**AGNICO-EAGLE MEADOWBANK**
555 Burrard Street, Suite 375
Box 209, Two Bentall Centre
Vancouver, British Columbia V7X 1M8
Tel. 604.608.2557 Fax. 604.608.2559

agnico-eagle.com

August 11, 2008

*Via email and Xpresspost*

Mr. Richard Dwyer
Licensing Administrator
Nunavut Water Board
PO Box 119
Gjoa Haven, NU X0B 1J0
Phone: (867) 360-6338

Dear Mr. Dwyer,

**Re: Meadowbank Water License 2AM-MEA0815: Document Submission**

As required by Water license 2AM-MEA0815, please find the following documents enclosed with this letter:

- Part H, Item 2: Spill Contingency Plan, please note that this document also includes revisions as per Water License 2BE-MEA0813 Amendment 1, Part H.
- Part I, Item 3: Ground Water Monitoring Plan
- Part I, Item 4: Operational ARD and ML Sampling and Testing Plan

Should you have any questions regarding this submission, please contact me directly at 604-622-6527 or via email at rgould@agnico-eagle.com.

Regards,

RL Gould

Rachel Lee Gould, M.Sc.
Project Manager, Environmental Permitting and Compliance Monitoring
*Encl (3)*

MEADOWBANK GOLD PROJECT

# Groundwater Monitoring Plan

In Accordance with Water License 2AM-MEA0815

Prepared by:
Agnico-Eagle Mines Limited – Meadowbank Division

Version 1
August 2008

# EXECUTIVE SUMMARY

This document presents the Meadowbank Mine Groundwater Monitoring Plan, a requirement of the Meadowbank Type A Water License No. 2AM-MEA0815 issued on June 09, 2008. Conditions applying to groundwater monitoring include the following:

> Part I, Condition 3: *The Licensee shall submit to the Board for approval, within thirty (30) days of License approval, a Ground Water Monitoring Plan*; and,
>
> Schedule 1, Table 2: annual monitoring of groundwater quality at well locations that are to be determined.

This Plan also supports Condition 8 of the Meadowbank Project Certificate No. 004, issued by the Nunavut Impact Review Board (NIRB) on December 30, 2006, which requires defective monitoring wells to be replaced.

## IMPLEMENTATION SCHEDULE

As required by Water License 2AM-MEA0815, Part B, Item 16, the proposed implementation schedule for this Plan is outlined below.

This Plan will be immediately implemented (August 2008) subject to any modifications proposed by the NWB as a result of the review and approval process**.**

## DISTRIBUTION LIST

AEM – Geology Superintendent

AEM – Senior Environmental Coordinator

## DOCUMENT CONTROL

| Version | Date (YMD) | Section | Page | Revision |
|---|---|---|---|---|
| 1 | 08/08/08 | | | Comprehensive plan for Meadowbank Project |
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Prepared By: _____
*Rachel Lee Gould*
*Project Manager, Environmental Permitting and Compliance Monitoring*

Approved by: _____
*Larry Connell*
*Regional Manager, Environmental, Social and Government Affairs*

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Figure 2: Schematic Monitoring Well Installation

# SECTION 1 • INTRODUCTION

This document presents the location and new design of the 3 replacement monitoring wells that are to be installed in 2008 and describes the groundwater sampling method to be used to recover samples of groundwater for chemical analysis.

# SECTION 2 • BACKGROUND

## 2.1 PURPOSE OF GROUNDWATER MONITORING

Groundwater quality data has been used to predict the future quality of water that will accumulate in the pits during operation, and to determine baseline groundwater quality underneath the tailings basin (the north arm of Second Portage Lake) before tailing deposition. To this end, groundwater monitoring wells have been installed to sample talik water (unfrozen ground beneath large lakes) in areas where through taliks exist. At these locations wells have been installed in each of the three main lithologies that will be encountered in the Goose Island and Portage pits, namely: Iron Formation (IF), Intermediate Volcanic (IV) and Ultramafic (UM) rock. No groundwater monitoring wells have been installed at the Vault deposit, as the Vault pit will be developed in an area where the talik does not extend down through the permafrost.

## 2.2 EXISTING MONITORING WELL INSTALLATIONS

Four of the seven wells currently at site were installed in 2003: MW03-01, MW03-02, MW03-03, and MW03-04. Three of these wells (MW03-02, MW03-03, and MW03-04) developed internal damage likely due to freezing, rendering them inoperable (Golder, 2004a; 2004b). In 2006, three additional wells (MW06-05, MW06-06, and MW06-07) were installed to replace the damaged wells. During the 2007 groundwater monitoring round, the three wells installed in 2006 were also found to be inoperable due to breakage or internal malfunction (MW06-05, MW06-06, and MW06-07). One groundwater well (MW03-01) remained operable at the end of the 2007 groundwater monitoring program.

The existing monitoring wells were designed to allow repeated sampling at each well; however, with time, usage and the harsh site conditions, the well pipe developed breakage or failures that rendered them inoperable. Maintenance of wells and replacement of inoperable wells is a condition of the NIRB project certificate and the Water License, and as such, a more robust installation has been designed to replace the damaged ones.

The proposed well locations have been moved outside the pit footprint to enable continued monitoring throughout mine life. The new design is anticipated to be more robust and includes redundant systems to minimize frost action on the instrumentation. The new design is anticipated to facilitate the sampling task and ensure accessibility of the well as mining progresses.

# SECTION 3 • REPLACEMENT MONITORING WELLS

## 3.1 LOCATION OF REPLACEMENT WELLS

The location of the new monitoring wells is intended to be as close as feasible to that of the existing ones but outside the pit outline to avoid their destruction during mining. The new wells will be screened at a similar depth and target the same formation as the previous ones, where possible. Five possible locations are proposed, from which 3 new wells will be chosen (Figure 1). The selected location of two of these 3 wells will depend on access at the time of drilling and installation. The location of the Second Portage Arm well MW08-01 is likely fixed.

In order to allow sufficient time to test the new, more robust, well designs, the 3 new wells are planned for installation in the 2008 and 2009 summer seasons. Table 1 presents the targeted location of the proposed new borehole (well) in UTM coordinates, azimuth, dip angle, total drilled depth and screened interval depth. These locations are shown on Figure 1.

**Table 3.1: Proposed New Monitoring Well Locations**

| New Well ID | Location UTM coordinates | | Azimuth (from true north) | Dip | Borehole depth | Rock Formation |
|---|---|---|---|---|---|---|
| | Easting | Northing | | | | |
| MW08-01 | 638562.34 | 7214355.91 | 045 | 60 | 200 m | IV |
| MW08-02 | 639185.90 | 7213901.29 | 010 | 60 | 200 m | IV |
| MW08-03 | 639232.61 | 7214448.12 | 200 | 60 | 200 m | UM |
| MW08-04 | 639341.86 | 7213928.95 | n/a | vertical | 150 m | unknown |
| MW08-05 | 639347.44 | 7214231.50 | n/a | vertical | 150 m | unknown |

### 3.1.1 Third Portage

Difficulties associated with well installation through permafrost would be avoided if wells were installed in a permafrost-free zone such as directly into the talik. This would be feasible by drilling vertical holes from and through the dike rock mass at locations where the lake bed is sufficiently deep for talik to be present at surface (uncertain but likely a minimum depth of 3 meters of water). Geological data interpreted from exploration boreholes within the pit area do not, however, extend to this area and consequently the rock formation at the proposed screened depth is unknown. Not withstanding this, two possible locations are proposed along the east dike, the accessibility of these locations will depend on the progress of dike construction. These sampling locations would allow monitoring of groundwater flow and quality between the proposed open pit and the lake on the other side of the dike (area with the greatest hydraulic head).

Two other well locations are proposed which would access Intermediate Volcanic (IV) rock and Ultramafic rock (UM) at the north and south edges of the Third Portage peninsula respectively. Iron Formation (IF) can be from Goose Island, however, this area is not accessible for monitoring well installation in 2008, consequently, no well targeting IF is included in the 2008 program.

### 3.1.2 Second Portage Arm

A new well will be installed from the south side of the north Arm of Second Portage Lake, closer to the west dike than the previous installations, but with the same azimuth and dip angle. The construction schedule for the west dike does not allow installation of a monitoring well from this location in 2008.

## 3.2 NEW MONITORING WELL DESIGN

The proposed new monitoring well design is presented in Figure 2. The design objectives and proposed solutions on which the design is based are summarized in Table 2 and described thereafter.

**Table 3.2: Well Instrumentation Design Objectives and Proposed Solutions**

| Design Objective | Effect | Proposed Solution |
|---|---|---|
| Prevent water ingress into the well section that intersects permafrost to avoid ice build-up pressures in the well | Remove ice build-up pressure; Minimizing time and energy requirement for sampling. | Install borehole steel casing from surface to below permafrost interval (at approximately 170m depth), and place one packer between the casing and the monitoring well, and second packer inside well, in the thawed ground (below 170 m depth). |
| Redundant groundwater access system | Continued use of well in case of failure of one or more elements of the design. | Heat trace cables included in design to thaw wells as contingency measure to packer leakage.<br><br>Heat trace cables will be activated prior to sampling to prevent groundwater from freezing during sampling. |
| Increased robustness of system | Improved resistance to ice build-up;<br>Protection of well instrumentation. | Use of stainless steel well pipes;<br>Improved, pre-fabricated heat trace cable connections;<br>Well pipe centralizer to avoid pinching of well instrumentation cables upon installation. |

### 3.2.1 Well Borehole

Boreholes will be drilled using standard HQ coring method. Heated water will be used as drilling fluid during drilling. The inclined boreholes will be cased with HWT flush-joint casing to approximately 170m (20m below the permafrost interval). Boreholes will be drilled at 60 degree angle and completed at approximately 200m depth (approximately 150 m true depth). Vertical boreholes drilled from the dike will be drilled to approximately 150m depth.

### 3.2.2 Well Instrumentation

Each well will be constructed of 1.5-inch diameter, schedule 40 stainless steel piping and 2-inch diameter screen. The annulus between the HWT borehole casing and the well pipe will be sealed at the base of the casing (below permafrost interval) with a pneumatic packer inflated with propylene glycol (a non-toxic and biodegradable anti-freeze). This will isolate the space between the borehole casing and the well pipe from the borehole interval below the permafrost. A one way valve will be place at the top of the packer to keep the packer permanently inflated. A small diameter double valve pump (DPV) driven by inert nitrogen gas will be fixed to the outside of the well pipe to remove water from the annulus above the packer following the installation to keep this area dry and prevent frost damage to the installation.

The well pipe will be sealed above the well screen to allow removal of the well water from within the permafrost zone between the sampling events. The valve will be constructed from a small diameter pneumatic packer that will be also inflated with propylene glycol. The packer will be fixed inside the well pipe immediately below the outside packer where it will be surrounded by relatively warm talik water which will prevent freezing of the instrument. The valve will be operated with a portable injection hand pump and by an inflation line mounted outside of the well casing.

A heating cable and cover pipe insulation will be attached to the outside of the well pipe through the expected permafrost interval. The heating cable will be activated at the time of sampling to prevent water from freezing during sampling and will constitute a back-up system to melt the ice inside the well in case of packer failure.

Centralizers will be fixed to the outside of the well pipe at regular intervals to prevent pinching of the various cables and lines running along the outside of the well pipe.

# SECTION 4 • SAMPLING METHOD

## 4.1 2008 WELL DESIGN

Well Preparation for Sampling

At the time of purging and sampling the heat trace cables will be activated to warm the well pipe. Once the new well has been warmed up the pneumatic valve inside the well pipe will be deflated to allow groundwater to flow into the well pipe.

Well Purging

The well is then purged to remove standing water inside the well and to induce the flow of fresh groundwater from the rock formation. Purging is done by lowering a portable double valve sampling pump (DVP) into the well pipe to approximately 10 to 20 meters above the top of the screened interval and activating the DVP. The pump is activated by pumping compressed air into a ¼" Low Density Polyethylene (LDPE) tubing attached to the DVP. The quality of the purged water is to be monitored for pH, electrical conductivity, temperature, water clarity and colour (visual observation) during this activity. A minimum of 3 well volumes (volume of water between the in-well packer and bottom of screened interval) are to be removed prior to sampling or until the monitored parameters stabilize (values remaining within 10% for three consecutive readings).

Groundwater Sampling

Groundwater is to be sampled immediately after purging, by lowering the intake of the DVP tubing to 3 to 5 meters above the screened interval. The same DVP pump and tubing used for purging is to be used for sampling but utilizing compressed nitrogen gas to evacuate water that entered the sampler unit. Nitrogen gas is stable (inert) and avoids alteration of groundwater chemistry during sampling. Chemical parameters are to continue to be measured during sampling.

A groundwater sample is to be collected in clean, laboratory-supplied containers. Where required, preservatives will be added to the sample bottles prior to sample collection, to minimize chemical alteration during transport to the laboratory. Samples analyzed for dissolved metals are to be filtered through a 45 μm inline filter.

Samples are to be collected in duplicate and submitted as blind duplicates (using different reference numbers) to the analytical laboratory. Duplicate samples are to be analyzed for chloride and dissolved metals only.

Well Close-Down Procedure

Once the water sample is obtained, the pneumatic valve will be re-inflated and the well water above the valve will be removed using the portable DVP pump. The DVP pump fixed to the outside of the well will also be activated to remove water accumulated in the annulus of the well during purging and sampling (if any). The heating cable will be de-activated and the cap will be replaced on the casing.

## 4.2 OLDER DESIGN WELL MW03-01

Well Preparation for Sampling

Because water is allowed to rise and freeze in place within the well pipe, the heat trace cable activation period will be considerably longer for well MW03-01, in the order of 4 days, to thaw standing water (ice) present in the well pipe.

Well Purging

Once ice is fully thawed purging is initiated in the same way as for the new wells, by inserting the DVP and tubing at 10 to 20 meters above the screened interval and removing well water by pumping compressed air. Groundwater will be continually pumped from the well until electrical conductivity and pH readings stabilized. This process may require more than 3 well volumes. In consideration of the low hydraulic conductivity of the rock at this location causing a very slow recovery of groundwater level (only a few litres of groundwater can be removed at a time), this process can take up to 4 days to complete.

Groundwater Sampling

Groundwater sampling will be carried out immediately after well purging, in the same manner as for the 2008 design wells (same equipment, elevation of tube intake for water sample, use of nitrogen gas, monitoring of water quality parameters during this process). Groundwater samples are to be collected in clean, laboratory-supplied containers. Where required, preservatives were added to the sample bottles prior to sample collection, to minimize chemical alteration during transport to the laboratory. Samples analyzed for dissolved metals were filtered through a 45 μm inline filter.

Samples are to be collected in duplicate and submitted as blind duplicates (using different reference numbers) to the analytical laboratory. Duplicate samples are to be analyzed for chloride and the suite of dissolved metals specified in Table 1 of Schedule 1 of the Meadowbank Water License.

Well Close-Down Procedure

Once the water sample is obtained, the heating cable will be de-activated and the cap will be replaced on the well.

## 4.3 CHEMICAL ANALYSES ON GROUNDWATER SAMPLES

Measurements of groundwater temperature, pH, electrical conductivity, total dissolved solids (TDS), and dissolved oxygen will be obtained in the field during purging and sampling. Measurements will be recorded for future reference and to check against laboratory data.

All groundwater samples will be stored in coolers with ice packs and shipped to the selected analytical laboratory. A record of samples collected and requested analytical parameters will accompany each shipment of samples. Analytical parameters will include the following, per Schedule 1, Table 1, Group 3 of the Meadowbank Water License: pH, alkalinity, turbidity, hardness, ammonia nitrogen, nitrate, nitrite, chloride, fluoride, sulphate, total dissolved solids (TDS), total and free cyanide (for well located in the flow path of the tailings containment area such as MW08-01), and the following dissolved metals: aluminum, arsenic, barium, cadmium, copper, iron lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium and zinc.

## 4.4 QUALITY ASSURANCE / QUALITY CONTROL

The following procedures will be followed to provide data quality control:

- Measurement of field parameters at selected intervals until stable readings (within 10% of each other);
- Minimization of the exposure of the sampled water to the atmosphere;
- Use of compressed, inert gas (nitrogen) to evacuate water for sample collection;
- In-situ measurement of sensitive chemical parameters (pH, conductivity, dissolved oxygen, alkalinity, where applicable); and

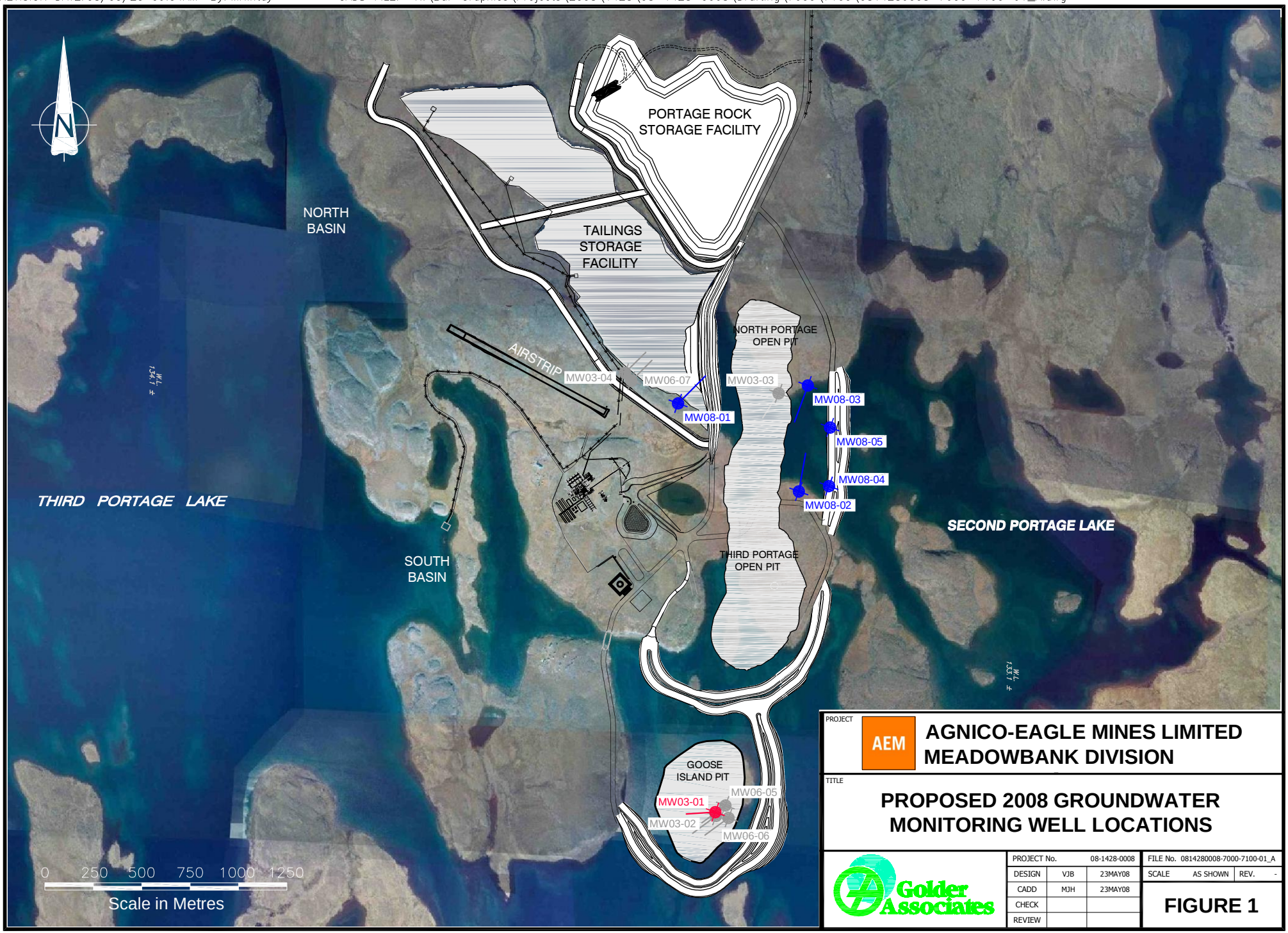
Abiding by sample preservation methods (refrigeration and use of preservatives where needed); and specified holding times.

## SECTION 5 • REPORTING

An annual groundwater monitoring report will be submitted by Agnico-Eagle Mines Limited to the Nunavut Water Board (NWB) by March 31 of the following year. This report will include the following information:

- Description of the instrumentation and location in UTM coordinates of monitoring wells;
- Description of the working condition of the existing wells;
- Date of groundwater sampling;
- Name and title of personnel who completed groundwater quality monitoring;
- Analytical results including: field data, laboratory analytical data and QAQC information; and
- Comparative assessment of data obtained to date to input values used in the Water Quality Model for the site.

REVISION DATE: 08/05/23 09:34AM By: MHintay CADD FILE: N:\Bur-Graphics\Projects\2008\1428\08-1428-0008\Drafting\7000\7100\0814280008-7000-7100-01_A.dwg




PROJECT

AEM

**AGNICO-EAGLE MINES LIMITED**
**MEADOWBANK DIVISION**

TITLE

# PROPOSED 2008 GROUNDWATER MONITORING WELL LOCATIONS

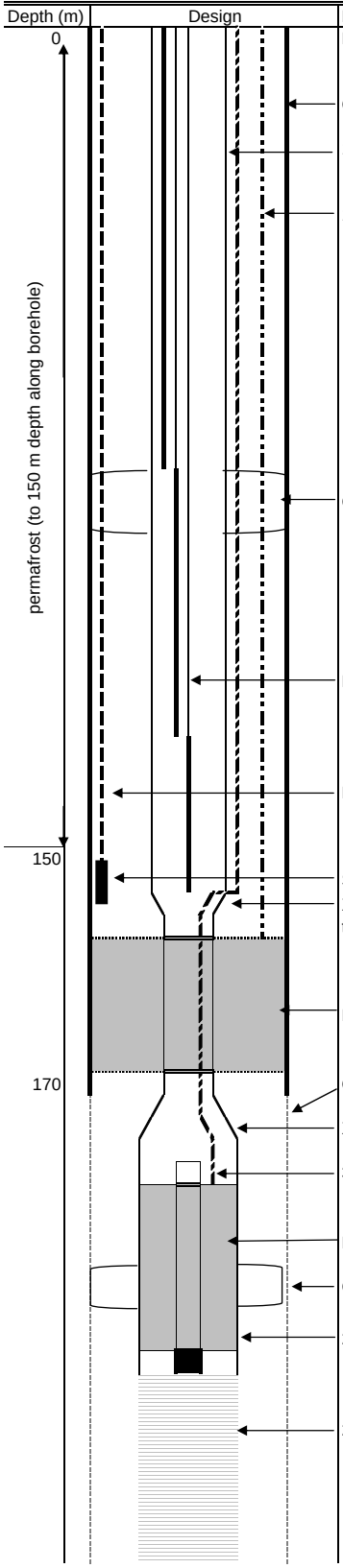
Golder Associates

| | | | | |
|---|---|---|---|---|
| PROJECT No. | | 08-1428-0008 | FILE No. 0814280008-7000-7100-01_A | |
| DESIGN | VJB | 23MAY08 | SCALE AS SHOWN | REV. - |
| CADD | MJH | 23MAY08 | | |
| CHECK | | | | |
| REVIEW | | | | |

**FIGURE 1**

**Figure 2. Proposed Monitoring Well Instrumentation**
**Meadowbank Project**
**Agnico-Eagle Mines**

**Date:** 01-Aug-08




| Description | ID (mm) | OD (mm) | packer size (mm) deflated | packer size (mm) max inflated | Notes |
|---|---|---|---|---|---|
| HQ - drilled borehole | | | | | |
| Casing HWT flush joint | 101.6 | | | | |
| 1 1/2" schedule 40, 304 stainless steel pipe | 40.4 | 48.3 | | | |
| 1/4" Nylon inflation line for PQ packer | | | | | |
| Centraliser | | | | | centralizer to prevent wires from getting pinched btwen casing and well |
| Heat trace cable | | | | | in case water leaks into well or annulus |
| Dual tubing for pump | | | | | pump to remove standing water |
| Solinst 5/8" double pump valve | | | | | |
| X-O 1 1/4" NPT male to 1 1/2" ASTM F480 female pipe thread with seal exit for inflation line | | | | | |
| PQ size packer | | | 72 | 160 | P-packer to prevent groundwater rizing, then freezing in the permafrost interval. Packer inflated with propylene glycol. |
| Open hole | | | | | |
| X-O 1 1/4" NPT female thread to 2" ASTM F480 male thread | | | | | |
| 3/16" stainless steel inflation line for packer | | | | | |
| BQ size packer | | | 33 | 65 | In-well packer installed below P-size packer to keep it unfrozen (heat from surrounding groundwater) |
| Centraliser | | | | | |
| 2" schedule 40, 304 stainless steel pipe | 51.9 | 60.3 | | | 2-inch well pipe to accommodate B-packer |
| 2" schedule 40, 304 stainless steel slotted pipe | | | | | |

**Not to scale**