MEADOWBANK
MINING CORPORATION

MEADOWBANK GOLD PROJECT

TYPE A WATER LICENSE APPLICATION

AUGUST 2007

EXECUTIVE SUMMARY

Meadowbank Mining Corp (MMC), formerly Cumberland Resources Ltd. (Cumberland), is proposing to develop a mine on the Meadowbank property. The property is located in the Kivalliq region approximately 70 km north of the Hamlet of Baker Lake on Inuit-owned surface lands. MMC has been actively exploring the Meadowbank area since 1995. Engineering, environmental baseline studies and community consultations have paralleled these exploration programs and have been integrated to form the basis of current project design.

The Meadowbank Gold Project is subject to the environmental review and related licensing and permitting processes established by Part 5 of the Nunavut Land Claims Agreement. This report and accompanying supporting documentation form MMC's Application submission to the Nunavut Water Board for a Type "A" Water License for the Project.

The Meadowbank Gold Project represents the construction, operation, maintenance, reclamation, closure, and monitoring of an open pit gold mine in the Kivalliq Region of Nunavut. The project is located on Inuit-owned land approximately 70 km north of Baker Lake. The Project consists of several gold-bearing deposits within reasonably close proximity to one another. The four main deposits are: Vault, Portage (including the Third Portage deposit, and the Connector Zone and North Portage deposit), and Goose Island. The gold will be extracted from three separate open pits during the roughly eight- to ten-year operational lifespan of the mine. Water retention dikes will be constructed from mined rock to allow for the mining of ore beneath shallow lakes. Tailings and waste rock will be placed in separate storage facilities. Upon conclusion of activities, MMC will fully decommission the mine by removing the mill and ancillary buildings, and access roads—including the all-weather access road, and by recontouring disturbed areas and reclaiming vegetation

Environmental baseline studies have been conducted in the project area, the results of which have been integrated into the current project design. Baseline physical environmental data have been collected for hydrology, permafrost, groundwater, water quality, sediment, geochemistry, lake bathymetry, biology, and engineering studies.

To facilitate mine operations, it will be required to withdraw and divert water from surrounding lakes, and from areas within the mine footprint, and to handle, manage and treat waste. Details on engineering and planning aspects involved in the management of water and waste for the Project are provided, as are proposed water quality discharge limits. Finally, monitoring plans developed to ensure that waste and water are being managed appropriately, and that any unexpected impacts to the receiving environment can be isolated and handled in an efficient and timely manner are described.

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ᐊᐳᖅᑎᓐᓇᖅᑐᒥ ᐅᔭᕋᑕᕆᐊᖅᑎᑦ, ᑲᒻᐳᓚᓐᒍᓚᐅᖅᑐᑦ, ᐅᑯᐃᓯᕙᓕᐊᔪᑦ ᐊᔭᕋᑕᕆᐊᕐᕕᒃᒥᒃ ᐊᐳᖅᑎᓐᓇᖅᑐᒥ. ᐊᐳᖅᑎᓐᓇᕐᑐᖅ ᐊᖓᓯᒃᑎᒋᔪᖅ 70 ᑭᓚᒥᑐᑦ, ᖃᒪᓂ'ᑐᐊᕐᒥᑦ, ᑭᕙᓕᕐᒥ. ᐅᔭᕋᑕᕆᐊᕕᐅᓯᐊᖅᑐᖅ ᓄᓇ ᓇᒥᓂᕆᔭᐅᔪᖅ ᐃᓄᓂᑦ ᐊᖏᖃᑎᒋᒍᑦ ᑐᖓᕕᑯᑦ ᐊᑐᕐᓗᒍ, ᑭᓯᐊᓂ ᓄᓇᐅᑉ ᑲᖓ ᓇᒥᓂᕆᔭᐅᔪᖅ. ᐊᐳᖅᑎᓐᓇᖅᑐᒥ ᐅᔭᕋᑕᕆᐊᖅᑐᑦ, ᑲᓄᕼᐊᕐᒥᒃ ᑭᓂᕆᐊᖅᑐᑦ ᐱᒋᐊᖅᓱᑎᒃ 1995ᒥ. ᐅᔭᕋᑕᕆᐊᕐᕕᐅᑉ ᓴᓇᔭᐅᕙᓕᐊᓂᖓ, ᐊᕙᑎᓕᕆᓂᕐᓗ, ᖃᒪᓂ'ᑐᐊᕐᒥᐅᑦᓗ ᑲᑎᒪᖃᑎᒋᕙᒃᓱᒋᑦ, ᐅᔭᕋᑕᕆᐊᕐᕕᒃ ᓴᕿᕙᓕᐊᓕᖅᑐᖅ.

ᑲᓄᕼᐊᕐᒥᒃ ᐅᔭᕋᑕᕆᐊᐸᓕᐊᑎᓗᒋᑦ ᓚᐃᓴᑦ ᐊᑎᒋᖏᑐᑦ ᐊᖏᖅᑕᐅᔭᕆᐊᖃᖅᑐᑦ. ᐅᑯᐊ ᓚᐃᓴᑕᕈᑕᐅᔭᕆᐊᖃᒪᑕ ᐊᕙᑎᓕᕆᓂᕐᒧᑦ, ᐃᒪᕐᒧᑦ, ᓄᓇᒧᑦ, ᐊᓯᖏᓄᑦᓗ. ᑕᒪᓇ ᓚᐃᓴᑕᕐᓂᖅ ᑐᖓᕕᑯᑦ ᐊᖏᕈᑎᖓᓂᒪᑦ ᒪᓕᒋᐊᖃᖅᓱᓂ, ᓇᓴᐅᑎᖓ 5. ᑕᒻᓇ ᑎᑎᕋᒃᓯᒪᔪᖅ ᓚᐃᓴᑕᕈᑕᐅᓂᓗᑉᒪᑦ, ᐃᒪᓕᕆᓂᕐᒧᑦ ᓇᓗᓇᐃᑯᑕᓕᒃ 'ᐊ', ᑐᓂᔭᐅᓂᐊᖅᓱᓂᓗ ᓄᓇᕗᒥ ᐃᒪᓕᕆᔾᑦ ᑲᑎᒪᔨᖏᓄᑦ, ᓚᐃᓴᓂᒃ ᑲᒪᕙᒪᑕ.

ᐊᐳᖅᑎᓐᓇᖅᑐᒥ ᐅᔭᕋᑕᕆᐊᕐᕕᒃ ᐱᔭᕆᐊᕐᑯᖅᑐᔪᖅ ᐅᑯᐊᓗ ᐱᓕᕆᐊᕆᔭᐅᔭᕆᐊᖃᖅᓱᑎᒃ. ᓴᓇᔭᐅᓗᓂ, ᐊᐅᓚᓗᓂ, ᓴᓇᔭᐅᕙᒃᓗᓂ, ᑕᐅᑕᖓᓄᑦ ᓄᓇ ᐊᕿᒋᐊᖅᓗᒍ, ᐊᒪᓗ ᐅᑯᐊᓇᐊᖅᐊᑦ ᑲᒪᒋᑦᓯᐊᕐᓗᒍ. ᓄᓇᒥᓗ ᐊᑦᓯᓕᖅᐸᓕᐊᔪᖅ ᐅᔭᕋᑕᕆᐊᕐᕕᒃ, ᑭᕙᓕᕐᒥ ᓄᓇᕗᒥ, ᑲᒪᒋᓗᒍ. ᐊᐳᖅᑎᓐᓇᖅᑐᒥ ᐅᔭᕋᑕᕆᐊᐸᓕᐊᔪᑦ ᐃᓄᐃᑦ ᓄᓇᖓᓂ ᓇᒥᓂᕆᔭᐅᔪᒥ, ᑭᓯᐊᓂ ᓄᓇᐅᑉ ᖃᖓ ᓇᒥᓂᕆᔭᐅᔪᖅ ᐃᓄᓂᑦ. ᐅᖓᓯᒃᑎᒋᔪᖅ 70ᓂᒃ ᑭᓚᒥᑐᑦ ᖃᒪᓂ'ᑐᐊᕐᒥᑦ. ᓄᓇᒥ ᑲᓄᕼᖃᖅᑐᑦ ᕿᐅᔾᒪᔭᐅᔪᑦ, ᖃᓂᖃᑎᒃᓱᑎᒃ, ᐊᒪᓗ ᓄᓇᐅᑉ ᖃᖓᓄᑦ ᖃᓂᑐᑦ. ᑲᓄᕼᐊᖃᖅᑐᑦ ᓯᑕᒪᐅᓗᐊᖅᑐᑦ ᐅᑯᐊ: ᕿᑭᖅᑕᐅᑉ ᐊᑦᒍᐊᓂ (Vault), ᕿᑭᖅᑕᐅᑉ ᓴᓂᐊᓂ (Third and North Portage) ᐊᒪᓗ ᕿᑭᖅᑕᒥᑐᖅ, (Goose Island). ᑕᑯᐊ ᓯᑕᒪᐅᔪᑦ ᑲᓄᕼᐊᖃᖅᑐᑦ. ᑲᓄᕼᐊᖅ ᐊᒧᔭᐅᕙᓕᐊᓂᐊᖅᑐᖅ ᓄᓇᐅᑉ ᖃᖓ ᐊᑦᓯᒃᓯᕙᓕᐊᓗᒍ, ᐊᒪᓗ ᐱᖓᓱᓗᐊᕐᓂᐊᖅᑐᑦ ᓄᓇᑦ ᖃᓄᕼᐊᕐᒥᒃ ᕿᓂᕐᕕᐅᔪᑦ. ᐅᑭᐅᓂᒃ 8ᓗ 10ᓗ ᐊᑯᓂᖓᓂ ᐅᔭᕋᑕᕆᐊᕐᓂᐊᖅᑐᑦ. ᑕᓯᐅᑉ ᐊᑕᓂ ᑲᓄᕼᐊᖅ ᐅᔭᕋᑕᕆᑕᐊᖅᑕᐅᓕᖅᐸᑦ, ᐃᒪᕐᒧᑦ ᓱᐳᒥᕕᒃ ᑐᐊᐸᒥᑦ ᓴᓇᔭᐅᓗᓂ ᐱᓕᕆᓂᐊᖅᑐᑦ. ᑭᓂᐸᒧᑦᓗ ᐃᒪᒃᓗᓂᑦ ᐅᑐᕈᓂᖅᑐᑦ, ᐅᔭᕋᐃᓗ ᐅᑐᓚᖏᑐᑦ ᑐᖁᕕᖃᓂᐊᖅᑐᑦ ᓴᓇᔭᐅᓗᓂ ᒪᓂᕋᒥ. ᐅᔭᕋᑕᕆᐊᓚᓂᒃᐸᑕ ᐃᒡᓗᕐᔪᐊᑦ ᓯᖁᑉᑎᓚᐅᓂᐊᖅᑐᑦ, ᐅᔭᕋᓂᒃᓗ ᓯᖁᑉᑎᕆᕕᒃ ᓯᖁᑉᑎᓚᐅᓗᓂ, ᐊᒪᓗ ᐊᑉᖁᑎᑦ ᓯᖁᑉᑎᒍᐅᓗᑎᒃ ᐱᓂᐊᖅᑐᑦ. ᑕᒪᓇᑕᐅᖅ ᐊᑉᖁᑦ ᖃᒪᓂ'ᑐᐊᕐᒥᑦ ᐊᐳᖅᑎᓐᓇᖅᑐᒧᑦ ᐊᑕᔪᖅ ᓯᖁᑉᑎᓚᐅᔪᒪᖅᑐᖅ ᐊᑐᐊᓂᒃᐸᑦ, ᐊᒪᓗ ᓄᓇᑦ ᐊᕿᓗᒍ ᐊᕿᒋᐊᖅᐸᑦ.

ᐊᕙᑎᓗᒃᑕᖅ ᓄᓇᒥᓗ ᓯᓚᒥᓗ ᖃᐅᔨᓴᓚᐅᔪᖅ ᓱᓕ, ᑕᒪᑯᐊᓗ ᖃᐅᔨᔭᐅᕙᓕᐊᔪᑦ ᐃᓱᒪᒋᔭᐅᑉᓗᑎᒃ ᐅᔭᕋᑕᕆᐊᕐᕕᒃ ᓴᓇᔭᐅᕙᓕᐊᑎᓗᒍ. ᑕᒪᑯᐊᓗ ᓄᓇᒥᓗ ᐃᒪᕐᒥᓗ ᖃᐅᔨᓴᓂᑯᑦ ᑲᑎᖅᓱᓚᐅᔪᑦ, ᐊᒪᓗ ᐃᓯᖏᑦ ᖃᐅᔨᓴᕐᓂᑯᑦ ᐅᑯᓄᖓ ᑲᑎᖅᓱᖅᑕᐅᒥᔪᑦ, ᐃᒪᓕᕆᓂᖅ, ᓄᓇᐅᑉ ᕿᕿᓂᖓ, ᐃᒪᖅ ᓄᓇᐅᑉ ᐃᓗᐊᓂ, ᐃᒪᖅ, ᓄᓇᕐᓗᒃ ᐃᒪᐅᑉ ᐊᓗᐊᓂ, ᓄᓇᓕᕆᓂᖅ, ᑕᓯᑦ ᐃᑎᓂᖏᑦ, ᐅᒪᔪᐊᓚᓕᕆᓂᖅ, ᐊᒪᓗ ᐅᔭᕋᑕᕆᐊᓕᕆᓂᖅ. ᑕᒪᑯᐊ ᖃᐅᔨᓴᓚᐅᓂᐊᖅᑐᑦ.

ᐊᐳᖅᑎᓐᓇᖅᑐᒥ ᐅᔭᕋᑕᕆᐊᕐᕕᒃ ᐅᑯᐃᖅᐸᑦ, ᑕᓯᑦ ᑯᒡᓂᖏᑦ ᐊᓚᖑᖅᓂᐊᖅᑐᑦ. ᐅᔭᕋᑕᕆᐊᕐᕕᐅᓂᐊᖅᑐᑉ ᐊᕙᑕᓂ ᑕᓯᑦ, ᑯᑦᓗ ᐊᓚᖑᓕᔭᕐᓂᐊᖅᑐᑦ. ᑕᒪᑯᐊ ᐅᔭᕋᑕᕆᐊᕐᕕᒃᒥ ᐃᒪᕐᒥᒃ ᐱᔪᑎᓕᑦ ᓇᓗᓇᐃᔭᖅᓯᒪᔪᑦ, ᐊᒪᓗ ᐅᔭᕋᑕᕆᐊᕐᕕᒃ ᑕᐅᑐᖅᑲᓂᐊᕐᒪᖓᑕ ᑎᑎᕋᒃᓯᒪᔪᑦ ᑕᒪᕐᒥᒃ. ᑕᒪᑯᐊᓗ ᑭᓂᐸᔪᑦᓗ ᐃᒪᐃᑦᓗ ᐊᑐᕈᓂᖅᑐᑦ ᖃᓄᖅ ᑲᒪᒋᔭᐅᓂᐊᕐᒪᖓᑕ ᑎᑎᖅᑲᓂᓗ ᓄᓇᖑᐊᕐᓂᓗ ᓄᓗᓇᐃᔭᖅᓯᒪᔪᑦ ᓄᓇᖑᐊᕐᓂ. ᑕᒪᑯᐊ ᐊᒥᓱᑦ ᓇᓗᓇᐃᔭᖅᓯᒪᔪᑦ.

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SECTION 1 • INTRODUCTION

Meadowbank Mining Corporation (MMC), formerly Cumberland Resources Ltd. (Cumberland), is proposing to develop the Meadowbank Gold Project located approximately 70 km north of Baker Lake in Nunavut. The Project is subject to the environmental review and related licensing and permitting processes established by Part 5 of the Nunavut Land Claims Agreement (INAC and TFN, 1993).

On March 31, 2003, Cumberland submitted its Project Description Report for the Meadowbank Gold Project to the Nunavut Impact Review Board (NIRB). Following receipt of the MMC's application and NIRB's screening review the Minister of the Department of Indian Affairs referred the Project to an environmental impact review under Part 5 or 6 of Article 12 of the Nunavut Land Claims Agreement.

Following submission of a Final Environmental Impact Statement (FEIS), and completion of the screening and environmental impact review process, NIRB recommended that the Project proposal proceed subject to certain terms and conditions. On November 17, 2006, the Minister of Indian and Northern Affairs Canada, on behalf of the federal government and pursuant to Article 12.5.7 of the NLCA, approved the Nunavut Impact Review Board's recommendation and the Meadowbank Gold Mine Project Certificate (Nunavut Land Claims Agreement Article 12.5.12) was issued (NIRB 2006).

1.1 TYPE-A WATER LICENSE APPLICATION

As per the terms and conditions of the Project Certificate (NIRB 2006), and the *Nunavut Water Board Preliminary Guidelines for Applicant: Cumberland Resources Ltd. – Meadowbank Project* issued March 14, 2007 (NWB 2007), the following document has been prepared in support of MMC's application for a Type-A Water License for the Meadowbank Gold Project. Appended to this document are a number of additional supporting documents, which contain more detailed information on some of the concepts and issues discussed herein. These documents are as follows:

- *Detailed Design of Central Dike, Meadowbank Gold Project* (Golder 2007a)
- *Report Addendum, Detailed Design of Dewatering Dikes, Meadowbank Gold Project, Nunavut* (Golder, 2007b)
- *Meadowbank Gold Project Mine Waste and Water Management* (MMC 2007a)
- *Detailed Design of Dewatering Dikes, Meadowbank Gold Project* (Golder 2007c)
- *Expert Review of Meadowbank Tailings and Dewatering Dike Designs - Draft* (Morgenstern 2007)
- *Pit Slope Design Criteria for the Portage and Goose Island Deposits, Meadowbank Project, Nunavut* (Golder 2007d)
- *Independent Review of Pit Slope Design Criteria for the Portage and Goose Island Deposits* (Stacey Mining Geotechnical Ltd. 2007).
- *Updated Predictions of Brackish Water Upwelling in Open Pits with Mining Rate of 8500 tpd, Meadowbank Project, Nunavut* (Golder 2007e)
- *Meadowbank Gold Project - 2006 Baseline Groundwater Quality* (Golder 2007o)

- *Mitigative Measures for Potential Seepage from Tailings Facility* (Golder 2007f)
- *Meadowbank Gold Project Fault Testing and Monitoring Plan* (MMC 2007b)
- *Conceptual Design of the Effluent Outfall Diffuser for Wally Lake* (Golder 2007g)
- *Assessment of Effluent Dilution Potential for the Third Portage Lake Diffuser* (Golder 2007h)
- *Meadowbank Gold Project Integrated Report on Evaluation of Tailings Management Alternatives* (Cumberland 2007)
- *Landfill Design and Management Plan, Meadowbank Gold Project* (Golder 2007i)
- *Landfarm Option Analysis, Meadowbank Gold Project, Nunavut* (Golder 2007j)
- *Sewage Treatment System to be Used at Meadowbank Gold Project, Nunavut* (Golder 2007k)
- *Proposed Water Treatment Methods, Meadowbank Gold Project* (Golder 2007l)
- *Meadowbank Gold Project Water Quality and Flow Monitoring Plan* (MMC 2007c)
- *Meadowbank Gold Project Operational ARD/ML Sampling and Testing Plan* (MMC 2007d)
- *Meadowbank Gold Project Aquatic Effects Management Program (AEMP)* (Cumberland 2005)
- *Meadowbank Gold Project No-Net-Loss Plan (NNLP)* (Cumberland 2006)
- *Cumberland Meadowbank NNLP – Habitat Compensation Addendum* (Azimuth 2007)
- *Meadowbank Gold Project Hazardous Materials Management Plan* (MMC 2007e)
- *Meadowbank Gold Project Spill Contingency Plan* (MMC 2007f)
- *Meadowbank Gold Project Emergency Response Plan* (MMC 2007g)
- *Meadowbank Gold Project Preliminary Closure and Reclamation Plan* (MMC 2007h)
- *Water Quality Predictions, Meadowbank Gold Project* (Golder 2007m)
- *Proposed Discharge Water Quality Criteria for the Portage and Vault Attenuation Ponds* (Golder 2007n)

Many of these supporting documents were prepared to address commitments specific to water use, diversion, impacts, treatment, and management made to the Nunavut Impact Review Board (NIRB), during the hearings that followed the submission of the Final Environmental Impact Statement (FEIS) for the Meadowbank Gold Project.

A summary of the conditions, commitments and information requests listed in the Project Certificate (NIRB 2006) and Application Guidelines (NWB 2007) related to the Type-A Water License Application submission for the mine site are provided Table 1.1.

Table 1.1: Concordance Table with Project Certificate (NIRB 2006) and Type-A Water License Guidelines (NWB 2007)

Reference #	Condition/Commitment/Information Request	MMC Type-A Water License Application
NIRB Condition #8	Cumberland shall, within 30 days of re-opening of the camp, re-sample existing groundwater monitoring wells and combining the sampling data with existing rounds of groundwater sampling data, re-evaluate the salinity, major ion concentrations, and dissolved metal load of groundwater flowing to the mine pits and incorporate the results into the water quality monitoring and treatment program. At the time samples are taken Cumberland shall also assess the condition of existing groundwater monitoring wells and replace any defective wells. Cumberland shall continue to undertake semi-annual groundwater samples and re-evaluate the groundwater quality after each sample collection. Cumberland shall report the results of each re-evaluation to NIRB's Monitoring Officer, INAC and EC, and incorporate the results of the additional data into the water license application to the NWB	Sec 2.3.3.7 Golder 2007e, m, o
NIRB Condition #9	Cumberland shall provide detailed plans for water treatment for the tailings (reclaim pond) discharge, and on a contingency basis for the attenuation pond discharge(s) and for the pits, including estimates of treatment efficiency for each parameter of concern and the description of pH adjustments in the water license application to the NWB.	Sec 3.3.2, 3.3.7, 4.3.2 Golder 2007l
NIRB Condition #10	Cumberland shall provide details of the camp sewage treatment, including the type of treatment to be used and the expected treatment capabilities, in the water license application to the NWB	Sec 3.3.6, 4.3.2 Golder 2007k
NIRB Condition #11	Cumberland shall provide details regarding the effluent outfall configuration, including discharge characteristics, the likely behaviour of the plume(s), and bathymetric information for Wally Lake in the water license application to the NWB.	Sec 2.3.3.3, 3.2.10, 3.2.11 Golder 2007g, h
NIRB Condition #12	Cumberland shall provide details of a comprehensive water use and water management plan for the Baker Lake marshalling area, including monitoring of the discharge from the marshalling area sump, in the water license application to the NWB.	Included with Type-B Water License Application submission for the Baker Lake Marshalling Area
NIRB Condition #13	Cumberland shall not permit the water discharged into Wally Lake and Third Portage Lake to exceed receiving environment discharge criteria established by the NWB or as otherwise required by law.	Sec 3.2.12, 4.3.3, 5, 6.8, 6.9 MMC 2007c, h Golder 2007g, h, l, m, n
NIRB Condition #14	Cumberland shall not remove dewatering dikes until the quality of water contained within them is of sufficient quality to meet receiving environment discharge criteria established by the NWB or as otherwise required by law.	Sec 3.2.12, 4.3.3, 4.9, 5, 6.8 MMC 2007a, h Golder 2007m, n
NIRB Condition #15	Cumberland shall within two (2) years of commencing operations re-evaluate the characterization of mine waste materials, including the Vault area, for acid generating potential, metal leaching and non metal constituents to confirm FEIS predictions, and re-evaluate rock disposal practices by conducting systematic sampling of the waste rock and tailing in order to incorporate preventive and control measures into the Waste Management Plan to enhance tailing management during operations and closure. The results of the re-evaluations shall be provided to the NWB and NIRB's Monitoring Officer.	Sec 4.1, 6.2 MMC 2007d
NIRB Condition #17	Cumberland shall undertake a detailed technical review of all dike and pitwall designs at the final design stage, and submit the final dike designs for water depths of greater than 10 metres for an expert analysis and Cumberland shall include the detailed technical review and the expert analysis in the application to the NWB for a water license.	Sec 3.2.1, 3.2.2 Golder 2007a, b, c, d Morgenstern 2007 Stacey Mining Geotechnical Ltd. 2007
NIRB Condition #18	Cumberland shall commit to a pro-active tailings management strategy through active monitoring, inspection, and mitigation. The tailings management strategy will include the review and evaluation of any future changes to the rate of global warming, compliance with regulatory changes, and the ongoing review and evaluation of relevant technology developments, and will respond to studies conducted during the mine operation.	Sec 2.3.4, 4.2, 6.3 MMC 2007a, c Golder 2007a Cumberland 2007
NIRB Condition #19	Cumberland shall provide for a minimum of two (2) metres cover of tailings at closure, and shall install thermistor cables, temperature loggers, and core sampling technology as required to monitor tailing freezeback efficiency. Cumberland shall report to NIRB's Monitoring Officer for the annual reporting of freezeback effectiveness.	Sec 4.2, 6.1, 6.3 MMC 2007a, h Golder 2007a
NIRB Condition #20	Prior to construction, Cumberland shall identify mitigation measures that can be taken if groundwater monitoring around the tailings facility demonstrates that contamination from tailings has occurred through the fault. Upon drawdown of the North arm of Second Portage Lake, Cumberland shall conduct further tests to assess the permeability of any faults and provide the results to regulators. If doubt remains Cumberland shall seal the fault and conduct further permeability testing and monitoring.	Sec 2.3.4.2, 2.3.4.3, 4.2.3, 6.3 MMC 2007a, b Golder 2007f
NIRB Condition #24	Cumberland shall identify an area and design for a landfill for disposal of operational and closure non-salvageable materials, including a list of any non-salvageable materials, and a procedural manual for preparation of location and placements of these materials, and incorporate the design into the final Waste Management Plan as instructed by the NWB.	Sec 3.3.4, 4.6, 6.5 Golder 2007i
NIRB Condition #25	Cumberland shall manage and control waste in a manner that reduces or eliminates the attraction to carnivores and/or raptors. Cumberland shall employ legal deterrents to carnivores and/or raptors at all landfill and waste storage areas. The deterrents are to be developed taking into consideration Traditional Knowledge and in consultation with the HTO, EC and INAC and incorporated into the final Waste Management Plan prior to filing the Plan with the NWB.	Sec 3.3.4, 4.2.1, 4.6 Golder 2007i
NIRB Condition #27	Cumberland shall ensure that the areas used to store fuel or hazardous materials are contained using safe, environmentally protective methods based on practical, best engineering practices.	Sec 4.8, 6.7 MMC 2007e, f, g
NIRB Condition #31	Cumberland shall provide detailed stream crossing design criteria, including consideration of the DFO Operational Statement for Clear-span bridges for all water crossings identified to have fish presence, final crossing designs, site specific mitigation procedures, an effects monitoring program, and a maintenance and closure plan for all water course crossings, to the DFO and the NWB for review and approval.	Sec 3.2.8 Cumberland 2005, 2006 Stream crossing details along AWPAR provided under separate water license application
NIRB Condition #47	Cumberland shall develop an adaptive approach to managing the water flow from Third Portage Lake, including the consideration of alternatives to deepening the easternmost channel; submission of detailed design of the easternmost channel modifications; a monitoring program for channel erosion, verification of the maintenance of water levels in Third Portage Lake, and the success of fish habitat enhancements; and contingencies in the event of channel failure, for approval by the DFO.	Sec 3.2.6
NIRB	Cumberland shall, in consultation with Elders and the HTOs, design and implement means of deterring caribou from the tailing ponds, such as temporary ribbon placement or Inuksuk, with such	Sec 4.2.1

Reference #	Condition/Commitment/Information Request	MMC Type-A Water License Application
Condition #59	designs not to include the use of fencing.	
NIRB Condition #72	On-site incinerators shall comply with Canadian Council of Ministers of Environment and Canada-Wide Standards for dioxins and furan emissions, and Canada-wide Standards for mercury emissions, and Cumberland shall conduct annual stack testing to demonstrate that the on-site incinerators are operating in compliance with these standards. The results of stack testing shall be contained in an annual monitoring report submitted to GN, EC, and NIRB's Monitoring Officer.	Sec. 3.3.3, 4.5, 6.4
NIRB Condition #76	Cumberland shall develop an "Early Warning Monitoring Program" along the east boundary of the Project's local study area (mine and road) including the location where Third Portage Lake flows into Tehek Lake. The "Early Warning Monitoring Program" shall discuss how the communities of Baker Lake and Chesterfield Inlet will be actively involved and shall be submitted to NIRB's Monitoring Officer for review prior to Project construction. If adverse effects from the project to any VEC are detected along this boundary, then Cumberland shall notify the NIRB's Monitoring Officer for determination as to whether and to what extent additional monitoring is required.	Sec 6.8, 6.9 Cumberland 2005, 2006
NIRB Condition #78 and #79	78. Cumberland shall file a complete Closure and Reclamation Plan developed to comply with INAC's policy for full cost of restoration and any related NWB requirements such that the Inuit and taxpayers are not liable for any cost associated with the cleanup, modification, decommission, or abandonment. 79. In addition to the NWB's requirements, the final Closure and Reclamation Plan shall require Cumberland to: 1. Ensure that mine facilities and infrastructure are abandoned in such a manner that: a. The Project site is physically stable and any requirements for long term maintenance and monitoring are minimized; b. Threats to public safety and wildlife are eliminated; and c. Affected areas are returned to the original undisturbed conditions to the fullest extent possible. 2. Prevent continuing impacts from contaminants and wastes on the environment including those associated with acid rock drainage; 3. Remove all hazardous materials and waste and as much salvageable waste as practicable from the Project area; and 4. Enter into written arrangements with its abandonment and reclamation contractors to ensure all site debris is cleaned up off the lands, including wind-blown debris.	Sec 4.9 MMC 2007h
NIRB Condition #85	Cumberland shall develop a detailed blasting program to minimize the effects of blasting on fish and fish habitat, water quality, and wildlife and terrestrial VECs.	Sec. 4.4 Cumberland 2005, 2006
NIRB Condition #26, #37, #38, #39, #42, #44, #75, #77, and #82 (emergency preparedness and spill response)	26. Cumberland shall ensure that spills, if any, are cleaned up immediately and that the site is kept clean of debris, including wind-blown debris. 37. Cumberland will contract only Transport Canada certified shippers to carry cargo for the Project, and will require shippers transporting cargo through Chesterfield Inlet to carry the most up-to-date emergency response/spill handling equipment as recommended and accepted by the Government of Canada with the crew trained to deploy the equipment, including practice drills deploying spill equipment in remote locations within the Inlet. 38. Cumberland shall make every reasonable effort to minimize the number of ships and barges transporting cargo for the Project, and require shippers transporting cargo for the Project through Chesterfield Inlet to be operated in accordance with safe shipping management policies, including using Canadian Hydrographic Service published detailed marine charts and nautical instructions, and be fitted with modern state-of-the-art navigation equipment. 39. Within three (3) months of contracting with a shipping company to transport cargo to the Project through Chesterfield Inlet and prior to the commencement of shipping, Cumberland shall advertise and hold a community information meeting in Chesterfield Inlet to fully discuss the shipping program for the Project. Thereafter, Cumberland shall annually advertise and hold a community information meeting in Chesterfield Inlet to report on the Project and to hear from Chesterfield Inlet residents and respond to concerns. A consultation report shall be submitted to NIRB's Monitoring Officer within one month of the meeting. 42. Cumberland shall ensure all fuel transfer operations take place in accordance with the *Arctic Waters Pollution Prevention Act* and relevant oil transfer guidelines. 44. Within one (1) month of contracting with a shipper, Cumberland shall submit a comprehensive Spill Contingency and Emergency Response Plan to regulatory authorities. 75. Cumberland shall provide a list of possible accidents and malfunctions for the Project. It must consider the all-weather road, shipping spills, cyanide and other hazardous materials spills, and pitwall/dikes/dam failures, and include and assessment of the accident risk and mitigation developed in consultation with Elders and potentially affected communities. 77. Cumberland shall as soon as possible, review and coordinate its Emergency Response Plan with the emergency response plans of the Hamlets of Baker Lake and Chesterfield Inlet. 82. Cumberland shall monitor the ingress/egress of ship cargo at Baker Lake and report any accidents or spills immediately to the regulatory agencies as required by law and to NIRB's Monitoring Officer annually.	Sec 4.8, 6.7 MMC 2007e, f, g Marine aspects included with Type-B Water License Application submission for the Baker Lake Marshalling Area
NIRB Commitment #1	Commit to re-run model for sensitivity analysis on total dissolved solids concentrations in pit waters	Sec 2.3.3.7 Golder 2007e, m, o
NIRB Commitment #2	Commit to resample groundwater monitoring wells in summer 2006	Sec 2.3.3.7 Golder 2007o
NIRB Commitment #4	Commit to identifying mitigation measures if groundwater contamination (tailings) has occurred during operation. Include what triggers would be used in this evaluation	Sec 2.3.4.2, 2.3.4.3, 4.2.3, 6.3 MMC 2007a, b Golder 2007f
NIRB Commitment #5	Commit to assessing permeability of fault upon drawdown of North arm of Second Portage Lake and commit to establishing trigger levels and mitigation strategies	Sec 2.3.4.2, 2.3.4.3, 4.2.3, 6.3 MMC 2007a, b

Reference #	Condition/Commitment/Information Request	MMC Type-A Water License Application
NIRB Commitment #43	Re-do WQ modeling with less conservative assumptions: no rock wetting factors, no permafrost, use 1-kg IV rather than 100-kg IV rates for poor-end; used 100-kg for best estimate; higher temperature of soil to air by 4.4^{0}C; long-term WQ w global warming; minimal improvement to WQ from UM cover (not automatic transition)	Sec 2.3.3.7, 5 Golder 2007m
NIRB Commitment #44	Additional field and lab analysis of WR to segregated PAG and non-PAG rock	Sec 4.1, 6.2 MMC 2007d
NIRB Commitment #45	Diffuser design and impact of effluent on receiving environments	Sec 2.3.3.3, 3.2.10, 3.2.11 Golder 2007g, h Cumberland 2005, 2006
NIRB Commitment #46	Adaptive management of (placement of) mine waste material considering monitoring results obtained during operation	Sec 4.1, 6.2 MMC 2007d
NIRB Commitment #48	Detailed plans for water treatment	Sec 3.3.2, 3.3.7, 4.3.2 Golder 2007g, h, l, n Cumberland 2005, 2006
NIRB Commitment #49	Evaluation of viability of proposed in-situ and active treatment system and subsequent effects of effluent to receiving environment (near and far-field)	Sec 3.3.2, 3.3.6, 4.3.2.2, 4.3.2.3 Golder 2007g, h, l
NIRB Commitment #50	Re-evaluate (salinity) model using 2003 and 2004 groundwater data	Sec 2.3.3.7 Golder 2007e, m, o
NIRB Commitment #60	Continued geochemical characterization (laboratory and field tests) of UM, PAG and uncertain PAG rock and input into adaptive waste management plan	Sec 4.1, 6.2 MMC 2007d
NIRB Commitment #61	Lake bed sediment samples to be collected and analyzed for geotechnical properties	Sec 2.3.4, 4.2.1 Golder 2007a
NIRB Commitment #62	Review tailings and waste management alternatives including climate change, conduct gap analysis to determine deficiencies required for engineering and construction of dikes	Sec 3.2.1, 3.2.2, 4.1, 4.2 MMC 2007a Golder 2007a, b, c Cumberland 2007
NIRB Commitment #63	Consolidate Tailings management alternatives assessment into one document	Sec 4.2 Cumberland 2007
NIRB Commitment #64	Perform a technical review of dewatering dikes	Sec 3.2.1, 3.2.2 Golder 2007a, b, c, d Morgenstern 2007 Stacey Mining Geotechnical Ltd. 2007
NIRB Commitment #65	Carry out coupled seepage-thermal and solute transport modeling including Second Portage Lake fault zone	Sec 2.3.3.7, 4.2 MMC 2007a, b Golder 2007a
NIRB Commitment #70	Prepare and implement Incinerator Waste Management Plan	Sec. 3.3.3, 4.5, 6.4
NIRB Commitment #73	Conduct annual incinerator stack emission monitoring for mercury, dioxins and furans and report results to Environment Canada and Government of Nunavut	Sec. 3.3.3, 4.5, 6.4
NIRB Commitment #74	Provide annual report of the quantity and type of waste generated at the mine site distinguishing landfilled, recycled and incinerated streams	Sec. 3.3.3, 4.5, 6.4
NIRB Commitment #75	Reassess the selection of incinerators and justify the decision in regards to best available economically feasible technologies (BAEFT)	Sec. 3.3.3, 4.5, 6.4
NIRB Commitment	Management approach to waste rock piles and quarry sites	Sec 4.1, 6.2 MMC 2007d

Reference #	Condition/Commitment/Information Request	MMC Type-A Water License Application
#86		
NIRB Commitments #6, #29, #33 - #36, #38, #41 & #42 (emergency preparedness and spill response)	6. Compile a technical memo that addresses "Accidents and Malfunctions' resulting from catastrophic events 29. Engage in discussions with representatives of the Canadian Coast Guard to reassess where response and spill kits are currently located within Nunavut, and not put the onus on TC for placing community spill kits in the Hamlets of Chesterfield Inlet and Baker Lake 33. Only a Transport Canada Certified Shipper will be hired to carry Cumberland's supplies 34. The shipping company will have spill equipment on board with crew trained to deploy the equipment 35. The Coast Guard will be notified as soon as a spill has occurred and, if required, will provide further spill support 36. Once the shipping company is hired, the shipper and Cumberland will return to Chesterfield Inlet for a one-day workshop to more fully discuss the successful companies' procedures, type of ships, spill equipment, etc. 38. Cumberland will request that the shipping company contracted to carry fuel for the project carry out practice drills deploying their spill equipment in various locations within the Inlet 41. Cumberland and the Shipper will carry shipping insurance 42. Cumberland will conduct annual community consultation visits in Chesterfield to report on the project and related shipping activities and to hear any concerns/comments from Chesterfield Inlet residents	Sec 4.8, 6.7 MMC 2007e, f, g Marine aspects included with Type-B Water License Application submission for the Baker Lake Marshalling Area
NWB Section 3.1(i)	Results of the assessment of the permeability of any faults beneath the northwest arm of Second Portage Lake (i.e. the tailings impoundment area)	Sec 2.3.4.2, 2.3.4.3, 4.2.3, 6.3 MMC 2007a, b
NWB Section 3.1(ii)	Mitigation measures that can be undertaken if groundwater monitoring around the Second Portage tailings facility demonstrates that contamination from tailings has occurred through the fault	Sec 2.3.4.2, 2.3.4.3, 4.2.3, 6.3 MMC 2007a, b Golder 2007f
NWB Section 3.1(iii)	Results of the re-sampling of the existing groundwater monitoring wells, which was to occur as soon as possible upon reopening the camp in 2007	Sec 2.3.3.7 Golder 2007o
NWB Section 3.1(iv)	Revised estimates of the quality of the groundwater that will flow into the open pits, using existing groundwater data from both rounds of sampling (i.e. 2003 and 2004)	Sec 2.3.3.7 Golder 2007e, m, o
NWB Section 3.1(v)	Revised site water quality model using the updated estimates of the quality of groundwater flowing to the pits, and additional groundwater quality data collected on site. The revised water quality model should be used to assess the impacts of pit water discharges on the environment and to the develop mitigation measures for disposing of pit water of poor quality	Sec 2.3.3.7, 5 MMC 2007a Golder 2007e, m, o
NWB Section 3.1(vi)	Detailed contingency plans for the treatment of turbid water during dewatering activities and/or increased suspended solids during operations (i.e. rewatering)	Sec 3.2.1, 3.2.5, 3.2.12, 4.3.1, 4.4, 6.8, 6.9 MMC 2007a Cumberland 2005, 2006
NWB Section 3.1(vii)	Detailed information regarding the disposal of lake bottom sediments	Sec 2.3.4, 3.2.1, 4.2.1 MMC 2007a Golder 2007a
NWB Section 3.1(viii)	Detailed water treatment plans for discharges from the Tailings Impoundment Area, as well as the Vault Pit attenuation pond (on a contingency basis). Water treatment plans should include estimates of treatment efficiency for each parameter of concern and a description of pH adjustment methods	Sec 3.3.2, 3.3.7, 4.3.2 Golder 2007l
NWB Section 3.1(ix)	Details regarding treatment of camp sewage, including the type of treatment system and the expected treatment capabilities	Sec 3.3.6, 4.3.2 Golder 2007k
NWB Section 3.1(x)	The NIRB Project Certificate requires the establishment of "receiving environment discharge criteria" for discharges into Wally Lake and Third Portage Lake. The water license application should clearly outline the proposed discharge criteria, how the criteria were developed, and how these criteria will be used to prevent ecological effects in the receiving environment as a result of reconnecting the pit lakes to the watershed (especially in regards to contaminants, major ions and nutrients)	Sec 3.2.10, 3.2.11, 5 Golder 2007g, h, n
NWB Section 3.1(xi)	Details regarding the effluent outfall configuration	Sec 3.2.10, 3.2.11 Golder 2007g, h
NWB Section 3.1(xii)	Predictions for the likely behaviour of the discharge plume	Sec 3.2.10, 3.2.11 Golder 2007g, h
NWB Section 3.1(xiii)	Bathymetric information for Wally Lake	Sec 2.3.3.3 Golder 2007g
NWB Section 3.1(xiv)	Detailed treatment plans for the treatment of effluent from attenuation pond and/or reclaim pond prior to transfer to the Goose Pit	Sec 3.3.2, 3.3.7, 4.3.2 MMC 2007a

Reference #	Condition/Commitment/Information Request	MMC Type-A Water License Application
		Golder 2007l
NWB Section 3.1(xv)	Discussion of the consequences of long-term stratification in the pit lakes and associated contingency plans	Sec 3.2.12
NWB Section 3.1(xvi)	Monitoring plan for the Baker Lake collection sump, including parameters to be sampled, sampling frequency and sampling locations.	Included with Type-B Water License Application submission for the Baker Lake Marshalling Area
NWB Section 3.2	i. Detailed Spill Contingency Plan for the mine site, the all-weather road, and the marine components. The Spill Plan should include, but not be limited to, the following information: ii. Identification, description and evaluation of the potential impacts of all project-related accidents and malfunctions (i.e. types, sources, threat-risk assessment, worst-case scenarios, etc.) that may occur during each phase of the project, including, but not limited to: a. Spills of petroleum hydrocarbons, hazardous materials, and other contaminants of concern onto land, ice, and into marine waters (i.e. ocean/sea/salt waters), freshwaters, ground waters, and potable water supplies; b. Explosions; c. Fires; d. Transportation accidents involving aircraft, marine vessels and barges, and land based motor vehicles, including any hazardous material cargoes for all modes. iii. Description of emergency response plans and procedures for the accidents, and malfunctions, including: the level of preparedness; safety; response capacity; and technological capability and any deficiencies or shortcomings in this regard, and indicate how the latter will be addressed. Plans should incorporate sufficient detail to understand and assess emergency preparedness and response capability; ensure emergency response plans will work; and, determine how and when plans will work. iv. Identification of communities, organizations, agencies, boards, and governmental parties (and their regulatory requirements) involved in preparing programs and identify opportunities for partnerships, coordination, and participation v. Explanation of how the Applicant will ensure project contractors meet the Applicants' due diligence standards with respect to oil and hazardous material spill prevention, preparedness, response, and restoration. vi. A timetable for when the Applicant will file the appropriate plans and procedures as required by the governmental parties.	Sec 4.8, 6.7 MMC 2007e, f, g Marine aspects included with Type-B Water License Application submission for the Baker Lake Marshalling Area
NWB Section 3.3(i)(ii)	i. Details regarding the timing of the removal of dewatering dikes and the implications of this action on water quality; and ii. Detailed information regarding the method used to remove/breach the dewater dykes, including details of any mitigation measures for any adverse impacts.	Sec 3.2.12, 4.3.3, 4.9, 5, 6.9 MMC 2007a, h Golder 2007m Cumberland 2005, 2006
NWB Section Sec 3.4	i. Monitoring plan for incinerator emissions (including, but not limited to, stack testing and annual reporting); ii. Detailed waste management plan; and iii. Justification regarding the selection of incinerators in regards to the use of best available economically feasible technologies.	Sec. 3.3.3, 4.5, 6.4
NWB Section Sec 3.5	Generally, to mitigate potential impacts to fish and fish habitat, any works or undertakings associated with the Meadowbank Project that are in or near waters frequented by fish should: Comply with the DFO legislation/policies/guidelines/Operational Statements as outlined below or noted within Section 3 of the Preliminary Guidelines for the Applicant. i. Be done in manner that prevents the deposit of any materials in waters frequented by fish, ii. Comply with the DFO Freshwater Intake End-of-Pipe Fish Screen Guideline (March, 1995), to minimize impingement/entrainment of fish, iii. Comply with the Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (Wright and Hopky, 1998), whenever possible iv. Ensure that hydrostatic testing be done in manner that prevents the transfer of aquatic species into water bodies where they do not currently frequent, v. Ensure that groundwater is managed in a manner that prevents any seepage of hazardous waste materials into waters frequented by fish. vi. Site specific environmental data considerations for works in or near waters that are frequented by fish should include, but not be limited to: vii. Description of proposed works or undertakings (culvert crossing, bridge, intake, infilling pipeline, etc.) viii. Construction Plans: a. proposed start and completion dates b. methods of construction c. detailed site description (incl. diagrams, photos) d. details of materials and machinery to be used e. a description of types and quantities of explosives to be used, if any f. operation and maintenance plans ix. Fish and Fish Habitat Present:	Sec 4.4, 6.9 Cumberland 2005, 2006

Reference #	Condition/Commitment/Information Request	MMC Type-A Water License Application
	a. detailed area description (including Photographic record), b. description of fish habitat (including river or lake bottom substrates such as silt, sand, or cobble), c. presence of sensitive habitats (spawning, migration corridors etc.), d. description of aquatic and riparian vegetation e. fish community and lifestage present, f. depth and watercourse width, g. max/min water flows, currents, tides, h. turbidity and sediment loads (total suspended solids) i. sport, commercial, subsistence fishery present x. Potential Environmental Effects and Mitigation Measures to Protect Fish Habitat a. potential effects on fish or fish habitat, b. area (in m^2) to be impacted, c. measures to avoid sensitive periods and habitat areas (i.e., spawning beds, migration corridors), d. measures to avoid physical impacts on habitat, e. measures to maintain flows and fish passage, f. measures to avoid sedimentation, xi. Compensation/Monitoring: a. Detailed habitat no-net-loss plan and site restoration plan, b. on site construction monitoring plan, c. post construction monitoring	
NWB Section Sec 3.6	The Applicant will also be responsible to provide formal applications to the Navigable Waters Protection Program (NWPP) for any works	Sec 1.2
NWB Section Sec 3.7	The annual report should include, but not be limited to, reporting of: i. Water related monitoring ii. Comparison of water quality and quantity monitoring data to the forecasted information in the summary table attached to the application; iii. Implementation of the conditions in the NIRB project certificate related to NWB mandate; iv. Project changes under Adaptive Management; and v. Any actions took to resolve directions from the Inspector.	Sec 4, 6
NWB Section Sec 3.8	The Applicant is to provide an estimate of security as defined under **Section 76** of *NWNSRTA* and **Section 12** of the NWT Water Regulations. The Applicant must inform the NWB if a compensation agreement is in place as required under Section 58 otherwise an estimate of compensation as suggested under Section 60 of the Act for the Board's decision is required.	Sec 4.9 MMC 2007h

1.2 MMC ENVIRONMENTAL POLICY

MMC has complied with all governmental policies and regulations pertaining to environmental and socioeconomic issues in developing the Meadowbank Gold Project and has an exemplary local employment and safety record over eleven years of exploration in Canada's Arctic. MMC has also been forthcoming with all government authorities during all aspects of project development, including applying for all necessary formal applications, and has a good rapport with the local Inuit people based on mutual respect and communication. MMC intends to build a mine with integrity—one that is safe, environmentally responsible, and beneficial to all parties involved. To this end, MMC intends to balance good stewardship in the protection of human health and the natural environment with the need for economic growth.

MMC is committed to achieving a high standard of environmental care in conducting its mineral exploration activities. MMC's Environmental Policy includes:

- Compliance with all applicable legislation including laws, regulations, and standards. Where laws do not exist, appropriate standards will be applied to minimize environmental impacts resulting from exploration activities.
- Open communication with government, the community, and employees on environmental issues.
- Development and adherence to management systems that adequately identify, monitor, and control environmental risks associated with MMC's exploration activities.
- Assurance that the employees are aware of their responsibilities and comply with MMC's Environmental Policy and field guide.

It is the policy of MMC to protect the environment, public health and safety, and natural resources by conducting operations in an environmentally sound manner while pursuing continuous improvement of our environmental performance.

MMC also subscribes to the principle of sustainable development in mining. While mining cannot occur without an impact on the surrounding natural environment and communities, MMC will make it our responsibility to limit negative environmental and social impacts and to enhance positive impacts.

To achieve these goals MMC is committed to:

- Assess the potential environmental impacts of any new undertaking with an objective to minimise them;
- Design and operate MMC facilities to ensure that effective controls are in place to minimise risks to health, safety and the environment;
- Implement an emergency response plan to minimise the impacts of unforeseen events;
- Provide a professional environmental staff to plan and direct environmental compliance programs and to assist in training and education activities;
- Provide training and resources to develop environmentally responsible employees;
- Ensure that environmental factors are included in the purchase of equipment and materials;

- Ensure that contractors operate according to MMC environmental policy and procedures;
- Comply with all applicable environmental laws and regulations;
- Communicate with employees, the public, government agencies and other stakeholders on activities involving health, safety and the environment;
- Regularly verify environmental performance and implement any required corrective action;
- Minimise the generation of hazardous and non-hazardous waste and ensure proper disposal of all wastes;
- Implement measures to conserve natural resources such as energy and water; and
- Rehabilitate sites in accordance with regulatory criteria and within the established time-frame.

1.3 MMC CORPORATE STRUCTURE

Pursuant to a take-over bid, Agnico-Eagle Mines Limited (AEM) acquired approximately 92% of the shares of Cumberland. AEM invoked the compulsory acquisition provisions of the British Columbia Companies Act and in early July 2007 Cumberland became 100% wholly-owned subsidiary of AEM. Through a series of steps, AEM amalgamated with Cumberland and MMC (a wholly-owned subsidiary of Cumberland) on August 1, 2007. As a result of this amalgamation, all of the rights, title, interests, liabilities and obligations of Cumberland and MMC are automatically, by law, transferred to and assumed by AEM. Therefore in all Type-A Water License documents, the terms ‘Cumberland’, ‘Meadowbank’, ‘MMC’ and ‘AEM’ are to mean the same entity: ‘Agnico-Eagle Mines Limited’.

SECTION 2 • PROJECT DESCRIPTION

The Meadowbank Gold Project represents the construction, operation, maintenance, reclamation, closure, and monitoring of an open pit gold mine in the Kivalliq Region of Nunavut. The project is located on Inuit-owned land approximately 70 km north of Baker Lake (see Figures 2.1 and 2.2). The gold will be extracted during the roughly eight- to ten-year operational lifespan of the mine. The project is designed as a "fly-in/fly-out" operation with an airstrip at Meadowbank and a private all-weather access road providing the access to the site from Baker Lake (see Figure 2.3). All construction and operating supplies for the project will be transported on ocean freight systems to facilities constructed at the Hamlet of Baker Lake, which will include barge unloading facilities, laydown area, and fuel tank storage area. The all-weather access road from Baker Lake to the Project will provide access and re-supply, while on-site mine access roads will connect the open pit areas to site infrastructure. On-site facilities include a mill, power plant, maintenance facilities, fuel tank farm, water treatment plant (if necessary), sewage treatment plant, airstrip, and accommodations for 344 people. A site layout plan is provided in Figure 2.4.

Open pit mining will occur in three separate areas with water retention dikes constructed from mined rock to allow for the mining of ore beneath shallow lakes. A low permeability cutoff wall will be constructed in the center of the dikes, and a grout curtain will be constructed in the near surface fractured bedrock, to minimize seepage from surrounding lakes into the work area. Construction of the dikes will use floating silt curtains to minimize the release of suspended solids into surrounding lake waters.

Tailings and waste rock will be placed in separate storage facilities. An operational sampling and testing program will be used to identify both potentially acid-generating (PAG) and metal leaching (ML) rock, which will be stored in designated areas designed for long-term stability. Any acidic runoff that is generated will be appropriately handled. Ore processing will involve cyanide leaching, cyanide destruction, and refining to produce doré bars. The freshwater supply for the mine and camp will be pumped from Third Portage Lake. Mine process water will be primarily reclaimed from the Reclaim and Attenuation ponds, and treated sewage will be discharged to the Reclaim Pond. Fish habitat compensation (Cumberland 2006) will be constructed in the form of submerged dike extensions and fingers, and habitat compensation mounts located within Third Portage and Second Portage lakes.

Environmental baseline studies have been conducted in the project area, the results of which have been integrated into the current project design. Valued ecosystem components (VECs) and valued social and economic components (VSECs) have been identified in consultation with regulatory authorities and members of the local community. VECs include: air quality, noise, water quality, surface water quantity, permafrost, fish populations, fish habitat, vegetation cover (wildlife habitat), ungulates, predatory mammals, small mammals, raptors, waterbirds, and other breeding birds. VSECs include: employment, training and business opportunities; traditional ways of life; individual and community wellness; infrastructure and social services; and sites of heritage significance.

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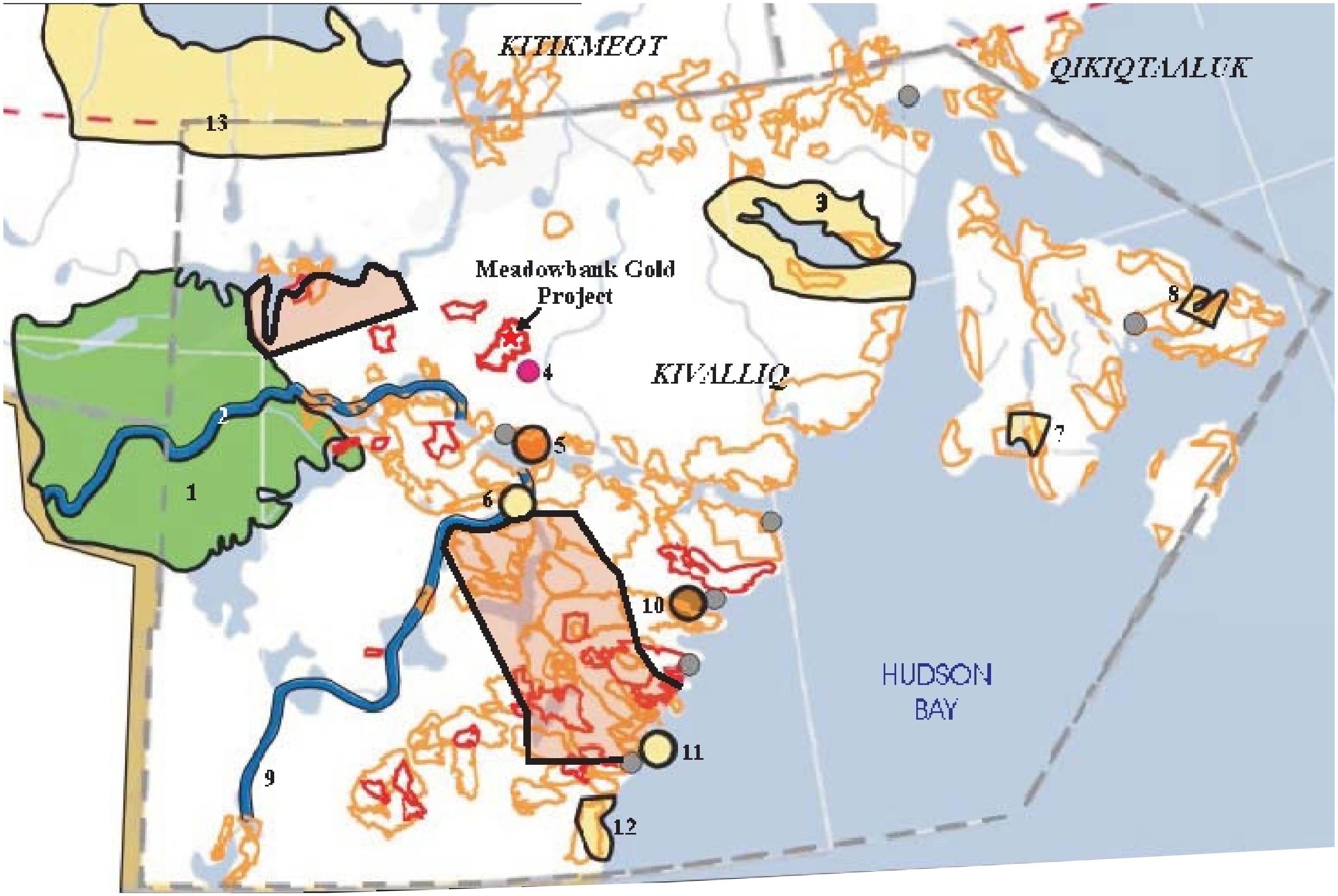
MEADOWBANK
MINING CORPORATION

MEADOWBANK GOLD PROJECT

MEADOWBANK PROJECT LOCATION	**FIGURE 2.1**



LEGEND

- INUIT OWNED LANDS-SURFACE RIGHTS ONLY
- INUIT OWNED LANDS-SURFACE AND SUBSURFACE RIGHTS ONLY
- TOWN
- CARIBON PROTECTION AREAS

KIVALLIQ

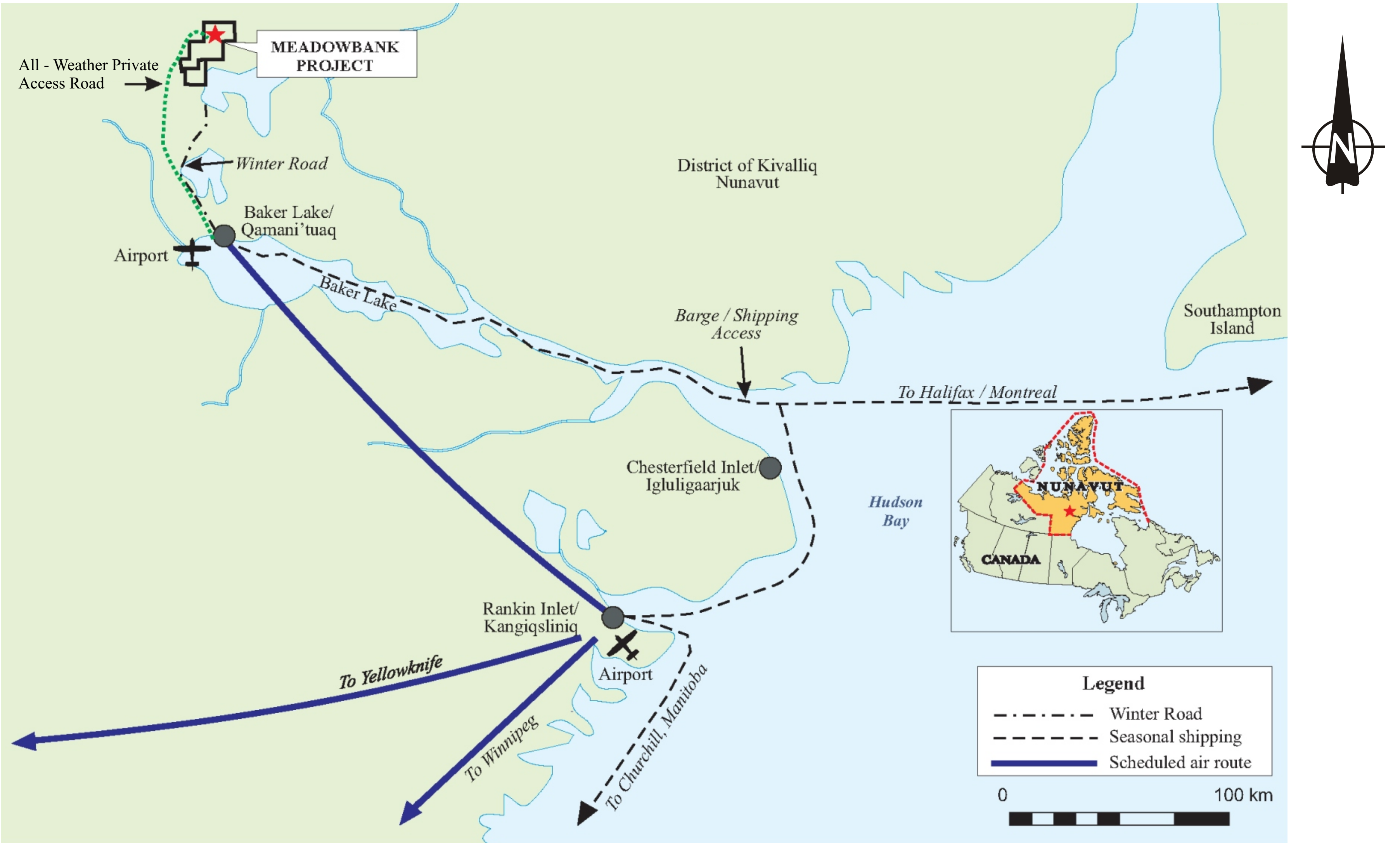
1) THELON WILDLIFE SANCTUARY
2) THELON HERITAGE RIVER
3) UKKUSIKSALIK NATIONAL PARK (PROPOSED)
4) GEOGRAPHIC CENTRE OF CANADA
5) INNUJARVIK TERRITORIAL PARK
6) FALL CARIBOU CROSSING NATIONAL HERITAGE SITE
7) HARRY GIBBONS BIRD SANCTUARY
8) EAST BAY BIRD SANCTUARY
9) .KAZAN HERITAGE RIVER
10) IJIRALIQ TERRITORIAL PARK
11) ARVIA'JUAQ NATIONAL HISTORIC SITE
12) MCCONNELL RIVER BIRD SANCTUARY
13) QUENN MAUD GULF BIRD SANCTUARY

MEADOWBANK MINING CORPORATION

MEADOWBANK GOLD PROJECT

PARKS AND CONSERVATION AREAS IN KIVALLIQ REGION

FIGURE 2.2

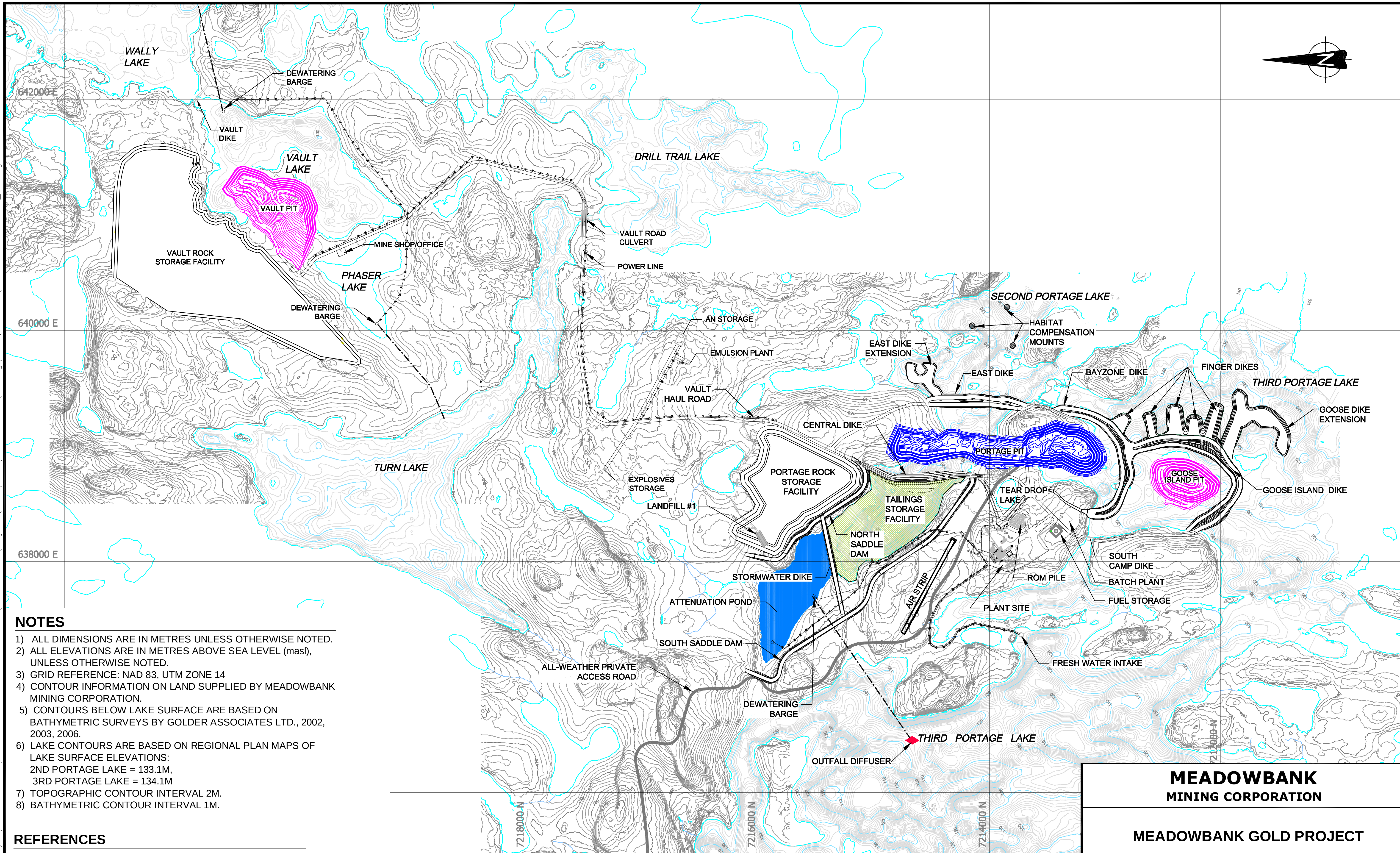


MEADOWBANK
MINING CORPORATION

MEADOWBANK GOLD PROJECT

SITE ACCESS AND TRANSPORTTION ALTERNATIVES

FIGURE 2.3



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 MEADOWBANK MINING CORPORATION.
5) CONTOURS BELOW LAKE SURFACE ARE BASED ON BATHYMETRIC SURVEYS BY GOLDER ASSOCIATES LTD., 2002, 2003, 2006.
6) LAKE CONTOURS ARE BASED ON REGIONAL PLAN MAPS OF LAKE SURFACE ELEVATIONS:
   2ND PORTAGE LAKE = 133.1M,
   3RD PORTAGE LAKE = 134.1M
7) TOPOGRAPHIC CONTOUR INTERVAL 2M.
8) BATHYMETRIC CONTOUR INTERVAL 1M.

REFERENCES

1) AMEC AMERICAS LTD., DRAWING NUMBER A1-131395-100-C-0001 (100-C-0001.DWG), MEADOWBANK FEASIBILITY STUDY, APRIL 2005.

0 300 600 900 1200 1500
Scale in Metres

MEADOWBANK
MINING CORPORATION

MEADOWBANK GOLD PROJECT

GENERAL SITE PLAN | FIGURE 2.4

REVISION DATE: 07/08/21 03:29PM By: ASalvador CADD FILE: N:\Bur-Graphics\Projects\2006\1413\06-1413-089\Drafting\FINAL\Doc. 485\061413089-1400-FIG_2.4.dwg

MMC will implement an Environmental Management System (EMS) consisting of three key elements: an integrated environmental management plan, a formal environmental awareness program, and ongoing environmental monitoring plans. Upon conclusion of activities, MMC will fully decommission the mine by removing the mill and ancillary buildings, and access roads—including the all-weather access road, and by recontouring disturbed areas and reclaiming vegetation.

2.1 MINE PLAN OVERVIEW

The Meadowbank Gold Project consists of several gold-bearing deposits within reasonably close proximity to one another. The four main deposits are: Vault, Portage (including the Third Portage deposit, and the Connector Zone and North Portage deposit), and Goose Island (see Figure 2.4).

The Third Portage deposit is located on a peninsula, and extends northward under Second Portage Lake and southward under Third Portage Lake. The North Portage deposit is located on the northern shore of Second Portage Lake. The Third Portage deposit, Connector Zone, and North Portage deposit will be mined from a single pit, termed the Portage pit, which will extend approximately 2 km in a north-south direction. The Goose Island deposit lies approximately 1 km to the south of the Third Portage deposit, and beneath Third Portage Lake. The Vault deposit is located adjacent to Vault Lake, approximately 6 km north from the Portage deposits.

There are four visible rock types on site: intermediate volcanic (IV), iron formation (IF), ultramafic (UM), and quartzite (QZ). Of these, only the first three rock types (IV, IF, and UM) are present in significant quantities. The ore in the Vault deposit is hosted in IV rocks. The ore in the Portage deposit is hosted in IF rocks.

Mining will be primarily a truck-and-shovel open pit operation. A series of dikes will be required to isolate the mining activities from the lakes. It is proposed to construct the dikes using materials produced during mining or by stripping from the footprint of the proposed waste rock storage areas.

The current mining plan indicates that approximately 22 Mt of ore will be mined over a nominal mine life of eight years. It is possible that some mining may occur into the tenth year. The operation will generate approximately 182 Mt of mine waste rock and about 9 Mt of till. Approximately 22 Mt of tailings will be produced.

The mine development sequence is summarized in Table 2.1. The mine plan has been used to prepare a materials balance, as shown in Table 2.2. This balance indicates the distribution of the following categories of materials by rock type:

- mine rock for general construction;
- mine rock for dike construction;
- mine rock for capping; and
- mine rock to waste rock storage areas.

Table 2.1: Mine Development Sequence

Mine Year	Key Water and Waste Management Issues
-2 to -1	• Stripping at Third Portage peninsula for construction materials • Construct East and Bay Zone dikes • Dewater behind East and Bay Zone dikes • Construct Central Starter and Stormwater dikes. Apply surfacing material on East and Central Starter dikes • Begin construction on East Dike Extension. Begin constructing Goose Island Dike if construction material becomes available • Construct plant site, airstrip, plant roads and road to ANFO storage
1	• Commence mining of Portage Pit, south end • Operate separate Reclaim and Portage Attenuation ponds • Runoff from Portage RSF and Landfill directed to Portage Attenuation Pond • Portage Pit water and plant site and airstrip runoff directed to Portage Attenuation pond, or pumped to water sump at Process Plant for use as process make-up water as required before discharge of excess to Portage Attenuation Pond • Monitor water quality within Portage Attenuation Pond, treating in–situ if required prior to decant of excess to Third Portage Lake and/or pumping to Process Plant for use as make-up water • Begin construction of North Saddle Dam. Apply surfacing material on Bay Zone Dike • Continue and complete construction of Goose Island Dike and East Dike Extension • Dewater behind Goose Island Dike. Commence stripping of Goose Island overburden materials
2	• Commence mining at Goose Island Pit • Commence construction of Finger Dikes and Goose Island Dike Extension • Raise Central Dike from El. 120 masl to El. 140 masl and apply surfacing material • Continue and complete construction of North Saddle Dam. Apply surfacing material on Goose Island Dike • Selective placement of ultramafic rock at Portage RSF for future use during closure • Continue to operate separate Reclaim and Portage Attenuation ponds • Runoff from Portage RSF and Landfill directed to Portage Attenuation Pond • Portage and Goose Island pit waters, and plant site and airstrip runoff directed to Portage Attenuation pond, or pumped to water sump at Process Plant for use as process make-up water as required before discharge of excess to Portage Attenuation Pond • Monitor water quality within Portage Attenuation Pond, treating in–situ if required prior to decant of excess to Third Portage Lake and/or pumping to Process Plant for use as make-up water
3-4	• Construct South Saddle Dam and Stormwater Dike filter. Continue construction of Finger Dikes and Goose Island Dike Extension • Continue to operate separate Reclaim and Portage Attenuation ponds • Runoff from Portage RSF and Landfill directed to Portage Attenuation Pond • Portage and Goose Island (until completion of mining) pit waters, and plant site and airstrip runoff directed to Portage Attenuation Pond, or pumped to water sump at Process Plant for use as process make–up water as required before discharge of excess to Portage Attenuation Pond • Monitor water quality within Portage Attenuation Pond, treating in–situ if required prior to decant of excess to Third Portage Lake and/or pumping to Process Plant for use as make-up water or to Goose Island Pit to assist with reflooding • Begin mining northward at Portage Pit. Selective placement of waste rock into south end of Portage Pit. Continue selective placement of ultramafic rock at Portage RSF for future use during closure • Construct Vault Haul Road and Vault Dike. Dewater Vault Lake and commence mining of Vault Pit • Complete mining of Goose Island Pit and commence pit reflooding

Table 2.1 continued

Mine Year	Key Water and Waste Management Issues
5	• Raise Central Dike from El. 140 masl to 147.0 masl and apply surfacing material • Continue and complete construction of Finger Dikes and Goose Island Dike Extension. Construct Fish Habitat Compensation Mounts in Second Portage Lake • Continue to operate separate Reclaim and Portage Attenuation ponds • Runoff from Portage RSF and Landfill directed to Portage Attenuation Pond • Portage Pit water (until completion of mining) and plant site and airstrip runoff to be directed to Portage Attenuation pond, or pumped to water sump at Process Plant for use as process make-up water as required before discharge of excess to Portage Attenuation Pond or Goose Pit to assist with reflooding • Monitor water quality within Portage Attenuation Pond, treating in–situ if required prior to decant of excess to Third Portage Lake and/or pumping to Process Plant for use as make-up water or to Goose Island and Portage pits to assist with reflooding • Continue Goose Island Pit flooding. Complete mining of Portage Pit and commence pit reflooding. • Monitor water quality withing flooded pits, treating in–situ if requred and/or pumping to Process Plant for use as process water • Continue mining of Vault Pit • Runoff from Vault RSF and Landfill directed to Vault Attenuation Pond • Monitor water quality within Vault Attenuation Pond, treating in–situ if required prior to decant of excess to Wally Lake
6-7	• Continue mining of Vault Pit • Runoff from Vault RSF and Landfill directed to Vault Attenuation Pond • Monitor water quality within Vault Attenuation Pond, treating in–situ if required prior to decant of excess to Wally Lake • Commence deposition of tailings in Northwest Basin on Second Portage Arm. Portage Attenuation and Reclaim ponds combine • Runoff from Portage Rock Strorage Facility and Landfill directed to Reclaim Pond • Plant site and airstrip runoff to be directed water sump at Process Plant for use as process make-up water as required before discharge of excess to Goose and Portage pits to assist with reflooding • Continue Portage and Goose Island Pit reflooding. Monitor water quality withing flooded pits, treating in–situ if requred and/or pumping to process plan for use as process water
8	• Complete mining at Vault • Runoff from Portage Rock Strorage Facility and Landfill directed to Reclaim Pond • Plant site and airstrip runoff to be directed water sump at Process Plant for use as process make-up water as required before discharge of excess to Goose and Portage pits to assist with reflooding • Reclaim Pond water treated if necessary and discharged to Goose and Portage pits to assist with reflooding • Continue Portage and Goose Island Pit reflooding. Commence Vault Pit reflooding • Monitor water quality withing flooded pits, treating in–situ if required • Mining complete, start final closure and reclamation
9	• Continue final closure and reclamation • Continue Portage, Goose Island and Vault Pit reflooding

Table 2.2: Materials Balance

		Year -2	Year -1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Total
PORTAGE PIT	Intermediate Volcanic (kt)	455.6	745.2	6,911.3	2,456.5	1,958.1	2,454.0	955.6	0.0	0.0	0.0	15,936.3
	Ultramafic (kt)	234.3	488.6	7,350.6	5,060.2	4,748.3	4,720.8	1,538.5	0.0	0.0	0.0	24,141.3
	Iron Formation (kt)	412.7	1,577.2	11,697.0	2,708.1	4,026.4	7,482.2	2,264.7	0.0	0.0	0.0	30,168.4
	Quartzite (kt)	0.0	42.6	21.6	0.0	285.3	562.8	22.0	0.0	0.0	0.0	934.4
	Till (kt)	623.9	1,215.4	2,070.5	0.0	756.6	1,431.2	21.3	0.0	0.0	0.0	6,118.9
	Total Waste (kt)	1,726.5	4,069.1	28,051.0	10,224.8	11,774.8	16,651.0	4,802.1	0.0	0.0	0.0	77,299.3
	Ore (kt)	110.7	387.0	2,604.8	2,510.3	1,914.2	2,524.7	1,126.1	0.0	0.0	0.0	11,177.8
	Waste Destination	1, 2, 5, 6	1, 2, 3, 5, 6, 11, 13	3, 4, 5, 6, 12	2, 4, 6, 9, 12, 13	6, 7*, 9, 11, 12	6, 7*, 9	6, 7*, 9, 10, 13	6	6	6	
GOOSE ISLAND PIT	Intermediate Volcanic (kt)	0.0	0.0	0.0	5,713.2	3,212.1	565.2	0.0	0.0	0.0	0.0	9,490.5
	Ultramafic (kt)	0.0	0.0	0.0	9,278.7	7,504.1	986.8	0.0	0.0	0.0	0.0	17,769.6
	Iron Formation (kt)	0.0	0.0	0.0	1,638.7	1,579.3	738.9	0.0	0.0	0.0	0.0	3,956.9
	Quartzite (kt)	0.0	0.0	0.0	2,080.5	442.7	0.0	0.0	0.0	0.0	0.0	2,523.2
	Till (kt)	0.0	0.0	0.0	3,045.1	0.0	0.0	0.0	0.0	0.0	0.0	3,045.1
	Total Waste (kt)	0.0	0.0	0.0	21,756.3	12,738.2	2,290.9	0.0	0.0	0.0	0.0	36,785.3
	Ore (kt)	0.0	0.0	0.0	592.2	1,188.3	466.8	0.0	0.0	0.0	0.0	2,247.3
	Waste Destination				2, 4, 6, 9, 12, 13	6	6					
VAULT PIT	Intermediate Volcanic (kt)	0.0	0.0	0.0	0.0	0.0	5,210.5	25,892.4	21,958.3	14,397.1	748.5	68,206.8
	Ultramafic (kt)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Iron Formation (kt)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Quartzite (kt)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Till (kt)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Waste (kt)	0.0	0.0	0.0	0.0	0.0	5,210.5	25,892.4	21,958.3	14,397.1	748.5	68,206.8
	Ore (kt)	0.0	0.0	0.0	0.0	0.0	111.0	1,976.4	3,102.5	3,102.5	175.9	8,468.3
	Waste Destination						8	8	8	8	8	
	Waste Destination Codes:	1 East Dike - 1.0 Mt			8 Vault Rock Storage Facility - 68.2 Mt							
		2 Roads, Foundations, misc. - 1.5 Mt			9 Finger Dikes and Finger Dike Extension - 7.8 Mt							
		3 Bay Zone Dike - 1.7 Mt			10 Habitat Compensation Mounts – 0.08 Mt							
		4 Goose Island Dike - 4.1 Mt			11 Stormwater Dike, Vault Dike - 0.77 Mt							
		5 East Dike Extension - 0.6 Mt			12 South Saddle Dam, North Saddle Dam - 2.3 Mt							
		6 Portage Rock Storage Facility - 62.8 Mt			13 Central Dike - 3.4 Mt							
		7 Portage Pit Backfill - 22.8 Mt			* Till will not be backfilled into Portage Pit							

To mine the ore at the deposit areas, three perimeter dewatering dikes will first be constructed:

- East Dike
- Bay Zone Dike
- Goose Island Dike.

The typical dike section includes two parallel rockfill embankments, a till core with a downstream filter zone, a cutoff wall through the till core and foundation soils to the underlying bedrock, and a grout curtain in the bedrock. Additional information on dewatering dike design can be found in the following supporting documents:

- *Detailed Design of Dewatering Dikes, Meadowbank Gold Project* (Golder, 2007a)
- *Report Addendum: Detailed Design of Dewatering Dikes, Meadowbank Gold Project* (Golder, 2007b)

Construction rockfill will initially come from pre-stripping operations and through the development of a starter pit at the Third Portage deposit. Once construction of the dewatering dikes has been completed, dewatering of Second Portage Lake Arm within the East Dike, and Third Portage Lake within the Bay Zone and Goose Island dikes will be accomplished by pumping water west into Third Portage Lake. Dewatering of Vault Lake will be accomplished by pumping water to the northeast into Wally Lake.

2.2 SUMMARY OF KEY BASELINE STUDIES

Baseline physical environmental data have been collected for hydrology, permafrost, groundwater, water quality, sediment, geochemistry, lake bathymetry, biology, and engineering studies. A brief description of the methods for the collection of data for these studies is provided below.

Hydrology – Hydrometric data were recorded from the on-site meteorological weather station (operational since 1997), as well as through monitoring of lake levels, lake outlet discharges and snow surveys. Climate data from Baker Lake, from 1947 to present, were also used to put the site in context with the regional environment.

Permafrost – Thermistor cables were initially installed at the site in 1996 as part of geotechnical drilling investigations for pit slope design purposes. Additional thermistors were installed in 1997, 1998, 2000, 2003, and 2006. A total of 23 thermistors have been installed at all of the deposit areas, proposed dike abutments, proposed plant site, in a lake bottom borehole along the proposed Central Dike alignment, and for background permafrost monitoring. An electromagnetic (EM) survey was completed over the proposed plant site, airstrip, and fuel tank farm areas to investigate ground ice.

Groundwater – Hydraulic conductivity testing was carried out in 35 boreholes. Groundwater baseline data were collected in 2003 and 2004 from four monitoring wells located within the three main rock types in the area of the Goose Island and Portage deposits and from the talik underlying the proposed Tailings Storage Facility (TSF) at Second Portage Lake. In 2006, three additional wells were installed to replace the damaged wells, and additional baseline data were collected. Wells were not installed in Vault as it lies within permafrost.

Water Quality – Water quality analyses were conducted on samples from project area lakes (Second Portage, Third Portage and Wally Lakes) between 1996 and 2003, ponded overland flow during the 2004 freshet, and water that accumulated in exploration trenches dug over the Third Portage and Vault deposits in 2002 and 2004. Additional samples of Third Portage Lake water were analyzed between 2004 and 2006 as part of the field cell leaching study (water from Third Portage Lake was used to leach cells that had not accumulated enough water for a full suite of laboratory analyses).

Sediment - Sediment was collected at all lake water sampling locations surveyed between 1996 and 2003. Sediment cores were also collected from discrete locations in 2005 to understand vertical distribution of metals.

Geochemistry – The geochemical characteristics of waste materials to be produced at Meadowbank have been investigated through both static and kinetic tests. The static tests included mineralogy, whole rock and solid phase elemental analyses to assess chemical composition, acid-base accounting (ABA) to assess acid rock drainage (ARD) potential, and shake flask extraction (SFE) tests to assess ML potential. These tests were conducted on samples of waste rock (214 samples), tailings (15 samples), and till (11 samples). The kinetic tests included standard humidity cell tests conducted on a subset of 12 individual waste rock samples, two composite waste rock samples, and ten tailings samples, and on-site field cell leaching tests conducted on composite samples of drill core, to assess long-term leaching behaviour. The results of the kinetic testing were used to formulate water quality predictions for various mine site components.

Lake Bathymetry – Bathymetric data was obtained for project area lakes (Second Portage, Third Portage, Wally, Turn, Drill Trail, and Vault lakes) using either an echosounder over open water (2006 survey), or ground penetrating radar (GPR) over ice (2002 and 2003 surveys), or both. These data were compared and merged to produce bathymetric maps of these lakes.

Biology - Studies targeting the physical (e.g., water depth, temperature, and substrate type), chemical (e.g., metals concentrations in water, sediment, and fish tissue) and/or ecological (e.g., phytoplankton, zooplankton, periphyton, benthic invertebrates, and fish) characteristics of the aquatic environment in the vicinity of the Meadowbank Gold Project have been conducted since 1991.

Geotechnical Engineering – A total of 56 geotechnical boreholes were drilled in the proposed footprints of various mine site components, including seven holes for the East Dike, five holes for the Bay Zone Dike, eight holes for the Goose Island Dike, eight holes for Central Dike, four holes for the Goose Island deposit, and 24 holes for the Portage deposits. With the exception of some of the holes drilled in the Portage deposits, all of these holes were oriented. Rock and soil samples were collected from these holes and tested in the laboratory. Tests conducted on rock samples included compressive strength tests, shear strength of discontinuities, density tests, and elastic modulus testing. Tests conducted on soil samples included atterberg limits, un-drained/drained strength tests, grain size distribution/hydrometer analysis, direct shear tests, large scale consolidation tests, moisture density relationship characterization and permeability testing.

2.3 Regional and Local Setting

2.3.1 Climate

The Meadowbank region is located within a low Arctic ecoclimate 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 2.3).

Table 2.3: 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.[1] (°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: Rounding of monthly averages has occurred. Temperatures and precipitation were estimated based on site data (1997 to 2004). Snowfall is based on adjusted Baker Lake data (1946 to 2004). Adjusted small lake evaporation was estimated from pan evaporation data (2002 to 2004). [1]Mean soil temperature is reported by AMEC to be measured at a depth between 0.2 m and 0.3 m below ground surface, but should be confirmed. Installation details such as slope aspect, surficial cover, site drainage, and annual snow cover are not available.
Source: AMEC 2003, 2005a and 2005b.

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 at Baker Lake, 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. Skies tend to be more overcast in winter than in summer.

The prevailing winds at Meadowbank for both the winter and summer months are from the northwest. A maximum daily wind gust of 83 km/h was recorded on 21 May 2002. Light to moderate snowfall is accompanied by variable winds up to 70 km/h, creating large, deep drifts and occasional whiteout conditions.

Monthly rainfall, snowfall, and total precipitation values shown in Table 2.3 were adjusted for undercatch using the values reported by Environment Canada for Baker Lake to develop estimates of adjusted monthly and annual values for Meadowbank (1949 to 2003). The resulting adjusted mean annual rainfall, snowfall, and precipitation totals are 142.5, 146.8, and 289.2 mm, respectively.

2.3.2 Permafrost

The Meadowbank Gold Project area is located within the zone of continuous permafrost (Figure 2.5) and, as such, is underlain by continuous permafrost except for lake induced taliks and thaw bulbs.

Thermal studies at the site were initiated during the 1996 summer exploration drilling program, with the installation of two thermistor cables in exploration boreholes drilled on Third Portage peninsula. These studies continued with the installation of additional thermistor cables during field investigations in 1997, 1998, 2002, 2003, and 2006. To date, 23 thermistor cables have been installed to characterize and monitor the thermal conditions and permafrost at the project site (Figure 2.6). The thermistors have been located to characterize the thermal regime at the project site both inland (away from the influence of deep lakes), as well as adjacent to lakes.

The depth of the permafrost and active layer are expected to vary based on proximity to lakes, overburden thickness, vegetation, climate conditions, and slope direction. Based on thermal studies and measurements of ground temperatures carried out to date, 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 from about 1.3 m in areas with shallow overburden, up to about 4 m adjacent to lakes.

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.

Taliks exist below Second Portage Lake and Arm, Third Portage Lake and Wally Lake and are expected to extend to the base of the permafrost. Taliks extending to the base of the permafrost are referred to as open taliks. Due to the size of Turn and Vault lakes, the underlying taliks are expected to be closed or confined within the permafrost. This means the taliks do not extend to the deep groundwater flow regime because the size and depths of the lakes are not sufficient for an open talik to develop (i.e., much of the lake freezes to the bottom during winter).

Additional information on permafrost and talik conditions on site can be found in the following support documents:

- *Meadowbank Gold ProjectMine Waste and Water Management* (MMC 2007a)
- *Detailed Design of Central Dike, Meadowbank Gold Project* (Golder 2007a)
- *Detailed Design of Dewatering Dikes, Meadowbank Gold Project* (Golder 2007c)
- *Final Report on Pit Slope Design Criteria for the Portage and Goose Island Deposits, Meadowbank Gold Project, Nunavut* (Golder 2007d)

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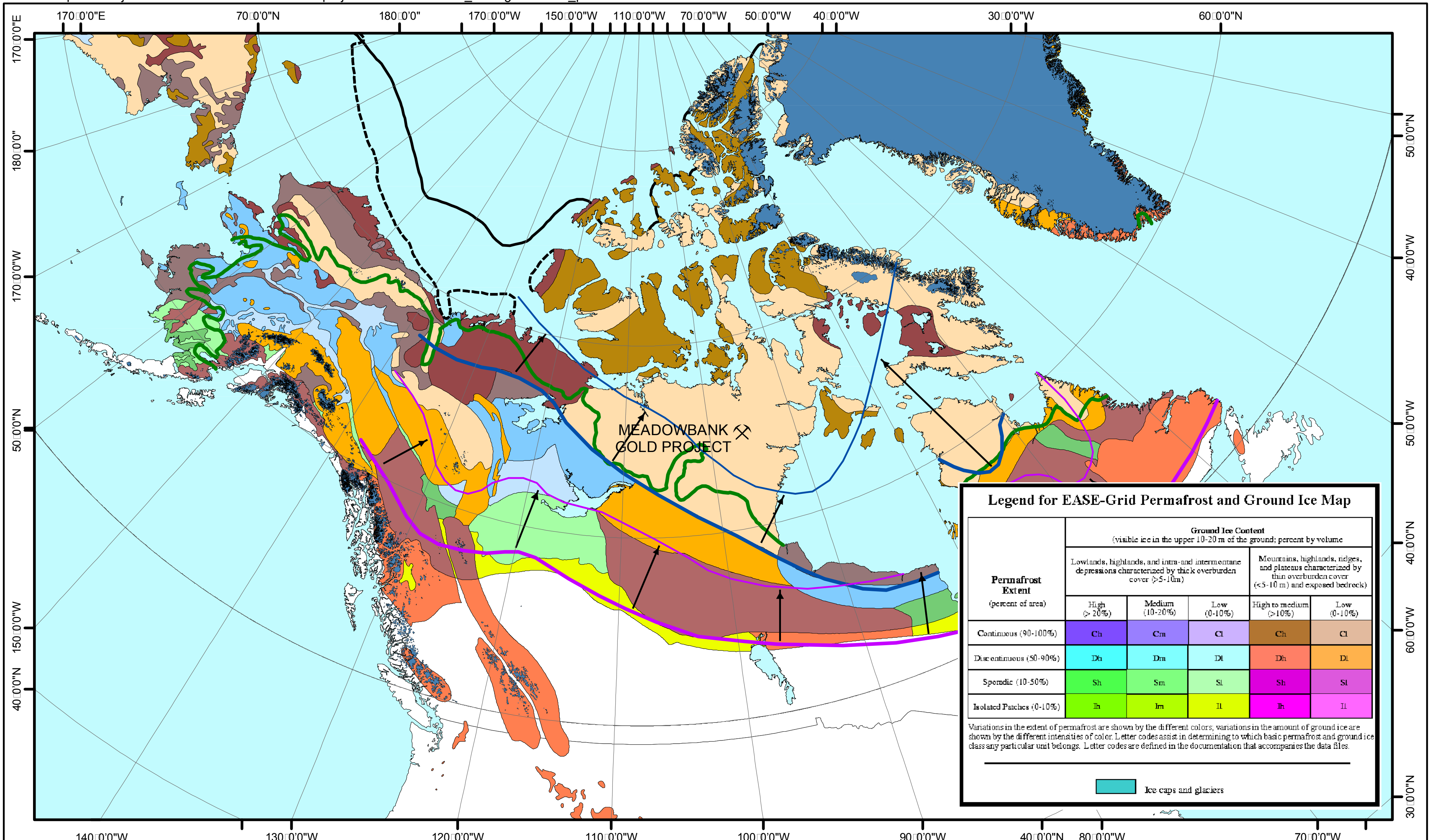

LEGEND

- 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

NOTES

1) PROJECTION: LAMBERT AZIMUTHAL EQUAL AREA

0 300 600 900 1,200 1,500

Scale in Kilometres

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.

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TITLE

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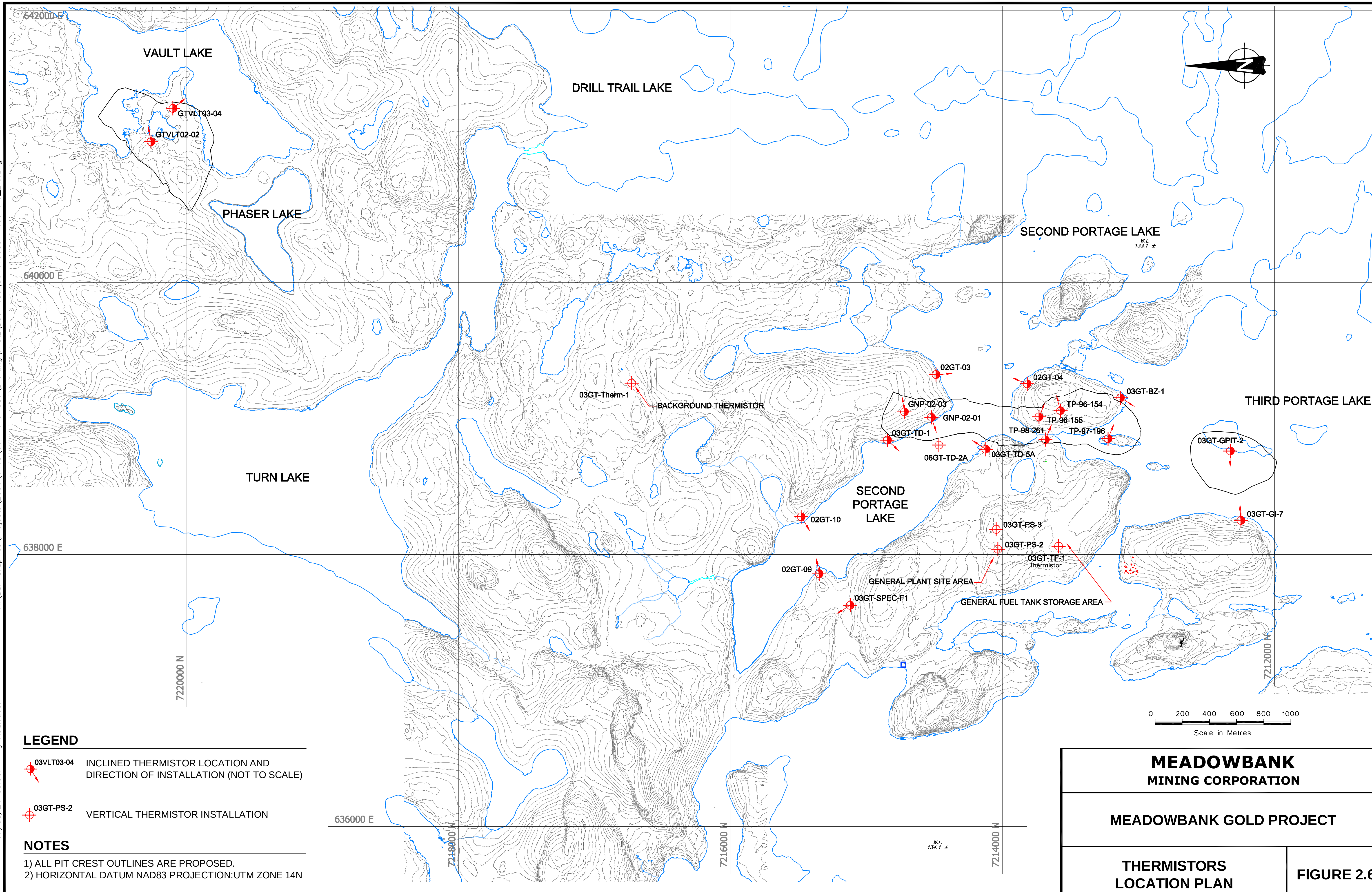
PERMAFROST MAP OF CANADA

FIGURE 2.5



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 14N

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THERMISTORS LOCATION PLAN

FIGURE 2.6

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REVISION DATE: 07/08/21 03:33PM By: ASalvador

2.3.2.1 Impact of Global Warming on Site Conditions

A report entitled, "Implications of Global Warming and the Precautionary Principle in Northern Mine Design and Closure" (BGC 2003) suggests that globally the average temperature may increase by about 2°C by 2100 due to global warming. However, 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. These estimates suggest that the average annual temperature for the Meadowbank property, located at around 65°N, may increase by approximately 5.5°C by 2100. In a more recent study, however, 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. Based on the above, a climate warming trend of 6.4°C over 100 years was selected as a conservative upper estimate of the potential climate change rate for the design of waste and water management facilities on site.

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 much faster.

Studies have indicated that the boundaries of discontinuous and continuous permafrost are expected to move northward due to global warming (Woo et al. 1992) (Figure 2.5). 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 under this scenario, but the active layer thickness would be expected to increase, and the total thickness of permafrost may slowly reduce in time. **These changes are predicted not to compromise permafrost encapsulation strategies for the Project rock storage and tailings storage facilities.**

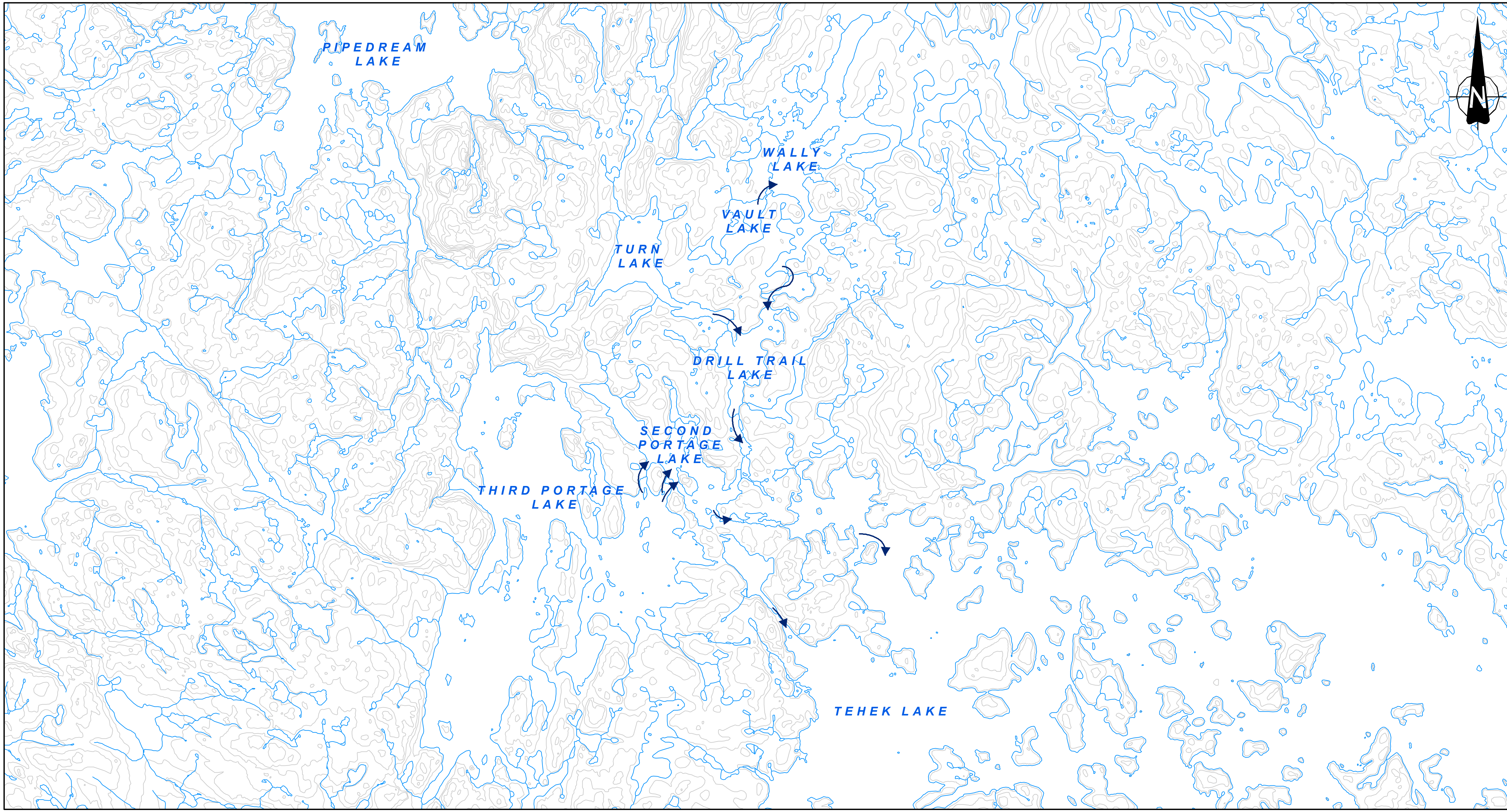
2.3.3 Surface Water Regime

The Meadowbank Gold Project is located close to the surface water divide between the Back River basin, which flows north to northeast towards the Arctic Ocean, and the Quoich River basin, which flows east to southeast into Chesterfield Inlet.

All lakes in the project area are connected by streams with boulder channels. Turn Lake drains southeast into Drill Trail Lake, which drains into Second Portage Lake. Third Portage Lake drains north into Second Portage Lake across a narrow strip of land dividing the two lakes via three distinct outflow channels: a western channel, a center channel, and an eastern channel (Figure 2.7).

2.3.3.1 Surface Water Quantity and Hydrology

Most streams in the Meadowbank Gold Project area are fed from lake outflows and are relatively short, small- to medium-width channels feeding into downstream lakes in a cascading network. Streamflow monitoring of Second Portage Lake outflow and tributary drainages of Third Portage, Drill Trail, and Turn lakes were carried out for the 2002, 2003, and 2004 open water seasons. Local data were supplemented by regional data from four Water Survey of Canada stations. Tables 2.4 and 2.5 show details of the regional and site gauging stations, respectively (AMEC 2003).



LEGEND

FLOW DIRECTION
WATER
CONTOUR (10 m INTERVAL)

NOTES

1) HORIZONTAL DATUM: NAD83 PROJECTION: UTM ZONE 14N

REFERENCES

1) BASE DATA FROM CUMBERLAND RESOURCES LTD.
2) OTHER DATA FROM AZIMUTH CONSULTING GROUP INC.

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FLOW DIRECTIONS PROJECT AREA LAKES

FIGURE 2.7

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Table 2.4: Regional WSC Streamflow Gauging Station

WSC Station Name	WSC Station Number	Drainage Area (km^2)	Gauge Location		Period of Record
Qinguq Creek near Baker Lake	06MA002	432	64° 15' 42"	96° 18' 53"	1969-1978, 1981-1983, 1985-1994
Akkutuak Creek near Baker Lake	06MA004	15	64° 18' 57"	95° 58' 23"	1978-1990
Prince River near Baker Lake	06MA005	2100	64° 18' 08"	95° 45' 31"	1979-1990
Anigaq River below Audra Lake	06MA007	2740	64 12' 48"	96° 35' 14"	1984-1994

Source: AMEC 2003.

Table 2.5: Drainage Areas

Monitoring Station	Basin	Land Surface (km^2)	Monitored Lake Surface (km^2)	Other Lakes		Total Lake Surface (km^2)	Total Area (km^2)	Ratio of Lake to Total Area
				Surface (km^2)	No.			
Third Portage Lake	Sub-Basin	49.4	36.0	3.4	55	39.5	88.9	0.444
Turn Lake	Sub-Basin	17.0	2.9	1.5	18	4.4	21.4	0.204
Drill Trail Lake	Sub-Basin	66.4	2.0	17.2	107	19.2	85.6	0.224
	Total Basin	83.4	4.9	18.7	125	23.6	107.0	0.221
Second Portage Lake	Sub-Basin	9.8	4.1	0.7	16	4.8	14.6	0.329
	Total Basin	142.6	45.0	22.8	196	67.9	210.5	0.323

Source: AMEC 2005a.

Snowmelt runoff in the region begins in the period from late May to mid-June and the snowmelt peak is often the maximum for the year. Secondary peaks due to rainfall events can occur during the summer and can occasionally exceed snowmelt peaks. Flows typically decline through the late summer and fall, with freeze-up occurring in late September for the smallest streams and in late November for the medium channels. All channels are thought to freeze to the bottom with zero flows over the winter period.

Average runoff depths for the four monitored basins over 2002 to 2004 ranged from 112 mm for Third Portage Lake to 176 mm for Drill Trail Lake. The variation in runoff correlates roughly with the relative percentage of lake surface area in each basin. Site runoff data were combined with analysis of available regional streamflow data to estimate long-term average and extreme discharge characteristics for the Meadowbank Gold Project area. Table 2.6 summarizes mean monthly runoff from May through October, as a proportion of total annual runoff.

Table 2.7 summarizes the results of frequency analyses of annual runoff for project area basins. Analysis of the available data from the four regional streamflow stations was carried out to develop estimates of flood flows and low flows for the outlets of Turn, Drill Trail, Third Portage, and Second Portage lakes. For these locations and a range of return periods, Table 2.8 summarizes estimated maximum daily discharges and Table 2.9 shows estimated low flows.

Table 2.6: Estimated Mean Monthly Runoff Depths as Proportion of Annual Depth – Project Basins

Month	Percent of Mean Annual Runoff
May	0%
June	30%
July	40%
August	20%
September	9%
October	1%
Year	100%

Source: AMEC 2003.

Table 2.7: Estimated Annual Runoff Depths - Project Basins

Return Period (Years)	Condition	Estimated Basin Runoff Depth (mm)		
		Drill Trail & Turn	Third Portage	Second Portage
100	Wet	378	238	284
50	Wet	345	217	259
20	Wet	300	189	225
10	Wet	266	168	200
5	Wet	230	145	173
2	Average	175	110	131
5	Dry	135	85.1	101
10	Dry	118	74.3	88.5
20	Dry	105	66.2	78.8
50	Dry	92.6	58.4	69.5
100	Dry	84.8	53.4	63.6

Source: AMEC 2003, 2005a.

Table 2.8: Lake Outlet Flood Discharge Estimates

Lake Outlet Station Name	Basin Area (km^2)	Maximum Daily Discharge (m^3/s)					
		1:2-Year	1:5-Year	1:10-Year	1:20-Year	1:50-Year	1:100-Year
Turn Lake Outlet	21.4	3.9	4.9	5.6	6.3	7.3	7.6
Third Portage Lake Outlet	88.9	12.8	16.3	18.6	20.8	23.8	24.7
Drill Trail Lake Outlet	107.0	15.0	19.1	21.7	24.3	27.7	28.8
Second Portage Lake Outlet	210.5	26.2	33.8	38.5	43.0	48.7	50.4

Source: AMEC 2003, 2005a.

Table 2.9: Lake Outlet Low-Flow Discharge Estimates – July to September

Lake Outlet Station Name	Basin Area (km^2)	Low-Flow Duration (days)	Mean Daily Discharge (m^3/s) 1:2-Year	1:5-Year	1:10-Year	1:20-Year	1:50-Year	1:100-Year
Turn Lake Outlet	21.4	7	0.026	0.005	0.000	0.000	0.000	0.000
		14	0.036	0.007	0.001	0.000	0.000	0.000
		30	0.065	0.015	0.004	0.000	0.000	0.000
		60	0.150	0.065	0.032	0.006	0.004	0.004
Third Portage Lake Outlet	88.9	7	0.147	0.038	0.006	0.002	0.000	0.000
		14	0.196	0.053	0.013	0.005	0.003	0.001
		30	0.315	0.093	0.033	0.007	0.002	0.001
		60	0.621	0.293	0.166	0.050	0.035	0.032
Drill Trail Lake Outlet	107.0	7	0.184	0.050	0.008	0.003	0.001	0.000
		14	0.245	0.069	0.018	0.007	0.004	0.002
		30	0.387	0.118	0.044	0.010	0.003	0.002
		60	0.747	0.357	0.206	0.066	0.046	0.043
Second Portage Lake Outlet	210.5	7	0.422	0.136	0.030	0.012	0.003	0.001
		14	0.553	0.182	0.062	0.027	0.014	0.009
		30	0.818	0.282	0.127	0.040	0.015	0.011
		60	1.470	0.733	0.453	0.182	0.127	0.117

Source: AMEC 2003, 2005a.

2.3.3.2 Surface Water Quality

The Meadowbank Gold Project area lakes (Second Portage, Third Portage, and Wally lakes) are ultra-oligotrophic, soft water, nutrient-poor, and isothermal with neutral pH and high oxygen concentrations year-round. Limnological conditions tend to be very stable, with uniform, vertical temperature, oxygen and nutrient distributions with only minor, temporary stratification. Water clarity is extremely high with Secchi depths of 10 m or more, with very low dissolved and suspended solids concentrations. Given the absence of tributary streams, there are no external sources of nutrients or sediment that might contribute to nutrient enrichment. Table 2.10 summarizes average baseline surface water quality for Third Portage, Second Portage, and Wally lakes between 1997 and 2002.

Total and dissolved solids in surface waters were low, typically below laboratory detection (<1 mg/L and <10 mg/L, respectively), as was turbidity (<1.1 NTU). Hardness (4.4 to 9.5 mg/L) and dissolved anions (chloride, fluoride, sulphate) were also very low (<0.05 to 0.06 mg/L) and also near detection limits. Surface water had circum-neutral pH (6.6 to 7.7) and low conductivity (5 to 77 µS/cm).

Table 2.10: Average Baseline Water Quality in Third Portage, Second Portage & Wally Lakes

Parameter	Units	Third Portage Lake (N=3)	Second Portage Lake (N=8)	Wally Lake (N=3)
Conventional Parameters				
Hardness	mg/L	5.3	8.9	17.2
pH	pH units	6.8	7.5	7.3
Dissolved Anions				
Total Alkalinity	mg/L	4	7	13
Chloride	mg/L	0.5	0.6	0.7
Fluoride	mg/L	0.07	0.07	0.05
Sulphate	mg/L	1.3	2.8	5.3
Nutrients				
Ammonia Nitrogen	mg/L	0.01	0.02	0.02
Total Kjeldahl Nitrogen	mg/L	0.09	0.08	0.11
Nitrate Nitrogen	mg/L	0.004	0.007	0.024
Nitrite Nitrogen	mg/L	0.001	0.001	0.001
Total Phosphate	mg/L	0.002	0.003	0.003
Total Phosphorus	mg/L	0.002	0.003	0.003
Organic Parameters				
Dissolved Organic Carbon	mg/L	1.4	1.7	2.2
Cyanides				
Total Cyanide	mg/L	0.005	0.005	0.005
Total Metals				
Aluminum	mg/L	0.006	0.007	0.008
Antimony	mg/L	0.0005	0.0005	0.0005
Arsenic	mg/L	0.0005	0.0005	0.0005
Barium	mg/L	0.02	0.02	0.02
Beryllium	mg/L	0.001	0.001	0.001
Boron	mg/L	0.1	-	0.1
Cadmium	mg/L	0.00005	0.00077	0.00005
Calcium	mg/L	1.2	2.3	4.6
Chromium	mg/L	0.001	0.001	0.001
Cobalt	mg/L	0.0003	0.0003	0.0003
Copper	mg/L	0.001	0.001	0.002
Iron	mg/L	0.03	0.03	0.03
Lead	mg/L	0.0006	0.0009	0.0007
Lithium	mg/L	0.005	0.005	0.005
Magnesium	mg/L	0.5	0.8	1.3
Manganese	mg/L	0.001	0.0016	0.0013
Mercury	mg/L	0.00005	0.00005	0.00005
Molybdenum	mg/L	0.001	0.001	0.001
Nickel	mg/L	0.001	0.001	0.001
Potassium	mg/L	2	2	2
Selenium	mg/L	0.001	0.001	0.001
Silver	mg/L	0.00002	0.00002	0.00002
Sodium	mg/L	2	2	2
Thallium	mg/L	0.0002	0.0002	0.0002
Tin	mg/L	0.0006	0.0005	0.0005
Titanium	mg/L	0.01	0.01	0.01
Uranium	mg/L	0.0002	0.0002	0.0002
Vanadium	mg/L	0.03	0.03	0.03
Zinc	mg/L	0.005	0.005	0.013

Note: N = number of samples used to calculate average values.
Source: Azimuth 2003.

Nutrient concentrations (nitrogen, carbon, phosphorus) in the project lakes did not differ appreciably within or between lakes and seasons. Values were very low and equivalent to values typical of ultra-oligotrophic lakes. Nitrogen nutrients (nitrate, nitrite, ammonia, dissolved phosphate) seldom exceeded 0.001 mg/L, while dissolved phosphate ranged from <0.001 to 0.003 mg/L. Dissolved organic carbon (DOC) values ranged from 1.4 to 2.3 mg/L over all lakes.

Total and dissolved metals concentrations in surface waters from project lakes were remarkably similar within and between lakes from 1997 to 2002. Total antimony, arsenic, chromium, copper, mercury, and nickel concentrations from project lakes were all below laboratory detection limits. The only metals to exceed detection limits were aluminium (0.006 to 0.014 mg/L), cadmium (up to 0.0015 mg/L), lead (up to 0.0012 mg/L), and zinc (0.001 to 0.019 mg/L). Only lead marginally exceeded surface water quality guidelines at a few stations. Dissolved metals concentrations comprised the vast majority of total metals concentrations where results exceeded detection limits, indicating that nearly all metals are dissolved and not associated with particulates, which is consistent with the low suspended solids concentrations observed at the time of sampling.

Due to the site's northern latitude and climate, lakes in the area naturally experience long periods of cold temperatures and low light levels during the winter months. Ice covers the lakes for extended periods of time each year and low water temperatures exist year round. The ice-free season is very short, with ice break-up in late June and ice-up beginning in late September. Maximum ice thickness is at least 2 m by March/April. Because the lakes are ice covered for most of the year, gas exchange with the atmosphere is limited. Oxygen concentration remains high under the ice, however, because of the low rates of biological activity and decomposition of organic material.

2.3.3.3 Lake Bathymetry

Figures 2.8 through 2.13 show the bathymetry of the lakes adjacent to and overlying the main deposits. These figures indicate the lake depths to be extremely variable, ranging from less than 1 m to about 38 m in areas of Second Portage Lake.

Table 2.11 summarizes estimates of total water volume within the Second Portage Lake Arm, Third Portage Lake, and Vault Lake for the areas that will be inside the proposed dewatering dikes. The estimated total volumes of water within the lakes within the project area are summarized in Table 2.12.

Table 2.11: Lake Volumes Inside Dewatering Dikes

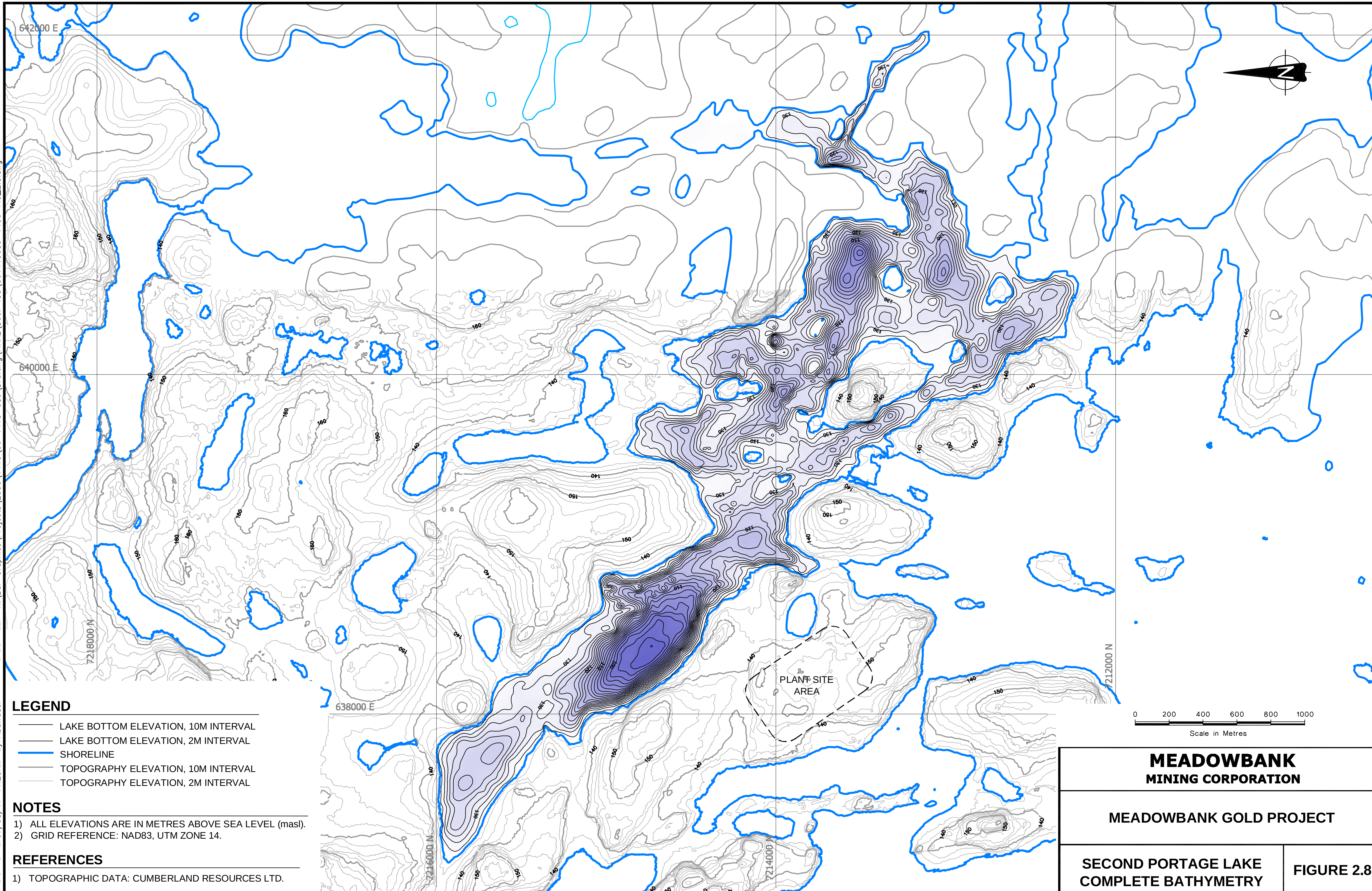
Location		Volume (Mm^3)
Second Portage Lake Arm (elevation 133.1 m masl)	Northwest Basin (attenuation pond)	2.0
	Main Basin (Main tailings)	10.5
	East Basin (adjacent to east dike)	2.0
	Total Second Portage Lake Arm within east dewatering dike	14.5
Third Portage Lake – Goose Island Area	Inside Bay Zone dewatering dike	0.7
	Between Bay Zone dike and Goose Island dewatering dikes	2.2
	Total Third Portage Lake – Goose Island Area within dewatering dike	2.9
Vault Lake (elevation 139.4 m masl)	Total Vault Lake within Vault dewatering dike	2.2

Notes: Volume estimates are based on site bathymetry.
Source: Golder 2007b.

Table 2.12: Estimates of Total Lake Volumes

Lake	Volume (Mm^3)
Second Portage Lake	29.7
Third Portage Lake	446.2
Turn Lake	26.5
Vault Lake	2.2
Drill Trail Lake	11.7
Wally Lake	27.9

Notes: Volume estimates are based on site bathymetry and on air photo interpretation of areas not covered by bathymetry.
Source: Golder 2006



LEGEND

- LAKE BOTTOM ELEVATION, 10M INTERVAL
- LAKE BOTTOM ELEVATION, 2M INTERVAL
- SHORELINE
- TOPOGRAPHY ELEVATION, 10M INTERVAL
- TOPOGRAPHY ELEVATION, 2M INTERVAL

NOTES

1) ALL ELEVATIONS ARE IN METRES ABOVE SEA LEVEL (masl).
2) GRID REFERENCE: NAD83, UTM ZONE 14.

REFERENCES

1) TOPOGRAPHIC DATA: CUMBERLAND RESOURCES LTD.

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SECOND PORTAGE LAKE
COMPLETE BATHYMETRY

FIGURE 2.8

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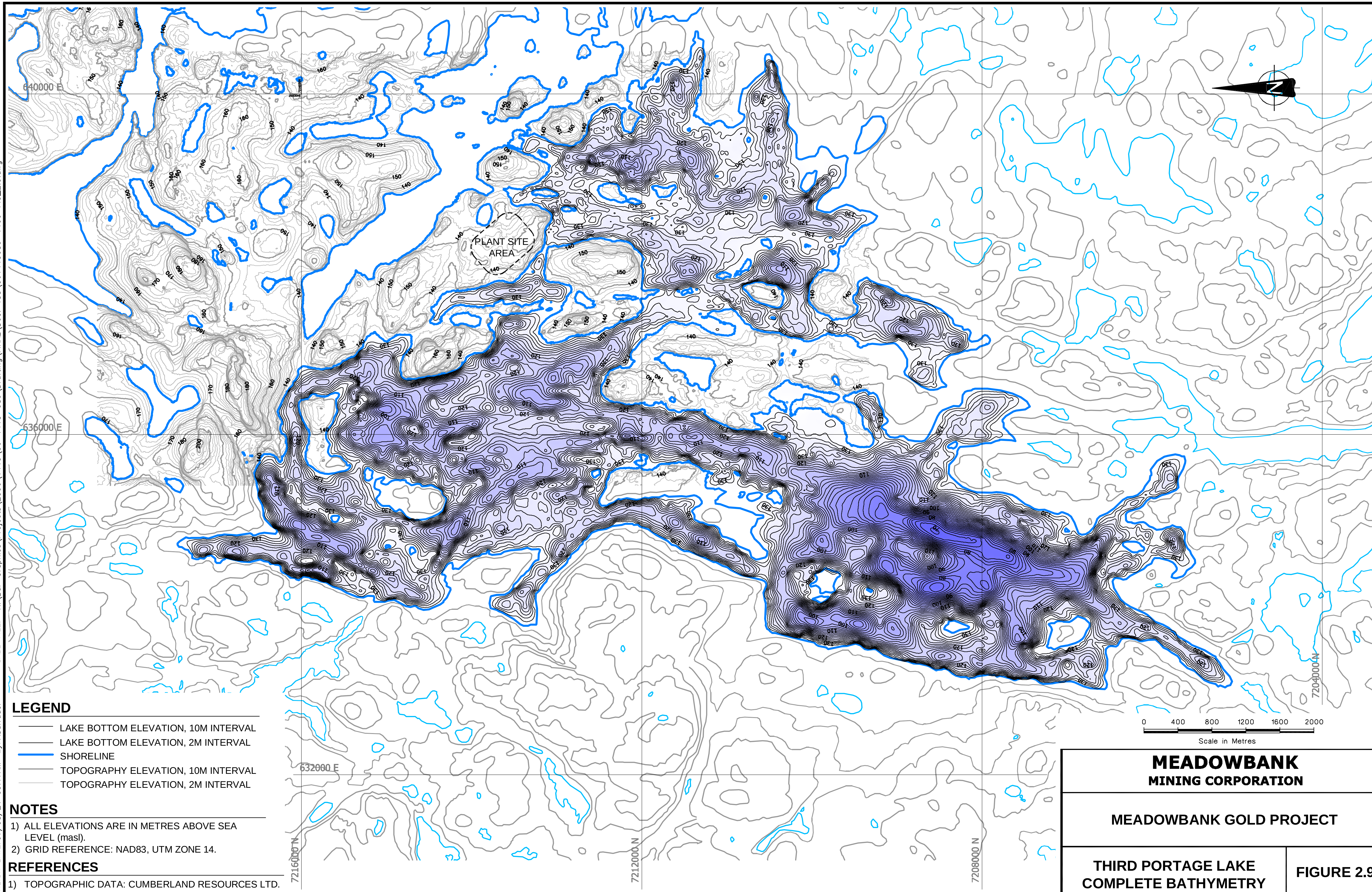
REVISION DATE: 07/08/17 11:23AM By: ASalvador



LEGEND

- LAKE BOTTOM ELEVATION, 10M INTERVAL
- LAKE BOTTOM ELEVATION, 2M INTERVAL
- SHORELINE
- TOPOGRAPHY ELEVATION, 10M INTERVAL
- TOPOGRAPHY ELEVATION, 2M INTERVAL

NOTES

1) ALL ELEVATIONS ARE IN METRES ABOVE SEA LEVEL (masl).
2) GRID REFERENCE: NAD83, UTM ZONE 14.

REFERENCES

1) TOPOGRAPHIC DATA: CUMBERLAND RESOURCES LTD.

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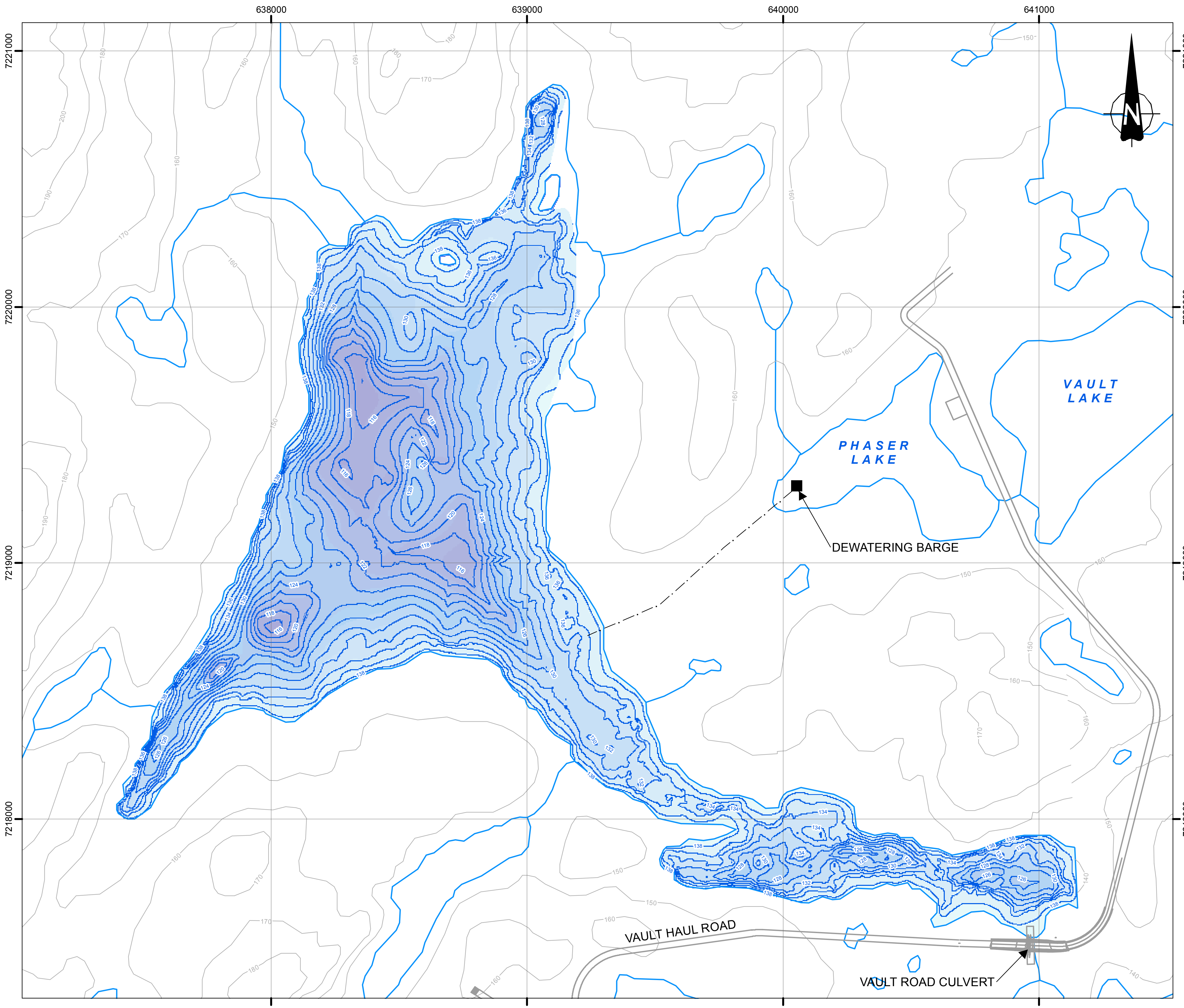
THIRD PORTAGE LAKE COMPLETE BATHYMETRY	FIGURE 2.9



LEGEND

- WATERBODY/WATERCOURSE
- TOPOGRAPHIC CONTOUR (10 M INTERVAL)
- BATHYMETRIC CONTOUR (2 M INTERVAL)

NOTES

1) ALL CONTOURS ARE EXPRESSED AS ELEVATIONS.
2) CALCULATED LAKE ELEVATION AT TIME OF SURVEY = 138.67 M.
3) BATHYMETRY GRIDDING PERFORMED USING NATURAL NEIGHBOURS INTERPOLATION IN ARCGIS 9.1 WITH THE SPATIAL ANALYST EXTENSION.

REFERENCES

1) TOPOGRAPHIC DATA: CUMBERLAND RESOURCES LTD.
2) HORIZONTAL DATUM: NAD83 PROJECTION: UTM ZONE 14N

0 150 300 450 600 750

Scale in Metres

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TURN LAKE BATHYMETRY	**FIGURE 2.10**

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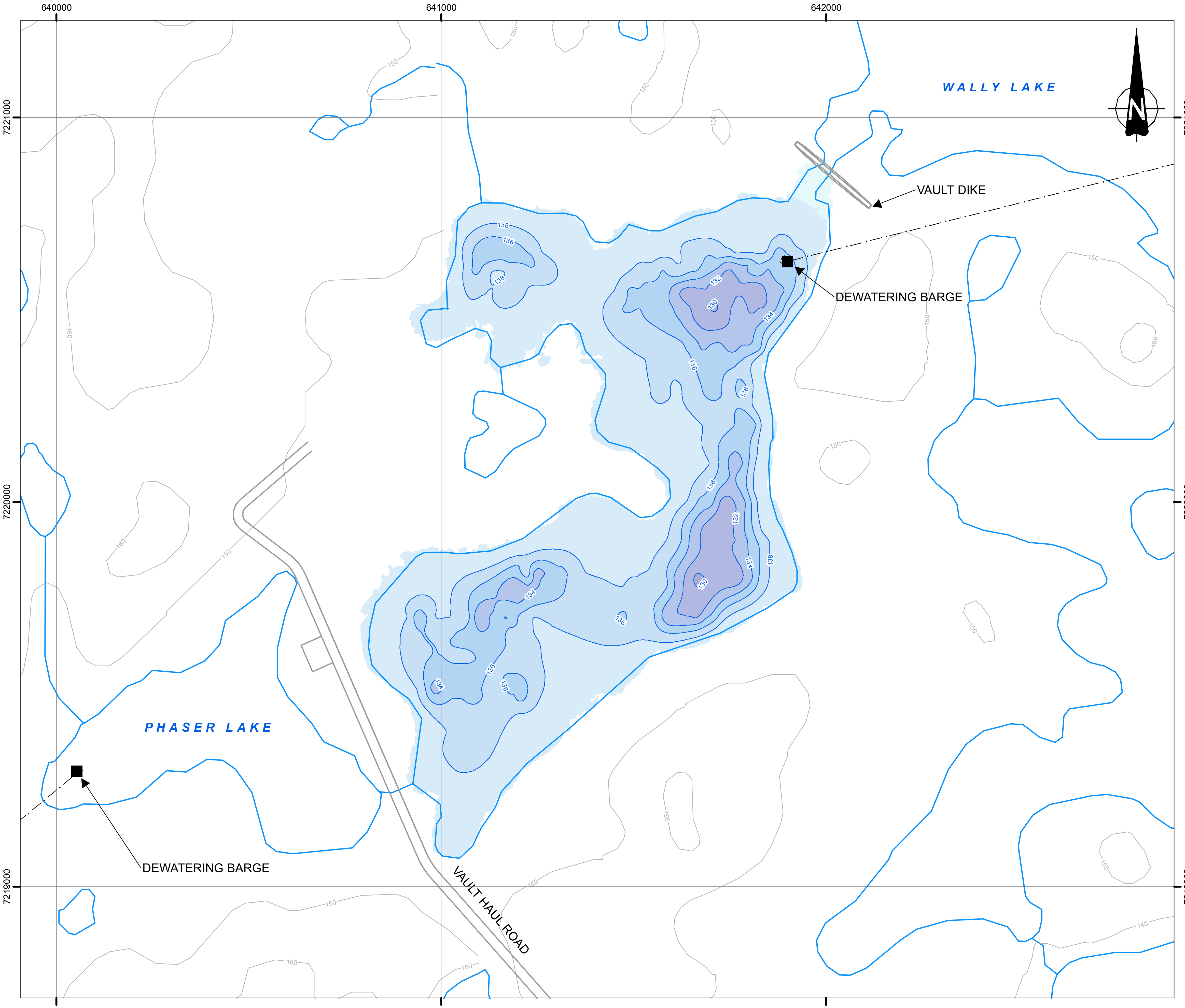

LEGEND

- WATERBODY/WATERCOURSE
- TOPOGRAPHIC CONTOUR (10 M INTERVAL)
- BATHYMETRIC CONTOUR (2 M INTERVAL)

NOTES

1) ALL CONTOURS ARE EXPRESSED AS ELEVATIONS.
2) CALCULATED LAKE ELEVATION AT TIME OF SURVEY = 137.15 M.
3) BATHYMETRY GRIDDING PERFORMED USING NATURAL NEIGHBOURS INTERPOLATION IN ARCGIS 9.1 WITH THE SPATIAL ANALYST EXTENSION.

REFERENCES

1) TOPOGRAPHIC DATA: CUMBERLAND RESOURCES LTD.
2) HORIZONTAL DATUM: NAD83 PROJECTION: UTM ZONE 14N

0 100 200 300 400 500
Scale in Metres

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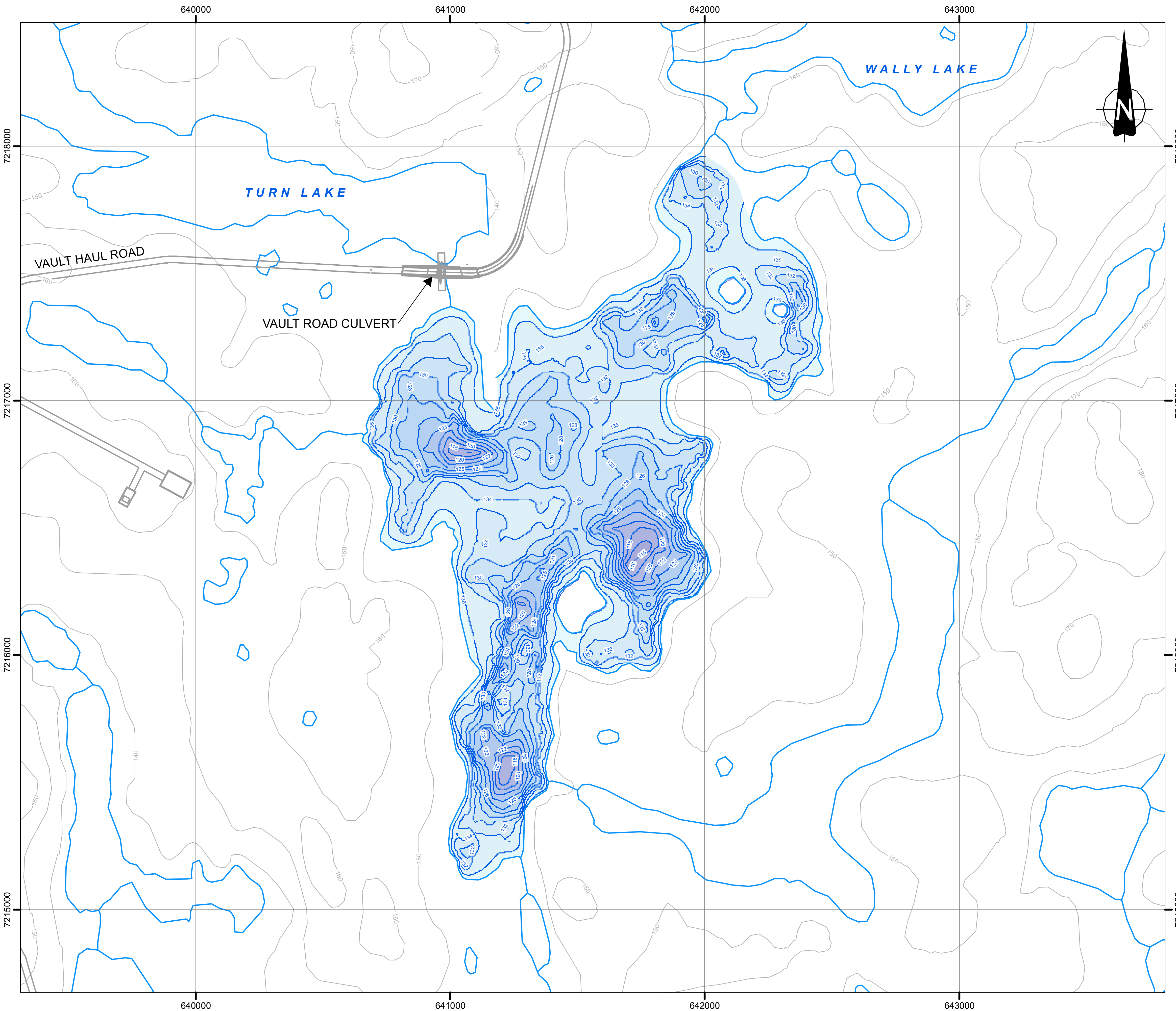
TITLE	
MEADOWBANK GOLD PROJECT	
VAULT LAKE BATHYMETRY	**FIGURE 2.11**

N:/Bur-Graphics/Projects/2006/1413/06-1413-089/GIS/projects/1400/Document_485/figure-02-11_vault-lake-bathymetry.mxd



LEGEND

- WATERBODY/WATERCOURSE
- TOPOGRAPHIC CONTOUR (10 M INTERVAL)
- BATHYMETRIC CONTOUR (2 M INTERVAL)

NOTES

1) ALL CONTOURS ARE EXPRESSED AS ELEVATIONS.
2) CALCULATED LAKE ELEVATION AT TIME OF SURVEY = 137.15 M.
3) BATHYMETRY GRIDDING PERFORMED USING NATURAL NEIGHBOURS INTERPOLATION IN ARCGIS 9.1 WITH THE SPATIAL ANALYST EXTENSION.

REFERENCES

1) TOPOGRAPHIC DATA: CUMBERLAND RESOURCES LTD.
2) HORIZONTAL DATUM: NAD83 PROJECTION: UTM ZONE 14N

0 150 300 450 600 750
Scale in Metres

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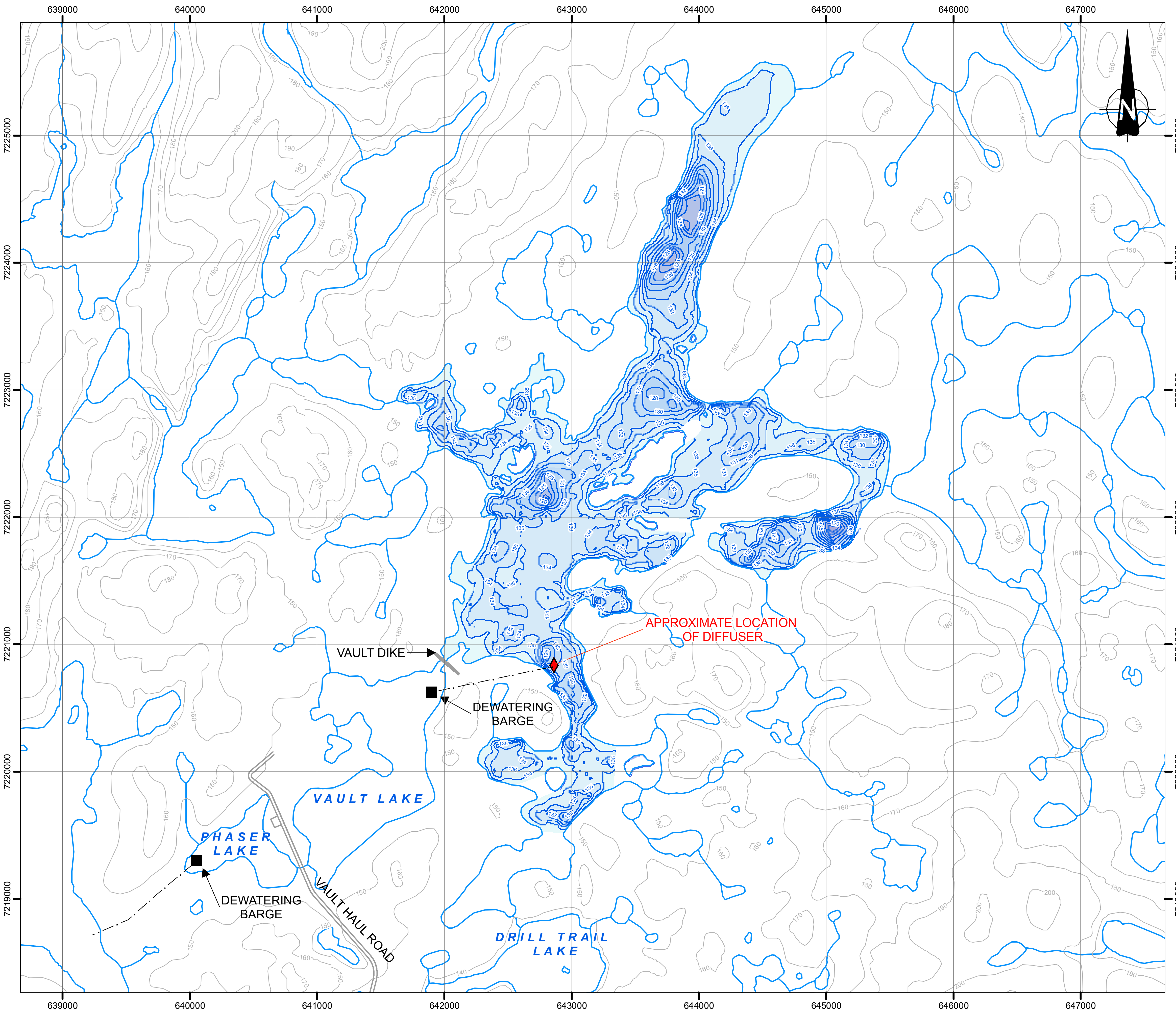
TITLE
MEADOWBANK GOLD PROJECT

DRILL TRAIL
LAKE BATHYMETRY

FIGURE 2.12

N:/Bur-Graphics/Projects/2006/1413/06-1413-089/GIS/projects/1400/Document_485/figure-02-12_drill-bathymetry.mxd



LEGEND

- WATERBODY/WATERCOURSE
- TOPOGRAPHIC CONTOUR (10 M INTERVAL)
- BATHYMETRIC CONTOUR (2 M INTERVAL)

NOTES

1) ALL CONTOURS ARE EXPRESSED AS ELEVATIONS.
2) CALCULATED LAKE ELEVATION AT TIME OF SURVEY = 139.40 M.
3) BATHYMETRY GRIDDING PERFORMED USING NATURAL NEIGHBOURS INTERPOLATION IN ARCGIS 9.1 WITH THE SPATIAL ANALYST EXTENSION.

REFERENCES

1) TOPOGRAPHIC DATA: CUMBERLAND RESOURCES LTD.
2) HORIZONTAL DATUM: NAD83 PROJECTION: UTM ZONE 14N

0 300 600 900 1200 1500
Scale in Metres

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WALLY LAKE BATHYMETRY | **FIGURE 2.13**

N:/Bur-Graphics/Projects/2006/1413/06-1413-089/GIS/projects/1400/Document_485/figure-02-13_wally-bathymetry.mxd

2.3.3.4 Overland Runoff

Overland runoff occurs principally during freshet period. This surface drainage will accumulate in pits and in drainage ditches and sumps at various areas.

Figure 2.14 shows sample locations of surface flow, lake water and soil geochemistry collected between 2002 and 2005. Table 2.13 shows water quality results. This water is moderately acidic and has very low sulphate, dissolved metals, and total dissolved solids (TDS). The quality of water indicates limited interaction of surface drainage water with the underlying bedrock, the likely presence of organic acids, and the low buffering capacity of the natural environment.

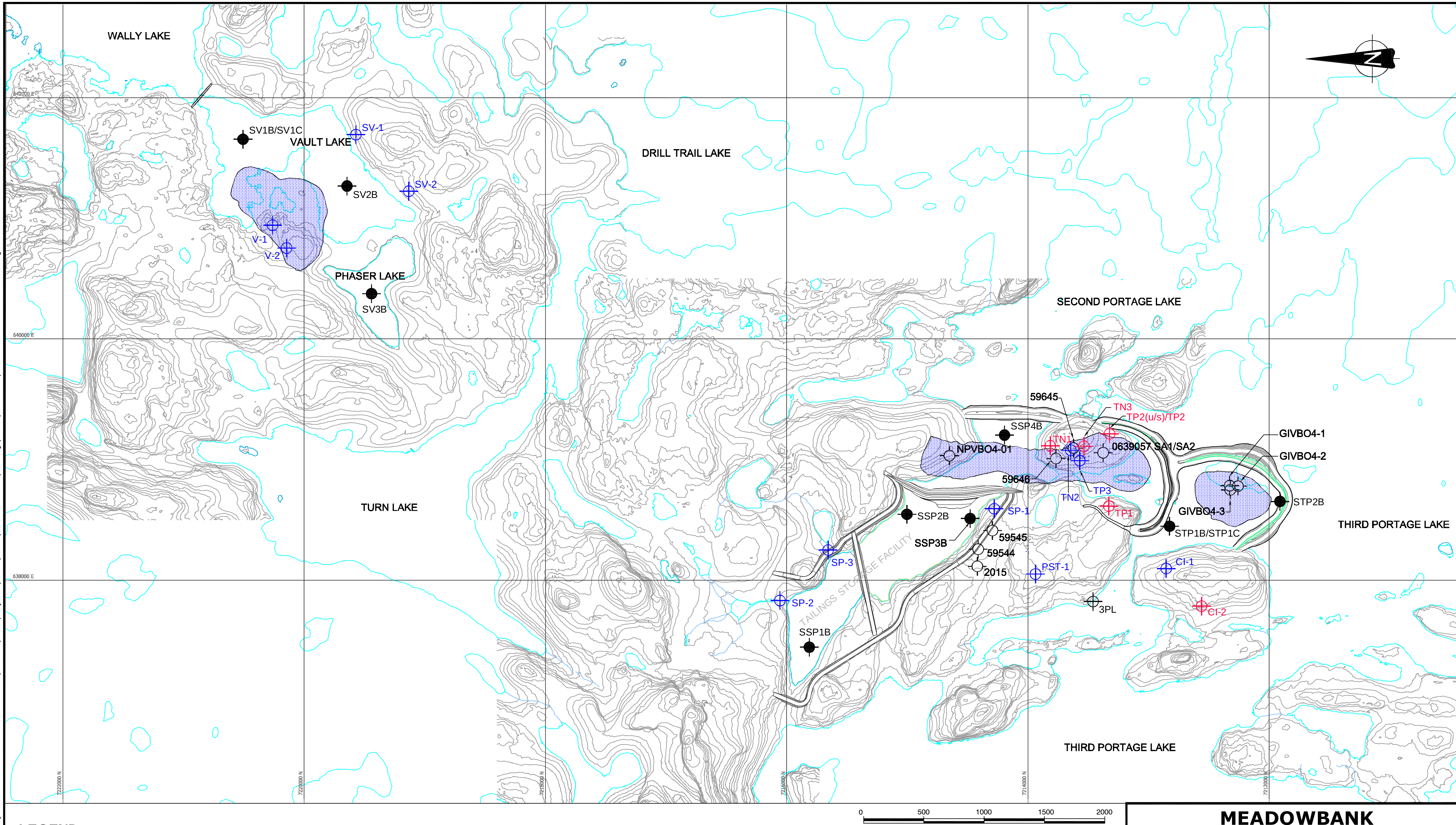
2.3.3.5 Groundwater Regime

In areas of continuous permafrost, there are two groundwater flow regimes: a deep regime beneath the permafrost and a shallow regime in the active layer near the ground surface (Figure 2.15). The deep groundwater regime is connected to taliks located beneath large lakes. The water level elevations in lakes that have these deep taliks provide the driving force, or hydraulic head, for the deep groundwater flow. The presence of the thick and low permeability permafrost beneath land located between large lakes results in negligible recharge to the deep groundwater flow. Smaller lakes, which have taliks that do not extend down to the deep groundwater regime, do not influence the groundwater flow in the deep regime. Consequently, recharge to the deep groundwater flow regime is predominantly limited to areas of talik beneath large surface water bodies.

From late spring to late summer when temperatures are above 0°C, the active layer becomes thawed. Within the active layer, the water table is expected to be a subdued replica of the topographic surface. Groundwater gradients, or the slope of the groundwater level, are assumed to be similar to topographic gradients. Locally, groundwater in the active layer would flow to local depressions and ponds that drain to Second Portage and Third Portage lakes, or would flow directly to lakes themselves.

2.3.3.6 Hydraulic Conductivity

There does not appear to be a detectable difference in the hydraulic conductivity of the various bedrock types located within the project area. UM, at a given depth, have similar hydraulic conductivity to those of the IV rocks at the same depth. The hydraulic conductivity of the shallow exfoliated and weathered bedrock and faults, regardless of rock type, is generally higher than the deeper, less fractured rock.



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LEGEND

- LAKE SEDIMENT SAMPLE (COMPOSITE)
- OVERBURDEN SAMPLE (GRAB)
- THIRD PORTAGE LAKE SAMPLING LOCATION
- SURFACE DRAINAGE SAMPLE (FULL CHEMICAL ANALYSIS CONDUCTED)
- SURFACE DRAINAGE SAMPLE (LIMITED FIELD MEASUREMENTS OBTAINED)
- APPROXIMATE OUTLINE OF PROPOSED OPEN PIT
- PROPOSED DIKE LOCATION

NOTES

1) GRID REFERENCE: NAD83, UTM ZONE 14N.

REFERENCES

1) AMEC AMERICAS LTD., DRAWING NUMBER A1-131395-100-C-0001 (100-C-0001.DWG), MEADOWBANK FEASIBILITY STUDY, APRIL 2005.

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SURFACE WATER AND SOIL SAMPLE LOCATIONS

FIGURE 2.14

Table 2.13: Overland (Non-Contact Overland Drainage) Results

Location Sample ID Year of Survey		Metal Mine Effluent Regulation[7] (MMER)	Vault Pit Drainage Basin		Exploration Camp	Second Portage Arm Drainage Basin			Third Portage Pit Drainage Basin	Goose Island Pit Drainage Basin (Camp Island)	CANTEST Method Detection Limit*
			SV-1 2004	SV-2 2004	Pst-1 2004	SP-1 2004	SP-2 2004	SP-3 2004	TP-3 2004	CI-1 2004	2004
Field Parameters											
pH (s.u.)		6.0-9.5	-	-	-	-	-	-	-	**5.6**	
Conductivity (µS/cm)			-	-	-	-	-	-	-	63	
Temp °C			-	-	-	-	-	-	-	6.0	
General Parameters											
Calculated TDS (mg/L)			24	13	28	23	27	27	126	20	-
pH (s.u.)		6.0-9.5	**6.4**	**6.3**	**6.4**	6.6	6.7	6.7	**3.7**	**6.3**	-
Conductivity (uS/cm)			29	12	33	24	31	33	196	23	2
Hardness $CaCO_3$ (mg/L)			10	4.1	14	10.5	12.7	11.1	17.4	7.1	0.2
Hardness (Total) $CaCO_3$ (mg/L)			12.2	5.1	16	12.8	14.7	13.5	21.2	9.3	0.2
Total Suspended Solids		15.00	< 1	1	< 1	< 1	1	< 1	3	< 1	1
Total Alkalinity $CaCO_3$ (mg/L)			9.7	6.3	-	13.6	15.6	13.6	< 0.5	8.2	0.5
Bicarbonate Alkalinity HCO_3 (mg/L)			11.8	7.7	19.8	16.5	19.0	16.6	< 0.5	10.1	0.5
Carbonate Alkalinity CO_3 (mg/L)			< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.5
Hydroxide Alkalinity OH (mg/L)			< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.5
Dissolved Sulphate SO_4 (mg/L)			4.1	1.4	0.58	0.52	1.5	3.9	107	2.6	0.5
Total Metals (mg/L)											
Aluminum[1]	Al		**0.19**	**0.19**	**0.038**	**0.025**	**0.021**	**0.029**	**4.39**	**0.16**	0.001
Antimony	Sb		<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Arsenic	As	0.5	0.0003	0.0003	<0.001	<0.0002	<0.0002	<0.0002	0.0004	<0.0002	0.0002
Barium	Ba		0.0059	0.0027	0.006	0.0045	0.0034	0.0032	0.0098	0.0065	0.0002
Beryllium	Be		<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0008	<0.0002	0.0002
Bismuth	Bi		<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Boron	B		<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Cadmium[3]	Cd		0.00002	<0.00001	<0.0002	<0.00001	0.00003	0.00002	0.00026	0.00011	0.00001
Calcium	Ca		3.38	1.22	4.61	3.68	3.54	3.03	4.55	2.46	0.01
Chromium[2]	Cr		0.0004	0.0004	<0.001	0.0002	<0.0002	<0.0002	0.0006	0.0004	0.0002
Cobalt	Co		<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.015	<0.0002	0.0002
Copper[3]	Cu	0.3	**0.0031**	0.0011	<0.001	0.0006	0.0008	0.0006	**0.017**	0.0018	0.0002
Iron	Fe		0.12	0.16	0.11	<0.01	0.06	0.15	**0.84**	0.06	0.01
Lead[3]	Pb	0.2	<0.0002	0.0006	<0.001	<0.0002	0.0004	<0.0002	**0.0010**	<0.0002	0.0002
Lithium	Li		0.0006	0.0003	<0.001	0.0007	0.0006	0.0006	0.0063	0.0008	0.0002
Magnesium	Mg		0.91	0.50	0.96	0.88	1.41	1.44	2.39	0.76	0.01
Manganese	Mn		0.0086	0.0045	0.001	0.0007	0.0007	0.017	0.34	0.0006	0.0002
Mercury	Hg		*<0.00002*	*<0.00002*	*<0.00002*	*<0.00002*	*<0.00002*	*<0.00002*	*<0.00002*	*<0.00002*	0.00002
Molybdenum	Mo		<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001
Nickel[3]	Ni	0.5	0.0020	0.0004	0.001	0.0009	0.0011	0.0057	**0.062**	0.0019	0.002
Phosphorus	PO4		0.15	<0.03	<0.15	0.04	<0.03	<0.03	0.05	<0.03	0.03
Potassium	K		0.68	0.24	0.4	0.41	0.35	0.45	0.78	0.56	0.02
Selenium	Se		<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Silicon	SiO2		3.57	1.98	1.0	0.80	0.75	1.09	4.45	3.70	0.05
Silver	Ag		<0.00005	<0.00005	*<0.00025*	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005
Sodium	Na		0.86	0.34	0.59	0.50	0.46	0.59	0.75	0.64	0.01
Strontium	Sr		0.017	0.0061	0.023	0.019	0.012	0.012	0.022	0.0080	0.0002
Tellurium	Te		<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Thallium	Tl		<0.00002	<0.00002	<0.0001	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.00002
Thorium	Th		<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001
Tin	Sn		0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Titanium	Ti		0.0049	0.0082	<0.001	0.0021	0.0002	0.0042	0.0030	0.0013	0.0002
Uranium	U		0.0003	0.0003	<0.0005	<0.0001	<0.0001	<0.0001	0.0022	0.0003	0.0001
Vanadium	V		<0.0002	0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Zinc	Zn	0.5	0.006	0.002	<0.005	0.002	0.002	0.001	**0.043**	0.003	0.001
Zirconium	Zr		<0.002	<0.002	<0.01	<0.002	<0.002	<0.002	<0.002	<0.002	0.002
Dissolved Metals (mg/L)											
Aluminum[1]	Al		**0.060**	**0.054**	**0.029**	**0.02**	**0.018**	**0.014**	**3.73**	**0.12**	0.001
Antimony	Sb		<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Arsenic	As	0.5	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0002	<0.0002	0.0002
Barium	Ba		0.0047	0.0015	0.006	0.0044	0.0031	0.0031	0.0082	0.0053	0.0002
Beryllium	Be		<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0007	<0.0002	0.0002

Table 2.13 continued

Location Sample ID Year of Survey		Metal Mine Effluent Regulation[7] (MMER)	Vault Pit Drainage Basin		Exploration Camp Pst-1 2004	Second Portage Arm Drainage Basin			Third Portage Pit Drainage Basin TP-3 2004	Goose Island Pit Drainage Basin (Camp Island) CI-1 2004	CANTEST Method Detection Limit* 2004
Bismuth	Bi		<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Boron	B		<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Cadmium[3]	Cd		<0.00001	<0.00001	<0.0002	<0.00001	<0.00001	<0.00001	0.00026	<0.00001	0.00001
Calcium	Ca		2.78	1.01	4.27	3.15	3.17	2.56	3.82	1.82	0.01
Chromium[2]	Cr		0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0004	0.0003	0.0002
Cobalt	Co		<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.013	<0.0002	0.0002
Copper[3]	Cu	0.3	0.0018	0.0006	<0.001	0.0005	0.0007	0.0005	**0.014**	0.0014	0.0002
Iron	Fe		<0.01	0.01	<0.05	<0.01	<0.01	0.06	**0.59**	<0.01	0.01
Lead[3]	Pb	0.2	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0007	<0.0002	0.0002
Lithium	Li		0.0004	<0.0002	<0.001	0.0005	0.0005	0.0004	0.0049	0.0007	0.0002
Magnesium	Mg		0.74	0.38	0.82	0.64	1.16	1.14	1.91	0.61	0.01
Manganese	Mn		0.0018	0.0010	<0.001	0.0002	0.0006	0.012	0.30	0.0003	0.000
Mercury	Hg		*<0.00002*	*<0.00002*	*<0.00002*	*<0.00002*	*<0.00002*	*<0.00002*	*<0.00002*	*<0.00002*	0.00002
Molybdenum	Mo		<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000
Nickel[3]	Ni	0.5	0.0012	0.0003	0.0010	0.0008	0.0010	0.0049	**0.052**	0.0016	0.002
Phosphorus	PO4		0.04	<0.03	<0.15	<0.03	<0.03	<0.03	<0.03	<0.03	0.03
Potassium	K		0.51	0.16	0.3	0.34	0.31	0.38	0.60	0.41	0.02
Selenium	Se		<0.0002	<0.0002	*<0.001*	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Silicon	SiO2		2.82	1.27	0.9	0.63	0.63	0.86	3.70	3.39	0.05
Silver	Ag		<0.00005	<0.00005	*<0.00025*	<0.00005	<0.00005	<0.00005	<0.00005	<0.00005	0.00005
Sodium	Na		0.71	0.26	0.52	0.38	0.40	0.47	0.59	0.53	0.0
Strontium	Sr		0.014	0.0051	0.019	0.016	0.011	0.010	0.019	0.0064	0.0002
Tellurium	Te		<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Thallium	Tl		<0.00002	<0.00002	<0.0001	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	0.00002
Thorium	Th		<0.0001	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001
Tin	Sn		<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Titanium	Ti		0.0006	0.0011	<0.001	0.0003	<0.0002	<0.0002	0.0003	0.0007	0.0002
Uranium	U		0.0002	0.0002	<0.0005	<0.0001	<0.0001	<0.0001	0.0019	0.0002	0.0001
Vanadium	V		<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002
Zinc	Zn	0.5	0.003	0.001	<0.005	0.001	0.002	0.001	**0.040**	0.002	0.001
Zirconium	Zr		<0.002	<0.002	<0.01	<0.002	<0.002	<0.002	<0.002	<0.002	0.002
Anions (mg/L)											
Fluoride[4]	F		0.06	0.05	0.07	<0.05	<0.05	0.07	**1.2**	0.07	0.05
Chloride	Cl		0.81	0.41	0.52	0.46	0.57	0.6	1.8	0.57	0.2
Bromide			-	-	-	-	-	-	-	-	-
Nutrients (mg/L)											
Nitrate and Nitrite	NO3 + NO2		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.21	< 0.05	0.05
Nitrate[5]	NO3		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.21	< 0.05	0.05
Nitrite	NO2		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002

NOTES: **1.** Freshwater Aquatic Life Guideline is pH, calcium and DOC dependent. Exceedances identified apply pH and calcium criteria. **2.** Freshwater Aquatic Life Guideline for chromium depends on valence of chromium ion (Cr(III) = 0.0089 mg/L, Cr(VI) = 0.001 mg/L). **3.** Freshwater Aquatic Life Guideline is hardness dependent. **4.** Freshwater Aquatic Life Guideline listed for inorganic fluorides. **5.** CEQG stipulates that concentrations that stimulate weed growth should be avoided. **7.** Maximum authorized monthly mean concentration (based on **total** concentration) (June 6, 2002). **8.** Values in *italics* indicate detection limit is above standard. # Range for cadmium is site specific and based on range in total hardness. < = less than the analytical detection limit. - = not analyzed. * Detection limits may change between samples, due to matrix interferences.
Source: Azimuth, 2003

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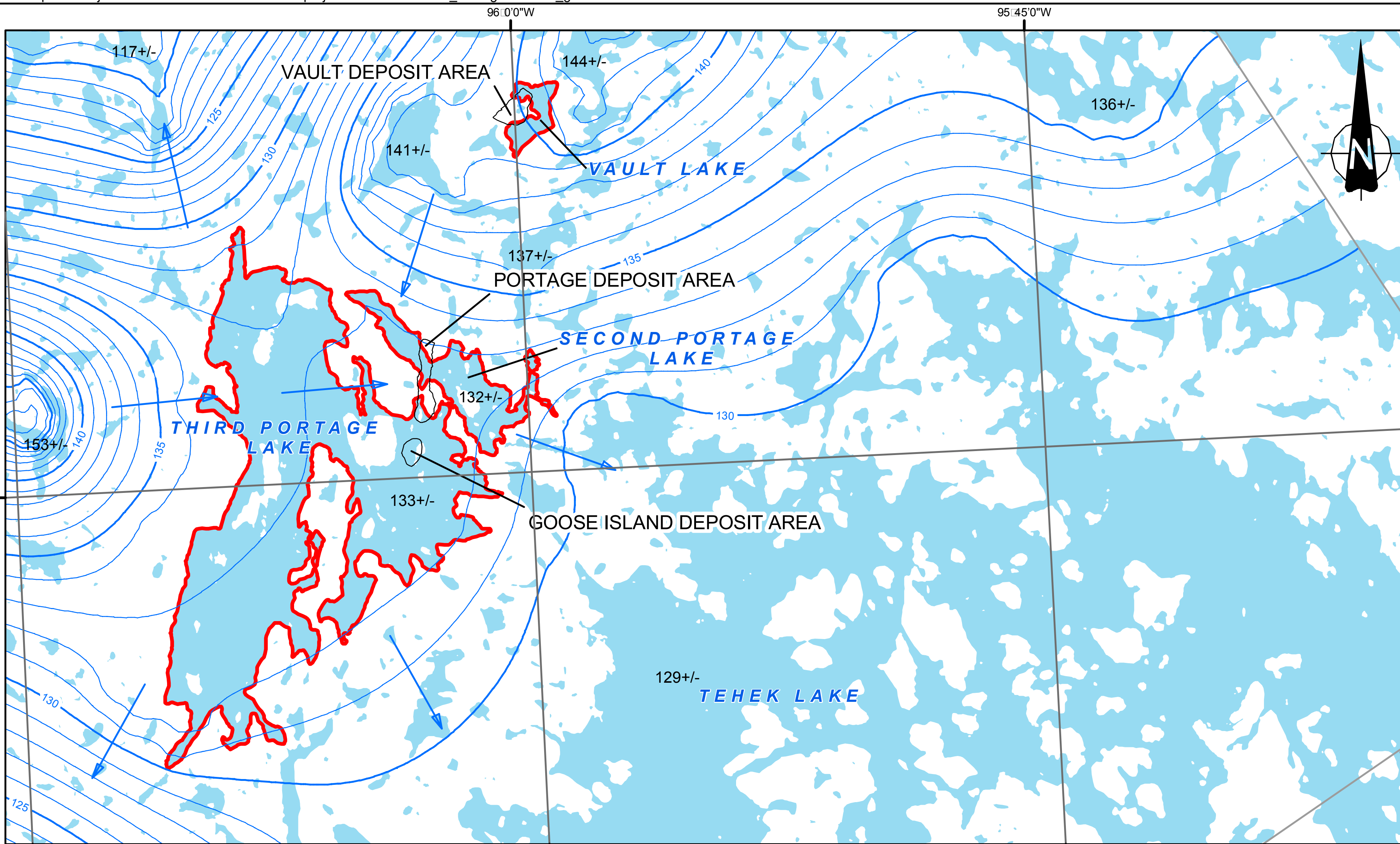

LEGEND

- PROPOSED OPEN PIT CREST
- INFERRED GROUNDWATER CONTOUR (1 M INTERVAL)
- INFERRED GROUNDWATER CONTOUR (5 M INTERVAL)
- INFERRED GROUNDWATER FLOW LINE
- 133 WATERBODY (ELEVATION IN MASL)

0 1250 2500 3750 5000 6250

Scale in Metres

REFERENCES

DISTRICT OF KEEWATIN, NORTHWEST TERRITORIES,
DEPARTMENT OF ENERGY, MINES AND RESOURCES,
MAPSHEETS 66A/16, 56E/04, 66H/01, 56D/13
DATUM: NAD83 PROJECTION: UTM ZONE 14

NOTE

WATER LEVELS VARY ANNUALLY AND MAY DIFFER FROM RECENTLY SURVEYED ELEVATIONS.

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INFERRED REGIONAL GROUNDWATER FLOW	**FIGURE 2.15**

2.3.3.7 Groundwater Quality

Groundwater baseline data were collected in 2003, 2004 and 2006 from monitoring wells located within the three main rock types in the area of the Goose Island and Portage deposits (Figure 2.16) and from the talik underlying the proposed TSF at Second Portage Arm. Wells were not installed in the Vault deposit as it lies within continuous permafrost.

No samples reported Metal Mining Effluent Regulations (MMER) exceedances. Concentrations of total metals generally exceeded those of dissolved metals for all wells. The chemical signature of groundwater (from major ion chemistry) is distinct between each lithology found within the project area and differs from that of lake water. Groundwater quality is generally consistent with rock leachate characteristics, with the majority of constituents present in rock leachate also present in the groundwater of the corresponding lithology.

The groundwater is brackish to saline with high TDS and chloride concentrations. Based on data from other sites in the Canadian Shield, it is expected that the salinity of the groundwater will increase with depth. Water samples collected from monitoring wells installed in the talik beneath Second and Third Portage lakes to depths of 212 m have chloride concentrations of up to 845 mg/L and TDS values up to 1,335 mg/L. This represents a salinity of 1.5, where salinity is equal to approximately 1.8 times the chloride concentration (in parts per thousand). Water samples collected from a number of large lakes in the area have chloride concentrations of less than 1 mg/L. By comparison, sea water has chloride concentrations of approximately 19,000 mg/L.

Predictions of the inflows and TDS concentrations of groundwater flowing into the Goose and Portage pits were made using a numerical model based on the TDS-depth profile developed for the site (Golder 2007e). Based on this model, it is estimated that the average TDS of groundwater inflow to both pits is predicted to reach a maximum of approximately 2,200 mg/l at the end of operating year four. This maximum TDS corresponds to the time when the Goose Pit reaches its ultimate depth. After this time through year eight, the Goose Pit is assumed to be in the process of flooding. The Portage Pit reaches its ultimate depth during year five, after which the average TDS is predicted to decrease to about 2,000 mg/L.

It should be noted that the inflows and average TDS predicted by the model are only representative of the groundwater inflow to the open pits; therefore, these estimates do not consider direct precipitation or leakage through dewatering dikes. These components are calculated separately, and the TDS concentration and quantity of the water prior to discharge to the lakes are predicted by the site wide water balance model.

Further details on groundwater quality and salinity modelling are provided in the following supporting documents:

- *Meadowbank Gold Project – 2006 Baseline Groundwater Quality* (Golder 2007o)
- *Updated Predictions of Brackish Water Upwelling in Open Pits with Mining Rate of 8500 tpd, Meadowbank Project, Nunavut* (Golder 2007e).

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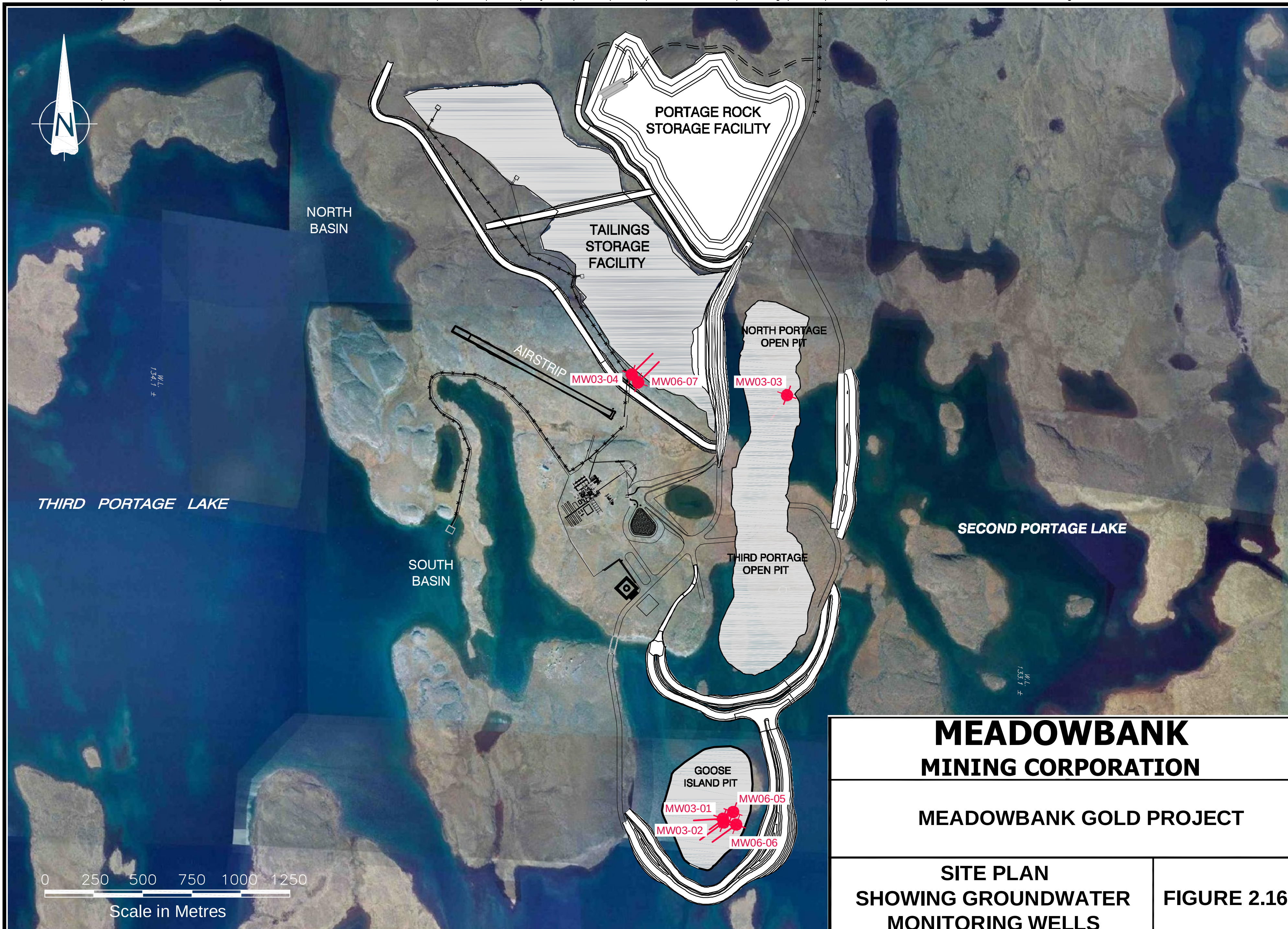

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SITE PLAN SHOWING GROUNDWATER MONITORING WELLS	**FIGURE 2.16**

2.3.4 Ground Conditions for Engineering Designs

The following summarizes specific ground conditions on site with relevance to engineering design. Additional information can be found in the following supporting documents:

- *Detailed Design of Central Dike, Meadowbank Gold Project* (Golder 2007a)
- *Detailed Design of Dewatering Dikes, Meadowbank Gold Project* (Golder 2007c)
- *Report Addendum: Detailed Design of Dewatering Dikes, Meadowbank Gold Project* (Golder 2007b)
- *Final Report on Pit Slope Design Criteria for the Portage and Goose Island Deposits, Meadowbank Gold Project, Nunavut* (Golder 2007d)

Topography

The general site area consists of low, rolling hills with numerous small lakes. The topography in the immediate vicinity of the main ore deposits (Third Portage, North Portage, and Goose Island Deposits) is of generally low relief with a range in elevation of about 70 m. Elevations vary from about 133 masl along the Second Portage Lake shoreline and 134 masl along the Third Portage Lake shoreline, to maximum elevations of approximately 200 masl to the northwest of the Portage area deposits.

Permafrost

The project is located within a zone of continuous permafrost. The land surface in the project area is underlain by continuous permafrost, while lakes that are deeper than approximately 2 m will be underlain by taliks. The depth of the active layer is estimated to be between 1.3 m and 4 m. The depth of permafrost and of the active layer will vary based on proximity to lakes, overburden thickness, vegetation, climate conditions, and slope direction (aspect).

Quaternary Geology

The project area is covered by laterally extensive deposits of glacial till. Glaciofluvial sand and gravel deposits reportedly occur in the three areas: on the north shore of Second Portage Lake, the north shore of the eastern arm of Turn Lake, and to the south of the Vault Deposit. Crysolic soils dominate on land, and lakebed sediment overlies till in the lakes.

Lakebed Sediments

A limited thickness of lakebed sediments is encountered at the Meadowbank site. The sediments have relatively high organic contents, associated high water contents, but have relatively low plasticity. Lakebed sediments samples tested indicate primarily sand, silt and clay-sized particles. The samples had organic contents of 7% and 17%, water contents of 300% to 670%, a liquid limit of 109%, and plasticity indices of 5% to 6%.

Further details on the lakebed sediments encountered at site, including information of the disposal of lake bed sediments stripped during dike construction, are provided in the following supporting documents:

- *Detailed Design of Central Dike, Meadowbank Gold Project* (Golder 2007a)
- *Detailed Design of Dewatering Dikes, Meadowbank Gold Project* (Golder 2007c)
- *Meadowbank Gold Project Mine Waste and Water Management* (MMC 2007a)

Glaciofluvial Deposits

Occurrences of gravel and sand were noted in some bore holes, and are consistent with a glaciated terrain.

Glacial Till

Descriptions of the disturbed soils that have been recovered from beneath the lakes during geotechnical drilling in proximity to the dike alignments generally are cobbles and gravel with traces of sand, silt and clay. Locally, samples of sand have been obtained. Samples of clayey sand material have been recovered using split spoon sampling methods. Average grain size distribution of 45 samples of till included 17% gravel, 52% sand, and 31% fines. Boulders were present in 15 of the 29 boreholes where till was noted.

Observations in 2006 during the airstrip construction indicated that near surface soils flowed when thawed. The behaviour indicates near surface ice contents that are wet of the liquid limit.

Further details on the glacial till encountered on site are provided in the following supporting documents:

- *Detailed Design of Central Dike, Meadowbank Gold Project* (Golder 2007a)
- *Detailed Design of Dewatering Dikes, Meadowbank Gold Project* (Golder 2007c).

Bedrock Geology

The Meadowbank Gold Project site is underlain by a sequence of Archaean greenstone (ultramafic and mafic flow sequences) and metasedimentary rocks that have undergone polyphase deformation resulting in the superposition of at least two major structural events. Enclosed within the greenstone are volcaniclastic sediments, felsic-to-intermediate flows and tuffs, sediments (greywackes), and oxide iron formations. The sequence also contains sericite schists, which are believed to be altered felsic flows or dikes. The UM rocks are variably altered, containing serpentinite, chlorite, actinolite, and talc. The ore in the Vault deposit is hosted in IV rocks. The ore in the Portage deposit is hosted in IF rocks.

2.3.4.1 Dike Construction Materials

There are four main rock types available for dike construction, including IF, IV, UM (serpentinized and non-serpentinized), and QZ.

There is a considerable amount of information available for the rock mass at Meadowbank from boreholes drilled at the site. The rock mass is generally of good quality. Mean Rock Quality Designation (RQD) was above 80%, with the exception of UM rock in North Portage which had a mean of 64% and a median of 73%.

2.3.4.2 Faults

The Second Portage Fault is located just north of the Third Portage peninsula area, and trends northwest, parallel to the northwest arm of Second Portage Lake (Figure 2.17). Its projected surface trace would intersect the proposed Central Dike as well as the East Dike. The Second Portage Fault is interpreted as a discrete, narrow focused brittle-ductile fault.

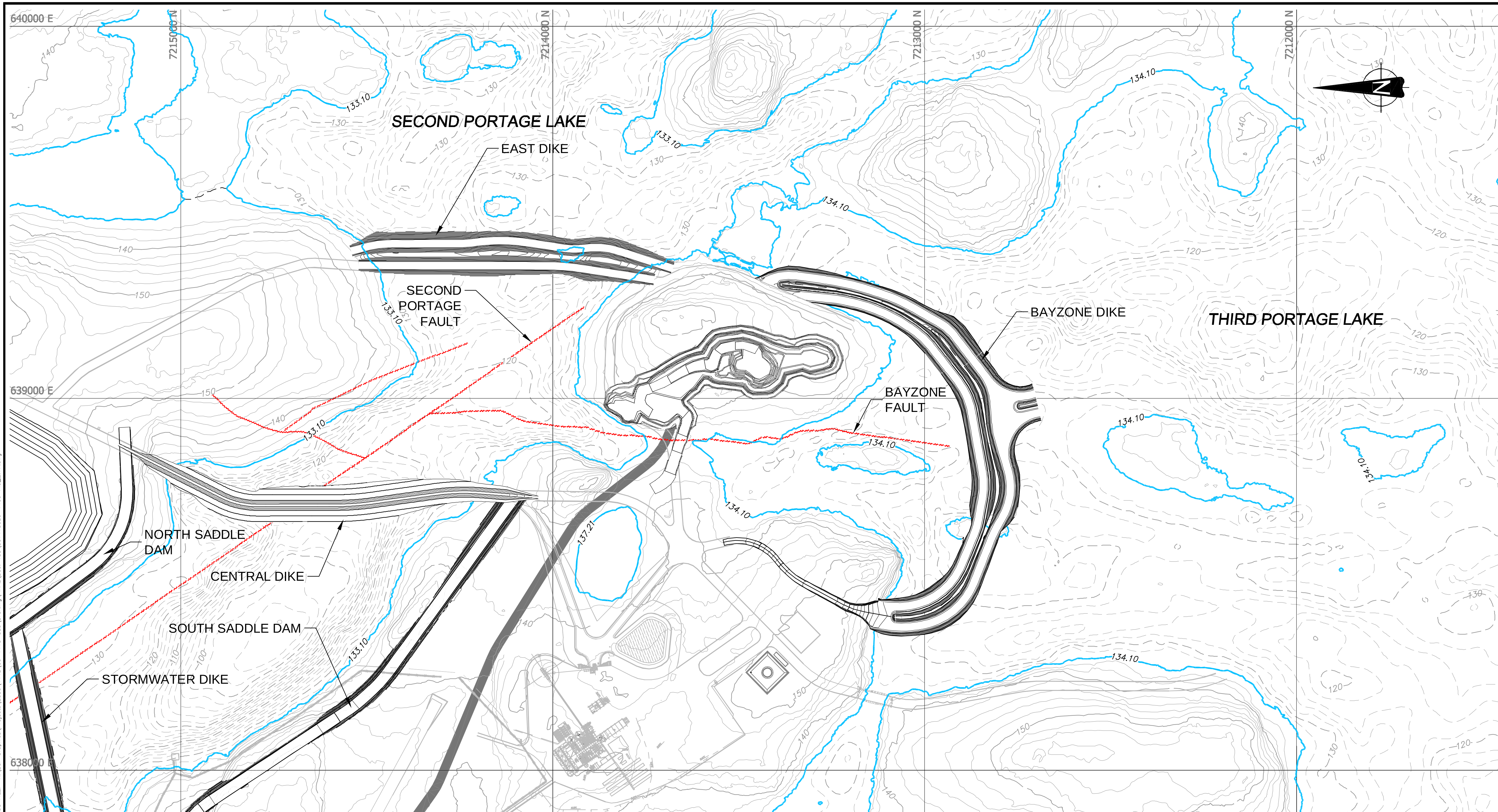
The Third Portage peninsula is flanked on the west by the north-south trending Bay Zone Fault, which roughly parallels the western shoreline of Third Portage peninsula and extends northward along the western flank of the North Portage deposit and south-southeastward between the eastern shore of the Bay Zone Island and the Third Portage peninsula. A splay trending off the Bay Zone Fault begins south of the narrows separating the Third Portage peninsula from the mainland and trends south along the western side of the Bay Zone Island. Both pass beneath the proposed Bay Zone Dike, but whether one or both pass beneath the Goose Island Dike is unknown. The Bay Zone fault is interpreted as a ductile shear, across which stratigraphic continuity is transposed but maintained.

The potential for fault reactivation is considered to be very low. The project area is in a zone of low seismic activity - Seismic Zone ‘0 ’. The Second Portage and Bay Zone faults are on the order of 1.7 to 1.9 billion years in age, and have been reported to have been tectonically inactive in spite of orogenic events in the areas. The potential for fault reactivation is low due to the type, or character, of the faults, the absence of evidence for reactivation despite known tectonism, and the low seismic activity of the area. Consequently, there is a very low risk for potential damage to the Central and dewatering dikes associated with reactivation of the Second Portage Lake or Bay Zone faults.

2.3.4.3 Hydraulic Conductivity below Central Dike

Bedrock – Hydraulic Conductivity

Tests along the Central Dike alignment indicate relatively high values of hydraulic conductivity in the rock below the dike to a depth of about 20 m and to greater depths near the Second Portage Fault. Hydraulic conductivity test results from a borehole drilled in the fault ranged from approximately $3x10^{-5}$ m/s to $3x10^{-9}$ m/s. In order to reduce the risk of potential seepage through the Second Portage Fault, bedrock grouting will be carried out beneath the Central Dike.



LEGEND

- LAKE SHORELINE CONTOUR
- LAND - BASED MAJOR CONTOUR
- LAND - BASED MINOR CONTOUR
- PIT DESIGN MAJOR CONTOUR
- PIT DESIGN MINOR CONTOUR
- 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 CUMBERLAND RESOURCES LTD.
5. CONTOUR BELOW LAKE SURFACE ARE BASED ON BATHYMETRIC SURVEYS BY GOLDER ASSOCIATES LTD., 2002, 2003, 2006. CONTOURS INTERVAL= 2m.
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.

PROJECT	
MEADOWBANK MINING CORPORATION	
TITLE	
MEADOWBANK GOLD PROJECT	
PROJECT AREA FAULT MAP	FIGURE 2.17

Potential seepage through the Second Portage Fault from the TSF will also be limited in following ways:

- Westward advancement of the tailings pond within the TSF to decrease the potential seepage pathway;
- Maintenance of a tailings beach at the dike to reduce seepage flux through the dike and through the foundation materials; and,
- Natural freezing of the tailings dike and TSF resulting in permafrost encapsulation.

Following dewatering of Second Portage Arm, several investigative procedures will be utilised to identify the location and hydraulic properties of faults that are present beneath the TSF site, including mapping of exposed bedrock, testing and monitoring during installation of the grout curtain in the Central Dike, and geophysical logging and packer testing in boreholes. If the testing interval indicates a zone of enhanced permeability then these zones will be sealed.

The results of the above investigations will be used to site monitoring wells and thermistors that will be installed within the dike, and between the Central Dike and crest of the Portage Pit. The wells will be used, together with other wells installed in the area of the tailings facility, to monitor groundwater quality and the effectiveness of the grout curtain in preventing the flow of contaminants from the tailings facility through the faults. Thermal data will be monitored to evaluate freeze back of the TSF, and of the Central Dike and foundation.

If it is determined that the quality of the water does not meet criteria as established during the water licensing process, then mitigative measures would be undertaken. The potential mitigative action would be dependent on observed flow rates and water quality data, but might include the following:

- Installation of an additional grout curtain between the downstream toe of the dike and the crest of the pit
- If, during monitoring, it is found that the freeze-back of the dike and tailings deposit are occurring at a rate less than predicted, then enhancement by artificial freezing methods may be considered.

Any seepage reporting from the TSF during operations will be collected at the pit face and re-directed back to TSF. Additional information regarding the prevention and mitigation of potential seepage from the TSF can be found following supporting documents:

- *Mitigative Measures for Potential Seepage from Tailings Facility* (Golder 2007f).; and
- *Meadowbank Gold Project Fault Testing and Monitoring Plan* (MMC 2007b).

2.3.5 Mine Waste Geochemistry

The following summarizes the geochemical characteristics of the rock (by deposit), tailings, and till on site based on the results of static and kinetic testing.

2.3.5.1 Waste Rock

Portage & Goose Areas

Table 2.14 presents a summary of geochemical characteristics of Portage and Goose Island pit rock. The summary includes the three major lithologies (IF, IV, and UM) present in the Portage and Goose Island pits, as well as a fourth but less common rock type present in these southern deposits (QZ). The characteristics of each lithologic unit are described below.

Statistical evaluation of results from samples contained within the starter pit (shallow portion of Third Portage pit) indicates that the chemical characteristics of each lithology within the starter pit are generally not statistically different from those of rocks outside the starter pit.

Ultramafic (UM)

The predominant minerals in UM rock include talc, chlorite, and iron-rich carbonate minerals (mostly iron-rich dolomite, some siderite, and calcite). These minerals provide UM rock with a relatively high neutralization potential. Some pyrite and pyrrhotite are present in UM rocks, although sulphide phases are generally sparse in this lithology.

UM volcanic waste is considered non-acid-generating (NPAG), with 96% of samples having a neutralization potential ration (NPR) >2. The UM field cell and the two UM rock samples kinetically tested contained available, reactive carbonate minerals, generating neutral drainage throughout the testing period and sustained alkalinity in leachates. This indicates that the bulk of UM rock will not generate ARD. Furthermore, the calculated rate of carbonate depletion in both samples and the field cell suggests that UM rock can be a long-term source of alkalinity, provided the carbonate minerals remain available (e.g., do not become coated in secondary minerals).

Table 2.14: Summary of Portage and Goose Pit Rock Geochemistry

Lithology	UM	IF	IV
Proportion of Pit Rock Waste	36%	37%1	28%
ARD Potential2	2% PAG 2% Uncertain 96% NPAG	67% PAG 13% Uncertain 20% NPAG	20% PAG 14% Uncertain 66% NPAG
Laboratory Test Leachate MMER Exceedances	As	pH, Zn	n.e.3
Field Barrel Test Leachate MMER Exceedances	n.e.	n.e.	n.e.

1. IF rock proportions includes 2% of QZ rock
2. Based on static testing database (Golder 2005)
3. Result from the 100-kg composite sample
n.e.: no exceedances

Iron Formation (IF)

The characteristic mineral assemblage of IF rock includes quartz, magnetite, chlorite, and amphibole, and generally excludes any carbonate minerals. The principal sulphides present in mineralized IF rocks are pyrrhotite and pyrite, both of which are approximately equal in proportion in the Goose Island deposit, with pyrite content increasing toward the North Portage deposit. Trace arsenopyrite and chalcopyrite are also present.

Sixty-seven percent of IF rock is potentially acid generating (PAG) (NPR<2) according to Indian and Northern Affairs guidelines (INAC 1992). Samples have a median total sulphur content of 0.9 and low neutralization potential. The NPAG IF rock also has low neutralization potential, but lower total sulphur (0.2%). All PAG IF rock samples, including one low-grade ore sample, generated acidic drainage (pH less than 5) in the early stages of kinetic testing, and the small amount of alkalinity present in each of these samples was depleted in that time. However, this reactivity was not demonstrated in the field cells exposed for over two years - the leachate so far yielding neutral pH, low alkalinity, and sulphate levels inferring limited pyrite oxidation. The differences are attributable to a combination of mixing of PAG and NPAG IF rock (more available alkalinity), colder field climate including eight months of frozen conditions, considerably lower proportion of fine particles, and one order of magnitude lower rate of flushing than laboratory conditions. Trench water quality does indicate, however, that ARD conditions can develop from mineralized IF rock within a time frame that is less than mine life. It is therefore possible that some of the IF rock will start acidifying during mine life. This rock type will require a management strategy that will prevent the onset of ARD or mitigate acidic solutions that may be generated. As a precautionary measure, such management strategies will be implemented in the early stages of mining.

Quartzite (QZ)

Six out of seven QZ samples tested were classified as PAG. Considering the median paste pH of 8.2 and low median total sulphur content (0.35%), it is uncertain whether the apparent potential of the QZ to generate ARD would ever be realized. The small quantity of QZ pit rock excavated during mining will, nonetheless, be considered and managed as PAG material since this lithology contains virtually no neutralization potential. The weathering characteristics of QZ were not evaluated.

Intermediate Volcanic (IV)

IV rock in this area consists mainly of quartz and aluminosilicate minerals, mostly muscovite and chlorite, and a variable carbonate mineral content, mainly as dolomite, some of which is iron-rich calcite and some siderite. Carbonate content increases from Goose Island to North Portage. Pyrite and pyrrhotite are the principal sulphide minerals, the average content ranging between 5% and 7% with the proportion of pyrite increasing toward the north. Minor sulphide phases also include arsenopyrite and trace amounts of chalcopyrite.

The ARD potential of Portage / Goose Island IV pit rock is variable, with 20% of waste rock designated as PAG and 14% having an uncertain ARD potential. A total of six kinetic tests were done on this material: four 1-kg accelerated weathering tests, one 100-kg accelerated weathering column, and one field barrel test. Of the four 1-kg tests, three samples were designated as PAG and a fourth sample was NPAG (based on static test results). Two of the three PAG samples developed acidic conditions in the early stages of testing, while the other sample did not generated ARD after 93 weeks of testing. This sample was collected within the Third Portage starter pit, from which the majority of construction materials will be obtained. Kinetic test leachates for PAG IV rock exceeded MMER (pH, Zn) for one or more samples/cycles. A large number of pH-dependent constituent concentrations increased with onset of ARD, and subsequently decreased. Metal constituents are associated with the sulphide content of the sample. Arsenic concentrations decreased after an initial peak, with short-term and long-term concentrations being similar.

The IV samples that had no potential to generate ARD based on static test results (including the 100-kg column and the field cell) generated neutral pH drainage, sustained alkalinity levels and moderate sulphate levels throughout the testing period. All NPAG IV kinetic test leachates were compliant with MMER. The occurrence of slow-reacting PAG IV rock suggests that some portion of IV rock may develop localized ARD, albeit after a long lag period— potentially longer than mine life or expected pile freeze-up time. Should portions of PAG IV rock oxidize and generate localized ARD, the composite cells indicate that the bulk of IV rock contains sufficient excess alkalinity to neutralize metal acidity, provided the neutralization capacity remains reactive in time.

Based on the above, PAG and NPAG IV materials will be segregated where feasible during mining operations, with the former managed to prevent the onset of ARD or mitigate acidic solutions that may be generated. The static test database together with results of the individual 1-kg waste IV rock cells suggest that samples having a total sulphur content of less than 0.1% in the Goose Island / Portage area, and less than 0.3% in the Vault area, are not acid-generating. Should effective segregation of PAG and NPAG IV rock not be feasible during operation, IV rock will be managed in a way that helps prevent the onset of ARD in the future.

Vault Area

Eleven percent of Vault IV waste rock is designated PAG, 14% uncertain, and 75% NPAG (Table 2.15). One of the laboratory Vault IV samples was PAG, but sustained a neutral drainage pH, moderate alkalinity, and relatively low sulphate levels throughout the 20-week testing period. Depletion calculations for this sample suggest a long lag time until ARD generation occurs. All NPAG Vault IV samples subjected to kinetic testing, including one 1-kg sample, the 100-kg laboratory composite, and the larger scale field cell composite samples, all generated neutral pH drainage, low alkalinity, sulphate, and dissolved metals including arsenic. Leaching rates of constituents of environmental interest released from field cells were one to two orders of magnitude lower than those from the 1-kg accelerated weathering tests but were of similar magnitude to the 100-kg laboratory composite sample. No MMER exceedances were noted in any of the testing cells. The pyrite- and carbonate-containing IV rock typical of Vault waste rock is considered less prone to generate ARD than pyrrhotite and aluminosilicate minerals typical of Goose Island IV rock.

Although some of the Vault PAG IV rock may generate localized acidic conditions in the future, mineral depletion calculations suggest that the bulk of Vault IV rock contains sufficient excess alkalinity to neutralize the acidity that could be generated, provided the carbonate minerals remain reactive. Furthermore, the bulk characteristics of this rock type together with the expected freezing of the Vault IV rock storage facility (RSF) will work together to minimize ARD from the Vault waste rock pile. It is therefore not expected that the Vault IV RSF will generate ARD.

Table 2.15: Summary of Vault Pit Waste Rock Chemistry

Lithology	IV
Proportion of Pit Rock Waste	100%
ARD Potential[1]	14% PAG; 11% uncertain; 75% NPAG
Laboratory Test Leachate MMER Exceedances	n.e.[2]
Field Barrel Test Leachate MMER Exceedances	n.e.

1. Based on static testing database (Golder 2005)
2. Result from the 100-kg composite sample
n.e. no exceedances

2.3.5.2 Tailings

Mineralogical analysis identified abundant carbonates in all tailing streams from Vault, consisting of dolomite with minor calcite, which imparts a greater neutralization capacity compared to tailings from Third Portage and Goose Island. Third Portage tailings were found to have minor carbonates, whereas the three Goose samples observed had no discernible carbonate grains. Sulphide content in flotation tailings ranged between 0.2% and 0.6%, while for concentrates, the sulphide content ranged between 13% and 29%. The principal sulphides in the Goose Island and Portage deposits include pyrite and pyrrhotite; the pyrrhotite content decreasing north from approximately equal proportion in the Goose Island deposit to trace amounts in the Vault deposit. Other sulphides present in minor to trace amounts include arsenopyrite and chalcopyrite. Table 2.16 provides a summary of tailings chemistry.

Table 2.16: Summary of Tailings Chemistry

Deposits		Portages	Goose Island	Vault
Proportion of Total Tailings		53%	8%	39%
ARD		PAG	PAG	PAG
Flotation Circuit Tailing Leachate	>MMER	pH, Cu, Ni, Zn	pH, Cu, Ni, Zn	n.e.
Whole Ore Circuit Tailing Leachate	>MMER	Cu	Total CN	n.e.

Note: n.e: no exceedances.
Source: Golder 2005.

All Goose Island and Third Portage tailing streams (concentrate, combined and flotation tailings) started to generate ARD within a relatively short period of time after initiation of testing. These tailings have a low buffering capacity and have a relatively large proportion of the more reactive pyrrhotite compared to Vault tailings. With the onset of ARD, pH-dependent metals increased in concentration, with a number of parameters exceeding MMER (pH, Cu, Ni, Zn) from Goose Island and Portage samples.

The composite sample of whole ore is PAG; however, the kinetic test leachate remained alkaline over the 60-week test period, with all constituent concentrations compliant to MMER. Mineral depletion calculations suggest that there is insufficient NP to maintain neutral conditions in the future and that ARD may eventually develop from these tailings after some period. Considering that the combined tailings from Goose Island and Third Portage deposits have shown higher reactivity than the composite whole ore, the tailings generated during processing will be managed in a way that helps prevent the onset of ARD in the short term.

2.3.5.3 Till

All samples of till, with the exception of Third Portage trench soil piles, have no potential to generate ARD. The ARD potential of trench soil piles is due to the higher sulphide content of soil directly above the ore deposit.

Table 2.17 summarizes MMER exceedances of till. Leachate from till materials was compliant with MMER.

Table 2.17: Summary of Till MMER Exceedances

Location	Sample ID	Exceedances MMER
Airstrip	59545	-
	59544	-
	2015	-
Third Portage Trenches	59645	pH
	59646	pH
Third Portage	0639057 SA1	pH
	0639057 SA2	-
North Portage	NPVBO4-1	-
Goose Island	GIVBO4-1	pH
	GIVBO4-2	pH
	GIVBO4-3	-

Source: Golder 2005.

SECTION 3 • WATER LICENSE ACTIVITIES

To facilitate operations at the Meadowbank Gold Project (Table 2.1), it will be required to withdraw and divert water from surrounding lakes, and from areas within the mine footprint. Withdrawal requirements include fresh water for camp use from Third Portage Lake, and water for mill use will be drawn from Third Portage Lake, the Portage Attenuation Pond, the Reclaim Pond, or from flooding pits, depending on volume requirements and the phase of mine life. Water diversion requirements include dewatering portions of Third Portage, Second Portage and Vault lakes in preparation for open pit mining and Vault attenuation storage, diversion or collection of surface water runoff using collection ditches and sumps, discharge of attenuation pond water (treated, if required) into Wally and Third Portage lakes to maintain the capacity of the attenuation ponds, and breaching of dewatering dikes after mining activities have been completed and water within the dikes meets MMER and Nunavut Drinking Water criteria.

For the purpose of this application, surface water has been grouped into two categories, contact and non-contact water. Contact water is defined as any water that may have been physically or chemically affected by mining activities. Contact water includes:

- surface runoff from the mining and milling areas
- groundwater seepage into open pits
- surface runoff and shallow drainage from rock storage areas
- surface runoff and shallow drainage from tailings disposal areas
- transport water from tailings
- water generated from consolidation of tailings (bleed water)
- flushing water from tailings distribution lines.

All contact water will be intercepted, contained, analyzed, treated if required, and discharged to the receiving environment.

Non-contact water is limited to runoff originating from areas unaffected by mining activity that does not come into contact with developed areas. Non-contact water will be intercepted and directed away from developed areas by means of natural or man-made diversion channels and allowed to flow to the neighbouring lakes untreated.

The following section provides further details on engineering aspects involved in the management of water and waste on site. Additional information on water and waste management activities can be found in the supporting documents that accompany this application.

3.1 WATER WITHDRAWAL ACTIVITIES

Figure 2.4 shows the location of the camp in relation to the rest of the Meadowbank site. Fresh water for site use will be pumped from Third Portage Lake to the plant site through heat-traced, insulated lines. The proposed freshwater intake barge has dimensions of approximately 10 m length, 5 m width, 2 m depth, 1.7 m operating draft, and 0.5 m freeboard (Appendix A). The barge hull would consist of six tanks and a centre sump for pumps. The barge will be housed in a building which includes an electrical room and pump rooms. The design basis is for up to three pumps.

The effects of installing the freshwater intake pipe and barge on fish populations and habitat will be mitigated through careful selection of timing and location of installation. Sensitive periods such as spawning and egg incubation (fall/winter) will be avoided. The piping will run along the bottom of the lake either directly on the fine sediment or on a gravel bed. Neither option will adversely affect fish habitat. The intake will be situated at least 1 m off of the bottom to minimize entrainment of sediment or benthos.

When the barge is operating, water will be drawn through the water intake pipe openings. These openings will be protected by steel wire mesh screens (approximately 60% open area) to avoid entrainment of fish.

Heat-traced, insulated piping will extend from the barge to an insulated main storage tank located at the plant site, providing both fire and fresh water storage. If needed, the water will be treated in a skid-mounted chlorination system before being stored in an insulated water tank.

3.1.1 Camp use

The camp is expected to accommodate approximately 344 people. Potable water will be drawn from the main storage tank in a skid-mounted chlorination system located in a pre-fabricated structure adjacent to the accommodation camp. The treated potable water will be stored in an insulated water tank. A water distribution pump, also skid mounted, will distribute potable water to the site. A potable water use rate of approximately 230 L/person/day is assumed during operations.

3.1.2 Mill use

Metallurgical studies were undertaken by AMEC (AMEC 2005b) followed by Hatch in 2007 (Hatch 2007) to develop the process flowsheet for the Meadowbank Gold Project. The original mill throughput was for 7,500 t/day, but has subsequently been increased to 8,500 t/day. The milling process includes standard crushing and grinding, gravity concentration, and carbon-in-pulp (CIP) cyanide leach technology, with cyanide destruction and refining to doré bars.

The mill water balance for 8,500 t/day indicates a minimum freshwater requirement of approximately 72.2 m^3/hr (Hatch 2007). Annual consumptive volume, assuming a continuous rate of 21 L/s (process and potable water use combined) is approximately 0.7 Mm^3 or 0.2% of the total volume of Third Portage Lake on an annual basis. Most of this volume will be redirected back to Third Portage Lake via the Portage Attenuation Pond up to operating year five; therefore, no significant impacts to the lake water balance are anticipated.

3.2 WATER DIVERSION ACTIVITIES

3.2.1 Dewatering Dikes

Some of the gold ore deposits in the Portage mine area are situated adjacent to and beneath Second Portage and Third Portage Lakes. The proposed mining concept includes a series of dewatering dikes to isolate open pit mining activities from these lakes.

It is proposed to construct the dewatering dikes primarily from materials available on site. The typical dike section includes two parallel rockfill embankments, a till core with downstream filter zone, and a cutoff wall through the till core and foundation soils to the underlying bedrock, and a grout curtain in the bedrock. The East and Bay Zone dikes would be constructed using materials gained from on-land mining activities in the areas of the Third Portage peninsula, and the on-land area located at north end of the Portage Pit. Later in the mine life, the Goose Island Dike will be constructed to allow mining of the Goose Island Deposit. The main characteristics of the dikes are described in Table 3.1.

Table 3.1: Dike Characteristics

	East Dike	Bay Zone Dike	Goose Island Dike
Maximum Water Depth at cutoff wall (m)	5.8	7.2	20.1
Crest Length at Centreline excluding abutments (m)	840	1,479 Includes 30 m Gosse Island Dike Stub	1,735
Crest Width (m)	77-93	86-102	82-134
Outer Slopes	1.6 horizontal: 1 vertical	1.6 horizontal: 1 vertical	1.6 horizontal: 1 vertical
Crest Elevation (masl)	136.1	136.1	136.1

The mine rock used to construct the dikes is specified to include UM+QZ rock above the water line. Below the water line, the rock fill shoulders are constructed of IF rock on the lake side, and IV rock on the pit side. The granular filters are constructed of IV rock.

The proposed construction methodology for the Dewatering Dikes does not include the removal of lake bottom sediments. These will be filled over with end-dumped rock fill material. It is recognized that the bottom sediments will introduce TSS into the water column during the advancement of the rockfill berms during Dewatering Dike construction. It is planned to use silt curtains to manage TSS during embankment rock placement. Such methods to manage TSS during embankment construction are routinely used at other mining operations in the north. The water depths are shallow, generally less than 4 m to 6 m. Much of the East Dike will be constructed through water that is 2 m or less in depth. The fine lake bottom sediments will be displaced or incorporated into the pore space of the rockfill. The displacement or incorporation of the fine lake bottom sediments into the rockfill is not expected to present any significant stability issues especially when the embankment height is low. Through the deepest section of the Goose Dike, along its southeast segment, dredging may be necessary. This can be achieved using a crane and clamshell dredging bucket if necessary.

As Dewatering Dike construction may proceed during the winter months, submerged silt curtains may be considered to control TSS under the ice and minimize potential damage to the silt curtains during ice break-up. A bubbler system may also be considered to reduce lake ice thickness along the dike alignment and extend the construction window.

The final design for the Dewatering Dikes and the Central Dike were submitted for expert analysis and detailed technical review by Dr. Norbert Morgenstern, University Professor (Emeritus) of Civil Engineering, University of Alberta. Draft comments by Dr. Morgenstern, dated March 30, 2007 are provided as a support document with this submission (Morgenstern, 2007), and are summarized as follows:

1) Central Dike Design - no major issues. A discussion of bituminous geomembrane was requested.

2) Dewatering Dike Designs - proof of concept required based on the following:

    a. Setback of dikes from pit edge - a pit slope design report is required for reference.

    b. Geotechnical behaviour of Till Core.

    c. Seepage management plan.

A copy of the support document *Pit Slope Design Criteria for the Portage and Goose Island Deposits, Meadowbank Project, Nunavut* (Golder 2007d) has since been provided to Dr. Morgenstern for reference. An expert external technical review of the pit slope design report was completed by Mr. Peter Stacey of Stacey Mining Geotechnical Ltd. A copy of Mr. Stacey's review comments are provided as a support document with this submission (Stacey Mining Geotechnical Ltd., 2007).

In order to further assess the geotechnical behaviour of the till core, a delineation and sampling program of till materials available at surface on site was completed in August 2007. Geotechnical laboratory testing will be conducted on the till samples collected from this program, with results to be forwarded to the Dr. Morgenstern for review. The results of this program testing and final review will be provided to the NWB prior to the construction of the dike till cores.

MMC agree with the need to prepare a Dewatering Dike Seepage Management Plan for the Dewatering Dikes. A detailed seepage management plan will be included as part of an Operations, Maintenance, and Surveillance (OMS) manual for the dikes to be completed prior to dewatering.

Further details on the design of the Dewatering Dikes, including results of a gap analysis completed prior to detailed design, are provided in the following support documents:

- *Detailed Design of Dewatering Dikes, Meadowbank Gold Project* (Golder 2007c);

- *Report Addendum: Detailed Design of Dewatering Dikes, Meadowbank Gold Project* (Golder 2007b); and
- *Pit Slope Design Criteria for the Portage and Goose Island Deposits, Meadowbank Project, Nunavut* (Golder 2007d).

3.2.2 Tailings Storage Facility Dikes

Tailings generated at the site will be stored in the basin formed by dewatering the northwest arm of Second Portage Lake. The TSF will be bounded by a series of dikes, including the Central Dike, Stormwater Dike, and Saddle Dams. The TSF is designed to be flexible to variances in slope, rate of deposition and tailings densities.

Further details on the design of the TSF dikes, including results of a gap analysis completed prior to detailed design, are provided in the support document *Detailed Design of Central Dike, Meadowbank Gold Project* (Golder 2007a).

As indicated above, the final design for the TSF dikes was submitted for expert analysis and detailed technical review by Dr. Norbert Morgenstern, University Professor (Emeritus) of Civil Engineering, University of Alberta. No major design issues were identified during the technical review process. Draft comments by Dr. Morgenstern, dated March 30, 2007 are provided as a support document to this application (Morgenstern, 2007).

3.2.2.1 Central Dike

The primary purpose of the Central Dike is to retain tailings. The section includes a cutoff trench tied to a grout curtain at the upstream toe. Upon closure, the flooding of the Portage Pit area will allow water to pond against the downstream toe of the Central Dike.

3.2.2.2 Stormwater Dike

The purpose of the Stormwater Dike to isolate drainage collected from the catchment to the northwest of the TSF from tailings. When tailings in the south portion of the impoundment over top the Stormwater Dike, the useful life to the dike is finished. The northwest basin then switches from a catchment for runoff collection to a TSF.

3.2.2.3 Saddle Dams

The North Saddle Dam is intended to act as a pipe berm and is not designed to inhibit seepage. The South Saddle Dam is designed as a permanent tailings retaining structure.

The Central Dike and Saddle Dams are permanent structures. The Stormwater Dike acts to divide the TSF north to south for a six year time period.

3.2.2.4 Dike Construction Materials

It is proposed to construct the dikes primarily from materials generated during mining. All three dike designs include a downstream rockfill, a filter zone, and an upstream impermeable element. The Central Dike uses a bituminous geomembrane liner on the upstream face. The Stormwater Dike and Saddle Dams use upstream bituminous geomembrane, or an upstream compacted till layer as the impermeable element. The two designs presented are ***Adaptive Management Strategies*** that depend on the availability of suitable till and cost of construction at the time of construction. The main characteristics of the dikes are presented in Table 3.2.

The Central Dike is primarily constructed of IV rock fill below the final Portage Pit Lake level waterline (134.1 masl). UM+QZ rock is placed above the final lake level waterline. UM+QZ rock is also placed as an upper 3 m rockfill cover over IV rockfill in the Central Dike. The Stormwater Dike will ultimately be covered in tailings, and may be constructed of any rock type. Similarly, the North Saddle Dam is exposed to tailings, and may be constructed of IV rockfill. The South Saddle Dam is a permanent structure constructed of UM+QZ rockfill. The granular filters are constructed of IV rockfill.

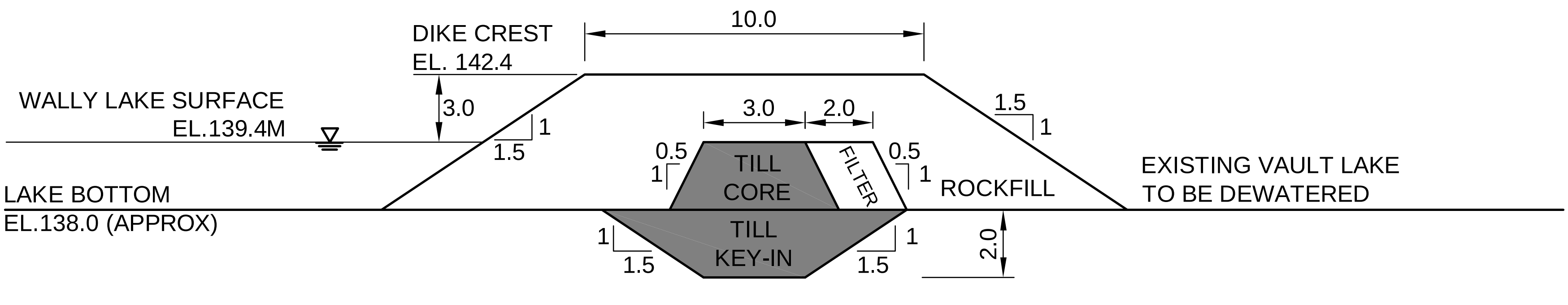
Table 3.2: Summary of Dike Characteristics

Description	Central Dike			Stormwater Dike	North Saddle Dam	South Saddle Dam
	Stage 1	Stage 2	Stage 3			
Crest Elevation (masl)	120	140	147	142	148	
Top of liner elevation (masl)	120	140	147	142	147	
Downstream Slope x Horizontal : 1 Vertical	1.5	1.5	1.5	1.3 (angle of repose rockfill)	1.3 (angle of repose rockfill)	
Upstream Slope x Horizontal : 1 Vertical	1.5	1.5	1.5	3	3	
Crest Width (m)	40	25	6	Minimum 6	Minimum 6	
Crest Length (m)	540	1,080	1,170	870	1,580	2,810

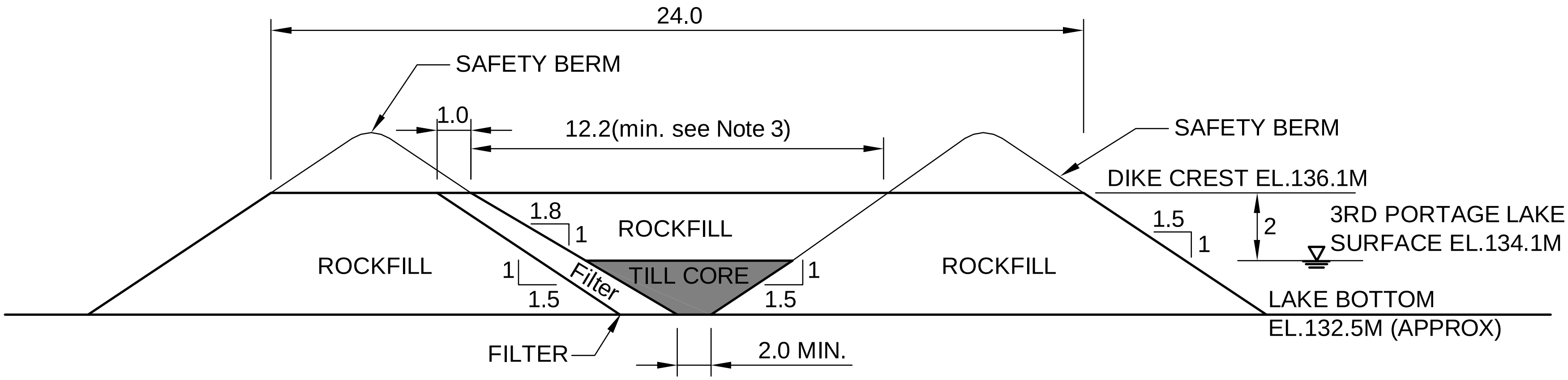
3.2.3 South Camp Dike

The South Camp Dike encloses the Goose Island area along with the Bay Zone Dike, Goose Island Dike, and nearby land, such that it can be isolated from Third Portage Lake.

The South Camp Dike will primarily be constructed of materials generated during mining. The dike crest is designed to be approximately 24 m wide and 2 m above the Third Portage Lake surface elevation (134.1masl) with additional safety berms along the crest surface. The dike is proposed to be constructed with two parallel rockfill embankments, a till core, and filter. A typical cross section of the South Camp Dike is provided in Figure 3.1.



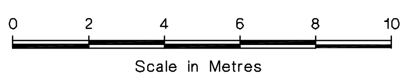
TYPICAL SECTION - VAULT DIKE



TYPICAL SECTION - SOUTH CAMP DIKE

NOTES

1) ALL DIMENSIONS IN METRES.
2) ALL ELEVATIONS IN METRES ABOVE MEAN SEA LEVEL.
3) SOUTH CAMP CREST WIDTH DESIGNED TO ACCOMMODATE 777D CATERPILLAR HAUL TRUCK, SINGLE-LANE TRAFFIC.



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VAULT DIKE AND SOUTH CAMP DIKE

FIGURE 3.1

3.2.4 Vault Dike

The Vault Dike is intended to isolate Vault Lake from Wally Lake in preparation for open pit mining and Vault attenuation storage. The Vault Dike will primarily be constructed of materials generated during mining. The dike crest is designed to be approximately 10 m wide and 3 m above the Wally Lake surface elevation (139.4 masl). The dike is proposed to be constructed with a till key (approximately 2 m depth below the lake bottom), a till core, and filter. A typical cross section of the Vault Dike is provided in Figure 3.1.

3.2.5 Lake Dewatering - Vault, Second and Third Portage Lakes

Once the dikes are constructed, the water contained within them will be pumped to adjacent lake areas prior to pit development. A fish salvage operation will be conducted before dewatering operations begin.

Table 2.11 summarizes estimates of the total volume of water inside the proposed dewatering dikes for Second Portage Lake Arm, Third Portage Lake, and Vault Lake, based on bathymetry carried out at the site in 2002, 2003 and 2006.

Second Portage Lake behind the East Dike will be drawn down by 28 m to allow construction of Portage Pit, and approximately 13.8 Mm^3 of water will be pumped from Second Portage Lake to Third Portage Lake. This is roughly equal to the total annual average discharge from Third Portage Lake (11.6 Mm^3) and is equivalent to an increase in volume of 3.0% and lake level of about 40 cm.

Dewatering of the Bay Zone and Vault Lake involve relatively small water volumes. The estimated maximum increase in Third Portage lake elevation from dewatering the Goose Island zone during operations is approximately 5 to 6 cm, which is well within typical annual changes in lake elevation (20 to 50 cm).

3.2.6 Third Portage Lake Outlet

Construction of the East Dike and Bay Zone dikes will isolate and eliminate the westernmost and primary connecting channel (i.e., 50% of current flows) between Third Portage and Second Portage lakes. Without mitigation, the natural flow outlet from Third Portage Lake would be constrained, potential causing higher water levels in Third Portage Lake and increased discharge through the remaining two channels. Dewatering of the west arm of Second Portage Lake to Third Portage Lake would exacerbate this problem.

MMC is committed to maintaining natural water levels in Third Portage Lake during mine lake dewatering and throughout mine operations. To mitigate the loss of the westernmost connecting channel between Third Portage and Second Portage lakes, it is proposed to that the easternmost channel be modified to handle increased flows and maintain natural lake water levels in Third Portage Lake. A detailed engineering study is currently under way to:

- Evaluate alternatives to deepen the easternmost channel;
- Prepare, if necessary, a detailed design for easternmost channel modifications;

- Develop a monitoring program for channel erosion, verification of the maintenance of water levels in Third Portage Lake; and
- Recommend contingencies in the event of channel failure.

The discharge from Second Portage Lake into Tehek Lake during dewatering of Second Portage Arm is projected to increase between 18% and 27% relative to current conditions. Therefore, adverse impacts to stream channel integrity at this location are expected to be negligible.

MMC will provide details of a final design and monitoring program for the easternmost channel to NWB and DFO once complete. Further details on the potential impacts of, and mitigative measures for, eliminating the westernmost lake outlet between Third Portage and Second Portage lakes are provided in the following support documents:

- *Meadowbank Gold Project Aquatic Effects Management Program* (Cumberland 2005); and
- *Meadowbank Gold Project No-Net-Loss Plan (NNLP)* (Cumberland 2006).

3.2.7 Ditches and Sumps

During the mine construction and operation life, a network of contact and non-contact water ditches and sumps will be constructed and maintained to facilitate mine site water management.

Contact water is defined as any water that may have been physically or chemically affected by mining activities. All contact water will be intercepted, contained, analyzed, treated if required, prior to discharge to the receiving environment.

Non-contact water is limited to runoff originating from areas unaffected by mining activity that does not come into contact with developed areas. Non-contact water will be intercepted and directed away from developed areas by means of natural or man-made interceptor channels and allowed to flow to the neighbouring lakes untreated.

The design of water management facilities must recognize the potential challenges presented by ice-rich ground, including icing, localized thawing, local ground instabilities, subsidence, and transport of fine-grained soils. The detailed design and maintenance procedures for the diversion infrastructure will take into consideration these challenges.

The sumps will generally be operated with a low water level to provide temporary storage capacity for runoff generated by an extreme runoff event, possible breakdowns, or power failures at the pump stations. The surface sumps are sized to store the runoff volume from a 24-hour, 1:100-year return storm event, while the open pit sumps are sized to store the runoff volume from the 24-hour, 1:10-year return storm event.

The pumping equipment and infrastructure for the sumps will be selected and designed to accommodate the sub-zero temperatures that will prevail during the early and late portion of the open-water season. This may entail heat tracing of the pump intakes and providing self-priming pumps and increased monitoring during these periods. Pumping of the sumps will likely be possible to temperatures of up to -10°C during late winter or early spring. Other options would be to pump the sumps dry prior to freeze-up, or to break and remove ice manually or mechanically. Further standard techniques of control and prevention will be investigated during detailed engineering design of the sumps.

Ditches are sized to accommodate the peak runoff discharge rate from a 1:100-year, 24-hour storm. For practical purposes, the ditches will be designed with a minimum uniform base width of 1 m, 2H:1V side slopes and minimum depths adjusted to suit discharge requirements.

Although no specific overburden information has been collected along the proposed ditch alignments, properly designed excavated channels are considered feasible. Attempts will be made to avoid crossing ice-rich areas where thaw instability is a concern. A variety of mitigation measures are available where ice-rich areas cannot be avoided. For contact water ditches, mitigation may include providing training berms instead of, or in combination with, ditches, and lining and insulating channels with compact till or excess bentonite from the construction of the soil/bentonite cut off wall in the dewatering dikes to prevent sedimentation and permafrost degradation. Where thaw-related impacts affect non-contact ditches, impacts may be somewhat higher because placement of a stabilizing liner may not be consistent with the “non-contact” designation. In these cases, special care will be taken to ensure aprons comprise non-acid-generating and non-metal-leaching granular materials.

The general location of the required infrastructure for water management has been located based on the layout of the mine waste, roads, and pits. Prior to ditch construction, a review of the existing topographic and geotechnical conditions will be carried out to locate, to the extent possible, the channel alignments in favourable ground with a ditch invert at or above the existing grade. If this can not be achieved, the alignment will be located in-ground with shallow excavation into the overburden soil or rock, which may require the excavation and replacement of ice-rich soils with compacted till materials. The channels have been designed as oversized structures, which will allow for the addition of insulated channel lining materials where required.

All water management channels required at closure will have been constructed and maintained throughout the operation life of the mine. Additional information on ditching and sumps can be found in the support document *Meadowbank Gold Project*, *Mine Waste and Water Management, Meadowbank Gold Project, Nunavut* (MMC 2007a)

3.2.8 Vault Haul Road Culvert

The Vault Haul Road will connect the Vault Deposit to the Portage mining area (Figure 2.4). The road will be constructed overland with one stream crossing located at the outlet of Turn Lake to Drill Trail Lake. The crossing will require two 2.5 m diameter round culverts, each 75 m long (to allow side slope ratio of 3H:1V for protection of habitat). The size of the culverts are sufficient to pass 1:100 year flood events, increased discharge due to dewatering of Phaser Lake into Turn Lake, and will not impair water movement out of Turn Lake, nor upstream fish movement (Cumberland 2006).

The culverts will situated at low-points in the channel profile. The low points will be graded to remove cobbles and create a minor depression for application of a sand-crushed rock bedding layer. The inlets and outlets to the culverts will be appropriately armoured to resist erosion. Additional design details for the culvert installation are provided in Section 4.2.3 (“Turn Lake Road Crossing”) of the support document *Meadowbank Gold Project*, *No-Net-Loss Plan (NNLP)* (Cumberland 2006).

The following general sediment and erosion control practices will be applied during the construction of the culvert crossing:

- construction activities within channel areas will be kept to an absolute minimum;
- the approach to the culverts will be armoured such that disturbed soils or permafrost are not subject to the erosive forces of water approaching the culverts, especially during freshet;
- any required stockpiles of materials will be located away from the watercourse and stabilized against erosion as soon as possible by temporarily covering with a geotextile or by placement of a perimeter sediment control structure;
- disturbed areas will be minimized as much as possible;
- silt fences will be installed to control the release of eroded sediment from the construction area during non-frozen conditions;
- any disturbed soils and slopes within or near the channel will be stabilized when possible with a permanent covering of clean shot rock underlain by geotextile to prevent loss of fines;
- turbidity curtains (or suitable alternative) will be installed downstream of the culverts during the construction period to ensure that disturbed soils do not release sediment downstream;
- additional erosion and sediment control structures to contain eroded sediments on site will be installed as required;
- upon completion of construction, all accumulated sediment, debris and work related material will be removed for proper disposal at approved locations; and,
- regular construction site inspections will be conducted to determine compliance with the above protocols.

Once constructed, the culvert crossing will be visually inspected on a regular and event basis (Table 3.3) to confirm:

- structural integrity;
- soil and permafrost stability; and
- minimal impact to fish habitat

Table 3.3: Vault Haul Road Culvert Inspection Schedule

Regular Inspection Schedule		Event Inspection Schedule
Mid-May through June	July through October	Following large storm events
Twice weekly	Weekly	As required

Inspections will be completed to confirm no downstream transport of sediments occurs due to erosion of the channel bed or scour around the culverts during spring freshet and the ice-free period, throughout the open water season, and following large storm events, as required. The inspection will assess the erosion and scour potential or whether erosion or scour has already occurred.

The inspections will also consist of:

- visual inspection of the infrastructure to identify defects, cracks or any other risks to structural integrity.
- visual inspection to identify sediment or other debris accumulation impeding the free flow of water through the crossings. Maintenance operations will consist of hand removal of accumulated debris and repairing damages as soon as possible.
- visual inspection of upstream and downstream channel to identify bed erosion or scour around the watercourse crossing structure. Particular attention will also be paid to potential sources of sediment transport at the crossing.

Inspection results will be recorded regularly and reported annually. Remediation of any detected problems would be undertaken as soon as possible.

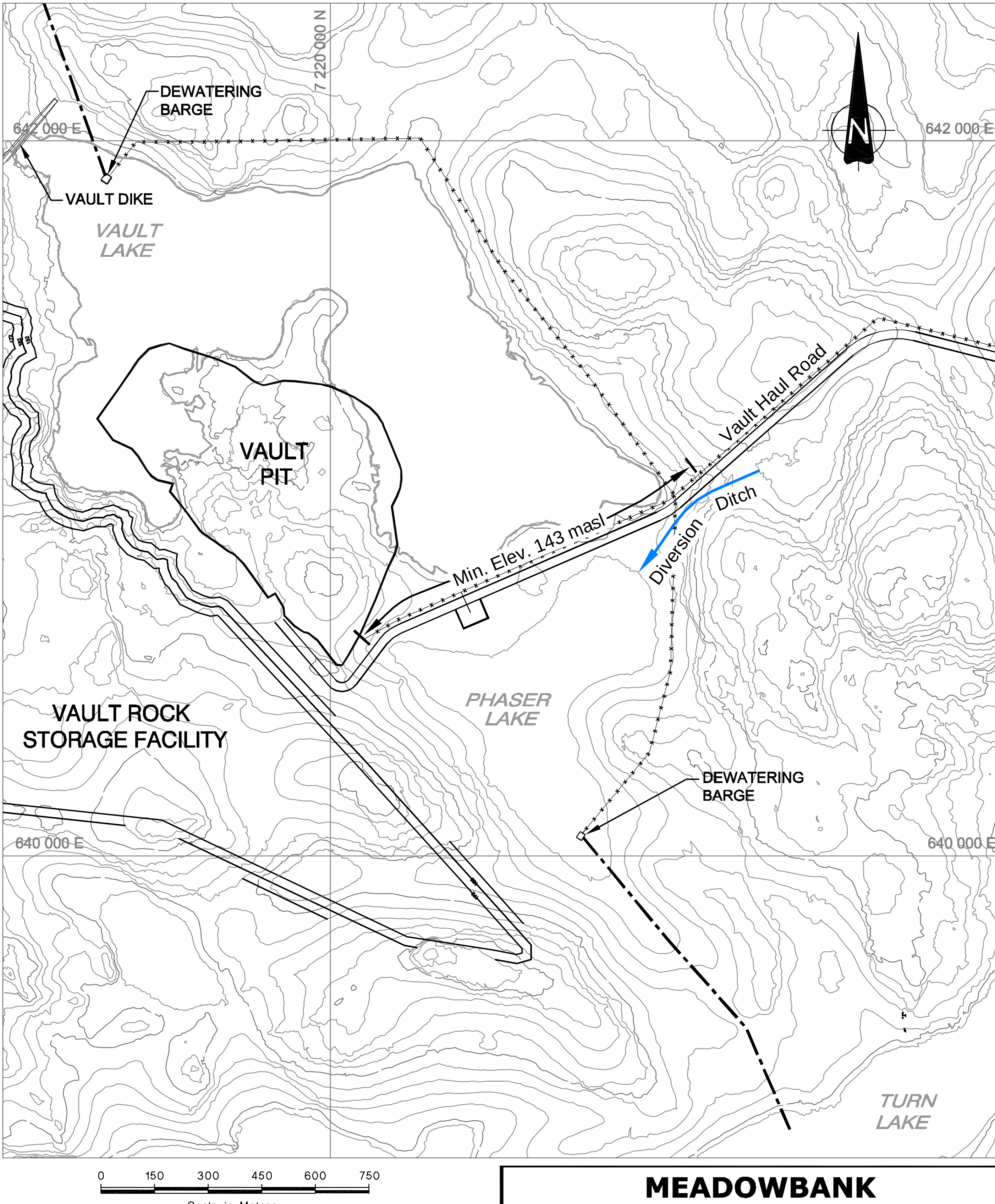
Depending upon site conditions encountered in the field at the time of construction, MMC may opt to install a bridge crossing instead of culverts as described in the *Meadowbank Gold Project Aquatic Effects Management Program* (Cumberland 2005). The same general sediment and erosion control practices and inspections as described above would be also be for the construction of a bridge crossing.

3.2.9 Phaser Lake

The proposed water management plan for the Vault mining area involves the diversion of approximately 152 ha of the Vault Lake tributary area to Turn Lake. This diversion necessitates the construction, during initial site development, of an interceptor ditch to divert non-contact water from the small unnamed lake to the south of Vault Lake toward Phaser Lake. Collection ditches and a sump will also be required along the southeast edge of the RSF to direct any contact water away from Phaser Lake and toward Vault Lake. Design of this infrastructure will follow the details provided in Section 3.2.7 above.

In order to restrict the flow of water from Phaser Lake to Vault Lake during significant precipitation events and/or spring melt periods, the Vault access road will be constructed to elevation 143 masl so as to provide sufficient capacity within the Phaser Lake basin to contain the 1:100-yr, wet year spring melt with 1 m of freeboard (Figure 3.2). The embankment will be designed to have low permeability, either through the use of native materials, man-made materials such as a geomembrane, or a combination of these. It is anticipated that the embankment will freeze, which will enhance its low permeability design.

Water collected in the Phaser Basin during the spring melt will be pumped or diverted to Turn Lake over the summer period in order to minimize impacts to overwintering fish habitat and provide sufficient storage for the following spring freshet and/or extreme runoff events.



CADD FILE: N:\Bur-Graphics\Projects\2006\1413\06-1413-089\Drafting\FINAL\Doc. 485\061413089-1400-FIG_3.2.dwg

REVISION DATE: 07/08/17 02:22PM By: ASalvador

NOTES

1) GRID REFERENCE: NAD 83, UTM ZONE 14.
2) CONTOUR INFORMATION ON LAND SUPPLIED BY MEADOWBANK MINING CORPORATION.

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VAULT HAUL ROAD AT PHASER LAKE	**FIGURE 3.2**

3.2.10 Third Portage Lake Diffuser

During Years 1 to 5 of mine life, the Portage Attenuation Pond will receive the site contact water, including runoff and seepage from the waste rock disposal facility, treated runoff from the Portage and Goose Island pits, and runoff originating from the mill and airstrip areas. Any process (tailings-related) water will be contained in the Reclaim Pond located within the TSF.

Contact water directed to the Portage Attenuation Pond will be used to satisfy water make-up requirements to the mill process, with any excess water treated, if required, and discharged to the environment via an effluent pipe and diffuser located within Third Portage Lake (Golder 2007h). The diffuser will be situated within a low value fish habitat area of the Third Portage Lake north basin. Effluent discharges will occur only during the open water period.

The effluent diffusers at the Meadowbank Gold Project will be designed with the objective to protect aquatic life and human health. To achieve this objective, the Third Portage Lake Diffuser will be designed to meet MMER water quality criteria at the point of discharge from the diffuser, and to achieve Nunavut Drinking Water guidelines and approach as close as possible to the CCME aquatic life guidelines or background concentrations at the boundary of a 30-m radius mixing zone from the center of the diffuser. These criteria are regularly applied to diffusers in several jurisdictions in Canada.

Preliminary near-field mixing and dilution analyses assuming a typical diffuser configuration indicate that the mine effluent would meet MMER at the point of discharge of the diffuser in Third Portage Lake, while Nunavut Drinking Water and CCME aquatic life guidelines would be achieved at the boundary of the mixing zone. Further details on the near-field mixing and dilution characteristics, and preliminary configuration and location of the Third Portage Lake Diffuser are provided in the supporting document *Assessment of Effluent Dilution Potential for the Third Portage Lake Diffuser* (Golder 2007h). Bathymetric information for Third Portage Lake is provided in Figure 2.9 above.

The effects of installing the diffuser and effluent discharge pipes on fish populations and habitat will be mitigated through careful selection of timing and location of installation. Sensitive periods such as spawning and egg incubation (fall/winter) will be avoided. The effluent pipe will run along the bottom of the lake either directly on the fine sediment or on a gravel bed. Neither option will adversely affect fish habitat.

MMC is committed to preparing a detailed design for the Third Portage Lake Diffuser prior to the start of mine operations. MMC will provide a copy of the detailed design to NWB once complete.

3.2.11 Wally Lake Diffuser

During mining operations in the Vault area (Years 4 to 8), runoff from the Vault RSF and Pit will be re-directed to the Vault Attenuation Pond for temporary storage, monitoring, and treatment, if necessary, prior to release to Wally Lake during open water conditions from June to September. A conceptual design and location for the outfall diffuser in Wally Lake has been prepared based on near-field mixing and dilution analyses of the potential mine effluent plume in Wally Lake (Golder 2007g).

The Wally Lake outfall diffuser, which will be located within low value fish habitat east of the Vault Dike approximately 80 m from shore (Figure 3.3), will have the following properties:

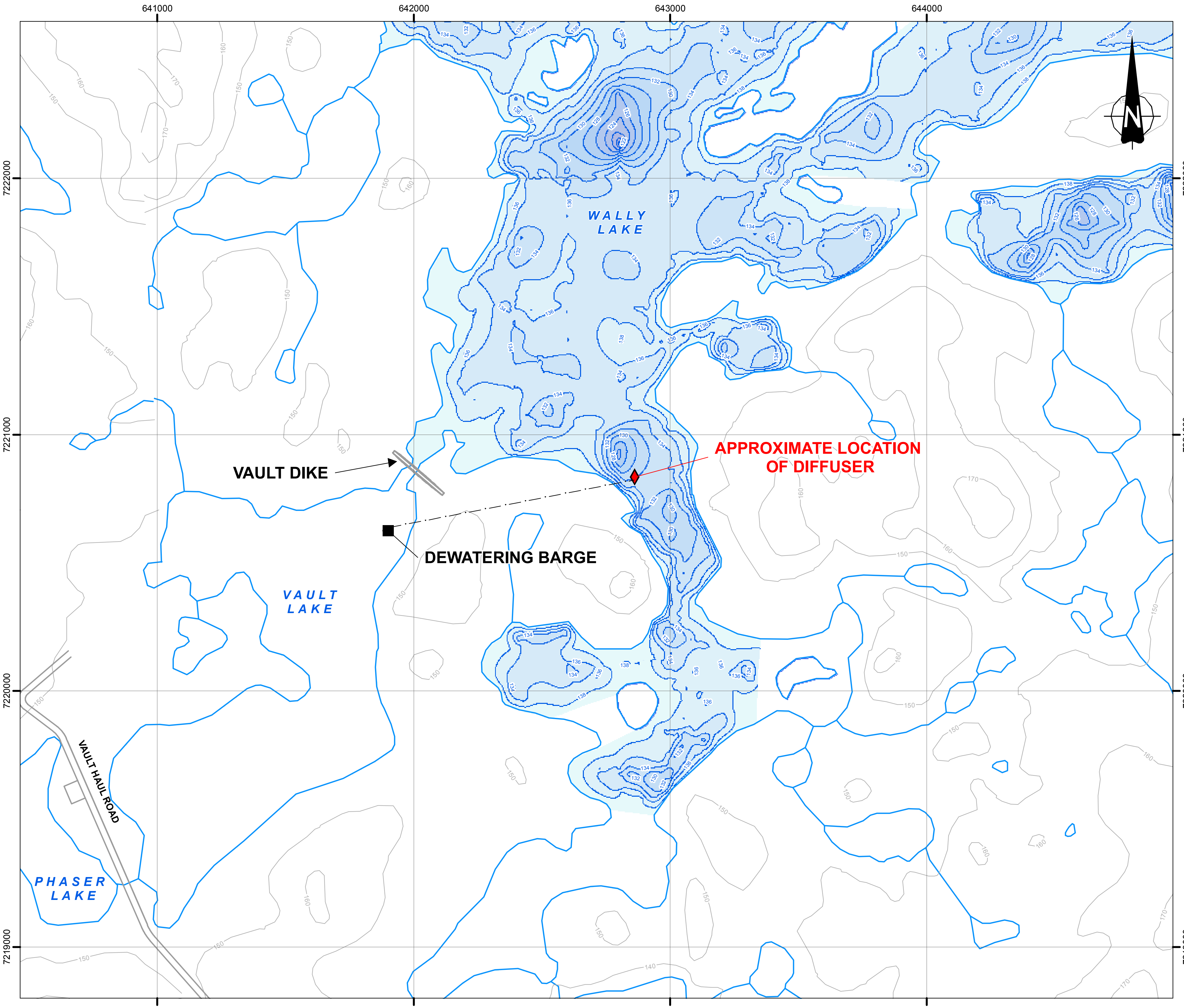
- Five 75 mm ports equally spaced along a 40 m long diffuser line;
- Diffuser ports rising vertically 1.0 m above the lake bottom to maximize mixing in water column and to minimize the risk of bottom sediment entrainment;
- valves or other flow control devices installed between each set of consecutive ports;
- located in a 7.4 m average depth of water during the open water period;
- 40 m long diffuser connected to an 80 m outfall pipe that conveys the effluent discharge to the diffuser line.

It should be noted that modelling a defined effluent plume within Wally Lake is not possible. A defined effluent plume occurs in ambient conditions with a steady water flow direction (e.g., a river). These conditions do not exist within Wally Lake. Instead, wave motions from winds will control current velocities and direction during the open water periods due to the size of the lake. Natural variations in wind direction will result in continuously changing lake currents, and thereby limit the ability to define the resulting effluent plume. Nevertheless, the results of the near-field mixing and dilution analyses indicate that the mine effluent pumped from the Vault Attenuation Pond will meet MMER and Nunavut Drinking Water guidelines at the point of discharge from the diffuser (i.e., without dilution). Assuming conservative steady-state conditions within the lake and at the diffuser discharge point, the modelling further indicates that mixing within the lake would reduce effluent concentrations to CCME guidelines for the protection of aquatic life or to the existing background concentration at the boundary of a 30m radius mixing zone (Golder 2007g).

The effects of installing the diffuser and effluent discharge pipes on fish populations and habitat will be mitigated through careful selection of timing and location of installation. Sensitive periods such as spawning and egg incubation (fall/winter) will be avoided. The effluent pipe will run along the bottom of the lake either directly on the fine sediment or on a gravel bed. Neither option will adversely affect fish habitat.

Detailed design of the Wally Lake diffuser will be completed in Year 2 or 3 of the mine operational life prior to commencing mining operation in the Vault area in Year 4. Delaying the detailed design until Year 2 or 3 of the mine plan will allow for the collection of additional background data within the Vault area to aid in the design process. MMC will provide a copy of the detailed design to NWB once complete.

Further details on the Wally Lake Diffuser conceptual design and near-field mixing and dilution analyses are provided in the supporting document *Conceptual Design of the Effluent Outfall Diffuser for Wally Lake* (Golder, 2007g). Bathymetric information for Wally Lake is provided in Figure 2.13 above.



LEGEND

- WATERBODY/WATERCOURSE
- TOPOGRAPHIC CONTOUR (10 M INTERVAL)
- BATHYMETRIC CONTOUR (2 M INTERVAL)

NOTES

1) ALL CONTOURS ARE EXPRESSED AS ELEVATIONS.
2) CALCULATED LAKE ELEVATION AT TIME OF SURVEY = 139.40 M.
3) BATHYMETRY GRIDDING PERFORMED USING NATURAL NEIGHBOURS INTERPOLATION IN ARCGIS 9.1 WITH THE SPATIAL ANALYST EXTENSION.

REFERENCES

1) TOPOGRAPHIC DATA: CUMBERLAND RESOURCES LTD.
2) HORIZONTAL DATUM: NAD83 PROJECTION: UTM ZONE 14N

0 150 300 450 600 750
Scale in Metres

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TITLE
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WALLY LAKE DIFFUSER LOCATION PLAN

FIGURE 3.3

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3.2.12 Dike Breach

Following completion of mining, the pits will be filled with water from Third Portage Lake (Goose and Portage pits) or Wally Lake (Vault pit) over a period of several years. The Portage and Goose Island pits will be rewatered (in the order of 45 Mm^3) over a roughly eight year period and eventually become part of Third Portage Lake. The Vault pit (21.5 Mm^3) will be rewatered over roughly 5 Years and will eventually become part of Vault Lake.

Since instantaneous breaching of the dikes would cause a significant drawdown of Third Portage and Wally Lakes, rewatering will be achieved by a combination of seepage, precipitation, and partial re-direction of annual freshet flows from Third Portage and Wally lakes in a controlled action by siphon over several years. Following completion of rewatering, the Goose Island, Bay Zone and Vault dikes will be breached and pit waters will be allowed to mix with adjacent water bodies provided that pit water quality is sufficiently high and water level between the pit and the adjacent lake is identical to maintain a water balance. The East Dike will remain as a permanent structure with a 1 metre head difference – with the west side connected to Third Portage Lake at 134.1 masl, and the east side connected to Second Portage lake at 133.1 masl. Studies to examine water quality and effects on fish will be undertaken to demonstrate that no adverse effects will occur before the dikes are breached.

Dike breaching will involve the removal of portion of the dike to a minimum depth of 3 m below average lake water level within Portage and Wally lakes. Consideration will be given to breach staging, with above water portions of the dike in the breach area removed during winter period when there will be little surface water flow, thereby minimizing the potential release of sediments to the neighbouring lake. The remainder of the breach would be completed during the open water following freshet so as to allow for the deployment of turbidity curtains to control potential releases of sediment. Exposed till surfaces within the breach opening above normal lake water levels will be covered with UM rock, while either UM, IF or IV materials would be used below surface depending upon availability.

It is predicted that the a temporary chemocline will develop during filling of the Goose Island and Portage pit lakes, at approximately 30 meters from the bottom of the pit (approximately 100 meters below pit lake surface). Considering that dike breaches will extend approximately 3 meters below lake water level, the vertical distance between the chemocline and the pit lake surface is considered to be large enough to prevent exchanges between the deeper water and the surface water upon dike breaching. The possibility of these two waters mixing is further reduced by the predicted decline in chemocline level with time. The denser water is predicted to remain at the bottom but slowly erode through groundwater seepage out of the pits and through gradual mixing with the overlying water column.

The presence and actual thickness of a chemocline for each pit lake will be monitored during flooding. Requirements for contingency actions, such as forced mixing of the deeper chemocline with the surface layer, will be evaluated at that time. Should a treatment plan be required, it will be drafted for NWB approval prior to breaching the dikes.

Additional information on pit reflooding can be found in the support document Meadowbank Gold Project *Mine Waste and Water Management, Meadowbank Gold Project, Nunavut* (MMC 2007a)

3.3 WASTE

Details on the planned waste storage and treatment facilities on site, such as the RSFs, TSF, incinerator, landfills (in which non-salvageable, non-hazardous solid wastes will be disposed), landfarm (in which petroleum-contaminated soils will be disposed), sewage and water treatment plants (if necessary) are discussed in the following sections. Water from these facilities will require appropriate collection, diversion, storage, reuse, and/or treatment, if necessary, prior to eventual discharge to the environment.

3.3.1 Portage and Vault Waste Rock Storage Facilities

The proposed mine plan will generate approximately 182 Mt of mine waste rock primarily composed of iron formation, intermediate volcanic, ultramafic rocks, and till. The till and ultramafic rocks are not expected to be acid generating. All other waste rock types and the tailings are potentially acid generating. Mine rock that is not used for construction or reclamation purposes will be trucked to mine waste rock storage areas. The quantities of waste rock to be placed in the waste rock storage facilities are summarized in Table 3.4.

Table 3.4: Quantities of Waste Rock Types to be Placed in Rock Storage Facilities

Rock Storage Facility	Rock Type	Quantity
Portage	Ultramafic and Mafic Volcanic	23.9 Mt
	Intermediate Volcanics	14.9 Mt
	Iron Formation	14.8 Mt
	Quartzite	1.9 Mt
Vault	Intermediate Volcanics	68.2 Mt
	Till (Option 1)[1]	7.3 Mt
	Till (Option 2)	6.9 Mt

Source: AMEC 2005b.

1: Should insufficient quantities of till be available for the construction of filters for the South Saddle Dam and Stormwater Dike, Option 1 will be implemented. This option involves the use of till, IV rock, and bituminous liner for these filters, while Option 2 only uses till and IV.

Due to the distance between the Portage mining area and the Vault mining area, two waste rock storage facilities are required. One facility would be near the Vault open pit; the second would be near the Portage (North Portage and Third Portage) and Goose Island pits. Unused (i.e. surplus) quantities of waste rock and till from Portage and Goose Island will be placed in the Portage RSF, except for the Portage waste rock produced during Year 3 through 5 of operation, which will be backfilled into the Portage Pit. Surplus material from Vault will be placed in the Vault RSF. Table 3.5 summarizes the estimated physical dimensions and aspects of the Portage and Vault RSFs. Figure 2.4 shows the locations of both the Portage and Vault RSFs.

Further details on the RSFs are provided in the supporting document *Meadowbank Gold Project Mine Waste and Water Management* (MMC, 2007a)

Table 3.5: Details of Proposed Rock Storage Facilities

Descriptors	Portage Rock Storage Facility	Vault Rock Storage Facility
Approximate storage volume	32 Mm^3	36 Mm^3
Approximate crest elevation	210 m	176 m
Approximate height	67 m	30 m
Maximum elevation of adjacent topography	192 m	190 m
Approximate footprint area	73 ha	191 ha
Approximate surface area	80 ha	195 ha

3.3.2 Tailings Storage Facility

Mill tailings will be discharged directly to the TSF in the form of a slurry at a solids concentration of 45% to 55% solids (by weight), which corresponds to the product stream of the gold recovery plant. This process will allow settling of solids and decanting of process solutions (reclaim water) for reuse. The recycling of water from the TSF will allow water quality to be managed within the process and minimize the impact of the process on the surrounding surface and groundwater.

The Central Dike will be constructed across Second Portage Lake to create the TSF in the northwest arm. Tailings will be transported by pipeline from the Process Plant to the tailings storage facility and spigotted from the central dike to progressively fill the impoundment in a westerly direction. The tailings will be initially deposited in a subaqueous environment, but thereafter the majority will be deposited subaerially. The final surface of the tailings will be approximately 8 m on average above the current lake level (133.1 masl), based on a total of 22 Mt of tailings being deposited in the facility. A series of perimeter dikes will be constructed to manage the tailings. The TSF, including the impoundment, the Reclaim Pond, and the Portage Attenuation Pond, is designed to fill the Second Portage Arm.

The water that is reclaimed for process from the Reclaim Pond will be pumped through heat-traced insulated lines from the tailings storage facility located northwest of the plant site. The pumps are sized to supply process water in the event fresh water is not available. The pumps will discharge to an insulated main storage tank located at the plant site. The reclaim water distribution pumps will be located inside the process building, adjacent to the process water tank.

At closure, water from the Reclaim Pond will be treated, if necessary, and discharged to the Goose Island or Portage pit lakes.

Further details on the TSF are provided in the following supporting documents:

- *Integrated Report on Evaluation of Tailings Management Alternatives* (Cumberland 2007)
- *Meadowbank Gold Project Mine Waste and Water Management* (MMC 2007a)
- *Final Report, Detailed Design of Central Dike, Meadowbank Gold Project* (Golder 2007a).

3.3.3 Incineration

Solid waste from the accommodation camp, kitchen, shops, and offices will be burned in a diesel-fired waste incinerator located in a prefabricated structure downwind of these facilities. Waste will be transported by pickup truck and loaded into the incinerator. The materials to be incinerated will be limited to sewage treatment sludge, putrescible waste such as paper, wood and food waste, and used petroleum products such as grease, heavy lubricants and engine oil. Ash from the incineration process will be disposed of within the landfill on site (Golder, 2007i).

The quantity of waste to be incinerated is estimated to be 762 kilograms per day during construction, and 874 kg per day during operations. This includes an allowance of 1.8 kg of sewage sludge per day per person, and a camp size of 300 during construction and 344 during operations. The quantity and type of materials incinerated on site during operations, together with results from annual stack emission monitoring, will be reported in an annual monitoring report to the NWB, Government of Nunavut (GN), Environment Canada (EC), and NIRB.

The selection of an incinerator for site will be completed prior to the start of mine operations. MMC is committed to selecting an incinerator that complies with CCME and Canada-Wide Standards for mercury, dioxin and furan emissions. MMC will document the incinerator selection process, including a reassessment of the use of incinerators in regards to concept of the best available economically feasible technology (BAEFT). Once the incineration selection process has been finalized, MMC will submit the selection results, detailed incinerator specifications and an Incinerator Waste Management Plan to NWB, GN, EC and NIRB.

3.3.4 Landfills

Landfills will be required at Meadowbank, for the disposal of non-salvageable, non-hazardous solid wastes from mining activities that cannot be incinerated. They will be built on or near the proposed Portage RSF. The total capacity of the landfills has conservatively been assumed to be equivalent to that typically required for a community of 500 persons and an 11 year landfill life (an average of 500 m^3 of waste), allowing for two years of pre-mine development, eight years of mine operation and one year for closure activities.

The strategy for the disposal of solid waste will first be to identify and segregate acceptable disposal items from non-acceptable items. Acceptable items that could be disposed at an on-site facility are those that are non-hazardous, non-putrescible, with a low leachate and heat generation potential. Solid waste from the accommodation camp, kitchen, shops, and offices will be burned in a diesel-fired waste incinerator on site. All other materials would either be incinerated or hauled offsite. This strategy for limiting the materials that could be placed in the landfills greatly reduces the concentration of constituents in the leachate. The quantity and type of materials landfilled on site during operations will be reported in an annual monitoring report to the Nunavut Water Board (NWB), Government of Nunavut (GN), Environment Canada, and the Nunavut Impact Review Board (NIRB).

The second part of the strategy is to concentrate disposal of solid waste at two landfills, Landfill #1 and Landfill #2. Landfill #1 will be located at the proposed west-northwest toe of the Portage RSF and will serve the mine for the first nine years (Figure 2.4). Landfill #2 will be located near the top of the Portage RSF and will serve the mine for the last two years of the mine operation/closure.

Demolition waste from the plant site removal / reclamation will be disposed of in Landfill #2. Landfills at the selected locations would allow any leachate that may be generated to be collected with seepage and runoff water from the Portage RSF, which reports to either the Portage Attenuation Pond (Years 1 to 5) or the Reclaim Pond (Year 6 to Closure). The leachate from the landfills is anticipated to be very weak due to the controls on materials placed in the landfill and thus site specific landfill leachate management is not considered to be required.

Further details on the landfills, including a landfill management plan, a list of permitted landfill materials, and mitigative measures wildlife and other Valued Ecosystem Components (VECs), are provided in the supporting document *Landfill Design and Management Plan, Meadowbank Gold Project* (Golder 2007i).

3.3.5 Landfarm

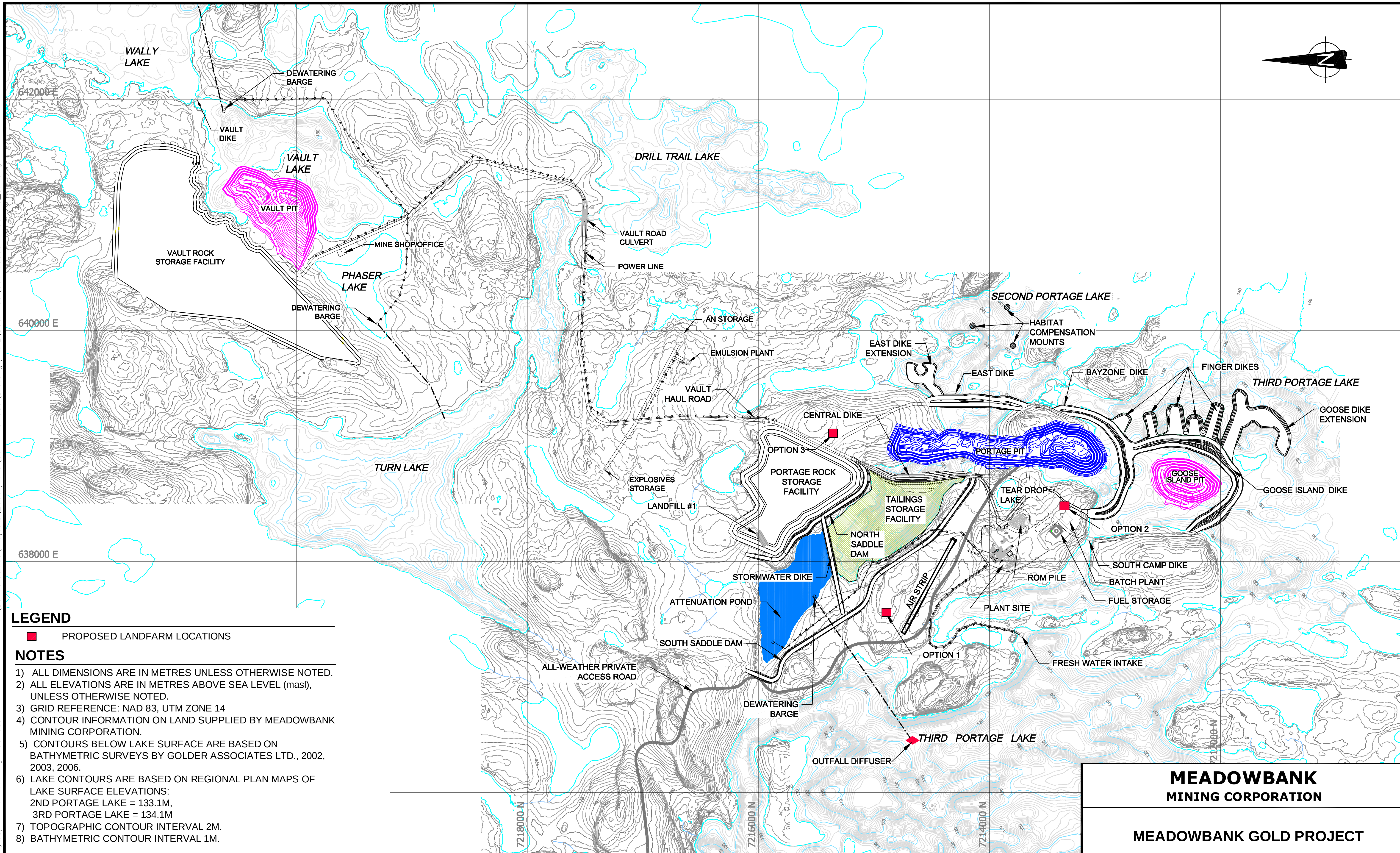
A landfarm will be operated to treat petroleum contaminated soils on site. This technology typically involves spreading excavated contaminated soils in a thin layer, or in windrows, on the ground surface and stimulating aerobic microbial activity within the soils through aeration and/or the addition of minerals, nutrients, and moisture.

An options analysis has been completed to evaluate which of three proposed locations would be most suitable for a landfarm operation (Figure 3.4). Only two categories of factors were considered important for this analysis: Environmental and operational. The relative weighting factors, based on the relative distribution of influence are Environmental 76% and Operational 24%.

Based on the screening criteria, Option 2 was selected as the preferred location, as it is closest to the access road and fuelling areas, but at the greatest distance from fish-bearing water bodies (Figure 3.4). Option 3 scores very well on the environmental factors but poorly on the operational factors because it is located a relatively long distance from the access road and from the tank farm.

A detailed design of the landfarm will be completed prior to the start of Dewatering Dike construction on site. The design will include the location and sizing of the preferred treatment option, the preparation of design drawings, and the development of operation procedures and closure and reclamation plans for the treatment facilities.

Further details on the proposed landfarm are provided in the supporting document *Landfarm Option Analysis, Meadowbank Gold Project, Nunavut* (Golder, 2007j).



LEGEND

■ PROPOSED LANDFARM LOCATIONS

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 MEADOWBANK MINING CORPORATION.
5) CONTOURS BELOW LAKE SURFACE ARE BASED ON BATHYMETRIC SURVEYS BY GOLDER ASSOCIATES LTD., 2002, 2003, 2006.
6) LAKE CONTOURS ARE BASED ON REGIONAL PLAN MAPS OF LAKE SURFACE ELEVATIONS:
2ND PORTAGE LAKE = 133.1M,
3RD PORTAGE LAKE = 134.1M
7) TOPOGRAPHIC CONTOUR INTERVAL 2M.
8) BATHYMETRIC CONTOUR INTERVAL 1M.

REFERENCES

1) AMEC AMERICAS LTD., DRAWING NUMBER A1-131395-100-C-0001 (100-C-0001.DWG), MEADOWBANK FEASIBILITY STUDY, APRIL 2005.

REVISION DATE: 07/08/17 10:11AM By: ASalvador CADD FILE: N:\Bur-Graphics\Projects\2006\1413\06-1413-089\Drafting\FINAL\Doc. 485\061413089-1400-FIG_3.4.dwg

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MEADOWBANK GOLD PROJECT

GENERAL SITE PLAN WITH PROPOSED LANDFARM LOCATIONS

FIGURE 3.4

3.3.6 Sewage Treatment

The sewage treatment facilities on site will be housed in a modular structure adjacent to the camp. Sewage will be collected initially from the accommodation complex during construction, and during operations, from the office area and change room facilities.

The plant will be sized for an on-site construction workforce of 300 persons, while the average number of operations personnel will be around 344 people. Two potential treatment systems are being considered, including a sequencing batch reactor (SBR), and a rotating biological contactor (RBC) (see Appendix B). The final selection of the sewage treatment system will be based on the principles of BAEFT and will be completed prior to the construction phase of the Project. Once a final decision has been made, MMC will provide NWB with full details of the sewage treatment system, including the type of treatment to be used and the expected treatment capabilities.

During the construction phase of the project before construction of the TSF, treated sewage water will be discharged into Tear Drop Lake, a small shallow (less than 2m deep) and fishless, water body (Figure 2.4). This water body is located within the mine footprint. Treated water from Tear Drop Lake will be pumped to the TSF via the tailings line following commissioning of the tailings storage facility and tailings line. During operations, the effluent will be pumped to the tailings pump box, then to the tailings storage facility. Tailings reclaim water will not be discharged until end of mine life, at which time it will be treated, if necessary, prior to release to the Goose Island or Portage pit lakes.

Further details on the proposed sewage treatment systems, including the anticipated treatment efficiencies of both options being considered, are provided in the supporting document *Sewage Treatment to be used at Meadowbank Gold Project, Nunavut* (Golder 2007k).

3.3.7 Water Treatment

The quality of the attenuation pond water to be discharged from the Portage and Vault areas into the receiving environment in the first years of operation is expected to meet MMER (2002) criteria, based on possible poor-end water quality predictions (Golder 2007m). The tailings disposal and water reclaim will be operated as a closed-circuit system during the operating period.

At the end of mine life, water in the Reclaim Pond will be drained to complete the reclamation of the TSF. Reclaim water will be transferred to the Goose Island or Portage pit lakes, which, at that time, will still be isolated from adjacent open waters by the Dewatering Dikes. It is predicted that the concentration of some constituents in reclaim water will exceed MMER limits. Reclaim water quality will be monitored during operation and may be treated prior to release to the Goose Island or Portage pit lakes. Reclaim water treatment requirements will be evaluated prior to transfer to the pit lakes, and will be based on achieving Nunavut Drinking Water Quality guidelines within the pit lakes after incorporation of reclaim water. The Goose Island Dike will be breached after reclaim water has been released to the pit lakes and water quality has all met Nunavut Drinking Water Quality guidelines and all MMER criteria including environmental effects monitoring (EEM) in the receiving environment (Cumberland 2005). The treatment alternatives considered for reclaim water are discussed in Golder (2007l). Detailed treatment plans, including expected treatment efficiencies, will be drafted during operation and will be submitted to NWB for approval prior to transfer of reclaim water to the Goose Island or Portage pit lakes.

Similarly at Vault, water quality predictions indicate that treatment will not be required in the Vault Pit Lake before breaching the Vault Dike. Contingency water treatment plans have been developed and are presented in Golder (2007l). Vault Pit Lake treatment requirements will be evaluated prior to breaching the Vault dike and will be based on achieving Nunavut Drinking Water Quality guidelines and MMER criteria including EEM within the Vault Pit Lake.

Conceptual treatment options have been proposed for the treatment of Reclaim and Attenuation Pond water in the supporting document *Proposed Water Treatment Methods, Meadowbank Gold Project* (Golder 2007l). If necessary, treatment of reclaim water may be completed in-situ or through a water treatment plant converted from the Process Plant.

SECTION 4 • MANAGEMENT PLANS

A series of management plans have been developed for the Meadowbank Gold Project. These plans include information on how waste and water will be managed during the various phases of mine life, as well as contingencies in cases where unexpected events may occur.

MMC understands that the management plans presented in this Application and the supporting documents may evolve as additional information is collected during the mine construction, operations, closure and post-closure phases of the Project. Modifications may also be required as a result of adaptive management decisions, or changes resulting from directions received from regulatory bodies. MMC is committed to providing NWB and other Regulatory Agencies, as required, with updates to Project activities and management plans in an annual report, or series of facility-specific or management plan-specific reports. These reports would include the monitoring results and progress updates on Project related terms and conditions defined under the water license.

4.1 WASTE ROCK MANAGEMENT

Waste rock from mine operations will be stored in one of two on-site facilities; the Portage RSF or the Vault RSF.

Waste rock from the North Portage, Third Portage, and Goose Island pits will be stored in the Portage RSF in an area to the north of Second Portage Arm. The storage area will be constructed to minimize the disturbed area and capped with a layer of NPAG at closure to constrain the active layer within relatively inert materials. The potentially acid generating waste rock below the capping layer is expected to freeze, resulting in low rates ARD generation in the long term. Water from the waste pile will be collected by perimeter ditches and directed to the Reclaim Pond.

Waste rock from the Vault Pit will be stored in the Vault RSF in an area to the north and west of the Vault Pit. The RSF will be graded at closure to encourage run-off 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 and capping of this facility is therefore not proposed.

4.1.1 Construction

Dumping of waste rock within the Portage RSF will commence closest to the Portage Pit and will proceed westward during development of the mine. In the case of the Vault RSF, dumping will commence in Year 4 and proceed until Year 8 as Vault Pit develops. Waste rock in both facilities will be placed on thaw-sensitive ground during winter months to minimize ground disturbance and permafrost degradation. Certain waste types, such as UM rock to be used for reclamation and capping purposes, will be assigned to specific waste RSF locations for later use.

A classification system will be used to identify the appropriate use and storage for all mine rock. Specifically, this system will identify PAG or NPAG rock types, as well as those with the potential to leach metals. PAG mine rock will be stored in designated areas designed for long-term stability with minimal environmental and aesthetic impact. The relative potentials of the rock types to generate ARD or leach metals under neutral drainage conditions and the implications for potential use as construction rock are presented in Table 4.1.

Table 4.1: Mine Waste Management Options Based on ARD/ML Potential

Open Pit	Waste Type	ARD Potential	ML Potential	Restrictions for Storage or Use in Construction
All Pits	Till	None	Low	None[1]
	Tailings	High	High	Requires measures to control ARD
	Lake Sediment	Variable (none to high)	High	May require collection and treatment of drainage
Portage & Goose	UM	None	Low	May require collection and treatment of drainage
	IV	Variable (none to moderate)	Moderate	Requires measures to control ARD
	IF	High	High under ARD conditions - Low under buffered conditions	Requires measures to control ARD
	QZ	High	Low	Co-disposal with ultramafic/mafic volcanic or cap/water cover
Vault	IV	Low	Variable (low to moderate)	May require collection and treatment of drainage

Source: Golder 2005.

1. ML potential of this waste type is expected to be short-term.

As shown in the above table, the waste types that will report to the RSFs show variable ARD potentials, some of which will require control measures. To address this, each RSF will be constructed as a cell, or series of cells, such that the interior of each cell is composed of any PAG and/or ML waste, and the exterior of each cell is composed of NPAG waste, as shown conceptually on Figure 4.1. The limits of each cell will be defined by a low berm, prior to, or concurrent with, placing material within the cell. Thus, any PAG and/or ML waste within each RSF will be encapsulated within NPAG waste, thereby limiting its exposure to oxidizing agents such as air and water, and providing a buffer for any drainage from the interiors of the cells. 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). An operational sampling and testing plan will be conducted to segregate PAG and/or ML waste from NPAG waste.

The water quality of the drainage from the RSFs and UM stockpile will be captured and monitored. Details on the monitoring plan are provided in *Meadowbank Gold Project Water Quality and Flow Monitoring Plan* (MMC, 2007c).

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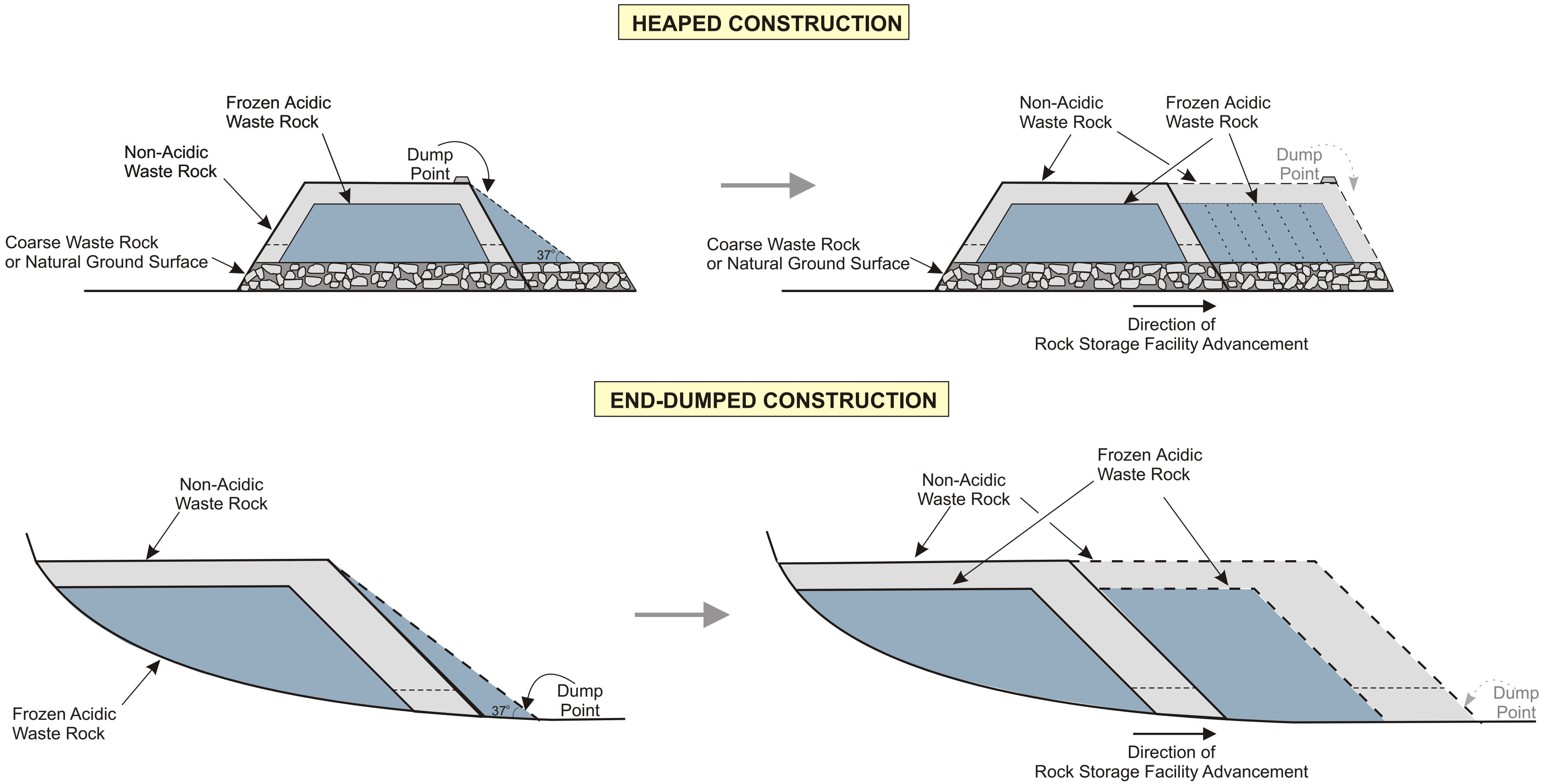

Not to Scale

REFERENCES

1) MEND 1.61.2, 1996

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WASTE ROCK STORAGE FACILITY CONSTRUCTION METHODS

FIGURE 4.1

4.1.2 Operation

Surplus waste rock will be managed in a similar manner during both construction and operation.

The internal temperature is expected to become superchilled and freeze, which will limit internal drainage as infiltrating water becomes frozen. The internal temperature of the RSFs will be monitored during operation so that the final topographic configuration and capping thickness can be optimized.

4.1.3 Closure and Post-Closure

As an ARD control measure in addition to the cellular construction of the RSFs, the Portage RSF will be capped with acid-buffering UM rock at closure. The Vault RSF is not expected to require capping, as the bulk of the material from this deposit is NPAG. The UM rock to be used for capping the Portage RSF and TSF will likely need to be stockpiled, as it is not expected that this rock type will be mined in any significant quantity at the end of mine life.

The water quality of the drainage from the RSFs and UM stockpile will continue to be monitored during closure and post-closure, as well as that of the Goose Island and Portage pit lakes.

Further details on the management of waste rock are provided in the supporting document *Meadowbank Gold Project Operational ARD/ML Testing Plan* (MMC 2007d).

4.2 TAILINGS MANAGEMENT

The proposed mine will generate approximately 22 Mt of tailings. Tailings will be stored in Second Portage Arm, which is currently underlain by a talik that extends through the permafrost to the underlying groundwater. Tailings will be placed in thin layers as thickened slurry, initially by subaqueous deposition and later subaerially. A Reclaim Pond will be operated within the TSF.

Throughout operation, the proposed tailings deposition plan will result in the development of a tailings beach starting on the upstream slope of the Central Dike and progressively advancing to the west, away from the Central Dike and open pit. In addition, the tailings deposited closest to the dike are expected to begin to freeze early in the operation. This will act to increase the potential seepage pathway and reduce seepage-flux through the Central Dike and foundation materials.

At closure, the tailings surface will be contoured or shaped and capped with acid-buffering UM rock to avoid accumulation of water on the tailings surface. The thickness of capping will be such as to promote active layer development within the acid-buffering capping layer, and promote the development of permafrost within the tailings. During the post-closure period, the tailings are predicted to freeze over a period of time, resulting in permafrost encapsulation. Until the tailings are frozen, tailings porewater seepage is expected to report to the Portage Pit Lake, which will be isolated from the adjacent Third Portage Lake until monitoring indicates the pit lake water quality achieves acceptable levels to allow removal of sections of the Goose Island Dike. Post-closure tailing porewater seepage through or underneath the tailing dike would only occur under a positive hydraulic gradient or until the freezing front has penetrated into the tailings down to the level of the pit lake. Thermal modelling of tailings freeze-back indicates that for the base case considered this would take place in about 10 to 15 years following mine operations (Golder 2007a). The model also indicated that the effects of global warming would not prevent freezing of the tailings or foundation of the Central Dike over the 100 year period of the model. This model uses the conservative assumption that the tailings are deposited instantaneously, and that no freezing of the tailings occurs during operations. In addition to this, once re-watering of the pits has been completed, the lake elevation adjacent to the Central Dike will be at approximately 134 meters above sea level. Consequently, there will not be a hydraulic gradient driving seepage toward the lake.

Once freezing has developed into the upper portion of tailings, migration of constituents into the talik beneath Second Portage Lake 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. Freezing to the base of the tailings is predicted to occur approximately 10 to 15 years following mine operations. The rate of advance of the freezing front into the talik beneath the Second Portage Lake is expected to exceed the rate of advance of diffusive transport and eventually encapsulate any constituents.

The development of permafrost in the core and tailings side of the Central Dike is a key aspect of the design concept for tailings management on site. Both steady-state and transient thermal modelling for the post-closure indicate that the dike will become frozen during operation and remain frozen after closure under current climate conditions, and under climate warming trends. Monitoring of ground temperatures and sub-permafrost pore pressures in the dike and its foundation will be undertaken during operation and post-closure to ensure that freeze-back and grouting are effectively mitigating groundwater flow between the TSF and Portage Pit / Third Portage Lake. MMC is also committed to completing additional coupled seepage-thermal and solute transport modeling prior to Central Dike construction to further evaluate the potential for groundwater seepage through the Second Portage Lake Fault and the requirement for additional mitigation controls, if any.

Further details on the design and management of the TSF are provided in the supporting documents *Meadowbank Gold Project Mine Waste and Water Management* (MMC 2007a) and *Detailed Design of Central Dike, Meadowbank Gold Project* (Golder 2007a).

4.2.1 Construction

Tailings will not be discharged during the construction period.

Lake bottom sediments will need to be removed to beyond the footprint of the Central and Stormwater dikes after the lakes have been drawn down (Golder 2007a). The sediments will be exposed and allowed to freeze, before being excavated with conventional equipment. Ripping or blasting may be required to loosen the materials, depending on the nature of the sediments and the time for which they are exposed to freezing conditions. A sample of the lake bottom sediments will be collected and analyzed for geotechnical properties.

The proposed construction methodology for the Dewatering Dikes does not include the removal of lake bottom sediments (Golder 2007c). These will be filled over with end-dumped rock fill material. Lake bottom sediments mined as part of development of the open pits will be placed in the area between the North Portage deposit and the East Dike for use as future reclamation material. There is no plan to use the soft lake bottom sediments as construction materials.

Within the Central Dike footprint, lake bottom sediments will be stripped to expose the till foundation and will be disposed of immediately upstream of the Central Dike. Stripped lake bottom sediments from the Stormwater Dike foundation will be placed downstream of the dike. The stripped material from the dike foundations will be placed on to dewatered lake bottom sediments and some may flow into the Reclaim Pond. This is not expected to affect water quality of the Reclaim Pond as the volume of sediments is small compared to the size of pond. Initial tailings deposit will be from the upstream face of Central Dike on the area of lake bottom sediment disposal from the Central Dike construction.

During the construction phase, MMC will design and implement measures aimed at deterring, without the use of fencing, caribou and other wildlife from the Reclaim Pond during operations. Potential measures that will be considered include the use of temporary ribbon placements or Inuksuk.

4.2.2 Operations

Tailings produced by milling activities will be pumped as slurry for deposition in the TSF. A tailings deposition plan is included in *Meadowbank Gold Project Mine Waste and Water Management* (MMC 2007a). The tailings deposition plan is designed to shape the surface of the tailings to drain to the south end of the Stormwater Dike location, forming a pond for operation of the reclaim barge. This tailings deposition strategy will result in the Second Portage Arm being filled with tailings at the end of the mine life.

Potential permafrost degradation associated with the tailings discharge pipeline will be avoided by using an insulated pipe with heat tracing, and by elevating the pipeline across thaw-sensitive terrain.

4.2.3 Closure and Post-Closure

At closure, the Reclaim Pond will be drained and a minimum 2-m thick dry cover of acid buffering UM rockfill will be placed over the tailings to confine the active layer within relatively inert materials (Golder, 2007a; MMC, 2007h). The cover will be contoured such that surface water runoff will collect at the former Reclaim Pond location for treatment, if necessary. The South Saddle Dam will be breached once ponded water meets discharge criteria and further surface water runoff will be allowed to flow to Third Portage Lake untreated.

Thermal modelling (see Appendix III of the *Detailed Design of Central Dike* report; Golder 2007a) indicates that the tailings will freeze in about 10 to 15 years following mine operations, and that the talik that currently exists below Second Portage Arm will freeze before seepage from the TSF reaches the groundwater below the permafrost. Therefore, the potential for groundwater contamination to occur as a result of seepage from the TSF is considered to be low.

The thermal regime of the tailings will be monitored during operations to confirm modelling predictions, and the proposed closure plan, are modified based on the actual site conditions. Further details on the tailings monitoring, including mitigative measures that can be undertaken should tailings freezeback not progress as fast as thermal modelling indicates, is provided in the supporting document *Meadowbank Gold Project Mine Waste and Water Management* (MMC, 2007a).

4.3 WATER MANAGEMENT

A Mine Waste and Water Management Plan (MMC 2007a), including a water balance, has been developed to minimize the impact of the proposed project on the quantity of surface water, and on the quality of surface water and groundwater. Specific mitigation strategies include:

- reducing the intake of fresh water from the neighbouring lakes by recycling and reusing water where practicable
- implementing measures to avoid the contact of clean runoff water with areas affected by the mine or mining activities
- collecting, transporting, and treating, if necessary, all mine water, camp sewage, and runoff water that comes into contact with project activities
- managing PAG or ML materials
- monitoring quality of discharges
- adjusting management practices if monitoring results indicate discharge quality does not meet discharge criteria.

The various components of the water management system will be designed to meet the following criteria:

- Water management infrastructure along the perimeter of the developed areas must be able to intercept and convey to proper handling facilities contact water from a 1:100-year, 24-hour precipitation event.
- Water management infrastructure located within mining affected areas where water has no chance of overflow outside of developed areas should be able to handle the runoff from a 1 in 10-year (1:10), 24-hour precipitation event.
- Water management infrastructure along the perimeter of the developed areas must be able to divert non-contact water from a 1:100-year, 24-hour precipitation event.
- Dewatering capacities for contact water sumps and ponds should be selected to handle the greater of the average year freshet volume in a 30-day period, or the 1:100-year freshet volume in a 90-day period
- Attenuation ponds should be sized to accommodate the runoff from a 1:100-year, 24-hour precipitation event in excess of their maximum operating storage volume (average year climate conditions), while maintaining a 1 m freeboard before the possibility of a spill to the receiving environment.

A site water balance model was prepared to identify the water sources and their relative contribution and to evaluate proposed water management infrastructure. Further details on the water management plan and site water balance are found in the supporting document *Meadowbank Gold Project Mine Waste and Water Management* (MMC 2007a).

4.3.1 Dewatering

Prior to the construction of the Central Dike and mining of the Portage Pit, Second Portage Lake will require dewatering down to elevation 105 masl within the area bounded by the east dike. The total lake volume to a lake level elevation of 133.1 m masl is estimated to be 14.5 Mm^3 within the area to the west of the East Dike. The dewatering volume is estimated to be 13.8 Mm^3, excluding the volume of water contained below elevation 105 m masl (~ 745,000 m^3). An additional 0.7 Mm^3 will also need to be dewatered from Third Portage Lake inside the Bay Zone Dike. The quality of water pumped from each basin will be closely monitored to ensure that total suspended solids (TSS) loadings from dewatering operations are acceptable for discharge to Third Portage Lake (Cumberland 2005).

If mitigation is needed, effective methods are available. Silt fences can be used to control the movement of fines into the remaining lake water or ponds. If necessary, drawdown pumping can be curtailed. Clarification ponds can be constructed in diked off portions of the lake bottoms, including the use of natural obstructions and closed depressions on the lake bottoms. Other measures involve the placement of a stabilizing rockfill, commonly in conjunction with a geotextile, thus insulating the thaw unstable area and slowing the rates of thaw and sediment production.

Bathymetric data of Second Portage Lake (Figure 2.8) indicates three separate basins; a Northwest Basin (~2.0 Mm^3), the Main Basin (~10.5 Mm^3), and an East Basin (~2.0 Mm^3) (see also Figure 9.2 of MMC 2007a).. A topographical divide exists at approximately 130 masl between the Northwest and Main basins, and at approximately 118 masl between the Main and East basins. A dewatering volume of 13.8 Mm^3 from Second Portage Lake assumes that all of the water from the Northwest Basin drains to the main basin during dewatering. However, the Northwest Basin will be used as a stormwater attenuation facility and source for freshwater make-up to process during early mine operations (until approximately mine year 6). Therefore, pool water below 130 masl (~1.0 Mm^3) may not be pumped from this basin during the dewatering process. Any water stored in this basin during dewatering will be used to supplement freshwater make-up requirements to the mill process at mine start-up.

An intensive fish salvage program using gill nets, trap netting and/or seining will be implemented to salvage as many fish as possible from each of the impoundments, prior to and during dewatering. People from the Hamlet of Baker Lake will ultimately be responsible for the majority of the fishing effort and for receiving the fish from each impoundment prior to drawdown. As the systems are dewatered, fish will be concentrated in the remaining water and some may be stranded in shallow residual pools. Fish will be collected by whatever means available at this time to minimize wastage.

Further details on dewatering and fish salvage are provided in the supporting documents *Meadowbank Gold Project Mine Waste and Water Management* (MMC 2007a) and *Meadowbank Gold Project Aquatic Effects Management Program* (Cumberland 2005), respectively.

4.3.2 Water Treatment

The water treatment options considered for the site are summarized in the following sections. Since open-water conditions at the site are limited to between approximately middle of June to middle of September, water treatment and discharge of treated water, if required, would be conducted on a seasonal basis, once a year, and will be completed within the four-month ice-free season. The treatment methodology will vary depending on the phase of the mine life.

Further details on the predicted mine water quality are provided in the supporting document *Water Quality Predictions, Meadowbank Gold Project, Nunavut* (Golder 2007m).

4.3.2.1 Construction

During the construction phase of the Project, the only water that is expected to require treatment is sewage water. This water will be treated using either a SBR or a RBC (see Appendix B). Details on these systems are provided in *Sewage Treatment to be used at Meadowbank Gold Project, Nunavut* (Golder, 2007k). Before construction of the TSF, treated sewage water will be discharged into Tear Drop Lake (Figure 2.4), a small, shallow (less than 2m deep) and fishless, water body. This water body is located between the proposed plant site and Portage Pit, within the mine footprint. Upon construction of the TSF, treated water from Tear Drop Lake will be pumped to the TSF via the tailings line.

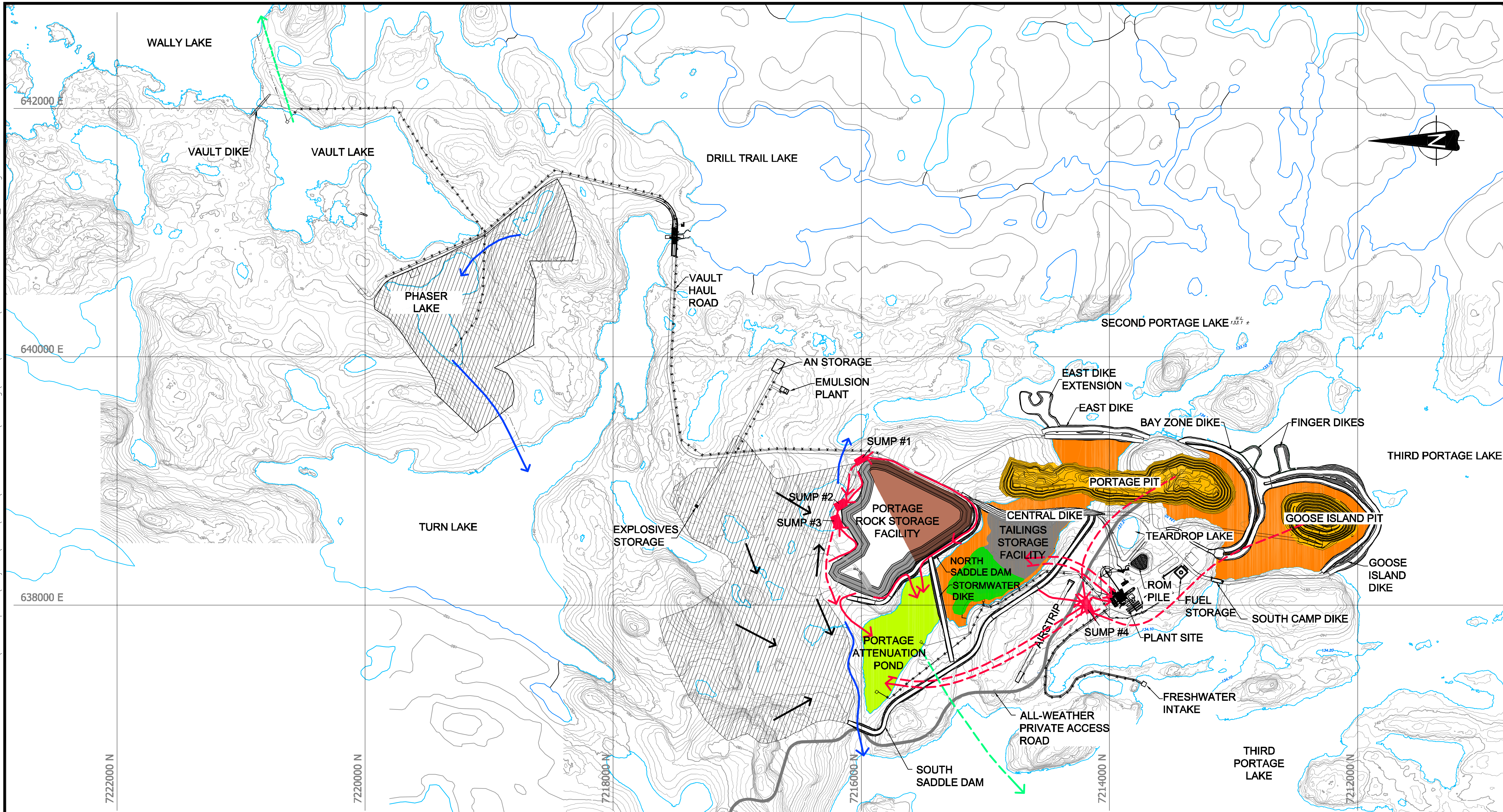
4.3.2.2 Operations

During operations, and until closure of the TSF, sewage water will be treated as in construction, and be disposed of into the tailings pond. Sewage sludge will be co-disposed with the treated water or incinerated.

Runoff and seepage water that has come into contact with mine rock (mine contact water) may also require treatment during this period. During operating Years 1 through 5, this water, which will include runoff and seepage from the Portage RSF, plant site, airstrip, and Third Portage, North Portage, and Goose Island pit sumps (including dike and groundwater seepage, if any), will be collected in the Portage Attenuation Pond. This water will be monitored, and treated if required prior to discharge to Third Portage Lake. Discharge would only occur during ice-free months to maintain the capacity of the pond to collect water in the following year. Possible treatment methods for this water may include:

- pH: lime;
- TSS: flocculant;
- Arsenic: ferric salt (such as ferric sulphate) followed by pH adjustment; and
- Ammonia (if required): biological methods (potentially including phosphorus addition) or selective ion exchange columns.

Also during operating Years 1 through 5, process water from the mill and the processing plant will be pumped to the Reclaim Pond, and eventually recycled back to the mill and the processing plant. No process water will be discharged to the receiving environment during this operating period. Figure 4.2 represents the general water management plan considered for the operating period Year 1 to Year 5.



LEGEND

- TAILINGS
- WASTE ROCK
- RECLAIM POND
- ATTENUATION POND
- DEWATERED LAKE
- DIVERTED AREA
- OPEN PIT
- CONTACT WATER INTERCEPTION
- PUMPED CONTACT WATER
- NON-CONTACT WATER DIVERSION
- SURFACE RUNOFF
- PUMPED ATTENUATION POND WATER
- SUMP

NOTES

1) GRID REFERENCE: NAD 83, UTM ZONE 14.
2) CONTOUR INFORMATION ON LAND SUPPLIED BY MEADOWBANK MINING CORPORATION.

REFERENCES

1) AMEC AMERICAS LTD., DRAWING NUMBER A1-131395-100-C-0001 (100-C-0001.DWG), MEADOWBANK FEASIBILITY STUDY, APRIL 2005.

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EARLY OPERATION PHASE

FIGURE 4.2

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The deposition of tailings will occur within the former Portage Attenuation Pond during operating Years 6 through 8. From Years 5 through 8 mine contact water will be directed to the mined-out Goose Island or Portage pits for reflooding. Flooding is expected to take five to eight years to complete. The quality of water within the resulting Goose Island and Portage pit lakes will be monitored during flooding. The predicted pit lake water quality is such that treatment is not expected to be required (Golder 2007m); nonetheless, a proposed contingency treatment scenario has been developed, and is described in *Proposed Water Treatment Methods, Meadowbank Gold Project* (Golder 2007l).

Vault area mining operations will be initiated in operating Year 4. Similar to the Portage Attenuation Pond, the Vault Attenuation Pond will collect, hold and discharge runoff and seepage water from the Vault RSF, Vault open pit sumps (including groundwater inflows), Vault Dike seepage (if any), and mine contact water from the Vault area drainage basin, during operating Years 4 through 8. Water quality predictions indicate water treatment will not be required during this period (Golder 2007m). Nonetheless, the water quality in the Vault Attenuation Pond will be monitored and the water will be treated if required prior to discharge. Figure 4.3 illustrates the general water management plan considered for the Operating period of Year 5 to Year 8.

4.3.2.3 Closure and Post-Closure

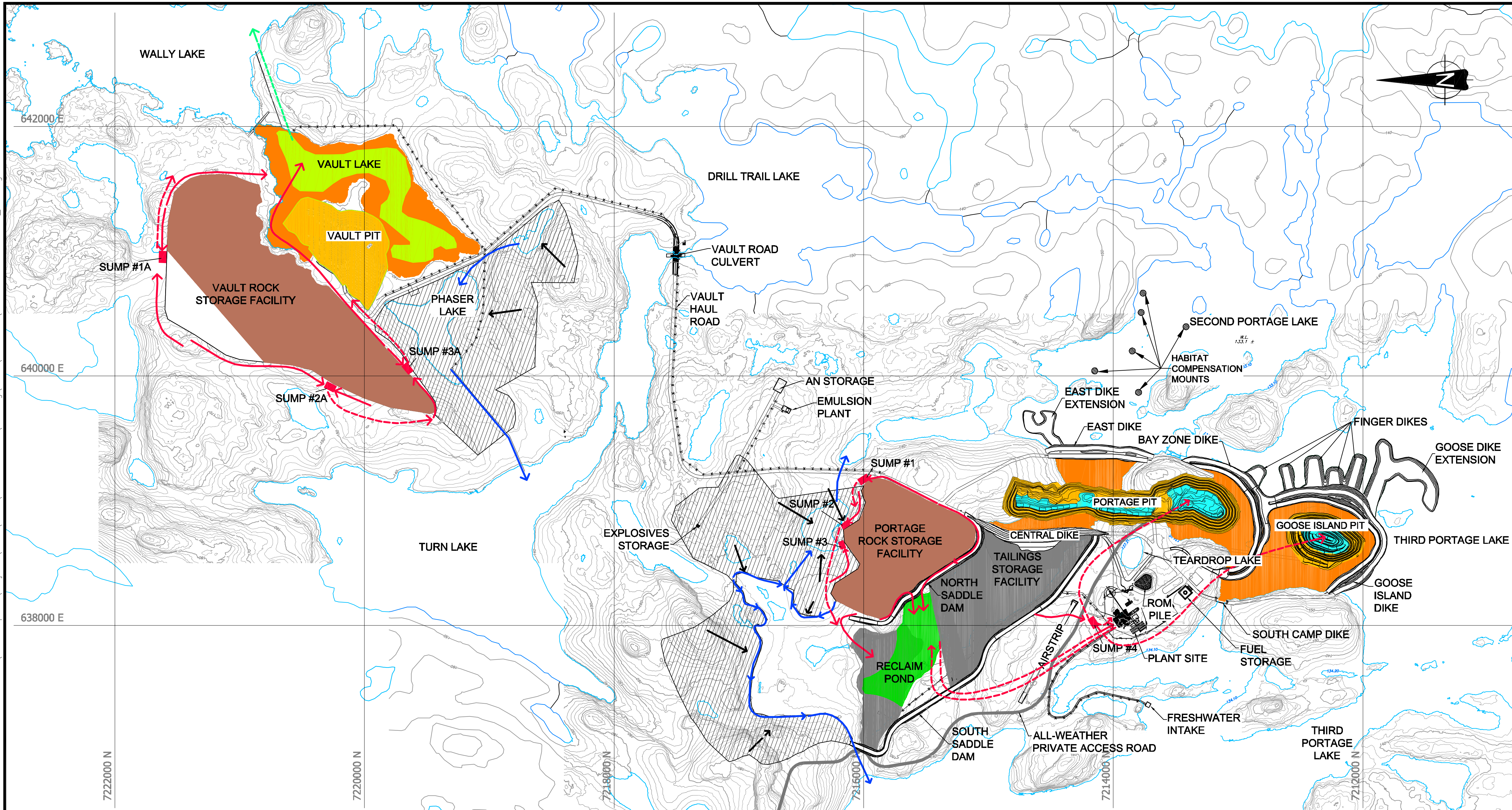
As part of preparing for site closure in operating Year 8, water remaining within the Reclaim Pond will be treated, if necessary, and discharged to the Goose Island or Portage pit lakes. Portage RSF drainage will continue to be routed to the Reclaim Pond. This water will also be treated, if necessary, and pumped to the Goose Island or Portage pit lakes. As tailings water will be discharged to the still fully diked pit lakes, no active discharge to the receiving environment is expected to occur during this period.

Vault Lake, including the Vault Pit, will be flooded using runoff from the Vault Lake catchment, supplemented by spring freshet runoff redirected from Wally Lake. Flooding is expected to require 5 to 7 years to complete. The water quality during flooding will be monitored, and the water will be treated if necessary, although water quality predictions indicate treatment will not be required (Golder 2007m). No active discharge to Wally Lake is expected to occur during this period.

Post-closure, drainage contact water originating from the Portage and Vault RSFs will be the only water source that could potentially require management. Should it be necessary, the water collected during ice-free months in sumps or drainage ditches in the Portage area could be treated in-situ or within a water treatment plant before being discharged to the Goose Island or Portage pit lakes. Water collected in drainage ditches in the Vault area will be routed to the Vault Pit Lake. The Goose Island, Bay Zone, and Vault dikes will not be breached until the quality of the water in the Portage, Goose, and Vault pit lakes is acceptable to mix with neighbouring lakes.

There is no expected need for a sewage treatment facility after closure of the TSF.

Further details on water treatment and the proposed sewage treatment systems are provided in the supporting documents Proposed *Water Treatment Methods, Meadowbank Gold Project* (Golder, 2007l) and *Sewage Treatment to be used at Meadowbank Gold Project, Nunavut* (Golder, 2007k), respectively.



LEGEND:

TAILINGS	CONTACT WATER INTERCEPTION
WASTE ROCK	PUMPED CONTACT WATER
RECLAIM POND	NON-CONTACT WATER DIVERSION
ATTENUATION POND	SURFACE RUNOFF
DEWATERED LAKE	PUMPED ATTENUATION POND WATER
DIVERTED AREA	SUMP
OPEN PIT	
PIT LAKE	

NOTES

1) GRID REFERENCE: NAD 83, UTM ZONE 14.
2) CONTOUR INFORMATION ON LAND SUPPLIED BY MEADOWBANK MINING CORPORATION.

REFERENCES

1) AMEC AMERICAS LTD., DRAWING NUMBER A1-131395-100-C-0001 (100-C-0001.DWG), MEADOWBANK FEASIBILITY STUDY, APRIL 2005.

0 300 600 900 1200 1500

Scale in Metres

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LATE OPERATION PHASE

FIGURE 4.3

REVISION DATE: 07/08/18 02:09PM By: ASalvador CADD FILE: N:\Bur-Graphics\Projects\2006\1413\06-1413-089\Drafting\FINAL\Doc. 485\061413089-1400-FIG_4.3.dwg

4.3.3 Pit Rewatering

Upon completion of mining, the Goose Island and Portage open pits will be flooded, and the water levels of the resulting pit lakes will eventually equilibrate with the adjacent lake elevations. It is expected that these pits will flood within approximately eight to nine years. Similarly, the Vault pit will be flooded at closure and become part of Vault Lake, which is expected to take approximately five to six years to complete. The final lake level within Vault Lake would then become equal to that of Wally Lake.

During operations, the walls of the open pits will be exposed, and some oxidation will occur. As the pits flood, the water will contact the oxidized rocks, affecting the water quality by increased concentrations of dissolved metals and lower pH (Golder 2007m). The water quality within the flooded pits will need to be managed, monitored, and treated (if necessary) until the water is of acceptable quality to mix with water in Third Portage and Wally Lakes.

The capacity of the completed Portage and Goose Island pits between the dikes will be on the order of 45 Mm^3. Instantaneous breaching of the dikes would cause a significant drawdown of Third Portage and Wally lakes, which would have a significant adverse impact on fish habitat. Therefore, flooding will be carried out through a combination of direct seepage, precipitation, and runoff to the Portage and Vault pits, and re-direction of spring freshet flows from Third Portage Lake and Wally Lake, respectively. The rate of discharge from Third Portage and Wally Lakes will be controlled through engineered structures such as siphons, spillway structures, side decant structures, or other designs. Where possible, the water for flooding will be removed from deep areas of waterbodies to avoid the removal of oxygenated surface waters. Water intakes will be properly screened.

Further details on the predicted water quality within the pit lakes are found in the supporting document *Water Quality Predictions, Meadowbank Gold Project, Nunavut* (Golder 2007m).

4.4 FISH AND FISH HABITAT

Management plans for works and undertakings associated with the Meadowbank Gold Project that are in or near waters frequented by fish are described in the following supporting documentation:

- *Meadowbank Gold Project Aquatic Effects Management Program* (Cumberland 2005); and
- *Meadowbank Gold Project No-Net-Loss Plan (NNLP)* (Cumberland 2006).

The management plans presented in these two documents have been developed to comply, wherever possible, with relevant legislation, policies, guidelines and operational statement related Project works or undertakings that are in or near waters frequented by fish, including DFO Freshwater Intake End-of-Pipe Fish Screen Guidelines (March 1995) and Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (Wright and Hopky, 1998).

Fish habitat management consists of a range of activities, including mitigation and environmental monitoring. The above documents quantify and assess the potential impacts to fish habitat during mine construction, operation, closure and post-closure, and describe the rationale, framework, strategy, methodology and scope of fish habitat management plans to be implemented during all phases of mine operation. Monitoring will be completed to detect potential adverse effects on aquatic VECs (i.e., water quality, fish habitat and fish populations) arising from any mine-related activity, in order that additional mitigation can be applied as necessary to eliminate, mitigate or reduce the adverse effects.

The management plans described within the AEMP and NNLP have been developed with respect to the following five main groups of project related stressors of potential concern to the aquatic VECs:

- Suspended solids and sedimentation;
- Contaminants (chemicals, ions, nutrients, etc);
- Blasting (particle velocity and noise);
- Direct habitat impacts (lake dewatering, stream crossings, hydrological alterations); and,
- Inhibition or prevention of fish movement.

Specific project activities considered include, but are not limited to, dike construction, dewatering, freshwater intake, effluent discharge, mine site infrastructure installation, Vault Haul Road Culvert installation, and blasting. For each activity, the following information is provided:

- description of the activity, works or undertakings including potential fish and fish habitat present;
- potential effects (physical and ecological) on aquatic VECs;
- mitigation measures and management plan to protect aquatic VECs;
- potential residual effects on aquatic VECs; and
- monitoring plan.

It should be noted that specific mine details (e.g. Mine Operating Years) presented in the AEMP and NNLP may differ slightly from that presented in this document and the remainder of the supporting documents. This is a result of recent updates to the recent changes in the mine plan. Nevertheless, the general activity descriptions, potential effects, mitigation plans, potential residual effects and monitoring plan presented in these two support documents still apply.

4.5 INCINERATOR WASTE MANAGEMENT

Solid waste from the accommodation camp, kitchen, shops, and offices will be burned in a diesel-fired waste incinerator located in a prefabricated structure downwind of these facilities. The materials to be incinerated will be limited to sewage treatment sludge, putrescible waste such as paper, wood and food waste, and used petroleum products such as grease, heavy lubricants and engine oil. Ash from the incineration process will be disposed of within the landfill on site (Golder, 2007i).

A detailed Incinerator Waste Management Plan will be developed prior to the start of mine operations. The management plan will include an incinerator monitoring program to monitor the quantity and type of materials incinerated on site, as well as a detailed stack emission testing program. The Incinerator Management Plan will be submitted to the NWB once it is complete.

4.6 LANDFILL MANAGEMENT

The landfill management plan which outlines the conceptual design, operation and closer for the two industrial waste landfills on site is briefly summarized in the following sections. These landfills are required for the disposal of non-salvageable, non-hazardous solid waste from mining activities that cannot be incinerated. The leachate from the landfills is anticipated to be very weak due to the controls on materials placed in the landfill, and thus specific leachate management is not considered to be required.

4.6.1 Construction

Landfill #1 will be constructed during pre-operations and will serve as the solid waste disposal facility for the first 6 to 7 years of mine life. The area to receive waste will be bounded on the northwest and southeast sides by a rockfill berm (Figure 4.4). The purpose of the rockfill berm is to act as a wind shield for the waste. The landfill will be a rectangular shape with the length perpendicular to the prevailing wind direction so that much of the waste can be protected from wind by the rockfill berm. The northwest berm will be 3 m above the final top of waste (or a total of 5.5 m high above existing ground surface). The southeast berm will be lower, 2 m above the final top of waste (or a total of 4.5 m high above existing ground surface), due to the typically lower wind speeds from this direction. Also for wind protection, the width of the waste surface will be limited to less than 10 times the height of the berm relative to the top of the waste.

4.6.2 Operations

Landfill #2 will be constructed during operations, and will fill a 4 m deep depression in the top of the Portage RSF. The depression will be constructed by the waste rock trucks discharging their loads in a controlled manner such that the dimensions of the depression are approximately as shown on Figure 4.5. The area to receive waste will be bounded on the northwest side by a 2 m high rockfill berm. The rockfill berm will act as a wind shield to reduce the amount of wind-blown debris, while providing material for intermediate cover of the landfill.

The landfills will be filled progressively in an orderly manner. Specifically, waste will be placed at one end of the landfill at full height and then the active waste area will progressively advance. Areas where the waste has been placed to full height and levelled will be progressively covered by placement of a minimum 0.3 m thickness of rock fill on top of the waste. Ash will be placed on the northwest half of Landfill #2 or close to the 5.5 m high temporary berm of Landfill #1, for wind protection. The ash will be spread by a rubber tired machine and then covered with other waste.

The slopes of the landfills will be covered with rockfill, thus protecting them from erosion. Additional surface water and erosion control measures from the *Meadowbank Gold Project Mine Waste and Water Management Plan* (MMC, 2007) (*e.g.*, diversion ditches) will be incorporated into landfill design, as appropriate.

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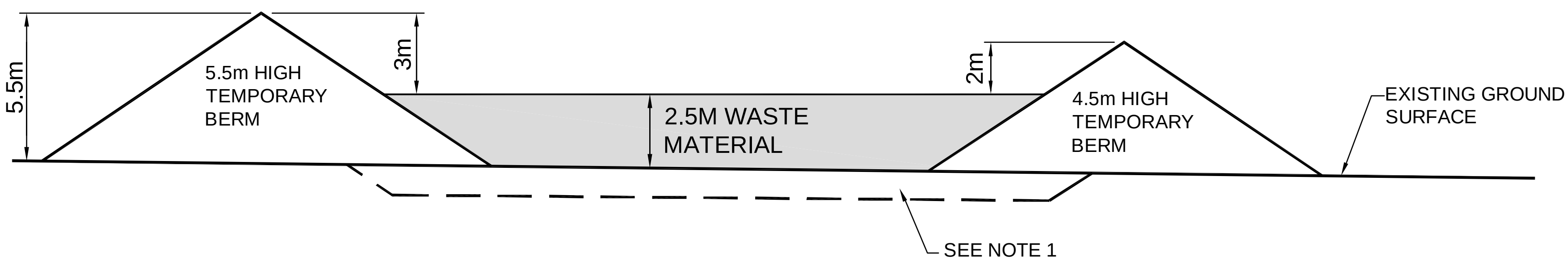
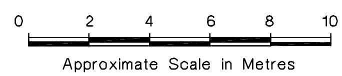


CONCEPTUAL CROSS - SECTION



NOTES

1) EXCAVATION SOIL TO BEDROCK OR 2.1M DEPTH, WHICHEVER IS LESS AND REPLACE WITH GRAVEL.
2) TEMPORARY BERM MATERIAL SHALL BE ROCKFILL.

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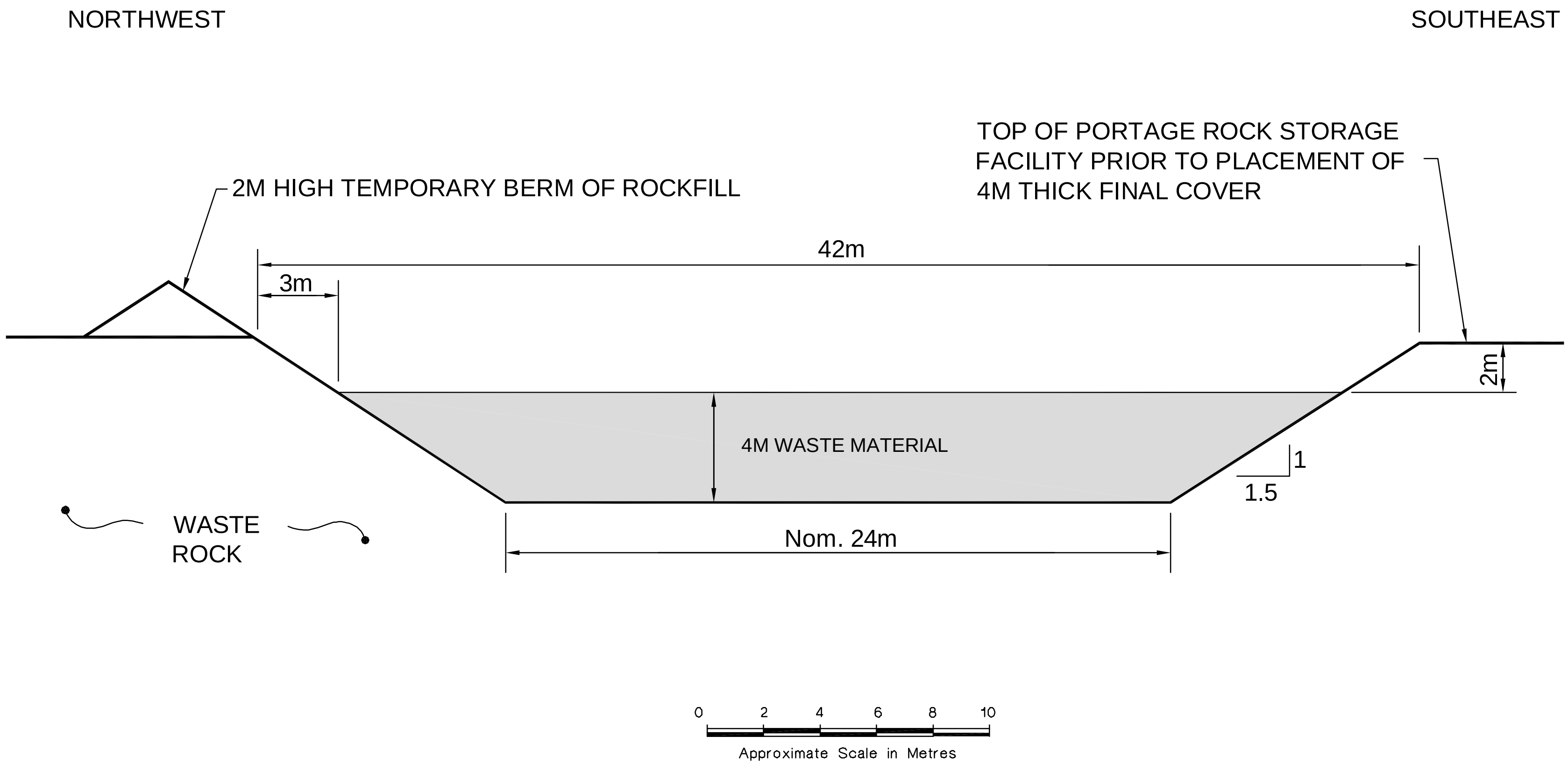
CONCEPTUAL CROSS SECTION OF LANDFILL #1 PRIOR TO PLACEMENT OF COVER	**FIGURE 4.4**

REVISION DATE: 07/08/21 09:42AM By: ASalvador CADD FILE: N:\Bur-Graphics\Projects\2006\1413\06-1413-089\Drafting\FINAL\Doc. 485\061413089-1400-FIG_4.4.dwg



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CONCEPTUAL CROSS SECTION OF LANDFILL #2 PRIOR TO PLACEMENT OF COVER	FIGURE 4.5

4.6.3 Closure and Post-Closure

The estimated closure date of Landfill #1 would be year 7 of mine operations and Landfill #2 would be Year 9. The waste of the landfill will be covered by a 0.3 to 1 m thickness of rockfill, covered with an additional 2 m thickness of coarse acid-buffering UM waste rock material. The final landfill slopes would be up to 50%. Drainage water from the landfills will be routed to the Portage RSF drainage system.

Further details on the landfills are provided in the supporting document *Landfill Design and Management Plan, Meadowbank Gold Project* (Golder 2007i).

4.7 LANDFARM MANAGEMENT

A landfarm will be operated in order to treat petroleum contaminated soils (Golder 2007j). MMC is committed to developing a detailed Landfarm Management Plan and Monitoring Program prior to the start of Dewatering Dike construction on-site. The Landfarm Management Plan will be submitted to the NWB once complete.

Further details on the proposed landfarm are provided in the supporting document *Landfarm Option Analysis, Meadowbank Gold Project, Nunavut* (Golder 2007j).

4.8 HAZARDOUS MATERIAL MANAGEMENT AND EMERGENCY RESPONSE

The Meadowbank Gold Project will require the transport to site, temporary storage, and use of hazardous materials as part of everyday activities during the pre-development, operation, and closure stages of the project. A hazardous material is one that, as a result of its physical, chemical, or other properties, poses a hazard to human health or the environment when it is improperly handled, used, stored, disposed of, or otherwise managed. They include industrial chemicals for process and water treatment, and hydrocarbon products, including but not limited to diesel fuel, gasoline, aviation fuel, and lubricants. Hydrocarbon products will be stored on site and used for electrical power generation and the operation of site equipment.

Procedures for the management of hazardous materials, and for accident and incident response and reporting for the mine site are provided in the following support documentation:

- *Hazardous Material Management Plan (HMMP)* (MMC 2007e)
- *Spill Contingency Plan (SCP)* (MMC 2007f)
- *Emergency Response Plan (ERP)* (MMC 2007g).

A copy of each of the above plans is provided as a supporting document to this Application. Detailed spill contingency and emergency response plans for the marine transport components of the project have been provided separately as part of the Type-B Water License Application for the Baker Lake Marshalling Area Facility.

4.8.1 Fuel and Explosives Storage

Diesel Fuel

During mine site operations, approximately 5.6 ML of diesel fuel will be stored on site in a steel tank located within a lined berm. The berm will have spill collection sumps and will meet all applicable fire codes, API standards, and insurance underwriter requirements. A fuel unloading and distribution pump module will be enclosed in an Arctic grade container installed on a concrete pad with spill collection and pumpout facilities. The distribution pumps will feed a network system throughout the plant area, supplying fuel to the exterior day tanks at the power plant and boilerhouse. The light vehicle fuel dispensing station and heavy vehicle fuel dispensing station will be located adjacent to the storage facility.

Gasoline

Gasoline will be required in relatively small quantities for small vehicles such as snowmobiles and ATVs. The gasoline dispensing station will have a self-contained, 10,000 L enviro tank with an on-board pump and hoses. The station will be in a bermed area adjacent to the diesel storage tank.

Aviation Fuel

The most commonly used fuel for turbine engine aircraft, Jet-B, will be stored in a 5,000 L self-contained enviro tank mounted on an elevated pad near the air terminal shelter. This reserve will be only for emergency use by aircraft. The tanker truck with on-board pump and hoses will refill the Jet-B storage tank after use in an emergency. Jet-B fuel will also be available, on an emergency basis, for helicopters.

Explosives

Ammonium nitrate will be stored at the mine site and loaded into the ANFO mixing truck as required. The emulsion, detonators, and accessories will be stored on site in magazines that conform to all regulations applicable to the supply and storage of explosives. The explosives contractor will mix the ANFO, transporting the explosives to the work site, and loading the holes. Mine personnel will be responsible for priming, and detonating the explosives.

For additional information on fuel and explosives storage, and emergency response procedures, see the *Hazardous Materials Management Plan* (MMC 2007e), *Spill Contingency Plan* (MMC 2007f), and *Emergency Response Plan* (MMC 2007g).

4.8.2 Hazardous Materials Management Plan

The HMMP (MMC 2007e) provides a consolidated source of information on the safe and environmentally sound transportation, storage, and handling of the major hazardous products to be used at the Meadowbank Gold Project. In combination with the SCP (MMC 2007f) and ERP (MMC 2007g), the HMMP provides information on the prevention, detection, containment, response, and mitigation of accidents that could result from handling hazardous materials.

The plan is based on the following principles of best practice management for hazardous materials:

- identify and prepare materials and waste inventories;
- characterize potential environmental hazards posed by those materials;
- allocate clear responsibility for managing hazardous materials;
- describe methods for transport, storage, handling, and use;
- identify means of long-term storage and disposal;
- prepare contingency and emergency response plans;
- ensure training for management, workers, and contractors whose responsibilities include handling hazardous materials; and,
- maintain and review records of hazardous material consumption and incidents in order to anticipate and avoid impacts on personal health and the environment.

MMC recognizes that incorporating proper hazardous material management into other environmental management plans and systems leads to risk reduction, improved process control, and cost savings.

All hazardous materials to be used at the Meadowbank operation will be manufactured, delivered, stored, and handled in compliance with all applicable federal and territorial regulations, as well as ISO 14001 environmental management standards. MMC is committed to preventing, to the greatest extent possible, both inadvertent release of these substances to the environment and accidents resulting from mishandling or mishap. MMC will institute programs for employee training, facility inspection, periodic drills to test systems, and procedural review to address deficiencies, accountability, and continuous improvement objectives.

MMC will actively work towards minimizing the generation of hazardous wastes by investigating alternatives to the use of hazardous materials, by recycling products and containers wherever feasible, and by treating wastes using state-of-the-art technologies before any release to the environment.

As with all other aspects of health and safety policy at the Meadowbank mine, all employees will be expected to comply with all applicable precautions and handling procedures with regard to hazardous materials. Employees are also expected to report any concerns to their supervisors, the Occupational Health & Safety Committee (HSC), or senior site management. All staff is encouraged to bring forward suggestions for improvements that can be incorporated into procedure revisions as appropriate.

4.8.3 Spill Contingency Plan

The SCP (MMC 2007f) provides a practical source of information required to assess spill risks, develop an effective countermeasures program, and respond in a safe and effective manner to spill incidents at the Meadowbank Gold Project. More specifically, the purpose of the SCP is:

- to comply with MMC's environmental policy;

- to identify the organization, responsibilities, and reporting procedures of the Meadowbank Emergency Response Team (ERT) in the event of an emergency or spill;
- to provide readily accessible emergency information to the cleanup crews, management, and government agencies in the event of a spill;
- to comply with federal and territorial regulations and guidelines pertaining to the preparation of contingency plans and notification requirements;
- to promote the safe and effective recovery of spilled materials;
- to minimize the environmental impacts of spills to water or land; and,
- to provide site information on the facilities and contingencies in place if a spill or malfunction should occur.

4.8.4 Emergency Response Plan

The ERP (MMC 2007g) provides a consolidated source of information for employees, contractors, and site visitors to respond quickly and efficiently to any foreseeable emergency that would likely occur at the Meadowbank Gold Project site. The ERP is a working document that will be reviewed and updated on a regular basis as mine development, construction and operations proceed.

The ERP addresses gold mining, processing, transportation and related activities at the Meadowbank site. Guiding the development of this document has been the principle that an effective ERP must provide:

- a clear chain of command for safety and health activities;
- accountability for safety and health performance;;
- well-defined corporate expectations regarding safety and health;
- comprehensive hazard prevention and control methods; and
- record-keeping requirements to track program progress.

MMC will ensure that all employees, contractors and site visitors fully understand and comply with all legislated safety standards, and the policies and procedures outlined in the ERP.

The ERP will be reviewed annually, or more frequently as required, to ensure compliance with applicable legislation, to evaluate its effectiveness and to continually improve the procedures. All employees, contractors and site visitors will be encouraged to offer suggestions for ways to eliminate potential hazards and improve work procedures.

4.9 CLOSURE AND RECLAMATION

Mine closure activities represent dismantling and removing all buildings (offices, mills, rock processing areas, and storage facilities), fuel, explosives, supplies, crushers, water treatment plants (if present), sewage treatment plant, camps, equipment (pipelines, extraction machines, and rock processing and ore smelting machinery), decommissioning of roadways and the airstrip, as well as drainage ditches.

Mine closure and reclamation will utilize currently accepted management practices and appropriate mine closure techniques that will 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 and as appropriate wildlife habitat.

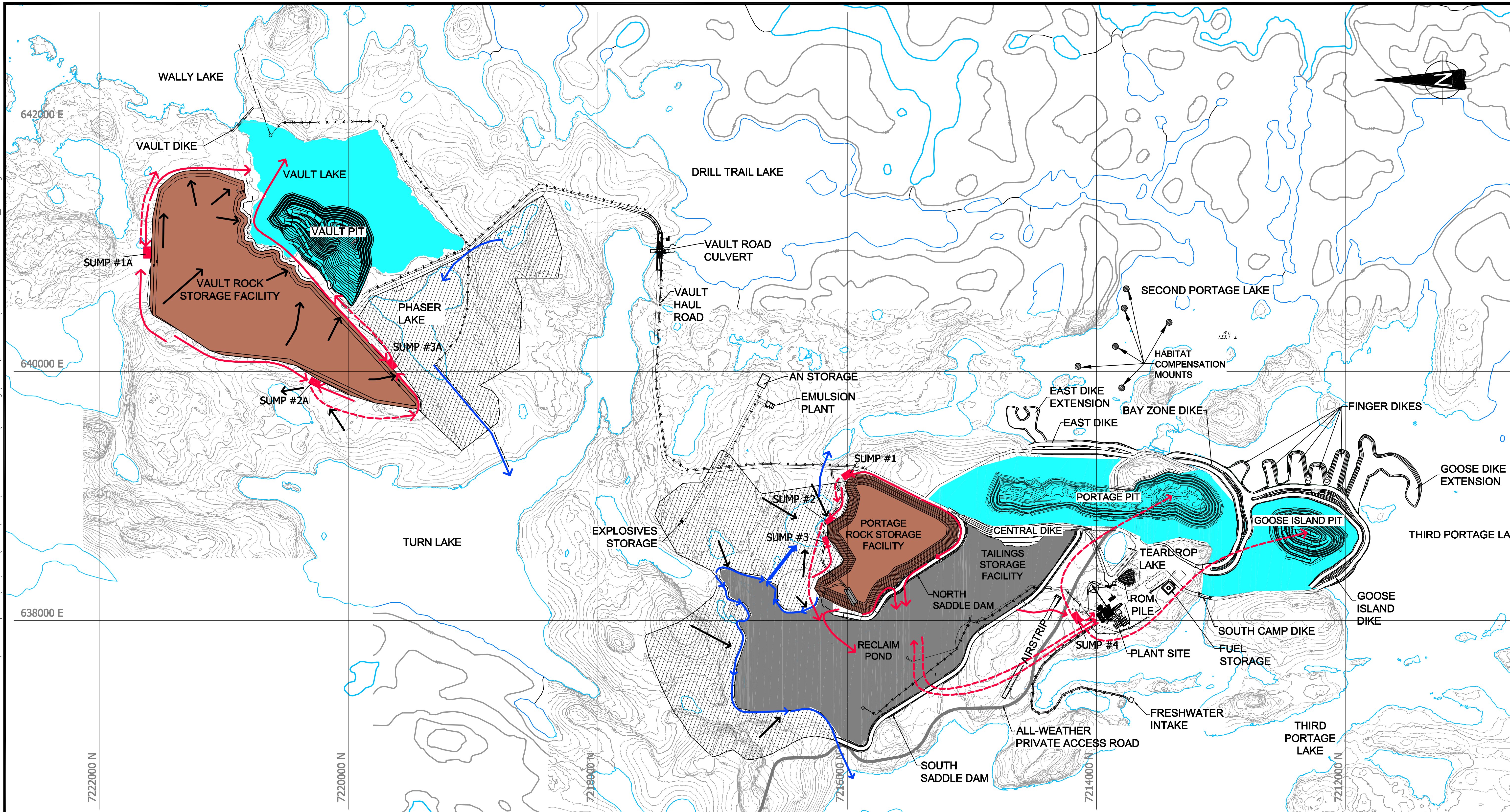
Figures 4.6 and 4.7 show the closure and post-closure concept for the Meadowbank mine. The waste storage facilities will be progressively closed during mine operations. A dry cover of NPAG UM rock will be placed over PAG waste rock piles and the TSF to confine the permafrost active layer within relatively inert materials.

All surface buildings and infrastructure will require reclamation and closure measures upon completion of mine operations. The primary crusher, ore storage building, mill complex, site services, and power plant will be dismantled and removed off site as salvage materials, or deposited in the open pits or Portage RSF. Other surface facilities (camp complex, the shop, warehousing and office complex, mine site tank farm, and miscellaneous dry storage facilities) will be dismantled and disposed of on site in the Portage RSF. All infrastructure that may be required for mine operations, closure and reclamation including the airstrip, roads, storage pads, quarries, granular borrow areas (if present), ditches and sumps will be re-contoured and/or surface treated according to site specific conditions to minimize erosion from surface runoff and wind blown dust, and enhance the development site area for revegetation and wildlife habitat.

At the end of active mining operations, rock berms will be placed around the perimeters of the pits that will be above water to restrict access and minimize hazards to people and wildlife. Re-watering of the Goose Island Pit and Portage Pit will commence before the completion of mining activities at Vault. All of the pits will eventually be flooded.

The Reclaim Pond will remain in place until mining has been completed. At this time, the water within the Reclaim Pond will be monitored and treated, if necessary, prior to discharge to the Goose Island or Portage pit lakes. If necessary, treatment of reclaim water may be in-situ (within the Reclaim Pond) or via a water treatment plant converted from the Process Plant. Once drained, the Reclaim Pond area will be filled with acid buffering ultramafic rock, and contoured to promote drainage Additional surface water collecting within the Reclaim Pond area will be monitored and treated, if necessary, prior to release to the Goose Island or Portage pit lakes. Once monitoring indicates that the runoff water quality is acceptable for mixing with receiving lakes, surface water runoff will be allowed to flow to Third Portage Lake untreated.

Goose Island Pit will be flooded during Years 4 to 11 and Portage Pit will be flooded during Years 5 to 12. During this period of time, water collecting within the pit lake will be monitored, and in-situ treatment will be applied if required. Once monitoring results demonstrate that the water quality meets MMER and Nunavut Drinking Water criteria, the Goose and Portage pit lakes will be hydraulically re-connected with Third Portage Lake.



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LEGEND:

- TAILINGS
- WASTE ROCK
- PIT LAKE
- DIVERTED AREA
- WATER DIVERSION DITCH
- SURFACE RUNOFF

NOTES

1) GRID REFERENCE: NAD 83, UTM ZONE 14.
2) CONTOUR INFORMATION ON LAND SUPPLIED BY MEADOWBANK MINING CORPORATION.

REFERENCES

1) AMEC AMERICAS LTD., DRAWING NUMBER A1-131395-100-C-0001 (100-C-0001.DWG), MEADOWBANK FEASIBILITY STUDY, APRIL 2005.

0 300 600 900 1200 1500

Scale in Metres

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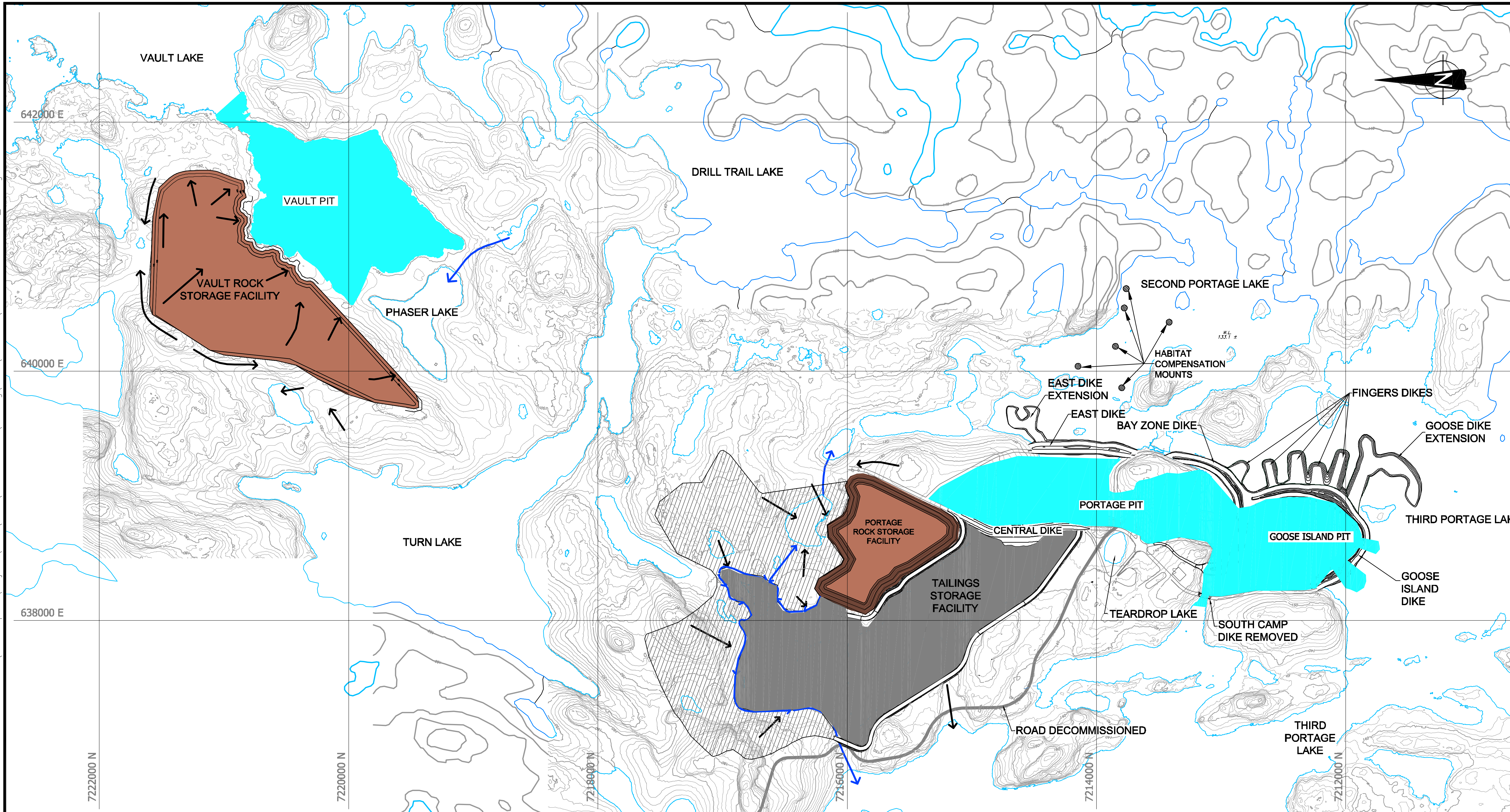
CLOSURE PHASE

FIGURE 4.6



LEGEND

- TAILINGS
- WASTE ROCK
- PIT LAKE
- DIVERTED AREA
- WATER DIVERSION DITCH
- SURFACE RUNOFF

NOTES

1) GRID REFERENCE: NAD 83, UTM ZONE 14.
2) CONTOUR INFORMATION ON LAND SUPPLIED BY MEADOWBANK MINING CORPORATION.

REFERENCES

1) AMEC AMERICAS LTD., DRAWING NUMBER A1-131395-100-C-0001 (100-C-0001.DWG), MEADOWBANK FEASIBILITY STUDY, APRIL 2005.

0 300 600 900 1200 1500

Scale in Metres

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POST CLOSURE PHASE	FIGURE 4.7

REVISION DATE: 07/08/20 09:44AM By: ASalvador CADD FILE: N:\Bur-Graphics\Projects\2006\1413\06-1413-089\Drafting\FINAL\Doc. 485\061413089-1400-FIG_4.7.dwg

The Vault Attenuation Pond will be allowed to fill upon cessation of mining activities. Water quality will be monitored, and in-situ treatment will be undertaken if necessary. Once monitoring results demonstrate that the water quality meets MMER and Nunavut Drinking Water criteria, the Vault Dike will be breached, and the reflooded Vault Lake will be hydraulically re-connected with Wally Lake.

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

Further details on the Closure and Reclamation Plan, including and estimate of security for the Project, are provided in the supporting document *Meadowbank Gold Project Preliminary Closure and Reclamation Plan* (MMC 2007h).

SECTION 5 • PROPOSED WATER QUALITY DISCHARGE LIMITS

During the first five years of mining operations at the Meadowbank Gold Project, the Portage Attenuation Pond will receive water that has had either physical or chemical contact with mining activities (contact water) exclusive of water derived from the ore processing stream (process water). The Attenuation Pond will function to remove suspended solids, nutrients, and metals from contact water prior to discharge to the environment.

Excess water will be discharged from the Portage Attenuation Pond annually during the open water season to the Third Portage Lake in order to maintain an optimum pond elevation and accommodate seasonal fluctuations in inflow volumes (e.g., freshet). Similarly, during the later years of mining operations, the Vault Attenuation Pond will operate in the Vault Mining Area receiving contact water from the mine facilities. Effluent from the Vault Attenuation Pond will be pumped to Wally Lake annually during the open water season. The Vault Attenuation Pond will be managed in order to allow collection and storage of surface runoff water during the spring freshet and prevent possible seepage of water from the pond through the active zone to the Vault Pit.

MMC is committed to discharge water that meets the receiving water discharge criteria for the Project. It is anticipated the effluent from the Portage and Attenuation Ponds will be near neutral pH with low TDS (roughly 70% to 80% of the water collected in the attenuation ponds is derived from low TDS groundwater pumped from the operating open pits). Predictive equilibrium thermodynamic modeling of the water suggests that the effluent will meet all MMER water quality guidelines (Golder 2007m). The water quality within the attenuation ponds will be monitored on a regular basis and should the water quality in the pond exceed MMER guidelines prior to discharge, water treatment will be applied to bring the water within the regulatory standards.

Effluent from both the Portage and Vault attenuation ponds will be piped and discharged to the respective receiving environments using submerged diffusers. The diffusers are designed with an objective to protect aquatic life and human health. As such, the discharge criteria for the effluent outfall diffusers are:

- MMER water quality guidelines at the point of discharge at the diffuser nozzle
- Revised Regulations of the Northwest Territories (RRNWT) drinking water quality guidelines and as close as possible to the CCME aquatic life water quality guidelines or background concentrations at the boundary of a 30-m radius mixing zone from the center of the diffuser.

These criteria are regularly applied in several jurisdictions in Canada.

Water quality of the discharge plume will be monitored during periods of outfall in both Third Portage and Wally Lake at:

- Near-field sites identified in the *Meadowbank Gold Project Aquatic Effects Management Program* (Cumberland 2005) lying near the diffusers but outside of the mixing zones or,

- Site specific monitoring stations lying outside of and downstream from the boundary of the mixing zones.

Further details on the placement and configuration of the Third Portage and Wally Lake effluent outfall diffusers are discussed in detail in the following supporting documents:

- *Conceptual Design of the Effluent Outfall Diffuser for Wally Lake* (Golder 2007g)
- *Assessment of Effluent Dilution Potential for the Third Portage Lake Diffuser* (Golder 2007h)

Further details on the site water quality predictions and proposed water quality discharge limits are provided in the supporting documents *Water Quality Predictions, Meadowbank Gold Project, Nunavut* (Golder 2007m) and *Proposed Discharge Water Quality Criteria for the Portage and Vault Attenuation Ponds* (Golder 2007n), respectively.

SECTION 6 • ENVIRONMENTAL MONITORING PLANS

Monitoring plans have been developed for the Meadowbank Gold Project to ensure that waste and water are being managed appropriately, and that any unexpected impacts to the receiving environment can be isolated and handled in an efficient and timely manner. Should monitoring of any mine site component show that the existing management strategy being implemented is insufficient in preventing impacts to the receiving environment, corrective actions will be taken to mitigate any undue impacts that have already occurred, and the management plan(s) in question will be revised and updated to prevent further impacts.

The results of monitoring will be reported in annual monitoring reports to be submitted to NWB and other Regulatory Agencies, as required.

6.1 PERMAFROST MONITORING

Several of the Meadowbank Gold Project components benefit from, or require, freezing conditions. During construction, operation, and closure of these facilities, thermistor strings will be installed and ground temperatures monitored to ensure predicted geothermal performance is in accord with actual performance.

Instrumentation and monitoring programs will be implemented during the development and operational stages of the mine to assess and evaluate thermal modelling predictions. An adaptive management approach will be adopted to include adequate instrumentation and monitoring, and continuing review and evaluation of the assumptions used in the modelling so that adaptations to the waste and water management systems can be incorporated into the final closure design, as necessary.

Instrumentation will include the installation of vertical thermistor strings in the Central dike and TSF, including extension into the talik beneath the TSF, to allow the monitoring of freezing progression (Golder 2007a). Consideration will be given to installing horizontal thermistor cables in the tailings beaches throughout a number of the active deposition stages for the facility. It is also proposed to install monitoring wells into the talik to monitor groundwater chemistry. Waste RSFs will also be instrumented with thermistors to monitor the freezing progression. The adaptive management strategies will also include the installation of thermistors into the rock mass beneath the Vault Pit to monitor the thermal regime in this area to confirm predictions.

Although freezing of the dewatering dikes is not considered a significant contributor to their performance, thermistor installations will be installed along the dewatering dike alignments to monitor the thermal regime within the dikes during operations and during the monitoring and maintenance phase of the Project (Golder 2007c, 2007b).

Further details on the permafrost monitoring are provided in the following supporting documents:

- *Meadowbank Gold Project Mine Waste and Water Management* (MMC 2007a);
- *Detailed of Central Dike, Meadowbank Gold Project* (Golder 2007a);

- *Detailed design of Dewatering Dikes, Meadowbank Gold Project* (Golder 2007c); and
- *Report Addendum: Detailed Design of Dewatering Dikes, Meadowbank Gold Project* (Golder 2007b).

6.2 ROCK STORAGE FACILITY MONITORING

In order to effectively assign waste to specific locations, sampling and testing will be required during operation to segregate the PAG and/or ML waste from the NPAG waste. Sampled materials will be inclusive of stripped till, drill core or pit walls, and blasthole cuttings. It is not proposed that stripped lake bed sediments will be sampled, as the total excavated volume of these materials is expected to be relatively low (i.e. less than approximately 1,180,000 m^3). The proposed tests are as follows:

- total sulphur, total carbon, and net acid generation (NAG) tests to estimate ARD potential of all waste samples collected during operation;
- total arsenic, copper, nickel and zinc tests to estimate leaching potential of all IF and Portage/Goose IV samples that have been classified as NPAG; and,
- total arsenic tests to estimate leaching potential of all UM and Vault IV samples that have been classified as NPAG.

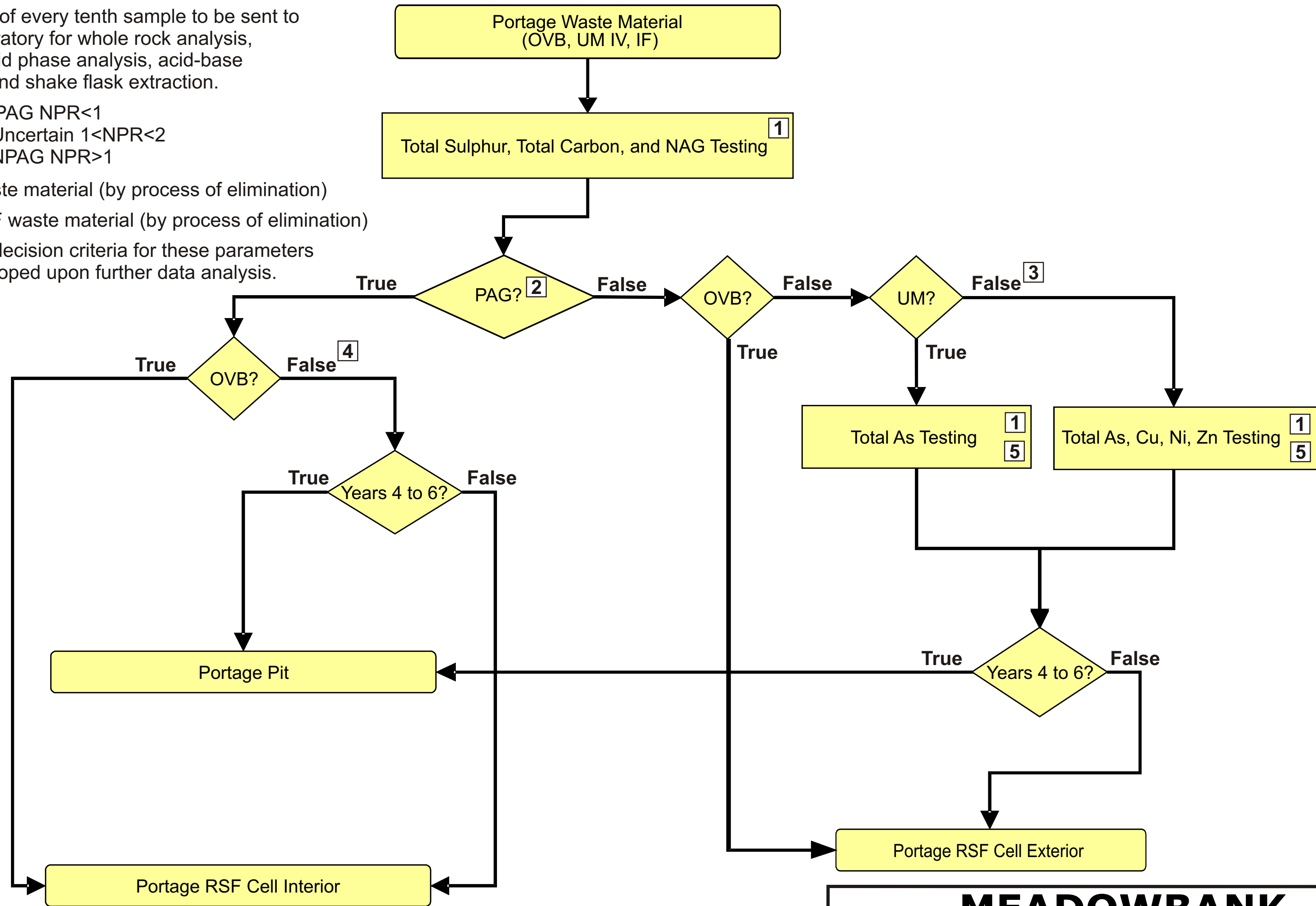
An overview of the samples on which these tests are to be conducted is provided in Figure 6.1 to 6.3. It is anticipated that these tests will be conducted at the assay lab to be constructed on site, which is expected to be running prior to production. Any wastes that are produced prior to the completion of the assay lab will require testing at an external laboratory.

Previously tested samples from Meadowbank were classified according to the criteria presented in Table 6.1. It is initially proposed that the waste samples submitted to the assay lab be classified according to these guidelines, using NPR values calculated from the total sulphur and total carbon contents provided by the assay lab. Any samples that are classified as having an “uncertain” ARD potential using these guidelines will be considered PAG for the purpose of material placement. These criteria will be re-evaluated on a bi-annual basis, as additional ABA, total sulphur, total carbon, and NAG test data become available. Should the NAG test be found to be a more useful or accurate indicator of ARD potential in the future, it may be used to classify waste materials according to ARD potential on site instead.

Table 6.1: Summary of ARD Guidelines Used to Classify Meadowbank Waste (INAC, 1992)

Initial Screening Criteria	ARD Potential
NPR < 1	Likely Acid Generating (PAG)
1 < NPR < 2	Uncertain
2 < NPR	Acid Consuming
	Not Potentially Acid Generating (NPAG)

1. A subsample of every tenth sample to be sent to external laboratory for whole rock analysis, elemental solid phase analysis, acid-base accounting, and shake flask extraction.
2. INAC, 1992: PAG NPR<1
   Uncertain 1<NPR<2
   NPAG NPR>1
3. IV and IF waste material (by process of elimination)
4. UM, IV and IF waste material (by process of elimination)
5. Site-specific decision criteria for these parameters may be developed upon further data analysis.



OVB	- Overburden	As	- Arsenic
UM	- Ultramafic	Cu	- Copper
IF	- Iron Formation	Ni	- Nickel
IV	- Intermediate Volcanic	Zn	- Zinc
NAG	- Net Acid Generation	RSF	- Rock Storage Facility
PAG	- Potentially Acid Generating		
NPAG	- Not Potentially Acid Generating		

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PORTAGE WASTE TESTING LOGIC DIAGRAM

FIGURE 6.1

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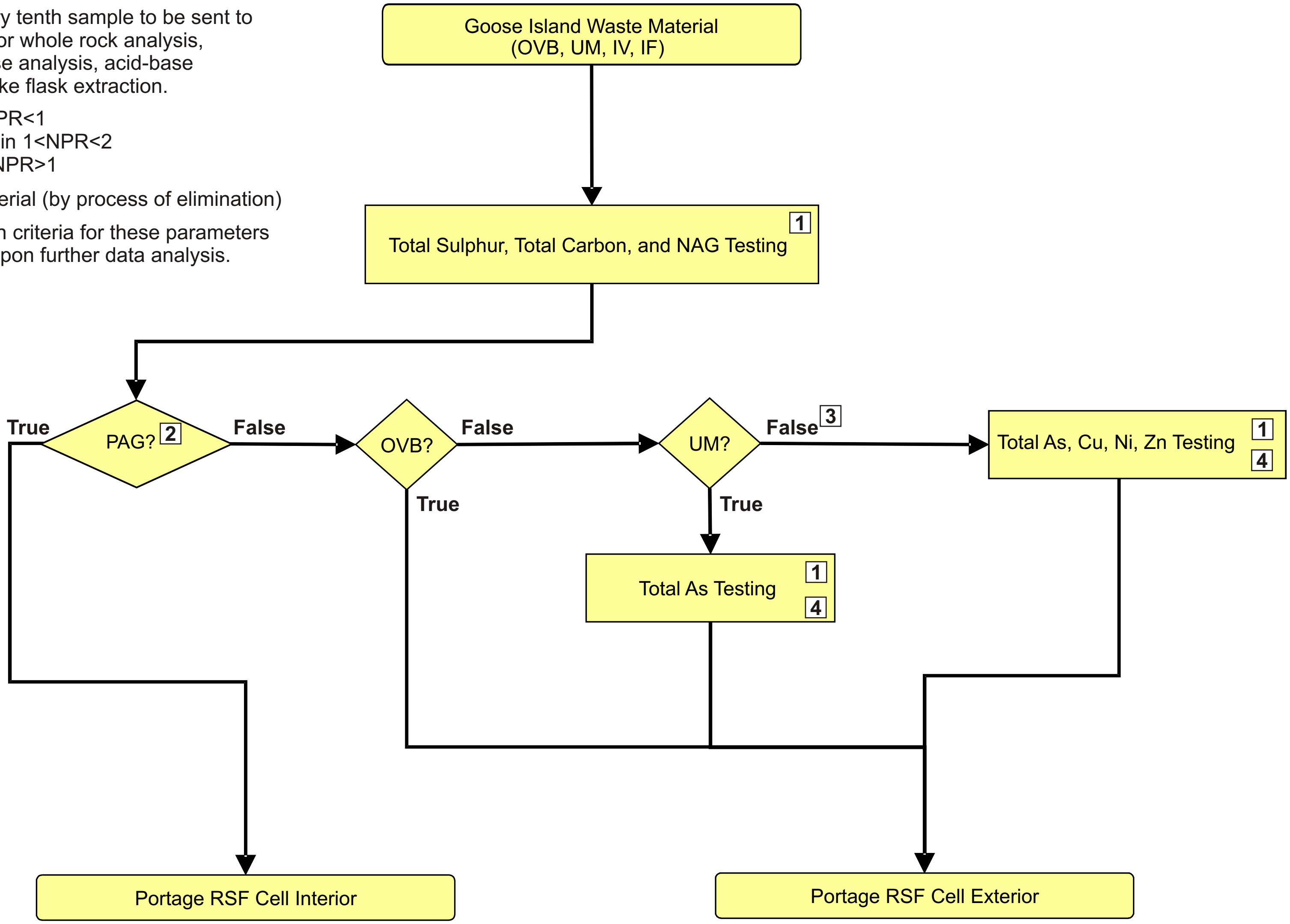
1. A subsample of every tenth sample to be sent to external laboratory for whole rock analysis, elemental solid phase analysis, acid-base accounting, and shake flask extraction.
2. INAC, 1992: PAG NPR<1
   Uncertain 1<NPR<2
   NPAG NPR>1
3. IV and IF waste material (by process of elimination)
4. Site-specific decision criteria for these parameters may be developed upon further data analysis.



OVB - Overburden
UM - Ultramafic
IF - Iron Formation
IV - Intermediate Volcanic
NAG - Net Acid Generation
PAG - Potentially Acid Generating
NPAG - Not Potentially Acid Generating

As - Arsenic
Cu - Copper
Ni - Nickel
Zn - Zinc
RSF - Rock Storage Facility

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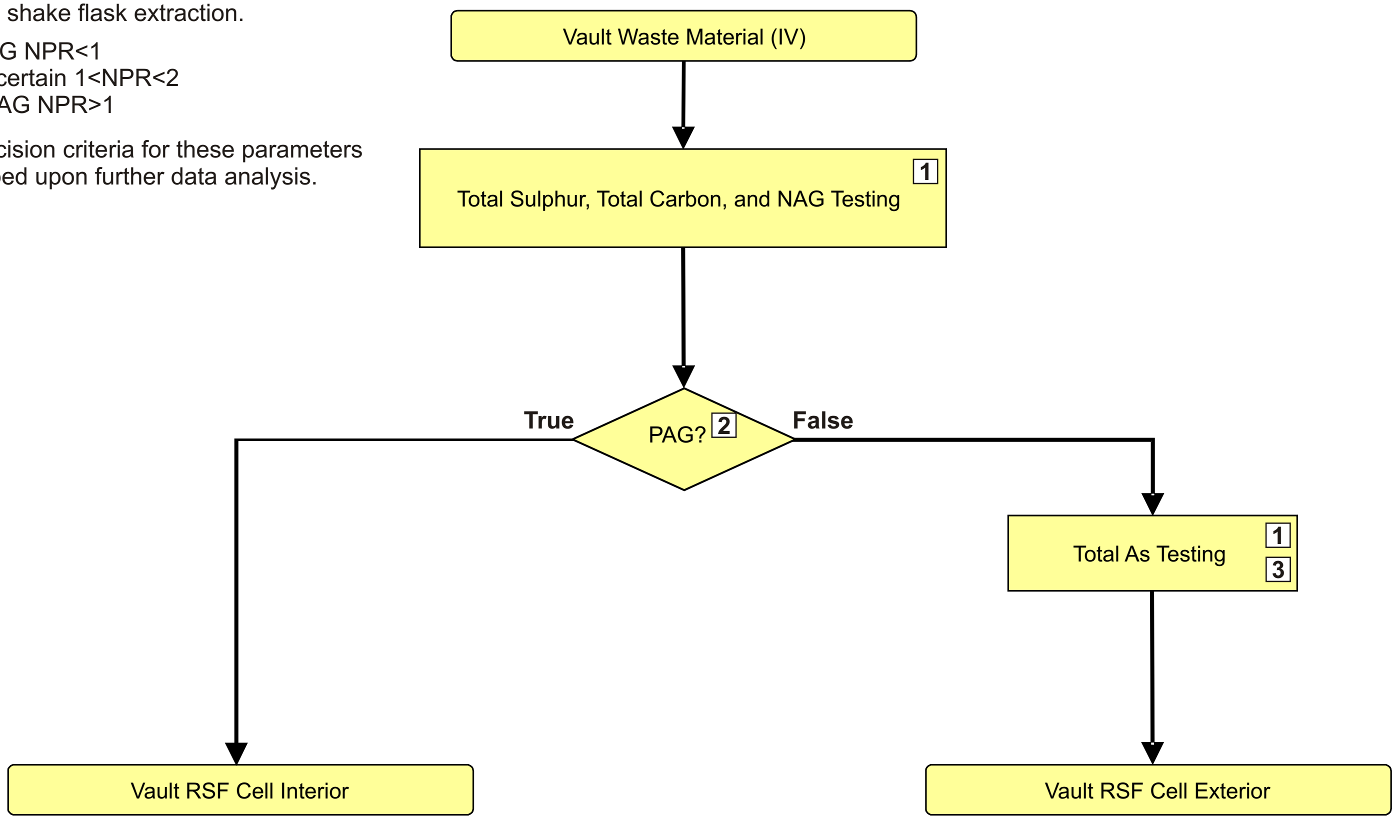
GOOSE ISLAND WASTE TESTING LOGIC DIAGRAM

FIGURE 6.2

DRAWING DATE: 16-Mar-07 COREL FILE: N:\Bur-Graphics\Projects\2006\1122\06-1122-386\Drafting\5000\06-1122-386-5000-A_3-.cdr

1. A subsample of every tenth sample to be sent to external laboratory for whole rock analysis, elemental solid phase analysis, acid-base accounting, and shake flask extraction.
2. INAC, 1992: PAG NPR<1
   Uncertain 1<NPR<2
   NPAG NPR>1
3. Site-specific decision criteria for these parameters may be developed upon further data analysis.



NAG - Net Acid Generation
PAG - Potentially Acid Generating
NPAG - Not Potentially Acid Generating
RSF - Rock Storage Facility
As - Arsenic

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VAULT WASTE ROCK TESTING LOGIC DIAGRAM

FIGURE 6.3

In order to assess ML potential, it is proposed that total concentrations of individual metals of concern be tested at the assay lab on site, and that periodic SFE tests be conducted on duplicate samples at an external laboratory, in order to assess whether correlations between total and leachable metals can be made[1]. If such correlations can be established, criteria that classify the ML potential of materials based on total concentrations of individual metals of concern will also be established. It is also proposed that the drainage from the RSFs and UM stockpile be monitored for metals of concern.

As a cross-check for the total sulphur, total carbon, NAG, and total metal tests to be conducted on site, it is proposed that duplicate samples of the material sent to the assay lab be sent to an external laboratory for ABA and SFE testing, as well as elemental solid phase and whole rock analyses. It is currently recommended that these tests be carried out on every 10th sample that is submitted to the assay lab for total sulphur, total carbon, NAG and/or total metal tests. Depending on how the results of these tests correlate with the total sulphur, total carbon, NAG, and total metal test results, this external testing frequency may be adjusted, along with decision criteria used to segregate the waste materials produced on site.

Further details on the sampling and testing of waste rock are provided in the supporting document *Meadowbank Gold Project Operational ARD/ML Testing Plan* (MMC 2007d).

6.3 TAILINGS MONITORING

Groundwater monitoring wells will be installed beneath and downstream of the TSF. Water samples will be periodically collected from the monitoring wells, and analysed to evaluate the quality of the groundwater. It is planned that some of these monitoring wells will be installed into faults beneath the TSF and downstream of the TSF. The location of these faults will be identified during the investigations conducted in the area of the TSF, which will include mapping of exposed bedrock, testing and monitoring during installation of the proposed grout curtain in the Central Dike, and geophysical logging and packer testing in boreholes. In addition to monitoring wells, thermistors will be installed in the Central Dike through to its foundation, and in the area between the downstream (pit side) toe and the pit crest to monitor freezeback of tailings, the dike structure and of the till and bedrock materials (Golder 2007a).

During the excavation of the Portage Pit, the quality of seepage into the pit, particularly those seeps emanating from the west wall of the pit which is closest to the Central dike, will be monitored (MMC 2007b). Should either the monitoring wells or pit wall seepage demonstrate that seepage from the TSF has occurred through the fault, or may occur through the fault, and that the volume of seepage requires modifications to the water management plan, then mitigative measures will be taken to limit the flow through the fault. These measures may include grouting of the fault zone, and/or artificial freezing of the fault zone and talik underlying the TSF (Golder 2007f).

Further details on the monitoring of tailings, including optional mitigation measures that may be undertaken should it be determined that seepage has occurred from the TSF through the faults, or that tailings freezeback is not progressing as fast as is predicted based on the thermal modelling, are provided in the following supporting documents:

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[1] It has not been possible to make such correlations based on the data obtained to date.

- *Meadowbank Gold Project Fault Testing and Monitoring Plan* (MMC 2007b);
- *Mitigative Measures for Potential Seepage from Tailings Facility* (Golder 2007f)
- *Meadowbank Gold Project Mine Waste and Water Management* (MMC 2007a); and
- *Detailed of Central Dike, Meadowbank Gold Project* (Golder 2007a).

6.4 INCINERATOR MONITORING

MMC is committed to developing a detailed Incinerator Waste Monitoring Program prior to the start of mine operations. The monitor program will designed to monitor the quantity and type of materials incinerated on site, as well as stack emissions.

Details of the Incinerator Waste Monitoring Program will be provided to NWB once it is complete. The results of the monitoring and testing will submitted in an annual report to the NWB, Government of Nunavut (GN), Environment Canada (EC), and NIRB.

6.5 LANDFILL MONITORING

The leachate from the landfills is anticipated to be very weak due to the controls on materials placed in the landfill and thus site specific landfill leachate management or monitoring is not considered to be required. Drainage water from the landfills will be routed to the Portage RSF drainage system and will be monitored as part of the Site Water Quality Monitoring Plan (see section 6.8).

During the first year of mine operations, three samples of incinerator ash will be tested to confirm that it is a non-hazardous waste and to determine the sodium chloride (salt) content. These samples will be collected on three separate occasions

Further details on Landfill monitoring are provided in the supporting documents *Meadowbank Gold Project Water Quality and Flow Monitoring Plan* (MMC 2007c) and *Landfill Design and Management Plan, Meadowbank Gold Project* (Golder 2007i).

6.6 LANDFARM MONITORING

MMC is committed to developing a detailed Landfarm Monitoring Program prior to the start of mine operations. The monitor program will designed to monitor the effectiveness of soil remediation within the facility, and to identify additional mitigative measure to improve efficiency, if required.

Details of the Landfarm Monitoring Program will be provided to NWB once it is complete. The results of the monitoring and testing will submitted in an annual report to the NWB, Government of Nunavut (GN), Environment Canada (EC), and NIRB.

Further details on the proposed landfarm are provided in the supporting document *Landfarm Option Analysis, Meadowbank Gold Project, Nunavut* (Golder 2007j).

6.7 HAZARDOUS MATERIALS STORAGE AREA MONITORING

Hazardous materials storage areas include sites for the storage of fuels and lubricants, explosives and Process Plant consumables, as well as associated secondary or spill containment areas.

Drainage into and from storage areas will be controlled in order to prevent leaks or spills from migrating off-site and to avoid run-off from entering the storage areas. In the event of an accidental release, each incident will be assessed by the MMC personnel for additional sampling and testing required for complete cleanup.

The condition of hazardous materials storage areas, containers, tanks, connectors and associated plumbing will be checked and noted on a regular basis. Drums/containers will be inspected for the presence and legibility of symbols, words or other marks identifying the contents, signs of deterioration or damage such as corrosion, rust, leaks at seams or signs that the drum/container is under pressure such as bulging and swelling, spillage or discoloration on the top or sided of the drum/container.

Additional information on hazardous material management on site is provided in the following support documents:

- *Meadowbank Gold Project Hazardous Materials Management Plan* (MMC 2007e).
- *Meadowbank Gold Project Spill Contingency Plan* (MMC 2007f).
- *Meadowbank Gold Project Emergency Response Plan* (MMC 2007g).

Further details regarding water quality monitoring during unexpected events are provided in Section 6.8 and in the supporting document *Meadowbank Gold Project Water Quality and Flow Monitoring Plan* (MMC 2007c)

6.8 MINE SITE WATER QUALITY MONITORING

The Site Water Quality Monitoring Plan (SWQMP) is a comprehensive program designed to monitor the performance of the waste and water management plans to:

- Verify and validate the predicted water quality of contact water at the Meadowbank site by empirical measurement of the water quality and flows; and
- Provide an adaptive management plan with detailed site specific trigger levels and action plans designed to control impacts to the receiving environment.

The SWQMP has been divided into four levels of investigation to characterize the range of impacts between the sources of contact water in the individual mine facilities and the point of discharge or release of contact water to the receiving environment. The four levels of monitoring from the point of discharge to the individual sources of contact water include:

Compliance Monitoring Program (CM) which are sites that either discharge directly to the receiving environment or interact with the receiving environment.

Internal Monitoring (**IM**) which are sites or sources of contact water reporting to CM sites or are sites monitored for operational purposes.

Site Specific Monitoring (SSM) which are sites that address specific point source water quality, groundwater quality and receiving water quality.

Event Monitoring (EM) which are sites resulting from unexpected events such as spills, accidents, and malfunctions.

The SWQMP provides guidelines keyed to each phase of the mine development from the construction phase through the operations, closure, and post-closure phases of the Meadowbank deposit. The plan includes guidelines that are facility and mining phase specific for each of the four monitoring levels (CM, IM, SSM, and EM) for: monitoring locations, monitored parameters, and monitoring frequency. In addition, the plan provides recommendations for the sampling and analyses programs, quality control and quality assurance (QA/QC), and monitoring results reporting. The plan also identifies pumped intervals of contact water between mine facilities that are scheduled to be monitored for flow volume monitoring.

The SWQMP provides trigger levels and actions plans within the CM and IM monitoring levels for each mine facility for which there are water quality predictions for compliance with the adaptive management program. When key monitored parameters exceed their respective trigger levels, site specific action plans are triggered and contingencies implemented.

Further details on predicted mine water quality and mine site water quality monitoring are provided in the supporting documents *Water Quality Predictions, Meadowbank Gold Project, Nunavut* (Golder 2007m) and *Meadowbank Gold Project Water Quality and Flow Monitoring Plan* (MMC 2007c), respectively.

6.9 RECEIVING WATER QUALITY AND FISH HABITAT MONITORING

The *Meadowbank Gold Project Aquatic Effects Management Program* (AEMP) (Cumberland 2005) and *Meadowbank Gold Project No-Net-Loss (NNLP)* Plan (Cumberland 2006) describe in detail the receiving water quality, and fish and fish habitat monitoring to be completed during the construction, operation, closure and post-closure phases of the Project. The monitoring described in both documents is considered complementary, and is designed to detect potential adverse effects on aquatic VECs arising from any mine-related activity, in order that (further) mitigation can be applied as necessary to eliminate or reduce adverse effects.

MMC is committed to working closely with DFO and the community to ensure the development of an appropriate monitoring framework that addresses key concerns of all stakeholders.

6.9.1 Aquatic Effects Management Program (AEMP)

The AEMP takes an integrated, ecosystem-based approach that links mitigation and monitoring of physical/chemical effects on key ecological receptors in the receiving environment. The AEMP has two main elements: mitigation and monitoring. Mitigation is incorporated into mine design from the beginning, but it can also be improved/changed or added based on learning and the results of monitoring. The AEMP has two primary components or layers: (1) *Core Monitoring Program* and (2) *Targeted Studies*.

6.9.1.1 Core Monitoring Program

The core program consists of a general strategy to monitor water and sediment quality, periphyton, benthic invertebrates, and fish that is tailored based on mine construction, operation, and infrastructure (e.g., dikes, effluents, etc.). This program will be developed in detail and implemented prior to and during construction and operation of the mine and will be conducted each year, until closure. The core program provides the foundation against which potential mine-related changes in chemical, physical, or biological characteristics of the receiving environment can be detected and acted upon, if necessary.

The core monitoring program will be conducted in four areas to ensure that mine-related impacts (both predicted and unexpected) are detected early and supplemental mitigation can be promptly implemented. The basic premise is to establish a series of stations in two arcs that surround each of the mine developments, with near-field and far-field stations as well as a Tehek Lake station and reference stations (Figure 6.4).

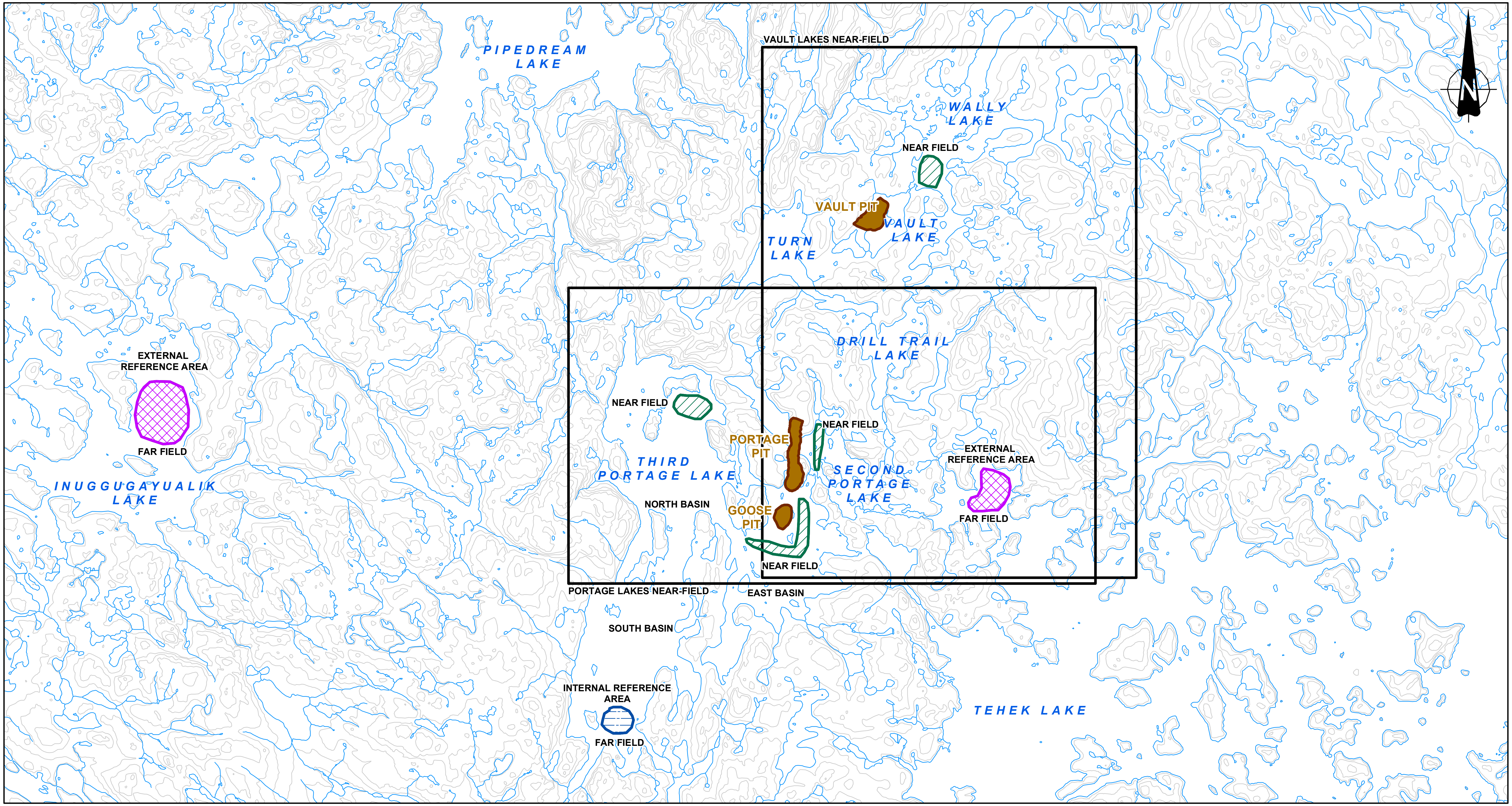
Near-field area – Stations will be situated in close proximity to the development, in particular near dikes and effluent sources. These stations provide the first line of defence or early-warning locations for introductions of stressors into the receiving environment. Based on modelled predictions of water quality, the dikes are not expected to have measurable effect on lake water pH.

Mine footprint area – Contact water quality in ditches and diversions around the mine site will be routinely monitored for TSS and metals concentrations. This is important to verify water quality predictions of contact water from the mine site (e.g., waste rock piles, roads, and airstrip) and loading of metals to attenuation ponds, and to determine potential hazards to wildlife that may drink from ditches containing metal-contaminated contact water.

Far-field area – Stations will be situated further offshore or away from the near-field stations encircling the near-field stations. These stations will determine if impacts can be discerned over a wider spatial field, further downstream of the mine-development.

The Tehek Lake area – Tehek stations are key stations that will ultimately determine whether or not contaminants are detectable downstream of the entire mine development. Lake waters from Second and Third Portage lakes and the Vault lakes (Vault, Wally, and Drill Trail) meet at the southern end of Second Portage Lake and discharge via a single channel into Tehek Lake.

Reference Lakes area – By definition, reference stations are sufficiently removed from the mine that they are presumed to be unaffected by any infrastructure (roads, dikes, runways) and point sources (aerial and aquatic) associated with mine development. Monitoring of reference areas is important because it is necessary to distinguish between possible mine-related changes in water quality or ecological parameters and natural changes, unrelated to the mine.



LEGEND

- EXTERNAL REFERENCE AREA
- INTERNAL REFERENCE AREA
- NEAR FIELD
- PIT
- WATER
- CONTOUR (10 M INTERVAL)

0 1000 2000 3000 4000 5000
Scale in Metres

REFERENCES

1) TOPOGRAPHIC DATA: CUMBERLAND RESOURCES LTD. AND OTHER DATA FROM AZIMUTH CONSULTING GROUP INC.
2) HORIZONTAL DATUM: NAD83 PROJECTION: UTM ZONE 14N

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PROJECT LAKES MONITORING AREAS

FIGURE 6.4

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6.9.1.2 Targeted Monitoring Program

Targeted studies are specific studies that typically have narrower temporal or spatial bounds or are designed to address specific questions related to particular components of mine development during construction or operation. These are integrated with and are complementary to the core monitoring program.

Examples of where targeted monitoring might be appropriate include:

- if a specific activity merits special study, for example, to monitor the performance of mitigation measures during dike construction;
- as part of a response to an unforeseen event (e.g., spill, unexpected environmental change); and,
- where an impact occurs that cannot be fully mitigated, or if there is uncertainty about the magnitude or extent of predicted effects.

In the last case, a targeted study would be designed and carried out to determine if adverse effects are actually occurring.

6.9.2 No-Net-Loss Plan (NNLP)

Consistent with the environmental management approach for the Project as a whole, monitoring will play an important role in successful implementation of the fish habitat compensation measures under the NNLP. In general, there will be two components to the NNLP Monitoring: Pre-implementation and Post-enhancement Monitoring. As with the AEMP, the strategy of adaptive management is an integral part of the monitoring of NNL enhancement features in the project lakes. Monitoring results will be used to provide feedback on NNLP implementation to maximize overall benefits to fish productivity and avoid significant impacts.

6.9.2.1 Pre-Implementation & Operational Monitoring

A central component of the NNLP is upgrading low quality or value fish habitat to high quality habitat. Operational improvements or enhancement programs are primarily associated with dike faces and the Goose Island finger dikes. Planned activities associated with developing the Meadowbank Gold Project (e.g., exposure of fish habitat through lake dewatering, monitoring of dike submerged dike slopes, etc.) will provide a valuable opportunity to refine the understanding of the key features that combine to make high quality fish habitat and utilization by fish. Several years of habitat assessment and monitoring experience will be gained prior to undertaking the bulk of habitat enhancement that will take place at post-closure. Thus, adaptive management will allow for optimization of habitat features prior to re-flooding and recovery of large amounts of habitat.

6.9.2.2 Post-Enhancement Monitoring

Performance monitoring of NNLP enhancement areas will be necessary to show they are functioning as intended. The staging of enhancement implementation (i.e., some during operations and others post-closure) provides an opportunity for adaptive management. The success of the engineered finger dikes as high value enhancement feature will be monitored during the operational period to provide direct feedback, along with the results of pre-implementation monitoring, to final design of post-closure enhancement features.

Although design specifications can meet life history requirements for fish, other factors must also be satisfied if fish habitat compensation measures are to function as productive habitat for plants, invertebrates, and fish. As such, a number of targeted monitoring programs or studies will be completed including:

Metal Leaching to Pore Water - metals leached from dikes into overlying pore waters could adversely affect periphyton growth, establishment of a benthic community, and egg survival and/or development of fish larvae during the initial flush shortly after dike construction. Pore water from the interstitial spaces within East Dike and Goose Island Dike will be sampled for dissolved metals concentrations up to four times during the first year of operation. Species composition, abundance, and biomass of periphyton communities will also be measured at discrete locations on the East dike and Goose Island dike and compared with periphyton data from reference areas. This will indicate whether the dikes are functioning as productive fish habitat by determining whether algal growth is impaired to any degree by metals leached from the rock material used to construct the dikes. Sampling will be conducted once annually in late summer during the height of periphyton growth from rock surfaces with similar attributes (e.g., depth, exposure to sun, aspect) to minimize inherent variation in periphyton biomass.

Lake Trout Spawning - A targeted study is also proposed to determine the extent to which dikes are used for spawning by lake trout. Similar methods, such as short-set gill nets during fall and underwater video will document whether fish are utilizing dike faces and finger dike habitat for spawning. Sampling for eggs under the ice, or for larvae during early spring at break-up will be used to provide direct evidence of spawning and egg survival. If necessary, fish can be spawned artificially and egg traps placed within the dike face material to determine egg survival and survival of fry prior to emergence and swim-up. These targeted studies will verify if dike face habitat is functioning as designed using the principals of adaptive management.

It is important to realize that the colonization of newly enhanced habitat by algae and benthic invertebrates will likely take several seasons and affect the degree of usage of these areas by fish. Furthermore, these lakes are not habitat limited. If, during the first few years, little or no activity is observed, it does not mean that the installed fish habitat compensation works are not productive habitat. As such, the results of monitoring will be used in consultation with DFO and the community to refine and adapt the monitoring program, if required, as mine operations proceed.

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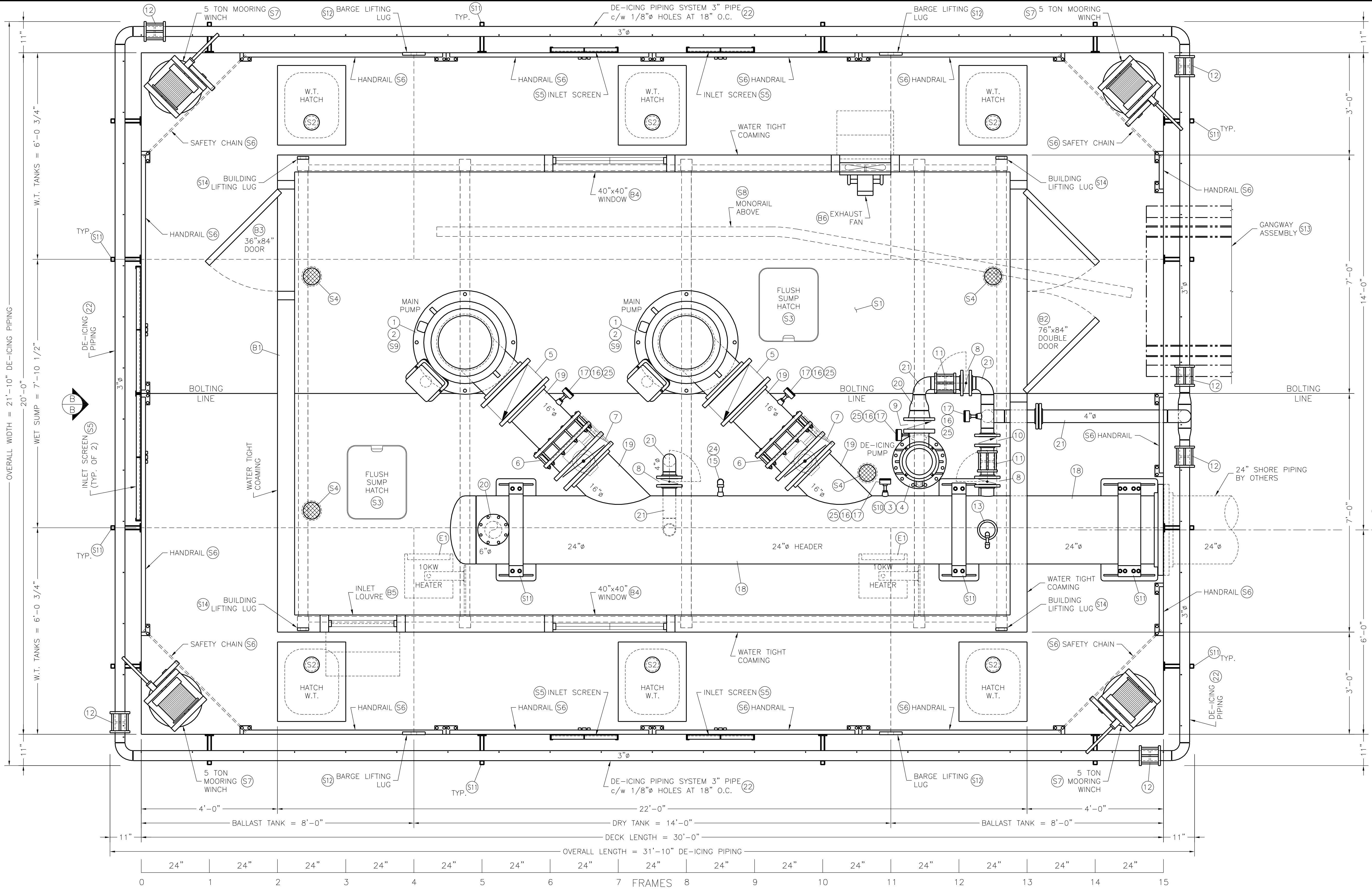
APPENDIX A

Freshwater Intake Barge Conceptual Drawings



PLAN VIEW
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FOR APPROVAL
CHAMCO INDUSTRIES LTD.

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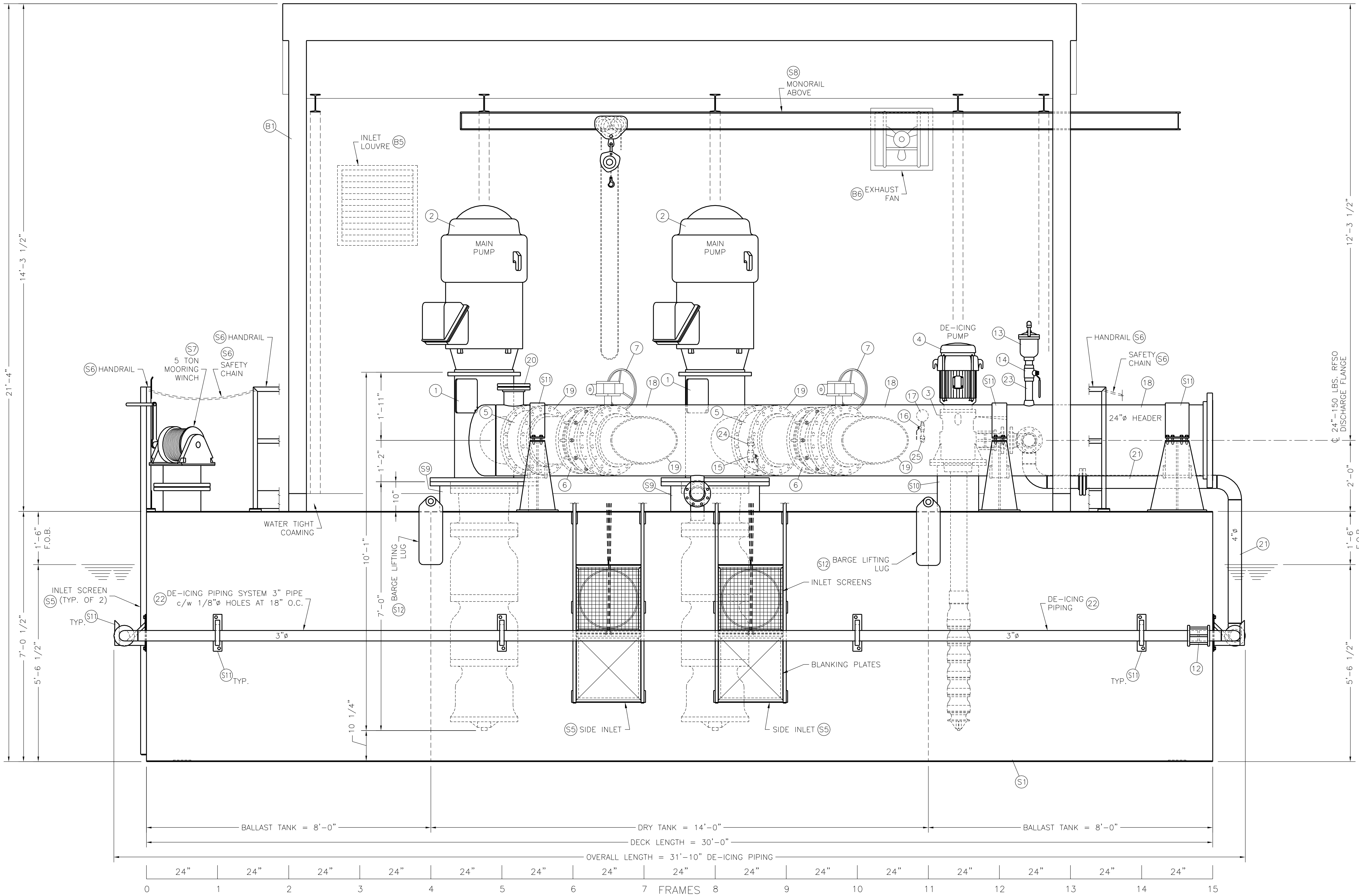
CHAMCO
CHAMCO INDUSTRIES LTD.
VANCOUVER – CALGARY – EDMONTON – PRINCE GEORGE

INMET MINING CORPORATION
c/o MET – CHEM CANADA
TROILUS PROJECT
PURCHASE ORDER No. A-31038

RECLAIM WATER BARGE
30'-0" x 20'-0" x 7'-0" HULL DIMENSIONS

PLAN VIEW

DESIGNED BY	D.J.C.
DRAWN BY	M.E.C.
CHECKED BY	D.C.G.
JOB No.	1011160ABS
DATE	27.06.05
SCALE	N.T.S.
DWG No.	C1011158-21
REV.	1



ELEVATION VIEW (A/A)
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PRELIMINARY
FOR APPROVAL
CHAMCO INDUSTRIES LTD.

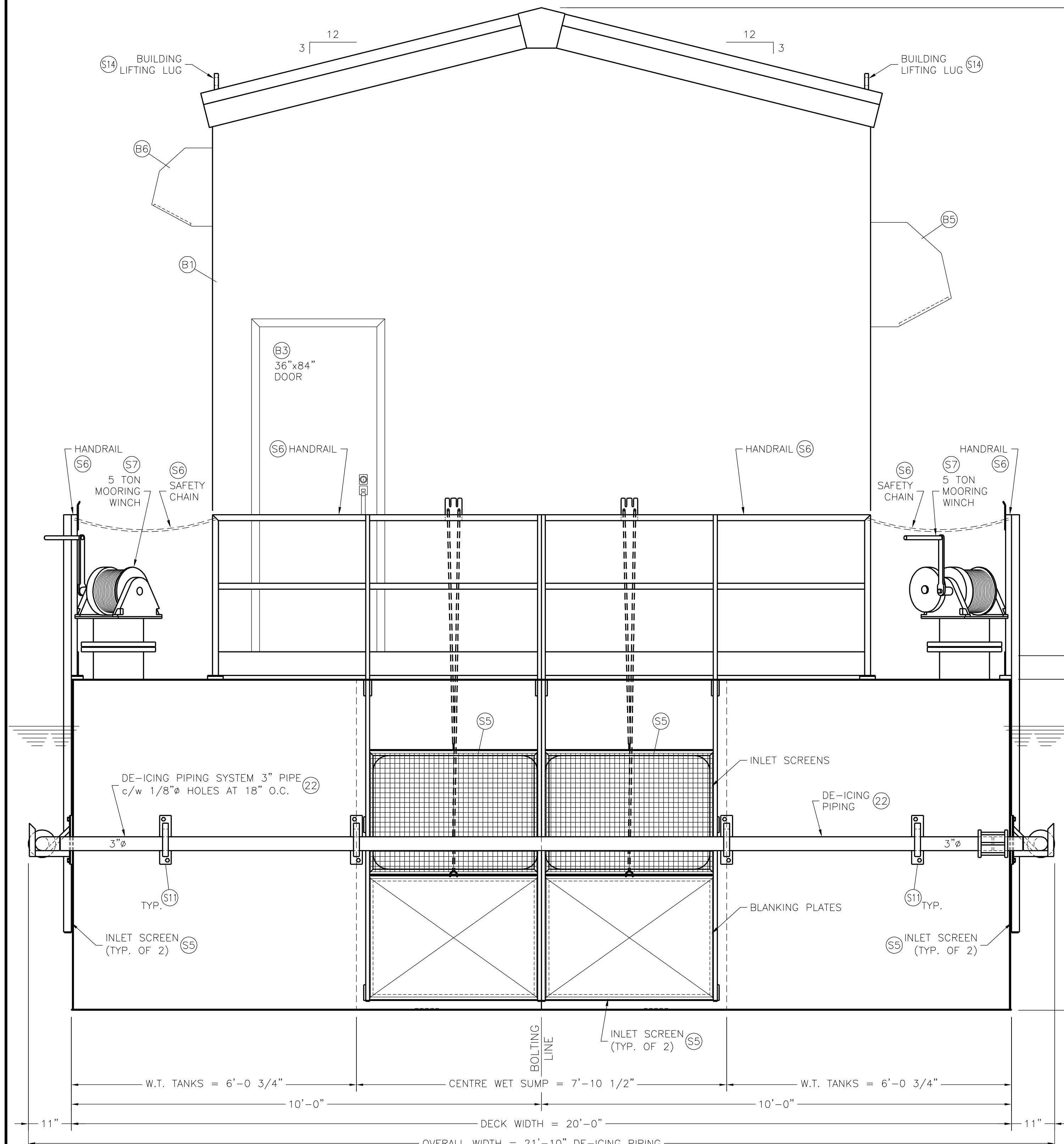
CHAMCO
CHAMCO INDUSTRIES LTD.
VANCOUVER – CALGARY – EDMONTON – PRINCE GEORGE

INMET MINING CORPORATION
c/o MET – CHEM CANADA
TROILUS PROJECT
PURCHASE ORDER No. A-31038

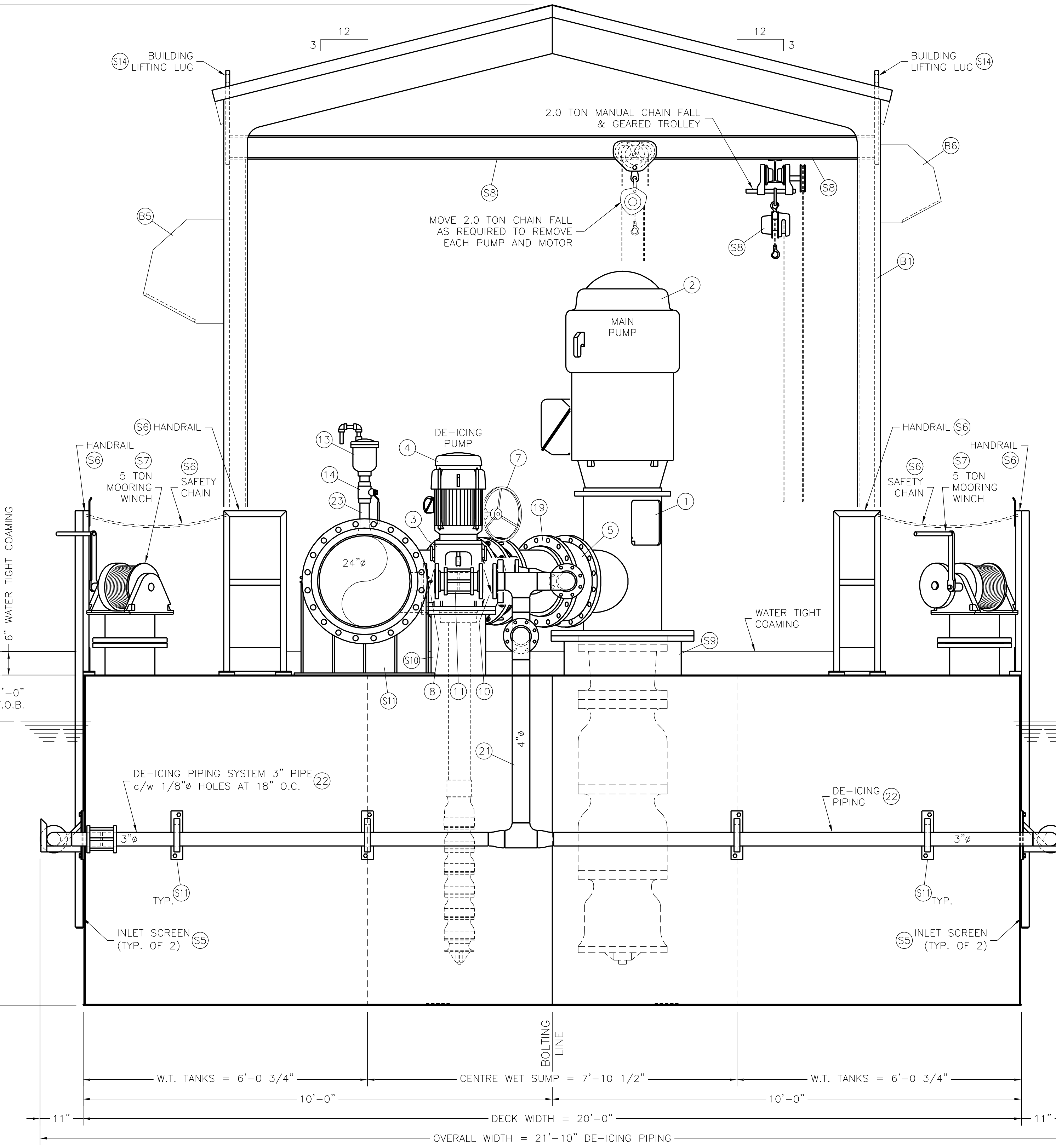
RECLAIM WATER BARGE
30'-0" x 20'-0" x 7'-0" HULL DIMENSIONS

ELEVATION VIEW A-A

DESIGNED BY	D.J.C.
DRAWN BY	M.E.C.
CHECKED BY	D.C.G.
JOB No.	1011160ABS
DATE	27.06.05
SCALE	N.T.S.
DWG No.	C1011158-22
REV.	1



ELEVATION VIEW B/B
SCALE: 1 TO 35



ELEVATION VIEW C/C
SCALE: 1 TO 35

REV.	DATE	BY	DESCRIPTION
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PRELIMINARY
FOR APPROVAL
CHAMCO INDUSTRIES LTD.

CHAMCO
CHAMCO INDUSTRIES LTD.
VANCOUVER – CALGARY – EDMONTON – PRINCE GEORGE

INMET MINING CORPORATION
c/o MET – CHEM CANADA
TROILUS PROJECT
PURCHASE ORDER No. A-31038

RECLAIM WATER BARGE
30'-0" x 20'-0" x 7'-0" HULL DIMENSIONS

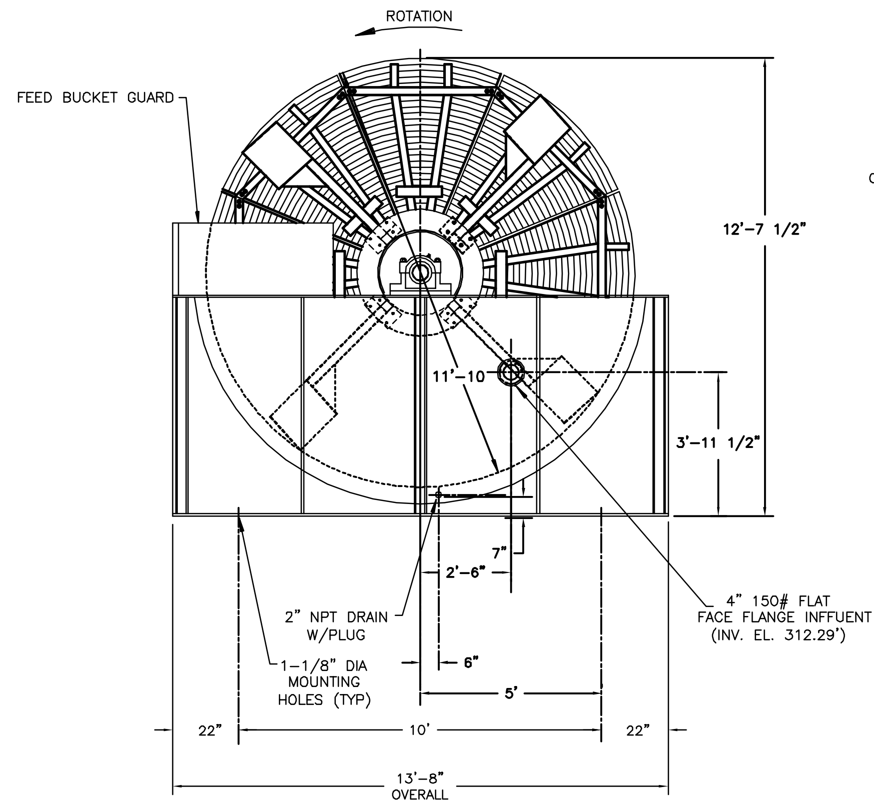
ELEVATION VIEW B-B & C-C

DESIGNED BY	D.J.C.
DRAWN BY	M.E.C.
CHECKED BY	D.C.G.
JOB No.	1011160ABS

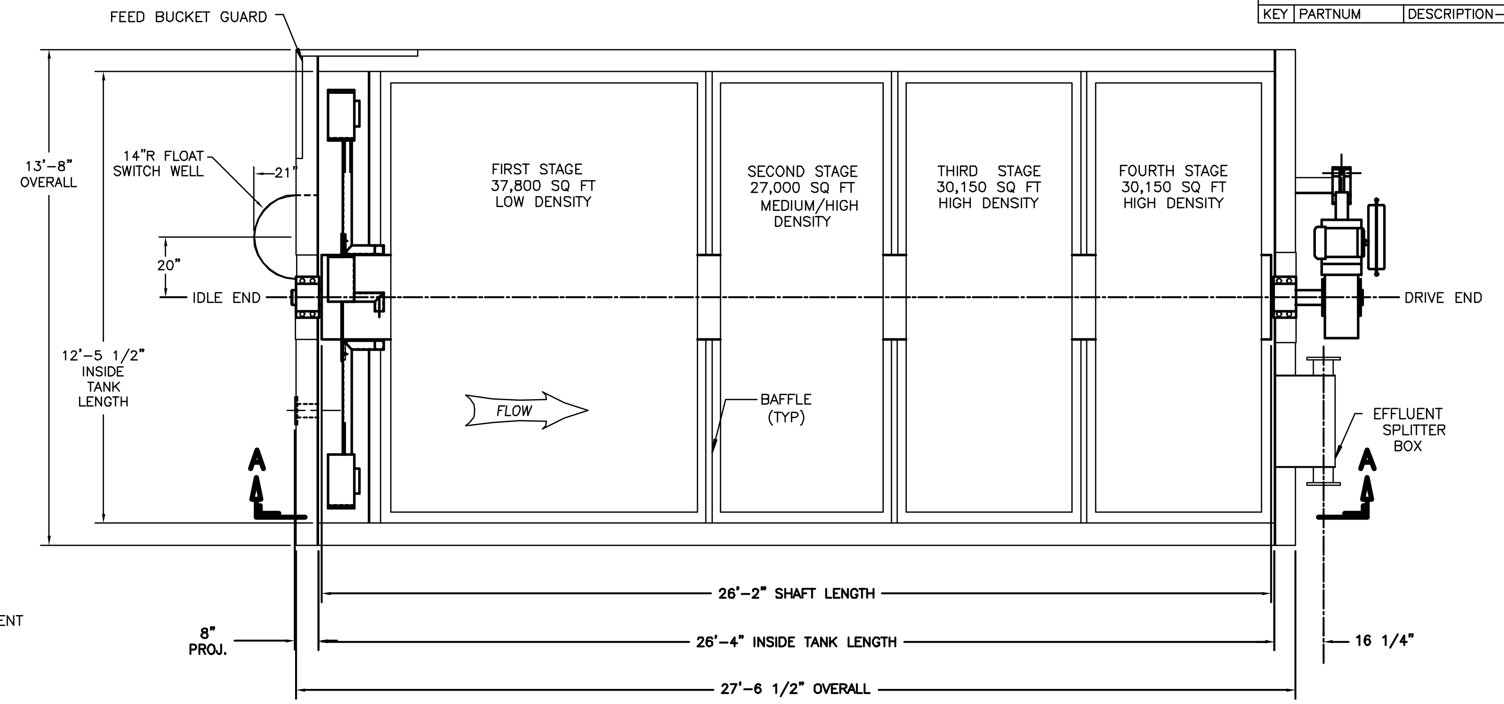
DATE	SCALE	DWG No.	REV.
27.06.05	N.T.S.	C1011158-23	1

APPENDIX B

Sewage Treatment Conceptual Drawings



IDLE & INLET END



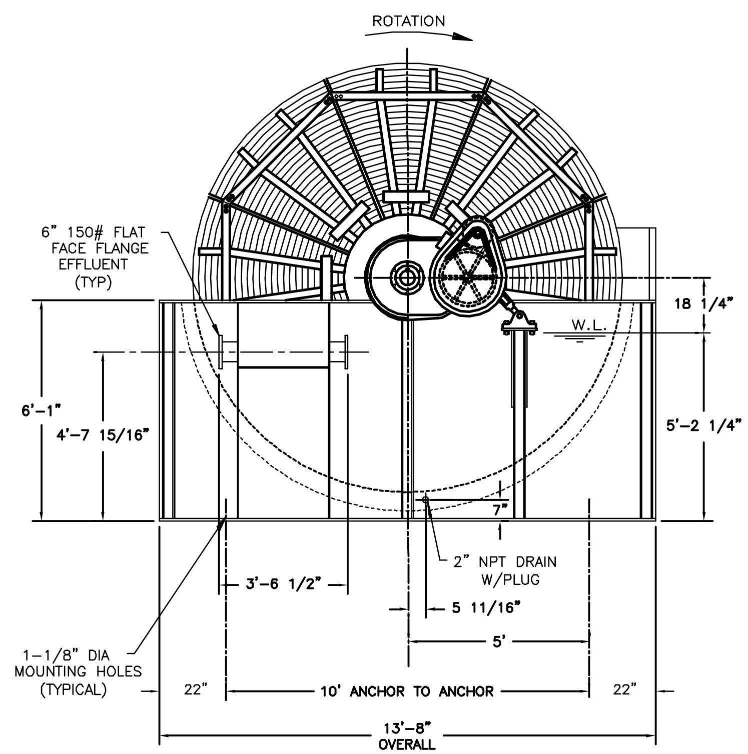
PLAN VIEW

MATERIAL LIST BOX

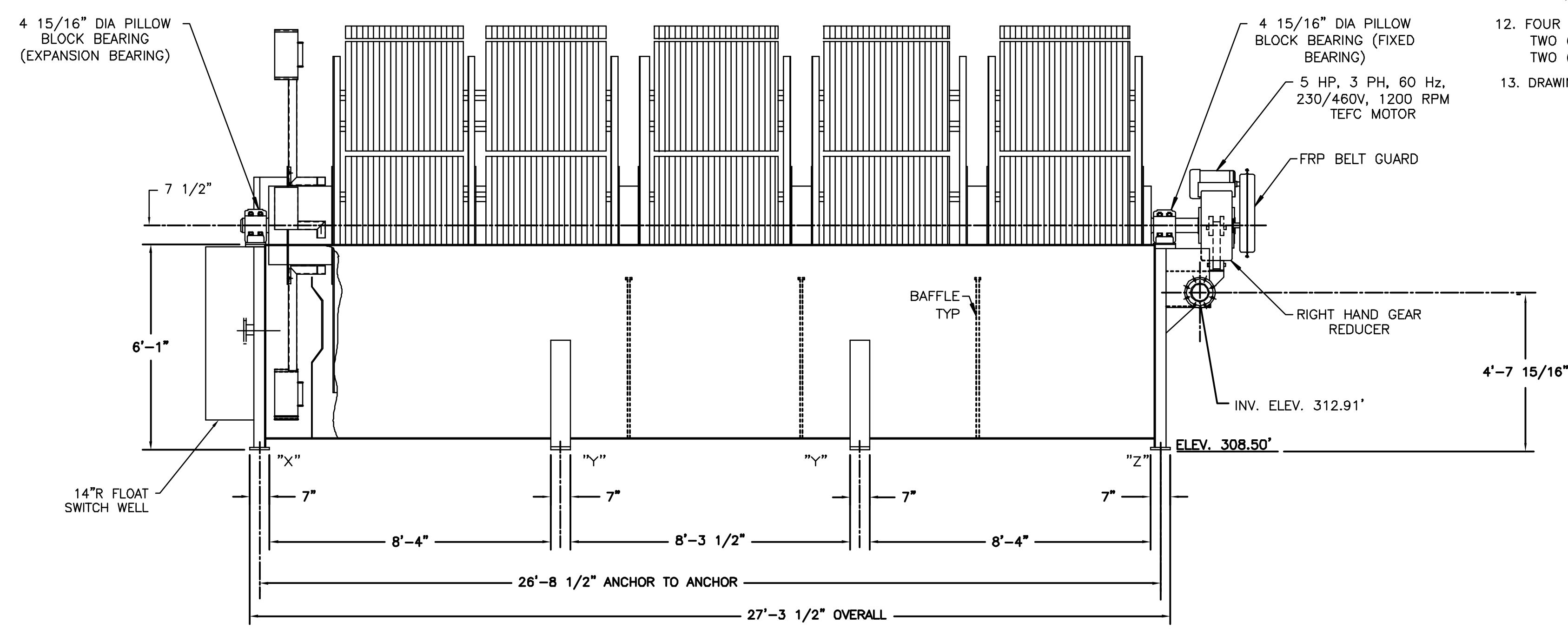
KEY	PARTNUM	DESCRIPTION-1	DESCRIPTION-2	PRI-DIM	SEC-DIM	UM	QTY

NOTES:

1. PURCHASER TO CONFIRM ALL DIMENSIONS.
2. ANY FOUNDATION, SLAB DESIGN AND ANCHORAGE CONSIDERATIONS BY PURCHASER.
3. RBC BEARING & TORQUE ARM BOLTS BY USFilter, ENVIREX PRODUCTS.
4. MATERIALS OF CONTRUCTION ARE:
   CENTRAL SHAFT: API 5L GRADE B CARBON STEEL PIPE 28" DIA. x 0.75" WALL
   BEARING STUB SHAFTS: AISI C1045 CARBON STEEL
   STRUCTURAL STEEL: ASTM A-36 CARBON STEEL
   MEDIA: HIGH DENSITY POLYETHYLENE
   MEDIA SUPPORT RODS: 1 1/2" FIBERGLAS REINFORCED PLASTIC
   GROMMET SLEEVE: ELASTOMER COMPOSITION
   BOLTS, NUTS, WASHERS: 18-8/316 STAINLESS STEEL.
5. CENTRAL SHAFT ASSEMBLY TO BE BLAST CLEANED TO SSPC-SP10, THEN PAINTED WITH TWO COATS OF EPOXY 10 TO 12 MILS MINIMUM DRY FILM THICKNESS.
6. MEDIA SUPPORT RING ASSEMBLIES TO BE HOT DIPPED GALVANIZED PER ASTM A-123, SECTION MP-252.02.
7. THE FOLLOWING ITEMS ARE SHIPPED LOOSE FOR FIELD ASSEMBLY/INSTALLATION BY OTHERS:
   A) GEAR REDUCER (1.5 SF. PER A.G.M.A. II RATING)
   B) DRIVE MOTOR
   C) V-BELTS AND SHEAVES
   D) BELT GUARDS
   E) BEARINGS
8. APPROXIMATE WEIGHTS:
   SHIPPING: RBC = 20,700 LBS.
   OPERATING: RBC = 52,200 LBS.
9. TANK DESIGN LOADING & BEARINGS 81,300 LBS.
10. APPROCIMATE OPERATING LOADS AT TANK SUPPORTS:
    AT "X" = 54,762#
    AT "Y" = 38,660#
    AT "Z" = 56,262#
11. ONE (1) RBC ASSEMBLIES REQUIRED.
12. FOUR (4) 7 GALLON FEED BUCKETS ARE PROVIDED. TWO (2) WILL BE FIXED VOLUME AND TWO (2) WILL BE VARIABLE VOLUME.
13. DRAWING IS NOT FOR FABRICATION.



DRIVE & EFFLUENT END



SECTION A-A

BAR = 1" AT PLOT SCALE

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CHECKER	HR	DATE	4-24-02
ENGINEER		DATE	
MANAGER		DATE	
FILE:		UPDATE:	
SCALE:	3/8"	SIZE:	D

TITLE
325LMHH-4-B – 125,100 SQ. FT.
ROTATING BIOLOGICAL CONTACTOR

CLIENT
CISCO SYSTEMS NEDC SITE 1

USFilter
DAVIS PRODUCTS
THOMASVILLE, GA
1-800-841-1550

PROJECT	CODE	DRAWING	SHEET	REV
10682		D10682RB-D2	1 OF 1	000

1) ALL INFORMATION AND DIMENSIONS GIVEN ARE PRELIMINARY IN NATURE AND INTENDED FOR INFORMATIONAL AND PLANNING PURPOSES ONLY. THIS ISSUE IS NOT TO BE USED FOR CONSTRUCTION AND/OR INSTALLATION AND ASSEMBLY OF EQUIPMENT.

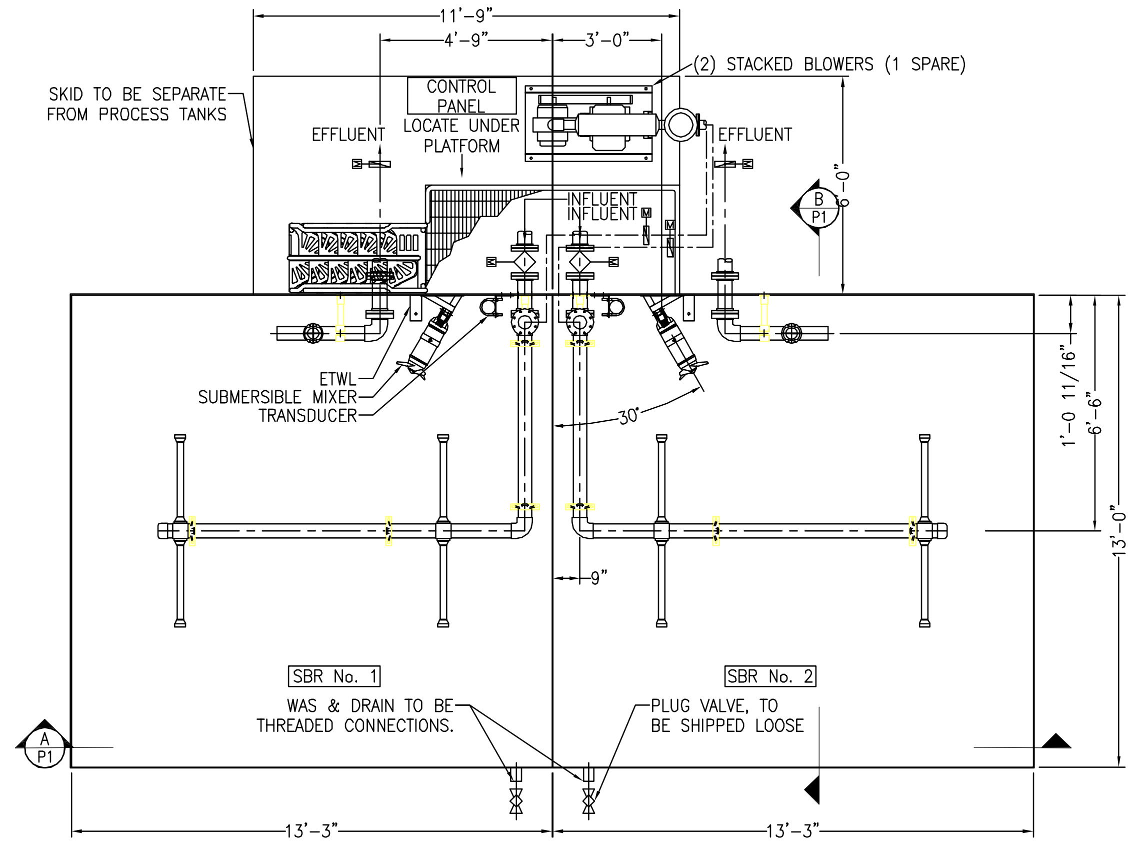
2) ALL FRP PIPE AND FITTINGS SHALL BE 75 PSI MIN. PRESSURE RATING.

3) ALL FLANGES FURNISHED BY JET TECH PRODUCTS SHALL MEET OUTSIDE DIAMETER, BOLT CIRCLE DIAMETER, NUMBER AND SIZE OF HOLES PER ANSI B.16.1 125 LB. CAST IRON, AND ANSI B16.5 150 LB. STEEL FLANGE SPECIFICATIONS.

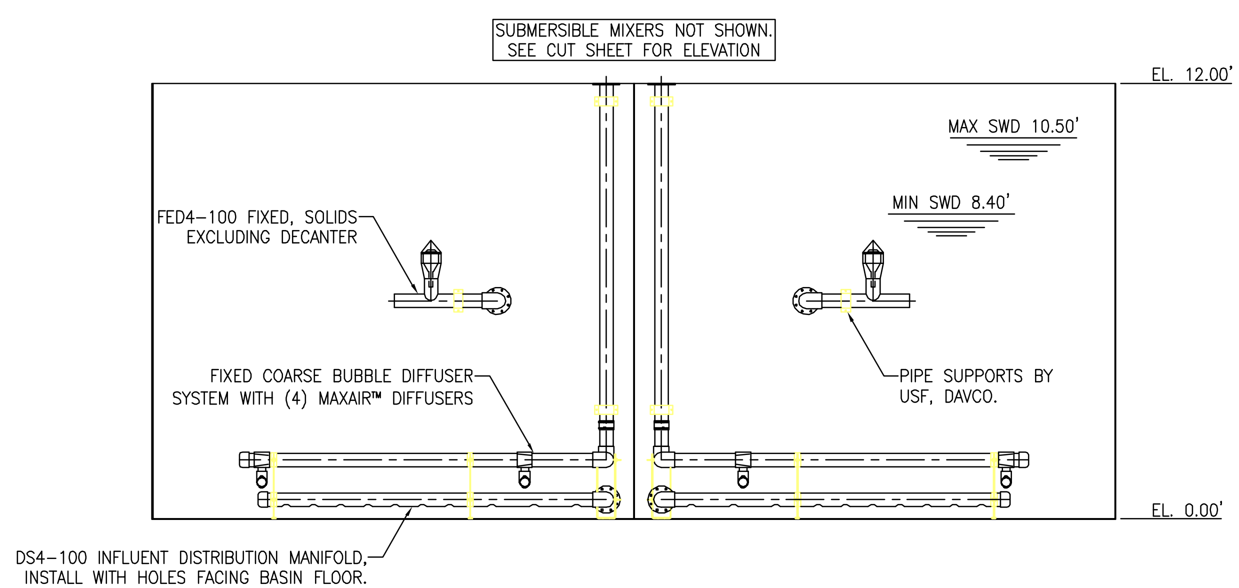
4) GASKETS SUPPLIED BY JET TECH PRODUCTS SHALL BE 3/16" THICK, FULL FACE BUNA-N RUBBER, WITH A DUROMETER HARDNESS OF 40-50 ON THE SHORE-A SCALE.

5) ALL DIFFUSERS SHALL BE HELD AT THE SAME DATUM LINE ELEVATION ± 1/4". DIFFUSER ELEVATION SHALL BE USED TO SET MANIFOLD ELEVATION. THE BASIN FLOORS SHALL NOT BE USED FOR ESTABLISHING ELEVATION.

6) LIGHTING, INTERCONNECTING WIRING AND CONCRETE PAD BY OTHERS.



PLAN VIEW
3/8" = 1'-0"



SECTION A P1 P1
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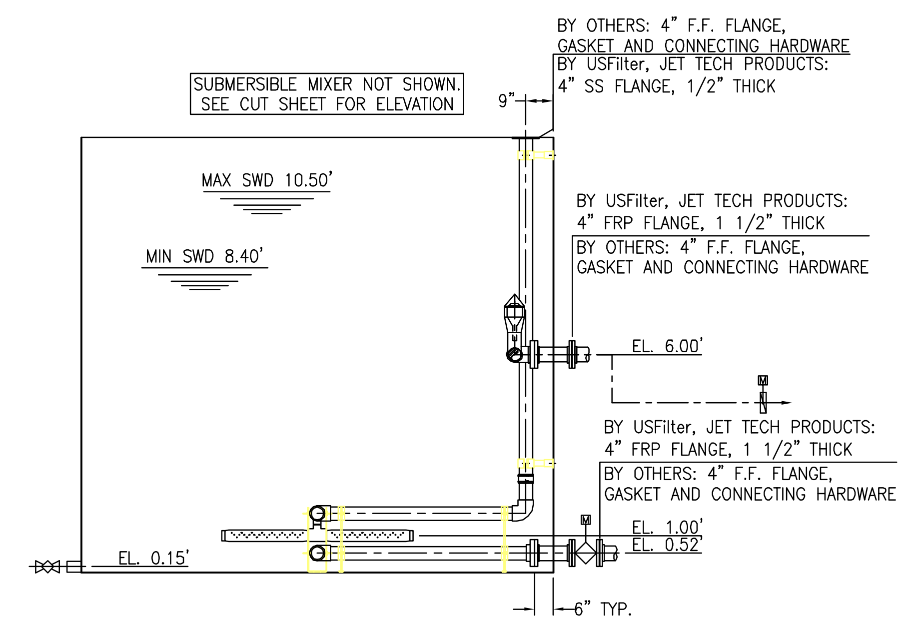

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CHECKER DATE
APP ENG DATE
PROJ MGR DATE
FILE: P1.DWG
SCALE: 3/8" = 1'-0"

TITLE 25,000 GPD PACKAGE OMNIFLO® SEQUENCING BATCH REACTOR PLAN & SECTION VIEWS WITH NOTES

CLIENT

USFilter JET TECH PRODUCTS EDWARDSVILLE, KS TEL: 913-422-7600

PROJECT	PURCHASE ORDER	DRAWING	SHEET	REV
PACKAGE25		P1	1 OF 1	–

STD: 0302-22X34D FILE LOCATION: F:\DRAWINGS\05p\PACKAGE BAR = 1" AT PLOT SCALE