AGNICO EAGLE

MELIADINE GOLD PROJECT

Water Management Plan

MARCH 2020
VERSION 9
6513-MPS-11

EXECUTIVE SUMMARY (ENGLISH)

Agnico Eagle Mines Limited (Agnico Eagle) is developing the Meliadine Gold Project (the Mine), located approximately 25 kilometres (km) north of Rankin Inlet, and 80 km southwest of Chesterfield Inlet in the Kivalliq Region of Nunavut. The Mine Plan proposes 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 water management objectives are to minimize potential impacts to the quantity and quality of surface water at the Mine. Water management structures (surface ponds, water retention dikes/berms, water diversion channels and culverts) are in place and will be constructed as needed to contain and manage the contact water from the areas affected by the Mine or mining activities. The major water management infrastructure includes: water containment ponds, water retention dikes, berms, channels, a potable Water Treatment Plant (WTP), a Sewage Treatment Plant (STP), a Saline Water Treatment Plant (SWTP), a Reverse Osmosis (RO) Plant, an Effluent Water Treatment Plant (EWTP), and a Saline Effluent Treatment Plant (SETP).

During mine Construction and Operations, contact water originating from affected areas on surface will be intercepted, diverted and collected within the various containment ponds. The collected water at the Mine will be eventually pumped and stored in Containment Pond 1 (CP1), where the contact water will be treated by the EWTP for removal of Total Suspended Solids (TSS) prior to discharge to the outside environment or as make-up water by the Process Plant. Contact water from the Underground Mine will be collected in underground storage stopes and sumps. Some water from Underground will be reused for underground operations. Excess saline contact water will be pumped to and stored in surface saline ponds, and subsequently treated at the SWTP or SETP for discharge to the sea.

The long-term, post-closure water quality in the containment ponds and in the flooded open pit lakes will meet Metal and Diamond Mining Effluent Regulations (MDMER) , Canadian Council of Ministers of the Environment Water Quality Guidelines (CCME-WQG) for the protection of aquatic life and/or the Site Specific Water Quality Objectives (SSWQO’s) developed for the Mine.

During mine closure, the water management infrastructure on site will remain in place until mine closure activities are completed and monitoring demonstrates that the water quality is acceptable for environmental discharge without treatment.

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ᐊᒡᓃᑯ ᐆᒍ ᐅᔭᕋᒃᑕᕆᐊᒃᑯᑦ (ᐊᒡᓃᑯᒃᑯᑦ) ᑕᓯᕐᔪᐊᕐᒥᑦ ᐅᔭᕋᒃᑕᕆᐊᓕᐅᖅᐸᓪᓕᐊᔪᑦ (ᐅᔭᕋᒃᑕᕆᐊᖅ), 25 ᑭᓛᒥᑕᓂᒃ ᐅᖓᓯᒃᑎᕆᔪᖅ ᐅᐊᖕᓇᖓᓂᑦ ᑲᖏᖅᖠᓂᐅᑉ, ᐊᒻᒪᓗ 80 ᑭᓛᒥᑕᓂᒃ ᐅᖓᓯᒃᑎᕆᑉᓗᓂ ᓂᕆᐊᓂᑦ ᐱᖓᖕᓇᖅᐸᓯᐊᓂᑦ ᐃᒡᓗᓕᒫᕐᔫᑉ ᑭᕙᓪᓕᕐᒥᑦ ᓄᓇᕗᒻᒥᑦ. ᐅᔭᕋᒃᑕᕆᐊᕐᒧᑦ ᐸᕐᓇᐅᑎ ᐅᔭᕋᒃᑕᕐᓂᕐᒧᑦ ᐱᓕᕆᐊᖃᕈᒪᔪᑦ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖓᔪᒥᑦ ᐊᒻᒪᓗ ᐊᑐᖅᑕᐅᓂᐊᖅᑐᓂᒃ ᐱᕙᓪᓕᐊᓗᒍ ᑎᕆᒐᓂᐊᖅ ᒎᓗᑕᓕᒃ, ᒪᕐᕘᖕᓂᒃ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖓᔪᓂᑦ (ᑎᕆᒐᓂᐊᖅ 1 ᐊᒻᒪᓗ ᑎᕆᒐᓂᐊᖅ 2) ᐊᒻᒪᓗ ᐊᑕᐅᓯᖅ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔭᕋᒃᑕᕐᓂᖅ.

ᐃᒪᕐᒥᒃ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐱᓕᕆᐊᖑᔪᒪᔪᑦ ᒥᑭᓛᒃᑰᖅᑎᓪᓗᒋᑦ ᐊᒃᑐᖅᓯᓂᐅᔪᖕᓇᖅᑐᑦ ᐃᒪᖃᖅᑎᕆᓂᖓ ᐊᒻᒪᓗ ᖃᓄᐃᓐᓂᖓᑕ ᖄᖓᓃᑦᑐᑦ ᐃᒪᐃᑦ ᐅᔭᕋᒃᑕᕆᐊᕐᒥᑦ. ᐃᒪᕐᒥᒃ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐋᖅᑭᐅᒪᔪᑦ (ᓄᓇᐅᑉ ᖄᖓᓂᑦ ᐃᒪᖅᓱᐃᑦ, ᐃᒪᕐᒥᒃ ᐸᐸᑦᑎᓂᕐᒧᑦ ᐊᕙᓗᐃᑦ, ᐃᒪᕐᒥᒃ ᓴᖑᑦᑎᑦᑎᓂᕐᒧᑦ ᓲᐸᓗᐃᑦ ᐊᒻᒪᓗ ᓲᐸᓘᑦ) ᑕᐃᒪᐅᔪᑦ ᐊᒻᒪᓗ ᓴᓇᔭᐅᓂᐊᖅᑐᑦ ᐱᔭᕆᐊᖃᕐᒪᑕ ᓄᖅᑲᖓᑎᓪᓗᒍ ᐊᒻᒪᓗ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐊᒃᑐᖅᑕᐅᔪᑦ ᐃᒪᐃᑦ ᐃᓂᐅᔪᓂᑦ ᐊᒃᑐᖅᑕᐅᓯᒪᔪᓂᑦ ᐅᔭᕋᒃᑕᕆᐊᕐᒥᑦ ᐅᕝᕙᓘᓐᓃᑦ ᐅᔭᕋᒃᑕᖅᑎᓪᓗᒋᑦ. ᐃᒪᓕᕆᓂᕐᒧᑦ ᐊᐅᓚᑦᑎᓂᐅᓗᐊᖅᑐᓄᑦ ᐱᕐᑯᑎᓂᑦ ᐃᓚᐅᔪᑦ: ᐃᒪᖃᕐᕖᑦ ᑕᓯᕋᔭᐃᑦ, ᐃᒪᖃᕐᕕᖕᓄᑦ ᐊᕙᓗᐃᑦ, ᓲᐸᓗᐃᑦ, ᐊᑐᖅᑕᐅᔪᖕᓇᖅᑐᒥᒃ ᐃᒪᓕᕆᕝᕕᒃ (WTP), ᖁᕐᕕᖕᒦᖅᑐᓕᕆᕝᕕᒃ (STP), ᑕᕆᐅᓕᖕᒥᑦ ᐃᒪᓕᕆᕝᕕᒃ (SWTP), ᐃᒪᑦᑎᐊᕙᓕᐅᕐᕕᒃ (RO), ᐊᒻᒪᓗ ᑯᕕᔪᒥᒃ ᐃᒪᓕᕆᕝᕕᒃ (EWTP), ᐊᒻᒪᓗ ᑕᕆᐅᓕᖕᒥᑦ ᑯᕕᔪᒥᒃ ᐃᒪᓕᕆᕝᕕᒃ (SETP).

ᐅᔭᕋᒃᑕᕆᐊᖅ ᓴᓇᔭᐅᑎᓪᓗᒍ ᐊᒻᒪᓗ ᐊᐅᓛᖅᑎᓪᓗᒍ, ᐃᒪᖅ ᐊᑐᖅᑕᐅᔪᖅ ᐊᒃᑐᖅᑕᐅᓯᒪᔪᓂᑦ ᐃᓂᐅᔪᓂᑦ ᐱᔭᐅᑉᓗᓂ ᓄᓇᐅᑉ ᖄᖓᓂᑦ ᐱᓕᕆᐊᖑᓂᐊᖅᑐᑦ, ᓴᖑᑎᑕᐅᓗᑎᒃ ᐊᒻᒪᓗ ᑲᑎᑕᐅᓗᑎᒃ ᐊᔾᔨᒌᙱᑦᑐᓄᑦ ᓄᖅᑲᖓᑦᑎᓂᕐᒧᑦ ᑕᓯᕋᔭᖕᓄᑦ. ᑲᑎᑕᐅᔪᖅ ᐃᒪᖅ ᐅᔭᕋᒃᑕᕆᐊᕐᒥᑦ ᑯᕕᑎᑕᐅᓕᕋᑕᕐᓂᐊᖅᑐᖅ ᐊᒻᒪᓗ ᓄᖅᑲᖓᑦᑎᓂᕐᒧᑦ ᑕᓯᕋᔭᒃ 1-ᒧᐊᖅᑕᐅᓗᓂ, ᐊᒃᑐᖅᑕᐅᓯᒪᔪᖅ ᐃᒪᖅ ᐱᓕᕆᐊᖑᓂᐊᖅᑐᖅ EWTP-ᒧᑦ ᐲᖅᑕᐅᓗᓂ ᑲᑎᖦᖢᒋᑦ ᑖᒥᓂᖅᓱᖅᑐᑦ ᓯᑎᔪᑦ (TSS) ᑯᕕᑎᑕᐅᖅᑳᖅᑎᓐᓇᒋᑦ ᓯᓚᒧᑦ ᐅᕝᕙᓘᓐᓃᑦ ᐊᑐᖅᑕᐅᔪᒃᓴᓕᐊᖑᓂᐊᕐᓗᓂ ᐱᓕᐅᕆᕙᓪᓕᐊᕝᕕᖓᓄᑦ. ᐊᒃᑐᖅᑕᐅᓯᒪᔪᖅ ᐃᒪᖅ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐅᔭᕋᒃᑕᕆᐊᕐᒥᑦ ᐱᔪᖅ ᑲᑎᑕᐅᓂᐊᖅᑐᖅ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᑐᖅᑯᖅᓯᓯᒪᕝᕕᖓᓄᑦ ᑯᕕᑎᑎᑦᔪᑎᓄᓪᓗ. ᐃᓚᖓ ᐃᒪᖅ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐱᔪᖅ ᐊᑐᖅᑕᐅᒃᑲᓐᓂᕐᓂᐊᖅᑐᖅ ᓄᓇᐅᑉ ᐃᓗᐊᓂᑦ ᐊᐅᓛᖅᑎᑦᑎᓂᕐᒧᑦ. ᑕᕆᐅᖃᓗᐊᖅᑐᖅ ᐃᒪᖅ ᑯᕕᑎᑕᐅᓂᐊᖅᑐᖅ ᑐᖅᑯᖅᑕᐅᓗᓂᓗ ᓄᓇᐅᑉ ᖄᖓᓄᑦ ᑕᕆᐅᓕᖓᑦ ᑕᓯᕋᔭᖓᑦ, ᐊᒻᒪᓗ ᐱᓕᕆᐊᖑᓗᓂ SWTP-ᒥᑦ ᐅᕝᕙᓘᓐᓃᑦ SETP-ᒥᑦ ᑯᕕᑎᑕᐅᓂᐊᕐᓗᓂ ᑕᕆᐅᕐᒧᑦ ᐃᒪᕐᒧᑦ.

ᐊᑯᓂᐅᔪᒥᑦ, ᐅᒃᑯᐊᖅᓯᒪᓕᖅᑎᓪᓗᒍ ᐃᒪᐅᑉ ᖃᓄᐃᓐᓂᖓ ᑐᖅᑯᖅᑕᐅᓯᒪᔪᓂᑦ ᑕᓯᕋᔭᖕᓂᑦ ᐊᒻᒪᓗ ᐃᒻᒥᖅᑐᖅᑕᐅᓯᒪᔪᑦ ᓄᓇᒥᑦ ᐅᒃᑯᐃᖓᔪᒥᑦ ᑕᓯᕐᓄᑦ ᑎᑭᐅᑎᓯᒪᓂᐊᖅᑐᑦ ᓴᕕᖕᓂᒃ ᐊᒻᒪᓗ ᓯᑎᔪᓂᒃ ᐅᔭᕋᕐᓂᒃ ᐅᔭᕋᒃᑕᕆᐊᕐᒥᑦ ᑯᕕᑎᑦᑎᓂᕐᒧᑦ ᒪᓕᒐᖁᓂᒃ (MDMER), ᑲᓇᑕᒥᑦ ᒥᓂᔅᑕᐅᑏᑦ ᑲᑎᒪᔩᑦ ᐊᕙᑎᒥᑦ ᐃᒪᐅᑉ ᖃᓄᐃᓐᓂᖓᓄᑦ ᒪᓕᒃᑕᐅᔫᖅᓯᖕᒥᑦ (CCME-WQG)-ᒥᑦ ᒥᐊᓂᕆᓂᐊᕐᓗᒋᑦ ᐃᒪᕐᒥᐅᑕᐃᑦ ᐊᒻᒪᓗ/ᐅᕝᕙᓘᓐᓃᑦ ᐃᓂᐅᔪᒥᑦ ᐱᔾᔪᑎᖃᖅᑐᒥᒃ ᐃᒪᕐᒧᑦ ᐱᓕᕆᐊᒃᓴᐃᑦ (SSWQO) ᐱᖁᔭᖅᑎᑕᐅᓯᒪᔪᑦ ᐅᔭᕋᒃᑕᕆᐊᕐᒧᑦ.

ᐅᔨᕋᖅᑕᕆᐊᖅ ᐅᒃᑯᐊᖅᐸᓪᓕᐊᑎᓪᓗᒍ, ᐃᒪᕐᒥᒃ ᐊᐅᓚᑦᑎᓂᕐᒧᑦ ᐱᖁᑏᑦ ᐃᓂᐅᔪᒦᓐᓂᐊᖅᑐᑦ ᑭᓯᐊᓂ ᐅᔨᕋᖅᑕᕆᐊᖅ ᐅᒃᑯᐊᖅᑕᐅᕙᓪᓕᐊᓂᖓ ᐱᐊᓂᒃᐸᑕ ᐊᒻᒪᓗ ᖃᐅᔨᒋᐊᖃᑦᑕᕐᓂᒃᑯᑦ ᖃᐅᔮᓐᓇᖅᓯᒃᐸᑦ ᐃᒪᐅᑉ ᖃᓄᐃᓐᓂᖓ ᓈᒻᒪᓕᕐᓂᖓᓄᑦ ᐊᕙᑎᒧᑦ ᑯᕕᑎᓐᓂᐊᕐᓗᒍ ᐱᓕᕆᐊᖑᙱᓪᓗᓂ.

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DOCUMENT CONTROL

Version	Date	Section	Page	Revision	Author
6	March 2019	All	All	Update is to fulfill annual review requirement (NWB)	Environment Department
		1	4	Update to Mine Development Plan information	
		3.1	8-12	Updated Version 6 changes	
		3.2	11-12	Updated existing water management control structures	
		3.3	12-14	Revised structure design semantics; corrections to culvert design; updated CP3, CP4 design parameters and naming convention; removed incorrect artifact pertaining to culvert 1 flow handling	
		3.6	15	Addition of SP3; updates to SP2 design	
		3.8, 3.9	17-21	Included as-built parameter values; updated berm and dike naming convention, thermistor information	
		3.11	21-22	Updated freshwater intake design information; updates to SWTP system; RO management; EWTP monitoring; removed incorrect information pertaining to Freshwater intake	
		4.1, 4.2	25-31	Updated management of saline discharge to sea; revised information proposed in initial design	
		4.6	35	Updated key management activities schedule to include discharge to sea; updated regarding underground inflow management; revised haul road management; revised wash bay management; updated process water quantities	
		6.3	37	Updated impacted waterbodies status	
		7	40	Revised semantics regarding flow paths	
				Included additional information regarding July 23rd exceedance	
		Figure 1.2		Updated Layout to most recent General Mine Site Plan	
		Figure 6.1, 6.2		Specified plan layouts are from feasibility level study	
		Figure 7.1a		Updated Layout with monitoring stations to most recent General Mine Site Plan	
7	August 2019	3.9.4	20	Updated EWTP trigger limit to account for variance introduced by TSS-turbidity correlation strength	
		4.1	26	Updated Key Activities (Table 10) to reflect changes to H19/H20 dewatering schedule	
		4.1.1	27-28	Revised H19/H20 dewatering plan with requirements for advancement in dewatering schedule; Updated dewatering schedule (Table 11)	

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8	November 2019	3.5	15-16	Updated Saline Pond section to include current existence of SP2 and plans for construction of SP4.
		Figure 3.2	55	Figure changed from planned location of SP2 to planned location of SP4.
9	March 2020	All	All	Update is to fulfill annual review requirement (NWB)
		Exec. Summary		Updated to include SETP, excess saline contact water management
		3.1	9	Updated existing water management systems (saline ponds, SETP, discharge to sea)
		3.2	12	Updated Table 2 and Table 3
		3.3	13	Updated to include CP4 as existing structure and modified CP6 construction date
		3.4	15	Update to Section
		3.5	15	Updated to Section
		3.6	16-17	Updated Table 7
		3.9	19-21	Update to SWTP and EWTP systems, addition of SETP
		3.11	22	Updated management of saline water discharge to sea
		3.12	23	Update to Section
		4.1	26-30	Updated Table 10 and Section
		4.2	31	Updated process water management
		4.3	32-33	Updated Meliadine Lake diffuser effluent flow rates and EWTP sludge disposal options
		5	33-34	Update to Section
		7	40	Update to Section. Removed information already presented in annual report (i.e., MEL-14 and MEL-SR results).
		Figure 1.1		Updated Layout to most recent General Mine Site Location Plan
		Figure 1.2		Updated Layout to most recent General Mine Site Plan

ACRONYMS

Agnico Eagle	Agnico Eagle Mines Limited
AWAR	All Weather Access Road
CCME-WQG	Canadian Council of Ministers of the Environment Water Quality Guidelines
CIRNAC	Crown-Indigenous Relations and Northern Affairs Canada
CP	Containment Pond
ECCC	Environment and Climate Change Canada
EMPP	Environmental Management and Protection Plan
EWTP	Effluent Water Treatment Plant
GWMP	Groundwater Management Plan
IDF	Inflow Design Flood
Licence	Type A Water Licence 2AM-MEL1631
MDMER	Metal and Diamond Mining Effluent Regulations
NWB	Nunavut Water Board
Mine	Meliadine Gold Project
SD	Support Document
SSWQO	Site Specific Water Quality Objectives
STP	Sewage Treatment Plant
SWTP	Saline Water Treatment Plant
TDS	Total Dissolved Solids
TSF	Tailings Storage Facility
TSS	Total Suspended Solids
WMP	Water Management Plan
WRSF	Waste Rock Storage Facility
WTP	Water Treatment plant

UNITS

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

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 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 Water Management Plan (WMP). The purpose of this update is to incorporate changes related to water management at the Mine, and comments received from Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) and Environment and Climate Change Canada (ECCC) towards previous versions of the Water Management Plan. Additionally, this update includes all changes related to the approval for discharge to sea that was received with the amended Project Certificate on February 26, 2019.

1.1 Water Management Objectives

The water management objectives are to minimize potential impacts to the quantity and quality of surface water at the Mine and surrounding waterbodies. The purpose of the WMP is to provide information to applicable mine departments (Environment, Engineering, Mine, Energy and Infrastructure, etc.) for sound water management practices, proposed and existing infrastructure, the water balance model, water quality predictions, and for the water quality monitoring plan for the Mine.

Water management structures (culverts, sumps, pipelines, water diversion channels and water retention dikes/berms) are utilized to contain and manage contact water 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 Water Management Plan

Revisions of the WMP 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 WMP 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 (m asl) 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.

2.2 Mine Development Plan

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

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 15.4 million tonnes (Mt) of ore, 31.4 Mt of waste rock, 7.0 Mt of overburden waste, and 15.4 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, two 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 1.2.

SECTION 3 • WATER MANAGEMENT CONTROLS AND STRUCTURES

A network of berms, dikes, containment ponds, channels, culverts and sumps are in place and maintained to facilitate water management. Design Reports and As-Built Reports have been submitted and approved for the water management structures discussed in this section, as applicable. This section is included to summarize design and as-built information.

3.1 Water Management Systems

The water management systems, as shown in Figure 1.2 and Figure 3.1, include the following components:

- Five water containment ponds (CP1, CP3, CP4, CP5, and CP6) and their associated dikes or thermal berms (D-CP1, Berm-CP3, Berm-CP4, D-CP5, and D-CP6)
- Three P-Area containment ponds (P1, P2, and P3) and four containment berms (DP1-A, DP1-B, DP2-A, and DP3-A)
- Four surface Saline Ponds (SP1, SP2, SP3, and SP4)
- Three diversion berms (Berm 1, Berm 2, and Berm 3)
- Eight water diversion channels (Channel 1 to Channel 8)
- Sixteen water passage culverts to convey water (Culverts 1 to 8, 10, 11, 13, 14 to 16, 18, 19 and 20)
- Five evaporators
- A reverse osmosis (RO) treatment plant
- An effluent water treatment plant (EWTP)
- A saline water treatment plant (SWTP)
- A saline effluent treatment plant (SETP)
- A sewage treatment plant (STP)
- A potable water treatment plant (WTP)
- A network of surface pumps and pipelines
- A freshwater intake
- Two jetties and pumping infrastructure (CP1 and CP5)
- An effluent diffuser located in Meliadine Lake
- An effluent diffuser located in Melvin Bay

The status of construction and planned construction dates of the above are listed in Table 1.

Surface contact water is intercepted, diverted and contained within various containment ponds prior to evaporation or treatment. Water collected in CP3 and CP4 is discharged upstream of Culvert 2 where it flows to CP1. Water collected in CP5 is either treated by an RO treatment plant prior to discharging to CP1 or discharged to CP1 directly, depending on the in situ CP5 water quality. Water collected in CP6 (constructed started Q1 2020) will be discharged directly to CP6. Water collected in the P-area is temporarily stored and then actively evaporated. At CP1, the water is treated for total suspended solids (TSS) at the EWTP and discharged through the diffuser located in Meliadine Lake. Water treated through the RO treatment plant at CP5 is moved to CP1 prior to treatment through the EWTP.

Contact water from the Underground Mine is collected in underground sumps, transported to a clarification system, and subsequently recirculated for use in various underground operations. Excess underground contact water is stored in temporarily inactive underground developments, and on surface in Saline Pond 1 (SP1) and Saline Pond 2 (SP2). Saline Pond 2 will be replaced by Saline Pond 4 (SP4) by Q2 2020 (Section 3.5). Underground contact water that is not used for operations is treated at the Salt Water Treatment Plant (SWTP) or Saline Effluent Treatment Plant (SETP) for discharge (Section 3.9).

As part of the strategy to manage excess groundwater infiltration of saline water within the underground portion of the mine, Agnico Eagle received approval from the Nunavut Impact Review Board to discharge saline water to sea (Melvin Bay, Rankin Inlet) with the amended Project Certificate on February 26, 2019. An overview of management around discharge to sea is found in Section 3.11. Further details are found in Appendix A.

During the mine closure, the water management infrastructure will remain in place until closure activities are completed and monitoring demonstrates that water quality is acceptable for discharge to the environment without treatment.

A list of the water management control structures are presented in Table 1 with each respective construction status. Figure 1.2 shows the location of the respective structures over the development stages (Year – 5 to Year 8) of the mine life. Final design details of these structures will be provided to the Regulators for approval at least 30 days prior to construction, as per the Licence.

Table 1: Water Management Control Structures

Mine Phase	Infrastructure Name	Construction Status
Pre-Production Construction (Y-5 to Y 1)	Channel 1	Constructed
	Channel 2	Constructed
	Channel 3	Constructed
	Channel 4	Constructed
	Channel 5	Constructed
	Channel 6	TBD*
	Channel 7	Constructed
	Channel 8	Constructed
	Culvert 1	Constructed
	Culvert 2	Constructed
	Culvert 3	Constructed

	Culvert 4	Constructed
	Culvert 5	TBD*
	Culvert 6	TBD
	Culvert 7	Constructed
	Culvert 8	Constructed
	Culvert 10	Constructed
	Culvert 11	Constructed
	Culvert 13	Constructed
	Culvert 14	TBD
	Culvert 15	Constructed
	Culvert 16	Constructed
	Culvert 18	Constructed
	Culvert 19	TBD
	Culvert 20	Constructed
	CP1	Constructed
	CP3	Constructed
	CP4	Constructed
	CP5	Constructed
	D-CP1	Constructed
	Berm-CP3	Constructed
	Berm-CP4	Constructed
	D-CP5	Constructed
	CP1 Jetty	Constructed
	CP5 Jetty	Constructed
	Saline Pond (SP1)	Constructed
	Saline Pond 2 (SP2)	Constructed
	Saline Pond 3 (SP3)	Constructed
	Berm 1	Constructed
	Berm 2	Constructed
	Berm 3	Constructed
	Freshwater Intake Causeway & Pump Station	Constructed
	Submerged Diffuser	Constructed
	WTP Intake	Constructed
Sustaining Construction during Mine Operation (Y1 to Y8)	CP6 and Berm-CP6	Q2 2020

* Construction tentative based on future water management strategies

3.2 Water Management Structures Design Criteria

The water management systems meet the following criteria:

- Water quality will meet regulatory criteria of the Licence (described in Appendix E).
- Design capacity of the EWTP is sufficient to ensure that D-CP1 and CP1 is able to manage the surface contact water from the entire site for a 1:100 wet year spring freshet, or a 1:2 mean year spring freshet in combination with a 1:1000 return 24-hour extreme rainfall.
- D-CP5 and CP5 is able to manage the water from its catchment area for 3/7 of a 1:100 wet year spring freshet or a 1:1000 return 24-hour extreme rainfall. This design is based on an allowable 3-day delay in initiation of pumping during a 7-day, 1:100 year freshet. Design capacity of pumping from CP5 to CP1 is sufficient to ensure that remaining freshet inflows to CP5 are managed via pumping to CP1.
- Storage capacity of each of the other water management ponds (CP3, CP4, and CP6,) is able to manage the water from their respective catchment area for 3/7 of a 1:100 wet year spring freshet or a 1:1000 return 24-hour extreme rainfall.
- The daily pumping rate for each of the ponds (CP3 to CP6) is designed to have sufficient pumping capacity to handle the runoff water, which would result from one day (24.4 mm) of a 1:100 return wet spring freshet plus a 1:2 return one-hour rainfall (9.8 mm).

Channel 2 to Channel 4 are in place to pass an extreme intensity flow under a 5-minute 1:100 return rainfall of 9.2 mm. Channel 1 and Channel 5 to Channel 8 in place or designed as internal channels where any water overflowing the channels will remain within the catchment areas of various containment ponds. Hydraulic analyses indicated that very wide channels are required to pass an extreme intensity flow under a 5-minute 1:100 return rainfall of 9.2 mm. As a result, these channels were designed to have a reasonable bottom width to pass a flow with lesser intensity, but the water overflowing the channels can be safely managed by berms or temporarily stored in a lower basin nearby. For example, water overflowing Channel 5 can be contained by Berm 3. Water overflowing Channel 7 and Channel 8 can be stored in the lower basin in the drained Pond H13, and Berm 1 combined with a mass till backfill protects the Portal No.2 entrance from flooding. Furthermore, the MULTI-PLATE at Portal No. 2 is protected by compacted, engineered structural fill. Water overflowing Channel 1 will flow through the flat ground between Ore Pad 2 (OP2) and future WRSF2 into CP1. Table 2 presents the design parameters for CP1, CP5 and CP6.

Table 2: As-Built Parameters for CP1 and CP5

Pond	CP1	CP5
Pond Volume at Maximum Operating Elevation under Normal Operating Conditions and Mean Precipitation Years (m^3)	742,075	46,674
Maximum Operating Water Elevation (m)	66.2	66.0

Pond	CP1	CP5
Maximum Water Elevation during IDF (m)	66.6	66.3
Estimated Pond Volume for Water Elevation at Maximum Operating Water Elevation during IDF (m^3)	855,245	70,000
Dike for Pond	D-CP1	D-CP5
As-Built Crest Elevation of Dike Containment Element (liner system) (m)	67.37	66.72

CP3, CP4 and CP6 are established through excavation of the original ground to increase water storage capacity and help ensure water levels do not reach the thermal protection berms. The key design parameters for CP3, CP4 and CP6 are provided in Table 3 and are discussed in further detail within Tetra Tech (2018a) and Tetra Tech (2020).

Table 3: Design Parameters for CP3 and CP4

Pond	CP3	CP4	CP6
Elevated Pond Bottom Elevation (m)	56.0	56.0	54.0
Estimated Maximum Water Elevation during IDF (m)	63.0	63.0	60.0
Pond Volume for Water Elevation at Estimated Maximum Water Elevation during IDF (m^3)	28,800	35,093	32,757
Pond Surface Area at Estimated Maximum Water Elevation during IDF (m^2)	6,583	8,805	8,602
Thermal Berm for Pond	Berm-CP3	Berm-CP4	Berm-CP6

3.3 Water Containment ponds

Four water containment ponds (CP1, CP3, CP4 and CP5) have been constructed to date as part of the water management infrastructure. One more water containment pond, CP6, will be constructed in 2020. Table 4 presents the locations and the required operational period of the containment ponds. The locations of the five water containment ponds are shown on Figure 1.2.

Table 4: Location of Containment Pond and Required Operation Periods

Containment Pond	**Relative Location**	**Required Operation Period**
CP1	Pond H17 and H6	Year 2017 to Mine closure
CP3	North of Lake B7 and southwest of TSF	Year 2019 to Mine closure
CP4	Southeast of Lake B7 and south of WRSF1	Year 2019 to Mine closure

CP5	North of Tiriganiaq Pit 2	Year 2017 to Mine closure
CP6	Pond H19 and north of WRSF3	Year 2020 to Mine closure

3.4 P-Area Containment Ponds

The P-area consists of three storage ponds, four water containment berms and five evaporators. This area contains surface runoff and is part of the surface water management system dedicated to saline water. The total storage capacity of the P-Area ponds is 46,041 m^3. P1 is divided by a berm, producing P1-A (6,131.8 m^3) as the southern section of P1, and P1-B (14,649 m^3) as the northern section. P2 is adjacent and located south of P1-A. P3 was constructed east of the existing south access road, with the primary purpose of collecting seepage originating from the P2 confining berm and its abutments. A pumping station is in place to collect and pump any collected water from P3 to P1.

P1, P2 and P3 are contained by berms DP1-A, DP1-B, DP2-A, and DP3-A. Five evaporators have been installed on DP1-B. Table 5 summarizes the as-built capacities for the P-Area ponds and Figure 3.1 illustrates the P-Area plan view. Comparison of P-Area capacity in relation to stored water volumes is found in Table 2 of the Groundwater Management Plan (Appendix A).

In Q2 of 2019, SP3 was installed within the southwestern portion of P3. SP3 is lined with a polyethylene geomembrane to prevent any seepage into or out of the containment structure, and acts as the final effluent storage pond for saline water that is to be discharged to sea (Section 3.11). After construction of SP3, the usable P3 containment volume was decreased by approximately 84%, due to a reduced footprint from the portion occupied by SP3, and a reduced water elevation to preserve the integrity of the SP3 liner.

In 2019, inputs to the P-Area were limited in an effort to begin the de-commissioning process of the containment structures. Winter construction of SP3 within the P3 footprint required the removal of ice which was deposited into P2 due to its sufficient storage and water of similar quality to P3. No additional saline water inputs were made to the P-Area throughout 2019. All subsequent inflows to the P-Area were primarily the result of direct precipitation and surface run-off from up-gradient areas. Evaporators were used throughout the open water season to reduce the volume of water in the P-Area cells as well as the additional inflows received via precipitation. Agnico Eagle is exploring alternatives to active evaporation for P-Area water management over 2020.

A contaminated snow cell used to store snow containing hydrocarbons (i.e. snow on which spills occur) is located in northwest corner of P1. Upon snowmelt an oil-water separator is used to treat the water which is then discharged to P1. The contaminated snow cell was constructed in 2017 (Agnico Eagle, 2017a) and is currently in place as a contingency measure for contaminated snow storage over the winter (Freshet Management Plan in Appendix B).

The snow cell is lined with a polyethylene liner to avoid seepage of melting snow into the surrounding environment. The cell is designed to contain a volume of 1500 m^3 of snow and to contain 930 m^3 of water at a water surface elevation of 69.5 m.

Table 5: As-Built Capacity for P-Area Ponds

Pond	P1	P2	P3
As-built Capacity (m^3)	20,781	6,828	2,912*
Maximum Design Water Elevation (m)	68.5	67.5	66.22*
Total P-Area Capacity (m^3)	30,521		

*Former as-built volume reduced from 18,432 m^3 due to construction of SP3 within the P3 footprint.

Water monitoring protocols for the P-Area have been implemented to include water quality and transfer data, such as locations and flow volumes for water pumped to and from the containment ponds. This is discussed further in Appendix E.

3.5 Saline Ponds

Saline Pond 1 (SP1) was constructed in Q3 2016 to accommodate excess saline water from the Underground Mine. SP1 is located east of P3 and north of CP5 (Figure 1.2). Table 6 summarizes the Saline Pond capacity for storage and maximum designed operating water levels. The maximum saline water capacity is the volume that can be stored in SP1 prior to winter freeze. Approximately 7,500 m^3 capacity should be available to accommodate precipitation that may accumulate throughout winter and at freshet.

Saline Pond 2 (SP2) was constructed in Q2 2019 as a temporary saline water storage pond on site, with the purpose of further accommodating excess saline water from the Underground Mine until treatment and discharge to sea performance is sufficient to dewater surface saline storage (Section 3.11; Appendix A). SP2 was constructed in bedrock within the footprint of Tiriganiaq Pit 2. SP2 was constructed to have a maximum storage volume of 78,000 m^3, of which 10,000 m^3 is reserved for precipitation accumulation over winter and runoff at freshet. SP2 is scheduled for decommissioning in Q2 2020 to allow the mining of Tiriganiaq Pit 2. SP2 is to be replaced by Saline Pond 4 (SP4) which is scheduled to be commissioned in March of 2020. The addition of SP4 has two purposes. First, to replace SP2 and allow the mining of Tiriganiaq Pit 2, and second, to supply additional storage for saline water on site. The additional storage is required due to continued groundwater infiltration to the underground workings and finite existing surface storage capacity. Following the completion of SP4, the water contained within SP2 will be transferred to SP4. SP2 will be decommissioned following this transfer of water.

SP4 will be temporary in nature and will be constructed in bedrock within the footprint of Tiriganiaq Pit 1 (Figure 3.2). Based on the design, a total of 249,708 m^3 of overburden and 305,393 m^3 of waste rock is expected to be removed from Tiriganiaq Pit 1 for the construction of SP4. A portion of the waste rock removed will be used immediately for a perimeter safety berm and overburden protective cover. The residual waste rock will be stockpiled temporarily between the footprints of Tiriganiaq Pit 1 and Tiriganiaq Pit 2, south-east of SP4. All of the overburden removed was placed within the south portion of WRSF1.

Groundwater will be pumped to SP4 where it will remain in storage until it is treated at the SWTP (desalination; Section 3.9.3) or at the SETP for discharge to sea (Section 3.11; Appendix A). Inputs to SP4 will be similar in chemical nature to SP1, mainly originating from the underground water storage system. SP4 is designed to have a minimum storage volume of 233,000 m^3; allowing for 1.5 m of freeboard in bedrock. October to June precipitation runoff volumes to SP4 are preliminarily estimated to be 19,300 m^3 for a mean climate year and 31,700 m^3 for a 1:100 wet climate year. These values include June precipitation occurring during the snowmelt period. To ensure the capability to store runoff from a 1:100 wet climate year freshet, stored volume in SP4 prior to freshet will be maintained with a reserve of 31,700 m^3. Freshet runoff volumes and maximum allowable volumes to be stored prior to freshet are subject to change based on as-built dimensions and will be finalized following the completion of SP4 construction.

Table 6: Storage Capacities for Saline Pond 1, Saline Pond 2 and Saline Pond 4

Item	Saline Pond 1	Saline Pond 2	Saline Pond 4
Maximum Design Water Elevation (m)	62.9	62.5	56.0
Maximum Water Capacity (m^3)	32,686*	78,8628§	233,122†

* Tetra Tech (2017)
§ Maximum storage in bedrock to allow 0.3 m freeboard
† Minimum volume based on design to included 1.5 m freeboard

Saline pond water capacity in relation to stored volumes can be found in Table 2 of the Groundwater Management Plan (Appendix A).

3.6 Water Diversion Channels, Dikes and Berms

3.6.1 Water Diversion Channels

Seven water diversion channels (Channels 1 to 5, 7, 8) have been constructed and form part of the water management infrastructure. Construction of Channel 6 is tentative based on future water management strategies downstream of WRSF2. The as-built and design parameters for the water diversion channels are presented in Table 7.

Table 7: As-Built and Design Parameters for Channels

Item	Channel							
	1 (As-Built)	**2 (As-Built)**	**3 (As Built)**	**4 (As Built)**	**5 (As-Built)**	**6**	**7 (As-Built)**	**8 (As-Built)**
Approximate Total Length (m)	528	269.5	656	930	429†	69	240	114
Bottom Width (m)	3	1.257	1.2 to 2.4 or 0.8 to 3.3*	1.0 to 1.7 or 0.8 to 4.5*	2.3 to 2.9	1	2.0	2.4
Side Slopes	3(H):1(V)**	1.82(H):1(V)	1.8(H):1.0(V) to 3.5(H):1.0(V)	1.8(H):1.0 (V) to 5.0(H):1.0 (V)	1.9(H):1(V)	3(H):1(V)	3(H):1(V)	3(H):1(V)
Rip-rap Thickness (m)	0.3 to 0.5	0.277	0.3†	0.37	0.2	0.3	0.59	0.3
Minimum Bottom Slope Gradient (%)	0.2	0.30†	5.3 (upper) 0.4 (lower)	2.1 to 5.3 (upper) 0.1 to 4.2 (lower)	0.17†	0.44	0.8 (Avg.)	1.4 (Avg.)

* 1 m bottom width for first 100 m upstream section, and 2 m bottom wide for the remaining channel section

** Except from Sta. 0+050 to 0+130: 2(H):1(V)

† As-built parameter values not available; value displayed is from design

3.6.2 Water Retention Dikes and Berms

In general terms, "dikes" were constructed with impervious liner systems and "berms" are constructed with entirely till cores. At the end of Mine closure, when the water quality in the corresponding pond meets direct discharge criteria, each of the dikes and berms on site (except for Berm 2) will be breached to restore the original natural drainage paths. Berm 2 will remain in place to prevent non-contact water from flowing into the TSF.

Water retention dikes D-CP1 and D-CP5 have been designed as a zoned earth fill dams with a geomembrane liner keyed into the permafrost foundation to limit the seepage through the dike and its foundation. The characteristics of the dikes and berms required for the WMP are summarized in Table 8.

3.6.2.1 Thermal Monitoring

Horizontal Ground Temperature Cables (GTCs) are installed along the key trenches of D-CP1 and D-CP5 at a depth of approximately 3 m below the original ground level. These installations are in place to verify that the foundations remain frozen and dike integrity is not compromised. D-CP1 and D-CP5 also contain vertical GTCs installed to an approximate depth of 15 m below the crest of each dike.

Thermal Berms CP3, CP4 and CP6 will similarly contain vertical GTSs installed to a minimum of 7 m below original ground elevation. Thermal records collected from these sensors provide temporal analysis of vertical temperature profiles to assess whether the structures are performing as designed.

D-CP1 and D-CP5 readings are obtained, recorded, and assessed weekly during open water season and monthly after freeze-up. Data loggers are set to record temperatures in the dikes every 12-hours. Reading frequency at the thermal berms is generally monthly during the first year following construction and quarterly thereafter. The measured readings are analyzed by an Agnico Eagle geotechnical engineer and are reported in the annual geotechnical inspection report.

In addition to thermal monitoring, visual geotechnical inspections of water management structures are currently performed, as described in Section 3.12 below.

Table 8: As-Built and Design Parameters for Water Retention Dike/Berm

Item	D-CP1	Berm-CP3	Berm-CP4	D-CP5	Berm-CP6	DP1-A	DP1-B	DP2-A	DP3-A	Berm1	Berm2	Berm3
Approximate Maximum Height (m)	6.6	4.9	5.0	3.3	6.0	3.7	3.4	4.0	3.4	2.6	1.5	2.76
Maximum Elevation (m)	68.5	69.9	69.1	67.3	68.0	70.5	70.7	69.5	69.0	69.0	varies	67.37
Maximum Head of Water Retained (m)	3.6	0.0	0.0	1.4	0.0	68.5	68.7	67.5	67.0	0	0	0

3.7 Evaporators

Five evaporators are installed on jetties constructed at DP1-B. The evaporator system is designed for vaporizing water contained at the P-Area. The evaporators are installed to accommodate the quantity of excess saline water before saline water treatment options and disposal plans have been finalized at the Mine. Based on data collected during 2016, the efficiency of one evaporator was estimated to be 22 m^3/hr. Agnico Eagle is assessing alternatives to active evaporation for P-Area water management over 2020, to support potential decommissioning of the P-Area.

3.8 Freshwater Intake

Freshwater usage at the Mine includes potable uses, fire suppression, make-up water for the mill, and other operational requirements, such as drilling water, dust suppression, batch plant use, and use at the washbay. The main freshwater intake is located northeast of the industrial pad in Meliadine Lake, as shown on Figure 1.2. The intakes consist of vertical filtration wells fitted with vertical turbine pumps that supply water on demand. Both intake pipes are fitted with a screen of an appropriate mesh size to ensure that fish will not be entrained and shall withdraw water at a rate such that fish do not become impinged on the screen (NWB, 2016).

3.9 Water Treatment

Contact water will be treated (if necessary) to meet Licence requirements prior to being discharged to the environment. TSS mitigation techniques (i.e., attenuation ponds, silt screens, etc.), oil separation treatment, the STP, the SWTP, the SETP, the RO Plant, and the EWTP are used accordingly at various locations at the Mine prior to water being transferred to containment ponds and/or as effluent discharge to Meliadine Lake or Melvin Bay. Water quality criteria is discussed in Section 7 and Appendix E.

3.9.1 Freshwater Treatment Plant (WTP)

Freshwater from Meliadine Lake will be treated in the WTP before being directed to the camp areas for potable (domestic) water uses. The design flow rate for freshwater for the main camp and accommodations is 216 m^3/day. In the WTP, freshwater will be pumped through cartridge filters, then pumped through ultraviolet units, and finally treated with sodium hypochlorite (chlorine). The treated water will be stored within a potable water tank. Potable water will be monitored according to the Nunavut Health Regulations for total and residual chlorine and microbiological parameters. Operation and maintenance details for the WTP can be reviewed in the Process and Control Narrative (H2O Innovation, 2016).

3.9.2 Sewage Treatment Plant (STP)

Wastewater from the accommodation complex and from satellite sewage tanks will be treated in the STP before being directed to CP1. Operation and maintenance details for the STP can be reviewed in the Operational & Maintenance Manual – Sewage Treatment Plant (Agnico Eagle, 2017b).

3.9.3 Saline Water Treatment Plant (SWTP)

The SWTP is used to treat saline water stored in the Underground Mine and Saline Ponds. The SWTP removes excessive total suspended solids (TSS), calcium chloride ($CaCl_2$), sodium chloride (NaCl), metals, phosphorous (P), and nitrogen compounds from the influent saline water. The influent and effluent from the SWTP are monitored every 12 hours (night shift and day shift) for pH and TDS, and bi-weekly for chloride (Cl), ammonia (NH_4), nitrite (NO_2), nitrate (NO_3), TDS, TSS, total phosphorus (P), total cyanide (Cn), total metals and total mercury (Hg).

Effluent from the SWTP is intended to be discharged to CP1. In February 2019, the discharge point was moved, temporarily directing effluent to CP5. Over the open water season of 2020, the discharge point will be reverted back to CP1.

The SWTP consists of two parallel units. Each unit can be operated to produce brine or solid by-product. The SWTP will operate in solid-mode over the duration of 2020. Solid-mode of one unit within the SWTP is designed with an operational rate of 60 m^3/day at an expected operational availability of 95%. Further specifications of the SWTP can be found within the SWTP Design Report (Agnico Eagle 2018) and the SWTP As-Built Report (Agnico Eagle 2019a).

EWTP effluent discharge to Meliadine Lake was performed in 2019 in accordance with the conditions outlined in Part F, Item 3 of the Water Licence. Discharge to Meliadine Lake, including the treated groundwater, will remain within the permitted discharge criteria defined in the License, be non-acutely lethal, and meet the Canadian federal end-of-pipe discharge criteria (per the amended MDMER; GC 2017). Additionally, SSWQOs for EWTP effluent (including treated groundwater) will be met at the edge of the mixing zone in Meliadine Lake. Further details regarding the EWTP are provided in Section 3.9.4 and Section 4.3.

SWTP effluent and CP1 water quality will continue to be monitored according to the SWTP Design Report to identify future exceedances and potential impacts to CP1.

Discussion on realized SWTP treatment rates over 2020 in relation to the groundwater management strategy can be found in the Groundwater Management Plan (Appendix A).

3.9.4 Effluent Water Treatment Plant (EWTP)

Based on the maximum flow rate of the Actiflo® system model ACP-600R, the EWTP currently has a maximum capacity of 520 m^3/h (nominal flow). In Q2 2020, the system will undergo upgrades to improve treatment capacity to 1,167 m^3/h, which is within the range of the predicted discharge rates to Meliadine Lake over the Life of Mine. Further information regarding EWTP operation can be found in the EWTP As-Built (Tetra Tech 2018b).

Forecasted monthly averages requiring treatment at the EWTP are provided in Table 13. The volume of water requiring treatment and discharge over 2020 is expected to be 1,610,000 m^3 under mean climate year precipitation and subsequently decreasing to 791,784 m^3 the following year (2021). Anticipated volume requiring treatment and discharge over 2020 is expected to be greater than normal due to residual volumes from the 2019 open water season.

Trigger limits are in place at the EWTP as a component of TSS and TDS exceedance mitigation during periods of discharge. These trigger limits are based on rating curves developed with simple linear regressions to predict TSS concentration as a function of turbidity and TDS as a function of specific conductivity. The regressions are developed with *in situ* specific conductivity and turbidity readings paired with corresponding MEL-14 sample lab results as a means to produce a relationship (rating curve) between field readings and corresponding lab results. Rating curves are then be applied to continuous *in situ* specific conductivity and turbidity readings taken from internal probes within the EWTP prior to discharge to approximate TDS and TSS, respectively.

Agnico will continue to gather calibration/confirmatory paired samples in the future to actively increase the number of data points and strengthen the turbidity-TSS and conductivity-TDS correlations. Thus, the rating curves used will be maintained internally and available for review upon request.

3.9.5 Saline Effluent Treatment Plant (SETP)

Prior to discharge of saline effluent to sea at Melvin Bay (Section 3.11; Appendix A), excess saline contact water stored on site is treated at the SETP for ammonia and total suspended solids. The main feed source to the SETP will be from the saline ponds (SP1 and SP4). Treated saline water will meet MDMER end-of-pipe discharge criteria. Initial treatment will include a clarification unit for TSS removal. Next, break-point chlorination treatment will be applied to remove elevated ammonia levels, which are inferred to be the result of the use of explosives and washing of development faces/muck underground. Excess free chlorine will be removed with activated carbon filters. Following treatment, saline water will pumped to Saline Pond 3 (SP3) for final settling and storage. The SETP will be designed for 2020 to treat 1,600 m^3/day of saline water for TSS and ammonia. Further information on the SETP design can be found in Agnico Eagle (2019b).

Prior to haulage of saline water from the Meliadine Site to Itivia for discharge to sea over the open water season, Agnico Eagle will measure pH, turbidity, specific conductivity, and temperature of the effluent as a means to continually advise discharge operations and help ensure discharge parameters are met. Samples will be analyzed for the full suite and Group 3 (MDMER) parameters as listed in the Water License and the Water Quality and Flow Monitoring Management Plan (Appendix E).

3.9.6 Oil Separators

An oil separation treatment system was installed in 2018 at the Maintenance Shop to collect and separate oil from water used for washing mining equipment. A second oil-water separator is installed at Landfarm A. In the event of water accumulation at Landfarm A due to rainfall or snowmelt, the ponded water will be pumped through the oil-water separator to remove PHC residue and will be analyzed for BTEX, lead, and oil and grease prior to discharge to CP1 or used on the windrows to increase moisture content, as required. Water accumulating in the landfarm will not be discharged directly to the receiving environment.

3.10 Meliadine Lake Discharge Diffuser

The discharge diffuser is the final surface contact water effluent discharge location for the Mine. The overall purpose of the diffuser is to discharge water from CP1 (at sampling station MEL-14) to Meliadine Lake while providing minimal environmental impacts to the Lake. The effluent mixing will be dependent on ambient currents in Meliadine Lake, driven by wind during the open water period. The diffuser modelling was initially conducted by Golder Associates Ltd. (Golder, 2015) and updated design progress was reported by Tetra Tech EBA (Tetra Tech EBA, 2016).

3.11 Saline Water Discharge to Sea

Based on the current standing of saline water stored on site, the rate at which the SWTP can treat saline water (Section 3.9.3), and the forecasted inflows (Appendix A), it was anticipated that a second discharge location was required for long-term groundwater management. Following an application to the NIRB in 2018, Agnico Eagle received approval for discharge of saline water to a marine environment (Melvin Bay, Rankin Inlet) along with an amended Mine Project Certificate from the NIRB on February 26, 2019. Detailed information regarding treatment and discharge criteria are provided in the Groundwater Management Plan (Appendix A).

3.12 Water Management Structure Monitoring

Pursuant to Part E, Item 15 of the Licence, Agnico Eagle will carry out weekly inspections of all Water management structures during periods of flow and monthly thereafter. The records will be maintained for review upon request of an Inspector. More frequent inspections may be required at the request of an Inspector. Inspections will focus on structures and conditions in Sections 3.12.1 to 3.12.5 to follow. The associated inspection template can be found in Appendix G.

3.12.1 Culvert and Water Crossing Inspections

Culverts listed in Section 3.1, as well as culverts and water crossings along the AWAR, Bypass Road, and at the Itivia site will be inspected for the following conditions. These inspections also satisfy the monitoring procedures outlined in the Sediment and Erosion Management Plan (Appendix D):

- Damage to the inlet or outlet of the culvert which may impede flow capacity;
- Bed erosion upstream and downstream of watercourse crossing structures;
- Scour under bridge abutments and abutment foundations;
- Erosion along cutslopes and fillslopes of embankments (rill and gully erosion);
- Blockages within the culvert including snow, ice, debris; and
- Snow cover or snow piles which would prevent routing of water towards the inlet of the culvert (only applicable prior to freshet).

In the case that any of the above conditions are observed, corrective actions will be taken to optimize culvert/water crossing function and integrity.

3.12.2 Containment Pond Inspections

Water containment ponds discussed in Section 3.3 and P-Area containment ponds discussed in Section 3.4 will be inspected for the following conditions:

- Laboratory water quality results as a trigger to implement mitigation actions;
- Unplanned inputs via surface runoff which are not part of the water management system; and
- Water level elevation above the operating manual maximum (OMM).

In the case that any of the above conditions are observed, corrective actions will be taken to prevent unaccounted for losses of available water capacity or potential compromise to dike integrity.

3.12.3 Dike and Thermal Berm Inspections

Dikes and thermal berms discussed in Section 3.6.2 are inspected in order to track natural (expected) movement of the structure. Pertaining to dikes, a 'master" sketch of all the issues that were documented in the past is maintained as a means to spot any changes/new issues. Inspections focus on the upstream slope, the crest, the downstream slope, and downstream toe and observations include the following:

- New areas of movement/deterioration not previously documented;
- Changes to previously documented areas of movement/deterioration;
- Seepage through the downstream slope;
- Water presence in downstream channel/sump; and
- Areas of movement/deterioration of downstream channel/sump (where present).

Any issues or potential problems identified will be addressed accordingly by the Geotechnical Engineer in order to mitigate risks and maintain dike integrity.

3.12.4 Water Diversion Channel and Berm Inspections

In addition to the water management structures requiring inspections under the Water Licence, Agnico Eagle will carry out inspections of all channels on site listed within Section 3.6.1 and Table 1 for the following conditions:

- Obstructions to flow (ice, debris);
- Inflows not part of the water management system;
- Structural failure of channel banks;
- Seepage through water diversion berms resulting in water movement to areas not planned within the water management system; and

- Erosion of diversion berms (i.e., undercutting, slope failure).

In the case that any of the above conditions are observed, corrective actions as directed by the Geotechnical Engineer will be taken if there is potential for compromise effectiveness of the channel function or potential for unplanned impact to water quality or quantity in associated containment ponds.

SECTION 4 • WATER MANAGEMENT STRATEGY

There are three major sources of inflow water considered in the Mine water management system; freshwater pumped from Meliadine Lake, natural run off from precipitation and natural groundwater inflow to the Underground Mine.

A brief summary of the water management strategy for the Mine is presented as follows:

- Contact water from key mine infrastructure will be diverted and/or collected in the containment ponds (CP1, CP3, CP4, CP5, CP6, the Saline Ponds and the P-Area).
- The collected water in CP3 to CP6 will be pumped to CP1. Water collected in CP1 may be reused by the process plant and the excess water will be treated by the EWTP prior to discharge via the diffuser into Meliadine Lake.
- Contact water from the Underground Mine will be contained in underground sumps and the water storage stope and reused for mining operations. Excess water volumes will be stored in temporarily inactive underground developments, the Saline Ponds, treated by the SWTP to be transported to CP1, or will be treated at the SETP and discharged to Melvin Bay.
- Runoff water in the open pits will be collected in sumps and then pumped to the designated water containment ponds (CP5).
- Natural flooding of the open pits at end of mining will be supplemented by using freshwater from Meliadine Lake.
- Upon the completion of underground mining, the Underground Mine workings will be allowed to naturally flood by groundwater seepage.

Appendix B presents the Freshet Action Plan, which includes the Freshet Action Procedure and the Snow Management Procedure for the Mine. Table 9 summarizes the overall contact water management plan for the key infrastructure and presents the initial water collection locations and final water destinations. The plans for water management at key areas are described in following sections.

Table 9: Overall Site Surface Contact Water Management Plan

Contact Water Source	Initial Contact Water Collection Location	Final Contact Water Collection Location
Industrial Site Pad Area (camp/process plant area)	CP1	CP1
WRSF1 Area	CP1, CP4 and CP5	
WRSF2 Area	CP1 and CP5	
WRSF3 Area	CP6	
Dry Stack TSF Area	CP1 and CP3	
Ore Stockpile OP2	CP1	
Landfill	CP1	
Landfarm (biopile)	Sump within Landfarm	To CP1 after oil separation
Tiriganiaq Pit 1 Tiriganiaq Pit 2	Open pit sumps	First to CP5 and then to CP1
Tiriganiaq underground	Sumps in underground mine	Sumps in underground mine, surface saline water storage ponds (saline ponds), SWTP to CP1 and/or discharge to sea

The following sections describe the strategy for water management at different areas for the Mine.

4.1 Key Water Management Activities

The activities required for the WMP are summarized in Table 10. Water management activities during closure are described in Section 6.

Table 10: Key Water Management Activities

Mine Year	Major Water Management Activities and Sequence
Q4 of Yr -5 (2015)	• Started to re-use the underground water • Dewatered top 0.5 to 1.0 m of fresh water in Pond H17 • Constructed Channel 2
Yr -4 (2016)	• Dewatered H17 into Meliadine Lake. • Started construction of D-CP1 to impound CP1 • Started construction of D-CP5 to impound CP5 • Dewatered Pond A54 in Q3 of Year -4 and pumped the water to CP1 • Constructed Saline Pond 1 (SP1) for additional underground saline water storage • Constructed and operated P-Area Containment Ponds

Mine Year	Major Water Management Activities and Sequence
	• Started to store the excess groundwater from the underground mine at surface. • Implemented and tested evaporators at P-Area to reduce water volumes stored at surface. • Constructed trenches down gradient from DP1-B and DP3-A to be able to pump collected water and pump back to P1 and P3, respectively. • Constructed Channel 5 • Installed Culverts 3 and 4
Yr -3 (2017)	• Completed construction of D-CP1, jetty and Pumping station CP1 • Completed construction of D-CP5, jetty and Pumping station CP5 • Started construction Channel 1 • Constructed Berm 3 • Constructed freshwater intake in Meliadine Lake and installed pumping station • Constructed Lv75 water stope for additional underground saline water storage • Installed Culvert 13 • Started to treat sewage from Sewage Treatment Plant (STP) and pump the treated sewage from STP to CP1. • Started to pump the contact water from CP5 to CP1 for treatment (solids removal) • Started to pump water collected in trenches, down gradient from D-CP1, D-CP5, DP1 and DP3 to the associated containment pond • Started to pump the water from the Type A Landfarm to CP1 after oil/water separator treatment • Started to pump water from washbay to underground for storage until a biological treatment unit for hydrocarbon reduction/removal arrives at the site
Yr -2 (2018)	• Completed construction of Channel 1 • Started construction Channel 3, Berm CP3 and Pond CP3 • Installed Culverts 1, 2, 15 and 16 • Constructed Berm 2 • Started to pump the water from CP1 to EWTP for treatment prior to discharge via the diffuser to Meliadine Lake. • Pumped the solids sludge from EWTP to CP1. To limit recirculation of the sludge within CP1, the discharge of the sludge was located away from the EWTP intake. • Started diversion of the contact water from industrial pad to CP1 via Channel 1 • Constructed and commissioned (in Q4) SWTP to discharge to CP1.
Yr -1 (2019)	• Constructed Saline Pond 2 within footprint of Tiriganiaq Pit 2 and began storing excess saline water • Installed culverts 7, 8, 10, 11 and 20 • Constructed Channels 7 and 8 and Berm 1 • Completed construction of Channel 3, Berm CP3 and Pond CP3 and started to collect contact water • Constructed Channel 4, Pond CP4 and Berm CP4 and started to collect contact water • Start to pump the contact water in Ponds CP3 and CP4 to the partially drained Pond H13 where the water will flow through Channel 1 into CP1

Mine Year	Major Water Management Activities and Sequence
	• Constructed, commissioned and started discharge of saline water through the discharge to sea diffuser system • Partially dewatered Ponds H19 and H20 in Q3 of Year -1 by pumping water to the EWTP for discharge to Meliadine Lake • Started construction of Saline Pond 4 (SP4) within footprint of Tiriganiaq Pit 1
Yr 1 (2020)	• Complete construction of Saline Pond 4 (SP4) • Construct Pond CP6 and Berm CP6 • Transfer water from Saline Pond 2 to Saline Pond 4 • Start to pump contact water in CP6 to CP1 • Start to pump contact water collected in Tiriganiaq Pit 2 to CP5 • Assess feasibility of pumping EWTP sludge to process plant filter press to be added to TSF
Yr 2 (2021)	• Start to pump contact water collected in Tiriganiaq Pit 1 to CP5 • If feasible, begin pumping EWTP sludge to process plant filter press to be added to TSF
Yr 3 (2022)	• Stop pumping water from Tiriganiaq Pit 2 to CP5 when mined out • Tiriganiaq Pit 2 to serve as temporary saline water storage, if needed
Yr 4 (2023)	• Water management plan similar to Year 3
Yr 5 (2024)	• Water management plan similar to Year 3
Yr 6 (2025)	• Water management plan similar to Year 3
Yr 7 (2026)	• Stop pumping water from Tiriganiaq Pit 1 to CP5 when mined out
Yr 8 (2027)	• Start to fill the mined-out Tiriganiaq Pits 1 and 2 with active pumping from Meliadine Lake • Stop pumping excess water from underground when underground mine is completed • Start natural flooding of Tiriganiaq Underground mine with groundwater seepage • Stop pumping water to process plant when the processing is completed

4.1.1 Pond Dewatering and Displacement

The initial dewatering at Lake H17 and Lake A54 was conducted in 2016 prior to constructing CP1 and CP5, respectively. The water from these ponds was pumped to Meliadine Lake through a temporarily installed diffuser.

Preparation for construction of CP4 facility required dewatering of the two shallow ponds B8 and B9 into CP1. Preparation for CP3 did not require dewatering as B28 contained insufficient volumes to dewater.

In Q3 2019, partial dewatering of Ponds H19 and H20 to the EWTP took place, following the advanced timeline for the construction of CP6 and WRSF3. Specifically, H19 was partially dewatered to facilitate construction of Berm-CP6, while H20 was partially dewatered to allow the placement of waste rock and overburden within the drained lake basin. Detailed information regarding the CP6 design and subsurface thermal analysis can be found in the CP6 and Berm Design Report (Tetra Tech, 2020).

Table 11 summarizes the pond dimensions, dewatering date, and estimated dewatered volumes.

Table 11: Estimated Pond Dewatering Schedule

Pond	B8	B9	H20	H19
Maximum Pond Water Depth (m)	-	1.4	1.6	1.4
Existing Pond Surface Area (ha)	-	0.63	9.58	2.91
Dewatering Schedule	Q4 2018	Q4 2018	Q3 2019	Q3 2019
Estimated Total Volume of Water Dewatered (m^3)	2,993	6,840	90,307	16,431

4.1.2 Underground Water Management

The Underground Mine will extend approximately 650 m below the ground surface and part of the underground workings will be operated below the base of continuous permafrost. The underground excavations act as a sink for groundwater flow during mining, with water induced to flow through the bedrock to the Underground Mine workings below the base of the permafrost.

The underground water management system is designed to prevent water from affecting the workings or production. The system contains a series of sumps (generally one at the access of each level) designed to capture groundwater inflows and runoff from mining operations (i.e., drilling), a clarification system, and a pumping system to redistribute the clarified water. Excess underground water is pumped to surface to be managed in the saline ponds. Temporarily inactive underground developments (similar to the water stope) are used for additional storage of excess underground water. Further details on the underground water management system is provided in Appendix A.

Beginning December 2018, the SWTP began treating groundwater to reduce stored saline water on site (See Section 3 for details). Furthermore, as part of the strategy to manage excess groundwater infiltration of saline water within the underground portion of the mine, Agnico Eagle received approval for marine discharge of saline water with the amended Project Certificate on February 26, 2019 (See Section 3.11 and Appendix A for details).

Combined (mine-wide) inflow values to the Underground Mine are currently estimated by manually measuring and summating all visible inflows across the mine. Recorded measurements are logged in a database from which daily estimated inflow rates can be produced.

Table 12 presents the predicted groundwater inflow rates estimated for passive groundwater inflow to the Underground Mine. Details pertaining to model inputs and assumptions are found in Appendix A. Values presented in Table 12 do not include grouting efforts or ventilation loss.

Table 12: Predicted Groundwater Inflow to the Underground Mine (2017 to 2032)

Year	Quarter	Predicted Groundwater Inflow (m^3/day)
2020	Q1	410
2020	Q2	410
2020	Q3	420
2020	Q4	420
2021	Q1	420
2021	Q2	430
2021	Q3	440
2021	Q4	460
2022	Q12	480
2022	Q34	510
2023	-	530
2024	-	540
2025	-	580
2026	-	570
2027	-	530
2028	-	510
2029	-	490
2030	-	480
2031	-	470
2032	-	460
203	-	450

4.1.3 Water Management for Haul Road

A network of roads provide access to infrastructure at the Mine. The majority of the roadways servicing the mining area are located so that drainage is directed by berms, channels and culverts towards CP1, CP3, CP4, CP5, and CP6. As shown in Appendix C, water diverted to CP3, CP4, CP5 and CP6 will eventually be transferred to CP1. Detailed information about water management on roads is described in the Roads Management Plan (Agnico Eagle, 2019c).

4.1.4 Water Management for Landfarm and Landfill

Any water that accumulates at the onsite Landfarm is pumped through an oil/water separator prior to discharge into CP1. Additional details for Landfarm water management are described in the Landfarm Management Plan (Agnico Eagle, 2015a).

Leachate from the Landfill is anticipated to be non-hazardous and non-toxic due to the controls put in place on the materials accepted for deposition in the Landfill. Annual Landfill operations involves clearing of snow prior to spring melt. In the event there is leachate from the Landfill due to periods of heavy rainfall or spring freshet, the runoff will be collected, controlled and treated, if necessary (Agnico Eagle, 2015b), and sent to CP1.

4.1.5 Water Management for Emulsion Plant Area

Freshwater is trucked to the emulsion plant and used for manufacturing emulsion as well as for washing vehicles. Water within the emulsion plant is re-used when feasible, and excess water is collected and disposed of on site (i.e., STP) or stored and shipped south as hazmat.

4.1.6 Water Management for the Wash Bay

Water used in the Wash Bay is re-used when feasible and excess water is recycled through a biological treatment system designed to reduce or remove hydrocarbons. Waste from the treatment process is removed in the form of solids and disposed of appropriately (Landfarm or hazmat).

4.2 Freshwater and Sewage Management

Additional freshwater usage and sewage management is described in the following sections.

4.2.1 Freshwater Management

Major freshwater usages on site include potable use, fire suppression, make-up water for the mill, and other operational needs, such as drilling. Freshwater is sourced from Meliadine Lake through a freshwater intake and pump system. For dust suppression, water is sourced from any ponded water located along the All Weather Access Road (AWAR) or small ponds proximal to the road.

Freshwater is pumped through an overland pipeline to an insulated main storage tank located at the plant site. Under the Licence, 318,000 m^3/year of freshwater is permitted during operation phase. Additionally, approximately 4,000,000 m^3 of freshwater is permitted per year to fill the mined-out open pits during the mine closure. These quantities are inclusive of water needs for dust suppression.

The design flow rate for the potable water for the main camp and accommodations (kitchen, laundry) is 136 m^3 per day (based on a 680-people camp capacity and a nominal consumption of 200 L/day/person). There is an onsite Potable Water Treatment System (Section 3.9.1). Treated potable water is piped to areas in the service complex and other facilities requiring potable water.

4.2.2 Sewage Management

Sewage collected from the camp and MSB facilities is pumped to the STP. The objective of the STP is to treat sewage to an acceptable level for discharge to CP1 via a treated sewage water discharge pipeline. The STP is housed in a prefabricated (modular) structure, located at south-east of the service complex at the Industrial Pad, as shown in Figure 1.2. The sewage treatment system is designed based on a flow rate of 200 L per day per worker for a peak load of 680 people, for an average daily flow rate of 136 m^3 (5.67 m^3/h).

The STP for the camp facilities is designed to meet appropriate guidelines for wastewater discharge (Agnico Eagle, 2017c). Details regarding STP specifications and operation can be found in the Operation & Maintenance Manual Sewage Treatment Plant (Agnico Eagle, 2017c).

4.2.3 Process Water Management

Process water is required in the mill for ore processing and is primarily sourced from Meliadine Lake through the freshwater intake system. However, contact water from CP1 is currently being evaluated for reclaim purposes in order to minimize the amount of freshwater use at the mill. The permitted freshwater usage value of 318,000 m^3/d will be in sufficient to provide make-up water at the mill over life of mine. Agnico Eagle is currently investigating strategies to reclaim water (i.e., from CP1) and assessing mill water usage over life of mine. A Licence amendment to accommodate required mill water usage will be requested accordingly.

4.3 Meliadine Lake Diffuser Effluent Flow Rates

The EWTP is currently configured to discharge effluent to Meliadine lake via a diffuser at a rate of 11,688 m^3/day (a water treatment rate of 12,000 m^3/day minus 312 m^3/day of sludge returned back to CP1). The pump does not operate continuously. The amount of effluent requiring discharge over each month per year (Table 13) is based on the overall water balance for a mean climate year (Tetra Tech EBA, 2016). In Q2 of 2020, the EWTP, pumping stations, and diffuser system may be upgraded to the full design capacity of 28,000 m^3/day minus 728 m^3/day of sludge returned to CP1 (Tetra Tech, 2017). This treatment and subsequent discharge rate was assessed in the initial design of the Meliadine Lake diffusor and falls within the acceptable range for capacity in the receiving environment. Feasibility assessment and engineering is occurring of Q1 of 2020, and installation/commissioning would occur over Q2 2020.

As a mitigation to water quality impacts at CP1 during closure, AEM is investigating EWTP sludge disposal options. Over 2020, the potential long-term EWTP sludge disposal option of TSF deposition will be assessed. This option would generally include further thickening of sludge from the Actiflo® unit via a Multflo® unit at the EWTP (Tetra Tech, 2017). This thickened sludge would then be transferred to the filter press at the mill to be filtered with tailings from the mill process and deposited within the TSF. Over 2020, assessments on operational requirements (i.e., piping, pumping) and sludge characteristics (i.e., particle size distribution, geochemistry) are planned. Information gathered will be applied to assess operational feasibility and potential geotechnical risks at the TSF.

Table 13 shows the estimated total volume of effluent released per month per year.

Table 13: Estimated Effluent Flow Rates over Mine Operating Life

Year	Effluent Released Over the Course of the Month under Mean Climate conditions (m^3)				
	June	July	August	September	October
Year 1: 2020	450,000*	450,000*	450,000*	215,000*	45,000*
Year 2: 2021	175,320	350,640	128,568	105,192	35,064
Year 3: 2022	175,320	350,640	128,568	93,504	35,064
Year 4: 2023	175,320	350,640	128,568	93,504	35,064
Year 5: 2024	175,320	350,640	128,568	93,504	35,064
Year 6: 2025	175,320	280,512	105,192	81,816	35,064
Year 7: 2026	175,320	292,200	116,880	93,504	35,064
Year 8: 2027	175,320	292,200	116,880	93,504	35,064
Year 9: 2028	175,320	280,512	116,880	93,504	35,064
Year 10: 2029	-	-	-	-	-
Year 11: 2030	-	-	-	-	-

* Volumes are predicted based on current water level in CP1. 2020 volumes are expected to be greater due to residual volumes not discharged over 2019 (See section 3.9.4).

SECTION 5 • WATER BALANCE

5.1 Global Water Balance

A water balance model was developed to assist in the evaluation of the water management infrastructure and estimation of the pumping requirements over the life of the Mine and under closure conditions. The model includes a water balance conducted on both a monthly and yearly basis. The model focuses specifically on contact water management infrastructure and areas that are affected by mining activities.

A monthly site-wide water balance was conducted for CP1, CP3, CP4, CP5, CP6, Tiriganiaq Pit 1, Tiriganiaq Pit 2, water in the underground mine operation, make-up water for the mill, water for the WTPs, and freshwater during mine construction period to mine closure under mean precipitation years.

The following sections present the parameters and assumptions adopted in the water balance model. A water balance model update was submitted in January 2019 with Version 5 of the WMP. The next updated version will be submitted in 2021 as per Part E item 12 of the Water License.

5.2 Water Balance Framework

The water balance framework developed for the site-wide water balance model was presented in Version 1 of the WMP (Agnico Eagle, 2015a). To simulate a range of conditions, the model was run for the proposed mine life and closure conditions.

5.3 Water Balance Assumptions

The water balance was based on the following:

- Snow accumulates throughout the months of October to May, and thaws in June during the annual spring freshet period;
- Average precipitation year climate conditions;
- The open pits and water containment ponds (CP3 to CP6) are not to be used for long-term storage of water during operations;
- The water collection sumps and ponds are empty in the autumn prior to the spring freshet each year; and
- Other water management assumptions described in Section 4 of this WMP.

A general water management flow sheet illustration is presented in Appendix C.

5.4 Water Balance Results

The estimated maximum annual water input/output from each of the various water management facilities under mean precipitation conditions are summarized in Table 14. Results were also provided for 1:100 year wet and dry conditions, with corresponding basis and assumptions, in a separate technical memorandum (Tetra Tech EBA, 2015).

Table 14: Estimated Maximum Annual Volumes from Mine Site Water Balance

Item	Maximum Annual Water Volume (Mm^3)
Contact Water from CP1	0.800
Contact Water from CP3	0.088
Contact Water from CP4	0.087
Contact Water from CP5	0.240
Contact Water from CP6	0.076
Water Pumped from CP1 to EWTP for Treatment	0.798
Fresh Water Pumped from Meliadine Lake during Construction	0.062
Fresh Water Pumped from Meliadine Lake during Operation	0.318
Treated Water from EWTP to be Discharged to Outside Environment	0.730
Underground Water Pumped to Underground TSS Removal Plant	0.696
Excess Water from Underground Mine to be Stored on Surface	0.155
Fresh Water Pumped from Meliadine Lake to Fill Mined-out Tiriganiaq Pit 1	3.068
Fresh Water Pumped from Meliadine Lake to Fill Mined-out Tiriganiaq Pit 2	0.749

5.5 Waterbody Inventory

Table 15 presents the three watersheds (Watershed A, Watershed B and Watershed H) and various waterbodies that are impacted by the Mine activities. Watersheds and waterbodies in proximity to the Mine location and waterbodies affected by Mine infrastructure are shown on Figure 5.1.

Table 15: Inventory of Waterbodies Impacted by Mining Activities

Watershed	Waterbody	Maximum Lake Water Depth, m	Total Area (ha)	Water Volume (m^3)	Notes
A	A9	N/A	0.18	-	Flow regimes impacted by the development of Tiriganiaq Pit 1
	A10	0.67	0.26	-	Ponds removed by development of Tiriganiaq Pit 1
	A11	0.45	0.40	-	
	A12	0.87	0.47	-	Pond drained due to construction of Channel 5
	A13	0.30	0.26	-	
	A17	0.30	0.16	-	Covered by WRSF 1
	A38	N/A	0.05	-	Flow regimes impacted by the development of Tiriganiaq Pit 2
	A39	0.48	0.12	-	Ponds removed by development of Tiriganiaq Pit 2
	A54	1.3	5.99	34,545	Dewatered for CP5
	A58	0.50	0.43	-	Covered by WRSF 2
B	B8	0.8	1.43	-	As part of CP4/Berm-CP4
	B9	1.40	0.64	-	Dewatered for CP4
	B10	0.8	0.33	-	Ponds removed by development of Tiriganiaq Pit 1
	B28	N/A	0.45	-	As part of CP3/D-CP3
H	H6	0.58	0.75	-	As part of CP1
	H7	0.67	0.11	-	
	H8	0.59	0.38	-	Partially covered by WRSF2 and haul road
	H9	0.40	0.42	-	Partially covered by WRSF2 and OP2
	H10	0.11	0.10	-	Partially covered by WRSF2 and OP2, drained due to construction of Channel1
	H11	0.27	0.28	-	
	H12	0.81	0.97	-	Drained due to construction of Channel1 and partially covered by OP2
	H13	1.04	3.49	-	Drained due to construction of Channel1 and partially covered by industrial pad
	H14A	0.37	0.15	-	Covered by industrial pad
	H15D	0.30	0.15	-	Partially covered by TSF
	H15G	0.40	0.38	-	
	H17	1.70	15.8	195,700	Dewatered for CP1
	H17A	1.50	0.13	1,365	Dewatered for Meliadine esker
	H17B	1.50	0.69	10,350	Dewatered for Meliadine esker
	H17C	1.50	0.23	3,450	Dewatered for Meliadine esker
	H18	0.67	0.74	-	Covered by OP2
	H19	1.40	2.91	16,431	Dewatered for CP6
	H20	1.60	9.58	90,307	Covered by WRSF3

Watershed	Waterbody	Maximum Lake Water Depth, m	Total Area (ha)	Water Volume (m^3)	Notes
"-" indicates that data not available or not applicable		Ponds to be drained		Ponds to be dewatered	

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SECTION 6 • WATER MANAGEMENT DURING CLOSURE

The detailed Mine closure and reclamation activities are provided in the Preliminary Closure and Reclamation Plan (Agnico Eagle, 2015d). An Interim Closure and Reclamation Plan was submitted in December 2019 as per the Water License requirement part J item 1. The Interim Closure and Reclamation Plan is currently pending approval. Until the Interim Closure and Reclamation Plan is approved, the Preliminary Closure and Reclamation Plan (Agnico Eagle, 2015d) remains the acting plan.

Water management during closure and reclamation will involve flooding the open pits using precipitation and freshwater from Meliadine Lake, flooding the Underground Mine workings with groundwater inflows (groundwater seepage), and maintaining contact water management systems on site until monitoring results demonstrate that water quality are acceptable for discharge of all contact water to the environment without further treatment. Once water quality meets the discharge criteria, the water management systems will be decommissioned to allow the water to naturally flow to the environment.

The key water management activities during Mine closure are summarized in Table 16. Figures 6.1 and 6.2 illustrate the WMP during and after Mine closure, respectively. Additional details for the activities are described in the following sections.

Table 16: Key Water Management Activities during Mine Closure

Mine Year	Figure	Key Water Management Activities and Sequence
Yr 9 to 11 (2028 to 2030)	6.1	• Finish flooding the mined-out Tiriganiaq Pit 1 and Tiriganiaq Pit 2 by Q4 of Year 10 • Continue to collect and manage the contact water in CP1, CP3, CP4, CP5 and CP6 • Continue to pump the contact water in CP1 to EWTP, if required, for treatment before being discharged to the outside environment • Remove non-essential site infrastructure • Pump the underflow sludge water from EWTP to CP1 • Continue natural flooding of Tiriganiaq Underground Mine with groundwater seepage • Remove Meliadine Lake pumping system
Post-Closure	6.2	• Treat the contact water until water quality meet direct discharge criteria and then decommission the water management system • Continue natural flooding of Tiriganiaq Underground (progressive reclamation since Year 8) • Breach water retention dikes D-CP1, D-CP5, and thermal berms CP3, CP4, and CP6 once water quality monitoring results meet discharge criteria to allow water to naturally flow to outside environment • Remove culverts and breach remaining water retention berms in Year 18 (pending the demonstration of acceptable water quality)

6.1 Open Pits Flooding

When flooding the open pits for closure, the maximum pumping rate from Meliadine Lake shall not exceed 4,000,000 m^3/year during closure of the Mine, as stated in Part E Item 2 of the Licence. The planned pumping period will occur during the open water season from mid-June to end of September for each year. Table 17 summarizes the pit volume and expected water elevations at the completion of flooding activities. It will take approximately three years to fill the pits with an assumed pumping rate of 0.44 m^3/s (38,300 m^3/day). The assumed pumping rate of 0.44 m^3/s from Meliadine Lake during closure will have negligible effect to Meliadine Lake when compared to the average outflow rate at the outlet of Meliadine Lake. The pumping rate will be evaluated further to validate that any possible negative effects to Meliadine Lake do not occur.

Table 17: Pit and Underground Flooding

Pit	Volume (Mm^3)	Final Water Elevation (masl)	Water Source
Tiriganiaq Pit 1	9.20	64.14	Freshwater from Meliadine Lake
Tiriganiaq Pit 2	2.25	64.38	Freshwater from Meliadine Lake
Tiriganiaq Underground	1.4	Groundwater level	Groundwater seepage

The water quality model results indicated that water quality in the flooded pits will meet the discharge criteria and post closure treatment will not be required. The water quality within the pits will be monitored during flooding to verify the prediction of the water quality model. The information will be used to develop a strategy to minimize contamination of the regional surface water system.

6.2 Underground Mine Flooding

Passive flooding of the Tiriganiaq Underground Mine will occur following the completion of mining. The estimated total flooding volume of the underground workings is 1,372,000 m^3. Seepage water into the Underground Mine will be the main water source for flooding. At the predicted seepage rate it is estimated to take 6 years to flood the Underground Mine.

6.3 Containment Ponds, Dikes and Berms

The containment ponds, dikes and berms will remain in place to collect the surface runoff water and seepage from the Mine until the water quality meets discharge criteria. Once the water quality meets discharge criteria, dikes/berms will be breached to allow runoff to follow natural (topographically induced) flow paths. Dikes/berms breaching will involve the removal of a portion of the dikes to a minimum depth of 1 m below average water level or back to original ground levels. Consideration will be given to breach staging, with the above water portions of the dike/berm in the breach area removed during winter periods, when there will be little surface water flow, thereby minimizing the potential release of sediments to the neighbouring waterbodies. The remainder of the breach would be conducted during the open water season following freshet. Turbidity curtains would be deployed to minimize any potential sediment release to surface water.

6.3 Channels and Sumps

Once monitoring results have indicated that contact water conveyed in channels and sumps meets acceptable water quality, the infrastructure will be graded and/or surface treated according to site-specific conditions to minimize wind-blown dust and erosion from surface runoff, if required. This closure activity is intended to enhance site area development for re-colonization by native plants and wildlife habitat.

SECTION 7 • WATER QUALITY

Water quality monitoring is an important part of the Water Management Plan to verify the predicted water quality trends, conduct adaptive management should differing trends be observed, and to ensure all water quality limits at discharge points are met (i.e., effluent to Meliadine Lake and Melvin Bay). Water quality results and water transfers (i.e., origin, destination, rate) at the Mine are monitored and documented pursuant the Licence.

Water quality monitoring was initiated at the pre-development stage, continued through construction into operations, and will continue into closure and post-closure. Monitoring occurs at three levels:

1. Regulated discharge monitoring that occurs at monitoring points specified in the Licence or MDMER regulations.
2. Verification monitoring that is undertaken for operational and water management purposes by Agnico Eagle.
3. General monitoring that is commonly included in the Licence, specifying what is to be monitored according to a schedule. This monitoring is subject to compliance assessment to confirm sampling was carried out using established protocols, included quality assurance/quality control provisions, and addressing identified issues. General monitoring is subject to change as directed by an Inspector, or by the Licensee, subject to approval by the NWB.

Appendix E details the Water Quality and Flow Monitoring Plan, which will be further defined as the Mine advances. Figure 7.1a and Figure 7.1b depict Monitoring Program Stations on Site and at Itivia.

Water quality predictions for the Mine were generated using the GoldSim database management and simulations code (Version 11.1.2) where Mine contact water flows derived from the Meliadine water balance are combined with chemistry data from materials exposed in mine infrastructure (tailings storage facility, waste rock piles, etc.), and site baseline information. Where site-specific information is not available, data collected at other mine sites in the north were used to supplement input data.

Water quality estimates were generated for the operational and post-closure periods for effluent to Meliadine Lake, each contact water containment pond (CP1, CP3, CP4, CP5, and CP6), for sumps in the two open pits and for the two fully flooded open pit lakes post-closure. These results were submitted with the 2015 Water Management Plan.

The sensitivity of water quality to an added TSS load was evaluated outside of the GoldSim mass balance model. Total parameter concentrations were evaluated at ponds that discharge to the receiving environment (i.e., CP1 during operations, and CP1, CP3, CP4, and CP6 post-closure) based on an addition of 15 mg/L TSS. Given the uncertainties associated with the modelling exercise (i.e., the development stage of the Mine, laboratory-based input values, assumptions where data do not exist and consideration of an average climate year), the predicted concentrations are considered to be order-of-magnitude estimates. The estimates are sensitive to the assumptions and design elements considered.

As per Part E Item 12 of the Licence, an updated water quality forecast will be submitted with the WMP in 2021. Similar to the water balance (Section 5), a 2019 model update was provided in January 2019 with Version 5 of the WMP.

7.1 Summary of Regulatory Guidelines

Water quality results are compared to MDMER criteria and effluent quality limits listed in the Licence. Water quality pertaining to MEL-14 will be compliant to Part F, Item 3 of the Licence prior to discharging to Meliadine Lake. All surface runoff and/or discharge from drainage management systems associated with the Mine, including laydown areas and All-Weather Access Road, where flow may directly or indirectly enter a Water body, shall not exceed the Effluent quality limits listed in Part D, Item 18 of the Licence. Furthermore, all waters from natural water body dewatering activities shall be directed to Meliadine Lake and shall not exceed the Effluent quality limits listed in Part D, Item 12.

Post-closure discharge water quality will be compared to Canadian Council of Ministers of the Environment Water Quality Guidelines (CCME-WQG) guidelines or the Meliadine SSWQO developed for aluminum, fluoride, and iron (Golder 2013a, 2013b, 2014). The Meliadine SSWQO criteria was developed as a conservative protection to the aquatic receiving environment and was developed by Golder (2013a, 2014) to assess whether waste rock consisted of a deleterious substance according to Environment Canada (2013). The outcome of the assessment was that Meliadine waste rock is not a deleterious substance (Environment Canada 2014).

7.3 Operations

According to model predictions, CP3 arsenic concentration may exceed MDMER on occasion if precipitation events or the freshet flows generate drainage from the TSF (Golder, 2012c). The main source of arsenic in CP3 is predicted to be from residual process water that is assumed to be present in the filtered tailings. Arsenic transfer from process water to CP3 water will be minimized by effective dewatering of the tailings prior to placement into the TSF, and from freezing of the tailings in the TSF. Frozen tailings will act to limit infiltration and seepage. Water from CP3 will be pumped to CP1 where it will mix with other site waters before discharge. Dissolved arsenic concentration in CP1 is predicted to meet the MDMER monthly average maximum concentration. All other chemical parameters in CP3 and all chemical parameters in CP1, CP4, CP5, and CP6 are predicted to meet MDMER limits for chemical constituents.

7.4 Post-Closure

Long-term, post-closure water quality in the containment ponds (CP1, CP3, CP4, CP5, and CP6) and in the flooded open pit lakes are anticipated to meet MDMER limits and CCME-WQG for the protection of aquatic life or the SSWQO developed for the Mine for aluminum, fluoride, and iron. Arsenic concentrations in CP3 could slightly exceed the SSWQO post-closure, a criteria that is conservatively protective of the receiving aquatic environment (Golder, 2013a). If arsenic levels exceed post-closure SSWQOs then water arsenic treatment will be implemented accordingly until arsenic levels decrease below the SSWQO concentration.

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FIGURES

Figure 1.1 General Mine Site Location Plan

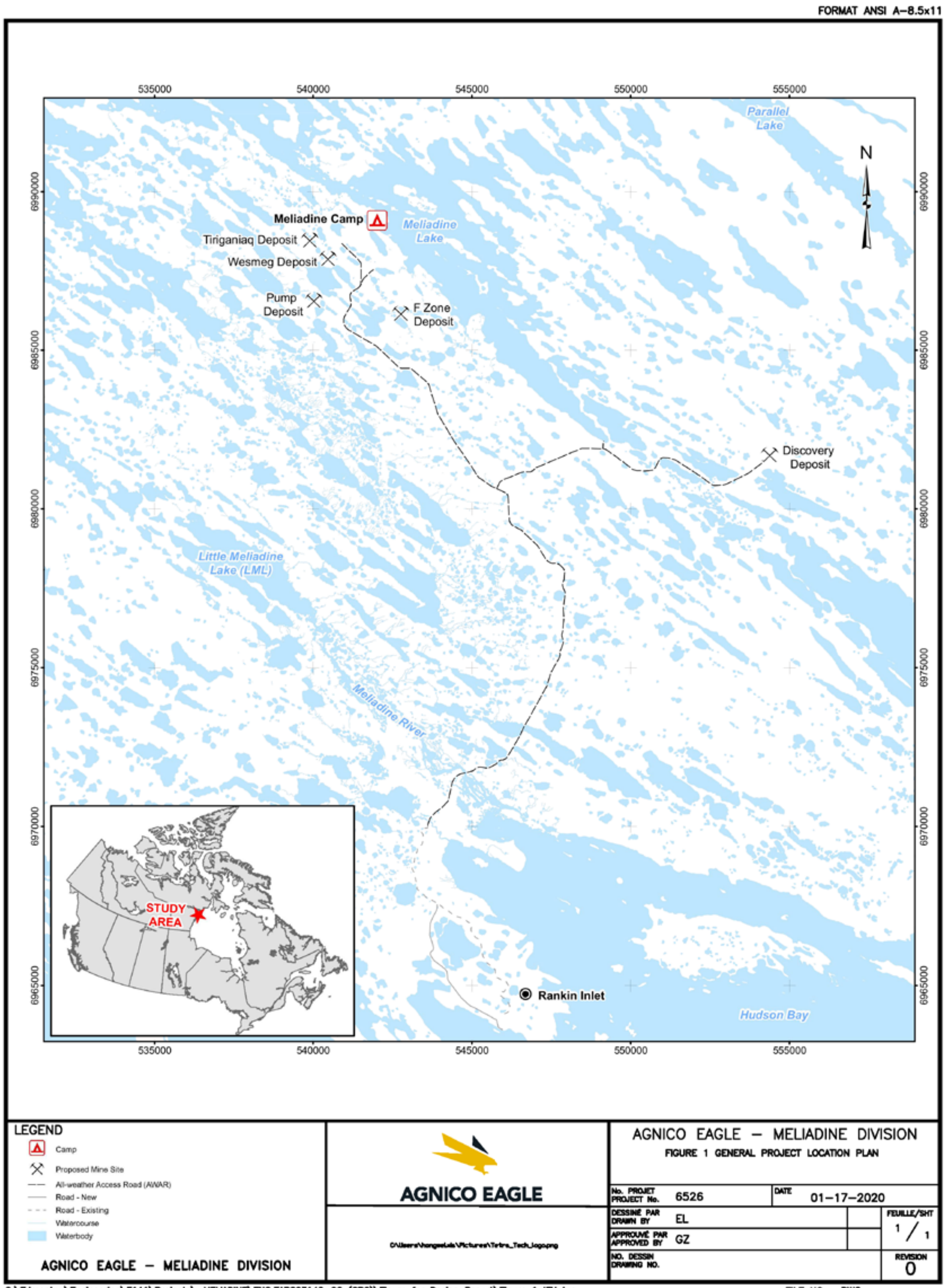

Figure 1.2 General Mine Site Plan Layout

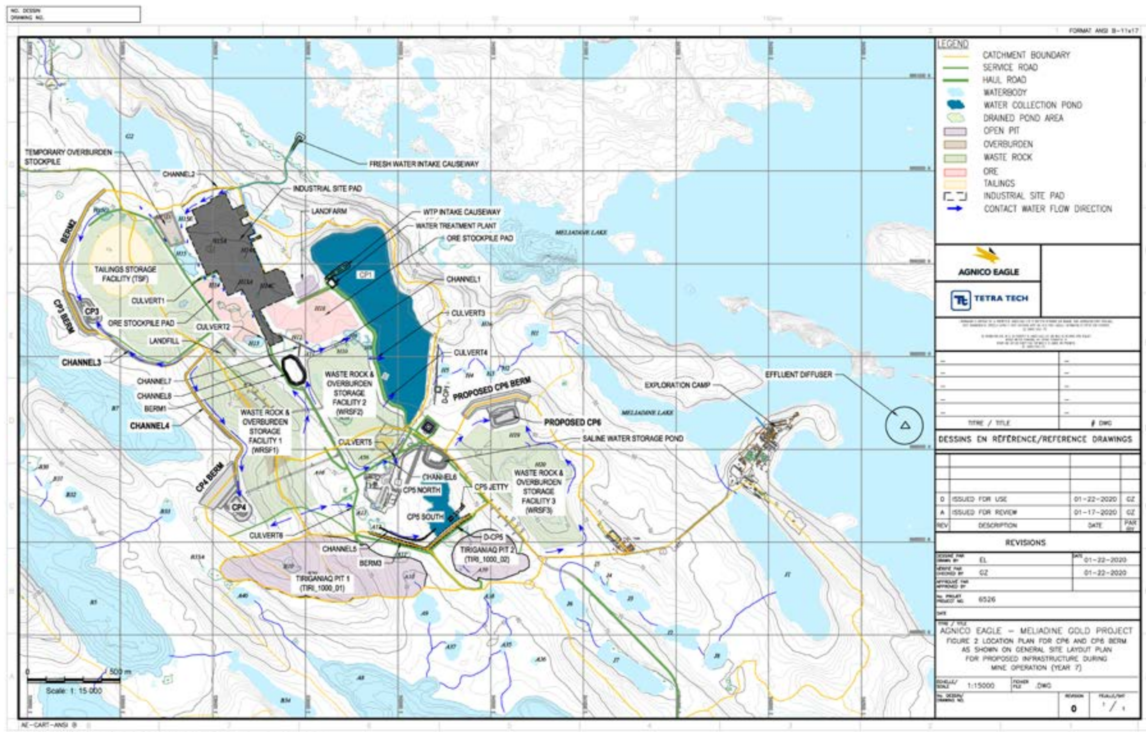

Figure 3.1 P-Area Plan View

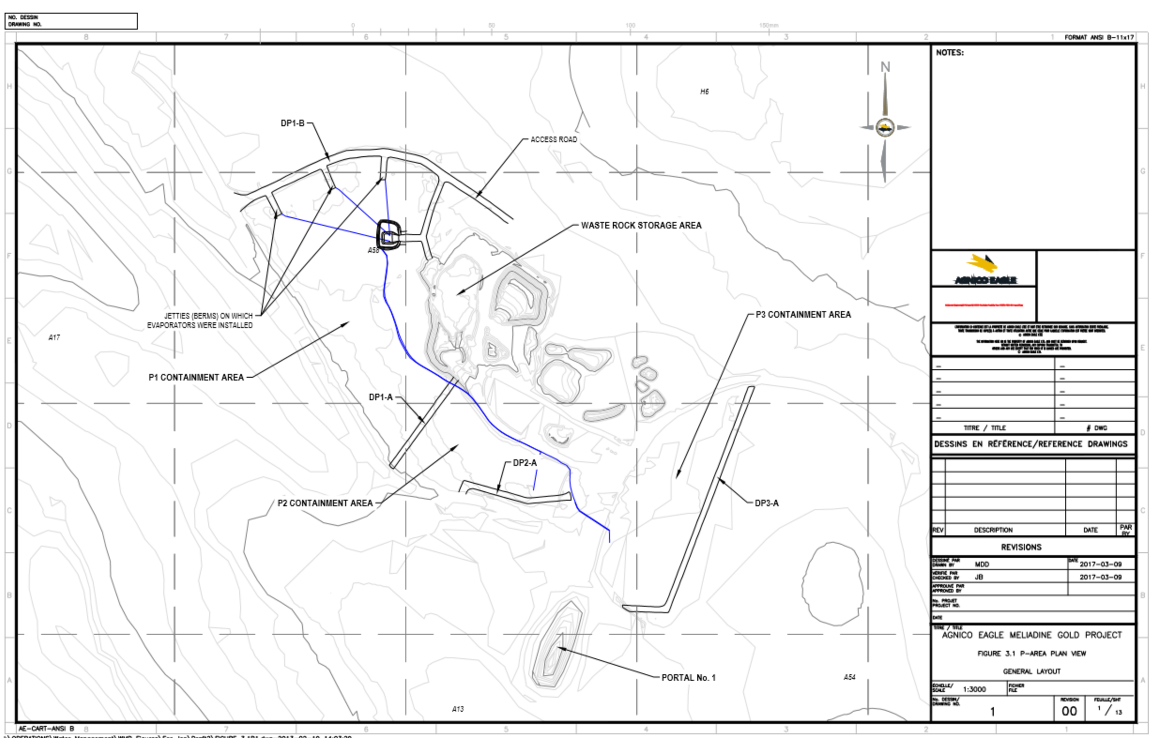

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Figure 3.2 Location and design of Saline Pond 4 (SP4) within Tiriganiaq Pit 1

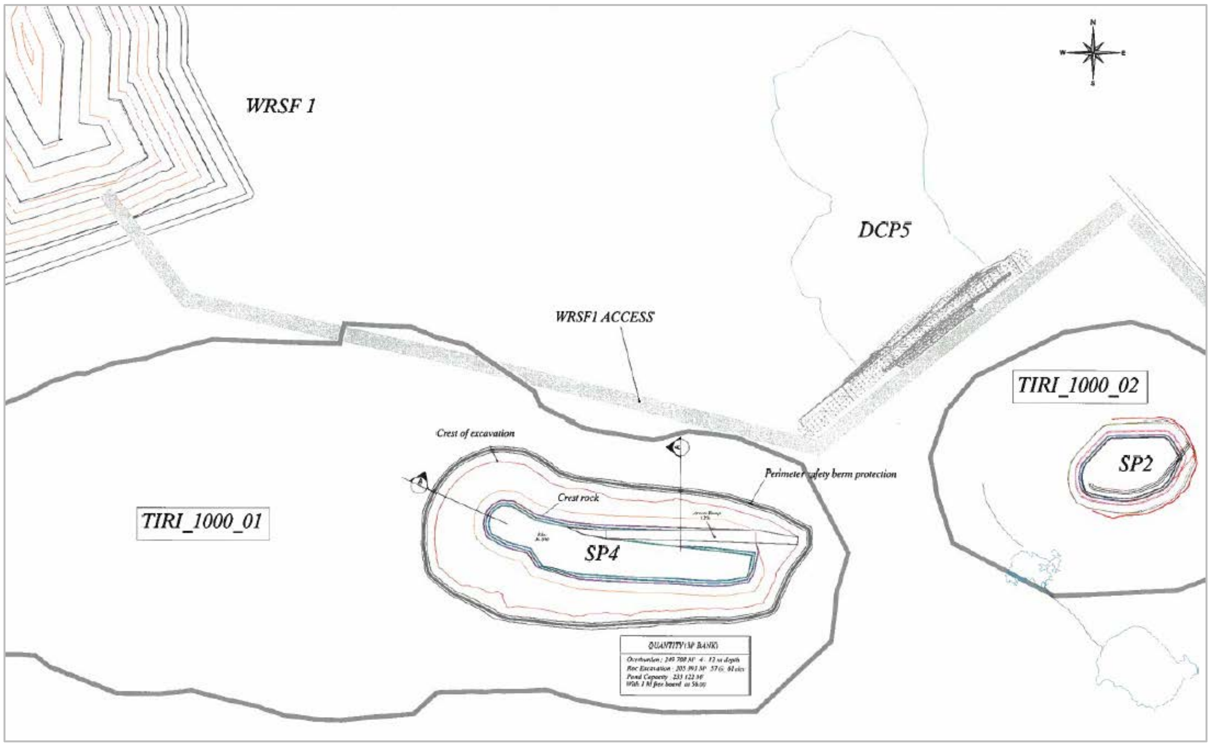

Figure 5.1 Watersheds and Waterbodies in Proximity of Mine Site

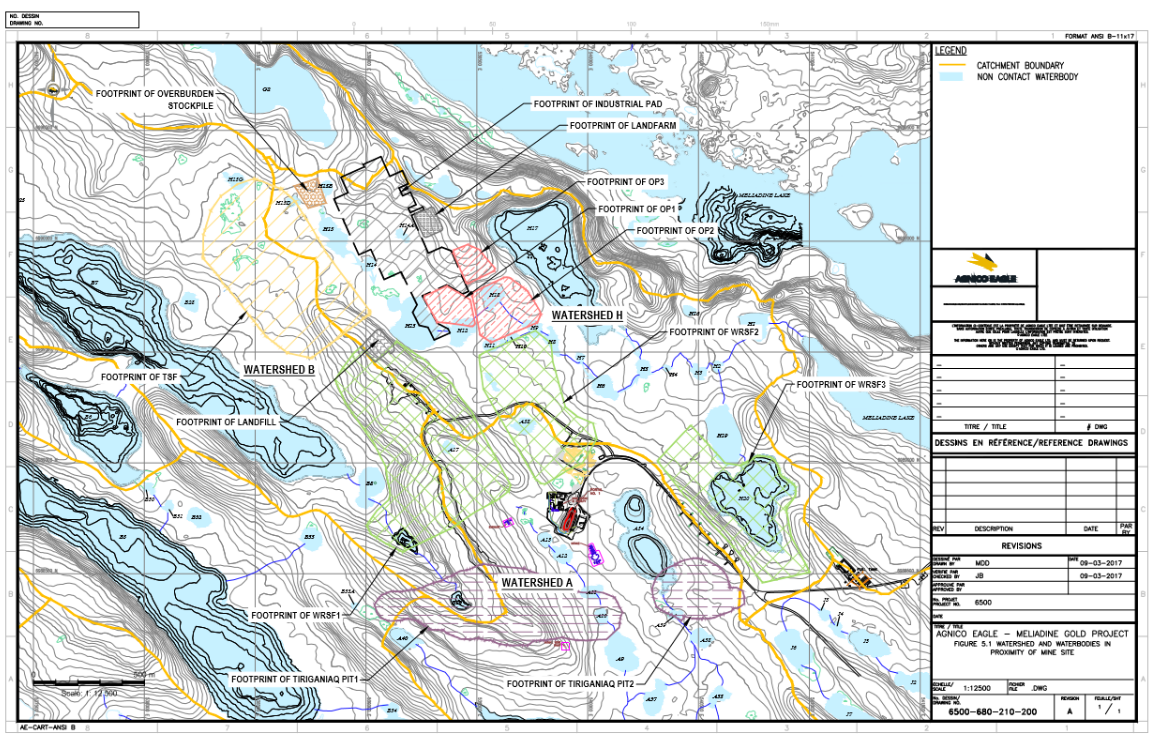

Figure 6.1 Mine Site Layout for Water Management During Closure from Feasibility Level Study. (TetraTech, 2014).

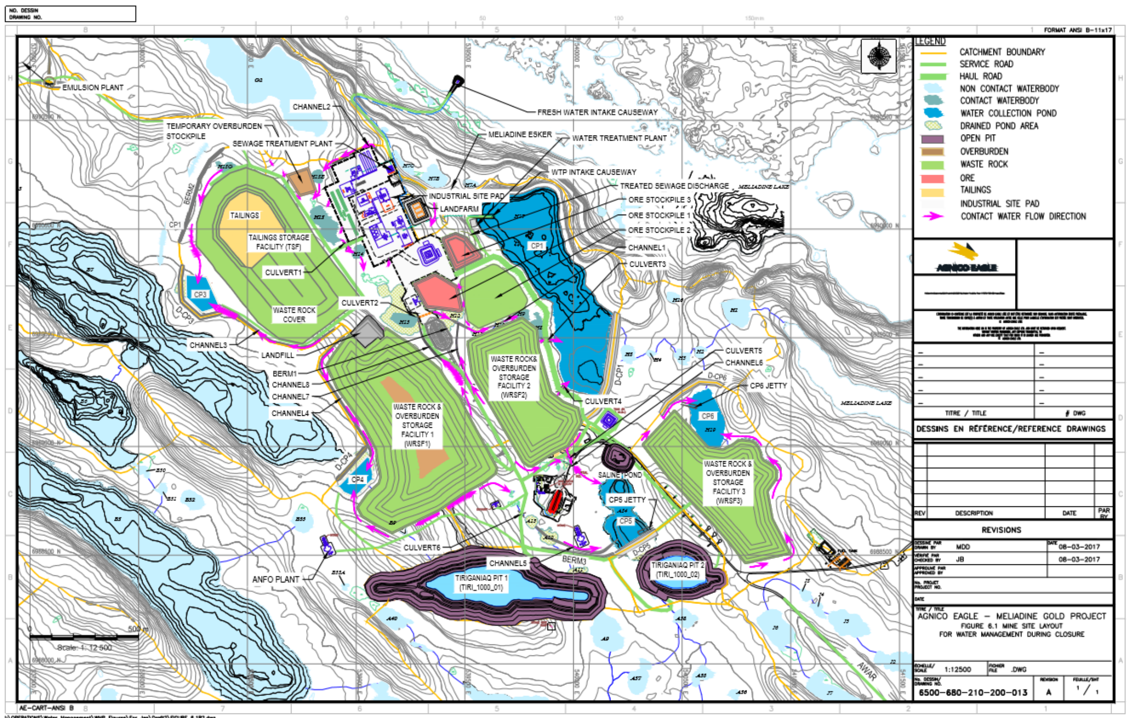

Figure 6.2 Mine Site Layout After Closure from Feasibility Level Study. (TetraTech, 2014).

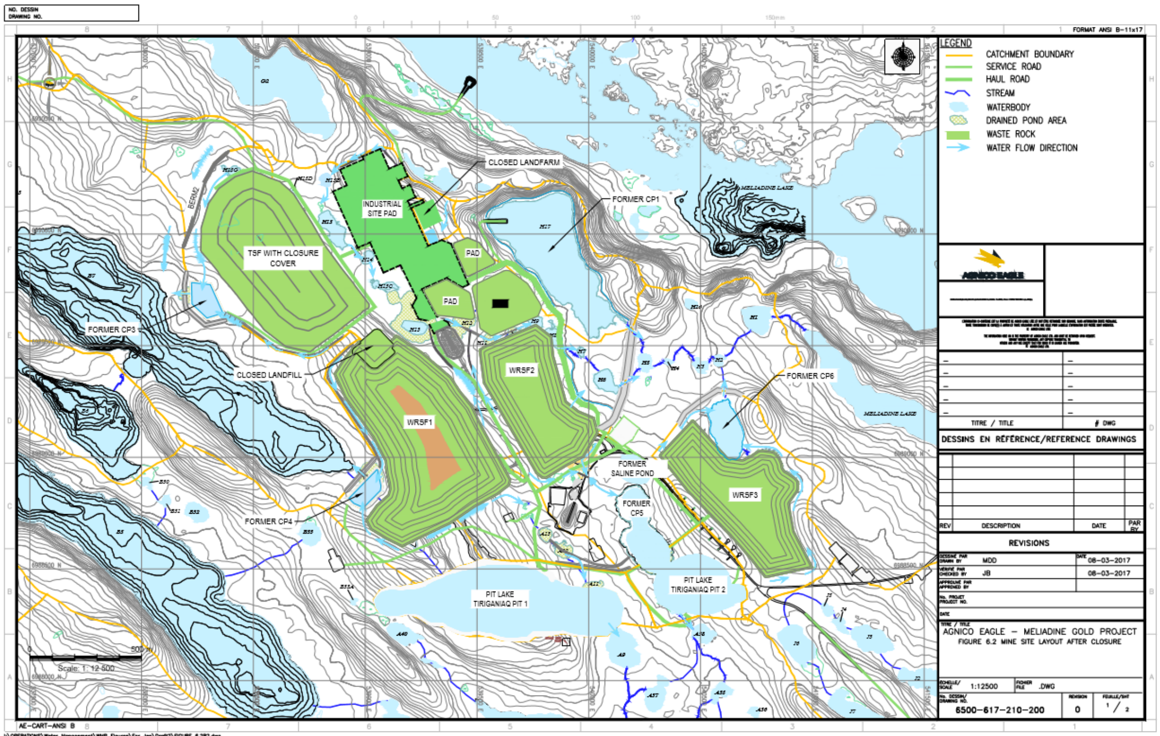

Figure 7.1a Water Quality Monitoring Locations on Site

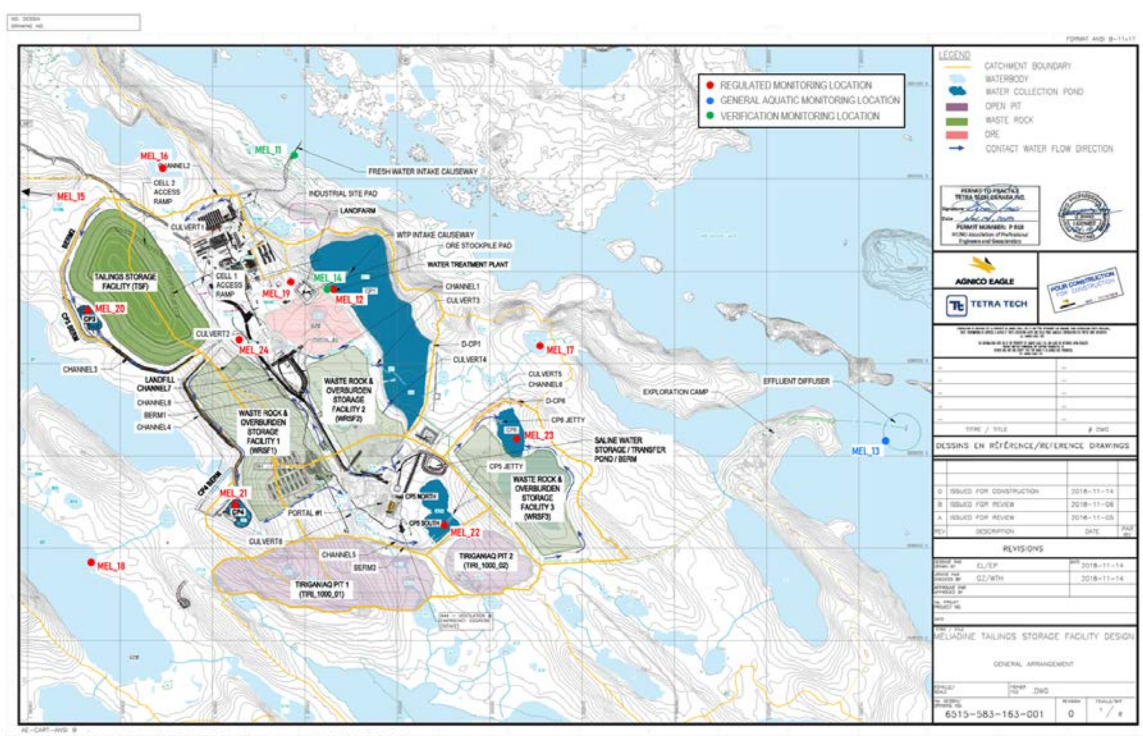

Figure 7.1b Water Quality Monitoring Locations at Itivia

Note – MEL-12 is located to the Northwest along the Bypass road but could not be effectively included in this map due to its distance from Itivia.

APPENDIX A • MELIADINE GROUNDWATER MANAGEMENT PLAN

APPENDIX B • FRESHET MANAGEMENT PLAN

APPENDIX C • WATER MANAGEMENT SCHEMATIC FLOW SHEET

APPENDIX D • SEDIMENT AND EROSION MANAGEMENT PLAN

APPENDIX E • WATER QUALITY AND FLOW MONITORING PLAN