APPENDIX B21 - MINE WASTE ROCK AND TAILINGS MANAGEMENT PLAN, VERSION 1 (MARCH 2014)

MEADOWBANK GOLD MINE

UPDATED MINE WASTE ROCK AND TAILINGS MANAGEMENT PLAN - 2013

MARCH 2014

EXECUTIVE SUMMARY

Agnico Eagle Mines Ltd. Meadowbank Division (AEM) is operating the Meadowbank Gold Mine (the Mine), located on Inuit-owned surface lands in the Kivalliq region approximately 70 km north of the Hamlet of Baker Lake, Nunavut. The Mine is subject to the terms and conditions of both the Project Certificate issued in accordance with the Nunavut Land Claims Agreement Article 12.5.12 on December 30, 2006, and the Nunavut Water Board Water Licence No. 2AM_MEA0815 issued on June 9, 2008. This report presents an updated version of the Mine Waste Management Plan for the Mine and forms a component of the documentation series that has been produced in accordance with the above.

The Mine consists of several gold-bearing deposits: Vault, Portage and Goose Island. A series of dikes are required to isolate the mining activities from neighbouring lakes. The dikes were and will be constructed using quarried materials or using materials produced during mining.

Waste rock from the Portage and Goose Island Pits is currently being stored in the Portage Rock Storage Facility (RSF), and in the Portage pit as infill. Pit infill is only carried out in areas where mining is completed, and as such contributes to the overall fish habitat compensation approved by the Fisheries and Oceans Canada (DFO). The Portage Rock Storage Facility was constructed to minimize the disturbed area and will be capped with a 4m layer of non-acid-generating rock to constrain the active layer within relatively inert materials. The control strategy to minimize the onset of oxidation and the subsequent generation of acid rock drainage includes freeze control of the waste rock through permafrost encapsulation and capping with an insulating convective layer of NAG rock. The waste rock below the capping layer is expected to freeze, resulting in low rates of acid rock drainage (ARD) generation in the long term.

Waste rock from the Vault Pit will be stored in the Vault Rock Storage Facility. Geochemical predictions indicate that a capping layer will not be required over this area. An adaptive management plan will include monitoring of water quality during operations to confirm modelling predictions and to allow adjustments to the closure plan as required. The waste rock is expected to eventually freeze.

The Tailings Storage Facility (TSF) is delineated by a series of dikes built and to be built around and across the basin of the dewatered northwest arm of Second Portage Lake. The TSF is divided into the North and South Cells. From 2010 to 2015 tailings are to be stored in the North Cell, delineated by the Stormwater Dike and Saddle Dams 1 and 2. Once the North Cell is full, deposition will switch to the South Cell until mine operations cease in 2017. The South Cell will be delineated by the Central Dike and Saddle Dams 3, 4 and 5. The division of the TSF into cells allows tailings management in comparatively smaller areas with shorter beach lengths that reduce the amount of water that is trapped and permanently stored as ice. Operation in cells also allows progressive closure and cover trials to begin in the North Cell while tailings deposition continues in the South Cell.

AEM is considering a Tailings Optimization Plan that may affect the future configuration of the South Cell. Should this Plan move forward AEM will advise regulatory bodies in advance and obtain any permits, licenses, etc. as required.

Tailings are placed sub-aerially as slurry and water from the pond is reclaimed during operation. The tailings deposition strategy is to build beaches against the faces of the perimeter dikes to push the pond away, and ultimately produce a tailings surface that directs drainage towards the western abutment of the Stormwater Dike. Following mine operations, a minimum 2-m thick cover of NAG rockfill will be placed over the tailings as an insulating convective layer to confine the active layer within relatively inert materials. The final thickness of the rockfill cover layer will be confirmed based on thermal monitoring to be completed during operations. The control strategy to minimize water infiltration into the TSF and the migration of constituents out of the facility includes freeze control of the tailings through permafrost encapsulation.

A Thermal Monitoring Plan (TMP) was developed to observe the freezeback of the TSF and RSFs in order to comply with Part I, Conditions Applying to General and Aquatic Effects, Item 11 of the Nunavut Water Board (NWB) water license 2AM-MEA0815. Item 11 requires a TMP to monitor temperatures of the TSF and RSFs during and after, mining operations.

All infrastructures needed for mine operations, closure and reclamation, including mine waste management areas, will be re-contoured and/or surface treated during closure according to site specific conditions to minimize windblown dust and erosion from surface runoff. This activity is designed to enhance the potential for re-vegetation to occur and wildlife habitat re-establishment.

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MEADOWBANK MINE LOCATION MAP

SECTION 1 • INTRODUCTION

During operations an according to the 2014 Life of Mine calculation, the mine will generate a total of approximately 180.6 Mt of mine waste rock & till and 28.1 Mt (dry) of tailings from the following deposits:

- Portage
- Goose; and
- Vault.

Tailings are stored within the Tailings Storage Facilities (TSF – North and South Cells). The TSF includes dikes/dams built; and to be built, and is located within the basin of the former north-west arm of Second Portage Lake (2PL) which has been dewatered to allow mining in the Portage Pit. The TSF was separated by the Stormwater Dike to form a North and South Cell. From present until November 2014, and again in June – November 2015, tailings are to be deposited into the North Cell. The South Cell is now operating as the Portage Attenuation Pond (PAP) which collects site contact water as well as freshet flow. A series of Saddle Dams (1 and 2) have been constructed around the TSF to ensure that the tailings are impounded onsite. From November 2014 – June 2015, and November 2015 – 2017 (end of mine life); tailings will be deposited into the South Cell. South Cell containment will be accomplished after construction of the Central Dike which is now completed to elevation 120m. Construction will continue in 2014 to elevation 130m. Final elevation of this dike is currently planned to be 143m. The footprint area designated for tailings storage has not changed from the previous Plan (where the mine was scheduled to close in 2021). The mine is now scheduled to cease production at the end 2017.

At the present time, tailings are placed sub aerially as slurry in the North Cell and water from the pond is reclaimed by the mill. The tailings deposition strategy is to build beaches against the faces of the perimeter dikes/dams such that water/drainage is directed toward the western abutment of the Stormwater Dike. Thermal modelling indicates that the tailings will freeze in the long term, and that the talik that currently exists below 2PL Arm will freeze before seepage from the TSF reaches the groundwater below the permafrost. Thermistor monitoring results to date indicate that this is occurring, therefore the potential for groundwater contamination to occur as a result of seepage from the TSF is considered low. To date, AEM's groundwater monitoring program has not detected any parameters of concern (i.e. cyanide) downstream from the TSF.

Tailings are potentially acid generating (PAG); therefore a minimum 2-m thick cover of non-potentially acid generating (NAG) rock-fill will be placed over the tailings to physically isolate the tailings and to confine the active layer within relatively inert materials. Cover trials will be completed during operations (when deposition to North Cell is completed) to confirm the required cover thickness to physically isolate the tailings and to confine the active layer within relatively inert materials. The control strategy to minimize water infiltration into the TSF and the migration of constituents out of the facility includes freeze control of the tailings through permafrost encapsulation.

Waste rock from the Portage and Goose open pits is stored in two areas. The first being an area to the north of 2PL Arm and to the west of the Vault Haul Road, designated as the Portage Rock Storage Facility (Portage RSF). The second storage location is within the mined out portion of

Portage Pit – pits B, C and D - which will ultimately be flooded. This deposition forms part of AEM's fisheries habitat compensation approved by the Fisheries and Oceans Canada (DFO). Waste rock from the Vault Pit will be stored in an area to the west of the pit, designated as the Vault Rock Storage Facility (Vault RSF) (see Figure 2-1).

The Portage RSF has been progressively capped around the perimeter with a 4m layer of NAG rock to constrain the active layer within relatively inert materials. The final capping (top portion) will be completed upon mine closure to the same specification. All capping will be graded to promote runoff from the facility. The PAG waste rock is expected to freeze resulting in low rates of acid rock drainage (ARD) generation in the long term. To date, thermistor readings taken from the Portage RSF indicate freezeback is occurring as predicted.

The Vault RSF will be graded at closure to encourage runoff and to provide a final shape consistent with the surrounding topography. The water seepage from the Vault RSF area is expected to be of suitable quality to allow discharge to the environment without treatment (Golder, 2007c), and capping of this facility is therefore not proposed. An adaptive management plan will include monitoring of water quality during operations to confirm modelling predictions, and to allow adjustments to the closure plan as required. The waste rock is expected to eventually freeze.

A plan for the management of contact and diverted water is presented in this document. Generally contact water will be directed toward the TSF and Attenuation pond, and non-contact water will be diverted by a ditching system to prevent contact with mine related activities (see Figure 2-1 and the site Water Management Plan).

SECTION 2 • BACKGROUND INFORMATION

2.1 MINING OPERATION DESCRIPTION

The Meadowbank Gold Mine consists of several gold-bearing deposits within reasonably close proximity to one another. The three main deposits are: Vault, Portage (South, Center and North Portage deposits), and Goose Island.

The South Portage deposit is located on a peninsula, and extends northward under Second Portage Lake (2PL) and southward under Third Portage Lake (3PL). The North Portage deposit is located on the northern shore of 2PL. The South, Center and North Portage deposits will be mined from a single pit, termed the Portage Pit, which will extend approximately 2 km in a north-south direction. The Goose deposit lies approximately 1 km to the south of the Portage deposit, and beneath 3PL. The Vault deposit is located adjacent to Vault Lake, approximately 6 km north of the Portage deposits. A series of dewatering dikes (East, West Channel, Bay-Goose, South Camp and Vault) are required to isolate the mining activities from the lakes. Additional dikes (Central Dike, Stormwater Dike and Saddle Dams) are required to manage tailings within the dewatered 2PL Arm. East Dike, West Channel, Bay-Goose, South Camp and Stormwater Dikes, Saddle Dam 1 and Saddle Dam 2 were all constructed within the past 4 years. The dikes were and will be constructed primarily using materials produced on site.

Mining is a truck-and-shovel open pit operation. The current mining plan indicates that approximately 15.0 Mt of ore will be mined over a nominal mine life of approximately 3.5 years.

2.1.1 Site Conditions

The site layout is illustrated in Figure 2-1.

2.1.2 Climate

The Meadowbank region is located within a low Arctic Eco climate described as one of the coldest and driest regions of Canada. Arctic winter conditions occur from October through May, with temperatures ranging from +5°C to -40°C. Summer temperatures range from -5°C to +25°C with isolated rainfall increasing through September (Table 2.1).

Table 2.1: Estimated Average Monthly Climate Data – Meadowbank Site

Month	Max. Air Temp. (°C)	Min. Air Temp. (°C)	Rainfall (mm)	Snowfall (mm)	Total Precip. (mm)	Lake Evap. (mm)	Min. Relative Humidity (%)	Max. Relative Humidity (%)	Wind Speed (km/h)	Soil Temp. (°C)
January	-29.1	-35.5	0	11.2	11.2	0	67.1	75.9	16.3	-25.5
February	-27.8	-35.2	0	10.5	10.5	0	66.6	76.5	16.0	-28.1
March	-22.3	-30.5	0.1	14.6	14.6	0	68.4	81.4	16.9	-24.9
April	-13.3	-22.5	2.3	16.7	19.0	0	71.3	90.1	17.3	-18.1
May	-3.1	-9.9	9.8	11.3	21.1	0	75.7	97.2	18.9	-8.0
June	7.6	0.0	14.5	3.9	18.4	8.8	62.6	97.2	16.4	2.0
July	16.8	7.2	36.7	0.0	36.7	99.2	47.5	94.3	15.1	10.5
August	13.3	6.4	45.5	0.9	46.4	100.4	59.2	97.7	18.4	9.3
September	5.7	0.9	30.1	8.8	38.9	39.5	70.8	98.6	19.3	3.6
October	-5.0	-10.6	3.5	30.3	33.8	0.1	83.1	97.4	21.4	-2.8
November	-14.8	-22.0	0	23.6	23.6	0	80.6	91.1	17.9	-11.7
December	-23.3	-29.9	0	15.0	15.0	0	73.3	82.7	17.7	-19.9

Note: Data from Baker Lake A station is available from 1946 to 2011. During this period, the data quality is good, with the exception of years 1946 to 1949, and 1993 which were removed from the compilation.

The long-term mean annual air temperature for Meadowbank is estimated to be approximately 11.1°C. Air temperatures at the Meadowbank area are, on average, about 0.6°C cooler than Baker Lake air temperatures, and extreme temperatures tend to be larger in magnitude. This climatic difference is thought to be the effect of a moderating maritime influence at Baker Lake.

The prevailing winds at Meadowbank for both the winter and summer months are from the northwest. A maximum daily wind gust of 93 km/h was recorded on September 1, 2009. Light to moderate snowfall is accompanied by variable winds up to 70 km/h, creating large, deep drifts and occasional whiteout conditions. Skies tend to be more overcast in winter than in summer.

The Table 2.1 presents monthly rainfall, snowfall and total precipitation values for the mine site. August is the wettest month, with a total precipitation of 43.4 mm, and February is the driest month, with a total precipitation of 6.1 mm. During an average year the total precipitation is 249.6 mm, split between 147.5 mm of rainfall and 102.1 mm of snowfall precipitation.

2.1.3 Faults

As indicated on Figure 2-5, two main faults are inferred in the Portage deposit area. The Second Portage fault trends to the northwest and is expected underneath the Central Dike and TSF, roughly parallel to the orientation of the Second Portage Lake. Analysis conducted during the design of the Central Dike showed little seepage potential. To date Central Dike has been completed to elevation 115 and no seepage has been evident in Portage pit. However if seepage that affects operation in the future mitigation plans such as grouting could be carried out beneath the Central Dike.

2.1.4 Permafrost

The Meadowbank Gold Mine is located in the area of continuous permafrost, as shown on Figure 2-2.

Lake ice thicknesses of between 1.5 m and 2.5 m have been encountered during geotechnical investigations in mid to late spring. Taliks (areas of permanently unfrozen ground) are expected where water depth is greater than about 2 to 2.5 m. Based on thermal studies and measurements of ground temperatures (Golder, 2003), the depth of permafrost at site is estimated to be in the order of 450 to 550 m, depending on proximity to lakes. The depth of the active layer ranges based on depth of overburden, vegetation and organics, proximity to lakes, and aspect is about 1 to 1.5 m

Based on ground conductivity surveys and compilation of regional data, the ground ice content is expected to be low. Locally 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.

A thermal monitoring plan, which meets the requirement of the Water Licence, is presented in Section 8 of this document.

2.1.4.1 Second Portage Lake Talik

Thermistors have been installed in numerous boreholes (see Figure 2-3 for locations); the inferred thermal regime beneath the 2PL Arm, based on measurements from these instruments, is shown in Figure 2-4. A talik exists below 2PL Arm, and is expected to extend to the base of the permafrost (Figure 2-6).

2.1.4.2 Vault Lake Talik

Due to the size of Vault Lake, the underlying talik is expected to be closed or confined within the permafrost. This means it does not extend to the deep groundwater flow regime, because the size and depth of the lake is not sufficient for an open talik to develop. Much of the lake is less than 2 m in depth; consequently it freezes to the bottom during winter.

2.1.4.3 Impact of Global Warming on Site Conditions

A report titled "Implications of Global Warming and the Precautionary Principle in Northern Mine Design and Closure" (BGC, 2003) was prepared for Indian and Northern Affairs Canada, and provides guidance relevant to mine design in Nunavut.

This report suggests that globally the average temperature may increase by about 2°C by 2100 due to global warming. However, the report also states that the increase may be double the global average for sites located at 50°N, and may be 3.5 times greater for sites located at 80°N. In a more recent study, the Intergovernmental Panel on Climate Change (IPCC, 2007) projected the maximum average air temperature to increase by 6.4°C by 2100 for a site located at 65°N latitude.

Table 2.2 presents a summary of reported climate change predictions used on a number of northern projects that have been reported in the engineering and scientific literature.

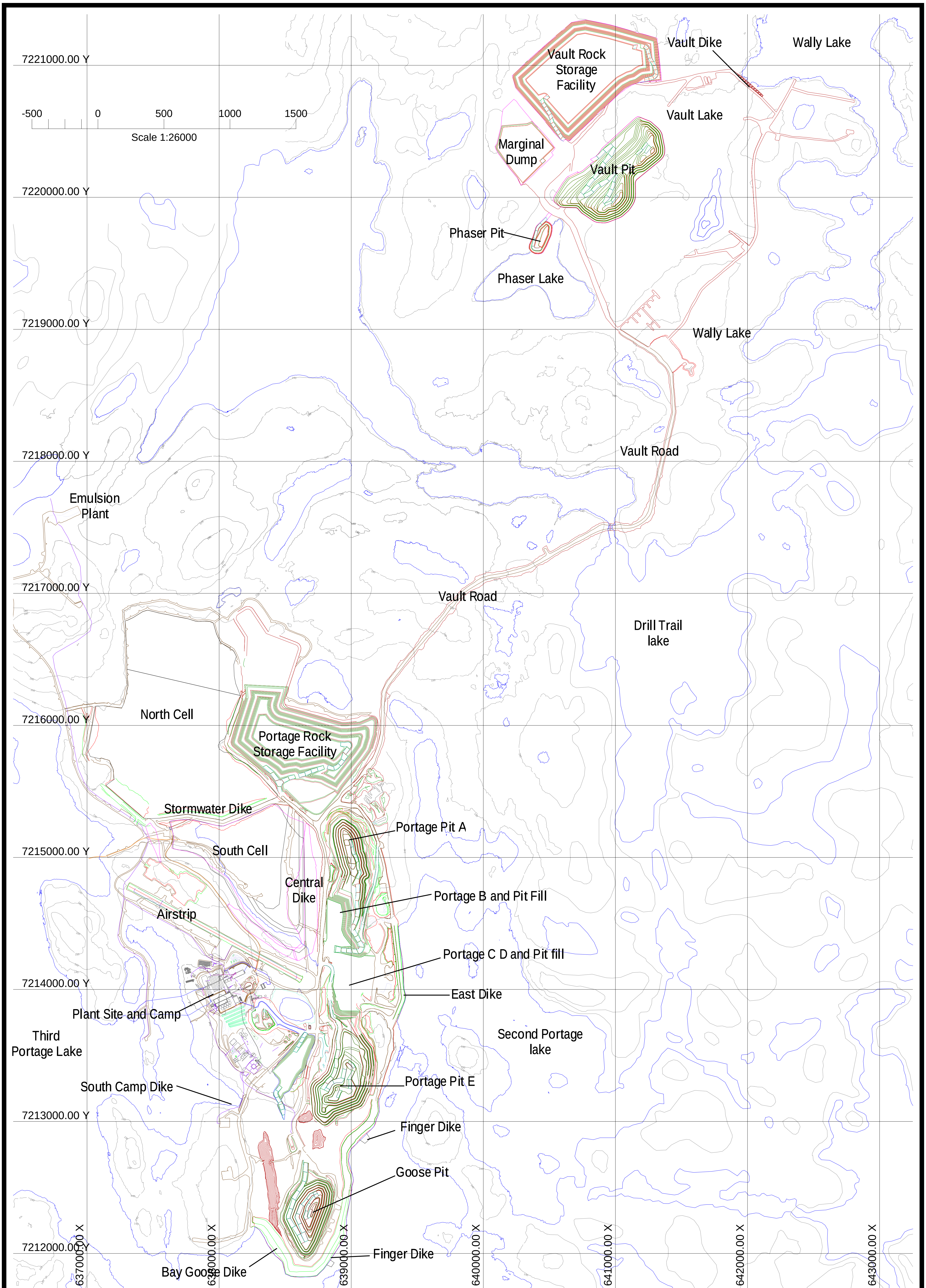
Table 2.2: Summary of Reported Climate Change Rates Used in Northern Projects Engineering Studies

Reference	Increase in MAAT by Year 2100 (°C)	Notes
Hayley (2004)	4.7	Used in design studies for the Inuvik Regional Health Center. Reported as increase of 0.47°C per decade.
Hayley and Cathro (1996)	5.0	Used for Raglan Dam analyses.
Diavik	3.2	Used for the Processed Kimberlite Containment Facility Design
Burn (2003)	6.0	For use in the Western Arctic for pipeline design projects. Reported as increase of 1.75°C over a 29 year period

Based on Table 2.2, a climate warming trend of 6.4°C over 100 years is considered to be a conservative upper estimate of the climate change rate for the mine area and is consistent with predicted and recommended climate change trends for projects in the north.

By the middle of the 21st century, the effect of temperature change is predicted to reduce near-surface permafrost by 12% to 15% once equilibrium conditions become established under the new temperatures. The predicted increase in active layer thickness of 15% to 30% will reach equilibrium relatively faster (NRC, 2004).

Studies indicate that the boundaries of discontinuous and continuous permafrost are expected to move northward due to global warming (Woo et al., 1992) (Figure 2-2). Predictions based on a warming of 4°C to 5°C over the next 50 years (NRC, 2004) (approximately double the rate predicted above) suggests that the Meadowbank property would remain within the zone of continuous permafrost, but the active layer thickness would be expected to increase, and the total thickness of permafrost may slowly reduce in time.



AGNICO EAGLE

Notes:

1) All dimensions are in metres unless otherwise noted.

2) All elevations are in metres above sea level (masl)

Grid Reference: NAD 83, UTM zone 14

Date: 2014/03/08

By : Jose Condoretty

Figure 2.1

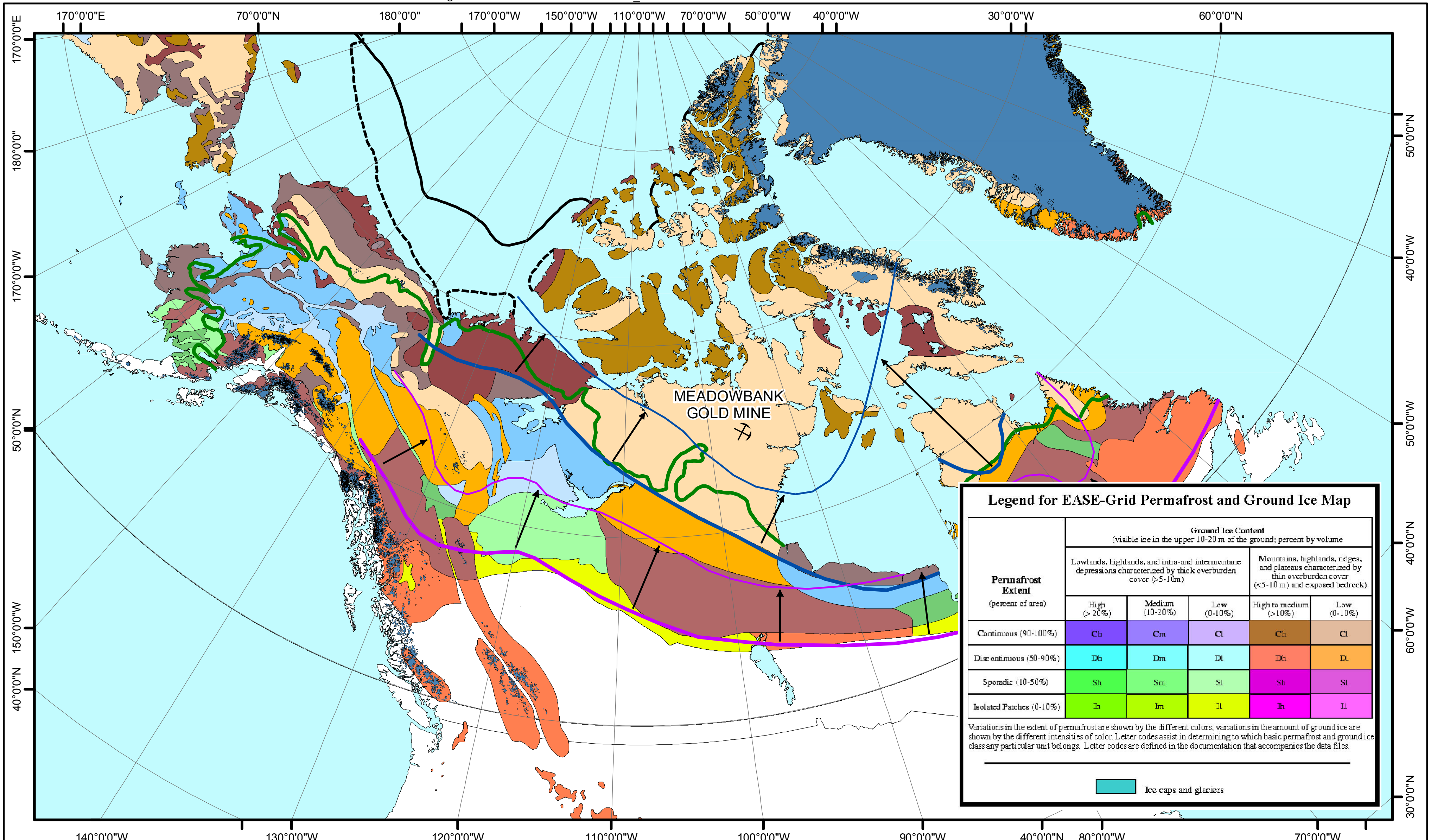
MEADOWBANK DIVISION

Meadowbank Gold Mine

Nunavut

General Site Plan

N:\Actif\2012\1221\12-1221-0029 AEM Meadowbank Water and Waste Management Plan\4 CAD-GIS\GIS\FIG_2.2.mxd



Permafrost Extent (percent of area)	Ground Ice Content (visible ice in the upper 10-20 m of the ground; percent by volume)				
	Lowlands, highlands, and intra-and intermontane depressions characterized by thick overburden cover (>5-10m)			Mountains, highlands, ridges, and plateaus characterized by thin overburden cover (<5-10 m) and exposed bedrock)	
	High (> 20%)	Medium (10-20%)	Low (0-10%)	High to medium (>10%)	Low (0-10%)
Continuous (90-100%)	Ch	Cm	Cl	Ch	Cl
Discontinuous (50-90%)	Dh	Dm	Dl	Dh	Dl
Sporadic (10-50%)	Sh	Sm	Sl	Sh	Sl
Isolated Patches (0-10%)	Ih	Im	Il	Ih	Il

LEGEND

- TREELINE
- SEA-ICE EDGE LIMIT
- SUBSEA PERMAFROST LIMIT
- SOUTHERN BOUNDARY OF DISCONTINUOUS PERMAFROST - PRESENT
- SOUTHERN BOUNDARY OF DISCONTINUOUS PERMAFROST - PREDICTED
- SOUTHERN BOUNDARY OF CONTINUOUS PERMAFROST - PRESENT
- SOUTHERN BOUNDARY OF CONTINUOUS PERMAFROST - PREDICTED
- PREDICTED MOVEMENT OF PERMAFROST BOUNDARIES

0 300 600 900 1 200 1 500

Scale in Kilometres

NOTES

1) PROJECTION: LAMBERT AZIMUTHAL EQUAL AREA

REFERENCES

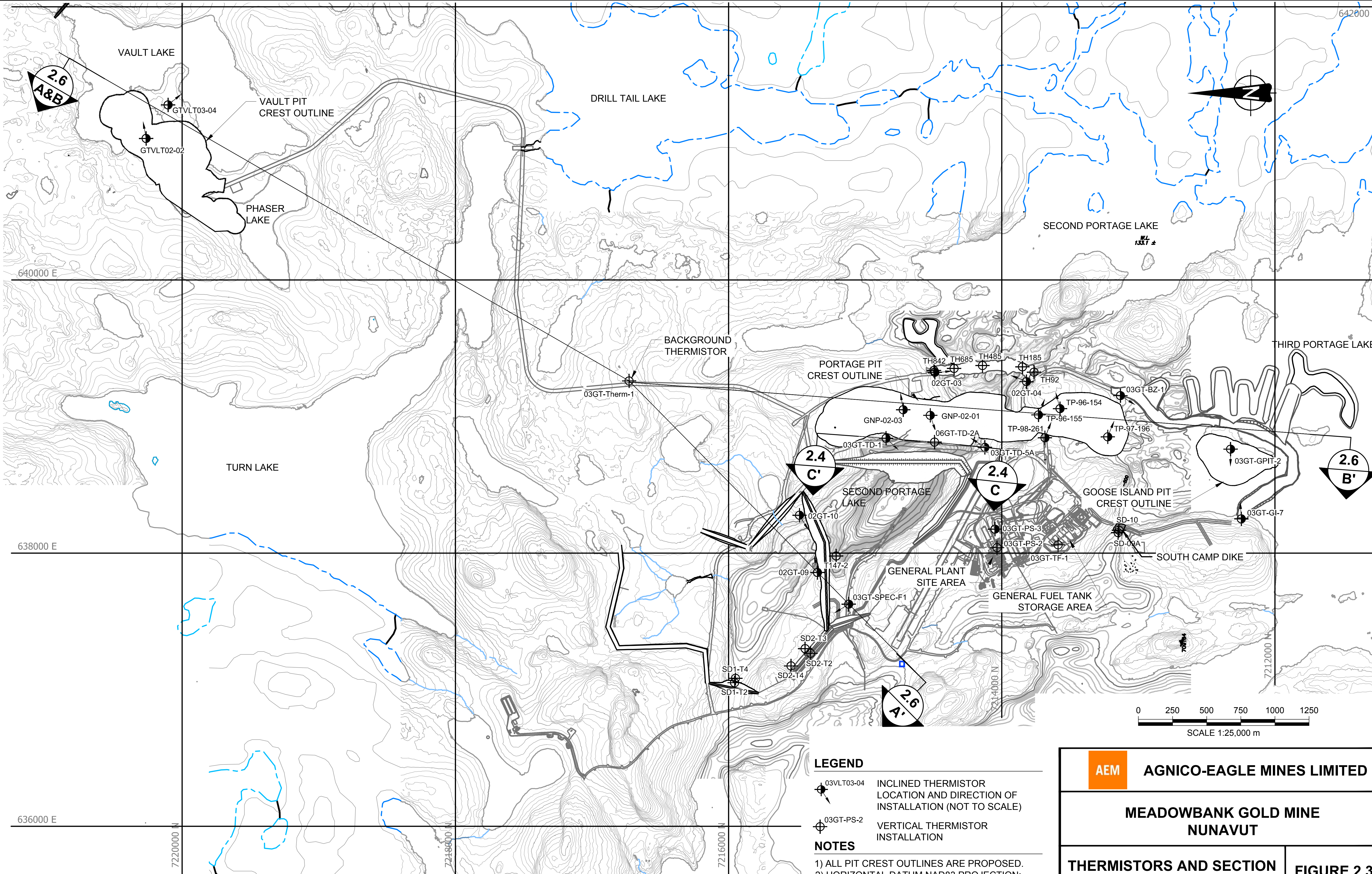
1) BROWN, J., O.J. FERRIANS JR., J.A. HEGINBOTTOM, AND E.S. MELNIKOV. 1998. CIRCUM-ARCTIC MAP OF PERMAFROST AND GROUND-ICE CONDITIONS. BOULDER, CO: NATIONAL SNOW AND ICE DATA CENTER/WORLD DATA CENTER FOR GLACIOLOGY. DIGITAL MEDIA.
2) PREDICTED PERMAFROST BOUNDARIES BASED ON WOO ET AL., 1992.

AEM AGNICO-EAGLE MINES LIMITED

MEADOWBANK GOLD MINE
NUNAVUT

PERMAFROST MAP OF CANADA

FIGURE 2.2



LEGEND

03VLT03-04 — INCLINED THERMISTOR LOCATION AND DIRECTION OF INSTALLATION (NOT TO SCALE)

03GT-PS-2 — VERTICAL THERMISTOR INSTALLATION

NOTES

1) ALL PIT CREST OUTLINES ARE PROPOSED.
2) HORIZONTAL DATUM NAD83 PROJECTION: UTM ZONE 14

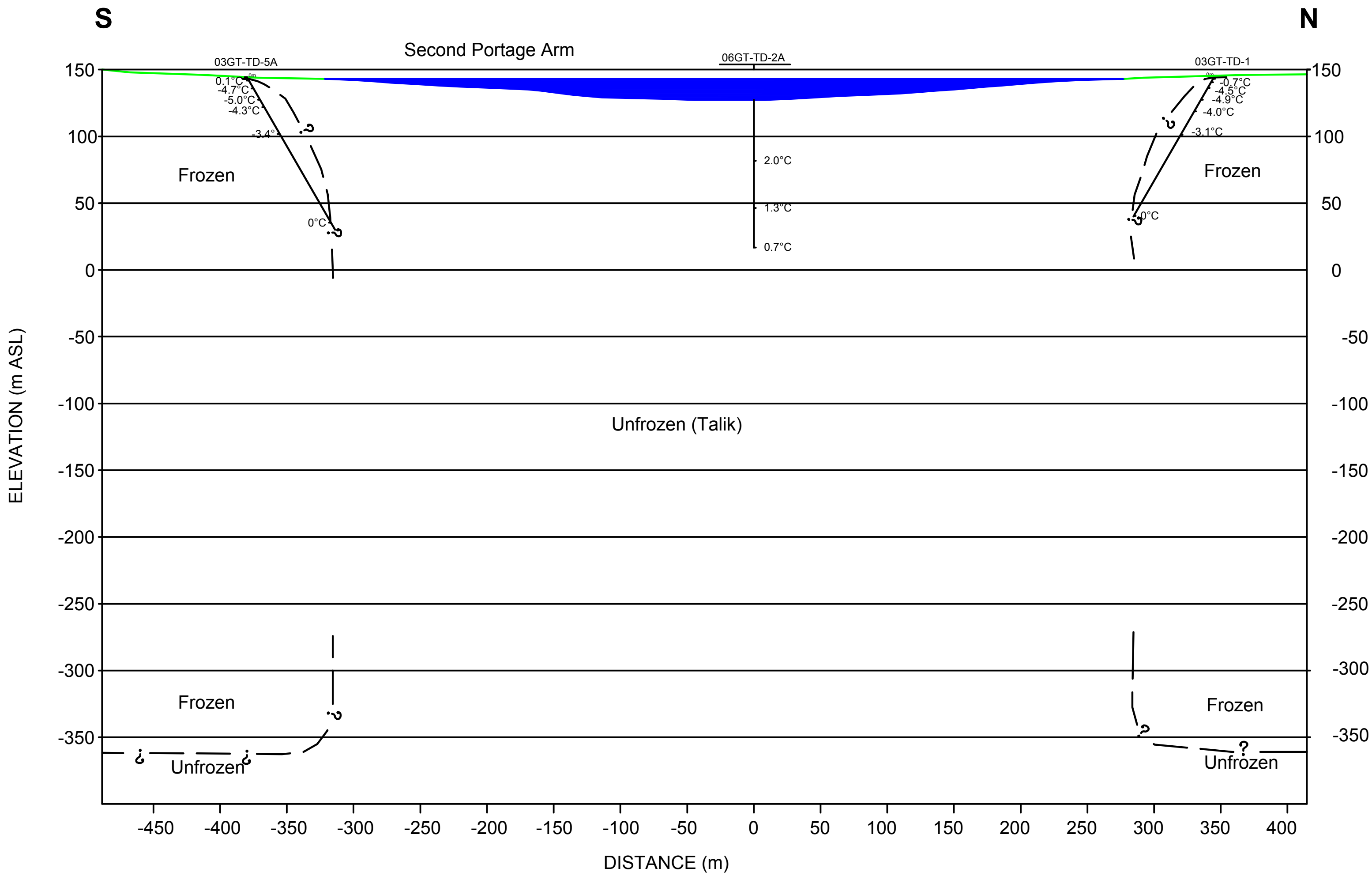
AEM **AGNICO-EAGLE MINES LIMITED**

MEADOWBANK GOLD MINE
NUNAVUT

THERMISTORS AND SECTION LOCATION PLAN

FIGURE 2.3

REVISION DATE: 09/07/07 09:08AM By: ASalvador CADD FILE: N:\Bur-Graphics\Projects\2009\1428\09-1428-0014\Drafting\2000\Task-1000\0914280014-1000-FIG_2.3.dwg



C
2.3

CROSS SECTION C-C'

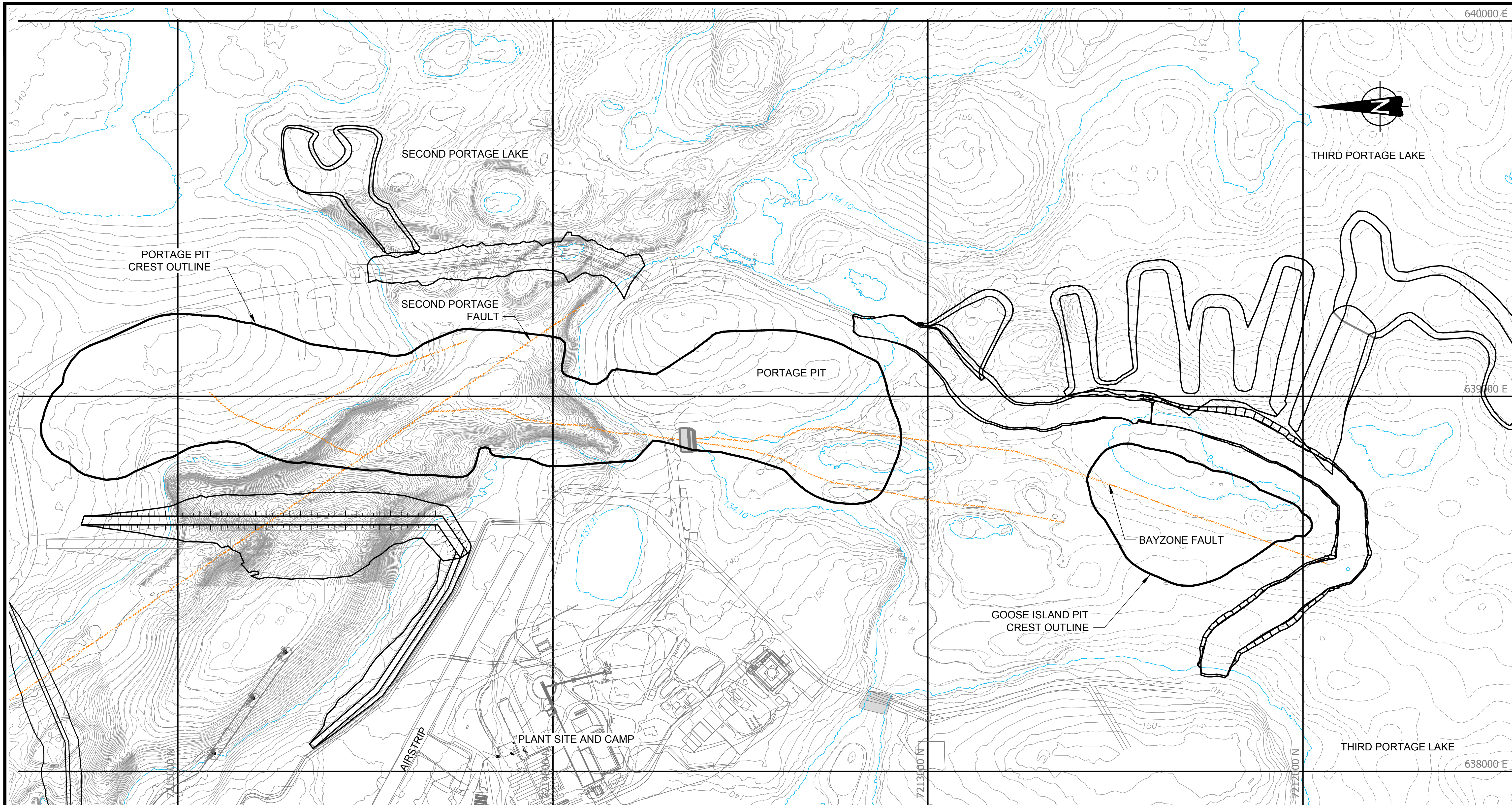
0 50 100 150 200 250

SCALE IN METRES

LEGEND

— —? — Inferred Permafrost Boundary

AEM	**AGNICO-EAGLE MINES LIMITED**
MEADOWBANK GOLD MINE NUNAVUT	
BASELINE THERMAL CONDITION BELOW SECOND PORTAGE ARM	**FIGURE 2.4**



LEGEND

- LAKE SHORELINE CONTOUR
- LAND - BASED MAJOR CONTOUR
- LAND - BASED MINOR CONTOUR
- PIT CREST
- BATHYMETRY MAJOR CONTOUR
- BATHYMETRY MINOR CONTOUR
- INFERRED LOCATION OF FAULTS

NOTES

1) ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2) ALL ELEVATIONS ARE IN METRES ABOVE SEA LEVEL (masl), UNLESS OTHERWISE NOTED.
3) GRID REFERENCE: NAD 83, UTM ZONE 14.
4) CONTOUR INFORMATION ON LAND SUPPLIED BY AGNICO-EAGLE MINES LIMITED
5) CONTOUR BELOW LAKE SURFACE ARE BASED ON BATHYMETRIC SURVEYS BY GOLDER ASSOCIATES LTD., 2002, 2003, 2006.
6) BATHYMETRY CONTOUR DATA SUBJECT TO FUTURE UPDATE.
7) LAKE CONTOURS ARE BASED ON SURVEYED LAKE SURFACE ELEVATIONS:
2nd PORTAGE LAKE= 133.1m,
3rd PORTAGE LAKE= 134.1m.
8) TOPOGRAPHIC CONTOUR INTERVAL 2M.
9) BATHYMETRIC CONTOUR INTERVAL 1M.

0 100 200 300 400 500
SCALE 1:10,000 m

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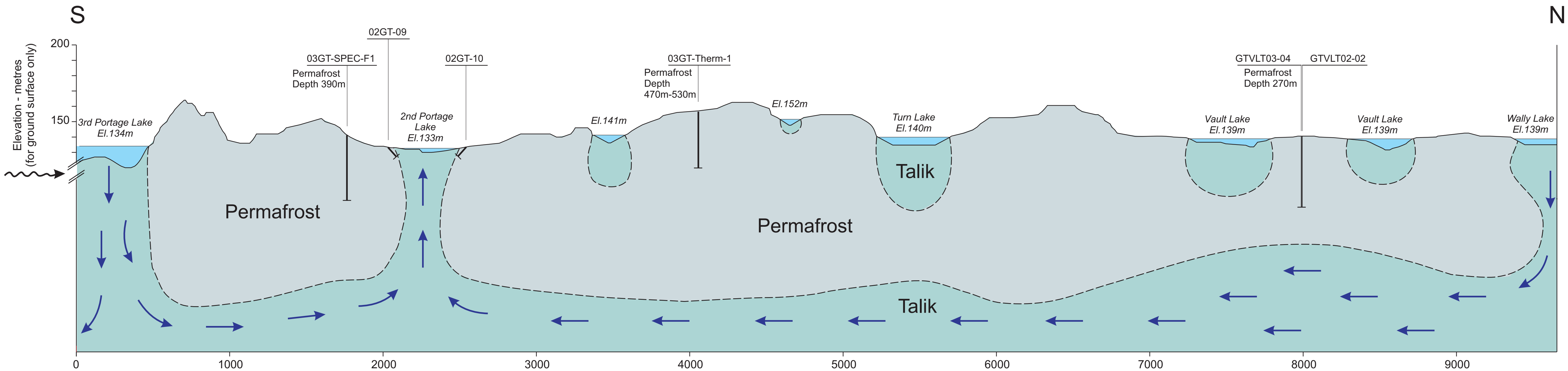
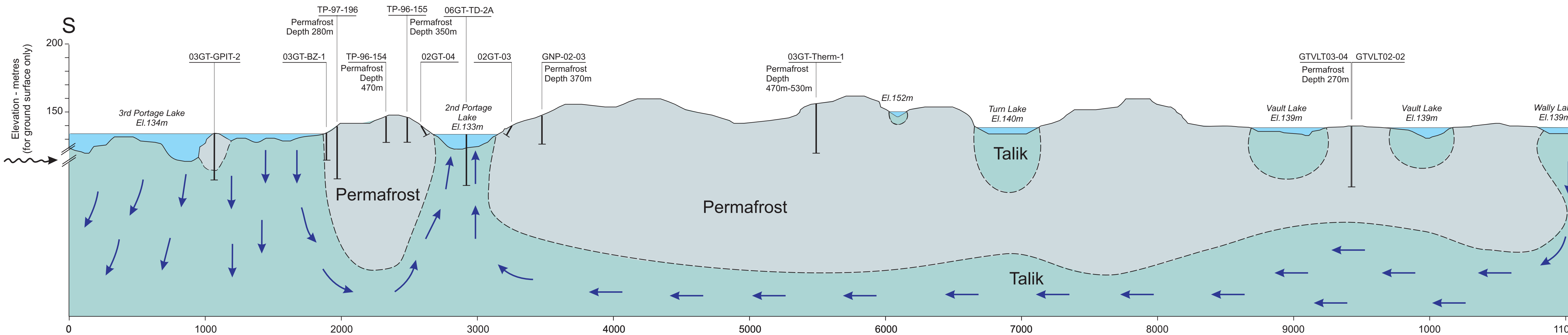
MEADOWBANK GOLD MINE
NUNAVUT

INFERRED LOCATIONS OF FAULTS

FIGURE 2.5



A 2.3 **CROSS SECTION A-A'**



B 2.3 **CROSS SECTION B-B'**

0 400 800 1200 1600 2000

Horizontal Scale (m)

0 40 80 120 160 200

Vertical Scale (m)
(above ground surface)

0 100 200 300 400 500

Depth Scale (m)
(For below ground surface. Permafrost depth measured from ground surface.)

NOTES

1. DIKES AND PITS NOT SHOWN.

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MEADOWBANK GOLD MINE
NUNAVUT

BASELINE PERMAFROST AND GROUNDWATER CONDITIONS	**FIGURE 2.6**

SECTION 3 • MINE DEVELOPMENT PLAN

3.1 MINE WASTE PRODUCTION SEQUENCE

The current mine plan (2014 to 2017) indicates that an approximate further 15.0 Mt of ore will be processed over a nominal mine life of 4 years, including ore from pits and stockpiles. During this time, approximately 77.2 Mt of mine waste rock will be produced. At the end of the mine life, an approximate total of 23.2 Mt of tailings will have been generated.

The 2009, 2010, 2011, 2012 and 2013 material balances are presented in Table 3.1, Table 3.2, Table 3.3, Table 3.4 and Table 3.5 respectively, with predicted remaining material balance presented in Table 3.6. This balance indicates the distribution of the following categories of materials by rock type:

- Mine rock for construction;
- Mine rock for dike construction;
- Mine rock for capping; and
- Mine rock to RSFs and Portage Pit fill.

Table 3.7, Table 3.8 and Table 3.9 show the material destination distribution for Portage Pit and Goose Pit, as well as material taken from NAG stockpiles.

NAG classified waste rock produced by pre-stripping and generic mining activities will be used for construction of the remaining mine infrastructure and dikes at the site, as has been the practice to date. Based on current material balance calculations, sufficient quantities of suitable rock fill and till borrow materials will be available for construction, capping activities and closure/reclamation projects. The general mine development sequence is described in Section 3.2.

Table 3.1: Meadowbank Mined Tonnages for 2009

	North Portage (Tonnes)			South Portage (Tonnes)			Total (Tonnes)
	Rock	Ore	Waste	Rock	Ore	Waste	-
January	160,294	-	-	-	-	-	-
February	103,323	-	-	-	-	-	-
March	256,972	-	280	-	-	-	-
April	388,725	12,733	1,306	-	-	-	-
May	516,829	-	-	-	-	-	-
June	531,933	729	-	-	-	-	-
July	584,364	5,910	6,820	-	-	-	-
August	741,518	-	-	-	-	-	-
September	528,191	9,618	4,445	-	-	-	-
October	640,295	42,452	250	19,778	-	2,548	-
November	378,005	33,247	3,167	601,807	94,848	4,061	-
December	322,641	6,307	-	341,547	339,991		-
TOTAL	****5,153,090**	*****110,996**	***16,268**	****963,132**	*****434,839**	***6,609**	**6,684,934**
*Total Waste Rock Transferred to Waste Dump							22,877
**Total Rock Used for Construction Purposes (road, dikes, etc.)							6,116,222
***Total Ore							545,834

Table 3.2: Meadowbank Mined Tonnages for 2010

	Portage Pit (tonnes)									Ore Processed in Mill (tonnes)
	Ore	Waste Rock								
		Dikes	Roads	Crushers	Waste Dump[1]	Landfill	Stockpiles	Other	Total	
January	97,446	223,842	190,281	156,162	173,736	-	-	-	744,021	-
February	43,979	281,368	46,654	123,727	359,649	-	32,298	1,295	844,991	47,745
March	75,333	503,299	107,635	-	197,125	23,540	-	-	831,599	163,399
April	116,940	258,416	63,100	171,451	428,814	-	-	6,196	927,977	176,857
May	136,444	258,481	10,019	148,576	672,724	-	-	50,073	1,139,873	177,610
June	152,606	534,039	24,748	126,155	401,748	-	-	12,632	1,099,322	215,389
July	236,768	471,106	176,169	127,379	237,095	-	-	-	1,011,749	193,422
August	225,467	493,626	506,385	168,085	115,930	-	-	-	1,284,026	215,559
September	272,675	503,624	606,044	161,673	214,866	5,621	-	-	1,491,828	227,502
October	232,888	235,924	595,322	56,337	461,627	53,522	-	-	1,402,832	198,394
November	247,401	3,813	104,087	8,991	963,805	-	-	-	1,080,596	218,260
December	323,641	-	299,167	8,991	1,118,767	-	-	-	1,426,925	214,400
TOTAL	**2,161,588**	**3,767,538**	**2,729,611**	**1,257,527**	**5,345,886**	**82,683**	**32,298**	**70,196**	**13,285,739**	**2,048,537**

1. *Waste Rock disposed at the waste dump includes overburden stripped for exploitation of Portage Pit*

Table 3.3: Meadowbank Mined Tonnages for 2011

	Portage Pit (tonnes)									Ore Processed in Mill (tonnes)
	Ore	Waste Rock								
		Dikes	Roads	Crushers	Waste Dump[1]	Landfill	Stockpiles	Other	Total	
January	231,025	-	113,259	37,096	1,109,543	-	-	2,544	1,262,442	193,748
February	133,165	-	25,308	51,280	766,807	-	-	404	843,798	213,313
March	86,161	-	21,288	33,271	662,028	-	-	1,044	717,631	221,615
April	235,303	-	77,596	85,064	1,497,859	-	-	11,504	1,672,024	223,041
May	207,399	-	64,171	137,980	1,448,630	-	-	49,069	1,699,851	186,811
June	326,108	8,744	291,067	176,248	1,592,345	-	-	26,615	2,095,019	257,401
July	340,966	54,927	99,513	74,750	1,869,449	-	-	19,140	2,117,779	284,295
August	326,808	122,696	4,674	117,745	1,484,613	-	-	2,384	1,732,111	275,766
September	412,783	333,829	27,199	148,545	1,724,305	-	-	22,884	2,256,762	306,020
October	389,418	22,085	136,862	53,614	1,791,385	-	-	162,725	2,166,671	306,756
November	321,180	12,725	29,518	83,943	1,972,577	-	-	110,214	2,208,976	214,868
December	334,768	164,399	55,516	52,137	1,913,103	-	-	53,454	2,238,609	294,088
TOTAL	**3,345,084**	**719,404**	**945,971**	**1,051,671**	**17,832,645**	**-**	**-**	**461,981**	**21,011,673**	**2,977,722**

1. *Waste Rock disposed at the waste dump includes overburden stripped for exploitation of Portage Pit*

Table 3.4: Meadowbank Mined Tonnages for 2012

	Portage Pit, Goose Pit & Vault Pit (tonnes)									Ore Processed in Mill (tonnes)
	Ore	Waste Rock								
		Dikes	Roads	Crushers	Waste Dump[1]	Landfill	Stockpiles	Other	Total	
January	312,546	-	25,347	853	1,707,100	-	-	568,896	2,302,196	275,186
February	320,370	-	57,299	-	1,859,479	-	-	276,030	2,192,808	307,134
March	311,938	-	4,574	33,835	1,760,145	-	-	374,271	2,172,825	304,740
April	318,550	-	29,748	171,964	2,187,929	-	-	183,366	2,573,007	285,702
May	253,947	37,372	200,732	103,650	2,000,982	-	-	231,500	2,574,236	320,542
June	276,731	78,343	281,403	64,460	1,866,369	-	-	226,695	2,517,270	294,829
July	354,765	9,991	342,978	134,006	1,791,752	-	-	268,051	2,546,777	337,110
August	271,444	260,083	261,459	214,516	1,327,154	-	-	720,701	2,783,914	352,831
September	364,410	674,872	515,804	7,309	1,446,572	-	-	273,284	2,917,841	313,014
October	119,100	-	488,259	-	2,163,147	-	-	590,936	3,242,342	358,860
November	133,041	6,880	281,560	7,439	2,081,931	-	-	337,974	2,715,783	356,646
December	176,287	105,724	142,448	-	2,178,832	-	-	577,195	3,004,199	314,317
TOTAL	**3,213,129**	**1,173,266**	**2,631,610**	**738,031**	**22,371,392**	**-**	**-**	**4,628,899**	**31,543,198**	**3,820,911**

1. *Waste Rock disposed at the waste dump includes overburden stripped for exploitation of Portage Pit & Goose Pit*

Table 3.5: Meadowbank Mined Tonnages for 2013

	Portage Pit, Goose Pit & Vault Pit (tonnes)									Ore Processed in Mill (tonnes)
	Ore	Waste Rock								
		Dikes	Roads	Crushers	Waste Dump[1]	Landfill	Stockpiles	Other	Total	
January	184,536	-	14,052	531	2,486,541	-	-	222	2,501,346	320,729
February	196,802	-	61,036	8,913	2,495,018	-	-	-	2,564,967	329,709
March	311,380	1,520	58,325	393	2,691,265	-	-	294	2,751,797	368,323
April	271,823	317,845	79,530	77,730	2,071,408	-	-	82,810	2,629,323	309,458
May	336,532	269,930	51,645	-	2,299,765	-	-	29,650	2,650,990	363,625
June	249,724	397,170	252,710	153,310	1,443,285	-	-	494,975	2,741,450	355,498
July	330,024	54,525	16,010	111,360	2,234,897	-	-	340,655	2,757,447	368,058
August	316,136	-	92,460	145,385	2,824,875	-	-	125	3,062,845	321,294
September	307,532	-	61,465	5,940	2,774,724	-	-	98,255	2,940,384	357,595
October	353,697	-	33,470	-	2,504,101	-	-	188,000	2,725,571	377,118
November	282,046	-	35,365	-	2,637,689	-	-	-	2,673,054	300,779
December	299,298	-	18,490	-	2,073,386	-	-	125	2,092,001	370,655
TOTAL	**3,439,530**	**1,040,990**	**774,558**	**503,562**	**28,536,954**	**0**	**0**	**1,235,111**	**32,091,175**	**4,142,841**

1. *Waste Rock disposed at the waste dump includes overburden stripped for exploitation of Portage Pit & Goose Pit*

Table 3.6: **Projected Meadowbank Mined Tonnages (2014 – 2017)**

		2014	2015	2016	2017	
Portage Pit	Total Waste Rock (t)	13,728,025	9,826,926	3,109,248	2,489,498	**29,153,697**
	NAG (~ %)	53%	66%	33%	13%	**52%**
	PAG (~ %)	47%	34%	67%	87%	**48%**
	Till (t)	155,671	-	-	-	**155,671**
	Ore (t)	1,816,026	2,405,371	331,283	645,325	**5,198,005**
Goose Pit	Total Waste Rock (t)	2,632,126		-	-	**2,632,126**
	NAG (~ %)	65%	-	-	-	**65%**
	PAG (~ %)	35%	-	-	-	**35%**
	Till (t)	-	-	-	-	**0**
	Ore (t)	971,337	-	-	-	**971,337**
Vault Pit	Total Waste Rock (t)	9,851,664	13,724,806	15,827,238	3,700,788	**43,104,496**
	NAG (~ %)	95%	95%	95%	95%	**95%**
	PAG (~ %)	5%	5%	5%	5%	**5%**
	Till (t)	1,743,327	-	198,449	254,101	**2,632,126**
	Ore (t)	982,253	2,005,890	4,202,292	1,623,345	**8,813,780**

Note: Table updated May 2014

Table 3.7: Portage & Goose PAG, Destinations & Tonnages (2014 – 2017)

	2014	2015	2016	2017	
Portage Rock Storage Facility (PAG Dump)	-	1,560,995	1,811,676	1,252,545	**4,625,216**
	-	11%	12%	9%	**31%**
Portage Pit Fill	5,535,696	1,639,721	204,616	815,592	**8,195,626**
	38%	11%	1%	6%	**56%**
Central Dike	1,488,690	-	-	-	**1,488,690**
	10%	-	-	-	**10%**
Stockpile Marginal material	168,233	148,740	40,584	45,582	**403,139**
	1%	1%	0%	0%	**3%**
All Portage & Goose PAG Destination	7,192,619	3,349,456	2,056,877	2,113,718	**14,712,670**
	49%	23%	14%	14%	**100%**

Note: PAG material from Vault is not shown as all said material will be sent to the Vault RSF. To prevent acid mine drainage potential, the relatively small expected volume of PAG material will be capped with NAG waste rock as dumping proceeds.

Table 3.8: Portage & Goose NAG, Destinations & Tonnages (2014 – 2017)

	2014	2015	2016	2017	
Portage Rock Storage Facility (NAG Dump)	5,811,631	2,595,169	313,974	161,105	**8,881,879**
	35%	16%	2%	1%	**53%**
Central Dike	-	920,040	-	-	**920,040**
	-	6%	-	-	**5%**
Capping TSF (North Cell)	530,530	2,626,110	675,462	157,168	**3,989,270**
	3%	16%	4%	1%	**24%**
Saddle Dams	-	155,996	-	-	**155,996**
	-	1%	-	-	**1%**
Portage NAG stockpile	503,625	-	-	-	**503,625**
	3%	-	-	-	**3%**
NAG Rehandling Stockpiles	2,275,402	-	-	-	**2,275,402**
	14%	-	-	-	**14%**
All Portage & Goose NAG Destinations	9,121,188	6,297,315	989,437	950,226	**17,358,166**
	55%	38%	6%	2%	**100%**

Note:
The NAG rehandling stockpiles: Goose NAG dump and Central dump NAG stockpile; we also will use the NAG dump and the Portage NAG stockpile for rehandling.
NAG material from Vault is not shown as all said material will be sent to the Vault RSF.

Table 3.9: NAG Stockpile for mine closure requirement, Destinations & Tonnages (2014 – 2018)

	2014	2015	2016	2017	2018	
Capping Portage Rock Storage Facility (PAG Dump) with NAG	-	-	-	631,954	1,469,853	**2,101,807**
	-	-	-	4%	8%	**12%**
Capping TSF (North Cell)	-	-	1,272,213	5,824,904	722,344	**7,819,461**
	-	-	7%	34%	4%	**45%**
Capping TSF (South Cell)	-	-	-	-	5,013,300	**5,013,300**
	-	-	-	-	29%	**29%**
Central Dike	-	-	193,800	-	-	**193,800**
	-	-	1%	-	-	**1%**
Saddle Dams	-	-	344,097	-	-	**344,097**
	-	-	2%	-	-	**2%**
Primary Crusher NAG capping	-	-	-	589,283	-	**589,283**
	-	-	-	3%	-	**3%**
Goose Rock Garden/Finger Dikes	-	-	-	-	267,655	**267,655**
	-	-	-	-	2%	**2%**
Stormwater Dike Capping	-	-	-	-	350,064	**350,064**
	-	-	-	-	2%	**2%**
Capping Marginal Dump	-	-	-	-	642,600	**642,600**
	-	-	-	-	4%	**4%**
All Portage & Goose NAG to be stockpiled	-	-	1,810,110	7,046,141	8,465,815	**17,322,067**
	-	-	10%	41%	49%	**100%**

3.2 MINE DEVELOPMENT SEQUENCE

The general sequence of mine development over the operating life is listed in Table 3.10 and illustrated in Figure 3-1, Figure 3-2, Figure 3-3, Figure 3-4, Figure 3-5, Figure 3-6 and Figure 3-7. A conceptual sequence of pit development over the life of mine is illustrated in Figure 3-8.

Table 3.10: Mine Development Sequence

Fig. No.	Year	Items
3.3	2014	- Continue tailings deposition at the TSF North Cell until October up to 150 masl, switching deposition to the South Cell in October. - Raise Central Dike to elevation 136.1 masl from June to October. - Commence phase 1 of North Cell TSF capping in December. - Runoff from Portage RSF and Landfill directed to Reclaim Pond - Portage and Goose pit waters, plant site and airstrip runoff directed to Attenuation Pond until December, after which Goose contact water is maintained in Goose pit (following completion of active mining) as part of the reflooding process. - Selective placement of waste rock into Portage Pit. - Complete mining in Goose Pit. - Advance mining in North and South Portage Pits. - Stripping and initiate mining in Vault Pit. - Runoff from Vault RSF directed to Vault Attenuation Pond. - Vault pit waters directed to Vault Attenuation Pond. - Monitor water quality within the Portage Attenuation Pond, decanting excess through the WTP to 3PL until tailings deposition commences in the South Cell. - Reclaim Pond pumped to Process Plant for use as make-up water. - Monitor water quality within Vault Attenuation Pond, decanting excess to Wally Lake after treatment at Vault WTP.

Fig. No.	Year	Items
3.4	2015-2017	- Complete construction of Central Dike, to elevation 140 masl. - Complete construction for Saddle Dams 3, 4 and 5, to elevation 140 masl. - Return and complete tailings deposition at the TSF North Cell during summer 2015, temporally halting South Cell deposition until North Cell deposition is complete. - Continue TSF deposition at the South Cell in November 2015, and continue until mill closure towards end 2017. - Complete phase 1 of North Cell TSF capping during May 2015. - Commence phase 2 of North Cell TSF capping in December 2015. - Initiate final closure plans including capping of crusher pad and reclamation of temporary NAG stockpiles. - Reclaim pond moved to South Cell. - Goose contact water used for Goose re-flooding. - Advance and complete mining of North and South Portage, and Vault pits. - Commence flooding of Portage Pits, Goose Pit and Vault Pit Lake. - Runoff from Vault RSF directed to Vault Attenuation Pond. - Monitor water quality within Vault Attenuation Pond, decanting excess to Wally Lake through Vault WTP. - Runoff from Portage Rock Storage Facility and Landfill directed to South Cell Reclaim Pond. - Plant site and airstrip runoff to be directed to Stormwater Management Pond before discharge of excess to TSF. - Reclaim Pond water treated if necessary and discharged to Portage and Goose Pits to assist with flooding. - Monitor water quality within flooded pits, treating in–situ if required and/or pumping to Process Plant for use as process water. - Vault Pit waters directed to Vault Attenuation Pond. - Reclaim Pond pumped to Process Plant for use as make-up water. - Commence construction of finger dikes for fish habitat (preliminary placement of waste rock on ice at specified locations in 2PL).
10.1	post closure	- Completion of TSF capping - Capping of Portage RSF and portage marginal stockpile - Construction of fish habitat structures (Finger Dikes/Bay-Goose Dike/Goose Rock Garden/re-grading of pit fill surface). - Breach dewatering dikes once pit lake water quality meets CCME criteria for the Protection of Aquatic Life.

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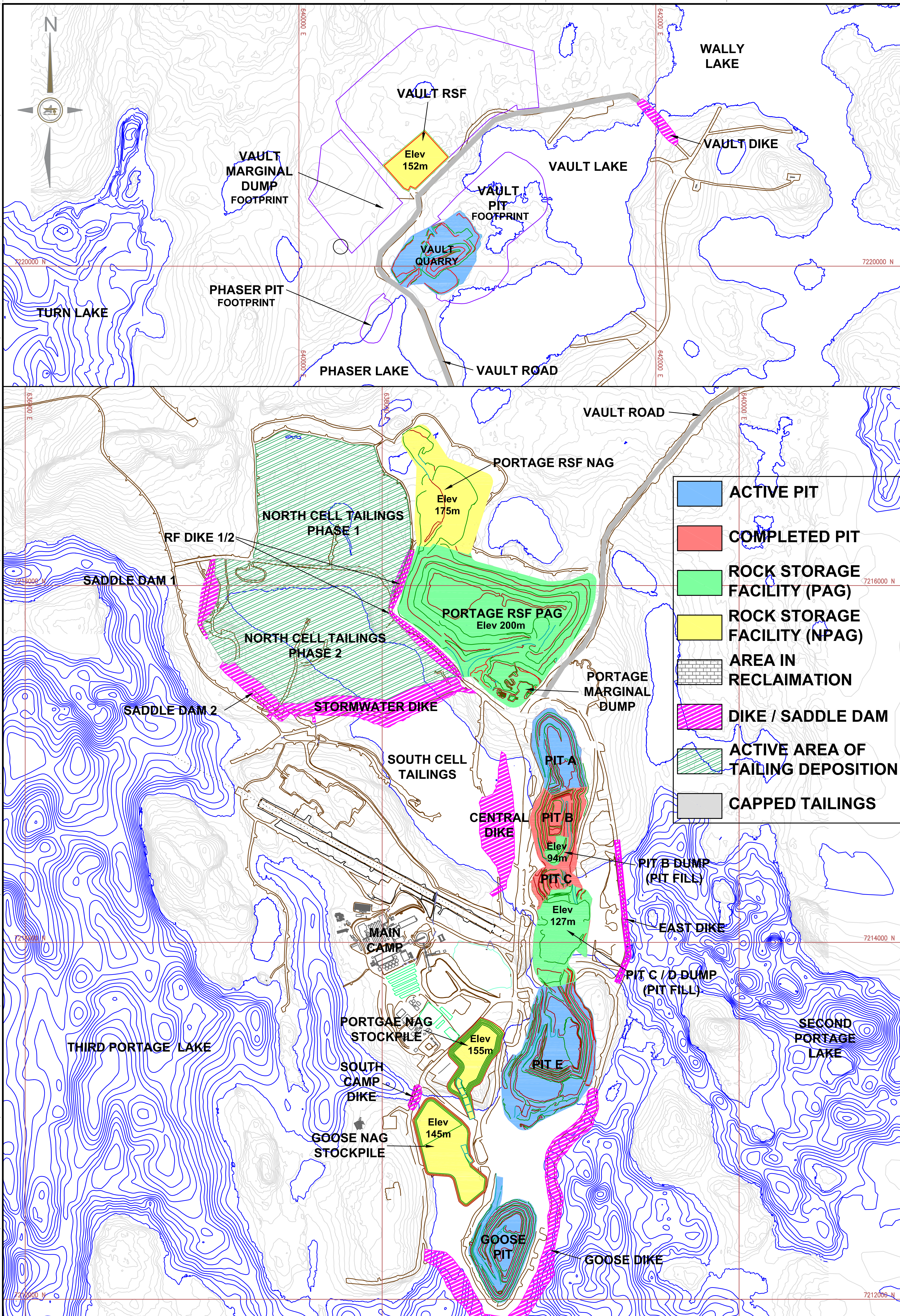

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PORTAGE, GOOSE & VAULT WASTE DEPOSITION PLAN
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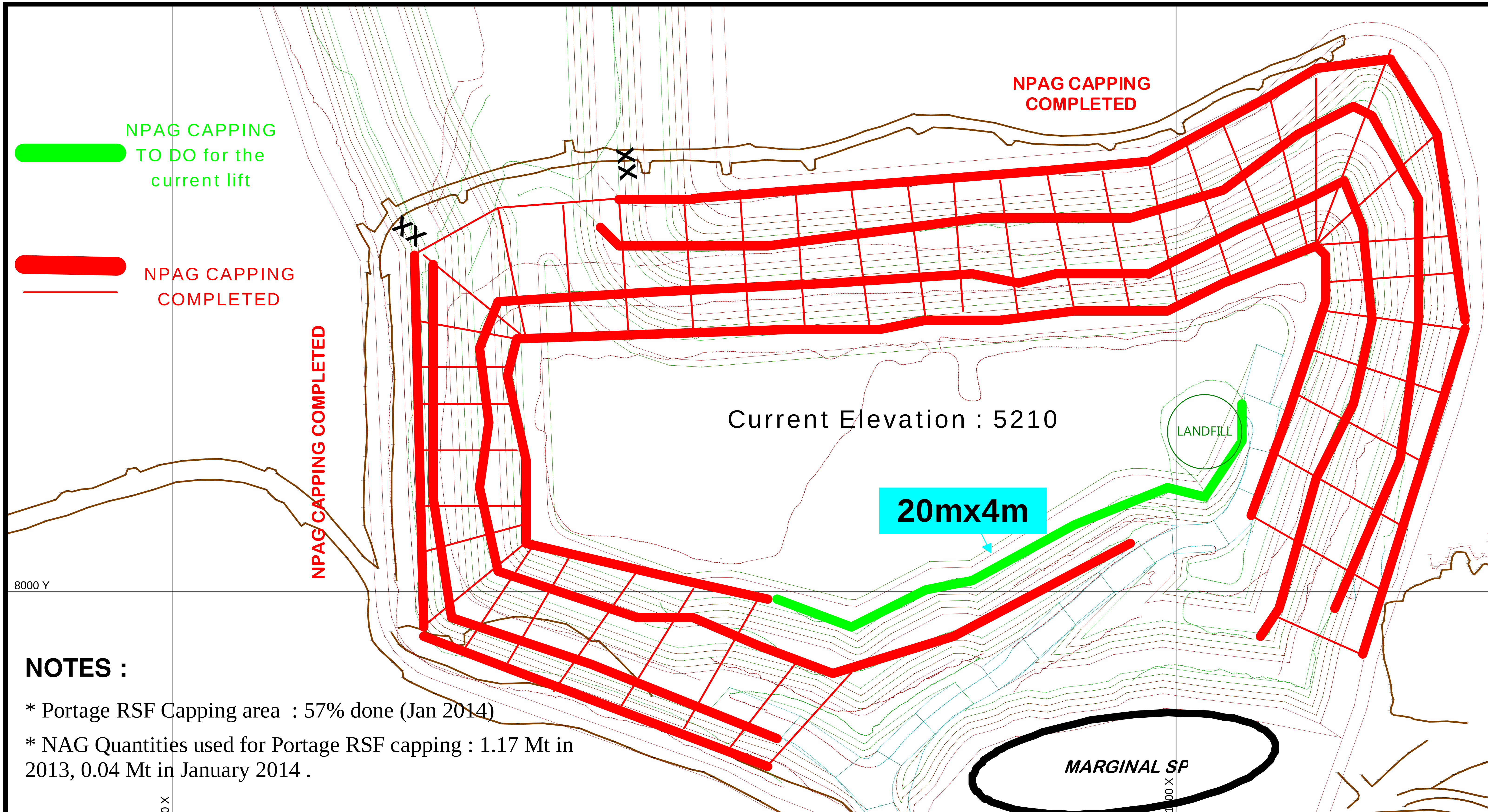

NOTES :

* Portage RSF Capping area : 57% done (Jan 2014)
* NAG Quantities used for Portage RSF capping : 1.17 Mt in 2013, 0.04 Mt in January 2014 .

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PORTAGE RSF CAPPING
JANUARY 2014

Figure 3.2

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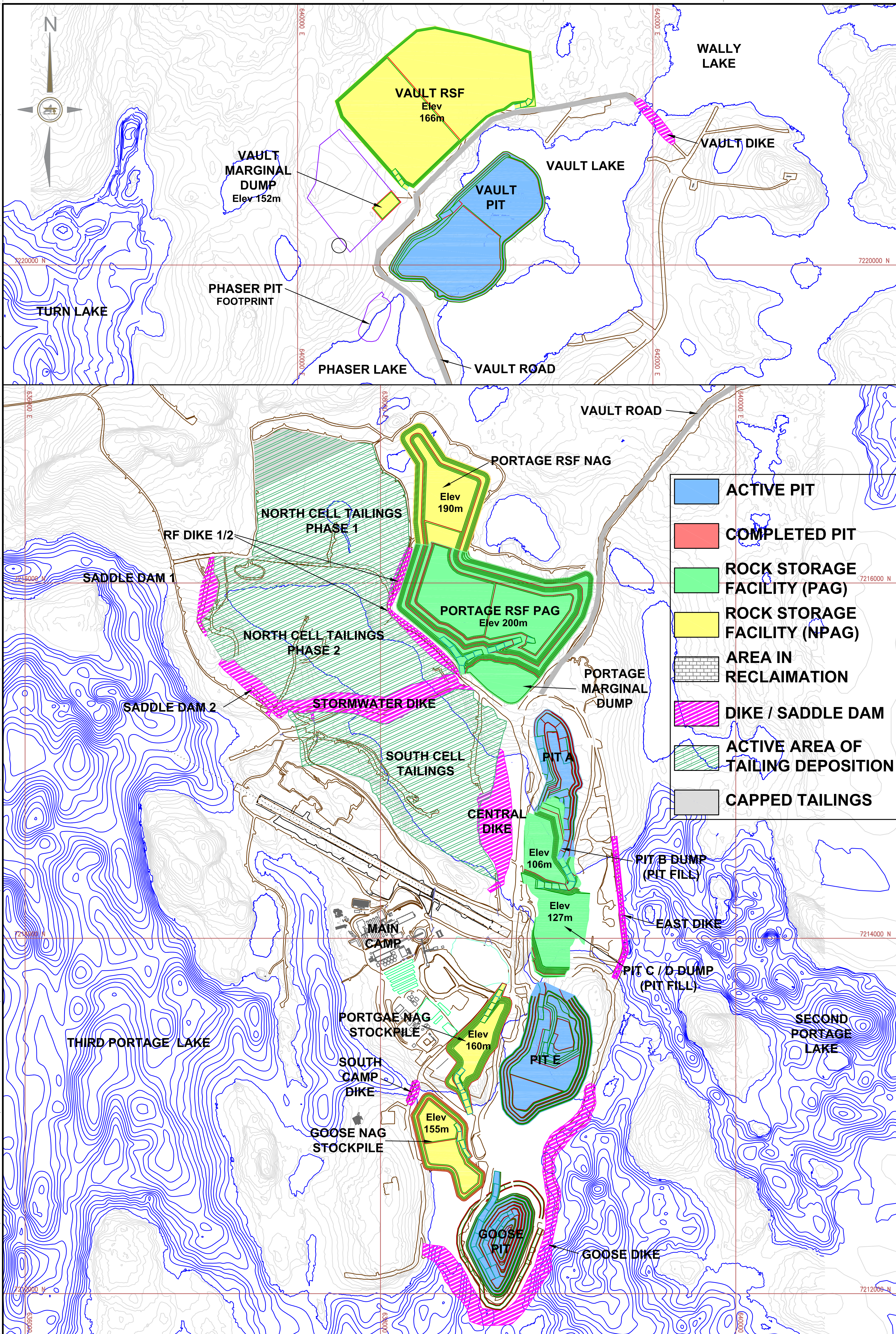

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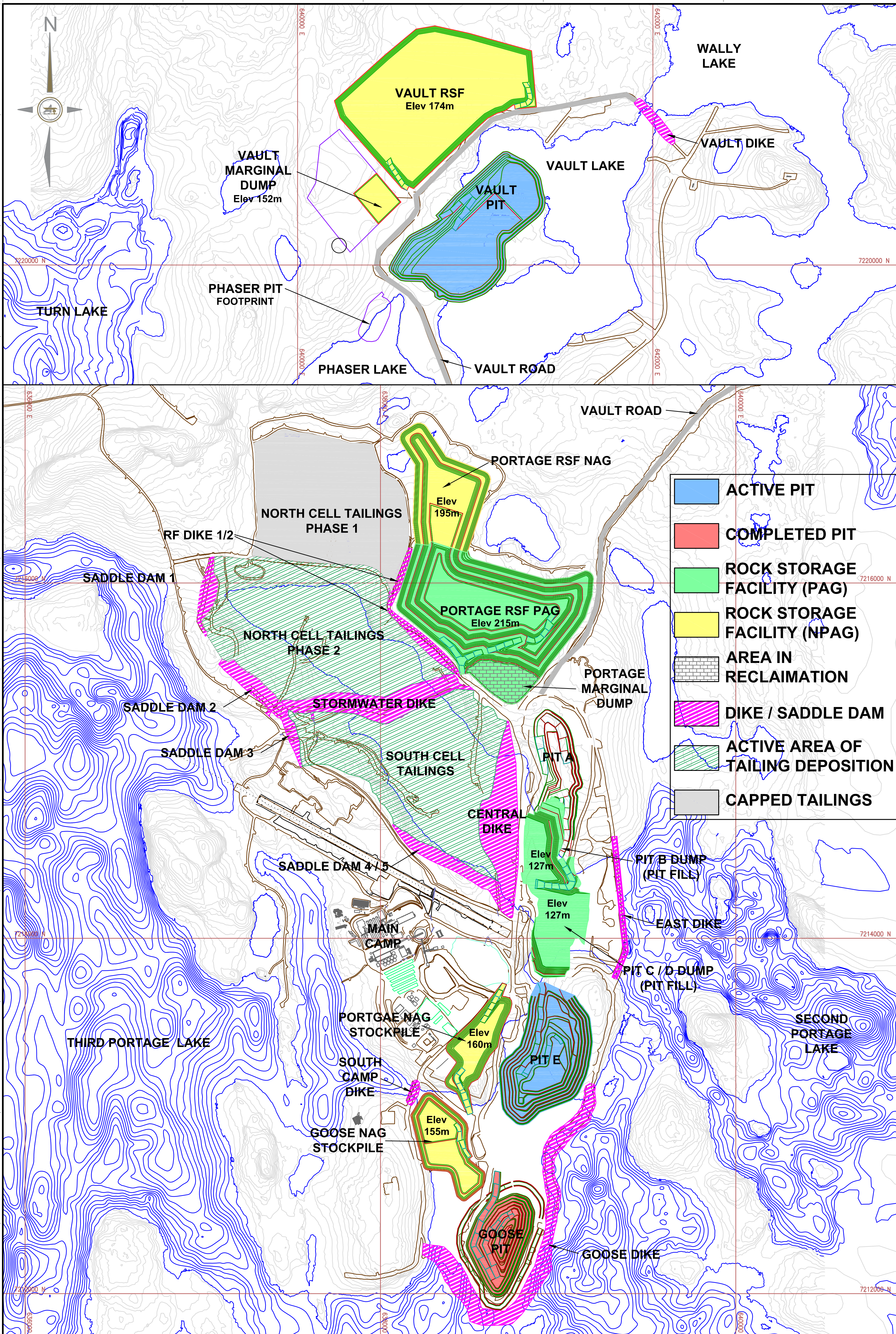

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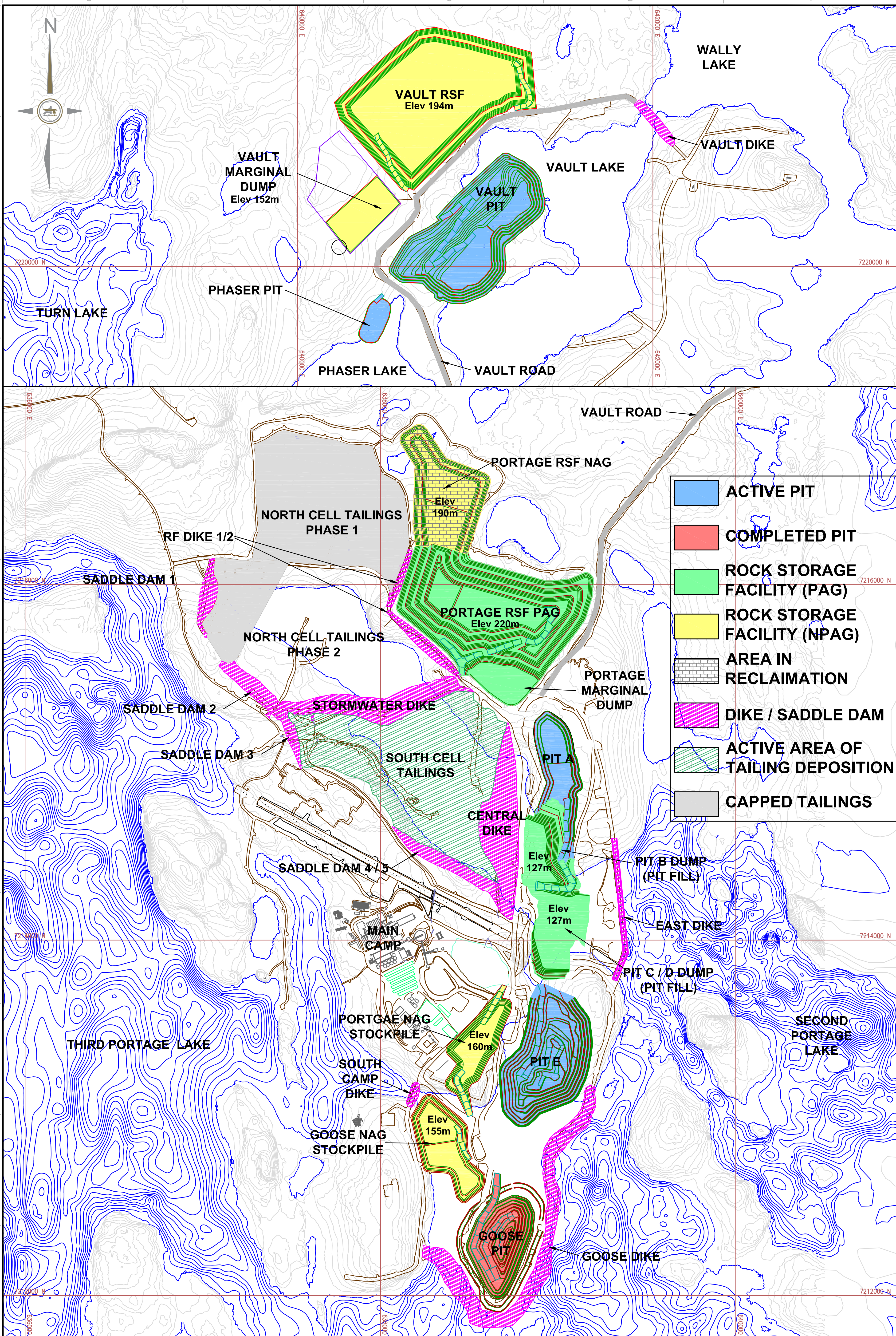

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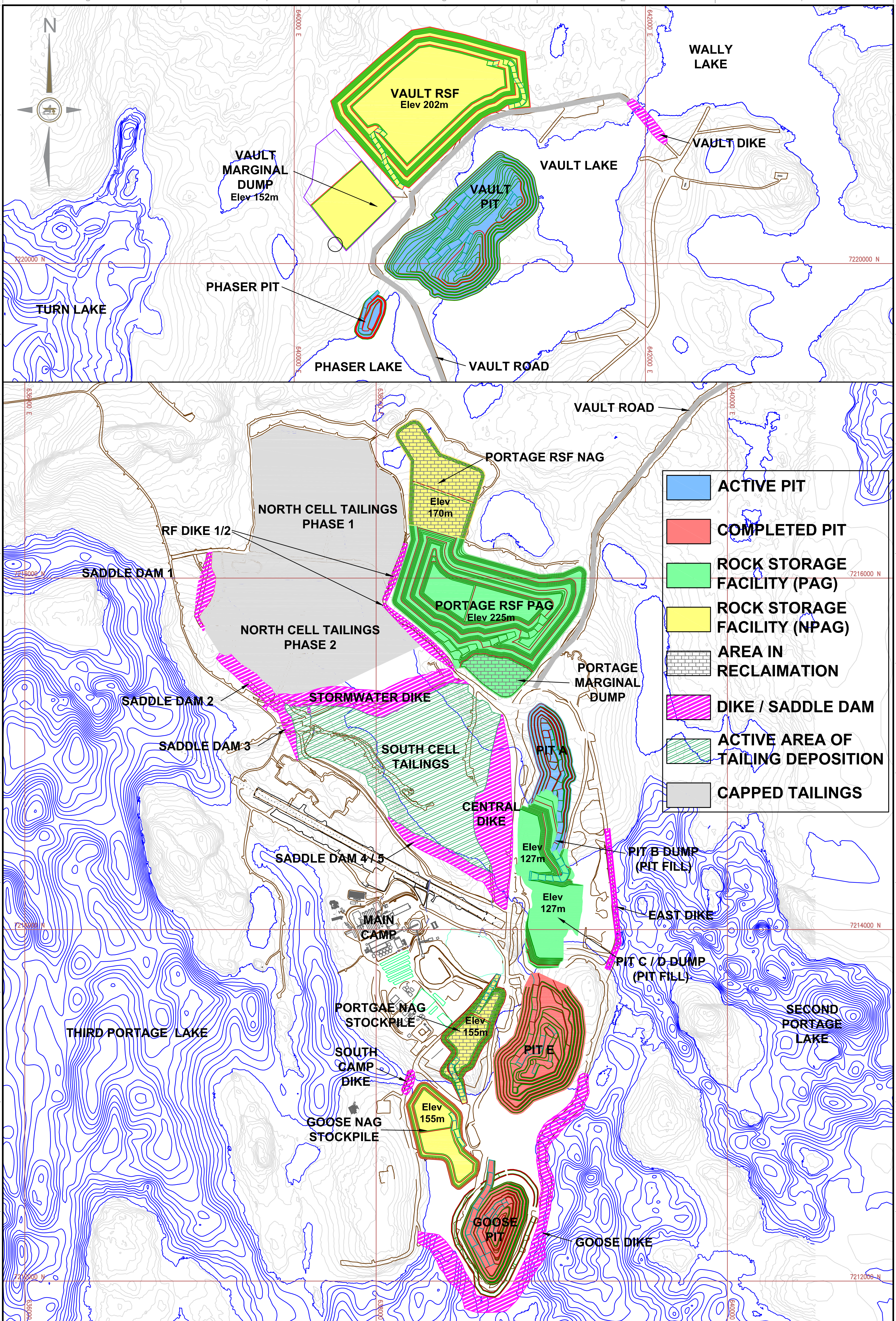

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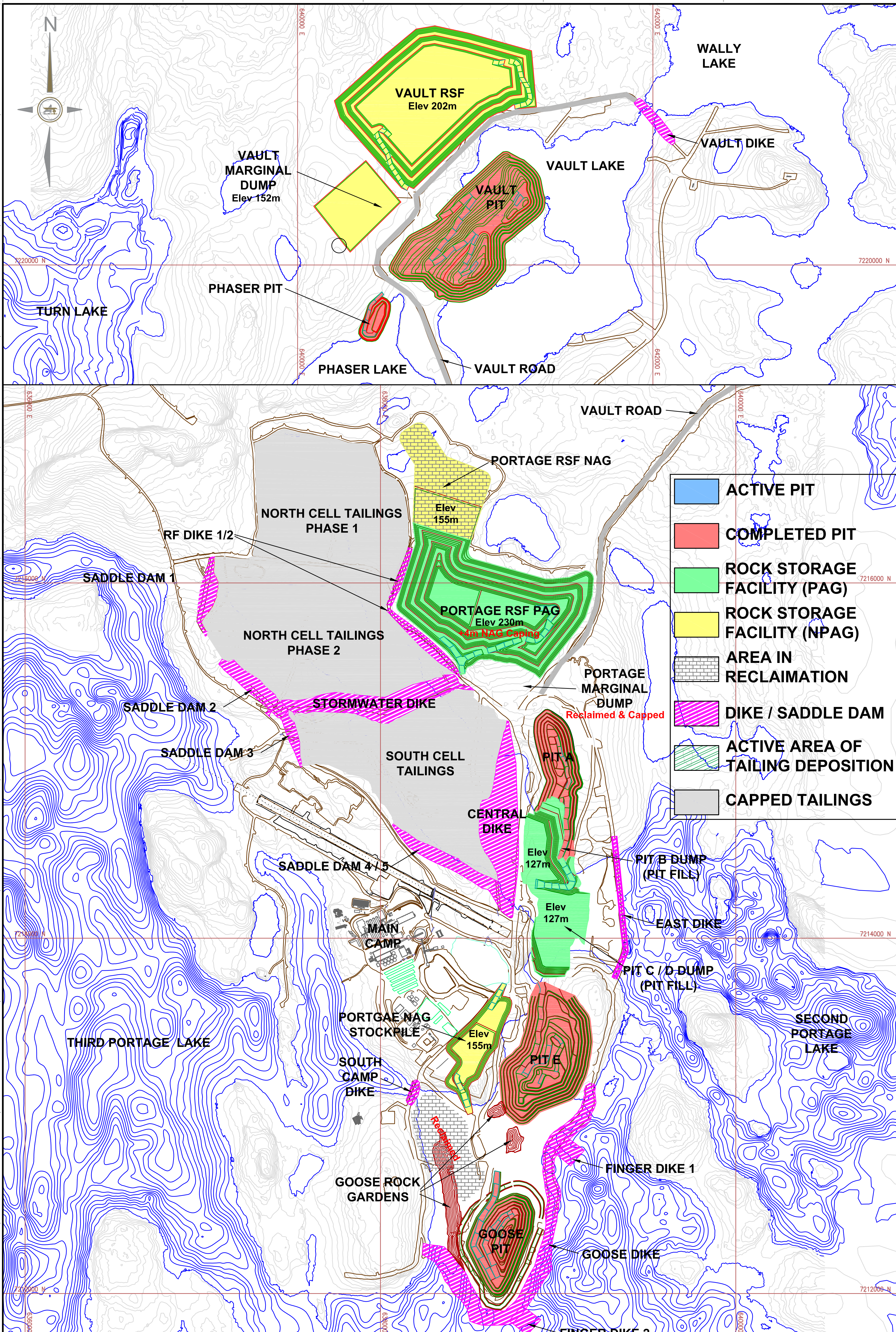

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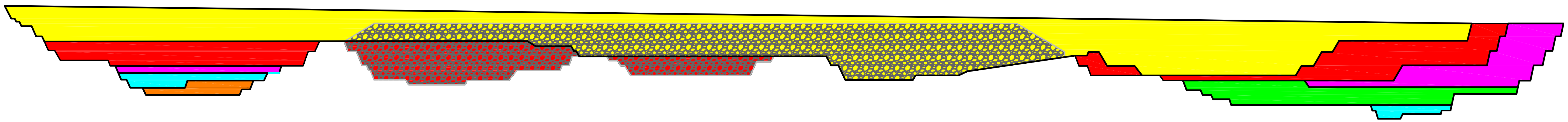
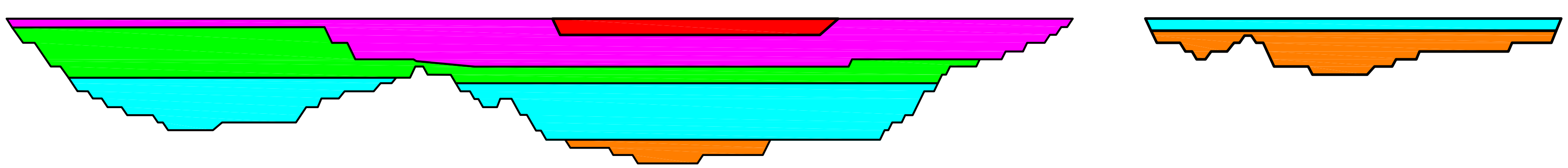
CONCEPTUAL MINING SEQUENCE AND ROCKFILL
PORTAGE PIT



CONCEPTUAL MINING SEQUENCE AND ROCKFILL
VAULT & PHASER PIT



CONCEPTUAL MINING SEQUENCE
GOOSE PIT

Mining Sequence by Year

- 2009 - 2012
- 2013
- 2014
- 2015
- 2016
- 2017
- Pit Fill

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CONCEPTUAL MINING SEQUENCE
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FIGURE 3.8

SECTION 4 • CONTROL STRATEGIES FOR ACID ROCK DRAINAGE IN COLD REGIONS

The generation of metal leachate in acidic drainage is a concern for mining projects. In evaluating the potential control strategies for the disposal of the mine waste at the Meadowbank Gold Mine, consideration was given to control strategies that are effective in cold regions. A discussion of the alternative control strategies considered for the Meadowbank Gold Mine is summarized below.

Common control strategies for the prevention or reduction of acid mine drainage in cold regions are:

1. Control of acid generating reactions;
2. Control of migration of contaminants; and
3. Collection and treatment.

In assessing the overall control strategies for the Meadowbank Gold Mine, emphasis has been placed on methods that satisfy (1) and (2) in the above list, which then has an impact on (3) by potentially reducing the requirements for these activities. Table 4.1 presents various acid mine drainage control strategies.

The Meadowbank Gold Mine is located within the zone of continuous permafrost, and has a mean annual air temperature of about -11.1°C. Based on thermal data collected from the site since 1996, the mine area is underlain by permafrost to depths between 450 and 550 m. In developing the Mine Waste Management Plan, freeze control and climate control strategies have been adopted.

Freeze control strategies rely on the immobilization of pore fluids to control acid mine drainage reactions, and the potential migration of contaminated pore water outside of the storage facility. The climate conditions at the Meadowbank Gold Mine site are amenable to freeze control strategies, and hence should be taken advantage of. In addition to immobilization of pore fluids, permafrost can reduce the hydraulic conductivity of materials by several orders of magnitude. Consequently, freeze control strategies are effective methods for reducing the migration of contaminants through materials.

According to Dawson and Morin (1996), freeze control strategies can only be effective if sufficient quantities of non-potential acid generating (NAG) waste rock are available for use as a cover and insulation protection. Based on the production forecast schedule for the Meadowbank Gold Mine, there will be sufficient NAG rock available to provide cover over the Portage RSF and TSF.

Table 4.1: Acid Mine Drainage Control Strategies of the Arctic

Strategy	Tailings	Waste Rock
Freeze Controlled	Total or perimeter freezing options can be considered. Can freeze up to 15 m annually if freezing in thin layers. Freezing rate decreased proportionately with depth. Process chemicals could cause high unfrozen water contents.	Requires considerable volumes of non-acid waste rock for insulation protection. Better understanding of air and water transport through waste rock required for reliable design.
Climate Controlled	May not be a reliable strategy for saturated tailings.	Requires control of convective air flow through waste rock, infiltration control with modest measures and temperature controls. Better understanding of waste rock air, water, and heat transport for reliable design.
Engineered Cover	Special consideration for freeze-thaw effects. Availability and cost of cover materials are major impediments.	
Subaqueous Disposal	Special considerations for winter ice conditions and pipeline freeze-up.	Very difficult to dispose of waste rock beneath winter ice.
Collection and Treatment	Costly to maintain at remote locations Long term maintenance cost.	
Segregation and Blending	Tailings are normally geochemically homogeneous.	May be very effective. Research and development on-going.

Reference: *(MEND 1.61.2, 1996)*

Climate control strategies rely on cold temperatures to reduce the rate at which oxidation occurs. The low net precipitation in permafrost regions limits infiltration of water into waste rock and tailings disposal areas. Consequently, the climate of the Meadowbank Gold Mine area will act as a natural control to reduce the production of acid mine drainage and metal leachate. Climate control strategies are best applied to materials placed at a low moisture content to reduce the need for additional controls on seepage and infiltration. This strategy is considered to be effective for waste rock, but not tailings. Therefore, the arid climate at the Meadowbank Gold Mine is also suited for climate control strategies for use with the RSFs.

Some research activities are going on to optimize the control strategies to be used in Meadowbank Gold Mine for the RSF and the TSF. Thermistors are *installed* in the RSF and TSF to monitor thermal behavior. NAG capping trials are planned for winter 2015 and will be conducted to determine the effectiveness of different cover thicknesses and designs over tailings.

SECTION 5 • OVERBURDEN MATERIALS

5.1 LAKE BOTTOM SEDIMENTS

The lakebed consisted of soft, fine-grained sedimentary deposits, referred to as lake bottom sediments that are underlain by till or other soil materials, and then bedrock. The thickness of lake bottom sediments was variable and ranged from a few centimetres up to 10 metres or more, as suggested by geophysical surveys and information obtained from various drilling programs.

The sediments present underneath the footprint of the Stormwater Dike and the coffer dam (constructed within the upstream limit of the Central Dike footprint) were removed prior to the construction. The sediments at the bottom of the core of the dewatering dikes were removed during the excavation of their main and center trenches. A portion of the sediments present in the footprint of Portage Pits were removed as part of pre-stripping activities.

The remaining sediments present in the footprint of Portage Pit and the sediments of Goose Pit will be removed as part of pre-stripping activities. The sediments present underneath the footprint of Central Dike, will be removed prior to construction.

The sediments removed for the Dewatering Dikes, Stormwater Dike, Goose Island Pit, the Portage Pits and the coffer dam were sent to Portage RSF. As for sediments that will be removed from the Central Dike footprint, and south portion of Portage Pit, an estimated range of potential volumes has been provided in Table 5.1. These estimates are using investigation results for the Central Dike that showed a thickness of up to 10 m and assuming 1 and 2 m average sediment thicknesses for the pit footprints. These sediments will be disposed of within the TSF but outside the footprint of the Central Dike or other areas to be determined.

Table 5.1: Estimate of Lake Bottom Sediment Volumes

	Approximate Footprint Area (m^2)	Volume (m^3) (thickness from geotechnical investigation)	Volume (m^3) (assuming 1 m average thickness)	Volume (m^3) (assuming 2 m average thickness)
Central Dike		108,500[2]		
South Portion Portage Pit	145,000[1]		145,000	290,000
Total	275,000	450,000	275,000	550,000

1. *Volumes are based on plan areas of pits and dike below lake level where soft sediments may be present, and not on total footprint areas.*
2. *The volume of soft sediment excavated from the foundation in 2011, 2012, and 2013 for the dam construction has been subtracted.*

5.2 TILL

The remainder of the overburden materials on site consist of well graded till or till-like materials with alluvial deposits of silt and sand intermixed. The till and till-like materials is generally described as a silty sand/gravel. It contains cobble and boulder-sized particles with an average of 30 to 40% silt and clay sized particles. Some of the till or till-like material has been and will continue to be used in the construction of TSF perimeter dikes/dams; with the balance placed in the RSFs. Till placed in the RSFs will either be mixed with the waste rock, or stockpiled separately for future use (*e.g.*, reclamation). The average till thicknesses throughout the Mine area varies based on location and may be from zero to upwards of 18 m.

SECTION 6 • MINE WASTE ROCK

Waste rock from the open pit mines, not used for site development purposes, has been and will be trucked to one of the two Waste Rock Storage Facilities (RSFs) until the end of mine operations. From 2014 to 2017 however, the majority (approximately 75%) of the PAG waste rock generated from the Portage and Goose Island pits will be placed within the mined out areas of Portage Pit. This PAG material will become submerged as the pit is flooded (subaqueous disposal) and is considered as fish habitat compensation in accordance with AEMs DFO authorization. Any material not able to be placed within the Portage pit as pit fill will be trucked to the nearest available RSF.

Due to the distance between the Portage mining area and the Vault mining area, two separate waste rock storage facilities are required. Waste rock from the Portage and Goose Island pits is stored in a storage facility located near to these pits (Portage RSF), while waste rock from the Vault open pit will be stored in a separate storage facility adjacent to the Vault Pit (Vault RSF).

6.1 WASTE ROCK PROPERTIES

The quantities of waste rock excavated between 2009 and 2013 are summarized in Table 3.1, Table 3.2, Table 3.3, Table 3.4 and Table 3.5. The quantities of waste rock to be excavated in the open pits from 2014 to 2017 are summarized in Table 3.6. The estimated quantities to be stored in each of the RSFs and other destinations are summarized in Table 6.1.

Table 6.1: Quantities* of Waste Rock by destination

Destination (RSF & Other destination)	Rock Type	Quantity
Portage RSF	Waste Rock (about 19% of NAG)	73.5 Mt**
Portage Pit Filling	Waste Rock (about 100% of PAG)	14.7 Mt
Construction	Waste Rock (NAG)	25.0 Mt
Tailings Capping	Waste Rock (about 100% of NAG)	16.8 Mt
Rock Garden	Waste Rock (about 100% of PAG)	0.3 Mt
Vault RSF	Waste Rock (about 95% of NAG and 5% PAG)	45.4 Mt

**The quantities have been adjusted as the loose density assumption changed from 2.15 to 2.04.*
*** The maximum quantity of PAG is realized at the end of mine life. The maximum quantity of NAG is realized at the end of 2015 (before the start of reclamation). The figure reported here reflects the maximum quantity at any one time which is reached at the end of 2016. Quantities also include NAG capping.*

6.2 WASTE ROCK FACILITY MANAGEMENT

Waste rock within the RSFs was and will be disposed of on land as well as within the Portage pit. The waste types that report to the RSFs show variable ARD potentials, some of which require control measures. Based on the results of thermal modelling, it is expected that the material within the RSFs will freeze within two years of placement (BGC, 2004).

Waste rock deposition plans for the Portage and Vault RSF's are shown on Figure 3-1, Figure 3-3, Figure 3-4, Figure 3-5, Figure 3-6 and Figure 3-7. Placement of waste rock within the Portage RSF commenced closest to the Portage Pit and progresses westward over the entire footprint, then upward to further benches during the development of the mine. Placement of waste rock within the Vault RSF has commenced closest to the Vault Pit and will generally proceed in a northward direction, rising upward as pit development progresses.

As a further ARD control measure, the Portage RSF will be capped with a 4-m thick cover of NAG rock. This capping is continually ongoing as parts of the RSF reach their limits. The final top capping will be completed at closure. The depth of cover was selected based on thermistor data and thermal modelling which indicates the depth of thaw (active layer depth) to be on the order of 1.5 m. The cover material would be coarse to allow the development of convective cooling during winter, and insulation through trapped air within voids during summer. Given the high evaporation rate and low annual average precipitation at the site, the average annual infiltration into the pile is expected to be low.

Most of the waste rock (90%) from the Vault deposit is NAG and water quality modeling concluded that the Vault RSF is not expected to require capping. As a precautionary measure, any PAG material encountered at Vault will be capped with NAG waste rock as dumping proceeds.

6.3 WASTE ROCK STORAGE DIMENSIONS

Table 6.2 summarizes the physical dimensions and aspects of the Portage and Vault RSFs.

Table 6.2: Details of Proposed Rock Storage Facilities

Descriptors	Portage Rock Storage Facility	Vault Rock Storage Facility
Approximate storage volume	39.3 Mm^3	29.1 Mm^3
Approximate crest elevation	225 m	200 m
Approximate height	75 m	55 m
Maximum elevation of adjacent topography	192 m	190 m
Approximate footprint area	80.8 ha	61.0 ha

6.4 PORTAGE ROCK STORAGE FACILITY EXPANDED AREA

In 2012, AEM decided to revise Portage rock storage facility (PRSF) footprint which resulted in a temporary expansion from the original area of the Waste Storage Facility from 63 ha to 80.8 ha (Figure 6-1). The expansion was necessary due to the absence of sufficient area within PRSF for the storage of NAG material. The deposition of waste rock within the PRSF must be completed according to strict engineering stability principles. NAG could not be stored in the storage area design previous to the 2012 change as the upward progress of deposition; combined with the volume of NAG generated on a day-to-day basis would have required all NAG to be covered with PAG material as and when it was produced. Reclamation of NAG for construction/capping projects then becomes problematic.

The current PRSF design volume is similar to the original 2009 design; the deposition pattern has however changed to allow for a separate NAG material storage area. The expansion is still within the original mine footprint and all runoff is directed to the TSF or the Attenuation pond, as in the original design. The diversion ditch system further prevents any watershed freshet from reaching the PRSF mitigating any potential contamination.

The design change is thus considered a minor revision. Reclamation activities will return the area affected by the temporary NAG expansion in accordance to the original design.

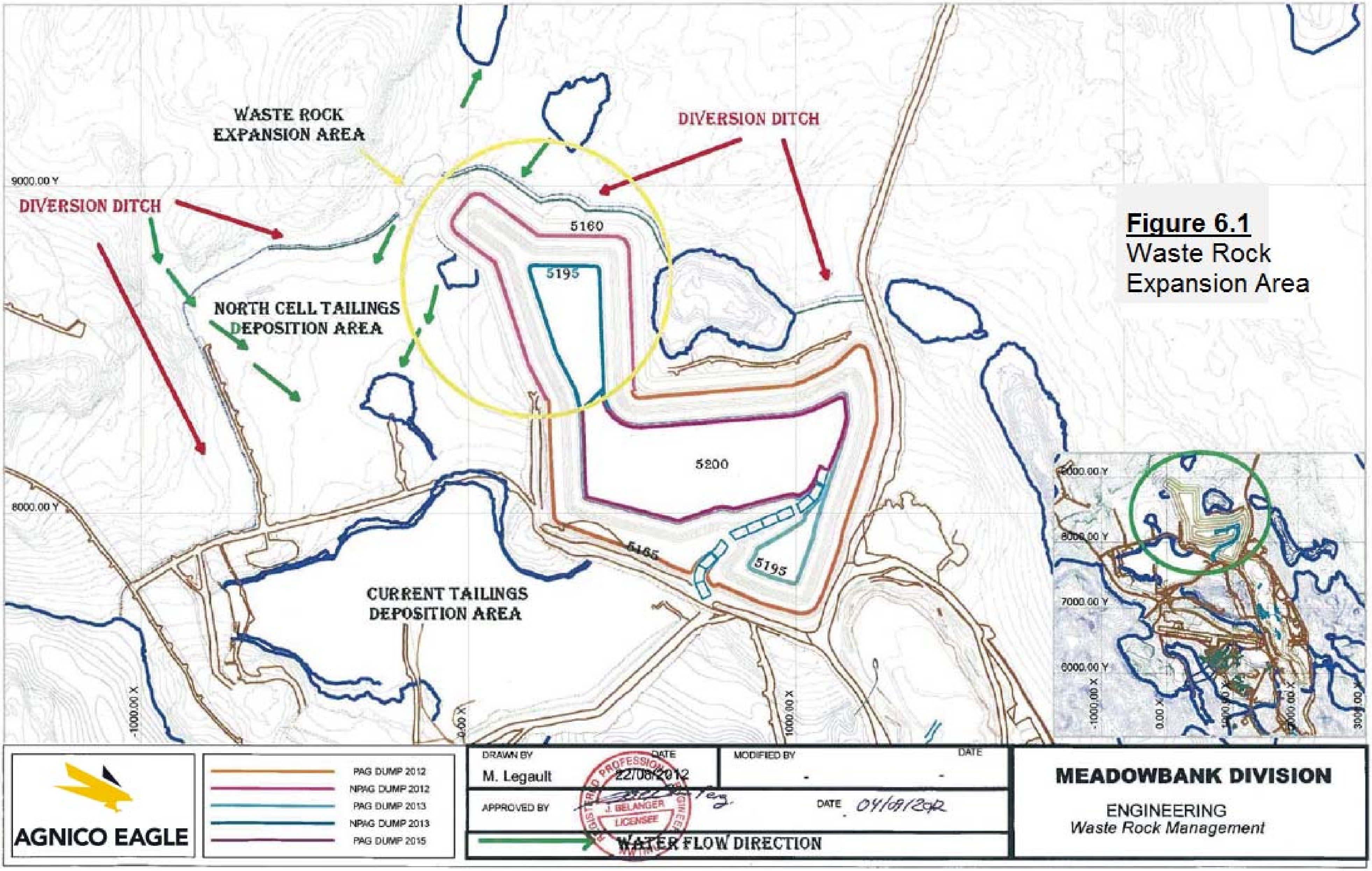


Figure 6.1
Waste Rock Expansion Area
WASTE ROCK EXPANSION AREA
DIVERSION DITCH
DIVERSION DITCH
NORTH CELL TAILINGS DEPOSITION AREA
CURRENT TAILINGS DEPOSITION AREA
5160
5195
5200
5185
5195
9000.00 Y
8000.00 Y
-1000.00 X
0.00 X
1000.00 X
9000.00 Y
8000.00 Y
7000.00 Y
6000.00 Y
AGNICO EAGLE
PAG DUMP 2012
NPAG DUMP 2012
PAG DUMP 2013
NPAG DUMP 2013
PAG DUMP 2015
DRAWN BY
M. Legault
DATE
22/08/2012
MODIFIED BY
DATE
APPROVED BY
J. BELANGER
LICENSEE
DATE 04/09/2012
WATER FLOW DIRECTION
MEADOWBANK DIVISION
ENGINEERING
Waste Rock Management

SECTION 7 • TAILINGS MANAGEMENT

Tailings are the processed material by-product of the gold recovery process. Tailings are processed through a cyanide destruction circuit, then pumped to the Tailings Distribution Box, and then pumped to the Tailings Storage Facilities – North and South Cells (TSF).

The TSF is divided by the Stormwater dike into the North and South Cells. The North Cell is currently delimited by the Saddle Dams 1 and 2. The structures of the North Cell are presently at final El.150m. The pond will be maintained at a maximum of El.148m (to allow a 2 meter freeboard of water) and the tailings are expected to reach El.149.5m (after dewatering).

The South Cell is currently delimited by the Central Dike which has partially been completed to El.120m. The Central Dike embankment was completed to El.115m in 2012 and partially to El.120m in 2013. LLDPE liner installation on the upstream surface is not fully completed to El.115. This dike will be raised to El.136m in 2014 with a final elevation currently planned to elevation 140m in 2015.

Tailings deposition began in February 2010, in the North Cell, and will switch to the South Cell in approximately October 2014. For the early years of operation, the pond in the South Cell is operated as an attenuation storage pond (Portage Attenuation Pond – PAP), while the reclaim pond is operated within the North Cell. When the deposition will switch to the South Cell, the Attenuation and Reclaim ponds will combine.

7.1 TAILINGS PROPERTIES

Properties of the tailings relevant to the design of the TSF are presented in Table 7.1.

Table 7.1: Relevant Data for Tailings Storage Facility

Property	Value
Mine design life	7.5 yrs
Mill production (solids)	Approx. 11,300 tpd
Ore processed (including In pit Reserves)	28.5 Mt
Goose pit (In pit Reserves)	1.0 Mt
Vault pit (In pit Reserves)	8.8 Mt
Portage and Goose pits (Ore mined)	12.6 Mt
Portage pit (In pit Reserves)	5.2 Mt
Average specific gravity for ore	3.1 t/m^3
Assumed void ratio	1.4
Assumed in situ dry density	1.27 t/m^3
Volume of tailings	23.26 Mm^3

Processed tailings volumes and associated properties for 2010, 2011, 2012 and 2013 are presented in Table 7.2, Table 7.3, Table 7.4 and Table 7.5.

Table 7.2: 2010 Processed Tailings Volume and Associated Properties

	Tailings (tonnes)	Density of Tailings (% solid)	Density of Slurry (tonnes / m^3)	Tailings pumped to TSF (m^3)
January	-	-	-	0
February	47,745	25%	1.20	39,659
March	163,399	34%	1.30	125,330
April	176,857	31%	1.27	139,341
May	177,610	34%	1.30	136,347
June	215,389	37%	1.33	161,963
July	193,422	43%	1.41	137,237
August	215,559	34%	1.30	165,911
September	227,502	45%	1.44	157,952
October	198,394	50%	1.51	131,460
November	218,260	45%	1.44	151,407
December	214,400	43%	1.41	151,544
TOTAL				**1,498,151**

Table 7.3: 2011 Processed Tailings Volume and Associated Properties

	Tailings (tonnes)	Density of Tailings (% solid)	Density of Slurry (tonnes / m^3)	Tailings pumped to TSF (m^3)
January	193,748	55%	1.60	121,337
February	213,313	53%	1.56	136,692
March	221,615	53%	1.56	141,906
April	223,041	52%	1.55	144,213
May	186,811	54%	1.58	118,424
June	257,401	54%	1.57	164,165
July	284,295	53%	1.56	181,984
August	275,766	54%	1.57	175,828
September	306,020	55%	1.58	193,082
October	306,756	56%	1.61	191,047
November	214,868	56%	1.61	133,255
December	294,088	51%	1.53	192,542
TOTAL				**1,894,475**

Table 7.4: 2012 Processed Tailings Volume and Associated Properties

	Tailings (tonnes)	Density of Tailings (% solid)	Density of Slurry (tonnes / m^3)	Tailings pumped to TSF (m^3)
January	275,186	49.71%	1.51	182,527
February	307,134	49.73%	1.51	203,668
March	304,740	49.78%	1.51	201,969
April	285,702	49.61%	1.51	189,682
May	320,542	49.74%	1.51	212,531
June	294,829	49.81%	1.51	195,350
July	337,110	49.81%	1.51	223,368
August	352,831	49.81%	1.51	233,780
September	313,014	49.81%	1.51	207,406
October	358,860	49.73%	1.51	237,973
November	356,646	49.71%	1.51	236,558
December	314,317	49.61%	1.51	208,676
TOTAL				**2,533,488**

Table 7.5: 2013 Processed Tailings Volume and Associated Properties

	Tailings (tonnes)	Density of Tailings (% solid)	Density of Slurry (tonnes / m^3)	Tailings pumped to TSF (m^3)
January	320,729	52.40%	1.55	206,888
February	329,709	54.87%	1.59	207,163
March	368,323	54.03%	1.58	233,525
April	309,458	53.31%	1.57	197,694
May	363,625	54.56%	1.59	229,228
June	355,498	54.59%	1.59	224,030
July	368,058	54.32%	1.58	232,626
August	321,294	54.55%	1.59	202,565
September	357,595	54.11%	1.58	226,511
October	377,118	53.83%	1.57	239,592
November	300,779	53.87%	1.57	191,014
December	370,655	54.08%	1.58	234,858
TOTAL				**2,625,694**

7.2 TAILINGS MANAGEMENT STRATEGIES

Due to the arid climate and permafrost environment, tailings are disposed of in a manner that encourages total freezing as a control strategy. Given the length of time that water at the site is ice covered, sub aerial disposal is preferred. The objective is to allow the tailings to be frozen in layers in order to maximize the total frozen thickness. It is anticipated that the tailings will eventually become encapsulated by permafrost; thus limiting oxygen diffusion and water infiltration into the tailings, seepage from the tailings, and the generation of acid mine drainage.

The TSF was designed in two cells in order to allow tailings management in smaller areas with shorter beach lengths reducing the amount of water that is trapped and permanently stored as ice. Operation in cells also allows progressive closure and cover trials to begin in the North Cell while tailings deposition continues in the South Cell.

Tailings deposition starts in the North Cell and is done from the perimeter dikes and rockfill structures. The primary objective is to build tailings beaches to keep the pond away from the dikes and rockfill structures; especially prior to the freezing period to protect the liner against ice build-up, and to prevent or limit any seepage out of the TSF.

Once deposition switches to the South Cell, Stormwater Dike becomes an internal dike dividing the North Cell from the South Cell. Exfiltration's from the Stormwater Dike (not evident to date) should flow to the South Cell.

The tailings deposition plan in the South Cell will result in the development of a tailings beach starting on the upstream slope of the Central Dike and progressively advancing northwest, away from the Central Dike and Portage pit. This will force potential seepage pathway away from Central Dike and its foundation materials reducing possible seepage-flux to the environment.

Once hydraulic gradients are reduced, the migration seep water into the talik beneath the North Arm of 2PL can only occur by diffusion. Diffusive transport is calculated to require more than $1x10^6$ years for 1% of the initial constituent concentration to reach the deep regional groundwater system. The rate of advance of the freezing front into the talik beneath the 2PL is therefore expected to exceed the rate of advance of diffusive transport, eventually encapsulating any constituents.

During operations, the cells (North or South) into which tailings will be deposited will initially be a local groundwater discharge area as the water level in the tailings will be below Second Portage Lake. As the Portage Pit is excavated however, it will become a regional hydraulic sink in the area. Any seepage into the talik beneath the tailings area will be directed towards the Portage Pit where it will be captured during the open pit operations and redirected back to the TSF. Groundwater sample analysis results to date have not detected any parameters associated with the tailings, ie, cyanide.

At closure, the tailings surface will be capped with a minimum 2-m thick layer of NAG rockfill and will be shaped to direct water away from the perimeter dikes. The final thickness of capping will be selected to limit yearly thawing (the active layer) to within the acid-buffering capping layer, and promote the development of permafrost within the tailings. Cover trials will be completed during operations to confirm the required cover thickness to physically isolate the tailings and to confine the active layer within relatively inert materials.

In addition to providing a layer to limit the depth of potential frost penetration into reactive tailings pile, the cover layer will also serve the following beneficial purposes:

- The cover will reduce the potential for wind-blown tailings;
- The cover will be composed of acid buffering waste rock; and
- The cover will contribute to shedding of water from the surface of the tailings, and consequently will limit infiltration of water into the tailings pile.

The beneficial effects of the cover layer will provide an alternative and secondary strategy for the management of the TSF in the event that permafrost develops more slowly than predicted.

During the post-closure period, the tailings are predicted to freeze with time, resulting in permafrost encapsulation. A very low seepage flux of tailings pore water is expected to report to the Portage Pit Lake until the tailings are frozen. The pit lake will be isolated from the adjacent 3PL until monitoring indicates the pit lake water quality achieves acceptable levels to allow removal of sections of the Bay-Goose Dike.

As mentioned previously, AEM is assessing a Tailings Optimization strategy that may include an alteration to the deposition strategy and sequencing. However, at this time the assessment process is still ongoing. Any potential changes will be discussed with the appropriate regulatory bodies, ie, NIRB, NWB to determine license and permitting requirements.

7.3 TAILINGS FREEZEBACK AND SEEPAGE

Modeling of tailings freezeback and contaminant transport was completed in two stages of increasing complexity, as described in Golder 2007a and 2008a. The first stage of modeling was completed using a simplified thermal model of the proposed tailings deposit in the northwest arm of 2PL. It was carried out to predict the range of time required to freeze the tailings and into the underlying talik (Golder, 2007a). The model was intended to simulate thermal changes in and beneath the tailings during operations and after closure. The second stage of modeling included the effects of staged flooding of the Portage Pit, and contaminant transport semi-coupled with seepage/thermal processes on foundation and tailings temperatures (Golder, 2008a).

The modeling assumed that tailings were deposited instantaneously as a thawed mass to the full depth, approximating advective heat flow preventing freezing of the tailings until the tailings cells have been fully filled by end of mine life. These are conservative assumptions, as it is expected that the climate conditions at site will result in some freezing of the tailings mass.

Climate change was also incorporated into the modeling exercise using climate warming trend of 6.4°C over 100 years. This is considered to be a conservative upper estimate of the climate change rate for the mine area and is consistent with predicted and recommended climate change trends for projects in the north.

The model results indicate that the degree of freezing, time to reach fully frozen tailings, and the depth of the frozen foundation beneath the tailing pile would depend upon the placement of the tailings and the duration of the exposure of the tailings to air temperature. The results also indicate that water flowing through the tailings will increase the time for the tailings to freeze completely.

However, the impact of heat introduced by water flow will be limited by the expected low hydraulic conductivity of the tailings.

The seepage component of the coupled model analysis indicated that water flux in the TSF will be mainly controlled in the short term by the hydraulic gradient existing between the tailings and Portage Pit areas. Upon mine closure and flooding of the Portage Pit, the hydraulic gradient between the two areas will gradually reduce as the lake level rises and the tailings drain. Hydrostatic equilibrium will occur within about 10 years causing flux from the tailings area to practically cease. After that, the freezing front will progressively advance into the tailings and the tailings will freeze within a period of about 40 years after closure.

7.3.1 Monitoring of Tailings Freezeback

During the development and mining of the deposits, an adaptive management plan will be implemented with respect to monitoring of the TSF. The Thermal Monitoring Plan (TMP) is presented in detail in Section 8 of this document.

During the operational phase, a number of test pad stratigraphies have and will be developed to assess various cover designs, and to determine the most appropriate design for the actual site conditions. Such an approach has been used previously at northern mines such as Nanisivik.

The monitoring program will provide the data required to validate the predictions of freezeback within the tailings. If it is determined by monitoring during operations that the tailings are freezing at lower rates than predicted, then mitigation procedures would be implemented.

A number of mitigation measures are available to control ground temperature and to enhance freezing. These include the use of passive or active thermosyphon systems. Passive systems rely on natural (or wind induced) ventilation while active systems rely on forced ventilation or circulation of refrigerants through a heat exchanger. The passive systems utilizing natural circulation are less costly, and are easily implemented, consisting essentially of an air convection pile, or pipe, that is open to the atmosphere. Heat is exchanged by convective circulation resulting from the cold air from the surface environment sinking within the open pipe, and warm air inside the pipe rising. These systems can also be closed systems having some internal fluid that is used as the heat transfer medium. Active (forced ventilation) systems utilize pumps and refrigerants to achieve the same cooling effect but at an accelerated rate. Both systems are used reliably in northern climates to preserve or promote freezing.

As indicated before, the tailings will also be covered with a minimum 2-m thickness of NAG rockfill (final thickness to be confirmed based on cover trials), which will provide an alternative and preventive strategy for the management of the TSF in the event that permafrost develops more slowly than predicted.

7.3.2 Monitoring of Tailings Seepage

Following dewatering of 2PL Arm and during investigations and construction of the TSF perimeter dikes several investigative procedures were and will continue to be used to identify the location and hydraulic properties of faults that are inferred to be present beneath the North Arm of 2PL including mapping of exposed bedrock, and packer testing in boreholes.

The results of the investigations are used to locate monitoring wells and thermistors that are and will be installed within the dikes, and between the Central Dike and crest of the Portage Pit. Thermal data are and will continue to be monitored to evaluate seepage from the TSF and freezeback of the TSF, and of the Central Dike and foundation.

- If monitoring indicates flow rates and water qualities of concern, then mitigation measures would be undertaken. The potential mitigation action would be dependent on observed flow rates and water quality data, but might include the following (Golder, 2007b): Installation of a grout curtain beneath the Central Dike; and
- If, during monitoring, it is found that the freezeback of the dike and tailings deposit are occurring at a rate less than predicted, then enhancement by artificial freezing methods may be considered.

7.3.3 Requirements for Sumps and Seepage Pump Back

Seepage collection systems are planned downstream of the TSF dikes and rockfill structures as a contingency against seepage. Seepage collection systems consist of trenches and sumps located immediately downstream of the TSF dikes. Seepage reporting to the sumps is to be pumped back over the dike into the TSF. Seepage pump back rates will be monitored and recorded as a measure of dike or rockfill performance.

In 2013 seepage was detected in a sump location on the North side of the Portage TSF. It was later determined that the source was the North Cell TSF reclaim water that had ponded against the rockfill structure adjacent to the Portage RSF. This water migrated under the WRSF and discharged to the sump location. Corrective measures (installation of a till plug, increased pumping and the installation of 4 additional thermistors to assist in monitoring freezeback in the WRSF) were undertaken to prevent migration to Lake NP-2. A report, including recommendations, was prepared by Golder (Jan, 2014) and forms part of AEM's Water Management Plan, 2013. AEM is committed to implementing the Golder recommendations to control the seepage.

7.4 TAILINGS DEPOSITION PLANNING

The main components of the TSF are illustrated in Figure 7-1 and the general operation of the TSF facilities will follow the sequence laid out in Table 3.10. The storage capacity of the tailings storage facilities, Attenuation/Reclaim Pond, and total basin capacity are shown on Figure 7-2. An updated operational detailed deposition plan for the TSF is presented in the 2013 Water Management Plan completed by AEM.

Tailings deposition planning for the mine is based on the following general objectives and operating philosophy:

- Define a deposition sequence based on proposed dike alignments with sufficient capacity to store the life of mine tailings plus a contingency while maintaining the required setback from the Portage Pit;

- Define a deposition sequence that allows the cells to be partitioned (Stormwater Dike) to facilitate the lake dewatering sequence, construction of the Central Dike, and to allow a portion of the TSF to be operated as an attenuation pond for at least 3 years. This has been completed as the Central Dike is partially constructed to elevation 120m. AEM is currently investigating the reuse of water collected in the attenuation pond in the mill process;
- Define a deposition sequence that maintains a reclaim pond with sufficient depth for efficient operation of the reclaim barge near the west side of the impoundment;
- Define a deposition sequence that maintains beaches on the upstream faces of perimeter dikes, Stormwater Dike, Central dike, all associated Saddle Dams and peripheral rock fill structures;
- Define a deposition sequence to operate in cells to reduce beach length to more efficiently operate in cold conditions to minimize the storage of ice;
- Define the staged construction schedule for the dikes so that adequate freeboard is maintained within the impoundment;
- Define a deposition sequence that creates a tailings surface that will require the minimum earthworks during closure and if possible will allow covering of some portion of the tailings surface during operations; and
- Define a deposition sequence that promotes freezing of the tailings during the operating period.

As mentioned above, the general operational management strategy for the TSF involves discharging tailings into the North Cell of the TSF to a maximum elevation of 149.5m. Once the North Cell is filled, a reclaim system will be established in the South Cell, and tailings deposition will continue. While the South Cell is operated, the North Cell will be allowed to freeze, and progressive reclamation trials will commence. The tailings will be covered with rockfill placed in the northern sector of North Cell and working towards Stormwater Dike.

7.5 TAILINGS STORAGE FACILITY CAPACITY

As mill processing rates and tailings characteristics are liable to fluctuate over the life of the mine, the design of the TSF and tailings deposition plan will continue to evolve based on changes in design parameters including mill process rates, tailings beach slopes, ice entrapment, and tailings in-situ densities. As such, a preliminary deposition plan was done in 2009 to provide guidelines for operation of the facility and to schedule the construction of the TSF perimeter dikes. The preliminary deposition plan was initially updated each year to include data collected from the previous year's deposition within the TSF. Since 2013 AEM has seen fit to put in place two on site water engineers, who regularly review/update the deposition plan accounting for any new and relevant information and changes to mine and operational planning.

The TSF was designed to have sufficient capacity to store the expected tailings volume over the life of mine (Golder, 2008b). In that same study, a sensitivity analysis was conducted to evaluate the impact of possible ice entrapment on the final elevation of the TSF. It is likely that some ice can be trapped in the tailings as a result of tailings transport water freezing before it reaches the Reclaim Pond. The results are summarized in Table 7.5. The original design included an assumption of a 20% tailings bulking factor due to ice entrapment. AEM completed the 2012 Water Management Plan. AEM has determined that there is actually an additional 20% water within the tailings pore water. The tailings solid content is 50.4 % (Ws/ (Ws+Ww)). This value means that for each ton of tailings, there is app 1 m^3 of water. This water is pumped in the North Cell - TSF with the slurry, but a part of this water is captured in the material void. This water could be found in different states: ice lens formation and the tailings capillarity hold water (inside the solid portion). As a result only 60% of the slurry water becomes reclaim water. The other 40% is trapped inside the tailings pond.

The quantity of ice trapped will depend on the tailings beach management, but increases in volume due to ice entrapment of up to 30% have been reported by other mines in similar environments. The impact of varying proportions of entrapped ice on the storage capacity of the TSF is presented in Figure 7.3. The figure indicates that an increase in bulking from 20% to 30% due to ice entrapment in the tailings would result in an increased final height of the tailings.

Since the beginning of deposition, bathymetric surveys conducted at least yearly revealed that density is lower than predicted by the sensitivity analysis; 1.21 t/m^3 measured compared to 1.37 t/m^3 predicted). Therefore, additional storage contingency may not be available within the TSF.

In addition to the contingency related to density, the design of the dikes allows for staging crest elevations without major re-design. The TSF dikes are raised by the downstream method, and the alignments of the dikes were selected to allow additional rising to occur above 150 masl, should additional ore bodies be identified.

The key variables that will influence the performance of the facility are the following:

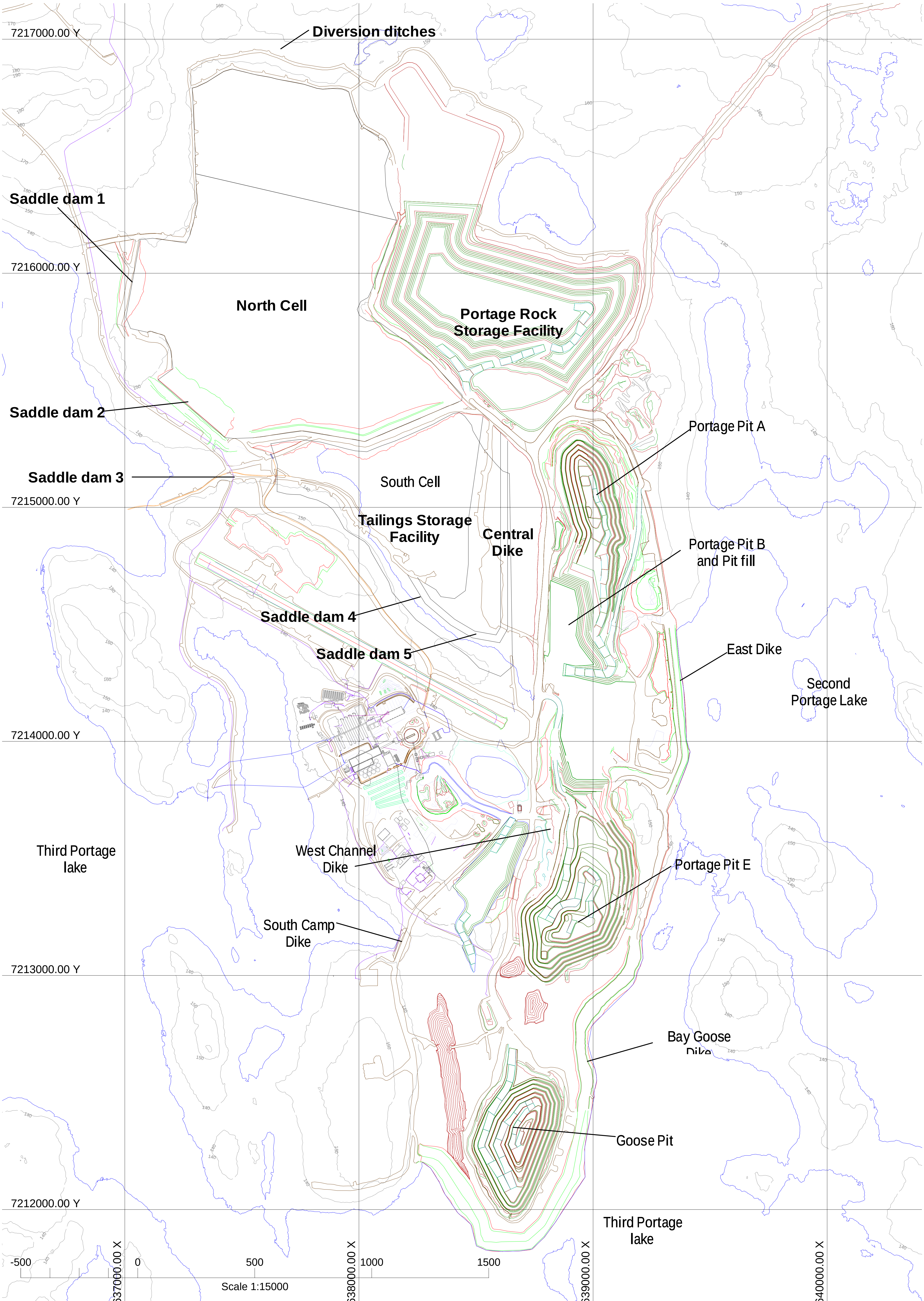
- Tailings beach slope;
- Reclaim pond volume;
- In-situ dry density;
- Seepage; and
- Ice content.

Regular monitoring of the TSF discharge operation, such as bathymetry and topography surveys, are to be conducted throughout the life of the TSF to adjust model parameters and deposition strategy. This ensures proper planning of the raisings/dikes construction, water availability in the TSF pond and water release strategy following freshet. It will also help in the evaluation of ice entrapment throughout the life of the TSF and verification of model parameters and deposition strategy within the updated deposition plan.

Table 7.6: Average Height Increase of Tailings Surface Elevation for Various Amounts of Ice Entrapment based on Golder, 2008b

Proportion of Entrapped Ice (%)	Average Height Increase of Final Tailings Surface Elevation* (m)
0	-
10	1.4
20	2.5
30	3.7

*Based on initial ore reserves.



AGNICO EAGLE

Grid Reference: NAD 83, UTM zone 14

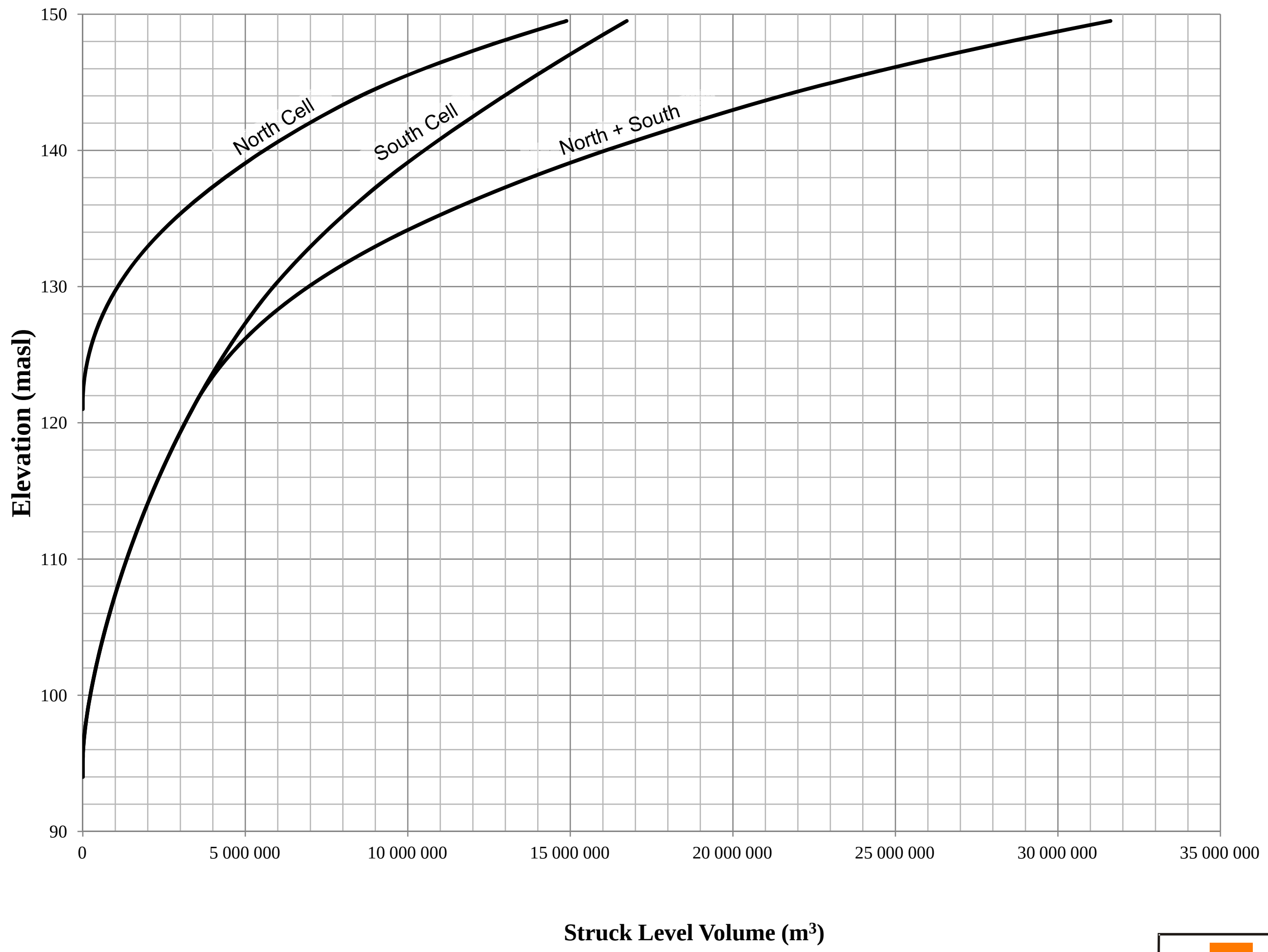
Date: 2014/03/08

By : Jose Condoretty

Figure 7.1

MEADOWBANK DIVISION

Tailings Storage Facility Main Components



REFERENCE

FROM THE TSF FILLING SCHEME MODEL (GOLDER 2011a)

AGNICO-EAGLE MINES LIMITED

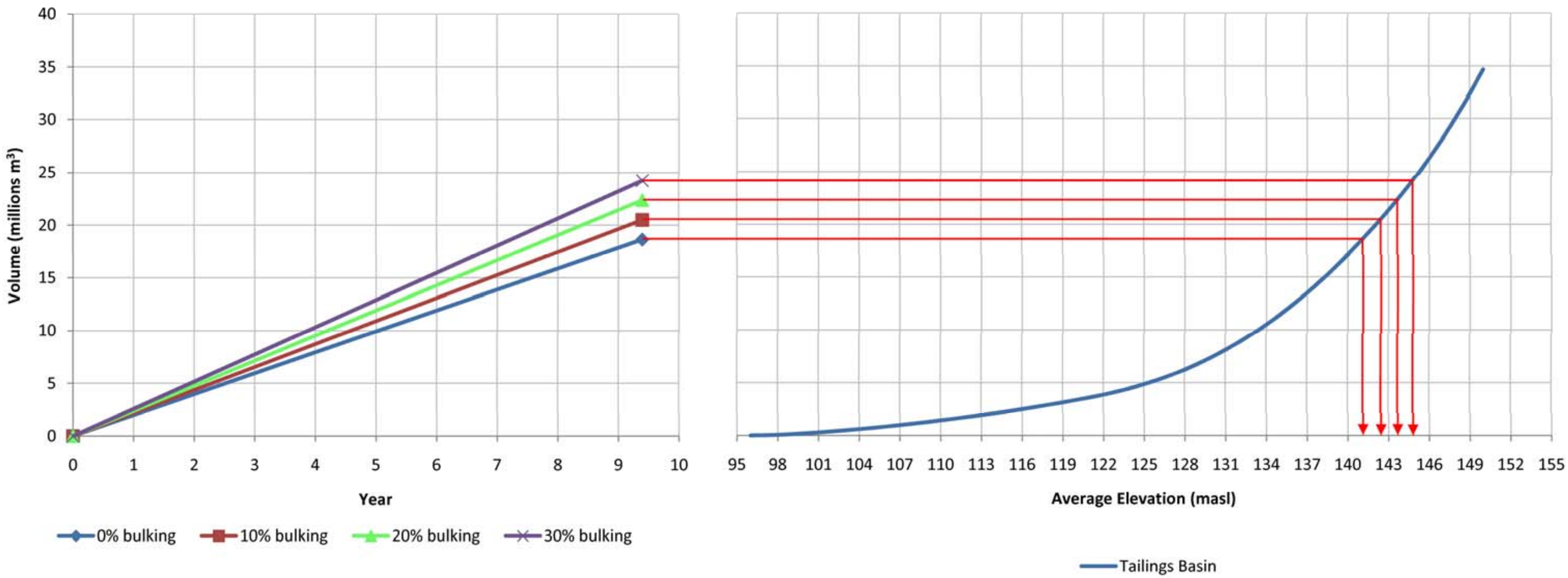
MEADOWBANK GOLD MINE
NUNAVUT

TAILINGS STORAGE FACILITY
STAGE STORAGE CURVE

FIGURE 7.2

REVISION DATE: 8JUL09 BY: DRW FILE:O:\Active_2008\1428\08-1428-0029 Meadowbank TSF Dike Design\7000 Updated Water Management Plan\GoldSim 2008\Updated Figures\Figure 3.18.ppt

REVISION DATE: 10JUL09 BY: DRW FILE:O:\Active_2009\1428\09-1428-0014 Mine Waste Meadowbank\2000 Figures\Figure 8.9.ppt



NOTE
FOR COMPARATIVE PURPOSES ONLY.
FINAL TAILINGS ELEVATIONS ARE AVERAGES ONLY AND DO NOT REFLECT POTENTIAL ELEVATION VARIATIONS ACROSS THE BASIN

AGNICO-EAGLE MINES LIMITED

MEADOWBANK GOLD MINE
NUNAVUT

TSF STORAGE AS A FUNCTION OF ICE CONTENT

FIGURE 7.3

SECTION 8 • THERMAL MONITORING PLAN

To observe the freezeback of the Tailing Storage Facility (TSF) and Rockfill Storage Facilities (RSF), a series of subsurface thermistors have been installed at strategic, prescribed locations at these facilities.

The thermistors have been installed in boreholes drilled around and in the perimeter of the RSF/TSF. The purpose of the thermistors in the TSF is to monitor the talik temperatures underneath the TSF as freezing progresses. The purpose of the thermistors in the RSF is to monitor the RSF temperature as freezing progresses. Finally, the purpose of the perimeter thermistors is to monitor the temperature of the perimeter structures which built the TSF/RSF area to make sure they remain frozen. See Figure 8.1 for specific location of those thermistors.

The thermistors are and will be monitored throughout the operational period as well as during closure and post closure. The results are and will continue to be used to evaluate the predicted thermal response of the facilities with the actual thermal response. This will allow adjustments to the tailings deposition plan and the Waste Rock deposition to be made during the operational period to attempt to influence the rate at which the TSF and RSF freeze.

Actually, the thermistors show that freezeback is occurring in the tailing and in the RSF structures. The thermistors install on the perimeter (in the dikes) of the TSF/RSF show that the foundation and the dikes remain frozen on year basis.

Additional thermistors are planned to be installed in tailings. These installations have and will continue to take place as the TSF is filled with tailings. Initially, some of the installations may be ‘sacrificial’ or temporary; in other words installations may be used to collect data over a short period and then may be destroyed or inaccessible as deposition progresses. The rationale behind installing such thermistors is to monitor the thermal conditions within and beneath the TSF from a very early stage in the life of the facility. As the TSF reaches final elevation, thermistors will be installed from the final tailings surface, and directly into the underlying bedrock. These will likely be on the order of 50 m to 75 m in length, potentially deeper, with nodes placed at intervals to monitor temperatures within the tailings and within the bedrock. The thermistors are currently monitored, and the results to date indicated freezeback is occurring in the RSF’s and the TSF.

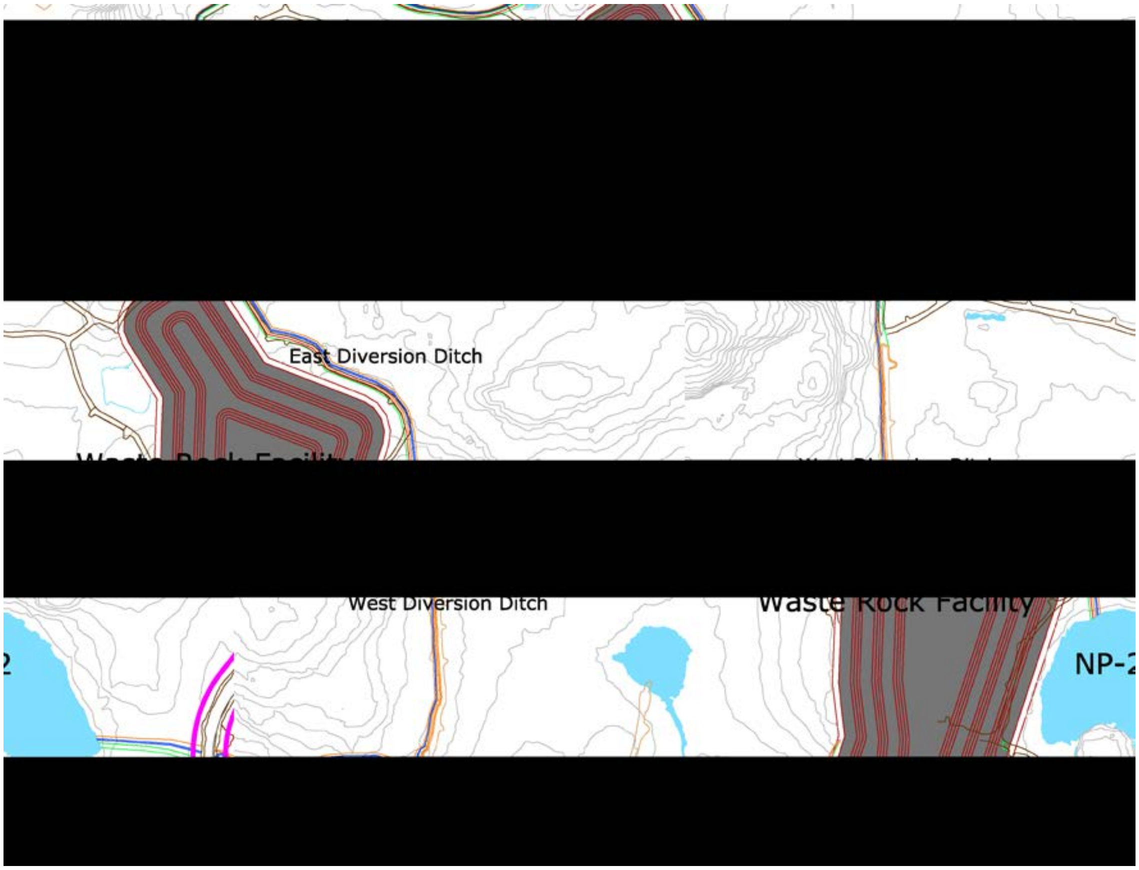
The locations and proposed phased installation of the thermistors are based on tailings deposition plans. For waste rock, the phasing and locations are based on the deposition plan described in Section 6 of this document. The sequence, methods and volumes of deposition presented in Tailings deposition plans may differ from actual deposition during operations. Timing and locations of thermistors is provided as a guideline to be followed as closely as possible. Future deposition plans will be taken into account prior to scheduling future installations, and if necessary thermistor specifications and locations should be modified as necessary.

In 2013 AEM installed 15 new thermistors; 9 at Central Dike (thermistors 750 P1, 650 P1, 580 P1, 545 P1, 650 P2, 545 P2, 875 P3, 650 P3, and 465 P3), five at the RSF (thermistors RSF1, RSF-3, RSF-4, RSF-5, RSF-6) and one along the slope of RF1 (thermistor RF1-3).

8.1 INSTRUMENT LOCATION

Installed and planned locations of thermistors are presented on Figure 8-1.

Figure 8-1: Planned and Installed Thermistor Location



8.1.1 Operations

During the operational life of Meadowbank, monitoring of the TSF can be divided into two phases, 2010 to 2015 in the North Cell and 2015 to 2017 in the South Cell.

The Portage RSF will operate from 2009 to 2016. The Vault RSF will operate from 2014 to 2018.

The following describes the requirement for thermistors at each storage facilities.

8.1.1.1 TSF North Cell

- Several thermistors have already been installed as part of Saddle Dam 1 (SD1), Saddle Dam 2 (SD2) and Stormwater Dike (SWD) construction in 2009-2011. Data collected from these structures form part of the TMP.

- SD2-T1; Installed in 2012 down to the till plug, at the upstream toe of SD2.

- T121-1(RF1); Installed in 2012 along the perimeter of RF1 (upstream). This will provide a leading indicator of seepage through RF1 towards the Portage RSF. It will also monitor thermal regime of the upper 40 m into the overlying soils and bedrock.

- T73-6 (RF1-2); Installed in 2012 along the perimeter of RF1 (upstream). This will also provide a leading indicator of seepage through RF1 towards the Portage RSF.

- RF1-3: Installed in 2013 along the upstream slope of the RF1. The purpose of the thermistor is to monitor the temperature of the tailings sitting on the slope of the RF1.

- T122-1 (RF-2); Installed in 2012 along the perimeter of RF2 (upstream). This will provide a leading indicator of seepage through RF2 towards the Portage RSF. It will also monitor thermal regime of the upper 40 m into the overlying soils and bedrock.

- T90-2 (SD-1); Installed in 2012 in tailings near the Saddle Dam 1.

- TSF-N-T3; Proposed to be installed as part of the TSF North Cell in 2015 as part of the cover trials. It will monitor the active cover layer, the tailings, and about 50 m below the lakebed into the Talik.

- Other thermistors will be installed inside and around the perimeter of the North Tailing cell in the year 2014.

8.1.1.2 TSF South Cell

- T147-1; this 57 m depth thermistor was installed in 2012 as part of the groundwater monitoring exploration wells. It replaced T147-2 which was installed in 2010.

- CD-T1 through CD-T6; The Central Dike will be fully instrumented during its construction between 2014 and 2016. In 2013 AEM installed 9 thermistors at Central Dike: 750 P1, 650 P1, 580 P1, 545 P1, 650 P2, 545 P2, 875 P3, 650 P3, and 465 P3).

- SD3-T1, T2, T3, T4; these thermistors are proposed as instrumentation for SD3. Construction is currently scheduled for 2015 to 2017 and installation of all thermistors will be done in 2015 and 2017.

- SD5-T1, T2, T3, T4; these thermistors are proposed as instrumentation for SD5. Construction is currently scheduled for 2014 to 2016 and installation of all thermistors will be done in 2014.TSF-S-T1.

- SD4-T1, T2, T3, T4; these thermistors are proposed as instrumentation for SD4. Construction is currently scheduled for 2014 and 2016 and installation of all thermistors will be done in 2014.

- TSF-S-T1; Location and specifications to be reviewed in conjunction with South Cell cover design, installation schedules in 2018. This would monitor a cross-section of the South Cell, including the active layer through the cover and tailings, about 50 m depth of tailings, and 40 m into the Talik.

8.1.1.3 Portage RSF

- RSF-1 and RSF 3 to 6; Installed in 2013 inside the perimeter of the RSF. The purpose of those thermistors is to monitor the freezeback of the RSF and validate the cover thickness.

- RSF-T3; Planned to be installed in 2015 inside the perimeter of the RSF. The purpose of this thermistor is to monitor the freezeback of the RSF and validate the cover thickness.

8.1.1.4 Vault RSF

- No instrumentation is currently planned within Vault RSF as it is expected to behave similarly to Portage RSF.

8.1.2 Closure

Final cover details for the TSF's will be subject to results obtained from the site trials previously discussed. The different thermistors installed will serve to monitor the performance of the covers on the Portage RSF, the TSF North Cell and the TSF South Cell, respectively. Monitoring of TSF and RSF freezeback in the post-closure phase is a requirement of the Water Licence.

8.2 INSTRUMENT SPECIFICATIONS

Each thermistor to be installed as part of the TMP must comply with the general specifications presented in Table 8.1. Table 8.2 provides details concerning the installations.

Table 8.1: Thermistor Specifications

Items	Specifications
Accuracy	1 degree Celsius
Thermistor temperature range	-40 to 40 degree Celsius
Method of cable termination	Amphenol connector
Cable termination enclosures	Weatherproof Animal resistant
Readout and data logger	Manual

Table 8.2: Existing and Proposed Thermistor Installation Details

Name	Northing	Easting	Year Installed (I) or Planned (P)	Purpose	Notes	Special Environmental Conditions	Top - Bot Elevation	Depth/ Length	Lead Length	Nodes	NODE DEPTHS (m)															
SD1-T2	7215956	637052	2009 (I)	Stage 1 Rockfill and foundation	Installed to 10m below bedrock, 2m spacing	Tailings	140 -110	30		16	0	2	4	6	8	10	12	…	2 m spacing to 30 m							
SD1-T4	7215949	637084	2009 (I)	Stage 1 U/S toe and foundation	Installed to 10m below bedrock, 2m spacing	Tailings	134- 119	15		16	0	1	2	3	4	5	6	…	1 m spacing to 16 m							
SD1-T1	7215978	637014	2010 (I)	Stage 1 & 2 U/S 3:1 slope	Installed to bedrock, at U/S toe of SD1	Tailings	149 -133	16		16	0	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SD1-T3	7215949	637084	2010 (I)	Stage 2 Rockfill and foundation	Installed to 10m below bedrock, 2m spacing	Tailings	148 -118	40		16	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32
SD2-T2	7215399	637267	2010 (I)	Stage 1 Rockfill and foundation	Installed to 10m below bedrock, 2m spacing	Tailings	148-118	30		16	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32
SD2-T3	7215439	637301	2010 (I)	Stage 2 Rockfill and foundation	Installed to 10m below bedrock, 2m spacing	Tailings	144-129	15		16	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SD2-T4	7215542	637175	2010 (I)	Stage 1 U/S toe and foundation	Installed to 10m below bedrock, 2m spacing	Tailings	144-121	23		16	0	1	2	3	4	5	6	7	9	11	13	15	17	19	21	23
T147-2	7215212	637979	2010 (I)	Monitor Talik beneath 2PL	Installed part of G/W monitoring Well investigation	Tailings	119.15	62		16	4	6	8	10	12	14	16	21	26	31	36	41	46	51	56	61
T147-1	7215204	637964	2012(I)	Monitor Talik beneath 2PL	To replace T147-2	Tailings	119.15	62		16	4	6	8	10	12	14	16	21	26	31	36	41	46	51	56	61
T121-1 (RF1-T1)	7215643	638268	2012 (I)	Monitor potential seepage through RF1 and foundation to RSF.	Installed on RF1 crest	PAG Rock	150- 90	60		16	7	9	11	13	15	17	19	21	23	25	27	31	35	40	50	60
T122-1	7216032	638096	2012 (I)	Monitor potential seepage through RF2 and	Installed on RF2 crest	PAG Rock	150- 90	60		16	7	9	11	13	15	17	19	21	23	25	27	31	35	40	50	60

Name	Northing	Easting	Year Installed (I) or Planned (P)	Purpose	Notes	Special Environmental Conditions	Top - Bot Elevation	Depth/ Length	Lead Length	Nodes	NODE DEPTHS (m)
				foundation to RSF.							
T90-2 (SD1)	7216002	637113.5	2012 (I)	Monitor Talik beneath 2PL	Former TSF-N-T2	Tailings	140.15-131				
SD2-T1	7215439	637300	2012 (I)	Stage 2 U/S 3:1 slope	Installed to till plug, at U/S toe of SD2	Tailings	148-145	30		16	0 2 4 6 8 10 12 2 m spacing to 30 m
T73-6	7215562	638277	2012(I)	Monitor potential seepage through RF2 and foundation to RSF.		Tailings	149.5-133			16	
750 P1	7214539.4	638679.8	2013 (I)	1) Water flow 2) Freeze back rates		PAG-NAG Rock	115-63	52		13	4 7 10 13 16 19 22 25 28 34 40 46 52
650 P1	7214639.7	638677.8	2013 (I)	1) Water flow 2) Freeze back rates		PAG-NAG Rock	115-63	52		13	4 7 10 13 16 19 22 25 28 34 40 46 52
580 P1	7214711.5	638681.5	2013 (I)	1) Water flow 2) Freeze back rates		PAG-NAG Rock	115-63	52		13	4 7 10 13 16 19 22 25 28 34 40 46 52
545 P1	7214745.4	638690.9	2013 (I)	1) Water flow 2) Freeze back rates		PAG-NAG Rock	115-63	52		13	4 7 10 13 16 19 22 25 28 34 40 46 52
650 P2	7214636.9	638754.2	2013 (I)	1) Water flow 2) Freeze back rates		PAG-NAG Rock	110-51	59		13	5 8 11 14 17 20 23 29 35 41 47 53 59
545 P2	7214746.6	638753.1	2013 (I)	1) Water flow 2) Freeze back rates		PAG-NAG Rock	112.5-51	61.5		13	7.5 10.5 13.5 16.5 19.5 22.5 25.5 31.5 37.5 43.5 49.5 55.5 61.5
875 P3	7214404.8	638821.5	2013 (I)	1) Water flow 2) Freeze back rates		PAG-NAG Rock	122-51	71		13	17 20 23 26 29 32 35 41 47 53 59 65 71
650 P3	7214675.1	638831.6	2013 (I)	1) Water flow 2) Freeze back rates		PAG-NAG Rock	109.5-51	58.5		13	4.5 7.5 10.5 13.5 16.5 19.5 22.5 28.5 34.5 40.5 46.5 52.5 58.5

Name	Northing	Easting	Year Installed (I) or Planned (P)	Purpose	Notes	Special Environmental Conditions	Top - Bot Elevation	Depth/ Length	Lead Length	Nodes	NODE DEPTHS (m)
465 P3	7214841.6	638852.3	2013 (I)	1) Water flow 2) Freeze back rates		PAG-NAG Rock	138-51	87		13	33 36 39 42 45 48 51 57 63 69 75 81 87
RF1-3	7215740	638126	2013 (I)	Monitor potential seepage through RF1 and foundation to RSF.	Installed on RF1 slope	PAG Rock	148.36-144.05	4.3		11	
RSF1	7215831	638129	2013 (I)	1) Potential Seepage from TSF through RF1 2) Freezeback of rockfill		PAG Rock	172.8-123.10	50		13	0 0.5 1 1.5 2 2.5 3 4 10 20 30 40 50
RSF-3	7215689	638370	2013 (I)	1) Potential Seepage from TSF through RF1 2) Freezeback of rockfill		PAG Rock	173.99-128.5	46		29	
RSF-4	7215892	638675	2013 (I)	1) Potential Seepage from TSF through RF1 2) Freezeback of rockfill		PAG Rock	210.21-131	79		29	
RSF-5	7216014	638630	2013 (I)	1) Potential Seepage from TSF through RF1 2) Freezeback of rockfill		PAG Rock	193.02-131	62		26	
RSF-6	7215647	638845	2013 (I)	1) Potential Seepage from TSF through RF1 2) Freezeback of rockfill		PAG Rock	197.79-127.8	70		29	

Name	Northing	Easting	Year Installed (I) or Planned (P)	Purpose	Notes	Special Environmental Conditions	Top - Bot Elevation	Depth/ Length	Lead Length	Nodes	NODE DEPTHS (m)
TSF-N-T1	7215570	637830	2014 (P)	Monitor Talik beneath TSF		Tailings	147-117	30	300	13	0 1 2 3 4 6 8 10 14 18 22 26 30
TSF-N-T2	7215740	637350	2014 (P)	Monitor Talik beneath TSF		Tailings	147-129	18	200	13	0 1 2 3 4 5 6 8 10 12 14 16 18
SD3-T1	7215196	637480	2015 (P)	Stage 1 & 2 U/S 3:1 slope	Install to bedrock, at U/S toe of SD3	Tailings	150-	~45		~9	0 5 10 20 25 30 35 …
SD3-T2	7215196	637480	2015 (P)	Stage 1 Rockfill and foundation	Installed to 10m below bedrock, 2m spacing	Tailings	145				0 2 4 6 8 10 12 …
SD3-T3	7215196	637480	2015 (P)	Stage 2 Rockfill and foundation	Installed to 10m below bedrock, 2m spacing		150				0 2 4 6 8 10 12 …
SD3-T4	7215196	637480	2015 (P)	Stage 1 U/S toe and foundation	Installed to 10m below bedrock, 2m spacing	Tailings	138				0 2 4 6 8 10 12 …
RSF-T3	7215868	638532	2015 (P)	1) Potential Seepage from TSF through RF1 2) freezeback of rockfill 3) RSF Cover Trial		PAG Rock	240-120	120		16	0 1 2 3 4 6 75 85 95 98 101 104 107 110 113 120
TSF-N-T3	7215715	637746	2015 (P)	1) Monitor freezeback of cover and tailings 2) Monitor talik	Install on tailings cover. Location to be determined, node locations to be reviewed upon cover design.	Tailings	145-75	70		14	0 1 1 2 2 2.5 3 5 10 20 25 30 50 70
CD-T1	7215089.51	638657.24	2016 (P)	U/S – Freezback of tailings		Tailings	150-110			21	0 5 10 15 20 25 30 … 100
CD-T2	7215089.51	638673.51	2016 (P)	Rockfill and foundation		PAG-NAG Rock	150-86			32	0 2 4 6 8 10 12 … 62

Name	Northing	Easting	Year Installed (I) or Planned (P)	Purpose	Notes	Special Environmental Conditions	Top - Bot Elevation	Depth/ Length	Lead Length	Nodes	NODE DEPTHS (m)
CD-T3	7214689.51	638657.24	2016 (P)	U/S – Freezback of tailings		Tailings	150-110			21	0 5 10 15 20 25 30 … 100
CD-T4	7214689.51	638673.51	2016 (P)	Rockfill and foundation		PAG-NAG Rock	150-86			32	0 2 4 6 8 10 12 … 62
CD-T5	7214439.51	638657.24	2016 (P)	U/S – Freezback of tailings		Tailings	150-110			21	0 5 10 15 20 25 30 … 100
CD-T6	7214439.51	638673.51	2016 (P)	Rockfill and foundation		PAG-NAG Rock	150-86			32	0 2 4 6 8 10 12 … 62
TSF-S-T1	7214755	638435	2018 (P)	1) Monitor freezeback of cover and tailings 2) Monitor talik	Installed on tailings cover. Location to be determined, node locations to be reviewed upon cover design.	Tailings	150-60	90		16	0 1 1 2 2 2.5 3 5 10 20 35 50 55 60 75 90

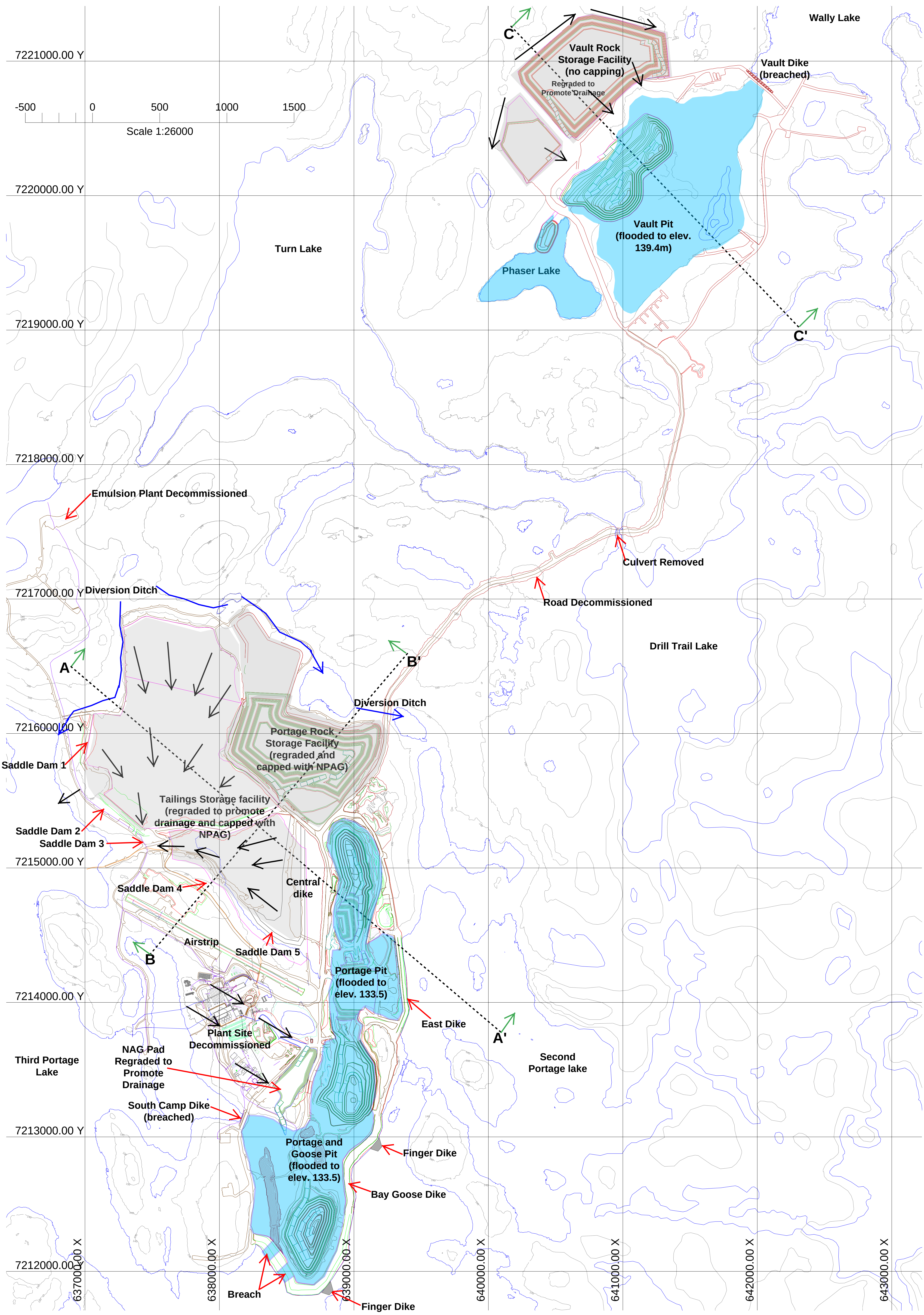
SECTION 9 • MONITORING AND CLOSURE

Mine closure and reclamation will utilize currently accepted management practices and appropriate mine closure techniques that comply with accepted protocols and standards. Closure will be based on project design and operation to minimize the area of surface disturbance, stabilize disturbed land surfaces and permafrost against erosion, and return the land to post-mining uses for traditional pursuits (MMC, 2007a). An update Interim Closure Plan was prepared by Golder in December, 2013. The document is included as part of AEM's Annual Report.

The post-closure concept is illustrated in Figure 9-1. Mine waste rock and tailings storage facilities will be progressively closed during mine operations. The current plan proposed a 4m cover of NAG rock will be placed over PAG waste rock piles at the PRSF and a minimum of 2m (depending on cover trials) will be placed over the TSF to confine the active layer within relatively inert materials while promoting freezeback. It is important to mention that NAG capping studies are in progress and in-situ trials are planned for winter 2015 and will be conducted to determine the effectiveness of different cover thicknesses and designs. Final cover design for the RSF and TSF will be confirmed with these studies and trials. The surfaces of the Portage and Vault RSFs will be contoured to direct drainage to the Reclaim Pond and Vault Attenuation pond areas. Sections through the Portage RSF and TSF areas at closure are illustrated in Figure 9-2. A section through the Vault RSF is shown on Figure 9-3.

The Reclaim Pond will remain in place in the South Tailings Cell until mining and milling has been completed. At this time, reclaim water will be drained from the TSF and treated, if necessary, prior to discharge to the Goose or Portage pit lakes. If necessary, treatment of reclaim water will be completed in-situ or through a water treatment plant.

All infrastructures associated with mine operations, closure and reclamation including waste management facilities will be re-contoured and/or surface treated according to site specific conditions to minimize windblown dust and erosion from surface runoff, and to enhance the re-establishment of natural vegetation and wildlife habitat. The Interim Reclamation and Closure Plan for the Mine (Golder, 2014) has been developed and will be updated in conjunction with the mine plan so that considerations for site closure are incorporated into the mine design. Monitoring will be carried out during all stages of the mine life in accordance with all permits and licenses. Additional operational monitoring will also be conducted to assist in final and progressive reclamation activities. Monitoring is required to demonstrate appropriate and safe environmental performance of all mine facilities. If any non-compliant or inappropriate conditions are identified, then corrective measures will be implemented in a timely manner to ensure the successful and safe completion of the Reclamation and Closure Plan.



AEM

Legend
Waste Rock and Capping
Flooded Area
Non-Contact Water Diversion
Drainage Direction

Grid Reference: NAD 83, UTM zone 14

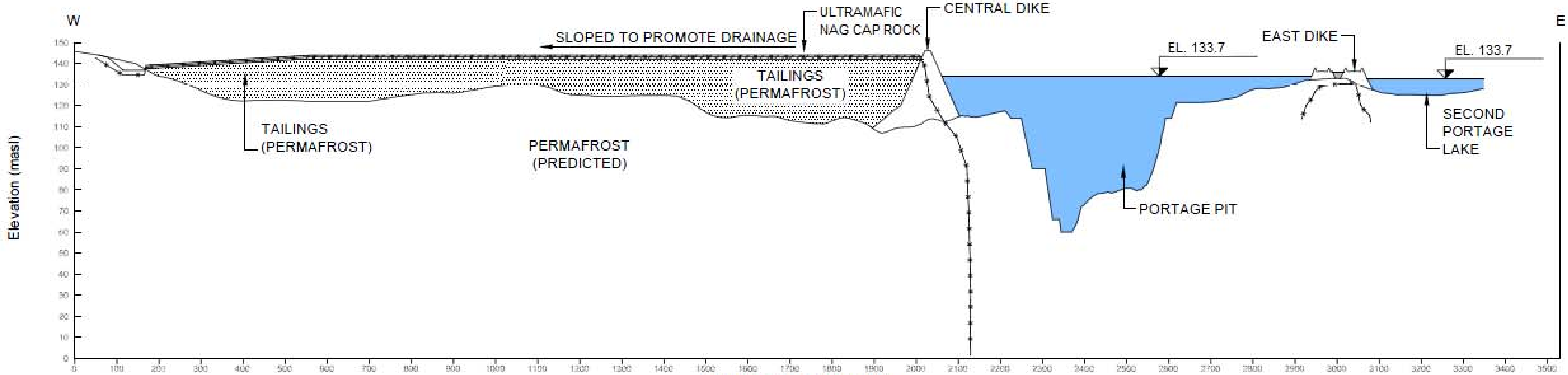
Date: 2013/10/28

By : Chris Teske

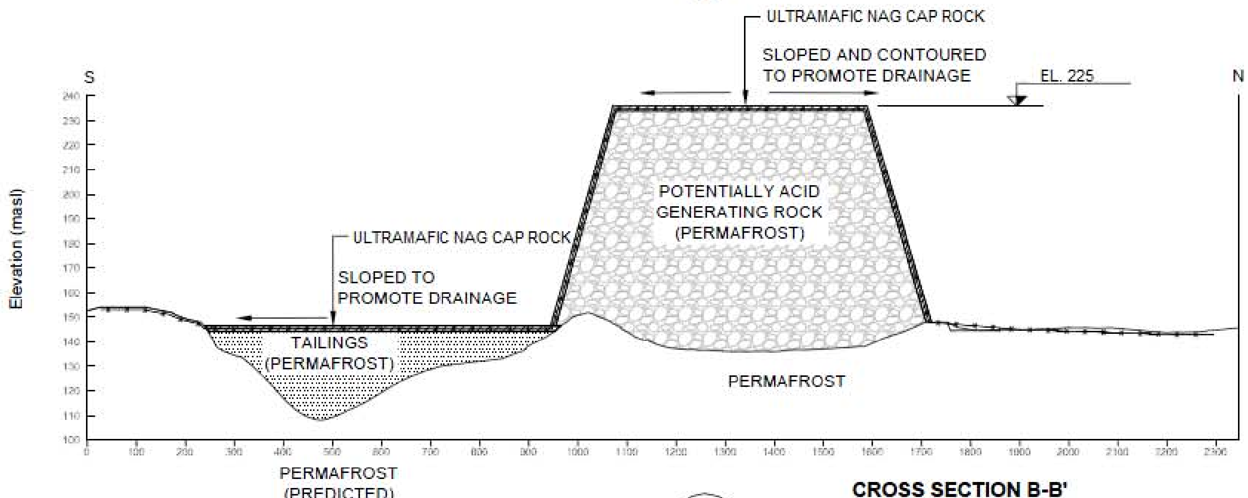
Figure 9.1

MEADOWBANK DIVISION

Site Post Closure Concept



CROSS SECTION A-A'
TAILINGS STORAGE FACILITY
A
10.1



CROSS SECTION B-B'
PORTAGE ROCK STORAGE FACILITY
B
10.1

NOTE:
The vertical exaggeration is 5x

0 100 200 300 400 500
HORIZONTAL SCALE IN METRES

0 20 40 60 80 100
VERTICAL SCALE IN METRES

LEGEND:
PERMAFROST BOUNDARY (INFERRED)

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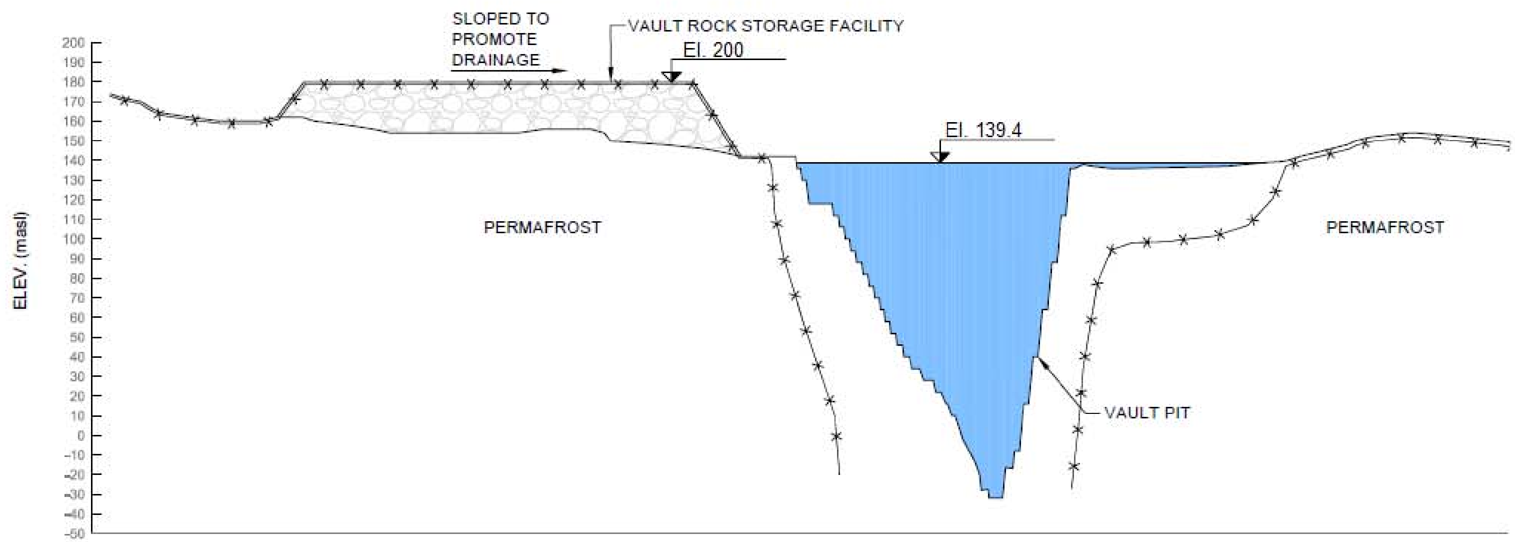
NUNAVUT

PORTAGE TAILINGS AND ROCK STORAGE CLOSURE DESIGN CONCEPT CROSS SECTION

FIGURE 9.2



C
10.1

CROSS SECTION C-C'
VAULT ROCK STORAGE FACILITY

LEGEND:

Permafrost Boundary (inferred)

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VAULT ROCK STORAGE
CLOSURE DESIGN CONCEPT
CROSS SECTION

FIGURE 9.3

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Minesched LOM file: LOM2014_20140225_V1d_endFEB14_v8pitdump_BaseCase.minesched

Supporting LOM files location: N:\20 - PLANNING\01 - LOM\LOM 2014\Draft VersionsLOM2014_20140225_V1d_endFEB14_v8pitdump_BaseCase