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FINAL REPORT
DETAILED DESIGN OF CENTRAL DIKE
MEADOWBANK GOLD PROJECT
VOLUME 1

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EXECUTIVE SUMMARY

Meadowbank Mining Corporation (MMC) is preparing an "A Water License" application for submission to the Nunavut Water Board (NWB).

This report presents the detailed design, specifications and drawings suitable for pricing and negotiation with contractors for the construction of Central Dike, Meadowbank Gold Project. Other dikes considered herein include the Stormwater Dike and the Saddle Dams located around the perimeter of the Portage Tailing Storage Facility.

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1.0 INTRODUCTION

The Meadowbank Gold Project is located approximately 70 km north of Baker Lake, Nunavut. Tailings generated at the site will be stored in the basin formed by dewatering the north west arm of Second Portage Lake. The Second Portage Tailings Storage Facility (TSF) will be bounded by a series of dikes. The dikes considered by this report are presented in plan in Drawing 4000-01 and include the:

- Central Dike,
- Stormwater Dike, and
- Saddle Dams.

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

This report presents the detailed design for dikes associated with the Second Portage Tailing Storage Facility. The report is presented in three volumes. Volume 1 includes:

- Design criteria,
- Site conditions,
- Results of technical analyses,
- Construction techniques,
- Summary of quantities, and
- Construction sequence.

Volume 2 includes

- Specifications, and
- Drawings.

Volume 3 includes the feasibility level design report with a list of design changes.

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 1.1.

TABLE 1.1: 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
Volume Excavation (m^3)	145,262	17,232	5,429	26,930	-	33,490
Volume Rockfill (m^3)	240,405	981,150	318,417	277,250	511,381	540,184
Bituminous Liner Option						
Volume Fine Filter (m^3)	12,271	8,139	7,584	-	-	22,725
Volume Coarse Filter (m^3)	12,271	8,139	7,584	11,670	-	36,185
Volume Till Uncompacted (m^3)	201,532	-	-	47,230	-	116,960
Area of Bituminous Liner (m^2)	21,542	36,679	16,535	31,775	-	86,705
Compacted Till Option						
Volume Fine Filter (m^3)	-	-	-	-	-	18,765
Volume Coarse Filter (m^3)	-	-	-	11,110	-	32,395
Till Core Option - Volume Till Compacted (m^3)	-	-	-	115,700	-	299,715

2.0 DESIGN CRITERIA

2.1 Introduction

This section presents criteria used in the design of the dikes.

General criteria for dike location and design include:

- Maintain adequate setback from open pits,
- Meet or exceed required factors of safety for dam stability,
- Minimize footprint of tailings management facility,
- Maximize the use of materials available on-site, and
- Minimize construction effort and cost

The design must consider all aspects of constructability, stability, thermal effects, deformation, seepage and resistance to external and internal erosion forces.

2.2 Setback of Central Dike

The distance from the downstream toe of the Central Dike to the open pit crest is the "setback." The purpose of the setback is to isolate the dikes from potential failures occurring through the pit wall at ultimate mining depth, to isolate the dikes from the effects of blasting, to provide a working area, and to allow for drainage collection works.

A minimum setback of 60 m was selected based on pit wall stability analyses presented in Golder (2007a).

To define the footprint of the Central Dike, and provide a contingency to raise the dike should additional ore be processed, a setback of 70 m was used in the design. Rockfill for the haul road on the pit-side of the dike will be placed within the setback for later stages of the dike.

2.3 Freeboard

The Canadian Dam Association Dam Safety Guidelines states:

- For embankment dams, the freeboard should generally be sufficient to avoid dam (dike) overtopping for 95% of waves created under the specified wind conditions. Wave conditions and set-up due to wind with a 1/1000 Annual Exceedance Probability (AEP) with the reservoir at its maximum normal level, or determined using a "windspeed- total duration" relationship over the expected life of the project. Wave conditions and set-up due to the most severe reasonable wind conditions (1 in 100 year event) for the reservoir at its maximum extreme level based on the selected Inflow Design Flood (IDF) (1 in 10000 year event) (CDA 1999, Section 7.2, p. 7-4).

- Sufficient freeboard shall be provided to accommodate expected settlement of the crest and cracks cause by frost action. (CDA 1999, Section 8.2.1, p. 8-6).

- The freeboard shall be adequate to accommodate the expected settlement, including settlement due to permafrost (CDA 1999, Section 8.4, p. 8-13).

- The freeboard shall be sufficient to accommodate estimated settlements due to earthquake loading (CDA 1999, Section 8.2.7, p. 8-9).

The design freeboard is a minimum of 2.0 m from tailings to top of dike crest. Minimum freeboard between the liner (impermeable element) and the tailings is 1.0 m. Additional freeboard of 1.9 m will be provided by rockfill safety berms along the haul road on the dike crest during operations for Central Dike Stages 1 and 2.

In addition to freeboard, the upstream slopes of the dam (dikes) and its abutments shall be provided with adequate protection to guard against erosion and possible breaching due to wave and ice action and against burrowing animals such as beaver and muskrat. Failure of the riprap must not result in dam failure. (CDA 1999, Section 8.2.5, p. 8-7).

2.4 Crest Width

The dike crest width will depend on:

- Height and hazard category of the dam,

- Roadway requirements,

- Constructability, and

- Requirement to operate the tailings pipeline on the crest of the dike.

Crests of dikes will act as haul roads for heavy equipment. Where dike crests are used as haul roads, the crest width should comply with NWT Mine Health and Safety Act and Regulations, or equivalent regulations for Nunavut, for minimum width of haul roads (NWT and Nunavut 1995). For single lane traffic the minimum width is twice the width of the widest haulage vehicle used on the road; for double lane traffic the minimum width is three times the width of the widest haulage vehicle. A shoulder barrier of at least three-quarters the height of the largest tire on any vehicle using the road is required.

The design vehicle used as a basis for sizing the roads is a Caterpillar 777D with a width of 6.05 m, tire diameter of 2.5 m Caterpillar 27.00R49 tire.

Based on NWT Mine Health and Safety Regulations, the minimum width is

- 18.2 m surface for two way traffic, and

- 12.1 m surface for one way traffic.

An additional width for safety berms with a minimum of 1.9 m height is required on haul roads.

For the Central Dike, the downstream construction method that will be used in the staged construction of the dike results in a wide crest in Stage 1 and 2. Up to a 40 m crest width is provided in the design, which provides sufficient room to operate a two way haul road and operate the tailings pipeline. For the final stage of the Central Dike, a 6 m crest width is specified. There is sufficient room on the downstream side of the dike to construct a haul road at an elevation below the dike crest. The elevation of this haul road will be determined by the mine operator to provide a nearly level haul in the area of the Central Dike. The haul road fill would reduce the overall slope of the downstream face of the Central Dike, and increase the stability of the dike.

2.5 Design Earthquake

Canadian Dam Safety Guidelines (CDA 1999) state that dams shall be designed to withstand ground motions associated with the Maximum Design Earthquake Design (MDE) without release of the reservoir. Selection of the MDE is based on the consequence of failure of the dam, shown in Table 2.1.

TABLE 2.1: Classification of Dams in Terms of Consequences of Failure, with Maximum Design Earthquake (after CDA 1999, p.1-12, 5-2)

Consequence Category	Potential for Incremental Consequences of Failure		Maximum Design Earthquake (MDE)
	Loss of Life	Financial	Probabilistically Determined (Annual exceedance Probability)
Very High	Large increase	Excessive Increase	1/10,000
High	Some Increase	Large Increase	1/1,000 to 1/10,000
Low	No Fatalities	Moderate Damages	1/100 to 1/1,000
Very Low	No fatalities	Minor Damages beyond owner's property	

The Central Dike and south Saddle Dam fall into the category of a High Consequence Structure. The maximum design earthquake (MDE) for the Central Dike and Saddle Dams is the 1 in 10,000 year event.

The Stormwater Dike falls into the category of Low Consequence. The maximum design earthquake (MDE) for the Stormwater Dike is the 1 in 1,000 year event.

2.6 Slope Stability

Canadian Dam Association Dam Safety Guidelines for static assessment of slope stability are included in Table 2.2

TABLE 2.2: Factors of Safety, Static Assessment (CDA 1999, Section 8.2.2, p. 8-5)

Loading Conditions	Minimum Factor of Safety	Slope
Steady state seepage with maximum storage pool	1.5	Downstream
Full rapid drawdown	1.2 to 1.3	Upstream
End of construction prior to reservoir filling	1.3	Downstream and Upstream

For pseudo-static conditions using the 1 in 10,000 year earthquake a design factor of safety of 1.1 is adopted here.

CDA (1999, Section 8.4, p.8-13) states that dams (dikes) on permafrost shall meet the same stability requirements as embankment dams, and shall remain stable in spite of large foundation settlements.

2.7 Seepage and Drainage Control

CDA (1999, Section 8.2.3, p. 8-6) states

> "Filters shall be placed between materials where otherwise significant migration of particles by seepage forces would be possible."
>
> "The hydraulic gradients in the dam, in foundation abutments and along conduits, shall be low enough to prevent piping and heave in the existing material.
>
> The flow capacity of filters and drains shall be designed to accommodate the maximum anticipated seepage."

Criteria used for filter design included those in Fell et al. (2005), and the U.S. Army Corps (2004). In addition to using established empirical design criteria such as $D_{15}/d_{85} \leq 5$, laboratory evidence of filter performance is also considered for filter gradation design (Eldridge and Gilmer 2002).

2.8 Impermeable Element

The criteria for the impermeable element within the dike section include:

- A low value of hydraulic conductivity to limit seepage quantities,
- Constructability – must be able to efficiently construct in cold or freezing conditions to meet the construction schedule,
- Must be able to function in a very cold environment without degradation, and
- Must minimize cost of construction.

Bedrock foundation grouting shall be applied where necessary to control seepage through fractured bedrock and to control piping of tailings and foundation soils into open fractures at the bedrock surface.

3.0 SITE CLIMATE AND HYDROLOGICAL CONDITIONS

The following section describes the climate and hydrological conditions at the Meadowbank site.

3.1 Climate

The project site is located along the southern boundary of the Northern Artic Ecozone in the District of Keewatin. The climate in the Northern Arctic Ecozone is dry and cold, and is described as a polar desert, generally with mean annual precipitation ranging from 100 mm to 200 mm per year. The closest climate station to the Meadowbank site is at Baker Lake, at 64.3^{o}N Latitude and 96.083^{o}W Longitude, approximately 70 km to the south.

Meteorological data has been collected at Meadowbank since 1997. Longer term climate data are available from the regional climate station at Baker Lake. Tables 3.1 and 3.2 summarize the monthly climate data (AMEC, 2005a).

TABLE 3.1: Summary of Monthly Climate Data

Month	Mean Monthly					
	Maximum[1] Air Temperature (°C)	Minimum[1] Air Temperature (°C)	Minimum Relative Humidity (%)	Maximum Relative Humidity (%)	Wind Speed (km/h)	Soil Temperature[1] (°C)
January	-29.1	-35.5	67.1	75.9	16.3	-25.5
February	-27.8	-35.2	66.6	76.5	16.0	-28.1
March	-22.3	-30.5	68.4	81.4	16.9	-24.9
April	-13.3	-22.5	71.3	90.1	17.3	-18.1
May	-3.1	-9.9	75.7	97.2	18.9	-8.0
June	7.6	0.0	62.6	97.2	16.4	2.0
July	16.8	7.2	47.5	94.3	15.1	10.5
August	13.3	6.4	59.2	97.7	18.4	9.3
September	5.7	0.9	70.8	98.6	19.3	3.6
October	-5.0	-10.6	83.1	97.4	21.4	-2.8
November	-14.8	-22.0	80.6	91.1	17.9	-11.7
December	-23.3	-29.9	73.3	82.7	17.7	-19.9

Note. 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.

[1] Sources: AMEC (2003, 2005a).

TABLE 3.2: Estimated Average Monthly Temperature & Precipitation – Meadowbank Site

Month	Mean [1] Temperature (°C)	Average Precipitation (mm)			Lake Evaporation (mm)
		Rainfall [1]	Snowfall	Total	
January	-32.4	0	11.2	11.2	0
February	-31.7	0	10.5	10.5	0
March	-26.3	0.1	14.6	14.6	0
April	-17.7	2.3	16.7	19.0	0
May	-6.3	9.8	11.3	21.1	0
June	3.7	14.5	3.9	18.4	8.8
July	12.1	36.7	0.0	36.7	99.2
August	9.7	45.5	0.9	46.4	100.4
September	3.4	30.1	8.8	38.9	39.5
October	-7.4	3.5	30.3	33.8	0.1
November	-17.9	0	23.6	23.6	0
December	-25.8	0	15.0	15.0	0

Note. Monthly averages have been rounded. Mean temperatures and rainfall are based on site data (1997 to 2004). Snowfall is based on adjusted Baker Lake data (1946 to 2004) and reported as water equivalent. Adjusted small lake evaporation was estimated from pan evaporation data (2002 to 2004).
[1]Source: AMEC (2003, 2005a, 2005b).

The prevailing winds at Meadowbank (1997 to 2003 data) for both the winter and summer months are from the northwest. A maximum daily wind gust of 83 km/h was recorded on May 21, 2002. Estimates of wave heights on Third Portage Lake during one such event were reportedly on the order of 2 to 3 ft (0.6 m to 0.9 m) based on personal communication with Cumberland site personnel during 2002.

Meadowbank total annual rainfall averaged 85% of the Baker Lake total over common periods of record. The estimated annual rainfall, snowfall, and precipitation for Meadowbank are 142.6, 148.8 and 292.8 mm, respectively. Estimates of extreme annual rainfall, snowfall and total precipitation at the site are shown in Table 3.3.

TABLE 3.3: Estimates of Extreme Rainfall, Snowfall, and Total Precipitation at Meadowbank Camp

Return Period (Years)	Condition	Rainfall (mm)	Snowfall (cm)	Total Precipitation (mm)
100	Wet	245	265	452
50	Wet	232	252	433
25	Wet	218	237	411
10	Wet	195	212	376
5	Wet	175	189	343
2	Average	139	145	285
5	Dry	108	104	233
10	Dry	93.6	84.4	208
25	Dry	79.2	64.6	183
50	Dry	70.4	52.4	168
100	Dry	62.9	41.8	155

Source: AMEC (2003, 2005a)

The annual precipitation at the site generally falls as rain between June and September while snow falls generally between October and May. However, snowfall may occur at any time of the year. Table 3.4 presents a comparison of annual total precipitation data at Baker Lake and the Meadowbank site (AMEC, 2003).

TABLE 3.4: Comparison of Annual Total Precipitation (1998 to 2003)

Baker Lake				Meadowbank Camp		
Year	Adjusted[1] Rainfall (mm)	Adjusted[1] Snowfall (mm)	Adjusted[1] Total Precipitation (mm)	Adjusted[1] Rainfall (mm)	Estimated Adjusted[1] Snowfall (mm)	Estimated Adjusted[1] Total Precipitation (mm)
1998	250.7	246.5	497.1	210.7	207.2	417.8
1999	251.4	189.1	440.6	243.3	183.0	426.3
2000	152.6	243.8	396.5	142.2	227.2	369.5
2001	158.1	173.9	332.1	117.4	129.2	246.6
2002	236.8	221.5	479.0	181.2	169.5	386.1
2003	147.4	138.9	300.8	120.8	113.9	246.3
Mean	199.5	202.3	407.7	169.3	171.7	348.8

[1]Rainfall, snowfall, and total precipitation values at Baker Lake and at the Meadowbank Camp have been adjusted for undercatch based on undercatch adjustment factors for Baker Lake, as reported by AMEC (2003).

3.1.1 Windspeed Data

There is a long-term Environment Canada meteorological station at Baker Lake, referred to as Baker Lake A. A mean hourly wind rose using the Baker Lake data from 1963 to 2002 was presented in the baseline hydrology report (AMEC, 2003). This wind rose included year round data. Due to winter freeze-up and icing over of the lakes, it is appropriate to use summer winds only.

A mean hourly wind rose using data from May to October for 2002 was also presented in (AMEC 2003) and these data were adopted for the present analysis, assuming that they are representative of a typical open water season. These hourly data were downloaded from Environment Canada (2006). Based upon these data, average hourly wind speeds ranged from 10 to 50 knots (5.1 to 25.7 m/s). Winds from the south occurred about 4.4% of the time, and from the southeast occurred about 11.4%.

The Environment Canada climate normals for Baker Lake indicate that winds blow predominantly from the northwest about 10 months of the year. During June and July, winds blow predominantly from the east and north, respectively.

Maximum hourly windspeeds are available for the Baker Lake A meteorological station from the Environment Canada climate normals. Maximum summer winds have typically occurred from the west and the north and have ranged up to 121 km/hr (33.6 m/s).

However, the highest hourly average windspeed on record occurred on February 19, 1959 and was from the southeast (124 km/hr or 34.4 m/s).

3.2 Permafrost

The Meadowbank Project is located within the zone of continuous permafrost. The land surface in the project area is underlain by continuous permafrost, while lakes that are deeper than about 2 m will be underlain by a talik, or zone of permanently unfrozen ground. Based on thermal studies carried out to date, the depth of permafrost is estimated to be on the order of 450 m to 550 m. The depth of the active layer ranges from about 1.3 m in areas with soils, up to about 4 m adjacent to lakes. The depth of permafrost and of the active layer will vary based on proximity to lakes, soils thickness, vegetation, climate conditions, and slope direction.

Based on ground conductivity surveys and compilation of regional data, the ground ice content is expected to be low (0% to 10%). Locally on land, ice lenses and ice wedges are present, as indicated by ground conductivity, and by permafrost features such as peat palsas. These areas of local ground ice are generally associated with low lying areas of poor drainage.

Lake ice thicknesses of between 1.5 m and 2.5 m have been encountered during geotechnical investigations in mid to late spring. It is possible that mid-winter ice thickness will be greater; however, no data relating to ice thickness currently exists for the mid-winter period.

Ground temperatures have been monitored at Baker Lake since 1997 as part of the Circumpolar Active Layer Monitoring (CALM) program. Table 3.5 presents ranges in the recorded mean annual ground temperature at an estimated depth of 2 m for the Baker Lake CALM station.

TABLE 3.5: Range in Mean Annual Ground Temperature – Baker Lake CALM Site (1998 to 2001)

Site Number	Latitude	Longitude	Elevation (m)	Location (km)	Mean Annual Ground Temperature (2 m depth) (°C)
C20	64° 19.6'N	96° 2.5'W	50	70 km South of Meadowbank	-6.6 to -8.4

The mean annual ground temperatures recorded at the station in Baker Lake are comparable to those estimated at the Meadowbank site (see below). Annual thaw depths at the CALM site are reported in Table 3.6.

TABLE 3.6: Annual Thaw Depth at the Baker Lake CALM Site

Thaw Depth in Centimetres (Baker Lake CALM Site)						
Station	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Baker Lake C20	120	170	174	189	193	207

Thermal studies at the Meadowbank site were initiated during the 1996 summer exploration drilling program, with the installation of two thermistor cables in exploration boreholes drilled on the Third Portage Peninsula. Theses studies have continued with the installation of additional thermistor cables during field investigations in 1997, 1998, 2002, 2003 and 2006.

To date, twenty three 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 for the influence of deep lakes), as well as adjacent to the lakes. The thermistors were monitored during periods of time that the camp was open. Generally, data were collected from March through to September.

Thermistor cables were installed at several of the abutments areas of the proposed Central dike. The purpose of the installations was to characterize the permafrost directly adjacent to the dike abutments areas. An additional thermistor was installed to provide background data relating to the regional thermal regime and was located a minimum of 500 m from lake bodies. Thermistors were also installed at the abutments of dewatering dikes, at various deposits, plant site, tank farm and at the east-west linear feature on the strip of land separating Second Portage Lake from Third Portage Lake. Thermistor locations and geothermal properties are summarized in Tables 3.7 and 3.8.

TABLE 3.7: Summary of Thermistor Locations

Borehole	Ground Slope	Slope Aspect	Offset from Nearest Water Body	Drilling Direction (with respect to shoreline)	Comments
03GT-BZ-1	~1% to 2%	South Facing	30 m	Towards	Third Portage Peninsula
TP97-196	<1%	East Facing	22 m	Towards	Bay Zone Island
03GT-SPEC-F1	5% to 8%	North Facing	200 m	Parallel	Base of North Facing Slope
03GT-GI-7	~9%	East Facing	27 m	Towards	East Shore of South Camp Island in Lee of Slope
03GT-GPIT-2	~1%	West Facing	8 m	Towards	West Shore of Goose Island
03GT-Therm-1	~21%	South Facing	500 m	Vertical	Crest of south facing slope 500 m from nearest small lake, and 1000 m from nearest large lake
GT02-NP-1	~23%	West to Southwest Facing	31 m	Towards	West to Southwest shore of North Portage Deposit
GT02-NP-3	~12%	West Facing	155 m	Away	West shore of North Portage Deposit
03GT-PS-2	<1%	West Facing	330 m	Vertical	Thin felsenmeer and till; bedrock near surface
03GT-PS-3	<1%	-	460 m	Vertical	Thin felsenmeer and till; bedrock near surface
02GT-03	~11%	South Facing	25 m	Towards	Lee of slope; heavy snow accumulation.
02GT-04	~11%	Northeast Facing	33 m	Towards	North shore of Third Portage Deposit area.
03GT-TD-1	~21%	West Facing	30 m	Towards	West Shore of North Portage Deposit
03GT-TD-5A	~1%	North Facing	40 m	Towards	South Shore Second Portage Lake
03GT-TF-1	<1%	-	250 m	Vertical	Thin felsenmeer and till;

Borehole	Ground Slope	Slope Aspect	Offset from Nearest Water Body	Drilling Direction (with respect to shoreline)	Comments
					bedrock near surface
TP98-261	~5%	East Facing	38 m	Perpendicular	Installed across Bay Fault, beneath water course between Third Portage and Mainland
TP96-154	~7%	West Facing	150 m	Away	Third Portage Deposit Area
TP96-155	~7%	West Facing	105 m	Away	Third Portage Deposit Area
GT02-VLT-2	~8%	East Facing	48 m	Towards	Vault Deposit drilled towards very small lake; small bowl shaped depression
GT03-VLT-4	<1%	East to Southeast Facing	110 m	Towards	Vault Deposit drilled towards Vault Lake
02GT-09	~7%	East Facing	30 m	Towards	Second Portage Lake south shore on outcrop of quartzite, no soil
02GT-10	~9%	Southwest Facing	37 m	Towards	Second Portage Lake north shore
06GT-TD2A	N/A	Lake Bottom	0 m	Vertical	Vibrating Wire Piezometer located under Second Portage Lake at proposed Central dike location

TABLE 3.8: Summary of Geothermal Conditions at Dike Thermistors.

Borehole	Location	Vertical Depth of Installation (below ground surface) (m)	Depth of Zero Annual Amplitude (m)	Zero Amplitude Temp. (°C)	Vertical Depth of Active Layer (m)
03GT-BZ-1	Bay Zone	43.1	Insufficient Data	Insufficient Data	Insufficient Data
02-GT03	East Dike North Abutment	22.9	20 - 30	-2.5	3.5
02-GT04	East Dike South Abutment	23.0	20 - 30	-6.5	1.3
02GT-09	West Dike South Abutment	22.1	Indeterminate	Indeterminate	3.8
02GT-10	Stormwater Dike North Abutment	22.5	20 - 30	-5.5	3.0
03GT-TD5A	Stormwater Dike South Abutment	42.5	Insufficient Data	Insufficient Data	2.8
03GT-TD-1	Central Dike North Abutment	44.2	Insufficient Data	Insufficient Data	1.3
06GT-TD2A	Central Dike Second Portage Lake Bottom	94.96	N/A	N/A	N/A

Note 1. N/A indicates the estimations of certain geothermal conditions are Not Applicable due to the proximity of installation to lake body.

Note 2. Insufficient data indicates that insufficient data have been collected to estimate certain geothermal conditions.

Note 3. During packer testing of the permafrost/talik interface at borehole 02GT-09, the packer equipment became lodged and subsequently frozen within the borehole. The thermistor cable was folded back on itself and installed to the depth of the frozen equipment.

Note 4. Vertical depth of 06GT-TD2A refers to depth below lake bottom.

3.3 Projected Climate Change

The climate change considered in this report follows the worst case "high sensitivity" models described in the latest Intergovernmental Panel on Climate Change (IPCC, 2007). These models predict an increase of 6.4°C to the maximum average air temperature (MAAT) by the year 2100 for a site located at 65°N latitude.

Table 3.9 presents a summary of reported climate change predictions used on a number of northern projects which have been reported in the engineering and scientific literature.

TABLE 3.9: Summary of Reported Climate Change Rates Used in Northern Projects Engineering Studies.

Reference	Increase in MAAT by Year 2100 (°C)	Notes
IPCC(2007)	6.4	For site at 65° North Latitude
Hayley (2004)	4.7	Used in design studies for the Inuvik Regional Health Center. Reported as increase of 0.47°C per decade.
Hayley and Cathro (1996)	5.0	Used for Raglan Dam analyses.
Burn (2003)	6.0	For use in the Western Artic for pipeline design projects. Reported as increase of 1.75°C over a 29 year period

3.4 Hydrological Conditions

Maximum and minimum expected lake water elevations are shown in Table 3.10.

TABLE 3.10: Lake Elevation Variations[1]

Return Period	Maximum Water Level (masl)		
	Third Portage Lake	Second Portage Lake	Difference (m)
100 yr wet	134.19	133.39	0.80
10 yr wet	134.14	133.28	0.86
average	134.09	133.17	0.92
10 yr dry	134.03	133.08	0.95
100 yr dry	133.99	132.98	1.0

[1] Source: AMEC 2005a p. 7 and p.11

4.0 GEOLOGICAL AND GEOTECHNICAL CONDITIONS

4.1 Topography and Bathymetry

The general site 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 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.

Bathymetric surveys were conducted by Golder in 2002, 2003 and 2006 for lake areas adjacent to and over the main deposits at Meadowbank. The lake bottom has a similar topography to the adjacent land. Water depths reach a maximum of 38 m in the north west arm of Second Portage Lake.

4.2 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.

4.3 Bedrock Geology

The Meadowbank 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 ultramafic rocks are variably altered, containing serpentinite, chlorite, actinolite, and talc. The ore in the Vault deposit is hosted in intermediate volcanic rocks. The ore in the Portage deposit is hosted in iron formation rocks.

There are four main rock types available for dike construction, including iron formation (IF), intermediate volcanic (IV), and ultramafic volcanic (UM) (serpentinized and non-serpentinized), and quartzite (QTZ).

4.4 Geotechnical Conditions

Available geotechnical data for the Meadowbank site are summarized here. Borehole locations are shown in Drawing 4000-02.

4.4.1 Lakebed Sediments

Lakebed sediment samples from the Meadowbank site were provided to Golder's Geotechnical Laboratory in Burnaby, BC. Composite samples were tested for grain size, water content, organic content, and specific gravity.

Organic contents were 6.8% and 16.5%. Water contents for disturbed samples were 306%, 490% and 667%. Liquid Limit of the sediments was 109%, and Plasticity Index was 5.7%.

The Specific Gravity of sediments was 1.69 with organics present, and 2.52 without.

Hydrometer test results are presented in Figure 4.1, and indicate that lakebed sediments are primarily sand, silt and clay-sized particles. Laboratory data sheets for 2006-2007 testing are included in Appendix I.

<u>Lakebed Sediments: Strength</u>

Seabed Terminal Impact Newton Gradiometer (STING) tests results for dynamic bearing strength profile of lake sediments from Golder (2007b) are presented in Table 4.1. A 1 m long steel shaft and foot instrumented for vertical acceleration and water pressure measurements are dropped onto the lakebed. Results indicate a limited thickness of sediments, underlain by a harder material – typically a rocky till or bedrock.

TABLE 4.1: Penetrometer Testing Locations

Lake	Site Name	Easting	Northing	Thickness Soil (m)	Dynamic Bearing Strength (kPa)
Second Portage	2-A	639416	7213795	0.2	<20
Second Portage	2-B	639345	7213916	0.1	20-50
Second Portage	2-C	638708	7214795	0.2	increasing with depth to 300 kPa
Third Portage	3-A	638312	7212033	0.25	Penetration depths of 0.25 m at 300 kPa
Third Portage	3-B	638641	7213032	0.15	20 - 200
Third Portage	3-C	638799	7212833	0.23	20 - 100

4.4.2 Glaciofluvial Deposits

Occurrences of gravel and sand in boreholes are reported below.

4.4.3 Glacial Till

Observations and thicknesses of on-land and lakebed soils overlying bedrock are summarized in Tables I-1 and I-2. Thickness of soils in boreholes on land varied from 0 m to 5.1 m with an average of 2 m on land where present. Drilling observations for lakebed soils indicated thickness of 0 m to 18.1 m, with an average of 3.8 m. Drilling observations are summarized in Tables I-1, I-2, and I-3 in Appendix 1.

<u>Till Gradation</u>

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. The till had 25% silt and 6% clay sizes for 42 samples tested by hydrometer analyses. Boulders were present in 15 of the 29 boreholes where till was noted, from Table I-3. Laboratory test data for till gradation are summarized in Table I-4 in Appendix A, and on Figure 4.2.

Till –Density Related Properties

Values of Specific Gravity for till samples were 2.67 and 2.71.

Moisture Density relation testing conducted of samples of till from the Meadowbank site are presented in Table 4.2.

TABLE 4.2: Moisture – Density Test Results from Second Portage Trench Area

			Corrected for Oversize Particles	
Sample	**Optimum Moisture Content (%)**	**Maximum Dry Density ρ_{dry} (kg/m^3)**	**Optimum Moisture Content (%)**	**Maximum Dry Density ρ_{dry} (kg/m^3)**
1	6.4	2217	5.4	2309
2	7.5	2123	6.4	2211
3, 6 & 7 Combined	7.1	2142	5.6	2272
4	9.3	2085	7.4	2212
5	7.6	2095	7.1	2139
8	5.5	2211	4.7	2295
9 & 10	7.7	2101	7.5	2118
11	8.5	2062	7.9	2109
12	7.9	2119	6.5	2232
Meadowbank Airstrip	13.2	1856	11.3	1948
Average	8.1	2101	7.0	2185

Till moisture content and Plasticity Indices are presented in Table 4.3.

TABLE 4.3: Till Moisture Content and Plasticity Indices

Borehole	Sample	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Reference
02GT-07	3	10.5	16.8	11.3	5.5	Golder 2002b
	5	13.1	15.9	12.7	3.2	
	6	11.1	16.9	13	3.9	
Sample from 2nd Portage Trenches Area by CRL	Till Spoil 1	4.4	15	15.1	Non-plastic	2006 Lab Testing – Appendix I
Sample from 2nd Portage Trenches Area by CRL	Till Spoil 2	5.7			Non-plastic	
Sample from 2nd Portage Trenches Area by CRL	Till Spoil 3	5.9	17.2	16	1.2	
Sample from 2nd Portage Trenches Area by CRL	Till. Grassland 4	14.8	18.8	18	0.8	
Sample from 2nd Portage Trenches Area by CRL	Till Spoil 5	5.3	16.3	15.8	0.5	
Sample from 2nd Portage Trenches Area by CRL	Till Spoil 6 & 7	5			Non-plastic	
Sample from 2nd Portage Trenches Area by CRL	Till Spoil 8	4.2			Non-plastic	
Sample from 2nd Portage Trenches Area by CRL	Till Spoil 9-10	7			Non-plastic	
Sample from 2nd Portage Trenches Area by CRL	Till Spoil 11	10.9	17.5	16.8	0.7	
Sample from 2nd Portage Trenches Area by CRL	Till Spoil 12	8.2	19.4	17.6	1.8	
Average		8.2	17.1	15.1	2.2*	

* calculated for samples returning plastic results.

The average moisture content is wet of the optimum moisture content identified in the compaction tests. Most of the samples from the trenches were dry of optimum moisture content, but it is noted that samples may have dried in transit to the laboratory.

Till Strength

A 5.9 m thick deposit of soil with the upper 2.9 m comprising silt, sand and clay was present in Borehole 02GT-07. A 4.2 m thick deposit of till with upper 1.6 m thick comprising clay, silt, sand and gravel was present in Borehole 02GT-08. Standard penetration testing results are presented Table 4.4 (Golder 2002b). The blow counts indicate a stiff material, with an expected undrained strength in the range of 100 to 200 kPa. Shear strength testing of a composite specimen of samples collected from 02GT-07 are presented in Table 4.5.

TABLE 4.4: SPT Blow Counts from Boreholes 02GT-7 and 02GT-08

Sample	**Depth Below Ice Surface**		**SPT Blow Counts (Blows/0.3 m)**
	From (m)	**To (m)**	
02GT-07			
Sa#1	3.60	4.05	15
Sa#2	4.05	4.50	11
Sa#3	4.50	4.95	11
Sa#4	4.95	5.40	35
Sa#5	5.40	5.85	15
Sa#6	5.85	6.30	14
02GT-08			
Sa#1	4.10	4.55	56 (Refusal)
Sa#2	5.25	5.70	94 (Refusal)
Sa#3	6.50	7.10	Shelby Tube Attempted – no recovery
Sa#4	7.10	7.55	29

Strength testing of till samples indicated strength parameters shown in Table 4.5.

TABLE 4.5: Strength Test Results for Till

Borehole	Sample	Friction Angle (degrees)	Cohesion (kPa)	Test Type	Reference
02GT-07	3,5,6	32	22	Consolidated Drained Direct Shear	Golder (2002b)
Third Portage Trench	59644, 59645, 59646	37	17	Consolidated Drained Direct Shear	Golder (2002b)
Third Portage Trench	3,6,7	33	0	Undrained Triaxial Test	Laboratory Testing – Appendix I

Till Hydraulic Conductivity and Consolidation Response

Till hydraulic conductivity testing included:

- Borehole 02GT-03 interval El. 132 to 133 masl within bouldery till: $>3x10^{-4}$ m/s,
- Borehole 02GT-07 interval El. 126 to 127 masl: $1x10^{-7}$ m/s, and
- Laboratory consolidation testing: $2x10^{-9}$ m/s

The laboratory hydraulic conductivity value was derived from progress of consolidation of a large diameter (152 mm diameter) sample of reconstituted fine till. However, the sample was noted to be unsaturated. Consolidation test results are included in Appendix I.

Ice Rich Soils

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.

4.4.4 Rock

There is a considerable amount of information available for the rock mass at Meadowbank from boreholes drilled at the site. Borehole locations are shown in Drawing 4000-02. Bed rock elevations are summarized in Table I-3 in Appendix I.

The rock mass is generally of good quality. Rock Quality Designation (RQD), tunnelling parameter Q', and Rock Mass Rating (RMR) are presented for each rock type in Table 4.6 with unconfined compressive strength (UCS) testing results. Discontinuity properties are summarized in Table 4.7.

TABLE 4.6: Summary of Pit Rock Properties

Rock Type	Pit	RQD		UCS (MPa) (Lab Testing)	Q'		RMR (from Q')		mi
		Mean	**Median**		**Mean**	**Median**	**Mean**	**Median**	
IF	Goose	97/95*	98/100*	137 to 248	17/32*	21/44*	69/75*	71/78*	20
	Third	92	97	(avg. 175)	14	17	68	69	
	North	93	96		16	16	69	69	
IV	Goose	97/93*	99/100*	51 to 148	18/36*	20/38*	70/76*	71/77	18
	Third	92	97	(avg. 94)	11	12	66	66	
	North	86/92**	91/97**		10/18**	11/12**	65/70**	66/66**	
UMV	Goose	86/81*	92/87*	40 to 92	8/14*	11/16*	63/68*	66/69*	10
	Third	85	92	(avg. 66)	9	14	64	68	
	North	64	73	Serpentinized avg. 32	4	5	56	58	
QTZ	Goose	-	-	70 to 140	-	-	-	-	20
	Third	84	89	(avg. 107)	14	14	68	68	
	North	-	-		-	-	-	-	

*Based on Data Collected by Cumberland/ Golder 2003d

**IV/IVCL / IV/IVCS

TABLE 4.7: Summary of Main Discontinuity Properties

Type	Portage & Goose Island Deposits			Vault Deposit		
	Dip	Dip Direction	Average Spacing (m)	Dip	Dip Direction	Average Spacing (m)
Foliation	Dec-72	255-300	0.5 -1.5	21-23	136-164	0.5-0.8
Orthogonal	76-10	067-121	1.4-12	60-70	333-336	2.8-8.1
CJ1	43-79	201-237	2.5 11.4	83-85	197-209	1.7-7.4
CJ2	36-81	025-068	2.5-8.3	80-82	040-053	
CJ3	65-86	125-148	1.2-9.5	-	-	-
CJ4	58 -73	299-340	1.0-7.0	-	-	-
East-dipping	-	-	-	67-81	086-108	3.7-6.1
South-dipping	-	-	-	45-48	174-198	3.7-6.1
Cross	46-63	002-031	0.4-19.4	73	253	4.4
Cross	62-88	341-350		-	-	-
Cross	26-62	170-191		-	-	-
Flat	-	-	-	13-09	330-335	8.3

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. 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 fault and Bay fault are on the order of 1.7 to 1.9 billion years in age (Pehrsson, 2001; Rainbird, et al 2005). Pehrsson et al2005) reports that the structures in the deposit area have not been demonstrably reactivated by orogenic events in the area. McMartin and Dredge (2005) report that these structures do not localize post-glacial rebound. 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 Dike and loss of tailings pond integrity associated with reactivation of the Second Portage Lake Fault.

Bedrock – Hydraulic Conductivity

A summary of bedrock hydraulic conductivity test data is shown in Table I-5. Figure 4.3 plots hydraulic data versus elevation. Tests along the Central Dike alignment are plotted in Drawing 4000-03, and 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.

Second Portage Fault

The Second Portage Fault passes below the alignment of the Central Dike. Borehole 06GT-TD1, was drilled in the fault. Hydraulic conductivity test results from 06GT-TD-1 ranged from more than $3x10^{-5}$ m/s to $3x10^{-9}$ m/s.

4.5 Tailings

Laboratory test data for tailings include Specific Gravity and particle size from hydrometer analyses for Third Portage and Vault deposit tailings.

Values of Specific Gravities included 3.34 for Third Portage tailings and 2.85 for Vault tailings.

Laboratory test data sheets are included Appendix I.

4.6 Ground Water - Hydrogeology

In areas of continuous permafrost there are two groundwater flow regimes: a shallow groundwater regime located in the active layer near the ground surface, and a deep groundwater regime beneath the permafrost.

4.6.1 Shallow Groundwater Flow Regime

From late spring to late summer, when temperatures are above 0^oC, the active layer thaws, creating the shallow groundwater regime. Within the active layer, the water table is expected to be subdued replica of the topographic gradients. Locally, groundwater in the active layer flows to local depressions and ponds that drain or flow directly to Second and Third Portage lakes or flows directly to Second and Third Portage lakes.

Permafrost reduces the hydraulic conductivity of the rock by at least one or two orders of magnitude (Anderson and Morgenstern, 1973; Burt and Williams, 1976). Consequently, hydraulic conductivity in permafrost will be very low compared to unfrozen rock at the Meadowbank site. The shallow groundwater flow regime therefore has negligible hydraulic connection with the groundwater regime located below the deep permafrost except where taliks exist beneath large waterbodies.

4.6.2 Deep Groundwater Flow Regime

In areas of continuous permafrost, the deep groundwater regime is connected by taliks located beneath large lakes. Taliks exist beneath lakes that do not freeze to the bottom in winter. If a lake is large enough, the talik extends down to the deep groundwater regime. At Meadowbank, analyses have predicted that open taliks extending to the deep groundwater regime will occur beneath lakes that do not freeze completely, when the diameter is roughly 570 m or greater for round lakes or the width is at least 320 m for elongated lakes. Based on these analyses, open taliks exist beneath Third and Second Portage lakes, including Second Portage Arm. These analyses also suggest that the talik beneath Vault Lake does not extend to the deep groundwater flow regime because this lake is relatively shallow and much of the lake freezes to the bottom in winter.

The water elevation of lakes with open taliks provides the hydraulic head required to drive deep groundwater flow. The presence of the thick, low permeability permafrost beneath land located between large lakes results in negligible recharge to the deep groundwater flow from these areas. Smaller lakes have isolated, or closed, taliks that do not extend down to the deep groundwater regime and thus do not influence the groundwater flow in the deep regime. Consequently, recharge to the deep groundwater flow regime is limited to the open taliks beneath large lakes. Generally, groundwater will flow from higher elevation lakes to lakes located at lower elevations.

4.7 Seismicity

The Meadowbank Project is located in an area of low seismicity.

Peak horizontal ground accelerations for the Meadowbank site are summarized in Table 4.8.

TABLE 4.8: Peak Horizontal Ground Acceleration for the Meadowbank Site

Return Period of Seismic Event (years)	Peak Horizontal Ground Acceleration (g)
100	0.02
200	0.03
475	0.03
975	0.04
10000	0.07*

Source: 100 to 975 year data from Geological Survey of Canada (2003).
*10000 year event extrapolated from Geological Survey of Canada (2003) data

5.0 DIKE DESIGN

5.1 Central Dike

5.1.1 Design Concept

The purpose of the Central Dike is retain the tailings and limit seepage towards the Portage Pit. The dike will also act as a haul road, and support the tailings pipeline and spigots. A typical section through the Central Dike is shown in Drawing 4000-07.

Foundation soils include lakebed sediments and till overlying bedrock. The lakebed sediments will be removed from the Central Dike footprint after lake dewatering. Zones of coarse granular materials may exist within the foundation tills as layers or as channels. High permeability materials that can transmit large flows can have dimensions that are too small to detect with conventional drilling methods. The solution to dealing with high permeability layers is an engineered cutoff through the till to bedrock. Bedrock grouting will be carried out beneath the cutoff.

A trench will be excavated to bedrock along the upstream toe of the Central Dike rockfill. The bedrock surface will be cleaned and a low strength concrete slab poured. Grouting of the bedrock will be carried out through the concrete slab. A low permeability bituminous geomembrane liner will be anchored to the concrete in the base of the trench and extended up the face of the trench and dike. Bituminous geomembranes have been successfully installed on mine sites in northern Canada at temperatures down to about -25^{o}C. (Breul et al 2006) A filter to prevent the tailings from moving into the rockfill will be provided beneath the liner. The filter will also act as the liner bedding.

The bulk of the Central Dike will be constructed of run-of-mine rockfill that will be placed and compacted in lifts. The rockfill side slopes for the Central Dike are 1.5 Horizontal: 1 Vertical.

Granular filters will be placed on the surface of the foundation till below the upstream face of the Stage 1 section to prevent movement of foundation soils into the rockfill.

A layer of loose till will be placed upstream of the liner, to prevent uplift of the liner by water accumulating within the rockfill.

The dike will be built in three stages to elevations of 120, 140, and 147 masl. Crests of the first two stages of the dike will act as haul roads and as pipe berms for tailings deposition. The design of the Central Dike allows the raising sequence to be changed to accommodate changes in the mine plan without affecting the performance of the structure.

At the end of mine life, the pits are flooded, and lake water rises to elevation 134.1 masl against the downstream face (pit side) of the Central Dike.

The tailings profile is ultimately expected to freeze through into the foundation.

5.1.2 Construction Materials

The Central Dike rockfill will be constructed of IV rock below final lake level of 134.1 masl, and UM and QZT rock types above 134.1 masl.

The till placed over the liner will be obtained from pit stripping activities or the cutoff trench excavation. The till placed directly against the liner will require processing to remove oversize materials, but not moisture conditioning as this till is required only to provide a weight on the liner to prevent uplift.

Till that will be used as an impermeable element on the Stormwater Dike or Saddle Dams will require processing to remove oversize material and moisture conditioning for compaction.

The granular filters will be constructed of IV rock. The filter has two zones designated Coarse and Fine Filter, which are designed to filter the till and tailings against the rockfill.

Filter Design

Filter gradations were designed on the basis of available grain size data, which are presented in Figure 5-1. Waste rock gradations were predicted from blasting design (Golder 2004a) and represent the coarsest expected gradations for UM and IV rock types. The till samples from the Meadowbank site contained 15 to 50% passing the No. 200 or 0.075 mm sieve. Gradations for the Filters are presented in Table 5.1 and Figure 5-2.

Hydrometer test data for tailings generated from Third Portage and Vault deposits in 2004 are presented in Figure 5-1. The design gradation for the tailings has 100% passing the No. 200 sieve.

TABLE 5.1: Gradations Limits for Fine and Coarse Filters

US STANDARD SIEVES MAXIMUM SIZE	Size (mm)	Fine Filter % Passing	Coarse Filter % Passing
24"	610		100
12"	305		100-90
6"	152		100-50
3"	76.2	100	92-33
1"	25.4	100-68	44-7
1/2"	12.7	75-56	22-5
#4	4.75	55-40	10-3
#10	2	43-30	
#40	0.425	23-10	
#200	0.075	8-5	

The fine filter gradation is based on the typical gradation of the Zone 2B material in concrete faced rockfill dams. Laboratory testing of this gradation has demonstrated it to be internally stable under high gradients, and able to retain materials with 100% passing the No. 200 sieve (Eldridge and Gilmer 2002), making it suitable for use in the Central Dike. Crushing, screening and washing will most likely be required to produce the fine filter.

The coarse filter was designed based on Fell et al. (2005), and meets filtration criteria against the fine filter zone specification. The Coarse Filter is designed to be produced by scalping run-of-mine IV rock of sizes greater than 150 mm diameter. Depending on the crushing and screening plant available on site, processing of run-of-mine rock through the crushing plant may be carried out to reduce material handling requirements.

5.1.3 Thermal Analyses of Central Dike

Details of thermal analyses performed for the Central Dike, and for the tailings are presented in Appendix III. A summary of findings is presented here.

Thermal analyses were carried out to evaluate the patterns of temperatures that are likely to develop in the tailings, Central Dike and foundation materials during operations and post closure at the Meadowbank Gold Project. The model was divided into two components: Tailings Model and Central Dike Model.

A sequential 1D model was developed based on the tailings deposition plan, included in Appendix IV, and considered different scenarios with respect to the time tailings were exposed to air temperature between two subsequent depositions from the same spigot. The best case scenario considered tailings being exposed to air temperature during all the spigots inactive time. The worst case scenario assumed that tailings would be exposed only for 25% of the spigot inactive time with the remainder of the time the tailings receiving a small amount of warm tailings from adjacent spigots. An intermediate scenario considered tailings exposed for 50% of the spigot inactive time.

The models indicated that at the end of operations, the tailings would be completely frozen only for the best case scenario. For the other two scenarios, there would be thawed zones in the tailings at end of operations. Long-term analyses indicated however, that the entire tailings body would be frozen a decade after the end of operations, irrespective of the scenario evaluated. The rockfill cap placed on top of tailings works as an insulation media and prevents the active layer from reaching the tailings body.

The 2-D Central Dike model considered a typical section of the Central Dike, with tailings deposited in the upstream area. The model indicated that the upper part of the dike will be frozen at end of operations, but this zone will thaw once the lake returns to the downstream area. The long-term analysis indicated that the lake will influence the temperatures downstream of the Central Dike, and tailings will govern the temperatures pattern in the upstream portion. The tailings and foundation will remain frozen in the long-term.

The long-term analysis showed that foundation beneath the tailings will freeze progressively with time, and the frozen zone will range from 30 to 50 m beneath the bottom of the tailings. The models also indicated that the effect of global warming will not be sufficient to prevent freezing beneath the tailings during the 100 years period analyzed.

5.1.4 Stability Analyses

Computer analyses were conducted to determine the stability of the Central Dike during each stage of construction for upstream and downstream failure modes for static and pseudostatic earthquake loading conditions. Effect of undrained strength of foundation soils was also examined.

Methodology and Assumptions

Stability analyses were performed using the GeoSlope SLOPE/W, Version 6.2 computer program for general solution of slope stability by two dimensional limit equilibrium methods.

Compacted rockfill produces a free draining, internally stable structure. Cooke (1993) states: “Considering experience, testing and judgement, a value of 45^{o} may be assumed for compacted rockfill of sound rock. The shear strength decreases with increased confining pressure, as determined in triaxial testing. For stability analysis this can be taken into account. However, since no rockfill is known to have experienced a structural failure, an analysis on an assumed failure plane is academic. For the CFRD, analyses are not needed. The upstream slope may be 1.3 Horizontal: 1 Vertical since upstream failure is not possible. For the downstream shell, which receives only small water loading, the slope could be 1.3 Horizontal: 1 Vertical, but 1.4 Horizontal: 1 Vertical is used on high dams to take into account the reduced strength under confining pressures.” Cooke continues “Seismic loading results in crest zone deformation, settlement and ravelling, and not in a slope stability failure. For extreme seismic loading a wider crest and greater freeboard is a more effective response than flatter slopes.”

Slope stability analyses for the Central Dike have therefore been focussed on potential slip surfaces that involve the foundation materials or the liner on the upstream face rather than shallow slip surfaces that are contained completely within the compacted rockfill.

Four sections were analyzed, based on the deepest section for Stages 1, 2, 3, and for closure conditions with a 2 m waste rock cover on the tailings and a downstream lake elevation of 134.1 masl. Sections are shown in Figures III-24 to III-27, and listed in Table 5.2.

TABLE 5.2: Sections for Slope Stability Analysis

Description	Crest Elevation (masl)	Crest Width (m)
Stage 1	120	40
Stage 2	140	25
Stage 3	147	6
Closure	148	-

Other model geometry parameters are listed in Table 5.3

TABLE 5.3: Stability Analysis Model Geometry

Parameter	Value
Embankment upstream and downstream slopes	1.5 Horizontal: 1 Vertical
till placed as weight over liner	4 Horizontal: 1 Vertical
slope of pit wall	1:1
setback from pit crest to dike toe	70 m
final lake elevation	134.1 masl

The phreatic surface was taken from seepage analyses.

Material Properties

The soil parameters used in the analysis are listed in Table 5.4.

TABLE 5.4: Material Parameters for Stability Analysis

	Unit Weight (kN/m^3)	Cohesion *c* (kPa)	Angle of internal friction ϕ' (degrees)
IV Rockfill (unsaturated)	19.2	0	38*
IV Rockfill (saturated)	21.8	0	38*
UM & Q Rockfill (unsaturated)	19.8	0	38
Fine Filter	19.8	0	38
Coarse filter	21.4	0	38
Saturated Till	21.4	0	32
Bedrock	28	500	40
Bituminous Liner	15	300	0
Grout Curtain	25	300	40
Tailings	18	0	35
Water	9.8	0	0

* Note: Shear strength of compacted rockfill estimated from Douglas (2002) for confining pressure of 700 to 1000 kPa for analysis of slip surfaces involving the foundation. Cohesion of till assumed to be 125 kPa for undrained analyses. (Table 4.1)

For pseudostatic conditions a coefficient of horizontal acceleration of 0.04 (equal to one-half the peak horizontal ground acceleration corresponding to a predicted 1 in 10,000 year event) was applied (US Corps of Engineers 1984).

Stage 1 Results

Results of analyses for Stage 1 construction for upstream failure are shown in Figure III-28 for static and pseudostatic conditions. Similarly, results for downstream failure are shown in Figure III-29.

Results for undrained conditions after till placement are shown in Figure III-30.

The worst case for undrained conditions will be for upstream failure during cutoff trench construction, shown in Figure III-31. An investigation of the soil conditions, and particularly strength, will be carried out after the soft lakebed sediment has been removed from the footprint area and the configuration of the excavation adjusted to suit site condition.

All Factors-of-Safety (FoS) are above design criteria.

Results of a sensitivity analysis are shown in Figure III-32 as a plot of FoS against upstream failure versus till undrained strength.

Stage 2 Results

Results of analyses for Stage 2 construction for upstream failure are shown in Figure III-33 for static and pseudostatic conditions. Similarly, results for downstream failure are shown in Figure III-34.

Results for undrained conditions are shown in Figure III-35.

All Factors-of-Safety (FoS) are above design criteria.

Stage 3 Results

Results of analyses for Stage 3 construction for upstream failure are shown in Figure III-36 for static and pseudostatic conditions. Similarly, results for downstream failure are shown in Figure III-37. Results for undrained conditions are shown in Figure III-38.

Upstream failure for Stage 3 with a haul road for static and pseudostatic conditions is shown in Figure III-39.

All Factors-of-Safety (FoS) are above design criteria.

As a check on the effect of the drained strength of foundation soils for Stage 3 downstream failure, FoS is plotted in Figure III-40 versus friction angle of the lakebed till.

Sensitivity analyses for strength of the rockfill are shown in Figure III-41, using the function shown in Figure III-42.

Closure Results

Results of analyses of closure conditions for downstream failure are shown in Figures III-43 and III-44 for static and pseudostatic conditions. Yield acceleration conditions are shown in Figure III-45. All Factors-of-Safety (FoS) are above design criteria.

5.1.5 Seepage

The Central Dike was modelled to determine maximum expected rates of seepage and hydraulic gradients present in the foundation for use in sizing pumps and pipelines for water management and for determining the need for internal erosion control measures. Sensitivity analyses were performed to determine the influence of hydraulic conductivity on the gradients and total flows.

Freezing of the tailings, dam fill, or foundation was not considered in the seepage analysis. Water tables are assumed to be at the surface of the tailings beach, which is an extreme case as the tailings pond will be located at a lower elevation to the west (see Tailings Deposition plan in Appendix IV). For the closure scenario the tailings pond was considered to be completely saturated, which also represents an extreme case. The results for predicted seepage are therefore conservative in terms of quantities expected.

Summary of Results

Predicted seepage through the Central Dike is presented in Table 5.5.

TABLE 5.5: Summary of Predicted Flows through Central Dike

	Tailings Pond Elevation (masl)	Downstream Condition	Flow through liner (m^3/day)	Flow through foundation (m^3/day)	Total Flow (m^3/day)
Stage 1	118	No pit	0.02	350	350
Stage 2 (pit open)	138	Pit at El. 60m	0.06	1750	1750
Stage 3	146	Pit at El. 60m	0.07	2000	2000
Closure (prior to tailings pond draining)	146	Lake at El. 134.1m	0.07	625	625

Methods

Seepage modeling was done using a 2D finite element numerical code, SEEP/W Version 6.20. Deep and shallow sections, shown in Figures III-46 and III-47, were used in the analyses.

Maximum expected seepage through the foundation of the dike was 3.4 m^3/day/m at the deepest section for sizing of hydraulic facilities. Gradients as high as 17 were predicted across the bedrock grout curtain. Predicted gradients within the till foundation directly below the filter zone were a maximum of 0.5 confirming the requirement for a filter between the till foundation and rockfill.

Each section was assessed for gradient and total flow for the boundary conditions in Table 5.6.

TABLE 5.6: Boundary Conditions for Seepage Modeling

Stage	Upstream Boundary	Downstream Boundary
Stage 1	Tailings at 118 masl	No pit
Stage 2	Tailings at 138 masl	No pit and fully excavated pit
Stage 3	Tailings at 146 masl	Fully excavated pit and fully excavated pit with lake to 134.1 masl

The Central Dike will be constructed primarily on lakebed soils, and therefore on a talik. Taliks are unfrozen areas underlying water bodies within the continuous permafrost zone. The assumption of unfrozen ground makes estimates of seepage conservative with respect to total volume.

The values of hydraulic conductivity of the soils and the construction materials used in the analyses are summarized in Table 5.7.

TABLE 5.7: Summary of Parameters for Seepage Modeling

Material	Hydraulic Conductivity (m/s)		
	Range Observed	**Seepage Volume Analyses**	**Sensitivity Analyses**
Rockfill/Filter	n/a	$1x10^{-2}$	$1x10^{-2}$
Till	$3x10^{-4}$ to $1x10^{-7}$	$1x10^{-7}$	$1x10^{-5}$
Bedrock (0-20 m below bedrock surface)	$1x10^{-4}$ to $3x10^{-9}$	$5x10^{-6}$	$5x10^{-6}$
Grouted Bedrock	n/a	$1x10^{-7}$	$1x10^{-7}$
Bedrock (20m to ultimate depth below bedrock surface)	$1x10^{-8}$	$2x10^{-7}$	$2X10^{-7}$
Tailings (estimated from grain size)	$3x10^{-5}$ and $7.6x10^{-9}$	$5x10^{-7}$	$1x10^{-5}$
Grout Curtain	n/a	$1x10^{-7}$	$1x10^{-7}$
Bituminous Liner	n/a	Impermeable	Impermeable

Seepage through the bituminous liner was estimated as a constant rate of 100 L/ha/day based on average rates reported for liners in landfill applications (Bonaparte et al. 2002).

Results

Detailed results from seepage analyses are presented in Table 5.8. Water table profiles for the deep section for each stage of mine life are presented in Figures III-48 to III-52.

TABLE 5.8: Seepage Analysis Results for Central Dike.

Stage	Max. Gradient Grout Curtain	Max. Gradient Till Rockfill Interface
1	5.9	0.2
2	15	0.4
3	17.4	0.5

5.1.6 Settlement and Consolidation

Consolidation analyses on the deepest section of the Central Dike indicate:

- The rockfill may settle 0.40 m based on 1% settlement; and
- The foundation till may settle up to 0.54 m.

There will be sufficient freeboard at all times to accommodate the settlement. Settlement at the centreline of the Central Dike at final crest elevation and at the surface of the foundation till was calculated to determine the maximum anticipated settlements. One dimensional analyses were conducted based elevations in Table 5.9, using properties from Table 5.10.

TABLE 5.9: Summary of Elevations for Settlement Calculations

Materials	Stage 3 Centerline
Rockfill Crest Elevation (masl)	148
Till Elevation (masl)	108
Bedrock Elevation (masl)	90

TABLE 5.10: Material Parameters for Settlement/Consolidation Analysis

Material	Specific Gravity G_s	Void Ratio e	Dry Unit Weight (KN/m^3)	Saturated Unit Weight (KN/m^3)	Compression Index, C_c	Coefficient of Consolidation c_v (m^2/sec)	Comments
Rockfill - Intermediate Volcanics and Quartzite/Ultramafic Cap	2.89[A]	0.5	19.2	21.8	n/a	n/a	1% consolidation [B]
Till	2.71	0.51	20.4	21.4	0.0656[C]	1.22x10^{-3} and 2X10^{-5} [C, D]	

Note A. Table 5.2 of CRL (2005b)
Note B. experience with similar construction materials, Marsal (1973)
Note C. 2006 laboratory testing on reconstituted samples
Note D. c_v calculated from hydraulic conductivity, K=5x10^{-6}m/s, and m_v derived from 2006 laboratory testing on reconstituted samples.
n/a Not applicable

The consolidation analyses indicate that the 18 m thick till foundation layer may undergo settlement of 0.54 m under the final dam configuration, with the rockfill settling an additional 0.5 m. The predicted time to achieve 95% consolidation for the foundation till (18 m thick with drainage path length of 9 m) varies between about 4 and 200 days based on c_v values of 1.2x10^{-3} m^2/s to 2x10^{-5} m^2/s. Based on these analyses, it is expected that pore water pressures in the foundation tills generated by placement of rockfill will dissipate during stages of construction.

5.1.7 Wave Action and Rip Rap Protection

The Central Dike will be operated with tailings against the dam face and the reclaim water pond remote from the dam. Wave action overtopping the upstream face of the dam is therefore not a concern.

Water will be against the downstream face of the Central Dike after the Portage Pit is flooded. The final water surface elevation will be 134.1 masl. For a dike crest elevation of 147 m, the freeboard above the lake level will be 13 m.

The downstream face of the Central Dike comprises compacted rockfill which will be resistant to erosion and rip-rap protection will not be required.

Wave Hindcast

Wave heights corresponding to the overwater windspeeds were estimated using the simplified procedure in the Coastal Engineering Manual (US Army Corps of Engineers 2006). Preliminary calculations were undertaken using wind durations of 1, 2 and 3 hours and it was determined that waves will be fetch limited, due to the short overwater fetch lengths.

A detailed hindcast to derive wave heights corresponding to different return periods was not undertaken. Rather, wave heights corresponding to the largest recorded windspeeds during the 2002 open water season were calculated. The maximum recorded windspeed of 124 km/hr was also used to hindcast waves from each of the relevant overwater fetches, and these hindcasted waves were used to derive estimates of the potential maximum wave runups. The 1/1,000 year wind event was 83 km/hr, and the design windspeed of 124 km/hr is therefore conservative with respect to expected wave height and run-up.

Fetch lengths and maximum water depths are included in Table 5.11.

TABLE 5.11 Fetch Length and Maximum Water Depth

Dike	Fetch Direction	Fetch (km)	Maximum water depth at dike (m)
Central Dike	east	0.5 km	12 m
Central Dike	southeast	0.7 km	12 m

Wave Runup

Wave runup was estimated using Hughes (2003) assuming rough slopes and is estimated with respect to the still water line (SWL) for sideslopes for the Central dike of 1.5 Horizontal :1 Vertical.

The procedure derives estimates of wave runup corresponding to $Ru_{2\%}$, which is defined as the runup exceeded by 2% of the incoming waves. For example, for every 100 waves, 2 of them will result in runup equal to or exceeding this estimate.

The results for each fetch are tabulated in Table 5.12 below.

TABLE 5.12: Estimated Wave Runup, Second Portage Lake

Dike	Fetch	Wind speed (m/s)	Wave Height Hmo (m)	Wave Period Tp (s)	Runup (m), above still water line
Central Dike	SE	20.6	0.3	1.3	0.4
		34.4	0.6	1.72	1.0
	E	15.4	0.5	1.5	0.8
		34.4	0.2	1.1	0.3

Riprap Revetment Design

Revetment design was undertaken for the erosion protection works on the dikes. Revetment was designed using the Coastal Engineering Manual methodology (US Army Corps of Engineers 2006, Part 6-Chapter 5).

The maximum estimated incident wave heights given in Table 5.12 above, were used to estimate the required riprap sizes for each of the incident fetches. For construction simplicity, it was then assumed that a single revetment would be specified.

Central Dike (east face)

M50 = 40.5 kg, D50 = 285 mm

The run-of-mine rockfill will exceed this gradation and additional protection of the face of the dam will not be required.

5.2 Stormwater Dike

Basic design concepts and analyses for the Stormwater Dike are presented here. The Stormwater dike is shown in plan on Drawing 4000-18 and in section on Drawing 4000-19.

5.2.1 Design Concept

The purpose of the Stormwater Dike is to isolate the tailings management area from the attenuation pond area for the first 4 years of ore processing. After 4 years, tailings will be deposited in the attenuation pond area north of the Stormwater dike, and this dike will no longer be required to retain water or tailings.

The Stormwater Dike will be a rockfill with an impermeable element keyed into the foundation till. The Dike will be constructed by stripping the lakebed sediments from the footprint, then dumping a 30 m wide rockfill (width to suit two way haul truck traffic) along the alignment. The upstream (south) face will be re-graded by bulldozers to 3 Horizontal: 1 Vertical and a cutoff trench will be excavated through the till to bedrock along the upstream toe. Options for the impermeable upstream element include a bituminous geomembrane liner, and a compacted till layer. The 3 Horizontal :1 Vertical side slopes allow liner and bedding or till to be placed and compacted on the slope. The alignment of the Stormwater dike is shown in plan on Drawing 4000-18. A filter zone is not required to retain tailings.

5.2.2 Stability Analyses

Analyses conducted for the Stormwater dike include stability analyses for failure through the foundation. Analyses indicated Factors-of-Safety (FoS) exceeded the design criteria for upstream and downstream failure modes for static and pseudostatic conditions. Results are shown in Figures III-53 to III-54 for a bituminous liner option.

Stability analyses were performed using the GeoSlope SLOPE/W, Version 6.2 computer program for general solution of slope stability by two dimensional limit equilibrium methods.

Model geometry parameters are listed in Table 5.13.

TABLE 5.13: Stability Model Geometry – Stormwater Dike

Parameter	Value
Crest Elevation (masl)	142
Crest Width (m)	6
upstream slope	3 Horizontal:1 Vertical
downstream slope	1.32 Horizontal:1 Vertical

The soil parameters used in the analysis are listed in Table 5.14.

TABLE 5.14: Material Parameters for Stability Analysis

	Unit Weight (kN/m^3)	**Cohesion *c* (kPa)**	**Angle of internal friction ‘ (degrees)**
Rockfill (unsaturated)	19.2	0	38*
Fine Filter	19.8	0	38
Course filter	21.4	0	38
Saturated Till	21.4	0	32
Fractured Bedrock	28	500	40
Bituminous Liner	15	300	0
Grout Curtain	25	300	40
UM & Q	19.8	0	38
Tailings	18	0	35
Water	9.8	0	0

* Note: Shear strength of compacted rockfill estimated from Douglas (2002) for confining pressure of 700 to 1000 kPa for analysis of slip surfaces involving the foundation. Till cohesion = 125 kPa for undrained analyses. (Table 4.1)

5.3 Saddle Dams

Basic design concepts and analyses for the Saddle Dams are presented here. The Saddle Dams are shown in plan on Drawing 4000-18, and in Section on Drawing 4000-20.

5.3.1 Design Concept

The purpose of the Saddle Dams is to retain the tailings and limit seepage. The Saddle Dams will also act as a haul road surface during construction, and as a pipe berm for tailings deposition. Saddle Dams along the north of the TSF are designed as haul roads and pipe berms only. Saddle Dams on the south of the TSF are designed as seepage and tailings barriers.

The Saddle Dams along the south side of the tailings facility will be constructed by dumping a 30 m wide rockfill along the alignment, re-sloping the upstream face, excavating a trench to bedrock along the upstream toe and the installation of an impermeable element.

The south Saddle Dam section includes a two zone filter with gradations as described in Section 5.12, to prevent the movement of tailings particles. The filter will be placed on a 3 Horizontal : 1 Vertical slope. This slope angle allows equipment traffic on the slope, so till and filter materials may be placed and compacted on the slope. The impermeable element will be a bituminous geomembrane liner or compacted till. Selection of the impermeable element type will be made at the time of construction and will depend on availability of till suitable for placement and compaction.

The Saddle Dams are constructed primarily of rockfill. Concerns for stability include thawing of ice rich foundation soils and other foundation soil failures. Ice rich soils are removed prior to construction.

Thermal analyses were conducted to determine the depth of frost action on till placed as an impermeable element.

5.3.2 Stability Analyses

Analyses conducted for the Saddle Dams include stability analyses for failure through the foundation. Analyses indicated FoS exceeded the design criteria for upstream and downstream failure modes for static and psuedostatic conditions. Results are shown in Figures III-55 to III-58 for compacted till core and bituminous liner options.

Stability analyses were performed using the GeoSlope SLOPE/W, Version 6.2 computer program for general solution of slope stability by two dimensional limit equilibrium methods.

Model geometry parameters are listed in Table 5.15.

TABLE 5.15: Stability Model Geometry – Saddle Dams

Parameter	Value
Height (m)	14
Crest Width (m)	6
upstream slope	3 Horizontal:1 Vertical
downstream slope	1.32 Horizontal:1 Vertical

The soil parameters used in the analysis are listed in Table 5.14. Typical upstream and downstream static and pseudostatic failures are shown in Figures III-55 and III-56.

Analysis results indicate FoS exceeded the design criteria for static and pseudostatic conditions.

5.3.3 Thermal Analyses

Till placed over the rockfill as an impermeable element will be subject to freeze-thaw effects until covered with tailings. Thermal analyses were conducted to determine what thickness of till placed over rockfill would be affected by freeze thaw. Analyses indicate that depth of the active layer is approximately 1.9 m in till.

Analyses were conducted using TEMP/W Version 6.20, with a 1D mesh shown in Figure III-59. Properties used for the analysis are listed in Table 5.16. Results are presented graphically in Figure III-60.

It is noted that freeze thaw action on the till will be of limited duration. As the tailings rise and cover the till, only the upper surface will undergo freeze and thaw. In order to limit the degradation of compacted till to an upper layer a minimum thickness of 4 metres of till is recommended.

TABLE 5.16: Material Parameters for Thermal Modeling

Material	Moisture Content (%)	Dry Density (t/m^3)	Specific Gravity *Gs* (t/m^3)	Void ratio *e*	Porosity *n* (%)	Degree of Saturation (%)	Volumetric Water Content	Thermal Conductivity (W/m °C)		Volumetric Heat Capacity (MJ/m^3 °C)	
								Frozen	Thawed	Frozen	Thawed
Rockfill saturated	16.0	2.22	3.44	0.55	35.5	100	0.36	2.1	1.7	1.6	2.5
Rockfill unsaturated	5.0	2.22	3.44	0.55	35.5	28.9	0.09	1.9	1.6	1.5	1.9
Filter	5.0	1.87	2.89	0.55	35.5	26.3	0.09	1.9	1.6	1.5	1.6
Till	16.6	1.87	2.71	0.45	30.0	100	0.31	2.1	1.6	1.6	2.3
Fractured bedrock	0.5	2.71	3.0	-	-	100	0.05	2.9	2.9	2.4	2.4
Bedrock	0.5	2.71	3.0	-	-	100	0.07	2.9	2.9	2.4	2.4
Tailings	40.0	1.45	3.1	1.38	0.54	100	0.54	2.3	1.7	2.1	2.3

6.0 CONSTRUCTION QUANTITIES AND SCHEDULE

6.1 Mine Development Plan

Table 6.1 summarizes the proposed development sequence for the Meadowbank Project provided by MMC.

TABLE 6.1: Mine Development Plan

Year	Key Issues
-2 and -1	• Stripping at Third Portage peninsula for construction materials • Construct East, Bay Zone, and Central Dikes • Begin constructing Goose Island Dike as construction material becomes available • Lower water level behind East and Bay Zone Dikes • Construct plant site
1	• Commence mining of Portage Pit, south end • Portage Pit water pumped to water sump at process plant • Continue and complete construction of Goose Island Dike. Dewater behind dike. Commence stripping of overburden materials
2	• Commence mining at Goose Island Pit • Raise Central Dike from El. 120 masl to El. 140 masl • Portage and Goose Island Pit waters, and plant site and airstrip runoff to be directed to attenuation pond, or pumped to water sump at process plant for use as process water as required before discharge of excess to attenuation pond
3-4	• Portage and Goose Island Pit waters, and plant site runoff waters, pumped to water sump at process plant for monitoring and treatment and use as process water as required before discharge of excess to attenuation pond. • Begin construction of Vault haul road • Construct Vault Dike and dewater Vault Lake
5	• Complete mining of Goose Island Pit • Raise Central Dike from El. 140 masl to 147.0 masl • Goose Island Pit is available for storage of pit water • Pump pit water from Portage Pit to Goose Island Pit for early flooding, water quality monitoring, and in-pit treatment as required. Small quantity to be pumped to the process plant for treatment and use as process water • Begin mining northward at Portage Pit. Selective placement of waste rock into south end of Portage Pit, or into Goose Island Pit. Selective placement of ultramafic rock at Portage Rock Storage Facility for future use during closure. • Commence mining at Vault
6-7	• Continue and complete mining of Portage Pit (north end) • Continue mining of Vault Pit • Continue pumping Portage Pit water to Goose Island Pit lake until Portage Pit is mined-out then allow pits to fill

Year	Key Issues
	• Monitor water quality within flooded pits, treating in-situ as required and/or pumping to process plant for use as process water
8	• Complete mining in Vault • Continue pumping Portage Pit water to Goose Island Pit lake until Portage Pits are mined-out, then allow pits to fill • Monitor water quality within flooded pits treating in-situ as required and/or pumping to process plant for use as process water • Continue Goose Island Pit flooding, monitoring and water treatment; commence Portage Pit flooding, monitoring and water treatment.
9	• Mining complete, start final abandonment and restoration • Commence Vault Pit flooding.

6.2 Materials Balance

The quantities of material available during startup and mine operations are summarized in Appendix II. The table also provides a breakdown of rock type availability. It is important to note that the construction sequence can be adjusted without impacting the performance of the dikes. Also construction of the North Saddle Dam can be staged to meet the availability of rockfill.

Table 6.2 summarizes estimates of 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 and 2003, and 2006.

TABLE 6.2: Lake Volumes Inside Dewatering Dikes

Location	Lake Section	Volume (Mm^3)
Second Portage Lake Arm (elevation 133.1 masl)	Northwest Basin (run-off pond)	1.9
	Main Basin (Main tailings)	7.6
	East Basin (adjacent to east dike)	3.0
	Total Second Portage Lake Arm within east dewatering dike	12.5
Third Portage Lake – Goose Island Area	Inside Bay Zone dewatering dike	0.5
	Between Bay Zone dike and Goose Island dewatering dikes	2.4
	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
Total		**17.6**

Note. Volume estimates are based on site bathymetry
Source: Golder (2004b), Golder 2006a

6.3 Pre-Construction Geotechnical Investigations

Geotechnical investigations required during construction of the Central Dike:

- To map bedrock surface geology and soil conditions in upstream cutoff trench footprint.
- To investigate perimeter of the tailings impoundment for coarse materials or potential flow pathways for tailings or supernatant.

Foundation soils along the south Saddle Dam alignment will be investigated for ice rich soils. Ice rich soils will be removed in order to found the dike on bedrock, or ice-poor soils.

6.4 Construction Sequence and Techniques

6.4.1 Central Dike

Construction of Stage 1 of the Central Dike occurs in Year -1 and -2 of mine life, and will include (summarized in Drawing Nos. 4000-07 to 4000-17):

1. Stripping of soft lakebed sediments from the dike footprint
2. Cutoff trench excavation and bedrock grouting
3. Bituminous geomembrane liner placement in the cutoff trench
4. Trench backfill and till placement in the cutoff trench
5. Rockfill, filter, and bituminous geomembrane liner placement of the upstream face

Soil will be excavated to bedrock to form the cutoff trench. A lean concrete mat will be poured on the prepared bedrock surface in the base of the trench. Grouting will be completed through the concrete mat.

The trench wall will be prepared for placement of the bituminous liner. The liner will bonded to the concrete mat. The liner will be advanced up the face of the rockfill and held in an anchor trench at the crest. Uncompacted till soils are placed against the liner to counteract pressure due to water ponded in the rockfill.

Rockfill placement may occur concurrently with trench excavation. Rockfill will be compacted in lifts to minimize settlement.

Filter zones are placed and compacted as rockfill construction progresses. The fine filter will act as the bedding for the bituminous geomembrane liner. Coarse filter material is placed at spigot locations to protect the liner.

Instrumentation will be installed during and following construction stages.

The crest elevation for Stage 1 construction is 120 masl.

Stages 2 and 3 will follow a similar construction sequence. Trench excavation will encounter frozen ground at higher stages, and grouting may necessarily be limited. For Stage 2, the tailings pond will be against the Stormwater Dike, and in Stage 3 the tailings pond will be in the northern basin.

Crest elevation for Stage 2 is 140 masl.

Stage 3 includes an optional haul road built on the downstream side of the rockfill embankment within the setback area.

Capping the TSF for closure brings the crest of the dike to 148 masl.

6.4.2 Stormwater Dike

Access for construction of the Stormwater Dike will be by rockfill roads constructed as berms for piping and spigots associated with tailings deposition. The rockfill roads will ultimately become part of the Saddle Dams.

Construction of the Stormwater Dike will include:

1. Footprint stripping
2. Rockfill embankment construction
3. Cutoff trench excavation
4. Liner bedding placement
5. Compacted till placement, or
6. Bituminous liner placement

Stripping will include removal of lakebed sediments and soft soils in the footprint of the Stormwater Dike. Rockfill embankment construction will be by mine haul truck. The initial crest of the Stormwater Dike will be 30 metres wide to accommodate truck traffic. The width of the initial crest can be adjusted to suit construction equipment. Upon completion of the road, the east slope is re-sloped at 3 Horizontal : 1 Vertical, and the cutoff trench is excavated. An appropriate bedding is prepared and the impermeable element is placed. The impermeable element may be comprised of compacted till or bituminous geomembrane liner.

6.4.3 Saddle Dams

The North Saddle Dam is essentially a berm for piping and spigots associated with tailings deposition. The North Saddle Dam is constructed using mine haul trucks to a crest width of 30 m. The South Saddle Dam uses the same initial construction technique, but portions of the South Saddle Dam are modified to retain tailings and water.

Construction of the South Saddle Dam will include:

1. Footprint stripping
2. Rockfill embankment construction
3. Trench excavation
4. Filter placement
5. Compacted till placement, or
6. Bituminous liner placement

Stripping will include removal of ice rich soils from the areas marked on Drawing 4000-23. Rockfill embankment crest width will be 30 metres to accommodate construction with mine haul trucks. If the large haul trucks are not used for placing the rockfill, the crest width can be reduced. Upon completion of the road, the north (upstream) slope is pushed by bulldozer to between 2.5 and 3 Horizontal: 1 Vertical, depending on contractor’s preference. A cutoff trench is excavated at the toe of the re-sloped rock fill.

Coarse and fine filters are placed and compacted by rollers. An impermeable element comprising compacted till or bituminous geomembrane liner is then placed.

6.5 Instrumentation and Monitoring

Table 6.3 summarizes geotechnical instrumentation which will be installed to monitor the behaviour of the Central Dike and foundation during construction and operation.

TABLE 6.3: Central Dike Instrumentation

Instrumentation	Stage 1	Stage 3
ML Piezometers	9	6
Thermistor (Total Strings/Total Beads)	12/130	13/82
Surface Monuments and Survey Prisms	21	40
Survey Control Monuments	1 at each abutment (25 m from chainage start and end)	
Seismographs	2 portable units	

In general the instrumentation is intended to provide the following:

- Confirmation that the performance of the dike is consistent with the predictions made during the design studies with respect to stability, deformation, seepage and thermal analyses; and
- Early warning of the development of potentially adverse trends such as excessive pore water pressure, seepage and/or deformation.

All instrumentation will be read manually immediately following installation and during construction. An automatic field data acquisition system will allow the collection of the data from the piezometers and thermistors during operation.

6.5.1 Piezometers

Geokon multi-level vibrating wire piezometers (MLP) shall be installed as shown in Drawings 4000-24 and 4000-25. The piezometers shall provide the following information:

- During construction – measurement of excess pore water pressures, which may have developed in the foundation soils following fill placement. Analyses indicates that pore water pressures due to fill placement may dissipate in less than 2 weeks; and
- During operations – determine the effects of blast induced ground acceleration and velocities and deformation of the embankment and foundation; monitoring of pore water pressure and groundwater gradients under the dike and near the downstream toe, simultaneously with permafrost penetration into the dike fill and foundation and open pit deepening.

6.5.2 Thermistor Strings

The thermistors shall be used to monitor the development of permafrost within the foundation and fill. The thermistor readings will be used to validate or calibrate the thermal analyses done for various parts of the dike.

Thermistors shall be installed as shown on Drawings 4000-24 and 4000-25.

6.5.3 Surface Monuments and Survey Prisms

Survey monuments and survey prisms shall be installed at 25 m intervals along the crest centerline for the given stage as shown on Drawing 4000-24 to measure the vertical and lateral movements associated with fill settlement and foundation soil consolidation during operation. Accurate measurements will require the use of high resolution surveying equipment and a network of stable control monuments.

6.5.4 Surface Control Monuments

Survey control monuments shall be installed at locations as shown on the Drawing 4000-24 to provide control points for surveys. Survey monuments shall be embedded 1.5 m into bedrock. Accurate measurements will require the use of high resolution surveying equipment and a network of stable control monuments.

6.5.5 Seismograph

Blast monitoring will be carried out using a portable seismograph that will measure both velocities and accelerations induced by blasting at the crest and/or the toe of the dike. dike as shown on the drawings.

6.5.6 Automated Data Acquisition System

The proposed instrumentation system includes fifteen multi-level vibrating wire piezometers and twenty-five thermistors. The automatic data acquisition system will be used to collect data from these instruments. Software enables graphic data interpretation, visualization of fill and foundation behaviour and alarm management.

The required system includes one data logger and will require installation of one shelter. The data logger terminal requires electrical and heating supply to keep the monitoring system at a temperature greater than 0^{o}C.

6.5.7 Monitoring Frequencies

Table 6.4 summarizes the routine monitoring program during construction and operation. The frequency of monitoring will depend, to some degree, on the data collected and on the state of operation.

TABLE 6.4: Instrumentation Monitoring Frequency

Instrumentation	Monitored By	Reported To	Frequency during Construction	Frequency during Operations
MLP Piezometers	Manually during construction by Contractor Automatically during operations	Construction Manager and Engineer	Every 12 hours to weekly	Daily to weekly
Thermistors	Manually during construction by Contractor Automatically during operations	Construction Manager and Engineer	Every second week	Every second week
Surface Monuments and Surface Prisms	Manually by Contractor during construction Manually by operating personnel during operations	Construction Manager and Engineer	Daily	Weekly
Seismographs	Manually by Contractor during construction Manually by operating personnel during operations	Construction Manager and Engineer	During Blasting	During Blasting

6.6 Water Handling and Seepage Management Plan

6.6.1 Central Dike

Lakebed bathymetry shown in Drawing 4000-04 indicates that drainage of the area between the pit and the Central Dike will be towards the dike.

Seepage through the Central Dike and foundations is therefore expected to pond within the rockfill against the filter zones and bituminous liner until the Portage Pit is developed to sufficient depth to draw the phreatic surface down.

Rainfall and snowmelt on the rock fills will be collected within the dam fill. Rainfall and snowmelt from the catchment immediately to the east of the Central Dike is expected to drain west to the dike toe.

A seepage collection sump will be excavated into the till downstream of the Central Dike. Excavation can be during stripping, or during operations based on observed drainage. Sump location will be at approximate chainage 700 m, as shown in Drawings 4000-08 and 4000-09. The trench will only collect drainage from the catchment to the east of the Central Dike until water ponded within the dike rises to the elevation of the downstream dike toe.

6.6.2 Stormwater Dike

The Stormwater Dike is a water management structure, and serves to separate tailings from water collected from the catchment to the north west of the TSF. Seepage through the dike will depend on the relative levels of the tailings pond and the pond to the west of the Stormwater Dike.

6.6.3 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 intended to retain tailings and inhibit seepage. As with the Central Dike, the topography in the area to the south of the south Saddle Dam will govern drainage. Where drainage is to the south, stripping operations for removal of ice rich soils from the Saddle Dam footprint will include excavation of a collection trench and sump, as shown on Drawing 4000-23.

7.0 CLOSURE

The reader is referred to the "Important Information and Limitations of This Report" which follows the text but forms an integral part of this document.

If you have any questions please do not hesitate to contact us.

GOLDER ASSOCIATES LTD.

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Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, and safety and equipment capabilities.

Soil, Rock and Groundwater Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. **The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report.** The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

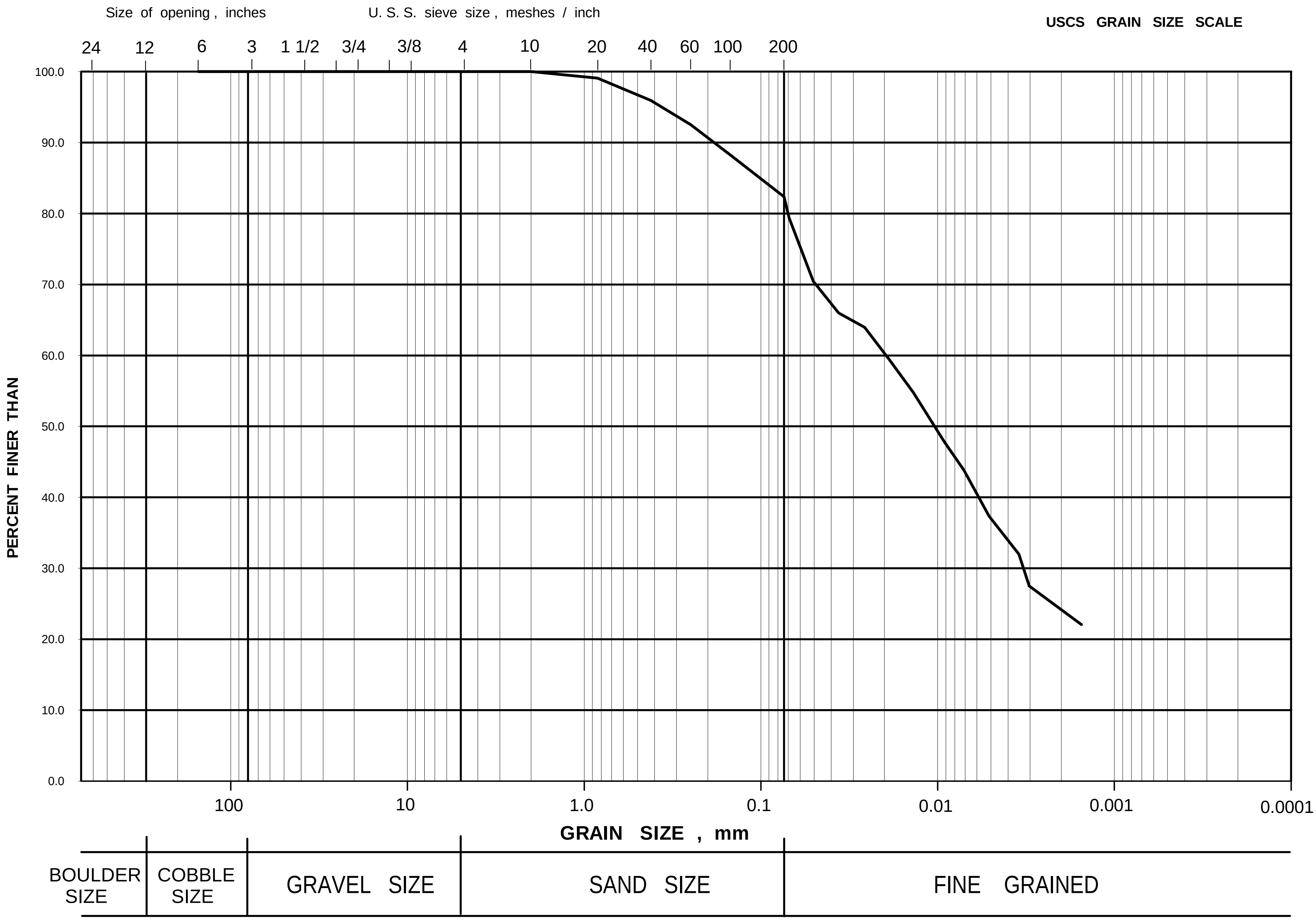
Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.



Project No.	06-1413-089
Drawn	TM
Reviewed	LL
Date	03/16/07

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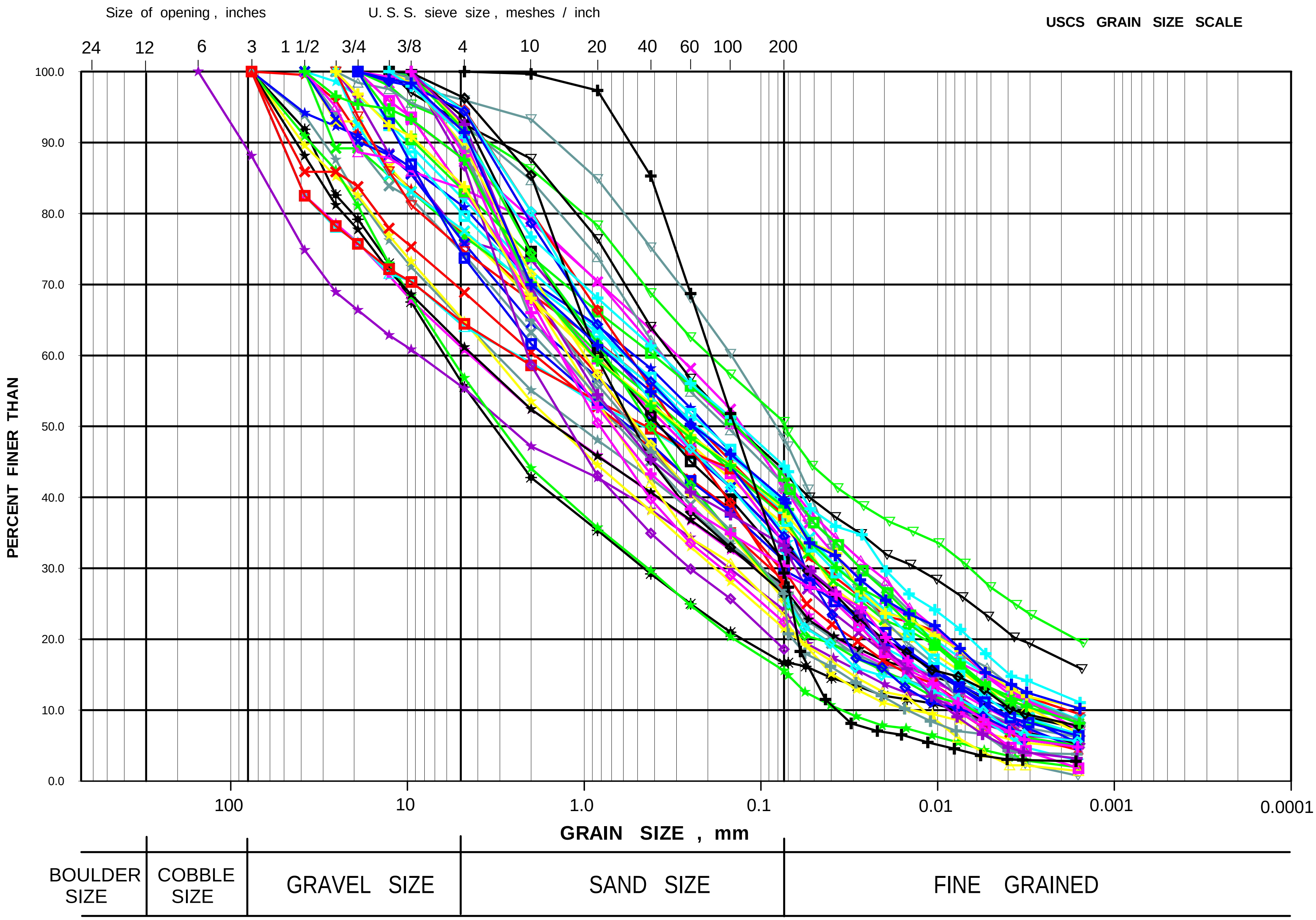
GRAIN SIZE LAKEBED SEDIMENTS
MEADOWBANK GOLD PROJECT, NUNAVUT

Figure 4.1



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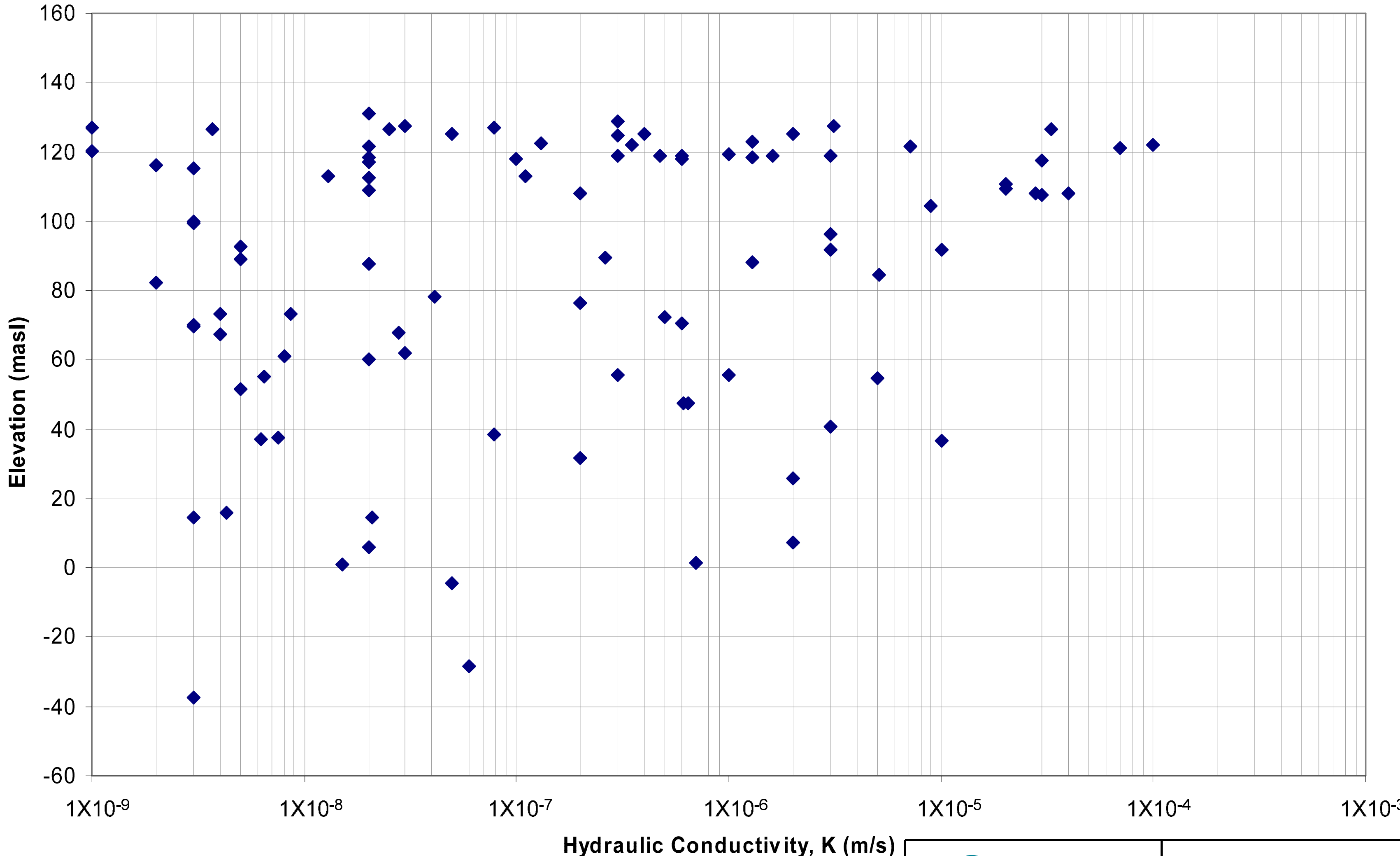
GRAIN SIZE TILL
MEADOWBANK GOLD PROJECT, NUNAVUT

Figure 4.2



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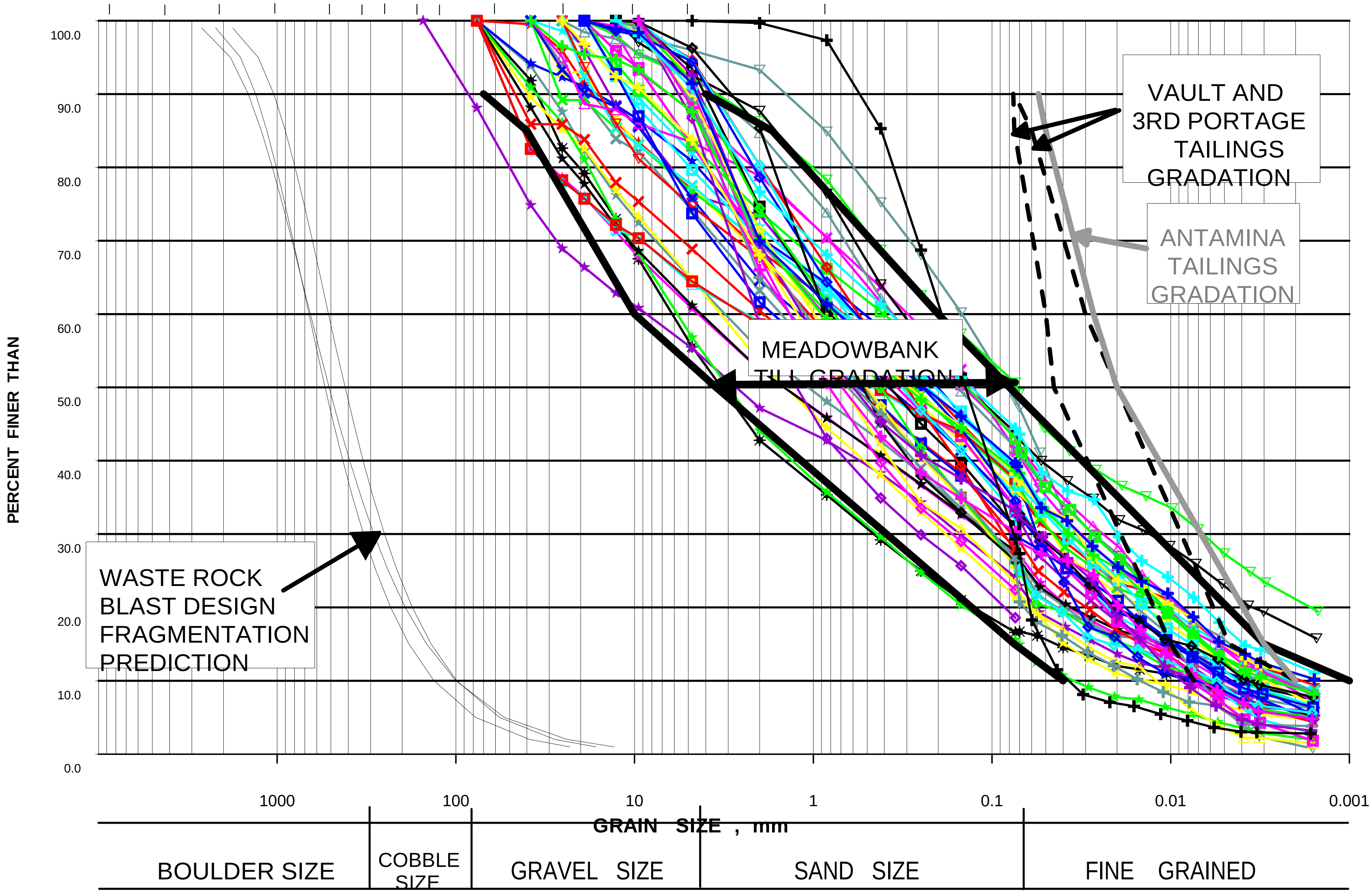
Bedrock Hydraulic Conductivity Versus Elevation Meadowbank Gold Project

Drawn: TC	App'd:	Date: Feb. 21, 2007	Figure: 4.3

Project No.: 06-1413-089 Revision No.:



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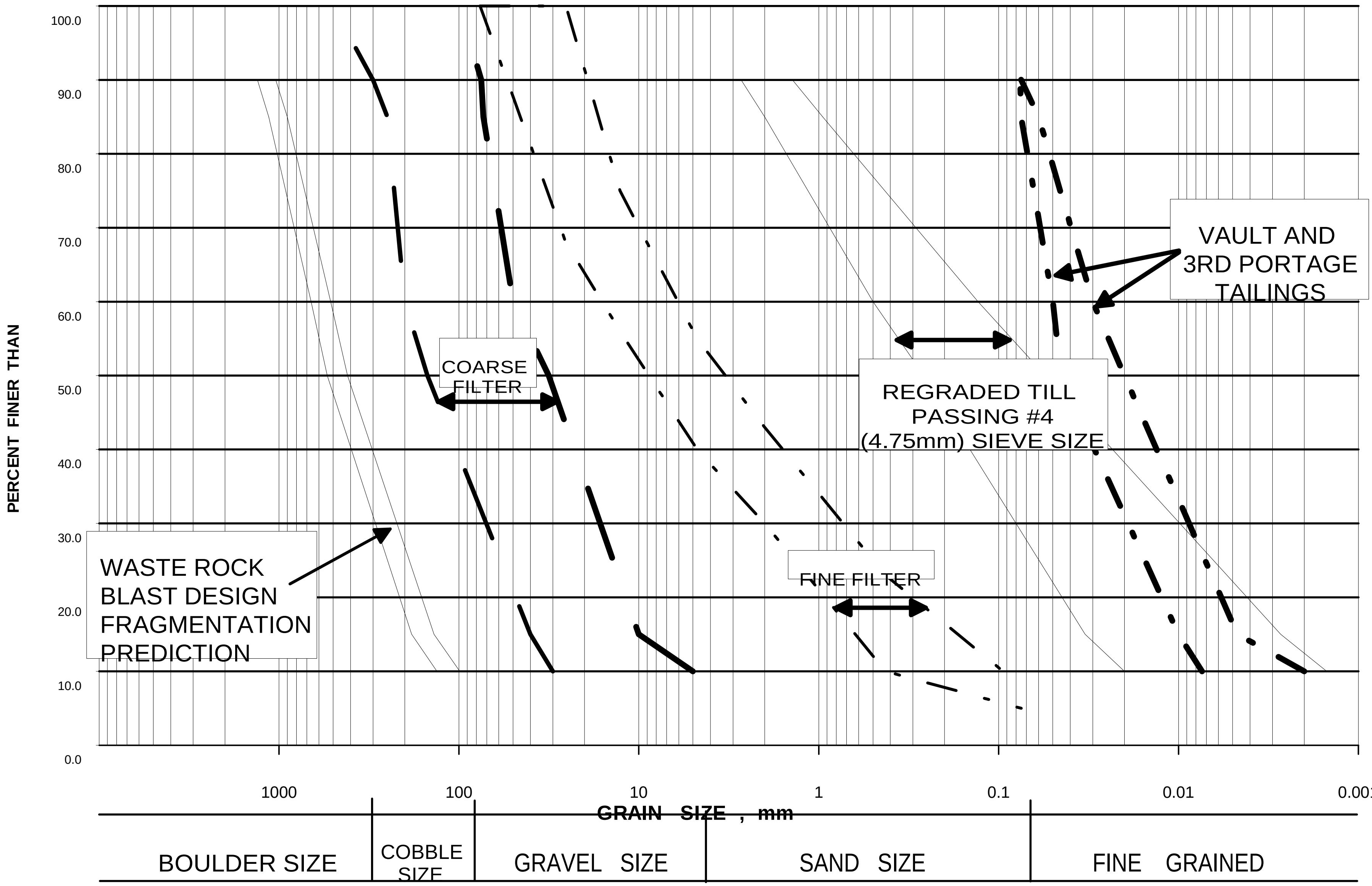
GRAIN SIZE FOR FILTER DESIGN
MEADOWBANK GOLD PROJECT, NUNAVUT

Figure 5-1



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GRAIN SIZE COARSE AND FINE FILTERS
MEADOWBANK GOLD PROJECT, NUNAVUT

Figure 5-2

APPENDIX I

SITE DATA SUMMARY TABLES AND 2006/2007 LABORATORY TEST RESULTS

SITE DATA SUMMARY TABLES

TABLE I-1: Summary of On-land Borehole Observations of Soil Overlying Bedrock

Borehole	Ground Surface El. (masl)	Bedrock Surface El. (masl)	Thickness (m)	Description of Soils
02GT-01	131.50	126.40	5.10	Cobbles and gravel
03GT-GI-7	139.35	134.97	4.38	Gravel and cobbles
03GT-PS-1	149.16	147.76	1.40	Boulders and cobbles with silty sand and trace gravel over cobbles with gravel and trace silt
03GT-PS-4	149.33	148.68	0.65	Cobbles and boulders with some gravel
03GT-PS-5	144.68	140.08	4.60	Cobbles and boulders with some angular gravel
03GT-PS-7	149.82	149.37	0.45	Cobbles and boulders with trace gravel and 0.05 m of organics
03GT-PS-9	147.47	146.72	0.75	Cobbles and boulders with trace gravel
03GT-PS-10	148.14	147.49	0.65	Cobbles and boulders with some gravel
03GT-PS-11	149.58	148.88	0.70	Cobbles and boulders with trace gravel
03GT-TD-1	136.41	134.34	2.07	Loose cobbles and round gravel with occasional boulders
03GT-Spec-F1	139.85	138.89	0.97	Cobbles and some angular gravel

TABLE I-2: Summary of Soil Depth and Description for Boreholes Drilled in Lakes

Borehole	Thickness of Soils Encountered (m)	Description
02GT-02A	2.7	Loose, homogenous, wet, dark grey, well graded, clean sand
02GT-02B	3.1	Loose, homogenous, wet, dark grey, well graded, clean sand
02GT-05	1.5	Lake bottom sediments and coarse sand, cobble and gravel
02GT-07	0.45	Loose, yellow silty clay
02GT-08	4.2	Dense yellow clay, silt, sand and gravel over loose gravel and cobbles over loose grey green, white rounded to sub-rounded cobbles, coarse gravel and sand
02GT-11	1.6	Lake bottom sediments and till
03GT-BZ-2	2.16	Loose cobbles and gravel with trace sand
03GT-BZ-3	1.20	Gravel and cobbles
03GT-BZ-5	2.74	Cobbles and boulders with some gravel, trace sandy silt
03GT-BZ-6	4.43	Boulders and cobbles with some gravel, trace sand and silt
03GT-GI-1	3.31	Boulder over cobbles and gravel with trace of clay and sand
03GT-GI-2	3.60	Cobbles and gravel over silty clay with some sand and trace gravel over sandy clay with gravel over sandy clay and gravel with cobbles
03GT-GI-3	1.25	Cobbles and gravel
03GT-GI-4	1.81	Cobble and gravel with trace sand and clay
03GT-GI-5	1.84	Gravel
03GT-GI-6	5.90	Loose cobbles and gravel with trace sand
03GT-GI-8	3.52	Cobbles and boulder with some gravel

Borehole	Thickness of Soils Encountered (m)	Description
03GT-GPIT-1	10.45	Cobbles and gravel
03GT-GPIT-3	14.30	Gravel and cobbles with trace and clay and sand
03GT-GPIT-4	14.94	Cobbles and gravel with trace coarse sand, silty fine grained sand over medium to fine grained sand
03GT-SE-1	4.58	Stiff layered moist light brown and grey greasy silty clay with little gravel over gravel and cobbles
03GT-SE-2	1.54	Cobbles and gravel
03GT-TD-2	5.33	Cobbles and gravel
03GT-TD-3	14.40	Green mud over cobbles and gravel with trace sand and clay
03GT-TD-4	5.84	Cobbles and gravel with trace of sand
03GT-TD-6	18.13	Cobbles and gravel
03GT-Spec-F2	1.61	Gravel
06GT-TD1	10.5	Cored boulders
06GT-TD2	14.4	Fine gravel over boulder and cobbles
06GT-TD3	16.21	Boulder and cobbles with trace of silt, coarse sand to fine gravel over clay silt and sand layer over cobbles

TABLE I-3: Borehole Observations of Bedrock Surface Elevation, Till Surface Elevation, and Boulder Presence

Borehole Number	Bedrock Elevation (masl)	Till Elevation (masl)	Thickness of soils (m)	Boulders Present (Y/N)	Location	Reference
G02-NP-1	136.22	N/A	N/A	N/A	North Portage	Golder (2002b)
GT02-NP-2	127.57	136.87	9.3	Y	North Portage	
GT02-NP-3	142.34	146.84	4.5	Y	North Portage	
G02-TP-01	134.09	N/A	N/A	N/A	3rd Portage	
GT02-TP-2	135.31	N/A	N/A	N/A	3rd Portage	
02GT-07	N/A	4.5 below reference elevation	0.45	N	N/A	
MRC02-01	N/A	at reference elevation	1.8	N	N/A	
MRC02-02	N/A	0.7m below reference elevation	1.52	N	N/A	
MRC02-03	N/A	2.64 m below reference elevation	0.36	N	N/A	
MRC02-04	N/A	at reference elevation	1.2	N	N/A	
MRC02-360	N/A	0.95m below reference elevation	1.05	N	N/A	
MRC02-284	N/A	at reference elevation	0.45	N	N/A	
MRC02-365	N/A	at reference elevation	1.6	N	N/A	
MRC02-362	N/A	at reference elevation	2.1	Y	N/A	
MRC02-04	N/A	1.2m below reference elevation	1.5	Y	N/A	

Borehole Number	Bedrock Elevation (masl)	Till Elevation (masl)	Thickness of soils (m)	Boulders Present (Y/N)	Location	Reference
MRC02-01	N/A	1.8m below reference elevation	1.5	Y	N/A	
MRC02-01	N/A	at reference elevation	1.5	Y	N/A	
MRC02-364	N/A	1.0m below reference elevation	0.1	Y	N/A	
MRC02-366	N/A	at reference elevation	1.4	Y	N/A	
MRC02-363	N/A	1.1m below reference elevation	0.5	Y	N/A	
MRC02-367	N/A	at reference elevation	1.1	Y	N/A	
MRC02-02	N/A	0.7 below reference elevation	1.5	Y	N/A	
MRC02-282	N/A	at reference elevation	0.7	Y	N/A	
MRC02-283	N/A	at reference elevation	0.6	Y	N/A	
MRC02-359	N/A	at reference elevation	1	Y	N/A	
MRC02-361	N/A	at reference elevation	0.8	N	N/A	
02GT-01	126.4	none		N	East Dyke	Golder (2002a)
02GT-02A	125.88	none		N	East Dyke	
02GT-02B	125.48	none		N	East Dyke	
02GT-03	132.74	135.07	2.33	Y	East Dyke	

Borehole Number	Bedrock Elevation (masl)	Till Elevation (masl)	Thickness of soils (m)	Boulders Present (Y/N)	Location	Reference
02GT-04	133.07	136.04	2.97	Y Below 2.75m	East Dyke	
02-GT-05	120.28	none		N	Causeway Alignment, North Hole	
02-GT-07	120.87	126.12	3	Y	West Dyke	
02GT-08	124.3	none		N	West Dyke	
02GT-09	135.58	136.77	1.19	Y	West Dyke	
02GT-10	135.16	136.16	1	Y	West Dyke	
02GT-11	112.88	114.48	1.6	N	Causeway	
03GT-BZ-2	126.34	none		N	Bay Zone	Golder (2003d)
03GT-BZ-3	131.35	none		N	Bay Zone	
03GT-BZ-5	125.59	none		Y	Bay Zone	
03GT-BZ-6	125.4	none		Y	Bay Zone	
03GT-GI-1	129.08	none		Y	Goose Island Dike	
03GT-GI-2	129.49	none		N	Goose Island Dike	
03GT-GI-3	122.2	none		N	Goose Island Dike	
03GT-GI-4	131.58	none		N	Goose Island Dike	
03GT-GI-5	129.74	none		N	Goose Island Dike	
03GT-GI-6	121	none		N	Goose Island Dike	
03GT-GI-7	130.59	none		N	Goose Island Dike	
03GT-GI-8	125.4	none		N	Goose Island Dike	

Borehole Number	Bedrock Elevation (masl)	Till Elevation (masl)	Thickness of soils (m)	Boulders Present (Y/N)	Location	Reference
03GT-GPIT-1	119.481	none		N	Goose Island Pit	
03GT-GPIT-2	132.22	none			Goose Island Pit	
03GT-GPIT-3	115.83	none		N	Goose Island Pit	
03GT-GPIT-4	113.47	none		N	Goose Island Pit	
03GT-PS-1	146.36	none		Y	Plant site	
03GT-PS-2	147.14	none		N	Plant site	
03GT-PS-3	148.05	none		N	Plant site	
03GT-PS-4	148.03	none		N	Plant site	
03GT-PS-5	135.48	none		N	Plant site	
03GT-PS-6	146.63	none		N	Plant site	
03GT-PS-7	148.92	none		Y	Plant site	
03GT-PS-8	143.72	none		N	Plant site	
03GT-PS-9	145.97	none		Y	Plant site	
03GT-PS-10	146.84	none		Y	Plant site	
03GT-PS-11	148.18	none		Y	Plant site	
03GT-SE-1	124.67	none		N	2nd Portage Lake	
03GT-SE-2	131.16	none		N	3rd Portage Lake	
03GT-TD-1	132.27	none		Y	Tailings Dike 2nd Portage abutment	
03GT-TD-2	110.89	none		N	Tailings Dike 2nd Portage	

Borehole Number	Bedrock Elevation (masl)	Till Elevation (masl)	Thickness of soils (m)	Boulders Present (Y/N)	Location	Reference
03GT-TD-3	Below 94.60	none		N	Tailings Dike 2nd Portage	
03GT-TD-4	112.32	none		N	Tailings Dike 2nd Portage	
03GT-TD-6	91.34	none		N	Tailings Dike 2nd Portage	
03GT-Spec-F1	137.93	none		N	Between 2nd and 3rd Port Lakes	
03GT-Spec-F2	125.93	none		N	Between 2nd and 3rd Port Lakes	
06GT-TD1	96.64	N/A		Y	2nd Portage Lake	Golder (2006d)
06GT-TD2	91.21	N/A		Y	2nd Portage Lake	
06GT-TD2A	93.56	N/A		Y	2nd Portage Lake	
06GT-TD3	112.98	N/A		N	2nd Portage Lake	

TABLE I-4: Summary of Till Gradations

Borehole	Depth (m)	% Gravel (>#4)	% Sand (>#200 & <#4)	% Silt (>0.002 mm & <#200)	% Clay (<0.002 mm)	Moisture Content (%)	Reference
Third Portage Trench spoil (59644)	N/A	26	43	24	7	4.4	Golder (2002b)
Third Portage Trench spoil (59645)	N/A	20	41	32	7	4	
Third Portage Trench spoil (59646)	N/A	17	40	37	6	2.7	
MRC02-01-2001	0-1.8	11	60	24	6	3.1	
MRC02-03	2.64-3.0	9	68	22		1.5	
MRC02-04	0-1.2	11	62	23	4	1.4	
MRC02-360	0.95-2.0	7	61	27	5	2.6	
MRC02-284	0-0.45	11	64	21	4	3	
MRC02-365	0-1.6	5	63	24	8	3.6	
MRC02-362	0-2.0	4	70	18	8	4.8	
MRC02-04	1.2-2.7	11	62	23	4	0.8	
MRC02-01-2002	1.8-3.3	12	58	25	5	2.9	
MRC02-01-2003	3.3-4.9	7	59	30	3	0.5	
MRC02-364	1-1.1	6	60	30	5	1.3	
MRC02-366	0-1.4	6	63	24	8	3.7	
MRC02-363	N/A	7	69	18	7	2.8	
MRC02-367	0-1.0	8	65	21	5	3.6	

Borehole	Depth (m)	% Gravel (>#4)	% Sand (>#200 & <#4)	% Silt (>0.002 mm & <#200)	% Clay (<0.002 mm)	Moisture Content (%)	Reference
02GT-02	128.58	3	93	4		16.3	
02GT-07-3	128.12	16	46	27	11	10.5	
02GT-07-4	127.67	12	49	30	9	11.4	
02GT-07-5	127.22	9	46	33	12	13.1	
02GT-07-6	126.79	9	52	29	10	11.1	
02GT-07-7	125.89	0	71	26	3	19.6	
GT02-TP-1	40.291	4	56	34	6	N/A	
Till Spoil 1	N/A	45	37	13	6	4.4	Golder Laboratory Testing 2006
Till Spoil 2	N/A	35	38	20	7	5.7	
Till Spoil 3	N/A	44	31	18	7	5.9	
Till. Grassland 4	N/A	39	33	22	6	14.8	
Till Spoil 5	N/A	23	41	26	10	5.3	
Till Spoil 6 & 7	N/A	34	44	16	6	5	
Till Spoil 8	N/A	43	40	15	2	4.2	
Till Spoil 9-10	N/A	18	46	34	2	7	
Till Spoil 11	N/A	19	42	33	6	10.9	
Till Spoil 12	N/A	39	33	20	8	8.2	
06-1413-034/3000-SA 9	N/A	25	48	18	10	N/A	Sampled Aug-29-06 by Golder, previously unreported
06-1413-034/3000-SA 2	N/A	25	42	27	6	17.2	

Borehole	Depth (m)	% Gravel (>#4)	% Sand (>#200 & <#4)	% Silt (>0.002 mm & <#200)	% Clay (<0.002 mm)	Moisture Content (%)	Reference
051413036-SA1	N/A	18	48	28	6	24.1	Reported in 05-1413-036/4000 – Aug 29 2005 Letter to CRL
051413036-SA2	N/A	13	48	30	9	11.2	
051413036-SA3	N/A	14	48	28	9	23.6	
051413036-SA4	N/A	15	49	28	8	23	
051413036-SA5	N/A	26	45	24	5	11.8	
051413036-SA6	N/A	4	54	33	8	20.5	
CJC04-034-002		36	27	38		N/A	Sept 13 2004 Site Visit Report
CJC04-034-003		15	52	31	2	N/A	
MRC02-151-2472	N/A	6	70	22	2	N/A	

TABLE I-5: Summary of Bedrock Hydraulic Conductivity Test Data

Borehole	Reference Elevation (masl)	Down Hole Depth from ground surface or ice surface		Inclination (degrees)	Azimuth (degrees)	End of Borehole (down the hole depth m)	Vertical Depth		Elevation		Rock Unit	Hydraulic Conductivity (m/s)
		from (m)	to (m)				from (m)	to (m)	from (masl)	to (masl)		
06GT-TD1**	135.1	44.5	67.0	-89.4	-	204.0	44.5	67.0	91	68	Quartzite	$>3x10^{-05}$
	135.1	60.5	83.5	-89.4	-	204.0	60.5	83.5	75	52	Intermediate Volcanic And Quartzite	$>3x10^{-05}$
	135.1	80.5	113.0	-89.4	-	204.0	80.5	113.0	55	22	Quartzite	$5x10^{-06}$
	135.1	98.5	113.0	-89.4	-	204.0	98.5	113.0	37	22	Quartzite	$1x10^{-05}$
	135.1	109.5	144.0	-89.4	-		109.5	144.0	26	-9	Quartzite and Intermediate Volcanic	$2x10^{-06}$
	135.1	139.5	174.0	-89.4	-		139.5	174.0	-4	-39	Quartzite and Wack, Ultra Mafics	$5x10^{-08}$
	135.1	172.5	204.0	-89.4	-		172.5	204.0	-37	-69	Intermediate Volcanic	$3x10^{-09}$
06GT-TD2A	135.1	43.5	60.0	-89.3	-	201.0	43.5	60.0	92	75	Intermediate Volcanic	$3x10^{-06}$
	135.1	58.5	81.0	-89.3	-		58.5	81.0	77	54	Intermediate Volcanic/ Quartzite	$2x10^{-07}$
	135.1	79.5	105.0	-89.3	-		79.5	105.0	56	30	Quartzite, Intermediate Volcanic, Ultra Mafics	$3x10^{-07}$
	135.1	103.5	135.0	-89.3	-		103.5	135.0	32	0	Quartzite	$2x10^{-07}$
	135.1	133.5	164.0	-89.3	-		133.5	164.0	2	-29	Quartzite, 0.3m Sand Seam	$7x10^{-07}$
	135.1	163.5	201.0	-89.3	-		163.5	201.0	-28	-66	Intermediate Volcanic	$6x10^{-08}$
06GT-TD3	135.1	25.5	45.0	-89.6	-	126.0	25.5	45.0	110	90	Intermediate Volcanic	$2x10^{-05}$
	135.1	43.5	66.0	-89.6	-		43.5	66.0	92	69	Intermediate Volcanic	$1x10^{-05}$
	135.1	64.5	81.0	-89.6	-		64.5	81.0	71	54	Intermediate Volcanic, Iron Formation	$6x10^{-07}$
	135.1	79.5	96.0	-89.6	-		79.5	96.0	56	39	Intermediate Volcanic	$1x10^{-06}$
	135.1	94.5	117.0	-89.6	-		94.5	117.0	41	18	Quartzite, Intermediate Volcanic	$3x10^{-06}$
03GT-BZ-2	134	10.9	15.4	-90.0	-	15.4	10.9	15.4	123	119	Intermediate Volcanics	$1.3x10^{-06}$
03GT-BZ-3	134	6.4	9.4	-90.0	-	9.4	6.4	9.4	128	125	Intermediate Volcanics	$3.1x10^{-06}$
03GT-BZ-5	134	8.6	16.1	-90.0	-	16.1	8.6	16.1	125	118	Ultra Mafics	$5x10^{-08}$
03GT-BZ-6	134	11.6	16.1	-90.0	-	16.1	11.6	16.1	122	118	Ultra Mafics	$1.3x10^{-07}$
03GT-GI-1	134	7.6	12.1	-90.0	-	12.1	7.6	12.1	126	122	Intermediate Volcanics	$2.5x10^{-08}$
03GT-GI-2	134	7.5	12.0	-90.0	-	12.0	7.5	12.0	126	122	Intermediate Volcanics	$3.7x10^{-09}$
03GT-GI-3	134	15.4	18.4	-90.0	-	18.4	15.4	18.4	119	116	Intermediate Volcanics	$1.3x10^{-06}$
03GT-GI-5	134	7.6	12.1	-90.0	-	12.1	7.6	12.1	126	122	Ultra Mafics	$3.3x10^{-05}$

Borehole	Reference Elevation (masl)	Down Hole Depth from ground surface or ice surface		Inclination (degrees)	Azimuth (degrees)	End of Borehole (down the hole depth m)	Vertical Depth		Elevation		Rock Unit	Hydraulic Conductivity (m/s)
		from (m)	to (m)				from (m)	to (m)	from (masl)	to (masl)		
03GT-GI-6	134	15.0	18.8	-90.0	-	18.8	15.0	18.8	119	115	Quartzite	$4.7x10^{-07}$
03GT-GPIT-1	132.92	106.8	150.3	-62.0	51.0	150.3	94.3	132.7	39	0	Ultra Mafics	$7.8x10^{-08}$
	132.92	61.8	150.3	-62.0	51.0		54.5	132.7	78	0	Ultra Mafics	$4.1x10^{-08}$
	132.92	22.8	150.3	-62.0	51.0		20.1	132.7	113	0	Ultra Mafics	$1.1x10^{-07}$
03GT-GPIT-3	133.01	22.7	33.2	-61.0	133.0	150.2	19.9	29.1	113	104	Ultra Mafics	$1.3x10^{-08}$
	133.01	97.7	150.2	-61.0	133.0		85.5	131.4	48	2	Iron Formation-Intermediate Volcanics	$6.4x10^{-07}$
	133.01	97.7	150.2	-61.0	133.0		85.5	131.4	48	2	Iron Formation-Intermediate Volcanics	$6.1x10^{-07}$
	133.01	49.7	150.2	-61.0	133.0		43.5	131.4	90	2	Iron Formation-Mafics-Volcanics	$2.6x10^{-07}$
	133.01	28.7	150.2	-61.0	133.0		25.1	131.4	108	2	Iron Formation-Mafics-Volcanics	$2x10^{-07}$
03GT-GPIT-4	129.77	108.7	149.2	-58.0	291.0	149.1	92.2	126.6	38	3	Iron Formation-Mafics	$7.6x10^{-09}$
	129.77	87.7	149.2	-58.0	291.0		74.4	126.6	55	3	Iron Formation-Mafics	$6.5x10^{-09}$
	129.77	66.7	149.2	-58.0	291.0		56.6	126.6	73	3	Iron Formation-Mafics	$8.6x10^{-09}$
	129.77	24.7	149.2	-58.0	291.0		21.0	126.6	109	3	Iron Formation-Mafics	$2x10^{-08}$
03GT-TD-2	133	24.9	29.4	-90.0	-	29.4	24.9	29.4	108	104	Ultra Mafics	$2.8x10^{-05}$
03GT-TD-4	133	24.8	29.3	-90.0	-	29.3	24.8	29.3	108	104	Intermediate Volcanics	$4x10^{-05}$
03GT-TD-6	132.58	47.8	52.3	-90.0	-	52.3	47.8	52.3	85	80	Intermediate Volcanics	$5.1x10^{-06}$
03GT-SE-1	133	11.3	15.8	-90.0	-	15.8	11.3	15.8	122	117	Quartzite	$7.2x10^{-06}$
03GT-SE-2	133	5.8	10.3	-90.0	-	10.3	5.8	10.3	127	123	Intermediate Volcanics	$7.9x10^{-08}$
03GT-SPEC-F2	132.20	15.9	35.4	-58.0	232.0	174.4	13.5	30.0	119	102	Mainly Ultra Mafics	$1.6x10^{-06}$
	132.20	51.9	74.4	-58.0	232.0		44.0	63.1	88	69	Mainly Ultra Mafics	$1.3x10^{-06}$
	132.20	75.9	104.4	-58.0	232.0		64.3	88.5	68	44	Mainly Ultra Mafics	$2.8x10^{-08}$
	132.20	111.9	135.9	-58.0	232.0		94.9	115.2	37	17	Mainly Ultra Mafics	$6.3x10^{-09}$
	132.20	138.9	147.9	-58.0	232.0		117.8	125.4	14	7	Mainly Ultra Mafics	$2.1x10^{-08}$
	132.20	154.9	174.4	-58.0	232.0		131.3	147.9	1	-16	Ultra Mafics-Iron Formation	$1.5x10^{-08}$
	132.20	136.9	174.4	-58.0	232.0		116.1	147.9	16	-16	Ultra Mafics-Iron Formation	$4.3x10^{-09}$
02GT-01	132.5	7.5	9.5	-90.0	-	9.5	7.5	9.5	125	123	Intermediate Volcanic	$2x10^{-06}$
	132.5	7.5	9.5	-90.0	-		7.5	9.5	125	123	Intermediate Volcanic	$4x10^{-07}$
02GT-02	132.48	10.5	12.5	-90.0	-	12.5	10.5	12.5	122	120	Intermediate Volcanic	$3.5x10^{-07}$

Borehole	Reference Elevation (masl)	Down Hole Depth from ground surface or ice surface		Inclination (degrees)	Azimuth (degrees)	End of Borehole (down the hole depth m)	Vertical Depth		Elevation		Rock Unit	Hydraulic Conductivity (m/s)
		from (m)	to (m)				from (m)	to (m)	from (masl)	to (masl)		
02GT-04	136.04	6.5	8.5	-50.3	22.0	30.1	5.1	6.6	131	129	Intermediate Volcanic	$2x10^{-08}$
	136.04	9.5	17.5	-50.3	22.0		7.4	13.6	129	122	Intermediate Volcanic	$3x10^{-07}$
	136.04	18.5	29.5	-50.3	22.0		14.4	22.9	122	113	Intermediate Volcanic	$2x10^{-08}$
02GT-05	132.5	15.0	17.0	-90.0	-	17.0	15.0	17.0	118	116	Intermediate Volcanic	$3x10^{-05}$
02GT-07	132.621	13.5	15.5	-90.0	-	15.5	13.5	15.5	119	117	Quartzite	$1x10^{-06}$
02GT-08	132.6	10.5	12.5	-90.0	-	17.0	10.5	12.5	122	120	Intermediate To Felsic Volcaniclasitics	$1x10^{-04}$
	132.6	11.5	17.0	-90.0	-		11.5	17.0	121	116	Intermediate To Felsic Volcaniclasitics	$7x10^{-05}$
	132.6	13.5	17.0	-90.0	-		13.5	17.0	119	116	Granite	$3x10^{-06}$
02GT-09	136.77	24.5	30.5	-48.4	79.0	30.8	18.3	22.8	118	114	Ultra Mafics Volcanic	$2x10^{-08}$
02GT-10	136.29	15.5	28.0	-48.7	238.0	30.0	11.6	21.0	125	115	Intermediate Volcanic	$3x10^{-07}$
	136.29	21.5	30.0	-48.7	238.0		16.1	22.5	120	114	Intermediate Volcanic	$1x10^{-09}$
02GT-11	132.78	25.0	27.0	-90.0	-	27.0	25.0	27.0	108	106	Ultra Mafics Volcanic	$3x10^{-05}$
	132.78	22.0	27.0	-90.0	-		22.0	27.0	111	106	Ultra Mafics Volcanic	$2x10^{-05}$
NP02-401	132.91	135.0	158.0	-66.4	113.9	158.0	125.5	144.7	7	-12	Intermediate Volcanic	$2x10^{-06}$
	132.91	129.0	158.0	-66.4	113.9		118.2	144.7	15	-12	Intermediate Volcanic	$3x10^{-09}$
	132.91	66.0	158.0	-66.4	113.9		60.5	144.7	72	-12	Intermediate Volcanic	$5x10^{-07}$
NP02-412	133.24	31.0	39.0	-68.3	109.1	69.0	28.8	36.2	104	97	Ultra Mafics	$9x10^{-06}$
	133.24	40.0	69.0	-68.3	109.1		37.1	64.1	96	69	Intermediate Volcanic	$3x10^{-06}$
GT02-NP-1	136.87	25.5	111.0	-59.9	251.0	111.0	21.6	96.0	115	41	Iron Formation/Ultra Mafics/ Intermediate Volcanic	$3x10^{-09}$
	136.87	55.5	111.0	-59.9	251.0		48.0	96.0	89	41		$5x10^{-09}$
	136.87	73.5	111.0	-59.9	251.0		63.6	96.0	73	41	Intermediate Volcanic	$4x10^{-09}$
	136.87	88.5	111.0	-59.9	251.0		76.6	96.0	60	41	Chloritic Intermediate Volcanic	$2x10^{-08}$

Borehole	Reference Elevation (masl)	Down Hole Depth from ground surface or ice surface		Inclination (degrees)	Azimuth (degrees)	End of Borehole (down the hole depth m)	Vertical Depth		Elevation		Rock Unit	Hydraulic Conductivity (m/s)
		from (m)	to (m)				from (m)	to (m)	from (masl)	to (masl)		
GT02-NP-2	136.87	12.0	16.5	-50.2	292.0	109.5	9.2	12.7	128	124	Mafic	$3x10^{-08}$
	136.87	25.5	30.0	-50.2	292.0		19.6	23.0	117	114	Quartzite/Mafic Volcanic	$2x10^{-08}$
	136.87	31.5	42.0	-50.2	292.0		24.2	32.3	113	105	Ultra Mafics	$2x10^{-08}$
	136.87	64.5	81.0	-50.2	292.0		49.1	62.2	88	75	Ultra Mafics/Fault	$2x10^{-08}$
	136.87	87.0	109.5	-50.2	292.0		66.8	84.1	70	53	Iron Formation/Intermediate Volcanic/ Ultra Mafics	$3x10^{-09}$
	136.87	99.0	109.5	-50.2	292.0		76.0	84.1	61	53	Ultra Mafics	$8x10^{-09}$
TP98-258	133.5	18.5	173.0	-58.0	112.0	173.0	15.7	146.7	118	-13	Intermediate Volcanic-Highly Fractured	$1x10^{-07}$
	133.5	18.5	38.0	-58.0	112.0		15.7	32.2	118	101	Intermediate Volcanic	$6x10^{-07}$
	133.5	39.5	173.0	-58.0	112.0		33.5	146.7	100	-13	Iron Formation	$3x10^{-09}$
	133.5	75.5	173.0	-58.0	112.0		64.0	146.7	70	-13	Ultra Mafics-Bz Fault 82.33 To 88.10	$3x10^{-09}$
	133.5	96.5	173.0	-58.0	112.0		81.8	146.7	52	-13	Ultra Mafics	$5x10^{-09}$
	133.5	150.5	173.0	-58.0	112.0		127.6	146.7	6	-13	Intermediate Volcanic/Iron Formation	$2x10^{-08}$
TP98-261	134.79	9.5	152.0	-56.0	112.0	101.0	7.9	126.0	127	9	Quartzite-Highly Fractured	$1x10^{-09}$
	134.79	22.5	152.0	-56.0	112.0		18.7	126.0	116	9	Intermediate Volcanic/Ultra Mafics	$2x10^{-09}$
	134.79	42.5	152.0	-56.0	112.0		35.2	126.0	100	9	Intermediate Volcanic/Iron Formation	$3x10^{-09}$
	134.79	63.5	152.0	-56.0	112.0		52.6	126.0	82	9	Ultramafics-Bz Fault 73.5 To 76.8	$2x10^{-09}$
	134.79	81.5	152.0	-56.0	112.0		67.6	126.0	67	9	Intermediate Vol./Iron Formation/ Ultra Mafics	$4x10^{-09}$
TP98-265	133.41	18.5	50.0	-52.0	112.0	152.0	14.6	39.4	119	94	Int. Volcanic/Iron Formation-Highly Fractured	$3x10^{-07}$
	133.41	18.5	101.0	-52.0	112.0		14.6	79.6	119	54	Int. Volcanic/Iron Formation-Highly Fractured	$6x10^{-07}$
	133.41	51.5	101.0	-52.0	112.0		40.6	79.6	93	54	Intermediate. Volcanic/Iron Formation	$5x10^{-09}$
	133.41	90.5	101.0	-52.0	112.0		71.3	79.6	62	54	Intermediate. Volcanic/ Ultra Mafics-Bz Fault 92.87 to 93.22	$3x10^{-08}$

** Drilling targeted fault zone

TILL SPECIFIC GRAVITY

SPECIFIC GRAVITY OF SOLIDS

Project No. :	06-1413-089	**Client :**	Meadowbank Mining Corporation	**Borehole :**	Trench Area Till
Sch No.	277	**Project :**	Dike Design	**Sample Number :**	1
Lab Work:	SK	**Location:**	Meadowbank Gold Project	**Depth :**	
Test ID:	Test 1			**Date :**	Nov 22 2006

Specific Gravity of Fine Fraction (ASTM D 854-02)

Percentage Passing #4 Sieve		55.5	
Test Number		1	2
Flask Number		1	2
Air Removal Method		Vacuum	Vacuum
Mass of Flask (g)	M_p	179.44	172.65
Mass of Flask + Dry Soil (g)		279.90	273.09
Mass of Dry Soil (g)		100.46	100.44
Mass of Flask + Soil + Water (g)	$M_{\rho ws,t}$	739.30	732.84
Test Temperature (g)	T_t	28.6	29.5
Mass of Flask + Water (g)	$M_{\rho w,t}$	677.05	670.01
Number of Evaporating Dish		1	2
Mass of Dish + Dry Soil (g)		117.45	117.53
Mass of Dish (g)		16.99	17.09
Mass of Oven Dry Soil (g)	M_s	100.46	100.44
Temperature Coefficient	K	0.9979	0.9976
Density of Solids (g/cm^3)	ρ_s	2.63	2.67
Specific Gravity at Test Temperature	G_t	2.64	2.68
Specific Gravity at 20ºC	$G_{20°C}$	**2.6**	**2.7**
AVERAGE SPECIFIC GRAVITY		**2.7**	

Specific Gravity of Coarse Fraction (ASTM C 127-88)

Percentage Retained on #4 Sieve		44.5
Mass of Sample in Water (g)	**A**	430.6
Mass of Sample @ SSD (g)	**B**	690.7
Mass of Oven Dryed Sample (g)	**C**	686.5
Bulk G (Oven Dry)	**C/(B-A)**	2.64
Bulk G (SSD)	**B/(B-A)**	2.66
Apparent	**C/(C-A)**	**2.68**
Absorbtion (%)	**(B-C)/C**	0.01

Specific Gravity of Total Sample

COMBINED SPECIFIC GRAVITY	$G_{avg@20°C}$	**2.67**

Remarks:

Method used: Method A Procedure for Moist Specimens

Sample Description:

SPECIFIC GRAVITY OF SOLIDS

Project No. :	06-1413-089	**Client :**	Meadowbank Mining Corporation	**Borehole :**	Trench Area Till
Sch No.	277	**Project :**	Dike Design	**Sample Number :**	2
Lab Work:	SK	**Location:**	Meadowbank Gold Project	**Depth :**	
Test ID:	Test 1			**Date :**	

Specific Gravity of Fine Fraction (ASTM D 854-02)

Percentage Passing #4 Sieve		64.7	
Test Number		1	2
Flask Number		1	2
Air Removal Method		Vacuum	Vacuum
Mass of Flask (g)	M_p	179.44	172.65
Mass of Flask + Dry Soil (g)		280.18	278.84
Mass of Dry Soil (g)		100.74	106.19
Mass of Flask + Soil + Water (g)	$M_{\rho ws,t}$	740.60	737.22
Test Temperature (g)	T_t	23.3	23.6
Mass of Flask + Water (g)	$M_{\rho w,t}$	677.72	670.70
Number of Evaporating Dish		1	2
Mass of Dish + Dry Soil (g)		117.54	123.05
Mass of Dish (g)		16.80	16.86
Mass of Oven Dry Soil (g)	M_s	100.74	106.19
Temperature Coefficient	K	0.9993	0.9992
Density of Solids (g/cm^3)	ρ_s	2.66	2.68
Specific Gravity at Test Temperature	G_t	2.67	2.68
Specific Gravity at 20ºC	$G_{20°C}$	**2.7**	**2.7**
AVERAGE SPECIFIC GRAVITY		**2.7**	

Specific Gravity of Coarse Fraction (ASTM C 127-88)

Percentage Retained on #4 Sieve		35.3
Mass of Sample in Water (g)	**A**	523.3
Mass of Sample @ SSD (g)	**B**	821.8
Mass of Oven Dryed Sample (g)	**C**	816.1
Bulk G (Oven Dry)	**C/(B-A)**	2.73
Bulk G (SSD)	**B/(B-A)**	2.75
Apparent	**C/(C-A)**	**2.79**
Absorbtion (%)	**(B-C)/C**	0.01

Specific Gravity of Total Sample

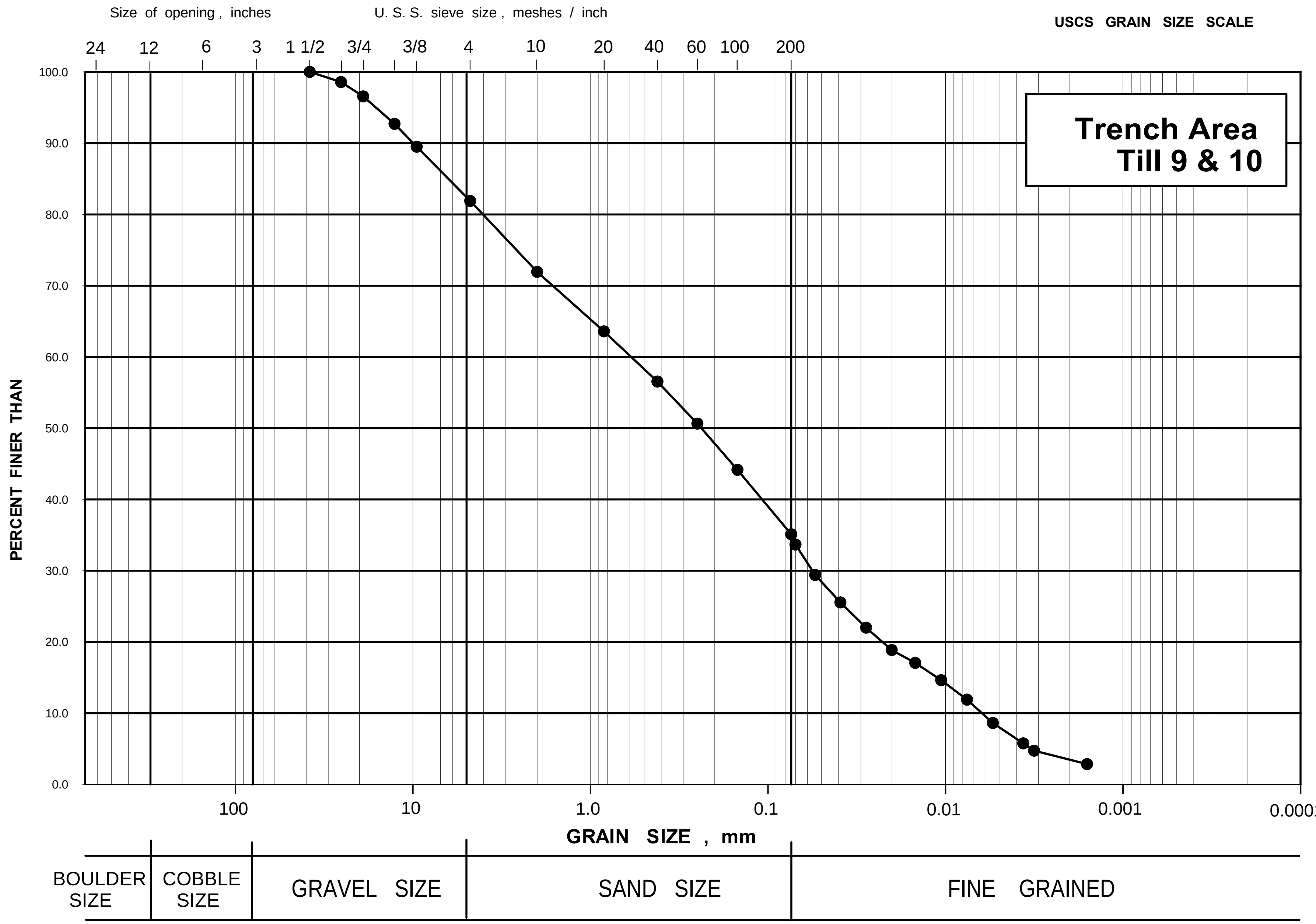
COMBINED SPECIFIC GRAVITY	$G_{avg@20°C}$	**2.71**

Remarks:

Method used: Method A Procedure for Moist Specimens

Sample Description:

TILL GRADATION AND HYDROMETER



Project No. 06-1413-089
Drawn TMTrench
Reviewed LL
Date 03/09/07

Golder Associates

GRAIN SIZE DISTRIBUTION
Meadowbank Mining Corporation
Meadowbank Gold Project

Figure I-1

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	06-1413-089	**Client :**	Meadowbank Mining Corporation	**BH :**	Trench Area Till
Sch#	277	**Project :**	Dike Design	**Sample :**	9 & 10
Lab Work:	TM	**Location:**	Meadowbank Gold Project		

First Sieving
Total Weight (g) = 13210.9

Hydrometer: (Minus #10)
Before Wash (g) = 50.0
After Wash (g) = 25.9

Residual No. 200 (g) = 0.3
Total minus 200 (g) = 24.4
Gs (assumed) = 2.70

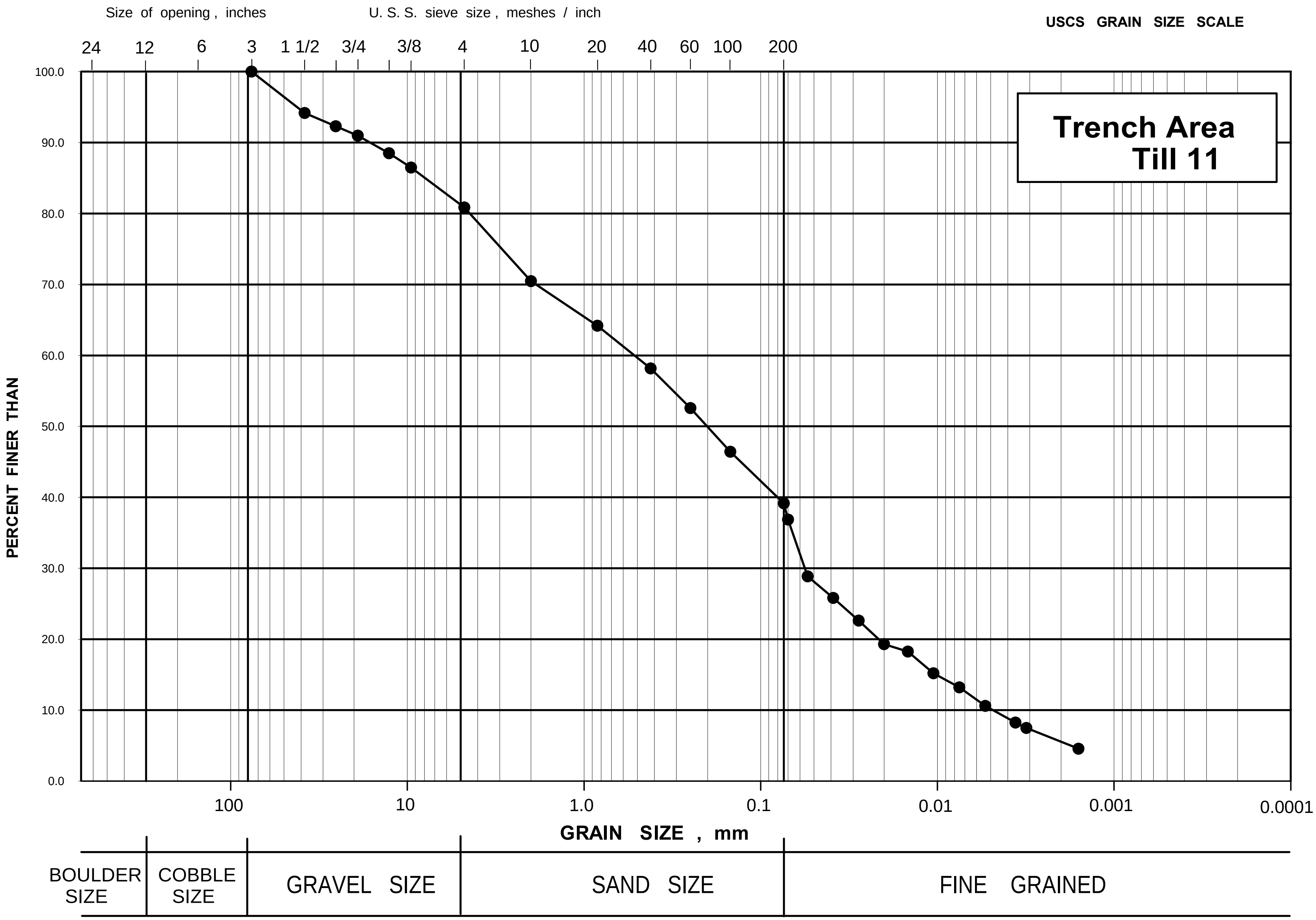
Size (USS)	Weight Retained (g)	Retained (%)	Weight Retained (g)	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	0.0					**38.1**	**100.0**
1"	185.5	1.4			1.4	**25.4**	**98.6**
3/4"	268.2	2.0			2.0	**19.1**	**96.6**
1/2"	509.4	3.9			3.9	**12.7**	**92.7**
3/8"	423.2	3.2			3.2	**9.52**	**89.5**
#4	1005.7	7.6			7.6	**4.76**	**81.9**
#10	1316.3	10.0			10.0	**2.00**	**71.9**
#20			5.8	11.6	8.3	**0.840**	**63.6**
#40			4.9	9.8	7.0	**0.420**	**56.5**
#60			4.1	8.2	5.9	**0.250**	**50.6**
#100			4.5	9.0	6.5	**0.149**	**44.2**
#200			6.3	12.6	9.1	**0.074**	**35.1**
Pan			24.4	48.8	35.1		

HYDROMETER ANALYSIS

Hydrometer No.: 87024 **Dispersion Method:** Stirring **Dispersion Period (min):**

Comments:

Time (min)	Hydrometer Reading	Temperature (ºC)		Composite Correction	Corrected Reading	Diameter (mm)	Percentage Passing
0.5	27.0	19.0		-3.33	23.7	**0.0700**	**33.7**
1	24.0	19.0		-3.33	20.7	**0.0543**	**29.4**
2	21.3	19.0		-3.33	18.0	**0.0391**	**25.6**
4	18.8	19.0		-3.33	15.5	**0.0281**	**22.0**
8	16.6	19.0		-3.33	13.3	**0.0201**	**18.9**
15	15.0	20.0		-3.00	12.0	**0.0148**	**17.1**
30	13.3	20.0		-3.00	10.3	**0.0106**	**14.7**
60	11.2	20.5		-2.83	8.4	**0.0076**	**11.9**
120	8.9	20.5		-2.83	6.1	**0.0054**	**8.6**
270	6.9	20.5		-2.83	4.1	**0.0037**	**5.8**
360	6.0	21.0		-2.67	3.3	**0.0032**	**4.7**
1440	6.0	17.0		-3.99	2.0	**0.0016**	**2.9**



Project No. 06-1413-089
Drawn TM
Reviewed LL
Date 03/09/07

Golder Associates

GRAIN SIZE DISTRIBUTION
Meadowbank Mining Corporation
Meadowbank Gold Project

Figure I-2

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	06-1413-089	**Client :**	Meadowbank Mining Corporation	**BH :**	**Trench Area Till**
Sch#	277	**Project :**	Dike Design	**Sample :**	11
Lab Work:	TM	**Location:**	Meadowbank Gold Project		

First Sieving		**Hydrometer: (Minus #10)**		Residual No. 200 (g) =	0.7
Total Weight (g) =	15616.4	Before Wash (g) =	50.4	Total minus 200 (g) =	28.0
		After Wash (g) =	23.1	Gs (assumed) =	2.70

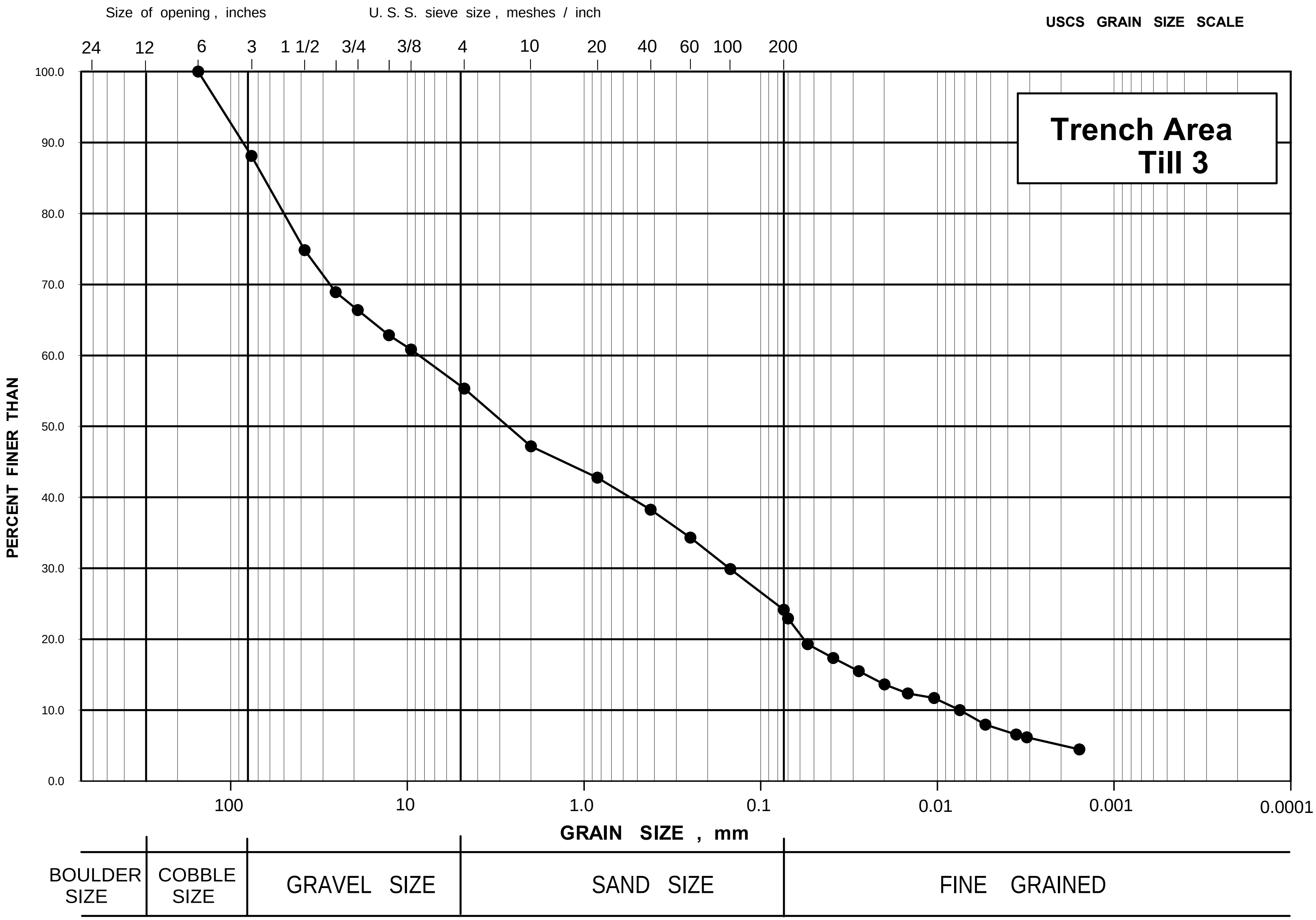
Size (USS)	Weight Retained (g)	Retained (%)	Weight Retained (g)	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	911.4	5.8			5.8	**38.1**	**94.2**
1"	291.6	1.9			1.9	**25.4**	**92.3**
3/4"	206.9	1.3			1.3	**19.1**	**91.0**
1/2"	388.5	2.5			2.5	**12.7**	**88.5**
3/8"	312.9	2.0			2.0	**9.52**	**86.5**
#4	879.9	5.6			5.6	**4.76**	**80.8**
#10	1620.2	10.4			10.4	**2.00**	**70.5**
#20			4.5	8.9	6.3	**0.840**	**64.2**
#40			4.3	8.5	6.0	**0.420**	**58.2**
#60			4.0	7.9	5.6	**0.250**	**52.6**
#100			4.4	8.7	6.2	**0.149**	**46.4**
#200			5.2	10.3	7.3	**0.074**	**39.2**
Pan			28.0	55.6	39.2		

HYDROMETER ANALYSIS

Hydrometer No.: 87024 **Dispersion Method:** Stirring **Dispersion Period (min):**

Comments:

Time (min)	Hydrometer Reading	Temperature (ºC)		Composite Correction	Corrected Reading	Diameter (mm)	Percentage Passing
0.5	30.0	19.0		-3.33	26.7	**0.0700**	**36.9**
1	24.2	19.0		-3.33	20.9	**0.0542**	**28.9**
2	22.0	19.0		-3.33	18.7	**0.0389**	**25.8**
4	19.7	19.0		-3.33	16.4	**0.0279**	**22.6**
8	17.3	19.0		-3.33	14.0	**0.0200**	**19.3**
15	16.2	20.0		-3.00	13.2	**0.0147**	**18.3**
30	14.0	20.0		-3.00	11.0	**0.0105**	**15.2**
60	12.4	20.5		-2.83	9.6	**0.0075**	**13.2**
120	10.5	20.5		-2.83	7.7	**0.0054**	**10.6**
270	8.8	20.5		-2.83	6.0	**0.0036**	**8.2**
360	8.1	21.0		-2.67	5.4	**0.0031**	**7.5**
1440	7.3	17.0		-3.99	3.3	**0.0016**	**4.6**



Project No. 06-1413-089
Drawn TM
Reviewed LL
Date 03/09/07

Golder Associates

GRAIN SIZE DISTRIBUTION
Meadowbank Mining Corporation
Meadowbank Gold Project

Figure I-3

PARTICLE SIZE ANALYSIS OF SOILS   ASTM D 422-63

Project No. :	06-1413-089	**Client :**	Meadowbank Mining Corporation	**BH :**	**Trench Area Till**
Sch#	277	**Project :**	Dike Design	**Sample :**	3
Lab Work:	TM	**Location:**	Meadowbank Gold Project		

First Sieving
Total Weight (g) = 11381.4

Hydrometer: (Minus #10)
Before Wash (g) = 50.2
After Wash (g) = 24.9

Residual No. 200 (g) = 0.4
Total minus 200 (g) = 25.7
Gs (assumed) = 2.70

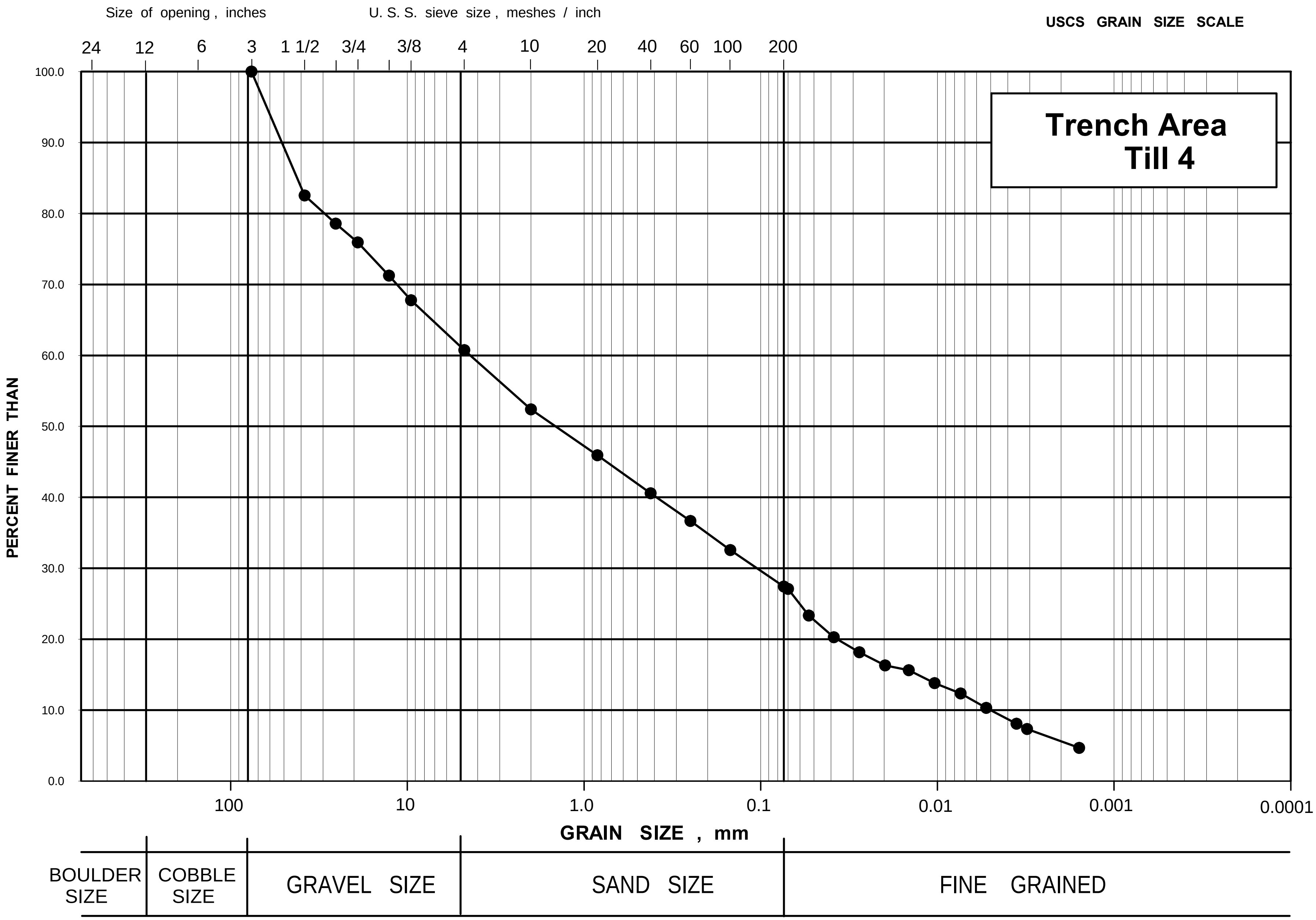
Size (USS)	Weight Retained (g)	Retained (%)	Weight Retained (g)	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					**152.4**	**100.0**
3"	1354.0	11.9			11.9	**76.2**	**88.1**
1 1/2"	1510.3	13.3			13.3	**38.1**	**74.8**
1"	672.1	5.9			5.9	**25.4**	**68.9**
3/4"	288.8	2.5			2.5	**19.1**	**66.4**
1/2"	401.9	3.5			3.5	**12.7**	**62.9**
3/8"	230.4	2.0			2.0	**9.52**	**60.8**
#4	627.4	5.5			5.5	**4.76**	**55.3**
#10	926.4	8.1			8.1	**2.00**	**47.2**
#20			4.7	9.4	4.4	**0.840**	**42.8**
#40			4.8	9.6	4.5	**0.420**	**38.3**
#60			4.2	8.4	3.9	**0.250**	**34.3**
#100			4.7	9.4	4.4	**0.149**	**29.9**
#200			6.1	12.2	5.7	**0.074**	**24.2**
Pan			25.7	51.2	24.2		

HYDROMETER ANALYSIS

Hydrometer No.: 87024   **Dispersion Method:** Stirring   **Dispersion Period (min):**

Comments:

Time (min)	Hydrometer Reading	Temperature (ºC)		Composite Correction	Corrected Reading	Diameter (mm)	Percentage Passing
0.5	28.0	19.0		-3.33	24.7	**0.0700**	**22.9**
1	24.1	19.0		-3.33	20.8	**0.0543**	**19.3**
2	22.0	19.0		-3.33	18.7	**0.0389**	**17.4**
4	20.0	19.0		-3.33	16.7	**0.0279**	**15.5**
8	18.0	19.0		-3.33	14.7	**0.0200**	**13.6**
15	16.3	20.0		-3.00	13.3	**0.0147**	**12.4**
30	15.6	20.0		-3.00	12.6	**0.0104**	**11.7**
60	13.6	20.5		-2.83	10.8	**0.0075**	**10.0**
120	11.4	20.5		-2.83	8.6	**0.0053**	**8.0**
270	9.9	20.5		-2.83	7.1	**0.0036**	**6.6**
360	9.3	21.0		-2.67	6.6	**0.0031**	**6.2**
1440	8.8	17.0		-3.99	4.8	**0.0016**	**4.5**



Project No. 06-1413-089 **Drawn** TMT **Reviewed** LL **Date** 03/09/07	**GRAIN SIZE DISTRIBUTION** **Meadowbank Mining Corporation** **Meadowbank Gold Project**	**Figure** **I-4**

Golder Associates

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	06-1413-089	**Client :**	Meadowbank Mining Corporation	**BH :**	**Trench Area Till**
Sch#	277	**Project :**	Dike Design	**Sample :**	4
Lab Work:	TM	**Location:**	Meadowbank Gold Project		

First Sieving
Total Weight (g) = 10768.1

Hydrometer: (Minus #10)
Before Wash (g) = 51.0
After Wash (g) = 24.3

Residual No. 200 (g) = 0.0
Total minus 200 (g) = 26.7
Gs (assumed) = 2.70

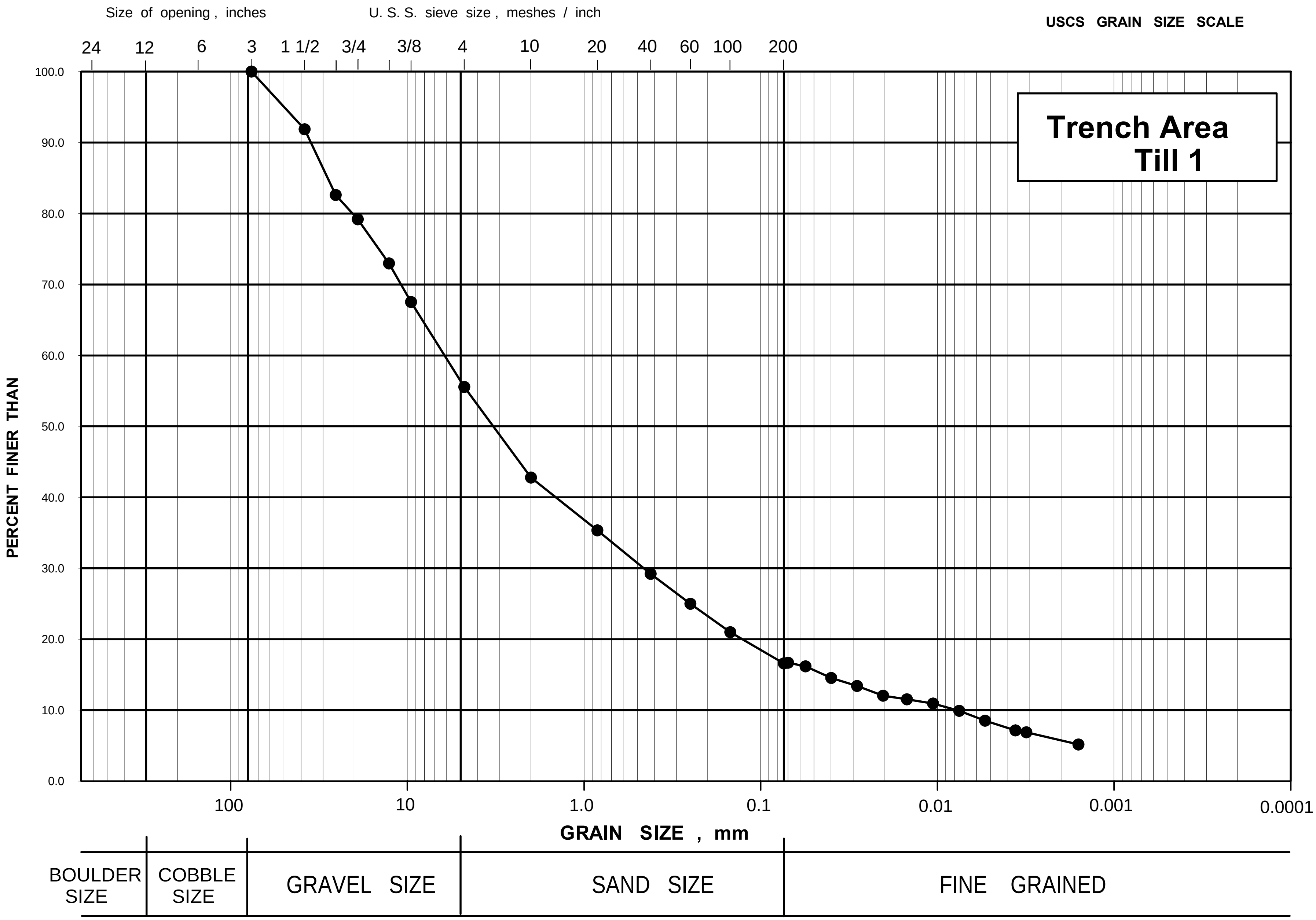
Size (USS)	Weight Retained (g)	Retained (%)	Weight Retained (g)	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	1881.5	17.5			17.5	**38.1**	**82.5**
1"	425.4	4.0			4.0	**25.4**	**78.6**
3/4"	284.2	2.6			2.6	**19.1**	**75.9**
1/2"	506.1	4.7			4.7	**12.7**	**71.2**
3/8"	372.7	3.5			3.5	**9.52**	**67.8**
#4	756.3	7.0			7.0	**4.76**	**60.8**
#10	901.1	8.4			8.4	**2.00**	**52.4**
#20			6.3	12.4	6.5	**0.840**	**45.9**
#40			5.2	10.2	5.3	**0.420**	**40.6**
#60			3.8	7.5	3.9	**0.250**	**36.7**
#100			4.0	7.8	4.1	**0.149**	**32.6**
#200			5.0	9.8	5.1	**0.074**	**27.4**
Pan			26.7	52.4	27.4		

HYDROMETER ANALYSIS

Hydrometer No.: 87024 **Dispersion Method:** Stirring **Dispersion Period (min):**

Comments:

Time (min)	Hydrometer Reading	Temperature (ºC)		Composite Correction	Corrected Reading	Diameter (mm)	Percentage Passing
0.5	30.0	19.0		-3.33	26.7	**0.0700**	**27.1**
1	26.3	19.0		-3.33	23.0	**0.0534**	**23.3**
2	23.3	19.0		-3.33	20.0	**0.0386**	**20.3**
4	21.2	19.0		-3.33	17.9	**0.0277**	**18.1**
8	19.4	19.0		-3.33	16.1	**0.0198**	**16.3**
15	18.4	20.0		-3.00	15.4	**0.0145**	**15.6**
30	16.6	20.0		-3.00	13.6	**0.0104**	**13.8**
60	15.0	20.5		-2.83	12.2	**0.0074**	**12.4**
120	13.0	20.5		-2.83	10.2	**0.0053**	**10.3**
270	10.8	20.5		-2.83	8.0	**0.0036**	**8.1**
360	9.9	21.0		-2.67	7.2	**0.0031**	**7.3**
1440	8.6	17.0		-3.99	4.6	**0.0016**	**4.7**



Project No. 06-1413-089
Drawn TM
Reviewed LL
Date 03/09/07

Golder Associates

GRAIN SIZE DISTRIBUTION
Meadowbank Mining Corporation
Meadowbank Gold Project

Figure I-5

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	06-1413-089	**Client :**	Meadowbank Mining Corporation	**BH :**	**Trench Area Till**
Sch#	277	**Project :**	Dike Design	**Sample :**	1
Lab Work:	TM	**Location:**	Meadowbank Gold Project		

First Sieving
Total Weight (g) = 10410.8

Hydrometer: (Minus #10)
Before Wash (g) = 49.5
After Wash (g) = 30.3

Residual No. 200 (g) = 0.0
Total minus 200 (g) = 19.2
Gs = 2.67

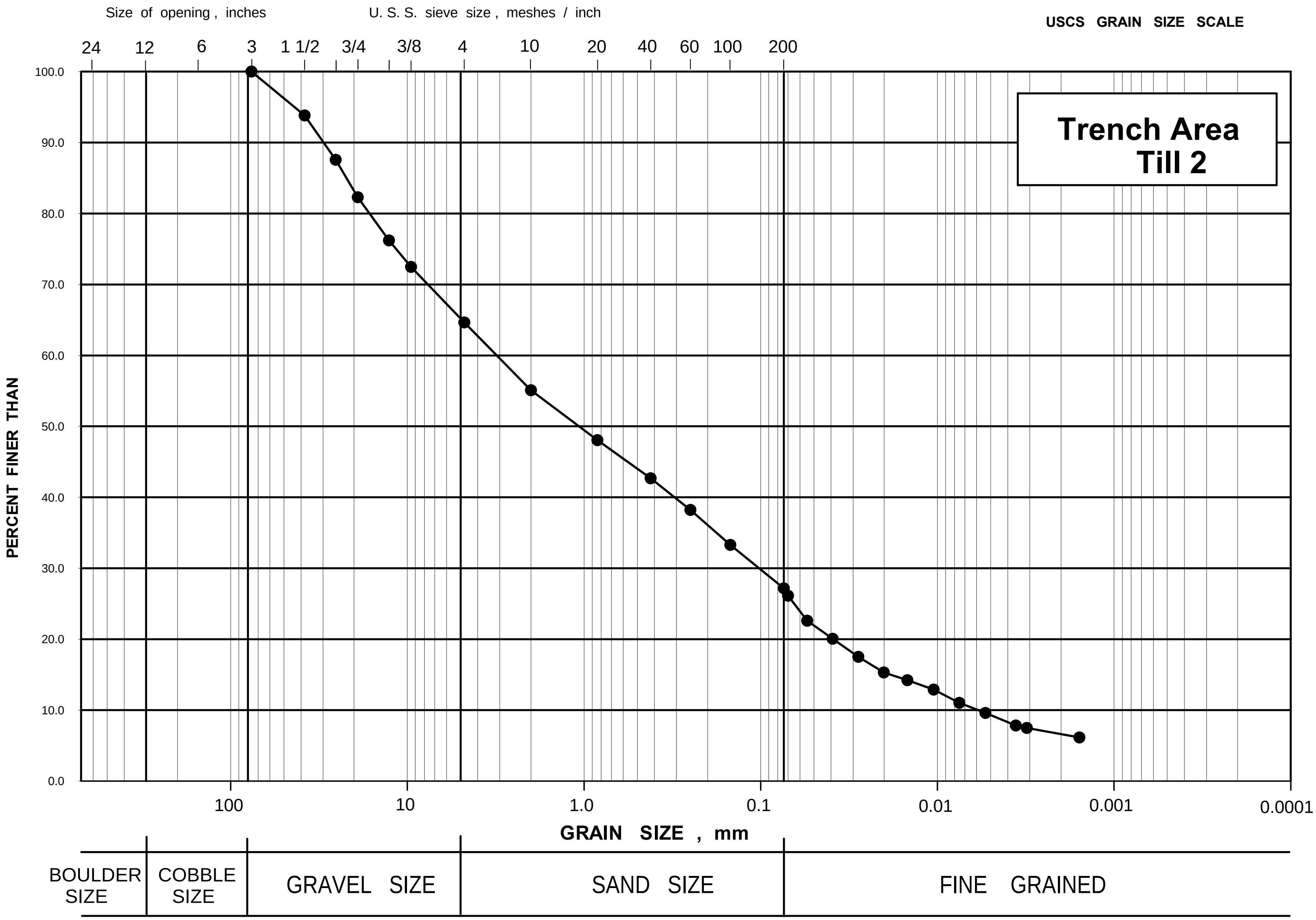
Size (USS)	Weight Retained (g)	Retained (%)	Weight Retained (g)	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	848.0	8.1			8.1	**38.1**	**91.9**
1"	962.2	9.2			9.2	**25.4**	**82.6**
3/4"	356.7	3.4			3.4	**19.1**	**79.2**
1/2"	646.9	6.2			6.2	**12.7**	**73.0**
3/8"	565.8	5.4			5.4	**9.52**	**67.5**
#4	1249.1	12.0			12.0	**4.76**	**55.5**
#10	1327.6	12.8			12.8	**2.00**	**42.8**
#20			8.6	17.4	7.4	**0.840**	**35.4**
#40			7.1	14.3	6.1	**0.420**	**29.2**
#60			4.9	9.9	4.2	**0.250**	**25.0**
#100			4.6	9.3	4.0	**0.149**	**21.0**
#200			5.1	10.3	4.4	**0.074**	**16.6**
Pan			19.2	38.8	16.6		

HYDROMETER ANALYSIS

Hydrometer No.: 8589 **Dispersion Method:** Stirring **Dispersion Period (min):**

Comments:

Time (min)	Hydrometer Reading	Temperature (ºC)		Composite Correction	Corrected Reading	Diameter (mm)	Percentage Passing
0.5	21.7	19.0		-2.30	19.4	**0.0700**	**16.7**
1	21.1	19.0		-2.30	18.8	**0.0558**	**16.2**
2	19.2	19.0		-2.30	16.9	**0.0400**	**14.5**
4	17.9	19.0		-2.30	15.6	**0.0285**	**13.4**
8	16.3	19.0		-2.30	14.0	**0.0203**	**12.0**
15	15.5	20.0		-2.10	13.4	**0.0149**	**11.5**
30	14.8	20.0		-2.10	12.7	**0.0106**	**10.9**
60	13.5	20.5		-2.00	11.5	**0.0075**	**9.9**
120	11.9	20.5		-2.00	9.9	**0.0054**	**8.5**
270	10.3	20.5		-2.00	8.3	**0.0036**	**7.1**
360	9.9	21.0		-1.90	8.0	**0.0031**	**6.9**
1440	8.7	17.0		-2.71	6.0	**0.0016**	**5.2**



Project No. 06-1413-089 Drawn TMT Reviewed LL Date 03/09/07	Golder Associates	**GRAIN SIZE DISTRIBUTION** **Meadowbank Mining Corporation** **Meadowbank Gold Project**	**Figure I-6**

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	06-1413-089	**Client :**	Meadowbank Mining Corporation	**BH :**	**Trench Area Till**
Sch#	277	**Project :**	Dike Design	**Sample :**	2
Lab Work:	TM	**Location:**	Meadowbank Gold Project		

First Sieving
Total Weight (g) = 11026.2

Hydrometer: (Minus #10)
Before Wash (g) = 49.3
After Wash (g) = 25.0

Residual No. 200 (g) = 0.0
Total minus 200 (g) = 24.3
Gs = 2.71

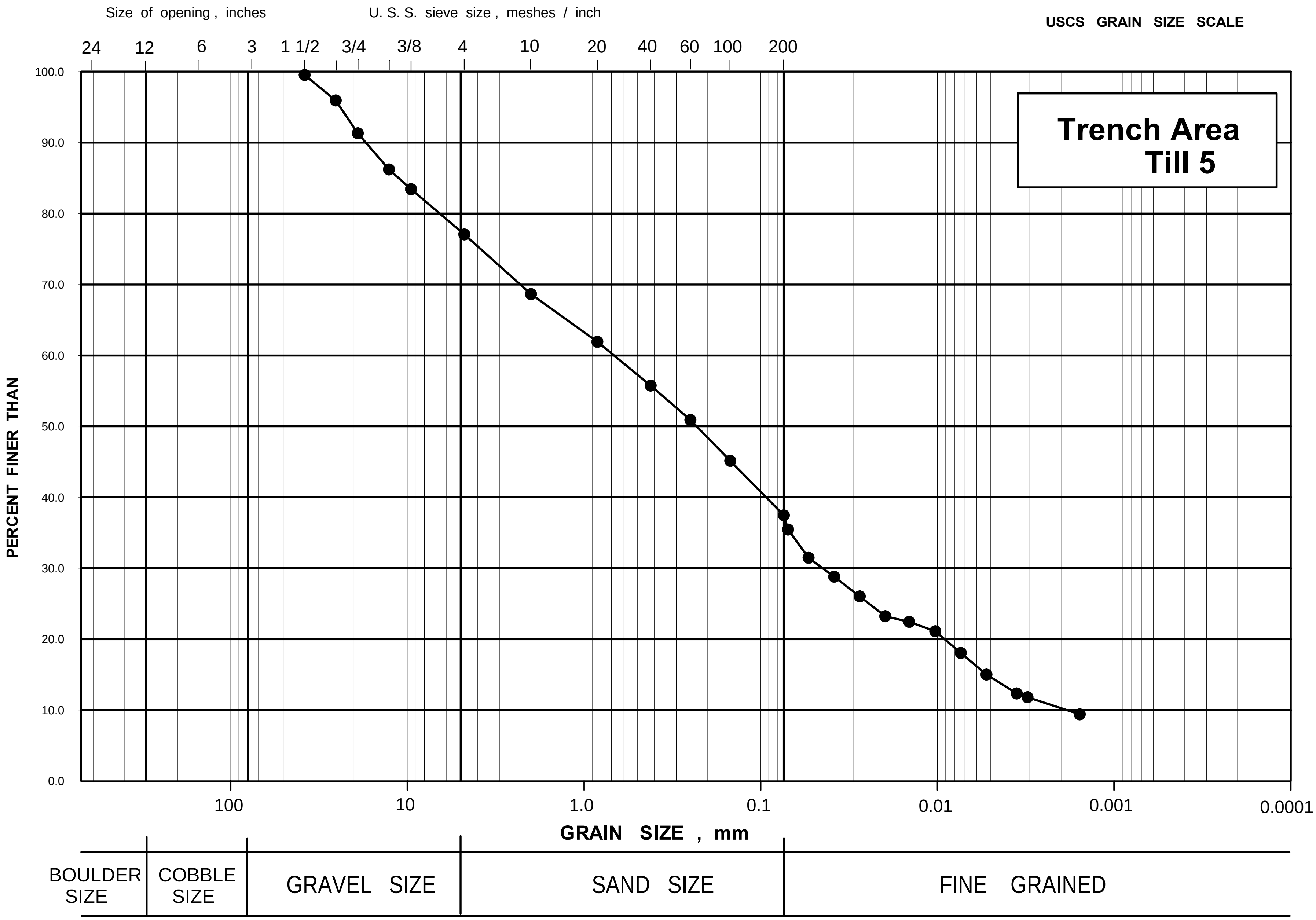
Size (USS)	Weight Retained (g)	Retained (%)	Weight Retained (g)	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	681.2	6.2			6.2	**38.1**	**93.8**
1"	688.3	6.2			6.2	**25.4**	**87.6**
3/4"	583.1	5.3			5.3	**19.1**	**82.3**
1/2"	671.8	6.1			6.1	**12.7**	**76.2**
3/8"	410.4	3.7			3.7	**9.52**	**72.5**
#4	861.7	7.8			7.8	**4.76**	**64.7**
#10	1054.4	9.6			9.6	**2.00**	**55.1**
#20			6.3	12.8	7.0	**0.840**	**48.1**
#40			4.8	9.7	5.4	**0.420**	**42.7**
#60			4.0	8.1	4.5	**0.250**	**38.2**
#100			4.4	8.9	4.9	**0.149**	**33.3**
#200			5.5	11.2	6.1	**0.074**	**27.2**
Pan			24.3	49.3	27.2		

HYDROMETER ANALYSIS

Hydrometer No.: 8589 **Dispersion Method:** Stirring **Dispersion Period (min):**

Comments:

Time (min)	Hydrometer Reading	Temperature (ºC)		Composite Correction	Corrected Reading	Diameter (mm)	Percentage Passing
0.5	26.0	19.0		-2.30	23.7	**0.0700**	**26.1**
1	22.8	19.0		-2.30	20.5	**0.0546**	**22.6**
2	20.5	19.0		-2.30	18.2	**0.0392**	**20.1**
4	18.2	19.0		-2.30	15.9	**0.0281**	**17.5**
8	16.2	19.0		-2.30	13.9	**0.0201**	**15.3**
15	15.0	20.0		-2.10	12.9	**0.0148**	**14.2**
30	13.8	20.0		-2.10	11.7	**0.0105**	**12.9**
60	12.0	20.5		-2.00	10.0	**0.0075**	**11.0**
120	10.7	20.5		-2.00	8.7	**0.0053**	**9.6**
270	9.1	20.5		-2.00	7.1	**0.0036**	**7.8**
360	8.7	21.0		-1.90	6.8	**0.0031**	**7.5**
1440	8.3	17.0		-2.71	5.6	**0.0016**	**6.2**



Project No. 06-1413-089 Drawn TM Reviewed LL Date 03/09/07	Golder Associates	**GRAIN SIZE DISTRIBUTION** **Meadowbank Mining Corporation** **Meadowbank Gold Project**	**Figure I-7**

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	06-1413-089	**Client :**	Meadowbank Mining Corporation	**BH :**	**Trench Area Till**
Sch#	277	**Project :**	Dike Design	**Sample :**	5
Lab Work:	TM	**Location:**	Meadowbank Gold Project		

First Sieving
Total Weight (g) = 10816.6

Hydrometer: (Minus #10)
Before Wash (g) = 51.1
After Wash (g) = 23.7

Residual No. 200 (g) = 0.5
Total minus 200 (g) = 27.9
Gs (assumed) = 2.70

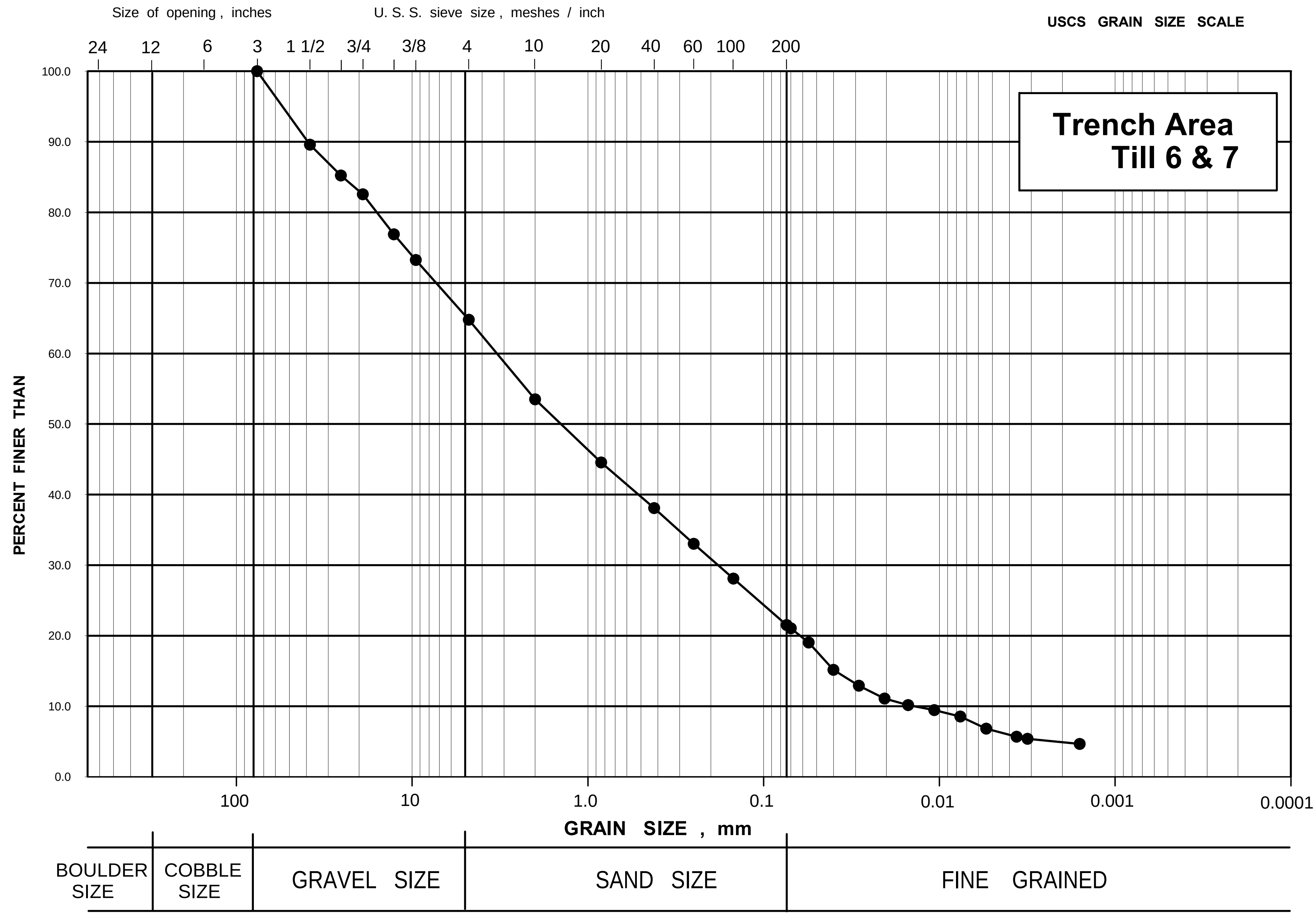
Size (USS)	Weight Retained (g)	Retained (%)	Weight Retained (g)	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	51.6	0.5			0.5	**38.1**	**99.5**
1"	389.2	3.6			3.6	**25.4**	**95.9**
3/4"	499.5	4.6			4.6	**19.1**	**91.3**
1/2"	551.4	5.1			5.1	**12.7**	**86.2**
3/8"	300.4	2.8			2.8	**9.52**	**83.4**
#4	689.0	6.4			6.4	**4.76**	**77.1**
#10	911.2	8.4			8.4	**2.00**	**68.6**
#20			5.0	9.8	6.7	**0.840**	**61.9**
#40			4.6	9.0	6.2	**0.420**	**55.7**
#60			3.6	7.0	4.8	**0.250**	**50.9**
#100			4.3	8.4	5.8	**0.149**	**45.1**
#200			5.7	11.2	7.7	**0.074**	**37.5**
Pan			27.9	54.6	37.5		

HYDROMETER ANALYSIS

Hydrometer No.: 8589 **Dispersion Method:** Stirring **Dispersion Period (min):**

Comments:

Time (min)	Hydrometer Reading	Temperature (ºC)		Composite Correction	Corrected Reading	Diameter (mm)	Percentage Passing
0.5	29.0	19.0		-2.30	26.7	**0.0700**	**35.5**
1	26.0	19.0		-2.30	23.7	**0.0536**	**31.5**
2	24.0	19.0		-2.30	21.7	**0.0384**	**28.8**
4	21.9	19.0		-2.30	19.6	**0.0275**	**26.0**
8	19.8	19.0		-2.30	17.5	**0.0197**	**23.2**
15	19.0	20.0		-2.10	16.9	**0.0145**	**22.4**
30	18.0	20.0		-2.10	15.9	**0.0103**	**21.1**
60	15.6	20.5		-2.00	13.6	**0.0074**	**18.1**
120	13.3	20.5		-2.00	11.3	**0.0053**	**15.0**
270	11.3	20.5		-2.00	9.3	**0.0036**	**12.4**
360	10.8	21.0		-1.90	8.9	**0.0031**	**11.8**
1440	9.8	17.0		-2.71	7.1	**0.0016**	**9.4**



Project No. 06-1413-089
Drawn TM
Reviewed LL
Date 03/09/07

Golder Associates

GRAIN SIZE DISTRIBUTION
Meadowbank Mining Corporation
Meadowbank Gold Project

Figure I-8

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	06-1413-089	**Client :**	Meadowbank Mining Corporation	**BH :**	**Trench Area Till**
Sch#	277	**Project :**	Dike Design	**Sample :**	6 & 7
Lab Work:	TM	**Location:**	Meadowbank Gold Project		

First Sieving
Total Weight (g) = 16491.9

Hydrometer: (Minus #10)
Before Wash (g) = 52.0
After Wash (g) = 31.4

Residual No. 200 (g) = 0.3
Total minus 200 (g) = 20.9
Gs (assumed) = 2.70

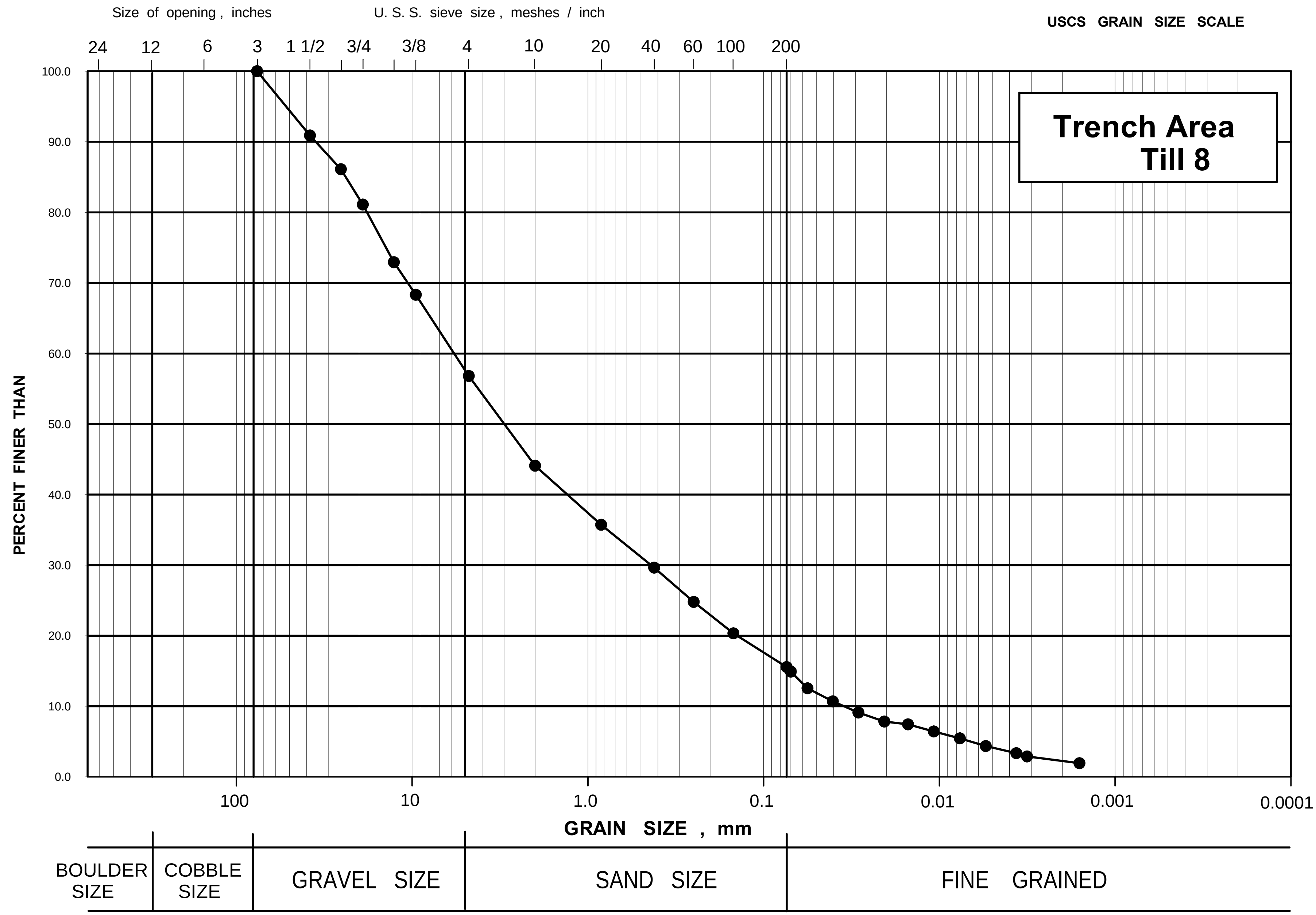
Size (USS)	Weight Retained (g)	Retained (%)	Weight Retained (g)	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	1718.2	10.4			10.4	**38.1**	**89.6**
1"	721.2	4.4			4.4	**25.4**	**85.2**
3/4"	438.5	2.7			2.7	**19.1**	**82.5**
1/2"	934.6	5.7			5.7	**12.7**	**76.9**
3/8"	599.2	3.6			3.6	**9.52**	**73.2**
#4	1398.0	8.5			8.5	**4.76**	**64.8**
#10	1857.6	11.3			11.3	**2.00**	**53.5**
#20			8.7	16.7	9.0	**0.840**	**44.6**
#40			6.3	12.1	6.5	**0.420**	**38.1**
#60			4.9	9.4	5.0	**0.250**	**33.0**
#100			4.8	9.2	4.9	**0.149**	**28.1**
#200			6.4	12.3	6.6	**0.074**	**21.5**
Pan			20.9	40.2	21.5		

HYDROMETER ANALYSIS

Hydrometer No.: 8589 **Dispersion Method:** Stirring **Dispersion Period (min):**

Comments:

Time (min)	Hydrometer Reading	Temperature (ºC)		Composite Correction	Corrected Reading	Diameter (mm)	Percentage Passing
0.5	23.0	19.0		-2.30	20.7	**0.0700**	**21.1**
1	21.0	19.0		-2.30	18.7	**0.0554**	**19.0**
2	17.2	19.0		-2.30	14.9	**0.0401**	**15.2**
4	15.0	19.0		-2.30	12.7	**0.0287**	**12.9**
8	13.2	19.0		-2.30	10.9	**0.0205**	**11.1**
15	12.1	20.0		-2.10	10.0	**0.0151**	**10.2**
30	11.4	20.0		-2.10	9.3	**0.0107**	**9.5**
60	10.4	20.5		-2.00	8.4	**0.0076**	**8.6**
120	8.7	20.5		-2.00	6.7	**0.0054**	**6.8**
270	7.6	20.5		-2.00	5.6	**0.0036**	**5.7**
360	7.2	21.0		-1.90	5.3	**0.0032**	**5.4**
1440	7.3	17.0		-2.71	4.6	**0.0016**	**4.7**



Project No.	06-1413-089
Drawn	TM
Reviewed	LL
Date	03/09/07

Golder Associates

GRAIN SIZE DISTRIBUTION
Meadowbank Mining Corporation
Meadowbank Gold Project

Figure I-9

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	06-1413-089	**Client :**	Meadowbank Mining Corporation	**BH :**	Trench Area Till
Sch#	277	**Project :**	Dike Design	**Sample :**	8
Lab Work:	TM	**Location:**	Meadowbank Gold Project		

First Sieving
Total Weight (g) = 12741.8

Hydrometer: (Minus #10)
Before Wash (g) = 51.6
After Wash (g) = 34.1

Residual No. 200 (g) = 0.7
Total minus 200 (g) = 18.2
Gs (assumed) = 2.70

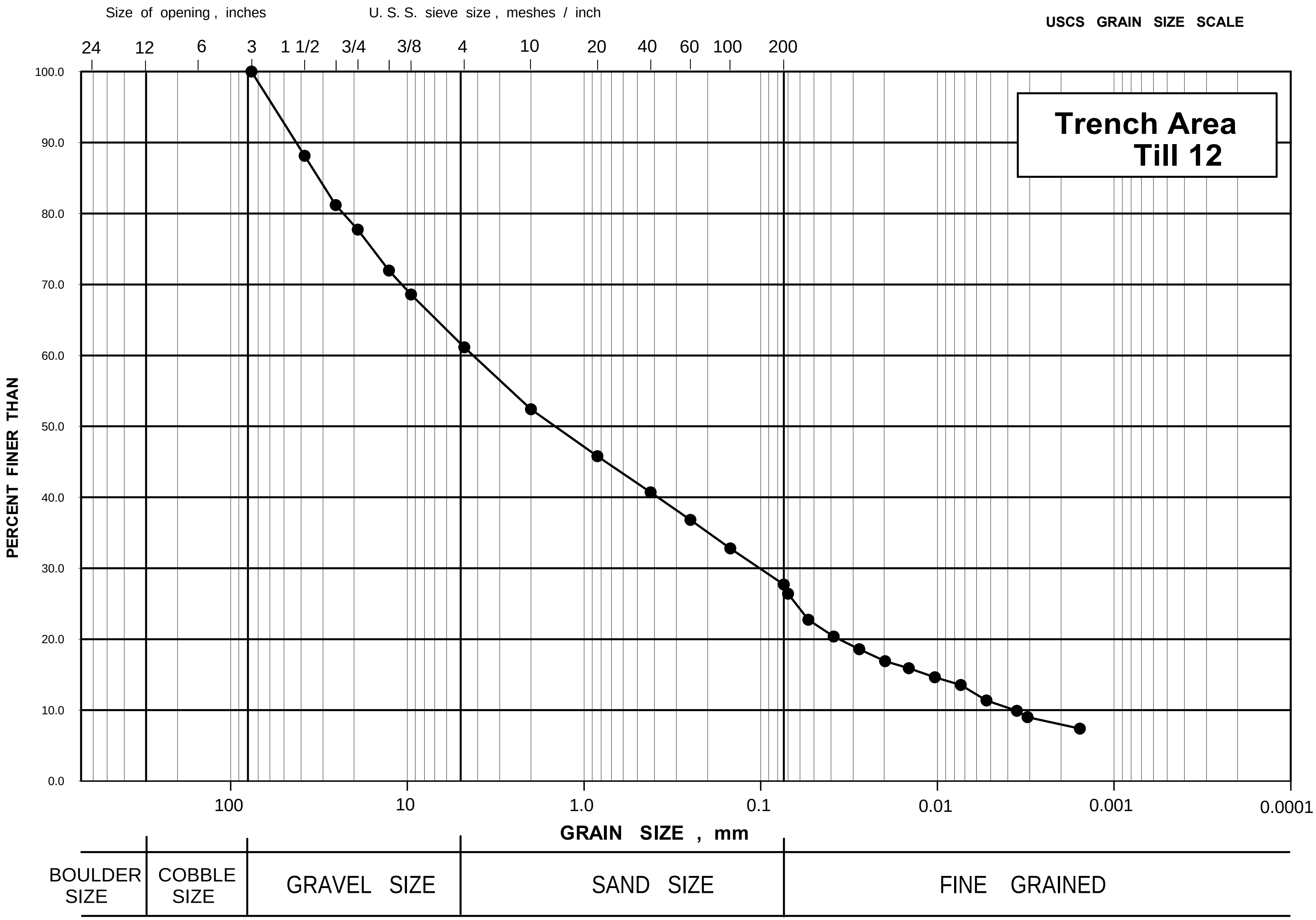
Size (USS)	**Weight Retained** (g)	**Retained** (%)	**Weight Retained** (g)	**Retained** (%)	**% Retained Total**	**Diameter** (mm)	**% Passing**
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	1160.6	9.1			9.1	**38.1**	**90.9**
1"	609.7	4.8			4.8	**25.4**	**86.1**
3/4"	636.2	5.0			5.0	**19.1**	**81.1**
1/2"	1042.6	8.2			8.2	**12.7**	**72.9**
3/8"	586.1	4.6			4.6	**9.52**	**68.3**
#4	1466.3	11.5			11.5	**4.76**	**56.8**
#10	1621.7	12.7			12.7	**2.00**	**44.1**
#20			9.8	19.0	8.4	**0.840**	**35.7**
#40			7.1	13.8	6.1	**0.420**	**29.7**
#60			5.7	11.0	4.9	**0.250**	**24.8**
#100			5.2	10.1	4.4	**0.149**	**20.3**
#200			5.6	10.9	4.8	**0.074**	**15.6**
Pan			18.2	35.3	15.6		

HYDROMETER ANALYSIS

Hydrometer No.: 87024 **Dispersion Method:** Stirring **Dispersion Period (min):**

Comments:

Time (min)	**Hydrometer Reading**	**Temperature** (ºC)		**Composite Correction**	**Corrected Reading**	**Diameter** (mm)	**Percentage Passing**
0.5	21.0	19.0		-3.33	17.7	**0.0700**	**14.9**
1	18.2	19.0		-3.33	14.9	**0.0564**	**12.6**
2	16.0	19.0		-3.33	12.7	**0.0404**	**10.7**
4	14.1	19.0		-3.33	10.8	**0.0289**	**9.1**
8	12.6	19.0		-3.33	9.3	**0.0206**	**7.8**
15	11.8	20.0		-3.00	8.8	**0.0151**	**7.4**
30	10.6	20.0		-3.00	7.6	**0.0107**	**6.4**
60	9.3	20.5		-2.83	6.5	**0.0076**	**5.5**
120	8.0	20.5		-2.83	5.2	**0.0054**	**4.4**
270	6.8	20.5		-2.83	4.0	**0.0037**	**3.4**
360	6.1	21.0		-2.67	3.4	**0.0032**	**2.9**
1440	6.3	17.0		-3.99	2.3	**0.0016**	**1.9**



Project No. 06-1413-089 Drawn TM Reviewed LL Date 03/09/07	Golder Associates	**GRAIN SIZE DISTRIBUTION** **Meadowbank Mining Corporation** **Meadowbank Gold Project**	**Figure I-10**

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	06-1413-089	Client :	Meadowbank Mining Corporation	BH :	Trench Area Till
Sch#	277	Project :	Dike Design	Sample :	12
Lab Work:	TM	Location:	Meadowbank Gold Project		

First Sieving
Total Weight (g) = 16782.5

Hydrometer: (Minus #10)
Before Wash (g) = 52.4
After Wash (g) = 25.2

Residual No. 200 (g) = 0.5
Total minus 200 (g) = 27.7
Gs (assumed) = 2.70

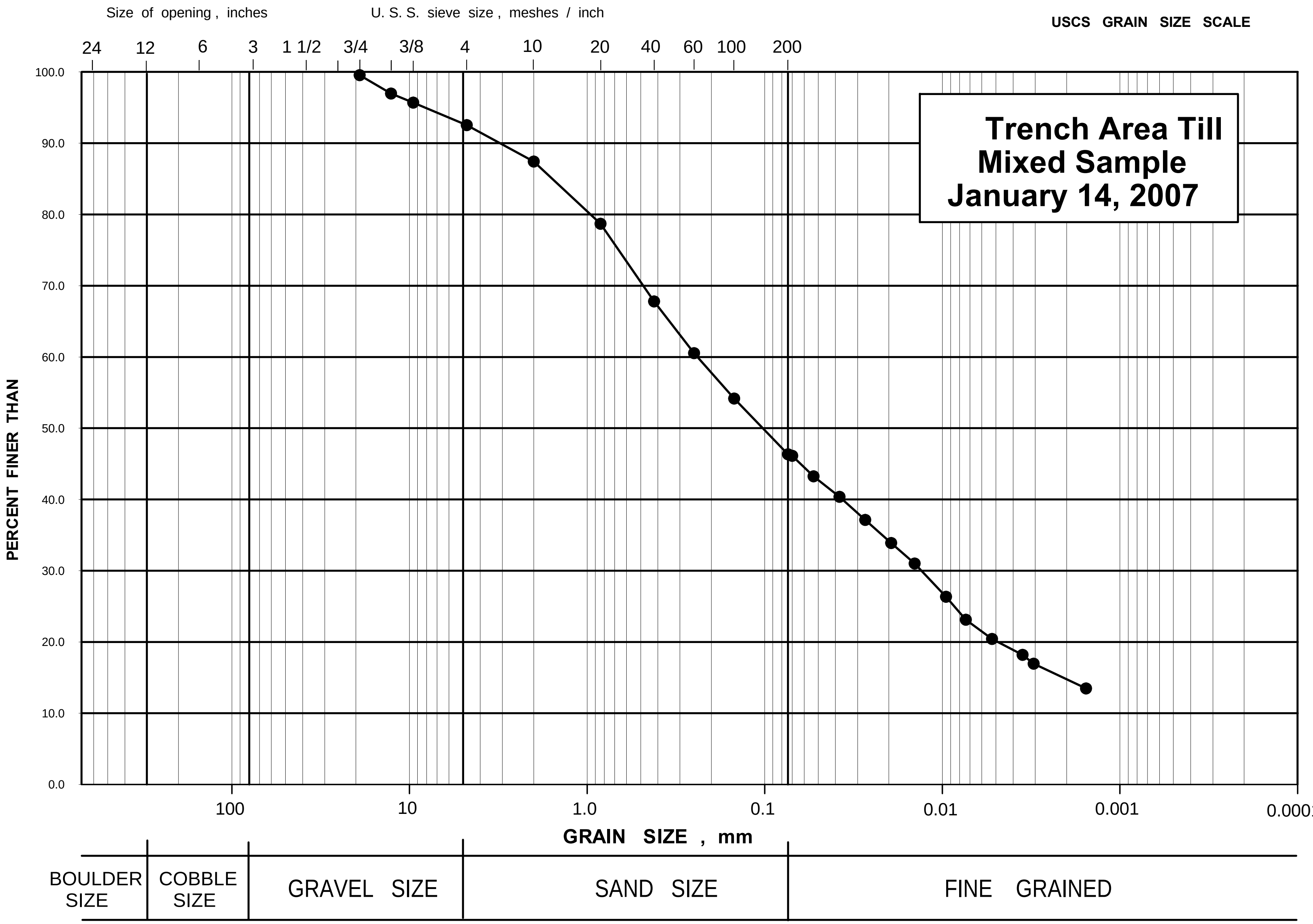
Size (USS)	Weight Retained (g)	Retained (%)	Weight Retained (g)	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	1992.1	11.9			11.9	**38.1**	**88.1**
1"	1166.2	6.9			6.9	**25.4**	**81.2**
3/4"	578.3	3.4			3.4	**19.1**	**77.7**
1/2"	969.0	5.8			5.8	**12.7**	**72.0**
3/8"	565.8	3.4			3.4	**9.52**	**68.6**
#4	1248.8	7.4			7.4	**4.76**	**61.1**
#10	1466.3	8.7			8.7	**2.00**	**52.4**
#20			6.6	12.6	6.6	**0.840**	**45.8**
#40			5.1	9.7	5.1	**0.420**	**40.7**
#60			3.9	7.4	3.9	**0.250**	**36.8**
#100			4.0	7.6	4.0	**0.149**	**32.8**
#200			5.1	9.7	5.1	**0.074**	**27.7**
Pan			27.7	52.9	27.7		

HYDROMETER ANALYSIS

Hydrometer No.: 8589 **Dispersion Method:** Stirring **Dispersion Period (min):**

Comments:

Time (min)	Hydrometer Reading	Temperature (ºC)		Composite Correction	Corrected Reading	Diameter (mm)	Percentage Passing
0.5	29.0	19.0		-2.30	26.7	**0.0700**	**26.4**
1	25.3	19.0		-2.30	23.0	**0.0538**	**22.7**
2	22.9	19.0		-2.30	20.6	**0.0387**	**20.4**
4	21.1	19.0		-2.30	18.8	**0.0277**	**18.6**
8	19.4	19.0		-2.30	17.1	**0.0198**	**16.9**
15	18.2	20.0		-2.10	16.1	**0.0145**	**15.9**
30	16.9	20.0		-2.10	14.8	**0.0104**	**14.6**
60	15.7	20.5		-2.00	13.7	**0.0074**	**13.6**
120	13.5	20.5		-2.00	11.5	**0.0053**	**11.4**
270	12.0	20.5		-2.00	10.0	**0.0036**	**9.9**
360	11.0	21.0		-1.90	9.1	**0.0031**	**9.0**
1440	10.2	17.0		-2.71	7.5	**0.0016**	**7.4**



Project No. 06-1413-089 Drawn TMTr Reviewed LL Date 03/09/07	Golder Associates	**GRAIN SIZE DISTRIBUTION** **Meadowbank Mining Corporation** **Meadowbank Gold Project**	**Figure I-11**

PARTICLE SIZE ANALYSIS OF SOILS   ASTM D 422-63

Project No. :	06-1413-089	**Client :**	Meadowbank Mining Corporation	**Sample : Trench Area Till Mixed Mixed Samples**	
Sch#	288	**Project :**	Dike Design		January 14, 2007
Lab Work:	TM	**Location:**	Meadowbank Gold Project		

First Sieving
Total Weight (g) = 3840.3

Hydrometer: (Minus #10)
Before Wash (g) = 48.1
After Wash (g) = 22.7

Residual No. 200 (g) = 0.1
Total minus 200 (g) = 25.5
Gs (assumed) = 2.70

Size (USS)	**Weight Retained** (g)	**Retained** (%)	**Weight Retained** (g)	**Retained** (%)	**% Retained Total**	**Diameter** (mm)	**% Passing**
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	0.0					**38.1**	**100.0**
1"	0.0					**25.4**	**100.0**
3/4"	17.8	0.5			0.5	**19.1**	**99.5**
1/2"	99.1	2.6			2.6	**12.7**	**97.0**
3/8"	48.8	1.3			1.3	**9.52**	**95.7**
#4	120.9	3.1			3.1	**4.76**	**92.5**
#10	196.6	5.1			5.1	**2.00**	**87.4**
#20			4.8	10.0	8.7	**0.840**	**78.7**
#40			6.0	12.5	10.9	**0.420**	**67.8**
#60			4.0	8.3	7.3	**0.250**	**60.5**
#100			3.5	7.3	6.4	**0.149**	**54.2**
#200			4.3	8.9	7.8	**0.074**	**46.3**
Pan			25.5	53.0	46.3		

HYDROMETER ANALYSIS

Hydrometer No.: 87024   **Dispersion Method:** Stirring   **Dispersion Period (min):**

Comments:

Time (min)	**Hydrometer Reading**	**Temperature** (ºC)		**Composite Correction**	**Corrected Reading**	**Diameter** (mm)	**Percentage Passing**
0.5	28.0	22.0		-2.34	25.7	**0.0700**	**46.1**
1	26.4	22.0		-2.34	24.1	**0.0531**	**43.2**
2	24.8	22.0		-2.34	22.5	**0.0380**	**40.4**
4	23.0	22.0		-2.34	20.7	**0.0272**	**37.1**
8	21.2	22.0		-2.34	18.9	**0.0194**	**33.9**
15	19.6	22.0		-2.34	17.3	**0.0143**	**31.0**
35	17.0	22.0		-2.34	14.7	**0.0095**	**26.4**
60	15.2	22.0		-2.34	12.9	**0.0074**	**23.1**
120	13.7	22.0		-2.34	11.4	**0.0053**	**20.4**
270	12.3	22.5		-2.17	10.1	**0.0035**	**18.2**
360	11.6	22.5		-2.17	9.4	**0.0031**	**16.9**
1440	10.5	20.0		-3.00	7.5	**0.0016**	**13.5**

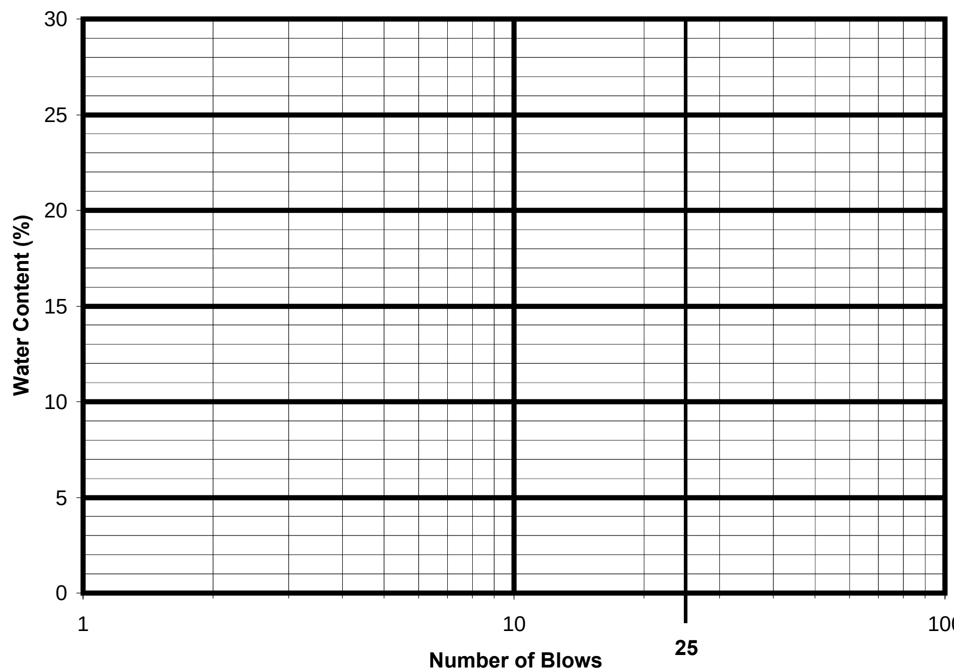
TILL ATTERBERG LIMITS

Project # 06-1413-089 Tech : TM

Liquid Limit, Plastic Limit and Plasticity Index of Soils
ASTM D 4318-93

TYPE OF TEST	LL	LL	LL	LL		W% Nat.
CONTAINER NUMBER						
NUMBER OF BLOWS						
MASS WET SOIL + TARE						15848.80
MASS DRY SOIL + TARE						14909.60
MASS OF WATER						939.20
MASS OF CONTAINER						1472.60
MASS OF DRY SOIL						13437.0
WATER CONTENT W (%)						7.0

TYPE OF TEST	PL	PL	BOREHOLE NO.	Trench Area Till
CONTAINER NUMBER			SAMPLE	9 & 10
MASS WET SOIL + TARE			DEPTH	
MASS DRY SOIL + TARE			LIQUID LIMIT (%)	NA
MASS OF WATER			PLASTIC LIMIT (%)	NA
MASS OF CONTAINER			PLASTICITY INDEX (%)	NA
MASS OF DRY SOIL			W% Natural (%)	7.0
WATER CONTENT W (%)			LIQUIDITY INDEX	NA



SAMPLE DESCRIPTION : Non Plastic Result
Could not achieve 25 blows

Meadowbank Mining Corporation
Meadowbank Gold Project

Project # 06-1413-089 **Tech : TM**

Liquid Limit, Plastic Limit and Plasticity Index of Soils
ASTM D 4318-93

TYPE OF TEST	LL	LL	LL	LL		W% Nat.
CONTAINER NUMBER						
NUMBER OF BLOWS	7	15	21	32		
MASS WET SOIL + TARE	45.93	50.04	43.27	47.60		18746.30
MASS DRY SOIL + TARE	43.05	47.06	40.95	44.88		17042.30
MASS OF WATER	2.88	2.98	2.32	2.72		1704.00
MASS OF CONTAINER	28.73	30.89	27.85	28.66		1425.90
MASS OF DRY SOIL	14.32	16.17	13.10	16.22		15616.4
WATER CONTENT W (%)	20.1	18.4	17.7	16.8		10.9

TYPE OF TEST	PL	PL	BOREHOLE NO.	Trench Area Till
CONTAINER NUMBER			SAMPLE	11
MASS WET SOIL + TARE	36.56	19.18	DEPTH	
MASS DRY SOIL + TARE	35.45	18.21	LIQUID LIMIT (%)	17.5
MASS OF WATER	1.11	0.97	PLASTIC LIMIT (%)	16.8
MASS OF CONTAINER	28.66	12.57	PLASTICITY INDEX (%)	0.7
MASS OF DRY SOIL	6.79	5.64	W% Natural (%)	10.9
WATER CONTENT W (%)	16.3	17.2	LIQUIDITY INDEX	-8.06

SAMPLE DESCRIPTION : CL

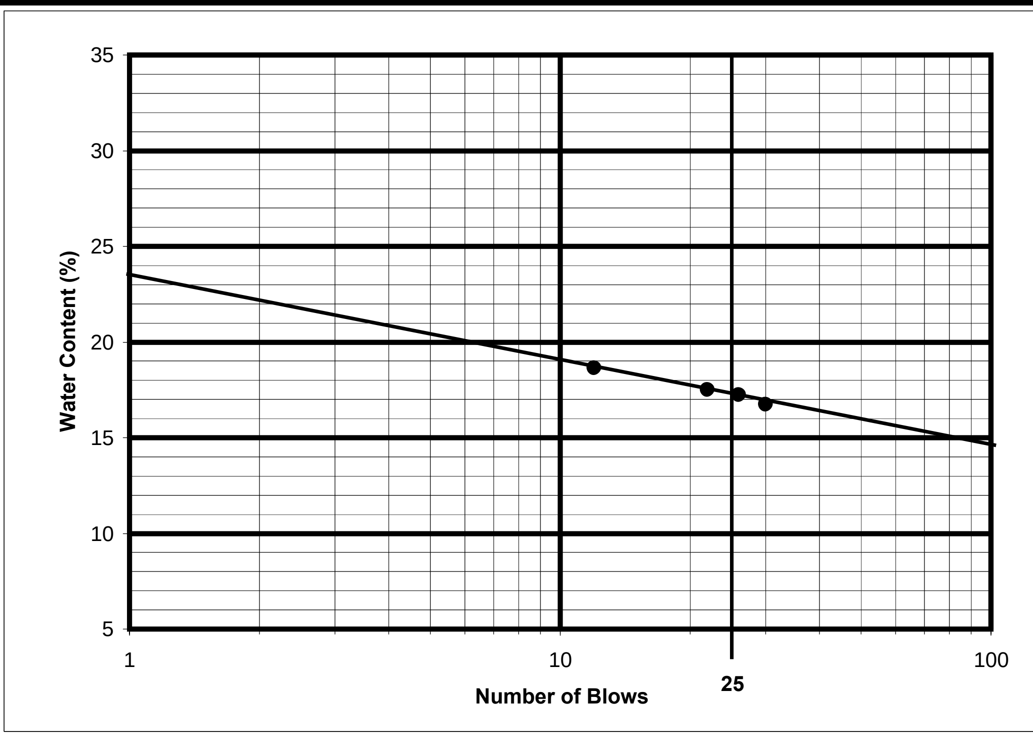
Meadowbank Mining Corporation
Meadowbank Gold Project

Project # **06-1413-089** **Tech :** **TM**

Liquid Limit, Plastic Limit and Plasticity Index of Soils
ASTM D 4318-93

TYPE OF TEST	LL	LL	LL	LL		W% Nat.
CONTAINER NUMBER						
NUMBER OF BLOWS	30	26	22	12		
MASS WET SOIL + TARE	43.57	51.84	46.59	50.31		13376.30
MASS DRY SOIL + TARE	41.39	48.76	43.92	46.92		12704.80
MASS OF WATER	2.18	3.08	2.67	3.39		671.50
MASS OF CONTAINER	28.36	30.88	28.67	28.75		1269.60
MASS OF DRY SOIL	13.03	17.88	15.25	18.17		11435.2
WATER CONTENT W (%)	**16.7**	**17.2**	**17.5**	**18.7**		**5.9**

TYPE OF TEST	PL	PL	BOREHOLE NO.	Trench Area Till
CONTAINER NUMBER			SAMPLE	3
MASS WET SOIL + TARE	38.72	40.86	DEPTH	
MASS DRY SOIL + TARE	37.25	39.43	LIQUID LIMIT (%)	17.2
MASS OF WATER	1.47	1.43	PLASTIC LIMIT (%)	16.0
MASS OF CONTAINER	27.97	30.57	PLASTICITY INDEX (%)	1.2
MASS OF DRY SOIL	9.28	8.86	W% Natural (%)	5.9
WATER CONTENT W (%)	**15.8**	**16.1**	LIQUIDITY INDEX	-8.36



SAMPLE DESCRIPTION : CL

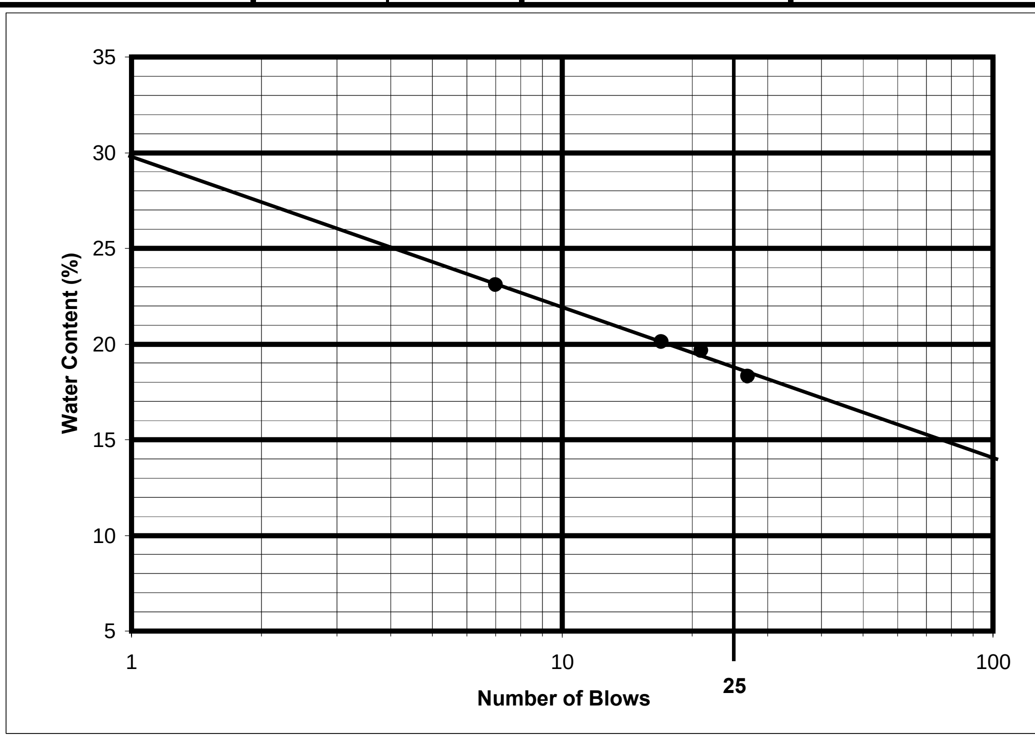
Meadowbank Mining Corporation
Meadowbank Gold Project

Project # 06-1413-089 Tech : TM

Liquid Limit, Plastic Limit and Plasticity Index of Soils
ASTM D 4318-93

TYPE OF TEST	LL	LL	LL	LL		W% Nat.
CONTAINER NUMBER						
NUMBER OF BLOWS	7	17	21	27		
MASS WET SOIL + TARE	44.13	43.24	46.86	47.16		13779.60
MASS DRY SOIL + TARE	41.27	40.70	43.86	44.26		12164.40
MASS OF WATER	2.86	2.54	3.00	2.90		1615.20
MASS OF CONTAINER	28.89	28.07	28.58	28.41		1269.60
MASS OF DRY SOIL	12.38	12.63	15.28	15.85		10894.8
WATER CONTENT W (%)	23.1	20.1	19.6	18.3		14.8

TYPE OF TEST	PL	PL	BOREHOLE NO.	Trench Area Till
CONTAINER NUMBER			SAMPLE	4
MASS WET SOIL + TARE	42.47	40.03	DEPTH	
MASS DRY SOIL + TARE	40.56	38.37	LIQUID LIMIT (%)	18.8
MASS OF WATER	1.91	1.66	PLASTIC LIMIT (%)	18.0
MASS OF CONTAINER	29.95	29.17	PLASTICITY INDEX (%)	0.8
MASS OF DRY SOIL	10.61	9.20	W% Natural (%)	14.8
WATER CONTENT W (%)	18.0	18.0	LIQUIDITY INDEX	-4.11



SAMPLE DESCRIPTION : CL

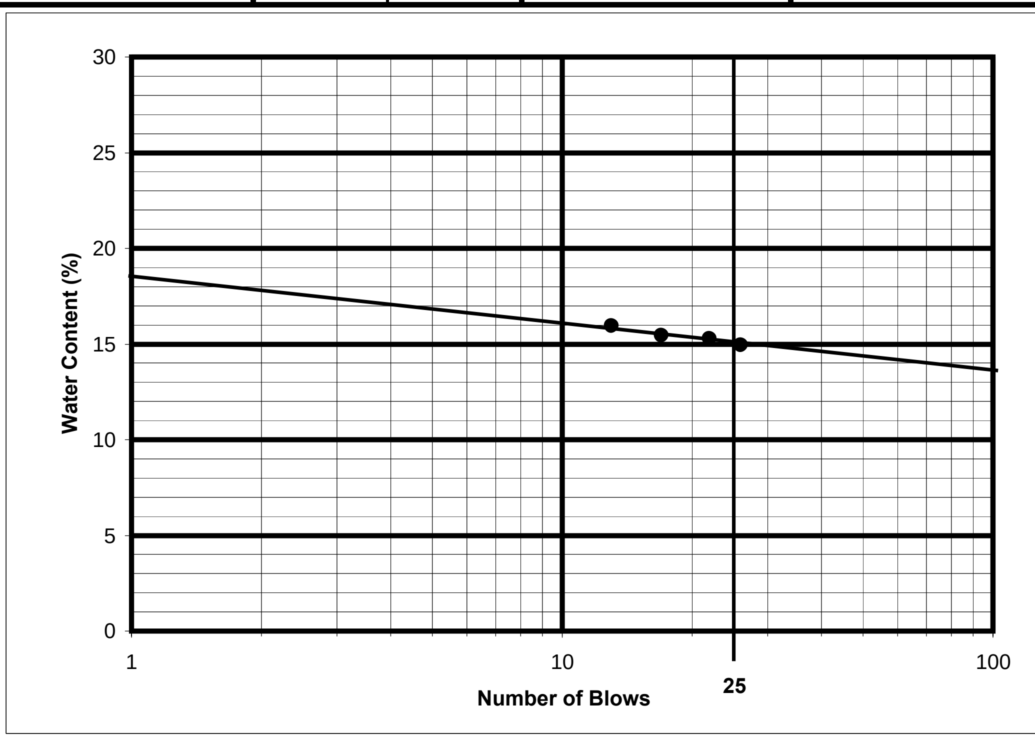
Meadowbank Mining Corporation
Meadowbank Gold Project

Project # 06-1413-089 **Tech : TM**

Liquid Limit, Plastic Limit and Plasticity Index of Soils
ASTM D 4318-93

TYPE OF TEST	LL	LL	LL	LL		W% Nat.
CONTAINER NUMBER						
NUMBER OF BLOWS	26	22	17	13		
MASS WET SOIL + TARE	28.97	46.92	44.32	50.34		12396.00
MASS DRY SOIL + TARE	26.86	44.50	42.06	47.34		11936.70
MASS OF WATER	2.11	2.42	2.26	3.00		459.30
MASS OF CONTAINER	12.76	28.67	27.42	28.53		1492.00
MASS OF DRY SOIL	14.10	15.83	14.64	18.81		10444.7
WATER CONTENT W (%)	15.0	15.3	15.4	15.9		4.4

TYPE OF TEST	PL	PL	BOREHOLE NO.	Trench Area Till
CONTAINER NUMBER			SAMPLE	1
MASS WET SOIL + TARE	31.27	38.04	DEPTH	
MASS DRY SOIL + TARE	30.27	36.81	LIQUID LIMIT (%)	15.0
MASS OF WATER	1.00	1.23	PLASTIC LIMIT (%)	15.1
MASS OF CONTAINER	23.68	28.65	PLASTICITY INDEX (%)	---
MASS OF DRY SOIL	6.59	8.16	W% Natural (%)	4.4
WATER CONTENT W (%)	15.2	15.1	LIQUIDITY INDEX	---



SAMPLE DESCRIPTION : Non Plastic Result

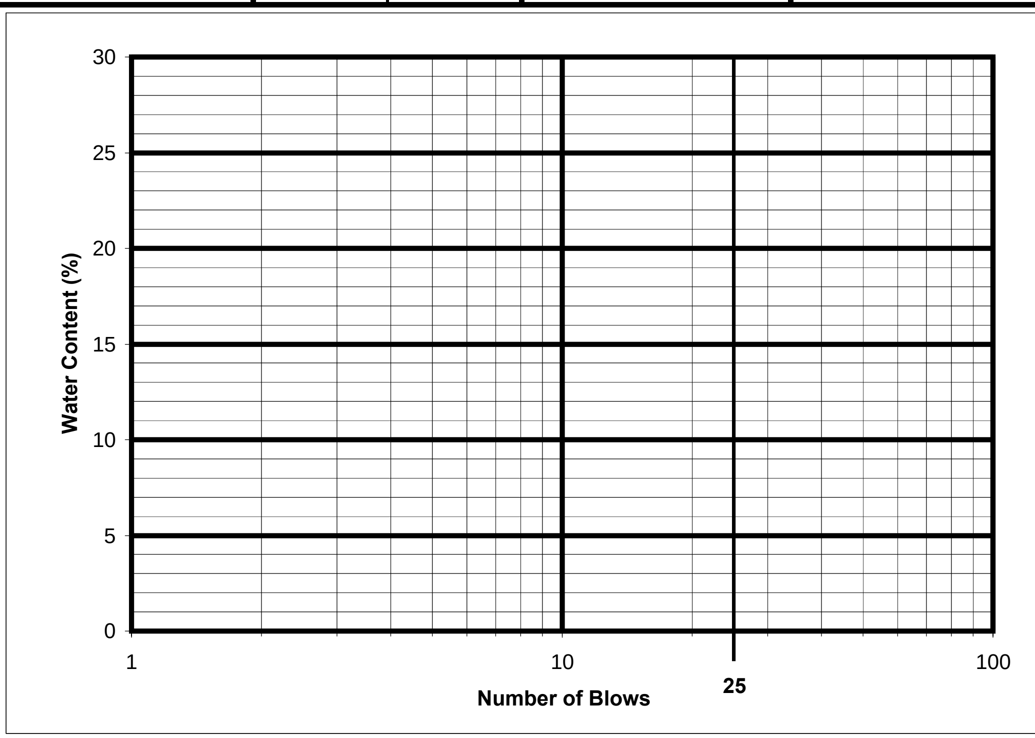
Meadowbank Mining Corporation
Meadowbank Gold Project

Project # 06-1413-089 Tech : TM

Liquid Limit, Plastic Limit and Plasticity Index of Soils
ASTM D 4318-93

TYPE OF TEST	LL	LL	LL	LL		W% Nat.
CONTAINER NUMBER						
NUMBER OF BLOWS						
MASS WET SOIL + TARE						12923.40
MASS DRY SOIL + TARE						12295.40
MASS OF WATER						628.00
MASS OF CONTAINER						1234.60
MASS OF DRY SOIL						11060.8
WATER CONTENT W (%)						5.7

TYPE OF TEST	PL	PL	BOREHOLE NO.	Trench Area Till
CONTAINER NUMBER			SAMPLE	2
MASS WET SOIL + TARE			DEPTH	
MASS DRY SOIL + TARE			LIQUID LIMIT (%)	NA
MASS OF WATER			PLASTIC LIMIT (%)	NA
MASS OF CONTAINER			PLASTICITY INDEX (%)	NA
MASS OF DRY SOIL			W% Natural (%)	5.7
WATER CONTENT W (%)			LIQUIDITY INDEX	NA



SAMPLE DESCRIPTION : Non Plastic Result
Could not achieve 25 blows

Meadowbank Mining Corporation
Meadowbank Gold Project

Project # 06-1413-089 Tech : TM

Liquid Limit, Plastic Limit and Plasticity Index of Soils
ASTM D 4318-93

TYPE OF TEST	LL	LL	LL	LL		W% Nat.
CONTAINER NUMBER						
NUMBER OF BLOWS	26	17	14	10		
MASS WET SOIL + TARE	16.96	21.93	19.36	19.59		12648.00
MASS DRY SOIL + TARE	14.79	19.01	16.78	16.86		12072.40
MASS OF WATER	2.17	2.92	2.58	2.73		575.60
MASS OF CONTAINER	1.50	1.49	1.51	1.50		1230.10
MASS OF DRY SOIL	13.29	17.52	15.27	15.36		10842.3
WATER CONTENT W (%)	16.3	16.7	16.9	17.8		5.3

TYPE OF TEST	PL	PL	BOREHOLE NO.	Trench Area Till
CONTAINER NUMBER			SAMPLE	5
MASS WET SOIL + TARE	11.61	9.40	DEPTH	
MASS DRY SOIL + TARE	10.26	8.32	LIQUID LIMIT (%)	16.3
MASS OF WATER	1.35	1.08	PLASTIC LIMIT (%)	15.8
MASS OF CONTAINER	1.54	1.60	PLASTICITY INDEX (%)	0.5
MASS OF DRY SOIL	8.72	6.72	W% Natural (%)	5.3
WATER CONTENT W (%)	15.5	16.1	LIQUIDITY INDEX	-20.00

SAMPLE DESCRIPTION : CL

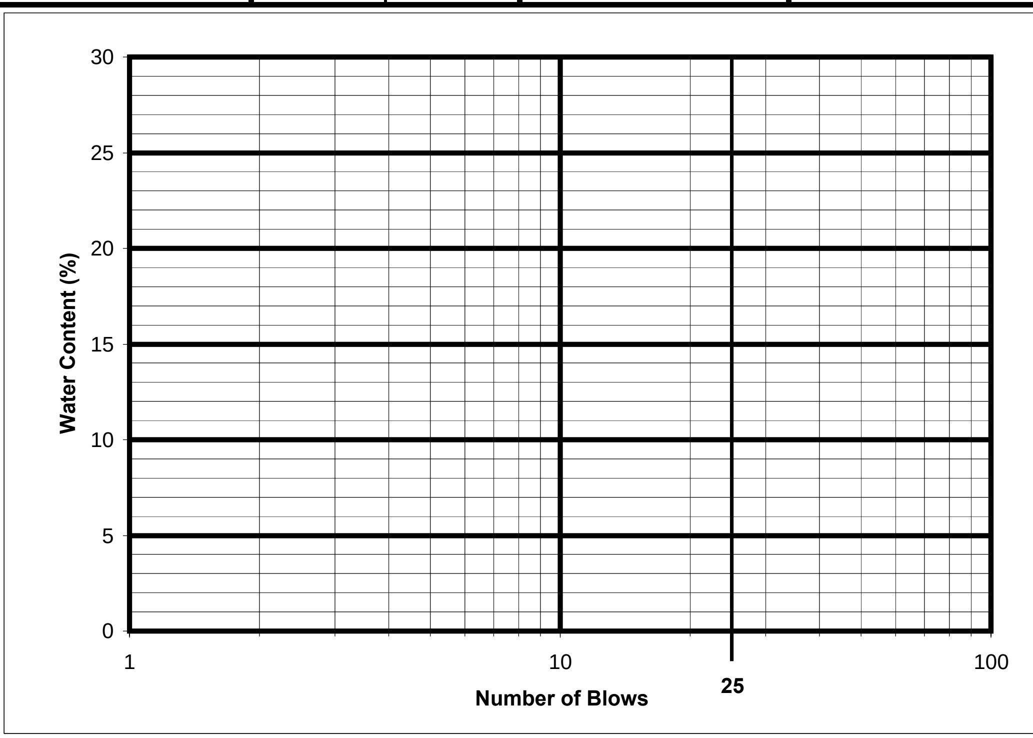
Meadowbank Mining Corporation
Meadowbank Gold Project

Project # 06-1413-089 Tech : TM

Liquid Limit, Plastic Limit and Plasticity Index of Soils
ASTM D 4318-93

TYPE OF TEST	LL	LL	LL	LL		W% Nat.
CONTAINER NUMBER						
NUMBER OF BLOWS						
MASS WET SOIL + TARE						18496.00
MASS DRY SOIL + TARE						17672.50
MASS OF WATER						823.50
MASS OF CONTAINER						1134.70
MASS OF DRY SOIL						16537.8
WATER CONTENT W (%)						5.0

TYPE OF TEST	PL	PL	BOREHOLE NO.	Trench Area Till
CONTAINER NUMBER			SAMPLE	6 & 7
MASS WET SOIL + TARE			DEPTH	
MASS DRY SOIL + TARE			LIQUID LIMIT (%)	NA
MASS OF WATER			PLASTIC LIMIT (%)	NA
MASS OF CONTAINER			PLASTICITY INDEX (%)	NA
MASS OF DRY SOIL			W% Natural (%)	5.0
WATER CONTENT W (%)			LIQUIDITY INDEX	NA



SAMPLE DESCRIPTION : Non Plastic Result
Could not achieve 25 blows

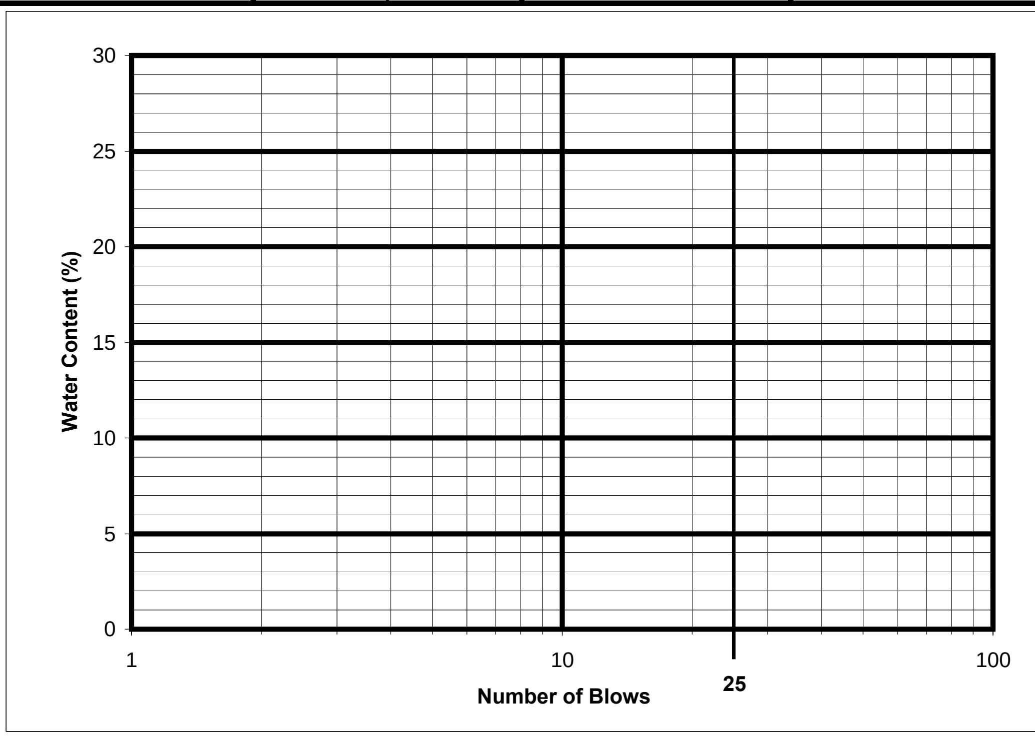
Meadowbank Mining Corporation
Meadowbank Gold Project

Project # 06-1413-089 Tech : TM

Liquid Limit, Plastic Limit and Plasticity Index of Soils
ASTM D 4318-93

TYPE OF TEST	LL	LL	LL	LL		W% Nat.
CONTAINER NUMBER						
NUMBER OF BLOWS						
MASS WET SOIL + TARE						14752.30
MASS DRY SOIL + TARE						14213.90
MASS OF WATER						538.40
MASS OF CONTAINER						1425.90
MASS OF DRY SOIL						12788.0
WATER CONTENT W (%)						4.2

TYPE OF TEST	PL	PL	BOREHOLE NO.	Trench Area Till
CONTAINER NUMBER			SAMPLE	8
MASS WET SOIL + TARE			DEPTH	
MASS DRY SOIL + TARE			LIQUID LIMIT (%)	NA
MASS OF WATER			PLASTIC LIMIT (%)	NA
MASS OF CONTAINER			PLASTICITY INDEX (%)	NA
MASS OF DRY SOIL			W% Natural (%)	4.2
WATER CONTENT W (%)			LIQUIDITY INDEX	NA



SAMPLE DESCRIPTION : Non Plastic Result
Could not achieve 25 blows

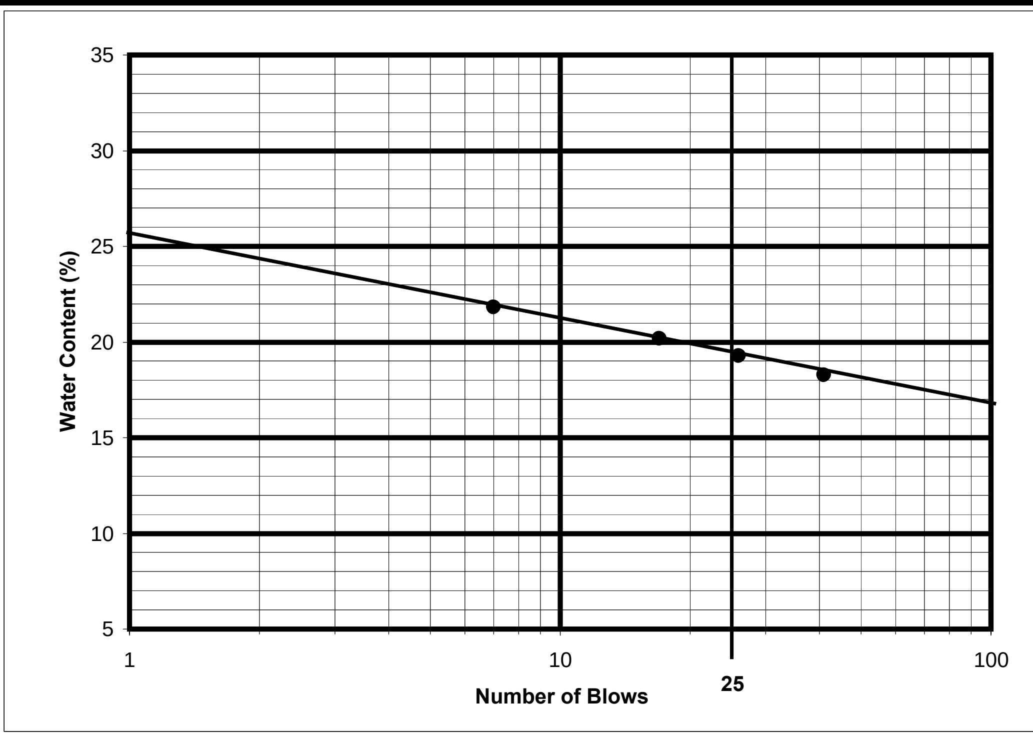
Meadowbank Mining Corporation
Meadowbank Gold Project

Project # 06-1413-089 **Tech :** TM

Liquid Limit, Plastic Limit and Plasticity Index of Soils
ASTM D 4318-93

TYPE OF TEST	LL	LL	LL	LL		W% Nat.
CONTAINER NUMBER						
NUMBER OF BLOWS	7	17	26	41		
MASS WET SOIL + TARE	46.50	46.20	45.36	46.10		19462.20
MASS DRY SOIL + TARE	43.34	43.47	42.62	43.31		18083.10
MASS OF WATER	3.16	2.73	2.74	2.79		1379.10
MASS OF CONTAINER	28.87	29.95	28.42	28.05		1218.20
MASS OF DRY SOIL	14.47	13.52	14.20	15.26		16864.9
WATER CONTENT W (%)	**21.8**	**20.2**	**19.3**	**18.3**		**8.2**

TYPE OF TEST	PL	PL	BOREHOLE NO.	Trench Area Till
CONTAINER NUMBER			SAMPLE	12
MASS WET SOIL + TARE	36.42	37.44	DEPTH	
MASS DRY SOIL + TARE	35.44	36.11	LIQUID LIMIT (%)	19.4
MASS OF WATER	0.98	1.33	PLASTIC LIMIT (%)	17.6
MASS OF CONTAINER	29.85	28.57	PLASTICITY INDEX (%)	1.8
MASS OF DRY SOIL	5.59	7.54	W% Natural (%)	8.2
WATER CONTENT W (%)	**17.5**	**17.6**	LIQUIDITY INDEX	-5.18



SAMPLE DESCRIPTION : CL

Meadowbank Mining Corporation
Meadowbank Gold Project

TILL WATER CONTENT

Project Number : **06-1413-089** **Tech :** **TM**

Laboratory Determination of Water Content of Soil and Rock
ASTM D 2216-92

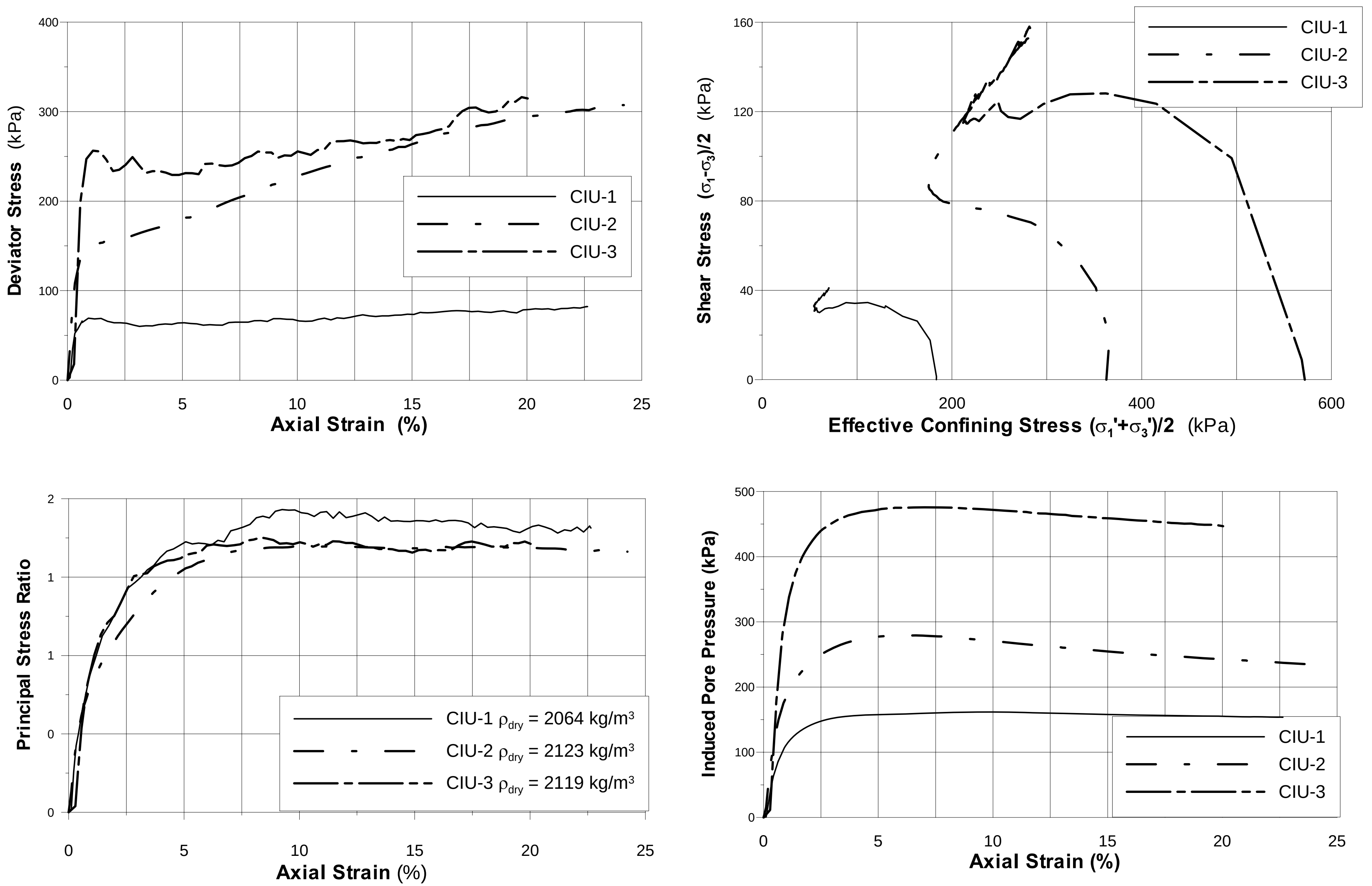
Borehole	**Till Spoil**	**Till Spoil**	**Till**	**Till, Grassland**	**Till Spoil**	**Till Spoil**
Sample Number	**1**	**2**	**3**	**4**	**5**	**6 & 7**
Depth (m)						
CONTAINER NUMBER						
MASS WET SOIL + TARE	12396.0	12923.4	13376.3	13779.6	12648.0	18496.0
MASS DRY SOIL + TARE	11936.7	12295.4	12704.8	12164.4	12072.4	17672.5
MASS OF WATER	459.3	628.0	671.5	1615.2	575.6	823.5
MASS OF CONTAINER	1492.0	1234.6	1269.6	1216.8	1230.1	1134.7
MASS OF DRY SOIL	10444.7	11060.8	11435.2	10947.6	10842.3	16537.8
Water Content W (%)	**4.4**	**5.7**	**5.9**	**14.8**	**5.3**	**5.0**

Borehole	**Till Spoil**			**Till, Trenches**		
Sample Number	**8**	**9 & 10**	**11**	**12**		
Depth (m)						
CONTAINER NUMBER						
MASS WET SOIL + TARE	14752.3	15848.8	18746.3	19462.2		
MASS DRY SOIL + TARE	14213.9	14909.6	17042.3	18083.1		
MASS OF WATER	538.4	939.2	1704.0	1379.1		
MASS OF CONTAINER	1425.9	1472.6	1425.9	1218.2		
MASS OF DRY SOIL	12788.0	13437.0	15616.4	16864.9		
Water Content W (%)	**4.2**	**7.0**	**10.9**	**8.2**		

Borehole						
Sample Number						
Depth (m)						
CONTAINER NUMBER						
MASS WET SOIL + TARE						
MASS DRY SOIL + TARE						
MASS OF WATER						
MASS OF CONTAINER						
MASS OF DRY SOIL						
Water Content W (%)						

Meadowbank Mining Corporation
Meadowbank Gold Project

TILL TRIAXIAL



Golder Associates

Project No. 06-1413-089
Drawn AS
Reviewed
Date 03/09/07

CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL TEST
TILL SAMPLES 3, 6 AND 7 COMPOSITE
Meadowbank Mining Corporation
Meadowbank Gold Project

Figure I-12

Undrained Triaxial Compression Test

Project No. :	06-1413-089/4000	Client :	Meadowbank Mining Corporation	Location :	
Sch No.		Project :	Dike Design	Type :	Trench Area Till
Lab Work:	ROB	Location:	Meadowbank Gold Project	Depth :	
Test ID:	CIU - 1				

Equipment

Machine:	Trautwein
Chamber:	C2
Load Cell:	205856
Axial DCDT:	LP-175
Cell Pressure:	PS-3118
Back Pressure:	PS-3125
Pore Pressure:	PS-2232

Specimen Geometry

	Initial	Final
Height (mm) =	128.13	99.13
Diameter (mm) =	73.05	83.05
Area (cm^2) =	41.91	54.17
Volume (cm^3) =	537.02	537.02

Phase Relationships

	Initial	Final
e =	0.32	0.32
ρ_{sat} (kg/m^3) =	2308	2308
ρ_{dry} (kg/m^3) =	2064	2064
Gs =	2.73	

Strength Results

q_{MAX} (kPa) =	82.2
Strain @ =	22.63
η_{MAX} =	1.54
Strain @ =	9.25
B Value	0.96
Target Mean Effective Stress (kPa)	183.55

Axial Strain (%)	Load (kN)	ΔU (kPa)	Cell Pressure (kPa)	Pore Pressure (kPa)	A_c (cm^2)	σ_1' (kPa)	σ_3' (kPa)	p' (kPa)	q (kPa)	Stress ratio η		
0.00	0.00	0.00	955.98	772.4	41.9	183.6	183.6	183.6	0.0	0.00		
0.11	0.01	0.92	955.55	773.3	42.0	185.0	182.2	183.1	2.8	0.02		
0.22	0.15	23.72	955.42	796.1	42.0	194.7	159.3	171.1	35.4	0.21		
0.32	0.22	46.31	955.86	818.7	42.0	189.6	137.1	154.6	52.5	0.34		
0.44	0.24	63.63	955.68	836.1	42.1	176.4	119.6	138.6	56.8	0.41		
0.63	0.28	86.38	955.85	858.8	42.2	163.0	97.0	119.0	66.0	0.55		
0.63	0.27	86.21	955.75	858.6	42.2	161.5	97.1	118.6	64.4	0.54		
0.91	0.29	106.71	955.63	879.1	42.3	145.7	76.5	99.6	69.2	0.70		
1.18	0.29	119.71	955.53	892.1	42.4	131.8	63.4	86.2	68.4	0.79		
1.46	0.29	129.23	955.37	901.7	42.5	122.7	53.7	76.7	69.0	0.90		
1.74	0.28	135.89	955.52	908.3	42.7	113.1	47.2	69.2	65.9	0.95		
2.03	0.27	141.34	955.57	913.8	42.8	106.0	41.8	63.2	64.2	1.02		
2.30	0.28	145.24	955.67	917.7	42.9	102.2	38.0	59.4	64.2	1.08		
2.57	0.27	148.61	955.42	921.0	43.0	97.9	34.4	55.6	63.6	1.14		
2.87	0.27	150.98	955.44	923.4	43.2	93.7	32.0	52.6	61.7	1.17		
3.14	0.26	152.87	955.40	925.3	43.3	90.2	30.1	50.1	60.1	1.20		
3.41	0.26	154.13	955.44	926.6	43.4	89.7	28.9	49.2	60.8	1.24		
3.69	0.26	155.52	955.91	928.0	43.5	88.7	28.0	48.2	60.7	1.26		
3.97	0.27	156.01	955.50	928.4	43.6	89.2	27.1	47.8	62.1	1.30		
4.25	0.27	156.88	955.48	929.3	43.8	88.8	26.2	47.1	62.7	1.33		
4.54	0.27	157.34	955.45	929.8	43.9	88.1	25.7	46.5	62.5	1.34		
4.79	0.28	157.57	955.63	930.0	44.0	89.5	25.6	46.9	63.8	1.36		
5.08	0.28	157.87	955.44	930.3	44.2	89.4	25.1	46.6	64.2	1.38		
5.36	0.28	157.92	955.53	930.3	44.3	88.6	25.2	46.3	63.4	1.37		
5.63	0.28	158.24	955.52	930.7	44.4	87.8	24.8	45.8	62.9	1.37		
5.91	0.27	158.60	955.42	931.0	44.5	85.9	24.4	44.9	61.5	1.37		
6.19	0.28	158.66	955.85	931.1	44.7	86.6	24.8	45.4	61.9	1.36		
6.47	0.28	158.99	955.32	931.4	44.8	85.6	23.9	44.5	61.7	1.39		
6.74	0.28	159.35	955.81	931.8	44.9	85.5	24.0	44.5	61.4	1.38		
7.02	0.29	159.70	955.46	932.1	45.1	87.6	23.3	44.8	64.3	1.44		
7.30	0.29	160.27	955.98	932.7	45.2	88.2	23.3	44.9	64.9	1.44		
7.57	0.29	160.58	955.91	933.0	45.3	87.7	22.9	44.5	64.8	1.46		
7.86	0.29	160.61	955.56	933.0	45.5	87.3	22.5	44.1	64.8	1.47		
8.13	0.30	161.09	955.63	933.5	45.6	88.6	22.1	44.3	66.5	1.50		
8.42	0.30	161.11	955.41	933.5	45.8	88.4	21.9	44.1	66.6	1.51		
8.70	0.30	161.50	955.72	933.9	45.9	87.4	21.8	43.7	65.6	1.50		
8.96	0.32	161.28	955.54	933.7	46.0	90.6	21.8	44.7	68.7	1.54		
9.25	0.32	161.89	955.89	934.3	46.2	90.3	21.6	44.5	68.7	1.54		
9.54	0.32	161.80	955.72	934.2	46.3	89.6	21.5	44.2	68.1	1.54		
9.80	0.32	161.92	955.77	934.3	46.5	89.4	21.4	44.1	68.0	1.54		
10.08	0.31	161.99	955.63	934.4	46.6	87.3	21.2	43.2	66.1	1.53		
10.36	0.31	161.78	955.46	934.2	46.8	87.1	21.3	43.2	65.8	1.52		
10.64	0.31	161.31	955.48	933.7	46.9	87.8	21.7	43.8	66.0	1.51		
10.91	0.32	161.40	955.59	933.8	47.0	89.8	21.8	44.4	68.0	1.53		
11.18	0.33	160.94	955.39	933.4	47.2	91.2	22.0	45.1	69.2	1.53		
11.47	0.32	160.58	955.45	933.0	47.3	89.9	22.5	44.9	67.4	1.50		
11.73	0.33	160.78	955.43	933.2	47.5	91.9	22.2	45.5	69.7	1.53		
12.03	0.33	160.40	955.73	932.8	47.6	91.9	22.9	45.9	69.0	1.50		
12.30	0.34	160.17	955.69	932.6	47.8	93.3	23.1	46.5	70.2	1.51		
12.57	0.34	159.98	955.68	932.4	47.9	94.8	23.3	47.1	71.6	1.52		
12.85	0.35	159.68	955.55	932.1	48.1	96.5	23.4	47.8	73.0	1.53		
13.14	0.35	159.47	955.53	931.9	48.3	95.5	23.6	47.6	71.8	1.51		
13.42	0.34	159.33	955.97	931.8	48.4	95.4	24.2	47.9	71.2	1.48		
13.70	0.35	158.95	955.09	931.4	48.6	95.4	23.7	47.6	71.7	1.51		
13.97	0.35	158.72	955.55	931.1	48.7	96.2	24.4	48.4	71.8	1.49		

Axial Strain (%)	Load (kN)	ΔU (kPa)	Cell Pressure (kPa)	Pore Pressure (kPa)	A_c (cm^2)	σ_1' (kPa)	σ_3' (kPa)	p' (kPa)	q (kPa)	Stress ratio η		
14.25	0.35	158.60	955.66	931.0	48.9	97.2	24.6	48.8	72.6	1.49		
14.52	0.36	158.40	955.60	930.8	49.0	97.6	24.8	49.0	72.8	1.48		
14.80	0.36	158.04	955.58	930.5	49.2	98.8	25.1	49.7	73.7	1.48		
15.07	0.36	158.09	955.39	930.5	49.4	98.3	24.9	49.4	73.4	1.49		
15.36	0.37	157.71	955.81	930.1	49.5	101.4	25.7	50.9	75.7	1.49		
15.63	0.37	157.41	955.47	929.8	49.7	100.9	25.6	50.7	75.2	1.48		
15.91	0.38	157.56	955.50	930.0	49.8	101.2	25.5	50.8	75.7	1.49		
16.18	0.38	157.12	955.49	929.5	50.0	102.0	25.9	51.3	76.0	1.48		
16.47	0.39	156.98	955.46	929.4	50.2	103.1	26.1	51.7	77.0	1.49		
16.75	0.39	156.94	955.55	929.4	50.3	103.6	26.2	52.0	77.4	1.49		
17.03	0.39	156.75	955.53	929.2	50.5	103.9	26.4	52.2	77.5	1.49		
17.32	0.39	156.49	955.52	928.9	50.7	103.9	26.6	52.4	77.3	1.48		
17.59	0.39	156.15	955.75	928.6	50.9	103.7	27.2	52.7	76.5	1.45		
17.87	0.39	156.47	955.42	928.9	51.0	103.5	26.5	52.2	77.0	1.48		
18.15	0.39	156.20	955.63	928.6	51.2	103.2	27.0	52.4	76.2	1.45		
18.43	0.39	155.76	954.92	928.2	51.4	102.4	26.7	52.0	75.7	1.46		
18.70	0.40	155.86	955.54	928.3	51.6	104.1	27.3	52.9	76.8	1.45		
18.98	0.40	155.55	955.64	928.0	51.7	105.2	27.7	53.5	77.5	1.45		
19.27	0.39	155.55	955.61	928.0	51.9	103.6	27.6	53.0	76.0	1.43		
19.56	0.39	155.30	955.32	927.7	52.1	102.7	27.6	52.6	75.1	1.43		
19.83	0.41	155.31	955.99	927.7	52.3	106.9	28.3	54.5	78.6	1.44		
20.10	0.41	155.16	955.41	927.6	52.5	106.8	27.8	54.1	79.0	1.46		
20.37	0.42	155.00	955.28	927.4	52.6	107.6	27.9	54.5	79.8	1.47		
20.65	0.42	154.76	955.27	927.2	52.8	107.5	28.1	54.5	79.4	1.46		
20.92	0.42	154.31	955.34	926.7	53.0	108.3	28.6	55.2	79.7	1.44		
21.20	0.42	154.28	955.70	926.7	53.2	107.6	29.0	55.2	78.6	1.42		
21.50	0.43	154.28	955.53	926.7	53.4	108.8	28.8	55.5	80.0	1.44		
21.77	0.43	154.17	955.70	926.6	53.6	109.2	29.1	55.8	80.1	1.44		
22.04	0.44	154.33	955.47	926.8	53.8	109.8	28.7	55.7	81.0	1.45		
22.31	0.43	153.67	955.59	926.1	54.0	110.1	29.5	56.4	80.6	1.43		
22.58	0.44	154.01	955.29	926.4	54.1	110.9	28.9	56.2	82.1	1.46		
22.63	0.45	153.84	955.53	926.3	54.2	111.4	29.3	56.7	82.2	1.45		

Undrained Triaxial Compression Test

Project No. :	06-1413-089/4000	**Client :**	Meadowbank Mining Corporation	**Location :**	
Sch No.		**Project :**	Dike Design	**Type :**	Trench Area Till
Lab Work:	ROB	**Location:**	Meadowbank Gold Project	**Depth :**	
Test ID:	CIU - 2				

Equipment

Machine:	Trautwein
Chamber:	C1
Load Cell:	205858
Axial DCDT:	LP-175
Cell Pressure:	PS-3118
Back Pressure:	PS-3125
Pore Pressure:	PS-2232

Specimen Geometry

	Initial	Final
Height (mm) =	118.39	89.72
Diameter (mm) =	69.53	79.87
Area (cm^2) =	37.97	50.10
Volume (cm^3) =	449.50	449.50

Phase Relationships

	Initial	Final
e =	**0.29**	**0.29**
ρ_{sat} (kg/m^3) =	**2345**	**2345**
ρ_{dry} (kg/m^3) =	**2123**	**2123**
Gs =	2.73	

Strength Results

q_{MAX} (kPa) =	308.2
Strain @ =	23.80
η_{MAX} =	1.36
Strain @ =	11.10
B Value	0.95
Target Mean Effective Stress (kPa)	362.69

Axial Strain (%)	Load (kN)	ΔU (kPa)	Cell Pressure (kPa)	Pore Pressure (kPa)	A_c (cm^2)	σ_1' (kPa)	σ_3' (kPa)	p' (kPa)	q (kPa)	Stress ratio η
0.00	0.00	0.00	1090.60	727.9	38.0	362.7	362.7	362.7	0.0	0.00
0.11	0.14	15.48	1090.64	743.4	38.0	385.0	347.3	359.8	37.7	0.10
0.21	0.31	52.34	1090.84	780.3	38.0	392.8	310.6	338.0	82.2	0.24
0.32	0.41	85.55	1090.50	813.5	38.1	385.4	277.0	313.2	108.3	0.35
0.44	0.47	112.21	1090.52	840.1	38.1	373.4	250.4	291.4	123.0	0.42
0.55	0.51	133.35	1090.57	861.3	38.2	364.0	229.3	274.2	134.7	0.49
0.66	0.54	150.02	1090.67	877.9	38.2	353.5	212.7	259.7	140.8	0.54
0.77	0.55	163.57	1090.76	891.5	38.3	343.0	199.3	247.2	143.7	0.58
0.87	0.56	175.27	1090.64	903.2	38.3	333.8	187.5	236.2	146.3	0.62
0.99	0.57	184.74	1090.64	912.7	38.3	326.7	178.0	227.6	148.7	0.65
1.10	0.58	193.31	1090.76	921.2	38.4	321.3	169.5	220.1	151.8	0.69
1.21	0.58	200.38	1090.68	928.3	38.4	313.5	162.4	212.8	151.2	0.71
1.32	0.59	207.02	1090.60	934.9	38.5	308.4	155.7	206.6	152.8	0.74
1.43	0.59	213.10	1090.82	941.0	38.5	303.1	149.8	200.9	153.3	0.76
1.53	0.59	218.41	1090.79	946.3	38.6	298.2	144.5	195.7	153.7	0.79
1.65	0.60	223.08	1090.69	951.0	38.6	294.9	139.7	191.4	155.2	0.81
1.77	0.60	227.69	1090.83	955.6	38.7	289.6	135.2	186.7	154.4	0.83
1.88	0.60	231.52	1090.49	959.4	38.7	286.0	131.1	182.7	155.0	0.85
1.98	0.61	235.05	1090.50	963.0	38.7	284.4	127.5	179.8	156.9	0.87
2.10	0.61	238.98	1090.64	966.9	38.8	281.1	123.7	176.2	157.4	0.89
2.21	0.61	242.07	1090.50	970.0	38.8	278.9	120.5	173.3	158.3	0.91
2.31	0.61	244.83	1090.48	972.7	38.9	275.9	117.7	170.4	158.1	0.93
2.58	0.62	251.60	1090.63	979.5	39.0	270.6	111.1	164.3	159.5	0.97
2.85	0.63	256.86	1090.60	984.8	39.1	267.4	105.8	159.7	161.6	1.01
3.13	0.64	261.45	1090.67	989.4	39.2	265.7	101.3	156.1	164.4	1.05
3.40	0.65	265.47	1090.61	993.4	39.3	263.4	97.2	152.6	166.2	1.09
3.69	0.67	268.71	1090.70	996.6	39.4	263.0	94.1	150.4	168.9	1.12
3.96	0.67	271.36	1090.39	999.3	39.5	261.7	91.1	148.0	170.5	1.15
4.22	0.68	273.60	1090.61	1001.5	39.6	261.8	89.1	146.6	172.7	1.18
4.51	0.70	275.30	1090.78	1003.2	39.8	263.7	87.6	146.3	176.1	1.20
4.78	0.71	276.48	1090.74	1004.4	39.9	264.5	86.4	145.7	178.1	1.22
5.07	0.73	277.64	1090.82	1005.6	40.0	266.7	85.3	145.8	181.5	1.24
5.33	0.73	278.39	1090.57	1006.3	40.1	266.0	84.3	144.9	181.8	1.25
5.60	0.74	279.02	1090.64	1006.9	40.2	268.8	83.7	145.4	185.1	1.27
5.88	0.76	279.06	1090.55	1007.0	40.3	271.3	83.6	146.1	187.7	1.28
6.15	0.77	279.50	1090.93	1007.4	40.5	274.4	83.5	147.1	190.8	1.30
6.43	0.78	279.23	1090.62	1007.1	40.6	276.6	83.5	147.9	193.2	1.31
6.71	0.80	279.42	1090.66	1007.3	40.7	279.9	83.3	148.8	196.5	1.32
6.98	0.81	278.78	1090.45	1006.7	40.8	282.9	83.8	150.1	199.1	1.33
7.25	0.83	278.36	1090.63	1006.3	40.9	286.7	84.4	151.8	202.3	1.33
7.52	0.84	278.09	1090.65	1006.0	41.1	288.9	84.6	152.7	204.3	1.34
7.79	0.85	277.46	1090.68	1005.4	41.2	292.1	85.3	154.2	206.8	1.34
8.08	0.87	276.50	1090.30	1004.4	41.3	296.1	85.9	156.0	210.2	1.35
8.36	0.88	275.92	1090.67	1003.8	41.4	299.1	86.8	157.6	212.3	1.35
8.62	0.89	274.92	1090.51	1002.8	41.6	302.5	87.7	159.3	214.8	1.35
8.91	0.91	274.19	1090.72	1002.1	41.7	307.0	88.6	161.4	218.4	1.35
9.18	0.92	273.26	1090.77	1001.2	41.8	309.7	89.6	163.0	220.1	1.35
9.44	0.93	272.25	1090.70	1000.2	41.9	313.4	90.5	164.8	222.8	1.35
9.73	0.95	271.25	1090.59	999.2	42.1	317.6	91.4	166.8	226.1	1.36
10.00	0.96	270.42	1090.85	998.3	42.2	320.2	92.5	168.4	227.6	1.35
10.28	0.98	269.63	1090.72	997.5	42.3	323.7	93.2	170.0	230.5	1.36
10.56	0.99	268.71	1090.55	996.6	42.5	326.5	93.9	171.4	232.5	1.36
10.83	1.00	267.67	1090.67	995.6	42.6	329.9	95.1	173.4	234.8	1.35
11.10	1.01	266.86	1090.52	994.8	42.7	332.9	95.7	174.8	237.1	1.36
11.38	1.02	265.93	1090.57	993.8	42.8	335.7	96.7	176.4	239.0	1.35

Axial Strain (%)	Load (kN)	ΔU (kPa)	Cell Pressure (kPa)	Pore Pressure (kPa)	A_c (cm^2)	σ_1' (kPa)	σ_3' (kPa)	p' (kPa)	q (kPa)	Stress ratio η		
11.66	1.04	264.86	1090.68	992.8	43.0	339.1	97.9	178.3	241.1	1.35		
11.95	1.05	264.07	1090.60	992.0	43.1	341.4	98.6	179.5	242.7	1.35		
12.22	1.06	263.16	1090.69	991.1	43.3	345.5	99.6	181.6	245.9	1.35		
12.48	1.08	262.55	1091.04	990.5	43.4	348.8	100.6	183.3	248.2	1.35		
12.76	1.08	261.54	1090.59	989.5	43.5	350.1	101.1	184.1	249.0	1.35		
13.03	1.10	260.58	1090.57	988.5	43.7	353.1	102.1	185.8	251.1	1.35		
13.32	1.11	259.61	1090.49	987.5	43.8	355.9	103.0	187.3	252.9	1.35		
13.60	1.12	258.67	1090.67	986.6	43.9	359.2	104.1	189.1	255.1	1.35		
13.86	1.13	257.84	1090.55	985.8	44.1	361.6	104.8	190.4	256.8	1.35		
14.14	1.14	257.22	1090.61	985.1	44.2	363.0	105.5	191.3	257.5	1.35		
14.41	1.16	256.42	1090.65	984.3	44.4	367.0	106.3	193.2	260.7	1.35		
14.69	1.16	255.58	1090.17	983.5	44.5	367.3	106.7	193.5	260.6	1.35		
14.98	1.18	254.71	1090.50	982.6	44.7	371.4	107.9	195.7	263.5	1.35		
15.24	1.19	253.92	1090.44	981.8	44.8	374.2	108.6	197.1	265.6	1.35		
15.51	1.20	253.23	1090.54	981.1	44.9	375.6	109.4	198.1	266.2	1.34		
15.79	1.21	252.51	1090.52	980.4	45.1	377.9	110.1	199.4	267.8	1.34		
16.07	1.22	251.81	1090.54	979.7	45.2	381.0	110.8	200.9	270.1	1.34		
16.35	1.25	251.11	1090.64	979.0	45.4	387.0	111.6	203.4	275.4	1.35		
16.63	1.26	250.22	1090.70	978.1	45.5	388.9	112.6	204.7	276.3	1.35		
16.88	1.27	249.76	1090.50	977.7	45.7	391.2	112.8	205.6	278.4	1.35		
17.17	1.28	249.04	1090.55	976.9	45.8	393.2	113.6	206.8	279.6	1.35		
17.46	1.29	248.45	1090.44	976.4	46.0	395.4	114.1	207.8	281.3	1.35		
17.72	1.31	247.83	1090.48	975.7	46.1	397.8	114.7	209.1	283.0	1.35		
18.00	1.32	247.12	1090.68	975.0	46.3	400.5	115.6	210.6	284.9	1.35		
18.28	1.33	246.52	1090.63	974.4	46.5	401.5	116.2	211.3	285.3	1.35		
18.55	1.34	245.75	1090.43	973.7	46.6	403.5	116.8	212.3	286.8	1.35		
18.82	1.35	245.24	1090.63	973.2	46.8	406.2	117.5	213.7	288.7	1.35		
19.09	1.36	244.48	1090.63	972.4	46.9	408.9	118.2	215.1	290.6	1.35		
19.37	1.37	243.77	1090.56	971.7	47.1	410.0	118.9	215.9	291.1	1.35		
19.65	1.39	243.30	1090.83	971.2	47.3	412.8	119.6	217.3	293.1	1.35		
19.92	1.40	242.73	1090.66	970.6	47.4	414.2	120.0	218.1	294.2	1.35		
20.20	1.40	242.04	1090.38	969.9	47.6	415.6	120.4	218.8	295.2	1.35		
20.49	1.41	241.68	1090.57	969.6	47.8	416.6	121.0	219.5	295.7	1.35		
20.76	1.42	241.08	1090.64	969.0	47.9	418.7	121.6	220.7	297.1	1.35		
21.03	1.43	240.75	1090.72	968.7	48.1	420.2	122.1	221.4	298.1	1.35		
21.32	1.44	239.90	1090.56	967.8	48.3	421.9	122.7	222.5	299.1	1.34		
21.58	1.45	239.52	1090.95	967.4	48.4	422.7	123.5	223.2	299.1	1.34		
21.87	1.46	238.84	1090.68	966.8	48.6	424.2	123.9	224.0	300.2	1.34		
22.15	1.47	238.53	1090.93	966.4	48.8	426.3	124.5	225.1	301.8	1.34		
22.42	1.48	237.89	1090.88	965.8	48.9	427.0	125.1	225.7	302.0	1.34		
22.70	1.48	237.08	1090.70	965.0	49.1	427.4	125.7	226.3	301.7	1.33		
22.96	1.50	236.64	1090.55	964.5	49.3	430.0	126.0	227.3	304.0	1.34		
23.24	1.51	236.19	1090.62	964.1	49.5	431.7	126.5	228.2	305.2	1.34		
23.52	1.52	235.29	1090.53	963.2	49.6	432.9	127.3	229.2	305.6	1.33		
23.80	1.54	234.96	1090.52	962.9	49.8	435.9	127.6	230.4	308.2	1.34		
24.06	1.54	234.68	1090.80	962.6	50.0	435.4	128.2	230.6	307.2	1.33		
24.22	1.54	234.15	1090.76	962.1	50.1	436.1	128.7	231.2	307.4	1.33		

Undrained Triaxial Compression Test

Project No. :	06-1413-089/4000	**Client :**	Meadowbank Mining Corporation	**Location :**	
Sch No.		**Project :**	Dike Design	**Type :**	Trench Area Till
Lab Work:	ROB	**Location:**	Meadowbank Gold Project	**Depth :**	
Test ID:	CIU - 3				

Equipment

Machine:	Trautwein
Chamber:	C1
Load Cell:	194249
Axial DCDT:	LP-175
Cell Pressure:	PS-3118
Back Pressure:	PS-3125
Pore Pressure:	PS-2232

Specimen Geometry

	Initial	Final
Height (mm) =	121.90	97.49
Diameter (mm) =	67.74	75.75
Area (cm^2) =	36.04	45.07
Volume (cm^3) =	439.36	439.36

Phase Relationships

	Initial	Final
e =	**0.29**	**0.29**
ρ_{sat} (kg/m^3) =	**2343**	**2343**
ρ_{dry} (kg/m^3) =	**2119**	**2119**
Gs =	2.73	

Strength Results

q_{MAX} (kPa) =	316.2
Strain @ =	19.77
η_{MAX} =	1.40
Strain @ =	8.29
B Value	0.99
Target Mean Effective Stress (kPa)	572.02

Axial Strain (%)	Load (kN)	ΔU (kPa)	Cell Pressure (kPa)	Pore Pressure (kPa)	A_c (cm^2)	σ_1' (kPa)	σ_3' (kPa)	p' (kPa)	q (kPa)	Stress ratio η		
0.00	0.00	0.00	1440.36	868.3	36.0	572.0	572.0	572.0	0.0	0.00		
0.29	0.06	11.52	1439.64	879.9	36.1	577.6	559.8	565.7	17.9	0.03		
0.56	0.72	176.32	1440.34	1044.7	36.2	594.0	395.7	461.8	198.3	0.43		
0.82	0.90	279.87	1440.11	1148.2	36.3	539.0	291.9	374.3	247.1	0.66		
1.11	0.93	338.28	1440.42	1206.6	36.4	490.2	233.8	319.3	256.4	0.80		
1.39	0.93	374.53	1439.59	1242.9	36.6	452.2	196.7	281.9	255.5	0.91		
1.68	0.90	398.77	1439.93	1267.1	36.7	419.6	172.8	255.1	246.8	0.97		
1.97	0.86	416.28	1439.90	1284.6	36.8	388.8	155.3	233.1	233.6	1.00		
2.25	0.87	430.26	1440.30	1298.6	36.9	376.8	141.7	220.1	235.1	1.07		
2.53	0.89	440.69	1440.43	1309.0	37.0	372.0	131.4	211.6	240.6	1.14		
2.83	0.92	447.89	1439.99	1316.2	37.1	373.0	123.8	206.8	249.2	1.21		
3.12	0.89	454.39	1440.23	1322.7	37.2	357.5	117.5	197.5	240.0	1.22		
3.40	0.86	459.20	1440.18	1327.5	37.3	344.1	112.6	189.8	231.5	1.22		
3.70	0.87	463.33	1439.82	1331.7	37.4	341.6	108.1	186.0	233.4	1.26		
3.98	0.88	465.83	1440.04	1334.2	37.5	339.6	105.9	183.8	233.7	1.27		
4.28	0.87	468.42	1440.04	1336.8	37.7	335.2	103.3	180.6	231.9	1.28		
4.55	0.87	469.76	1439.79	1338.1	37.8	331.0	101.7	178.1	229.3	1.29		
4.85	0.87	471.19	1440.06	1339.5	37.9	329.9	100.5	177.0	229.3	1.30		
5.14	0.88	473.07	1440.22	1341.4	38.0	330.1	98.8	175.9	231.3	1.31		
5.43	0.88	473.98	1440.14	1342.3	38.1	329.1	97.8	174.9	231.3	1.32		
5.71	0.88	474.84	1439.79	1343.2	38.2	326.6	96.6	173.3	230.0	1.33		
5.99	0.93	474.99	1440.35	1343.3	38.3	338.6	97.0	177.5	241.6	1.36		
6.28	0.93	475.14	1439.93	1343.5	38.5	338.5	96.4	177.1	242.0	1.37		
6.58	0.93	475.54	1440.27	1343.9	38.6	336.6	96.4	176.4	240.2	1.36		
6.86	0.93	475.74	1440.51	1344.1	38.7	335.8	96.4	176.2	239.3	1.36		
7.16	0.93	475.63	1440.12	1344.0	38.8	336.1	96.1	176.1	240.0	1.36		
7.44	0.95	475.30	1440.34	1343.6	38.9	339.6	96.7	177.7	242.9	1.37		
7.72	0.97	475.61	1440.14	1344.0	39.1	344.2	96.2	178.9	248.1	1.39		
8.01	0.98	475.53	1440.50	1343.9	39.2	347.1	96.6	180.1	250.5	1.39		
8.29	1.00	475.00	1440.40	1343.3	39.3	352.6	97.1	182.2	255.5	1.40		
8.58	1.00	474.57	1440.16	1342.9	39.4	351.6	97.3	182.0	254.4	1.40		
8.88	1.01	473.64	1440.35	1342.0	39.6	352.8	98.4	183.2	254.4	1.39		
9.15	0.99	473.52	1440.31	1341.9	39.7	346.7	98.5	181.2	248.3	1.37		
9.45	1.00	473.08	1440.70	1341.4	39.8	350.4	99.3	183.0	251.1	1.37		
9.73	1.00	472.17	1440.14	1340.5	39.9	350.3	99.6	183.2	250.7	1.37		
10.02	1.02	471.66	1440.29	1340.0	40.1	355.9	100.3	185.5	255.6	1.38		
10.31	1.02	471.36	1440.44	1339.7	40.2	354.4	100.7	185.3	253.7	1.37		
10.59	1.01	470.32	1440.52	1338.7	40.3	353.6	101.9	185.8	251.7	1.35		
10.88	1.04	469.79	1440.39	1338.1	40.4	359.4	102.3	188.0	257.1	1.37		
11.17	1.05	468.97	1440.34	1337.3	40.6	360.8	103.0	188.9	257.8	1.36		
11.45	1.08	468.39	1440.26	1336.7	40.7	369.1	103.5	192.1	265.6	1.38		
11.72	1.09	467.16	1439.75	1335.5	40.8	371.1	104.3	193.2	266.9	1.38		
12.02	1.09	466.28	1439.95	1334.6	41.0	372.4	105.3	194.3	267.0	1.37		
12.31	1.10	466.02	1440.06	1334.4	41.1	373.5	105.7	195.0	267.8	1.37		
12.59	1.10	465.11	1439.93	1333.4	41.2	372.9	106.5	195.3	266.4	1.36		
12.87	1.10	464.46	1440.16	1332.8	41.4	372.1	107.4	195.6	264.7	1.35		
13.16	1.10	463.99	1440.00	1332.3	41.5	372.9	107.7	196.1	265.2	1.35		
13.45	1.10	462.50	1439.79	1330.8	41.6	373.9	108.9	197.3	264.9	1.34		
13.75	1.12	461.84	1440.19	1330.2	41.8	377.6	110.0	199.2	267.6	1.34		
14.03	1.12	461.31	1440.08	1329.7	41.9	378.7	110.4	199.9	268.3	1.34		
14.31	1.12	460.46	1440.02	1328.8	42.1	378.5	111.2	200.3	267.3	1.33		
14.61	1.14	459.94	1440.39	1328.3	42.2	381.6	112.1	201.9	269.5	1.33		
14.90	1.14	458.65	1440.02	1327.0	42.4	381.2	113.0	202.4	268.2	1.32		
15.17	1.16	458.82	1440.46	1327.2	42.5	387.0	113.3	204.5	273.7	1.34		
15.47	1.17	458.12	1440.09	1326.5	42.6	388.7	113.6	205.3	275.0	1.34		

Axial Strain (%)	Load (kN)	ΔU (kPa)	Cell Pressure (kPa)	Pore Pressure (kPa)	A_c (cm^2)	σ_1' (kPa)	σ_3' (kPa)	p' (kPa)	q (kPa)	Stress ratio η		
15.75	1.18	456.97	1440.87	1325.3	42.8	392.0	115.6	207.7	276.5	1.33		
16.04	1.20	456.22	1440.16	1324.6	42.9	394.9	115.6	208.7	279.3	1.34		
16.33	1.21	455.49	1440.15	1323.8	43.1	396.8	116.3	209.8	280.5	1.34		
16.61	1.23	455.07	1440.35	1323.4	43.2	400.7	116.9	211.5	283.7	1.34		
16.91	1.28	454.46	1440.55	1322.8	43.4	411.7	117.7	215.7	294.0	1.36		
17.19	1.31	453.44	1439.99	1321.8	43.5	418.8	118.2	218.4	300.6	1.38		
17.47	1.33	453.03	1440.13	1321.4	43.7	423.0	118.8	220.2	304.2	1.38		
17.77	1.34	451.69	1440.18	1320.0	43.8	424.8	120.1	221.7	304.7	1.37		
18.04	1.32	451.43	1439.90	1319.8	44.0	421.3	120.1	220.5	301.2	1.37		
18.34	1.32	450.59	1439.90	1318.9	44.1	420.1	121.0	220.7	299.1	1.36		
18.64	1.33	450.63	1440.11	1319.0	44.3	421.3	121.1	221.2	300.2	1.36		
18.91	1.35	449.33	1440.71	1317.7	44.4	427.1	123.0	224.4	304.1	1.36		
19.21	1.39	448.96	1440.29	1317.3	44.6	434.6	123.0	226.9	311.6	1.37		
19.50	1.39	448.88	1440.14	1317.2	44.8	433.9	122.9	226.6	311.0	1.37		
19.77	1.42	448.30	1440.13	1316.6	44.9	439.7	123.5	228.9	316.2	1.38		
20.03	1.42	446.66	1439.96	1315.0	45.1	439.8	125.0	229.9	314.8	1.37		

TILL CONSOLIDATION

One-Dimensional Consolidation Properties of Soils of Soils - ASTM D 2436 - 96

Project No. :	06-1413-089/4000	**Client :**	Meadowbank Mining Corporation	**Borehole:**	
Sch No.		**Project :**	Dike Design	**Sample:**	Trench Area Till
Lab Work:	ROB/LL	**Location:**	Meadowbank Gold Project	**Depth :**	

Equipment

Machine:	Sigma-1
Mach No.	Station 1
Ring No.	Large
Lever Arm Ratio	0.0
Drainage:	Double-sided

Specimen Geometry

	Initial	Final
Height (mm) =	71.21	62.15
Diameter (mm) =	152.40	152.40
Area (cm^2) =	182.41	182.41
Volume (cm^3) =	1298.93	1133.65

Phase Relationships

	Initial	Final
Wet Wt (g) =	2701.80	2566.60
Dry Wt (g) =	2305.10	2305.10
w (%) =	**17.21**	**11.34**
e =	**0.54**	**0.34**
ρ_{wet} (kg/m^3) =	**2080**	**2264**
ρ_{dry} (kg/m^3) =	**1775**	**2033**
S (%) =	**87.3**	**90.4**

Remarks

ASTM Method:	B - Constant Time Increment
Method for Cv :	Casagrande
H_{avg} :	Half the specimen height
Time Increment:	

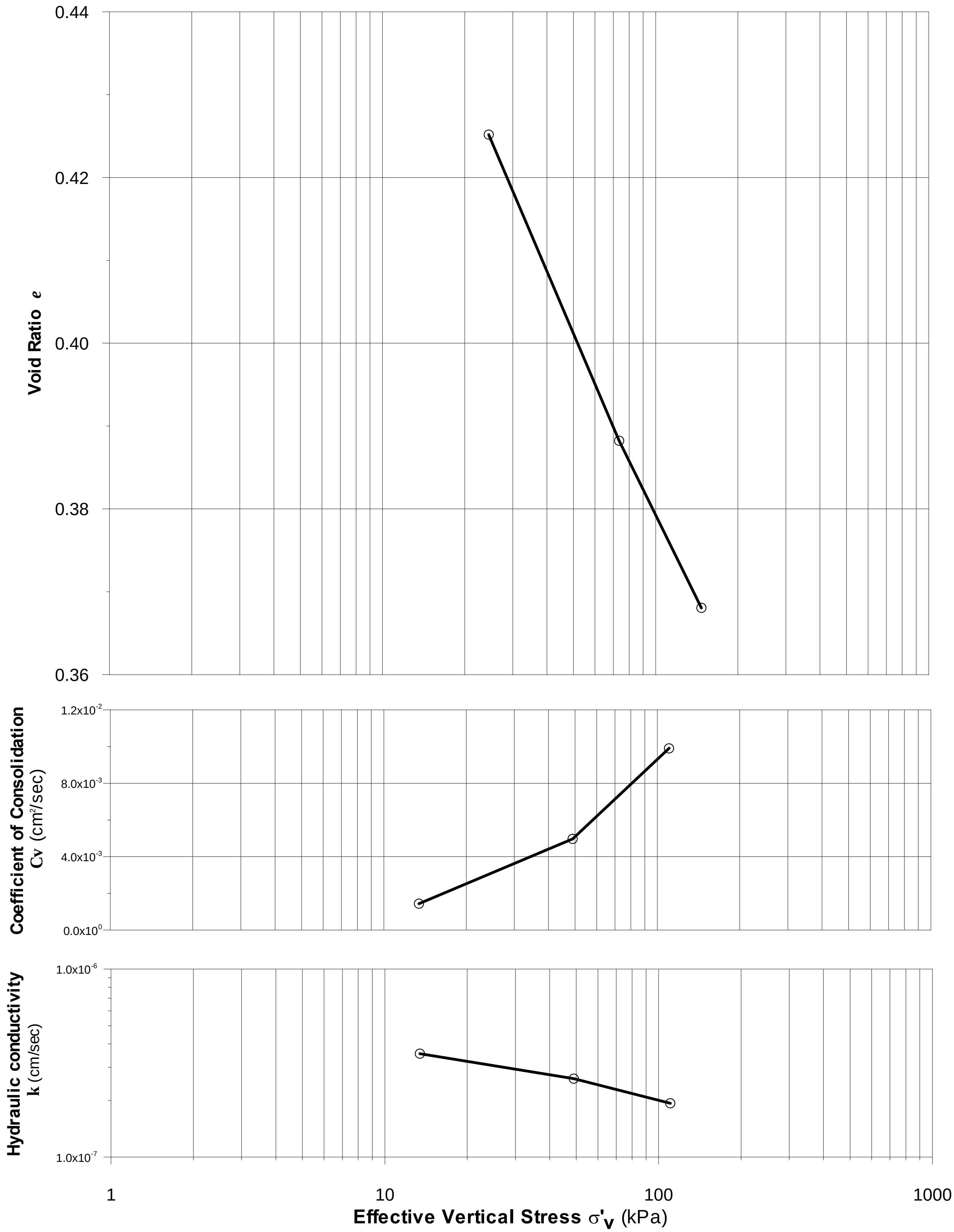
Sample Properties

G_s =	2.73	Calculated
H_s (mm) =	46.29	

Stress (kPa)	ΔH (mm)	Corrected d_f (mm)	ε Σ ΔH / Ho (%)	$H-H_s$ (mm)	e $(H-H_s)/H_s$	Stress $_{avg}$ (kPa)	e_{avg}	H_{avg} (mm)	t 50 (min)	Cv (cm^2/sec)	k (cm/sec)
2.3	1.49	69.75	2.05	23.46	**0.51**						
24.5	4.25	65.97	7.36	19.68	**0.43**	**13.4**	**0.47**	67.86	105.000	**1.4E-03**	**3.5E-07**
73.5	2.01	64.26	9.76	17.97	**0.39**	**49.0**	**0.41**	65.11	28.000	**5.0E-03**	**2.6E-07**
147.0	1.11	63.32	11.07	17.04	**0.37**	**110.2**	**0.38**	63.79	13.500	**9.9E-03**	**1.9E-07**

Comments:

Sample Description :



Golder Associates	Project No. 06-1413-089 Drawn ROB Reviewed LL Date 01/09/07	**ONE-DIMENSIONAL CONSOLIDATION LABORATORY TEST RESULTS OF TILL** **Meadowbank Mining Corporation** **Meadowbank Gold Project**	**Figure I-13**

TILL STANDARD PROCTOR

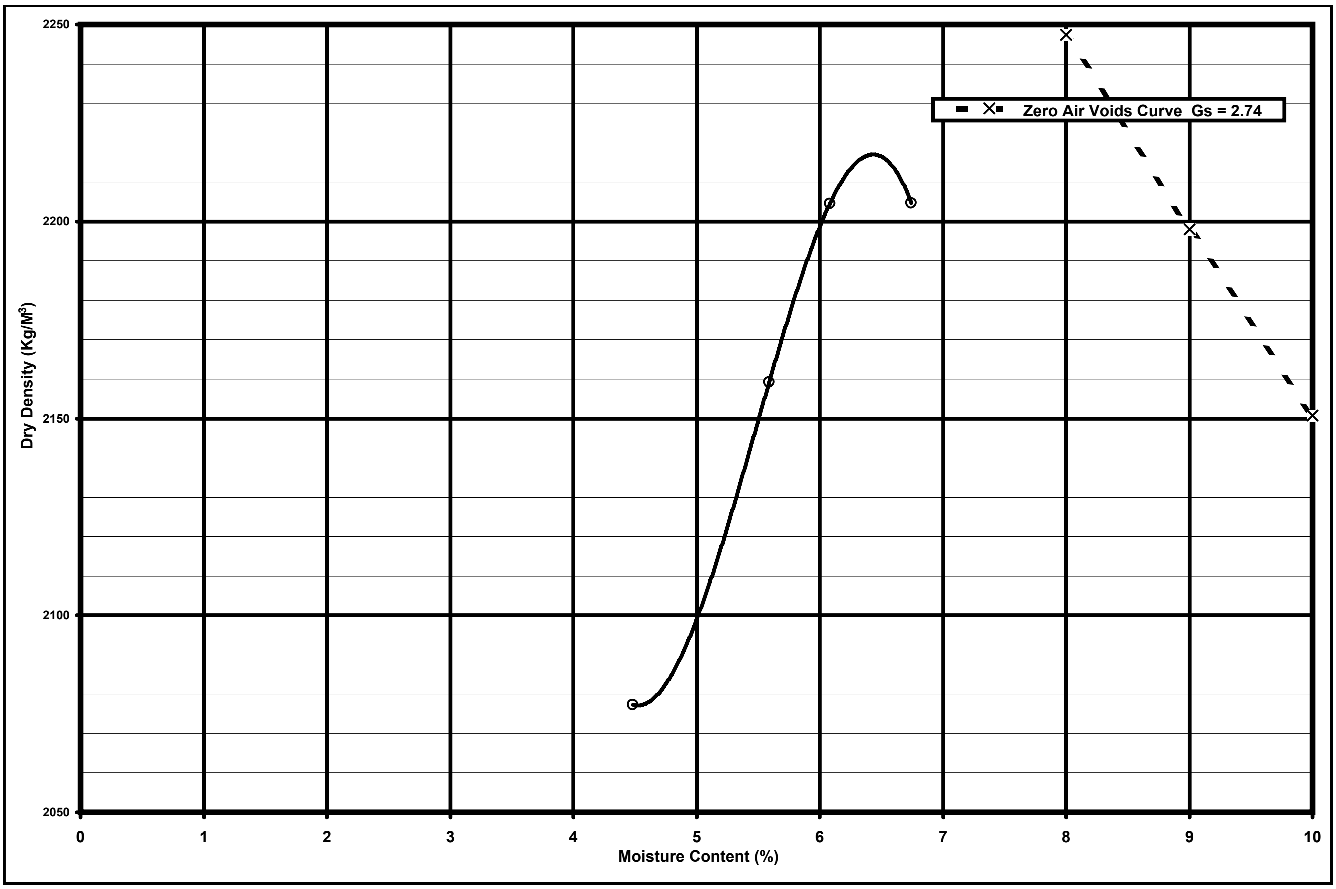
Test Method for Laboratory Compaction Charateristics of Soil

Project #	06-1413-089	**Sample Identification :**		ASTM D 698-91 Standard Proctor		
Client	Meadowbank Mining Corporation	Sample	1	*Method*	C	
Project	Dike Design		Second Portage, Lake Trench,	*Optimum WC =*	6.4	%
Location	Meadowbank Gold Project		Trench Area Till	*Max P dry*	2217	Kg/M³

Technician	TM	**Sample Description :**		*ASTM D 4718-87*		
Schedule #	13			*Correction for oversize particles*		
Proctor Type (S/M)	S			*Optimum WC =*	5.4	%
		Mould Volume =	0.002124 m^3	*Max ρ_{dry} =*	2309	Kg/M³

TRIAL NO.	*1*	*2*	*3*	*4*			*Percent Oversize :*		
WT SOIL WET + MOULD	10252	10484	10609	10640			SCREEN SIZE :	19.00	mm
WEIGHT OF MOULD	5642	5642	5642	5642			*Coarser Fraction*		
WT OF SOIL WET	4610	4842	4967	4999			P_c =	20.8	%
WET DENSITY (Kg/M^3)	2170	2280	2339	2353			Gs =	2.74	assumed
DRY DENSITY (Kg/M^3)	*2077*	*2159*	*2205*	*2205*			W_c =	1.5	%

CONTAINER NO.							*Finer Fraction*		
WT OF WET SOIL + TARE	435.2	372.7	423.0	514.7			P_f =	79.2	%
WT OF DRY SOIL + TARE	425.6	358.9	404.8	494.4			Gs =	2.74	assumed
WEIGHT OF WATER	9.6	13.8	18.2	20.3			W_f =	6.4	%
TARE WEIGHT	211.5	112.0	105.6	193.4			Zero Air Voids Curve Gs =		2.74
WEIGHT OF DRY SOIL	214.1	246.9	299.2	301.0			Bulk Gs =	2.74	
MOISTURE CONTENT (%)	*4.5*	*5.6*	*6.1*	*6.7*			Saturation =	100.0	%



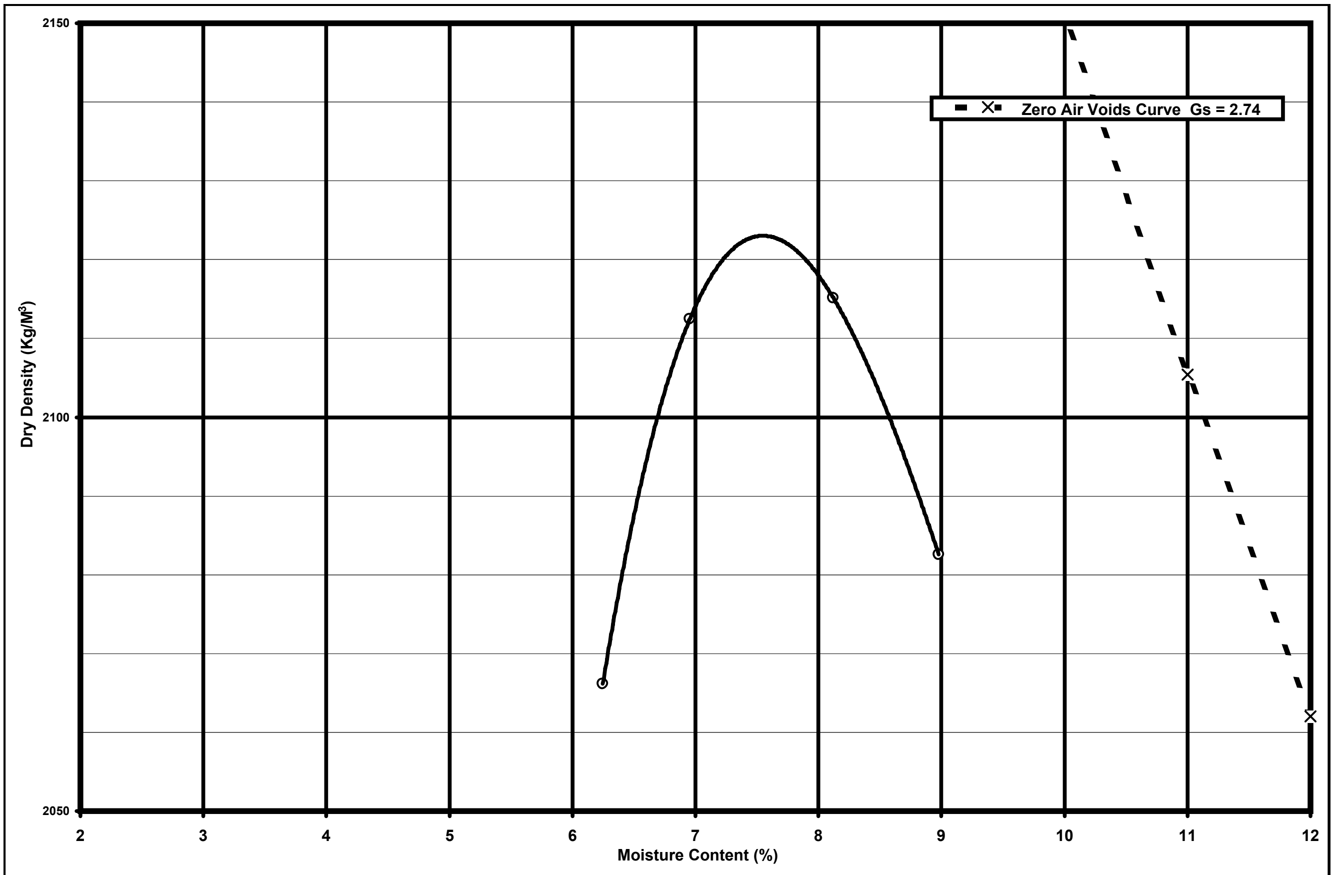
Test Method for Laboratory Compaction Charateristics of Soil

Project #	06-1413-089	Sample Identification :		ASTM D 698-91 Standard Proctor		
Client	Meadowbank Mining Corporation	Sample	2	*Method*	C	
Project	Dike Design		Second Portage, Trench,	*Optimum WC =*	7.5	%
Location	Meadowbank Gold Project		Trench Area Till	*Max ρ_{dry} =*	2123	Kg/M³

Technician	TM	Sample Description :		*ASTM D 4718-87*		
Schedule #	13			*Correction for oversize particles*		
Proctor Type (S/M)	S			*Optimum WC =*	6.4	%
		Mould Volume =	0.002124 m^3	*Max ρ_{dry} =*	2211	Kg/M³

TRIAL NO.	*1*	*2*	*3*	*4*			*Percent Oversize :*		
WT SOIL WET + MOULD	10305	10441	10499	10462			SCREEN SIZE :	19.00	mm
WEIGHT OF MOULD	5642	5642	5642	5642			*Coarser Fraction*		
WT OF SOIL WET	4663	4799	4857	4821			P_c =	17.7	%
WET DENSITY (Kg/M³)	2195	2259	2287	2270			Gs =	2.74	assumed
DRY DENSITY (Kg/M³)	***2066***	***2112***	***2115***	***2083***			W_c =	1.5	%

CONTAINER NO.							*Finer Fraction*		
WT OF WET SOIL + TARE	394.3	552.9	510.1	481.2			P_f =	82.3	%
WT OF DRY SOIL + TARE	377.6	530.7	487.7	450.8			Gs =	2.74	assumed
WEIGHT OF WATER	16.7	22.2	22.4	30.4			W_f =	7.5	%
TARE WEIGHT	110.3	211.5	211.8	112.2			Zero Air Voids Curve Gs =		2.74
WEIGHT OF DRY SOIL	267.3	319.2	275.9	338.6			Bulk Gs =	2.74	
MOISTURE CONTENT (%)	***6.2***	***7.0***	***8.1***	***9.0***			Saturation =	100.0	%



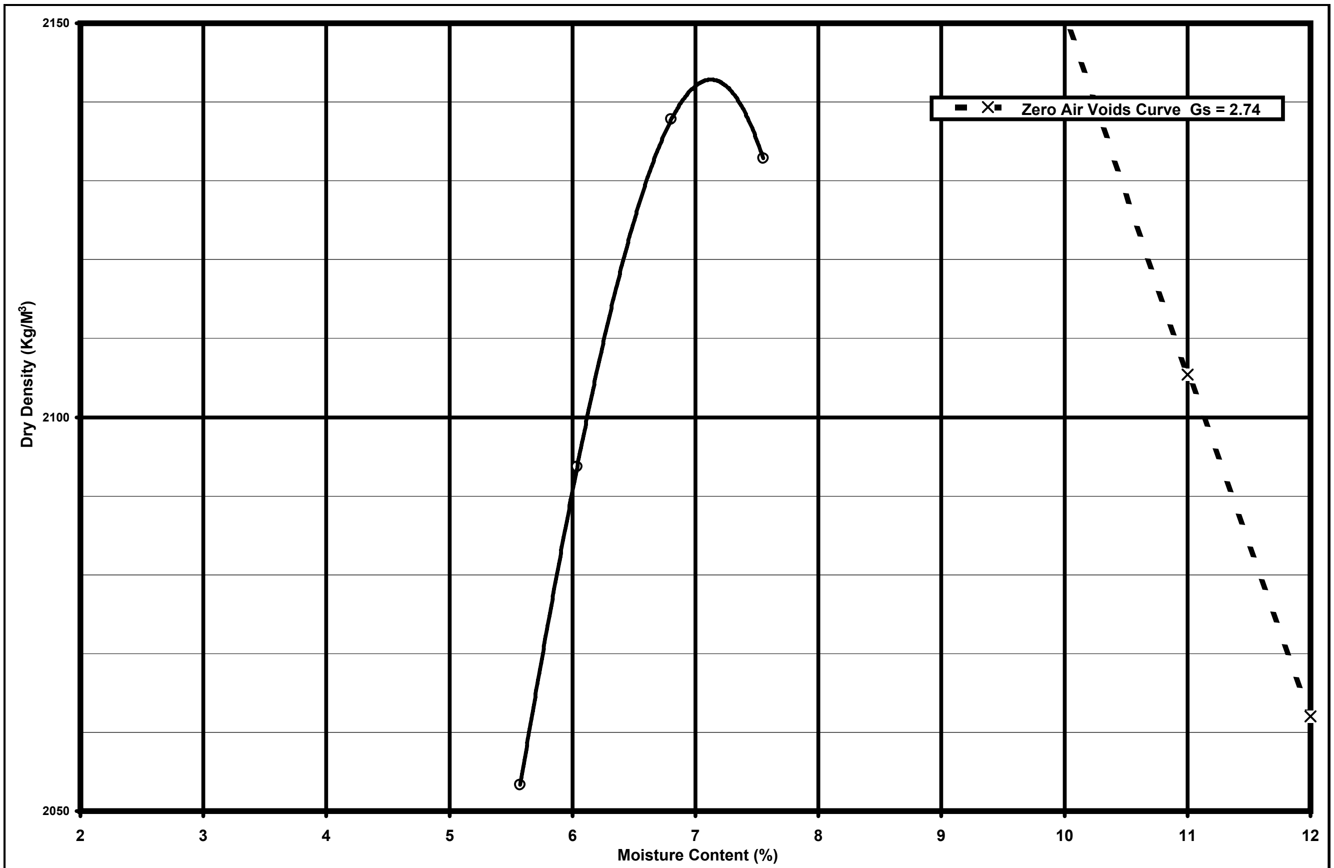
Test Method for Laboratory Compaction Charateristics of Soil

Project #	06-1413-089	Sample Identification :		ASTM D 698-91 Standard Proctor		
Client	Meadowbank Mining Corporation	Sample	3, 6 & 7 Combined	*Method*	C	
Project	Dike Design		Second Portage, Lake Trench,	*Optimum WC =*	7.1	%
Location	Meadowbank Gold Project		Trench Area Till	*Max ρ_{dry} =*	2142	Kg/M³

Technician	TM	Sample Description :		*ASTM D 4718-87*		
Schedule #	13			*Correction for oversize particles*		
Proctor Type (S/M)	S			*Optimum WC =*	5.6	%
		Mould Volume =	0.002124 m^3	*Max ρ_{dry} =*	2272	Kg/M³

TRIAL NO.	1	2	3	4			*Percent Oversize :*		
WT SOIL WET + MOULD	10246	10357	10492	10514			SCREEN SIZE :	19.00	mm
WEIGHT OF MOULD	5642	5642	5642	5642			*Coarser Fraction*		
WT OF SOIL WET	4605	4716	4850	4872			P_c =	26.3	%
WET DENSITY (Kg/M^3)	2168	2220	2283	2294			Gs =	2.74	assumed
DRY DENSITY (Kg/M^3)	***2053***	***2094***	***2138***	***2133***			W_c =	1.5	%

CONTAINER NO.							*Finer Fraction*		
WT OF WET SOIL + TARE	339.3	475.1	349.1	546.4			P_f =	73.7	%
WT OF DRY SOIL + TARE	327.2	460.1	334.0	522.9			Gs =	2.74	assumed
WEIGHT OF WATER	12.1	15.0	15.1	23.5			W_f =	7.1	%
TARE WEIGHT	110.2	211.7	112.1	211.6			Zero Air Voids Curve Gs =		2.74
WEIGHT OF DRY SOIL	217.0	248.4	221.9	311.3			Bulk Gs =	2.74	
MOISTURE CONTENT (%)	***5.6***	***6.0***	***6.8***	***7.5***			Saturation =	100.0	%



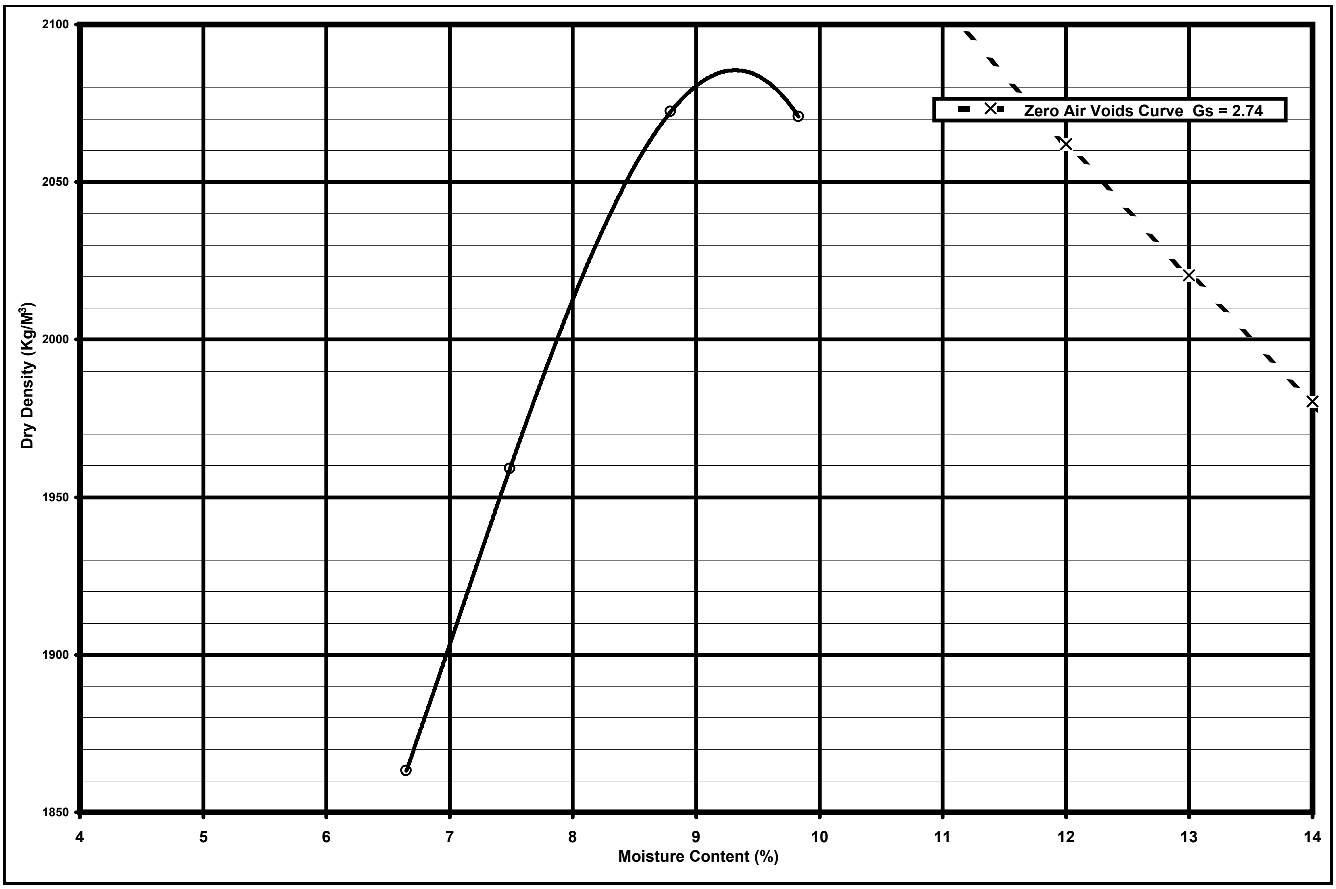
Test Method for Laboratory Compaction Charateristics of Soil

Project #	06-1413-089	**Sample Identification :**		**ASTM D 698-91 Standard Proctor**		
Client	Meadowbank Mining Corporation	Sample	4	*Method*	C	
Project	Dike Design		Second Portage, Lake Trench,	*Optimum WC =*	9.3	%
Location	Meadowbank Gold Project		Trench Area Till	*Max ρ_{dry} =*	2085	Kg/M³

Technician	TM	**Sample Description :**		*ASTM D 4718-87*		
Schedule #	13			*Correction for oversize particles*		
Proctor Type (S/M)	S			*Optimum WC =*	7.4	%
		Mould Volume =	0.002124 m^3	*Max ρ_{dry} =*	2212	Kg/M³

TRIAL NO.	1	2	3	4			*Percent Oversize :*		
WT SOIL WET + MOULD	9862	10114	10431	10472			SCREEN SIZE :	19.00	mm
WEIGHT OF MOULD	5642	5642	5642	5642			*Coarser Fraction*		
WT OF SOIL WET	4221	4473	4789	4831			P_c =	24.1	%
WET DENSITY (Kg/M³)	1987	2106	2255	2274			Gs =	2.74	assumed
DRY DENSITY (Kg/M³)	***1863***	***1959***	***2072***	***2071***			W_c =	1.5	%

CONTAINER NO.							*Finer Fraction*		
WT OF WET SOIL + TARE	335.0	398.5	381.8	552.3			P_f =	75.9	%
WT OF DRY SOIL + TARE	320.7	378.4	360.0	520.2			Gs =	2.74	assumed
WEIGHT OF WATER	14.3	20.1	21.8	32.1			W_f =	9.3	%
TARE WEIGHT	105.6	110.0	112.1	193.6			Zero Air Voids Curve Gs =		2.74
WEIGHT OF DRY SOIL	215.1	268.4	247.9	326.6			Bulk Gs =	2.74	
MOISTURE CONTENT (%)	***6.6***	***7.5***	***8.8***	***9.8***			Saturation =	100.0	%



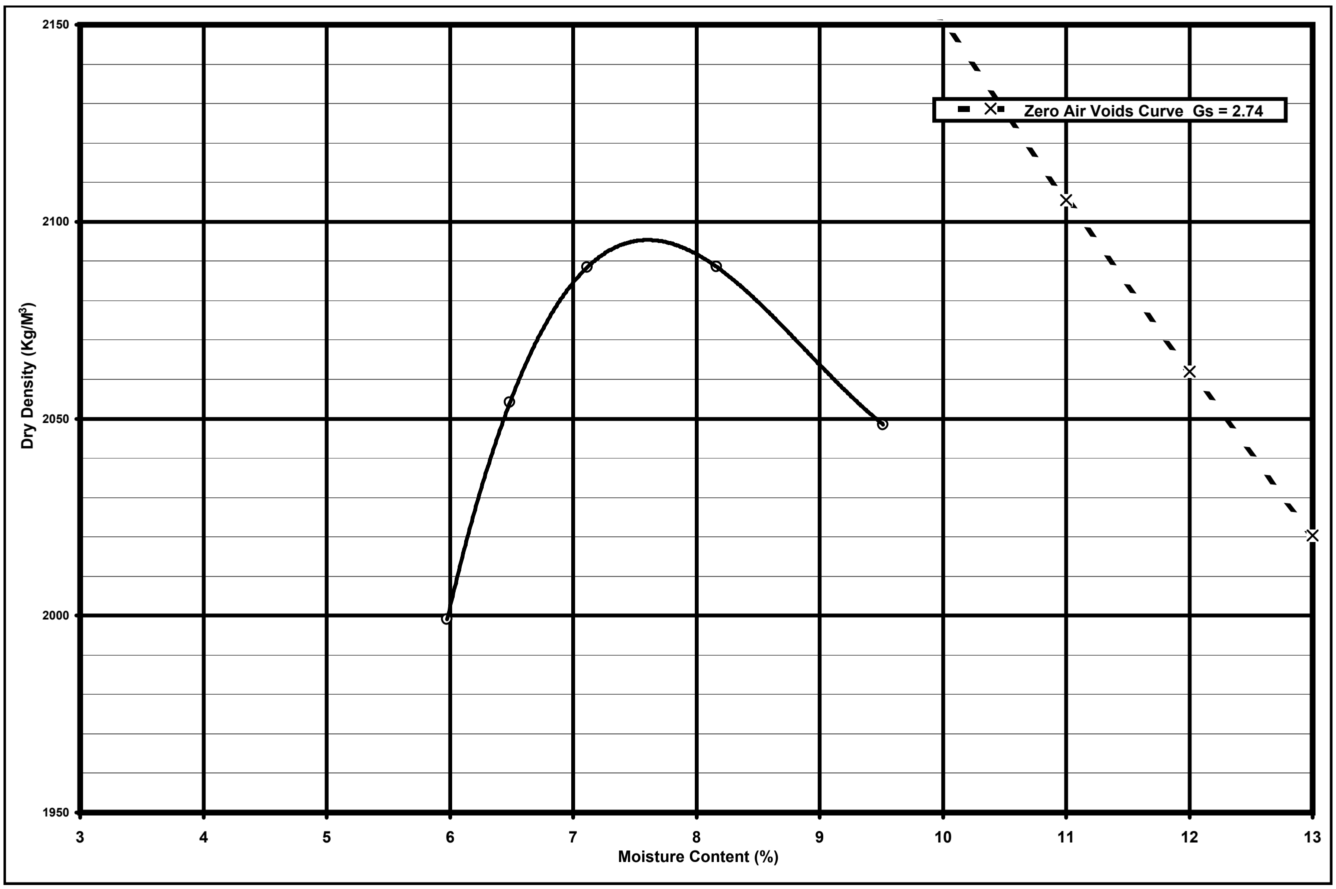
Test Method for Laboratory Compaction Charateristics of Soil

Project #	06-1413-089	Sample Identification :		ASTM D 698-91 Standard Proctor		
Client	Meadowbank Mining Corporation	Sample	5	Method	C	
Project	Dike Design		Second Portage, Lake Trench,	Optimum WC =	7.6	%
Location	Meadowbank Gold Project		Trench Area Till	Max ρ_{dry} =	2095	Kg/M³

Technician	TM	Sample Description :		ASTM D 4718-87		
Schedule #	13			Correction for oversize particles		
Proctor Type (S/M)	S			Optimum WC =	7.1	%
		Mould Volume =	0.002124 m³	Max ρ_{dry} =	2139	Kg/M³

TRIAL NO.	1	2	3	4	5		Percent Oversize :		
WT SOIL WET + MOULD	10142	10288	10440	10407	10393		SCREEN SIZE :	19.00	mm
WEIGHT OF MOULD	5642	5642	5642	5642	5642		Coarser Fraction		
WT OF SOIL WET	4500	4646	4798	4765	4751		P_c =	8.7	%
WET DENSITY (Kg/M³)	2119	2187	2259	2243	2237		Gs =	2.74	assumed
DRY DENSITY (Kg/M³)	1999	2054	2089	2049	2088		W_c =	1.5	%

CONTAINER NO.							Finer Fraction		
WT OF WET SOIL + TARE	503.6	540.7	621.6	666.0	542.2		P_f =	91.3	%
WT OF DRY SOIL + TARE	486.1	520.6	590.7	626.5	518.1		Gs =	2.74	assumed
WEIGHT OF WATER	17.5	20.1	30.9	39.5	24.1		W_f =	7.6	%
TARE WEIGHT	193.4	210.8	212.1	211.4	179.3		Zero Air Voids Curve Gs =		2.74
WEIGHT OF DRY SOIL	292.7	309.8	378.6	415.1	338.8		Bulk Gs =	2.74	
MOISTURE CONTENT (%)	6.0	6.5	8.2	9.5	7.1		Saturation =	100.0	%



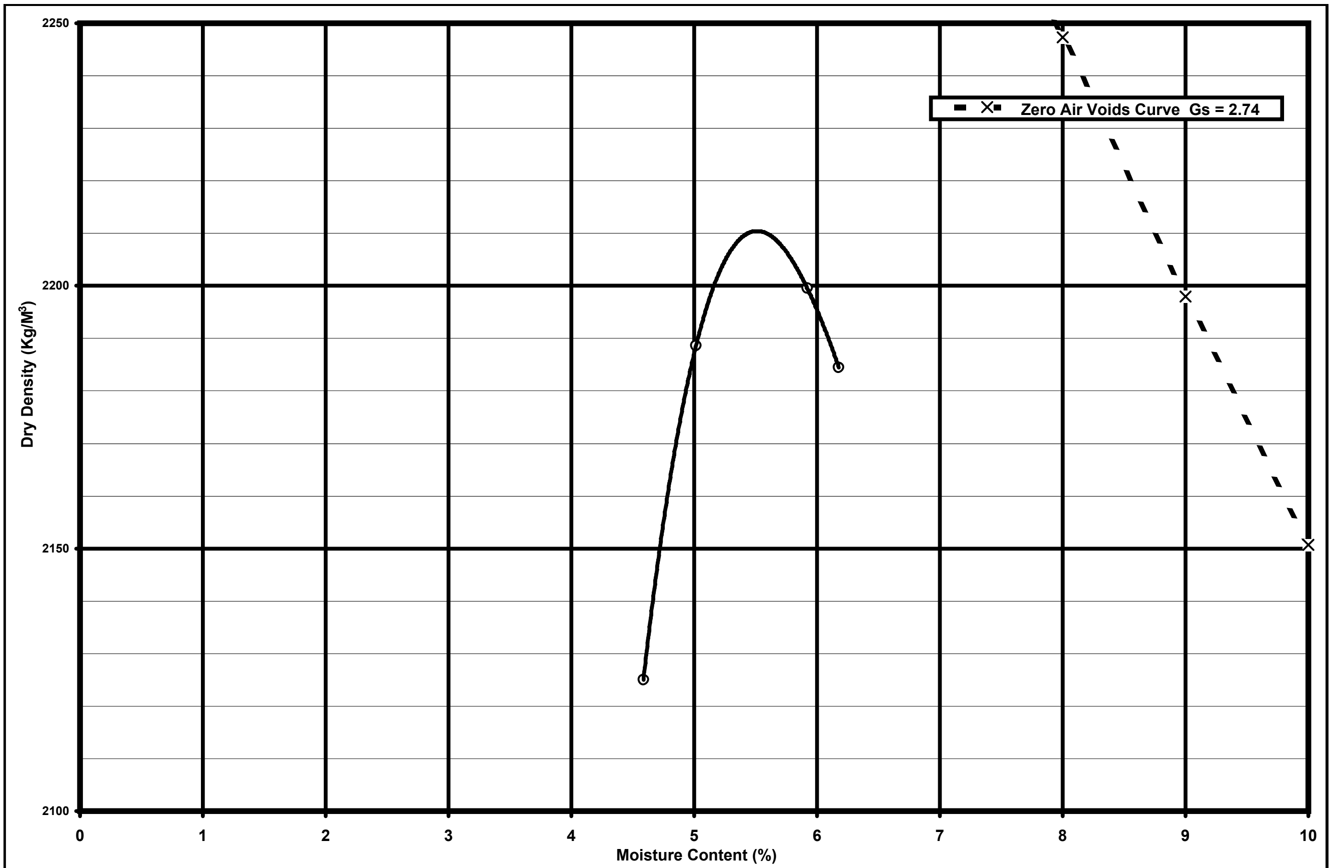
Test Method for Laboratory Compaction Charateristics of Soil

Project #	06-1413-089	Sample Identification :		ASTM D 698-91 Standard Proctor		
Client	Meadowbank Mining Corporation	Sample	8	*Method*	C	
Project	Dike Design		Second Portage, Lake Trench,	*Optimum WC =*	5.5	%
Location	Meadowbank Gold Project		Trench Area Till	*Max ρ_{dry} =*	2211	Kg/M³

Technician	TM	Sample Description :		*ASTM D 4718-87*		
Schedule #	13			*Correction for oversize particles*		
Proctor Type (S/M)	S			*Optimum WC =*	4.7	%
		Mould Volume =	0.002124 m^3	*Max ρ_{dry} =*	2295	Kg/M³

TRIAL NO.	*1*	*2*	*3*	*4*			*Percent Oversize :*		
WT SOIL WET + MOULD	10362	10524	10590	10568			SCREEN SIZE :	19.00	mm
WEIGHT OF MOULD	5642	5642	5642	5642			*Coarser Fraction*		
WT OF SOIL WET	4721	4882	4949	4927			P_c =	18.9	%
WET DENSITY (Kg/M^3)	2222	2298	2330	2319			Gs =	2.74	assumed
DRY DENSITY (Kg/M^3)	*2125*	*2189*	*2200*	*2185*			W_c =	1.5	%

CONTAINER NO.							*Finer Fraction*		
WT OF WET SOIL + TARE	569.2	580.7	564.4	571.2			P_f =	81.1	%
WT OF DRY SOIL + TARE	553.5	563.1	544.7	548.4			Gs =	2.74	assumed
WEIGHT OF WATER	15.7	17.6	19.7	22.8			W_f =	5.5	%
TARE WEIGHT	211.2	212.2	211.9	179.3			Zero Air Voids Curve Gs =		2.74
WEIGHT OF DRY SOIL	342.3	350.9	332.8	369.1			Bulk Gs =	2.74	
MOISTURE CONTENT (%)	*4.6*	*5.0*	*5.9*	*6.2*			Saturation =	100.0	%



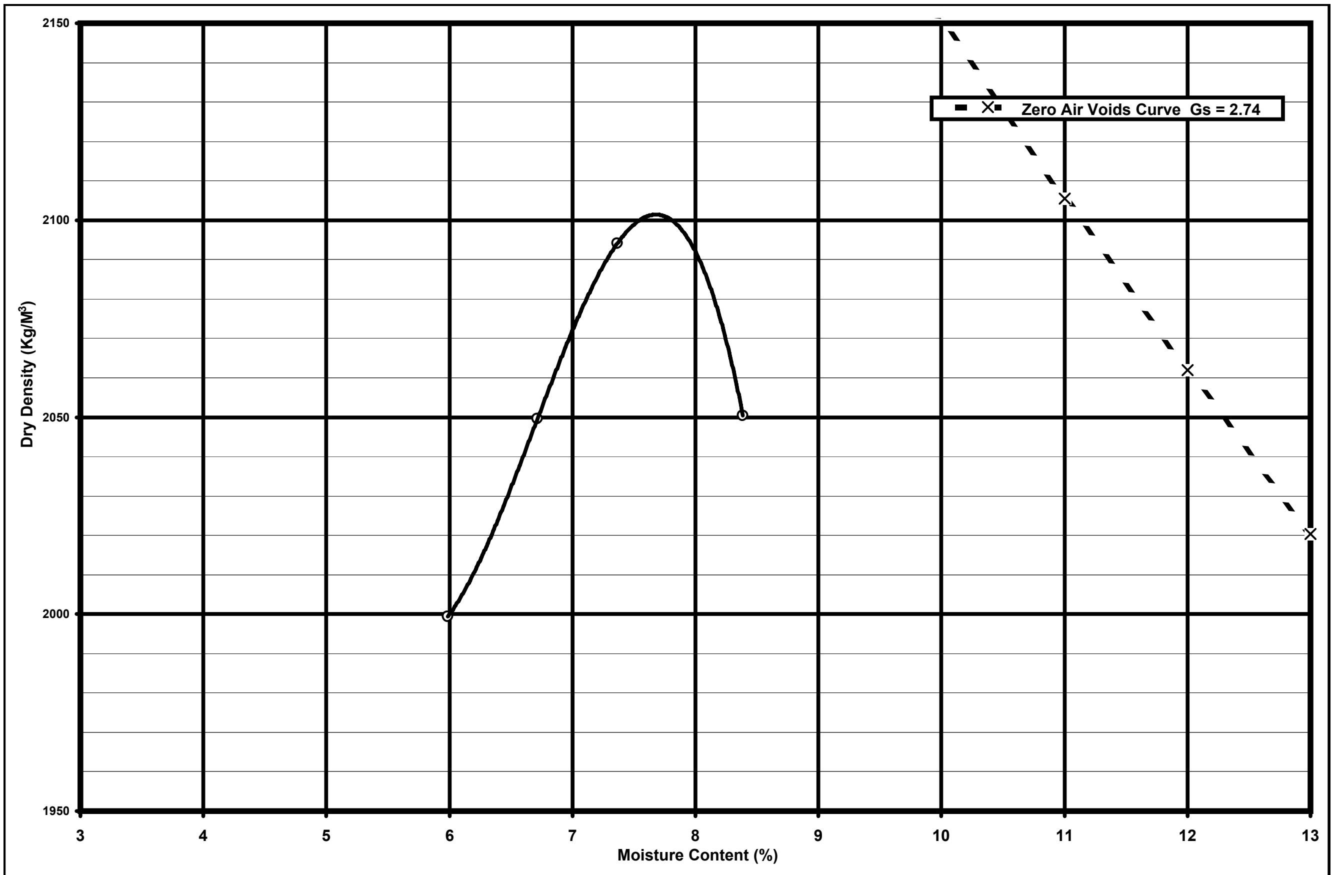
Test Method for Laboratory Compaction Charateristics of Soil

Project #	06-1413-089	Sample Identification :		ASTM D 698-91 Standard Proctor		
Client	Meadowbank Mining Corporation	Sample	9 & 10	*Method*	C	
Project	Dike Design		Second Portage, Lake Trench	*Optimum WC =*	7.7	%
Location	Meadowbank Gold Project		Trench Area Till	*Max ρ dry =*	2101	Kg/M³

Technician	TM	Sample Description :			*ASTM D 4718-87*		
Schedule #	13				*Correction for oversize particles*		
Proctor Type (S/M)	S				*Optimum WC =*	7.5	%
		Mould Volume =	0.002124	m^3	*Max ρ dry =*	2118	Kg/M³

TRIAL NO.	*1*	*2*	*3*	*4*			*Percent Oversize :*		
WT SOIL WET + MOULD	10143	10287	10417	10362			SCREEN SIZE :	19.00	mm
WEIGHT OF MOULD	5642	5642	5642	5642			*Coarser Fraction*		
WT OF SOIL WET	4501	4646	4776	4720			P_c =	3.4	%
WET DENSITY (Kg/M³)	2119	2187	2248	2222			Gs =	2.74	assumed
DRY DENSITY (Kg/M³)	*1999*	*2050*	*2094*	*2050*			W_c =	1.5	%

CONTAINER NO.							*Finer Fraction*		
WT OF WET SOIL + TARE	384.9	471.5	597.6	342.3			P_f =	96.6	%
WT OF DRY SOIL + TARE	369.5	454.0	571.1	324.0			Gs =	2.74	assumed
WEIGHT OF WATER	15.4	17.5	26.5	18.3			W_f =	7.7	%
TARE WEIGHT	112.2	193.4	211.3	105.8			Zero Air Voids Curve Gs =		2.74
WEIGHT OF DRY SOIL	257.3	260.6	359.8	218.2			Bulk Gs =	2.74	
MOISTURE CONTENT (%)	*6.0*	*6.7*	*7.4*	*8.4*			Saturation =	100.0	%



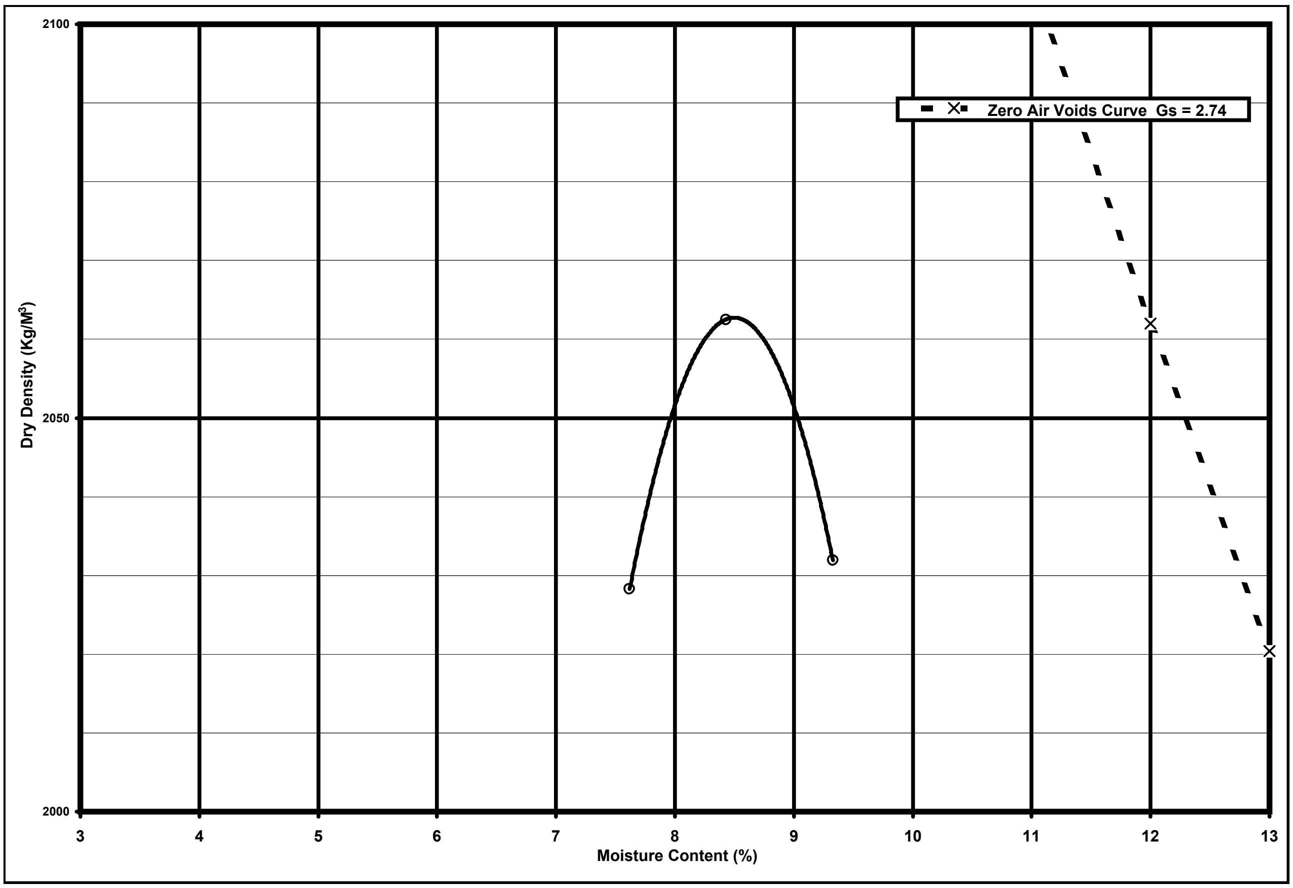
Test Method for Laboratory Compaction Charateristics of Soil

Project #	06-1413-089	Sample Identification :		ASTM D 698-91 Standard Proctor		
Client	Meadowbank Mining Corpora	Sample	11	*Method*	C	
Project	Dike Design		Trench Area Till	*Optimum WC =*	8.5	%
Location	Meadowbank Gold Project			*Max ρ_{dry} =*	2062	Kg/M³

Technician	TM	Sample Description :		*ASTM D 4718-87*		
Schedule #	13			*Correction for oversize particles*		
Proctor Type (S/M)	S			*Optimum WC =*	7.9	%
		Mould Volume =	0.002124 m^3	*Max ρ_{dry} =*	2109	Kg/M³

TRIAL NO.	*1*	*2*	*3*				*Percent Oversize :*		
WT SOIL WET + MOULD	10278	10392	10360				SCREEN SIZE :	19.00	mm
WEIGHT OF MOULD	5642	5642	5642				*Coarser Fraction*		
WT OF SOIL WET	4636	4750	4718				P_c =	9.0	%
WET DENSITY (Kg/M³)	2183	2236	2221				Gs =	2.74	assumed
DRY DENSITY (Kg/M³)	*2028*	*2063*	*2032*				W_c =	1.5	%

CONTAINER NO.							*Finer Fraction*		
WT OF WET SOIL + TARE	400.2	305.4	442.0				P_f =	91.0	%
WT OF DRY SOIL + TARE	385.6	289.9	422.4				Gs =	2.74	assumed
WEIGHT OF WATER	14.6	15.5	19.6				W_f =	8.5	%
TARE WEIGHT	194.0	106.0	212.3				Zero Air Voids Curve Gs =		2.74
WEIGHT OF DRY SOIL	191.6	183.9	210.1				Bulk Gs =	2.74	
MOISTURE CONTENT (%)	*7.6*	*8.4*	*9.3*				Saturation =	100.0	%



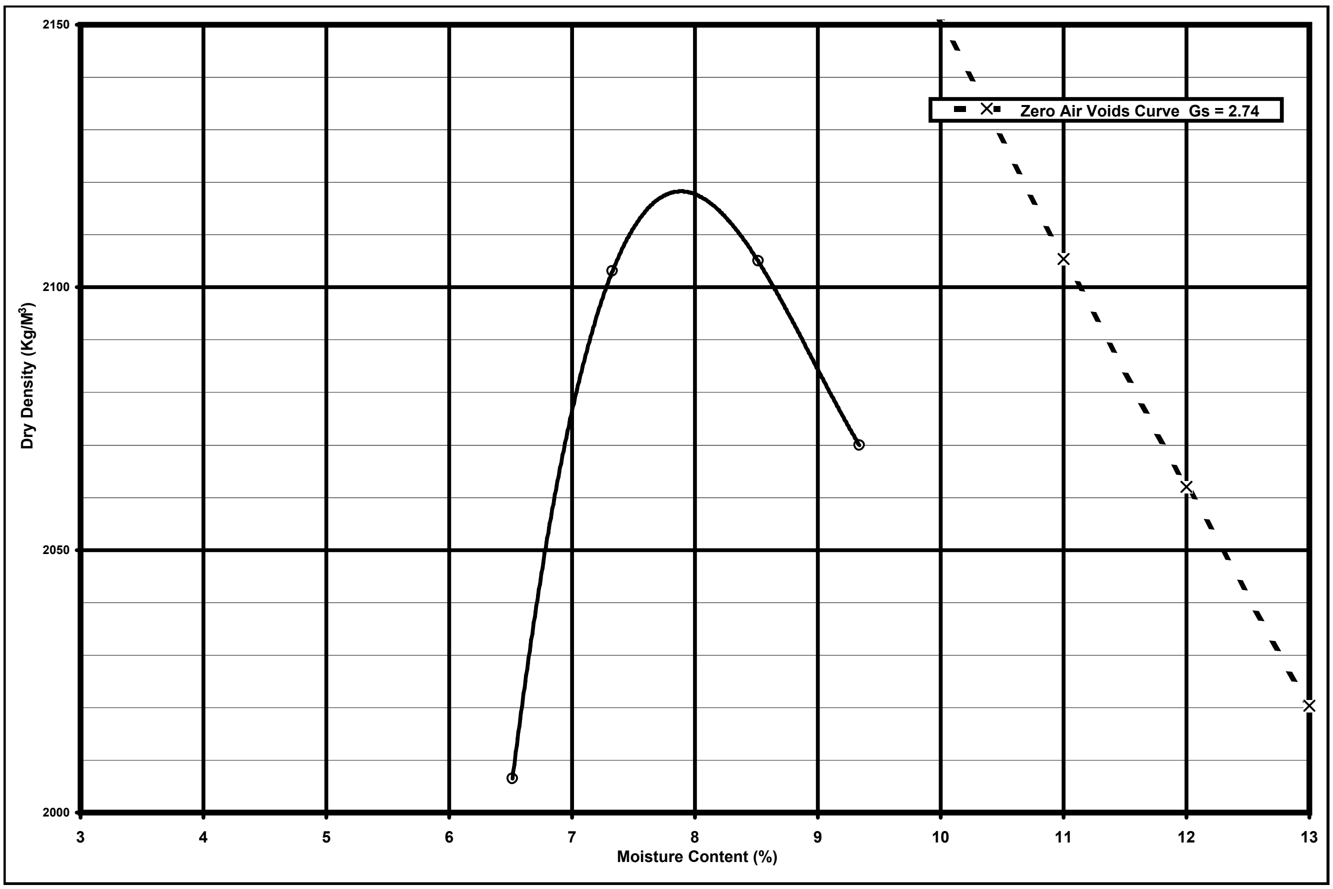
Test Method for Laboratory Compaction Charateristics of Soil

Project #	06-1413-089	**Sample Identification :**		ASTM D 698-91 Standard Proctor	
Client	Meadowbank Mining Corporation	Sample	12	*Method*	C
Project	Dike Design		Second Portage, Lake Trench,	*Optimum WC =*	7.9 %
Location	Meadowbank Gold Project		Trench Area Tiill	*Max ρ dry =*	2119 Kg/M³

Technician	TM	**Sample Description :**		*ASTM D 4718-87*	
Schedule #	13			*Correction for oversize particles*	
Proctor Type (S/M)	S			*Optimum WC =*	6.5 %
		Mould Volume =	0.002124 m^3	*Max ρ dry =*	2232 Kg/M³

TRIAL NO.	*1*	*2*	*3*	*4*			*Percent Oversize :*		
WT SOIL WET + MOULD	10181	10436	10494	10449			SCREEN SIZE :	19.00	mm
WEIGHT OF MOULD	5642	5642	5642	5642			*Coarser Fraction*		
WT OF SOIL WET	4540	4794	4852	4807			P_c =	22.3	%
WET DENSITY (Kg/M³)	2137	2257	2284	2263			Gs =	2.74	assumed
DRY DENSITY (Kg/M³)	*2007*	*2103*	*2105*	*2070*			W_c =	1.5	%

CONTAINER NO.							*Finer Fraction*		
WT OF WET SOIL + TARE	560.7	536.7	527.5	604.5			P_f =	77.7	%
WT OF DRY SOIL + TARE	539.4	507.6	502.7	569.4			Gs =	2.74	assumed
WEIGHT OF WATER	21.3	29.1	24.8	35.1			W_f =	7.9	%
TARE WEIGHT	212.5	110.5	211.4	193.5			Zero Air Voids Curve Gs =		2.74
WEIGHT OF DRY SOIL	326.9	397.1	291.3	375.9			Bulk Gs =	2.74	
MOISTURE CONTENT (%)	*6.5*	*7.3*	*8.5*	*9.3*			Saturation =	100.0	%



LAKEBED SEDIMENTS SPECIFIC GRAVITY

SPECIFIC GRAVITY OF SOLIDS

Project No. :	06-1413-089	**Client :**	Meadowbank Mining Corporation	**Sample Number :**	WAL-1 & TPS-1
Sch No.	13	**Project :**	Dike Design	**Date :**	25/01/2007
Lab Work:	TM	**Location:**	Meadowbank Gold Project		

Specific Gravity of Fine Fraction (ASTM D 854-02)

Percentage Passing #4 Sieve		100	
Test Number		1	2
Flask Number		1	1
Air Removal Method		Vacuum	Vacuum
Mass of Flask (g)	M_p	179.42	179.42
Mass of Flask + Dry Soil (g)		213.12	212.61
Mass of Dry Soil (g)		33.70	33.19
Mass of Flask + Soil + Water (g)	$M_{\rho ws,t}$	698.66	698.11
Test Temperature (g)	T_t	18.0	18.0
Mass of Flask + Water (g)	$M_{\rho w,t}$	678.22	678.22
Number of Evaporating Dish			
Mass of Dish + Dry Soil (g)		33.70	33.19
Mass of Dish (g)		0.00	0.00
Mass of Oven Dry Soil (g)	M_s	33.70	33.19
Temperature Coefficient	K	1.0004	1.0004
Density of Solids (g/cm^3)	ρ_s	2.54	2.50
Specific Gravity at Test Temperature	G_t	2.55	2.50
Specific Gravity at 20ºC	$G_{20°C}$	**2.55**	**2.50**
AVERAGE SPECIFIC GRAVITY		**2.52**	

Specific Gravity of Coarse Fraction (ASTM C 127-88)

Percentage Retained on #4 Sieve		0
Mass of Sample in Water (g)	**A**	
Mass of Sample @ SSD (g)	**B**	
Mass of Oven Dryed Sample (g)	**C**	
Bulk G (Oven Dry)	**C/(B-A)**	
Bulk G (SSD)	**B/(B-A)**	
Apparent	**C/(C-A)**	
Absorbtion (%)	**(B-C)/C**	

Specific Gravity of Total Sample

COMBINED SPECIFIC GRAVITY	$G_{avg@20°C}$	**2.52**

Remarks:

Method used: Method A Procedure for Moist Specimens

Sample Description:

SPECIFIC GRAVITY OF SOLIDS

Project No. :	06-1413-089	**Client :**	Meadowbank Mining Corporation	**Sample :**	TPN-1
Sch No.	288	**Project :**	Dike Design		INUG-1
Lab Work:	TM	**Location:**	Meadowbank Gold Project		SP-1 Sed
Test ID:	Test 1			**Date :**	07/12/2006

Specific Gravity of Fine Fraction (ASTM D 854-02)

Percentage Passing #4 Sieve		100	
Test Number		1	2
Flask Number		1	1
Air Removal Method		Vacuum	Vacuum
Mass of Flask (g)	M_p	179.44	179.44
Mass of Flask + Dry Soil (g)		245.01	245.29
Mass of Dry Soil (g)		97.32	97.23
Mass of Flask + Soil + Water (g)	$M_{\rho ws,t}$	716.96	718.55
Test Temperature (g)	T_t	19.0	18.0
Mass of Flask + Water (g)	$M_{\rho w,t}$	678.14	678.22
Number of Evaporating Dish			
Mass of Dish + Dry Soil (g)		97.32	97.23
Mass of Dish (g)		0.00	0.00
Mass of Oven Dry Soil (g)	M_s	97.32	97.23
Temperature Coefficient	K	1.0002	1.0004
Density of Solids (g/cm^3)	ρ_s	1.66	1.71
Specific Gravity at Test Temperature	G_t	1.67	1.71
Specific Gravity at 20ºC	$G_{20°C}$	**1.67**	**1.71**
AVERAGE SPECIFIC GRAVITY		**1.69**	

Specific Gravity of Coarse Fraction (ASTM C 127-88)

Percentage Retained on #4 Sieve		0
Mass of Sample in Water (g)	**A**	
Mass of Sample @ SSD (g)	**B**	
Mass of Oven Dryed Sample (g)	**C**	
Bulk G (Oven Dry)	**C/(B-A)**	
Bulk G (SSD)	**B/(B-A)**	
Apparent	**C/(C-A)**	
Absorbtion (%)	**(B-C)/C**	

Specific Gravity of Total Sample

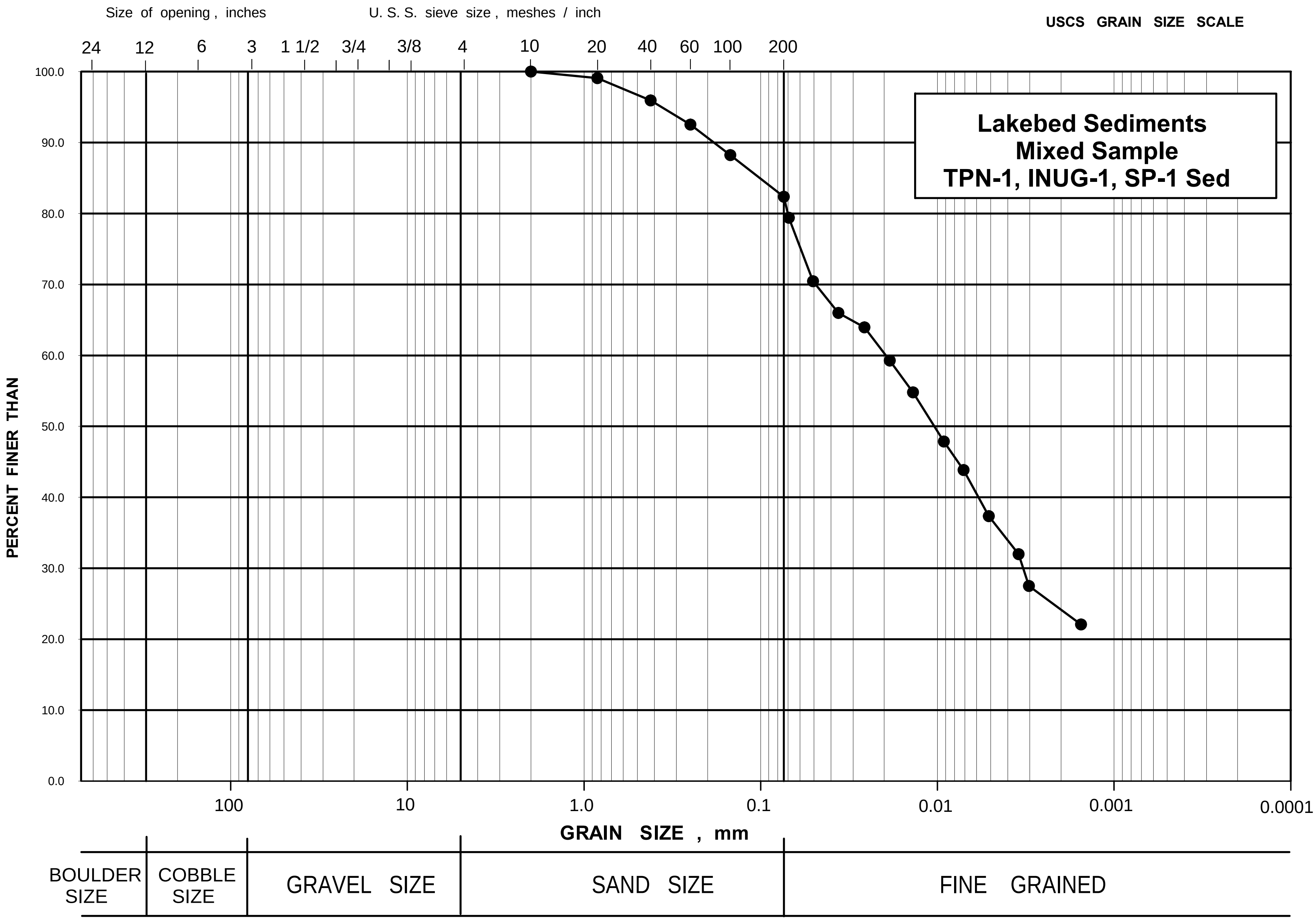
COMBINED SPECIFIC GRAVITY	$G_{avg@20°C}$	**1.69**

Remarks:

Method used: Method A Procedure for Moist Specimens

Sample Description:

LAKEBED SEDIMENTS GRADATION AND HYDROMETER



Project No. 06-1413-089
Drawn PK
Reviewed LL
Date 03/09/07

Golder Associates

GRAIN SIZE DISTRIBUTION
Meadowbank Mining Corporation
Meadowbank Gold Project

Figure I-14

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	06-1413-089	**Client :**	Meadowbank Mining Corporation	**Sample :**	TPN-1
Sch#	288	**Project :**	Dike Design		INUG-1
Lab Work:	TM	**Location:**	Meadowbank Gold Project		SP-1 Sed

First Sieving		**Hydrometer: (Minus #10)**		Residual No. 200 (g) =	0.4
Total Weight (g) =	44.2	Before Wash (g) =	44.2	Total minus 200 (g) =	36.4
		After Wash (g) =	8.2	Gs (assumed) =	2.70

Size (USS)	Weight Retained (g)	Retained (%)	Weight Retained (g)	Retained (%)	% Retained Total	Diameter (mm)	% Passing
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	0.0					**38.1**	**100.0**
1"	0.0					**25.4**	**100.0**
3/4"	0.0					**19.1**	**100.0**
1/2"	0.0					**12.7**	**100.0**
3/8"	0.0					**9.52**	**100.0**
#4	0.0					**4.76**	**100.0**
#10	0.0					**2.00**	**100.0**
#20			0.4	0.9	0.9	**0.840**	**99.1**
#40			1.4	3.2	3.2	**0.420**	**95.9**
#60			1.5	3.4	3.4	**0.250**	**92.5**
#100			1.9	4.3	4.3	**0.149**	**88.2**
#200			2.6	5.9	5.9	**0.074**	**82.4**
Pan			36.4	82.4	82.4		

HYDROMETER ANALYSIS

Hydrometer No.:	8589	**Dispersion Method:**	Stirring	**Dispersion Period (min):**	

Comments:

Time (min)	Hydrometer Reading	Temperature (ºC)		Composite Correction	Corrected Reading	Diameter (mm)	Percentage Passing
0.5	38.0	18.0		-2.51	35.5	**0.0693**	**79.4**
1	34.0	18.0		-2.51	31.5	**0.0506**	**70.5**
2	32.0	18.0		-2.51	29.5	**0.0363**	**66.0**
4	31.1	18.0		-2.51	28.6	**0.0259**	**64.0**
8	29.0	18.0		-2.51	26.5	**0.0186**	**59.3**
15	27.0	18.0		-2.51	24.5	**0.0138**	**54.8**
35	23.9	18.0		-2.51	21.4	**0.0092**	**47.9**
60	22.0	18.5		-2.41	19.6	**0.0071**	**43.8**
120	19.1	18.5		-2.41	16.7	**0.0051**	**37.3**
270	16.6	19.0		-2.30	14.3	**0.0035**	**32.0**
360	14.6	19.0		-2.30	12.3	**0.0030**	**27.5**
1440	13.0	15.0		-3.12	9.9	**0.0015**	**22.1**

LAKEBED SEDIMENTS ATTERBERG LIMITS

Project # 06-1413-089 **Tech : TM**

Liquid Limit, Plastic Limit and Plasticity Index of Soils
ASTM D 4318-93

TYPE OF TEST	LL	LL	LL	LL		W% Nat.
CONTAINER NUMBER						
NUMBER OF BLOWS	43	18	35	26		
MASS WET SOIL + TARE	35.45	30.39	35.48	35.09		491.90
MASS DRY SOIL + TARE	31.69	27.00	32.59	31.58		401.60
MASS OF WATER	3.76	3.39	2.89	3.51		90.30
MASS OF CONTAINER	28.19	23.91	29.92	28.35		372.10
MASS OF DRY SOIL	3.50	3.09	2.67	3.23		29.5
WATER CONTENT W (%)	**107.4**	**109.7**	**108.2**	**108.7**		**306.1**

TYPE OF TEST	PL	PL	SAMPLE	TPE-1 Sed
CONTAINER NUMBER				
MASS WET SOIL + TARE	31.65	33.57		
MASS DRY SOIL + TARE	29.62	31.78	LIQUID LIMIT (%)	108.9
MASS OF WATER	2.03	1.79	PLASTIC LIMIT (%)	103.2
MASS OF CONTAINER	27.67	30.03	PLASTICITY INDEX (%)	5.7
MASS OF DRY SOIL	1.95	1.75	W% Natural (%)	306.1
WATER CONTENT W (%)	**104.1**	**102.3**	LIQUIDITY INDEX	35.56

SAMPLE DESCRIPTION : OH

Meadowbank Mining Corporation
Meadowbank Gold Project

LAKEBED SEDIMENTS WATER CONTENT

Project Number : **06-1413-089** **Tech :** **TM**

Laboratory Determination of Water Content of Soil and Rock
ASTM D 2216-92

Borehole						
Sample Number	**WAL-1**		**TPS-1**			
Depth (m)						
CONTAINER NUMBER						
MASS WET SOIL + TARE	232.1		267.6			
MASS DRY SOIL + TARE	125.4		147.0			
MASS OF WATER	106.7		120.6			
MASS OF CONTAINER	109.4		122.4			
MASS OF DRY SOIL	16.0		24.6			
Water Content W (%)	**666.9**		**490.2**			

Borehole						
Sample Number						
Depth (m)						
CONTAINER NUMBER						
MASS WET SOIL + TARE						
MASS DRY SOIL + TARE						
MASS OF WATER						
MASS OF CONTAINER						
MASS OF DRY SOIL						
Water Content W (%)						

Borehole						
Sample Number						
Depth (m)						
CONTAINER NUMBER						
MASS WET SOIL + TARE						
MASS DRY SOIL + TARE						
MASS OF WATER						
MASS OF CONTAINER						
MASS OF DRY SOIL						
Water Content W (%)						

Meadowbank Mining Corporation
Meadowbank Gold Project

LAKEBED SEDIMENTS ORGANIC CONTENT

Project Number : **06-1413-089** **Tech :** **TM**

Moisture, Ash and Organic Matter of Peat and Other Organic Soils
ASTM D 2974-87 Method C

Borehole						
Sample Number	Combined TPS-1 & WAL-1					
Depth (m)						
Tare Number						
Mass of Soil @ 105^0 C + Tare	90.83					
Mass Soil @ 440^0 C + Tare	84.30					
Mass of Organics	6.53					
Mass of Tare	51.14					
Mass of soil @ 105^0 C	39.69					
Organic Content (%)	**16.45**					

Borehole						
Sample Number						
Depth (m)						
Tare Number						
Mass of Soil @ 105^0 C + Tare						
Mass Soil @ 440^0 C + Tare						
Mass of Organics						
Mass of Tare						
Mass of soil @ 105^0 C						
Organic Content (%)						

Borehole						
Sample Number						
Depth (m)						
Tare Number						
Mass of Soil @ 105^0 C + Tare						
Mass Soil @ 440^0 C + Tare						
Mass of Organics						
Mass of Tare						
Mass of soil @ 105^0 C						
Organic Content (%)						

Recommended Standard Furnace Time @ 440^0 C for Different Soil Types

Sandy Soils	1 Hr
Clay Soils	2 Hr
Organic Soils	3 Hr
Peat	4 Hr

Meadowbank Mining Corporation
Meadowbank Gold Project

Project Number : **06-1413-089** **Tech :** **TM**

Moisture, Ash and Organic Matter of Peat and Other Organic Soils
ASTM D 2974-87 Method C

Borehole							
Sample Number	**TE-1 Sed**	**TE-1 Sed**					
Depth (m)							
Tare Number							
Mass of Soil @ 105^0 C + Tare	41.87	43.05					
Mass Soil @ 440^0 C + Tare	40.88	42.03					
Mass of Organics	0.99	1.02					
Mass of Tare	27.28	27.78					
Mass of soil @ 105^0 C	14.59	15.27					
Organic Content (%)	**6.79**	**6.68**					

Borehole							
Sample Number							
Depth (m)							
Tare Number							
Mass of Soil @ 105^0 C + Tare							
Mass Soil @ 440^0 C + Tare							
Mass of Organics							
Mass of Tare							
Mass of soil @ 105^0 C							
Organic Content (%)							

Borehole							
Sample Number							
Depth (m)							
Tare Number							
Mass of Soil @ 105^0 C + Tare							
Mass Soil @ 440^0 C + Tare							
Mass of Organics							
Mass of Tare							
Mass of soil @ 105^0 C							
Organic Content (%)							

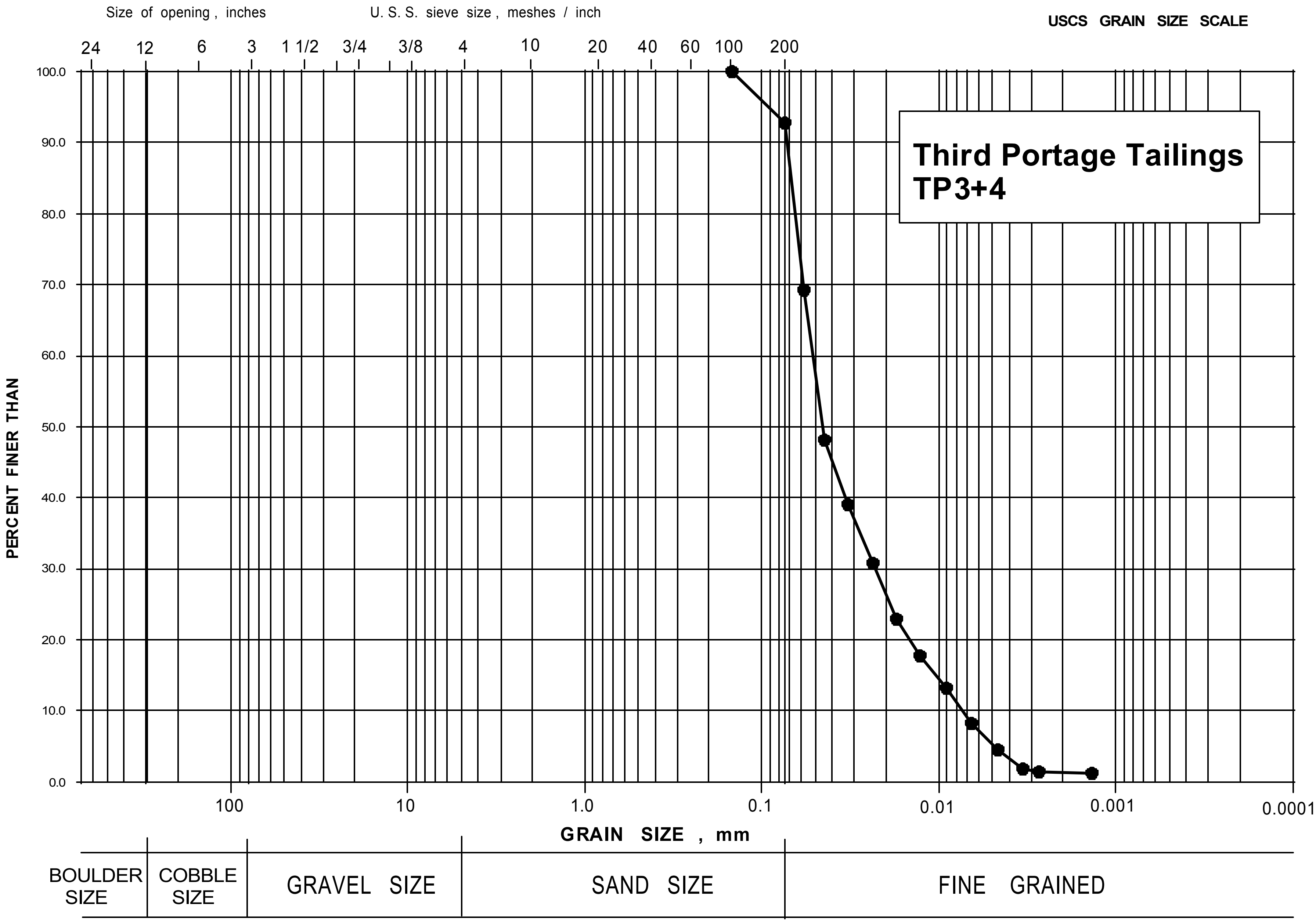
Recommended Standard Furnace Time @ 440^0 C for Different Soil Types

Sandy Soils	1 Hr
Clay Soils	2 Hr
Organic Soils	3 Hr
Peat	4 Hr

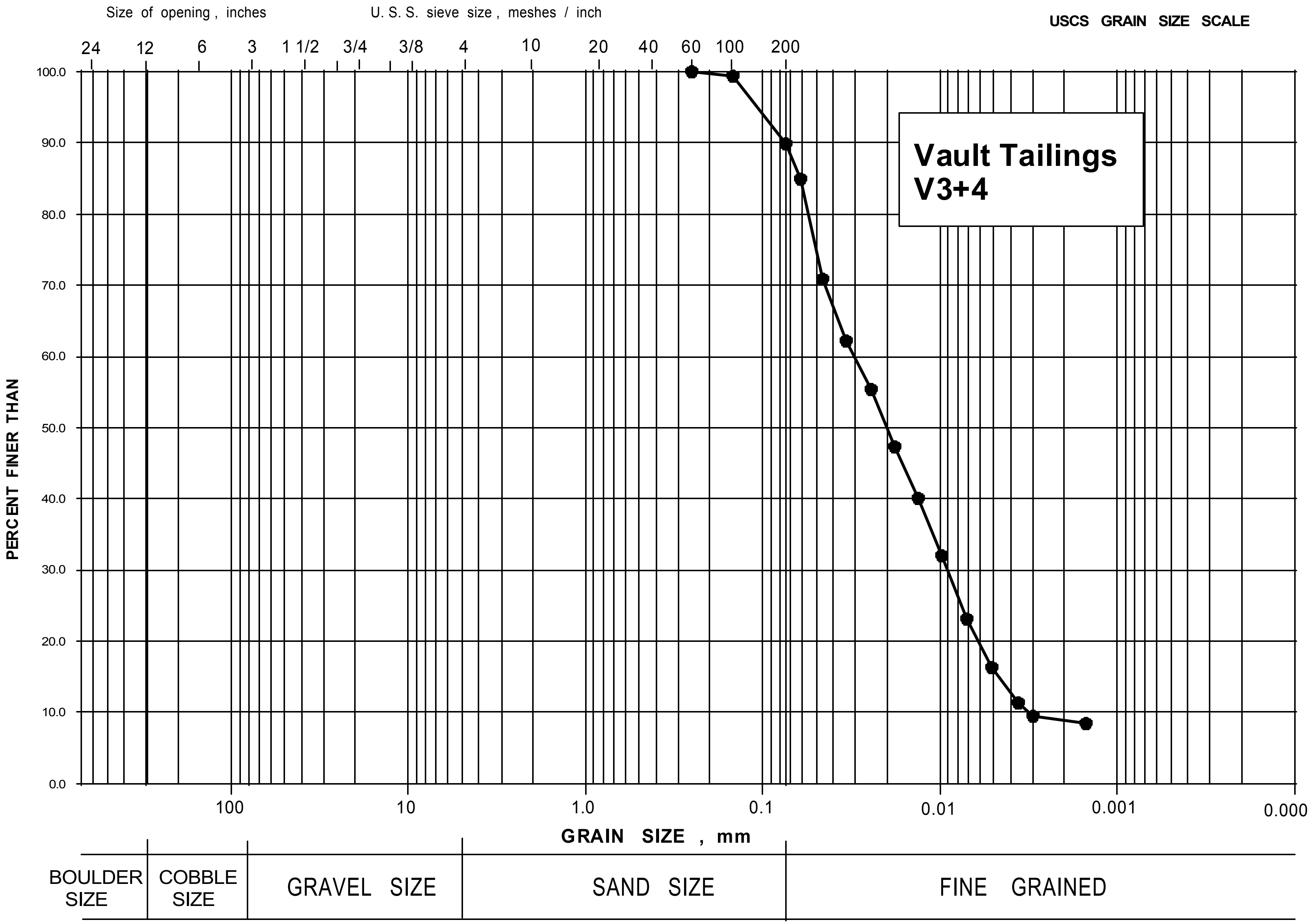
Meadowbank Mining Corporation
Meadowbank Gold Project

TAILINGS GRADATIONS

HYDROMETER



Project No. 06-1413-089 Drawn TM Reviewed LL Date 15/03/07	Golder Associates	GRAIN SIZE DISTRIBUTION Meadowbank Mining Corporation Meadowbank Gold Project	Figure I-15



Project No. 06-1413-089
Drawn TM
Reviewed LL
Date 15/03/07

Golder Associates

GRAIN SIZE DISTRIBUTION
Meadowbank Mining Corporation
Meadowbank Gold Project

Figure I-16

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	06-1413-089	**Client:**	Meadowbank		Third Portage Tailings		
Sch#	25	**Project :**	Dike Design		TP3+4		
Lab Work:	TM	**Location:**	Meadowbank				
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	1.9	
	Total Weight	46.2	Before Wash	46.2	Total -200	42.9	
			After Wash	5.2	Gs	3.34	
Size (USS)	**Weight Retained**	**Retained** (%)	**Weight Retained**	**Retained** (%)	**% Retained Total**	**Diameter** (mm)	**% Passing**
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	0.0					**38.1**	**100.0**
1"	0.0					**25.4**	**100.0**
3/4"	0.0					**19.1**	**100.0**
1/2"	0.0					**12.7**	**100.0**
3/8"	0.0					**9.52**	**100.0**
#4	0.0					**4.76**	**100.0**
#10	0.0					**2.00**	**100.0**
#20			0.0			**0.840**	**100.0**
#40			0.0			**0.420**	**100.0**
#60			0.0			**0.250**	**100.0**
#100			0.0			**0.149**	**100.0**
#200			3.3	7.1	7.1	**0.074**	**92.9**
Pan			42.9	92.9	92.9		

HYDROMETER ANALYSIS

Time (min)	**Hydrometer Reading**	**Temperature** (^oC)		**Composite Correction**	**Hydrometer Corrected**	**Diameter** (mm)	**% Passing**
0.5	40.0	18.0		-4.04	36.0	**0.0580**	**69.2**
1	29.0	18.0		-4.04	25.0	**0.0447**	**48.0**
2	24.3	18.0		-4.04	20.3	**0.0327**	**39.0**
4	20.0	18.0		-4.04	16.0	**0.0238**	**30.7**
8	15.9	18.0		-4.04	11.9	**0.0172**	**22.8**
15	13.1	19.5		-3.84	9.3	**0.0128**	**17.8**
30	10.7	19.5		-3.84	6.9	**0.0092**	**13.2**
60	8.1	20.0		-3.77	4.3	**0.0066**	**8.3**
120	6.0	20.5		-3.70	2.3	**0.0047**	**4.4**
240	4.4	22.0		-3.48	0.9	**0.0033**	**1.8**
360	4.2	22.0		-3.48	0.7	**0.0027**	**1.4**
1440	4.1	19.0		-3.48	0.6	**0.0014**	**1.2**

PARTICLE SIZE ANALYSIS OF SOILS ASTM D 422-63

Project No. :	06-1413-089	**Client :**	Meadowbank		Vault Tailings		
Sch#	25	**Project :**	Dike Design		V3+4		
Lab Work:	TM	**Location:**	Meadowbank				
	1ST SIEVING		**Hydrometer: (Minus #10)**		Residual #200	2.4	
	Total Weight	48.5	Before Wash	48.5	Total -200	43.5	
			After Wash	7.4	Gs	2.85	
Size (USS)	**Weight Retained**	**Retained (%)**	**Weight Retained**	**Retained (%)**	**% Retained Total**	**Diameter (mm)**	**% Passing**
							100.0
6"	0.0					**152.4**	**100.0**
3"	0.0					**76.2**	**100.0**
1 1/2"	0.0					**38.1**	**100.0**
1"	0.0					**25.4**	**100.0**
3/4"	0.0					**19.1**	**100.0**
1/2"	0.0					**12.7**	**100.0**
3/8"	0.0					**9.52**	**100.0**
#4	0.0					**4.76**	**100.0**
#10	0.0					**2.00**	**100.0**
#20			0.0			**0.840**	**100.0**
#40			0.0			**0.420**	**100.0**
#60			0.0			**0.250**	**100.0**
#100			0.3	0.6	0.6	**0.149**	**99.4**
#200			4.6	9.5	9.5	**0.074**	**89.9**
Pan			43.5	89.7	89.7		

HYDROMETER ANALYSIS

Time (min)	**Hydrometer Reading**	**Temperature** (°C)		**Composite Correction**	**Hydrometer Corrected**	**Diameter** (mm)	**% Passing**
0.5	47.0	18.0		-4.04	43.0	**0.0612**	**85.0**
1	39.9	18.0		-4.04	35.9	**0.0461**	**70.9**
2	35.5	18.0		-4.04	31.5	**0.0338**	**62.2**
4	32.0	18.0		-4.04	28.0	**0.0246**	**55.3**
8	28.0	18.0		-4.04	24.0	**0.0179**	**47.4**
15	24.1	19.5		-3.84	20.3	**0.0134**	**40.1**
30	20.0	19.5		-3.84	16.2	**0.0097**	**32.0**
60	15.5	20.0		-3.77	11.7	**0.0071**	**23.2**
120	11.9	20.5		-3.70	8.2	**0.0051**	**16.2**
240	9.2	22.0		-3.48	5.7	**0.0037**	**11.3**
360	8.3	22.0		-3.48	4.8	**0.0030**	**9.5**
1440	7.8	19.0		-3.48	4.3	**0.0015**	**8.5**

TAILINGS SPECIFIC

GRAVITY

SPECIFIC GRAVITY OF SOILS

ASTM D 854-92

Project # 06-1413-089
Third Portage Tailings
TP3+4

Sch# : 25
Tested By : TM/RLD
Calculated By : TM/RLD
Checked By : LL

TEST NUMBER			1	2		
BOTTLE NUMBER			2	3		
AIR REMOVAL METHOD			Vacuum	Vacuum		
WEIGHT OF BOTTLE , g.			172.69	173.97		
INITIAL WEIGHT OF BOTTLE + SOIL, g.			248.48	249.51		
INITIAL WEIGHT OF SOIL, g			75.79	75.54		
WEIGHT OF BOTTLE + SOIL + WATER, g.		**W_1**	723.73	724.89		
TEMPERATURE, ^{0}C		**T**	20.0	20.0		
WEIGHT OF BOTTLE + WATER, g.		**W_2**	671.24	672.39		
EVAPORATING DISH NUMBER			34	L3		
WEIGHT OF DISH + DRY SOIL, g.			430.42	421.31		
WEIGHT OF DISH, g.			355.41	346.48		
WEIGHT OF SOIL, g.		**W_S**	75.01	74.83		
Correction Factor @ Temperature T		**G_k**	1.0000	1.0000		
$G_K W_S$			75.01	74.83		
$W_1 - W_2$			52.49	52.50		
$W_S-(W_1-W_2)$			22.52	22.33		
SPECIFIC GRAVITY OF SOIL		**G_S**	**3.33**	**3.35**		

$G_S = (G_K * W_S)/((W_S-(W_1-W_2))$ = **3.34** (average value)

REMARKS :
(1) Method A - Oven Dried Procedure
(2) Passing the #10 sieve (2.00 mm)

Golder Associates
Appendix I

SPECIFIC GRAVITY OF SOILS

ASTM D 854-92

Project #	**06-1413-089**	**Sch# :**	**25**
	Vault Tailings	**Tested By :**	**TM/RLD**
	V3+4	**Calculated By :**	**TM/RLD**
		Checked By :	**LL**

TEST NUMBER		1	2		
BOTTLE NUMBER		1	4		
AIR REMOVAL METHOD		Vacuum	Vacuum		
WEIGHT OF BOTTLE , g.		179.52	172.72		
INITIAL WEIGHT OF BOTTLE + SOIL, g.		253.28	254.29		
INITIAL WEIGHT OF SOIL, g		73.76	81.57		
WEIGHT OF BOTTLE + SOIL + WATER, g.	**W_1**	725.84	724.14		
TEMPERATURE, ^{0}C	**T**	20.0	20.0		
WEIGHT OF BOTTLE + WATER, g.	**W_2**	678.05	671.37		
EVAPORATING DISH NUMBER		27	20		
WEIGHT OF DISH + DRY SOIL, g.		425.56	441.73		
WEIGHT OF DISH, g.		351.94	360.46		
WEIGHT OF SOIL, g.	**W_S**	73.62	81.27		
Correction Factor @ Temperature T	**G_k**	1.0000	1.0000		
$G_K W_S$		73.62	81.27		
$W_1 - W_2$		47.79	52.77		
$W_S-(W_1-W_2)$		25.83	28.50		
SPECIFIC GRAVITY OF SOIL	**G_S**	**2.85**	**2.85**		

$G_S = (G_K * W_S)/((W_S-(W_1-W_2))$ = **2.85** (average value)

REMARKS :

(1) Method A - Oven Dried Procedure

(2) Passing the #10 sieve (2.00 mm)

APPENDIX II

MATERIAL BALANCE
REVISED MINING SEQUENCE
2007

MEADOWBANK GOLD PROJECT
MATERIALS BALANCE

	Estimate of Required Material Quantities by Year (m3)											
	-2	-1	1	2	3	4	5	6	7	8	9	TOTAL
Overburden												
East Dike	72,090	-	-	-	-	-	-	-	-	-	-	72,090
	-	-	-	-	-	-	-	-	-	-	-	-
Bay Zone Dike	-	145,034	-	-	-	-	-	-	-	-	-	145,034
Second Portage Tailings Dike	-	45,000	-	91,740	-	-	35,750	-	-	-	-	172,490
Central Dike Full Cut-off (if required)	-	201,532	-	-	-	-	-	-	-	-	-	201,532
Stormwater Dike	-	-	-	-	-	-	-					-
Goose Island Dike	-	-	433,593	-	-	-	-	-	-	-	-	433,593
Vault Dike	-	-	-	-	6,600	-	-	-	-	-	-	6,600
Tailings Containment Berms	-	-	-	-	16,522	-	-	-	-	-	-	16,522
Total Volume Required for Dike	72,090	391,566	433,593	91,740	23,122	-	35,750	-	-	-	-	1,047,861
Road to ANFO Storage	-	-	-	-	-	-	-	-	-	-	-	-
Plant Roads	-	-	-	-	-	-	-	-	-	-	-	-
Vault Haul Road	-	-	-	-	-	-	-	-	-	-	-	-
Airstrip	-	-	-	-	-	-	-	-	-	-	-	-
Mill Foundations	-	-	-	-	-	-	-	-	-	-	-	-
Total Volume Required for Construction	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL OVERBURDEN REQUIRED	72,090	391,566	433,593	91,740	23,122	0	35,750	0	0	0	0	1,047,861
TOTAL OVERBURDEN AVAILABLE [2]	367,000	714,941	1,217,941	1,791,235	0	1,266,118	33,372	0	0	0	0	5,390,607
SURPLUS (DEFICIT)	294,910	323,375	784,348	1,699,495	(-23,122)	1,266,118	(-2,378)	0	0	0	0	4,342,746
UM+QZ												-
East Dike (Surfacing)	-	-	192,587	-	-	-	-	-	-	-	-	192,587
East Causeway (Surfacing)	-	-	-	-	-	-	-	-	-	-	-	-
Bay Zone Dike (Surfacing	-	-	186,303	-	-	-	-	-	-	-	-	186,303
Cental Dike (Surfacing)	-	51,364		233,801	-	-	318,417	-	-	-	-	603,582
South Saddle Dam					540,184							
Goose Island Dike (Surfacing)	-	-	-	273,409	-	-	-	-	-	-	-	273,409
Vault Dike (Surfacing)	-	-	-	-	-	-	6,760	-	-	-	-	6,760
Tailings Containment Berms (Surfacing)	-	-	-	-	-	-	-	-	-	-	-	-
Finger Dikes (Surfacing)	-	-	-	-	39,200	78,400	39,200	39,200	-	-	-	196,000
Total Volume Required for Dikes	-	51,364	378,890	507,210	579,384	78,400	364,377	39,200	-	-	-	1,998,825
Stockpiling Capping Material for Portage Dump	-	-	-	660,000	660,000	-	-	-	-	-	-	1,320,000
Stockpiling Capping Material for Vault Dump	-	-	-	-	-	-	-	-	-	-	-	-
Stockpiling Capping Material for Tailings Pond	-	-	-	1,450,000	1,450,000	-	-	-	-	-	-	2,900,000
Total Capping Volume Required	-	-	-	2,110,000	2,110,000	-	-	-	-	-	-	4,220,000
Road to ANFO Storage (Capping)	-	25,349	-	-	-	-	-	-	-	-	-	25,349
Plant Roads (Capping)	-	34,644	-	-	-	-	-	-	-	-	-	34,644
Vault Haul Road (Capping)	-	-	-	36,000	-	-	-	-	-	-	-	36,000
Airstrip	-	-	-	-	-	-	-	-	-	-	-	-
Mill Foundations	20,000	20,000	-	-	-	-	-	-	-	-	-	40,000
Total Volume Required for Construction	20,000	79,993	-	36,000	-	-	-	-	-	-	-	135,993
									0			
TOTAL UM+QZ REQUIRED	20,000	131,357	378,890	2,653,210	2,689,384	78,400	364,377	39,200	0	0	0	6,354,819
TOTAL UM+QZ AVAILABLE [2]	123,290	279,607	3,522,355	7,583,302	6,599,308	4,050,175	1,438,513	281,587	0	0	0	23,878,136
SURPLUS (DEFICIT)	103,290	148,250	3,143,465	4,930,092	3,909,924	3,971,775	1,074,135	242,387	0	0	0	17,523,318
IV												
East Dike (Construction)	100,332	-	-	-	-	-	-	-	-	-	-	100,332
		-	-	-	-	-	-	-	-	-	-	-
Bay Zone Dike (Construction)	-	206,147	-	-	-	-	-	-	-	-	-	206,147
Central Dike (Construction)	-	213,583	-	763,627	-	-	15,168	-	-	-	-	992,378
North Saddle Dam (Construction)	-	511,381	-	-		-	-	-	-	-	-	511,381
Goose Island Dike (Construction)	-	-	439,837	-	-	-	-	-	-	-	-	439,837
Vault Dike (Construction) [1]	-	-	-	-	-	-	12,380	-	-	-	-	12,380
Tailings Containment Berms (Construction)	-	-	-	-	71,640	-	-	-	-	-	-	71,640
Finger Dikes (Construction)	-	-	-	-	-	-	-	-	-	-	-	-
Total Volume Required for Dikes	100,332	931,111	439,837	763,627	71,640	-	27,548	-	-	-	-	2,334,095
Road to ANFO Storage	-	75,000	-	-	-	-	-	-	-	-	-	75,000
Plant Roads	-	103,932	-	-	-	-	-	-	-	-	-	103,932
Vault Haul Road	-	-	-	356,450	-	-	-	-	-	-	-	356,450
Airstrip	-	18,700	-	-	-	-	-	-	-	-	-	18,700
Mill Foundations	60,000	60,000	-	-	-	-	-	-	-	-	-	120,000
Total Volume Required for Construction	60,000	257,632	-	356,450	-	-	-	-	-	-	-	674,082
												-
TOTAL IV REQUIRED	160,332	1,188,743	439,837	1,120,077	71,640	0	27,548	0	0	0	0	3,008,177
TOTAL IV AVAILABLE [2]	239,784	392,234	3,446,746	3,956,876	2,508,588	1,800,654	834,349	203,287	0	0	0	13,382,517
SURPLUS (DEFICIT)	79,452	(-796,510)	3,006,909	2,836,799	2,436,948	1,800,654	806,801	203,287	0	0	0	10,374,339
IF												-
East Dike (Construction)	146,859	-	-	-	-	-	-	-	-	-	-	146,859
East Dike Extension	275,080	-	-	-	-	-	-	-	-	-	-	275,080
Finger Dike Extension	-	-	-	-	258,621	517,242	258,621	258,621	-	-	-	1,293,104
NNLP HC Mounts (M1, M2, M3, M4, M5, M6)	-	-	-	-	-	-	34,182	-	-	-	-	34,182
East Causeway (Construction)	-	-	-	-	-	-	-	-	-	-	-	-
Bay Zone Dike (Construction)	-	245,210	-	-	-	-	-	-	-	-	-	245,210
Tailings Dike (Construction)	-	-	-	-	-	-	-	-	-	-	-	-
Stormwater Dike (Construction)		277,250					-	-	-	-	-	277,250
Goose Island Dike (Construction)	-	-	886,534	-	-	-	-	-	-	-	-	886,534
Vault Dike (Construction)	-	-	-	-	-	-	-	-	-	-	-	-
Tailings Containment Berms (Construction)	-	-	-	-	-	-	-	-	-	-	-	-
Finger Dikes (Construction)	-	-	-	-	420343.4	840686.8	791343.4	49343.4	-	-	-	2,101,717
Total Volume Required for Dike	421,939	522,460	886,534	-	678,964	1,357,928	1,084,146	307,964	-	-	-	5,259,936
Road	-	-	-	-	-	-	-	-	-	-	-	-
Plant Roads	-	-	-	-	-	-	-	-	-	-	-	-
Vault Haul Road	-	-	-	-	-	-	-	-	-	-	-	-
Airstrip	-	-	-	-	-	-	-	-	-	-	-	-
Mill Foundations	-	-	-	-	-	-	-	-	-	-	-	-
Total Volume Required for Construction	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL IRON FM. REQUIRED	421,939	522,460	886,534	0	678,964	1,357,928	1,084,146	307,964	0	0	0	5,259,936
TOTAL IRON FM. AVAILABLE [2]	217,225	830,122	5,956,608	2,025,875	1,745,133	4,407,913	2,469,286	308,533	0	0	0	17,960,695
SURPLUS (DEFICIT)	(-204,714)	307,662	5,070,074	2,025,875	1,066,168	3,049,985	1,385,140	569	0	0	0	12,700,759
WASTE MATERIALS BALANCE												
WASTE REQUIREMENTS [1]	674,361	2,234,127	2,138,854	3,865,027	3,463,110	1,436,328	1,511,821	347,164	0	0	0	15,670,793
WASTE ROCK PRODUCTION [2]	947,299	2,216,904	14,143,650	15,357,288	10,853,028	13,496,428	12,506,512	11,613,545	9,262,245	5,566,085	547,297	96,510,281

MINED VOLUMES[2]	**Year - 2**	**Year -1**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Total**
PORTAGE AREA[2]												
Intermediate Volcanic (m3)	239,784	392,234	3,446,746	1,198,329	885,436	1,224,598	797,091	203,287	0	0	0	8,387,504
Ultramafic (m3)	123,290	257,178	3,510,979	2,247,242	2,401,272	2,479,555	1,404,847	281,587	0	0	0	12,705,949
Iron Formation (m3)	217,225	830,122	5,956,608	1,254,465	1,149,964	3,811,261	2,349,923	308,533	0	0	0	15,878,101
Quartzite (m3)	0	22,429	11,376	0	0	427,153	30,817	0	0	0	0	491,776
Overburden (m3)	367,000	714,941	1,217,941	0	0	1,266,118	33,372	0	0	0	0	3,599,372
Total Waste (m3)	947,299	2,216,904	14,143,650	4,700,035	4,436,672	9,208,685	4,616,050	793,407	0	0	0	41,062,701
GOOSE AREA[2]												
Intermediate Volcanic (m3)	0	0	0	2,758,547	1,623,152	576,056	37,258	0	0	0	0	4,995,013
Ultramafic (m3)	0	0	0	4,283,136	3,922,954	1,143,466	2,848	0	0	0	0	9,352,405
Iron Formation (m3)	0	0	0	771,410	595,168	596,653	119,363	0	0	0	0	2,082,594
Quartzite (m3)	0	0	0	1,052,924	275,082	0	0	0	0	0	0	1,328,006
Overburden (m3)	0	0	0	1,791,235	0	0	0	0	0	0	0	1,791,235
Total Waste (m3)	0	0	0	10,657,253	6,416,356	2,316,174	159,470	0	0	0	0	19,549,253
VAULT AREA[2]												
Intermediate Volcanic (m3)	0	0	0	0	0	1,971,569	7,730,992	10,820,138	9,262,245	5,566,085	547,297	35,898,326
Ultramafic (m3)	0	0	0	0	0	0	0	0	0	0	0	0
Iron Formation (m3)	0	0	0	0	0	0	0	0	0	0	0	0
Quartzite (m3)	0	0	0	0	0	0	0	0	0	0	0	0
Overburden (m3)	0	0	0	0	0	0	0	0	0	0	0	0
Total Waste (m3)	0	0	0	0	0	1,971,569	7,730,992	10,820,138	9,262,245	5,566,085	547,297	35,898,326

Notes:

1. All construction material will come from the Portage and Goose Pits, except for the Vault Dike construction material which will come from the Vault Pit.
2. Mined Volumes (m^3) converted from Mined Tonnages using density: 1.9 tonnes/m^3 (IV, IF, UM+QTZ) and 1.7 tonnes/m^3 (overburden)

Minor variations in estimates c
material quantities may resu
from rounding errors anc
variations in assumptions.

Material balance based on mined
tonnages provided by AMEC 2005b
O:\Final\2006\1413\06-1413-089\4000\6000\Appendix II\Materials Balance Revised Mining Sequence 2007

APPENDIX III

ANALYSIS RESULTS

1.0 INTRODUCTION

The Meadowbank Gold Project site is located at about 65 degrees north latitude and 96 degrees west longitude in the eastern Canadian Artic region. Climate data collected at this site indicates a mean annual average air temperature of about -11°C. Ground temperature data from a number of thermistors installed at this site indicate that permafrost extends to a depth of up to 550 m away from the influence of lakes. Taliks extend through the permafrost beneath the larger lakes.

Thermal modeling was carried out to predict the evolution of temperatures within the tailings beaches and Central Dike during operations based on the tailings deposition plan. As well, the thermal performance of the Central Dike and adjacent tailings beach was assessed for the post closure period when the Portage Pit is flooded and water is against the Central Dike. The post closure modeling included the impact of climate change.

2.0 SITE CLIMATE

Site climate data used in the thermal model is based on "Meadowbank Gold Project Baseline Hydrology Report" (Amec, 2003).

Table III-1 presents a summary of the mean monthly temperature, relative humidity and wind speed data available from the Meadowbank site climate station over the period of September 1997 to August 2003. The annual average air temperature based on this data is -11.5^{o}C.

TABLE III-1: Meadowbank Site Climate Station Mean Monthly Data (1997 – 2003)

Month	Max. Air Temp (C^{o})	Min. Air Temp (C^{o})	Min. Rel. Humidity (%)	Max. Rel. Humidity (%)	Wind Speed (km/hr)
January	-28.2	-34.9	67.8	76.8	17.1
February	-27.9	-35.2	66.6	76.3	16.1
March	-21.7	-29.7	69.3	81.9	16.9
April	-12.7	-22.1	71.4	90.3	17.1
May	-2.3	-9.3	75.7	97.4	19.0
June	7.8	0.0	61.7	96.8	16.3
July	17.2	7.6	47.2	94.0	14.9
August	13.6	6.7	58.5	97.7	18.3
September	5.8	1.1	69.6	98.3	18.7
October	-4.8	-10.6	82.4	97.0	21.1
November	-14.5	-21.5	80.8	90.9	17.4
December	-22.3	-28.9	74.0	83.4	18.1

Table III-2 presents the calculated annual freezing and thawing indices for the mean monthly air and soil temperature data.

TABLE III-2: Annual Freezing and Thawing Indices

Temperature Data	Annual Freezing Index (°C – Days)	Annual Thawing Index (°C - Days)
Air	4900	850
Soil	4100	775

Based on the site climate station measured mean monthly air temperature, the thaw season begins about day 150 of the year (May 30th) and ends about day 270 of the year (September 27th).

Table III-3 presents a summary of the long-term mean monthly rain, snowfall and total precipitation data for the site, as estimated from the available data as reported in Amec (2003).

TABLE III-3: Meadowbank Site Mean Monthly Precipitation Based on Long-Term Climate Data from Baker Lake

Month	Mean Monthly Rainfall, (mm)	Mean Monthly Snowfall, (mm)	Mean Monthly Total Precipitation[1], (mm)
January	0	113	11.4
February	0.1	105	10.6
March	0	145	14.6
April	0.8	171	17.8
May	6.2	112	17.4
June	18.2	38	22.1
July	37.7	0	37.8
August	40.3	0.9	41.2
September	30.4	89	39.3
October	6.8	307	37.5
November	0.2	233	23.6
December	0	148	14.8
Annual Total	**141**	**1462**	**288.1**

Note 1: Total precipitation is rainfall and snowfall water equivalent.

2.1 Long Term Climate Change

The climate change considered in this study follows the worst case "high sensitivity" model described by the Intergovernmental Panel on Climate Change (IPCC, 2007). This model predicts an increase of 6.4°C in the maximum average air temperature (MAAT) by the year 2100 for a site located at 65°N latitude. For the thermal model, the 6.4°C temperature increase is assumed to occur uniformly over the 100 year period.

Table III-4 presents a summary of reported climate change predictions used on a number of northern projects which have been reported in the engineering and scientific literature.

TABLE III-4: Summary of Reported Climate Change Rates Used in Northern Projects Engineering Studies.

Reference	Increase in MAAT by Year 2100 (°C)	Notes
IPCC(2007)	6.4	Used in Meadowbank thermal models for site at 65° North Latitude
Hayley (2004)	4.7	Used in design studies for the Inuvik Regional Health Center. Reported as increase of 0.47°C per decade.
Hayley and Cathro (1996)	5.0	Used for Raglan Dam analyses.
Mackenzie Valley Land and Water Board (2002)	3.0	Used for the Ekati mine expansion.
Burn (2003)	6.0	For use in the Western Artic for pipeline design projects. Reported as increase of 1.75°C over a 29 year period.
IPCC (2003)	0.8-5.2	Predicted range for change in the global average surface air temperature.

3.0 THERMAL MODEL

3.1 Model steps

The thermal models were prepared using TEMP/W by Geoslope International Ltd. TEMP/W is a two-dimensional (2-D) finite element based thermal modeling package. The models of the tailings beach and of the Central Dike were prepared and calibrated as described in the following sections.

3.1.1 Tailings Beach Model

1. Estimation of thermal properties for the foundation and tailings materials.

2. Calibration of temperature at the bottom of the lake and deep foundation based on measured temperature data from thermistors installed to a maximum depth of 96 m below the bottom of Second Portage Lake in the area of the Central Dike.

3. Determination of the regional geothermal gradient from the site thermistor data (Golder 2003).

4. Development of a surface temperature function based on the daily site climate data available from the period 1997 to 2003 and additional mean monthly data until December 2005.

5. Development of a simplified model to evaluate the model sensitivity for different tailings thermal properties.

6. Development of a sequential 1-D model based on the tailings deposition plan to assess the temperature profile through the tailings during the operating period.

7. Running a long-term case to evaluate tailings and foundation temperatures during a 100 year period post closure considering the effects of global warming.

3.1.2 Central Dike Model

The model was intended to simulate evolution of temperatures during different phases of construction, operation and closure as follows:

1. Pre-construction: To assess variation in the foundation temperatures associated with the dewatering of Second Portage Arm;
2. Early/mid operation: To assess tailings, rockfill and foundation temperatures after 5 years of operation with tailings deposited up to 138 m elevation;
3. Early closure: To assess the evolution of tailings, dike and foundation materials up to one year after tailings deposition is complete. This included the placement of 2 m rockfill over tailings and prior to flooding of Portage Pit (*i.e.*, downstream face still dry); and
4. Long-term closure: to assess the evolution of tailings, dike and foundation temperatures in the long-term including the effects of global warming. This included a flooded downstream face of the Central Dike with the lake at elevation 134.1 m.

3.2 Thermal properties

The thermal conductivity of the materials was primarily defined based on the Johansen equation (Johansen, 1975), and then adjusted based on mineralogy and the geotechnical properties of each material, as well as reported values from the literature (Nidal H, 2000, MEND 1998, and Geoslope 2004). Table III-5 presents the material properties and the estimated thermal properties that were considered in the analyses. Geotechnical properties for the foundation, dike and tailings materials were established based on current project data.

The bedrock at the site includes greenstone ultramafic and mafic flow sequences, metasedimentary and intermediate volcanics rocks. The tailings material is processed iron formation and intermediate volcanic rock.

Estimates of the unfrozen water content relationship with temperature were made for the bedrock and the tailings materials using the relationship presented by Anderson et al. (1973) and published parameters for similar materials from Nixon (1991).

A simplified thermal model was run to verify the suitability of the thermal properties defined for the foundation material. A 104 m profile consisting of 16 m of glacial till over bedrock was considered with the thermal properties listed in Table III-5. The profile was based on the geological description of materials encountered in the borehole with the thermistors installed to a depth of 96 m below Second Portage Lake. The latest

(September 2006) temperature measurement from the thermistors was compared to the model calculated temperatures at the same depths. The thermal gradient beneath the lake was calculated as -0.02 0C/m, which is equivalent to a heat flux of -0.058 j/s considering the thermal conductivity of the bedrock is 2.9 W/m.Co. The temperature at the bottom of the lake was assumed as 2.8 oC based on measured values.

Figure III-1 shows the calculated temperature profile with depth and the measured temperatures taken on September 29, 2006. The model resulted in good agreement between estimated and measured temperatures at different depths, indicating that the thermal properties defined for the foundation materials are realistic.

TABLE III-5: Material Properties Used in the Thermal Models

Material	Moisture Content (%)	Dry Density (t/m^3)	Specific Gravity, Gs (t/m^3)	Void ratio, e	Porosity, n (%)	Degree of Saturation (%)	Volumetric Water Content	Thermal Conductivity (W/m °C)		Volumetric Heat Capacity (MJ/m^3 °C)	
								Frozen	Thawed	Frozen	Thawed
Rockfill saturated	16.0	2.22	3.44	0.55	35.5	100	0.36	2.1	1.7	1.6	2.5
Rockfill unsaturated	5.0	2.22	3.44	0.55	35.5	28.9	0.09	1.9	1.6	1.5	1.9
Filter	5.0	1.87	2.89	0.55	35.5	26.3	0.09	1.9	1.6	1.5	1.6
Till overburden	16.6	1.87	2.71	0.45	30.0	100	0.31	2.1	1.6	1.6	2.3
Fractured bedrock	0.5	2.71	3.0	-	-	100	0.05	2.9	2.9	2.4	2.4
Bedrock	0.5	2.71	3.0	-	-	100	0.07	2.9	2.9	2.4	2.4
Tailings	40.0	1.45	3.1	1.38	0.54	100	0.54	2.3	1.7	2.1	2.3

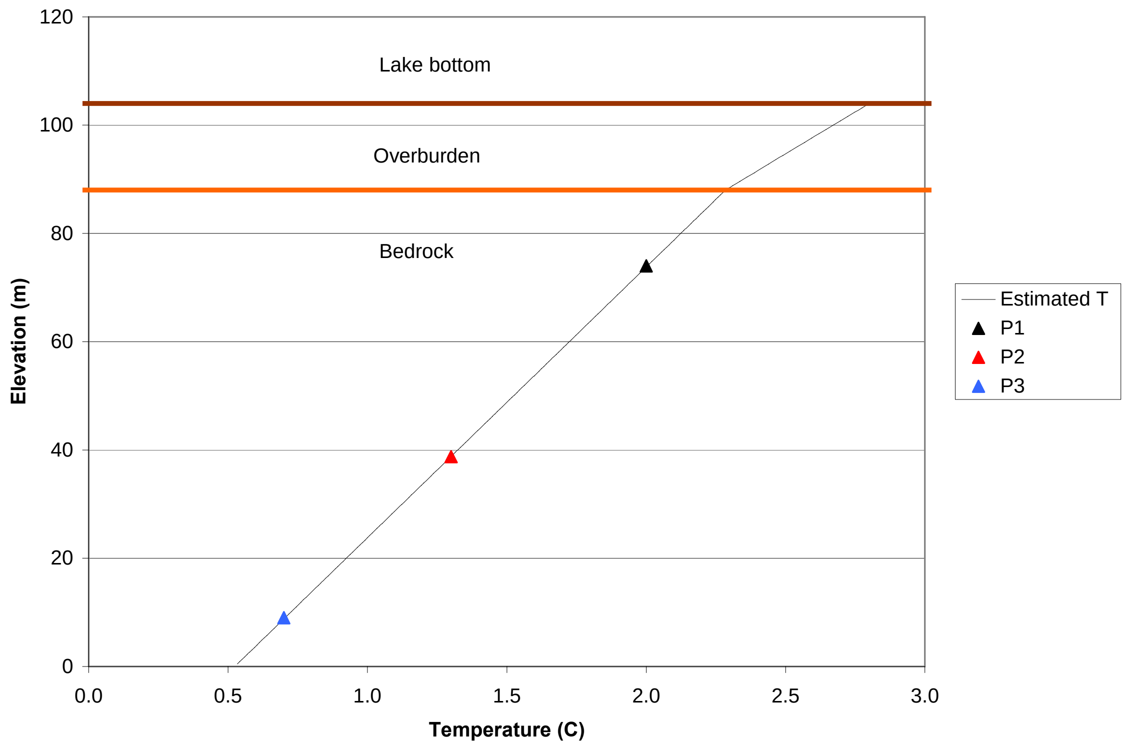


Figure III-1 Estimated and measured temperature profiles in the Second Portage Lake Bottom.

3.3 Sensitivity of Tailings Thermal Properties

Due to the fact that measured thermal properties of tailings were not available, a sensitivity analysis was carried out to evaluate the influence of the thermal properties of the tailings on the calculated temperature profiles. The sensitivity analysis was carried out using a transient 1D model composed of 10 m of tailings underlain by 20 m of till foundation, run for a period of 1 year. Different values of thermal conductivity and heat capacity were considered as presented in Table III-6. A surface temperature function was applied to all cases as upper boundary condition, and a geothermal gradient of 0.038 j/s (calculated from on site thermistors) was applied to the model as the lower boundary condition.

Table III-6: Range of Thermal Conductivity and Heat Capacity Evaluated for Tailings

Case	Thermal Conductivity W/m. ^oC		Heat Capacity MJ/m^3.^oC	
	Frozen	Unfrozen	Frozen	Unfrozen
1	1.5	1.4	2.1	2.9
2	1.7	1.6	2.1	2.9
3	***2.3***	***1.7***	***2.1***	***2.9***
4	2.7	1.9	2.1	2.9
5	1.5	1.4	2.6	3.3

Figures III-2 and III-3 show the tailings temperature profiles calculated for cases 1 to 4, depicting profiles for January and July, respectively. Figure III-4 shows the variation in temperature profiles due to changes in the values of heat capacity (cases 1 and 5).

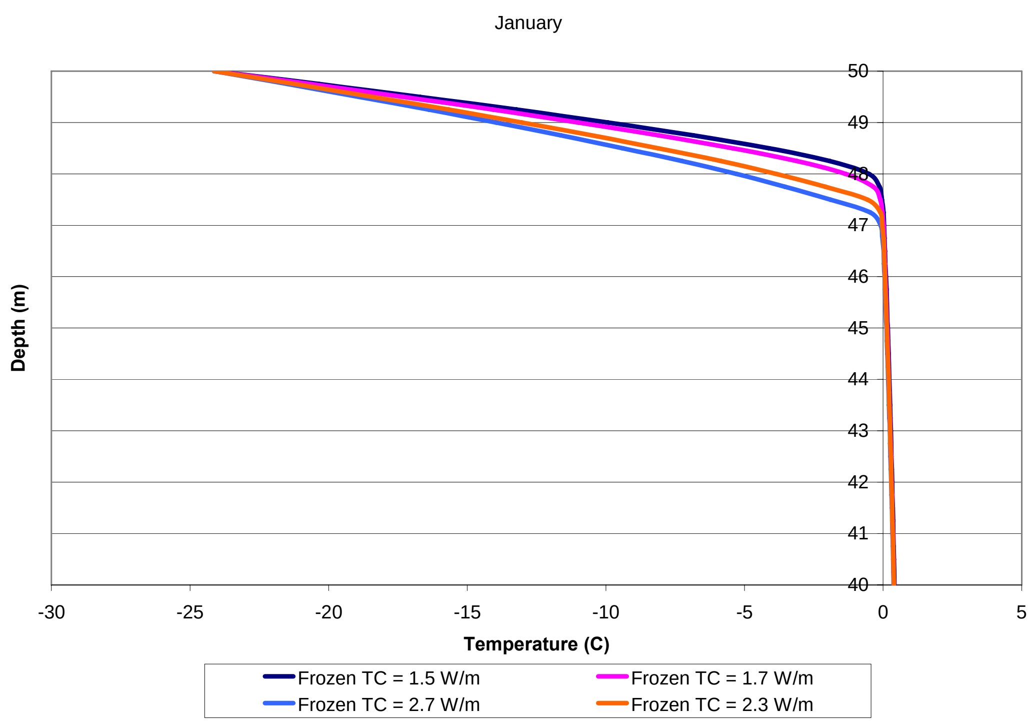


Figure III-2: Temperature profiles of tailings with different thermal conductivity values calculated for January

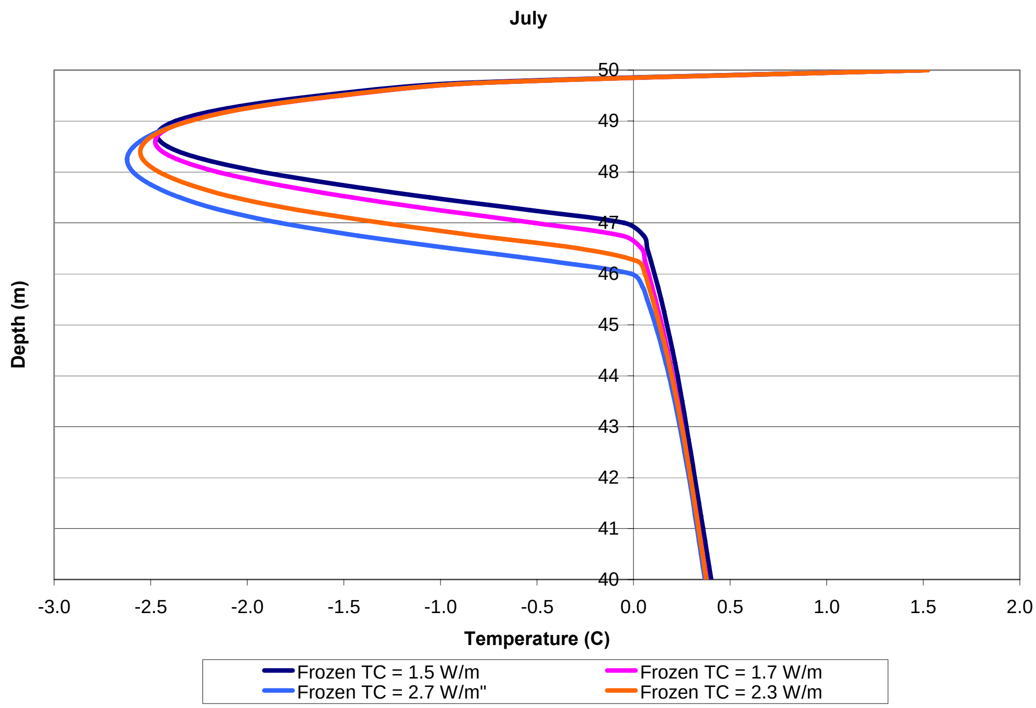


Figure III-3: Temperature profile of tailings with different thermal conductivity values calculated for July

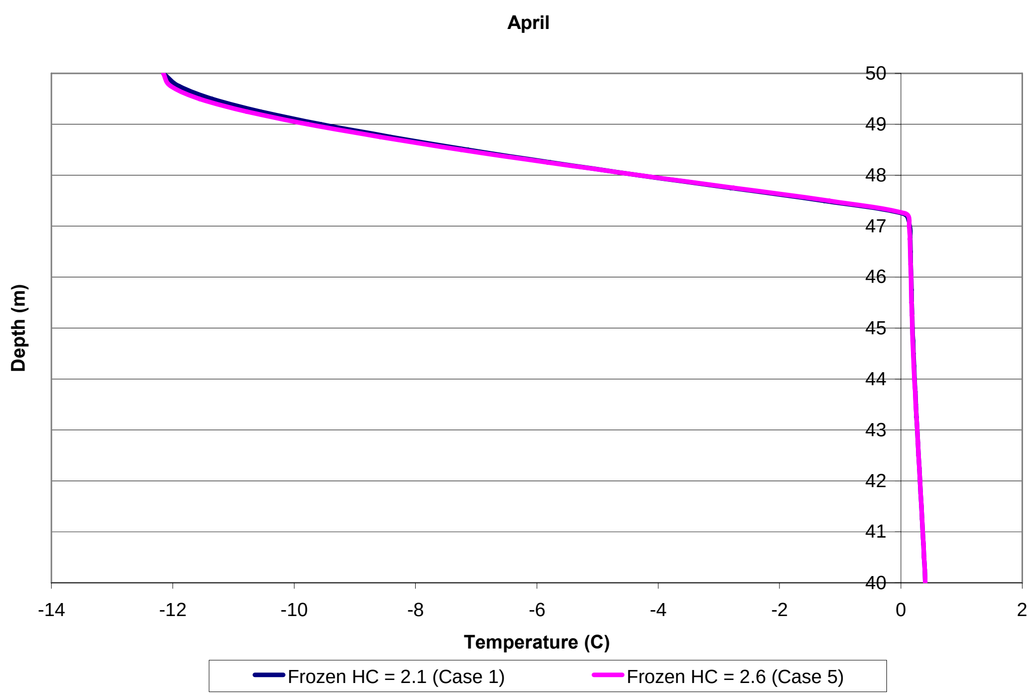


Figure III-4: Variation in tailings temperature profile with varying Tailings Heat Capacity

As can be seen in Figures III-2 and III-3, increasing the tailings thermal conductivity from 1.5 W/m C^o to 2.7 W/m C^o increases the depth of influence of the surface by about 1 m. The tailings generated from Meadowbank Gold Project are expected to be very fine and likely to contain dissolved metals. As reported for fine tailings from different gold mine projects (MEND, 1998), this will likely contribute to higher thermal conductivity values. Values of thermal conductivity of 2.3 W/mC^o (frozen) and 1.7 W/mC^o (unfrozen) were assumed to be realistic and were applied in this study. In terms of heat capacity, Figure III-4 shows that the calculated profiles of tailings temperature are much less sensitive to this parameter.

Therefore, after the sensitivity analysis, the tailings thermal properties described for Case 3 in Table III-6 were applied to this study.

3.4 Ground Surface Temperature Functions

3.4.1 Climate data review

Climate data was obtained from a weather station at the mine site for the period between September 1997 and December 2005. Daily climate data were available from September 1997 to September 2003, and mean monthly data were available for the period between September 2003 and December 2005. To assure higher precision in the calculated surface temperature function, only the daily data were used for this study, as presented in Figures III-5 and III-6.

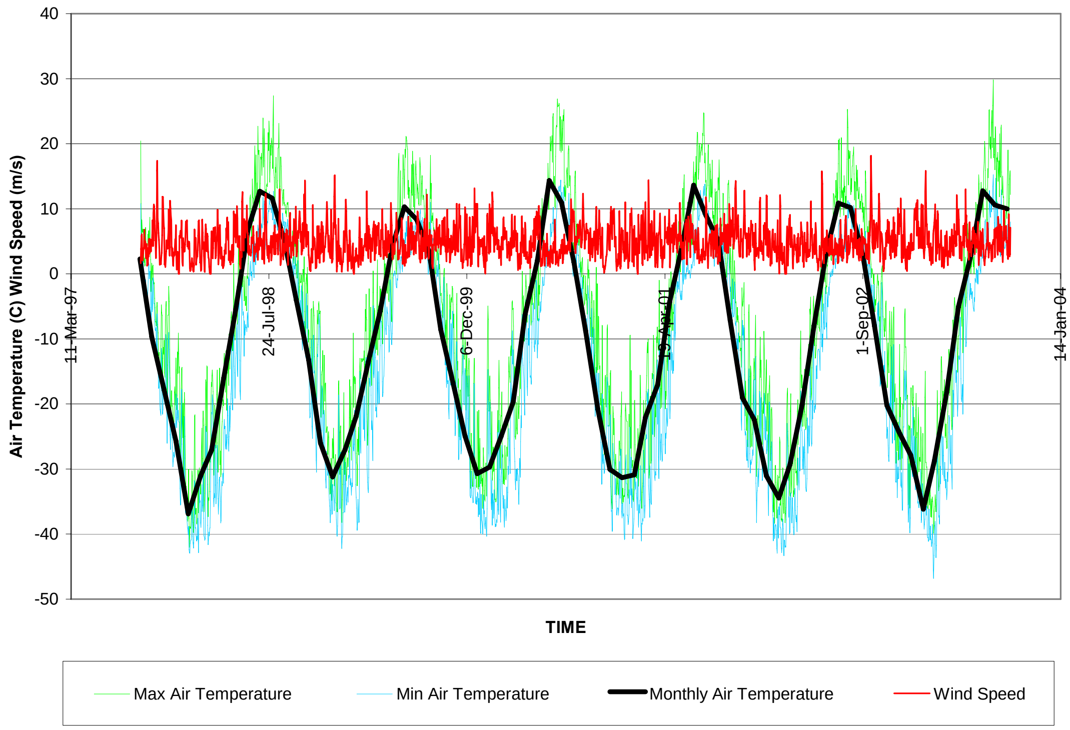


Figure III-5: Air Temperature and wind speed data

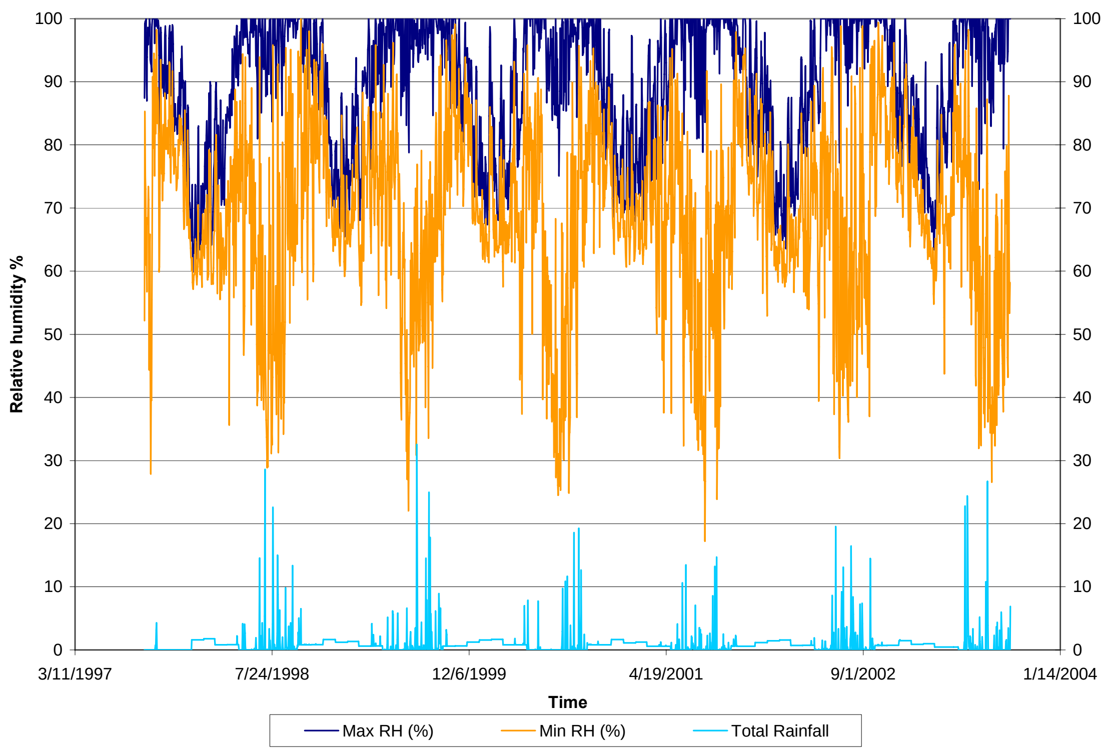


Figure III-6: Total precipitation and relative humidity

3.4.2 Ground Temperature Estimation

The climate information was used to perform numerical model analyses with TEMP/W, which uses a rigorous approach to calculation of ground temperature. The model covered a period of 6 years between September 1997 and September 2003.

The calculated ground surface temperature was averaged to general monthly values as shown on Figure III-7. In addition, the six-year period data was averaged by month to generate a general annual ground surface temperature function as shown on Figure III-8. Figure III-8 also shows the mean air temperature from the daily data between 1997 and 2003, the mean air temperature incorporating the monthly data available between 2003 and 2005, and the reported mean soil temperatures in 2005 at about 0.3 m depth.

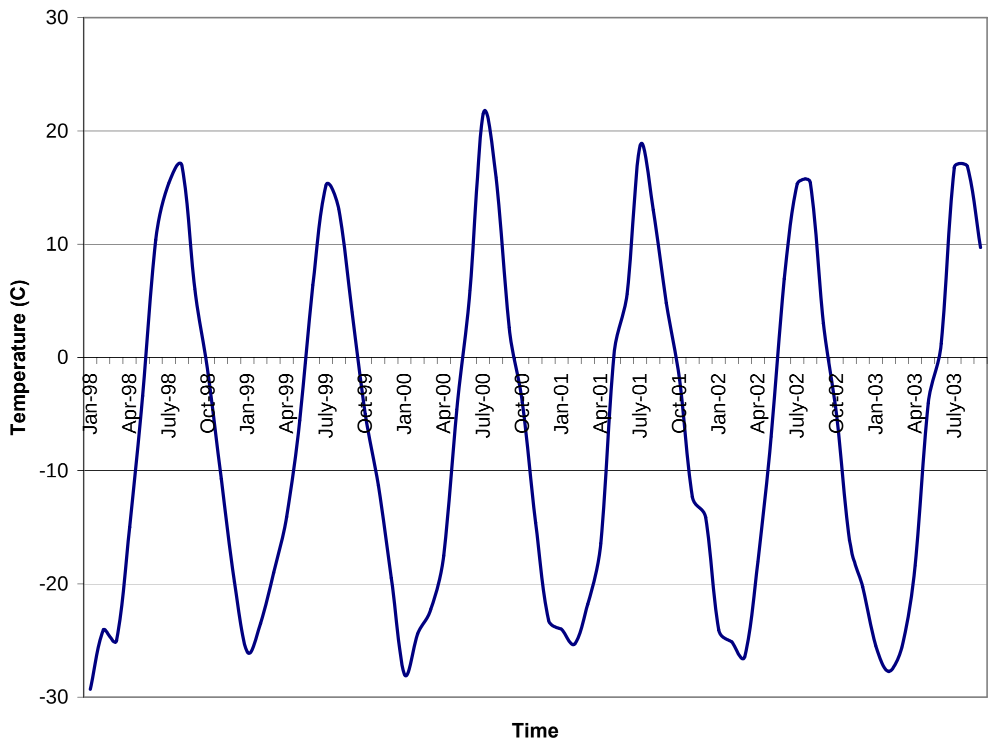


Figure III-7: Calculated ground surface temperature

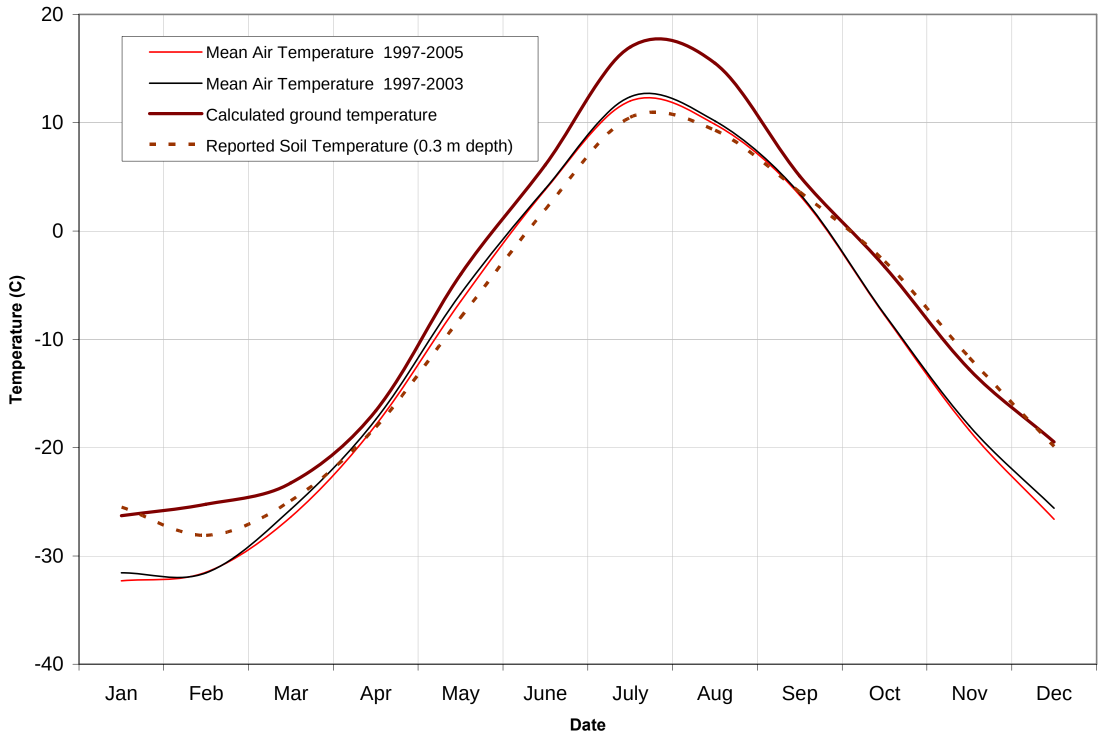


Figure III-8 General ground surface temperature function

As shown on Figure III-8, the mean air temperature function for the period 1997 to 2005 is almost the same as the 1997 to 2003 mean air temperature curve. The generated ground temperature curve agrees well with the reported soil temperatures in the winter period, but shows warmer temperatures during the summer period. It must be noted that the sensor that measured the soil temperature was reported to be at about 0.3 m depth, and so temperatures should in fact be cooler than surface at summer times. In addition, typically ground temperatures are warmer than air temperatures due to the high thermal conductivity of soils compared to air. Therefore, the estimated ground temperature function is considered realistic for the site.

3.5 Tailings Deposition Sequence

The modeled sequence of tailings deposition was based on the proposed tailings deposition plan for the southern basin (Appendix IV), with tailings rising from elevation 108 m to 143.5 m over a period of six years. The elevation of the tailings surface used in the sequential model is presented in Table III-7.

TABLE III-7: Tailings depositional plan used in the Thermal model (Appendix IV).

Start Date	End Date	Days (Accum.)	Tailings Surface Elevation (m)	Pond Elev. (m)
31-Jan-09	31-Jan-09	0	n/a	n/a
1-Feb-09	2-Mar-09	31	108.0	107.7
6-Nov-09	24-Dec-09	328	117.7	116.5
23-Jun-10	21-Jul-10	536	122.7	121.3
26-Aug-10	3-Oct-10	611	124.3	122.7
3-Nov-10	15-Dec-10	684	125.8	124.1
19-Jun-11	21-Jul-11	901	129.5	127.6
18-Aug-11	3-Oct-11	976	130.8	128.7
5-Nov-11	19-Dec-11	1,053	132.0	129.8
31-May-12	3-Jul-12	1,250	134.4	132.0
3-Aug-12	11-Sep-12	1,319	135.3	132.7
3-Nov-12	18-Dec-12	1,417	136.5	133.8
23-Jun-13	3-Aug-13	1,646	138.5	135.7
15-Sep-13	29-Oct-13	1,733	139.3	136.3
16-Dec-13	2-Feb-14	1,828	140.3	137.5
4-Aug-14	28-Sep-14	2,066	142.3	138.9
6-Feb-15	14-Mar-15	2,234	143.5	140.1

The rate of tailings rise is a function of the spigots spatial distribution, size of deposition areas and local topography. For a specific portion of the tailings area, tailings elevation will rise most during the time deposition is made from spigots located in or near that area, and should be less affected by deposition from spigots located further away.

To assess the impact of multiple spigots contributing to the rise of the tailings elevation, three scenarios were modeled:

- Tailings increase in elevation only during the active period of the nearest spigot;
- Tailings increase in elevation during the active period of the nearest spigot and extending for 50 % of the inactive period; and,
- Tailings increase in elevation during the active period of the nearest spigot and continue during 75 % of the time when the spigot is off.

Table III-8 summarizes the 3 scenarios modeled.

TABLE III-8: Tailings Deposition Scenarios Modeled Considering Different Exposure Periods

Model Stage	Start Date	End Date	Deposition Days	Tailings Elevation (m)	Scenario 1 Inactive Days (as designed)	Scenario 2 Inactive days (less 50%)	Scenario 3 Inactive days (less 75%)
1	1-Feb-09	2-Mar-09	30	108.0	249	125	63
2	6-Nov-09	24-Dec-09	48	117.7	181	90	45
6	23-Jun-10	21-Jul-10	28	122.7	37	18	9
4	26-Aug-10	3-Oct-10	38	124.3	30	15	8
5	3-Nov-10	15-Dec-10	43	125.8	186	93	46
6	19-Jun-11	21-Jul-11	32	129.5	28	14	7
7	18-Aug-11	3-Oct-11	46	130.8	33	16	8
8	5-Nov-11	19-Dec-11	44	132.0	164	82	41
9	31-May-12	3-Jul-12	33	134.4	30	15	8
10	3-Aug-12	11-Sep-12	39	135.3	53	26	13
11	3-Nov-12	18-Dec-12	45	136.5	187	93	46
12	23-Jun-13	3-Aug-13	42	138.5	43	21	11
13	15-Sep-13	29-Oct-13	44	139.3	48	24	12
14	16-Dec-13	2-Feb-14	47	140.3	183	91	46
15	4-Aug-14	28-Sep-14	55	142.3	131	66	33
16	6-Feb-15	14-Mar-15	36	143.5	-	-	-

The main impact of increasing tailings elevation after deposition is moved from one spigot to another is that tailings are directly exposed to ambient air temperatures for a short period of time between consecutive depositions from the same spigot. The longer tailings are exposed to the winter air temperature, the deeper the frozen portion becomes before another lift of tailings is deposited, and overall tailings temperature tends to be cooler at the end of operations.

3.6 Models Configuration and Boundary Conditions

3.6.1 Tailings Model

To evaluate the evolution of tailings temperature during the operational phase, a sequential 1-D model was developed consisting of tailings being deposited over 14 m of till underlain by 40 m of bedrock. The initial foundation temperatures prior to tailings deposition were estimated through a simplified model run for a period of 1 year. The model indicated that one year after the dewatering of north-west arm of Second Portage Lake, a frozen layer would develop to a depth of 3.0 m, and the temperature would be around 2°C at 20 m depth.

For each stage of the model, the tailings elevation was raised and then the ground surface temperature function was applied for the number of days presented in Table III-8. The final temperature profile calculated for one stage was applied as the initial temperature profile for the subsequent stage. Tailings were assumed to be deposited at 10°C in July and August, and at 5°C during other periods.

The calculated surface temperature function described in Section 3.4 was applied as the upper boundary condition to each stage of the sequential model. The calculated geothermal flux of 0.038 J/s (0.013 °C/m) was kept as the lower boundary condition at all times.

At end of operations, a 2 m thick rockfill cap was placed over the tailings, and a 100-year model was run for the three scenarios to evaluate the thermal performance of the tailings and foundation in the long-term.

The long-term analysis considered an increase of 6.4°C in temperature over a 100-year period as described in Section 2.1.

3.6.2 Central Dike Model

The boundary and initial conditions applied to the Central Dike model were derived from both field instrumentation data and the 1-D models as follows:

- Surface boundary: The ground surface temperature function described in Section 3.4 was applied as the upper boundary condition to the model;
- Tailings temperature profile: The temperature profiles calculated for Scenario 2 described in section 3.5.1 were applied;
- Foundation initial conditions: The initial foundation temperature after the dewatering of north-west arm of Second Portage Lake was estimated through a separate simplified model, based on ground surface temperatures and measured deep foundation temperatures; and
- Foundation boundary: A geothermal flux of 0.038 J/s was used as the lower boundary condition in the model.

4.0 MODEL RESULTS

4.1 Tailings Model

The results obtained from the 1-D tailings thermal model for the three scenarios studied are presented in the following sections.

4.1.1 Deposition Phase

The evolution of tailings temperature during deposition for the three scenarios modeled is presented in Figures III-9 to III-11. From these figures it can be seen that the tailings remain warmer as the exposure time between consecutive depositions decreases. For Scenario 1, considering tailings exposed to ambient air temperatures during all times when the spigot is inactive, the tailings would be completely frozen close to the end of operations. In the scenario 2, considering tailings exposed for half of the spigot inactive time, there would be a thawed zone in the tailings between approximately elevation 110 and 125 m, with maximum temperatures of about 2^oC. For the worst-case scenario, considering tailings exposed for only 25% of the spigot inactive time, most of tailings would remain thawed close to the end of operations, with maximum temperatures of about 5^oC.

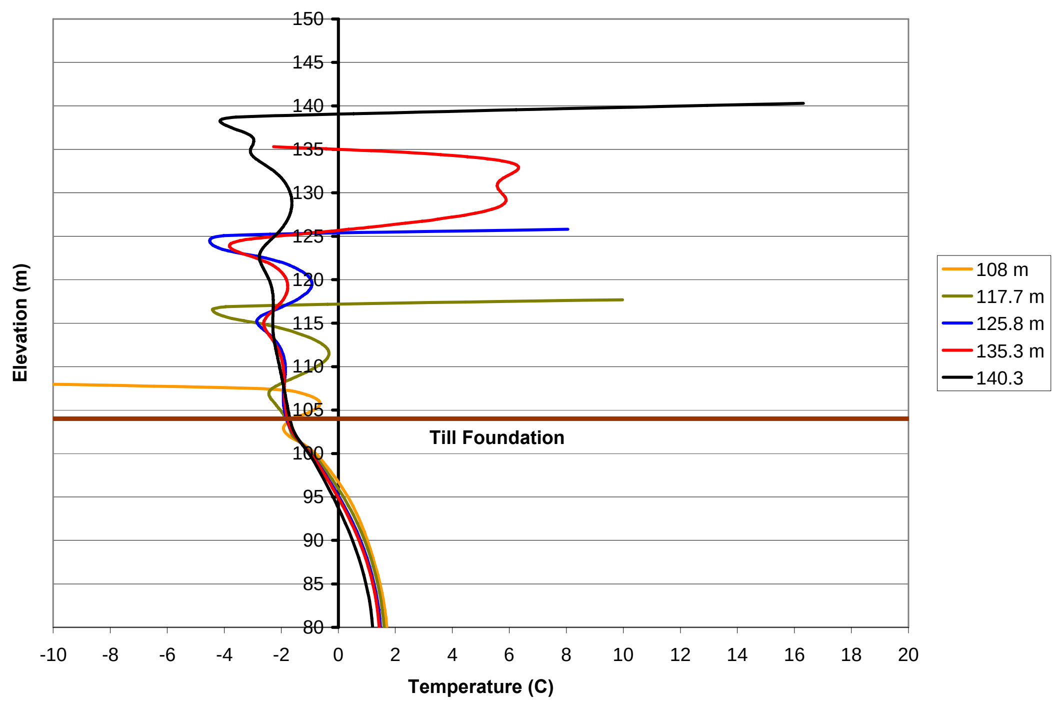


Figure III-9 Evolution of tailings temperatures for scenario 1 - Tailings increasing in elevation only during deposition from nearest spigot

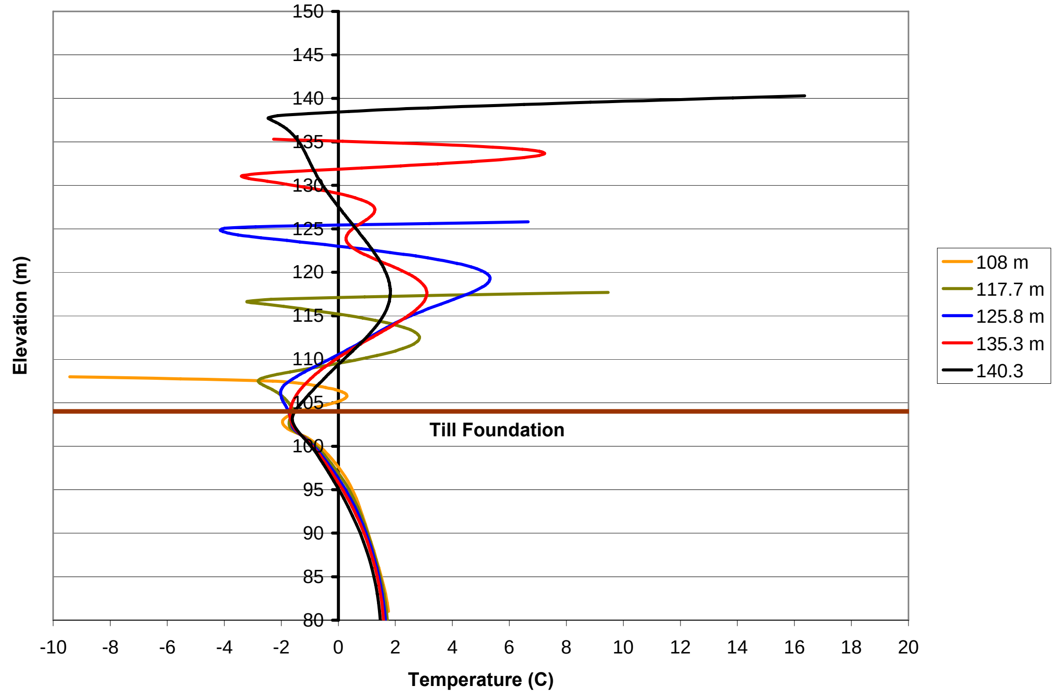


Figure III-10 Evolution of tailings temperatures for scenario 2 - Tailings increasing in elevation during deposition plus 50% of inactive time between periods of deposition

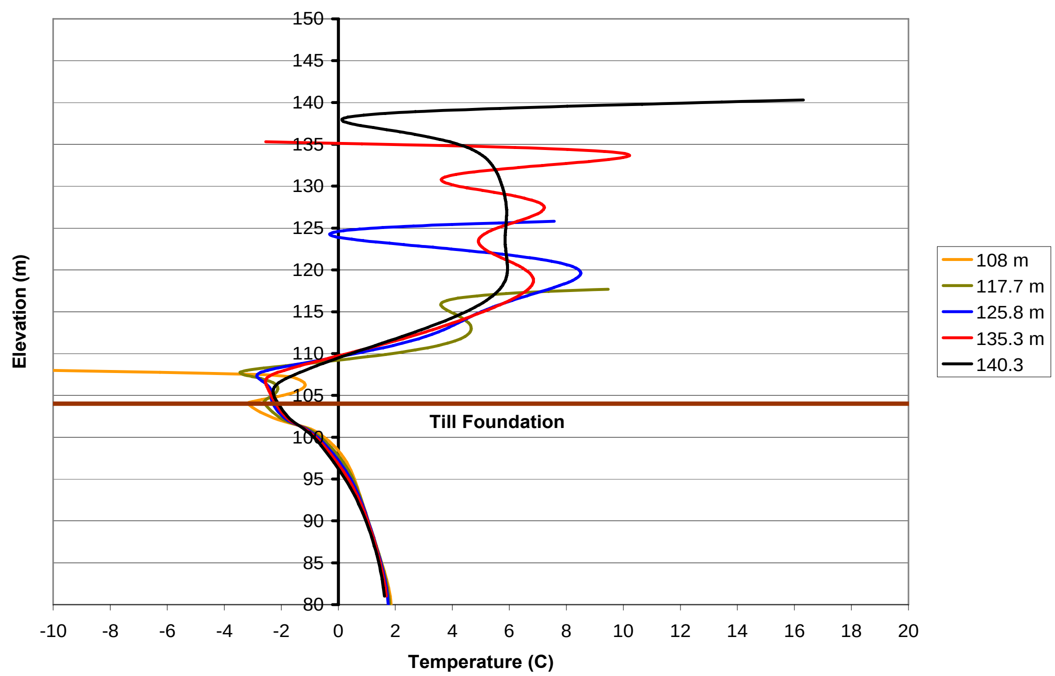


Figure III-11 Evolution of tailings temperatures for scenario 3 - Tailings increasing in elevation during deposition plus 75% of inactive time between periods of deposition

4.1.2 Long Term Models

Figures III-12 to III-17 show the calculated tailings temperature profile for February and August over the long-term for the three scenarios analyzed. For scenario 1 with tailings exposed during all the spigot inactive time, the model indicates that variation in the tailings temperature profile over the long-term would not be large, and the foundation would be frozen down to 51 m beneath the tailings at the end of 100 years.

For scenario 2, with tailings exposed for 50% of the spigot inactive time, the long-term analysis indicates that all tailings would be frozen 5 years after the end of operation and placement of the rockfill cap. The foundation would be frozen down to 47 m beneath the tailings at the end of 100 years.

For the worst-case scenario, with tailings exposed only for 25% of the spigots inactive time, the model indicates that 5 years after the end of operations the tailings would still present a thawed zone in its mid portion. Ten years after the end of operations, the entire tailings body would be frozen and the foundation would freeze down to 41 m beneath the tailings bottom at the end of 100 years.

In all scenarios modeled, the active layer is within or just below the 2 m thick rockfill cap, indicting that seasonal variations in temperatures will not affect the patterns of temperatures that develop in tailings and foundation in the long-term.

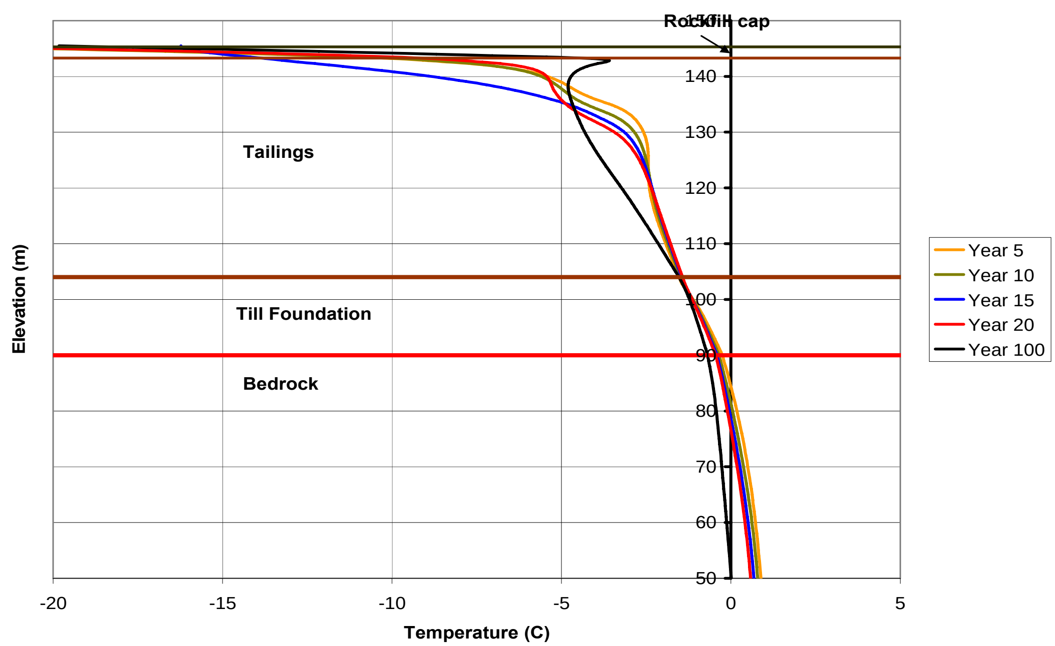


Figure III-12 Long-term temperature profiles in February for Scenario 1 – Tailings exposed during the entire spigot inactive time

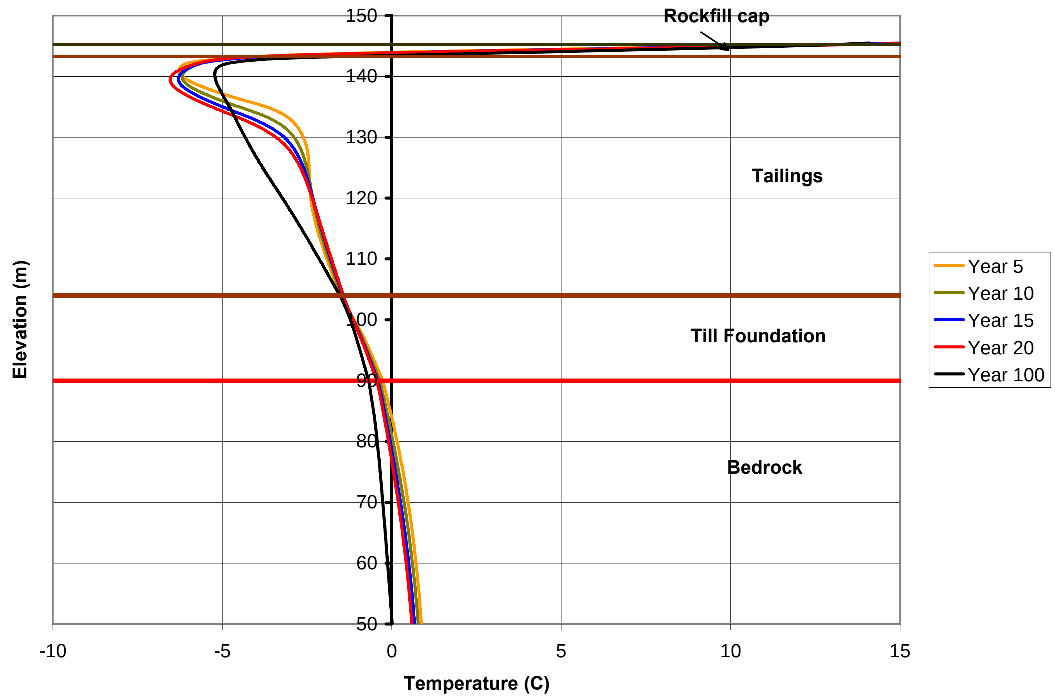


Figure III-13 Long-term temperature profiles in August for Scenario 1 – Tailings exposed during the entire spigot inactive time

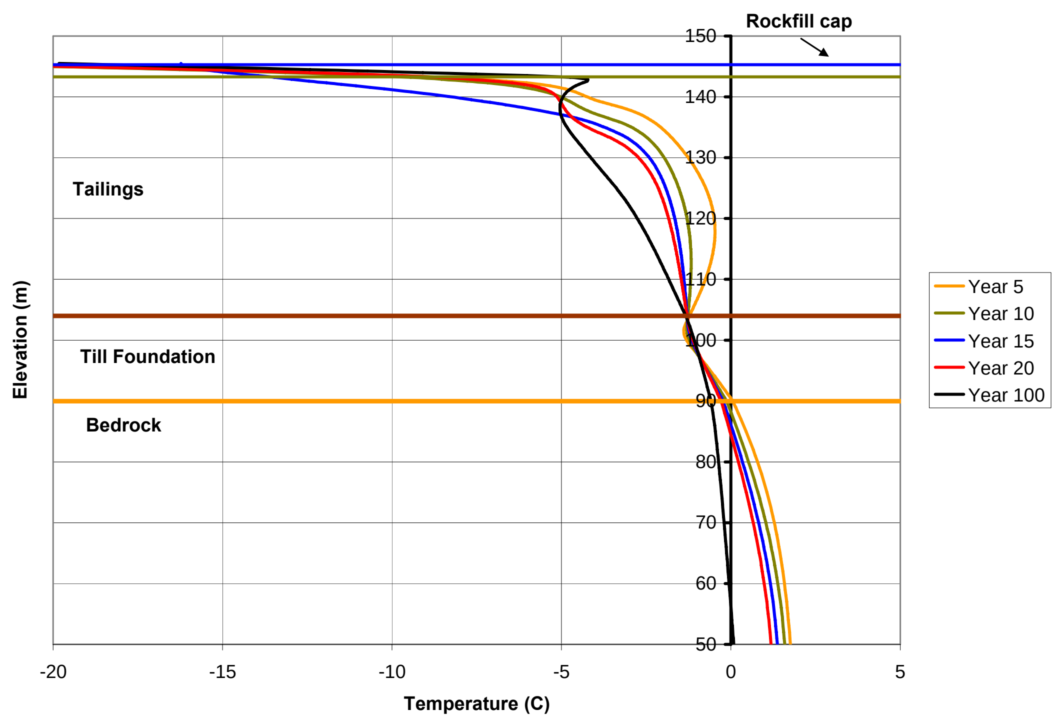


Figure III-14 Long-term temperature profiles in February for Scenario 2 – Tailings exposed for 50% of spigot inactive time

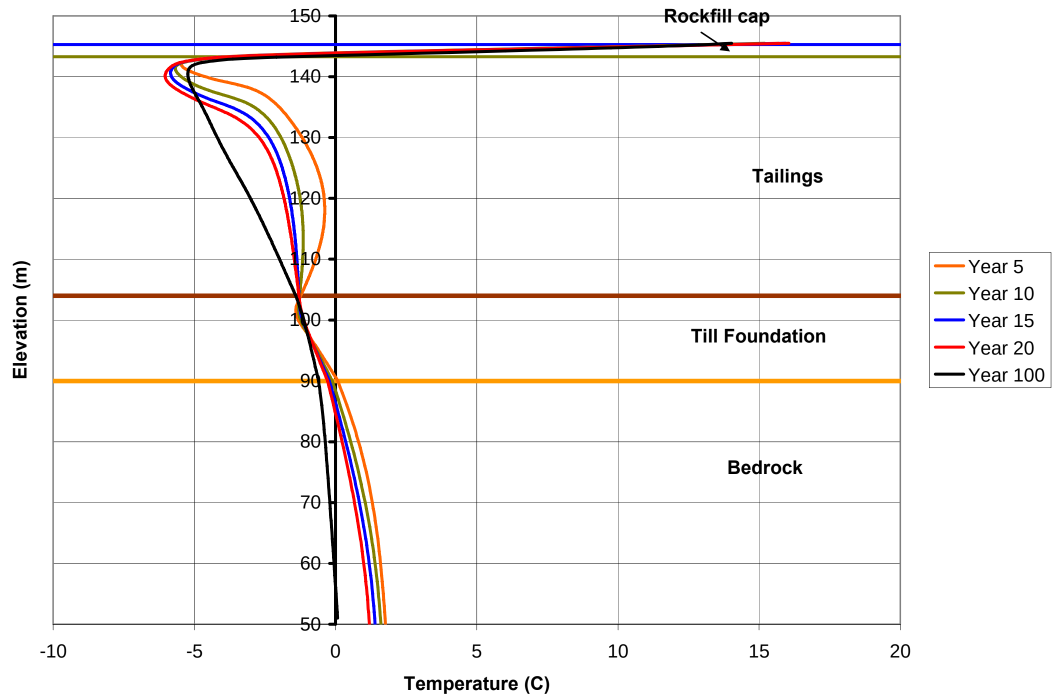


Figure III-15 Long-term temperature profiles in August for Scenario 2 – Tailings exposed for 50% of spigot inactive time

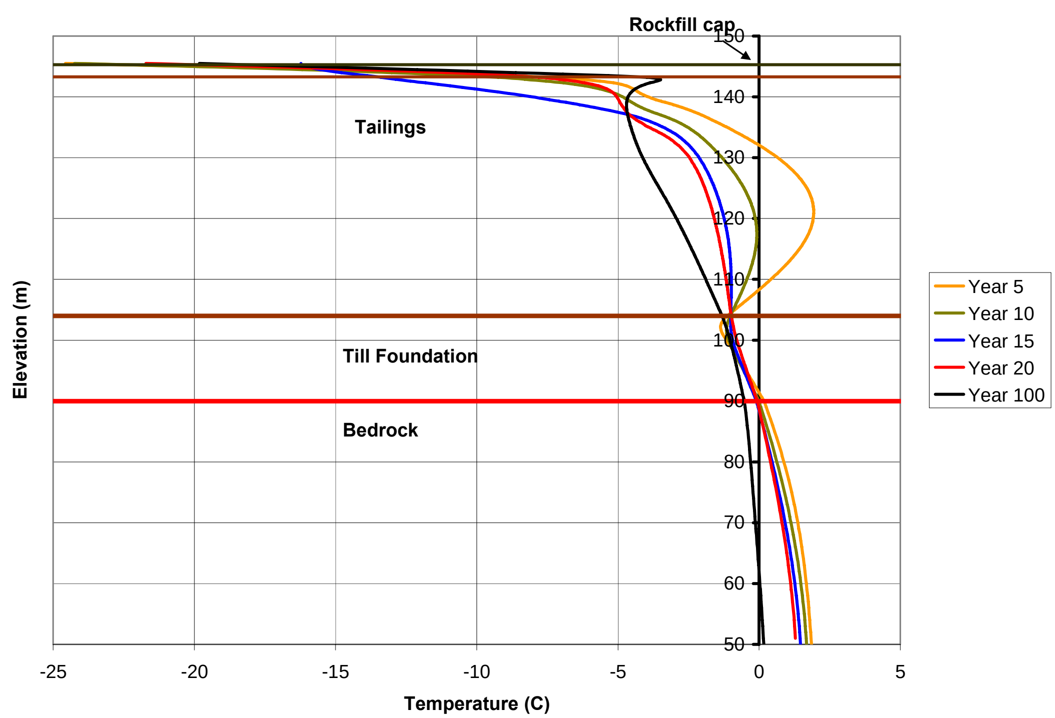


Figure III-16 Long-term temperature profiles in February for Scenario 3 – Tailings exposed for 25% of spigot inactive time

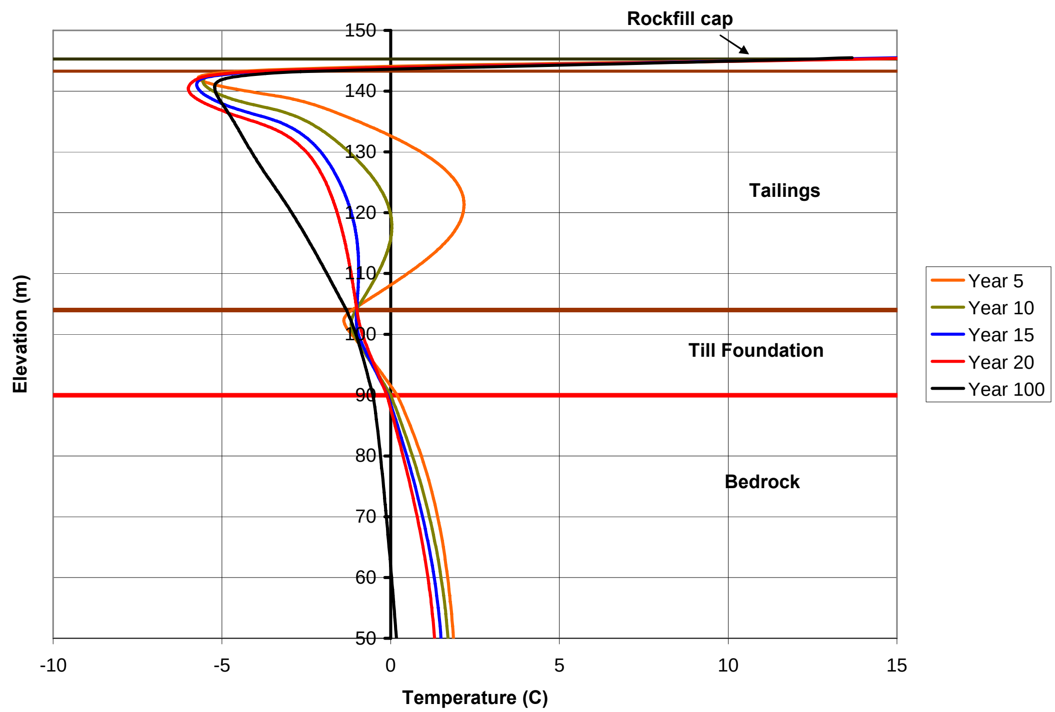


Figure III-17 Long-term temperature profiles in August for Scenario 3 – Tailings exposed for 25% of spigot inactive time

4.2 Central Dike Model

The evolution of temperatures in the Central Dike during operational and early closure phases are presented in Figures III-18 and III-19. The analyses indicate that during operations, the temperature of the upstream face of the dike will be strongly affected by the temperature of the tailings, and will oscillate between -0.5 ^{o}C and 0.5 ^{o}C, following the evolution of the tailings temperature profile.

As seen in Figures III-18 and III-19, the frozen portion of the downstream face of the dike becomes deeper and deeper during operations as this area will be exposed to ambient air temperatures and will not be affected by the tailings deposition.

With respect to the tailings near the dike, the models indicate that at end of operations the tailings would present a thawed zone in its mid portion, with the upper and lower parts frozen. In addition, the models show that the foundation will be frozen to a depth of approximately 10 m beneath tailings at the end of operations.

After the end of operations, the downstream face of the Central Dike will be flooded to a final elevation of 134.1 m. The models show that while the lake will affect the temperatures in the downstream face and foundation of the Central Dike, the tailings will control the temperatures in the upstream portion.

Figures III-20 to III-22 show the calculated temperature profiles at years 10, 25 and 100 after the downstream flooding. Figure III-23 shows the evolution of the dike and foundation frozen portions with time. The long-term analysis did consider the influence of global warming as described in section 2.1.

Figures III-20 to III-23 show that, in spite of the downstream portion of the dike thawing in response to the flooding, the upstream portion will continue freezing with time and the tailings and foundation will remain frozen even under the influence of global warming. The long-term analysis indicates that the foundation will be frozen down to about 30 m below tailings after 100 years.

The results obtained for the tailings long-term thermal modeling (Section 4.1.2), indicates that the portion of foundation under tailings that would be frozen after 100 years to a depth between 41 and 51 m. The thermal model carried out specifically for tailings did not consider the influence of the lake, and can be considered representative of tailings areas far from the dike, while the results showed in this section refer to the area near and under the Central Dike.

Thus, the combined analyses indicated that the tailings will remain frozen during all times after end of operations, and a frozen foundation will extend from about 30 to 50 m beneath the tailings, depending on the distance from the lake.

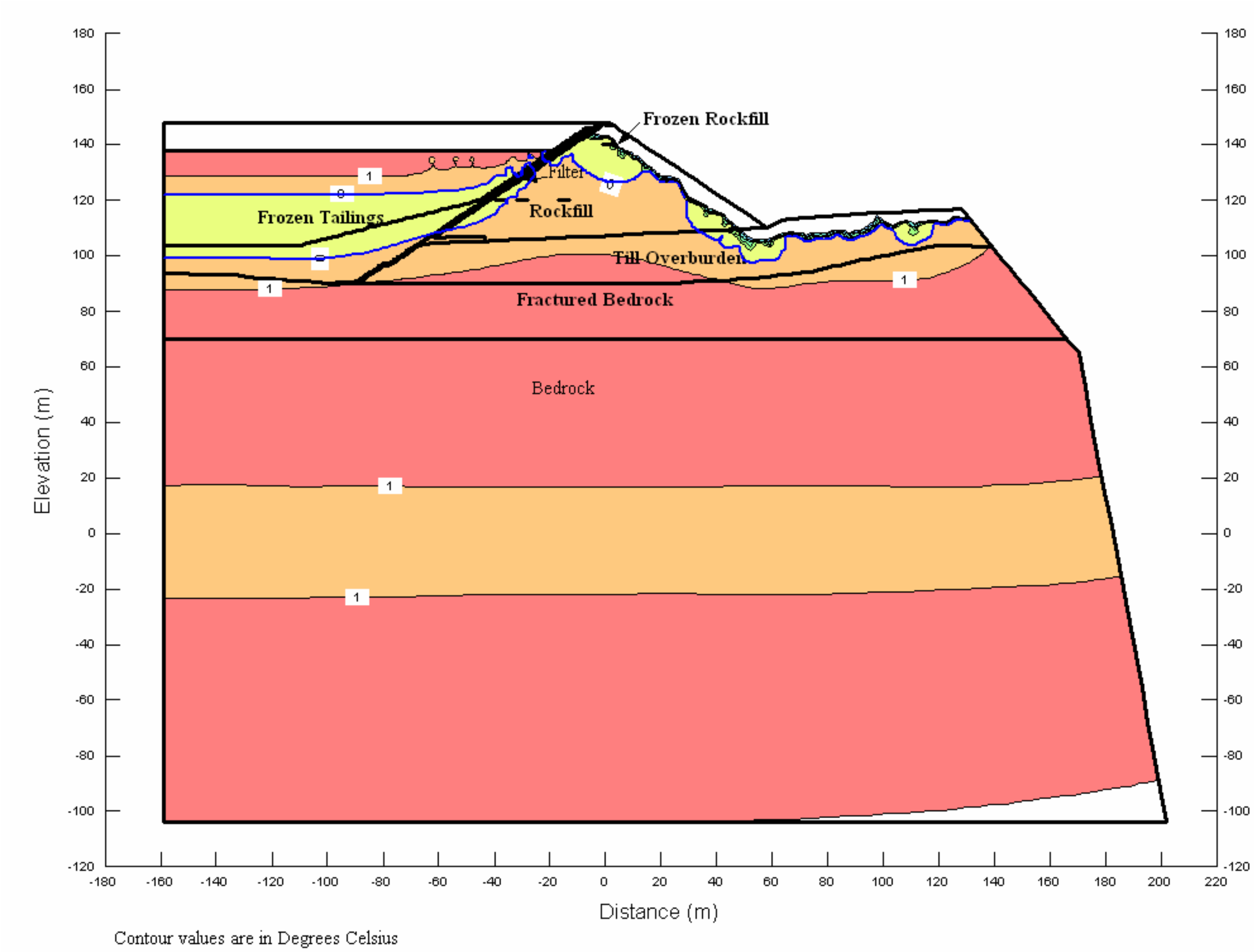


Figure III-18 Variation of temperatures in the Central Dike and tailings after 5 years of operation

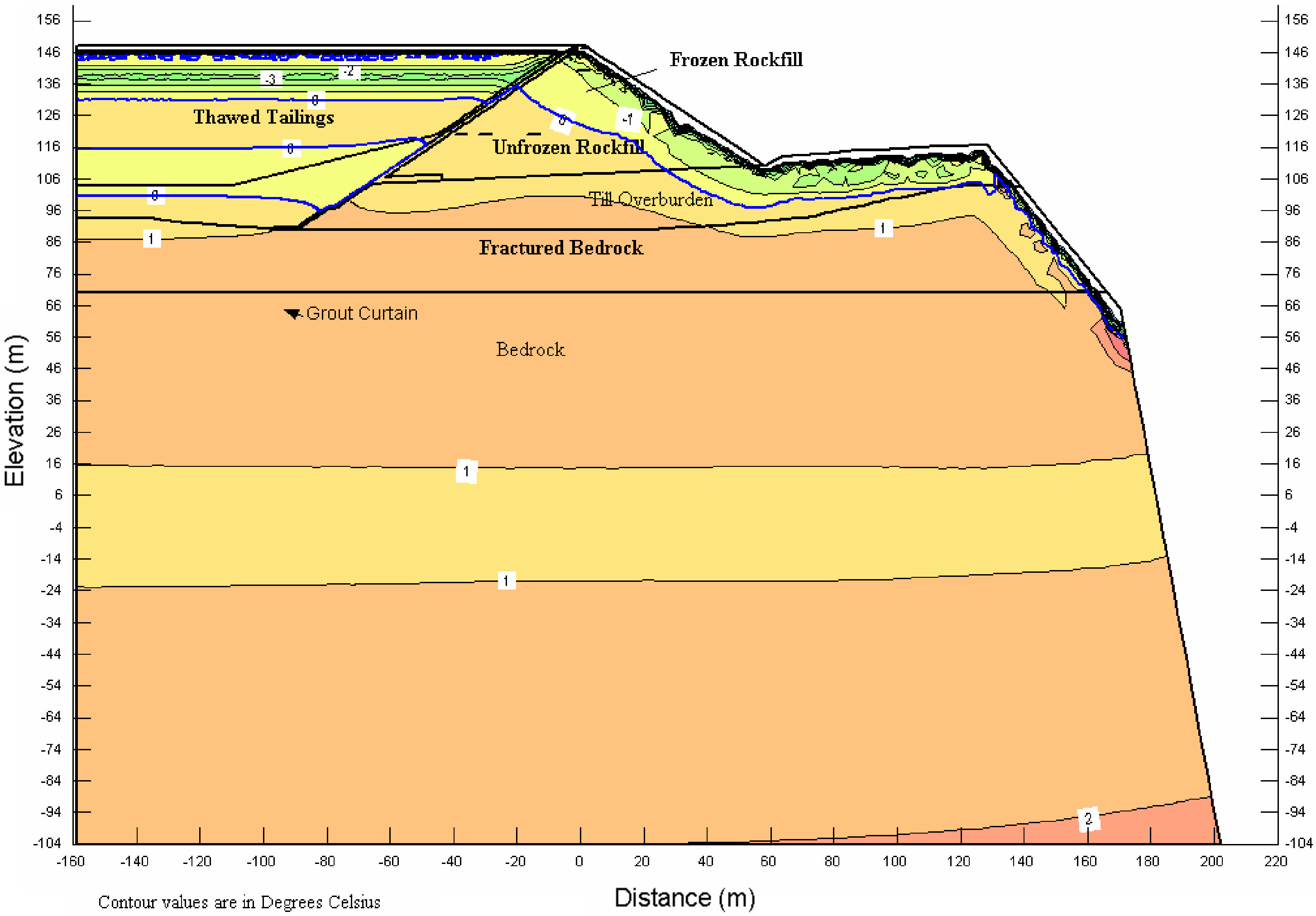


Figure III-19 Variation in temperatures in the Central Dike and tailings 1 year after closure. The downstream face is still dry

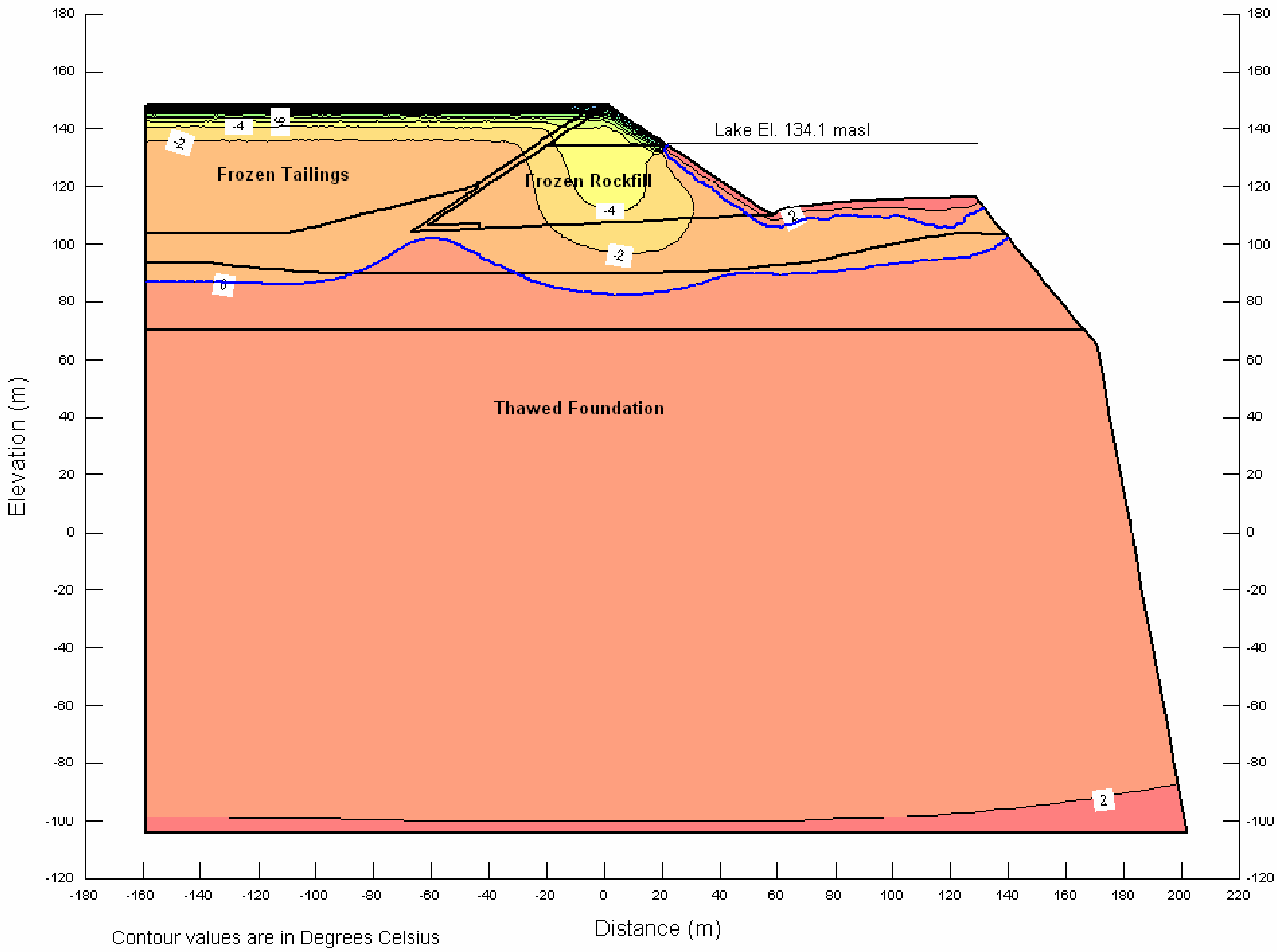


Figure III-20 Calculated temperatures at year 10 after downstream flooding

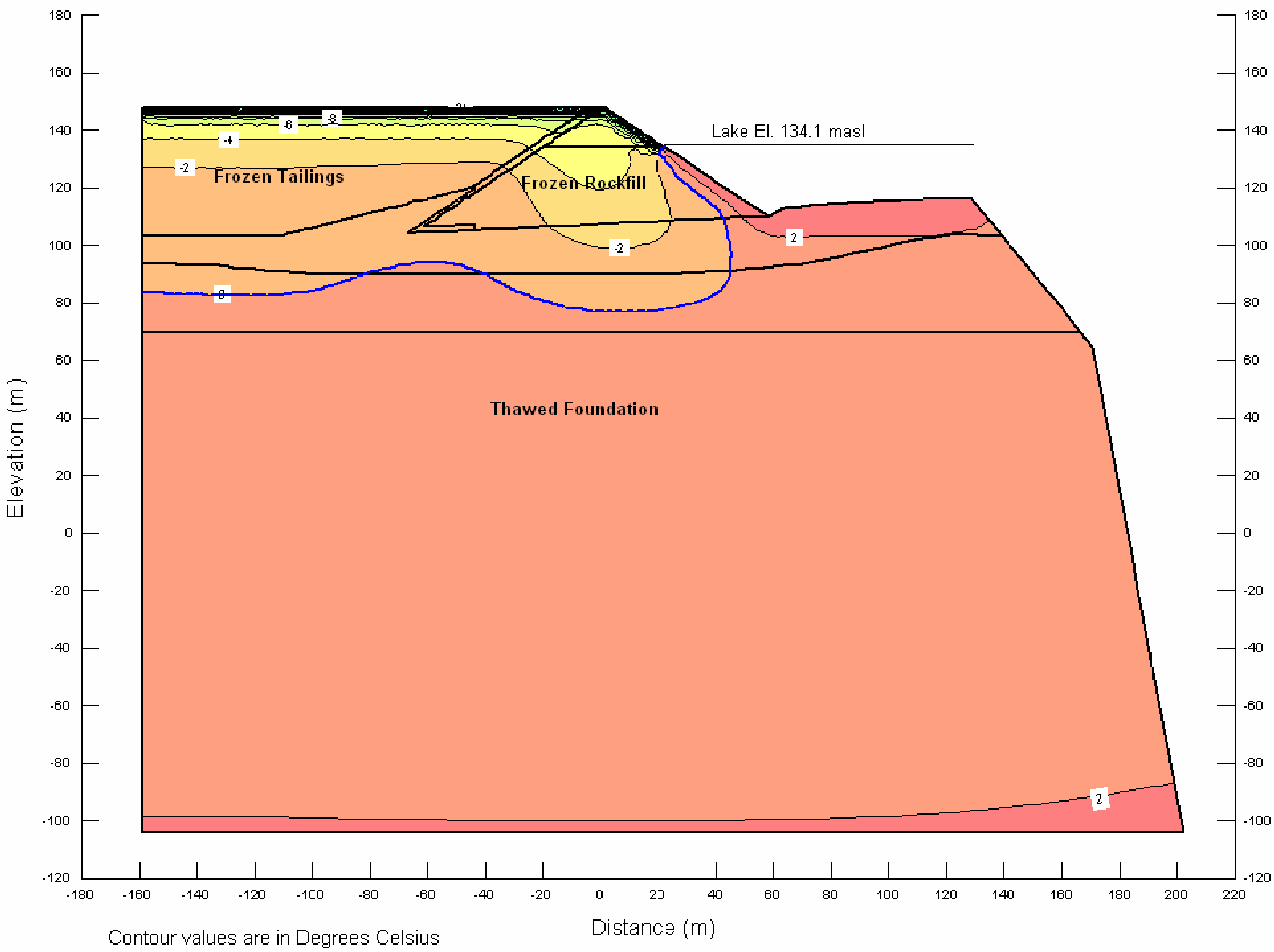


Figure III-21 Calculated temperatures at year 25 after downstream flooding

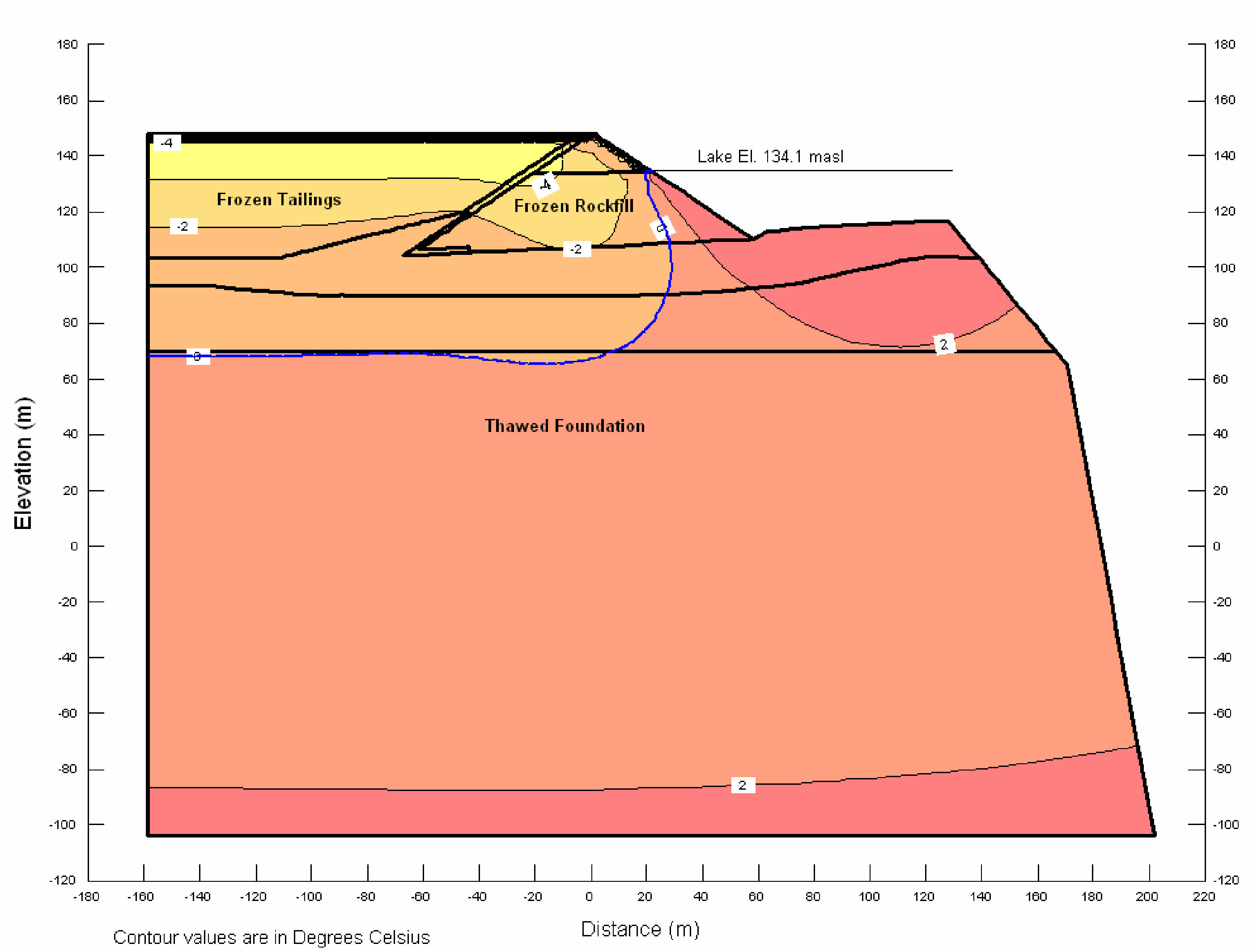


Figure III-22 Calculated temperatures at year 100 after downstream flooding

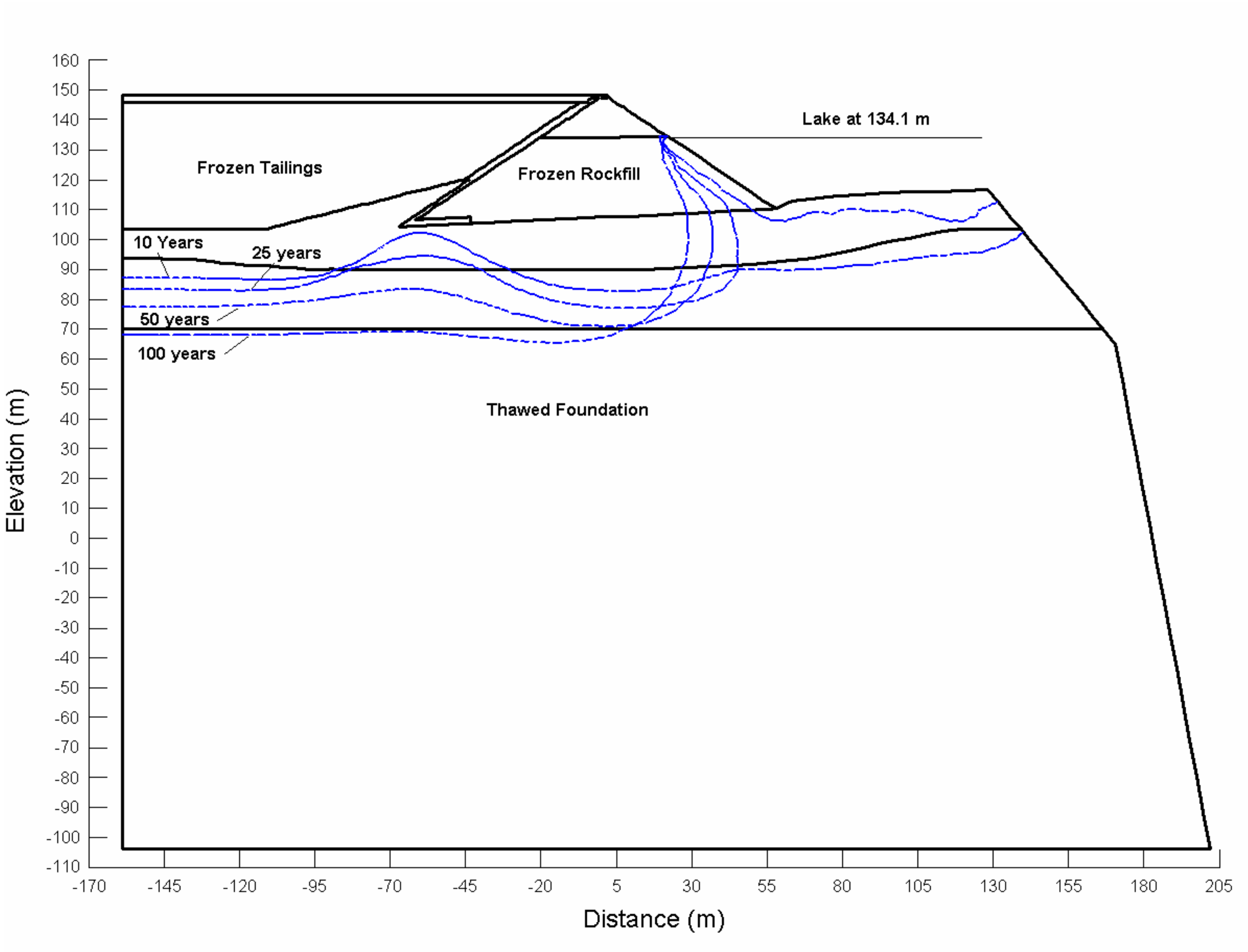


Figure III-23 Deepening of upstream frozen portion with time

5.0 CONCLUSIONS

Thermal analyses were carried out to evaluate the patterns of temperatures that are likely to develop within the tailings, Central Dike and foundation materials during operations and post closure phase at the Meadowbank Gold Project. The model was divided into two components: Tailings Model and Central Dike Model.

A sequential 1D model was developed based on the tailings depositional plan Appendix IV, and considered different scenarios with respect to the time tailings were exposed to ambient air temperatures between subsequent depositions from the same spigot. The best-case scenario considered tailings being exposed to ambient air temperatures during all the spigots inactive time. The worst-case scenario assumed that tailings would be exposed only for 25% of the spigot inactive time. An intermediate scenario considered tailings exposed for 50% of the spigot inactive time.

The models indicate that at the end of operations, the tailings would be completely frozen only for the best-case scenario. For the other two scenarios, there would be thawed zones in the tailings at end of operations. Long-term analyses indicated however, that the entire tailings body will freeze no later than 10 years after the end of operations, irrespective of the scenario evaluated. The rockfill cap placed on top of tailings works as an insulation media and prevents the active layer from reaching the tailings body.

The 2-D Central Dike model considered a typical section of the Central Dike, with tailings deposited in the upstream area. The model indicated that the upper part of the dike will be frozen at end of operations, but this zone will thaw once the lake returns to the downstream portion of the area. The long-term analysis indicated that the lake will influence the temperatures downstream of the Central Dike, and tailings will govern the temperatures pattern in the upstream portion. The tailings and foundation will remain frozen in the long-term irrespective of the presence of the lake.

The long-term analysis showed that foundation beneath the tailings will freeze progressively with time, and the frozen zone will range from 30 to 50 m beneath the bottom of the tailings. The models also indicated that the effect of global warming will not be sufficient to prevent freezing beneath the tailings or Central Dike during the 100 years period analyzed.

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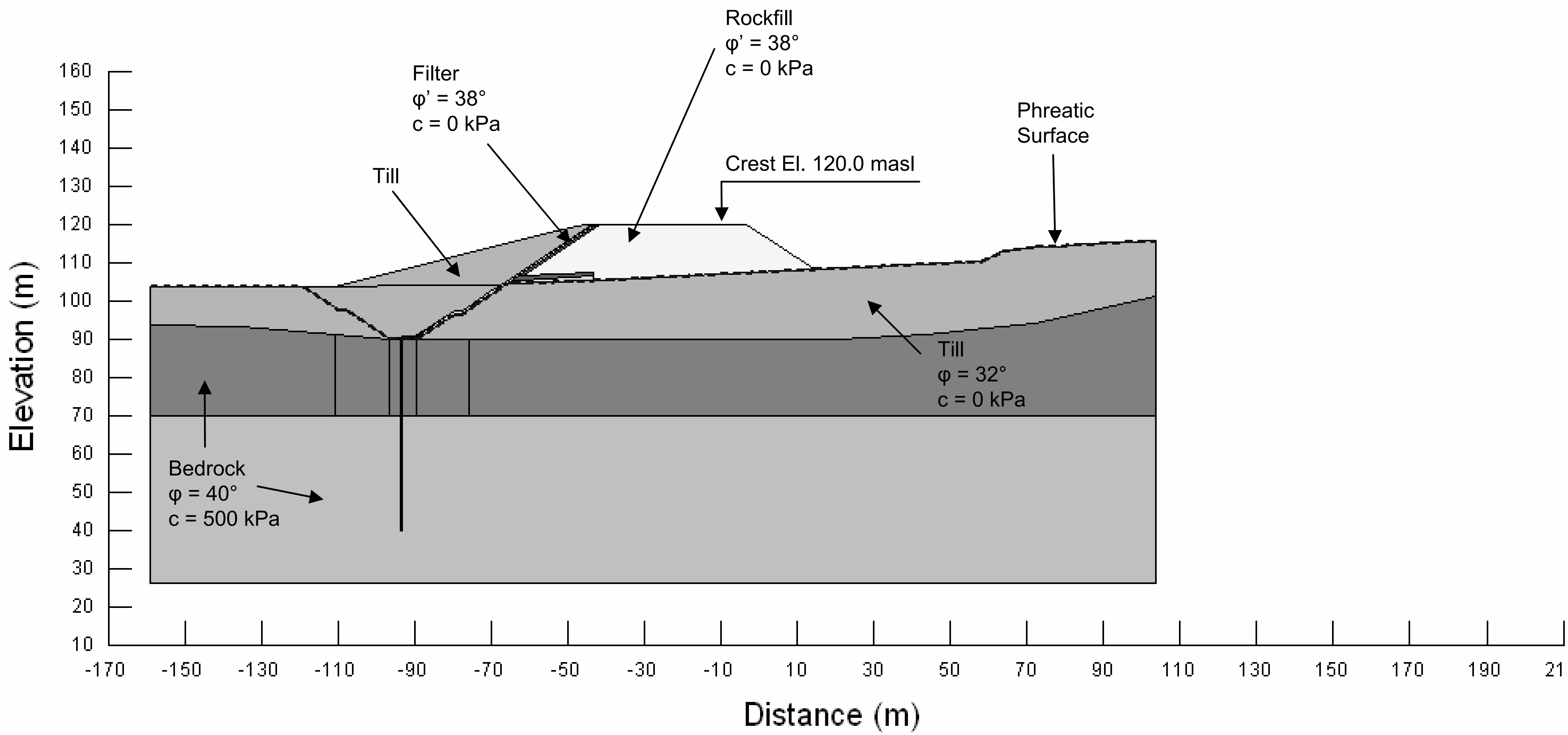

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Figure III-24
Central Dike, Stage 1
Stability Analysis

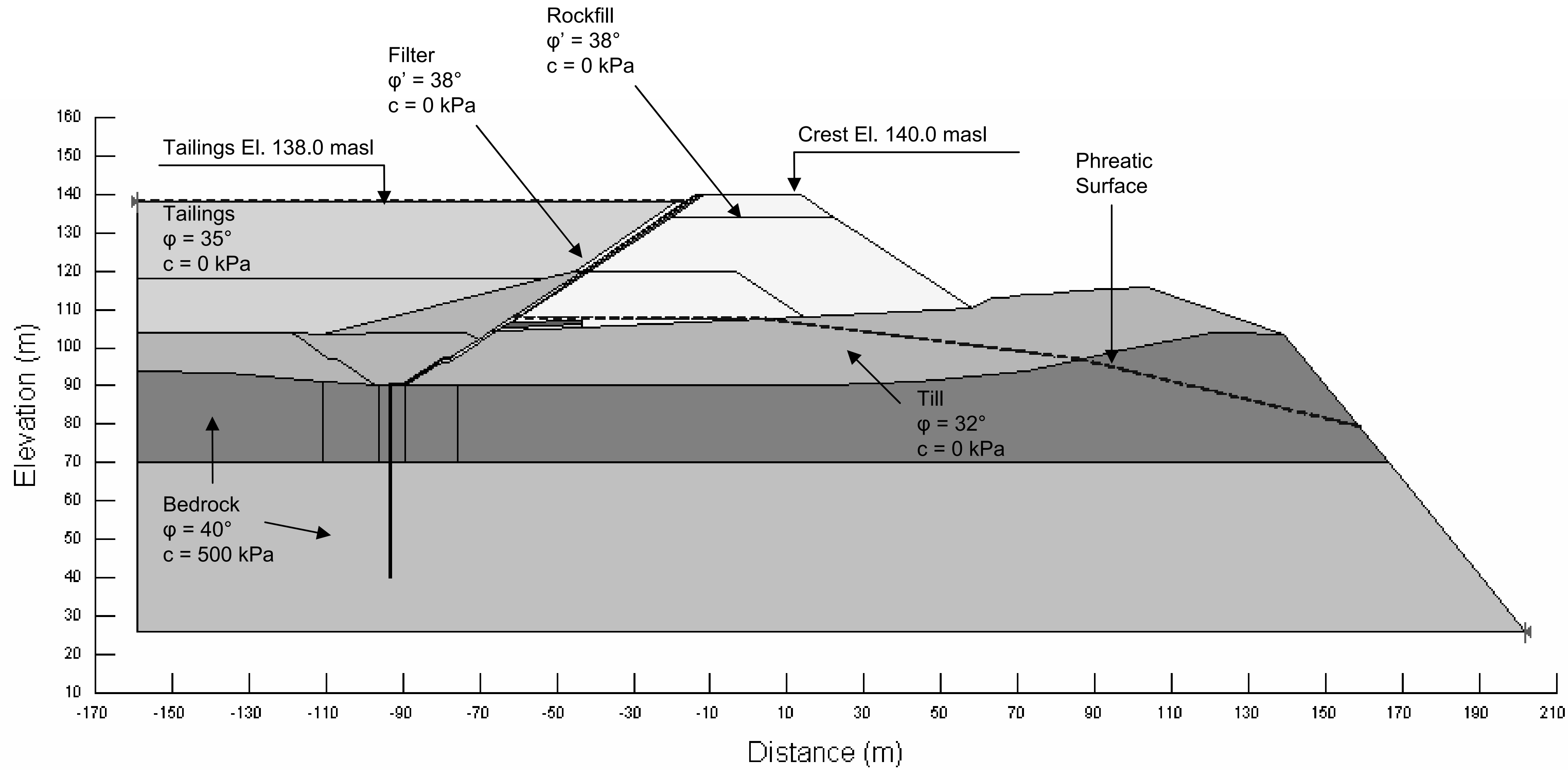

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Figure III-25
Central Dike, Stage 2
Stability Analysis

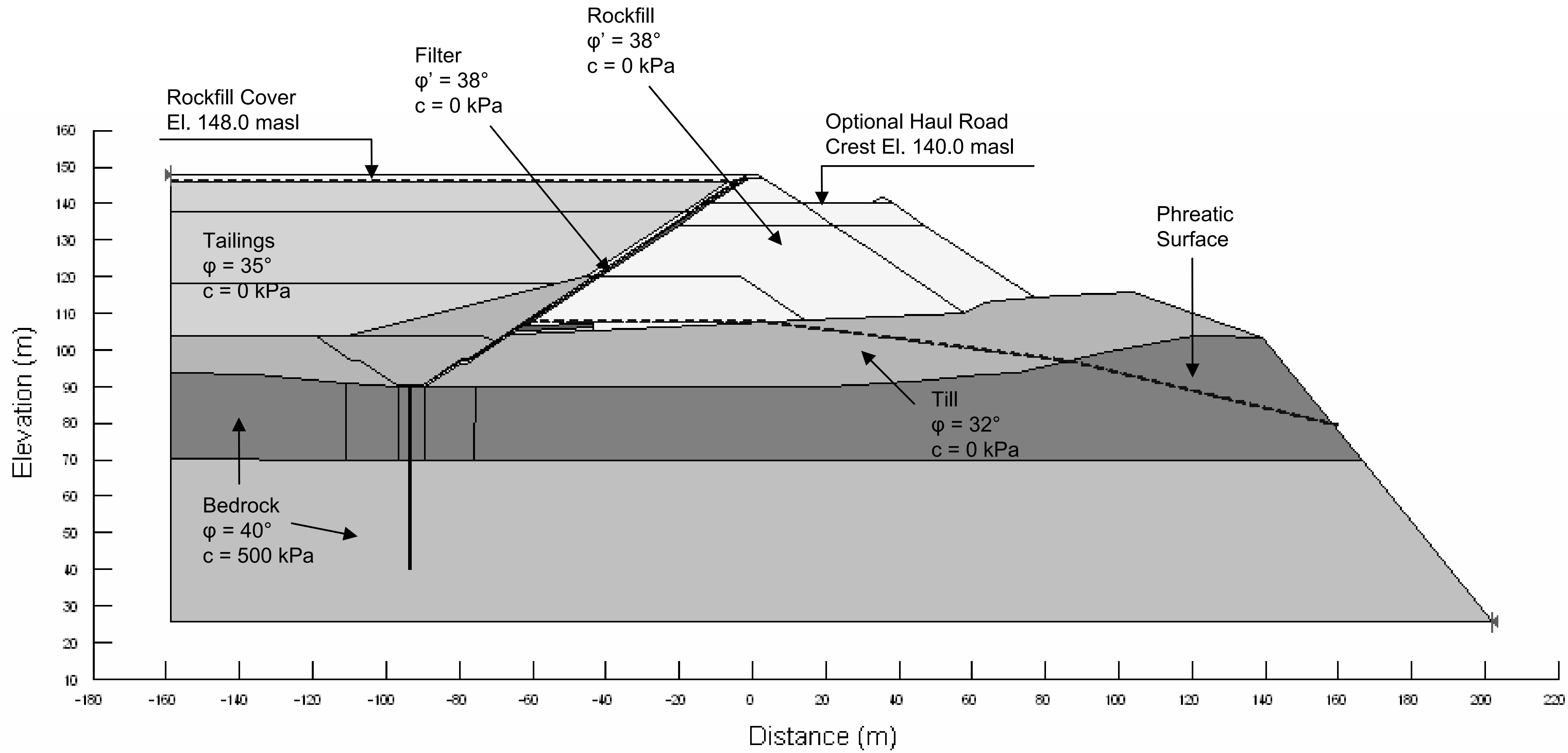

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Figure III-26
Central Dike, Stage 3
Stability Analysis

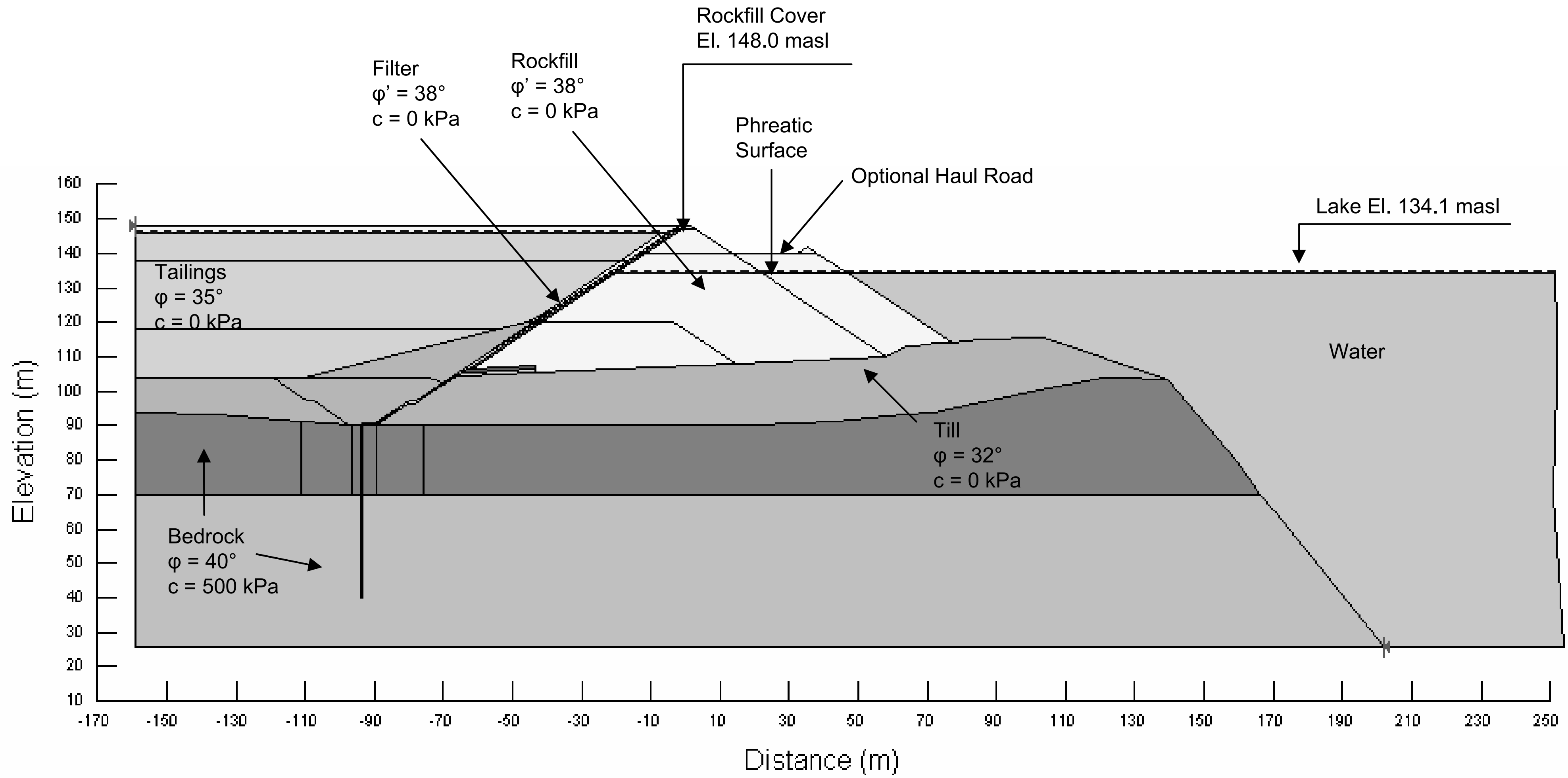

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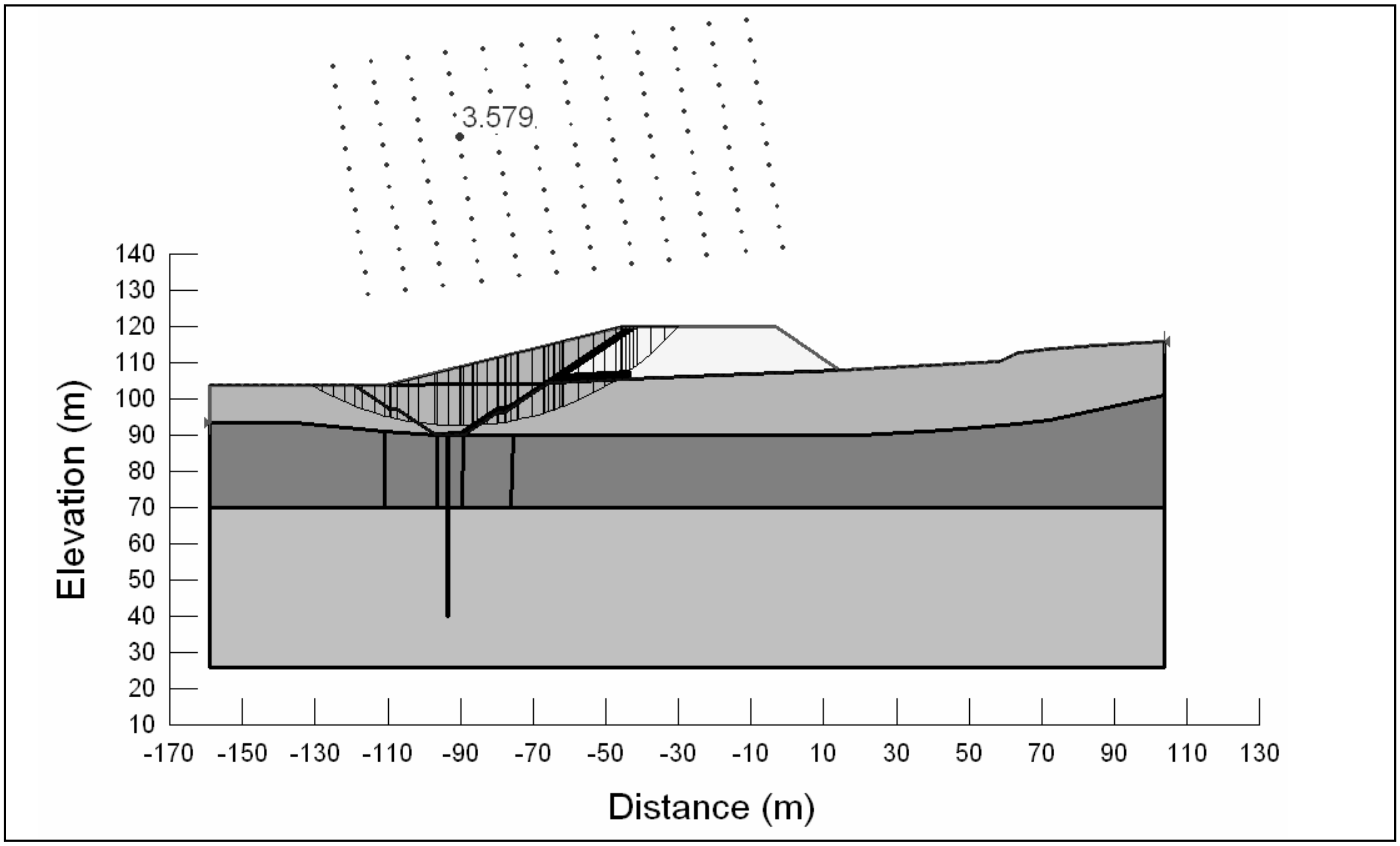
Figure III-27
Central Dike, Closure
Stability Analysis



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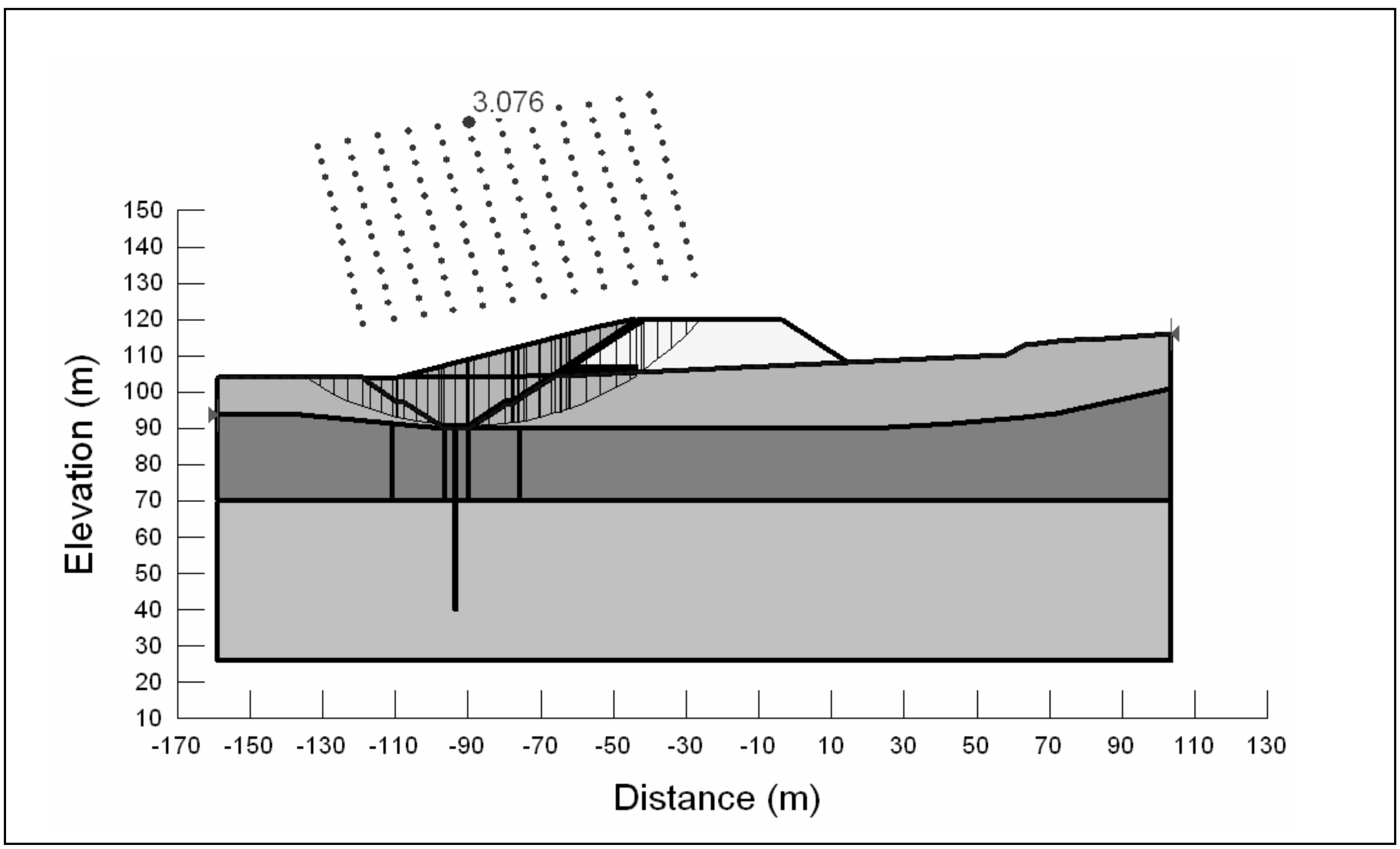

Pseudostatic

Figure III-28
SLOPE/W Analysis
Central Dike, Stage 1
Upstream, Drained

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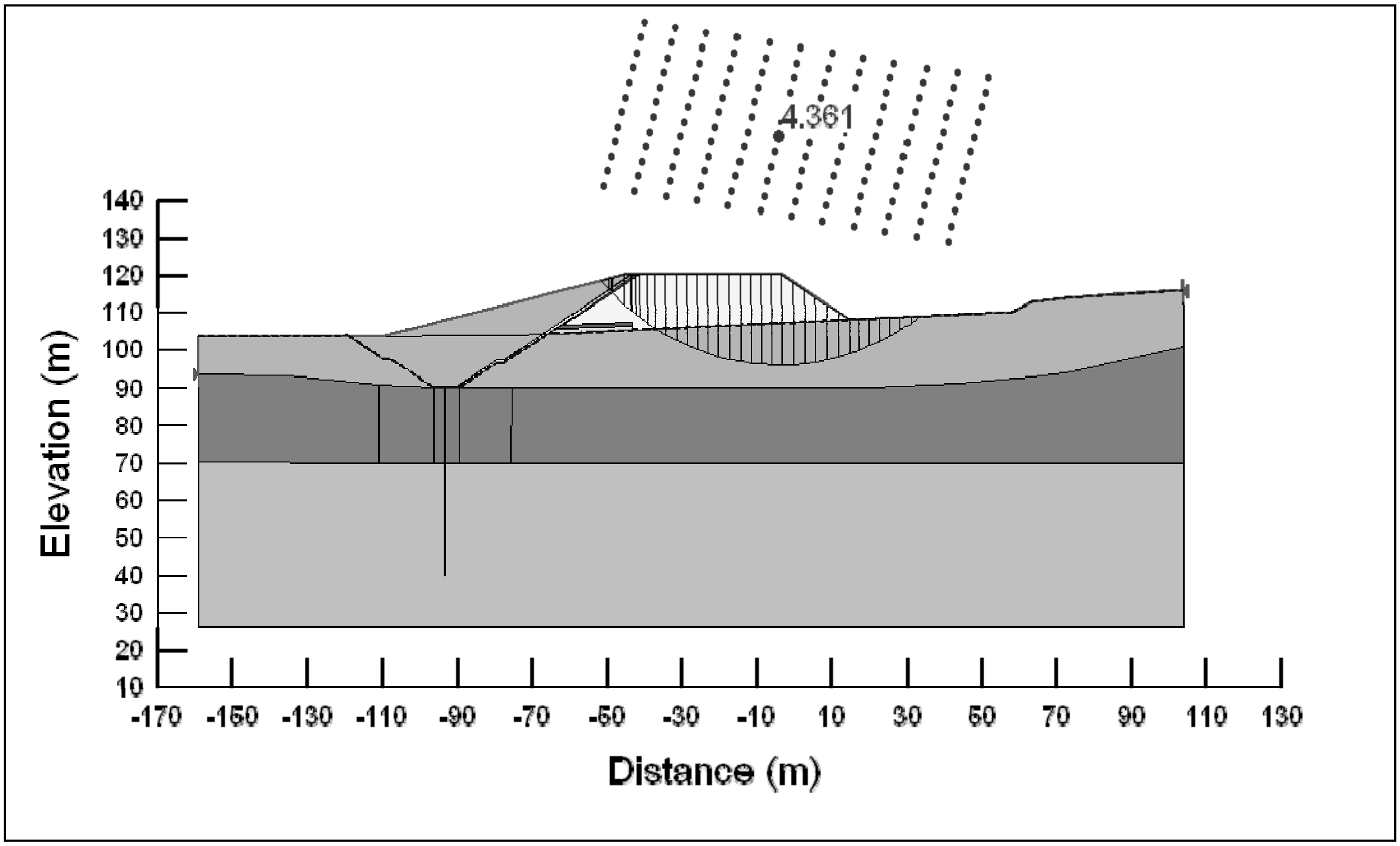

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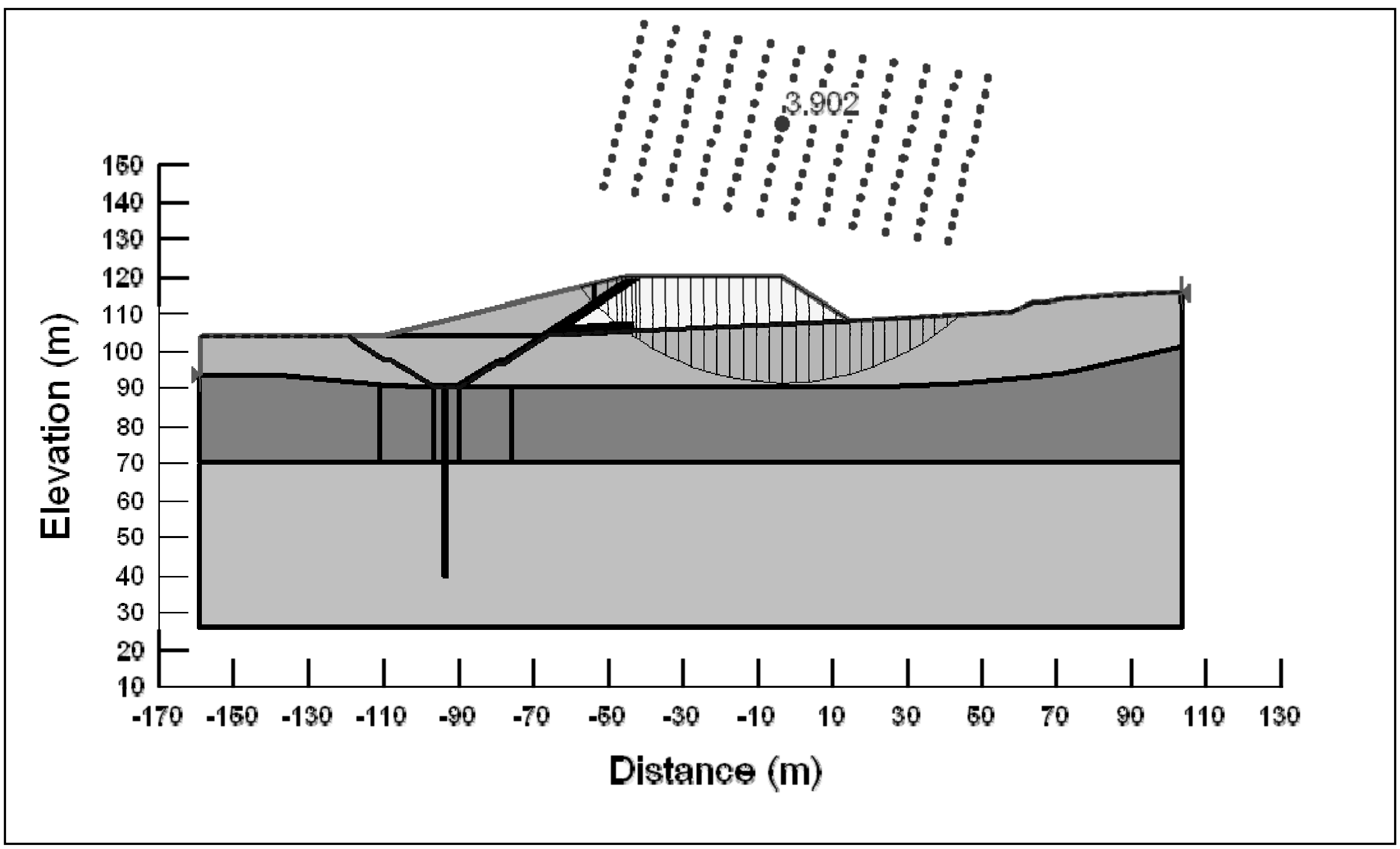

Pseudo Static

Figure III-29
SLOPE/W Analysis
Central Dike, Stage 1
Downstream, Drained

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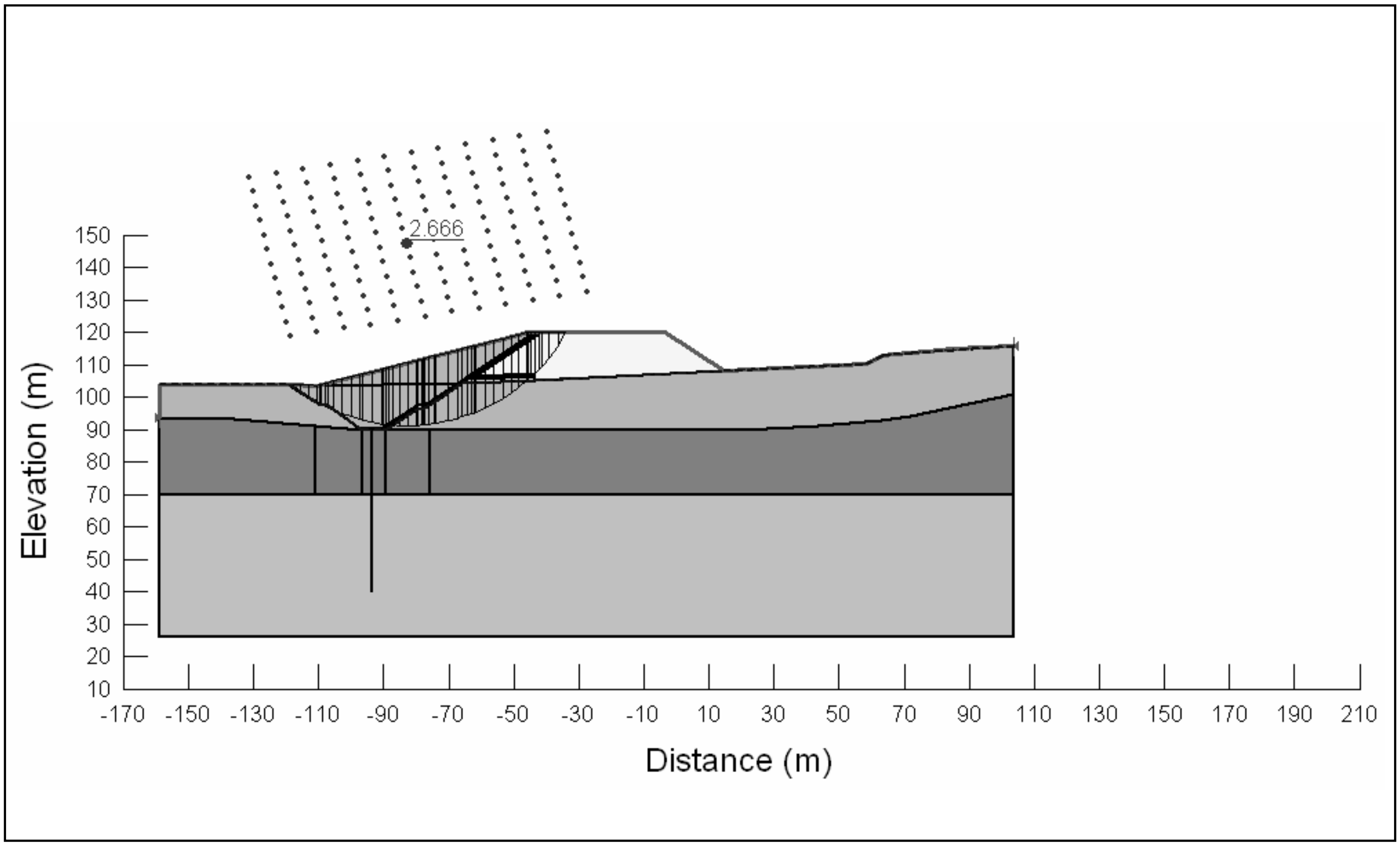
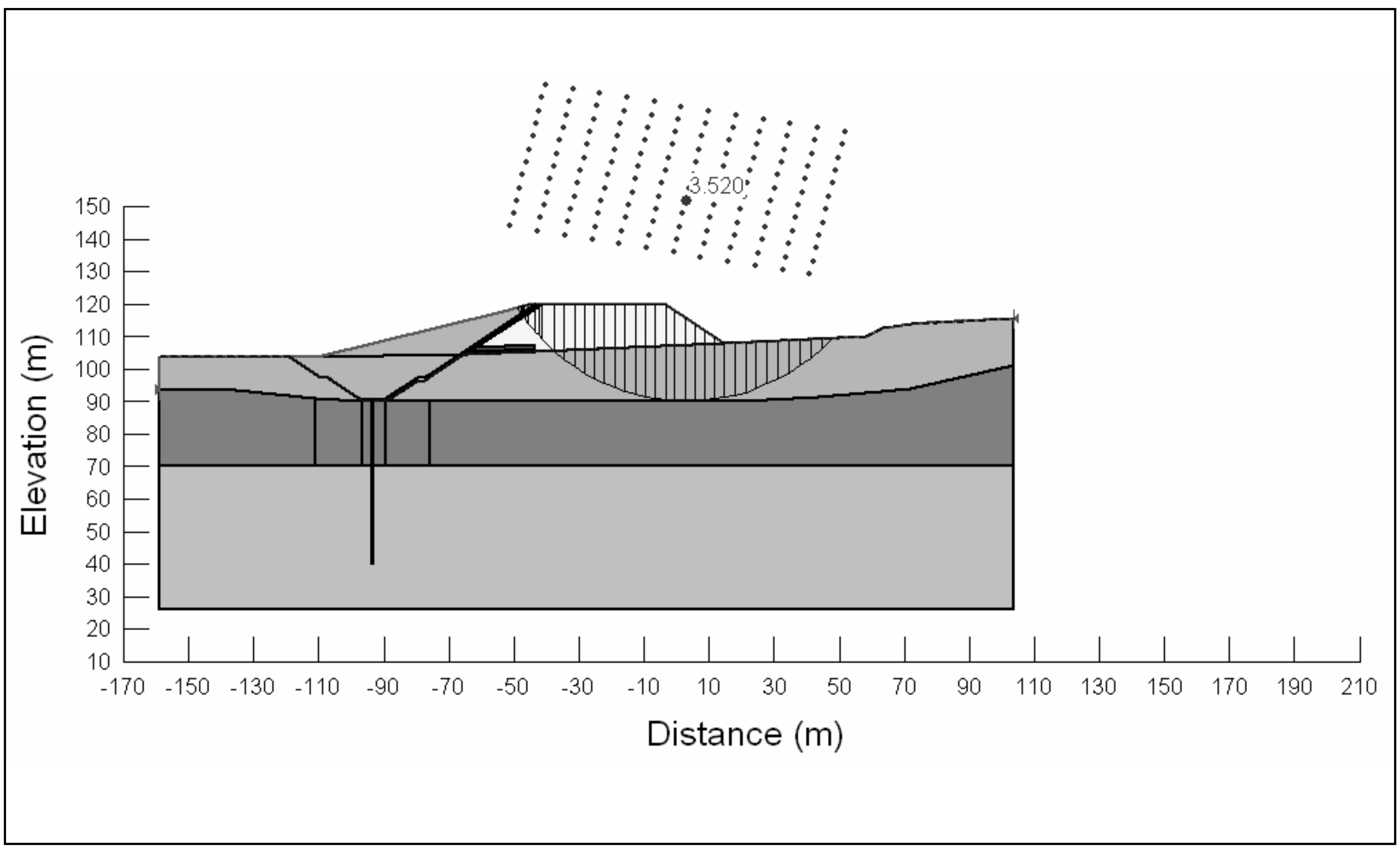


Upstream



Downstream

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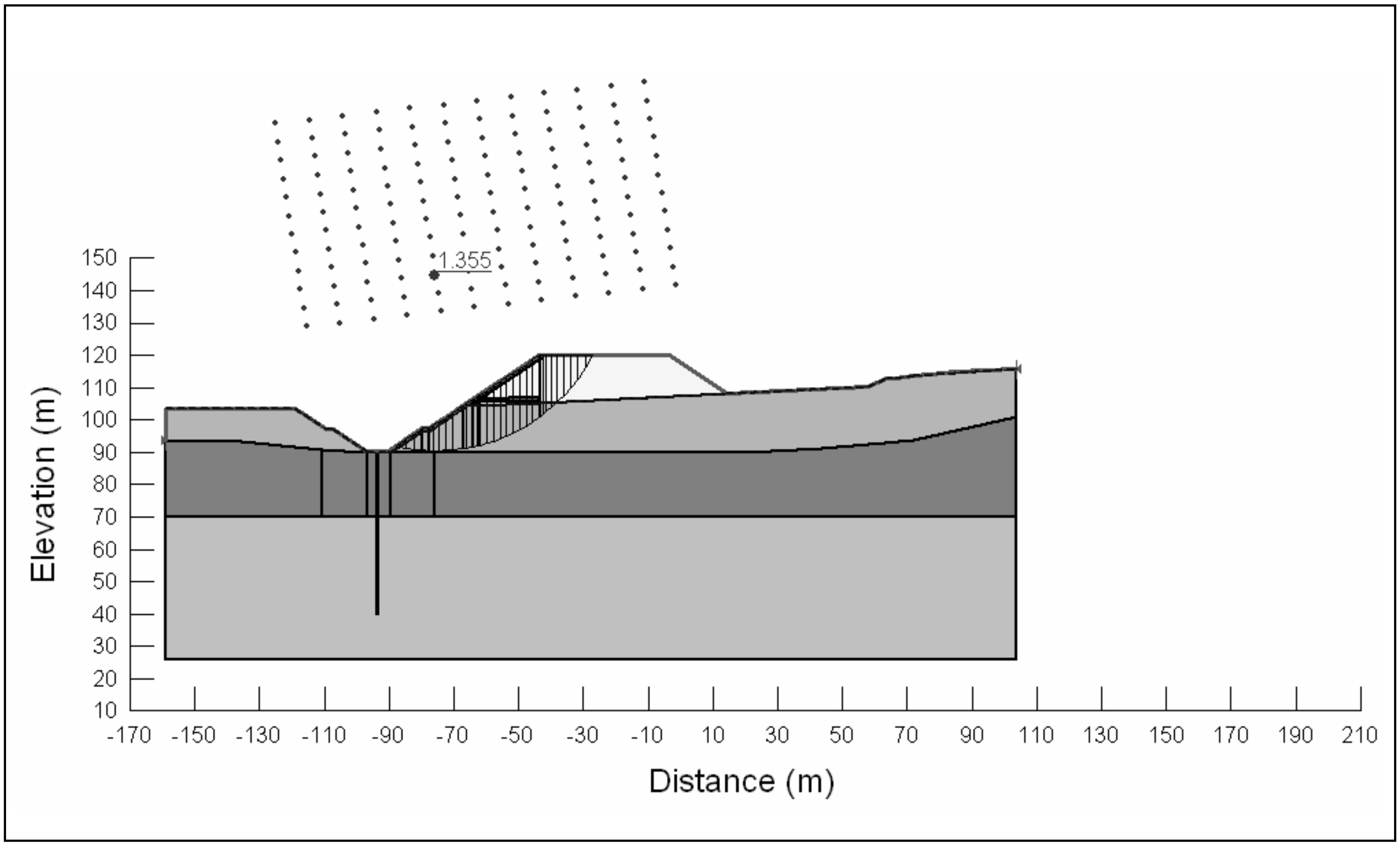
Figure III-30
SLOPE/W Analysis
Central Dike, Stage 1
Static, Till Cohesion = 125 kPa



Upstream

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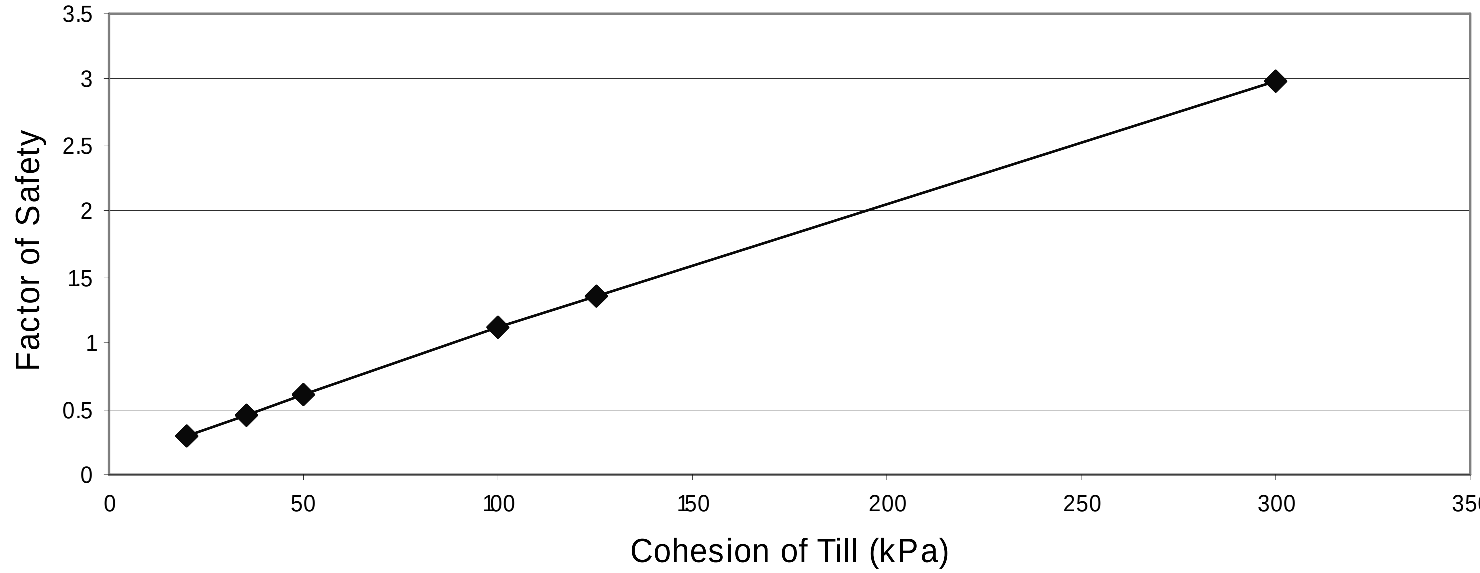
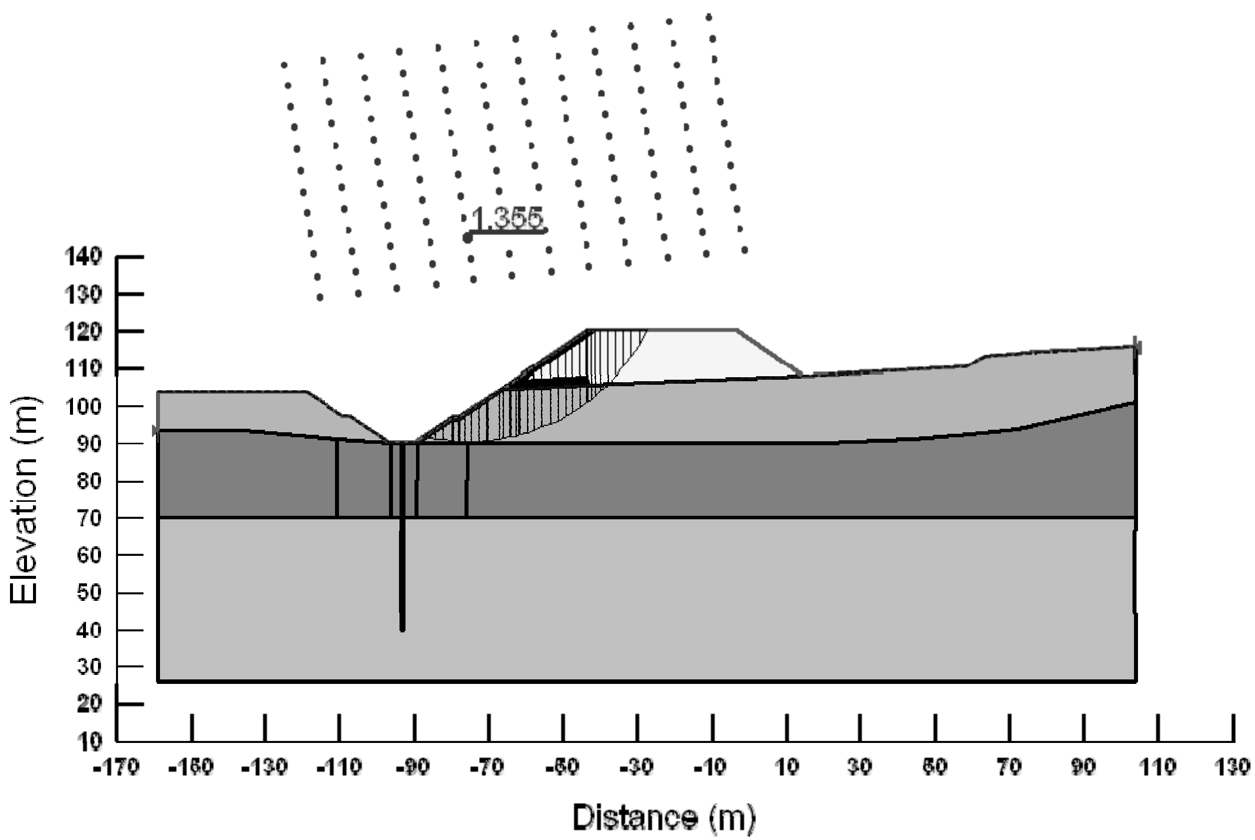
Figure III-31
SLOPE/W Analysis
Central Dike with trench, Stage 1
Undrained Analysis, Till Cohesion = 125 kPa

PROJECT NO. 06-1413-089 DRAWN: KD REVIEWED BY: DATE: 09-03-07 FILE LOCATION: O:\Active_2006\1413\06-1413-089_CumberlandNWB\4000 Tailings Dike Design\Task 6000 Design Report\Report Figures\Final Figures





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Undrained Strength Sensitivity For Till Foundation Stage 1 Trench Construction Meadowbank Gold Project

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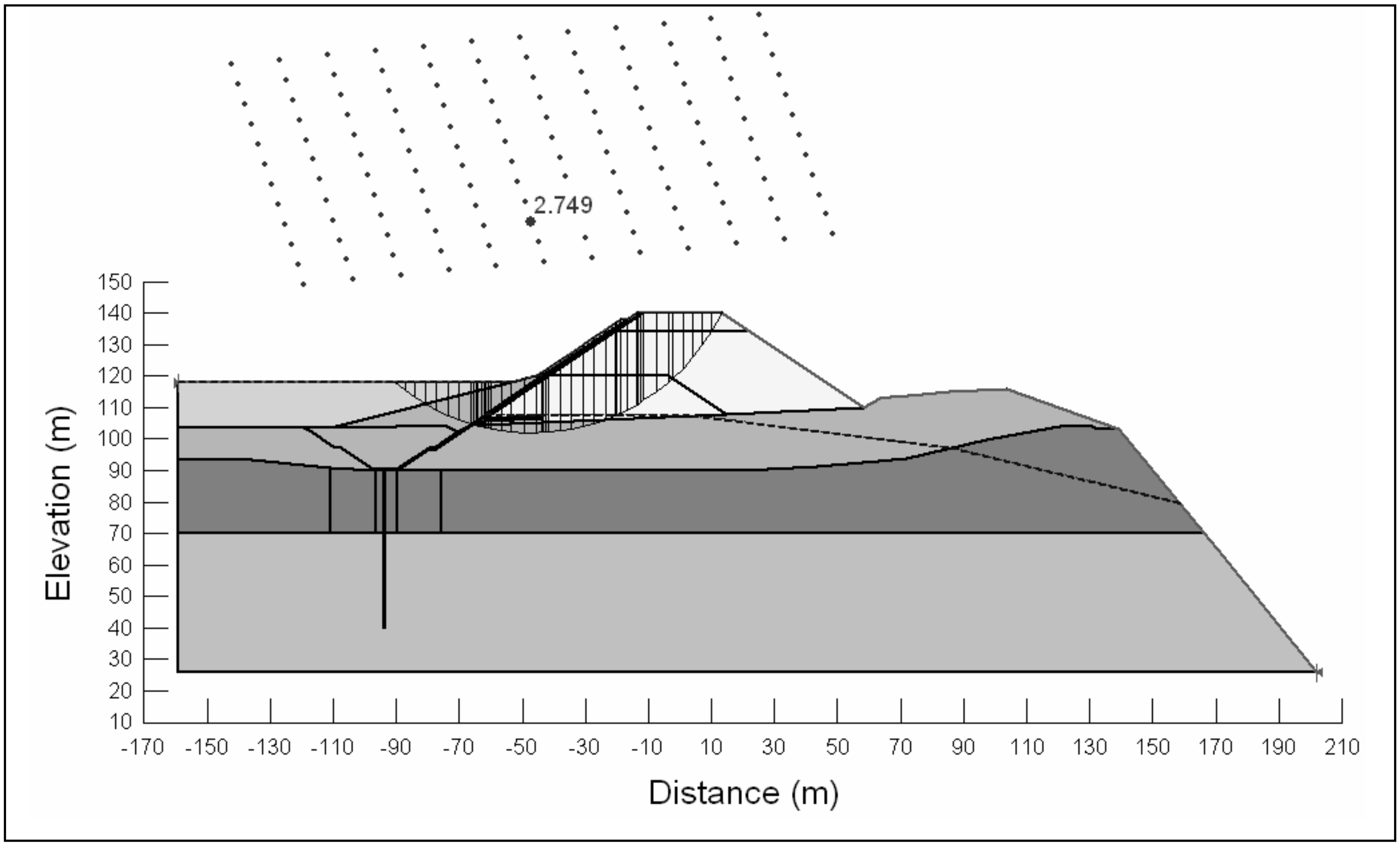

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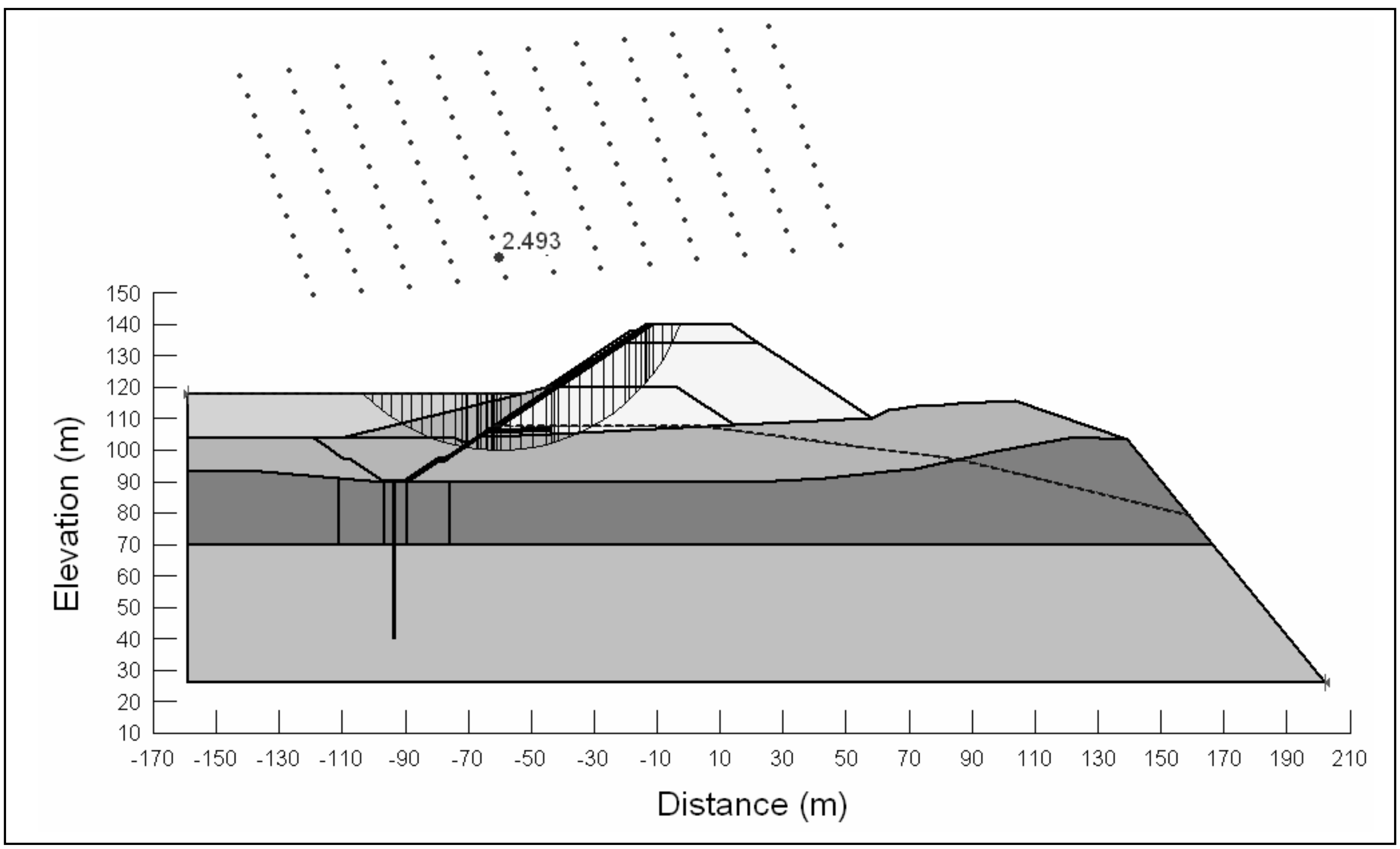
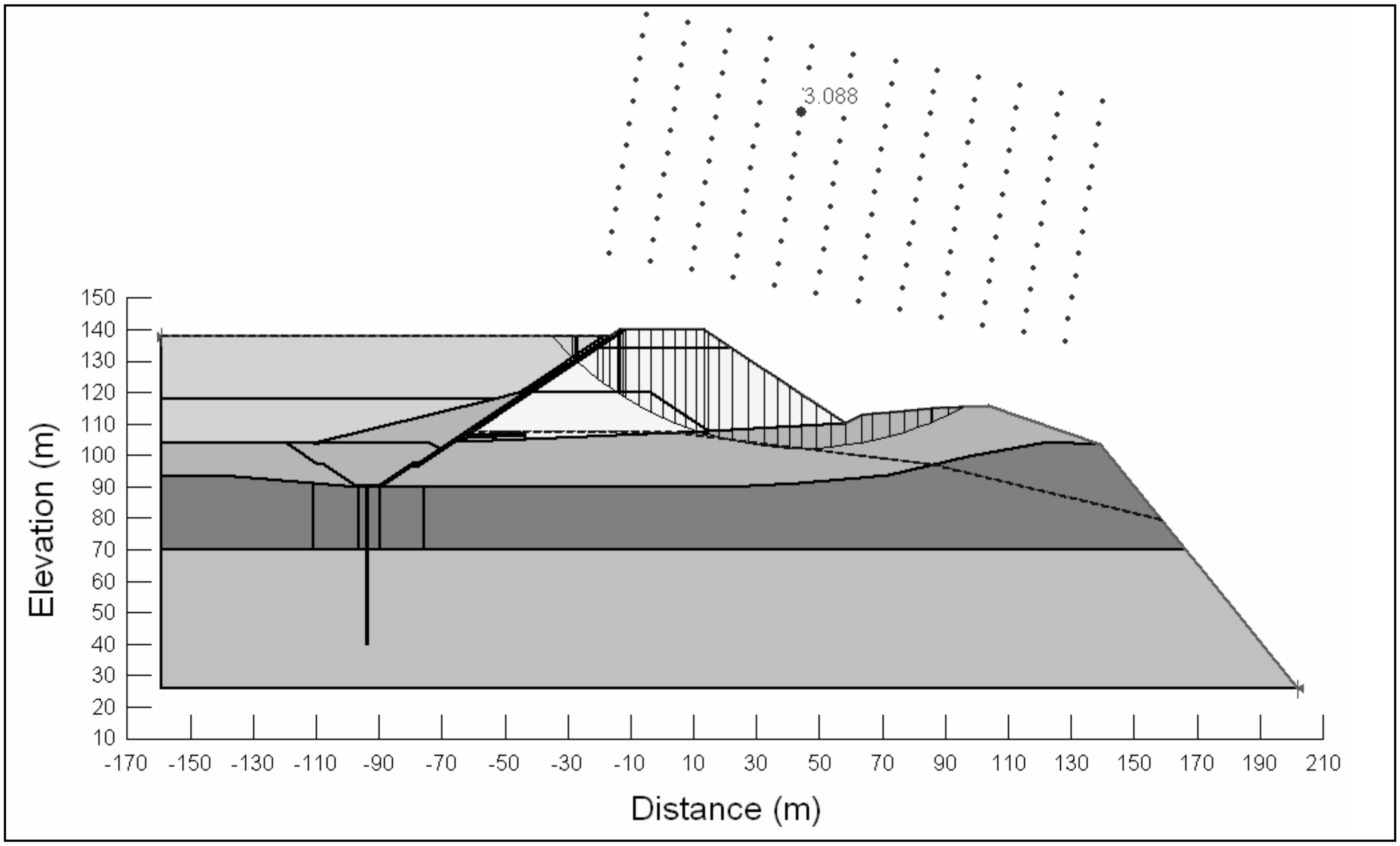


Pseudo-static

Figure III-33
SLOPE/W Analysis
Central Dike, Stage 2
Upstream, Drained



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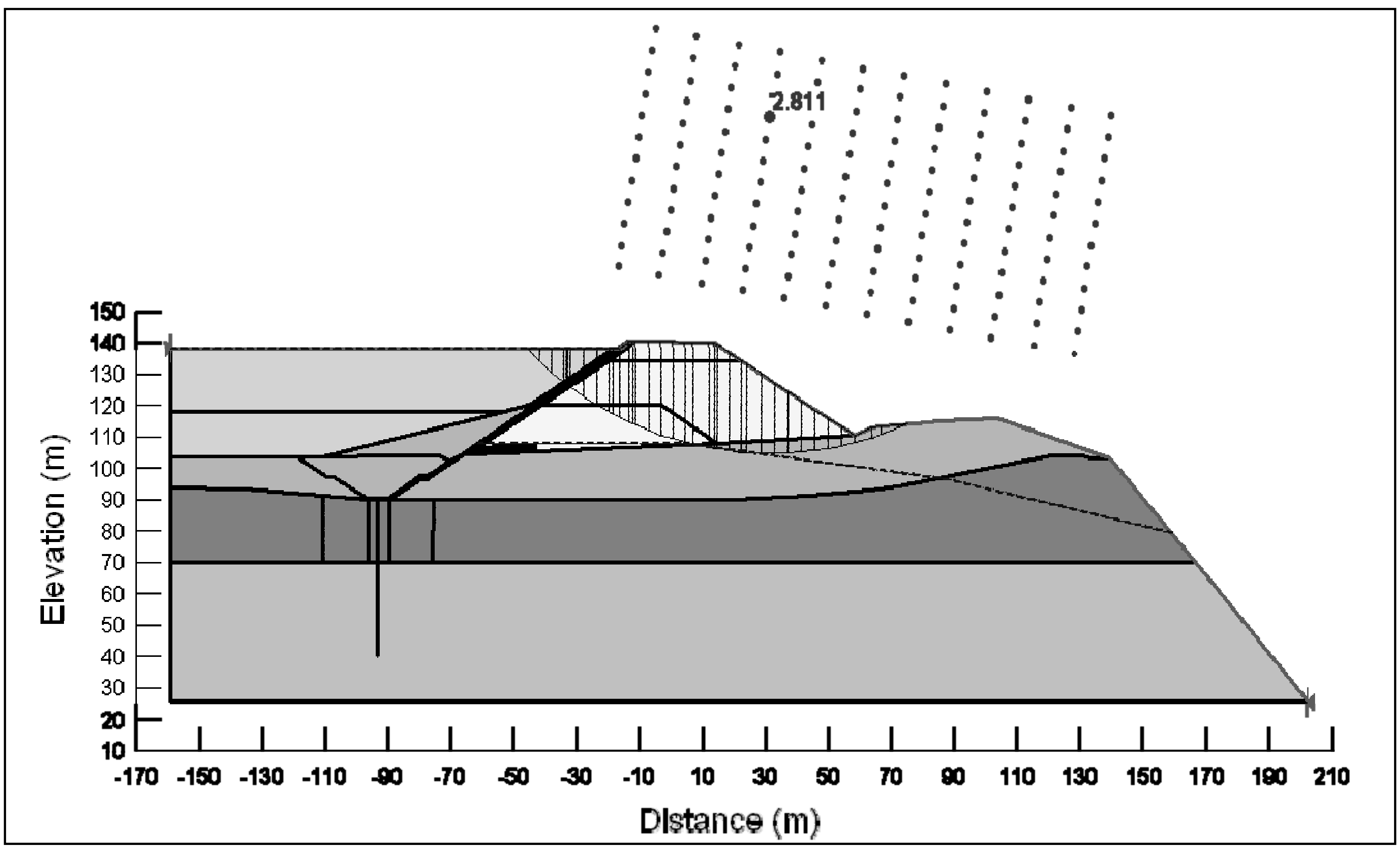

Pseudostatic

Figure III-34
SLOPE/W Analysis
Central Dike, Stage 2
Downstream Drained

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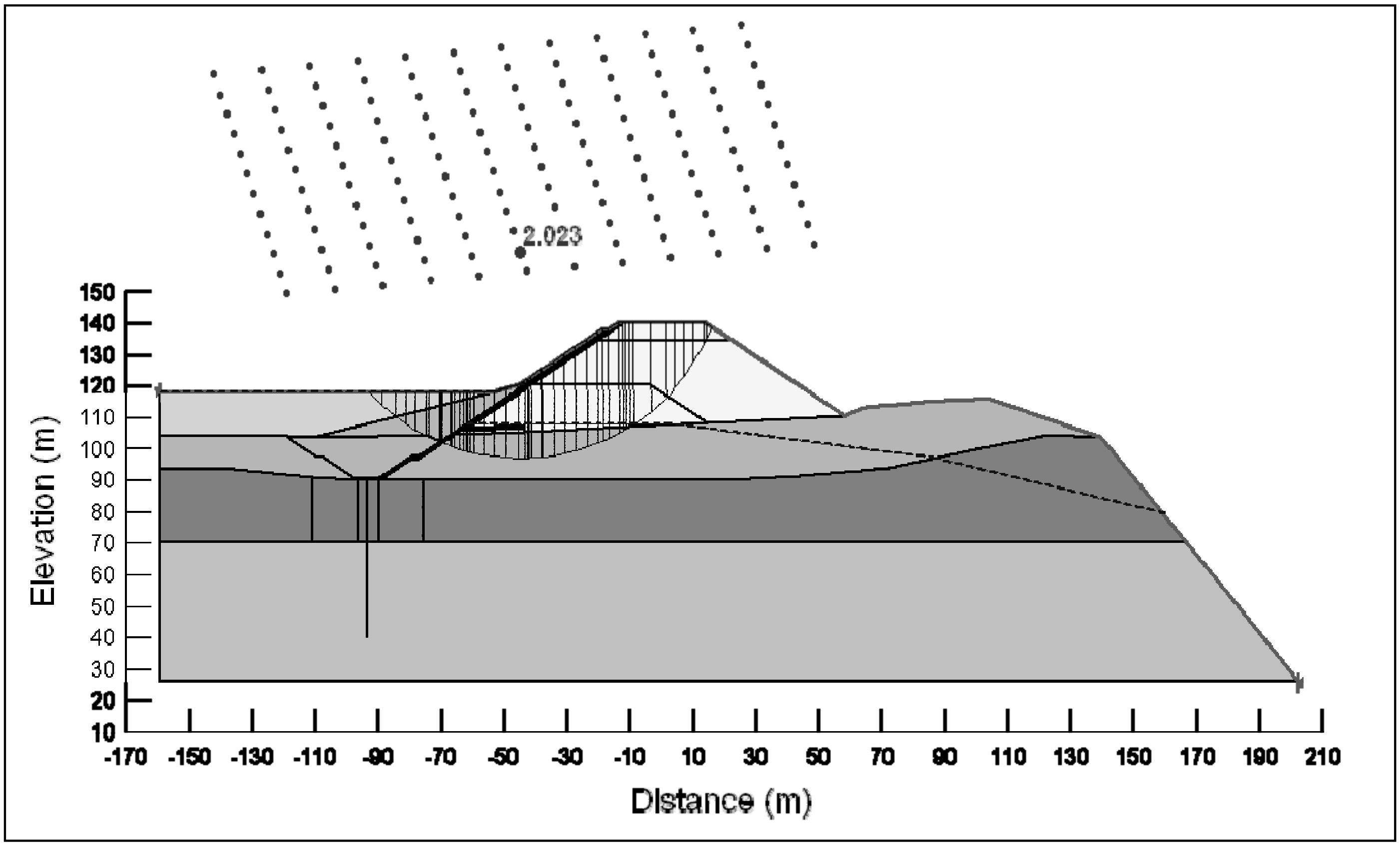
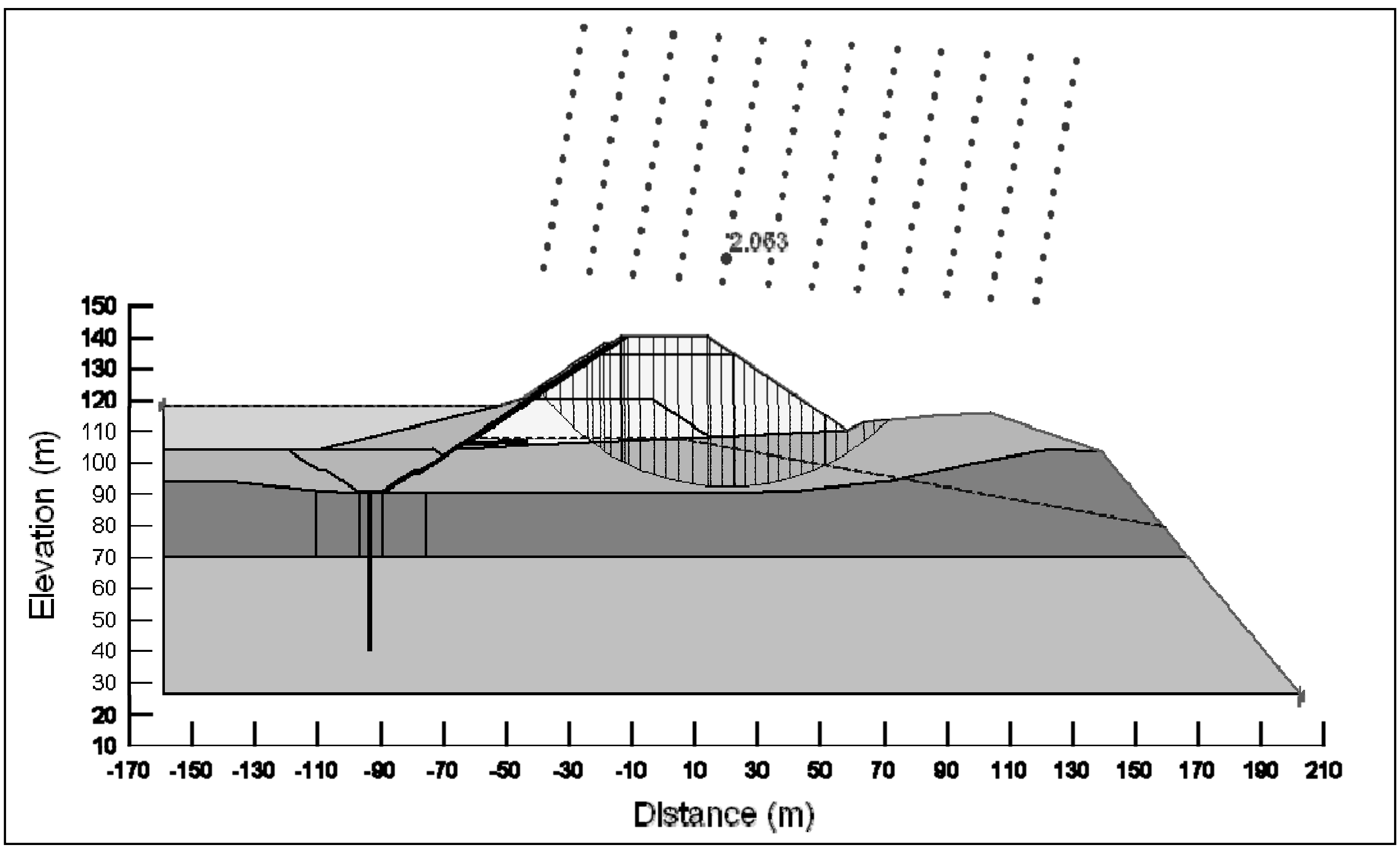


Upstream



Downstream

Figure III-35
SLOPE/W Analysis
Central Dike, Stage 2
Undrained Analysis, Till Cohesion = 125 kPa

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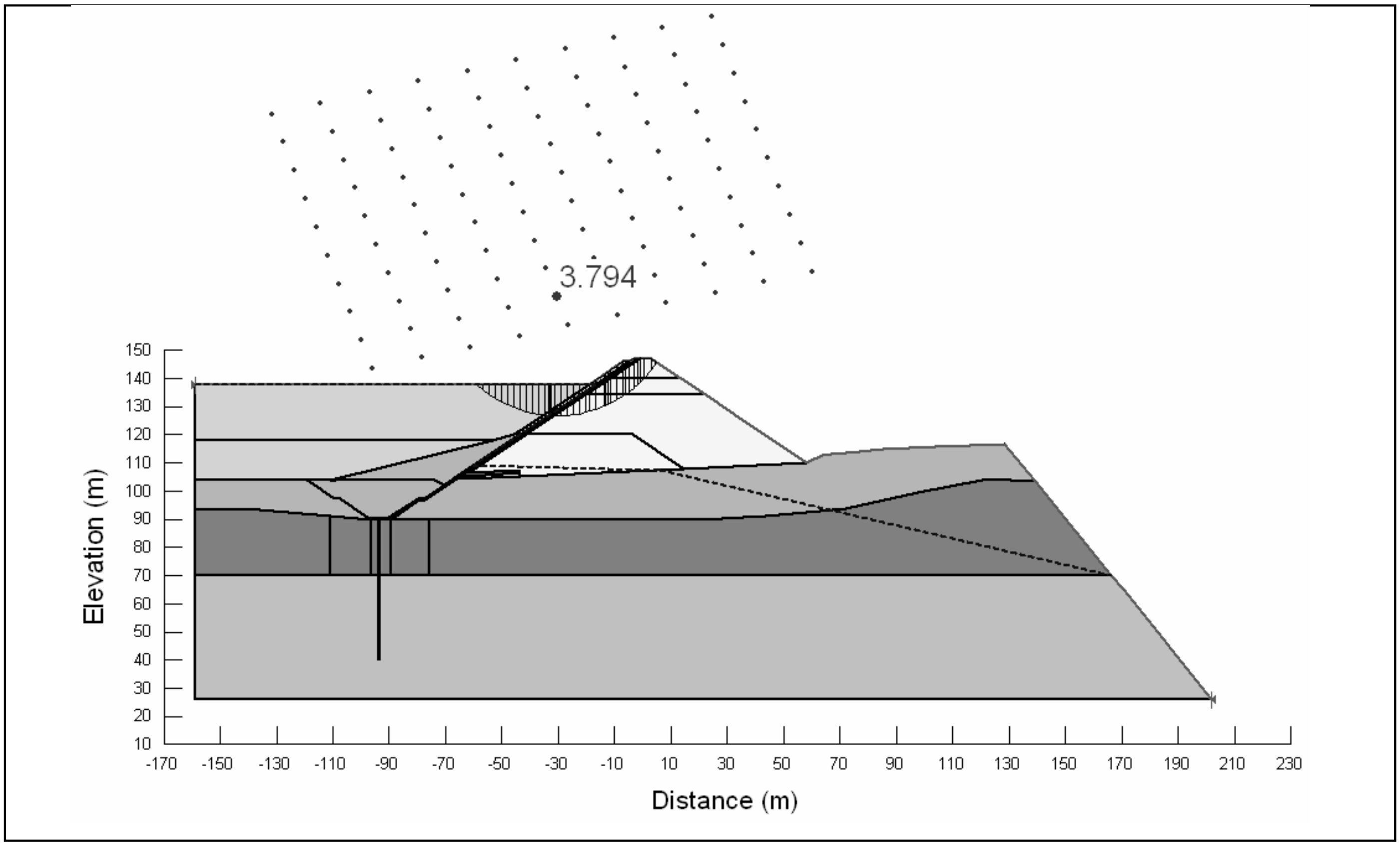

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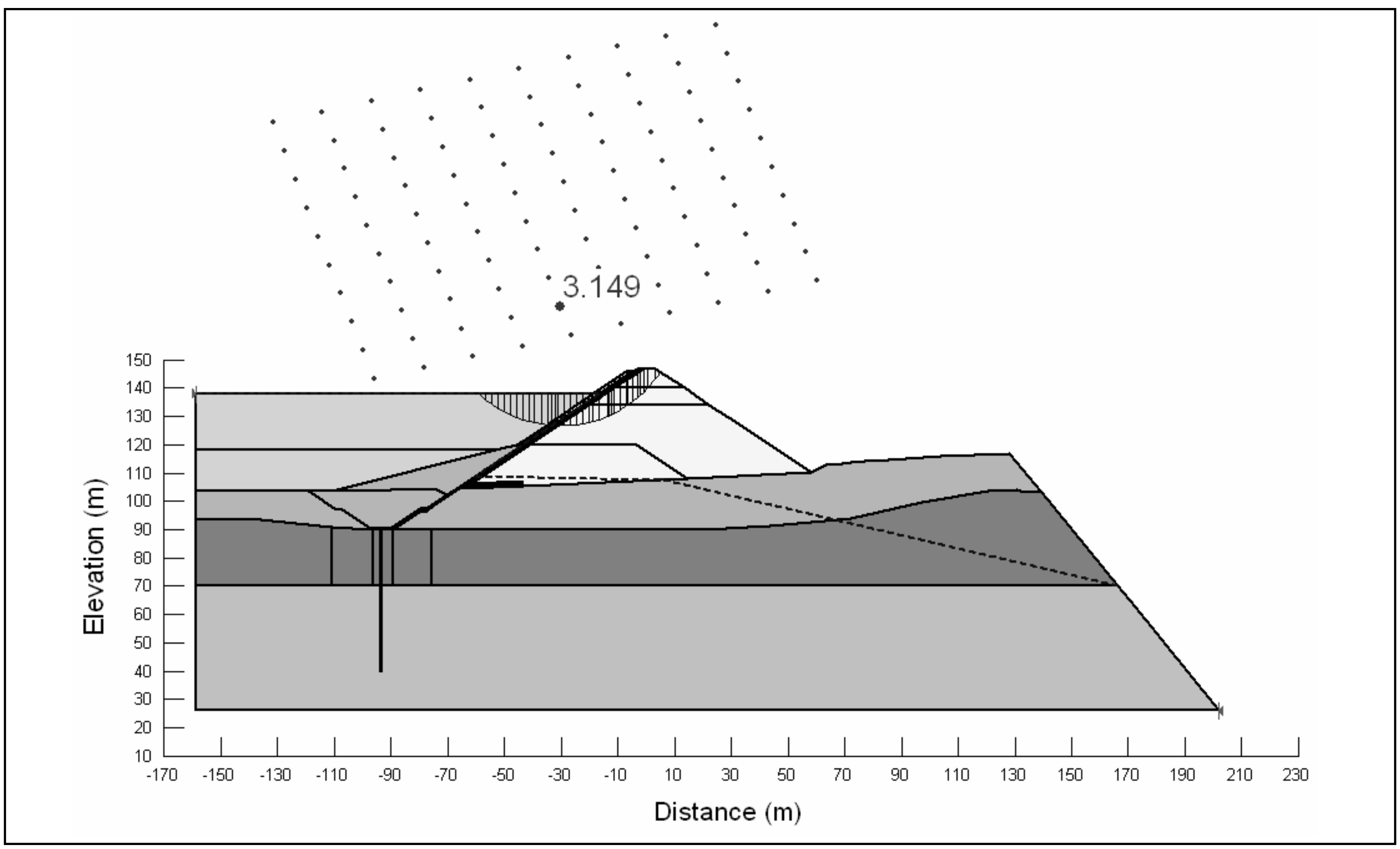

Pseudostatic

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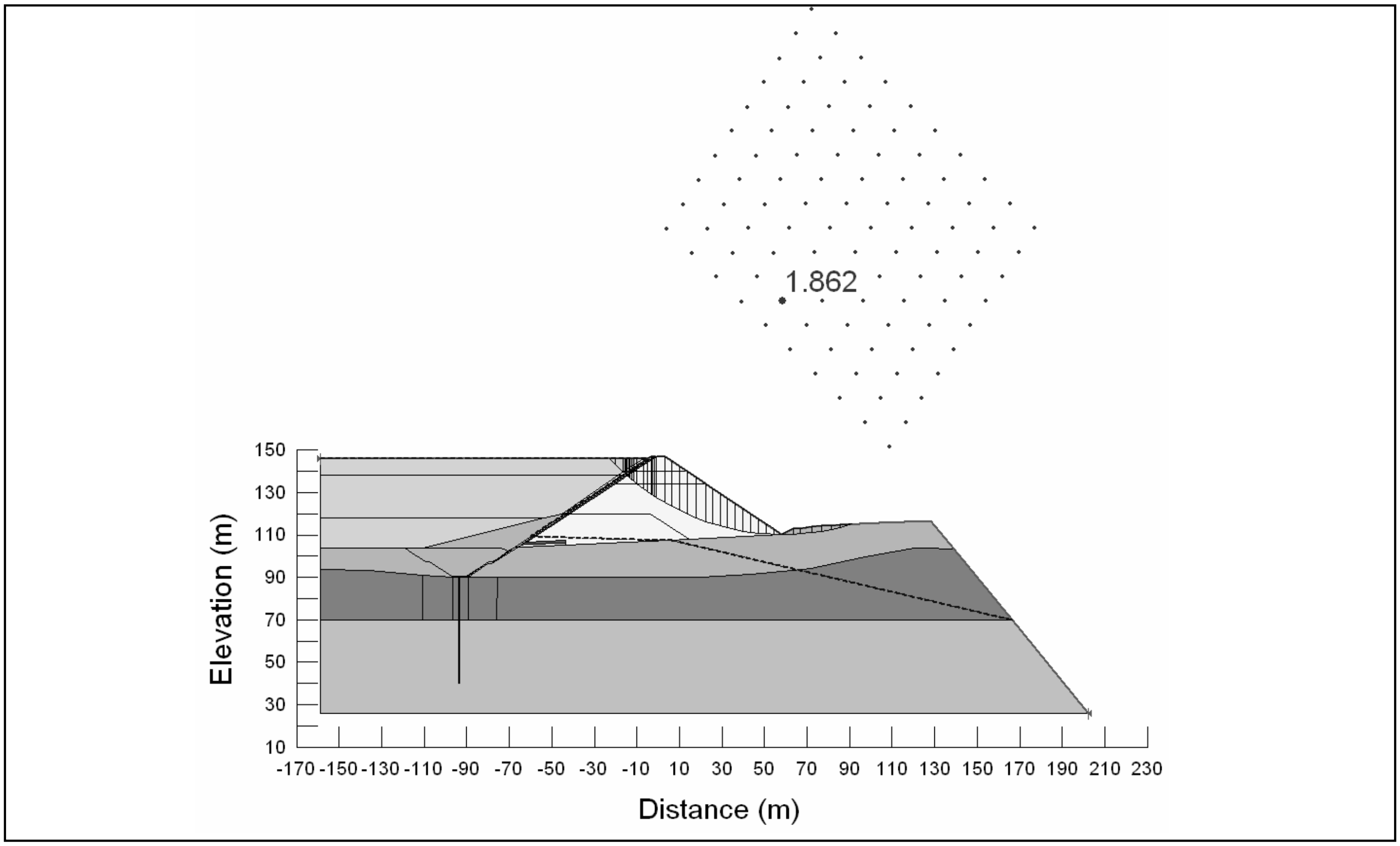
Figure III-36
SLOPE/W Analysis
Central Dike, Stage 3
Drained, Upstream Failure



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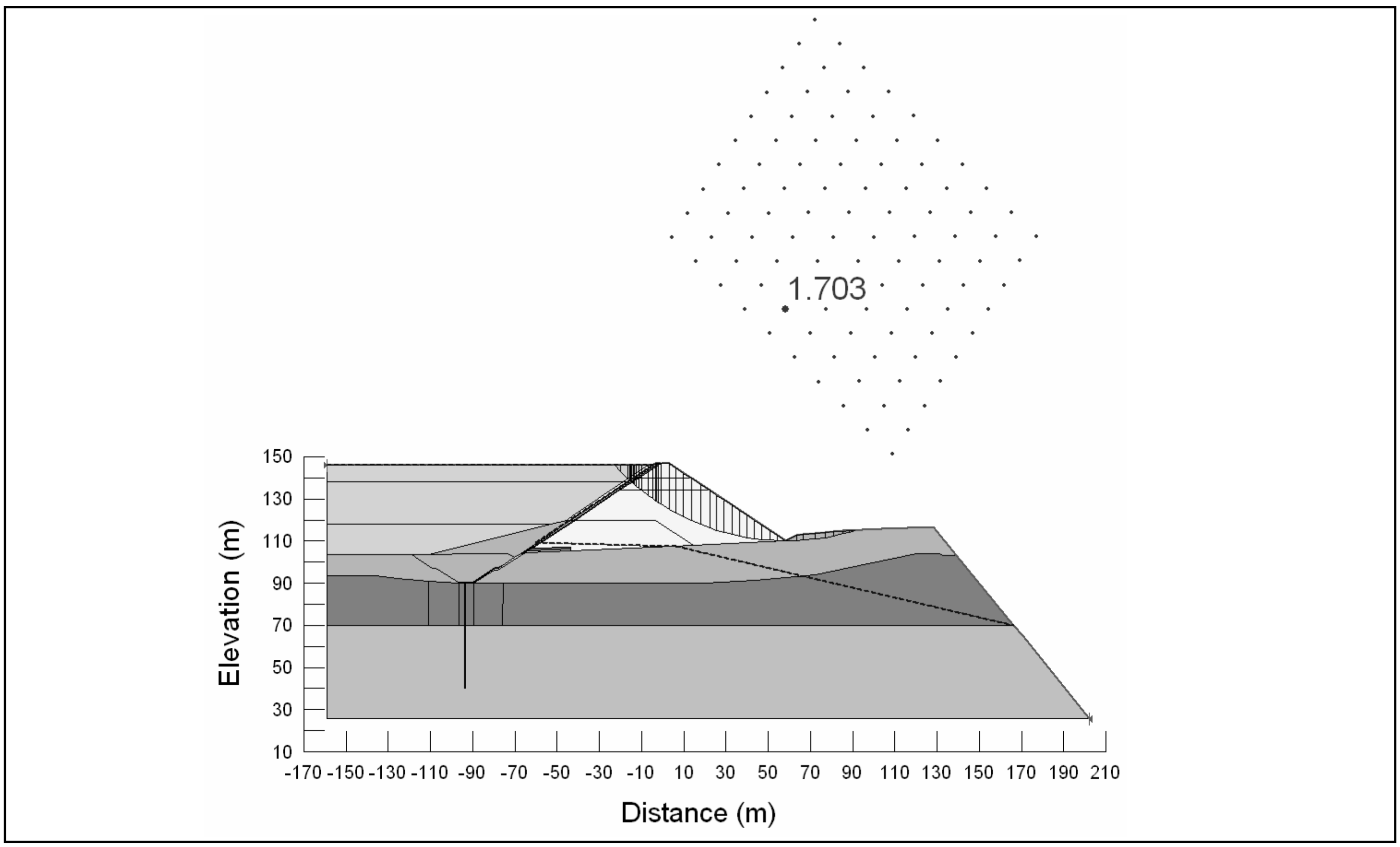

Pseudostatic

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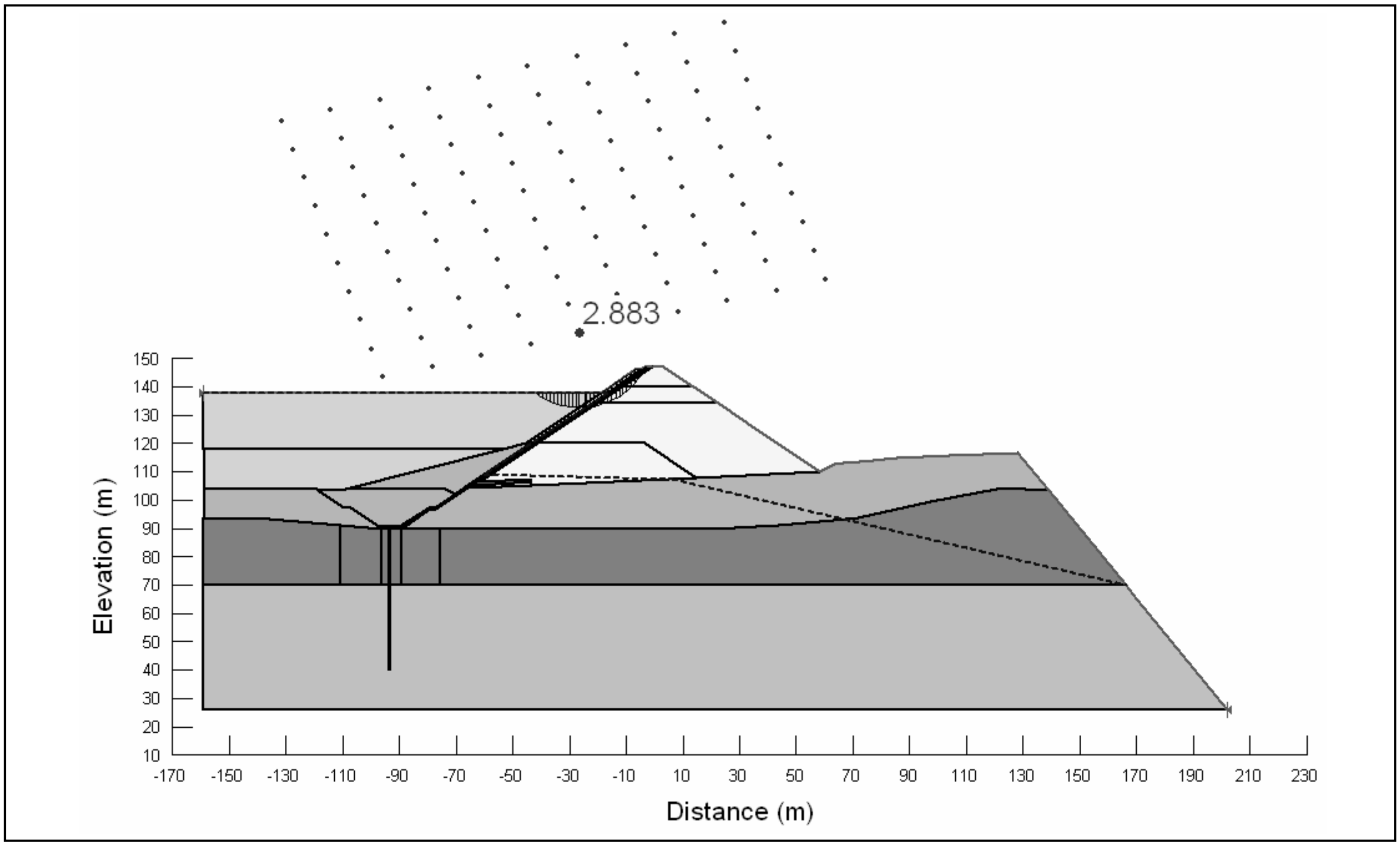
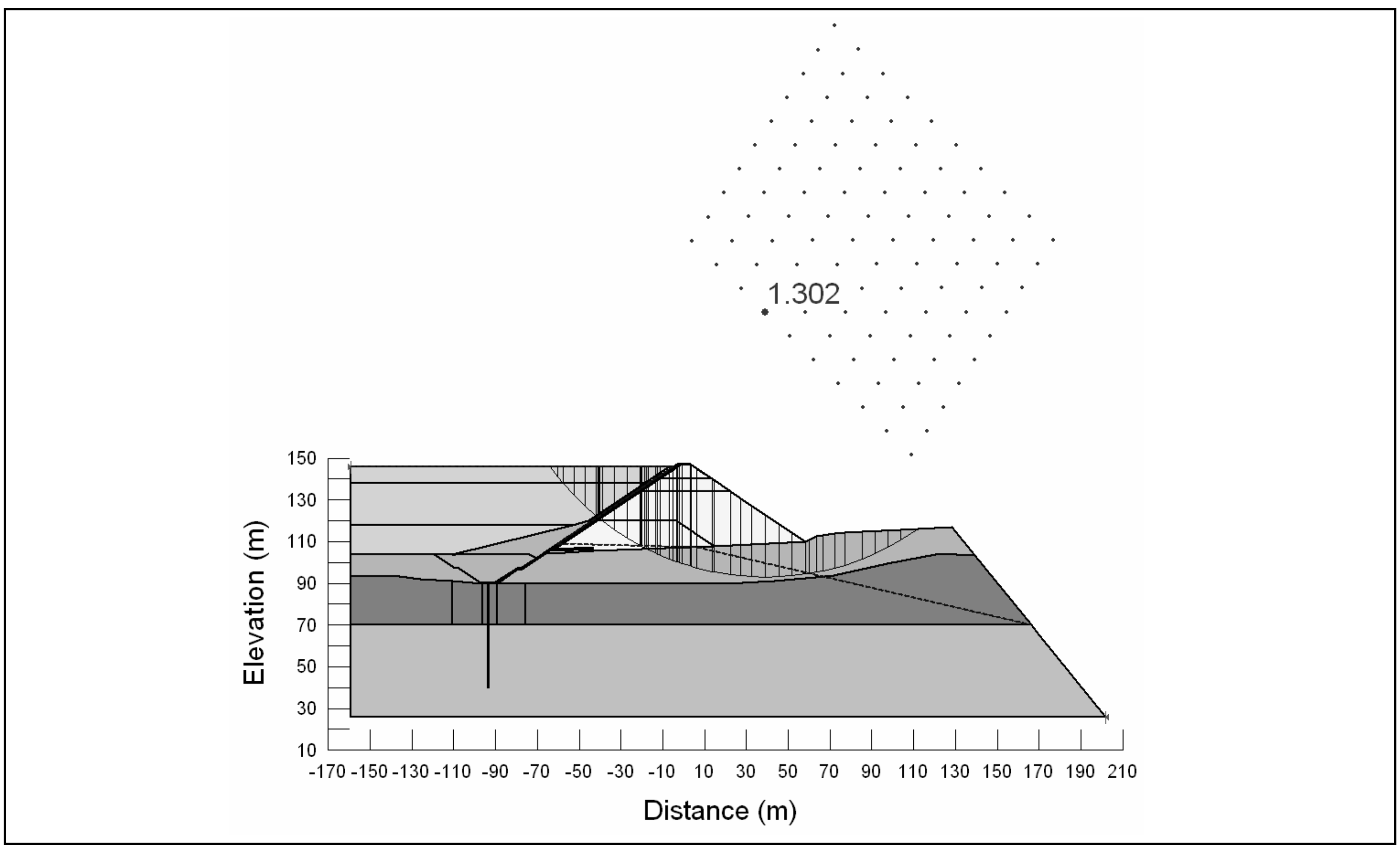
Figure III-37
SLOPE/W Analysis
Central Dike, Stage 3
Drained, Downstream Failure



Upstream



Downstream

Figure III-38
SLOPE/W Analysis
Central Dike, Stage 3
Static, Till Cohesion = 125 kPa

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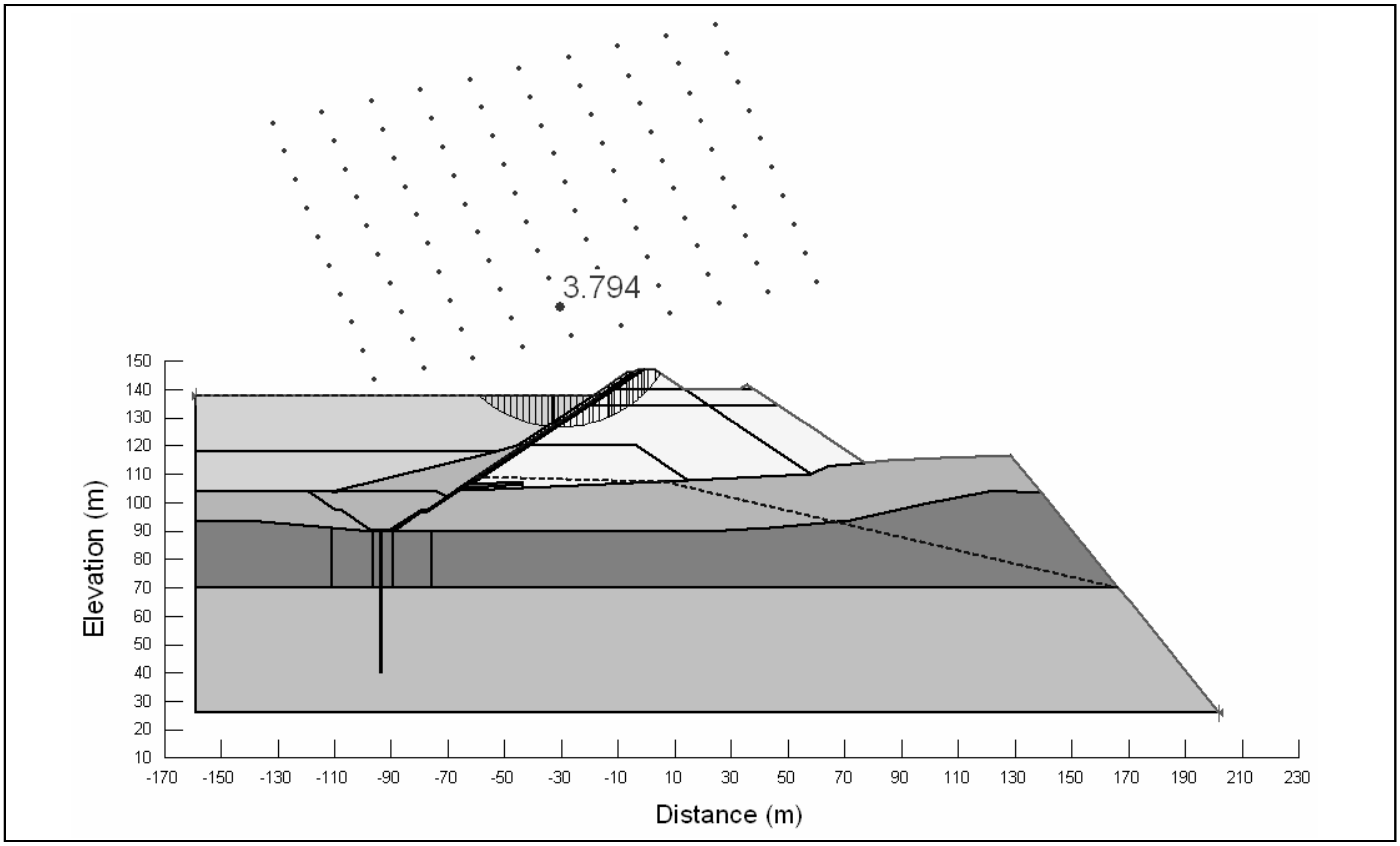

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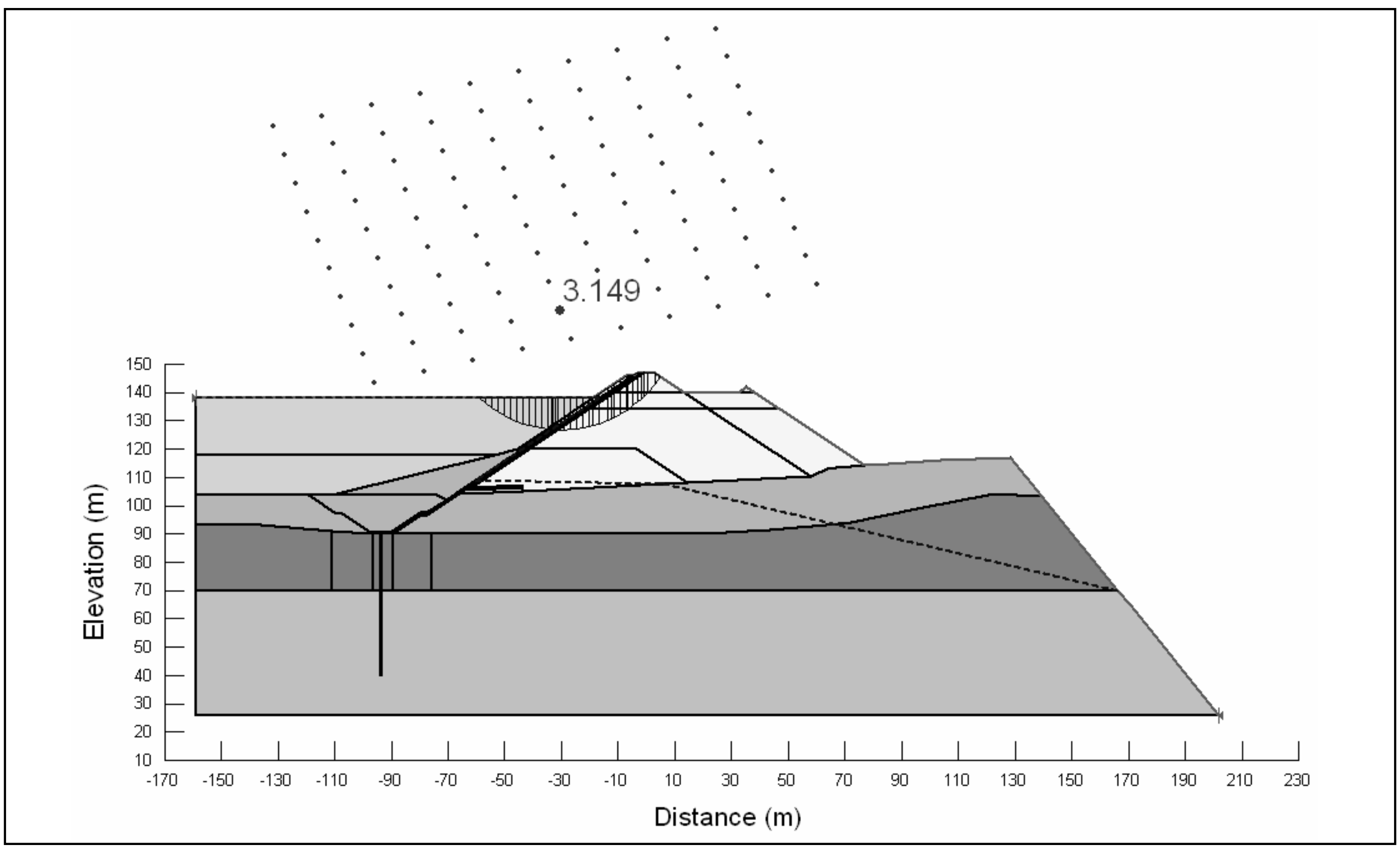

Pseudostatic

Figure III-39
SLOPE/W Analysis
Central Dike With Road, Stage 3
Drained, Upstream Failure

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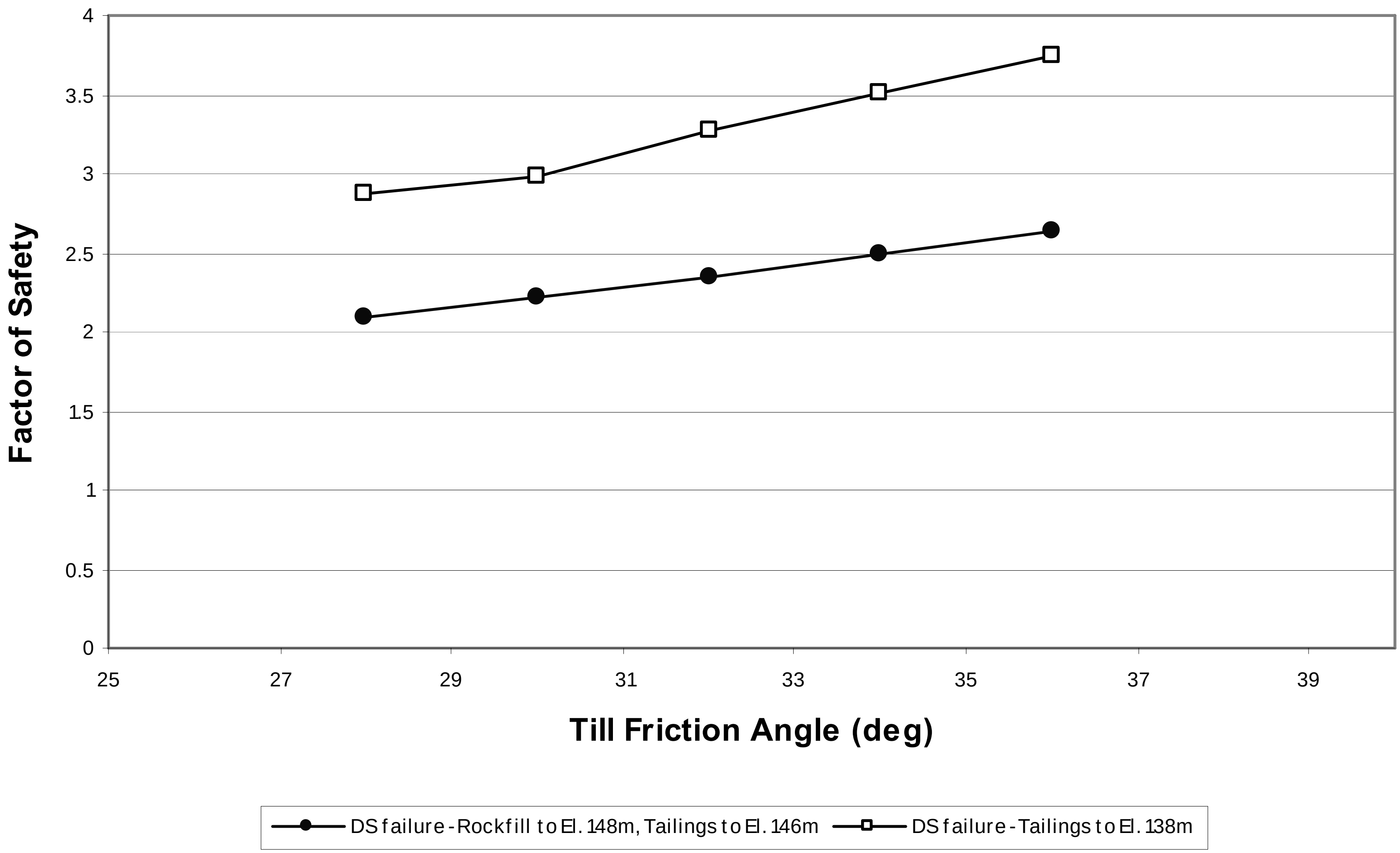
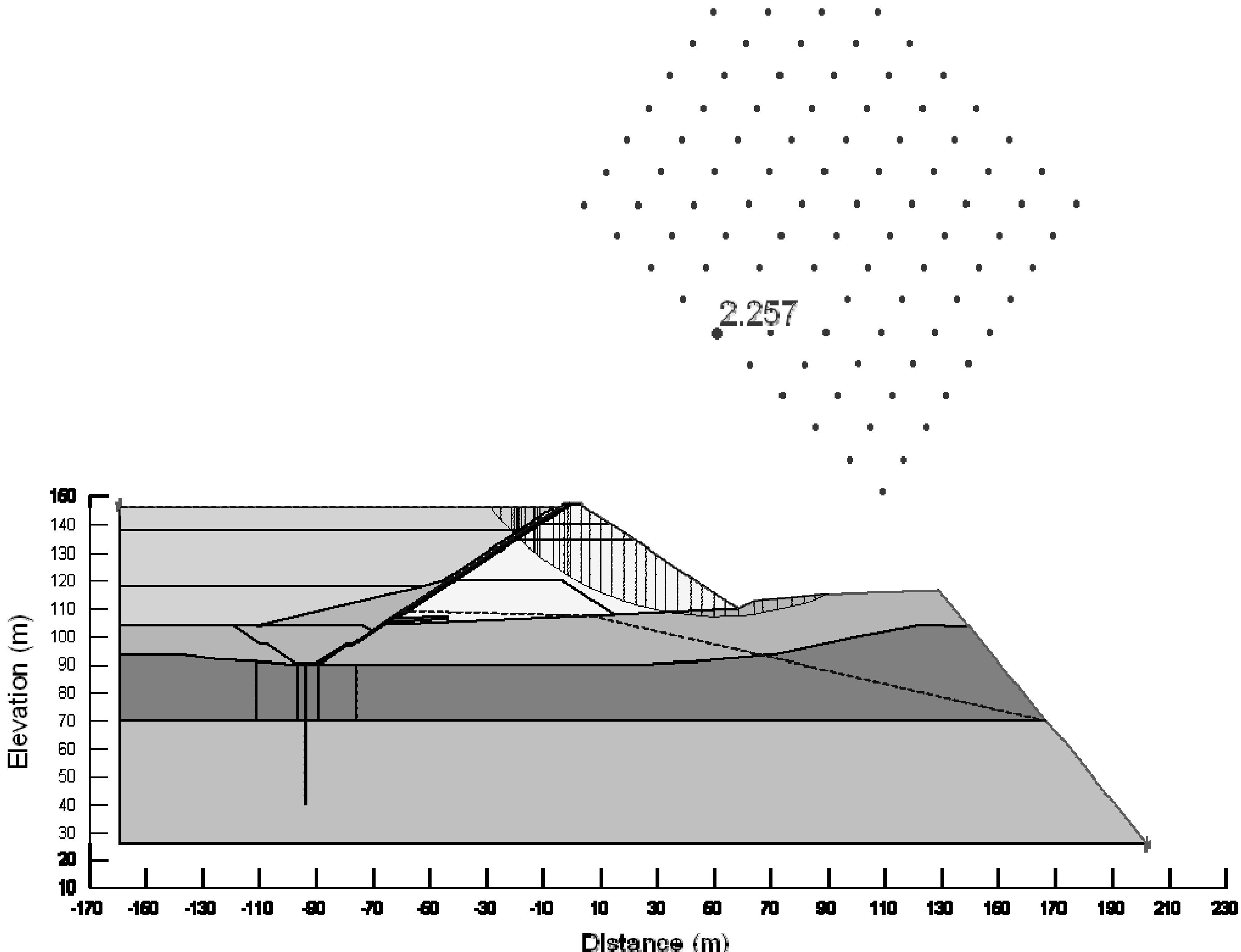


Lakebed Till Friction Angle Sensitivity Stage 3 Meadowbank Mining Corporation Meadowbank Gold Project			
Drawn: KD	App'd: BEW	Date: Mar. 09, 2007	Figure: III-40



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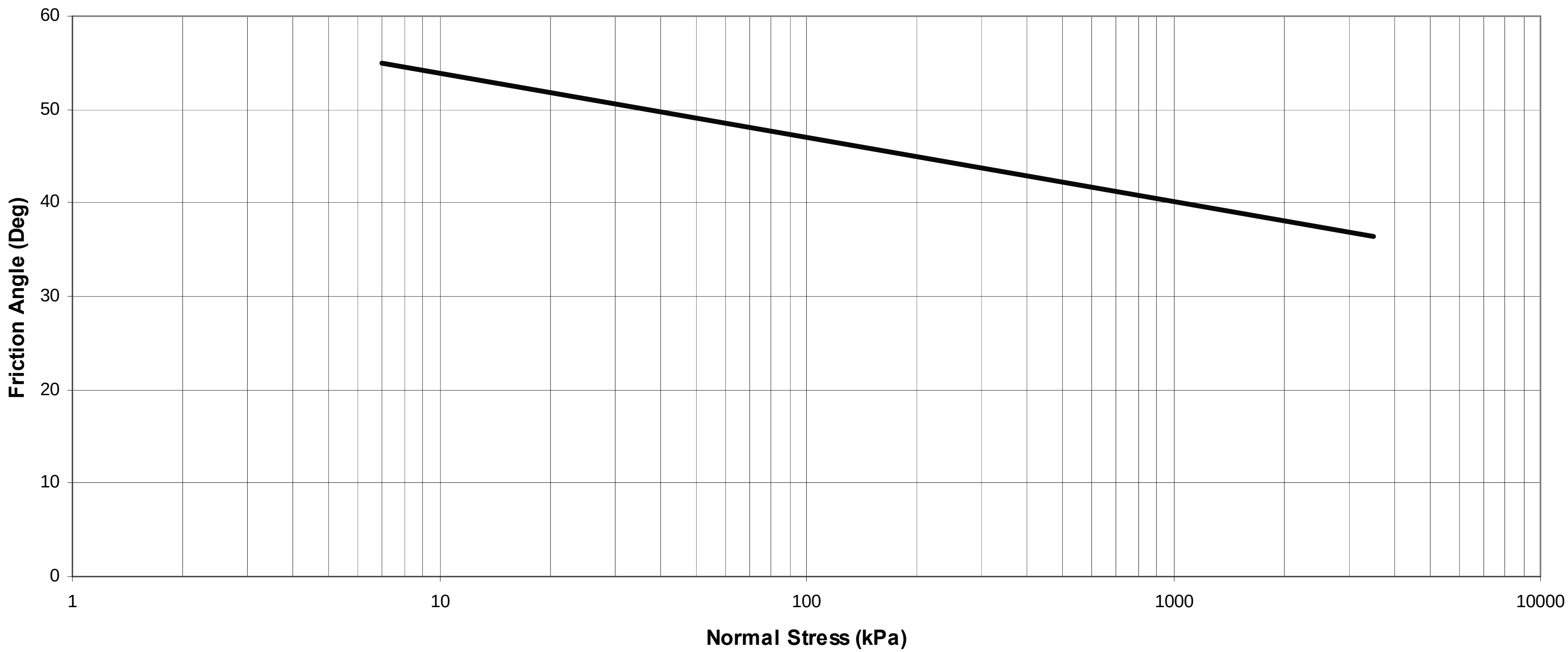
Sensitivity Analysis on Rockfill Strength
Meadowbank Mining Corporation
Meadowbank Gold Project

Drawn: KD	App'd: BEW	Date: Mar. 09, 2007	Figure: **III-41**



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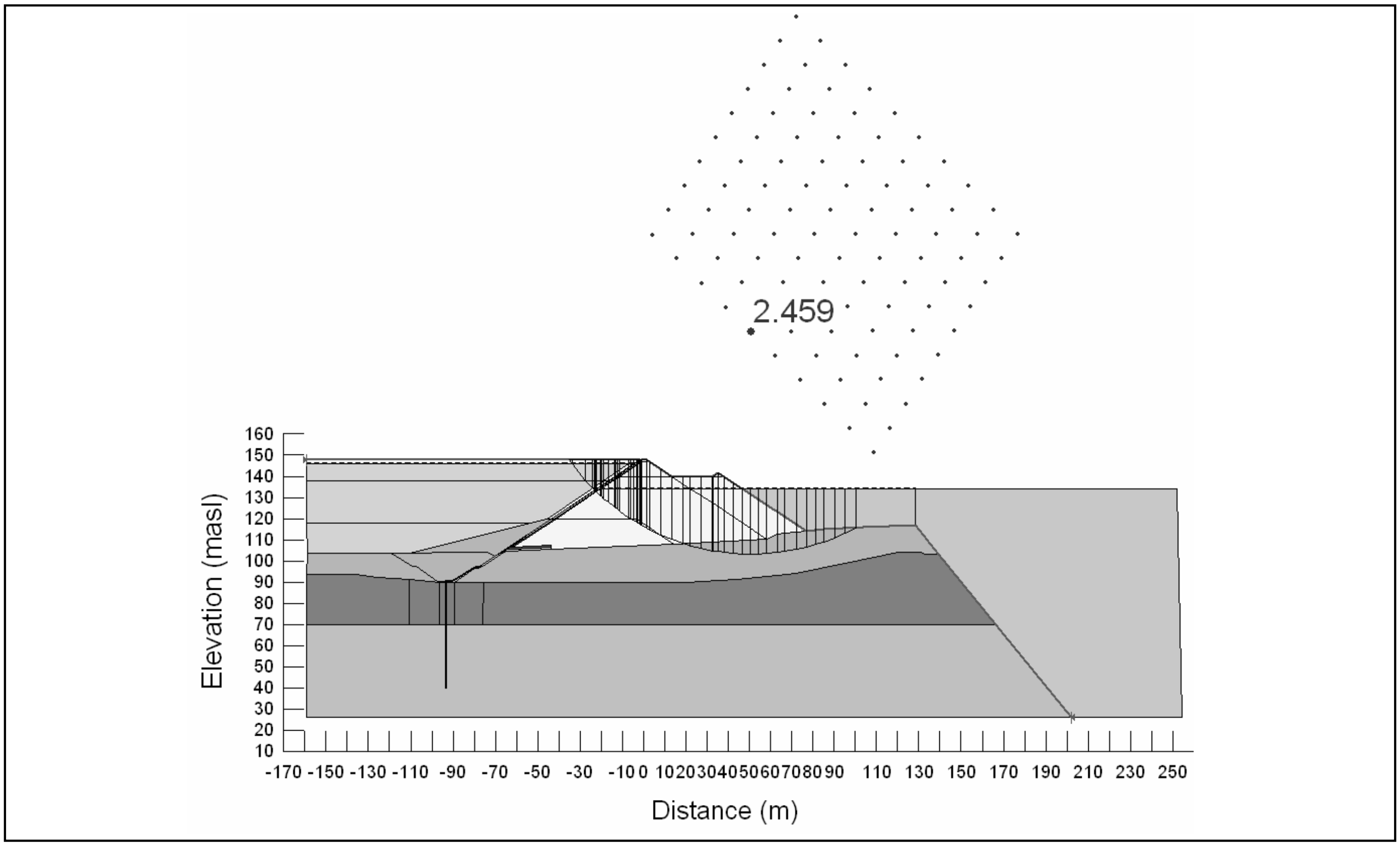
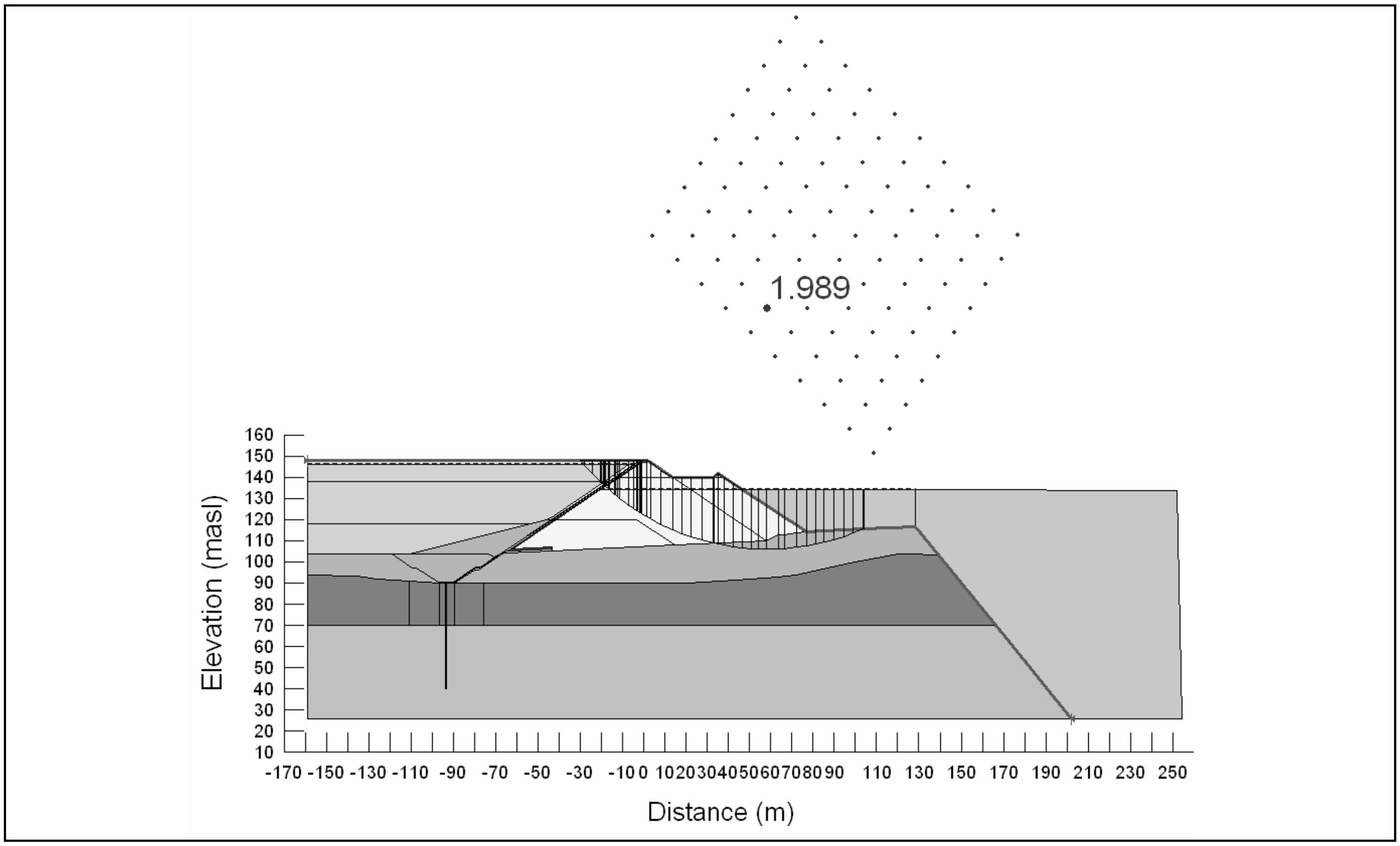
Rockfill Strength Function (after K.J. Douglas 2002)
Meadowbank Mining Corporation
Meadowbank Gold Project

Drawn: KD	App'd: BEW	Date: Mar. 09, 2007	Figure: **III-42**



Static

Figure III-43
SLOPE/W Analysis
Central Dike, Closure
Drained, Downstream Failure



Pseudostatic

Meadowbank Mining Corporation
Meadowbank Gold Project
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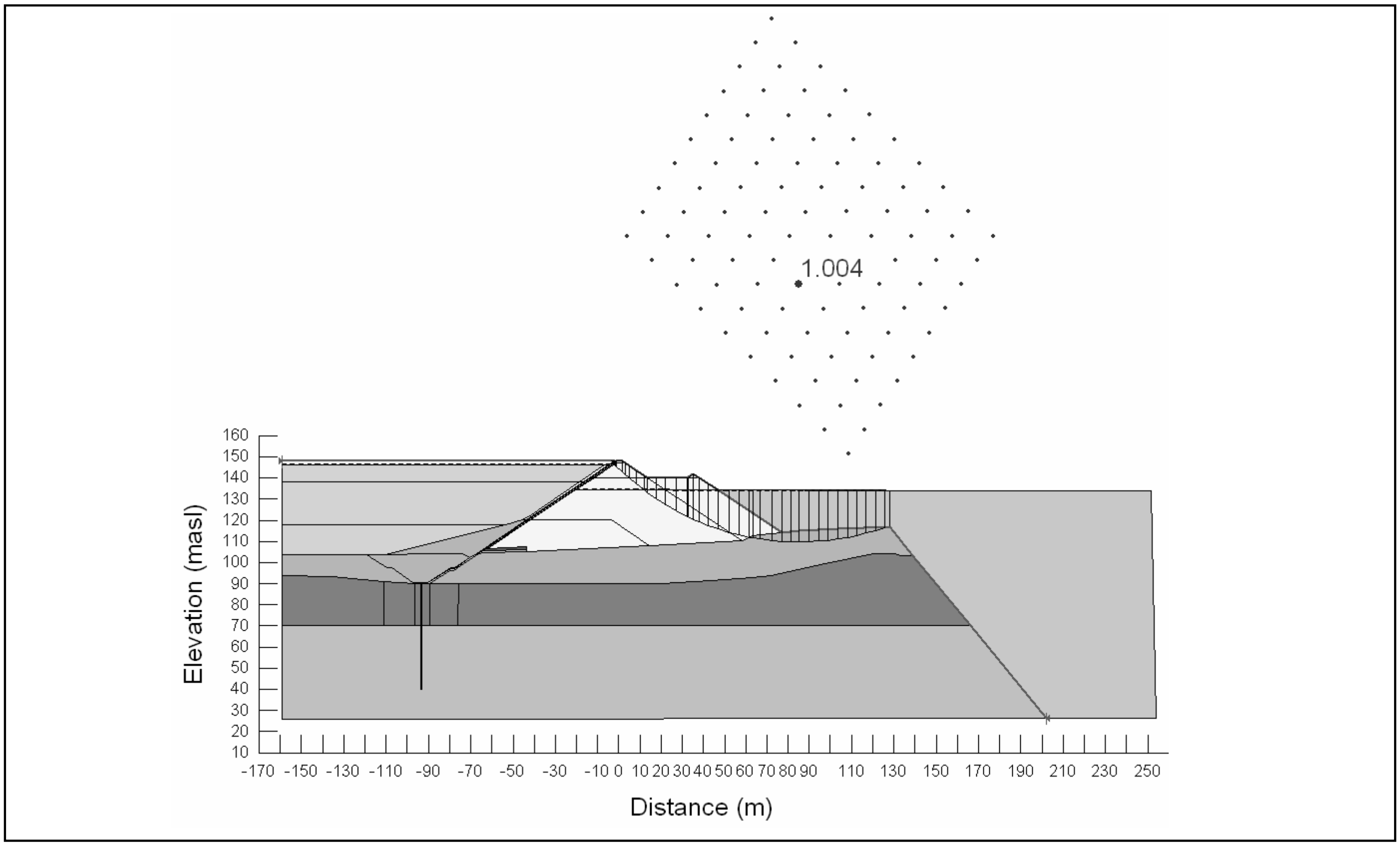
Figure III-44
SLOPE/W Analysis
Central Dike, Closure
Drained, Downstream Failure



Downstream Yield Acceleration a = 0.23 g

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Figure III-45
SLOPE/W Analysis
Central Dike, Closure
Drained, Pseudostatic

Material	Saturated Hydraulic Conductivity (m/s)
Rockfill	$1X10^{-2}$
Till	$1X10^{-5}$
Tailings	$5X10^{-7}$
Fractured Bedrock	$5X10^{-6}$
Grouted Bedrock	$1X10^{-7}$
Coarse Filter	$9X10^{-2}$
Fine Filter	$4X10^{-4}$
Bedrock	$2X10^{-7}$
Bituminous Liner	impermeable

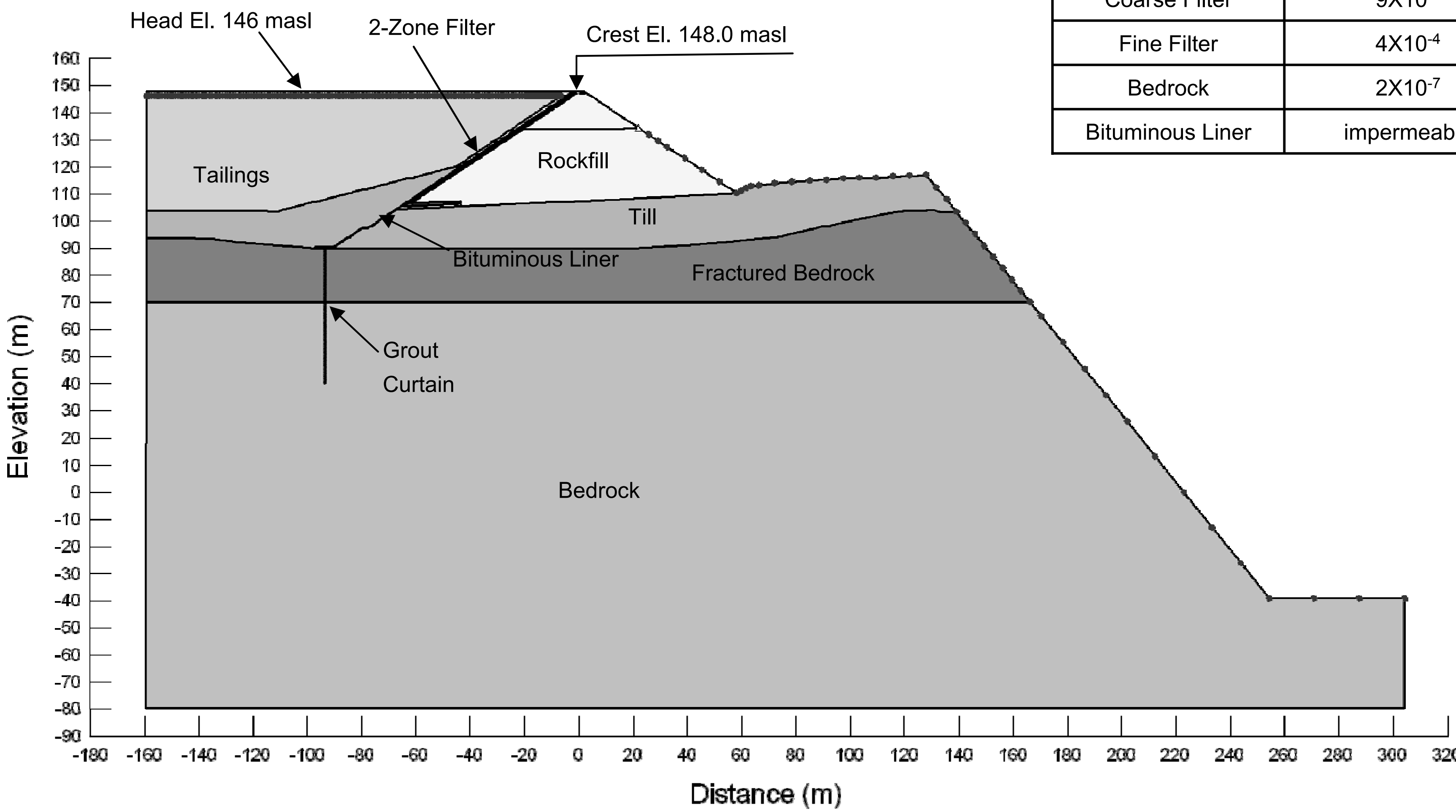

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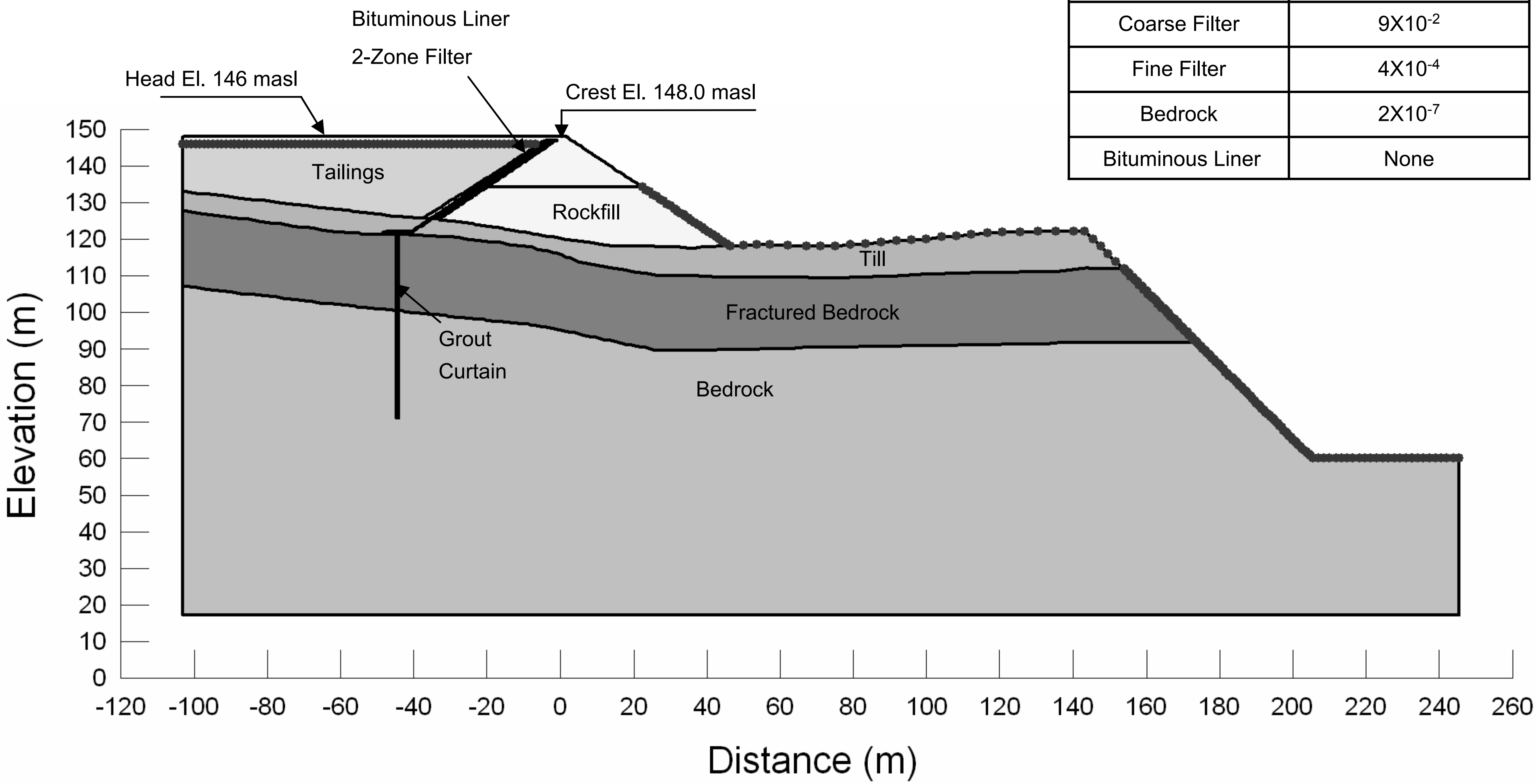
Figure III-46
SEEP/W Analysis
Central Dike, Deep Section
Closure – With Pit

Material	Saturated Hydraulic Conductivity (m/S)
Rockfill	$1X10^{-2}$
Till	$1X10^{-7}$
Tailings	$5X10^{-7}$
Fractured Bedrock	$5X10^{-6}$
Grouted Bedrock	$1X10^{-7}$
Coarse Filter	$9X10^{-2}$
Fine Filter	$4X10^{-4}$
Bedrock	$2X10^{-7}$
Bituminous Liner	None



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Meadowbank Gold Project
06-1413-089

Figure III-47
SEEP/W Analysis
Central Dike, Shallow Section
Closure – With Pit

Material	Saturated Hydraulic Conductivity (m/s)
Rockfill	$1X10^{-2}$
Till	$1X10^{-5}$
Tailings	$5X10^{-7}$
Fractured Bedrock	$5X10^{-6}$
Grouted Bedrock	$1X10^{-7}$
Coarse Filter	$9X10^{-2}$
Fine Filter	$4X10^{-4}$
Bedrock	$2X10^{-7}$
Bituminous Liner	impermeable

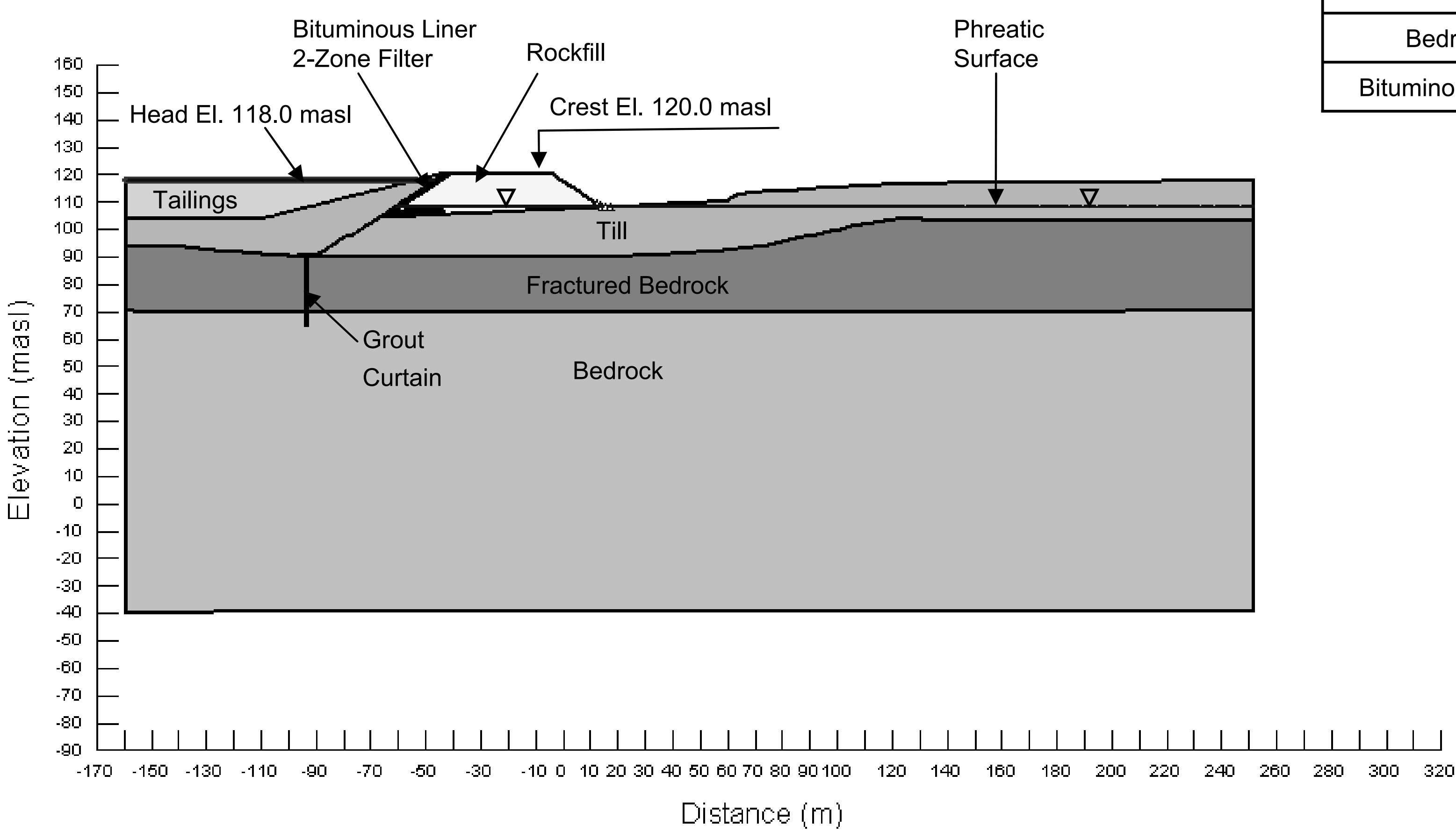
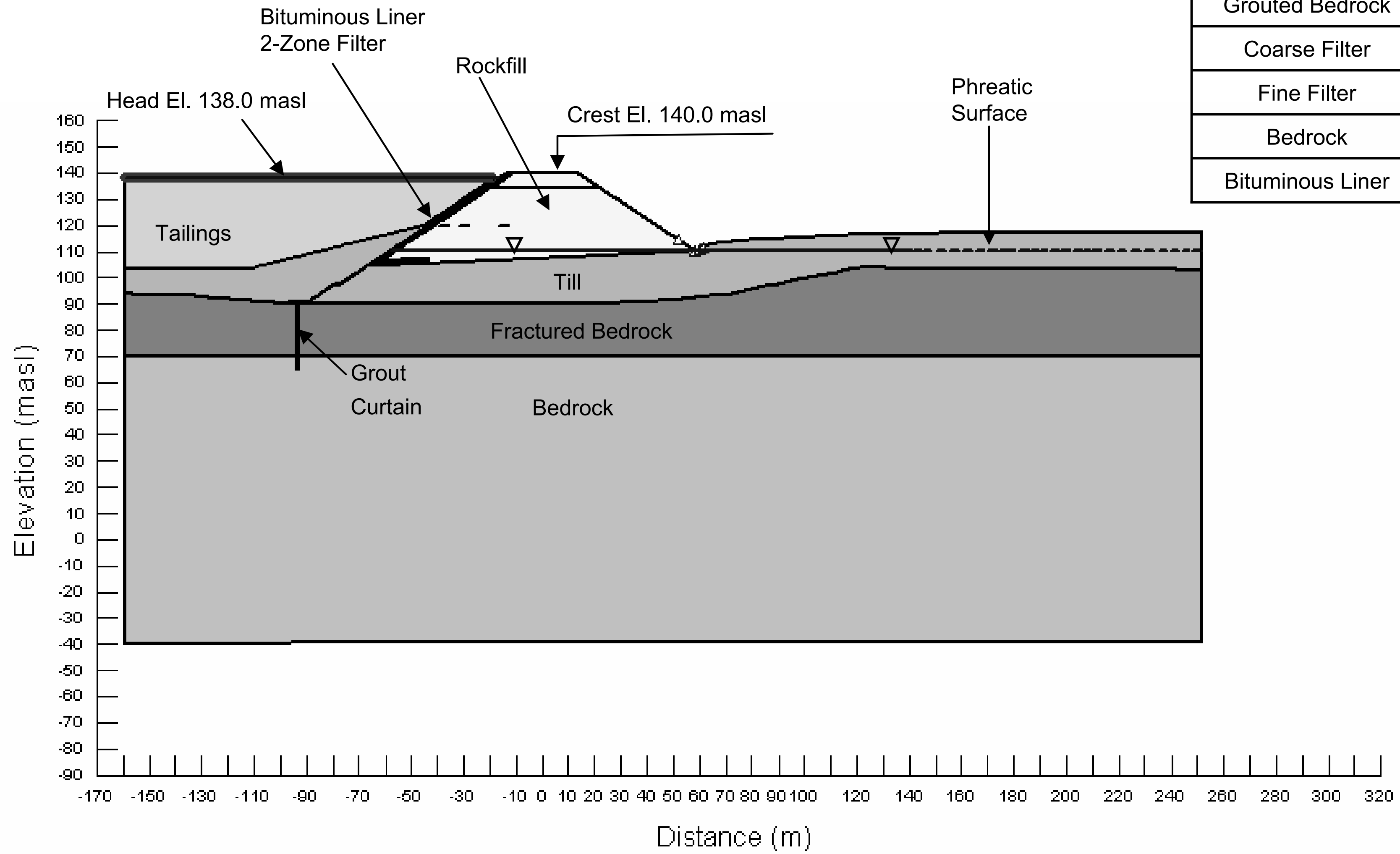


Figure III-48
SEEP/W Analysis
Central Dike, Deep Section
Stage 1 – No Pit



Material	Saturated Hydraulic Conductivity (m/s)
Rockfill	$1X10^{-2}$
Till	$1X10^{-5}$
Tailings	$5X10^{-7}$
Fractured Bedrock	$5X10^{-6}$
Grouted Bedrock	$1X10^{-7}$
Coarse Filter	$9X10^{-2}$
Fine Filter	$4X10^{-4}$
Bedrock	$2X10^{-7}$
Bituminous Liner	impermeable

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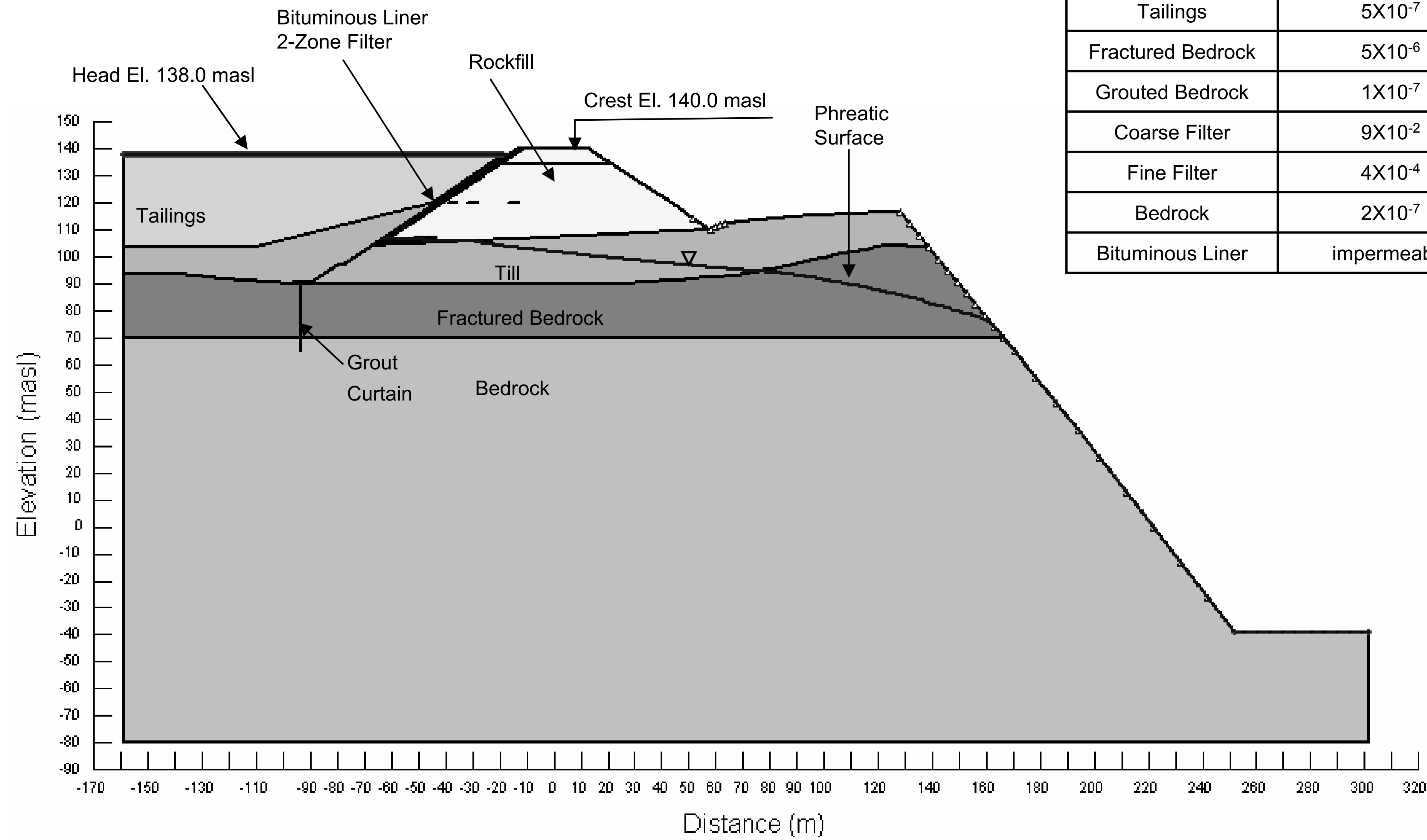
Figure III-49
SEEP/W Analysis
Central Dike, Deep Section
Stage 2 – No Pit

Material	Saturated Hydraulic Conductivity (m/s)
Rockfill	$1X10^{-2}$
Till	$1X10^{-5}$
Tailings	$5X10^{-7}$
Fractured Bedrock	$5X10^{-6}$
Grouted Bedrock	$1X10^{-7}$
Coarse Filter	$9X10^{-2}$
Fine Filter	$4X10^{-4}$
Bedrock	$2X10^{-7}$
Bituminous Liner	impermeable



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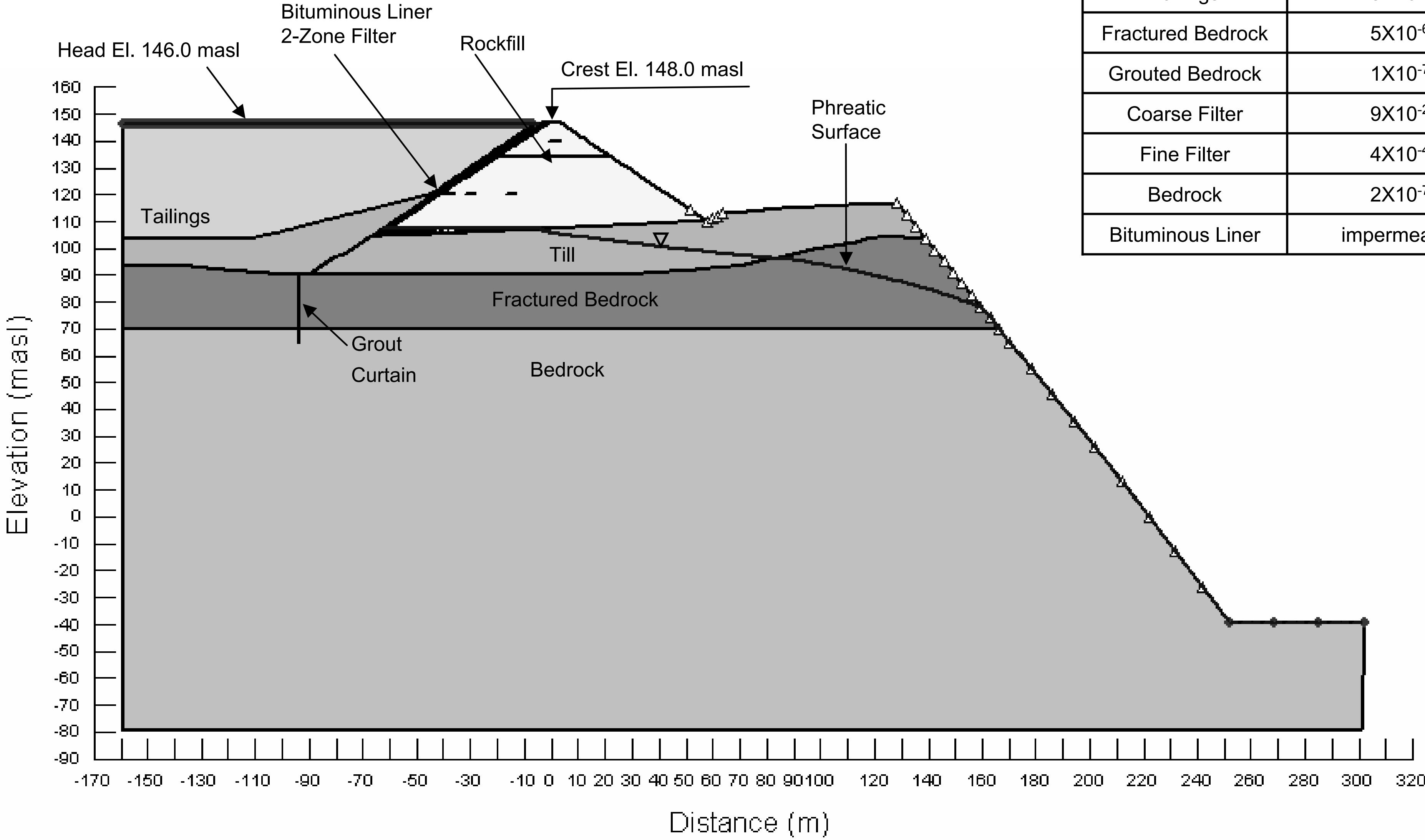
06-1413-089

Figure III-50
SEEP/W Analysis
Central Dike, Deep Section
Stage 2 –With Pit



Material	Saturated Hydraulic Conductivity (m/s)
Rockfill	$1X10^{-2}$
Till	$1X10^{-5}$
Tailings	$5X10^{-7}$
Fractured Bedrock	$5X10^{-6}$
Grouted Bedrock	$1X10^{-7}$
Coarse Filter	$9X10^{-2}$
Fine Filter	$4X10^{-4}$
Bedrock	$2X10^{-7}$
Bituminous Liner	impermeable

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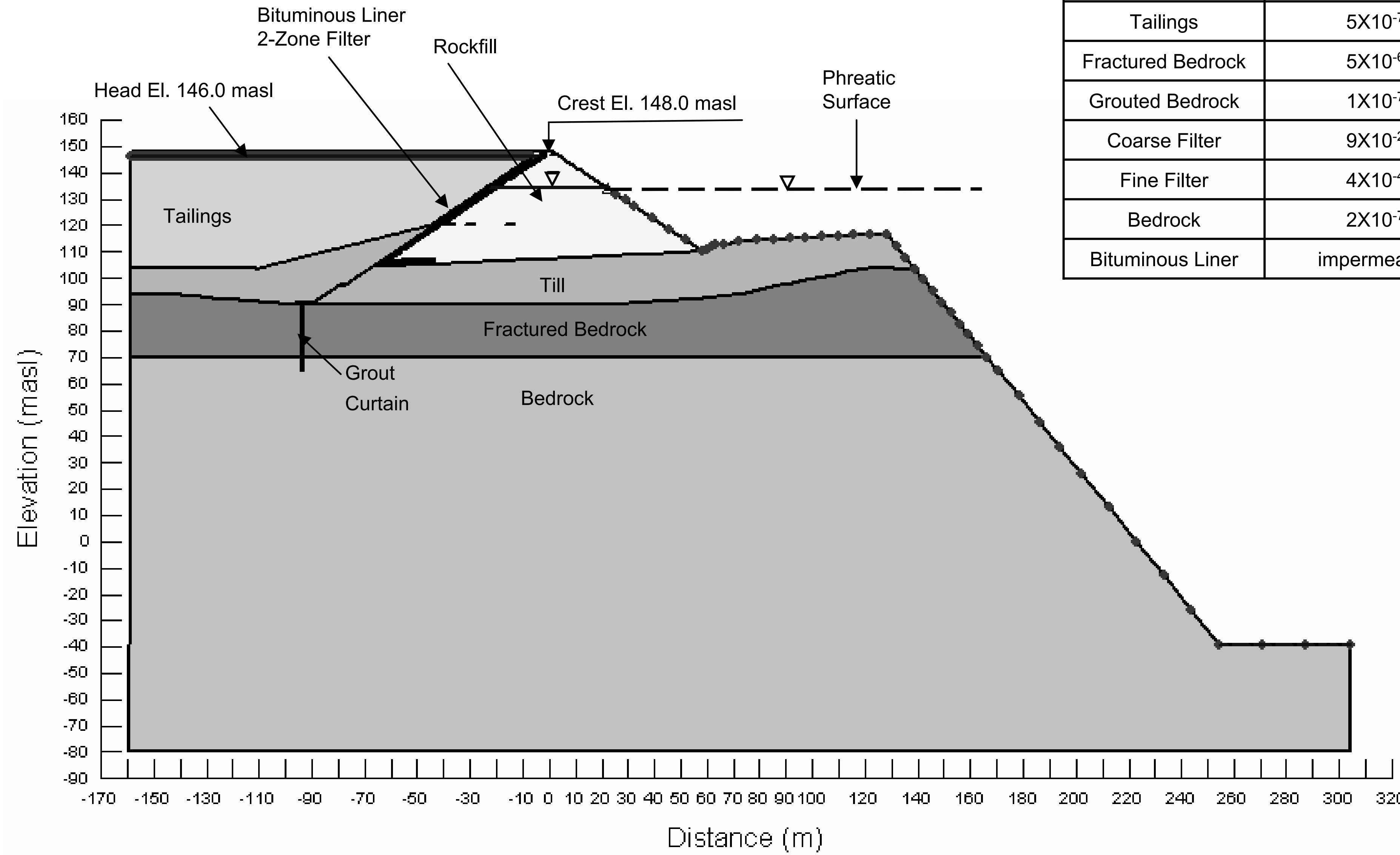
06-1413-089

Figure III-51
SEEP/W Analysis
Central Dike, Deep Section
Stage 3 –With Pit



Material	Saturated Hydraulic Conductivity (m/s)
Rockfill	$1X10^{-2}$
Till	$1X10^{-5}$
Tailings	$5X10^{-7}$
Fractured Bedrock	$5X10^{-6}$
Grouted Bedrock	$1X10^{-7}$
Coarse Filter	$9X10^{-2}$
Fine Filter	$4X10^{-4}$
Bedrock	$2X10^{-7}$
Bituminous Liner	impermeable

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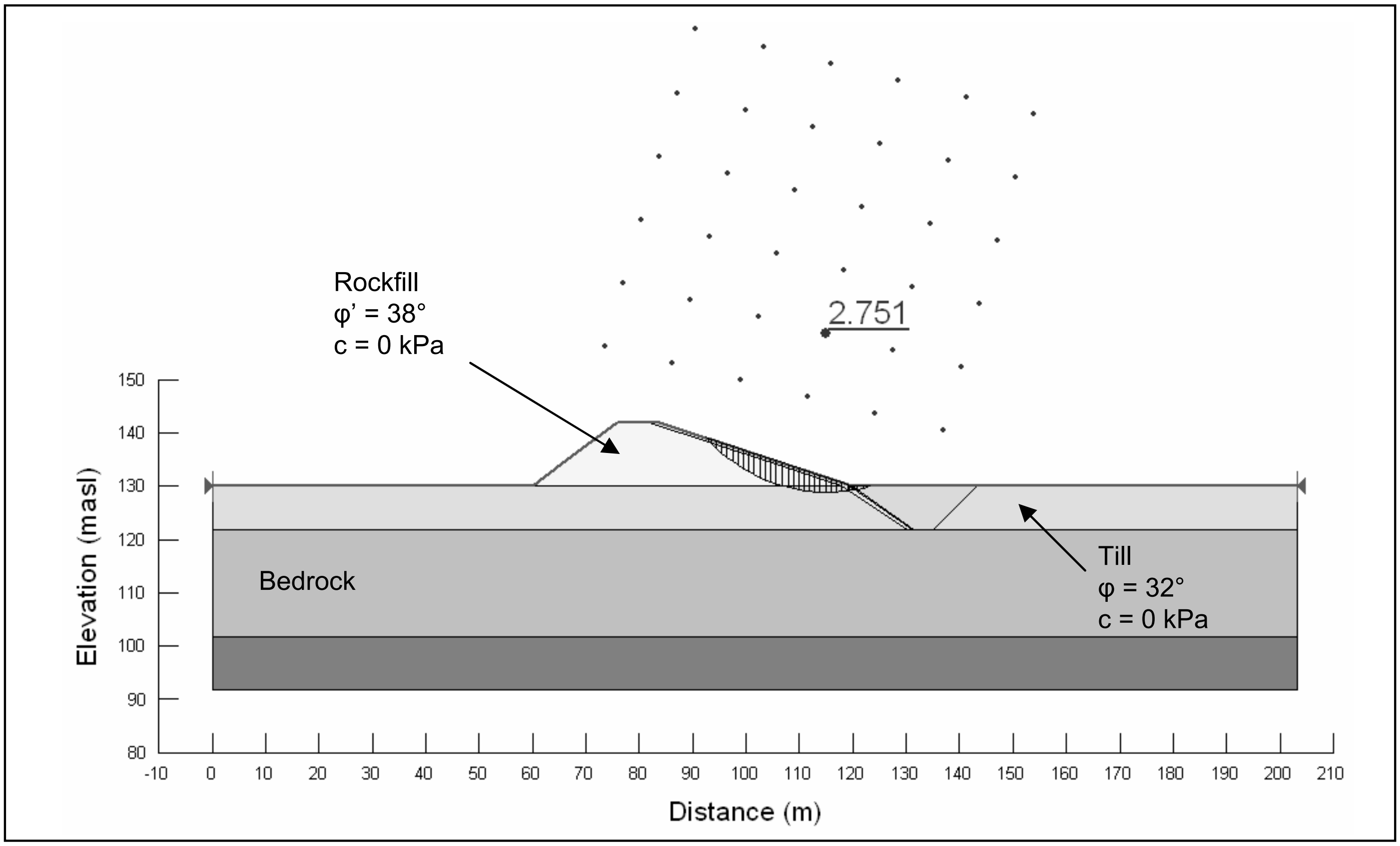
06-1413-089

Figure III-52
SEEP/W Analysis
Central Dike, Deep Section
Closure



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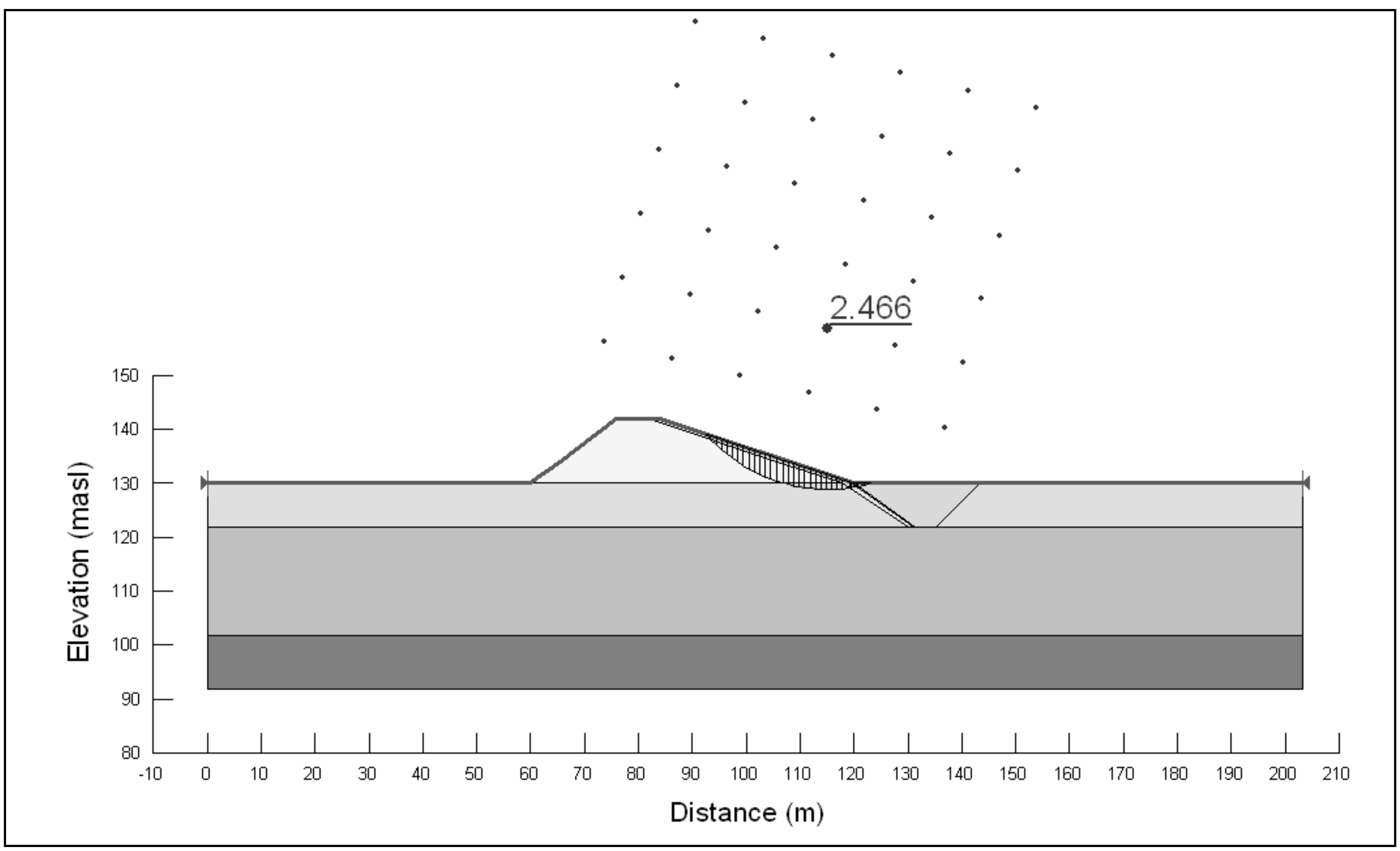

Pseudostatic

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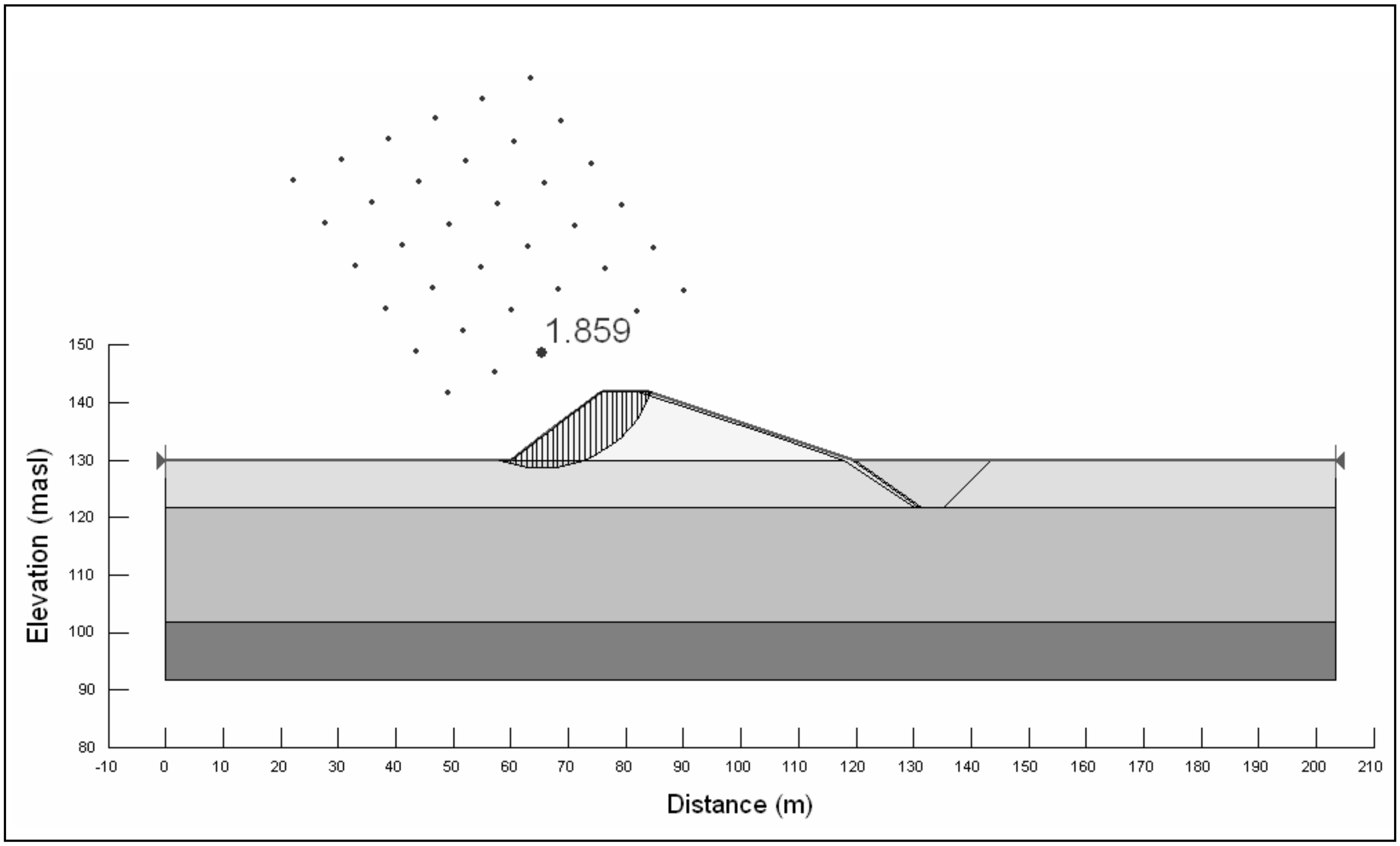
06-1413-089

Figure III-53
SLOPE/W Analysis
Stormwater Dike
Upstream Failure



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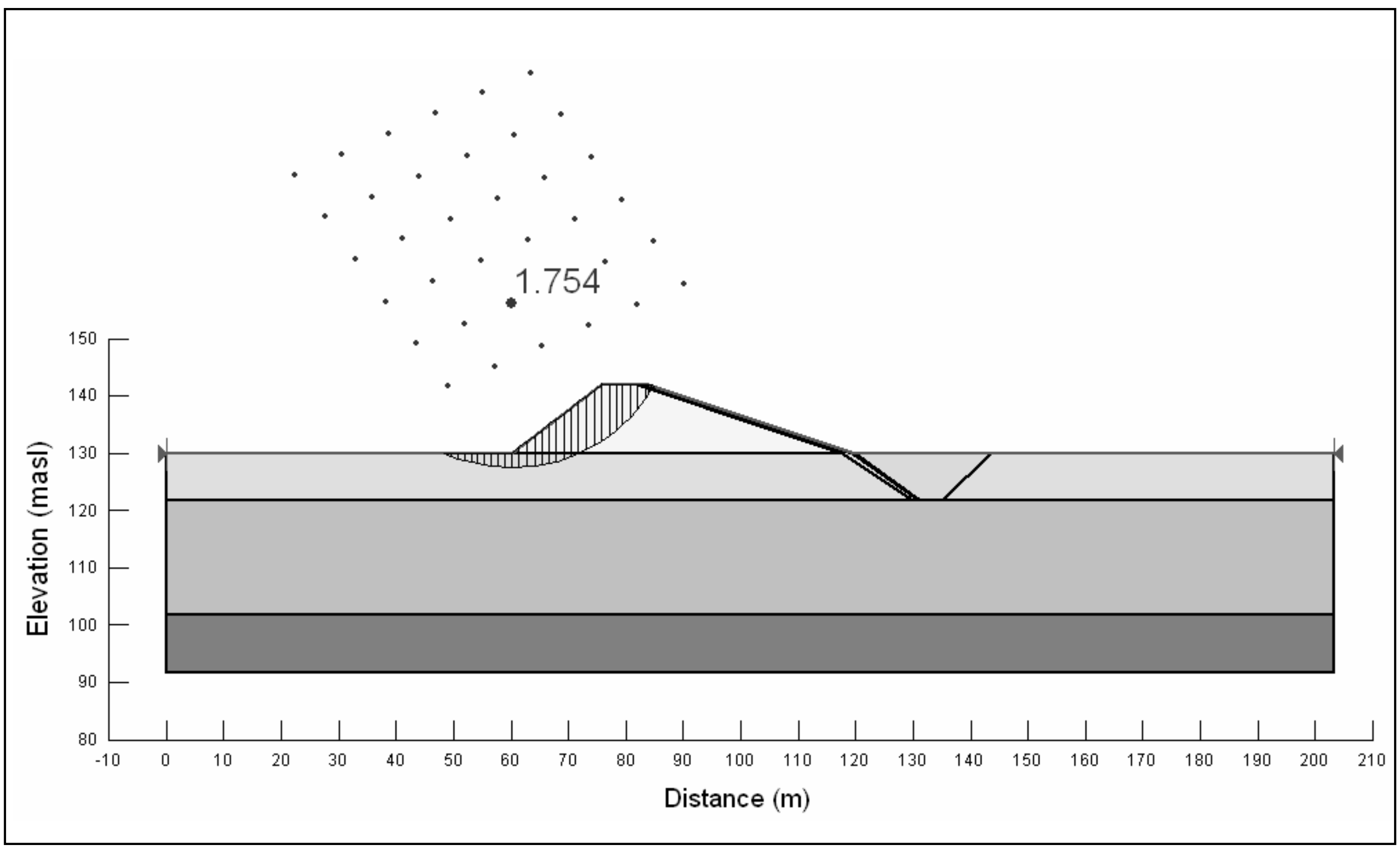

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Figure III-54
SLOPE/W Analysis
Stormwater Dike
Downstream Failure

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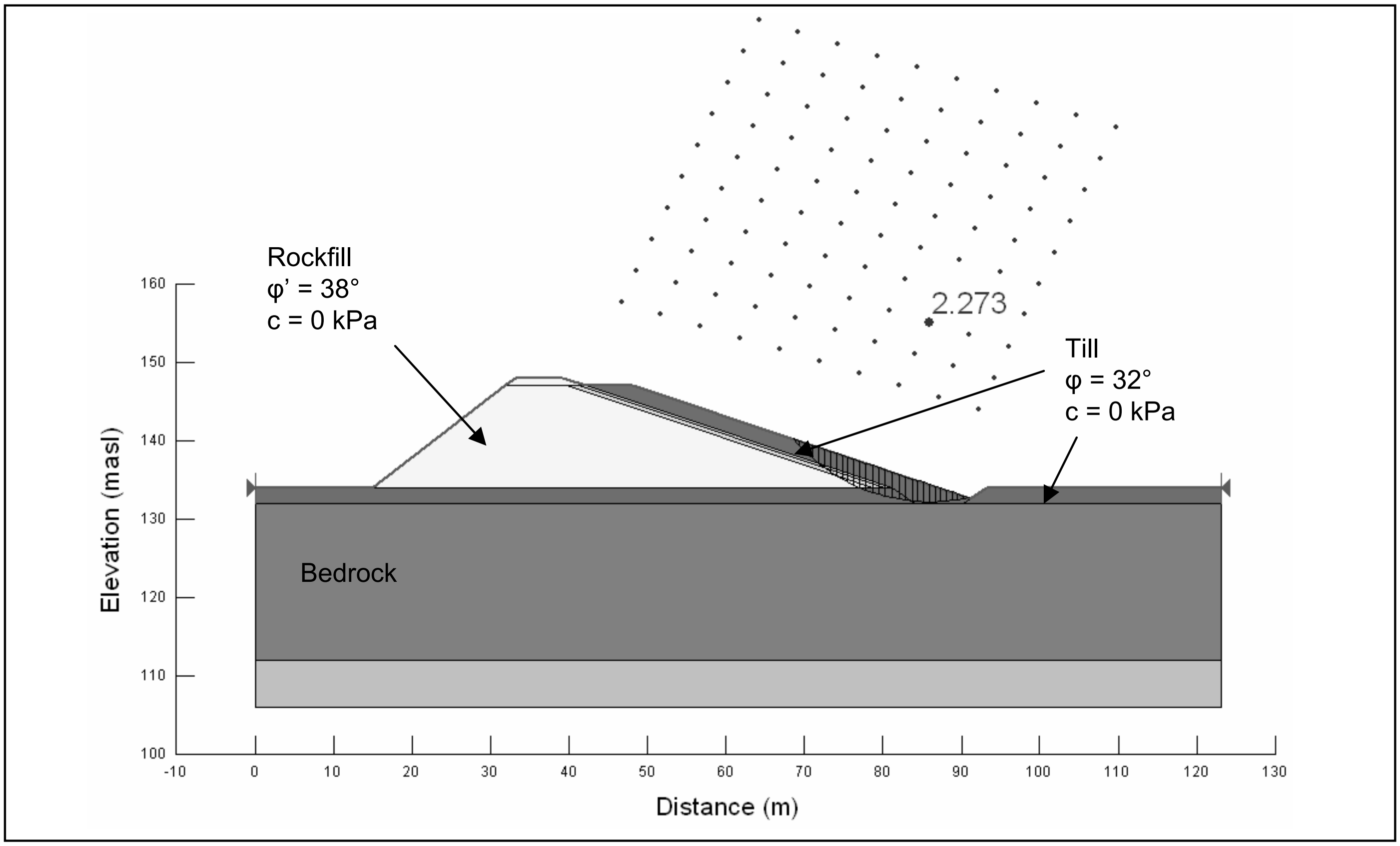

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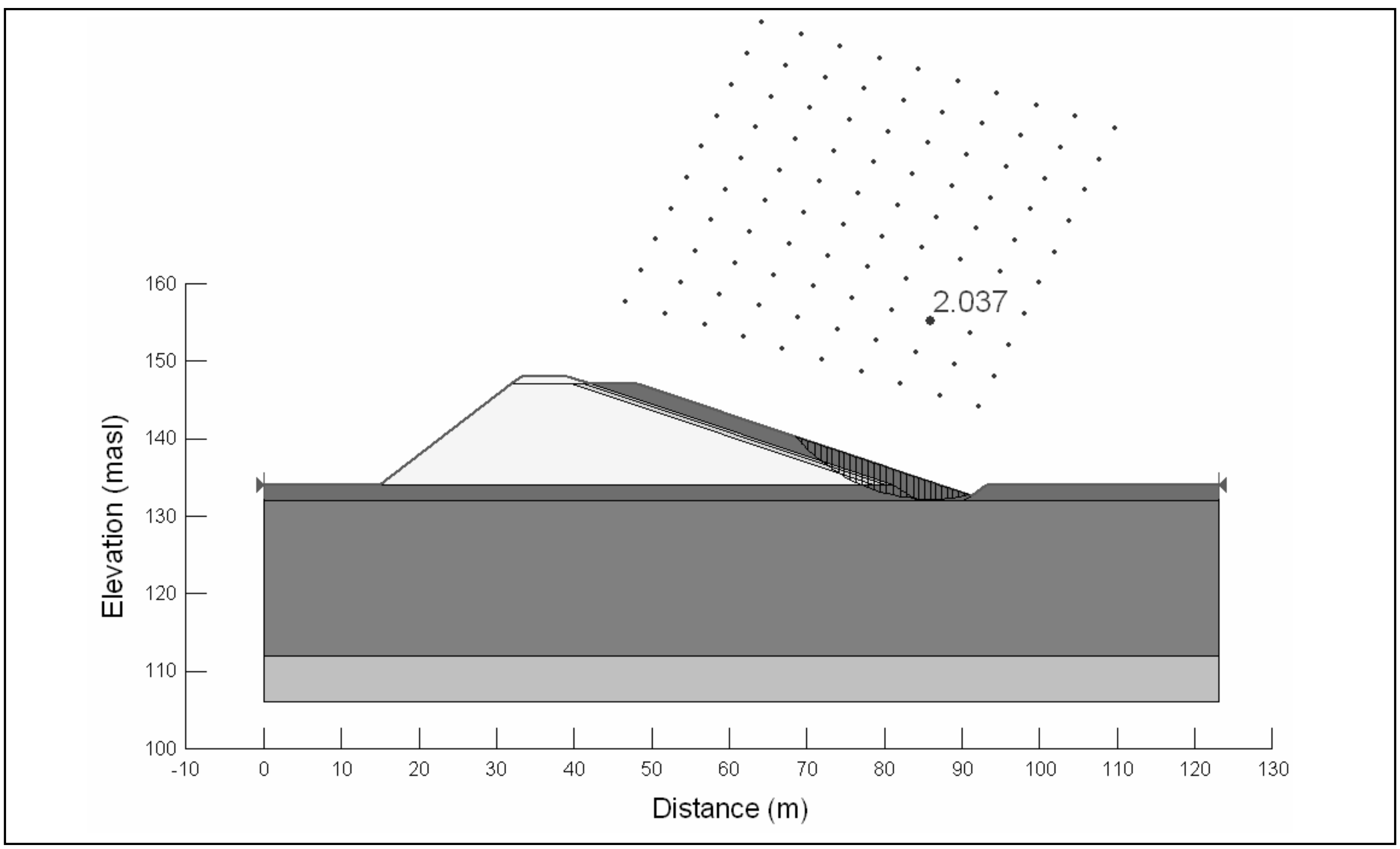
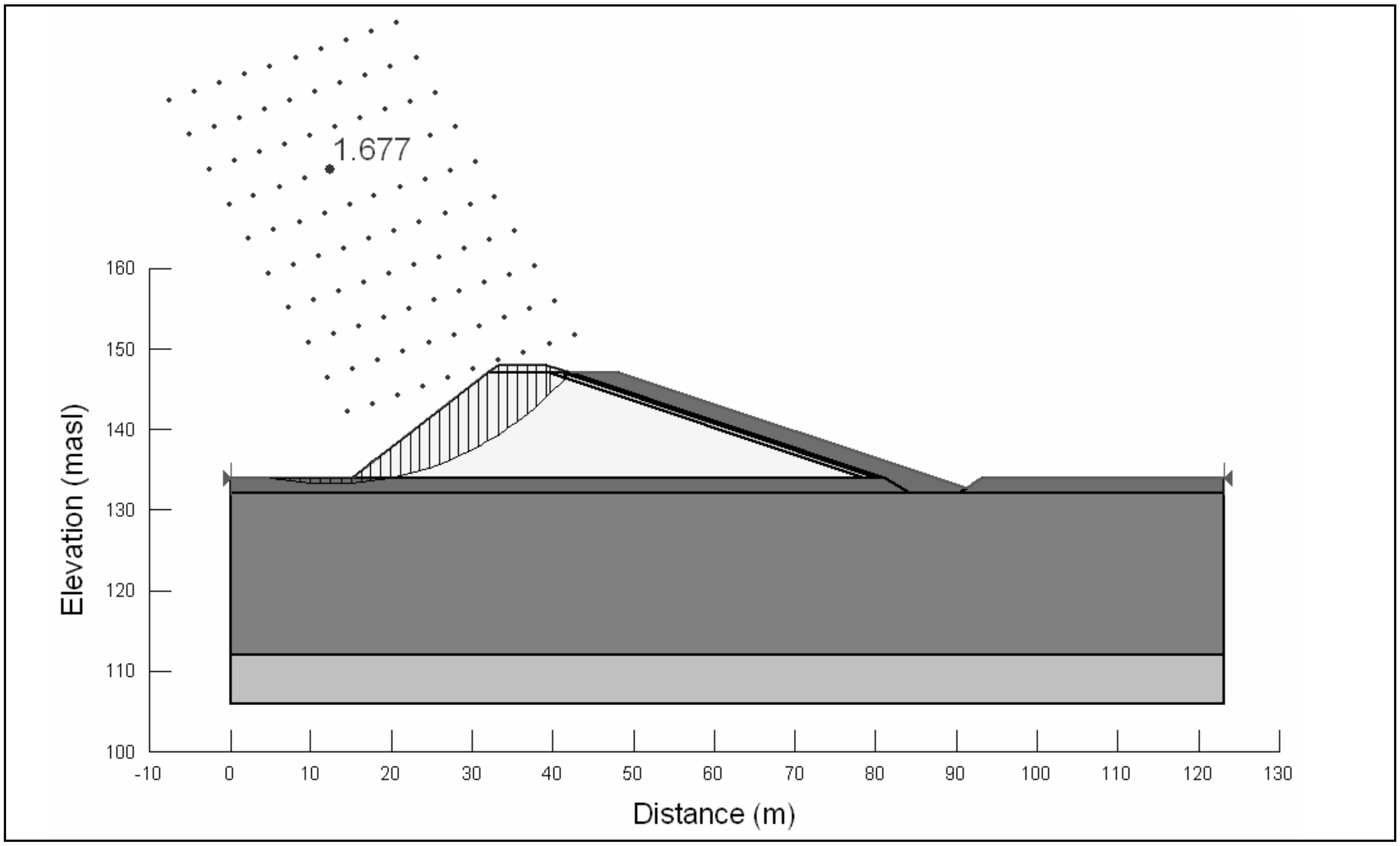


Pseudostatic

Meadowbank Mining Corporation
Meadowbank Gold Project
06-1413-089

Figure III-55
SLOPE/W Analysis
Saddle Dam With Compacted Till Core
Upstream Failure



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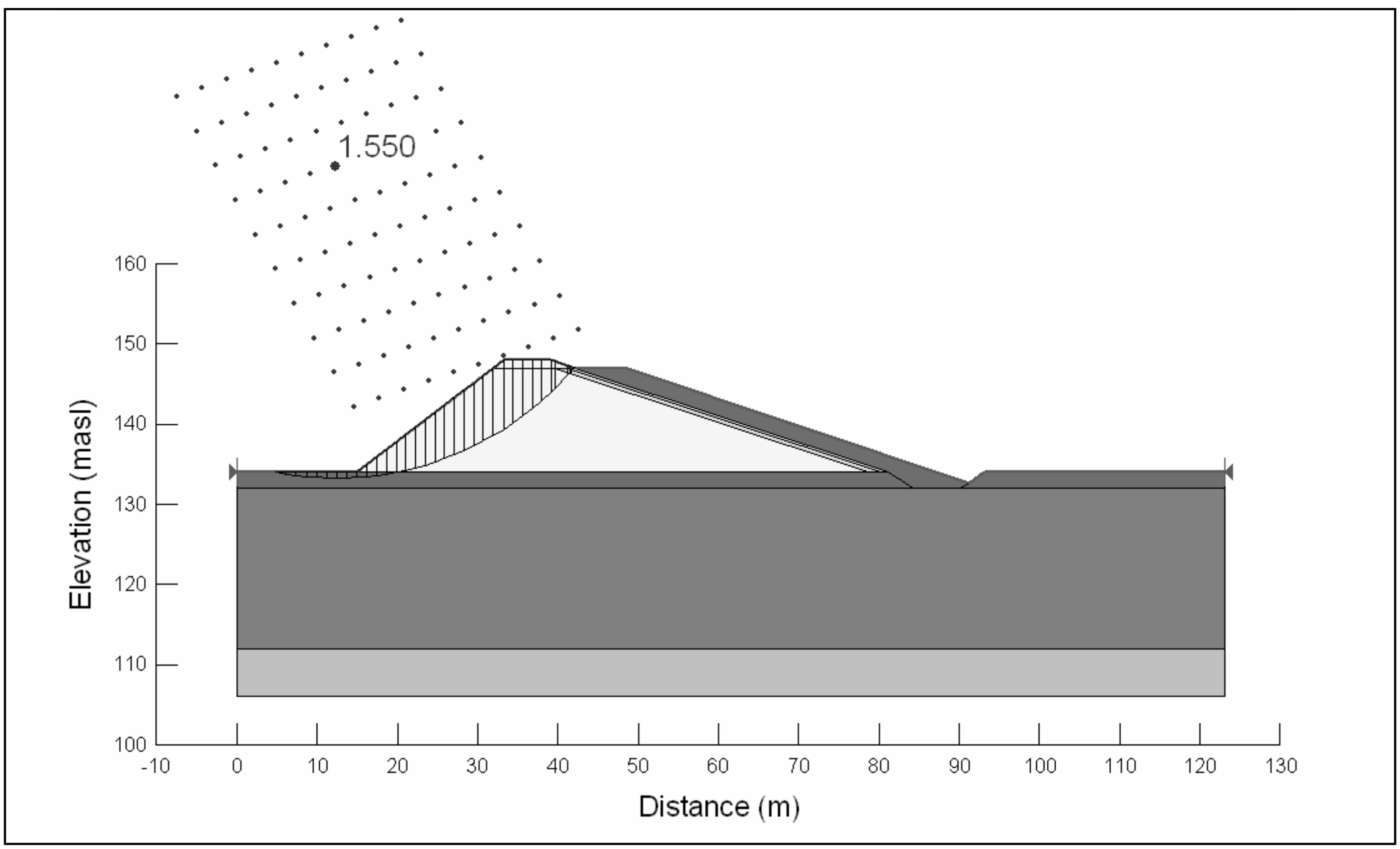
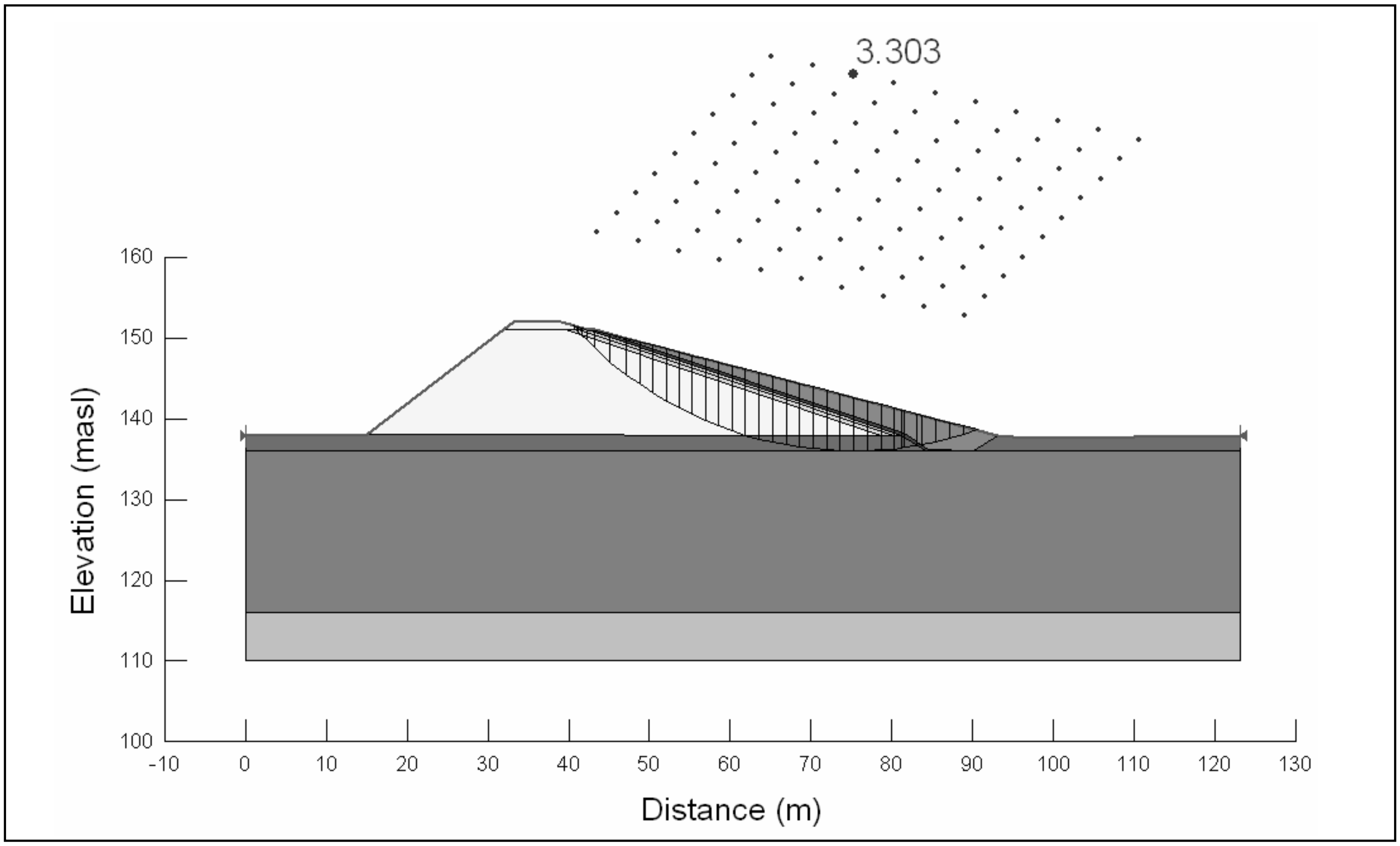


Pseudostatic

Figure III-56
SLOPE/W Analysis
Saddle Dam With Compacted Till Core
Downstream Failure



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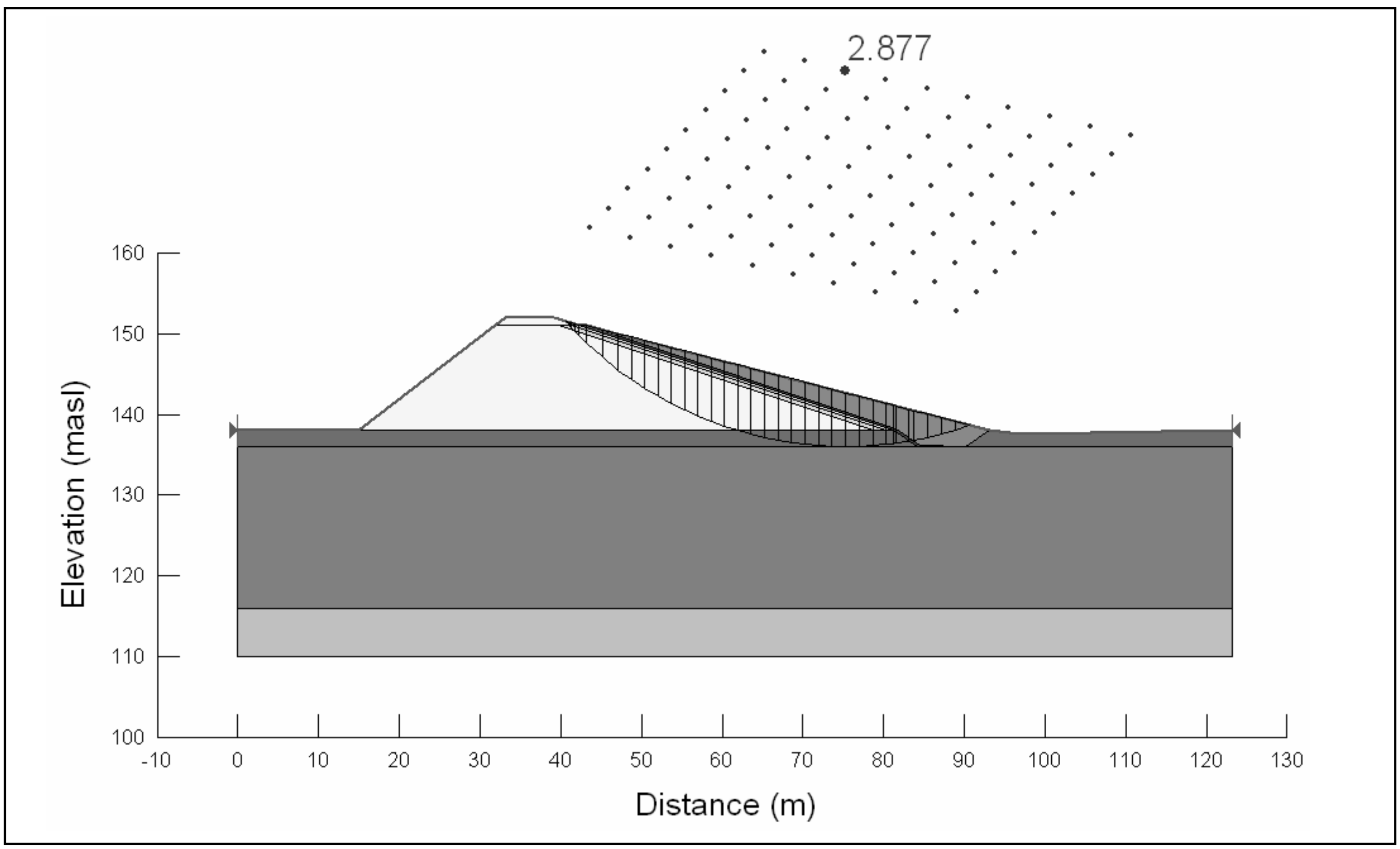
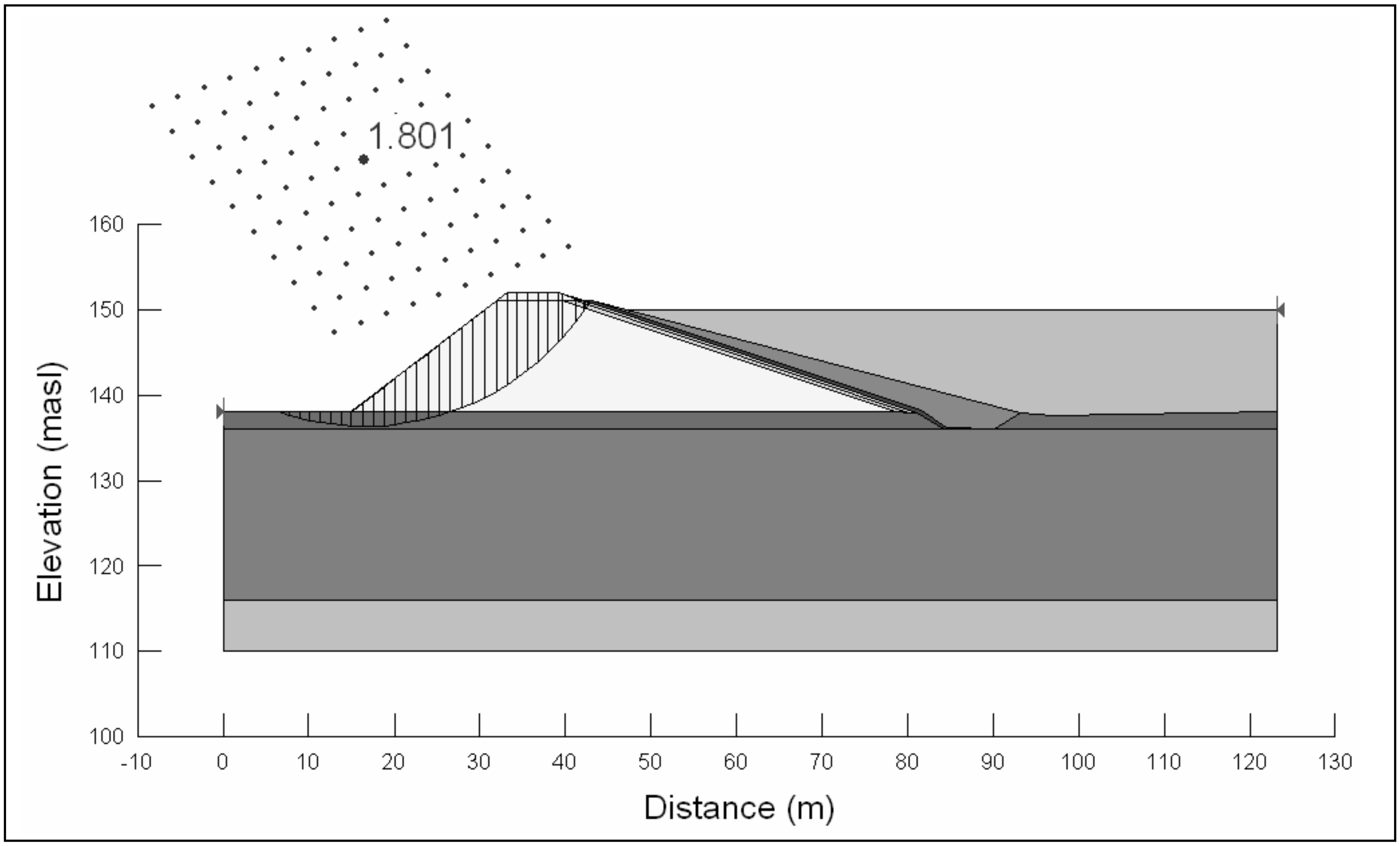


Pseudostatic

Figure III-57
SLOPE/W Analysis
Saddle Dam With Bituminous Liner
Upstream Failure

Meadowbank Mining Corporation
Meadowbank Gold Project
06-1413-089



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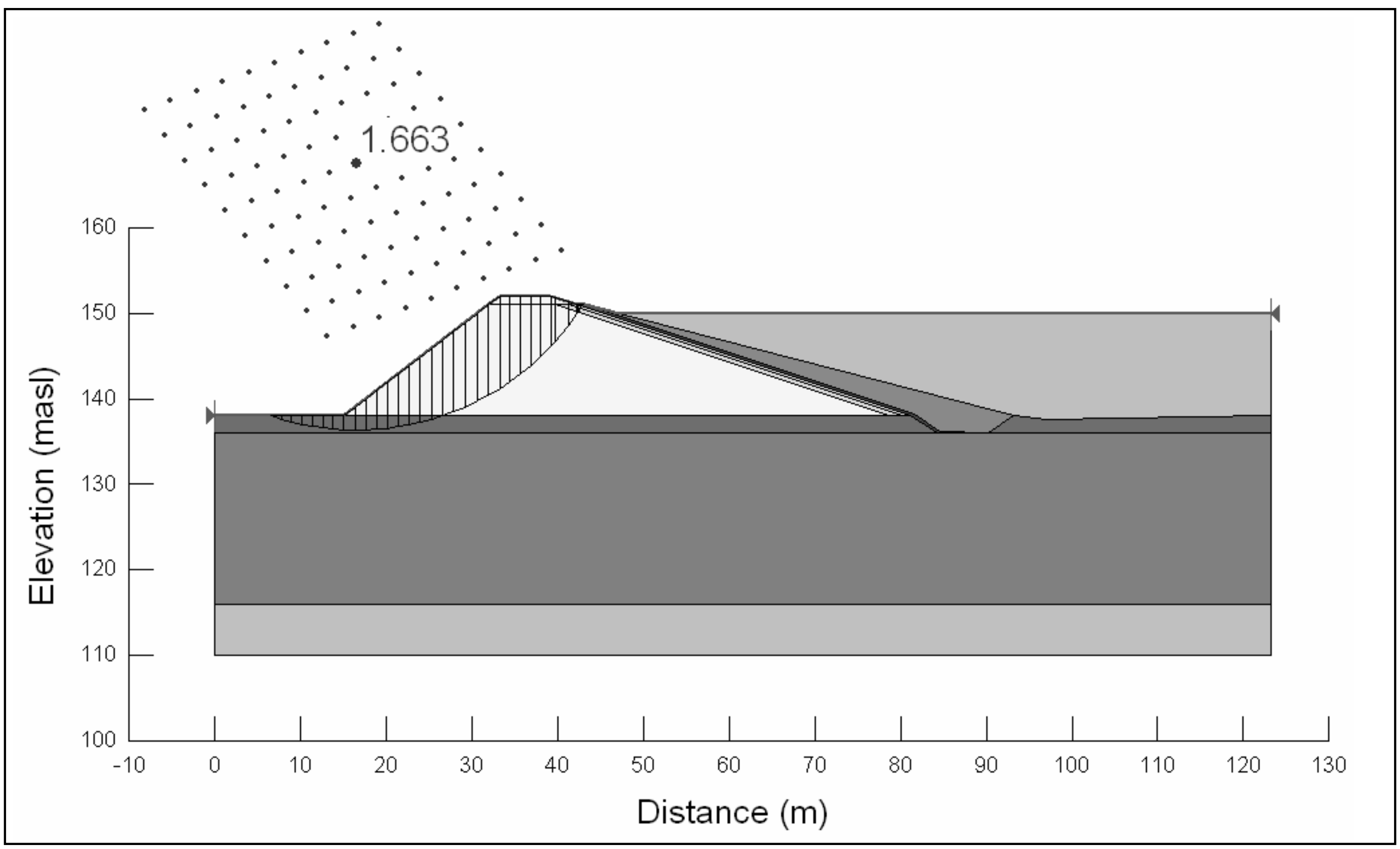
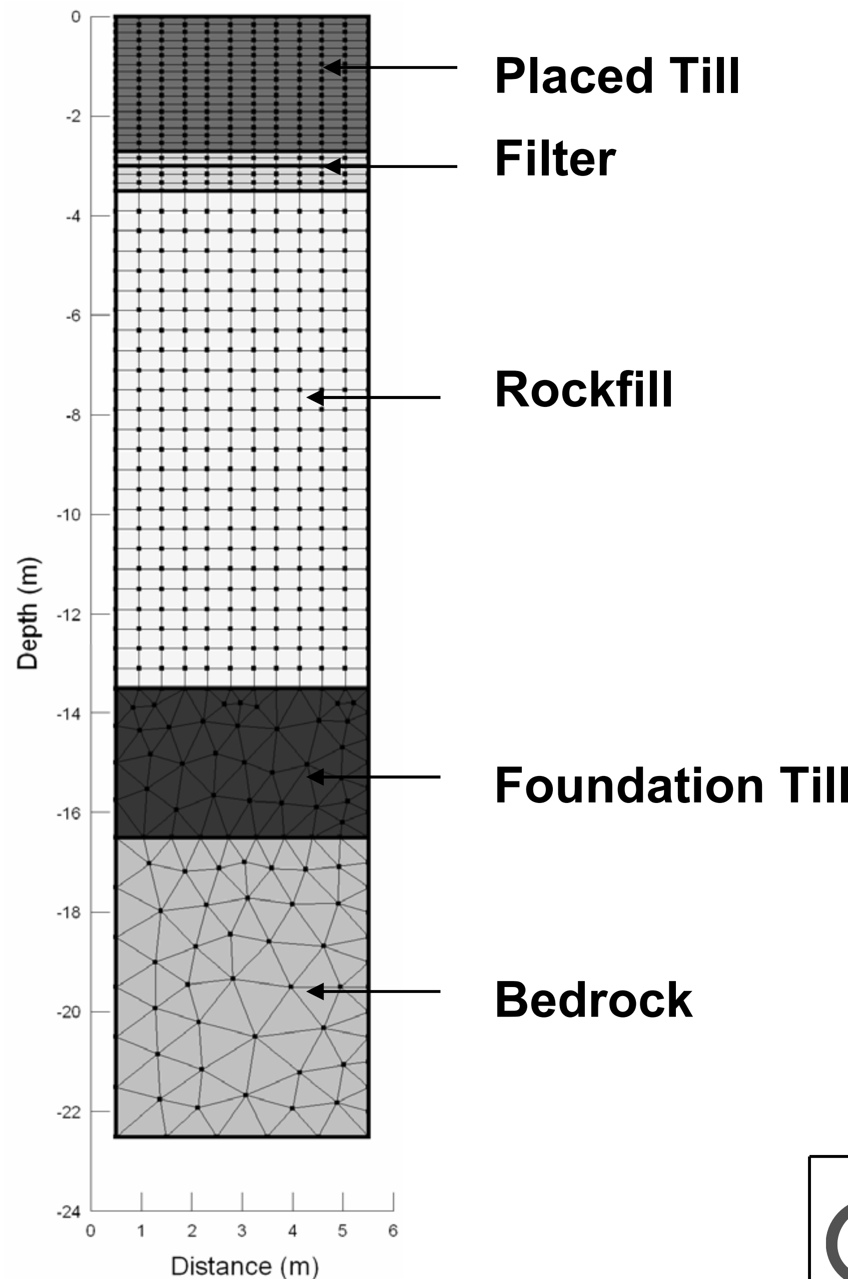


Pseudostatic

Figure III-58
SLOPE/W Analysis
Saddle Dam With Bituminous Liner
Downstream Failure

Meadowbank Mining Corporation
Meadowbank Gold Project
06-1413-089

PROJECT NO. 06-1413-089 DRAWN: KD REVIEWED BY: DATE: 13-03-07 FILE LOCATION: O:\Active_2006\1413\06-1413-089_CumberlandNWB\4000 Tailings Dike Design\Task 6000 Design Report\Report Figures\Final Figures

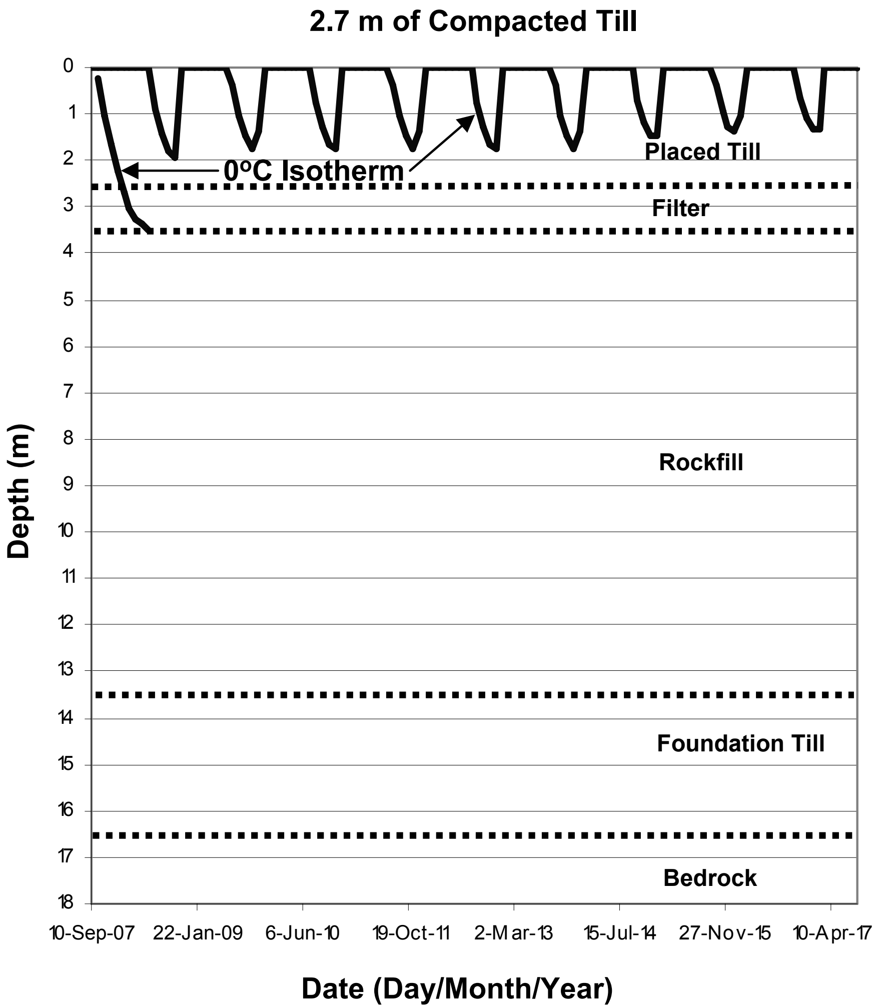


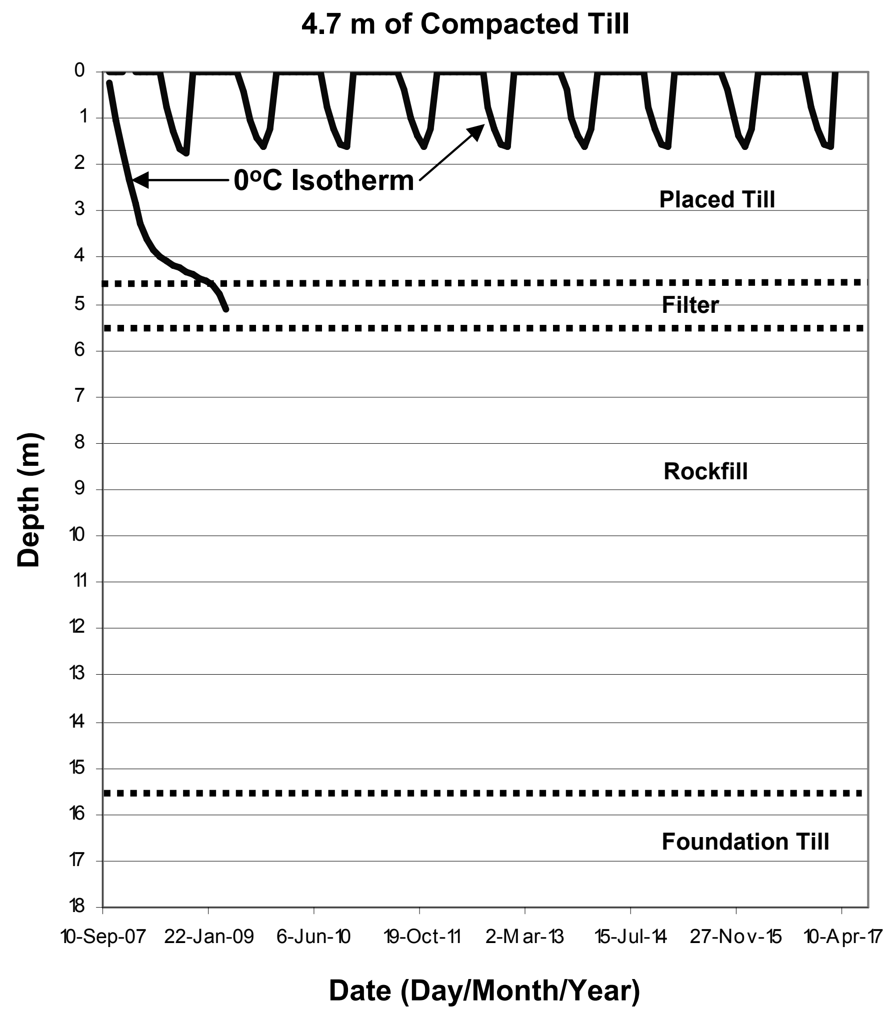
Golder Associates

1D Section, Saddle Dam
Thermal Analysis
Meadowbank Mining Corporation
Meadowbank Gold Project

Drawn: KD	App'd: BEW	Date: Mar. 13, 2007	Figure: III-59

PROJECT NO. 06-1413-089 DRAWN: KD REVIEWED BY: DATE: 13-03-07 FILE LOCATION: O:\Active_2006\1413\06-1413-089_CumberlandNWB\4000 Tailings Dike Design\Task 6000 Design Report\Report Figures\Final Figures





Golder Associates

0° C Isotherm- 1D Case
Saddle Dam Construction
Meadowbank Mining Corporation
Meadowbank Gold Project

Drawn: KD	App'd: BEW	Date: Mar. 13, 2007	Figure: III-60

APPENDIX IV

TAILINGS DEPOSITION PLAN

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

The objectives of the Portage Tailings Storage Facility (TSF) tailings deposition plan are to:

- Define the alignment of the Central Dike that will create an impoundment with capacity to store the life of mine tailings plus a contingency while maintaining the required setback from the Portage Pit.

- Define a deposition sequence that allows the basin to be partitioned and a portion of the TSF to be operated as a storm water attenuation pond for at least 4 years.

- Define a deposition sequence that maintains a tailings pond with sufficient depth for efficient operation of the reclaim barge near the west side of the impoundment.

- Define the staged construction schedule for the dikes so that adequate freeboard is maintained within the impoundment.

- Define a deposition sequence that creates a tailings surface that will require the minimum earthworks during closure and if possible will allow covering of some portion of the tailings surface during operations.

- Define a deposition sequence that promotes freezing of the tailings during the operating period.

2.0 DESCRIPTION OF THE FACILITY

The tailings storage facility will be located in the "2nd Portage Lake" area. The basin will be created by construction of the Central Dike at the southern limit of the impoundment. The storm water dike will divide the impoundment into two basins, with the northern basin being used as the attenuation pond. Saddle Dams will be constructed on the western perimeter and combined with a rockfill berm used as the tailings and water reclaim pipeline berm. The layout of the TSF is shown on Figure IV-1.

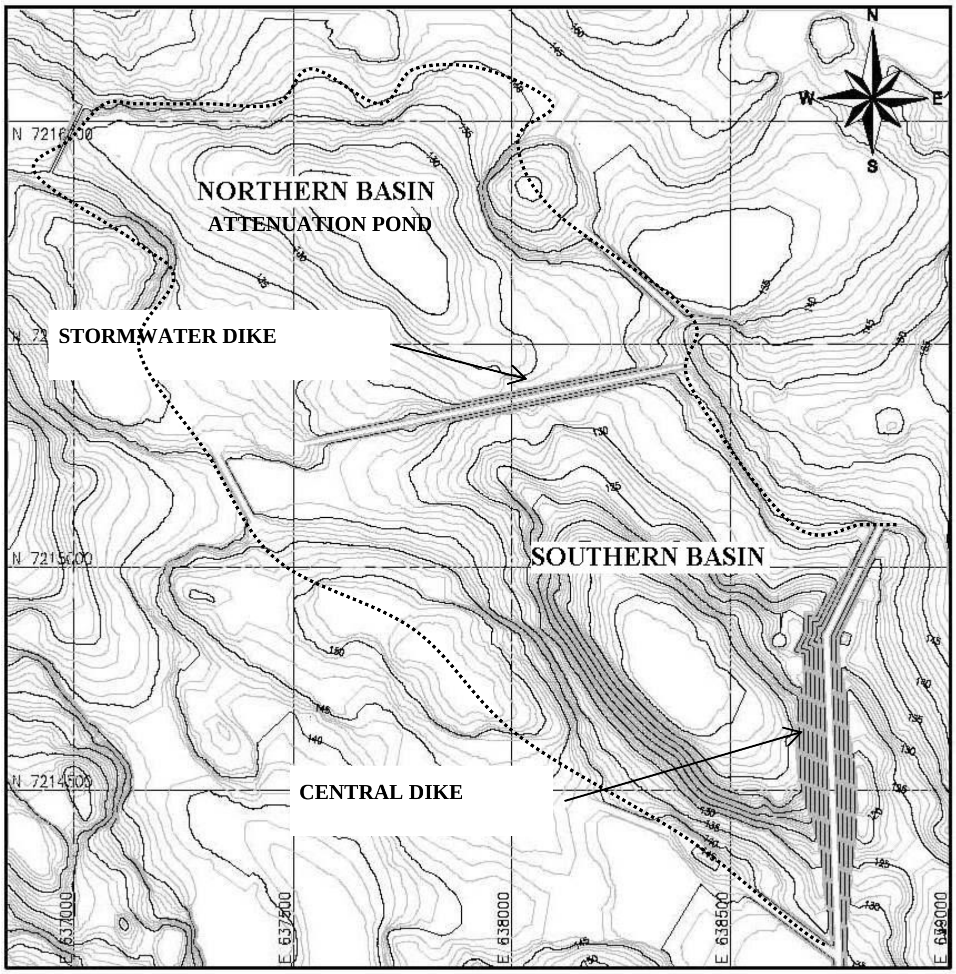


Figure IV-1: Meadowbank Gold Project - Tailings Storage Facility Layout

3.0 DESIGN CRITERIA AND PARAMETERS

The design criteria and parameters used in the development of the tailings deposition plan are summarized in Table IV-1.

Table IV-1: Tailings Deposition Plan Design Criteria

Design Criteria	Unit	Value
1. Start of operation		February 2009 (winter season)
2. Life Of Mine	year	8.4
3. Initial Pond Volume	m^3	750,000 (pond for winter operation)
4. Operating Pond		
Average range of pond volume (pond volume increased through the winter to minimize ice entrainment in beach)		
Autumn to Winter	m^3	750,000 (6,100m^3/day over 90 days period, plus 200,000 m^3 for ice build-up)
Spring to Summer	m^3	550,000 (6,100m^3/day over 90 days period)
Location		Western end of the TSF, moving towards NW during operation (pushed away from Central Dike)
5. Discharge lines		
System		ON/OFF
Quantity		Redundant pipelines required to allow uninterrupted operation during winter
6. Discharge Points		
Autumn to Winter		Spigots operated in sequence starting at spigot furthest from process plant and retreating towards the process plant.
Spring to Summer		Unrestricted, used to maintain pond location
7. Average Settled Dry Density	t/m^3	1.16 to 1.45 (average 1.31[1])
8. Tailings Production Rate		
Total Weight per day	t/day	7,500
Tailings slurry solids concentration	%	50.8
9. Total Required Capacity	Mt	22.0
10. Tailings Slopes		
Average tailings beach	%	0.5 to 1.0
Sub aqueous	%	5.0
11. Ice Bulking Volume Factor	%	20

[1] Average dry density assuming 20% bulking of tailings due to ice entrapment

4.0 GENERAL ASSUMPTIONS

The tailings deposition plan has been developed assuming that tailings will be discharged into the southern portion of the TSF to the maximum elevation prior to tailings being discharged into the northern basin. This will maximize the time that the northern part of the basin can be used as the storm water attenuation pond. Once the southern area is filled, the reclaim barge will be moved into the northern area, and tailings deposition continued into that basin. While the northern area is operated, the southern area will be allowed to freeze, and the rockfill cover placed starting from the Central Dike and working to the north.

Deposition plans were developed for two tailings beach slopes, 0.5% and 1.0%. A steeper tailings beach slope reduces the capacity of a basin, and therefore requires higher containment structures. The results of the deposition plan for the 1.0% beach slope were therefore used to determine the Central Dike alignment relative to the required setback from the Portage Pit crest. For the alignment selected, the Central Dike can be raised at least 3 m using downstream construction methods to provide additional storage capacity while maintaining the specified 60 m setback from the pit.

A flatter tailings beach slope creates a shallower pond that is more difficult to manage. The results of the deposition plan for the 0.5% beach slope were used to define the tailings pond location for reclaim barge operation.

Periodic topographic surveys of the tailings beach and bathymetric surveys of the tailings pond will provide information on beach and underwater slopes and average settled density for use in refining the deposition plan during operations.

The conceptual closure plan considers that the surface of the tailings will be shaped to promote surface runoff and then covered with a layer of rockfill. The thickness of the rockfill will be selected such that the active layer will be within the rockfill and, once frozen the tailings will remain frozen. To minimize the earthworks required at the end of the mine life, the deposition plan has been developed to create a surface that drains towards the left abutment of the storm water dike. On closure, the tailings can be covered with rockfill and a pond maintained against the Saddle Dam. The collected water can be tested, and treated or released depending on quality. Once the water collecting in the pond is demonstrated to be of suitable quality for release, the Saddle Dam can be removed and a permanent channel carrying surface runoff to Third Portage Lake can be constructed.

5.0 DISCHARGE POINTS

The discharge points are located strategically around the perimeter of the TSF to push the supernatant pond towards the barges location. Figure IV-2 shows the spigots location used in the deposition model.

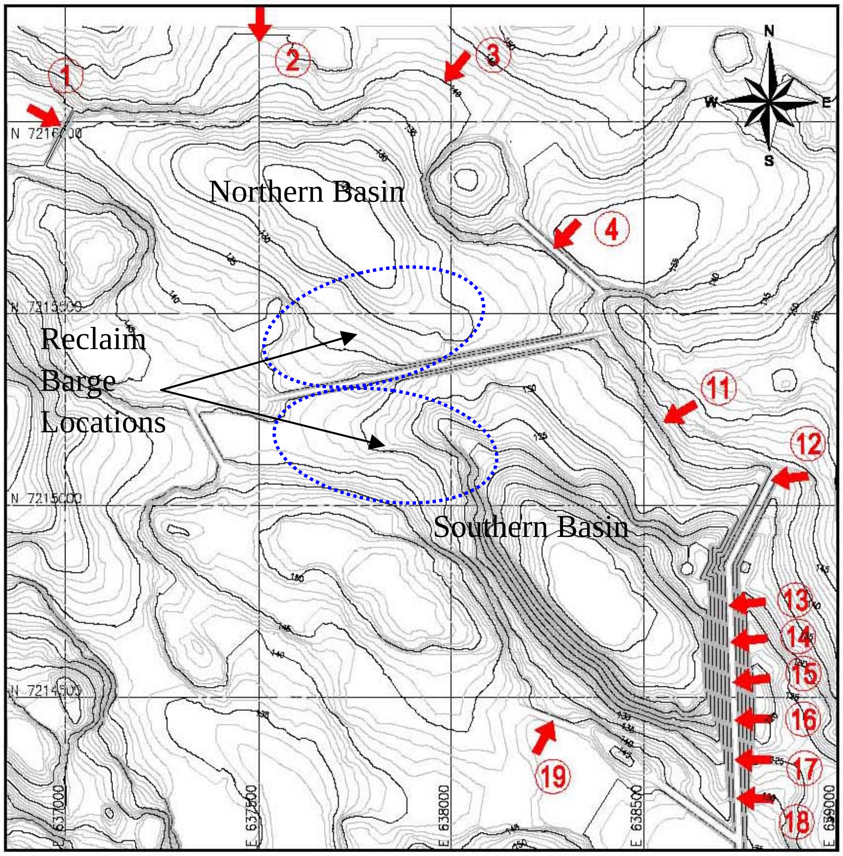


Figure IV-2: Spigot Locations for Tailings Deposition Model

To minimize the effort required to change spigots during the winter, the spigots will be used for the maximum time possible at a location and will be operated in sequence from the furthest from the process plant to the nearest to the process plant. Spigots will be changed either by opening the valve for the new spigot and closing the valve to the old spigot, or by shutting down the pipeline and installing an elbow and spigot line at the next discharge location.

During the summer, the spigots will be operated as required to localize the pond at the reclaim barge location.

6.0 TAILINGS DEPOSITION PLAN

6.1 Tailings Beach Slope 0.5%

Table IV-2 provides the sequence of discharge for a beach tailings slope of 0.5%.

Table IV-2: Tailings Deposition Plan - Sequence of Operation - 0.5% Beach Slope

Southern Basin - 0.5% Tailings Beach Slope

General Data

Tailings slope:			**Supernatant Pond:**			
Beach:	0.5	%	Summer season:	0.50	Mm^3	(May to October)
Below Water:	5.0	%	Winter Season:	0.75	Mm^3	(November to April)
Av. TailingsDry Density:	1.31	t/m^3	**References:**			
Tailings Producttion:	7,500	tpd	Winter Season			
	5,725	m^3/day	Summer Season			
Beginning of Operation:	01-Feb-09	(dd-mm-yy)	Note (1): Refers to tailings elevation at the end of the considered discharging period			

Discharge Sequence	Tailings Discharge Spigot	Tailings Discharge Elev. (1)	Tailings Discharge Area	Tailings Discharge Volume	Accum. Volume	Ending Discharge	Period of Operaton Days	Period of Operaton Months	Period of Operaton Years	Supernatant Pond Elev.	Supernatant Pond Area	Embankment or Location
#	#	m a.s.l.	(m^2)	(m^3)	(m^3)	(dd-mm-yy)	-	-	-	(m a.s.l.)	(m^2)	-
n/a	n/a	n/a	n/a	0	0	31-Jan-09	0	0.0	0.00	106.4	139,242	
1	13	108.00	55,055	175,805	175,805	02-Mar-09	31	1.0	0.08	107.7	144,932	Main Dam
2	14	110.00	88,217	264,757	440,562	17-Apr-09	77	2.6	0.21	109.3	135,798	Main Dam
3	15	111.00	65,548	76,297	516,859	01-May-09	90	3.0	0.25	110.1	135,368	Main Dam
4	16	114.00	128,288	497,895	1,014,754	27-Jul-09	177	5.9	0.49	112.5	127,729	Main Dam
5	14	114.70	123,923	196,409	1,211,163	30-Aug-09	212	7.1	0.58	113.6	135,152	Main Dam
6	15	115.70	147,924	174,418	1,385,581	30-Sep-09	242	8.1	0.66	114.2	126,151	Main Dam
7	16	117.00	158,009	208,038	1,593,619	05-Nov-09	278	9.3	0.76	115.1	126,369	Main Dam
8	13	117.70	136,508	282,683	1,876,302	24-Dec-09	328	10.9	0.90	116.5	146,153	Main Dam
9	14	119.00	184,709	267,437	2,143,739	09-Feb-10	374	12.5	1.03	117.5	128,016	Main Dam
10	15	120.50	189,427	237,850	2,381,589	22-Mar-10	416	13.9	1.14	118.7	135,793	Main Dam
11	16	121.70	205,672	263,494	2,645,083	08-May-10	462	15.4	1.27	119.4	130,047	Main Dam
12	17	122.70	215,351	259,997	2,905,080	22-Jun-10	507	16.9	1.39	120.3	159,272	Main Dam
13	13	122.70	133,773	166,319	3,071,399	21-Jul-10	536	17.9	1.47	121.3	150,593	Main Dam
14	15	123.80	219,246	203,275	3,274,674	25-Aug-10	572	19.1	1.57	121.7	130,201	Main Dam
15	13	124.30	183,320	221,615	3,496,289	03-Oct-10	611	20.4	1.67	122.7	146,667	Main Dam
16	15	125.30	194,617	167,857	3,664,146	02-Nov-10	640	21.3	1.75	123.2	140,549	Main Dam
17	13	125.80	206,718	250,925	3,915,071	15-Dec-10	683	22.8	1.87	124.1	147,519	Main Dam
18	14	126.70	253,153	244,427	4,159,498	27-Jan-11	733	24.4	2.01	124.7	138,716	Main Dam
19	15	127.80	267,300	288,832	4,448,330	18-Mar-11	779	26.0	2.13	125.4	138,444	Main Dam
20	16	129.00	277,782	263,148	4,711,478	03-May-11	825	27.5	2.26	126.2	147,990	Main Dam
21	17	130.10	287,617	259,995	4,971,473	18-Jun-11	870	29.0	2.38	126.8	147,762	Main Dam
22	13	129.50	176,107	189,763	5,161,236	21-Jul-11	903	30.1	2.47	127.6	170,207	Main Dam
23	15	130.40	253,261	155,933	5,317,169	17-Aug-11	930	31.0	2.55	127.8	154,011	Main Dam
24	13	130.80	248,644	268,875	5,586,044	03-Oct-11	977	32.6	2.68	128.7	164,267	Main Dam
25	15	131.60	236,485	181,991	5,768,035	04-Nov-11	1,009	33.6	2.76	128.9	156,865	Main Dam
26	13	132.00	265,702	259,554	6,027,589	19-Dec-11	1,054	35.1	2.89	129.8	166,882	Main Dam
27	14	132.80	325,679	239,287	6,266,876	30-Jan-12	1,096	36.5	3.00	130.3	164,587	Main Dam
28	15	133.60	339,407	245,381	6,512,257	13-Mar-12	1,139	38.0	3.12	130.7	162,819	Main Dam
29	16	134.60	359,412	267,650	6,779,907	29-Apr-12	1,186	39.5	3.25	131.3	173,365	Main Dam
30	17	135.30	377,159	179,666	6,959,573	30-May-12	1,217	40.6	3.33	131.5	170,613	Main Dam
31	13	134.40	226,898	196,787	7,156,360	03-Jul-12	1,252	41.7	3.43	132.0	186,932	Main Dam
32	15	135.40	359,831	166,570	7,322,930	02-Aug-12	1,281	42.7	3.51	132.3	192,903	Main Dam
33	13	135.30	290,118	231,364	7,554,294	11-Sep-12	1,321	44.0	3.62	132.7	197,227	Main Dam
34	15	136.40	417515	298,467	7,852,761	02-Nov-12	1,373	45.8	3.76	133.1	199,329	Main Dam
35	13	136.50	335080	262,491	8,115,252	18-Dec-12	1,419	47.3	3.89	133.8	208,763	Main Dam
36	14	137.20	464585	275,485	8,390,737	04-Feb-13	1,467	48.9	4.02	134.1	198,828	Main Dam
37	15	137.90	467974	256,943	8,647,680	21-Mar-13	1,512	50.4	4.14	134.4	198,747	Main Dam
38	16	138.70	486705	288,579	8,936,259	10-May-13	1,562	52.1	4.28	134.8	196,386	Main Dam
39	19	138.30	231523	243,176	9,179,435	22-Jun-13	1,605	53.5	4.40	135.4	222,686	SW Saddle Dam
40	13	138.50	264912	243,834	9,423,269	03-Aug-13	1,648	54.9	4.51	135.7	198,310	Main Dam
41	19	139.00	279719	240,757	9,664,026	14-Sep-13	1,690	56.3	4.63	135.9	190,446	SW Saddle Dam
42	13	139.30	317206	257,186	9,921,212	29-Oct-13	1,734	57.8	4.75	136.3	186,525	Main Dam
43	11	138.70	146206	267,530	10,188,742	15-Dec-13	1,781	59.4	4.88	137.3	251,858	Natural ground - Impact on Diversion Dike
44	13	140.30	368739	277,199	10,465,941	02-Feb-14	1,830	61.0	5.01	137.5	233,386	Main Dam
45	16	141.30	281686	256,923	10,722,864	18-Mar-14	1,875	62.5	5.14	137.5	220,069	Main Dam
46	19	141.00	265859	283,559	11,006,423	07-May-14	1,924	64.1	5.27	137.9	227,672	SW Saddle Dam
47	11	140.10	192308	268,100	11,274,523	23-Jun-14	1,971	65.7	5.40	138.5	233,057	Natural ground - Impact on Diversion Dike
48	12	141.90	301168	233,746	11,508,269	03-Aug-14	2,012	67.1	5.51	138.8	238,993	Main Dam
49	13	142.30	400140	322,829	11,831,098	28-Sep-14	2,068	68.9	5.67	138.9	212,644	Main Dam
50	16	143.10	232130	181,715	12,012,813	30-Oct-14	2,100	70.0	5.75	139.0	226,318	Main Dam
51	11	141.70	204218	283,749	12,296,562	18-Dec-14	2,149	71.6	5.89	139.8	257,597	Natural ground - Impact on Diversion Dike
52	12	143.50	392827	278,288	12,574,850	05-Feb-15	2,198	73.3	6.02	140.0	234,962	Main Dam
53	13	143.50	338274	214,040	12,788,890	14-Mar-15	2,235	74.5	6.12	140.1	203,389	Main Dam
54	17	143.50	98348	41,972	12,830,862	22-Mar-15	2,243	74.8	6.14	140.2	224,789	Main Dam
55	19	143.50	214898	219,052	13,049,914	29-Apr-15	2,281	76.0	6.25	140.4	221,253	SW Saddle Dam

Northern Basin - 0.5% Tailings Beach Slope

General Data						
Tailings slope:			**Supernatant Pond:**			
Beach:	0.5	%	Summer season:	0.50	Mm^3	(May to October)
Below Water:	5.0	%	Winter Season:	0.75	Mm^3	(November to April)
Av. TailingsDry Density:	1.31	t/m^3	**References:**			
Tailings Productiion:	7,500	tpd		Winter Season		
	5,725	m^3/day		Summer Season		
Beginning of Operation:	30-Apr-15	(dd-mm-yy)	Note (1): Refers to tailings elevation at the end of the considered discharging period			

Discharge Sequence	Tailings Discharge				Accum. Volume	Ending Discharge	Period of Operaton			Supernatant Pond		Embankment or Location
	Spigot	Elev. (1)	Area	Volume			Days	Months	Years	Elev.	Area	
#	#	m a.s.l.	(m^2)	(m^3)	(m^3)	(dd-mm-yy)	-	-	-	(m a.s.l.)	(m^2)	-
n/a	n/a	n/a		0	0	30-Apr-15	0	0.0	0.00	130.5	220,056	-
1	1	139.00	95,861	1,904,144	1,904,144	27-Mar-16	333	11.1	0.91	135.0	222,301	NW Saddle Dam
2	3	138.00	149,837	349,323	2,253,467	27-May-16	394	13.1	1.08	136.1	251,381	Potential NE Saddle Dam
3	1	140.50	318,952	424,636	2,678,103	10-Aug-16	468	15.6	1.28	136.4	201,887	NW Saddle Dam
4	3	140.00	242,850	447,230	3,125,333	27-Oct-16	546	18.2	1.50	137.6	242,231	Potential NE Saddle Dam
5	1	141.50	268,177	236,239	3,361,572	07-Dec-16	587	19.6	1.61	137.7	210,049	NW Saddle Dam
6	3	140.90	276,202	278,948	3,640,520	25-Jan-17	636	21.2	1.74	138.3	218,976	Potential NE Saddle Dam
7	2	142.00	392,836	491,473	4,131,993	21-Apr-17	722	24.1	1.98	138.9	196,101	Natural ground
8	1	143.00	219,962	210,356	4,342,349	27-May-17	758	25.3	2.08	139.2	221,222	NW Saddle Dam
9	3	143.00	302,002	449,083	4,791,432	14-Aug-17	837	27.9	2.29	140.1	255,610	Potential NE Saddle Dam
10	1	144.00	298,061	252,543	5,043,975	27-Sep-17	881	29.4	2.41	140.2	210,439	NW Saddle Dam
11	4	142.20	99,780	339,075	5,383,050	25-Nov-17	940	31.3	2.58	141.1	329,741	NE Saddle Dam

Cumulative volumes indicated in the table above correspond separately to southern and northern basins. The sequence of tailings deposition is shown schematically on Drawings IV - 001 to 004.

The struck level curve for the TSF is shown in Figure IV-3.

6.2 Tailings Beach Slope 1%

Table IV-3 provides the sequence of discharge for a beach tailings slope of 1%, as follows:

Table IV-3: Tailings Deposition Plan - Sequence of Operation – 1.0% Beach Slope

Southern Basin - 1% Tailings Beach Slope

General Data

Tailings slope:			**Supernatant Pond:**			
Beach:	1.0	%	Summer season:	0.50	Mm^3	(May to October)
Below Water:	5.0	%	Winter Season:	0.75	Mm^3	(November to April)
Av. TailingsDry Density:	1.31	t/m^3	**References:**			
Tailings Producttion:	7,500	tpd		Winter Season		
	5,725	m^3/day		Summer Season		
Beginning of Operation:	01-Feb-09	(dd-mm-yy)	Note (1): Refers to tailings elevation at the end of the considered discharging period			

Discharge Sequence	Tailings Discharge Spigot	Elev. (1)	Area	Volume	Accum. Volume	Ending Discharge	Period of Operaton Days	Months	Years	Supernatant Pond Elev.	Area	Embankment or Location
#	#	m a.s.l.	(m^2)	(m^3)	(m^3)	(dd-mm-yy)	-	-	-	(m a.s.l.)	(m^2)	-
n/a	n/a	n/a	n/a	0	0	31-Jan-09	0	0.0	0.00	106.4	139,242	
1	13	108.00	52,334	165,265	165,265	28-Feb-09	29	1.0	0.08	107.4	142,575	Main Dam
2	14	110.00	79,778	205,116	370,381	05-Apr-09	65	2.2	0.18	108.7	135,036	Main Dam
3	15	111.00	64,547	78,120	448,501	19-Apr-09	78	2.6	0.21	109.2	129,482	Main Dam
4	16	114.00	115,787	373,619	822,120	23-Jun-09	144	4.8	0.39	111.2	125,517	Main Dam
5	14	114.70	114,506	239,287	1,061,407	04-Aug-09	185	6.2	0.51	112.6	132,554	Main Dam
6	15	115.70	123,264	114,130	1,175,537	24-Aug-09	205	6.8	0.56	112.9	124,445	Main Dam
7	16	117.00	133,028	121,782	1,297,319	14-Sep-09	227	7.6	0.62	113.5	125,904	Main Dam
8	13	117.70	127,567	344,572	1,641,891	13-Nov-09	287	9.6	0.79	115.5	144,993	Main Dam
9	14	119.00	162,814	212,301	1,854,192	20-Dec-09	324	10.8	0.89	116.3	133,238	Main Dam
10	15	120.50	177,811	247,390	2,101,582	02-Feb-10	367	12.2	1.01	117.0	128,719	Main Dam
11	16	121.70	175,942	119,204	2,220,786	22-Feb-10	388	12.9	1.06	117.4	129,007	Main Dam
12	17	122.70	191,225	195,111	2,415,897	28-Mar-10	422	14.1	1.16	118.3	133,585	Main Dam
13	13	122.70	153,359	359,872	2,775,769	30-May-10	485	16.2	1.33	119.9	142,147	Main Dam
14	15	124.30	171,404	229,866	3,005,635	09-Jul-10	525	17.5	1.44	120.3	129,717	Main Dam
15	13	125.00	186,473	353,197	3,358,832	09-Sep-10	587	19.6	1.61	121.8	140,043	Main Dam
16	15	126.00	121,070	134,921	3,493,753	03-Oct-10	610	20.3	1.67	122.0	137,300	Main Dam
17	17	127.00	87,322	50,611	3,544,364	12-Oct-10	723	24.1	1.98	122.2	136,884	Main Dam
18	13	128.00	239,434	644,596	4,188,960	01-Feb-11	740	24.7	2.03	124.4	140,614	Main Dam
19	14	128.50	142,536	99,487	4,288,447	19-Feb-11	769	25.6	2.11	124.6	140,491	Main Dam
20	15	130.00	147,877	165,802	4,454,249	20-Mar-11	824	27.5	2.26	124.8	138,695	Main Dam
21	16	131.30	259,162	315,224	4,769,473	14-May-11	879	29.3	2.41	125.8	148,248	Main Dam
22	13	130.80	201,717	357,767	5,127,240	15-Jul-11	942	31.4	2.58	126.9	159,746	Main Dam
23	15	131.60	128,629	56,800	5,184,040	25-Jul-11	952	31.7	2.61	127.0	158,226	Main Dam
24	13	132.00	240,322	291,962	5,476,002	14-Sep-11	1,003	33.4	2.75	127.9	162,283	Main Dam
25	14	132.80	233,149	157,757	5,633,759	12-Oct-11	1,030	34.3	2.82	128.2	159,856	Main Dam
26	15	133.60	201,714	133,177	5,766,936	04-Nov-11	1,054	35.1	2.89	128.4	161,428	Main Dam
27	13	135.30	338,316	894,676	6,661,612	08-Apr-12	1,210	40.3	3.31	130.6	163,666	Main Dam
28	16	135.30	71,172	84,252	6,745,864	23-Apr-12	1,224	40.8	3.35	130.6	163,666	Main Dam
29	15	136.40	187,612	161,294	6,907,158	21-May-12	1,253	41.8	3.43	130.8	165,946	Main Dam
30	13	136.50	299,116	336,932	7,244,090	19-Jul-12	1,312	43.7	3.59	131.6	174,545	Main Dam
31	14	137.20	244,522	125,382	7,369,472	10-Aug-12	1,333	44.4	3.65	131.8	177,170	Main Dam
32	15	137.90	227,789	139,668	7,509,140	03-Sep-12	1,358	45.3	3.72	131.9	180,307	Main Dam
33	16	138.70	229,359	126,329	7,635,469	25-Sep-12	1,380	46.0	3.78	132.0	184,722	Main Dam
34	13	139.30	398,347	947,359	8,582,828	10-Mar-13	1,545	51.5	4.23	133.8	204,917	Main Dam
35	19	139.00	158,233	270,602	8,853,430	26-Apr-13	1,593	53.1	4.36	134.0	195,205	SW Saddle Dam
36	11	138.70	187,397	526,721	9,380,151	27-Jul-13	1,685	56.2	4.62	135.7	224,625	SE Saddle Dam - Impact on Diversion Dike
37	13	140.30	216,100	180,769	9,560,920	27-Aug-13	1,716	57.2	4.70	135.8	215,941	Main Dam
38	16	141.30	125,417	195,694	9,756,614	01-Oct-13	1,750	58.3	4.80	135.8	215,941	Main Dam
39	19	141.00	188,101	265,545	10,022,159	16-Nov-13	1,797	59.9	4.92	136.1	201,307	SW Saddle Dam
40	11	140.10	219,884	305,443	10,327,602	08-Jan-14	1,850	61.7	5.07	136.9	213,027	SE Saddle Dam - Impact on Diversion Dike
41	13	143.00	330,695	570,022	10,897,624	18-Apr-14	1,950	65.0	5.34	137.2	198,915	Main Dam
42	19	144.00	301,188	626,377	11,524,001	05-Aug-14	2,059	68.6	5.64	138.0	232,560	SW Saddle Dam
43	11	142.50	227,184	469,305	11,993,306	26-Oct-14	2,141	71.4	5.87	138.9	223,298	SE Saddle Dam - Impact on Diversion Dike
44	12	145.00	158,348	205,104	12,198,410	01-Dec-14	2,177	72.6	5.96	139.0	228,993	Main Dam
45	13	145.00	263,643	290,044	12,488,454	21-Jan-15	2,228	74.3	6.10	139.0	220,400	Main Dam
46	19	146.00	342,150	553,081	13,041,535	27-Apr-15	2,324	77.5	6.37	139.5	211,743	SW Saddle Dam
47	11	145.00	262,107	596,299	13,637,834	10-Aug-15	2,428	80.9	6.65	140.7	213,507	SE Saddle Dam - Impact on Diversion Dike

Northern Basin - 1% Tailings Beach Slope

General Data						
Tailings slope:			**Supernatant Pond:**			
Beach:	1.0	%	Summer season:	0.50	Mm^3	(May to October)
Below Water:	5.0	%	Winter Season:	0.75	Mm^3	(November to April)
Av. TailingsDry Density:	1.31	t/m^3	**References:**			
Tailings Producttion:	7,500	tpd		Winter Season		
	5,725	m^3/day		Summer Season		
Beginning of Operation:	11-Aug-15	(dd-mm-yy)	Note (1): Refers to tailings elevation at the end of the considered discharging period			

Discharge	Tailings Discharge				Accum.	Ending	Period of Operaton			Supernatant Pond		Embankment
Sequence	Spigot	Elev. (1)	Area	Volume	Volume	Discharge	Days	Months	Years	Elev.	Area	or Location
#	#	m a.s.l.	(m^2)	(m^3)	(m^3)	(dd-mm-yy)	-	-	-	(m a.s.l.)	(m^2)	-
n/a	n/a	n/a		0	0	11-Aug-15	0	0.0	0.00	130.5	220,056	
1	1	139.00	212,048	872,399	872,399	10-Jan-16	152	5.1	0.42	132.5	222,908	NW Saddle Dam
2	3	138.00	150,655	625,763	1,498,162	28-Apr-16	262	8.7	0.72	134.4	274,989	Potential NE Saddle Dam
3	1	140.50	174,638	229,941	1,728,103	07-Jun-16	302	10.1	0.83	134.5	233,643	NW Saddle Dam
4	3	140.00	211,675	381,924	2,110,027	13-Aug-16	369	12.3	1.01	135.5	256,986	Potential NE Saddle Dam
5	1	141.50	189,329	167,433	2,277,460	11-Sep-16	398	13.3	1.09	135.5	224,675	NW Saddle Dam
6	3	140.90	245,851	220,502	2,497,962	20-Oct-16	436	14.5	1.20	136.0	234,544	Potential NE Saddle Dam
7	2	142.00	269,427	522,166	3,020,128	19-Jan-17	528	17.6	1.45	136.7	217,362	Natural ground
8	1	143.00	138,058	162,093	3,182,221	16-Feb-17	556	18.5	1.52	136.8	218,830	NW Saddle Dam
9	3	143.00	229,850	340,940	3,523,161	17-Apr-17	615	20.5	1.69	137.5	224,734	Potential NE Saddle Dam
10	1	144.00	177,784	153,558	3,676,719	14-May-17	642	21.4	1.76	137.6	220,556	NW Saddle Dam
11	4	142.20	133,181	624,112	4,300,831	31-Aug-17	751	25.0	2.06	139.3	304,715	NE Saddle Dam
12	2	145.00	284,472	453,118	4,753,949	18-Nov-17	830	27.7	2.27	139.7	254,745	Natural ground
13	3	145.00	118,932	131,388	4,885,337	11-Dec-17	853	28.4	2.34	139.7	241,278	Potential NE Saddle Dam

Cumulative volumes indicated in the table above correspond separately to southern and northern basins.

The sequence of tailings deposition is shown schematically on Drawings IV - 05 to 08.

The struck level curve for the TSF is shown in Figure IV-3.

7.0 CONCLUSIONS

A summary of the main parameters for the tailings deposition plan are shown on Table IV-4 for the 0.5% beach slope and Table IV-5 for the 1.0% beach slope.

Table IV-4: Main Results - 0.5% - Summary

SUMMARY - 0.5% Tailings Beach Slope

DESCRIPTION	Unit	Value
Maximum Tailings Elevation:		
Southern Basin		
Against Main Dam (Spigot 12 to 18)	m a.s.l.	143.50
Against SW Saddle Dam (Spigot 19)	m a.s.l.	143.50
Near Diversion Dike (Spigot 11)	m a.s.l.	141.70
Northern Basin:		
Against NW Saddle Dam (Spigot 1)	m a.s.l.	144.00
Against Natural Ground (Spigot 2)	m a.s.l.	142.00
Against Potential NE Saddle Dam (Spigot 3)	m a.s.l.	143.00
Against NE Saddle Dam (Spigot 4)	m a.s.l.	142.20
Maximum Pond Elevation:		
Southern Basin	m a.s.l.	140.40
Northern Basin	m a.s.l.	141.10
Maximum Stored Volume:		
Southern Basin	Mm^3	13.05
Northern Basin	Mm^3	5.38
Total	Mm^3	18.43
Operating Period (approximate)		
Southern Basin	during (years)	6.25
Northern Basin	during (years)	2.58
Total	years	8.83

Table IV-5: Main Results - 1% - Summary

SUMMARY - 1% Tailings Beach Slope

DESCRIPTION	Unit	Value
Maximum Tailings Elevation:		
Southern Basin		
Against Main Dam (Spigot 12 to 18)	m a.s.l.	145.00
Against SW Saddle Dam (Spigot 19)	m a.s.l.	146.00
Near Diversion Dike (Spigot 11)	m a.s.l.	145.00
Northern Basin:		
Against NW Saddle Dam (Spigot 1)	m a.s.l.	144.00
Against Natural Ground (Spigot 2)	m a.s.l.	145.00
Against Potential NE Saddle Dam (Spigot 3)	m a.s.l.	145.00
Against NE Saddle Dam (Spigot 4)	m a.s.l.	142.20
Maximum Pond Elevation:		
Southern Basin	m a.s.l.	140.70
Northern Basin	m a.s.l.	139.70
Maximum Stored Volume:		
Southern Basin	Mm^3	13.64
Northern Basin	Mm^3	4.89
Total	Mm^3	18.52
Operating Period (approximate)		
Southern Basin	during (years)	6.65
Northern Basin	during (years)	2.34
Total	years	8.99

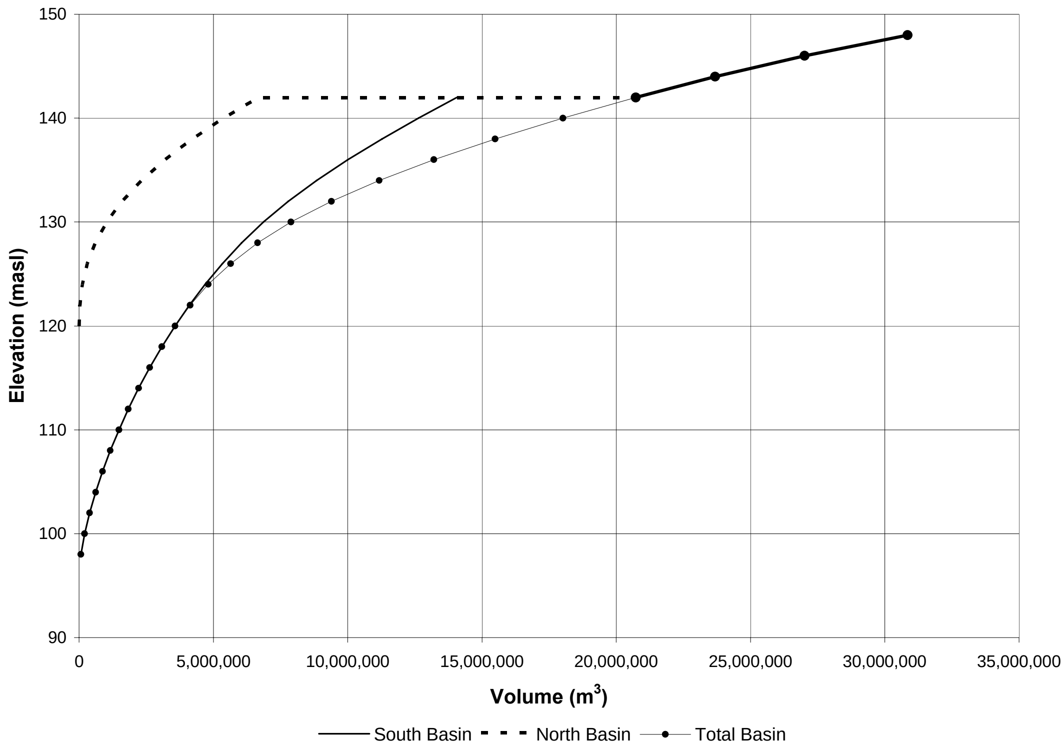
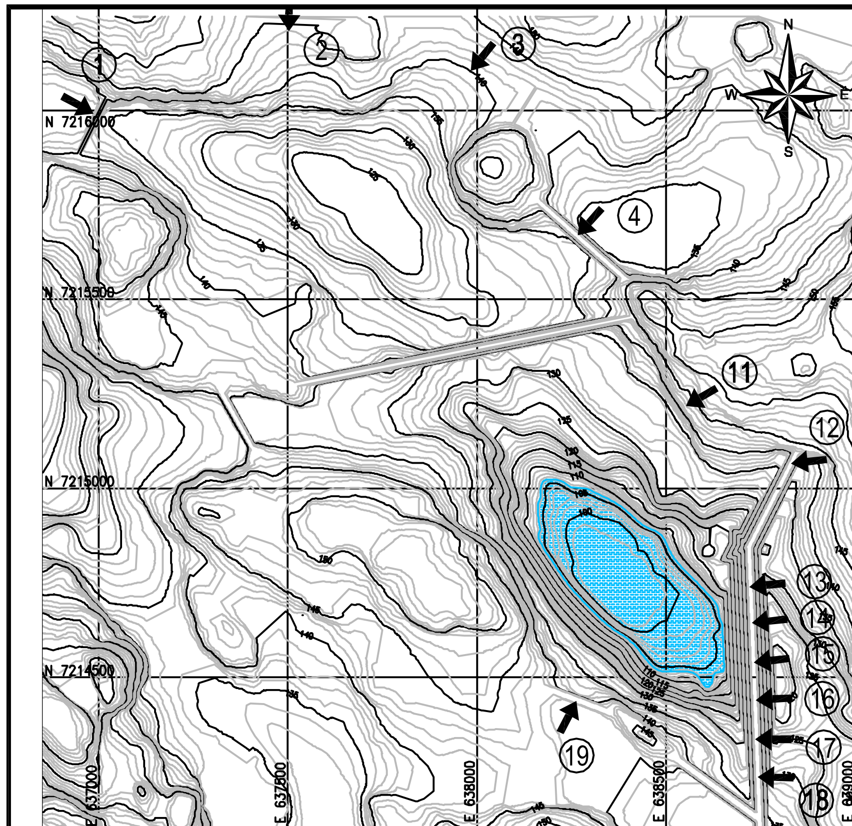
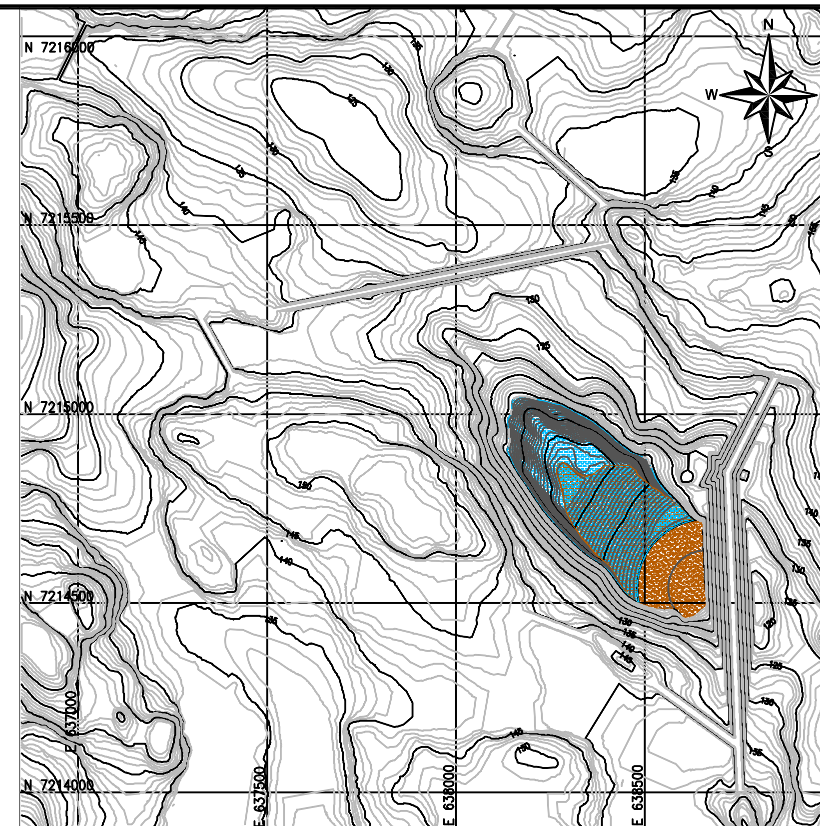


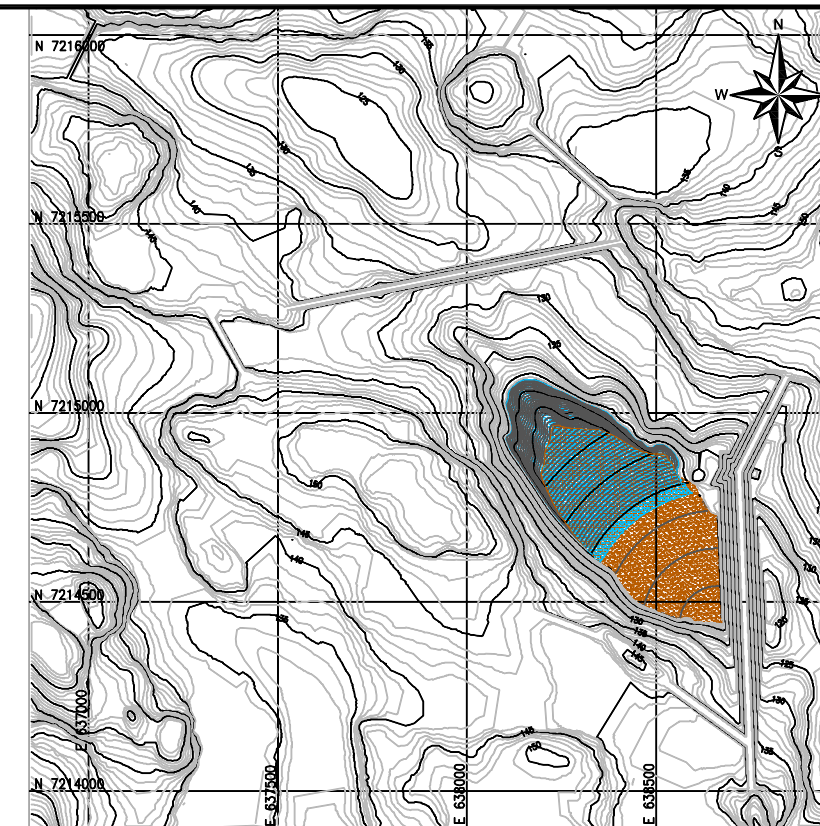
Figure IV-3: Struck Level Curve for TSF



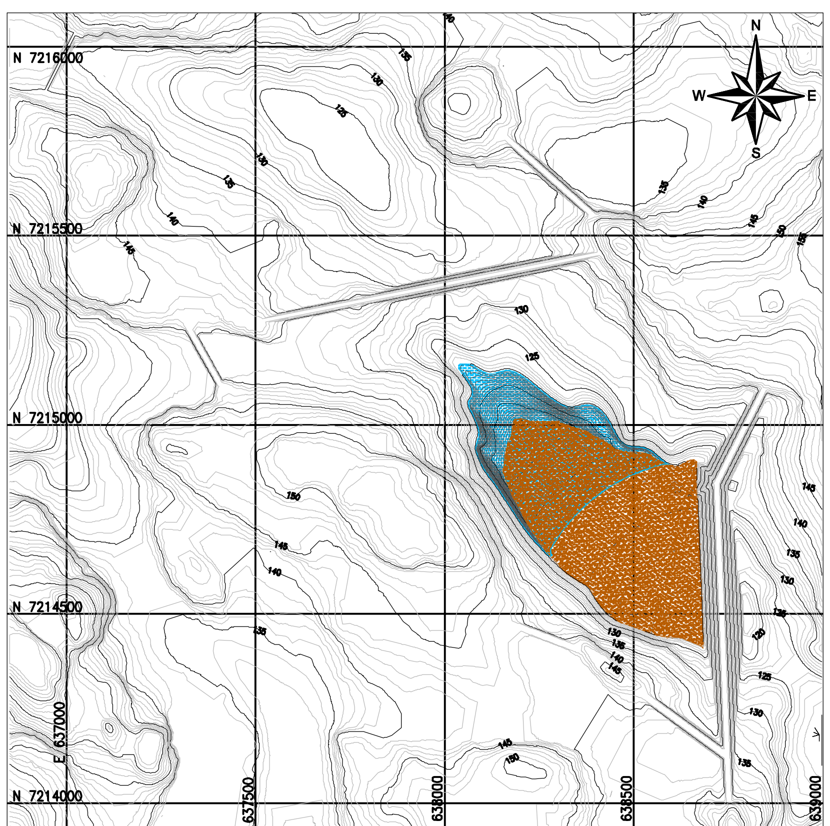
BASE TOPOGRAPHY, SPIGOTS LOCATION AND INITIAL POND



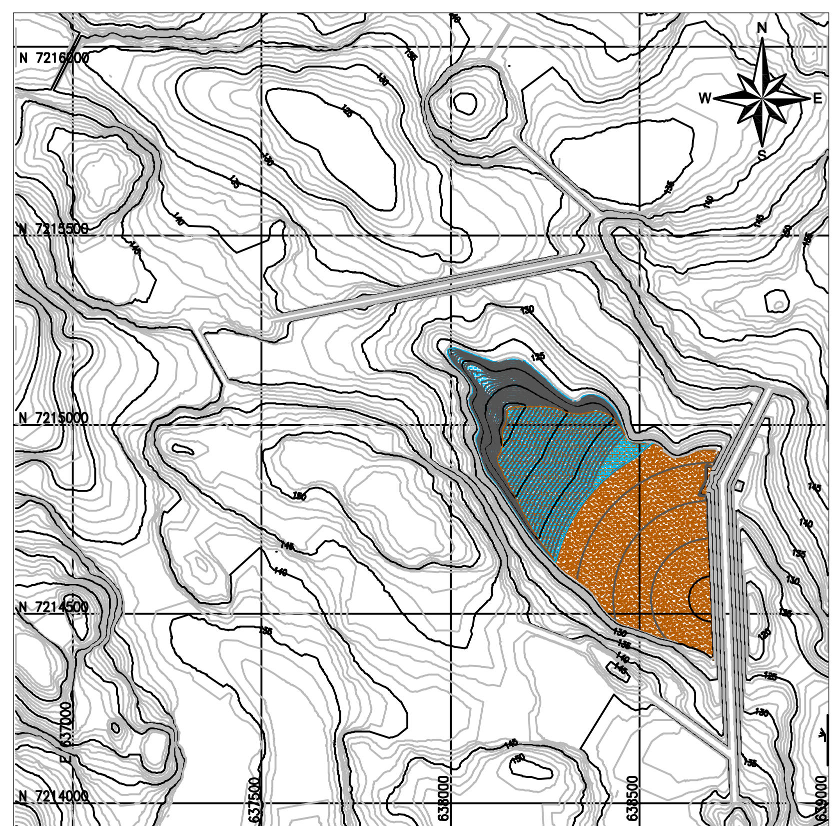
DISCHARGE OPERATING PERIOD: WINTER	from	18-APR-09	STAGE # 3 SOUTH
	to	01-MAY-09	
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	111.0	
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.08	
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	0.52	
SUPERNATANT POND ELEVATION	m a.s.l.	110.1	
ACTIVE SPIGOTS DURING THE PERIOD		13,14,15	
POND AREA	ha	13.53	
TAILINGS BEACH AREA	ha	3.54	



DISCHARGE OPERATING PERIOD: SUMMER	from	01-OCT-09	STAGE # 7 SOUTH
	to	05-NOV-09	
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	117.0	
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.21	
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	1.59	
SUPERNATANT POND ELEVATION	m a.s.l.	115.1	
ACTIVE SPIGOTS DURING THE PERIOD		16,14,15,16	
POND AREA	ha	12.63	
TAILINGS BEACH AREA	ha	7.63	



DISCHARGE OPERATING PERIOD: WINTER	from	23-MAR-10	STAGE # 11 SOUTH
	to	08-MAY-10	
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	121.7	
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.26	
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	2.65	
SUPERNATANT POND ELEVATION	m a.s.l.	119.4	
ACTIVE SPIGOTS DURING THE PERIOD		13,14,15,16	
POND AREA	ha	13.00	
TAILINGS BEACH AREA	ha	13.22	



DISCHARGE OPERATING PERIOD: SUMMER	from	04-OCT-10	STAGE # 16 SOUTH
	to	02-NOV-10	
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	125.3	
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.17	
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	3.66	
SUPERNATANT POND ELEVATION	m a.s.l.	123.2	
ACTIVE SPIGOTS DURING THE PERIOD		17,13,15,13,15	
POND AREA	ha	14.05	
TAILINGS BEACH AREA	ha	15.75	

NOTES:

1. THE DAM ALIGNMENTS SHOWN ARE INDICATIVE ONLY.
2. THE DAM FOOTPRINTS SHOWN PERTAIN TO THE ESTIMATED MAXIMUM CREST ELEVATIONS. THE CONSTRUCTION OF THE DAMS WILL BE STAGED OR DEFERRED.
3. AN AVERAGE TAILINGS DRY DENSITY OF 1.31 t/m^3 HAS BEEN ASSUMED. THE ESTIMATED MAXIMUM REQUIRED TAILINGS VOLUME IS 18.2 Mm^3
4. THE CONFIGURATION OF TAILINGS AND POND SHOWN AT EACH STAGE CORRESPONDS TO THE END OF THE SEASON.
5. "SUMMER" SEASON: MAY TO OCTOBER.
   "WINTER" SEASON: NOVEMBER TO APRIL.
6. SUPERNATANT POND VOLUME: 0.75 Mm^3 WINTER
   0.55 Mm^3 SUMMER.
7. SUBAQUEOUS TAILINGS SLOPE: 5%.
8. CONTOURS: MAJOR INTERVAL 5m, MINOR INTERVAL 2m. ALL ELEVATIONS IN METERS ABOVE SEA LEVEL.
9. GRID REFERENCE NAD83 UTM ZONE 14.

SYMBOLS

(X) SPIGOTS

SUPERNATANT POND

TAILINGS

20 10 0 10 20

SCALE 1:1000

NOT FOR CONSTRUCTION

STAMP

PROJECT

MEADOWBANK
MINING CORPORATION

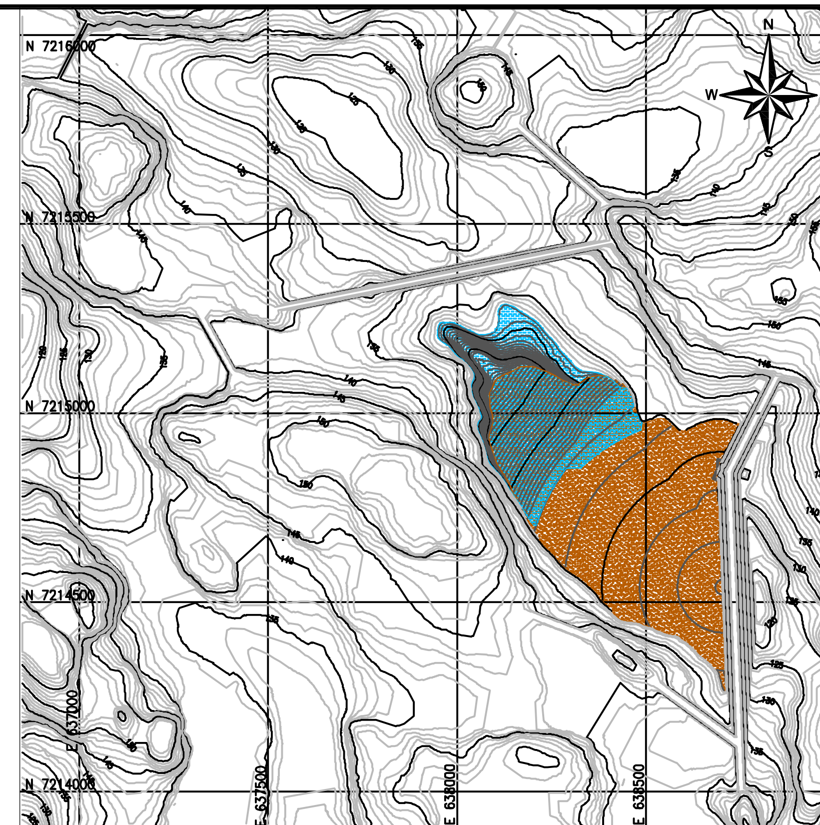
TITLE

MEADOWBANK GOLD PROJECT
TAILING DEPOSITION PLAN
CASE 1: TAILINGS BEACH SLOPE 0.5%

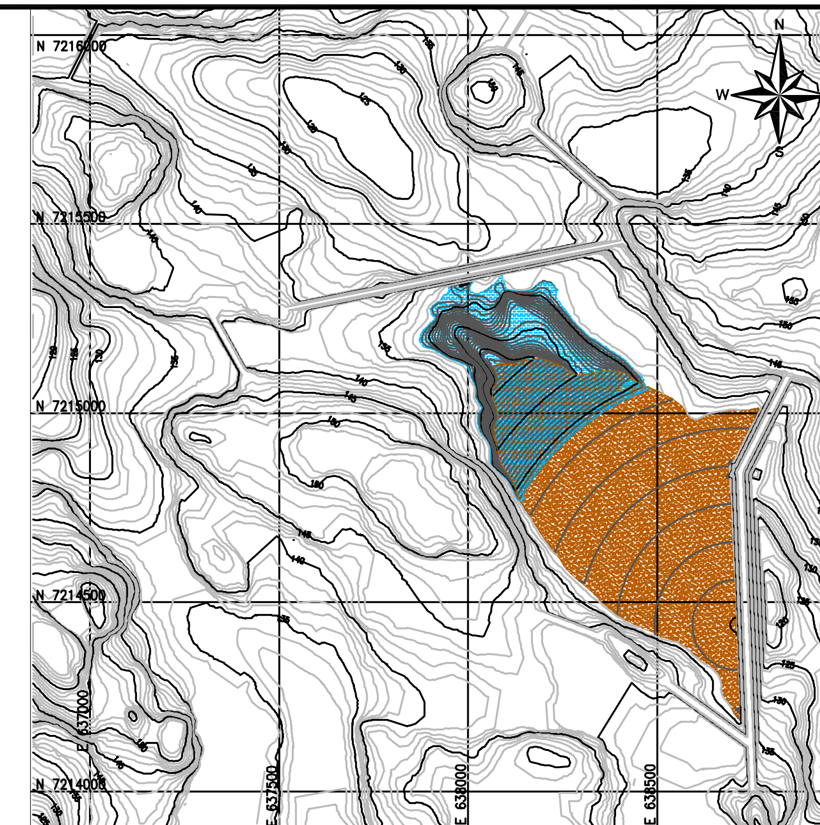
PROJECT No.		06-1413-089	FILE No. 061413089-6000-01	
DESIGN	M.B.	FEBRUARY 07	SCALE INDICATED	REV. A
CADD	R.A./C.S.	FEBRUARY 07	IV-01	
CHECK	M.M.	FEBRUARY 07		
REVIEW	C.A.	FEBRUARY 07		

REVISION DATE: 07/03/16 03:36PM By: ASalvador CADD FILE: N:\Bur-Graphics\Projects\2006\1413\06-1413-089\6000\Drafting\Rev B\061413089-6000-01.dwg

DISCHARGE OPERATING PERIOD: WINTER	from to	19–MAR–11 03–MAY–11	STAGE #
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	129.0	20
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.26	SOUTH
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	4.71	
SUPERNATANT POND ELEVATION	m a.s.l.	126.2	
ACTIVE SPIGOTS DURING THE PERIOD		13,14,15,16	
POND AREA	ha	14.79	
TAILINGS BEACH AREA	ha	19.97	



DISCHARGE OPERATING PERIOD: SUMMER	from to	04–OCT–11 04–NOV–11	STAGE #
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	131.6	25
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.18	SOUTH
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	5.77	
SUPERNATANT POND ELEVATION	m a.s.l.	128.9	
ACTIVE SPIGOTS DURING THE PERIOD		13,14,15,16	
POND AREA	ha	15.68	
TAILINGS BEACH AREA	ha	21.89	



DISCHARGE OPERATING PERIOD: WINTER	from to	14–MAR–12 29–APR–12	STAGE #
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	134.6	29
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.27	SOUTH
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	6.78	
SUPERNATANT POND ELEVATION	m a.s.l.	131.3	
ACTIVE SPIGOTS DURING THE PERIOD		13,14,15,16	
POND AREA	ha	17.33	
TAILINGS BEACH AREA	ha	29.05	

DISCHARGE OPERATING PERIOD: SUMMER	from to	12–SEPT–12 02–NOV–12	STAGE #
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	136.4	34
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.30	SOUTH
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	7.85	
SUPERNATANT POND ELEVATION	m a.s.l.	133.1	
ACTIVE SPIGOTS DURING THE PERIOD		17,13,15,13,15	
POND AREA	ha	19.93	
TAILINGS BEACH AREA	ha	36.49	

DISCHARGE OPERATING PERIOD: WINTER	from to	22–MAR–13 10–MAY–13	STAGE #
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	138.7	38
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.29	SOUTH
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	8.94	
SUPERNATANT POND ELEVATION	m a.s.l.	134.8	
ACTIVE SPIGOTS DURING THE PERIOD		13,14,15,16	
POND AREA	ha	19.63	
TAILINGS BEACH AREA	ha	46.46	

NOTES:
1. THE DAM ALIGNMENTS SHOWN ARE INDICATIVE ONLY.
2. THE DAM FOOTPRINTS SHOWN PERTAIN TO THE ESTIMATED MAXIMUM CREST ELEVATIONS. THE CONSTRUCTION OF THE DAMS WILL BE STAGED OR DEFERRED.
3. AN AVERAGE TAILINGS DRY DENSITY OF 1.31 t/m HAS BEEN ASSUMED. THE ESTIMATED MAXIMUM REQUIRED TAILINGS VOLUME IS 18.2 Mm^3
4. THE CONFIGURATION OF TAILINGS AND POND SHOWN AT EACH STAGE CORRESPONDS TO THE END OF THE SEASON.
5. "SUMMER" SEASON: MAY TO OCTOBER.
"WINTER" SEASON: NOVEMBER TO APRIL.
6. SUPERNATANT POND VOLUME: 0.75 Mm^3 WINTER
0.55 Mm^3 SUMMER.
7. SUBAQUEOUS TAILINGS SLOPE: 5%.
8. CONTOURS: MAJOR INTERVAL 5m, MINOR INTERVAL 2m. ALL ELEVATIONS IN METERS ABOVE SEA LEVEL.
9. GRID REFERENCE NAD83 UTM ZONE 14.

SYMBOLS

SUPERNATANT POND

TAILINGS

20 10 0 10 20
SCALE 1:1000

NOT FOR CONSTRUCTION

STAMP

PROJECT
MEADOWBANK
MINING CORPORATION

TITLE
MEADOWBANK GOLD PROJECT
TAILINGS DEPOSITION (2 OF 8)
CASE 1 : TAILINGS BEACH SLOPE 0.5%

PROJECT No.		06-1413-089	FILE No.	061413089-6000-02
DESIGN	M.B.	FEBRUARY 07	SCALE INDICATED	REV. A
CADD	R.A./C.S.	FEBRUARY 07	IV-02	
CHECK	M.M.	FEBRUARY 07		
REVIEW	C.A.	FEBRUARY 07		

Golder Associates

REVISION DATE: 07/03/16 03:38PM By: ASalvador CADD FILE: N:\Bur-Graphics\Projects\2006\1413\06-1413-089\6000\Drafting\Rev B\061413089-6000-02.dwg

DISCHARGE OPERATING PERIOD: SUMMER	from	15–SEPT–13	STAGE #
	to	29–OCT–13	42
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	139.3	SOUTH
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.26	
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	9.92	
SUPERNATANT POND ELEVATION	m a.s.l.	136.3	
ACTIVE SPIGOTS DURING THE PERIOD		19,13,19,13	
POND AREA	ha	18.65	
TAILINGS BEACH AREA	ha	46.46	

DISCHARGE OPERATING PERIOD: WINTER	from	19–MAR–14	STAGE #
	to	07–MAY–14	46
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	141.0	SOUTH
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.28	
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	11.01	
SUPERNATANT POND ELEVATION	m a.s.l.	137.9	
ACTIVE SPIGOTS DURING THE PERIOD		11,13,16,19	
POND AREA	ha	22.76	
TAILINGS BEACH AREA	ha	47.92	

DISCHARGE OPERATING PERIOD: SUMMER	from	29–SEPT–14	STAGE #
	to	30–OCT–14	50
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	143.1	SOUTH
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.18	
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	12.01	
SUPERNATANT POND ELEVATION	m a.s.l.	139.0	
ACTIVE SPIGOTS DURING THE PERIOD		11,12,13,16	
POND AREA	ha	22.63	
TAILINGS BEACH AREA	ha	57.69	

DISCHARGE OPERATING PERIOD: WINTER	from	23–MAR–15	STAGE #
	to	29–APR–15	55
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	143.5	SOUTH
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.22	
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	13.05	
SUPERNATANT POND ELEVATION	m a.s.l.	140.4	
ACTIVE SPIGOTS DURING THE PERIOD		11,12,13,17,19	
POND AREA	ha	22.12	
TAILINGS BEACH AREA	ha	57.69	

NOTES:
1. THE DAM ALIGNMENTS SHOWN ARE INDICATIVE ONLY.
2. THE DAM FOOTPRINTS SHOWN PERTAIN TO THE ESTIMATED MAXIMUM CREST ELEVATIONS. THE CONSTRUCTION OF THE DAMS WILL BE STAGED OR DEFERRED.
3. AN AVERAGE TAILINGS DRY DENSITY OF 1.31 t/m HAS BEEN ASSUMED. THE ESTIMATED MAXIMUM REQUIRED TAILINGS VOLUME IS 18.2 Mm^3
4. THE CONFIGURATION OF TAILINGS AND POND SHOWN AT EACH STAGE CORRESPONDS TO THE END OF THE SEASON.
5. "SUMMER" SEASON: MAY TO OCTOBER.
"WINTER" SEASON: NOVEMBER TO APRIL.
6. SUPERNATANT POND VOLUME: 0.75 Mm^3 WINTER
0.55 Mm^3 SUMMER.
7. SUBAQUEOUS TAILINGS SLOPE: 5%.
8. CONTOURS: MAJOR INTERVAL 5m, MINOR INTERVAL 2m. ALL ELEVATIONS IN METERS ABOVE SEA LEVEL.
9. GRID REFERENCE NAD83 UTM ZONE 14.

SYMBOLS

SUPERNATANT POND

TAILINGS

20 10 0 10 20
SCALE 1:1000

NOT FOR CONSTRUCTION

STAMP

PROJECT

MEADOWBANK
MINING CORPORATION

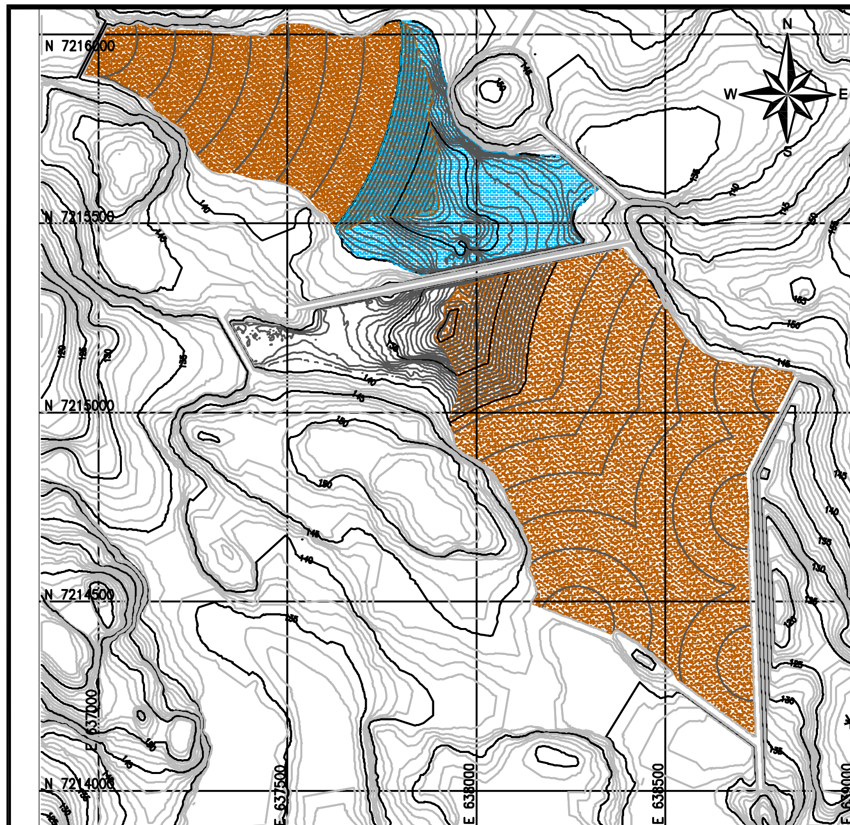
TITLE

MEADOWBANK GOLD PROJECT
TAILINGS DEPOSITION (3 OF 8)
CASE 1 : TAILINGS BEACH SLOPE 0.5%

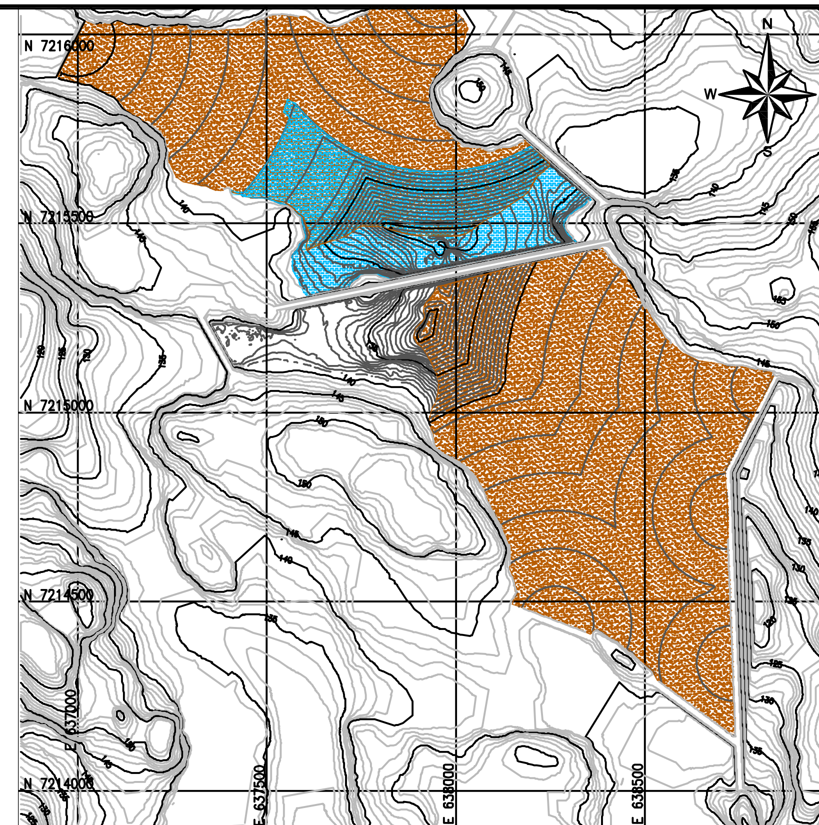
Golder Associates

PROJECT No.		06-1413-089	FILE No. 061413089-6000-03
DESIGN	M.B.	FEBRUARY 07	SCALE INDICATED REV. A
CADD	R.A./C.S.	FEBRUARY 07	IV-03
CHECK	M.M.	FEBRUARY 07	
REVIEW	C.A.	FEBRUARY 07	

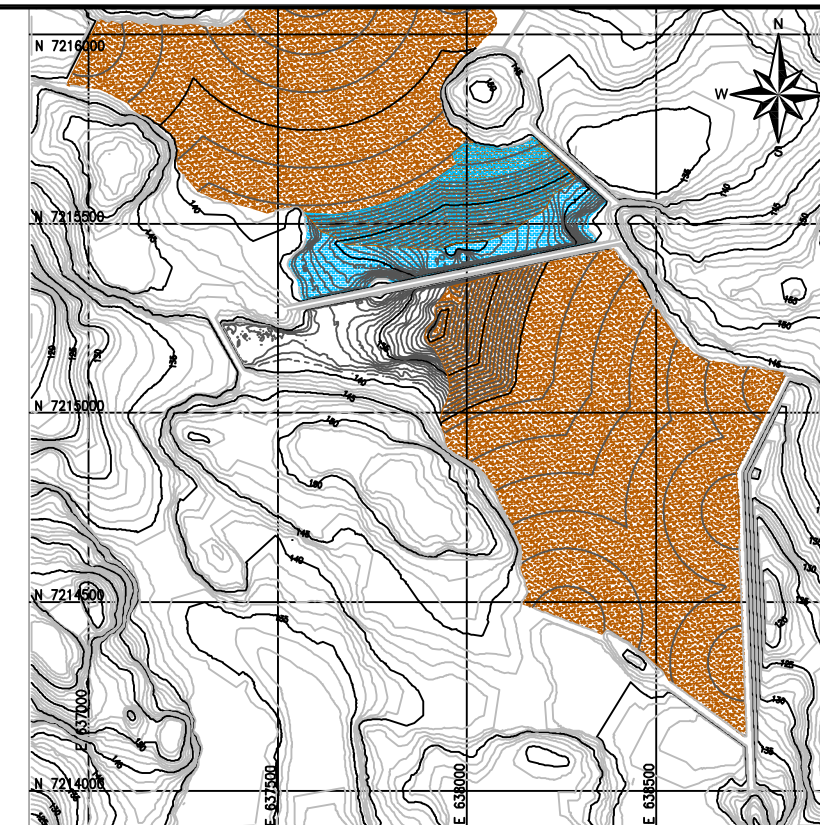
REVISION DATE: 07/03/16 03:39PM By: ASalvador CADD FILE: N:\Bur-Graphics\Projects\2006\1413\06-1413-089\6000\Drafting\Rev B\061413089-6000-03.dwg



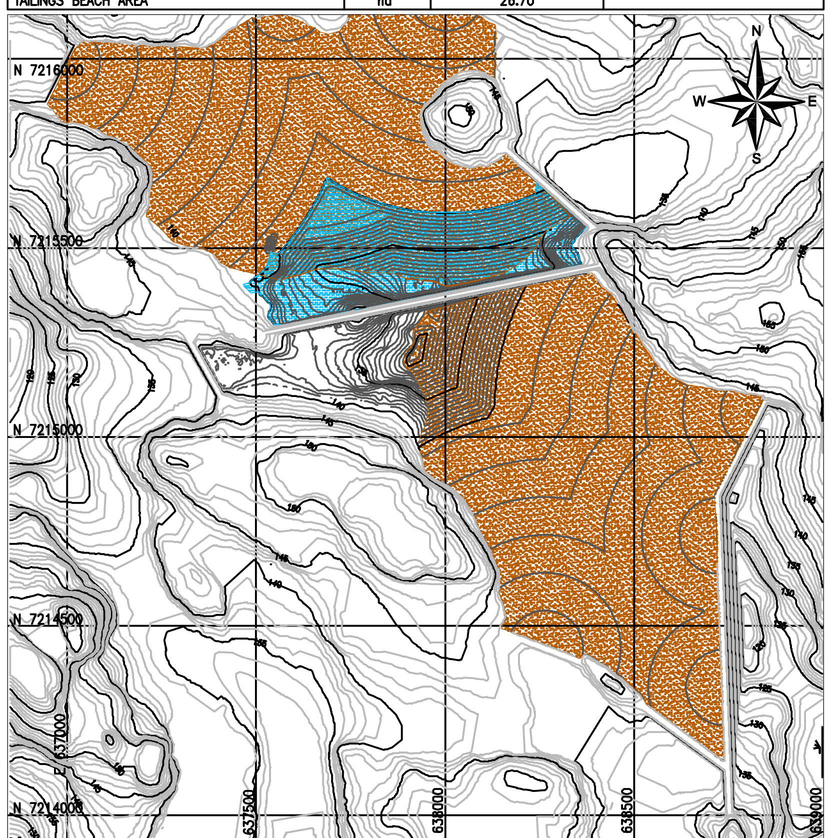
DISCHARGE OPERATING PERIOD:	WINTER	from / to	30-APR-15 / 27-MAR-16	STAGE # 1 NORTH
FINAL DISCHARGE POINT ELEVATION		m a.s.l.	139.0	
PARTIAL STORED TAILINGS VOLUME		Mm^3	1.90	
CUMULATIVE STORED TAILINGS VOLUME		Mm^3	1.90	
SUPERNATANT POND ELEVATION		m a.s.l.	135.0	
ACTIVE SPIGOTS DURING THE PERIOD			1	
POND AREA		ha	22.00	
TAILINGS BEACH AREA		ha	26.70	



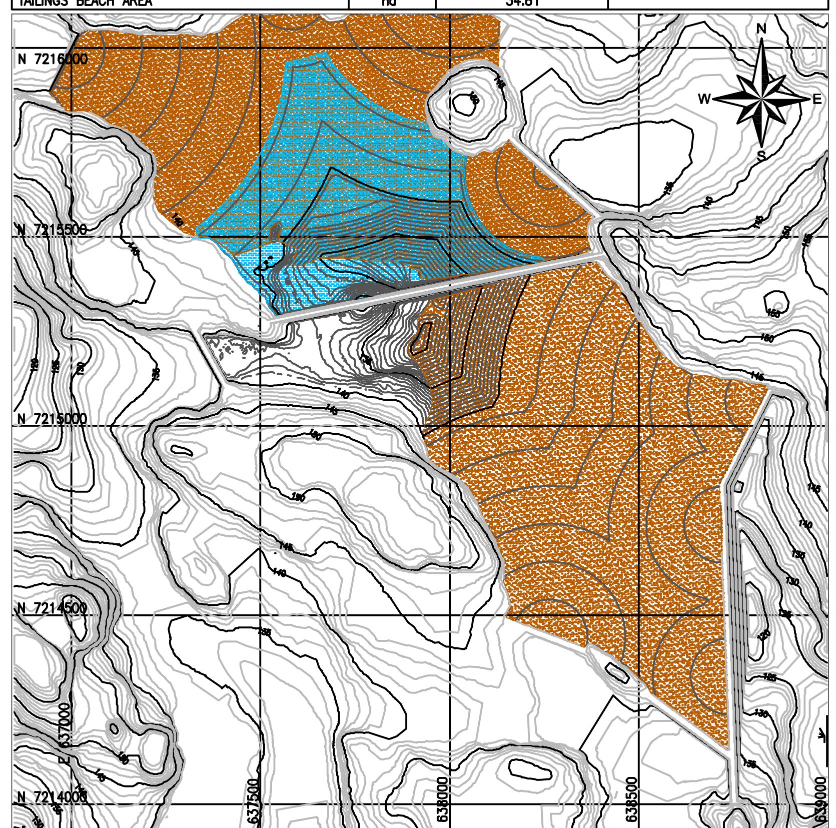
DISCHARGE OPERATING PERIOD:	SUMMER	from / to	11-AUG-16 / 27-OCT-16	STAGE # 4 NORTH
FINAL DISCHARGE POINT ELEVATION		m a.s.l.	140.0	
PARTIAL STORED TAILINGS VOLUME		Mm^3	0.45	
CUMULATIVE STORED TAILINGS VOLUME		Mm^3	3.13	
SUPERNATANT POND ELEVATION		m a.s.l.	137.6	
ACTIVE SPIGOTS DURING THE PERIOD			3,1,3	
POND AREA		ha	24.22	
TAILINGS BEACH AREA		ha	34.81	



DISCHARGE OPERATING PERIOD:	WINTER	from / to	26-JAN-17 / 21-APR-17	STAGE # 7 NORTH
FINAL DISCHARGE POINT ELEVATION		m a.s.l.	142.0	
PARTIAL STORED TAILINGS VOLUME		Mm^3	0.49	
CUMULATIVE STORED TAILINGS VOLUME		Mm^3	4.13	
SUPERNATANT POND ELEVATION		m a.s.l.	138.9	
ACTIVE SPIGOTS DURING THE PERIOD			1,3,2,	
POND AREA		ha	19.61	
TAILINGS BEACH AREA		ha	45.31	



DISCHARGE OPERATING PERIOD:	SUMMER	from / to	15-AUG-17 / 27-SEPT-17	STAGE # 10 NORTH
FINAL DISCHARGE POINT ELEVATION		m a.s.l.	144.0	
PARTIAL STORED TAILINGS VOLUME		Mm^3	0.25	
CUMULATIVE STORED TAILINGS VOLUME		Mm^3	5.04	
SUPERNATANT POND ELEVATION		m a.s.l.	140.2	
ACTIVE SPIGOTS DURING THE PERIOD			1,3,1	
POND AREA		ha	21.04	
TAILINGS BEACH AREA		ha	52.52	



DISCHARGE OPERATING PERIOD:	WINTER	from / to	28-SEPT-17 / 25-NOV-17	STAGE # 11 NORTH
FINAL DISCHARGE POINT ELEVATION		m a.s.l.	142.2	
PARTIAL STORED TAILINGS VOLUME		Mm^3	0.34	
CUMULATIVE STORED TAILINGS VOLUME		Mm^3	5.38	
SUPERNATANT POND ELEVATION		m a.s.l.	141.1	
ACTIVE SPIGOTS DURING THE PERIOD			4	
POND AREA		ha	32.97	
TAILINGS BEACH AREA		ha	33.81	

NOTES:

1. THE DAM ALIGNMENTS SHOWN ARE INDICATIVE ONLY.
2. THE DAM FOOTPRINTS SHOWN PERTAIN TO THE ESTIMATED MAXIMUM CREST ELEVATIONS. THE CONSTRUCTION OF THE DAMS WILL BE STAGED OR DEFERRED.
3. AN AVERAGE TAILINGS DRY DENSITY OF 1.31 t/m HAS BEEN ASSUMED. THE ESTIMATED MAXIMUM REQUIRED TAILINGS VOLUME IS 18.2 Mm^3
4. THE CONFIGURATION OF TAILINGS AND POND SHOWN AT EACH STAGE CORRESPONDS TO THE END OF THE SEASON.
5. "SUMMER" SEASON: MAY TO OCTOBER.
   "WINTER" SEASON: NOVEMBER TO APRIL.
6. SUPERNATANT POND VOLUME: 0.75 Mm^3 WINTER
   0.55 Mm^3 SUMMER.
7. SUBAQUEOUS TAILINGS SLOPE: 5%.
8. CONTOURS: MAJOR INTERVAL 5m, MINOR INTERVAL 2m. ALL ELEVATIONS IN METERS ABOVE SEA LEVEL.
9. GRID REFERENCE NAD83 UTM ZONE 14.

SYMBOLS

SUPERNATANT POND

TAILINGS

20 10 0 10 20

SCALE 1:1000

NOT FOR CONSTRUCTION

STAMP

PROJECT

MEADOWBANK

MINING CORPORATION

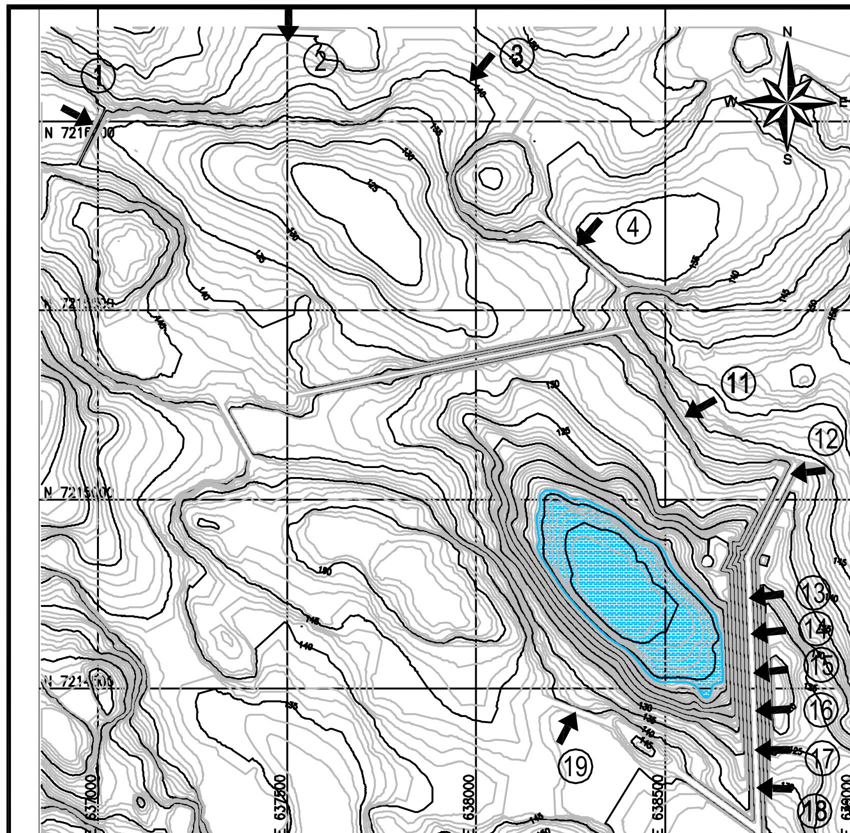
TITLE

MEADOWBANK GOLD PROJECT
TAILINGS DEPOSITION PLAN (4 OF 8)
CASE 1 : TAILINGS BEACH SLOPE 0.5%

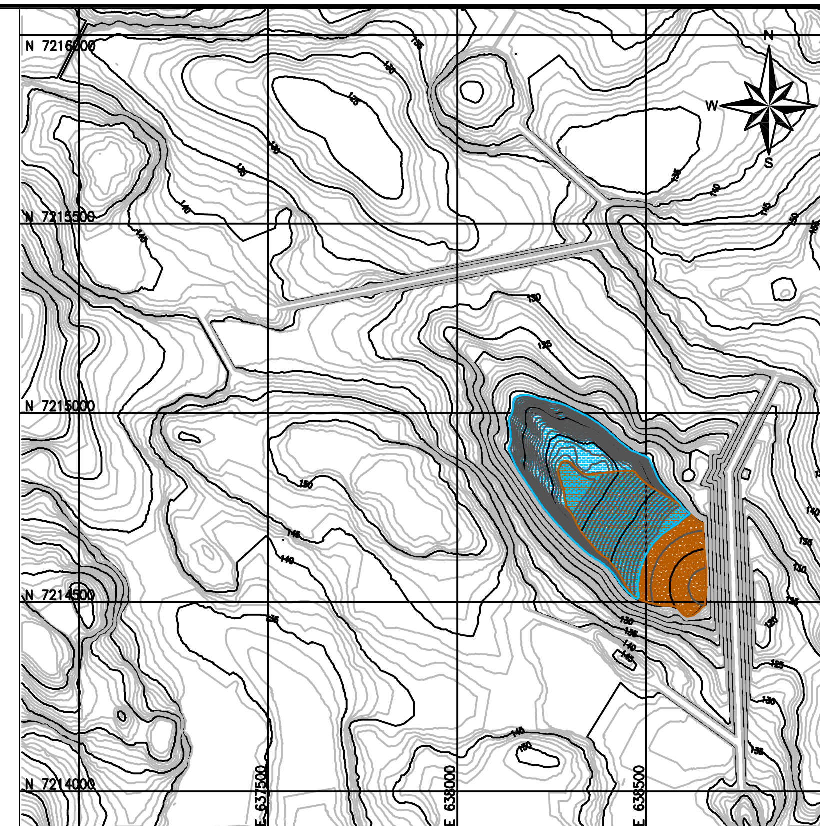
Golder Associates

PROJECT No.		06-1413-089	FILE No.	061413089-6000-04
DESIGN	M.B.	FEBRUARY 07	SCALE INDICATED	REV. A
CADD	R.A./C.S.	FEBRUARY 07	IV-04	
CHECK	M.M.	FEBRUARY 07		
REVIEW	C.A.	FEBRUARY 07		

REVISION DATE: 07/03/16 03:39PM By: ASalvador CADD FILE: N:\Bur-Graphics\Projects\2006\1413\06-1413-089\6000\Drafting\Rev B\061413089-6000-04.dwg



BASE TOPOGRAPHY, SPIGOTS LOCATION AND INITIAL POND

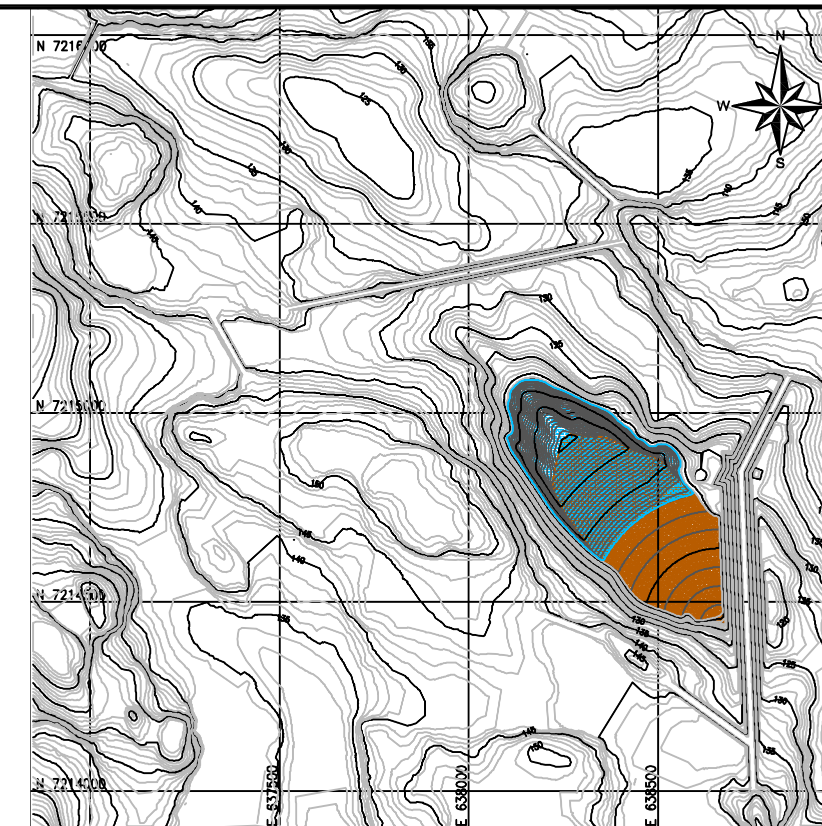


DISCHARGE OPERATING PERIOD: WINTER	from	06-APR-09
	to	19-APR-09
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	111.0
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.08
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	0.45
SUPERNATANT POND ELEVATION	m a.s.l.	109.2
ACTIVE SPIGOTS DURING THE PERIOD		13–14–15
POND AREA	ha	12.94
TAILINGS BEACH AREA	ha	3.52

STAGE #

3

SOUTH

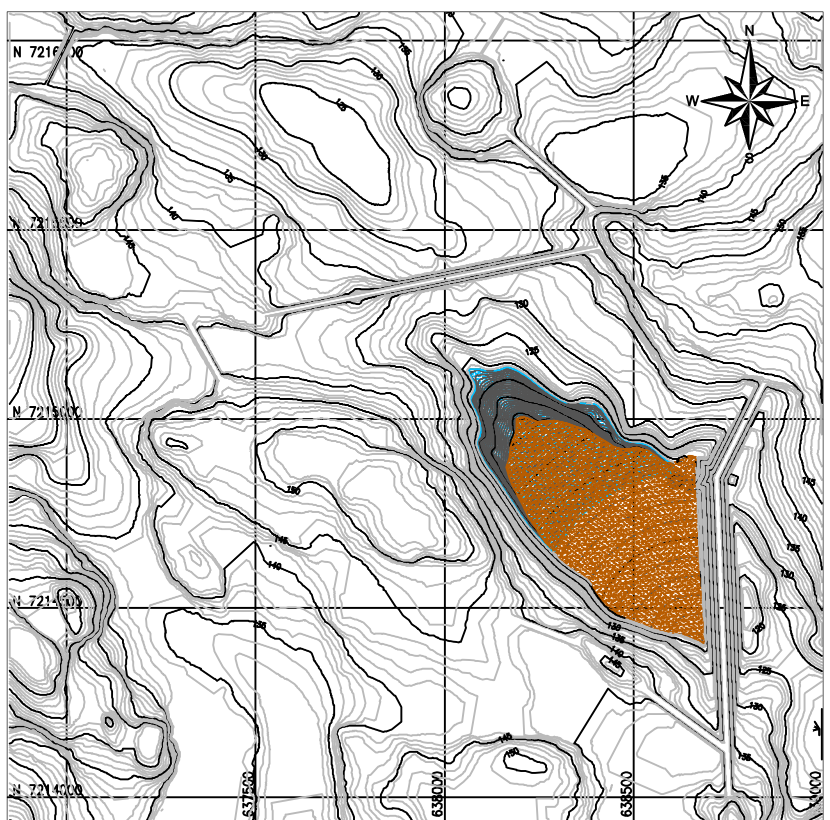


DISCHARGE OPERATING PERIOD: SUMMER	from	25-AGO-09
	to	14-SEP-09
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	117.0
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.12
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	1.30
SUPERNATANT POND ELEVATION	m a.s.l.	113.5
ACTIVE SPIGOTS DURING THE PERIOD		16,14,15,16
POND AREA	ha	12.59
TAILINGS BEACH AREA	ha	7.39

STAGE #

7

SOUTH

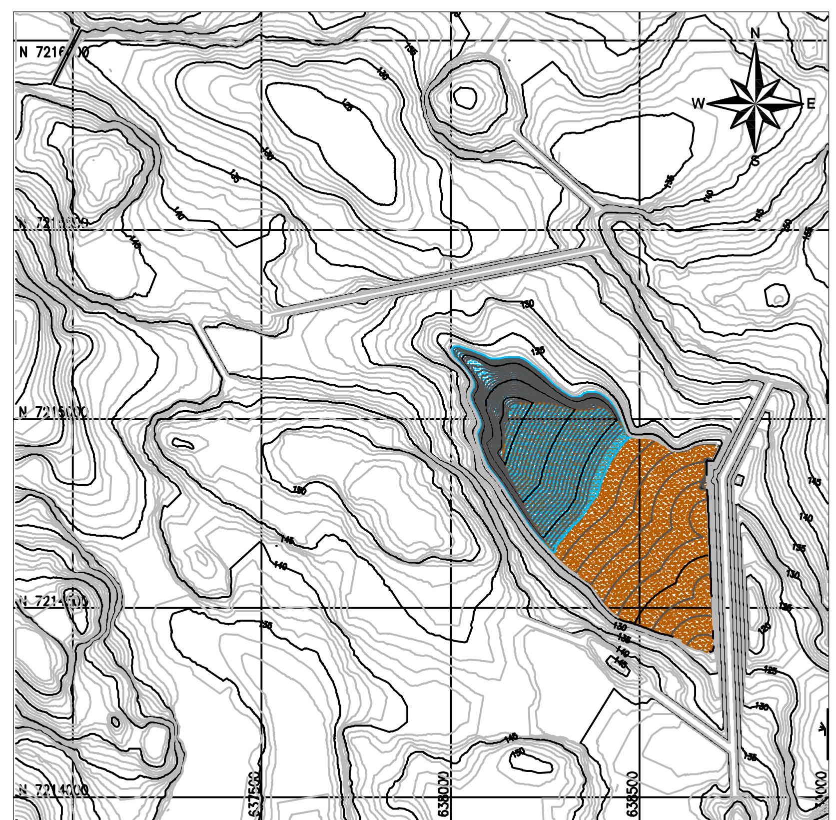


DISCHARGE OPERATING PERIOD: WINTER	from	23-FEB-10
	to	28-MAR-10
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	122.7
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.20
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	2.42
SUPERNATANT POND ELEVATION	m a.s.l.	118.3
ACTIVE SPIGOTS DURING THE PERIOD		13,14,15,16,17
POND AREA	ha	13.35
TAILINGS BEACH AREA	ha	12.00

STAGE #

12

SOUTH



DISCHARGE OPERATING PERIOD: SUMMER	from	04-OCT-10
	to	12-OCT-10
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	127.0
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.05
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	3.54
SUPERNATANT POND ELEVATION	m a.s.l.	122.2
ACTIVE SPIGOTS DURING THE PERIOD		13,15,13,15,17
POND AREA	ha	13.68
TAILINGS BEACH AREA	ha	15.83

STAGE #

17

SOUTH

NOTES:

1. THE DAM ALIGNMENTS SHOWN ARE INDICATIVE ONLY.
2. THE DAM FOOTPRINTS SHOWN PERTAIN TO THE ESTIMATED MAXIMUM CREST ELEVATIONS. THE CONSTRUCTION OF THE DAMS WILL BE STAGED OR DEFERRED.
3. AN AVERAGE TAILINGS DRY DENSITY OF 1.31 t/m HAS BEEN ASSUMED. THE ESTIMATED MAXIMUM REQUIRED TAILINGS VOLUME IS 18.2 Mm^3
4. THE CONFIGURATION OF TAILINGS AND POND SHOWN AT EACH STAGE CORRESPONDS TO THE END OF THE SEASON.
5. "SUMMER" SEASON: MAY TO OCTOBER.
   "WINTER" SEASON: NOVEMBER TO APRIL.
6. SUPERNATANT POND VOLUME: 0.75 Mm^3 WINTER
   0.55 Mm^3 SUMMER.
7. SUBAQUEOUS TAILINGS SLOPE: 5%.
8. CONTOURS: MAJOR INTERVAL 5m, MINOR INTERVAL 2m. ALL ELEVATIONS IN METERS ABOVE SEA LEVEL.
9. GRID REFERENCE NAD83 UTM ZONE 14.

SYMBOLS

(X) SPIGOTS

SUPERNATANT POND

TAILINGS

20 10 0 10 20

SCALE 1:1000

NOT FOR CONSTRUCTION

STAMP

PROJECT

MEADOWBANK

MINING CORPORATION

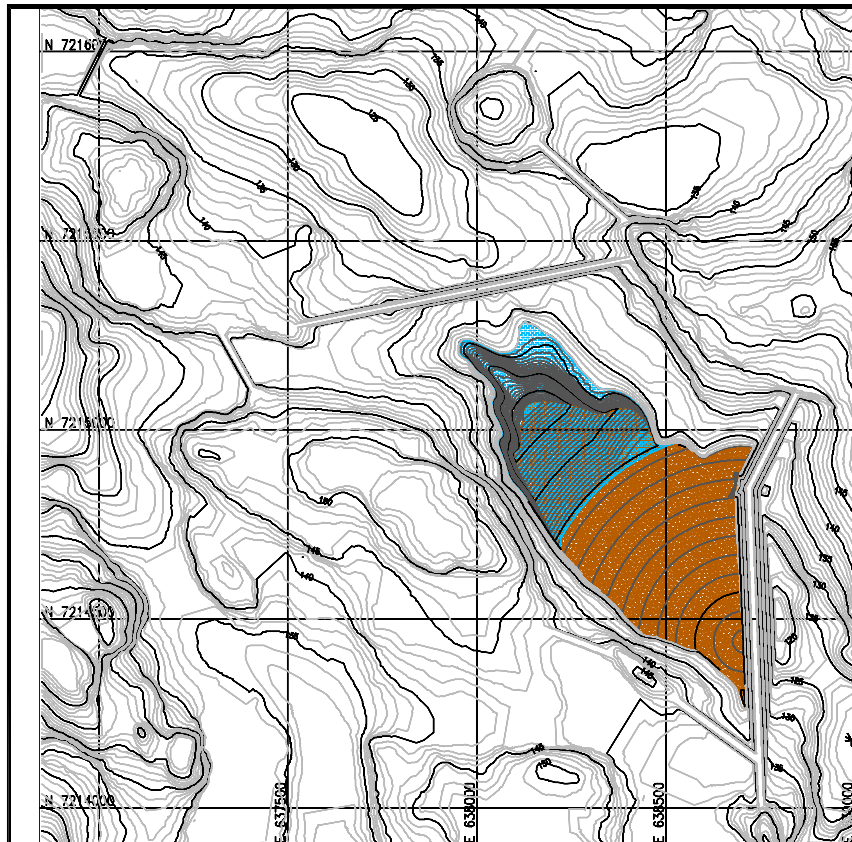
TITLE

MEADOWBANK GOLD PROJECT
TAILINGS DEPOSITION PLAN (5 OF 8)
CASE 2 : TAILINGS BEACH SLOPE 1%

Golder Associates

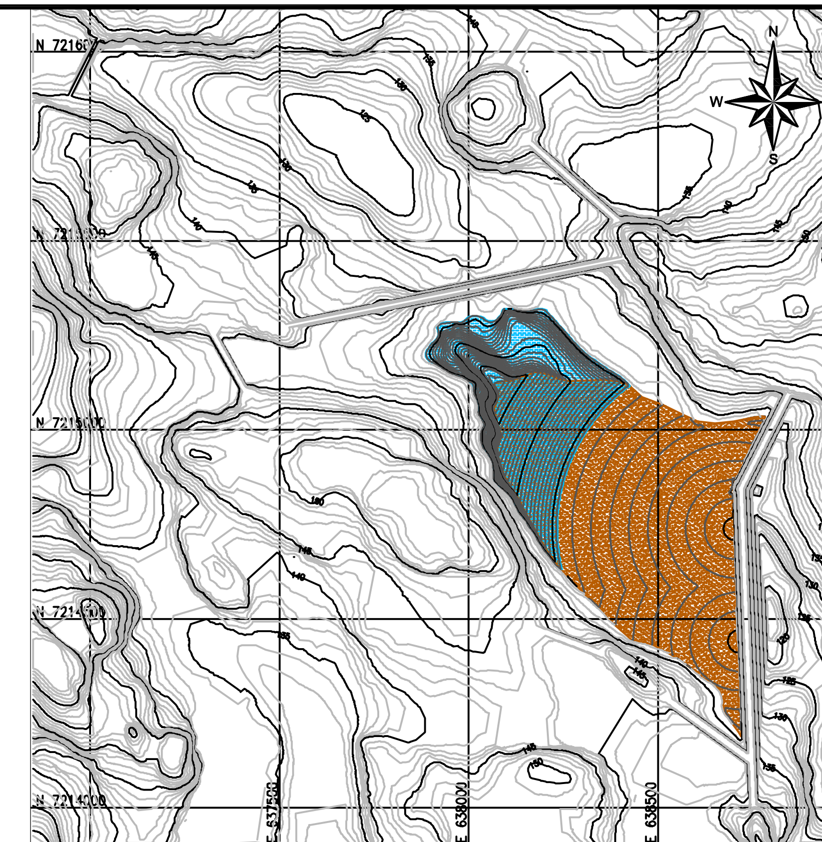
PROJECT No.		06-1413-089	FILE No.	061413089-6000-05
DESIGN	M.B.	FEBRUARY 07	SCALE INDICATED	REV. A
CADD	R.A./C.S.	FEBRUARY 07	IV-05	
CHECK	M.M.	FEBRUARY 07		
REVIEW	C.A.	FEBRUARY 07		

REVISION DATE: 07/03/16 03:37PM By: ASalvador CADD FILE: N:\Bur-Graphics\Projects\2006\1413\06-1413-089\6000\Drafting\Rev B\061413089-6000-05.dwg

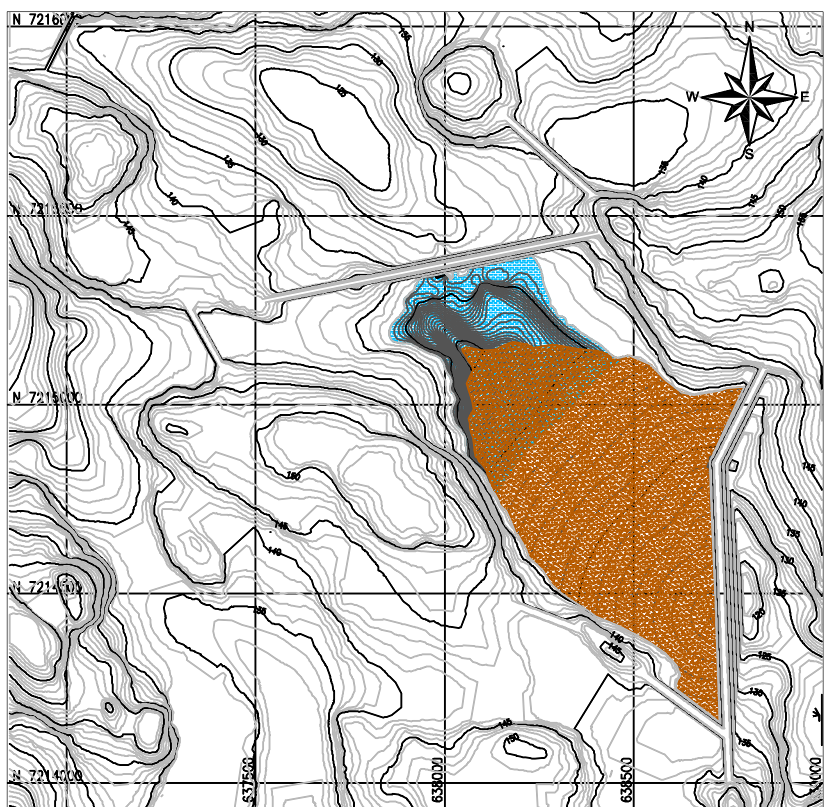


DISCHARGE OPERATING PERIOD: WINTER	from	21–MAR–11	STAGE #
	to	14–MAY–11	
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	131.3	21
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.32	SOUTH
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	4.77	
SUPERNATANT POND ELEVATION	m a.s.l.	125.8	
ACTIVE SPIGOTS DURING THE PERIOD		13,14,15,16	
POND AREA	ha	14.82	
TAILINGS BEACH AREA	ha	19.91	

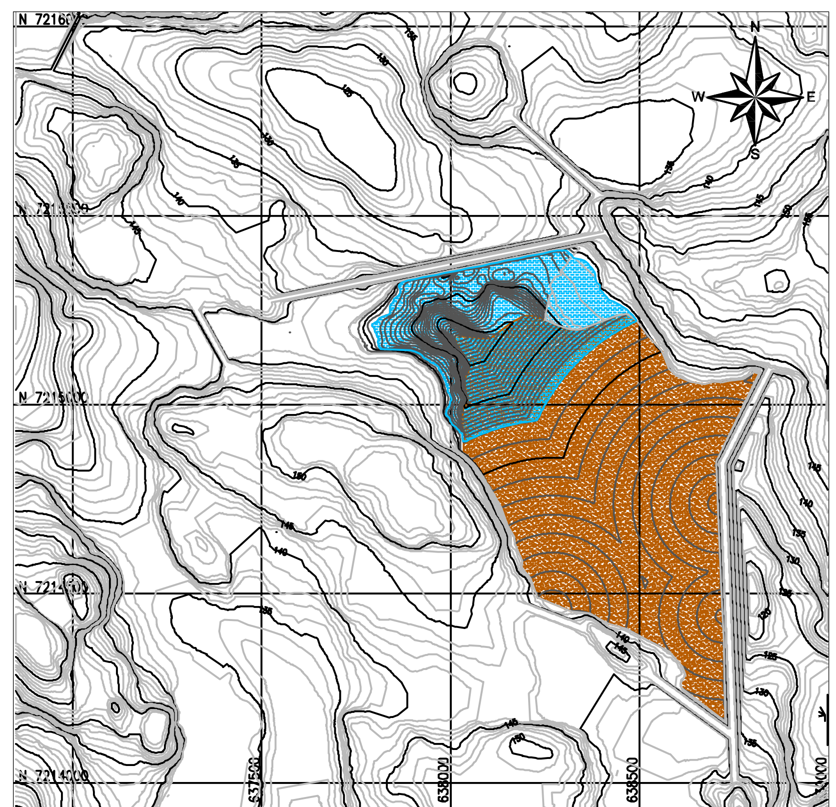
DISCHARGE OPERATING PERIOD: SUMMER	from	13–OCT–11	STAGE #
	to	04–NOV–11	
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	133.6	26
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.13	SOUTH
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	5.77	
SUPERNATANT POND ELEVATION	m a.s.l.	128.4	
ACTIVE SPIGOTS DURING THE PERIOD		13,15,13,14,15	
POND AREA	ha	16.14	
TAILINGS BEACH AREA	ha	22.72	



DISCHARGE OPERATING PERIOD: WINTER	from	09–APR–12	STAGE #
	to	23–APR–12	
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	135.3	28
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.08	SOUTH
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	6.75	
SUPERNATANT POND ELEVATION	m a.s.l.	130.6	
ACTIVE SPIGOTS DURING THE PERIOD		13,16	
POND AREA	ha	16.36	
TAILINGS BEACH AREA	ha	28.52	



DISCHARGE OPERATING PERIOD: SUMMER	from	04–SEP–12	STAGE #
	to	25–SEP–12	
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	138.7	33
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.13	SOUTH
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	7.64	
SUPERNATANT POND ELEVATION	m a.s.l.	132.0	
ACTIVE SPIGOTS DURING THE PERIOD		15,13,14,15,16	
POND AREA	ha	18.47	
TAILINGS BEACH AREA	ha	33.64	



DISCHARGE OPERATING PERIOD: WINTER	from	11–MAR–13	STAGE #
	to	26–APR–13	
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	139.0	35
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.27	SOUTH
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	8.85	
SUPERNATANT POND ELEVATION	m a.s.l.	134.0	
ACTIVE SPIGOTS DURING THE PERIOD		13,19	
POND AREA	ha	19.52	
TAILINGS BEACH AREA	ha	41.36	

NOTES:

1. THE DAM ALIGNMENTS SHOWN ARE INDICATIVE ONLY.
2. THE DAM FOOTPRINTS SHOWN PERTAIN TO THE ESTIMATED MAXIMUM CREST ELEVATIONS. THE CONSTRUCTION OF THE DAMS WILL BE STAGED OR DEFERRED.
3. AN AVERAGE TAILINGS DRY DENSITY OF 1.31 t/m HAS BEEN ASSUMED. THE ESTIMATED MAXIMUM REQUIRED TAILINGS VOLUME IS 18.2 Mm^3
4. THE CONFIGURATION OF TAILINGS AND POND SHOWN AT EACH STAGE CORRESPONDS TO THE END OF THE SEASON.
5. "SUMMER" SEASON: MAY TO OCTOBER.
   "WINTER" SEASON: NOVEMBER TO APRIL.
6. SUPERNATANT POND VOLUME: 0.75 Mm^3 WINTER
   0.55 Mm^3 SUMMER.
7. SUBAQUEOUS TAILINGS SLOPE: 5%.
8. CONTOURS: MAJOR INTERVAL 5m, MINOR INTERVAL 2m. ALL ELEVATIONS IN METERS ABOVE SEA LEVEL.
9. GRID REFERENCE NAD83 UTM ZONE 14.

SYMBOLS

SUPERNATANT POND

TAILINGS

20 10 0 10 20
SCALE 1:1000

NOT FOR CONSTRUCTION

STAMP

PROJECT

MEADOWBANK
MINING CORPORATION

TITLE

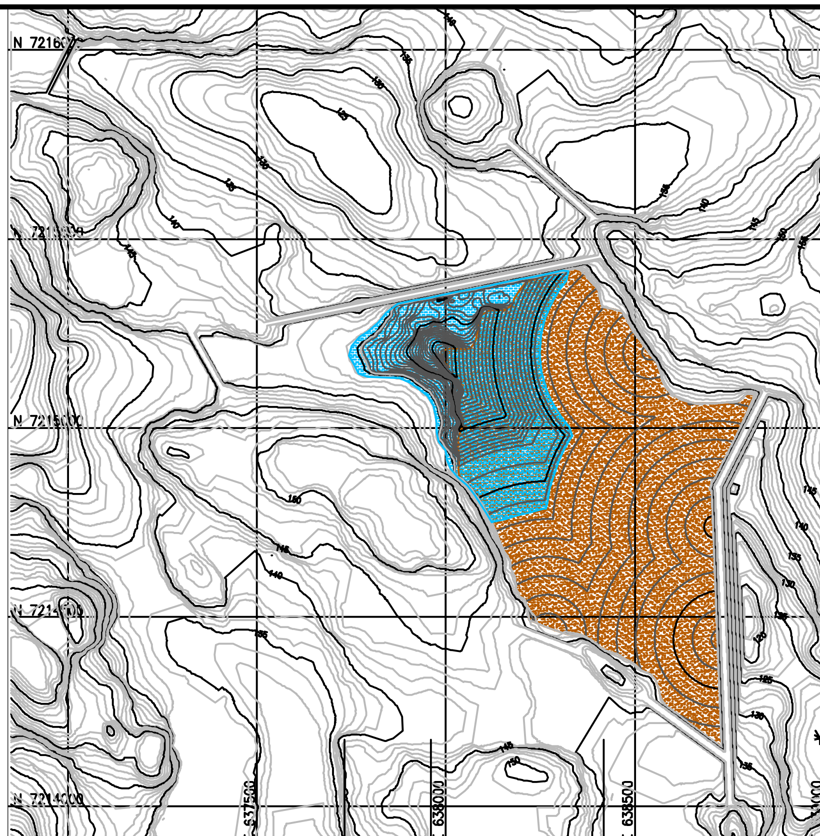
MEADOWBANK GOLD PROJECT TAILINGS DEPOSITION PLAN (6 OF 8) CASE 2 : TAILINGS BEACH SLOPE 1%

Golder Associates

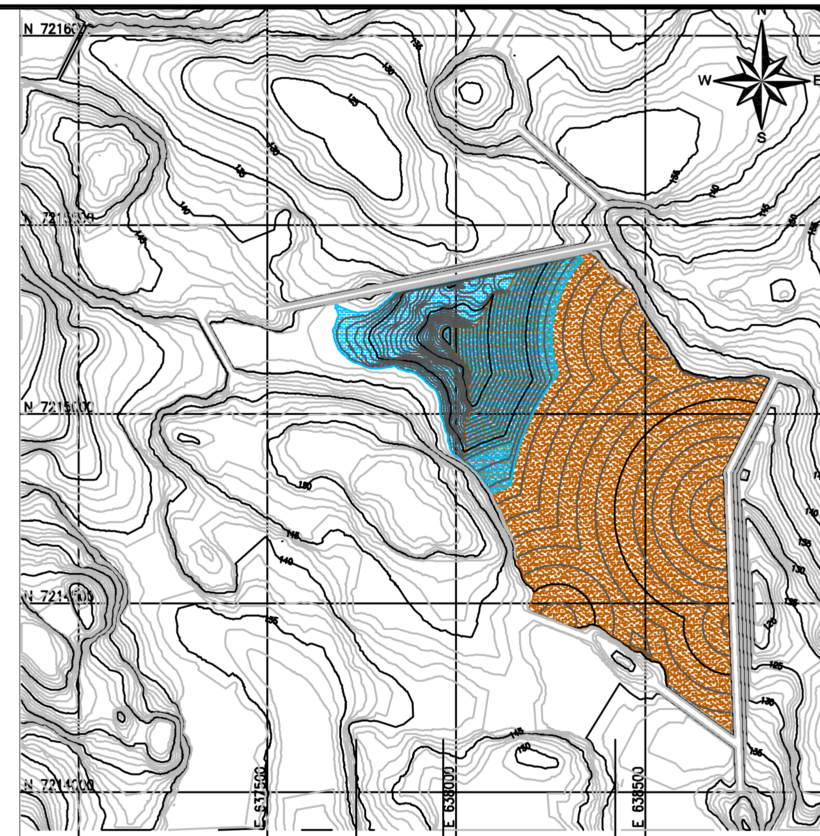
PROJECT No.		06-1413-089	FILE No.	061413089-6000-06
DESIGN	M.B.	FEBRUARY 07	SCALE INDICATED	REV. A
CADD	R.A./C.S.	FEBRUARY 07	IV-06	
CHECK	M.M.	FEBRUARY 07		
REVIEW	C.A.	FEBRUARY 07		

CADD FILE: N:\Bur-Graphics\Projects\2006\1413\06-1413-089\6000\Drafting\Rev B\061413089-6000-06.dwg

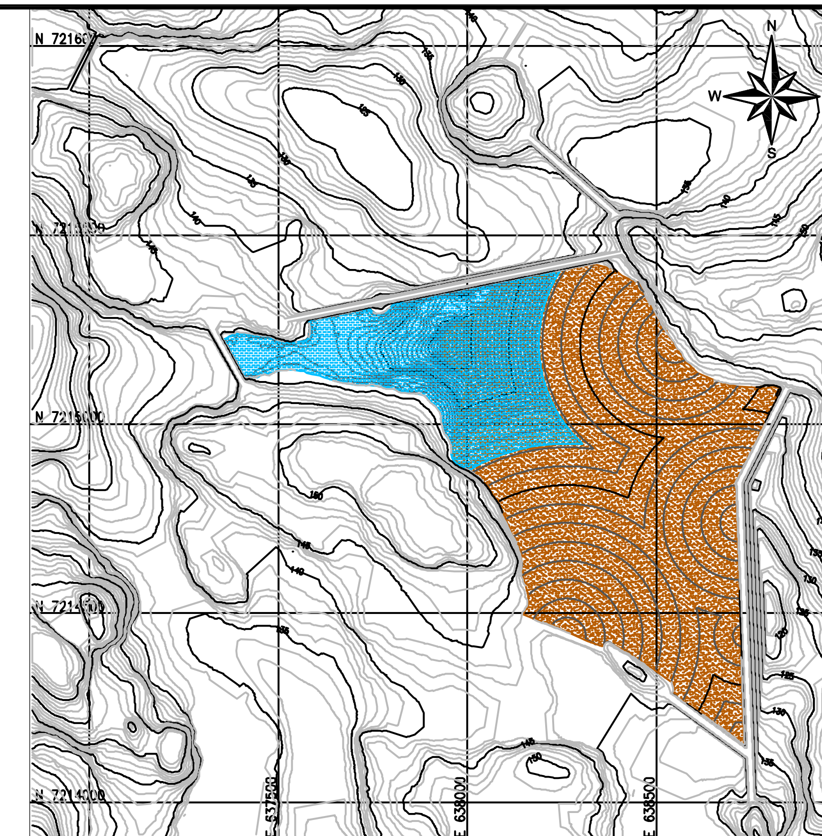
REVISION DATE: 07/03/16 09:05AM By: ASalvador



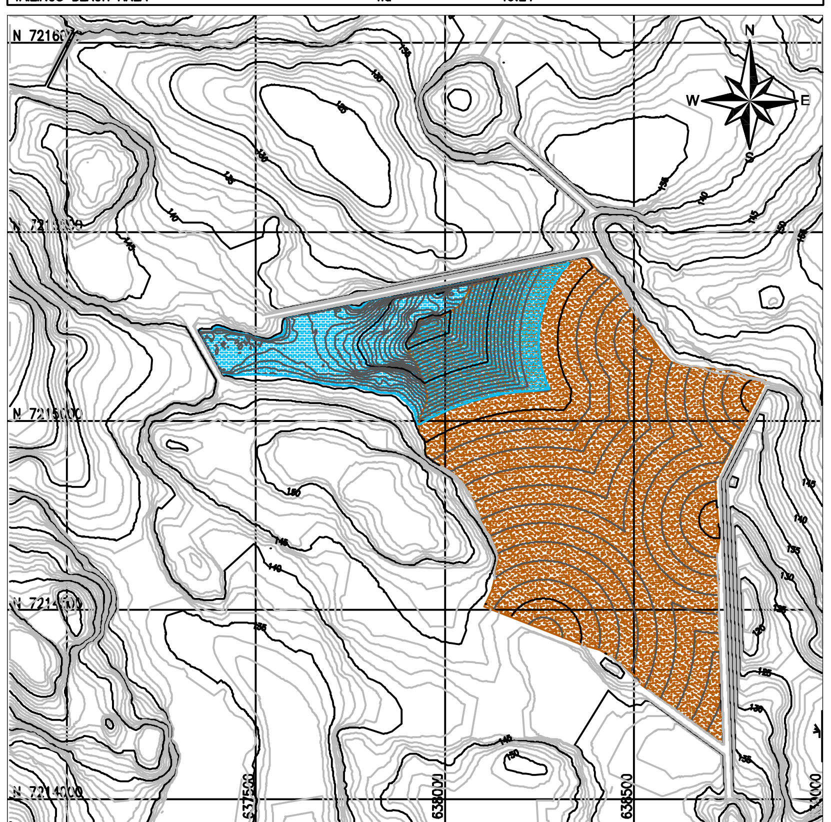
DISCHARGE OPERATING PERIOD: SUMMER	from	28-AUG-13	STAGE #
	to	01-OCT-13	38 SOUTH
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	141.3	
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.20	
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	9.76	
SUPERNATANT POND ELEVATION	m a.s.l.	135.8	
ACTIVE SPIGOTS DURING THE PERIOD		11,13,16	
POND AREA	ha	21.59	
TAILINGS BEACH AREA	ha	43.24	



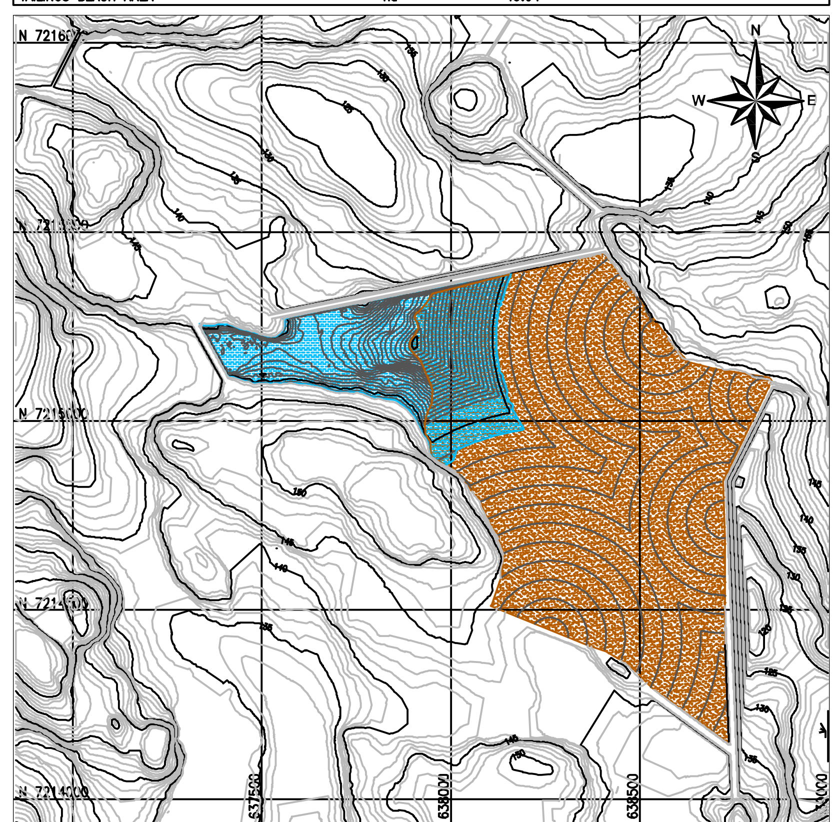
DISCHARGE OPERATING PERIOD: WINTER	from	09-JAN-14	STAGE #
	to	18-APR-14	41 SOUTH
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	143.0	
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.57	
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	10.90	
SUPERNATANT POND ELEVATION	m a.s.l.	137.2	
ACTIVE SPIGOTS DURING THE PERIOD		19,11,13	
POND AREA	ha	19.89	
TAILINGS BEACH AREA	ha	49.04	



DISCHARGE OPERATING PERIOD: SUMMER	from	06-AUG-14	STAGE #
	to	26-OCT-14	43 SOUTH
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	142.5	
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.47	
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	11.99	
SUPERNATANT POND ELEVATION	m a.s.l.	138.9	
ACTIVE SPIGOTS DURING THE PERIOD		19,11	
POND AREA	ha	22.23	
TAILINGS BEACH AREA	ha	54.03	



DISCHARGE OPERATING PERIOD: WINTER	from	22-JAN-15	STAGE #
	to	27-APR-15	46 SOUTH
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	146.0	
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.55	
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	13.04	
SUPERNATANT POND ELEVATION	m a.s.l.	139.5	
ACTIVE SPIGOTS DURING THE PERIOD		12,13,19	
POND AREA	ha	21.17	
TAILINGS BEACH AREA	ha	58.43	



DISCHARGE OPERATING PERIOD: SUMMER	from	28-APR-15	STAGE #
	to	10-AUG-15	47 SOUTH
FINAL DISCHARGE POINT ELEVATION	m a.s.l.	145.0	
PARTIAL STORED TAILINGS VOLUME	Mm^3	0.60	
CUMULATIVE STORED TAILINGS VOLUME	Mm^3	13.64	
SUPERNATANT POND ELEVATION	m a.s.l.	140.7	
ACTIVE SPIGOTS DURING THE PERIOD		11	
POND AREA	ha	21.35	
TAILINGS BEACH AREA	ha	61.20	

NOTES:
1. THE DAM ALIGNMENTS SHOWN ARE INDICATIVE ONLY.
2. THE DAM FOOTPRINTS SHOWN PERTAIN TO THE ESTIMATED MAXIMUM CREST ELEVATIONS. THE CONSTRUCTION OF THE DAMS WILL BE STAGED OR DEFERRED.
3. AN AVERAGE TAILINGS DRY DENSITY OF 1.31 t/m HAS BEEN ASSUMED. THE ESTIMATED MAXIMUM REQUIRED TAILINGS VOLUME IS 18.2 Mm^3
4. THE CONFIGURATION OF TAILINGS AND POND SHOWN AT EACH STAGE CORRESPONDS TO THE END OF THE SEASON.
5. "SUMMER" SEASON: MAY TO OCTOBER.
"WINTER" SEASON: NOVEMBER TO APRIL.
6. SUPERNATANT POND VOLUME: 0.75 Mm^3 WINTER
0.55 Mm^3 SUMMER.
7. SUBAQUEOUS TAILINGS SLOPE: 5%.
8. CONTOURS: MAJOR INTERVAL 5m, MINOR INTERVAL 2m. ALL ELEVATIONS IN METERS ABOVE SEA LEVEL.
9. GRID REFERENCE NAD83 UTM ZONE 14.

SYMBOLS

SUPERNATANT POND

TAILINGS

20 10 0 10 20
SCALE 1:1000

NOT FOR CONSTRUCTION

STAMP

PROJECT

MEADOWBANK
MINING CORPORATION

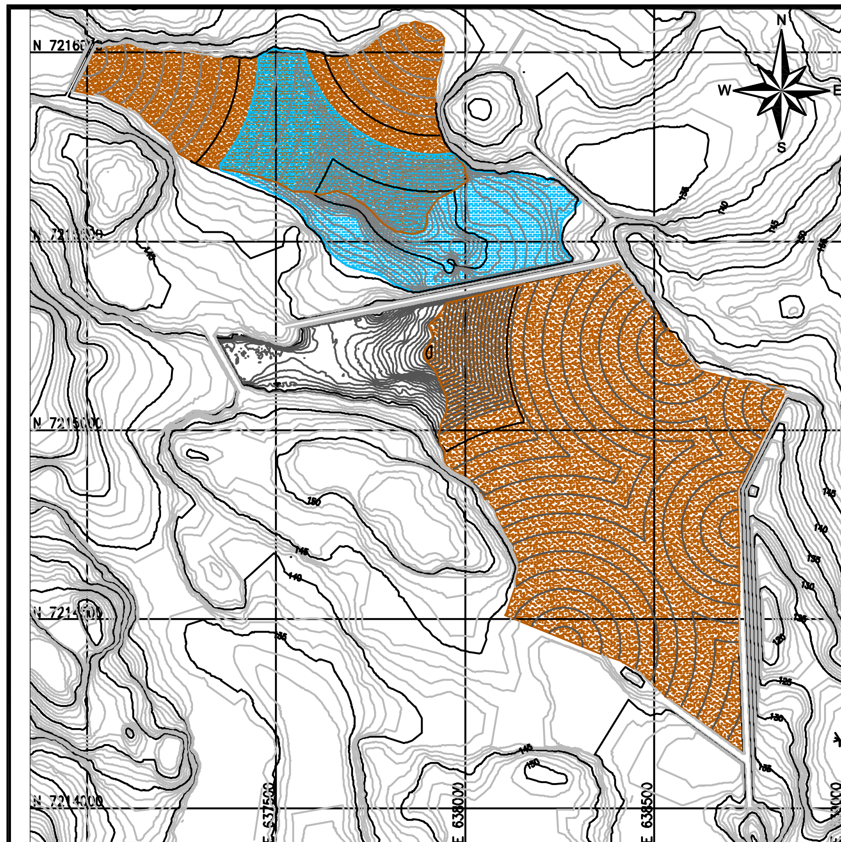
TITLE

MEADOWBANK GOLD PROJECT
TAILINGS DEPOSITION PLAN (7 OF 8)
CASE 2 : TAILINGS BEACH SLOPE 1%

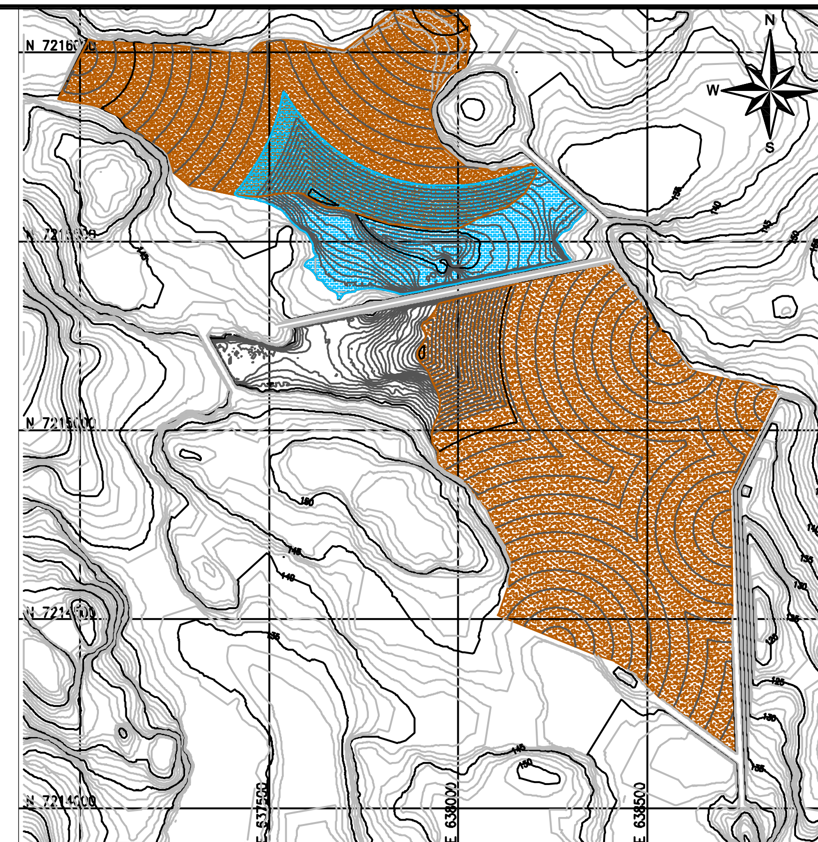
Golder Associates

PROJECT No.		06-1413-089	FILE No. 061413089-6000-07
DESIGN	M.B.	FEBRUARY 07	SCALE INDICATED / REV. A
CADD	R.A./C.S.	FEBRUARY 07	IV-07
CHECK	M.M.	FEBRUARY 07	
REVIEW	C.A.	FEBRUARY 07	

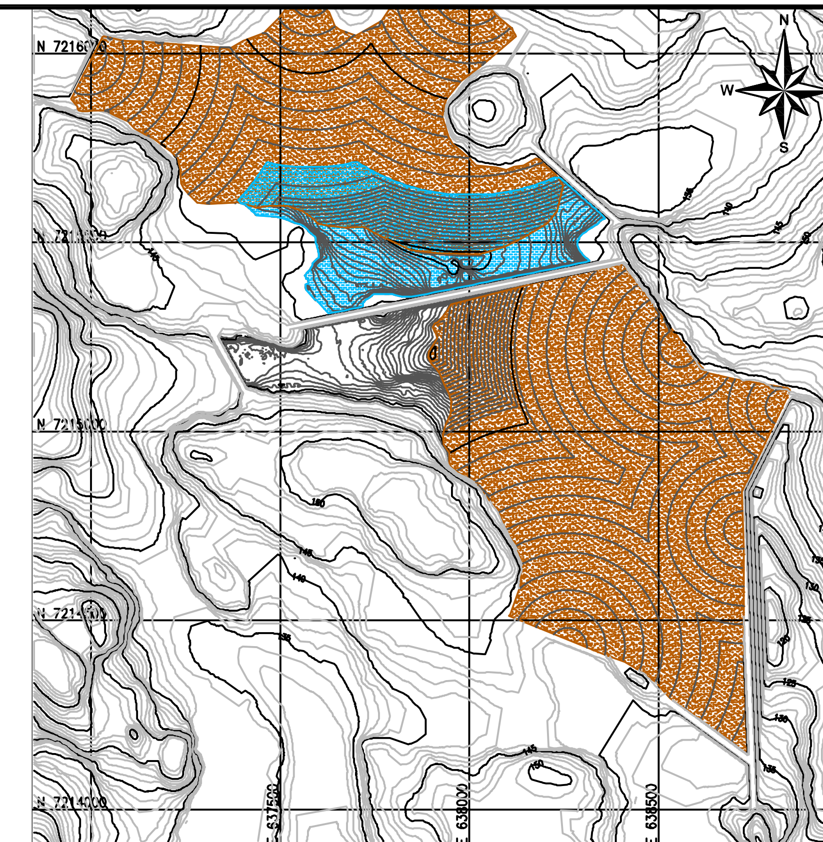
REVISION DATE: 07/03/16 12:34PM By: ASalvador CADD FILE: N:\Bur-Graphics\Projects\2006\1413\06-1413-089\6000\Drafting\Rev B\061413089-6000-07.dwg



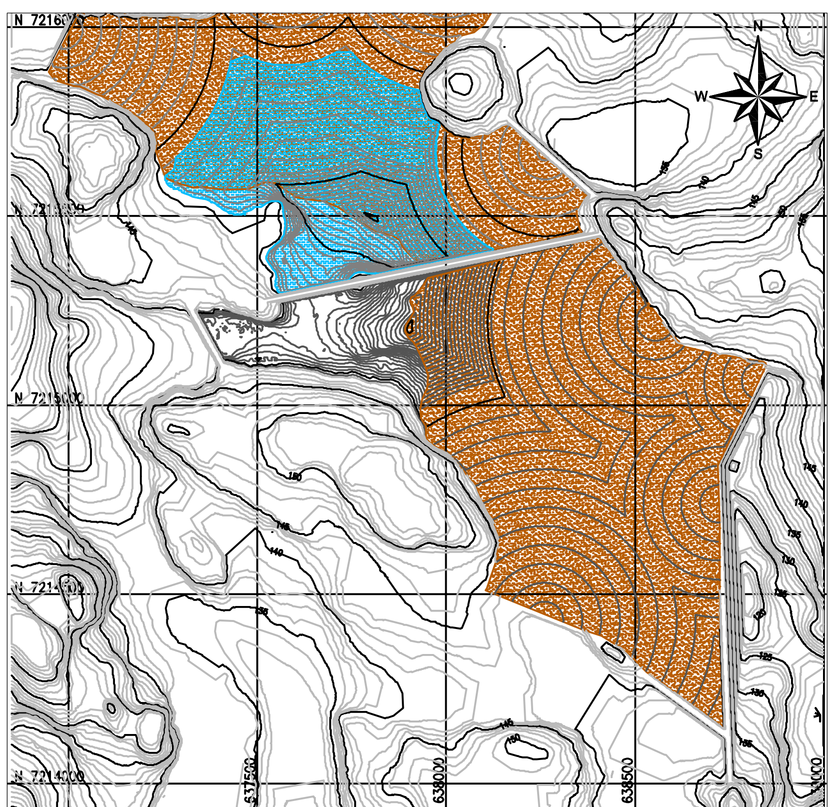
DISCHARGE OPERATING PERIOD:	WINTER	from	11-JAN-16	STAGE #
		to	28-APR-16	2 NORTH
FINAL DISCHARGE POINT ELEVATION		m a.s.l.	138.0	
PARTIAL STORED TAILINGS VOLUME		Mm^3	0.63	
CUMULATIVE STORED TAILINGS VOLUME		Mm^3	1.50	
SUPERNATANT POND ELEVATION		m a.s.l.	134.4	
ACTIVE SPIGOTS DURING THE PERIOD			1,3	
POND AREA		ha	27.49	
TAILINGS BEACH AREA		ha	17.69	



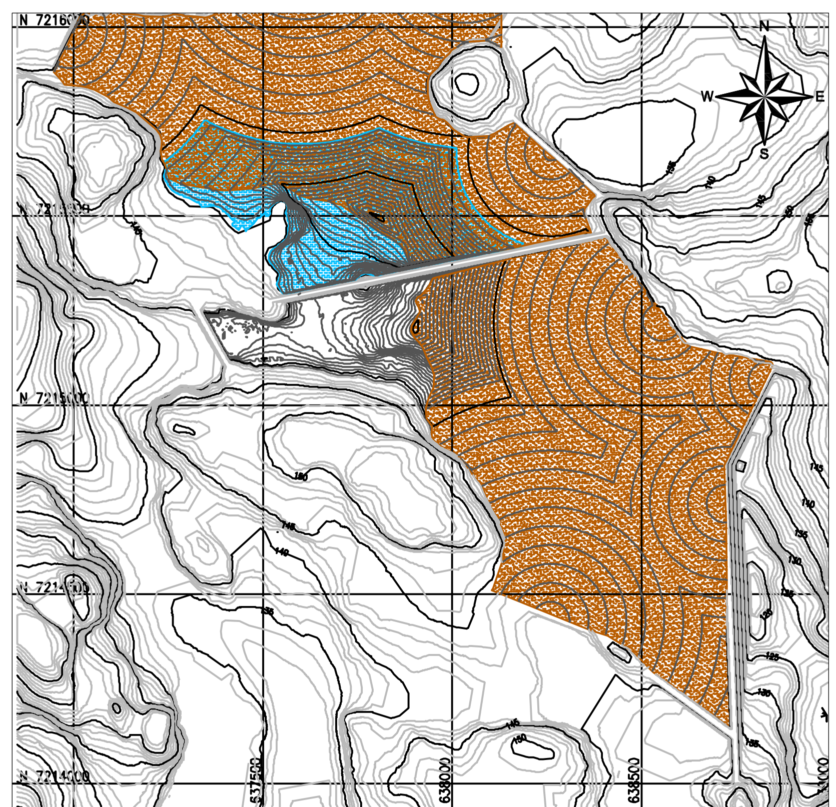
DISCHARGE OPERATING PERIOD:	SUMMER	from	12-SEP-16	STAGE #
		to	20-OCT-16	6 NORTH
FINAL DISCHARGE POINT ELEVATION		m a.s.l.	140.9	
PARTIAL STORED TAILINGS VOLUME		Mm^3	0.22	
CUMULATIVE STORED TAILINGS VOLUME		Mm^3	2.50	
SUPERNATANT POND ELEVATION		m a.s.l.	136.0	
ACTIVE SPIGOTS DURING THE PERIOD			1,3,1,3	
POND AREA		ha	23.45	
TAILINGS BEACH AREA		ha	31.53	



DISCHARGE OPERATING PERIOD:	WINTER	from	17-FEB-17	STAGE #
		to	17-APR-17	9 NORTH
FINAL DISCHARGE POINT ELEVATION		m a.s.l.	143.0	
PARTIAL STORED TAILINGS VOLUME		Mm^3	0.34	
CUMULATIVE STORED TAILINGS VOLUME		Mm^3	3.52	
SUPERNATANT POND ELEVATION		m a.s.l.	137.5	
ACTIVE SPIGOTS DURING THE PERIOD			2,1,3	
POND AREA		ha	22.47	
TAILINGS BEACH AREA		ha	40.65	



DISCHARGE OPERATING PERIOD:	SUMMER	from	15-MAY-17	STAGE #
		to	31-AUG-17	11 NORTH
FINAL DISCHARGE POINT ELEVATION		m a.s.l.	142.2	
PARTIAL STORED TAILINGS VOLUME		Mm^3	0.62	
CUMULATIVE STORED TAILINGS VOLUME		Mm^3	4.30	
SUPERNATANT POND ELEVATION		m a.s.l.	139.3	
ACTIVE SPIGOTS DURING THE PERIOD			1,4	
POND AREA		ha	30.47	
TAILINGS BEACH AREA		ha	35.05	



DISCHARGE OPERATING PERIOD :	WINTER	from	19-NOV-17	STAGE #
		to	11-DEC-17	13 NORTH
FINAL DISCHARGE POINT ELEVATION		m a.s.l.	145.0	
PARTIAL STORED TAILINGS VOLUME		Mm^3	0.13	
CUMULATIVE STORED TAILINGS VOLUME		Mm^3	4.89	
SUPERNATANT POND ELEVATION		m a.s.l.	139.7	
ACTIVE SPIGOTS DURING THE PERIOD			2,3	
POND AREA		ha	24.12	
TAILINGS BEACH AREA		ha	48.66	

NOTES:
1. THE DAM ALIGNMENTS SHOWN ARE INDICATIVE ONLY.
2. THE DAM FOOTPRINTS SHOWN PERTAIN TO THE ESTIMATED MAXIMUM CREST ELEVATIONS. THE CONSTRUCTION OF THE DAMS WILL BE STAGED OR DEFERRED.
3. AN AVERAGE TAILINGS DRY DENSITY OF 1.31 t/m HAS BEEN ASSUMED. THE ESTIMATED MAXIMUM REQUIRED TAILINGS VOLUME IS 18.2 Mm^3
4. THE CONFIGURATION OF TAILINGS AND POND SHOWN AT EACH STAGE CORRESPONDS TO THE END OF THE SEASON.
5. "SUMMER" SEASON: MAY TO OCTOBER.
"WINTER" SEASON: NOVEMBER TO APRIL.
6. SUPERNATANT POND VOLUME: 0.75 Mm^3 WINTER
0.55 Mm^3 SUMMER.
7. SUBAQUEOUS TAILINGS SLOPE: 5%.
8. CONTOURS: MAJOR INTERVAL 5m, MINOR INTERVAL 2m. ALL ELEVATIONS IN METERS ABOVE SEA LEVEL.
9. GRID REFERENCE NAD83 UTM ZONE 14.

SYMBOLS

SUPERNATANT POND

TAILINGS

20 10 0 10 20
SCALE 1:1000

NOT FOR CONSTRUCTION

STAMP

PROJECT

MEADOWBANK
MINING CORPORATION

TITLE

MEADOWBANK GOLD PROJECT
TAILINGS DEPOSITION PLAN (8 OF 8)
CASE 2 : TAILINGS BEACH SLOPE 1%

Golder Associates

PROJECT No.		06-1413-089	FILE No.	061413089-6000-08
DESIGN	M.B.	FEBRUARY 07	SCALE	INDICATED REV. A
CADD	R.A./C.S.	FEBRUARY 07	IV-08	
CHECK	M.M.	FEBRUARY 07		
REVIEW	C.A.	FEBRUARY 07		

REVISION DATE: 07/03/16 03:37PM By: ASalvador CADD FILE: N:\Bur-Graphics\Projects\2006\1413\06-1413-089\6000\Drafting\Rev B\061413089-6000-08.dwg