

# MEADOWBANK GOLD PROJECT

WASTE ROCK & WATER MANAGEMENT PLAN

**JULY 2008** 

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#### SECTION 1 • INTRODUCTION

This report presents the Waste and Water Management Plan for the pre-development work at the Meadowbank site. The mine pre-development activities will involve the construction and operation of a 200 person camp, set up and operation of a sewage treatment plant and a batch concrete plant, operation of Tear Drop Lake as a storm water management pond, pre-development stripping and stockpiling of overburden, the initial drilling and blasting of rock, and the construction and maintenance of access roads, as licensed under Type B water license 8BC-TEH0809. The pre-development work will occur during the spring of 2008 (late April thru July). Given the short 'open water' construction season in Nunavut, the objective is to prepare the Meadowbank camp and create a stockpile of suitable dike construction material in the second quarter of 2008 so that construction of the East Dike can commence as soon as possible after the Type A water License is approved by the Minister of Indian and Northern Affairs. The accelerated schedule is to prevent the Meadowbank Gold Project slipping by one year which could occur if the East Dike cannot be fully constructed in the summer of 2008.

This Waste and Water Management Plan supercedes previous management plans and will be implemented effective immediately (July 2008) subject to any modifications proposed by the Nunavut Water Board as a result of their review and approval process.

#### 1.1 SITE CONDITIONS

#### 1.1.1 Climate

The Meadowbank Gold Project 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. The long-term mean annual air temperature for Meadowbank is estimated at 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. Mean annual rainfall, snowfall, and total precipitation values, adjusted for under catch using values reported by Environment Canada for Baker Lake (1949 to 2003), are 142.5, 146.8, and 289.2 mm, respectively.

# 1.1.2 Topography

The general project area consists of low, rolling hills with numerous small lakes. The topography in the immediate vicinity of the main 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 m above sea level (masl) along the Second Portage Lake shoreline and 134 masl along the Third Portage Lake shoreline, to maximum elevations of approximately 200 masl northwest of the Portage area deposits.

# 1.1.3 Soil and Surficial Geology

In general, the project site has a thin, discontinuous cover of organic material, over about 1 to 5 m of mineral soil overlying weathered to intact ultramafic and metasedimentary bedrock. Bedrock is encountered within 2 m of existing ground surface in most areas and is typically exposed at ground surface in the plant site area, with weathered fractures observed within 1 to 2 m of the bedrock contact.

The soil is characterized by laterally extensive deposits of glacial till. Also, glaciofluvial sand and gravel deposits reportedly occur 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.

# 1.1.4 Permafrost

The Meadowbank Gold Project area is located within the zone of continuous permafrost 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. 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 Third Portage Lake and are expected to extend to the base of the permafrost.

## 1.1.5 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.

#### 1.2 PRE-DEVELOPMENT ACTIVITIES

#### 1.2.1 Construction and Operation of Camp

The camp will be constructed and operated to support the pre-development and mining activities for the duration of the project. The camp will consist of 74 pre-fabricated trailer units assembled to provide a total of 340 rooms, washrooms and shower facilities, laundry facilities, a kitchen facility, recreation and television trailers and office units all joined together by Arctic corridors. During this phase of the project the water license allows for a maximum average water use of 45 m<sup>3</sup>/day to support a maximum camp capacity of 200 persons (200 x 225 l/per person/day).

## 1.2.2 Construction and Operation of Sewage Treatment Plant

A rotary biological contactor sewage treatment plant (STP) will be constructed and operated at the Meadowbank Gold Project site. The proposed plant will consist of the following elements:

- A lift station and pump to transfer sewage from the camp to the sewage treatment plant which would be set up adjacent to the north end of the site airstrip;
- A 65 m<sup>3</sup> capacity equalization tank to attenuate the flow peaks entering the STP;
- A standard Seprotech B130 series rotary biological contactor with a primary settling tank, a standard RBC, and a final settling tank;
- A lift station and pump to transfer treated overflow effluent from the final settling tank to Tear Drop Lake; and
- A plate filter press set up in an adjoining Seacan container with filter feed pump to filter sewage sludge drawn through sludge ports on the bottom of the primary settling tank on an as needed basis with the filtrate being recycled to the equalization tank and the sludge incinerated.

Effluent from the sewage treatment plant will be directed to Tear Drop Lake, the stormwater management pond.

#### 1.2.3 Operation of Tear Drop Lake as a Stormwater Management Pond

Tear Drop Lake is a small non-fish bearing pond located in the immediate area proposed for the Meadowbank Gold Project mill and service facilities. It is a shallow pond that freezes to its bottom each winter. AEM proposes to build up the depth of this pond through impervious walls constructed as part of the proposed roads that encircle this pond to allow the pond to act as a stormwater management pond. During this phase the treated sewage from the STP would be pumped into this pond. Overflow from this pond would be pumped into the northwest arm of Second Portage Lake.

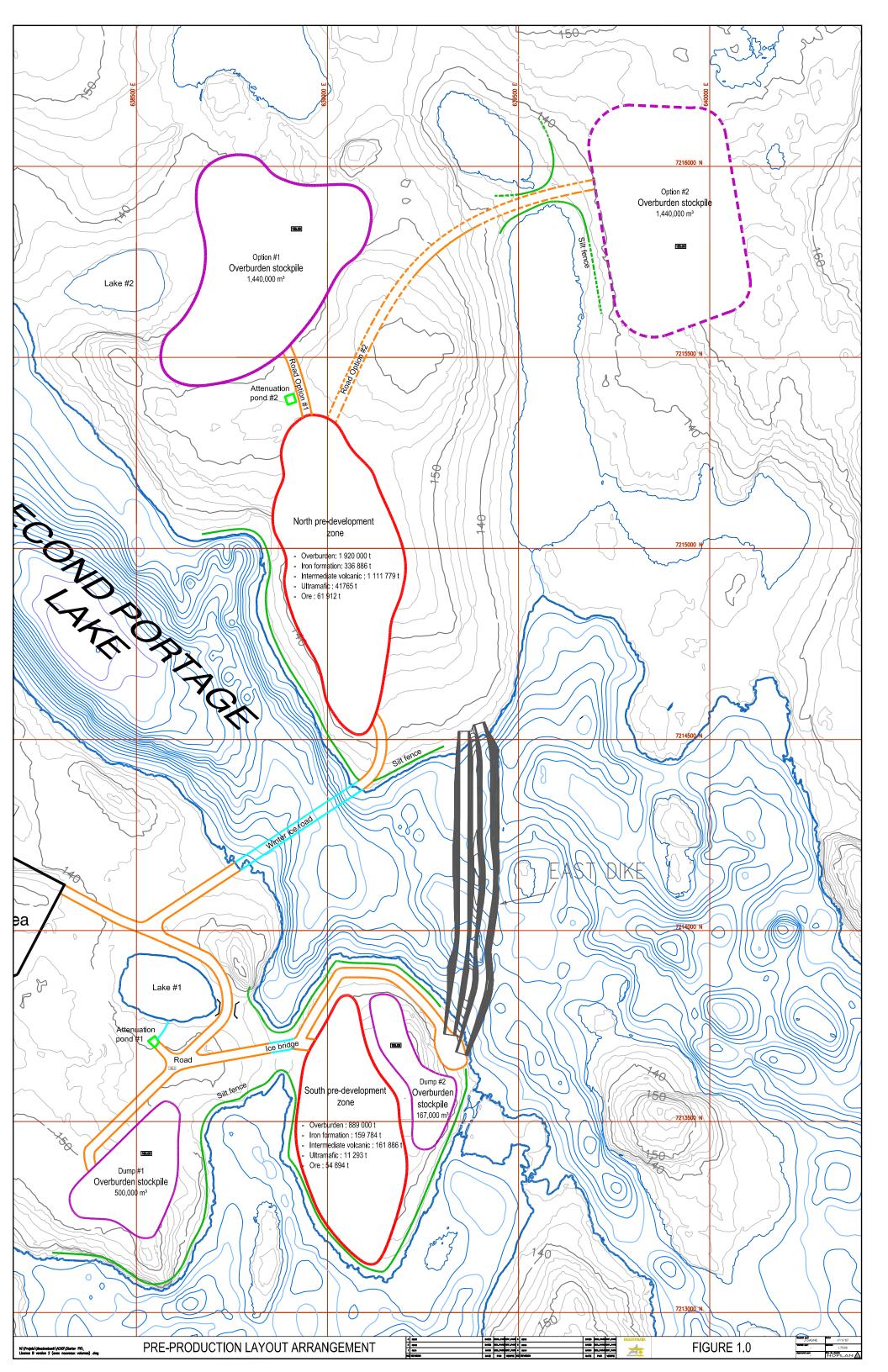
# 1.2.4 Operation of Batch Concrete Plant

A batch concrete plant was shipped to Baker Lake in the fall of 2007 to provide a source of concrete for initial construction activities at the camp and other mine site facilities. The water to be used for this initial concrete will come from Third Portage Lake off of the existing freshwater pump system. The maximum estimated water consumption will be 15 m<sup>3</sup> per day (average). The plant will generate no waste requiring disposal or storage.

#### 1.2.5 Pre-Development Stripping and Stockpiling of Overburden

Overburden material to be removed (stripped) from the two pre-development starter pits will need to be stored in permanent stockpiles (pending final reclamation). Stripping of 0.9 million tonnes of overburden from the South Portage Pit and 1.9 million tonnes from the North Portage Pit will be necessary for the pre-development activities. An assessment was conducted to select strategic places to store this material. The main priorities were to minimize the environmental risks and hauling distance. The piles will be constructed by free dumping in layers of 1 m thickness. The side slopes of the pile will be constructed to a maximum angle of 45°; the maximum height of the pile will be 15 m.

In the south zone, two stockpiles locations were selected; one stockpile is located to the south of the pit and one to the east. In the north, two locations are proposed but only one will be chosen. Pending condemnation drilling, option #1 (stockpile location north of the north zone) is the preferred solution. If condemnation drilling results confirm a potential ore resource in this location then the preferred overburden stockpile location for the north zone will be option #2. The stockpile locations and starter pits are shown in Figure 1. The specifications for these four stockpiles are presented in Table 1.



**Table 1: Proposed Pre-Development Overburden Stockpile Specifications** 

Zone	Dump #	Area	Height	Maximum	Volume	Tonnage
		$(m^2)$	(m)	Elevation (m)	$(m^3)$	(t)
South	1	54 000	5-15	+155	167 000	222 666
	2	36 000	5-15	+155	355 000	473 333
North*	Option #1	87 000	5-15	+155	889 017	1 185 356
	Option #2	88 800	5-15	+155	889 017	1 185 356

<sup>\*</sup> Only one of the two options will be chosen; AEM's preference is Option 1.

## 1.2.6 Drilling and Blasting Rock in the Starter Pits

The first zone to be excavated will be the south pre-development zone. Once overburden excavation is completed, the next step will be to prepare the rock within the exposed open pit zones for dike construction (the East Dike). The exposed surface waste rock will be drilled and blasted using the same procedures that were used to provide quarry rock.

As required under Part D, Items 1 and 2 of the Type B license, Agnico-Eagle Mines Ltd. (AEM) will not remove any of the rock excavated as part of the North and South Portage starter pit development work until the Meadowbank Project Type A Water License comes into effect. To confirm, this blasted material is not being used in the preparation of the rock fill pad for the permanent accommodation camp nor any other site infrastructure construction.

The rock source for the camp pad construction is the site airstrip quarry Q-02. This rock has been verified through ABA testing and metals analysis to contain low sulphur concentrations and is thus non-acid generating and to be have a low metal leaching potential. Once the NWB Type A Water License is in effect, AEM intends to use non-acid generating rock from the Portage Pit in site road and pad construction subject to the terms and conditions of the license.

Estimated quantities of drilled and blasted material in the south and north zones are summarized in the following tables.

Table 2: Estimated quantities of blasted rock left in place

Zone	Rock Type*	Volume in place (m <sup>3</sup> )	Volume blasted (m <sup>3</sup> )	Tonnes
South	Ore	17 594	26 931	54 894
	UM	4 019	6 028	11 293
	IV	58 868	88 301	161 886
	IF	51 213	76 819	159 784
	QZ	-	-	-
	Total	131 694	197 540	387 857
North	Ore	19 776	29 660	61 693
	UM	14 863	22 294	41 764
	IV	404 283	606 425	1 111 779
	IF	107 976	161 964	336 886
	QZ	2 469	3 703	6 542
	Total	549 365	824 047	1 558 665

<sup>\*</sup> Ore = Mineralized material; UM = Ultramafic; IV = Intermediate volcanic;

IF = Iron formation; QZ = Quartzite

Table 3: South zone blasted rock quantities left in place, by bench

	Tonnes					
	Ore	UM	IV	IF	QZ	Total
Bench 136	39 887	11 293	111 860	143 164	-	306 204
Bench 142	15 007	-	50 026	16 620	-	81 653
Total	54 894	11 293	161 886	159 784	-	387 857

Table 4: North zone blasted rock quantities left in place, by bench

	Tonnes					
	Ore	UM	IV	IF	QZ	Total
Bench 142	44 873	40 643	731 833	247 681	6 542	1 071 572
Bench 148	16 654	1 122	375 771	87 879		481 426
Bench 154	166	-	4 175	1 326	-	5 667
Total	693	41 765	1 111	779 336	6 542	1 558 665

#### 1.2.7 Construction and Maintenance of Access Roads

An all-weather private access road was constructed between the Hamlet of Baker Lake and the Meadowbank Gold Project site, a distance of 110 kilometers. This all-weather road provides access to the site for supplies (fuel, etc.) and personnel required at the site during construction and operations phases of the mine life.

Baseline environmental and geotechnical analysis of the proposed route was conducted prior to the submission of the Final Environmental Impact Statement. The right of way for the road was selected to minimize possible effects on the environment. The road was constructed above grade, using quarried material from non-acid generating country rock. Maintenance of the access road will continue for the duration of the mine life, using the same non-acid generating quarried material.

In addition, access roads around the mine site will be constructed to allow access to the various mining and milling facilities. Two main working areas will be developed in the spring of 2008, the South and the North pre-development zones.

#### Access to the South zone

A road will be constructed to connect the plant site to the south pre-development zone and East dike (see Figure 1). The road will be constructed using material already present on site (left from previous earthworks) and will be 2.1 km long and 25 m wide, with a height of 1 m and a maximum grade of 8%.

Access to the south zone starter pit will require crossing the western channel outlet between Second and Third Portage Lakes (see Figure 1). Initially this crossing will be achieved using an ice-bridge across the frozen channel. This will continue until ice conditions no longer allow for this safe crossing by mining vehicles. At that time the ice bridge will be replaced with a culverted crossing designed to allow unobstructed fish and water passage through the spring freshet. A short on land connecting road will have to be constructed to provide access between the Meadowbank camp site and the ice bridge/culverted crossing over the western channel between Second and Third Portage Lakes. The length of this connecting road is 280 meters with a width of 25 meters.

# Access to the North zone

There were several options considered to access the North Zone starter pit area during this pre-development phase. To minimize the overall footprint, AEM chose to access this area using an ice road built across Second Portage Lake. This option defers the need for the construction of a 2.5 km gravel road passing north of Second Portage Lake until after the Type A Water License is issued. All of the required mining equipment to strip the overburden and to develop the first bench in the north zone starter pit will be positioned using this ice road. This necessitates completion of the equipment movement prior to the loss of this ice road due to deteriorating ice conditions in the spring. The length of this ice-road is

approximately 370 meters (see Figure 1). The south end of the ice road will be connected to the road to the south zone starter pit with a short (200 meters) on land road connection.

During this pre-development phase the only road that will be used in the north predevelopment zone is a road needed to connect the north starter pit zone to the proposed overburden stockpile (see Figure 1). This road will be built using material already present on site (left from previous earthworks). The length of this road connecting the starter pit to the overburden stockpile option #1 is 170 meters and 985 meters for option #2. As previously stated, pending the results of condemnation drilling, AEM intends to use Option #1. The road width will be 25 meters with a road base thickness of approximately 1 meter.

#### SECTION 2 • WASTE ROCK

#### 2.1 MINE WASTE ROCK

There are 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 lithological 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 two starter pits are generally not statistically different from those of rocks outside the starter pit within the Portage Pit area.

# 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 ratio (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 acid rock discharge (ARD).

#### 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 classified as being potentially acid generating (PAG) (NPR<2). Samples have a median total sulphur content of 0.9 wt% and low neutralization potential. The Non-PAG IF rock also has low neutralization potential, but lower total sulphur (0.2%).

# 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.

# 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.

#### Overburden

The overburden is not expected to be net acid generating or a source of metal leaching based on previous static and kinetic characterization work (reported under the NIRB Environmental Assessment Process).

#### 2.2 MINE WASTE GEOCHEMISTRY

The relative potentials of the rock types and overburden to generate ARD or metal leaching (ML) were previously evaluated through both static and kinetic testing conducted by Golder Associates on AEM's behalf. The characterization results were previously reported on in the NIRB Environmental Assessment process and are summarized in Table 5 below.

Table 5: Summary of Geochemical Characterization for the Meadowbank Project

Open Pit	Material Type	Potential for ARD	Potential for ML	Restrictions for Storage or use in Construction
All Pits	Overburden	None	Low	None
	Tailings	High	High	Requires measures to control ARD
Portage & Goose	Ultramafic & Mafic Volcanic	Very low	Low	May require collection and treatment of drainage
	Intermediate Volcanics	Variable (65% low; 35% uncertain to high)	Moderate	Requires measures to control ARD
	Iron Formation	High	High under ARD conditions Low under neutral conditions	Requires measures to control ARD
	Quartzite	High	Low	Co-disposal with ultramafic/mafic volcanic or cap/water cover
Vault	Intermediate Volcanics	75% low; 25% uncertain to high	Variable (low to moderate)	May require collection and treatment of drainage

### SECTION 3 • WATER MANAGEMENT

#### 3.1 MINE PRE-DEVELOPMENT CONSTRUCTION AND OPERATIONS

A water management plan (WMP) for the pre-development work has been prepared to control and minimize potential impacts from surface water laden with elevated total suspended particles on the aquatic ecosystem of the adjacent water bodies.

The WMP divides surface water into two components, contact and non-contact water. Contact water is defined as any water that may be physically or chemically affected by mining related activities. Non-contact water is defined as any water that will not be physically or chemically affected by mining related activities.

The strategies to implement the WMP objectives are:

- All non-contact water must be intercepted by a network of ditches and culverts, and conveyed to sediment control ponds for the settling of suspended solids prior to discharge to the natural receiving environment.
- All contact water must be intercepted by a network of ditches and culverts, and conveyed to sumps and sediment control ponds. Discharge to the natural receiving environment may be allowed from a sediment retention pond. Water from sumps must be conveyed to a sediment retention pond prior to discharge.
- The quality of contact water in sumps and sediment retention ponds must be monitored. Discharges from contact sediment retention ponds to the natural receiving environment would be allowed only when the water quality meets the discharge criteria limits. If required, the contact water would be treated prior to discharge.
- Measures must be implemented to reduce the quantity of clean runoff water that requires treatment (i.e., non-contact water will be intercepted and directed away from ditches conveying contact water).
- Sediment and pollutant mobilization from working areas (including the overburden stockpiles and pit perimeters in contact with waste rock) must be minimized by implementing best management practices.
- Water management practices may be adjusted through adaptive management based on the monitoring results of the discharge quality if required.

#### 3.1.1 Best Management Practices

The following best management practices should be used during construction and operation to prevent erosion and to limit sediment release from water infrastructure to the environment.

**Rock sheets**: Exposed soils should be covered with a rock sheet as excavations advance.

**Sediment Barriers in Drainage Courses**: Sediment barriers constructed of riprap and drain rock should be provided in existing and constructed cut ditches to retain sediment.

**Waterbars**: Waterbars should be used along access roads to minimize erosion of the road surface. Waterbars should be provided on all roads with slopes greater than 2%.

**Stockpile Protection**: Runoff from all material stockpiles larger than 10 m<sup>3</sup> should be captured by a silt fence located on the downstream side of the stockpile.

**Silt Fencing**: Silt fencing should be placed along the edges of all areas where soils are disturbed to prevent sediment from reaching nearby water bodies during spring freshet and periods of extreme rain. Silt fences should be installed on ground contour as much as possible. The silt fences should comprise a permeable membrane held in place with 1.8 m tall steel spikes (0.9 m in the soil) spaced every 4 m. The total membrane width should be 1.5 m, with 0.9 m placed vertically above ground and 0.6 m placed horizontally and secured by 0-500 mm diameter blast rock.

The following sketch provides a typical cross-sectional representation of the proposed silt fence installation at Meadowbank for this pre-development phase.

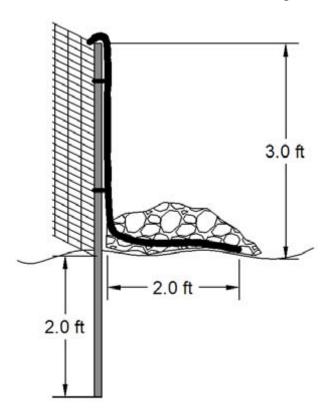


Figure 2: Typical Proposed Silt Fence Cross Section

#### 3.1.2 Attenuation and Stormwater Management Ponds

Under normal conditions any water that accumulates within the pre-development starter pits will remain in place. If the volume of water accumulating in the south pre-production zone pit is great enough to prevent blasting operations, then this water will be pumped to attenuation pond #1 (see Figure 3), which will then drain into Tear Drop Lake (Lake #1) which is slated to become the Stormwater management pond for the project. In the North pre-production zone, if water accumulation becomes problematic, similar actions will be taken: water will be pumped to attenuation pond #2 (see Figure 4) which will then drain through a ditch into Lake #2.

The role of these attenuation ponds (Ponds #1 and #2) and stormwater management ponds (Tear Drop Lake [Lake #1] and Lake #2) is to retain the contact water for water quality monitoring and treatment, if necessary, prior to discharge into Second Portage Lake.

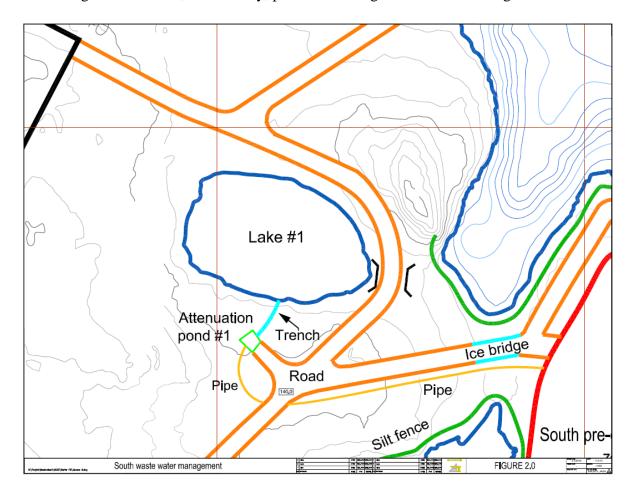


Figure 3: South Pre-development zone water management

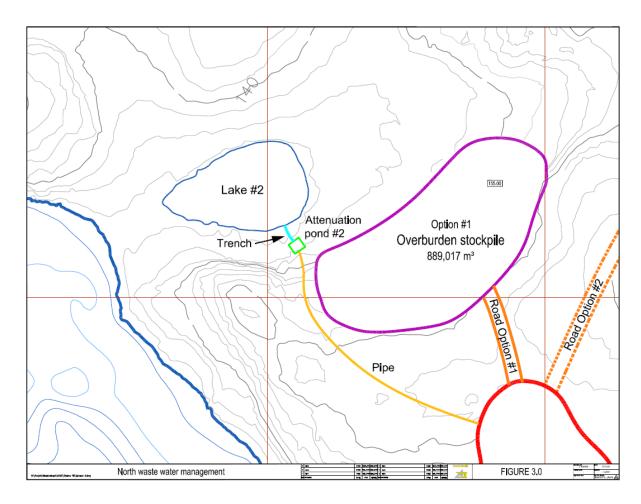


Figure 4: North pre-development zone water management

# 3.1.3 Discharge Criteria

Effluent from the stormwater management ponds (Tear Drop Lake [#1] and Lake #2) will be monitored for water quality parameters at Stations TEH-9 and TEH-10 (see monitoring plan for further details). Effluent from these ponds that is directed to the northwest arm of Second Portage Lake shall not exceed the effluent quality limits presented in Table 6. Impacts, if any, to the receiving environment are addressed in the Aquatic Effects Management Plan and monitoring program.

Table 6: Discharge Criteria from Stormwater Management Ponds

Parameter	Maximum Average Concentration	Maximum Allowable Grab Sample Concentration
pН	6.0 to 9.5	6.0 to 9.5
TSS	15-25 mg/L	30-50 mg/L
BOD <sub>5</sub>	25 mg/L	50 mg/L
Fecal Coliforms	1000 CFU/dl	2000 CFU/dl
Oil and Grease	15 mg/L and no visible sheen	15 mg/L and no visible sheen
Benzene <sup>1</sup>	370 ug/L	370 ug/L
Toluene <sup>1</sup>	2 ug/L	2 ug/L
Ethylbenzene <sup>1</sup>	90 ug/L	90 ug/L
Aluminum	1.5 mg/L	3.0 mg/L
Arsenic	0.5 mg/L	1.0 mg/L
Copper	0.3 mg/L	0.6 mg/L
Cyanide	1.0 mg/L	2.0 mg/L
Lead <sup>1</sup>	1 ug/L	1 ug/L
Lead	0.2 mg/L	0.4 mg/L
Nickel	0.5 mg/L	1.0 mg/L
Zinc	0.5 mg/L	1.0 mg/L
Radium-226	0.37 Bq/L	1.11 Bq/L

Footnote: 1. if discharge from bulk fuel storage facility is received by stormwater management pond

## 3.2 ACCESS ROAD CONSTRUCTION

The all weather private access road was constructed between the Hamlet of Baker Lake and the Meadowbank Gold Project in 2007-2008. This road includes 22 stream channel crossings; 9 bridge crossings (5 Clear-Span bridges and 4 Non-Clear-Span bridges) and 13 culvert crossings. As described in Section 1.2.7, additional roads will be constructed around the mine site to gain access to the various mining and milling facilities.

Sediment and erosion control measures for roads under construction or newly constructed near water crossings are particularly important, as the road is subject to the highly erosive effects of spring thaw and freshet on the newly disturbed soils and permafrost. Mitigation measures to control sediment and erosion have been developed to maximize the protection of the existing watercourses during this construction/newly constructed phase.

The following general sediment and erosion control practices will be employed during the construction of access roads.

- Construction activities within the channel areas will be kept to an absolute minimum.
- Any required stockpiles of materials will be located at a minimum of 30 m from watercourses and stabilized against erosion by covering with geotextile or by placement of a perimeter sediment control structure.
- Disturbed areas will be minimized as much as possible.
- Any disturbed soils and slopes within or near the channels will be stabilized when
  possible with a permanent covering of clean shot rock underlain by geotextile to
  prevent loss of fines.
- Eroded sediments will be contained on site with additional erosion and sediment control structures as required.
- Upon completion of construction, all accumulated sediment, debris and work related material will be removed for proper disposal in completed borrow pits.

#### 3.2.1 Non Fish-Bearing Watercourses – Culverts

Although non-fish bearing, these crossings may connect to fish-bearing lakes or ponds downstream, and therefore, measures will be used to minimize the amount of sediment introduced into these channels. The following mitigation measures will be employed during construction and upon spring freshet for the culvert crossings.

- The approaches to culverts will be armoured such that disturbed soils or permafrost are not subject to the erosive forces of water approaching the culvert, especially during spring freshet.
- Silt curtains will be installed downstream of the culverts to ensure that disturbed soils do not release sediment downstream during freshet.
- Monitoring (by visual inspection) of all culvert crossings will be completed during spring thaw and freshet to ensure that active or potential sediment sources are identified and appropriate sediment control measures are undertaken.

## 3.2.2 Clear-Span Bridge Crossings of Fish-Bearing Watercourses

Particular care must be taken during construction at these crossings to ensure that the bridge abutments do not intrude into the defined watercourse channel. Providing the abutments do not encroach on the channel, the watercourse should not be subject to erosion from constriction of the flow or erosion of fine materials around the abutments.

Notwithstanding the above, the abutments themselves may be exposed to high flows during spring freshet, and therefore will be armoured to resist the erosive forces of water and ice. As any fine materials located within the abutment armouring material may be washed away during freshet flows, the clear-span bridge crossings will be visually inspected during spring

freshet to ensure that sediment is not being carried into the watercourse. If necessary, turbidity curtains or other sediment control means will be installed around the abutments.

#### 3.2.3 Non Clear-Span Bridge Crossings of Fish-Bearing Watercourses

In these instances, flow constriction between the bridge abutments will increase the erosive potential of the flow. In an attempt to limit the release of sediment at these crossings, the extent of encroachment by the bridge abutments into the watercourse channel will be minimized as much as possible. The upstream approach to the abutments, and the abutments themselves, will be sufficiently armoured with clean coarse materials to resist erosion. Finally, the crossings will be visually inspected during spring freshet to ensure that sediment is not being carried into the watercourse. If necessary, turbidity curtains or other sediment control means will be installed around the abutments.

#### 3.3 ACCESS ROAD AND QUARRY MAINTENANCE

The access roads will be surveyed annually in the spring for seeps and pooled water areas. Water samples will be collected at all locations where road rock contacts surface water. In addition, visual inspection of the crossings and along the road will be conducted at the onset of spring thaw and at regular intervals during the open water season to ensure that sediment and erosion control measures are functioning properly. Turbidity and silt curtains will be available to be deployed, if necessary, to control TSS. For further details, please refer to the monitoring plan.

The spring freshet survey will also include the quarry sites from which construction rock is extracted. A sump will be constructed at each developed quarry to collect runoff water from the quarry area. A water quality sample will be collected from each sump. Turbidity and silt curtains will be available to be deployed, if necessary, to control TSS. For further details, please refer to the monitoring plan.

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