April 2014

FINAL REPORT

SD 2-8 Mine Waste Management Plan - Meliadine Gold Project, Nunavut

Submitted to:
Agnico Eagle Mines Limited
Mines Agnico Eagle, Division Services Techniques
10200, Route de Preissac
Rouyn-Noranda, Quebec J0Y 1C0

REPORT

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Executive Summary

Agnico Eagle Mines Limited (AEM) is developing the Meliadine Gold Project (the Project), located approximately 25 kilometres (km) north from Rankin Inlet, and 80 km southwest from Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson's Bay, the Project site is located on a peninsula (the Peninsula) between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit owned lands.

This report presents a conceptual Mine Waste Management Plan (Plan) prepared for inclusion in the Project Environmental Impact Statement. The Plan will be reviewed and updated on a regular basis as the Project proceeds into detailed design, construction, operations and closure.

The current mining plan indicates that approximately 37.8 Mt of ore will be mined from open pit and underground activities over a mine life of 13 years. Both operations will generate about 378.6 Mt of mine waste rock, 57 Mt of overburden and about 37.8 Mt of tailings. About 2.2 Mt of waste rock generated by the underground development will be used as backfill. Results of geochemical testing indicate that most of the waste rock and all of the overburden are non-potentially acid generating (NPAG); both waste rock and overburden are considered as non-metal leaching.

Most tailings are NPAG except for the Discovery deposit tailings, which are PAG. Based on the current mine plan, the combined tailings mass is calculated to be NPAG on an annual basis over most of the mine life except for short periods during operations where the acid generation potential of the bulk tailings is calculated to be uncertain and possibly PAG. The final three years of the tailings production are calculated to be NPAG and will cover the majority of the deposit. The tailings solids streams have the potential to leach arsenic at concentrations above the CCME guidelines.

Waste rock and overburden will be trucked to waste rock storage facilities (WRSFs) until the end of mine operations, with distribution according to an operation schedule. Four main areas have been identified as WRSFs located in proximity to the Tailings Storage Facility (TSF), and the Pump, F Zone and Discovery open pits. A closure cover system is not proposed for the WRSFs, with the possible exception of Discovery, the need for which will be verified during operations as more information becomes available. It is anticipated that no additional re-grading will be required out as part of WRSF closure activities, and a lichen community will naturally re-vegetate the surface of the facilities over time.

Tailings will be stored within the TSF located in the B7 basin and watershed. The tailings will be placed as thickened slurry, with excess tailings water draining to a reclaim pond for re-use in the milling process. The TSF will be progressively closed through draining of the reclaim pond and placement of an engineered cover. It is anticipated that the TSF will freeze in the long term.

The waste rock and tailings storage facilities will be designed and operated to minimize the impact on the environment and considering geotechnical and geochemical stability. Measures to manage potential dust and seepage will be implemented and their effectiveness monitored. Water management infrastructure will remain in place until mine closure activities are completed and monitoring results demonstrate that water quality is acceptable for release to the environment without further treatment. Monitoring will be carried out during all stages of the mine life to demonstrate geotechnical stability and the acceptable environmental performance of the facilities. If any non-compliant conditions are identified, then maintenance and planning for corrective measures will be completed in a timely manner to ensure successful completion of the closure and reclamation plan.

Study Limitations

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Abbreviation and Acronym List

AANDC	Aboriginal Affairs and Northern Development Canada
AEM	Agnico Eagle Mines Limited
ARD	Acid Rock Drainage
FEIS	Final Environmental Impact Statement
DFO	Fisheries and Oceans Canada
Golder	Golder Associates Ltd.
IPCC	Intergovernmental Panel on Climate Change
LSA	Local Study Area
MEND	Mine Environment Neutral Drainage Program
MMER	Metal Mining Effluent Regulations
NIRB	Nunavut Impact Review Board
NPAG	Non-Potentially Acid Generating
PAG	Potentially Acid Generating
TSF	Tailings Storage Facility
WRSF	Waste Rock Storage Facility

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APPENDIX A
Environmental, Social, Economic and Technological Characterization of Waste Rock Storage Facilities

1.0 INTRODUCTION

Agnico Eagle Mines Limited (AEM) is developing the Meliadine Gold Project (the Project), located approximately 25 kilometres (km) north from Rankin Inlet, and 80 km southwest from Chesterfield Inlet in the Kivalliq Region of Nunavut. Situated on the western shore of Hudson Bay, the proposed Project site is located on a peninsula (the Peninsula) between the east, south, and west basins of Meliadine Lake (63°1'23.8'' N, 92°13'6.42"W), on Inuit owned lands.

The proposed mine will generate approximately 37.8 Mt of ore, 378.6 Mt of mine waste rock and 57 Mt of overburden from five deposits that include, from west to east Tiriganiaq, Wesmeg, Pump, F Zone and Discovery. The deposits will be mined using conventional open pit mining methods with additional underground mining for the Tiriganiaq deposit. Approximately 8,500 tonnes of ore will be processed per day.

Proposed mining facilities in the area include a camp/plant site, an ore stockpile site, a tailings storage facility (TSF), waste rock storage facilities (WRSFs), and diversion and containment dikes. A general location plan of the proposed Meliadine Mine is shown in Figure 1.1.

This document presents a conceptual Mine Waste Management Plan for the Project. The Plan is divided into the following components:

- A brief summary of the physical setting at the mine site, the mine plan and the mine waste storage facility locations (Section 2);
- A description of waste rock, overburden and tailings geochemistry (Section 3);
- A description of waste rock and overburden management at the mine site (Section 4); and
- A description of tailings management at the mine site, including the current tailings deposition plan for the Project (Section 5).

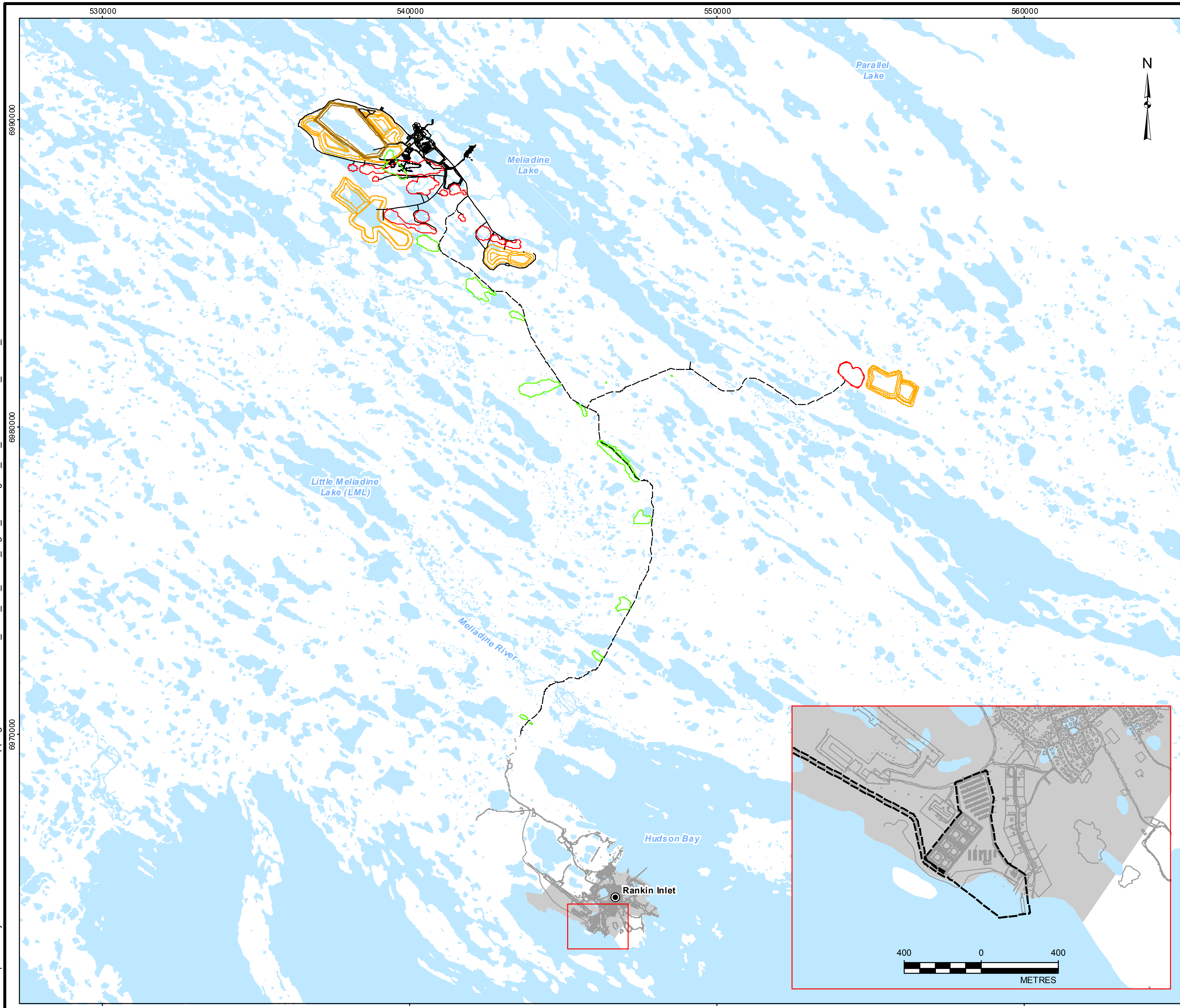
The Plan will be in effect for the operating phase of the Project. The purpose of the Plan is to provide consolidated information on mine waste management, including strategies for controlling dust, worker doses, and runoff from the tailings and waste rock storage facilities.

This Plan has been prepared to a conceptual level appropriate for inclusion in the Project Environmental Impact Statement. This Plan will be reviewed and updated on a regular basis as the Project proceeds into detailed design, construction, operations and closure.

This report has been prepared in accordance with the "Study Limitations of This Report," which are presented at the beginning of the report. The reader's attention is specifically drawn to this information for reference during the use of this report.

1.1 Concordance with Project Guidelines

The purpose of this document is to address Guidelines issued by the Nunavut Impact Review Board (NIRB) for the Project (NIRB 2012), and specifically those relating to the preparation of a Mine Waste Management Plan. Specific requirements set out in the guidelines relating to the preparation of the Plan are presented in FEIS Volume 1, Appendix 1.0-A.



N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\GIS\Mapping\MXD\FEIS\Volume_2\SD_2-8_Waste_Mgmt_Plan\Figure_1.1_Infrastructure_Rankin_Inlet.mxd

LEGEND

- Proposed Project Infrastructure
- Open Pit
- Tailings Storage Facility
- Waste Rock Storage Facility
- Borrow Pit/Quarry
- All-weather Access Road (AWAR)
- Road - New
- Road - Existing
- Watercourse
- Waterbody
- Municipal Boundary

REFERENCE

Base data obtained from Agnico Eagle Mines Limited (AEM).
Datum: NAD 83 Projection: UTM Zone 15

2,500 0 2,500
METRES

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

PROJECT LAYOUT, INCLUDING AWAR AND PROPOSED INFRASTRUCTURE IN RANKIN INLET FOR THE MELIADINE GOLD PROJECT

Golder Associates

PROJECT NO.	10-1373-0076		FILE No.	
DESIGN	DW	19 Nov. 2012	SCALE AS SHOWN	REV. 0
GIS	CDB	19 Nov. 2012		
CHECK	DW	11 Jan. 2013	**FIGURE 1.1**	
REVIEW	DW	11 Jan. 2013		

2.0 BACKGROUND INFORMATION

2.1 Site conditions

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

The local overburden typically consists of sand and gravel deposits of various thicknesses overlying till with cobbles and boulders. Some of the surfaces are covered by a thin layer of organics. Bedrock in the Project area consists of a stratigraphic sequence of clastic sediments, oxide iron formation, siltstones, graphitic argillite, and mafic volcanic flows (Snowden 2008; Golder 2009).

Low-lying areas are poorly drained as a result of a low slope in the landscape, and intermittent streams connect numerous shallow ponds and lakes. Most lakes in the study area are generally well oxygenated during open water conditions. Lakes have been found not to be thermally stratified during open water sampling events, and low dissolved oxygen concentrations have been observed in the Peninsula lakes during ice conditions, which likely limit their use by overwintering fish (SD 7-2 2011 Aquatics Baseline).

2.1.1 Climate

The Project is located in the Kivalliq Region of Nunavut, near the northern border of the southern Arctic terrestrial ecozone, and within the Arctic tundra climate region. Within this region daylight reaches a minimum of 4 hours per day during the winter, and a maximum of 20 hours during the summer. The climate is extreme with long cold winters and short cool summers. Temperatures are cool, with a mean temperature of 12 degrees Celsius (°C) in July and -31 °C in January. The mean annual air temperature of the Project site is approximately -10.4 °C (SD 7-2 2011 Aquatics Baseline).

The recorded prevailing winds are from north and north-northwest. The wind blows from the north and north-northwest direction more than 30% of the time, and the least frequent wind direction is west-southwest, with a frequency of 2.1%. The calm frequency is 2.8% of the time. The mean values for wind speed show that the north-northwest, north and northwest winds have the highest speeds and tend to be the strongest.

Mean annual precipitation at the Project site, based on the hydrological year from 1 October to 30 September, is estimated to be 411.7 millimetres (mm) after accounting for rainfall and snowfall undercatch. Approximately 51% of precipitation occurs as rain (207.1 mm) and 49% occurs as snow (199.1 mm). The 24-hour extreme rainfall intensity with a 10-year return period is estimated to be 1.9 mm/h, or 45.6 mm total depth. Corresponding values for the 100-year return period are 2.6 mm/h or 62.4 mm total depth.

2.1.2 Permafrost

The Project is located in the area of continuous permafrost, as shown on Figure 2-1.

Late-winter ice thicknesses on freshwater lakes in the Project area over the period of record are presented in SD 6-1 Permafrost Baseline Report, Table 12. Ice thickness ranges from 1 to 2.3 m with an average thickness of 1.7 m. Ice covers usually appear by the end of October and are completely formed in early November. The spring ice melt typically begins in mid-June and is complete by early July.

Published data regarding permafrost were used to recreate the permafrost map of Canada shown in Figure 2-1. Based on thermal studies and measurements of ground temperatures, the depth of permafrost at the Project site is estimated to be in the order of 360 to 495 m, depending on proximity to lakes. The depth of the active layer ranges from about 1 m in areas with shallow overburden, up to about 3 m adjacent to lakes. The depth of the permafrost and active layer will vary based on proximity to lakes, overburden thickness, vegetation, climate conditions, and slope direction (SD 6-1 Permafrost Baseline Report).

Based on ground conductivity surveys and compilation of regional data, the ground ice content at the site is expected to be low between 0% and 10% (dry permafrost). Regionally on land, ice lenses and ice wedges are present, as indicated by ground conductivity, and by permafrost features such as frost mounds. These areas of local ground ice are generally associated with low-lying areas of poor drainage. Thermistor cables have been installed at the site to characterize and monitor the thermal conditions and permafrost (Figure 2.2).

2.1.3 Taliks

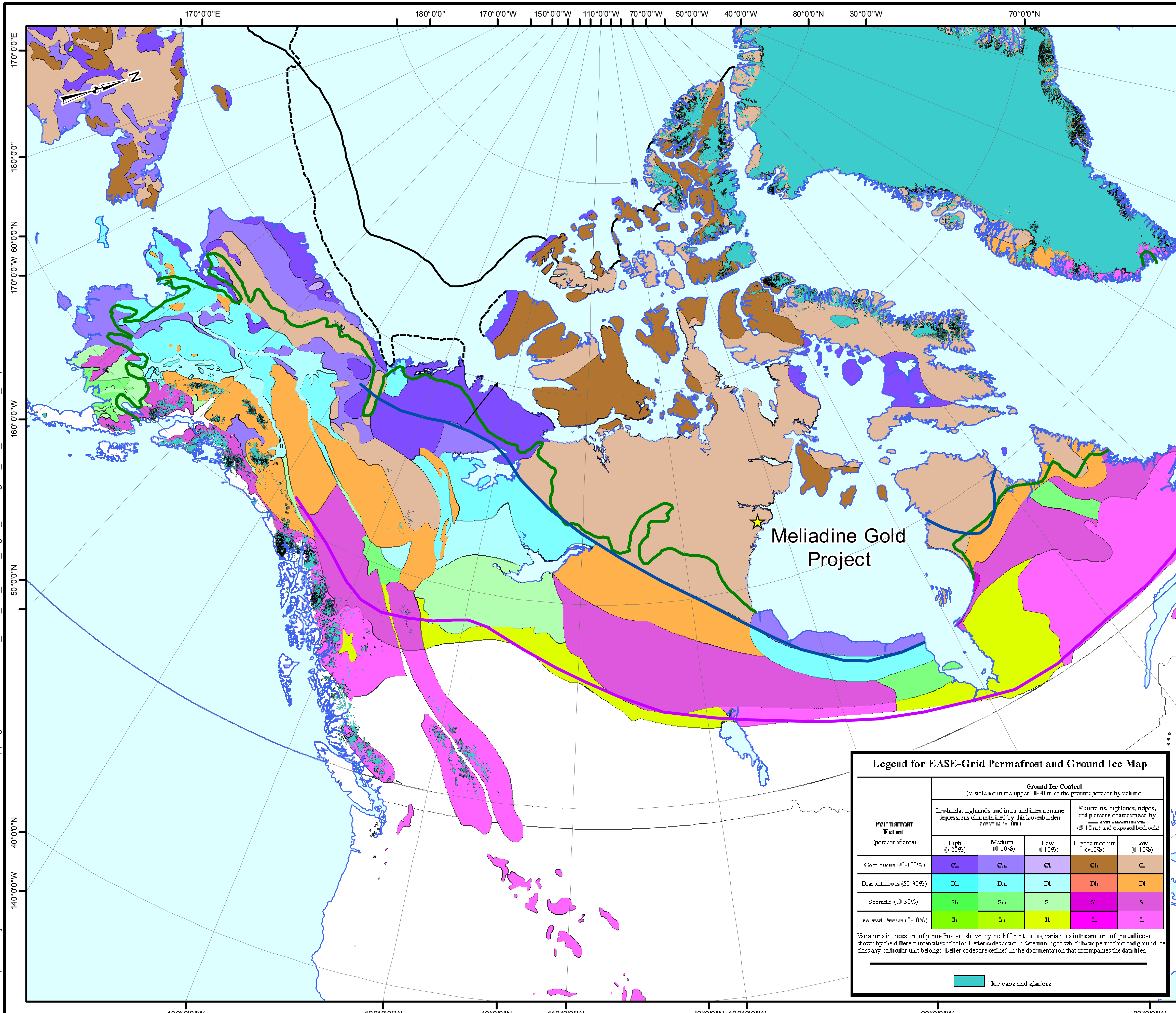
A talik is defined as a layer or body of unfrozen ground in a permafrost area, and includes several types based on the relationship to the permafrost and the mechanism related to the unfrozen conditions (Harris et al. 1988). Definitions for the three most common types of talik are presented here and are shown schematically in Figure 2.3:

- Closed talik: a talik occupying a depression in the permafrost table below a lake or river (also called "lake talik" and "river talik"); its temperature remains above 0ºC because of the heat storage effect of the surface water.
- Open talik: a talik that penetrates the permafrost completely (also called a “through talik”), connecting a water body above permafrost to the sub-permafrost aquifer (*e.g.,* below large rivers and lakes).
- Isolated talik: a talik entirely surrounded by perennially frozen ground.

Based on bathymetry data, maximum lake depth varies from 2.5 to 5 m (except Meliadine Lake and Chickenhead Lake), and late winter ice thickness ranges from 1.0 m to 2.3 m averaging approximately 1.7 m. Therefore, lake ice freezes to the lake bottom at depths shallower than approximately 1.0 to 2.3 m. Taliks (areas of unfrozen ground) are to be expected where lake depths are greater than about 1.0 to 2.3 m. Formation of open taliks that penetrate through the permafrost may also be expected for relatively deeper and larger lakes in the Project area.

Analytical solutions suggest that a critical depth beneath a lake to have open-talik formation is related to geothermal gradient, mean annual ground temperature and mean annual lake bottom temperature, but is independent of lake size. The following critical lake sizes for open-talik formation were estimated for the Project area based on assumed mean lake bottom and terrace temperatures:

- Taliks extending through the permafrost (open taliks) will exist beneath circular lakes having a minimum radius of 290 to 330 m, and beneath elongate lakes having a minimum half width of 160 to 195 m, without considering lake terrace geometries.
- When terrace effects are included in the analyses, the critical radius for a circular lake increases to between 310 and 485 m, and the critical half width for an elongate lake increases to between 170 and 280 m. These are based on assumptions that the terrace is 25% to 75% of the total lake width or diameter.



LEGEND

- ☆ MELIADINE GOLD PROJECT
- SOUTHERN BOUNDARY OF CONTINUOUS PERMAFROST - PRESENT
- SOUTHERN BOUNDARY OF DISCONTINUOUS PERMAFROST - PRESENT
- TREELINE
- SEA-ICE EDGE LIMIT
- SUBSEA PERMAFROST LIMIT

REFERENCE

BROWN, J., O.J. FERRIANS JR., J.A. HEGINBOTTOM, AND E.S. MELNIKOV. 1998. CIRCUM-ARCTIC MAP OF PERMAFROST AND GROUND-ICE CONDITIONS. BOULDER, CO: NATIONAL SNOWN AND ICE DATA CENTRE/WORLD DATA CENTER FOR GLACIOLOGY. DIGITAL MEDIA. PREDICTED PERMAFROSTBOUNDARIES BASED ON WOO ET AL., 1992. DATUM: NAD83 PROJECTION: UTM ZONE 15

500 0 500
KILOMETRES

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

PERMAFROST MAP OF CANADA

Golder Associates

PROJECT		10-1373-0076	FILE No.	
DESIGN	JC	27 July 2011	SCALE AS SHOWN	REV. 1
GIS	AL	27 July 2011		
CHECK	JC	28 Jun. 2012	FIGURE 2.1	
REVIEW	CJC	28 Jun. 2012		

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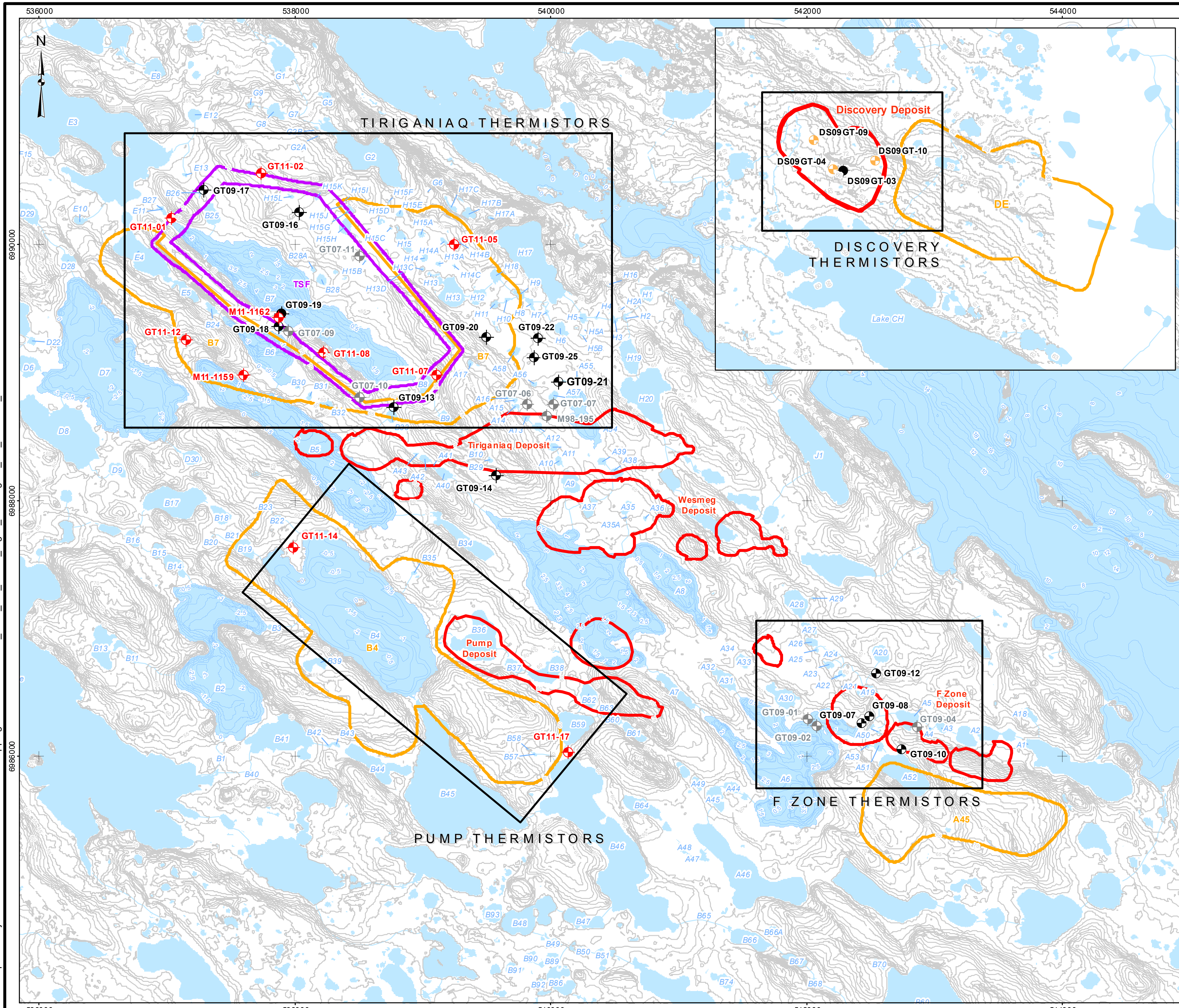


LEGEND

- GEOTECHNICAL BOREHOLE WITH THERMISTOR (2011)
- GEOTECHNICAL BOREHOLE WITH THERMISTOR (2009)
- HYDROGEOLOGICAL TESTING BOREHOLE WITH THERMISTOR (2009)
- HISTORIC GEOTECHNICAL BOREHOLE WITH THERMISTOR
- F ZONE GEOTECHNICAL BOREHOLE WITH THERMISTOR (2009)
- DISCOVERY GEOTECHNICAL BOREHOLE WITH THERMISTOR (2009)
- OPEN PIT
- PROPOSED TAILINGS STORAGE FACILITY
- PROPOSED WASTE ROCK STORAGE FACILITY
- TOPOGRAPHIC CONTOUR (1.0 m INTERVAL ABOVE SEA LEVEL)
- BATHYMETRIC CONTOUR (0.5 m INTERVAL AS DEPTH)
- WATERCOURSE
- WATERBODY

REFERENCE

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

500 0 500
METRES

PROJECT
AGNICO EAGLE
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
LOCATIONS OF BOREHOLES WITH THERMISTORS

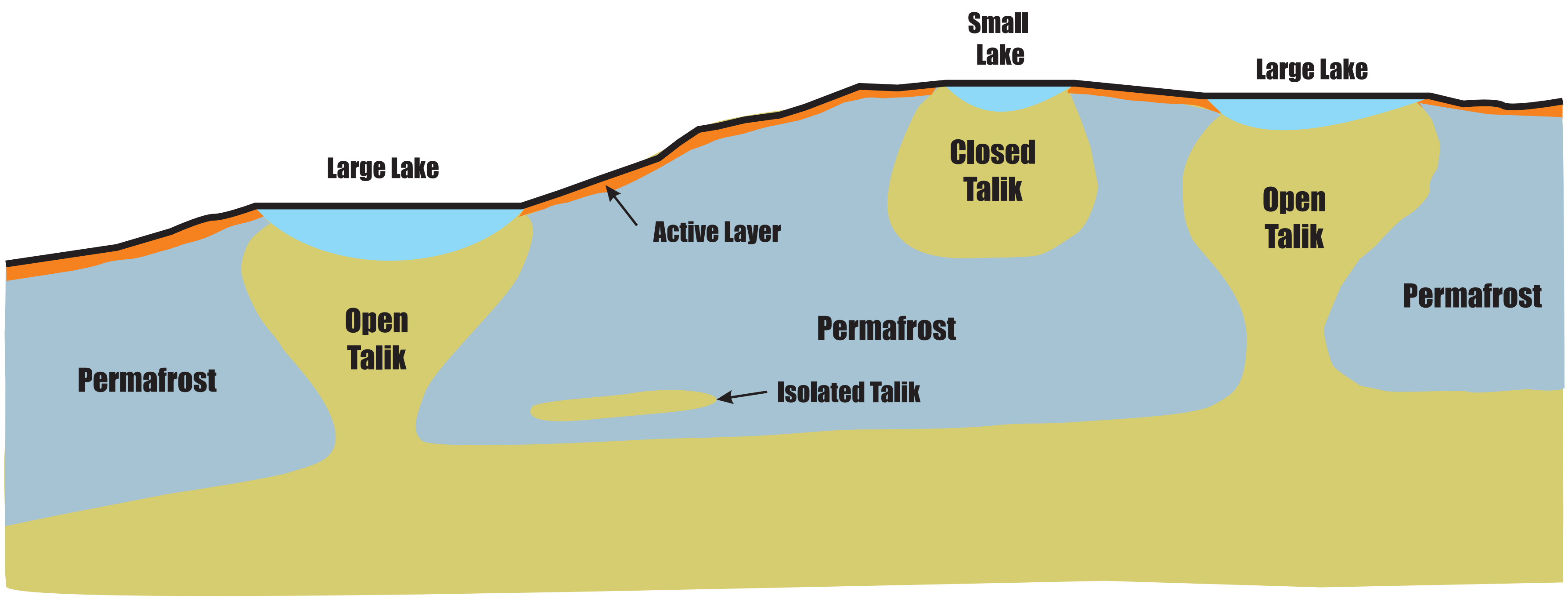
Golder Associates

PROJECT NO. 10-1373-0076			PHASE No.
DESIGN	KD	04 Sep. 2012	SCALE AS SHOWN REV. 1
GIS	CDB	04 Sep. 2012	
CHECK	DW	14 Jan. 2013	
REVIEW	DW	14 Jan. 2013	

FIGURE 2.2

N:\Bur-Graphics\Projects\2013\1428\13-1428-0007\GIS\Mapping\MXD\FEIS\Volume_2\SD_2-8_Waste_Mgmt_Plan\Figure_2.2_Borehole_Locations.mxd

DRAWING DATE: 14-Jul-11 COREL FILE: N:\Bur-Graphics\Projects\2010\1373\10-1373-0076\Drafting\3000\1013730076-3000-01.cdr



PROJECT	AGNICO EAGLE	AGNICO EAGLE MINES LIMITED MELIADINE GOLD PROJECT NUNAVUT			
TITLE		SCHEMATIC PERMAFROST THERMAL REGIME			
Golder Associates	PROJECT No.	10-1373-0076		PHASE No. 3000/2200	
	DESIGN	JC	14JUL11	SCALE NTS	REV.
	CADD	GG	14JUL11	FIGURE 2.3	
	CHECK	DW	14JAN13		
	REVIEW	DW	14JAN13		

2.2 Mining Plan

The current mining plan (FEIS Volume 2 Table 2-12) indicates that approximately 37.8 Mt of ore will be mined from open pit and underground activities over a mine life of 13 years. Both operations will generate about 378.6 Mt of mine waste rock and 57 Mt of overburden. About 2.2 Mt of waste rock generated by the underground development will be used as backfill, and therefore, will not be stockpiled at surface.

The following mining development sequence is currently planned:

- **Tiriganiaq**: Open pits and underground operation in this area are the first to start, but are also those with the longest mine life.
- **F Zone**: The second open pit area to be developed simultaneously with Wesmeg. This area is also somewhat remote.
- **Wesmeg**: Wesmeg is located south of the Tiriganiaq deposit. Wesmeg has multiple development pits and starts at Year 3 at the same time as F Zone. However Wesmeg has longer planned operational life.
- **Pump**: Located close to Wesmeg starting operation in Year 6.
- **Discovery**: Open pit area located at a distance from the mill and other mining infrastructure. It is currently planned to start developing Discovery open pit area at the same time as Pump following initiating development at Tiriganiaq.

The mine plan was used to prepare the material balance shown in Table 1. This balance indicates the distribution of the mine waste rock and overburden to associated WRSFs.

Table 1: Meliadine Waste Tonnage

		-1	1	2	3	4	5	6	7	8	9	10	11	12	Total
Tiriganiaq	Open Pit Ore tonnage (kt)	661	2,245	2,588	746	2,029	1,923	1,685	1,326	1,063	572	133	79	316	15,366
	Underground Ore tonnage (kt)		125	913	912	913	912	913	912	913	912	913	912	1,651[2]	10,901
	Total Waste Tonnage (kt)[3]	30,379	38,422	37,800	9,221	16,541	12,757	9,165	6,118	2,967	912	3,001	9,445	4,581	181,309
	Open Pit Waste Rock Tonnage (kt)	12,456	37,380	37,414	8,978	16,331	12,581	8,994	5,957	2,856	801	2,282	7,307	4,669	158,006
	Underground Waste Rock Tonnage (kt) [hauled to surface]	960 [960][1]	637 [637]	412 [386]	450 [243]	450 [210]	425 [176]	400 [171]	350 [161]	300 [111]	300 [111]	200 [11]	200 [11]	203 [-88][2]	5,287 [3,100]
	Overburden Tonnage (kt)	16,963	405									708	2,127		20,203
	Waste destination	B7, U/G	B7, U/G	B7, U/G	B7, U/G	B7, U/G	B7, U/G	B7, U/G	B7, U/G	B7, U/G	B7, U/G	B7, U/G	B4, U/G	B4, U/G	
F Zone	Ore tonnage (kt)				1,367	577	181								2,125
	Total Waste Tonnage (kt)				24,978	8,382	913								34,273
	Waste Rock Tonnage (kt)				17,691	8,382	913								26,986
	Overburden Tonnage (kt)				7,287	-	-								7,287
	Waste destination				A45	A45	A45								
Pump	Ore tonnage (kt)							454	306		1	656	278		1,695
	Total Waste Tonnage (kt)							15,963	3,586		3,096	14,198	2,268		39,111
	Waste Rock Tonnage (kt)							10,178	3,586		28	13,563	2,268		29,623
	Overburden Tonnage (kt)							5,785			3,068	635			9,488
	Waste destination							B4	B4		B4	B4	B4		
Discovery	Ore tonnage (kt)							47	375	649	1,206	868	31		3,176
	Total Waste Tonnage (kt)							5,352	23,869	29,681	31,070	8,824	144		98,940
	Waste Rock Tonnage (kt)							1,686	20,244	29,681	31,070	8,824	144		91,649
	Overburden Tonnage (kt)							3,666	3,625						7,291
	Waste destination							Discovery	Discovery	Discovery	Discovery	Discovery	Discovery		
Wesmeg	Ore tonnage (kt)				28	394	1,185	477	317	475	342	772	269	325	4,584
	Total Waste Tonnage (kt)				3,935	12,358	23,262	7,102	4,267	5,286	2,916	3,864	11,860	4,896	79,746
	Waste Rock Tonnage (kt)				512	7,945	23,207	7,102	4,267	5,286	2,916	3,864	7,867	4,065	67,031
	Overburden Tonnage (kt)				3,423	4,413	55						3,993	831	12,715
	Waste destination				B4	B4	B4	B4	B4	B4	B4	B4	B4	B4	
Total	**Total Ore tonnage (kt)**	**661**	**2,370**	**3,501**	**3,053**	**3,913**	**4,201**	**3,576**	**3,236**	**3,100**	**3,033**	**3,342**	**1,569**	**2,292[2]**	**37,847**
	Total Waste Tonnage (kt)	**30,379**	**38,422**	**37,800**	**38,134**	**37,281**	**36,932**	**37,582**	**37,840**	**37,934**	**37,994**	**29,887**	**23,717**	**9,447**	**433,379**
	Waste Rock Tonnage (kt)	**13,416**	**38,017**	**37,800**	**27,424**	**32,868**	**36,877**	**28,131**	**34,215**	**37,934**	**34,926**	**28,544**	**17,597**	**8,646**	**376,395[3]**
	Overburden Tonnage (kt)	**16,963**	**405**		**10,710**	**4,413**	**55**	**9,451**	**3,625**		**3,068**	**1,343**	**6,120**	**831**	**56,984**

Note 1: Including Year -3,-2 and -1
Note 2: Including Year 12 and 13
Note 3: Waste rock tonnage to be managed at surface

2.3 Mine Waste Storage

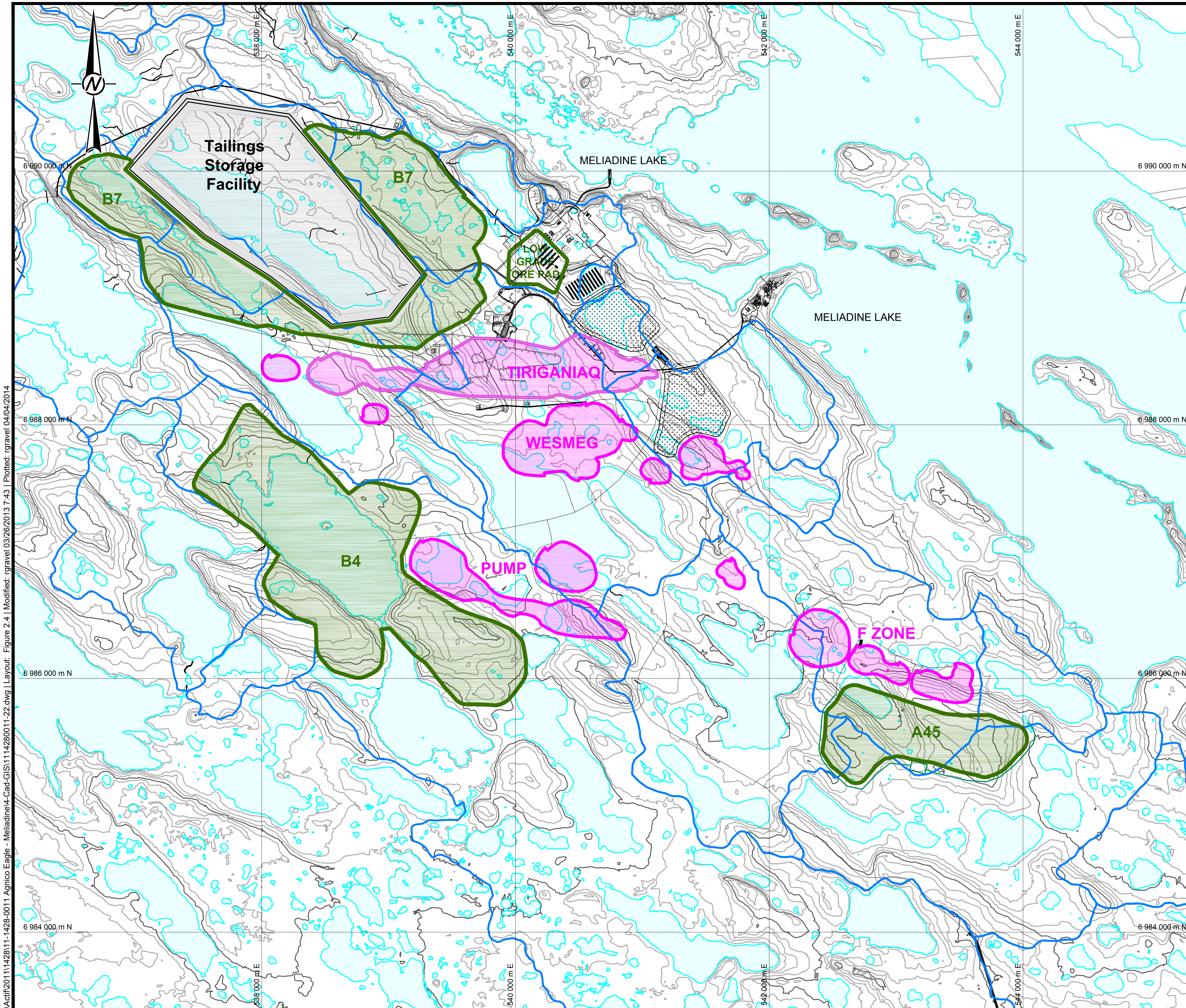
Several options for the storage of mine waste rock and tailings were evaluated using decision matrices, and preferred sites were selected (Appendix A; SD 2-2 Tailings Alternatives Assessment Report). The overall objective of the site selection process was to minimize the footprint of the areas occupied by the waste rock, overburden and tailings, and to avoid environmentally and socially sensitive areas, to the extent practicable.

Four main areas were identified as waste rock (and overburden) storage facilities, as shown on Figures 2.4 and 2.5. These disposal areas can be described as follows:

- B7 West/East/South : Area located around the proposed Tailings Storage Facility ;
- B4 : Area located northwest of the proposed Pump open pits, covering B4 basin;
- A45: Area located south of the proposed F Zone open pit; and
- Discovery (DE): Area located east of the proposed Discovery open pit.

A certain amount of waste rock generated from the underground will be returned underground as backfill.

Tailings will be stored in a Tailings Storage Facility (TSF) located in the B7 basin and watershed northwest of the plant site. Tailings will be placed as thickened slurry. A reclaim pond will be operated within the TSF. The TSF is shown on Figure 2.4.



LEGEND

PROJECTED OPEN PIT (LARGEST CONTOUR)

PROPOSED WASTE ROCK STORAGE FACILITY

WATERSHED DIVIDE

0 600 1,200 1,800

SCALE METRES

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE PROJECT
NUNAVUT

TITLE

WASTE ROCK AND OVERBURDEN PILES LOCATION

Golder Associates

PROJECT No.		11-1428-0011	FILE No.	1114280011-22
DESIGN	KD	28AUG12	SCALE AS SHOWN	REV. 0
CADD	RG	28AUG12		
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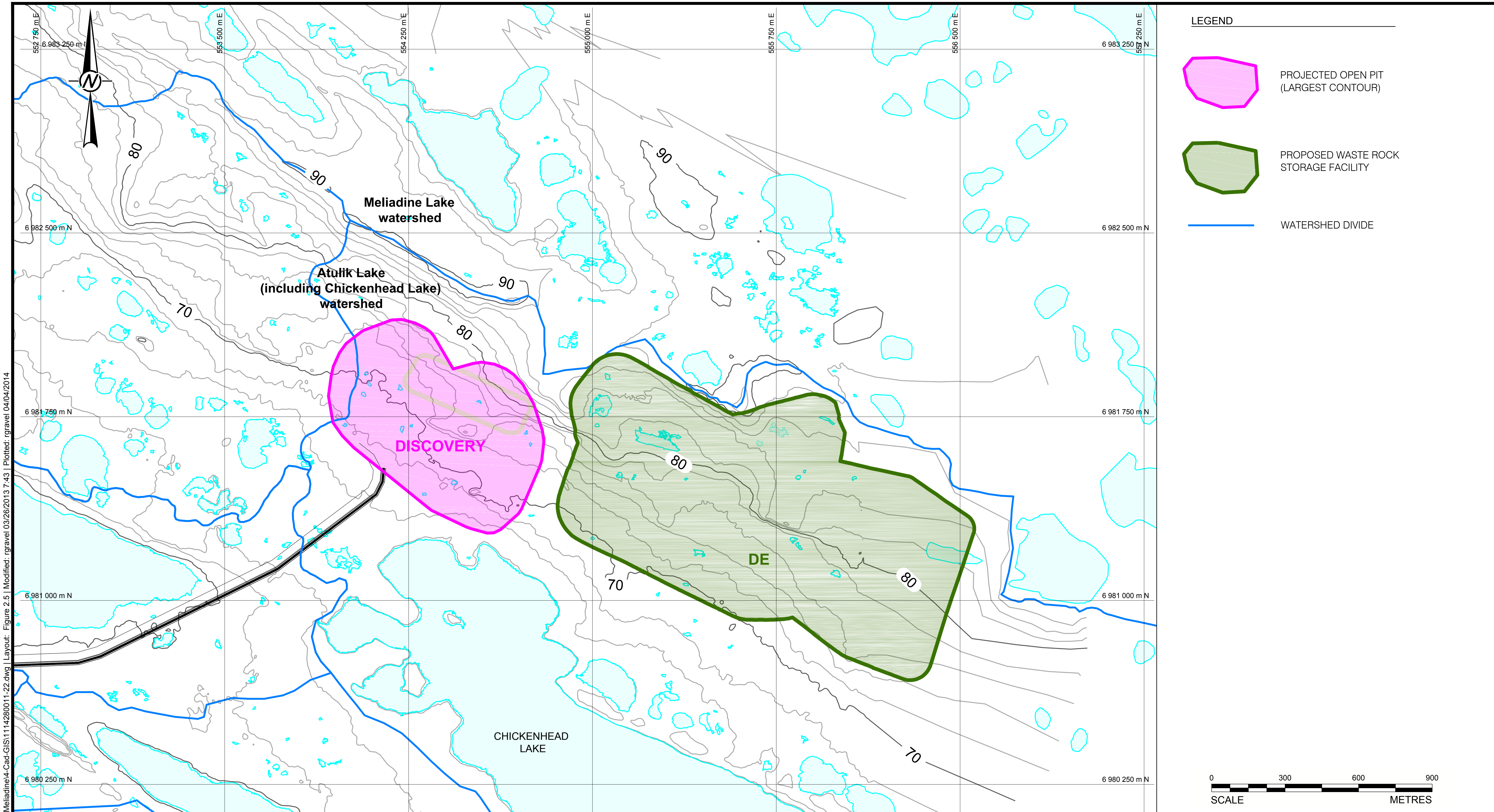

PROJECT: AGNICO EAGLE MINES LIMITED
MELIADINE PROJECT
NUNAVUT

TITLE: DISCOVERY WASTE ROCK AND OVERBURDEN PILE LOCATION

PROJECT No.	11-1428-0011	FILE No. 1114280011-22
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FIGURE 2.5

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3.0 GEOCHEMISTRY

A baseline geochemical characterization program for the Project was initiated in 2008 and consisted of static and kinetic testing methods to assess the chemical composition of the mine waste and overburden, its potential to generate acid rock drainage (ARD) and its potential to leach metals (ML) upon exposure to ambient conditions.

The objectives of the program were to identify chemicals of environmental interest in the framework of mine water and waste management and probable future mine water quality. Results of the geochemical characterization program are presented in FEIS SD 6-3 Geochemical Characterization of Waste Rock, Ore, Tailings and Overburden Meliadine Gold Project, Nunavut, and are summarized below.

The Meliadine properties are located in the Rankin Inlet Greenstone Belt. The Meliadine ore deposits are low-sulphide, gold-quartz vein deposits. The principal lithological units that are likely to be disturbed by mining include turbiditic sedimentary rocks, volcanic-hosted and sediment-hosted iron formation, sericite altered siltstones and graphitic argillite, and schistose and carbonate-altered mafic volcanic rocks.

The waste rock and ore sample selection was completed to obtain a data set that is compositionally and spatially representative of the material to be removed by mining at each deposit.

All waste rock, tailings, and overburden samples were subjected to a variety of static testing to evaluate chemical and mineralogical composition, the potential to generate acidic drainage (ARD), as well as short- and long-term metal leach potential. ARD potential was assessed following *Guidelines for Acid Rock Drainage Prediction in the North* (AANDC 1992) for waste rock and tailings. All leach test water quality results were screened against Metal Mining Effluent Regulations for effluent quality (MMER; DFO 2006).

3.1 Waste Rock

Most waste rock lithologies are NPAG except for Discovery greywacke and iron formation that are uncertain (FEIS SD 6-3). The iron formation waste rock from the Pump and F Zone deposits has an uncertain potential to generate ARD although these rock units constitute a minor proportion of the waste rock from these deposits (14% and 8% by tonnage, respectively). All other rock types from these deposits have excess buffering capacity such that the overall ARD potential of waste generated from Pump and F Zone, as well as from the Tiriganiaq, and Wesmeg deposits, is expected to be non-PAG. Therefore, waste rock from most deposits does not require means to prevent oxidation, with the possible exception of the waste rock stored in the Discovery WRSF. However, the Discovery WRSF is not expected to generate acidic drainage in the short-term based on the low reactivity of PAG rock samples (as demonstrated from kinetic testing) and AEM's experience at Meadowbank where the waste rock pile containing PAG rock froze within the first year of deposition.

The results of kinetic tests completed on all waste rock types at various scales, as well as the Mine Site Water Quality Predictions (FEIS SD 2-6) show that leachate is expected to meet MMER monthly mean effluent limits. Waste rock pile seepage and contact water will be managed to in a way to capture water and monitor water quality prior to discharge.

3.2 Overburden

Overburden from within the pit outlines is NPAG and do not require means to prevent oxidation. Metal release under laboratory conditions is low despite the relatively high total arsenic content. Leachate concentrations in overburden are generally lower than waste rock and all meet MMER monthly mean limits. Waste rock and overburden have compatible geochemical characteristics for Tiriganiaq, Wesmeg, Pump, and F Zone deposits and similar to non PAG rock from the Discovery deposit; such that they can be managed together in the same facility.

3.3 Tailings

With the exception of the Discovery deposit tailings which are PAG, most of the tested tailings samples have no potential to generate ARD. Based on the current mine plan (FEIS Volume 2 Table 2-12), the bulk of the tailings in the impoundment is anticipated to be non acid-generating on an annual basis over most of the mine life except for short periods during operation where the acid generation potential of the bulk tailings may be uncertain to PAG. The final three years of tailings production are NPAG.

The concentrations of most leachate parameters from static leaching tests (shake flask extraction test) meet mine effluent criteria (MMER; DFO 2002) with the exception of arsenic, which exceeds the MMER average monthly values in F Zone, Pump, and Tiriganiaq tailings but shows a decreased concentration with time in the kinetic testing results. Long-term chemical release from the tailings will be managed by placement of an engineered cover that is anticipated to minimize infiltration of water to the tailings surface.

Process water will be treated to destroy cyanide prior to discharge to the TSF to meet International Cyanide Management Code guidance concentrations. Tailing water within the TSF is likely to require attenuation of pH, arsenic, total cyanide and suspended solids to meet MMER criteria prior to discharge to the receiving environment. Other parameters may also require treatment for discharge if recycling of the TSF water results in further concentration of the process water.

4.0 WASTE ROCK AND OVERBURDEN

Waste rock from the open pit mines not used for site development purposes will be trucked to waste rock storage facilities until the end of mine operations. Overburden material stripped as part of the mine development, will be stored in the same facilities as the waste rock.

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

The term overburden designates all soils that need to be stripped at surface prior to developing the open pits. Overburden conditions were observed at the location of the proposed TSF and WRSF locations (excluding the Discovery area) during geotechnical field programs for the Project (SD 2-4A Factual Report on 2011 Geotechnical Drilling Program – Meliadine Gold Project, Nunavut); however, little variability is expected in overburden characteristics at the location of the planned open pits. According to the general subsurface conditions described in SD 2-4A, the overburden stratigraphy consists of a thin layer of native topsoil (< 5 cm) overlying a layer of non-cohesive soil with variable amounts of silt, sand and gravel. Frozen soil and presence of ice were observed at all drill locations. Laboratory tests showed that the non-cohesive layer has moisture contents varying between 5 and 33%, with ice content varying between 0.2 and > than 100%.

It is currently proposed to manage overburden material and waste rock in the same facilities as it is not anticipated that there will be potential to reuse the overburden at closure. Separately salvaging and storing overburden for reclamation activities has not been found feasible at northern mine sites as the material freezes and handling becomes very difficult. Overburden is retrieved early in the mining life, and based on the results from field investigations (SD 2-4A), the overburden is expected to have relatively high water and ice content. Overburden placed within the facilities is expected to be completely frozen at the time of closure, and therefore would require blasting and melting prior to reuse as a reclamation material. Experience from Meadowbank has shown that once the overburden material is blasted and melted, its nature and water content causes complete liquefaction which would make its handling and transportation challenging, if at all possible. The existing Mine Closure and Reclamation Plan (SD 2-17) is preliminary and will be reviewed and updated as the Project progresses, including the evaluation of closure options in relation to reclamation.

Due to the distance between the mining areas, several WRSFs are required. To assist with the environmental impact assessment phase of the Project, all proposed locations were characterized based on environmental, social, economic and technological considerations. This characterization was conducted according to a set of criteria (indicators) specifically developed for the Meliadine Project. The results of this characterization are provided in Appendix A and SD 2-1 Project Alternatives Section 5.8.

The contact water quality and the water management structures for the WRSFs will be monitored and assessed according to an approved environmental protocol during each stage of the mine life, including pre-development, operations, closure, and post-closure. Detailed design of the WRSFs will be completed by a qualified Geotechnical Engineer during the detailed design phase of the Project.

4.1 General Description of the Waste Rock Storage Facilities

4.1.1 B7 Waste Rock Storage Facility

The B7 WRSF accepts waste rock and overburden from Tiriganiaq, with the materials distributed around the TSF (Figure 2.4).

The western portion of the facility will impinge upon some waterbodies; however these waterbodies will be dewatered to advance the Tiriganiaq pit operations.

Waste rock and overburden expected to be excavated at the beginning of the open pit development will be placed north-east of the TSF. The rationale behind the disposal sequence is that this material is expected to be excavated at the beginning of the open pit development and placing it in the far north end will eliminate road crossing requirements and will simplify the operations.

The southern sector of the B7 WRSF is planned to be maintained at the same level as the crest of the TSF to provide access to the west and east waste rock storage areas as well as to the TSF itself.

Placing the waste rock and overburden in these areas will also contribute to the overall stability of the tailings storage facility.

4.1.2 B4 Waste Rock Storage Facility

The B4 WRSF encompasses Lake B4 and on-land storage to the south-east (Figure 2.4). Upstream lakes to Lake B4 will be dewatered to advance the Tiriganiaq open pit operations, and as such, storage of waste rock and overburden in the B4 basin footprint was identified as an opportunity to limit waste rock and overburden storage requirements in other areas.

The B4 WRSF will accept waste rock and overburden mainly from the Wesmeg and Pump open pit operations. Limited quantities of material from Tiriganiaq may also be placed in the facility.

4.1.3 A45 Waste Rock Storage Facility

The available area for waste rock and overburden storage near to F Zone was limited as significant effort was made to avoid Lake A6, as shown on Figure 2.4. Given the limited area, only small quantities of waste rock and overburden can be placed.

The A45 WRSF will be used to store waste rock and overburden from F Zone open pit operations.

4.1.4 Discovery Waste Rock Storage Facility

Discovery is located at distance from the main open pit areas and will have its own waste rock and overburden storage area (Figure 2.5). The Discovery WRSF was developed to accommodate the total planned tonnage of waste rock and overburden from the Discovery pit operations.

4.2 Waste Rock and Overburden Distribution

The following preliminary guidelines were established in consultation with AEM for initial sitting, configuration and footprint of the WRSFs (Golder 2011a, b):

- Specific gravity for the waste rock of 2.82 t/m^3 with a swell factor of 1.5, resulting in a conversion factor between waste rock tonnage and volume of 1.88 t/m^3.
- Dry density for the overburden of 1.7 t/m^3 with a swell factor of 1.2, resulting in a conversion factor between overburden tonnage and volume of 1.42 t/m^3.
- Preliminary minimal distance of 50 metres (165 feet) from the toe of a WRSF to open pits to be respected for the design. The distance of 50 m was selected as thick layers of soil may exist above the bedrock in some open pit areas, and a sufficient setback from the pit edge is required to accommodate for potential stability issues. This setback distance may be modified when more detailed data on the foundation conditions become available. It is expected that the location of the WRSF will not be moved, but the footprint of the facility may be increased or decreased.
- The maximum height for the WRSFs are not yet defined, as proper geotechnical studies need to be undertaken. The footprint presented in this document is considered to provide adequate storage capacity for the existing needs, based on the current mine plan (FEIS Volume 2 Table 2-12).

- Waste rock storage facility locations were selected to provide the shortest possible haulage distance from the open pits, where practicable, and in consideration of the mineral potential (or not) of the underlying ground.

These preliminary guidelines were established based on best available practices and past experience with other projects. Some of the parameters used for the analyses were also adjusted once modelling results were available in order to either achieve better configuration, improved overall stability, or to decrease the facility footprint.

Tables 2 and 3 present the expected distribution of waste rock and overburden, respectively, amongst the different storage facilities.

Table 2: Proposed Waste Rock Distribution to Waste Rock Storage Facilities

Deposit	Rock Type	Waste Rock Production (Mt)	Waste Rock Distribution to Facility (Mt)				
			B7	B4	A45	Discovery	U/G Backfill
Tiriganiaq open pit	Gabbro Mafic Volcanic Greywacke/Siltstone Undefined	158.0	146.0	12.0			
Tiriganiaq underground		5.3	3.1				2.2
Wesmeg	Iron Formation Mafic Volcanic Ultramafic	67.0		67.0			
Pump	Iron Formation Mafic Volcanic Greywacke/Siltstone	29.6		29.6			
Deposit	**Rock Type**	**Waste Rock Production (Mt)**	**Waste Rock Distribution to Facility (Mt)**				
			B7	**B4**	**A45**	**Discovery**	**U/G Backfill**
F Zone	Gabbro Iron Formation Mafic Volcanic	27.0			27.0		
Discovery	Gabbro Iron Formation Greywacke/Siltstone Undefined	91.6				91.6	
	Total	**378.6**	**149.1**	**108.6**	**27.0**	**91.6**	**2.2**

Table 3: Proposed Overburden Distribution to Waste Rock Storage Facilities

PIT	Overburden Production (Mt)	Overburden Distribution to Facility (Mt)			
		B7 West/East/South	B4	A45	Discovery
Tiriganiaq	20.2	18.1	2.1		
Wesmeg	12.7		12.7		
Pump	9.5		9.5		
F Zone	7.3			7.3	
Discovery	7.3				7.3
Total	**57.0**	**18.1**	**24.3**	**7.3**	**7.3**

The waste rock and overburden will be transferred to the WRSFs by truck with distribution according to an operation schedule. The number of truck loads will be monitored and compared to the mine plan to confirm volumes of materials stored within each of the facilities.

4.3 Contact Water Management

The water management objectives for the Project are to minimize potential impacts to the quantity and quality of surface water at the site (SD 2-6 Surface Water Management Plan). Diversion channels will be constructed as needed to direct clean runoff away from the WRSFs. Site contact water reporting from the facilities not meeting discharge quality criteria will be collected by necessary perimeter water management infrastructure. With the exception of the Discovery WRSF, the collected water will be pumped to the site attenuation pond for re-use, or monitoring and treatment (if required) prior to release to mine effluent. Contact water from the Discovery WRSF will be combined with Discovery pit contact water and used for dust control, with any excess directed to the reclaim pond.

The perimeter water management infrastructure will remain in place until mine closure activities are completed and monitoring results demonstrate that water quality conditions from the WRSFs are acceptable for discharge of all contact water to the environment without further treatment.

Further details on water management at the WRSFs, including the site wide water balance, are provided in SD 2-6 Surface Water Management Plan.

4.4 Closure and Reclamation

Mine closure and reclamation of the WRSFs will utilize currently accepted management practices and appropriate mine closure techniques that will comply with accepted protocols and standards (SD 2-17 Mine Closure and Reclamation Plan).

The footprint of the WRSFs indicated on Figures 2.4 and 2.5 show the closure footprint.

Geochemical testing indicates that all overburden and most waste rock at the B4, B7 and A45 WRSFs are non-acid generating and drainage water quality is expected to meet MMER monthly mean effluent limits. A cover system is not considered for the B4, B7 and A45 WRSFs.

Some of the waste rock at Discovery has an uncertain acid rock drainage (ARD) potential in the long-term; however, the Discovery WRSF is not expected to generate acidic drainage in the short-term based on the low reactivity of PAG rock (as demonstrated in kinetic testing) and AEM's experience at Meadowbank where the waste rock pile containing PAG rock froze within the first year of deposition. The Discovery WRSF is also expected to freeze prior to the onset of ARD. The ARD potential of Discovery rock will be verified during mining through monitoring of the buffering capacity and sulphur content of Discovery waste rock and monitoring of rock pile contact water quality. A surface layer of non PAG rock will be placed on the WRSF to host the active thaw layer should operational monitoring identify that some of the Discovery waste rock is PAG.

Once water quality monitoring results from each rock pile demonstrate that water quality is acceptable for direct release to the environment, contact water channels and sumps will be removed and a layer of NPAG rock will be placed over sediment in the sumps to prevent dusting and erosion.

In addition, as the facilities will be designed for long-term stability, no additional re-grading will be required as part of closure activities. It is anticipated that the lichen community will naturally re-vegetate the surface of the facilities over time.

The final Mine Closure and Reclamation Plan for the Project (SD 2-17) will be developed in conjunction with the mine plan so that considerations for site closure can be incorporated into the design and operation of the waste rock storage facilities. Monitoring will be carried out during all stages of the mine life to demonstrate geotechnical stability and the safe environmental performance of the facilities (Section 4.5). If any non-compliant conditions are identified, then maintenance and planning for corrective measures will be completed in a timely manner to ensure successful completion of the closure and reclamation plan.

4.5 Anticipated Environmental Performance

The WRSFs will be designed and operated to minimize the impact on the environment and considering geotechnical and geochemical stability. The material will be generally transported by truck and end-dumped, following a sequence developed for the operation.

It is proposed that each pile within a WRSF be constructed as an individual cell. The limit of each cell will be defined by a low berm, prior to, or concurrent with, placing material within the cell. Waste rock and overburden will be placed within the same area. Waste rock is expected to provide the robust matrix on which depends the long term behaviour of the impoundment. The geotechnical stability of the facility will be routinely monitored, and will be subject to annual inspections by a qualified Geotechnical Engineer.

Dust is expected to be a minor issue during operation. Waste rock produced at the site will generally be large in size, and not susceptible to wind erosion. Therefore, airborne dust is not expected to be an issue with respect to the waste rock piles. The overburden contains material that is smaller in size and more susceptible to wind erosion. However, the overburden materials are relatively high in moisture content, and therefore, wind eroded dust from the overburden stockpiles is not expected to be an issue. The need for additional dust control measures will be evaluated and implemented during operations, as required.

Seepage through the foundation and the piles is anticipated during operation of the WRSF. Seepage from each storage facility will be collected and managed using downstream perimeter ditching and sumps, as required. The perimeter water management infrastructure will also capture surface runoff reporting from the storage facilities. The water collected will be monitored and treated as required, prior to release to the environment, as part of the mine water management plan for the site (SD 2-6 Surface Water Management Plan). Each WRSF will be designed and operated to minimize seepage by promoting freeze back in the foundations and in the stored materials.

The WRSFs will be designed for stability by a Geotechnical Engineer qualified to work in permafrost environments. The waste rock and overburden will be disposed on land and in a manner that encourages total freezing as a control strategy. Based on experience at a similar project in the region (i.e., Meadowbank), it is expected that the material within each storage facility will freeze within one to two years of placement. This will be confirmed with thermal analyses to be completed during the detailed design phase of the Project, and thermistors will be placed during operations to confirm the rate of freezing for the various material cells. If required, management of the facilities will be modified based on the monitoring results. Therefore, potential implications to the stability of the facilities associated with periglacial processes (e.g., rock heave) are expected to be minor.

Operational monitoring of the Discovery WRSF will include monitoring of the buffering capacity and sulphur content of Discovery waste rock. The quality of waste rock contact water reporting from each WRSF will be monitored during operations.

4.6 Proposed Monitoring Activities

Table 4 summarizes the proposed monitoring activities for each WRSF. Each monitoring activity will be further defined, including location and type of instrumentation, at the detailed design stage of the Project according to an approved environmental protocol.

Table 4: Waste Rock and Overburden Proposed Monitoring Activities

Waste Rock Storage Facility	**Monitoring Periods**[1]								
	Pre-development	Operations					Closure and Post-closure[3]		
B7 West/East/South	Contact water collection and water quality monitoring[2]		Seepage collection and monitoring	Thermistor installations and freezeback monitoring	Routine geotechnical inspections	Annual geotechnical inspection by qualified Geotechnical engineer	Seepage collection and water quality monitoring[4]	Thermistor monitoring	Annual geotechnical inspection by qualified Geotechnical engineer
B4	Contact water collection and water quality monitoring[2]	Monitoring for buffering capacity and Sulfur content at Pump Pit	Seepage collection and monitoring	Thermistors installation and freezeback monitoring	Routine geotechnical inspections	Annual geotechnical inspection by qualified Geotechnical engineer	Seepage collection and water quality monitoring[4]	Thermistor monitoring	Annual geotechnical inspection by qualified Geotechnical engineer
A45	Contact water collection and water quality monitoring[2]	Monitoring for buffering capacity and Sulfur content at F Zone Pit	Seepage collection and monitoring	Thermistors installation and freezeback monitoring	Routine geotechnical inspections	Annual geotechnical inspection by qualified Geotechnical engineer	Seepage collection and water quality monitoring[4]	Thermistor monitoring	Annual geotechnical inspection by qualified Geotechnical engineer
Discovery	Contact water collection and water quality monitoring[2]	Monitoring for buffering capacity and Sulfur content at Discovery Pit	Seepage collection and monitoring	Thermistors installation and freezeback monitoring	Routine geotechnical inspections	Annual geotechnical inspection by qualified Geotechnical engineer	Seepage collection and water quality monitoring[4]	Thermistor monitoring	Annual geotechnical inspection by qualified Geotechnical engineer

Note 1: Monitoring periods are dependent on the life span of each WRSF. Generally, the pre-development period corresponds to one year before the beginning of the WRSF operation as presented in Table 1.
Note 2 Contact water at the pre-development stage comes from the construction and preparation activities (e.g. access roads, etc.) and is expected to require monitoring mainly for sediment control.
Note 3: Post-closure monitoring activities depend on monitoring results. The activities included in post-closure monitoring and their duration will depend on the performance of all closure measures.
Note 4: Water management infrastructure will remain in place until mine closure activities are completed and monitoring results demonstrate that contact water quality from the WRSFs and other mine infrastructure is acceptable for discharge to the environment without further treatment.

5.0 TAILINGS

Tailings are the processed material by-product of the gold recovery process. Tailings will be first processed through a cyanide destruction circuit before being pumped to the TSF area located north of Tiriganiaq pit. The TSF will be surrounded on the east, west, and south sides by the B7 waste rock storage facility (see Figure 2.4).

The TSF has been designed to hold life of mine tailings and provide a reclaim pond until end of mine operations. The tailings are to be deposited from the north to the south such that the reclaim pond shifts southward during operations. The current tailings deposition plan would result in NPAG tailings deposition over the majority of the deposit in the last three years. The exception would be at the north end of the facility. The tailings deposition plan will be reviewed during the detailed design phase of the Project to extend NPAG tailings deposition at the north end of the facility toward the end of mine life, to verify that NPAG tailings cover the entire surface area of the TSF.An engineered cover will also be placed over the tailings surface at the end of operations. The tailings deposition allows for closure activities to commence prior to the end of mining operations (i.e., progressive reclamation).

To assist with the environmental impact assessment phase of the Project, the location for the TSF was selected based on environmental, social, economic and technological considerations. The characterization was conducted according to a set of criteria (indicators) specifically developed for the Project as described in SD 2-2 Tailings Alternatives Assessment Report.

The discharge water quality and the water management structures for the TSF will be monitored and assessed according to an approved environmental protocol during each stage of the mine life, including construction, operations, closure, and post-closure.

Additional information regarding the TSF area and its preliminary design is provided in the support document SD 2-3 TSF Preliminary Design Report. Detailed design of the TSF will be completed by a qualified Geotechnical Engineer during the detailed design phase of the Project.

5.1 Tailings Storage Facility Operational Parameters

Properties of the tailings and TSF operation parameters relevant to the design of the TSF are presented in Table 4.

Table 5: Relevant Data for the Tailings Storage Facility

Parameters	Value
Mine design life	13 years
Mill production	2.9 Mt/year
Ore processed	37.8 Mt
- Tiriganiaq	26.3 Mt
- F Zone	2.1 Mt
- Pump	1.7 Mt
- Discovery	3.2 Mt
- Wesmeg	4.6 Mt
Average specific gravity of tailings	2.73 to 2.82 t/m^3
Tailings slurry solids content	55%
Assumed void ratio (unfrozen)	1.0
Assumed settled dry density (unfrozen)	1.37 t/m^3
Average tailings pond volume	2.9 Mm^3

5.2 Tailings Deposition Plan

The following presents the results of a preliminary deposition plan for the TSF. The objectives of the preliminary deposition plan were to confirm the storage capacity of the facility (Section 5.3) and to evaluate the feasibility of the conceptual closure concept for the TSF (Section 5.5).

5.2.1 Operational Criteria and Parameters

The tailings deposition plan was developed using the following operational criteria and parameters:

- A total planned tonnage of 37.8 Mt produced over a mine life of 13 years (34.4 Mt to be sent to the TSF and 3.4 Mt to be sent underground as paste backfill) (Note: the current mine plan indicates that 37.6 Mt of tailings will be produced over the mine life);
- An annual planned production of tailings to be sent to the TSF as presented in Table 5;
- Estimated pond volume fixed at a maximum of 2.9 Mm^3 during operations, diminishing to 1 Mm^3 in the last year of the operation. The 2.9 Mm^3 is based on the annual tailings water volume sent to the TSF including the design storm event;
- Average settled tailings dry density of 1.14 t/m^3 (this value includes 20% bulking factor due to ice);
- Tailings beach slope of 1% above water;
- Tailings beach slope below water of 5%; and
- Perimeter discharge points.

Table 6: Annual Tailings Planned Production

Milling Schedule (Year)	1	2	3	4	5	6	7	8	9	10	11	12	13
Tailings to TSF (1000's tonnes dry)	2,161	2,599	2,843	2,868	2,856	2,842	2,814	2,814	2,814	2,814	2,814	2,724	1,466

The deposition of tailings was modelled at four stages during the operation of the TSF. Table 6 presents the deposition periods considered with the corresponding tonnages and volumes of tailings modelled as well as the estimated pond volumes.

Table 7: Deposition Stage Values

Time Period	Tailings Stored		Tailings Stored		Estimated Pond Volume (Mm^3)
	Incremental (Mt)	Cumulative (Mt)	Incremental (Mm^3)	Cumulative (Mm^3)	
Year 2	4.76	4.76	4.18	4.18	2.9
Year 5	8.57	13.33	7.51	11.69	2.9
Year 9	11.28	24.61	9.90	21.59	2.9
Year 13	9.82	34.43	8.61	30.20	1.0

5.2.2 Deposition Plan

The main driver behind the deposition plan is progressive site closure. Progressive reclamation will start in the northern sector of the TSF and will progressively move towards the south of the facility. Considering this and also other operational requirements, the deposition plan was developed along the following guidelines:

- Maintain the tailings pond away from the perimeter dikes;
- Maintain a tailings reclaim pond with minimum water depth of 4 m for pumping purposes (this depth includes an average 2-m ice cap in winter);
- Maintain a 2-m freeboard for water above the operating pond;
- Maintain a minimal elevation of 0.5 m between the tailings and the dike crest (this elevation may be higher with regards to spillway location and closure scenario);
- Gradually move the pond towards the south and center of the facility towards the end of the mine life to facilitate closure;
- Aim for a gently sloping tailings surface towards the south of the TSF at the end of the operation to facilitate closure of the facility; and
- Aim to keep tailings surface below elevation 81 m in spillway area to reduce need to excavate tailings in this area as part of closure.

Deposition has been modelled using discharge points positioned all around the perimeter of the facility with the pipeline located at the upstream crest of the dike, and the spigot discharge locations 0.5 m below crest. Tailings will be discharged from the perimeter dike throughout the operation. Towards the end of the operation, discharge points inside the TSF will be required to develop a gently sloping surface towards the south of the facility. Access roads or platforms for discharge points inside the facility will be constructed if required.

Figure 5.1 presents the evolution of the tailings deposition surface throughout mine life. The deposition plan shows most of the deposition being done from the northwest end of the facility to develop beaches and a sloping surface towards the south. Deposition around the southern portion of the facility is also required throughout the life of the operation to maintain beaches in front of the TSF dikes. Near the end of the operation, spigots along the northwest boundary of the facility are planned to progressively advance towards the southeast to develop the final tailings surface (Figure 5.2) and allow progressive reclamation to take place in the northwest sector. With this deposition plan, it is assumed that access roads or platforms (possibly as part of the TSF reclamation cover) will be constructed, if required, to set up the discharge points inside the facility.

5.3 Tailings Storage Facility Capacity

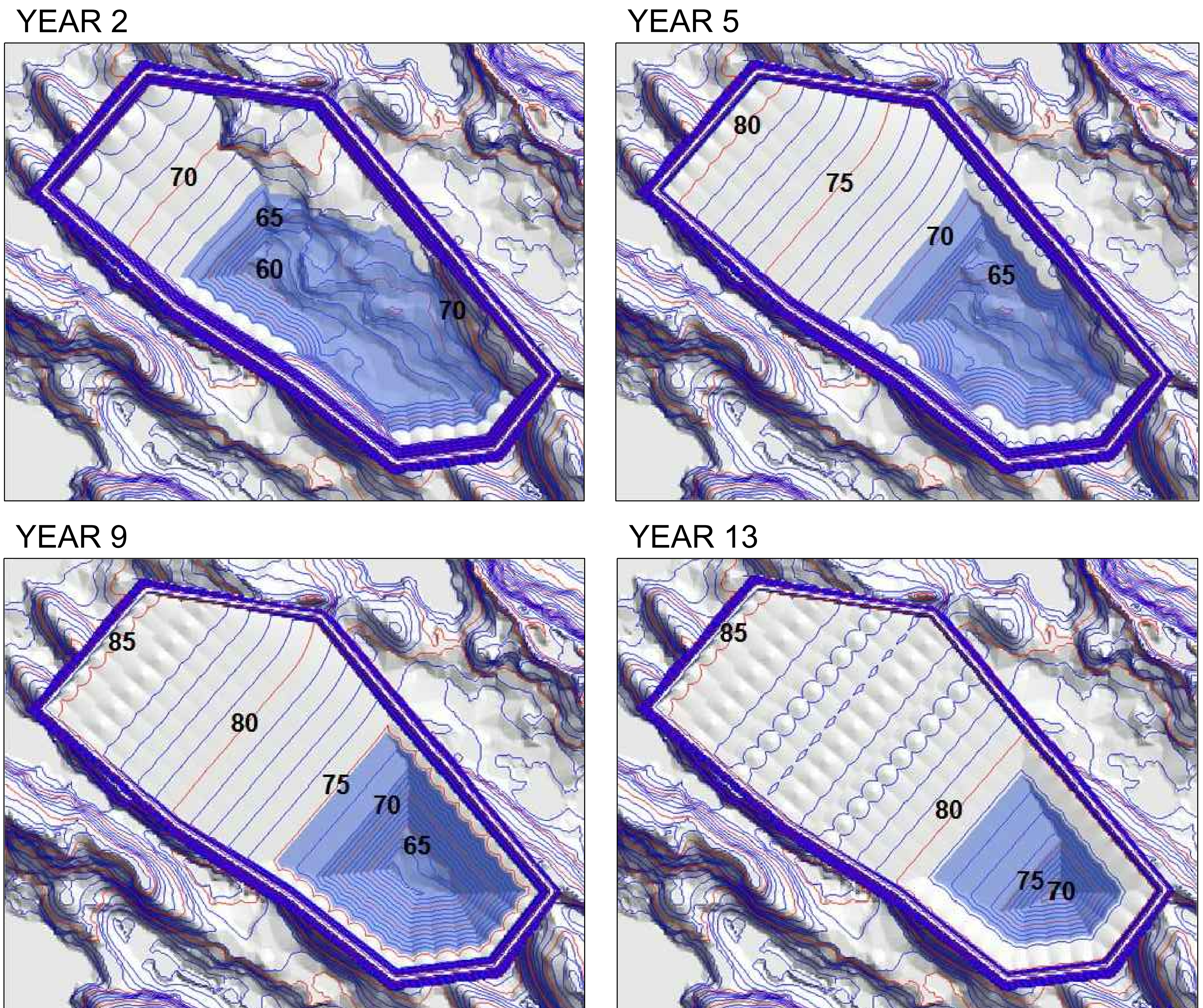
The required tailings storage capacity is calculated using the total life of mine tailings production mass going to the TSF (total tailings production of 37.8 Mt from which ~34.4 Mt are to be storaged at surface and 3.4 Mt to be used as backill) and the estimated average in-situ tailings density (1.14 t/m^3, including bulking due to ice) and requires a total storage volume of 30.2 Mm^3.

Figure 5.3 presents the available storage capacity curves for the four deposition periods modeled in the deposition plan. These curves represent the estimated free volume versus elevation between the modeled tailings surface and the fixed freeboard, and are based on a final elevation of 86 m for the dike crest and freeboard of 2 m (maximal pond elevation set at 84 m). The available storage capacity gradually decreases throughout the mine life from 32 Mm^3 to 6 Mm^3.

Figure 5.4 shows the tailings stored and the total storage capacity at struck level for the TSF at Year 13 of operation. The total capacity of the TSF (struck level) is 36 Mm^3 at elevation 84 m. Therefore, there is about 6 Mm^3 of storage volume available above the final tailings surface that can be used as contingency for ice entrapment, reclaim water or additional tailings.

For the given modelling parameters, the maximum tailings elevation is 85.5 m at the northwest end of the facility at the end of the operation. The tailings elevation decreases to 80.1 m at the southeast end of the facility. The pond elevation reaches its maximum elevation of 78.8 m at Year 13.

The tailings production rate from the mill will be monitored and crosschecked against the ore milling rate during operations. The solids content of the tailings slurry will also be monitored and compared against the reclaim pond volume and reclaim rate to monitor the cumulative mass of tailings deposited within the TSF. The reclaim pond and in-situ tailings elevations will be surveyed on an ongoing basis, and a combined bathymetric and topographic survey of the pond and the tailings beach will be completed on an annual basis to confirm tailings and water volumes and available storage capacity within the TSF. Results of the survey will be used to update the tailings deposition plan for the facility, as required.

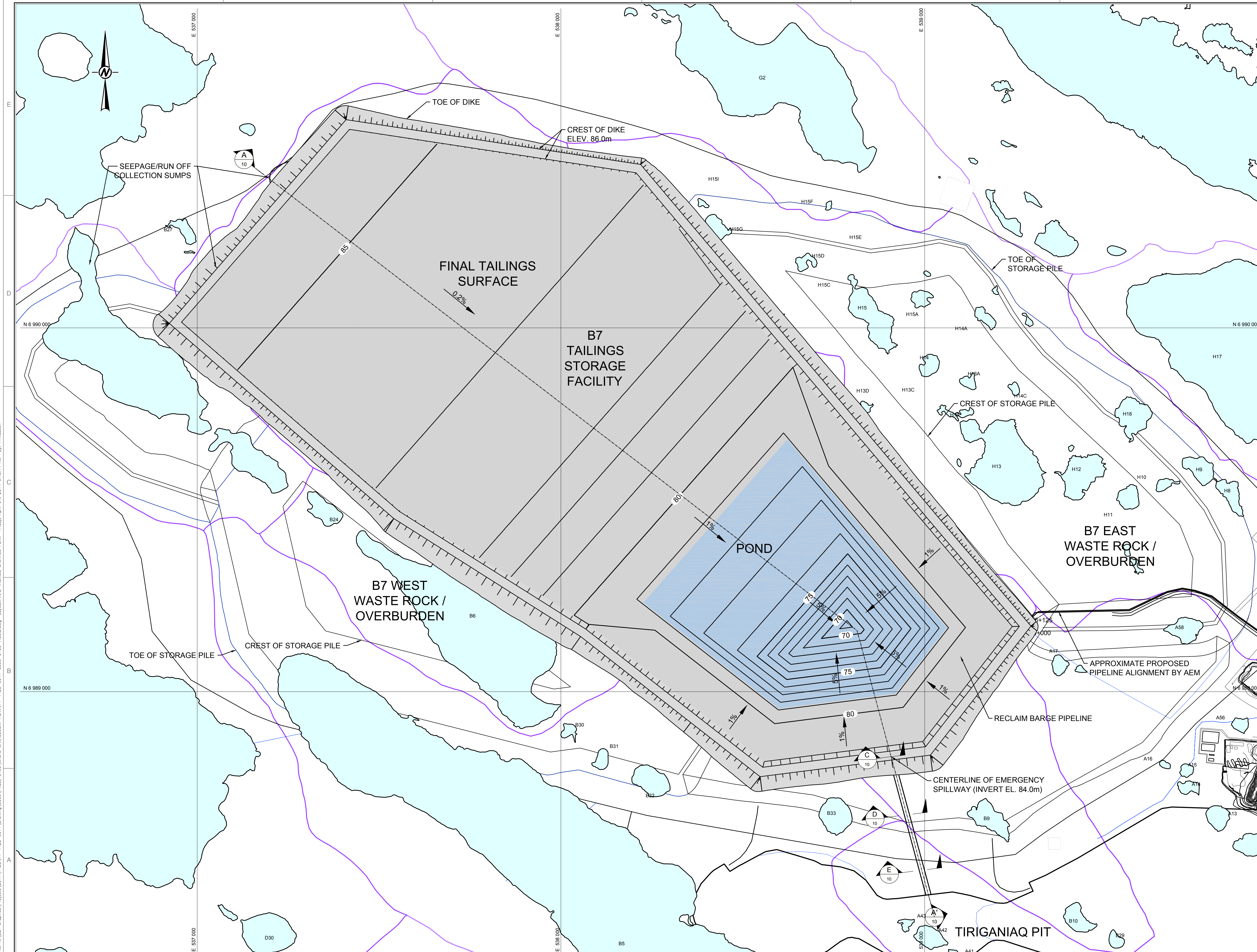


PROJECT	AGNICO EAGLE MINES LIMITED MELIADINE GOLD PROJECT NUNAVUT
TITLE	TAILINGS DEPOSITION SURFACE THROUGHOUT THE OPERATION OF THE TSF

PROJECT No.		11-1428-0011	FILE No. 11-1428-0011-FIG 5.1
DESIGN	AMD	2012-09-04	SCALE NOT APPLICABLE / REV. 0
CADD	SB	2012-09-04	
CHECK	DRW	2013-01-14	FIGURE 5.1
REVIEW	DRW	2013-01-14	

AGNICO EAGLE

Golder Associates



LEGEND

- TAILINGS STORAGE FACILITY DIKE
- LAKE
- WATERSHED BOUNDARY
- WATER MANAGEMENT INFRASTRUCTURE
- ACCESS / HAUL ROADS
- MAJOR TOPOGRAPHIC CONTOUR
- MINOR TOPOGRAPHIC CONTOUR
- POND
- TAILINGS

NOTES

1. ALL ELEVATIONS ARE IN METRES TO NORTH AMERICAN DATUM 1983 (NAD 83).
2. ALL COORDINATES ARE IN METRES TO UNIVERSAL TRANSVERSE MERCATOR PROJECTION (UTM) NAD83 ZONE 15.
3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
4. EXISTING TOPOGRAPHIC CONTOURS SHOWN AT 1m INTERVALS.
5. PIPELINE TO BE RELOCATED AS REQUIRED TO ADVANCE TAILINGS DEPOSITION FROM NORTHWEST TO SOUTH EAST.
6. FINAL TAILINGS SURFACE PRESENTED IS CONCEPTUAL AND IS EXPECTED TO BE DEVELOPED THROUGH TAILINGS DEPOSITION PLANNING AND PROGRESSIVE ROCKFILL COVER PLACEMENT FOR CLOSURE.

REFERENCES

1. 2007, 2009 AND 2011 TEST HOLE LOCATIONS SURVEYED AND PROVIDED BY AGNICO EAGLE MINES LIMITED. CAD FILE: GT_HOLES .DWG, NOVEMBER 2011.
2. BASE PLAN PROVIDED BY AGNICO EAGLE MINES LIMITED. SEPTEMBER 27 AND 29, 2011.

NOT FOR CONSTRUCTION

0 100 200 300m
SCALE

REV	DATE	DESCRIPTION	DRW	DES	CHK	RVW
0	01/11/13	ISSUED WITH VER. 0 REPORT	S.S.S.	J.C.C.	S.S.S.	J.C.C.

CLIENT
AGNICO EAGLE MINES LIMITED

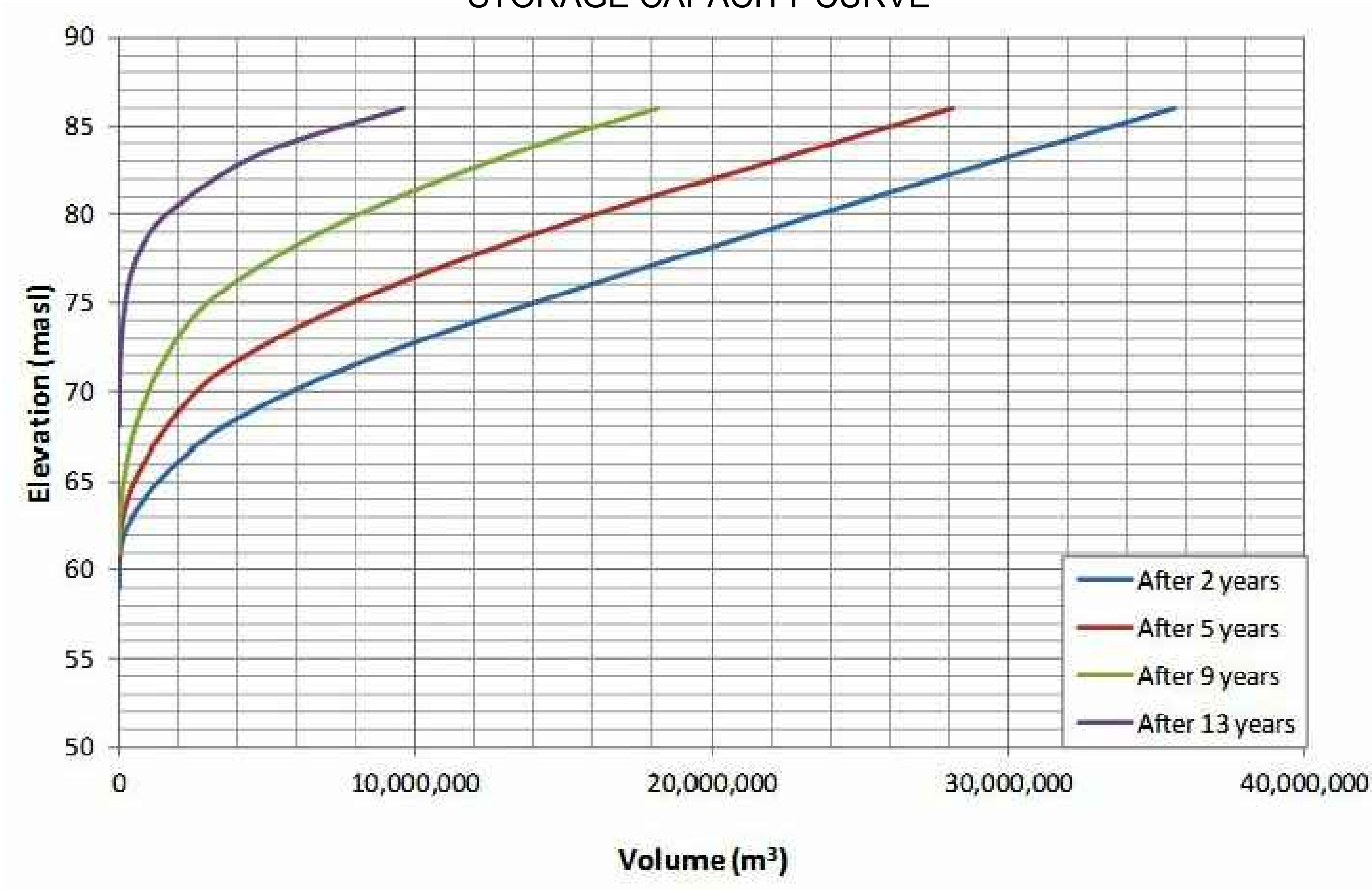
CONSULTANT
Golder Associates

PROJECT 11-1428-0011/3000/3400
MELIADINE MINE TAILINGS STORAGE FACILITY PRELIMINARY DESIGN

TITLE
FINAL TAILINGS STORAGE PLAN

DRAWING No. FIGURE 5.2
SHEET No. - OF -
SHEET SIZE ANSI D

STORAGE CAPACITY CURVE



PROJECT

AGNICO EAGLE

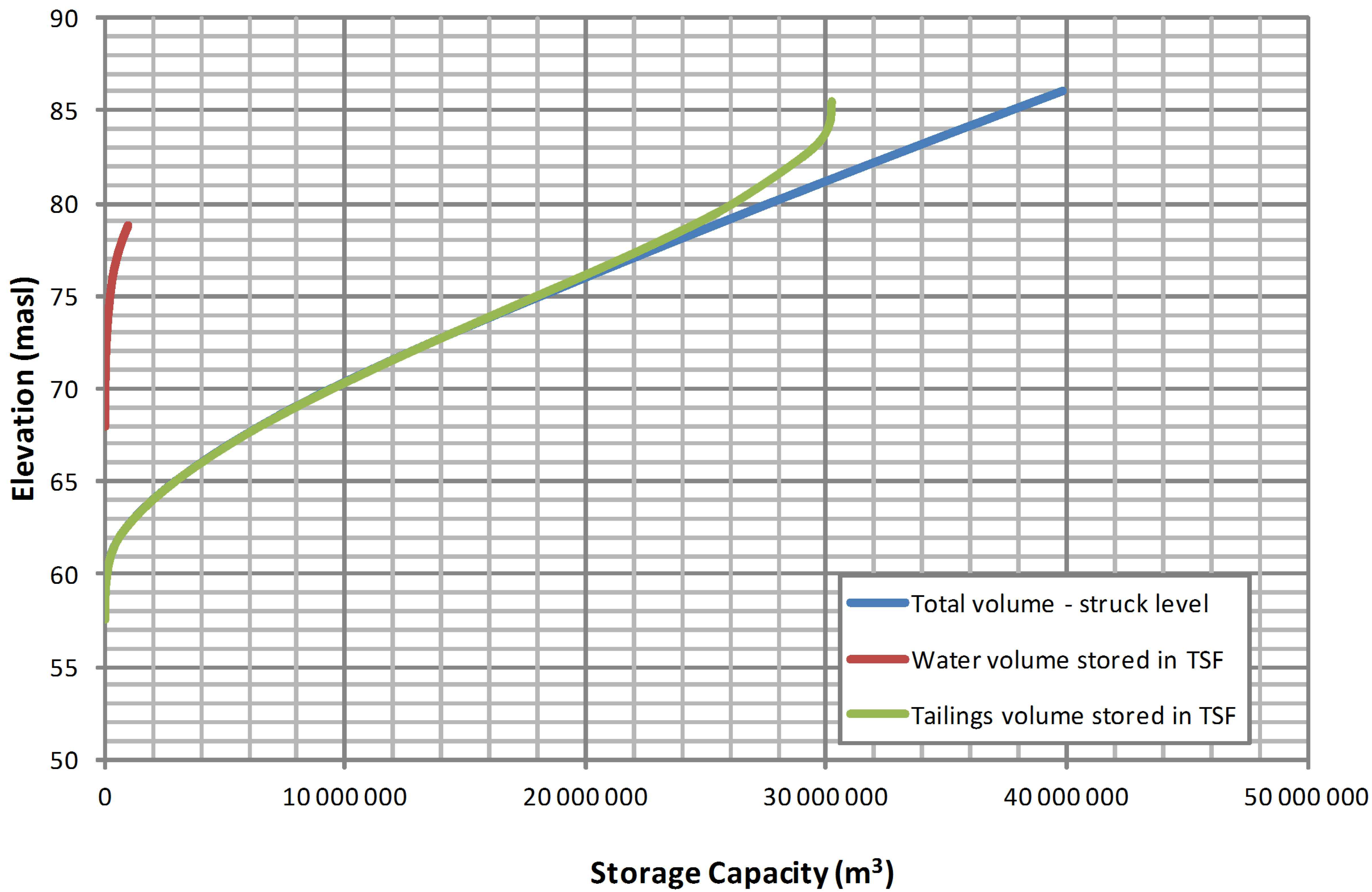
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

EVOLUTION OF STORAGE CAPACITY THROUGHOUT THE OPERATION OF THE TSF

PROJECT No.		11-1428-0011	FILE No. 11-1428-0011-FIG 5.3	
DESIGN	AMD	2012-09-04	SCALE NOT APPLICABLE	REV. 0
CADD	SB	2012-09-04	FIGURE 5.3	
CHECK	DRW	2013-01-14		
REVIEW	DRW	2013-01-14		

Golder Associates



NOTE:

TAILINGS AND WATER VOLUMES CAN ONLY BE USED FOR THE SCENARIO 2 AS IT WAS MODELLED. TOTAL VOLUME WILL BE THE SAME FOR EVERY SCENARIO.

PROJECT

AGNICO EAGLE

AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE

FINAL TSF STORAGE CAPACITY BY ELEVATION CURVES - YEAR 13

Golder Associates

PROJECT No.		11-1428-0011	FILE No.	11-1428-0011-FIG 5.4
DESIGN	AMD	2012-09-04	SCALE NOT APPLICABLE	REV. 0
CADD	SB	2012-09-04	FIGURE 5.4	
CHECK	DRW	2013-01-14		
REVIEW	DRW	2013-01-14		

5.4 Contact Water Management

The water management objectives for the Project are to minimize potential impacts to the quantity and quality of surface water at the site (SD 2-6 Surface Water Management Plan). Diversion channels will be constructed as needed to direct clean runoff away from the TSF area. Seepage and runoff from the TSF will be collected so that these water sources can be re-used in process, or analyzed and treated if required prior to discharge to the receiving environment. Water sources from the TSF will be managed as follows during operations:

- Seepage and runoff from the north side of the facility will be collected in a series of seepage collection ponds and pumped back to the reclaim pond;
- Seepage and runoff from east, south and west sides of the TSF will report to ditches and/or sumps, and will be pumped backed to the reclaim pond or re-directed to the site attenuation pond;
- Any process water (supernatant) seepage and surface water runoff from the tailings will be collected within the reclaim pond. Contact water reporting to the open pits will also be directed to the reclaim pond; and
- Reclaim pond water will be re-used in the process. The reclaim of supernatant and runoff water from the reclaim pond will be achieved using a floating barge, which will be moved progressively during the operation of the TSF.

At closure, the reclaim pond will be drained and the engineered cover graded to promote surface drainage towards the operating spillway. It is anticipated that the reclaim pond water will require treatment prior to discharge at closure. The water quality of surface runoff from the facility once the engineered cover has been placed will be monitored until it meets the discharge criteria that will be established for the Project during the water licensing stage. Surface runoff from the TSF will be directed through the spillway to Tiriganiaq Pit once it is shown to be of suitable quality for release without further management and treatment.

Water management infrastructure will remain in place until mine closure activities are completed and monitoring results demonstrate that contact water quality from the TSF and other mine infrastructure is acceptable for discharge to the environment without further treatment.

Further details on water management at the TSF, including the site wide water balance, are provided in SD 2-6 Surface Water Management Plan.

5.5 Tailings Freezeback

Based on ground temperatures measured in thermistors installed in the TSF footprint area and climate data for the Project site, it is anticipated that the TSF will freeze in the long term. During operation, efforts will be made to operate the facility to promote freezing of the foundation and the tailings deposit, which will help to minimize potential seepage from the facility. Monitoring data from other mine sites in the North (e.g., Meadowbank) indicates that tailings freezeback begins shortly after deposition.

A simplified 1-dimensional thermal model was developed to evaluate the potential rate of tailings and TSF foundation freezeback at the Project, both under current climate conditions and with climate change. The model was run for a period of 100 years considering instantaneous placement of the tailings to the full capacity of the facility at time zero, and at a temperature of 6°C. This is considered conservative as the tailings would in fact be placed in layers and would freeze progressively throughout the mine life. To investigate the potential effect of climate change, a 6.4°C temperature increase was assumed to occur uniformly over the 100 year period, equivalent to an annual increase of 0.064°C. The 6.4°C temperature increase follows the worst case "high sensitivity" model described by the Intergovernmental Panel on Climate Change (IPCC 2007). Further details on the analytical methodology, input parameters, and results from the thermal model are provided in FEIS Volume 6 Appendix 6.3-E.

Tables 7 and 8 summarize the modelled length of time required to freeze the tailings and foundation materials within the B7 basin footprint and on the surrounding dry ground, respectively. Results are presented for both current temperatures and temperatures affected by climate change.

Table 8: Time to Freeze Tailings and Foundation within the B7 Basin Footprint

Location in Section	Approximate Time to Freeze (years)	
	Current average temperature	Assuming Climate Change Predictions
Mid-depth of tailings (El. 71.5 m)	12 years	12 years
Base of tailings (El. 58 m)	28 years	28 years
Bedrock surface (El. 52 m)	40 years	41 years
Bedrock 66 m below tailings surface (El.19 m)	95 years	100 years

Table 9: Time required to Freeze Tailings and Foundation on Dry Ground

Location in Section	Approximate Time to Freeze (years)	
	Current average temperature	Assuming Climate Change Predictions
Mid-depth of tailings (El. 74.5 m)	3 years	3 years
Base of tailings (El. 64 m)	Less than 1 year	Less than 1 year
Bedrock surface (El. 55.5 m)	Remains Frozen	Remains Frozen

The simplified thermal model results indicate that complete freezing of the tailings, foundation soils and bedrock will occur with time even when climate change is considered. The model results also suggest that minimal thawing of the original ground is expected in permafrost areas.

A detailed thermal assessment of the TSF will be completed during the detailed design phases of the Project to confirm that the facility will freeze. If thermal analyses completed in future stages of the design indicate that the facility will not freeze back post-closure, a contingency closure plan will be developed, which may include the consideration of a low conductivity barrier. Thermistors will also be installed in the northwest area of the TSF during progressive reclamation, as the pond is shifted to the southeast and the closure cover is placed over the final tailings surface. Data collected from these thermistors will provide information regarding the post-closure thermal performance of the facility. The locations and number of instruments will be defined during the detailed design phase for the TSF.

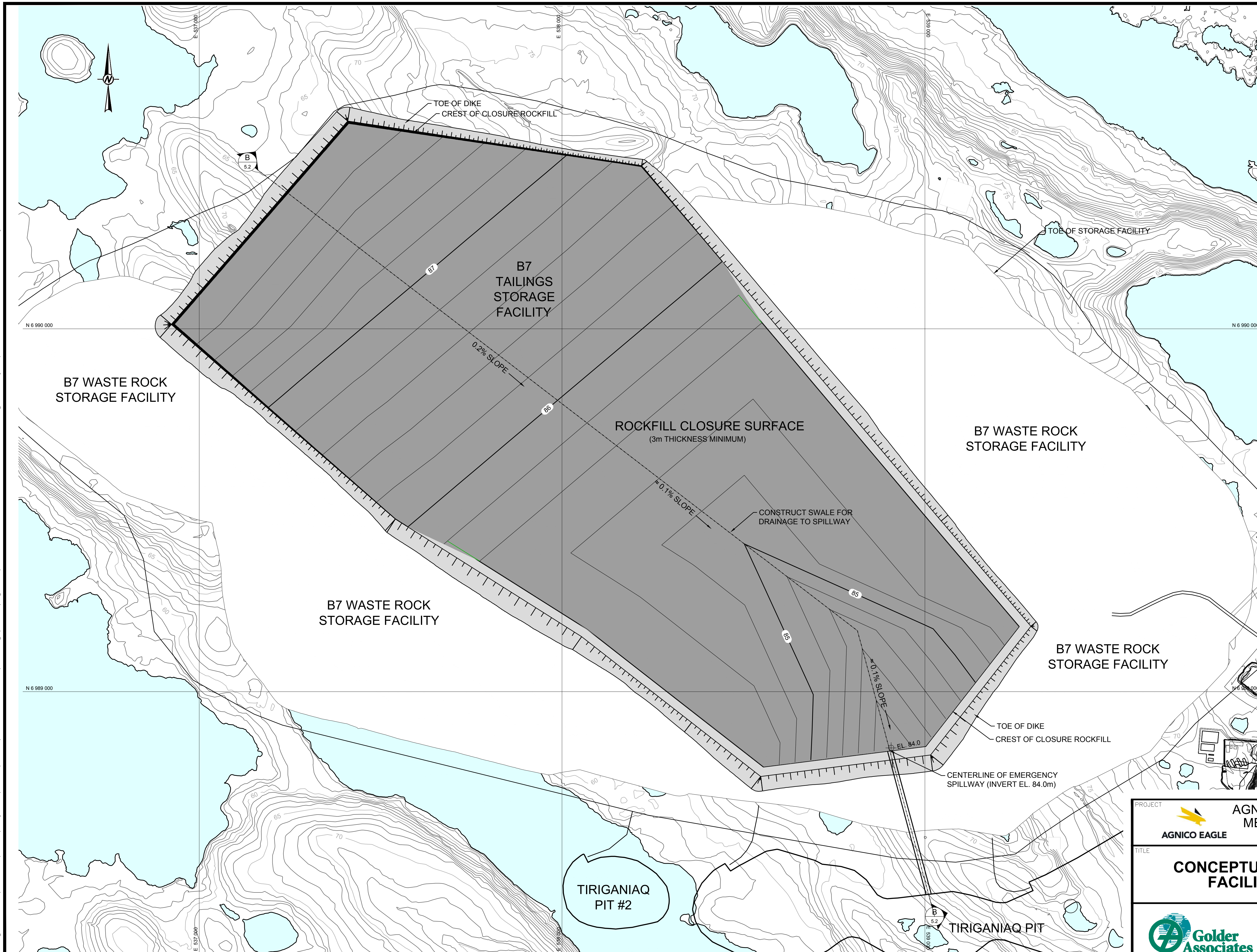
5.6 Closure and Reclamation

Mine closure and reclamation of the TSF will utilize currently accepted management practices and appropriate mine closure techniques that will comply with accepted protocols and standards (SD 2-17 Mine Closure and Reclamation Plan).The current geochemistry characterization and mine plan indicate that the last three years of tailings production are non PAG; however, some of the tailings produced prior to that time have an uncertain acid generation potential. The current tailings deposition plan would, with exception of the north end of the facility, result in non PAG tailings deposition over the the tailings deposit in the last three years. During the detailed design phase of the Project, the tailings depsotion plan will be reviewed and updated to extend non PAG tailings deposition at the north end of the faicility toward the end of mine life to ensure that non PAG tailings cover the entire surface area of the TSF.

The general closure concept for the TSF is to progressively place an engineered over the graded tailings surface. The intent of the engineered cover will be to limit vertical infiltration of water to the tailings surface. The placement of the engineered cover will also help prevent dust production.

At closure, the reclaim pond will be drained and the engineered cover graded to promote surface drainage towards the operating spillway. It is anticipated that the reclaim pond water will require treatment at closure. The water quality of surface runoff from the facility once the engineered cover has been placed will be monitored until it meets discharge criteria. Surface runoff from the TSF will be directed through the spillway to Tiriganiaq Pit once it is shown to be of suitable quality for release without further management and treatment.

The final Mine Closure and Reclamation Plan for the Project will be developed in conjunction with the mine plan so that considerations for site closure can be incorporated into the design and operation of the TSF. Monitoring will be carried out during all stages of the mine life to demonstrate the acceptable performance of the facilities (Section 5.7). If any non-compliant conditions are identified, then maintenance and planning for corrective measures will be completed in a timely manner to ensure successful completion of the closure and reclamation plan.



Drawing File: N:\Bur-Graphics\Projects\2010\1373\10-1373-0076\Drafting\6300\Figures\10-1373-0076-6000-FIG5_1-R0.dwg Friday, April 04, 2014 9:54:14 AM By: TYKlassen

LEGEND

- CONCEPTUAL ROCKFILL PLACEMENT AT CLOSURE
- TAILINGS STORAGE FACILITY DIKE
- LAKE
- MAJOR TOPOGRAPHIC CONTOUR (5m)
- MINOR TOPOGRAPHIC CONTOUR (1m)

NOTES

1. ALL ELEVATIONS ARE IN METRES TO NORTH AMERICAN DATUM 1983 (NAD 83).
2. ALL COORDINATES ARE IN METRES TO UNIVERSAL TRANSVERSE MERCATOR PROJECTION (UTM) NAD83 ZONE 15.
3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
4. EXISTING TOPOGRAPHIC CONTOURS SHOWN AT 1m INTERVALS.

REFERENCES

1. 2007, 2009 AND 2011 TEST HOLE LOCATIONS SURVEYED AND PROVIDED BY AGNICO EAGLE MINES LIMITED. CAD FILE: GT_HOLES .DWG, NOVEMBER 2011.
2. BASE PLAN PROVIDED BY AGNICO EAGLE MINES LIMITED. DATE: SEPTEMBER 27 AND 29, 2011.
3. DRAWING FROM SD 2-3 TSF PRELIMINARY DESIGN REPORT.

NOT FOR CONSTRUCTION

0 100 200 300m
SCALE

PROJECT
AGNICO EAGLE MINES LIMITED
MELIADINE GOLD PROJECT
NUNAVUT

TITLE
CONCEPTUAL TAILINGS STORAGE FACILITY CLOSURE PLAN

PROJECT No. 10-1373-0076			PHASE No.	6300
DESIGN	A.S.	14JAN2013	SCALE AS SHOWN	REV. 0
CADD	R.H.	14JAN2013	**FIGURE 5.5**	
CHECK	D.W.	14JAN2013		
REVIEW	J.H.	14JAN2013		

5.7 Anticipated Environmental Performance

The Meliadine TSF will be designed and operated to minimize the impact on the environment.

Experience with hydraulic placement of tailings indicates that dust is not a significant issue during operation. Tailings are most often either submerged, moist, or frozen so do not allow for significant dust production. The tailings are also deposited below the crest of the containment dikes; therefore, it is difficult for wind to distribute the tailings dust beyond the containment dikes. At closure, the tailings will be covered with an engineered cover which will prevent dust production. The progressive placement of this engineered cover as the tailings reach their maximum elevation will also help prevent dust production during the final years of operation. Progressive reclamation is planned to start in the northern sector of the TSF and progressively move towards the south of the facility. The need for additional dust control measures, including consideration of wind baffles, will be evaluated and implemented during operations, as required.

During operation of the TSF, seepage through the foundation and liner of the containment dikes is anticipated. The facility will be designed and operated to minimize this seepage by promoting freezeback in the foundations and the tailings (Section 5.5); however, not all seepage can be avoided. Seepage through the liner of the containment dikes will be collected and managed using downstream perimeter ditching and sumps, as required.

Seepage to the talik below Lake B7 during TSF operation is anticipated to be at a very low flux rate and with minimal quantity. During operations, this seepage will report to the Tiriganiaq underground workings, and will be collected as part of the underground mine water management system. Seepage flux to the foundation will be controlled by the low hydraulic conductivity tailings deposited over the base of the TSF and the low hydraulic conductivity of the bedrock that is anticipated to be within 5 to 10 m of the surface within the TSF footprint. Hydrogeology tests indicate that the deeper bedrock at the project site below the base of the permafrost or in taliks is generally of low hydraulic conductivity, on the order of 3×10^{-9} m/s. Groundwater velocities in the deep groundwater regime are very low, on the order of 0.2 to 0.3 m per year, and it is estimated that groundwater from Lake B7 would take over 5,000 years to travel in a northeast direction to Meliadine Lake. More details on anticipated seepage from the TSF can be found in FEIS Volume 7 Section 7.2.

At closure of the TSF, the tailings pond will be pumped out and an engineered cover will be placed over the tailings to minimize infiltration of precipitation in to the tailings deposit. Without a head of ponded water, seepage from the TSF is anticipated to significantly decrease at closure. Post closure, the facility is anticipated to freeze further reducing seepage (Section 5.5).

Thermistors and piezometers will be installed within the TSF dike and foundation during construction to monitor temperatures and pore water pressure conditions. The data will be used to evaluate seepage and freezing of the TSF, and of the dike and foundation. The location, number and type of instruments will be defined during the detailed design phase. If it is determined that the quality of the water does not meet criteria as established during the water licensing process, then mitigation measures would be undertaken. The potential mitigation action would be dependent on observed flow rates and water quality.

The detailed design of the TSF will be prepared by a Geotechnical Engineer qualified to work in permafrost environments. The geotechnical stability of the facility will be routinely monitored, and will be subject to annual geotechnical inspections. Therefore, potential implications to the stability and operation of the TSF associated with periglacial processes (e.g., rock heave) are expected to be minor.

5.8 TSF Proposed Monitoring Activities

Table 10 summarizes the proposed monitoring activities for the TSF. Each monitoring activity will be further defined, including location and type of instrumentation, at the detailed design stage of the Project according to an approved environmental protocol.

Table 10: TSF Proposed Monitoring Activities

Type of activity	Pre-development	Operations	Closure and Post-closure
Tailings production rate monitoring at the mill	n/a	Continuous	n/a
Solids content	n/a	Continuous	n/a
Seepage collection and water quality monitoring	n/a	When water is present	When water is present[3]
Surface runoff collection and water quality monitoring	Continuous during construction	Continuous	Continuous[3]
In-situ consolidation measurements (combined bathymetric and topographic survey)	n/a	Annually	n/a
Thermistor and piezometer installation and monitoring[1,2]	Monitoring for thermal performance and pore pressure conditions in the foundations	Installation of thermistors in the north and monitoring of thermal performance[2] within the tailings and dikes	Monitoring of all thermistors
Instrumentation for monitoring the cover performance[1,2]	n/a	n/a	To be determined

Note 1: The location, number and type of instruments will be defined during the detailed design phase.

Note 2: Thermistor installation in the northeast area of the TSF is part of the progressive reclamation effort. Data collected from these thermistors will provide information for final cover system design and post closure performance of the facility.

Note 3: Water management infrastructure will remain in place until mine closure activities are completed and monitoring results demonstrate that contact water quality from the TSF and other mine infrastructure is acceptable for discharge to the environment without further treatment.

6.0 CLOSURE

We trust that the information presented in this report meets your current requirements. Should you have any questions or concerns, please do not hesitate to contact us.

Yours very truly,

GOLDER ASSOCIÉS LTÉE

ORIGINAL SIGNED

Karine Doucet, P. Eng (QC, NWT/NU)
Geotechnical Engineer

ORIGINAL SIGNED

Mayana Kissiova, P.Eng (QC)
Associate

ORIGINAL SIGNED

Anne-Marie Dagenais, Eng. Ph.D.
Project Engineer

ORIGINAL SIGNED

Dan R. Walker, Ph.D., P.Eng. (BC, NT/NU)
Associate, Project Manager

KD/AMD/YB/MK/lw

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7.0 REFERENCES

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Golder (Golder Associates Ltd.) 2009. Report “Assess of Completeness of Geotechnical Data for Feasibility Design Tiriganiaq Open Pit”, submitted to Comaplex Minerals Corp., May 26, 2009, Doc. 008 Rev. 0

Golder 2011a. Technical Memorandum “Meliadine Project – Mine rock Management – Meeting Notes from May 20, 2011”, submitted to AEM, June 3, 2011, Doc. 153-11-1428-0011 Ver 0.

Golder 2011b. Technical Memorandum “Draft Meliadine Waste Rock Site Selection – Waste Rock Pile Alternatives – Tiriganiaq, Wesmeg, F Zone, Pump, Discovery and Wolf – Meliadine Gold Project”, submitted to AEM, August 9, 2011, Doc. 160-11-1428-0011 Ver D.

Harris, S.A., French, H.M., Heginbottom, J.A., Johnston, G.H., Ladanyi, B., Sego, D.C. and van Everdingen, R.O. 1988. “Glossary of Permafrost and Related Ground-Ice Terms. Permafrost Subcommittee, Associate Committee on Geotechnical Research, National Research Council of Canada, Technical Memorandum No. 142.

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NIRB (Nunavut Impact Review Board) 2012. Guidelines for the Preparation of an Environmental Impact Statement for Agnico-Eagle Mine’s Ltd.’s Meliadine Project (NIRB File No. 11MN034).

Snowden 2008. Report “Tiriganiaq Gold deposit, Nunavut – Resource Update”, submitted to Comaplex Minerals Corp., January 2008.

APPENDIX A

Environmental, Social, Economic and Technological Characterization of Waste Rock Storage Facilities

Environmental Aspects

Table A1: Environmental Aspects of the Waste Rock Storage Facilities for input into the Project Environmental Impact Assessment

Criteria		Description/Rationale		B7	B4 (extended)	A45	Discovery (DE)
				Description	Description	Description	Description
1-Possible production of contaminating agents	Potential to affect groundwater.	Waste Rock and Overburden Piles located in a lake basin have a higher likelihood of a talik below the facility and therefore a higher potential to affect groundwater. An open talik that extends through the permafrost layer is unfavourable as it can allow a connection to deep groundwater.		A corner of the north end of Lake B5 is below B7 West. Based on the width and depth of the north end of Lake B5 it is unlikely to have a talik. The other lakes below B7 West are small and are unlikely to have taliks. There are only very small ponds below B7 East, which are anticipated not have taliks below them.	Due to the width and depth of Lake B4 there is potential that an open talik exists below the lake.	A45-2 is located over land so there is no potential for a talik.	There are only very small ponds below DE, which are anticipated not have taliks below them
	Watersheds	Number of watershed(s) affected by Waste Rock and Overburden Pile footprints	Increasing the number of affected watersheds increases the chance of impacting hydrological conditions and water quality over a greater area in the event of a failure, acid rock drainage (ARD), chemical release, or by simple presence of the Waste Rock and Overburden Piles. Waterbodies for each Watershed are shown on Figure A1 to A5, located at the end of this Appendix A.	4 watersheds (A, B, E & H) including 23 waterbodies will be affected	1 watershed (B) including 4 waterbodies will be affected	2 watersheds (A, C) including 1 waterbody (Watershed A) will be affected.	1 watershed including 3 waterbodies (CH) will be affected
		Location within the watershed	Measures the potential for deteriorating the quality of water in a larger area in the event of a failure, ARD, or chemical release. Alternatives located in the upstream section of the watershed have a higher potential to affect more of the watershed than alternatives that are located in the downstream section of the watershed.	in upstream section of 3 watersheds (A, B, H) in downstream section of 1 watershed (E)	in middle section of B watershed	in middle section of C watershed in downstream section of A watershed	in upstream section of CH watershed
		Area of affected waterbodies (hectares)	Measures the potential for deteriorating the quality of water of waterbodies within the sub-catchment(s) the facility is located within due to a failure, ARD, or chemical release.	total area of 23 waterbodies is 34.4 ha (including 7 ha for E4, 10 ha for B6 and 5.6 ha for B5, excluding B7)	total area of 4 waterbodies is 90 ha (including 86 ha for B4)	total area of 1 waterbody is 5 ha	total area of 3 waterbodies is 2 ha
	Fish Habitat	Distance from Meliadine Lake (m)	Measures the safety margin for potential effects on Meliadine Lake due to a failure, ARD, or chemical release.	0.5 km	2.7 km	0.6 km	5.8 km
		Aquatic habitat loss in habitat units (HU)	Measures the potential loss of fish habitat within the waste rock and overburden storage areas. Measurement is by multiplying the area of the habitat within the storage footprint by 0.5 for low or unknown quality, and multiplying by 0.75 for medium to high quality habitat. The quality of habitat is assessed based on the number and type of species present and seasonal versus year-round use of habitat. Medium quality habitat is defined as habitat capable of providing overwintering potential and used by species other than ninespine stickleback.	Low quality = 16 ha * 0.5 = 8 HU; Med or high quality = 26 ha * 0.75 = 19.5 HU; Total = 27.5 HU	All are low quality. Total = 45 HU	All are low quality. Total = 1.5 HU	All are low quality. Total = 0.5 HU
		Diversions	Evaluates requirement for stream diversions constructed around waste rock and overburden storage facilities.	B7 and upper H basin need to be diverted	Large watersheds (B4 and B5) need to be diverted.	no diversions required	no diversions required

Table A1: Environmental Aspects of the Waste Rock Storage Facilities for input into the Project Environmental Impact Assessment (continued)

Criteria		Description/Rationale		B7	B4 (extended)	A45	Discovery (DE)
				Description	Description	Description	Description
	Fish Habitat	Stream crossing by the road/pipeline (# of crossings)	Measures the potential for altering the water quality during construction or when used during operations.	No permanent stream crossings along roads	No permanent stream crossings along roads	No permanent stream crossings along roads	No permanent stream crossings along roads
		Potential effect on surrounding aquatic habitat	Measures the potential for impacting "medium to high quality" fish habitat surrounding the waste rock and overburden storage areas. Medium to high quality habitat is defined here as habitat capable of providing overwintering potential and used by species other than ninespine stickleback.	These areas extend into lakes B5, B6, B7 and E4 which are medium or high quality habitat	Lake B2 (medium quality habitat) is about 300 m downstream	Lake A1 (medium quality habitat) is about 200 m downstream	Chickenhead Lake (high quality habitat) is about 200 m downstream
		Distance from a known spawning ground for sport or domestically important fish species	Measures the potential for disturbing a highly valued fish habitat.	Arctic grayling spawning habitat present in streams less than 1 km downstream	Arctic grayling spawning habitat present in streams less than 1 km downstream	Arctic grayling spawning habitat present in streams less than 1 km downstream	Lake trout spawning habitat in Chickenhead Lake 200 m downstream
Terrestrial habitat and species	Waste rock Pile footprint area (hectares)		Measures the impact to natural conditions	202 ha	249 ha	76 ha	131 ha
	Vegetation/ Habitat	Presence of vegetation that is uncommon or of interest within the footprint (hectares)	Measures the potential for impacting an uncommon vegetation community within the footprint of the storage area. Uncommon vegetation is defined as Birch Seep and Riparian Willow/Birch plant communities	0 ha of uncommon LSA vegetation will be removed from B7 West and B7 East	1.46 ha of uncommon LSA vegetation communities will be removed	17.9 ha of uncommon LSA vegetation communities will be removed	49.49 ha of uncommon LSA vegetation will be removed
		Potential effect on surrounding vegetation.	Measures the potential for impacting an uncommon vegetation community within a 60 m buffer surrounding each waste and overburden piles due to dust, failure, ARD, or chemical release. Values for potential effect on surrounding vegetation were calculated for each alternative by multiplying the area within a 60 m buffer where there is presence of uncommon vegetation by 1.5, the area where there is presence of special status receptors by 2, and then adding these values together.	0 ha of uncommon LSA vegetation will be affected in the 60 m buffer zone (0 ha in B7 west and 0 ha in B7 east): 0 * 1.5 = 0	0.36 ha of uncommon LSA vegetation communities will be affected in the 60 m buffer zone: 0.36 * 1.5 = 0.54	3.64 ha of uncommon LSA vegetation communities will be affected in the 60 m buffer zone:3.64*1.5 =5.46	6.84 ha of uncommon LSA vegetation communities will be affected in the 60 m buffer zone: 6.84*1.5 =110.26

Social Aspects

Table A2: Social Characteristics of the Waste Rock Storage Facilities for input into the Project Environmental Impact Assessment

Criteria	Description/Rationale	B7 West/South/East	B4 (extended)	A-45	Discovery
1-Traditional use					
Archaeological site, cultural or heritage asset	Measures the potential of affecting an archaeological site, cultural commodity or heritage asset that can be mitigated within the footprint of the storage area.	B7 East and West are assessed to have low archaeological potential since the areas are just west of a concentration of recorded archaeological sites near Meliadine Lake on elevated ground. There are a few archaeological sites all made up of single features present within these areas.	B4 has low to moderate archaeology potential. There are land use/ archaeological sites along the border of the storage area which were recorded in 2011.	This area was included in the archaeological survey conducted in 2008 relating to the road survey. No archaeological sites were identified. The area was also assessed in 2011 and no sites were recorded. The area should be clear for development; however, should sites be found in the process of land use, development activities should stop and be reported to project archaeologist and CLEY	This area as moderate to low potential for archaeological resources. The area is a distance from likely resource bearing lakes but there is some elevation therefore low significance sites might be present. IQ studies would better inform this assessment. During the 2011 archaeological survey the old boundaries were surveyed and some land use and archaeological features were recorded

Technical Aspects

Table A3: Technical Characteristics of the Waste Rock Storage Facilities for input into the Project Environmental Impact Assessment

Criteria	Description/Rationale		B7 West/East/South	B4	A45	Discovery
			Description	Description	Description	Description
Site Access: Access routes for roads, utilities, waste rock transport and infrastructure.	Waste rock and overburden storage facilities that have a shorter access route will result in lower costs, allow for easier operation and have less potential to affect the environment along the route (for example dust).		Waste rock and overburden will come from Tiriganiaq pits and underground development (Tiriganiaq deposit). Distance from Tiriganiaq deposit - less than 1 km (depending on the area). Tonnage from Tiriganiaq Deposit – 167.3 Mt	Waste rock and overburden will come from Wesmeg and Pump pits with small tonnages potentially from Tiriganiaq. Distance from Wesmeg Pit - 2.5 km. Tonnage from Wesmeg Pit – 79.7 Mt Distance from Pump Pit - less than 1 km. Tonnage from Pump Pit – 39.1 Mt Distance from Tiriganiaq- less than 1 km (depending on the area). Tonnage from Tirganiaq – 14.1 Mt	Waste rock and overburden will come from F Zone Pit only Distance from F Zone Pit less than 1 km. Tonnage from F Zone Pit - 34.3 Mt	Waste rock and overburden will come from Discovery Pit only. Distance from Discovery Pit – 0.5 km. Tonnage from Discovery Pit - 99 Mt
Criteria	**Description/Rationale**		**B7 West/East/South**	**B4**	**A45**	**Discovery**
			Description	**Description**	**Description**	**Description**
Surface Water Management Requirements	Sumps for collection of seepage and/or surface run-off.	Facilities with fewer requirements for sump construction for collection of seepage and run-off are easier to operate.	The area will require multiple sumps, approximately 7 in total.	B4 will require approximately 6 sumps.	A45 will require approximately 4 sumps.	Discovery will require approximately 4 sumps

Table A3: Technical Characteristics of the Waste Rock Storage Facilities for input into the Project Environmental Impact Assessment (continued)

Criteria	Description/Rationale	B7 West/East/South	B4	A45	Discovery
		Description	Description	Description	Description
Expansion possibilities	Waste rock and overburden storage alternatives that allow for expansion are preferred.	Vertical expansion possible but may be limited in some areas. Expansion possible to the West into Lake D7; however, this would require impacting another watershed.	Vertical expansion possible but may be limited in some areas. . Horizontal expansion possible to the south; however, this would impact Lake B45. Horizontal expansion to the north is possible, but would require impacting another watershed.	Vertical expansion possible. Minimal horizontal expansion possible to the North into Lake A6; however, it would require impacting the northern watershed	Expansions possible either vertically or horizontally.
Consequence of Failure on operating the waste rock and overburden piles	Waste rock and overburden storage alternatives that are constructed to larger heights are more likely to have a higher consequence due to a failure.	Modeled height – 114 m	Modeled height - 49 m	Modeled height - 60 m.	Modeled height - 82 m.

Economic Aspects

Table A4: Economic Characteristics of the Waste Rock Storage Facilities for input into the Project Environmental Impact Assessment

Criteria	Description/Rationale	B7 West/South/East	B4	A45	Discovery
		Description	Description	Description	Description
Capital Costs	Capital costs will involve road construction, so the further the storage areas are from the open pits the higher the capital costs.	The road length from Tiriganiaq Pit is 2.5 km. This is considered as a moderate to low distance.	The road length from Wesmeg Pit is 2.5 km. The road length from Pump Pit is less than 1km. Distance for hauling from Wesmeg is probably the longest; however, no further optimization is seen as possible at this stage.	The road length from F Zone Pit is less than 1 km.	The waste rock/overburden pile was located as close as possible to the open pit.
Operating Costs: distance/height	Waste rock and overburden storage areas that are located the furthest distance from the open pits and have the highest heights will generate the highest operating costs.	Waste rock and overburden will come from Tiriganiaq Pits. The western piles of B7 are considered to be the high. However increased height rather than increased footprint was seen as preferable from an environmental point of view.	Waste rock and overburden will come from Wesmeg and Pump Pits. B4 is anticipated to have a moderate height. Distance from Wesmeg is comparatively large, but in the current project setting the proposed area is considered the most economical as there are no other available areas to be developed close to Wesmeg.	Waste rock and overburden will come from F Zone Pit mainly. A45 is anticipated to have a moderate height.	Waste rock and overburden will come from Discovery only. The pile is anticipated to have a moderate height with large enough space for operation.
Closure/reclamation Costs	Cost based on the surface area of the waste rock and overburden piles.	The total surface area of B7 is 202 ha. Depending on the strategy. No regrading or cover being proposed.	The surface are of B4 is of 249 ha. Depending on the strategy. No regrading or cover being proposed.	The surface are of A45 is of 76 ha. Depending on the strategy. No regrading or cover being proposed.	The surface are of Discovery is of 131 ha. Depending on the strategy. No regrading or cover being proposed.

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Africa	+ 27 11 254 4800
Asia	+ 86 21 6258 5522
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 55 21 3095 9500

solutions@golder.com
www.golder.com

Golder Associés Ltée
1001 Blvd. de Maisonneuve West, suite 700
Montreal (Québec) H3A 3C8
Canada
T: +1 (514) 383-0990

Golder Associates