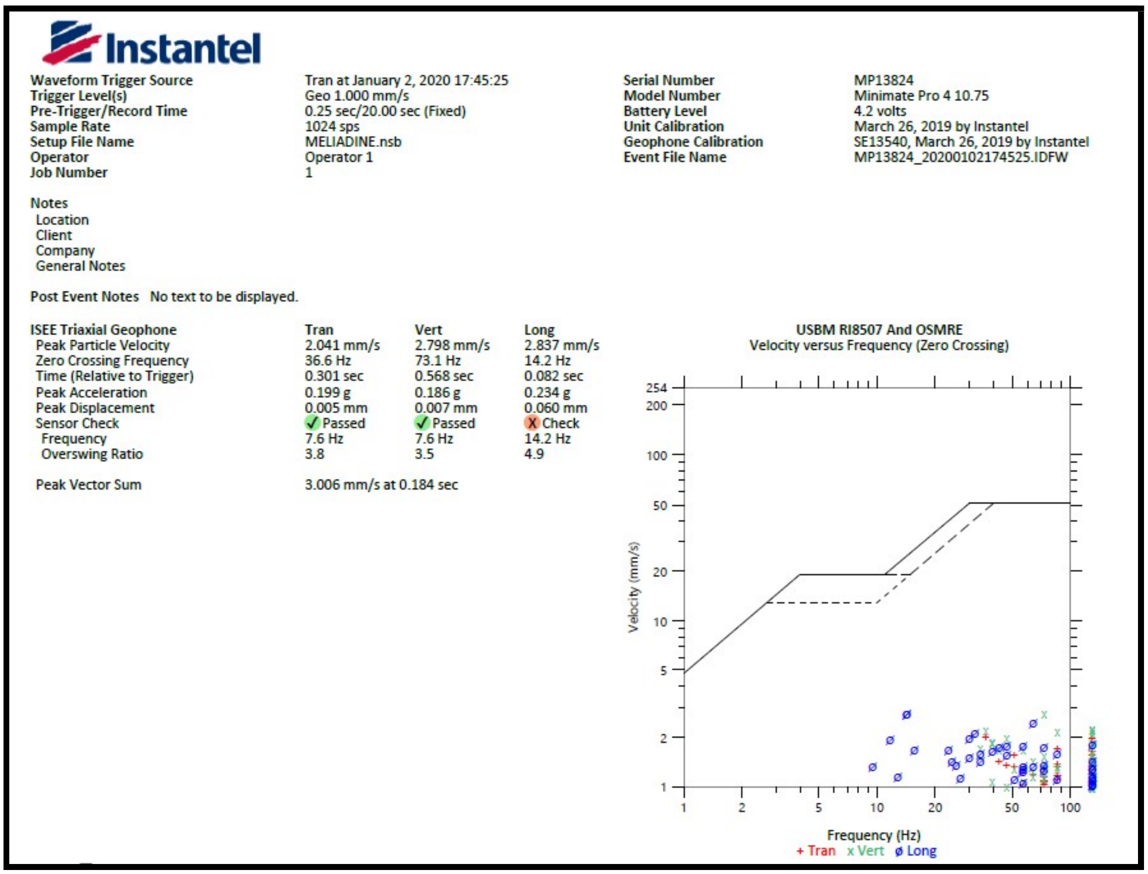


Figure 5. Surface blast monitoring station locations for TIR02 blasts (distances in meters

Figure 6. Surface Installation (Shelter & installation inside)

3.3 Instrumentation Reports

After each blast, the results are stored in a database and the report saved in the library for future reference. The blast monitoring results are interpreted, and a blast mitigation plan is implemented immediately if the vibrations or the overpressure exceed the permitted limit (see section 4). Figure 7 is an example of an Instantel Sample Vibration Report.



Instantel

Waveform Trigger Source	Tran at January 2, 2020 17:45:25	Serial Number	MP13824
Trigger Level(s)	Geo 1.000 mm/s	Model Number	Minimate Pro 4 10.75
Pre-Trigger/Record Time	0.25 sec/20.00 sec (Fixed)	Battery Level	4.2 volts
Sample Rate	1024 sps	Unit Calibration	March 26, 2019 by Instantel
Setup File Name	MELIADINE.nsb	Geophone Calibration	SE13540, March 26, 2019 by Instantel
Operator	Operator 1	Event File Name	MP13824_20200102174525.IDFW
Job Number	1		

Notes
Location
Client
Company
General Notes

Post Event Notes No text to be displayed.

ISEE Triaxial Geophone	Tran	Vert	Long
Peak Particle Velocity	2.041 mm/s	2.798 mm/s	2.837 mm/s
Zero Crossing Frequency	36.6 Hz	73.1 Hz	14.2 Hz
Time (Relative to Trigger)	0.301 sec	0.568 sec	0.082 sec
Peak Acceleration	0.199 g	0.186 g	0.234 g
Peak Displacement	0.005 mm	0.007 mm	0.060 mm
Sensor Check	✓ Passed	✓ Passed	X Check
Frequency	7.6 Hz	7.6 Hz	14.2 Hz
Overswing Ratio	3.8	3.5	4.9

Peak Vector Sum 3.006 mm/s at 0.184 sec

Figure 7. Instantel Sample Vibration Report

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SECTION 4 • CONSTRUCTION BLASTING

The first surface blast monitoring campaign began in 2017; it was led by Explotech, a third-party engineering consulting service specializing in explosives and blast vibration monitoring. A full-time on-site Vibration Monitoring Program was implemented to record vibration levels experienced at an array of locations near the work. Four (4) seismographs were installed to monitor the Laydown Yard/Tank Farm blasting operations from April 2017 to June 2017 and five (5) were installed to monitor the Itivia Pit Quarry blasting operations from June 2017 to September 2017. This program was focused primarily on blast-induced damage to public and private infrastructure and minimizing the nuisance associated with blasting noise.

Since then, construction blasting were monitored in previous years for several excavations at Meliadine site and will continue to be the analysed the same way as the surface blasting.

SECTION 5 • SURFACE BLASTING

Tiriganiaq resources located close to surface are to be mined by two open pits developed above the underground mine operation. Tiriganiaq Pit 1 (Tiri01) and Tiriganiaq Pit 2 pit (Tiri02), with respective ultimate depths of 130 m and 105 m. The planned location of these pits in relation to other mine infrastructure is shown below in Figure 8**Error! Reference source not found.**.

Since the start of open pit operations during April 2020, Mining Engineers & Technicians have thoroughly documented all blasting activities from design concept to final results – which include PPV and IPC measurements. If required, blasting procedure will be reviewed to ensure that the site remains within threshold limits and in continued compliance with regulations, as is part of the blast optimization process.

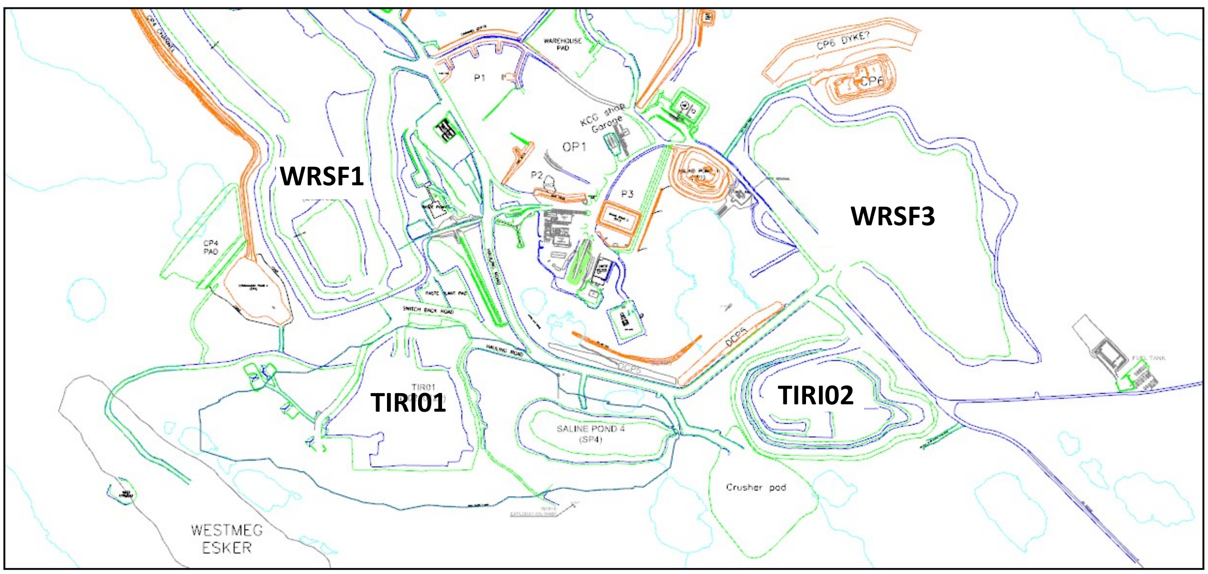

Figure 8. Open Pit Surface Plan

A conventional truck/shovel operation is used for both open pits using contractor resources for the start of the project with transitioning to Agnico Eagle resources later during the project. The same drills will be used for both production and pre-shearing.

Based on our engineering parameters, drill patterns for the selective mining zones were defined considering the material properties. The drill patterns for the non-selective mining areas are based on experiences at Meadowbank Mine, as the rock types are similar between the two mines. Moreover, these parameters will continue to be improved as mining advances. Table 5 summarizes the drilling pattern details considered for each application.

Table 5. Production Drilling Design Parameters

	Unit	Selective Mining	Non Selective Mining
Bench Height	m	5	10
Drill hole diameter	mm	165	165
Burden	m	4.1	4.65
Spacing	m	4.1	4.65
Sub-drill	m	0.5	1.0

It is expected that the overburden layer will be frozen and will require drilling and blasting prior to excavation. This material will have a drill pattern similar to the selective mining, as the tighter pattern performs better based on on-site construction experience.

Blasting with a high-energy bulk emulsion explosive is planned to target a powder factor from 0.38 to 0.71 kg/t in both ore and waste. Pumped emulsion reduces spillage and has excellent water resistance. This product will minimize nitrate leaching and thus reduce environmental impact (ammonia in water).

Each blast of the open pit operation will be monitored using permanent seismograph locations for real-time data collections and analysis.

SECTION 6 • UNDERGROUND BLASTING

The Mine entered commercial production in Q2-2019; there is currently one underground seismograph to monitor underground blast activity.

Since the start of underground stope production, 27 stopes had blasts exceeding 10,000 tonnes of ore blasted with only one exceeding the 30,000-tonnes triggering limit for required monitoring stated in the 2017 Program. The collected data for underground blasts confirms that these blasts will not have an effect on surface fish habitat or surface spawning beds; measured values are well below the permitted threshold of 50 kPa for overpressure and 13 millimeters per second for peak particle velocity.

SECTION 7 • BLAST MITIGATION PLAN

Should the vibrations or the overpressure approach or exceed the permitted limit, a retro analysis is conducted to identify the factors that may have caused higher than desired results. It will be important to consider the main factors influencing blast vibration intensity (Table 6, ISEE, 1998).

Table 6. Main Factors Influencing Blast Vibration Intensity & Overpressure (ISEE, 1998)

Main Factors Influencing Blast Vibration Intensity	Main Factors Influencing Overpressure
Maximum charge weight detonating at one time	Maximum charge weight per delay
True distance (distance the waves must travel)	Depth of burial of charges
Geological conditions	Exposed surface detonation material
Confinement	Atmospheric conditions
Physical properties of the rock	Wind
Coupling	Temperature gradients
Spatial distribution	Topography
Detonator timing scatter	Volume of displaced rock
Time of energy release	Delay interval and orientation
Type of Explosive	Type of Explosive

During open pit operations, if vibrations generated by blasting exceed the threshold 13 mm/sec or 50 KPa overpressure mitigation methods can be readily implemented to eliminate the effects of blasting.

Some of the mitigation methods include:

1. Reduction of charge per delay by decking the blast holes
2. Increasing the delay time between rows and holes to produce discrete explosions
3. Use of bubble/air curtains to disrupt the shock waves
4. Design of blasts and delay configurations to minimize vibrations

SECTION 7 • CONCLUSIONS

Environmental issues that arise from blasting increasingly restrict mining operations; for this reason, the importance of blast monitoring and trending of ground vibration are extremely important to eliminate environmental concerns. Peak Particle velocity (PPV) being the most common single ground descriptor for regulating blast designs, parameters of the common empirical relationship between peak particle velocity and scaled distance are used at Meliadine.

Blast monitoring process will continue to ensure that blast vibrations do not cause harm to aquatic life at Meliadine. Data collection started in 2017 will continue to populate the historical database providing a more varied basis to find a more site relevant confinement factor. The data collected will help correlate different factors that could influenced vibration intensity; historical data will be considered in the future to guarantee a constant improvement in controlling blast vibrations.

Agnico Eagle has overall successfully managed to keep vibration levels below threshold limits and is committed to monitoring all blasts in order to fully comply with the requirements.

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Minimate pro User Guide (online: https://www.instantel.com/media/436/download)

AGNICO EAGLE

MELIADINE GOLD MINE

Ammonia Management Plan

MARCH 2021
VERSION 3

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ᐱᓕᕆᐊᕐᒧᑦ ᑎᑎᖅᑲᖅ ᑐᓂᓯᔪᖅ ᒪᓕᒃᑕᐅᔾᔮᓯᓂᒃ ᖃᐅᔨᓴᐃᓂᐊᕐᓗᑎᒃ ᐊᒨᓂᐊ ᓇᓃᓐᓂᖏᓐᓂᒃ ᐅᔭᕋᒃᑕᕆᐊᕐᒥᑦ, ᐃᓚᒋᔭᐅᓗᓂ ᖃᓄᐃᖓᔭᕆᐊᖃᕐᓂᐅᔪᑦ ᐊᑐᖅᑕᐅᔪᑦ ᐊᒃᑕᑰᕆᓂᕐᓄᑦ ᐊᒻᒪᓗ ᐊᐅᓚᑦᑎᓂᕐᓄᑦ ᑎᑎᕋᖅᓯᒪᔪᑦ ᐃᒪᕐᒧᑦ ᓚᐃᓴᓯᒥᑦ (NWB 2016) ᑕᒪᑐᒨᖓ ᐃᒪᐅᑉ ᖃᓄᐃᓐᓂᖓᓄᑦ ᑭᒡᓕᐅᔪᒧᑦ.

EXECUTIVE SUMMARY

Agnico Eagle is committed to monitor ammonia in all surface sumps, seeps, etc., in accordance with the site Water Licence, to implement a comprehensive and routine inspection program related to explosives management within the mine. This includes regular inspections at the explosives manufacturing facility by the explosive supplier and on-site manufacture (Dyno Nobel) to ensure all explosive products are stored in locked, sealed containers prior to use and to perform continuous review of analytical results such that mitigation measures can be implemented when increasing trends of ammonia are determined.

This technical note provides guidance for monitoring ammonia levels at the mine site, as part of the conditions applying to waste disposal and management listed in the water licence (NWB 2016) for this water quality parameter.

TABLE OF CONTENTS

DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
1	March 2017	All		Creation of the Document	Jeffrey Pratt, Agnico Eagle Environmental Coordinator
2	March 2020	All		General Update	Vanessa Smith, Agnico Eagle Project Coordinator
3	March 2021	All		General Update	Agnico Eagle

ACRONYMS

AEMP	Aquatic Effects Monitoring Program
Agnico Eagle	Agnico Eagle Mines Limited
AMP	Ammonia Management Plan
AN	ammonium-nitrate
ANFO	ammonium nitrate, fuel oil
AWAR	All-Weather Access Road
CCME	Canadian Council of Ministers of the Environment
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
KIA	Kivalliq Inuit Association
NIRB	Nunavut Impact Review Board
NWB	Nunavut Water Board

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Ltd (Agnico Eagle) is committed to monitor ammonia in all mine pit sumps, seeps, etc., in accordance with the site Type A Water Licence (2AM-MEL1631), and implement a comprehensive and routine inspection program related to explosives management within the mine. This includes regular inspections at the explosives manufacturing facility by the explosive supplier and on-site manufacturer (Dyno Nobel) to ensure all explosive products are stored in locked, sealed containers prior to use and to perform continuous review of analytical results such that mitigation measures can be implemented when increasing trends of ammonia are determined. The Ammonia Management Plan (AMP) provides guidance for monitoring ammonia levels at the mine site, as part of the conditions applying to ammonia waste disposal and management listed in the Water Licence.

1.1 Ammonia

Blasting of ammonium-nitrate (AN) explosives is typically the primary source of ammonia in areas of mining operations. It is used in the blasting agent ANFO (ammonium nitrate, fuel oil). AN readily absorbs water and dissolves easily, thereby mobilizing ammonia in either groundwater or surface runoff. The commissioning of the Dyno Emulsion Plant in December 2017 has eliminated the use of ANFO at Meliadine. Meliadine is presently using an emulsion-based explosive.

Based on experience at other open pit mines in the Canadian Arctic, the largest potential source of ammonia in mine water will be from explosive residue from blasting. After contact with water. ammonia oxidizes to nitrite (NO_2^-) and nitrate (NO_3^-), the former being particularly toxic to fish and humans. Both nitrite and nitrate are regulated by the Canadian Council of Ministers of the Environment (CCME) for the Protection of Aquatic Life.

This Ammonia Management Plan (AMP) proposes the monitoring of blasting practices for the assessment of explosive quantity used and blast performance, and monitoring of water quality to determine ammonia levels in waters within the mine site. The monitoring results can be used to review and adjust blasting practices or water management if ammonia levels need to be reduced.

In addition to ammonia, monitoring of nitrate and nitrite is also considered in the Aquatic Effects Monitoring Program (AEMP), as both water quality parameters are signature compounds of AN based explosives. NO_3 is listed with a discharge level threshold in the conditions applying to waste disposal and management in the Type A Nunavut Water Board (NWB) Water License (NWB 2016).

SECTION 2 •EXPLOSIVE MANAGEMENT AND BLASTING PRACTICES

2.1 Site Description

2.1.1 Explosive Storage

A total of fourteen (14) permanent explosive and detonator magazines are located North-West of the Meliadine main camp, as indicated in Figure 1. Underground storage of explosive for underground mining operations are on levels 200, 300 and 400, for a total of six (6) active explosive and detonator magazines. The explosive products arrive by barge at the Rankin Inlet Itivia port. On occasion, product must be flown up on dedicated cargo flights for unplanned work. They are then transported by ground to the Meliadine site and offloaded to their respective storage areas; explosives are stored in a timely manner in the designated magazines while raw materials are transported to the Emulsion Plant storage area.

The Emulsion Plant is located approximately 1.4 kilometers north-west of the mine site and is accessible via service roads. This area consists of the modular emulsion plant, commissioned on December 12, 2017, the raw material storage, and the garage. Seacan storage of Ammonium Nitrate is only allowed in this area. All raw material required for emulsion manufacturing are packed in sea containers, which limits the possibility of spillage. The products are only removed from these containers prior to use at the emulsion plant.

2.1.2 Roads

The All-Weather Access Road (AWAR) is a restricted access road constructed and operated by Agnico for ground transportation between the Meliadine mine site and Rankin Inlet. This road is used to transport explosive products from the Rankin Inlet Itivia facilities to the emulsion plant area at the mine site. In preparation for blasting operations, explosive products are transported from the emulsion plant area to the appropriate blasting locations on surface and underground via local site roads.

2.1.3 Mine

Explosives are used for the mining of surface infrastructure, waste rock, overburden and ore for surface and underground operations.

2.2 Ammonia Pathways

Emulsion not fully detonated (i.e. a partial detonation) within the blasting operations allows for mobilization of ammonia through several pathways on the mine site. In the underground mine, groundwater and mine service water runoff is the primary mechanism for mobilization of ammonia. This water is collected by underground sumps and recirculated in the mine service water network for mining operations. Water is also diverted from the service water network and pumped to surface for storage and subsequent treatment prior to any discharge. On surface, similar mechanisms to the underground mobilization of ammonia are present in the open pits where blasting activities occur. Runoff in the open pits is captured by sumps where it is transported to the surface runoff collection ponds, eventually reporting to CP1.

Mobilization of ammonia directly from AN in storage or explosives in storage magazines would require exposure to environmental runoff, in the form of precipitation on surface or groundwater inflow to the underground mine. As described in section 2.1.1, AN is stored in sea cans for protection from environmental exposure and is only removed when required for emulsion production. Emulsion is produced as needed at the Dyno Emulsion Plant and temporarily stored in a sealed tank prior to being delivered for blasting operations on surface and underground. None of the products are readily exposed to the environment where mobilization and runoff of ammonia could occur. Should runoff infiltration to these storage areas occur and result in the mobilization of ammonia, an analysis of water shed delineations indicates drainage reports to local lakes E3 and B7 from the previously mentioned storage locations. Monitoring of Lake E3 is defined by Licence compliance monitoring station MEL-15, identified in Table 1. Monitoring of lake B7 for ammonia is performed under peninsula lakes monitoring in the AEMP.

Runoff from underground explosives storage described in section 2.1.1 is not anticipated due to the lack of exposure to a source of groundwater inflow in the explosive and detonator magazines. In the event an inflow was to occur in these locations, runoff containing ammonia from these storage locations would report to the sump network or pumped to surface storage.

Blasting residuals are also expected to be attached to waste rock and ore materials, which are transported from the underground mine to their respective storage and processing facilities. Residuals from waste rock may be washed off by precipitation and be ultimately conveyed to collection pond catchments in which ore or waste rock are located (CP1, CP4, CP5 and CP6). All of these pathways are monitored in accordance with the Water Licence requirement. No contact water from the waste rock or ore will be drained towards watercourses.

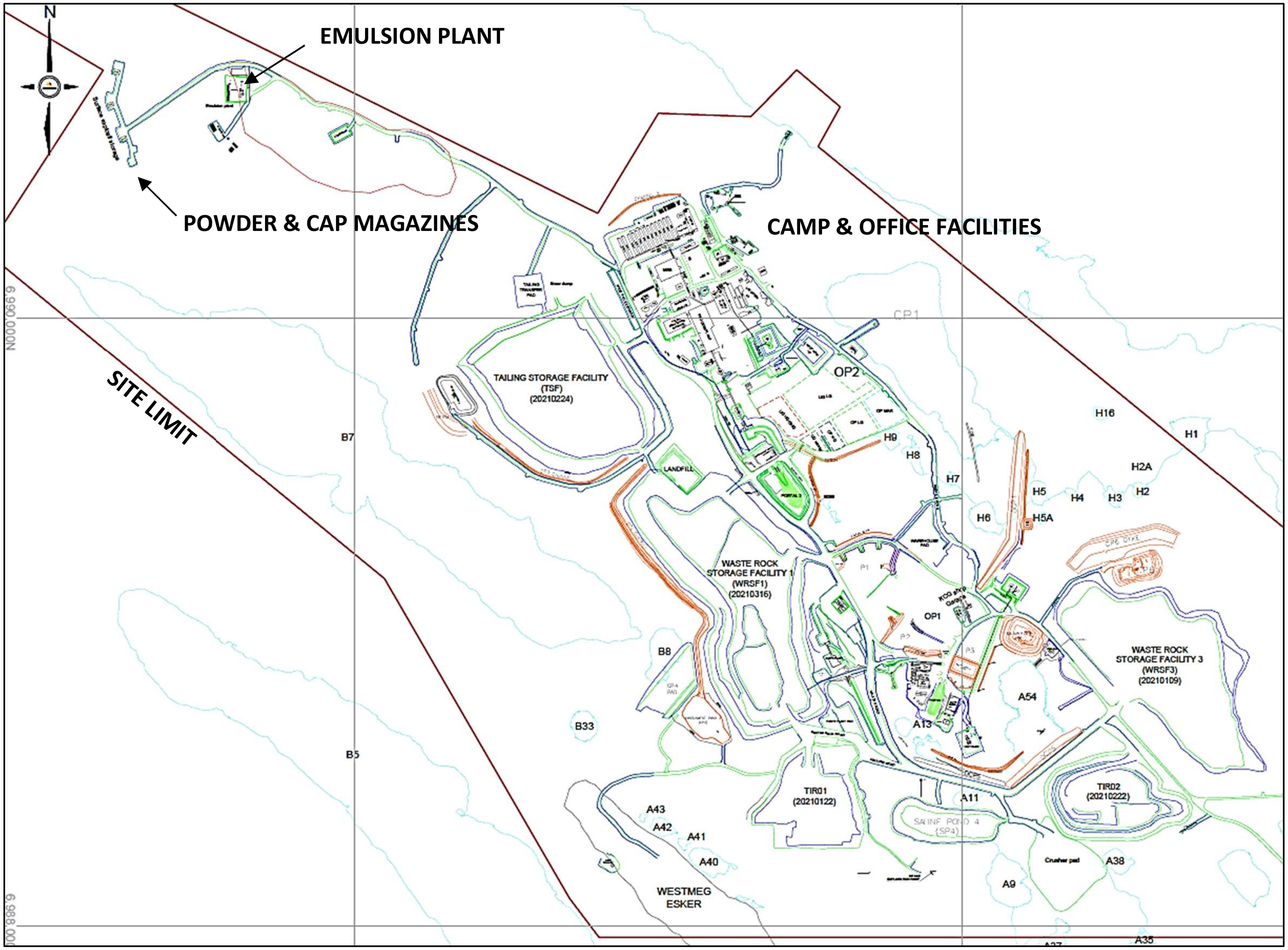

Figure 1. **Location of Cap Magazine, Powder Magazine, and Emulsion Plant**

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2.3 Explosives and Blasting

Based on experience at other open pit mines in the Canadian Arctic, the largest potential source of ammonia in mine water will be from explosive residue from blasting. Depending on the wetness of the site, water may leach explosives from blastholes prior to the blast. Other forms of ammonia release from AN are explosives flowing into cracks and fissures in the rock and not detonating, or from an incomplete detonation of the explosive column and misfired blastholes. Emulsion is an AN-based explosive (66-84% AN) and is used as a blasting agent at the Meliadine site. Emulsion breaks down slower than Ammonia Nitrate Fuel Oil (ANFO) and less product is dissolved in wet environments. Emulsion is the preferred blasting agent at Meliadine.

Blasting operations on site include monitoring of explosive quantities, blast design, procedures and practices. Combined with water monitoring, the compilation of these data is used to assess blasting performance. The results of this assessment are used to adjust blasting practices as needed to:

a) Optimize the use of explosives; and

b) Increase the completion and efficiency of explosive detonations.

Any modifications to blast design are intended to decrease the amount of ammonia that may become available for mobilization in mine water.

This section summarizes the explosive products and blasting design parameters, procedures and practices employed at Meliadine. Associated monitoring is also discussed.

2.3.1 Explosives Products

Explosive products used at the mine site include emulsion, packaged explosives, cast boosters, detonating cords, non-electric delay detonators and non-electric lead lines. Of these products, the greatest potential for water contamination comes from the bulk explosives. Presently, Meliadine uses Emulsion as the primary explosive for its blasting operations.

Although bulk explosives, including both surface and underground Emulsion, are water resistant, contaminants can be leached from the product if it is left in contact with standing or flowing water for extended periods. The performance of the explosive, and hence the potential for post-blast contaminations, deteriorates with the length of time that the explosive remains loaded (i.e., sleep time). Blast procedures currently in use are designed to minimize sleep time so that standing or flowing water is not in contact with the explosive for extended periods.

2.3.2 Procedures and Practices

Quality control procedures are in place to verify AN content in bulk explosives. Quality control procedures for the Emulsion occur at the plant.

The primary factors that may reduce the amount of ammonia available for mobilization in mine water are:

- Explosives handling

- Completeness of detonation

Emulsion spillage during loading could (as emulsion is resistant to water) be a source of ammonia that could be carried by water collected in the sumps. Spillage control protocols, procedures and handling of spilled material, and explosive management for storage and transport, are in place at the Meliadine site.

Incomplete detonation results in higher ammonia residue on the blasted rock. Evidence of incomplete detonation is often observed as an orange fume after a blast and sometimes an orange pigment on the blasted rock. Explosives that have failed to detonate may be observed in the muckpile. Muckpiles are routinely inspected by Meliadine staff for signs of incomplete detonation.

2.4 Monitoring

Monitoring of explosive handling and blasting is as follows:

a) Explosive quantities: Records of explosive quantities used for blasting are kept for each blasting event and will be conserved throughout the mine life.

b) Design parameters: Blast design parameters are in place. Blast design at the face is determine by the jumbo operator as required.

Loading standards are in place for the Meliadine Mine for both surface and underground operations. These standards are followed when loading explosives.

SECTION 3 • WATER MANAGEMENT

3.1 Transport

Water quantity and quality monitoring assist in the monitoring of ammonia loadings from explosive residuals. The Meliadine Water Licence (NWB 2016) includes monitoring stations that are used for the monitoring of ammonia loadings. The stations that specifically monitor for ammonia are listed in Table 1. Table 2 lists the monitoring parameters for each group.

Table 1. Water Monitoring Station Included under the Meliadine Water License A, 2AM-MEL1631

Station	Description	Phase	Monitoring Parameters	Frequency
MEL-SR-1-TBD	Surface Runoff – runoff downstream of Construction areas at Meliadine Site and Itivia Site, Seeps in contact with the roads, earthworks and any Runoff and/or discharge from borrow pits and quarries	Construction, and Operations	As defined in the Water Management Plan referred to in Part D, Item 18 and Part I, Item 11	Prior to Construction, Weekly during Construction
			Group 1	Monthly during open water or when water is present upon completion
MEL-11	Water intake from Meliadine Lake	Construction, Operation, and Closure	Full Suite	Monthly during periods of intake
			Volume (m^3)	Daily during period of intake
MEL-12	Water treatment plant (pre-treatment) coming from CP1, off the pipe and not in the pond	Construction (prior to release), Operations, and Closure	Group 1	Monthly during periods of discharge
MEL-13 (and AEMP Stations)	Mixing zone in Meliadine Lake, Station 1; and MDMER exposure stations for final discharge point within mixing zone	Construction (prior to release), Operations, and Closure	Full Suite, Group 3 (MDMER)	Monthly during periods of discharge
MEL-14(a) (MEL-01 suggested	Water treatment plant from CP-1 (post-treatment), end of	Construction (upon effluent release),	Full Suite, Group 3	Prior to discharge and Weekly during discharge

by AEM in the Aplication)	pipe (before offsite release) in the plant before release.	Operations, and Closure	Volume (m^3)	Daily during periods of discharge
			Acute Lethality	Once prior to discharge and monthly thereafter
MEL-15	Local Lake E-3	Operations, and Closure	Group 2	Bi-annually during open water
MEL-16	Local Lake G2	Construction, Operations, and Closure	Group 2	Bi-annually during open water
MEL-17	Local Pond H1	Construction, Operations, and Closure	Group 2	Bi-annually during open water
MEL-18	Local Lake B5	Construction, Operations, and Closure	Group 2	Bi-annually during open water
MEL-19	CP-2 Collection of natural catchment drainage from the outer berm slopes of the Landfarm and industrial pad	Construction, Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-20	CP-3 Collection of drainage from dry stacked tailings	Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-21	CP-4 Collection of drainage from WRSF1	Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-22	CP-5 Collection of drainage from WRSF1 and WRSF2	Construction, Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-23	CP-6 Collection of drainage from WRSF3	Construction, Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-24	Seepage from the Landfill between the landfill and Pond H3	Construction, Operations, and Closure	Group 1	Monthly during open water or when Water is present
MEL-25	Secondary containment area at the Itivia Site Fuel	Construction, Operation, Closure	Group 4, Volume (m^3)	Prior to discharge or transfer of Effluent

	Storage and Containment Facility			

In addition to the monitoring listed in Table 1 any surface runoff locations identified as potential receptors for increased ammonia are sampled as well.

Table 2. Monitoring Group (Meliadine Water License A, 2AM-MEL1631)

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

MMER - Metal Mining Effluent Regulations (SOR/2002-222).

SECTION 4 • REPORTING

Reporting of ammonia concentrations at the sampling stations listed in Table 1 is included as part of the requirement of the Water Licence (NWB 2016). The reporting frequency is required by the water license (NWB 2016), and includes:

- Brief monthly reports of the compiled water quality monitoring results, sent to the Nunavut Water Board (NWB), Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) Water License Inspector and to the Kivalliq Inuit Association (KIA); and

- An annual report submitted to the NWB, KIA, CIRNAC, Nunavut Impact Review Board (NIRB), Government of Nunavut, and other interested parties. This report summarizes monitoring results for each sampling station, annual seep water chemistry results, receiving water monitoring results, spills and any accidental releases, measured flow volumes, effluent volumes and loadings, and results of QA/QC analytical data.

Mine operation and environment personnel reviews on a monthly basis the data gathered from the sampling stations in Table 1 and from the monitoring action proposed under the AMP. If the data indicates that further studies and/or significant changes to the water management infrastructure are required to assess or control ammonia concentrations, Agnico will notify the NWB as early as practical. Results of these further studies and/or changes to the AMP monitoring actions will be transmitted to the Nunavut Water Board for review.

SECTION 5 • INSPECTION

On a regular basis, the Engineering department conducts inspections in the blasting area to ensure that the loading procedures are being implemented (in order to minimize blasting residues). In addition, environmental inspections are undertaken at explosive product storage facilities (Dyno Nobel) to ensure that explosives products are stored in sealed containers and there is no spillage. If any non-conformities are observed follow up actions are undertaken and corrective measures are put in place.

SECTION 6 • REVIEW OF THE AMMONIA MANAGEMENT PLAN

Review of the results of the site water quality and AMP monitoring during the year may provide new information, and/or indications that changes to the AMP are necessary. When revisions are warranted, an updated AMP will be submitted to the Nunavut Water Board for review.

REFERENCES

CCME (2010), Canadian Water Quality Guidelines for the Protection of Aquatic Life, Ammonia.

NWB (Nunavut Water Board License) (2016). Water License No: 2AM-MEL1631. Agnico- Eagle Mines Ltd. April 2016.

AGNICO EAGLE

Meliadine Division

Sediment and Erosion Management Plan

MARCH 2021
VERSION 3

EXECUTIVE SUMMARY

This document presents the Sediment and Erosion management plan (the Plan) at the Meliadine Gold Project. The purpose of this Plan is to provide consolidated information on the management and monitoring of potential areas subjected to erosion. This is accomplished by reviewing the potential effects of total suspended solids (TSS) and turbidity, the Federal guidelines and the license requirements, followed by the periods and types of activities subjected to erosion, and the specific monitoring and mitigating measures.

General findings on the effects of TSS on fish and fish habitat have been listed, such as sublethal and lethal effects on fish and their eggs. Federal TSS Guidelines have been cited, distinguishing the short-term and long-term exposure thresholds. Turbidity guidelines are also discussed in the present document. The Plan presents the monitoring and mitigating actions related to three (3) specific periods of activity: Periods of construction near water – during construction and operation; periods of freshet or significant runoff events – during construction, operation and closure; periods of potential impact to waterbodies – during operation. The proposed monitoring and mitigating measures are discussed for those periods of activity.

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ᖃᐅᔨᓯᐅᔪᑦ ᖃᓄᐃᙵᓕᖅᑎᑦᑎᓂᕐᕆᓐᓄᑦ TSS ᐃᖃᑐᖕᓄᑦ ᐃᓂᕐᕆᓐᓄᒡᓗ ᑎᑎᕋᖅᑕᐅᓚᐅᖅᑐᑦ, ᐅᑐᕆᐊᓇᑐᐊᕐᕆᑦᑐᑦ ᐊᒻᒪᓗ ᐅᑐᕆᐊᓇᖅᑐᑦ ᖃᓄᐃᙵᓕᖅᑎᑦᑏᑦ ᐃᖃᑐᖕᓄᑦ ᐊᒻᒪᓗ ᒪᓂᕐᕆᓐᓄᑦ. ᑲᓇᑕᒥᑦ TSS-ᒧᑦ ᒪᓕᒃᑕᐅᔪᓐᓴᐃᑦ ᐅᖃᓕᒫᖅᑕᐅᓯᒪᔪᑦ, ᓇᑐᓇᐃᖅᓱᒋᑦ ᓇᐃᑦᑐᒥᑦ ᐊᒻᒪᓗ ᐊᑯᓂᐅᔪᒥᑦ ᑕᑯᓐᓴᐅᓂᕐᒧᑦ ᑎᑭᐅᑎᓃᑦ. ᑕᕆᐅᖃᕐᓂᕐᒧᑦ ᒪᓕᒃᑕᐅᔪᓐᓴᐃᑦ ᐅᖃᐅᓯᐅᕐᒥᔪᑦ ᑕᒃᑯᓂ ᑎᑎᖅᑲᒥᑦ. ᐸᕐᓇᐅᑎ ᑐᓂᓯᔪᖅ ᖃᐅᔨᓯᐊᖃᑦᑕᕐᓂᕐᒥᒃ ᐊᒻᒪᓗ ᐊᕐᓕᑐᐊᕐᓕᕆᐊᖅᑎᑦᑎᓂᕐᒨᕐᒐᔪᓂᒃ ᐱᕐᒐᓱᓄᑦ ᖃᓄᐃᓕᐅᕐᓂᐅᔪᓄᑦ: ᓴᓇᕙᓪᓕᐊᓂᕐᒥᑦ ᐃᒪᐅᑉ ᖃᓂᑕᕐᒐᓂᑦ - ᓴᓇᕙᓪᓕᐊᑎᓪᓗᒋᑦ ᐊᒻᒪᓗ ᐊᐅᓃᖅᑎᑦᑎᓂᕐᒥᑦ; ᐊᐅᒃᐸᓪᓕᐊᓂᐅᑎᓪᓗᒍ ᐅᕙᕘᓐᓃᑦ ᑰᖕᓂᖃᑐᐊᕐᓂᐅᔪᓂᑦ - ᓴᓇᕙᓪᓕᐊᑎᓪᓗᒋᑦ, ᐊᐅᓃᖅᑎᑦᑎᓂᕐᒥᑦ ᐊᒻᒪᓗ ᐅᒃᑯᐊᖅᐸᓪᓕᐅᓂᕐᒥᑦ; ᐊᒃᑐᖅᑕᐅᓂᖃᑐᐃᓐᓇᕆᐊᖃᕐᓂᕐᕆᓐᓂᒃ ᐃᒪᖃᕐᓂᐅᔪᑦ - ᐊᐅᓪᓃᖅᑎᑦᑎᓂᖃᖅᑎᓪᓗᒋᑦ. ᖃᐅᔨᒋᐊᖃᑦᑕᕐᓂᐅᔪᖅ ᐊᒻᒪᓗ ᐊᕐᓕᑐᐊᕐᓕᕆᐊᖅᑎᑦᑎᓂᕐᒨᕐᒐᔪᑦ ᐅᖃᐅᓯᐅᔪᑦ ᖃᓄᐃᓕᐅᕐᓂᐅᔪᓂᑦ.

DOCUMENT CONTROL

Version	Date (YM)	Section	Page	Revision
1	March 2019	All		Comprehensive plan
2	March 2020	2.3 3.3	5 7	Updated to include TSS guidelines for MEL-14 Monitoring Program Station Updated mitigation measures to include check dams
3	March 2021	2.2.1	4	Updated Table 2.1

TABLE OF CONTENTS

Acronyms

Agnico Eagle	Agnico Eagle Mines Limited – Meliadine Division
CCME	Canadian Council of Ministers of the Environment
DFO	Fisheries and Oceans Canada
NIRB	Nunavut Impact Review Board
NTU	Nephelometric Turbidity Units
NWB	Nunavut Water Board
Plan	Sediment and Erosion Management Plan
TSS	Total Suspended Solids

UNITS

h	hour
km	kilometre
km^2	square kilometre
mg/L	milligram per litre

SECTION 1 • INTRODUCTION

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (Project), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the Project site is located on a peninsula between the east, south, and west basins of Meliadine Lake (63°1’23.8’’ N, 92°13’6.42"W), on Inuit owned lands. The Project is located within the Meliadine Lake watershed of the Wilson Water Management Area (Nunavut Water Regulations Schedule 4).

As presented in Table 1.1, there are four phases to the development of the Tiriganiaq deposit: 3.5 years construction (Q4 Year -5 to Q2 Year -1), 8.5 years mine operation (Q2 Year -1 to Year 8), 3 years closure (Year 9 to Year 11), and post-closure (Year 11 forwards).

Table 1.1 Overview of Timeline and General Activities

Phase	Year	General Activities
Construction	Year -5 to year -1	• Construct site infrastructure • Develop the underground mine ramp • Stockpile ore
Operations	Year -1 to 8	• Mining operations • Stockpile ore • Dry stack tailing deposition
Closure	Year 9 to 11	• Decommission of underground mine surface opening • Cover on top of tailings • Decommission non-essential mine infrastructure • Fill open pits with active pumping
Post-Closure	Year 11 forwards	• Site and surrounding environment monitoring

This document presents the Sediment and Erosion Management Plan (the Plan). The purpose of this Plan is to provide consolidated information on the management and monitoring of potential areas subjected to erosion. This is accomplished by presenting first a review of the potential effects of total suspended solids (TSS) and turbidity, the Federal guidelines and the license requirements, followed by the periods and type of activities subjected to erosion, and the specific monitoring and mitigating measures.

As per Nunavut Impact Review Board (NIRB) Meliadine Project Certificate No.006 Condition 28, the Sediment and Erosion Management Plan should be developed to prevent or minimize the effects of destabilization and erosion that may occur due to Project activities. The plan should also detail sediment control plans to prevent and/or mitigate sediment loading into surface water within the Project area.

The objectives of the plan are:

- To prevent the release of sediment into streams and waterbodies during construction activities;
- To reduce and mitigate erosion and the release of sediment during operations activities;
- To specify erosion and sediment control measures that, if implemented and maintained, will help Agnico Eagle maintain compliance with the Federal Fisheries Act, specifically with Section 36(3) of the Act, which prohibits the deposition of deleterious substances into waterbodies frequented by fish; and
- To provide references to approvals, relevant standards, control plans and procedures for training, communications, investigation and corrective action, and audits that are required under the Project Agreement.

SECTION 2 • TOTAL SUSPENDED SOLIDS/TURBIDITY EFFECTS, FEDERAL GUIDELINES AND LICENSE REQUIREMENTS

2.1 Effects of Total Suspended Sediments on Fish Habitat

Suspended sediments, and associated effects on water clarity, have the potential to affect fish and fish habitat in a variety of ways, including but not limited to:

- Smothering of deposited eggs or siltation of spawning habitats;
- Smothering of benthic invertebrate communities;
- Decreased primary productivity caused by reduced light penetration;
- Reduced visibility, which may decrease feeding efficiency and/or increase predator avoidance; and
- Clogging and abrasion of gills.

Moreover, the general findings for effects of TSS on fish and fish habitat indicate the following:

- Effects of TSS depend on both the concentration of TSS and duration of exposure;
- Effects of TSS can also be influenced by the size and shape of suspended particles;
- Lethal concentration of TSS on fish over acute exposure ranges from hundreds to hundreds of thousands of mg/L;
- Sublethal effects on fish (reduced growth, changes in blood chemistry, histological changes) associated with chronic exposures tend to be exhibited at TSS concentrations ranging from the tens to hundreds of mg/L;
- There is considerable uncertainty about potential effects of low TSS concentrations over long time periods;
- Overall, the most sensitive group of aquatic organisms to TSS appears to be salmonids, and guidelines are developed to protect this group;
- Adult salmonids are generally more sensitive to short durations of high concentrations of suspended sediments than juvenile salmonids; and
- Low suspended sediment levels are known to cause egg mortality (40 %) to rainbow trout at long durations (7 mg/L at 48 days). Guidelines for long-term exposure reflect these findings.

More details can be found in the report from Fisheries and Oceans Canada (DFO) on the effects of sediments on fish and their habitat (Fisheries and Oceans Canada, 1999).

2.2 Federal Guidelines

2.2.1 TSS Guidelines

The Canadian Council of Ministers of the Environment (CCME) specifies separate guidelines for TSS for clear and high flow periods. The guidelines are derived primarily from Caux *et al*. (1997), with application intended mainly for British Columbia streams. In the case of the application to the Meliadine Project lakes, the clear flow guidelines would be most relevant; even during freshet. The lakes would not expect to see large natural fluctuations in TSS except in localized areas for short periods.

The guidelines put forth by the CCME recognize that the severity of effects of suspended sediments is a function of both the concentration of suspended sediments and the duration of exposure. Guidelines are intended to protect the most sensitive taxonomic group and the most sensitive life history stages.

Table 2.1 CCME National Guidelines and MDMER Legislated Standards for TSS

Source	Short-Term Exposure	Long-Term Exposure
CCME (1999, updated 2002)	Anthropogenic activities should not increase suspended sediment concentrations by more than 25 mg/L over background levels during any short-term exposure period (e.g., 24-h).	For longer term exposure (e.g.,inputs lasting between 24h and 30 days), average suspended sediment concentrations should not be increased by more than 5 mg/L over background levels.
MDMER 2002, last amended June 2020	Maximum authorized concentration in a composite effluent sample = 22.5 mg/L. Maximum authorized concentration in a grab sample of effluent = 30 mg/L.	Maximum authorized monthly mean effluent concentration = 15 mg/L.

2.2.2 Turbidity Guidelines

Turbidity guidelines put forth by the CCME (1999) are based on extrapolation from the TSS guidance above, adjusted by a factor of about 3:1 (a typical average ratio for TSS: turbidity). In the case of turbidity for clear water, CCME (1999) recommends a maximum increase of 8 Nephelometric Turbidity Units (NTU) from background levels for a short-term exposure (e.g., 24-hour period), and a maximum average increase of 2 NTU from background levels for a longer term exposure (e.g., 30-day period).

CCME (1999) notes that in some cases short-term resuspension of sediments and nutrients in the water column can augment primary productivity, and in other cases, changes in light penetration may be inconsequential if a system is limited by other factors such as nutrients. The Caux *et al*. (1997) study considered effects of suspended sediment not only on fish but also on algae and zooplankton. In summary, the recommendations put forth by Caux *et al*. (1997) are based mainly on the most sensitive taxonomic group, which is salmonids.

However, research has shown that widespread, chronic turbidity can result in reduced light penetration and subsequent reductions of primary productivity (Fisheries and Oceans Canada, 1999; Canadian Council of Ministers of the Environment, 1999; Lloyd, Koenings, & Laperriere, 1987). Consequently, water clarity is of concern at broader spatial scales and longer time frames. It should be noted that DFO’s report on effects of sediment on fish and their habitat (DFO, 1999) endorses the guidelines for TSS put forth by the CCME (1999), but does not recommend following guidelines for turbidity. Rather, turbidity may be used as a surrogate for suspended sediment only when the relationship between the two parameters is established for a particular waterbody.

2.3 License Requirements for the Protection of Fish and Fish Habitat at Meliadine

The Nunavut Water Board (NWB) Type A Water License for the Meliadine Project includes:

All surface runoff and/or discharge from drainage management systems, at the Monitoring Program Stations MEL-SR-1 to MEL-SR-TBD referred to in Part I, Item 11, during the Construction/Operation of any facilities and infrastructure associated with this project, including laydown areas and All Weather Access Road, where flow may directly or indirectly enter a Water body, shall not exceed the Surface Runoff and Discharge from Drainage Management Systems quality limits in Table 2.3.

Table 2.3 Surface Runoff and Discharge from Drainage Management Systems Quality Limits

Parameter	Maximum Average Concentration	Maximum Concentration of Any Grab Sample
Total Suspended Solids (TSS) (mg/L)	50.0	100.0
Oil and Grease	No Visible Sheen	No Visible Sheen
pH	Between 6.0 and 9.5	Between 6.0 and 9.5

Additionally, the discharge of effluent from the Final Discharge Point at Monitoring Program Station MEL-14 directed to Meliadine Lake through the Meliadine Lake Diffuser shall not exceed the following TSS concentrations, in accordance with the requirements of the Type A Water License (Part F, Item 3) and MDMER (see Table 2.1 above):

- Maximum monthly mean effluent concentration: 15 mg/L;
- Maximum concentration of any grab sample of effluent: 30 mg/L.

SECTION 3 • SEDIMENT AND EROSION MONITORING AND MITIGATION

3.1 Sediment and Erosion during Specific Periods

The purpose of the Plan is to ensure that Agnico Eagle will successfully monitor signs of sedimentation and erosion and minimize its resulting effects. This plan presents the monitoring and mitigating actions related to three (3) specific periods of activity for Meliadine:

- Periods of construction near water – during construction and operation;
- Periods of freshet or significant runoff events – during construction, operation and closure;
- Periods of potential impact to waterbodies – during operation.

The construction of water management infrastructure could potentially lead to excess TSS. Therefore, erosion control methods must be considered during construction of water management infrastructure. In addition, erosion control must be considered during any dewatering activity.

The freshet season at Meliadine occurs approximately from mid-May until the end of June. In addition, there can be periods of high water flow due to rainfall events from late May – early October. As most site construction has been completed at the Meliadine site there are new areas and infrastructure that have become potentially vulnerable to excess water during the freshet season and in response to rainfall, such as, but not limited to:

- Culverts and other water management infrastructures;
- Newly constructed embankments, such as roads and berms;
- Water channels; and
- Surface runoff.

Water transfer and water discharge during operation can also lead to erosion and sedimentation.

3.2. Erosion and Sediment Monitoring

In order to monitor potential erosion and sedimentation, smaller water management infrastructure such as culverts, cross drains, surface runoff and ditches are inspected up to daily during freshet (minimum of weekly), on a monthly basis thereafter and daily after significant rain events. Larger culverts and bridges are inspected more often if they represent a risk for daily operations, for the receiving environment or for the health and safety of workers. More specifically, the following aspects are monitored during visual inspections:

- Accumulation of debris near the inlet of the crossings, impeding the free flow of water at those locations;
- Bed erosion upstream and downstream of watercourse crossing structures;
- Scour under bridge abutments and abutment foundations; and
- Erosion along cutslopes and fillslopes of embankments (rill and gully erosion), etc.

Newly excavated channels are inspected on a regular basis and after significant rain events. Erosion signs along the channel flow are monitored and documented. Inspections are carried out during the spring when surficial ice moves towards the inlet of the diversion channels to ensure that no ice blockage causes water buildup upstream of the channel, which could lead to subsequent erosion problems. It is important to develop a database to determine if adverse trends are occurring. If adverse trends are observed, then mitigation will be undertaken to prevent a major incident.

The frequency of water and turbidity sampling are in accordance with the requirements of the Type A Water License and MDMER. The frequency will be increased if required during the freshet season or during heavy rainfall events. Procedures for turbidity monitoring include:

- Collection of water at the site of sediment entrance (exposure), and at a reference site (i.e., in the same watercourse/waterbody in an area unaffected by the sedimentation [upstream, at least 50 m away where water does not appear to be impacted]).

- Analyze samples for turbidity using a field turbidity meter and compare the exposure sample to the reference sample.

- If the exposure sample results are higher than the reference then mitigation will be undertaken (i.e. installation of silt fencing, silt barrier booms, etc.) to prevent any impact to watercourses.

If Agnico Eagle is actively working in an area with elevated turbidity – the work will stop until the level of clarity returns to an acceptable level.

Monitoring will be documented with site photographs and inspection forms.

3.3 Mitigation Measures

The following mitigation measures could be used, if required, to reduce risks associated with erosion and sedimentation.

- Riprap or clean non-acid generating/non-metal leaching rockfill could be used to armor shorelines, bridge abutments, culverts inlets and outlets and toe berms;
- Ditches managing high volumes of water could be armored for erosion control and reduce the speed of water flow;
- Sedimentation basins could be constructed at sensitive locations to allow settlement of finer sediments;
- Check dams could be constructed in areas of sustained high levels of TSS to mitigate transport of TSS downstream;
- Ditches, culverts and other water crossing structures should be maintained free of debris to allow free flow of runoff water;
- Installation of erosion control material such as turbidity barriers, silt curtains or straw booms;
- Site-specific erosion issues may arise during the mine operation that require specific local corrective actions;
- In-stream construction during periods when streams are expected to be dry or frozen to the bottom (i.e., during winter or fall). Isolation methods will be used for work below the high water mark for streams with flowing water at the time of construction;

- Materials installed below the high water mark (i.e., riprap) will be cleaned prior to installation to avoid adding deleterious substances to watercourses. Where concrete is installed, it will be allowed to cure fully prior to installation;
- Riparian areas will be maintained whenever possible to minimize erosion and impacts to fish habitat, with vegetation removal limited to the width of the workspace footprint. Disturbed areas along the streambanks will be stabilized and allowed to re-vegetate upon completion of work to minimize future erosion;
- Debris and excess materials resulting from construction will be removed from the work site to prevent them reaching water bodies; and
- When using equipment that creates tracks on the surface, run the equipment slowly to create grooves running perpendicular the slope and not parallel to the slope. This type of texture on slopes can slow the speed of runoff and reduce the amount of erosion and sediment transported downhill. This method must also be combined with an additional method of catching sediment at the base of the slope, such as a silt fence, straw log, etc.

SECTION 4 • REFERENCES

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