

# **ATTACHMENT B**

## **NICO Tailings Dam and Process Plant Facilities: 2004 Geotechnical Site Investigation**

**EBA ENGINEERING  
CONSULTANTS LTD.**



CREATING AND DELIVERING BETTER SOLUTIONS

# **NICO Tailings Dam and Process Plant Facilities 2004 Geotechnical Site Investigation**



Project No.: 1700127.002

April 2005

# **EBA Engineering Consultants Ltd.**

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Creating and Delivering Better Solutions

## **NICO TAILINGS RETENTION DAM AND PROCESS PLANT FACILITIES 2004 GEOTECHNICAL SITE INVESTIGATION**

Submitted To:

FORTUNE MINERALS LTD.  
LONDON, ONTARIO

Prepared by:

EBA ENGINEERING CONSULTANTS LTD.  
YELLOWKNIFE, NORTHWEST TERRITORIES

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## EXECUTIVE SUMMARY

Fortune Minerals Ltd. is planning construction of a tailings retention dam and process plant facilities at their NICO gold-cobalt-bismuth mine, located 160 km northwest of Yellowknife, NT. EBA Engineering Consultants Ltd. (EBA) was retained by Fortune Minerals Ltd. to conduct a field investigation and provide feasibility stage geotechnical information.

In the fall of 2004, EBA observed the drilling of six boreholes along the proposed alignment of the tailings dam and five boreholes at the proposed footprints of the process plant facilities. Thermistor cables for monitoring subsurface temperatures were installed by EBA at two borehole locations to determine ground temperatures within the proposed footprint of the tailings dam. A single standpipe piezometer was installed in one borehole to monitor groundwater conditions at the southwest abutment of the tailings dam. Single standpipe piezometers were also installed at two borehole locations at the proposed process plant site.

This report describes EBA's site investigation and observations of the terrain and subsurface conditions with permafrost descriptions, ground ice classification, ground temperature data and laboratory soil and rock test results.

The subsurface conditions in the valley bottom along the proposed dam alignment generally comprise frozen, ice-rich organic material up to 1.5 m thick overlying the undifferentiated frozen, ice-rich glaciolacustrine and lacustrine clayey and silty deposits up to 3.0 m thick. The glaciolacustrine and lacustrine deposits are underlain by a 0.7 m thick layer of frozen, ice-rich sand with silt and gravel. The sandy layer covers frozen gravelly, cobbly and bouldery material up to 4.0 m thick, which occurs on top of bedrock. The bedrock consists predominantly of metamorphosed siltstone. Rhyolite bedrock outcrops were identified at higher elevations on the valley slopes at the proposed dam abutments, and a rhyolite intrusion was encountered in one borehole. The rock quality for both rock types varies widely. Bouldery colluvial deposits occur on the valley slopes and near the base of the valley slopes.

The subsurface conditions in areas of the proposed process plant developments comprise an apron of cobbly and bouldery deposits, up to 3.7 m thick overlying igneous and metamorphosed sedimentary bedrock. The bedrock consists of rhyolite, quartz-feldspar porphyry and metamorphosed siltstone. In general, the rock quality varies widely.

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## **1.0 INTRODUCTION**

Fortune Minerals Ltd. (Fortune Minerals) is planning construction of a tailings retention dam and process plant facilities at the company's NICO gold-cobalt-bismuth deposit, located 160 km northwest of Yellowknife, NT (Figure 1).

EBA Engineering Consultants Ltd. (EBA) was retained by Fortune Minerals to conduct a geotechnical site investigation to provide feasibility stage geotechnical information for the design of the proposed tailings dam and process plant facilities. The geotechnical site investigation was conducted between September 25 and October 16, 2004.

This report describes EBA's site investigation and observations of the terrain and subsurface conditions with permafrost descriptions, ground ice classification, ground temperature data and laboratory soil and rock test results.

## **2.0 GEOLOGICAL SETTING AND TERRAIN**

The area of the proposed development is located approximately 3.5 km southeast of the existing NICO Lou Lake exploration camp. The general topography of the project site and the proposed locations of the tailings retention dam and the process plant facilities are presented in Figure 1 and Photo 1. Photo 2 shows the proposed alignment of the tailings dam.

### **2.1 Geology**

The NICO deposit occurs in the southern part of the Great Bear magmatic zone (GBmz), which consists of Paleoproterozoic volcanic and plutonic rocks exposed from Great Slave Lake in the south to Great Bear Lake in the north (Golder, 2004).

The oldest exposed rocks in the vicinity of the NICO deposit are metasedimentary rocks, which predate magmatic activity of the GBmz. These rocks were mapped as Snare Group (Lord, 1942; McGlynn, 1968; Gandhi, 1994). Recent comparative studies by Gandhi (1999; 2001) of the stratigraphy on both sides of the Wopmay Fault led to the proposed renaming of metasedimentary exposures west of the fault as "Treasure Lake Group" (Golder, 2004).

The NICO deposit is hosted within subarkosic wacke (dominant), siltstone and carbonate (minor) of the Snare/Treasure Group. The wacke is widespread and generally non-bedded to thick-bedded. Siltstone intervals are only locally apparent in the hanging wall of the deposit, but are common in the footwall where they are considered to represent the basal stratigraphic unit of the meta-sedimentary sequence. The metasedimentary rocks are unconformably overlain by a generally fine-grained (aphanitic) to locally feldspar-phyric intermediate to felsic volcanic unit of the Faber Group. At least some of the intermediate to felsic material of the Faber Group are high-level sill-type intrusive rocks rather than extrusive rocks due to their location below rather than above the metasedimentary rocks (Golder, 2004). This is illustrated in a geological cross-section along the proposed tailings dam alignment (Figure 2). Borehole EBA-03 penetrated a rhyolite intrusion, which is overlain by metasedimentary siltstone rock.

## **2.2 Terrain**

The terrain of the proposed NICO development is characterized by glacially sculptured rounded bedrock ridges and hills separated by valleys and depressions (Photo 1). Elevations range from 198 m to 365 m above sea level with maximum local relief of approximately 60 to 80 m. Valley bottoms and depressions are underlain by frozen unconsolidated deposits of glacial and post-glacial origin (Figure 2). These lower-lying areas also correspond to the metasedimentary rocks. Hills and ridges correspond to the outcropping unfrozen igneous, predominantly volcanic (rhyolite) rocks, which overlie and intrude the metasedimentary rocks, as shown in Figure 2. The metasedimentary rocks are also intruded by quartz-feldspar and quartz-porphyritic dykes.

Hills and ridges in the project area exhibit well-developed cryoplanation terraces on their sides. The terraces and the lower portions of the bedrock slopes are mantled by unconsolidated rock debris, boulders and soil. Cryoplanation terraces are step-like benches thought to form on exposed bedrock slopes from intense frost wedging associated with snowbanks. In fact, it is proposed to locate the process plant facilities on a cryoplanation terrace on the northeast-facing slope of the proposed tailings impoundment valley (Photos 3 and 4). The terrace is up to 100 m wide.

Six boreholes drilled during the site investigation along the proposed tailings dam alignment have disclosed the presence of up to 8.4 m-deep buried channel (Figure 2) that was likely carved by glacial ice and later filled with locally derived glacial and postglacial deposits.

The project site is within the zone of discontinuous permafrost. In the valley floor along the proposed tailings dam alignment, ice-rich organic soils were encountered overlying ice-rich perennally frozen glaciolacustrine and lacustrine clays and silts. Preliminary ground temperatures measured two days after installation of the thermistor instrumentation suggest that the valley slope at the Borehole EBA-03 location may be unfrozen.

Vegetation at the valley floor consists of a thick *Sphagnum* moss cover and relatively dense stands of predominantly black spruce forest with some stunted trees leaning in random directions (Photo 5). This stand condition is often called a drunken forest. On flat lying terrain in permafrost settings drunken forests are often the result of repeated differential frost heave which occurs in the fine-grained perennally frozen soils. The valley slopes, bedrock hills and ridges are sparsely vegetated with lodgepole pine, white spruce, white birch and aspen, as shown in Photo 6.

### **3.0 GEOTECHNICAL INVESTIGATION**

#### **3.1 General**

The geotechnical site investigation program was conducted between September 25 and October 16, 2004 by Dr. Vladislav E. Roujanski, P. Geol. of EBA. Dr. Kathryn L. Neale of Fortune Minerals was the client's representative on site providing technical and logistical support to the program. Access to the drilling locations was provided by a Hughes helicopter and an all terrain vehicle.

The investigation consisted of drilling, logging and sampling six boreholes along the proposed tailings dam alignment and five boreholes at the proposed process plant facilities site, as shown in Figure 1.

The boreholes provided data regarding the overburden conditions, depth to bedrock and condition of the bedrock, which will be used for the tailings dam and process plant foundation design. The boreholes were terminated at selected depths. The maximum depth of drilling was 15.4 m.

### **3.2 Borehole Locations**

EBA and Fortune Minerals staked the borehole locations along the proposed tailings dam alignment. The borehole locations at the proposed plant site were staked by Fortune Minerals separately based on the recommendations provided by MetChem Canada Inc. As-drilled borehole coordinates were obtained with a hand-held “Garmin” GPS-V unit after completion of the drilling program.

Approximate surface elevations of the borehole locations were derived from a digital topographic map (an AutoCAD file) of the project area, which was provided by Fortune Minerals.

No survey has been carried out to date. All boreholes were staked for future survey.

The approximate coordinates and elevations for each borehole are presented on the respective logs and are summarized in Table 1. Borehole locations are shown in Figure 1.

**Table 1**  
**BOREHOLE SUMMARY**

Borehole	UTM ZONE 11		Surface Elevation <sup>2</sup> (m)	Water Depth (m)	Depth to Bedrock (m)	Completion Depth (m)
	Northing <sup>1</sup> (m)	Easting <sup>1</sup> (m)				
EBA-01	7045498	513607	203.5	-	4.4	15.3
EBA-02	7045538	513625	204.6	-	4.4	7.3
EBA-03 <sup>3</sup>	7045608	513634	213.0	-	0.3	15.4
EBA-04	7045450	513593	203.5	-	8.4	10.8
EBA-05 <sup>3</sup>	7045406	513584	204.0	-	6.0	15.3
EBA-06 <sup>4</sup>	7045319	513556	210.0	-	4.3	15.0
MC-01 <sup>4</sup>	7046092	512436	229.5	-	0.0	10.0
MC-05	7045872	512418	231.0	-	0.8	10.0
MC-12 <sup>4</sup>	7045813	512377	232.0	-	2.6	12.5
MC-15	7045751	512473	230.2	-	2.2	12.0
MC-17	7045712	512538	229.3	-	3.7	14.0

Note:

NAD27 Datum

1 - Borehole coordinates were obtained with a hand-held GPS unit. Boreholes staked for future survey.

2 - Surface elevations were derived from a digital topographic map.

3 - Ground temperature cable installed to 15.0 m depth.

4 - Standpipe piezometer installed to the bottom of borehole.

### 3.3 Drilling and Sampling Methodology

The geotechnical boreholes were drilled using a skid-mounted, Boyles-25A diamond drill operated by Connors Drilling Ltd. of Yellowknife, NT.

Frozen fine-grained soils and organic-rich overburden samples (clay, silt and peat) were recovered using a 1 m-long split core barrel (76 mm diameter core), shown in Photo 7. No drilling fluid was used during the coring. The split core barrel was slowly advanced into the frozen overburden by slow rotation with applied pressure.

Thawed and unfrozen coarse-grained overburden samples (sand, gravel, cobble and boulders) and bedrock samples were recovered using an NQ wireline core barrel (48 mm core diameter) and conventional diamond drilling techniques. Cold lake and stream water was used as the drilling fluid. Coarse-grained overburden samples that either natural unfrozen or thawed by drilling were disturbed and the core recovery was poor.

Thawed and unfrozen rock core samples were mostly of excellent to good quality.

All frozen and unfrozen overburden and bedrock core was examined in the field and logged. Soil and bedrock index parameters were determined immediately after sample recovery from the core barrel. Soil logging was based on Modified Unified Soil Classification System guidelines and included classification of the ground ice and percent recovery. Bedrock logging consisted of identifying the type of rock, degree of weathering, spacing of joints, fracture frequency (FF), rock quality designation (RQD) and percent recovery.

Borehole logs containing soil and rock descriptions, classification of ground ice, the laboratory testing data, and the structural characteristics of the recovered bedrock core are presented in Appendix B.

All of the overburden and bedrock core were photographed.

Overburden samples were bagged and bedrock core was placed in wooden core boxes.

### **3.4 Laboratory Testing**

All bagged overburden core samples were sent to EBA's Yellowknife laboratory. Testing included particle size analyses, moisture content, Atterberg limits, specific gravity, bulk density and permeability determination. Selected bedrock core samples were shipped to EBA's Vancouver laboratory for determination of point load strength index. The remainder of the bedrock core was left on site.

Appendix C provides a tabulated summary of all the laboratory test results from the borehole samples. Particle size distribution curves of select overburden samples are also provided. All laboratory testing was conducted in accordance with generally accepted geotechnical procedures and specifications.

### 3.5 Ground Temperature Monitoring

Ground temperature cables (GTCs) EBA-04-03 and EBA-04-05 were installed in Boreholes EBA-03 and EBA-05, respectively, inside 38 mm I.D. flush couple threaded PVC pipe. Dry silica sand was placed inside the PVC pipe. The annulus between the PVC pipe and the borehole walls was backfilled with coarse sand and/or grout. Manual ground temperature readings were taken immediately after installation and two days later. The ground temperature profiles are presented in Appendix D.

Borehole EBA-03 is located on a narrow cryoplanation terrace in the upper portion of the southwest-facing bedrock slope at the northeast abutment of the tailings dam, as shown in Figures 1 and 2, and Photo 8.

Borehole EBA-05 is located at the bottom of the proposed tailings impoundment valley along the proposed dam alignment as shown in Figures 1 and 2, and Photo 9.

Ground temperatures measured in EBA-03 two days after installation were above 0° C suggesting that the southwest-facing slope of the proposed northeast abutment is unfrozen. Ground temperatures measured in Borehole EBA-05 two days after installation were approximately 0° C between ground surface and 4.0 m depth, varied between 0° C and - 2° C between 4.0 m and 7.2 m depths, and were approximately - 2° C between 7.2 m and 15.35 m depths.

Ground temperatures measured at the time of investigation may not have reached full equilibrium. Therefore, further ground temperature measurements are required.

In Borehole EBA-01, an ice plug formed inside the thermistor PVC casing at a depth of 8.3 m. Therefore, a ground temperature cable was not installed.

### 3.6 Groundwater Monitoring

Standpipe piezometers constructed of rigid flush couple threaded PVC pipe (38 mm I.D.) with slotted ends were installed in three Boreholes (EBA-06, MC-01 and MC-12). The standpipe piezometer installation details are presented on the borehole logs in Appendix B. No water samples have been collected from the standpipe piezometers to date.

## **4.0 SUBSURFACE CONDITIONS**

### **4.1 General**

The proposed tailings retention dam is situated in a flat-bottomed valley with relatively steep bedrock slopes (Figure 2). The valley is closed at the northwest end and drains southeast to Peanut Lake. The proposed alignment of the tailings dam crosses a small stream near the outflow of a muskeg lake (Pond 8) within the valley. It is envisioned to turn the partially closed valley into a tailings impoundment reservoir, with the process plant and the associated facilities built upstream from the proposed dam on cryoplanation terraces located on the bedrock slopes.

The subsurface conditions encountered during EBA's 2004 site investigation are discussed in the following sections. The discussions are based on the data collected during the drilling, logging and laboratory testing phases of the investigation. Subsurface conditions between the borehole locations may deviate from the subsurface conditions discussed herein.

Borehole logs are provided in Appendix B. Table C.1 (Appendix C) summarizes the laboratory test results, which include moisture contents, Atterberg Limits and particle size distribution of the overburden. The plotted particle size distribution curves are, also, presented in Appendix C. Table C.2 (Appendix C) presents the rock sample point load strength test results. These results are also shown on the borehole logs (Appendix B). The rock strength description terms used in this report are based on those suggested by ISRM (1981). These terms are summarized in Table 2.

**Table 2**  
**CLASSIFICATION OF ROCK WITH REGARD TO STRENGTH**

Grade	Strength Classification	Field Identification Method	Range of Unconfined Compressive Strength (MPa)
R0	Extremely Weak	Indented by thumbnail	<1
R1	Very Weak	Crumbles under firm blows of geological hammer; can be peeled with a pocket knife	1 – 5
R2	Weak Rock	Can be peeled by a pocket knife with difficulty; shallow indentations made by a firm blow with point of geological hammer	5 – 25
R3	Medium Strong	Cannot be scraped or peeled with a pocket knife; specimen can be fractured with a single firm blow of geological hammer	25 – 50
R4	Strong	Specimen required more than one blow of geological hammer to fracture	50 – 100
R5	Very Strong	Specimen requires many blows of geological hammer to fracture	100 – 250
R6	Extremely Strong	Specimen can only be chipped by the geological hammer	>250

## 4.2 Tailings Dam

The generalized subsurface conditions encountered along the proposed tailings dam alignment are presented in Figure 2. Boreholes EBA-01, EBA-02, EBA-03, EBA-04, EBA-05 and EBA-06 were drilled along the alignment.

The valley bottom lithology can generally be described as a mantle of organic material overlying a blanket of undifferentiated glaciolacustrine and lacustrine deposits, which is underlain by gravelly, cobbly, and bouldery material. The underlying bedrock consists predominantly of metamorphosed siltstone. Bouldery colluvial deposits were encountered on the slopes upslope of the valley bottom and overlying valley bottom deposits along the flanks of the valley. Rhyolite bedrock outcrops were identified at

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higher elevations on the valley slopes at the proposed dam abutments and a rhyolite intrusion within the metamorphosed siltstone was encountered in Borehole EBA-03.

#### 4.2.1 Subsurface Soil Conditions

Soil conditions at the bottom of the valley, along the proposed tailings dam alignment, generally comprise a mantle of organic material up to 1.5 m thick overlying undifferentiated glaciolacustrine and lacustrine deposits up to 3.0 m thick (Photo 10). The glaciolacustrine and lacustrine deposits overlie up to 0.7 m thick layer of sand with silt and gravel. The sandy layer covers gravelly, cobbly and bouldery material up to 4.0 m thick, which occurs on top of bedrock.

The organic material is frozen and consists of peat (woody, coarse-fibrous with scattered chunks of wood), rootlets etc, as shown in Photo 10. The moisture content of the organic material varies from 401.4% (EBA-01) to 675.0% (EBA-04). Visually estimated ice contents vary from visible individual ice crystals or inclusions (Vx) with less than 15% ice (by volume) to visible horizontally oriented ice lenses (Vs) with 20-30% ice (by volume).

Underlying the surface organic material are undifferentiated glaciolacustrine and lacustrine deposits that are comprised of clay and silt (CL, CI, OH and ML) with trace of sand. The deposits get sandier with depth. A 1.8 m thick layer of clayey silt with high content of organics was encountered at a depth of 1.5 m in EBA-04, as shown in Photo 10. The glaciolacustrine and lacustrine deposits are frozen and ice-rich (Vs and Vr). The moisture content of the deposits varies from 20.2% (EBA-02) to 87.5% (EBA-04). Visually estimated ice contents vary from non-visible, well-bonded excess ice (Nbe) to visible stratified or randomly oriented ice formations (Vs and Vr) with more than 40% ice (by volume). Layers of ice and clay (i.e. discrete ice formations in frozen soils that are greater than 50% by volume) were encountered in EBA-05 and EBA-01. The apparent specific gravity of the lacustrine clay and silt sampled in Borehole EBA-01 (1.4-1.6 m depth) was determined to be 2.71 (Appendix C).

A constant head permeability test on a composite sample of the clay and silt (CL) with some sand obtained from Boreholes EBA-01, EBA-02, EBA-04 and EBA-05 was conducted in EBA's Edmonton geotechnical laboratory. The test results are presented in Appendix C.

The clayey and silty (glacio) lacustrine deposits are underlain by a layer of sand (SM) with silt and gravel, frozen, ice-rich. Moisture contents vary from 16.9% (EBA-02) to 29.7% (EBA-04).

The sandy layer covers frozen, gravelly, cobbly and bouldery material, which occurs on top of the bedrock. The material is frozen and possibly ice-rich; however, its volumetric ice content was difficult to estimate because most of the core was disturbed and matrix washed away during drilling.

The apparent specific gravity of the silt and sand with trace of clay sampled in Borehole EBA-04 (4.2 - 4.4 m) was determined to be 2.68 (Appendix C).

Upslope of the valley bottom and at the foot of the valley slopes are predominantly boulder and cobble colluvial deposits (Photo 6) that may form an apron overlying undifferentiated glaciolacustrine and lacustrine deposits.

#### 4.2.2 Bedrock

All six boreholes along the proposed tailings dam alignment confirmed top of bedrock at depths ranging from 0.3 m to 8.4 m, as shown in Figure 2. The bedrock consists predominantly of metamorphosed siltstone, pinkish and greenish dark grey to black, with inclined pistachio green epidote and pink feldspar bands. The metamorphosed siltstone is very fine-grained, fresh to highly weathered, extremely strong to weak and containing widely to extremely closely spaced joints. Weak siltstone occurred within highly weathered intervals.

The encountered metamorphosed siltstone is of fair to excellent quality, with fracture frequency (FF) values ranging from 1 to 11 per metre and rock quality designation (RQD) values ranging from 57 to 100%. Clay, silt, calcite, chlorite and limonite were identified in both the sub-vertical and sub-horizontal joints. Slight weathering and oxide staining were observed on the fracture planes.

A rhyolite intrusion was encountered in Borehole EBA-03 at a depth of 12.7 m, as shown in Figure 2. The rhyolite encountered is burgundy pink with scattered greenish black

grains of biotite, fresh, medium strong to very strong and containing closely to very closely spaced joints. It is characterized by partly glassy texture and conchoidal fracture.

The encountered rhyolite is of poor quality, with FF value of 17 per metre and RQD value of 31%. Biotite alteration, slight weathering and oxide staining were observed on the fracture planes.

A 9 cm thick fragmented zone formed by the intersection of very closely spaced joints was encountered in Borehole EBA-03 in the rhyolite intrusion at a depth of 13.3 m. Another fragmented zone was encountered in Borehole EBA-06 in metamorphosed siltstone at a depth of 5.1 m.

### **4.3 Process Plant Facilities**

Figure 1 shows locations of the five boreholes, that were drilled at the proposed process plant facilities site which include:

- MC-01 at the proposed jaw crusher site (Photo 11);
- MC-05 at the proposed concentrator site (Photo 12);
- MC-12 at the proposed service building site (Photo 13);
- MC-15 at the proposed pressure leaching site (Photo 3); and
- MC-17 at the proposed oxygen plant site (Photo 4).

Borehole MC-01 is located on a cryoplanation terrace on the southwest-facing slope of the valley. Boreholes MC-05, MC-12, MC-15 and MC-17 are located on a cryoplanation terrace on the northeast-facing slope of the valley that is up to 100 m-wide. The lithology can generally be described as an apron of colluvial deposits overlying igneous and metamorphosed sedimentary bedrock.

#### **4.3.1 Subsurface Soil Conditions**

Overburden conditions encountered at the proposed process plant facilities site consist of bouldery deposits overlying bedrock. The bouldery deposits are up to 3.7 m thick and possibly unfrozen as suggested by a ground temperature cable installed in Borehole EBA-03, which was drilled in similar terrain setting.

### 4.3.2 Bedrock

All five boreholes drilled at the proposed process plant site confirmed top of bedrock at depths ranging from 0.0 to 3.7 m. The bedrock consists of metamorphosed siltstone, rhyolite and quartz-feldspar porphyry.

#### Quartz-Feldspar Porphyry

Quartz-feldspar porphyry was encountered in only one borehole (MC-01). The quartz-feldspar porphyry encountered is reddish brown (when wet) to grey (when dry) with a mottled appearance due to occurrence of white quartz grains and greenish black inclusions of altered siltstone, coarse-grained, fresh to slightly weathered, very strong with moderately spaced sub-horizontal and sub-vertical joints.

The rock is of fair quality, with an FF value of 6 per metre and with RQD value of 74%. The joints were found to be infilled with silt, clay and chlorite. The joint surfaces are slightly weathered and oxide stained.

#### Metamorphosed Siltstone

The metamorphosed siltstone encountered is greenish dark grey to black with inclined pink feldspar, pistachio green epidote and white quartz bands. There are inclined zones of pyrite mineralization associated with feldspar bands. The rock is very fine-grained, fresh to faintly weathered, medium strong to very strong with very closely to widely spaced sub-horizontal and sub-vertical joints.

The rock is of good to excellent quality, with FF values ranging from 0 to 7 per metre and RQD values ranging from 81 to 100%. Some joints were found to be infilled with chlorite, calcite and pyrite. Slight weathering, hematite occurrence, pyrite mineralization, oxide and malachite staining were observed on the fracture planes.

A 0.45 m thick band of pink potassium feldspar with biotite veins, in-situ brecciated, with hematite occurrence and malachite staining on fracture planes was encountered at a depth of 7.3 m in MC-05.

#### Rhyolite

The rhyolite encountered is greyish pink to burgundy pink to reddish brown with scattered greenish black grains of biotite and hornblende, fresh to faintly weathered,

strong to extremely strong and containing closely to very widely spaced sub-horizontal and sub-vertical joints. It is characterized by partly glassy texture and conchoidal fracture.

The encountered rhyolite is of fair to excellent quality, with FF values ranging from 0 to 12 per metre and RQD values ranging from 59 to 100%. The joints were found to be infilled with limonite, chlorite, calcite and pyrite. Biotite alteration, slight weathering, pyrite mineralization and oxide staining were observed on the natural fracture faces of the discontinuities.

## **5.0 LIMITATIONS**

This data report presents information collected during EBA's 2004 geotechnical site investigation at the proposed tailings dam and the process plant. The conditions encountered during the fieldwork are considered to be reasonably representative of the respective investigated sites.

This report has been prepared for the exclusive use of Fortune Minerals Ltd., and their agents for specific application to the development of the NICO mine. It has been prepared in accordance with generally accepted soil and foundation engineering practices. No other warranty is made, either express or implied.

Reference should be made to the General Conditions included in Appendix A of this report for further limitations.

## 6.0 CLOSURE

We trust this submission meets your present requirements. If you have any questions, please contact the undersigned at your convenience.

Respectfully submitted,  
EBA Engineering Consultants Ltd.

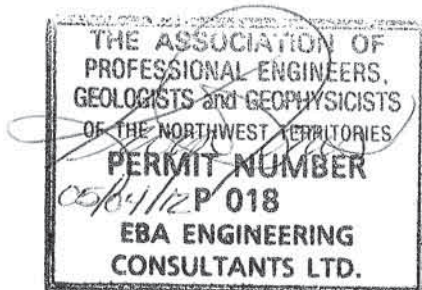



V. E. Roujanski, Ph.D., P.Geol. (NT/NU)  
Project Geologist  
Circumpolar Regions  
(Direct Line: (780) 451-2130 ext. 289)  
(E-mail: [vroujanski@eba.ca](mailto:vroujanski@eba.ca))




M.D. Watson, P.Eng. (NT/NU)  
Senior Geotechnical Engineer  
Arctic Practice  
(Direct Line: (780) 451-2130, ext. 277)  
(e-mail: [mwatson@eba.ca](mailto:mwatson@eba.ca))

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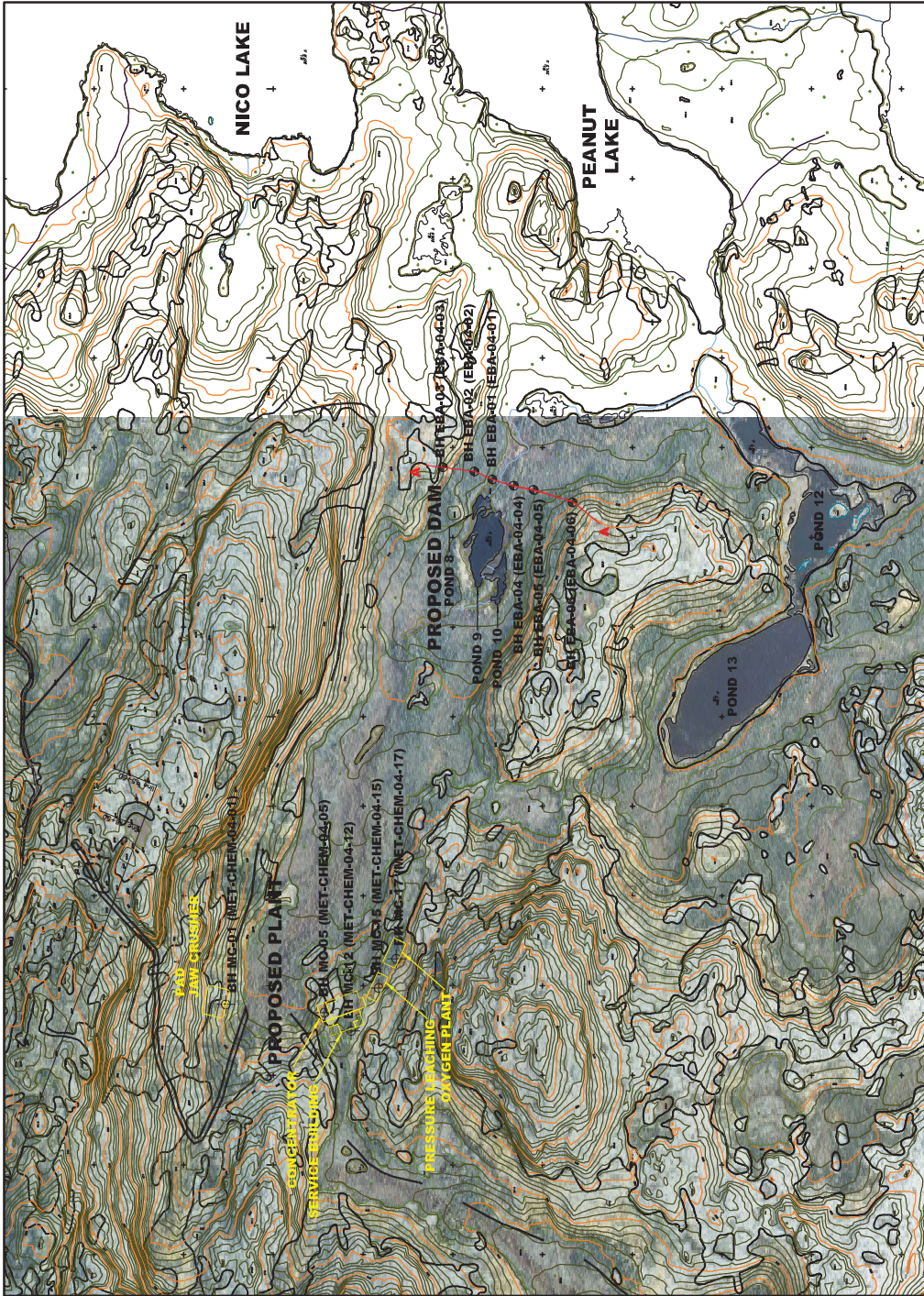


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## FIGURES

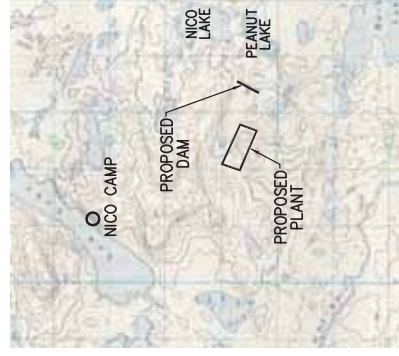


LEGEND:

- - BOREHOLE LOCATION (PROPOSED TAILINGS RETENTION DAM)
- ⊕ - BOREHOLE LOCATION (PROPOSED PROCESS PLANT SITE)

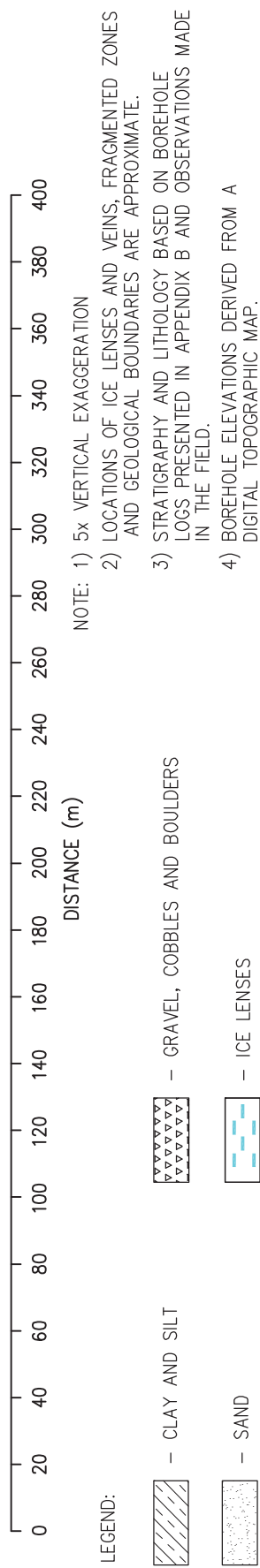
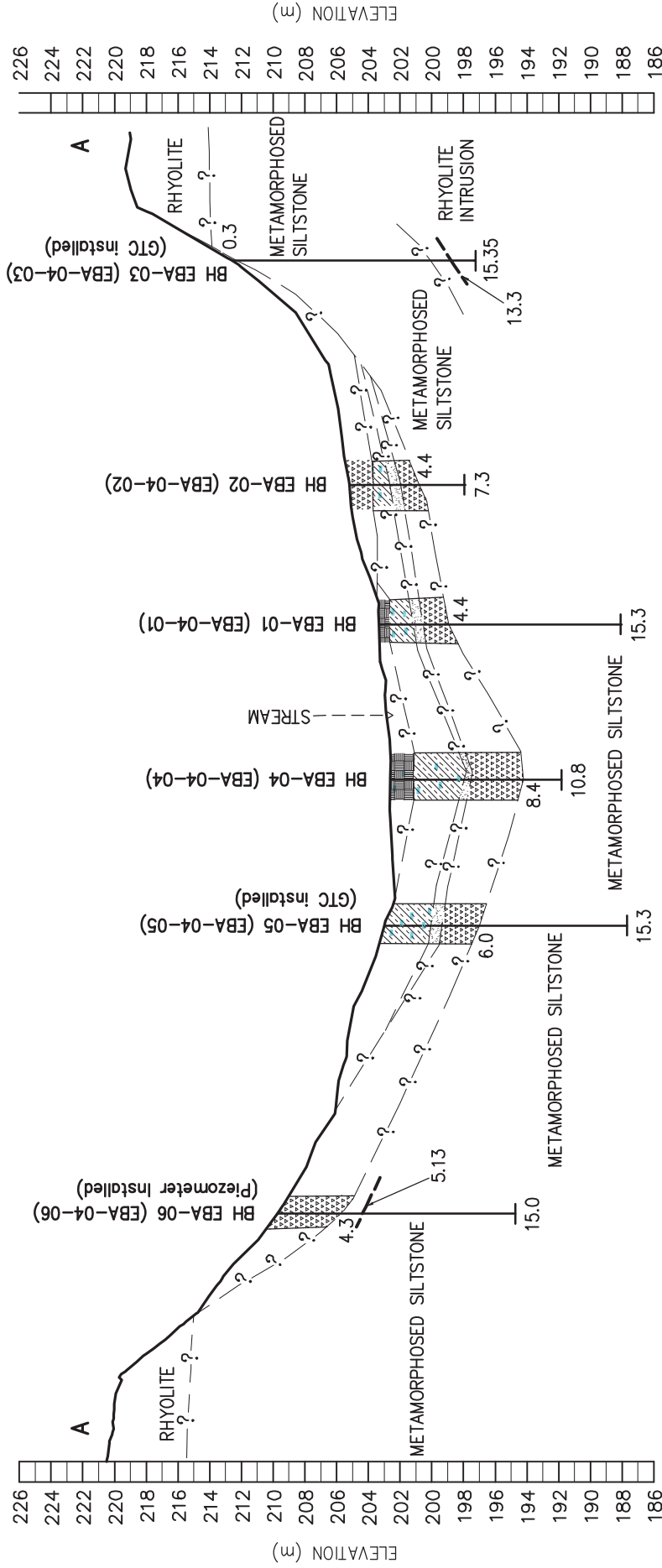


INDEX MAP  
N.T.S.



LOCATION MAP  
N.T.S.

Figure 1  
Site Plan  
Borehole Locations



**Figure 2**  
**NICO Tailings Dam**  
**Lithology and Ground Ice Occurrence**  
**Along Proposed Alignment**



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## PHOTOGRAPHS



**Photo 1**

The proposed tailings impoundment site, looking north northwest. Notice a drill rig at the EBA-01 drill site.



**Photo 2**

The proposed tailings dam alignment as viewed from the southwest abutment, looking northeast. Notice a drill rig at EBA-01 site.

**Photo 3**

MC-15 Site (Pressure Leaching Facility) within a cryoplanation terrace, looking approximately east.

**Photo 4**

MC-17 Site (Oxygen Plant) within a cryoplanation terrace, looking approximately southwest.



**Photo 5**

Drunken forest at EBA-01 site as viewed from the proposed alignment looking southwest.



**Photo 6**

Sparse mixed forest at the northeast abutment of the tailings dam, looking southwest.



**Photo 7**

Split core barrel used for coring frozen clayey and silty soils. The drill bit (76mm I.D.) has tungsten carbide teeth.



**Photo 8**

Drill rig at EBA-03 site on a cryoplanation terrace, looking southwest from the northeast abutment.



**Photo 9**  
Drill rig at EBA-05 site, looking south.



**Photo 10**  
BH EBA-04-04. Overburden core. Depth - 0.0 - 3.5m.



**Photo 11**

Drill rig at MC-01 Site (Jaw Crusher) as viewed from the opposite slope (MC-05 site), looking north.



**Photo 12**

MC-05 Site (Concentrator), looking approximately east.



**Photo 13**  
MC-12 Site (Service Building), looking approximately southwest.

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**APPENDIX A**  
**GENERAL CONDITIONS**

**EBA Engineering Consultants Ltd. (EBA)**  
**GEOTECHNICAL REPORT – GENERAL CONDITIONS**

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This report incorporates and is subject to these “General Conditions”.

### **1.0 USE OF REPORT AND OWNERSHIP**

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of EBA's client. EBA does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA's client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

### **2.0 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS**

Classification and identification of soils and rocks are based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. EBA does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

### **3.0 LOGS OF TEST HOLES**

The test hole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive.

Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

### **4.0 STRATIGRAPHIC AND GEOLOGICAL INFORMATION**

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historic environment. EBA does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional investigation and review may be necessary.

### **5.0 SURFACE WATER AND GROUNDWATER CONDITIONS**

Surface and groundwater conditions mentioned in this report are those observed at the times recorded in the report. These conditions vary with geological detail between observation sites; annual, seasonal and special meteorologic conditions; and with development activity. Interpretation of water conditions from observations and records is judgmental and constitutes an evaluation of circumstances as influenced by geology, meteorology and development activity. Deviations from these observations may occur during the course of development activities.

### **6.0 PROTECTION OF EXPOSED GROUND**

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

### **7.0 SUPPORT OF ADJACENT GROUND AND STRUCTURES**

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

**EBA Engineering Consultants Ltd. (EBA)**  
**GEOTECHNICAL REPORT – GENERAL CONDITIONS**

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**8.0 INFLUENCE OF CONSTRUCTION ACTIVITY**

There is a direct correlation between construction activity and structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques are known.

**9.0 OBSERVATIONS DURING CONSTRUCTION**

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

**10.0 DRAINAGE SYSTEMS**

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

**11.0 BEARING CAPACITY**

Design bearing capacities, loads and allowable stresses quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions assumed in this report in fact exist at the site.

**12.0 SAMPLES**

EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of

samples can be made at the client's expense upon written request, otherwise samples will be discarded.

**13.0 STANDARD OF CARE**

Services performed by EBA for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practising under similar conditions in the jurisdiction in which the services are provided. Engineering judgement has been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.

**14.0 ENVIRONMENTAL AND REGULATORY ISSUES**

Unless stipulated in the report, EBA has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

**15.0 ALTERNATE REPORT FORMAT**

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA's instruments of professional service), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding. The hard copy versions submitted by EBA shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancies, the hard copy versions shall govern over the electronic versions. Furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed version archived by EBA shall be deemed to be the overall original for the Project.

The Client agrees that both electronic file and hard copy versions of EBA's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. The Client warrants that EBA's instruments of professional service will be used only and exactly as submitted by EBA.

The Client recognizes and agrees that electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.



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**APPENDIX B**  
**BOREHOLE LOGS**

## GROUND ICE DESCRIPTION

### ICE NOT VISIBLE

GROUP SYMBOLS	SUBGROUP DESCRIPTION	
N	Poorly-bonded or friable	
	No excess ice, well-bonded	
	Excess ice, well-bonded	

### VISIBLE ICE LESS THAN 50% BY VOLUME

GROUP SYMBOLS	SUBGROUP DESCRIPTION	
V	Individual ice crystals or inclusions	
	Ice coatings on particles	
	Random or irregularly oriented ice formations	
	Stratified or distinctly oriented ice formations	

- NOTE:**
- Dual symbols are used to indicate borderline or mixed ice classifications
  - Visual estimates of ice contents indicated on borehole logs  $\pm 5\%$
  - This system of ground ice description has been modified from NRC Technical Memo 79, Guide to the Field Description of Permafrost for Engineering Purposes

LEGEND Soil Ice

### VISIBLE ICE GREATER THAN 50% BY VOLUME

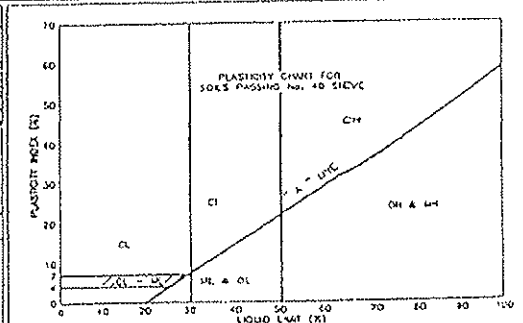
ICE	ICE + Soil Type	
	ICE	Ice without soil inclusions (greater than 25 mm (1 in.) thick)

## MODIFIED UNIFIED CLASSIFICATION SYSTEM FOR SOILS

MAJOR DIVISION	GROUP SYMBOL	GRAPH SYMBOL	COLOUR CODE	TYPICAL DESCRIPTION	LABORATORY CRITERIA		
COARSE GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN 200 SIEVE)	GRAVELS MORE THAN HALF COARSE GRAINS LARGER THAN NO. 4 SIEVE	GW		RED	WELL GRADED GRAVELS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 4$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$	
		GP		RED	POORLY GRADED GRAVELS, AND GRAVEL-SAND MIXTURES, LITTLE OR NO FINES		NOT MEETING ABOVE REQUIREMENTS
	SANDS MORE THAN HALF FINE GRAINS SMALLER THAN NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)	GM		YELLOW	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12%
			GC		YELLOW	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	
		CLEAN SANDS (LITTLE OR NO FINES)	SM		RED	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 6$ $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$
			SP		RED	POORLY GRADED SANDS, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS
DIRTY SANDS (WITH SOME FINES)	SM		YELLOW	SILTY SANDS, SAND-SILT MIXTURES	CONTENT OF FINES EXCEEDS 12%		
	SC		YELLOW	CLAYEY SANDS, SAND-CLAY MIXTURES		ATTERBERG LIMITS BELOW "A" LINE OR P.L. LESS THAN 4 ATTERBERG LIMITS BELOW "A" LINE P.L. MORE THAN 7	
FINE GRAINED SOILS (MORE THAN HALF BY WEIGHT PASSES 200 SIEVE)	SILTS BELOW "A" LINE NEGLECTIBLE ORGANIC CONTENT	$w_L < 50\%$	ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	CLASSIFICATION IS BASED UPON PLASTICITY CHART (SEE BELOW)	
		$w_L > 50\%$	MH		INORGANIC SILTS, VICINOUS OR UNIFORMEDUS, FINE SANDY OR SILTY SOILS		
	$w_L < 30\%$	CL		GREEN	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY OR SILTY CLAYS, LEAM CLAYS		
		$30\% < w_L < 50\%$	CI		GREEN-BLUE		INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS
	$w_L > 50\%$	CH		BLUE	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS		
		OH		BLUE	ORGANIC CLAYS OF HIGH PLASTICITY		
ORGANIC SILTS & CLAYS BELOW "A" LINE ON "K" LINE ON CHART	$w_L < 50\%$	OL		ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	WHENEVER THE NATURE OF THE FINES CONTENT HAS NOT BEEN DETERMINED, IT IS DESIGNATED BY THE LETTER "O", E.G. SO IF A MIXTURE OF SAND WITH SILT OR CLAY		
	$w_L > 50\%$	OH		ORGANIC SILTS AND ORGANIC SILTY CLAYS OF HIGH PLASTICITY			
HIGHLY ORGANIC SOILS		HI		PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOUR OR ODOR, AND OFTEN FIBROUS TEXTURE		

SPECIAL SYMBOLS	
LIMESTONE	
SANDSTONE	
SILTSTONE	
	OL SAND
	SHALE
	FILL (UNDIFFERENTIATED)

SOIL COMPONENTS			
FRACTION	U.S. STANDARD SIEVE SIZE	DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS	
	PASSING	PERCENT	DESCRIPTOR
GRAVEL	75mm	50-35	"AND"
	19mm		
SAND	4.75mm	35-20	"OR"LY"
	2.00mm		
	425µm		
SILT (NON PLASTIC)	75µm	20-10	"SOME"
	2µm		
CLAY (PLASTIC)	2µm	10-1	"TRACE"



1. ALL SIEVE SIZES MENTIONED ON THIS CHART ARE U.S. STANDARD A.S.T.M. #11  
 2. BOUNDARY CLASSIFICATIONS POSSESSING CHARACTERISTICS OF TWO GROUPS ARE GIVEN COMBINED GROUP SYMBOLS, E.G. GM-GC IS A WELL GRADED GRAVEL SAND MIXTURE WITH CLAY BINDER BETWEEN 5% AND 12%

OVERSIZED MATERIAL	
ROUNDED OR SUBROUNDED	NOT ROUNDED
COBBLES 75mm TO 200mm	ROCK FRAGMENTS > 75mm
BOULDERS > 200mm	ROCKS > 0.15 CUBIC METRE IN VOLUME

## ROCK DESCRIPTION TERMS USED ON BOREHOLE LOGS

### ESTIMATED MECHANICAL STRENGTH

TERM	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (MPa)
Extremely Weak	<1
Very Weak	1 – 5
Weak Rock	5 – 25
Medium Strong	25 – 50
Strong	50 – 100
Very Strong	100 – 250
Extremely Strong	>250

### GRAIN SIZE

NON-CARBONATE DETRITAL SEDIMENTARY ROCKS	OTHER ROCKS	GRAIN SIZE
Conglomerate or Breccia	Very Coarse Grained	More than 80 mm
Conglomerate or Breccia	Coarse Grained	4 to 80 mm
Sandstone <sup>1</sup>	Medium Grained	80 µm to 4 mm
<u>FISSILE</u>		
Silt Shale	Fine Grained	>2/3 silt-sized (2 to 80 µm)
Mud Shale	Fine Grained	silt and clay-sized (<80 µm)
Clay Shale	Very Fine Grained	>2/3 clay-sized (<2 µm)
<u>NON-FISSILE</u>		
Siltstone		
Mudstone		
Claystone		

<sup>1</sup> Sandstone further subdivided where appropriate into fine, medium, coarse

### DISCONTINUITY SPACING

BEDDING	OTHER DISCONTINUITIES	SPACING
Very thickly Bedded	Very Widely Spaced	More than 2 m
Thickly Bedded	Widely Spaced	600 mm to 2 m
Medium Bedded	Moderately Widely Spaced	200 to 600 mm
Thinly Bedded	Closely Spaced	60 to 200 mm
Very Thinly Bedded	Very Closely Spaced	20 to 60 mm
Laminated	Extremely Closely Spaced	6 to 20 mm
Thinly Laminated	Extremely Closely Spaced	2 to 6 mm
Fissile	Extremely Closely Spaced	Less than 2 mm

### WEATHERED STATE

TERM	DEGREE
Fresh	No visible signs of weathering
Slightly Weathered	Weathering only on open discontinuity surfaces
Moderately Weathered	Rock mass weathered but not friable
Highly Weathered	Rock mass weathered and partly friable
Completely Weathered	Wholly decomposed but texture and structure preserved
Residual Soil	Original rock texture and structure destroyed

### CORE RECOVERY

TERM	DESCRIPTION
Total Core Recovery	Total recovery expressed as a percentage of run length
Solid Recovery	Solid recovery expressed as a percentage of run length
Rock Quality Designation (RQD)	Sum of lengths of solid core more than 100 mm long expressed as a percentage of run length
Fracture Index (FI)	Number of breaks per metre of solid core (FI's in excess of 30 denoted as 30+)

### ROCK QUALITY

TERM	RQD
Very Poor Quality	0 to 25
Poor Quality	25 to 50
Fair Quality	50 to 75
Good Quality	75 to 90
Excellent Quality	90 to 100

## SYSTEM INTERNATIONAL UNITS

QUANTITY	NAME	SYMBOL	EXPRESSED IN TERMS OF OTHER SI UNITS	EXPRESSED IN TERMS OF BASE AND SUPPLEMENTARY UNITS
<b>SI UNITS</b>				
length	metre	m		
mass	kilogram	kg		
time	second	s		
electric current	ampere	A		
thermodynamic temperature	kelvin	K		
amount of substance	mole	mol		
luminous intensity	candela	cd		
<b>SI SUPPLEMENTARY UNITS</b>				
plane angle	radian	rad		
solid angle	steradian	sr		
<b>EXAMPLES OF SI DERIVED UNITS WITH SPECIAL NAMES</b>				
frequency	hertz	Hz	1/s	s <sup>-1</sup>
force	newton	N	m · kg/s <sup>2</sup>	m · kg · s <sup>-2</sup>
pressure, stress	pascal	Pa	N/m <sup>2</sup>	m <sup>-1</sup> · kg · s <sup>-2</sup>
energy, work, quantity of heat	joule	J	N · m	m <sup>2</sup> · kg · s <sup>-2</sup>
power, radiant flux	watt	W	J/s	m <sup>2</sup> · kg · s <sup>-3</sup>
<b>EXAMPLES OF SI DERIVED UNITS WITHOUT SPECIAL NAMES</b>				
velocity	linear - angular	metre per second (radian per second)	m/s rad/s	m · s <sup>-1</sup> rad · s <sup>-1</sup>
acceleration	- linear - angular	(metre per second) per second (radian per second) per second	m/s <sup>2</sup> rad/s <sup>2</sup>	m · s <sup>-2</sup> rad · s <sup>-2</sup>
concentration (of amount of substance)		mole per cubic metre	mol/m <sup>3</sup>	mol · m <sup>-3</sup>
dynamic viscosity		pascal second	Pa · s	m <sup>-1</sup> · kg · s <sup>-1</sup>
moment of force		newton metre	N · m	m <sup>2</sup> · kg · s <sup>-2</sup>
surface tension		newton per metre	N/m	kg · s <sup>-2</sup>
heat flux density, irradiance		watt per square metre	W/m <sup>2</sup>	kg · s <sup>-3</sup>
heat capacity, entropy		joule per kelvin	J/K	m <sup>2</sup> · s <sup>-2</sup> · K <sup>-1</sup>
specific heat capacity, specific entropy		joule per kilogram kelvin	J/(kg · K)	m <sup>2</sup> · s <sup>-2</sup> · K <sup>-1</sup>
specific energy		joule per kilogram	J/kg	m <sup>2</sup> · s <sup>-2</sup>
thermal conductivity		watt per metre kelvin	W/(m · K)	m · kg · s <sup>-3</sup> · K <sup>-1</sup>

## OTHER UNITS PERMITTED FOR USE WITH SI

QUANTITY	NAME	SYMBOL	DEFINITION
time	minute	min	1 min = 60 s
	hour	h	1 h = 3,600 s
	day	d	1 d = 86,400 s
	year	a	
plane angle	degree	°	1° = (π/180) rad
	minute	'	1' = (π/10,800) rad
	second	"	1" = (π/648,000) rad
area	hectare	ha	1 ha = 10,000 m <sup>2</sup>
volume	litre	L	1,000 L = 1 m <sup>3</sup>
temperature	degree Celsius	°C	0° C = 273.15 K temperature interval 1°C = 1 K
mass	tonne	t	1 t = 1,000 kg = 1 Mg

MULTIPLYING FACTOR	PREFIX	SYMBOL	MULTIPLYING FACTOR	PREFIX	SYMBOL
1,000,000,000,000,000,000 · 10 <sup>18</sup>	exa	E	0.1 · 10 <sup>-1</sup>	deca*	d
1,000,000,000,000,000 · 10 <sup>15</sup>	peta	P	0.01 · 10 <sup>-2</sup>	centi*	c
1,000,000,000,000 · 10 <sup>12</sup>	tetra	T	0.001 · 10 <sup>-3</sup>	milli	m
1,000,000,000 · 10 <sup>9</sup>	giga	G	0.000,001 · 10 <sup>-6</sup>	micro	μ
1,000,000 · 10 <sup>6</sup>	mega	M	0.000,000,001 · 10 <sup>-9</sup>	nano	n
1,000 · 10 <sup>3</sup>	kilo	k	0.000,000,000,001 · 10 <sup>-12</sup>	pico	p
100 · 10 <sup>2</sup>	hecto*	h	0.000,000,000,000,001 · 10 <sup>-15</sup>	femto	f
10 · 10 <sup>1</sup>	deca*	da	0.000,000,000,000,000,001 · 10 <sup>-18</sup>	atto	a

\* to be avoided where possible

## SYSTEM INTERNATIONAL CONVERSIONS

<b>AREA</b>		
1 km <sup>2</sup>	= 3.961 x 10 <sup>1</sup> mi <sup>2</sup>	1 km <sup>2</sup> = 100 hectares
1 km <sup>2</sup>	= 2.471 x 10 <sup>2</sup> acre	
1 m <sup>2</sup>	= 1.196 yd <sup>2</sup>	
1 m <sup>2</sup>	= 1.076 x 10 <sup>-1</sup> ft <sup>2</sup>	
1 mm <sup>2</sup>	= 1.550 x 10 <sup>-3</sup> in <sup>2</sup>	see note 1
<b>DENSITY</b>		
1 Mg/m <sup>3</sup>	= 6.243 x 10 <sup>-1</sup> lb <sub>m</sub> /ft <sup>3</sup>	see note 2
1 kg/m <sup>3</sup>	= 6.243 x 10 <sup>-2</sup> lb <sub>m</sub> /ft <sup>3</sup>	
<b>FORCE</b>		
1 N	= 2.248 x 10 <sup>-1</sup> lb <sub>f</sub>	
<b>HEAT ENERGY (E)</b>		
1 kJ	= 9.478 x 10 <sup>-1</sup> BTU (IST)	1 BTU = 252 cal
1 J	= 2.388 x 10 <sup>-1</sup> cal (IST)	
<b>HEAT FLUX (Q)</b>		
1 W/m <sup>2</sup>	= 3.170 x 10 <sup>-1</sup> BTU/(ft <sup>2</sup> · hr)	
<b>SPECIFIC HEAT CAPACITY (c)</b>		
1 kJ/(kg · °C)	= 2.388 x 10 <sup>-1</sup> BTU/(lb <sub>m</sub> · °F)	
<b>THERMAL CONDUCTIVITY (k)</b>		
W/(m · °C)	= 5.778 x 10 <sup>-1</sup> BTU/(ft · hr · °F)	
<b>COEFFICIENT OF HEAT TRANSFER (c<sub>f</sub>)</b>		
1 W/(m <sup>2</sup> · °C)	= 1.761 x 10 <sup>-1</sup> BTU/(ft <sup>2</sup> · hr · °F)	see note 3
<b>LENGTH</b>		
1 km	= 6.214 x 10 <sup>-1</sup> mi (statute)	
1 m	= 1.094 yd	
1 m	= 3.281 ft	
1 mm	= 3.937 x 10 <sup>-2</sup> in	
<b>MASS</b>		
1 Mg	= 1.102 T	1 T = 2000 lb <sub>m</sub>
1 Mg	= 2.205 x 10 <sup>3</sup> lb <sub>m</sub>	Mg is equivalent to tonne
1 kg	= 2.205 lb <sub>m</sub>	
<b>POWER</b>		
1 W	= 1.341 x 10 <sup>-3</sup> HP	1 HP = 550 ft · lb <sub>f</sub> /s

<b>PRESSURE, STRESS or ELASTIC MODULI</b>		
1 MPa	= 1.044 x 10 <sup>-1</sup> T <sub>r</sub> /ft <sup>2</sup> [TSF]	see note 4
1 kPa	= 1.044 x 10 <sup>-2</sup> T <sub>r</sub> /ft <sup>2</sup> [TSF]	
1 kPa	= 1.450 x 10 <sup>-1</sup> lb <sub>f</sub> /in <sup>2</sup> [PSI]	
1 kPa	= 3.346 x 10 <sup>-1</sup> ft of water	hydrostatic pressure of water at 1 ft. depth
1 Pa	= 2.089 x 10 <sup>-2</sup> lb <sub>f</sub> /ft <sup>2</sup> [PSF]	
<b>TEMPERATURE</b>		
°C	= (°F - 32)/1.8	0°C = 273.15° K
°C	= 1.8 °F	1°C = 1 K
<b>TIME</b>		
1 Ms	= 3.171 x 10 <sup>7</sup> yr	for one year equal to 365 days
1 ks	= 1.157 x 10 <sup>2</sup> day	
1 s	= 3.171 x 10 <sup>-8</sup> yr	
<b>VISCOSITY</b>		
<b>DYNAMIC (μ)</b>		
1 Pa · s	= 1.000 x 10 <sup>-3</sup> centipoise	
<b>KINEMATIC (ν)</b>		
1 mm <sup>2</sup> /s	= 1.000 centistoke	
<b>VOLUME</b>		
1 m <sup>3</sup>	= 8.107 x 10 <sup>-4</sup> acre · ft	
1 m <sup>3</sup>	= 1.358 yd <sup>3</sup>	
1 m <sup>3</sup>	= 3.531 x 10 <sup>-1</sup> ft <sup>3</sup>	
1 m <sup>3</sup>	= 2.200 x 10 <sup>2</sup> gal (Imperial)	1 m <sup>3</sup> = 1000 L
1 cm <sup>3</sup>	= 3.520 x 10 <sup>-2</sup> fl oz	see note 1
1 cm <sup>3</sup>	= 6.102 x 10 <sup>-2</sup> in <sup>3</sup>	
<b>VOLUME RATE OF FLOW</b>		
1 m <sup>3</sup> /s	= 1.901 x 10 <sup>-1</sup> mgpd (Imperial)	
1 m <sup>3</sup> /s	= 3.531 x 10 <sup>-1</sup> ft <sup>3</sup> /s	
<b>COEFFICIENTS</b>		
<b>VOLUME COMPRESSIBILITY OR SWELLING (m<sub>v</sub> or m<sub>v</sub>)</b>		
1 m <sup>2</sup> /MN	= 9.579 x 10 <sup>-2</sup> ft <sup>2</sup> /T <sub>r</sub>	
<b>CONSOLIDATION OR SWELLING (e<sub>v</sub> or c<sub>v</sub>)</b>		
1 m <sup>2</sup> /yr	= 1.076 x 10 <sup>-1</sup> ft <sup>2</sup> /yr	
1 m <sup>2</sup> /yr	= 2.949 x 10 <sup>-2</sup> ft <sup>2</sup> /day	
1 m <sup>2</sup> /yr	= 3.171 x 10 <sup>-4</sup> cm <sup>2</sup> /s	
<b>HYDRAULIC CONDUCTIVITY (k)</b>		
1 m/s	= 2.835 x 10 <sup>-5</sup> ft/day	see note 5

### NOTES

1. The use of cm<sup>2</sup> and cm<sup>3</sup> for area and volume is permissible.
2. To convert mass density (ρ) to weight per unit volume use:  

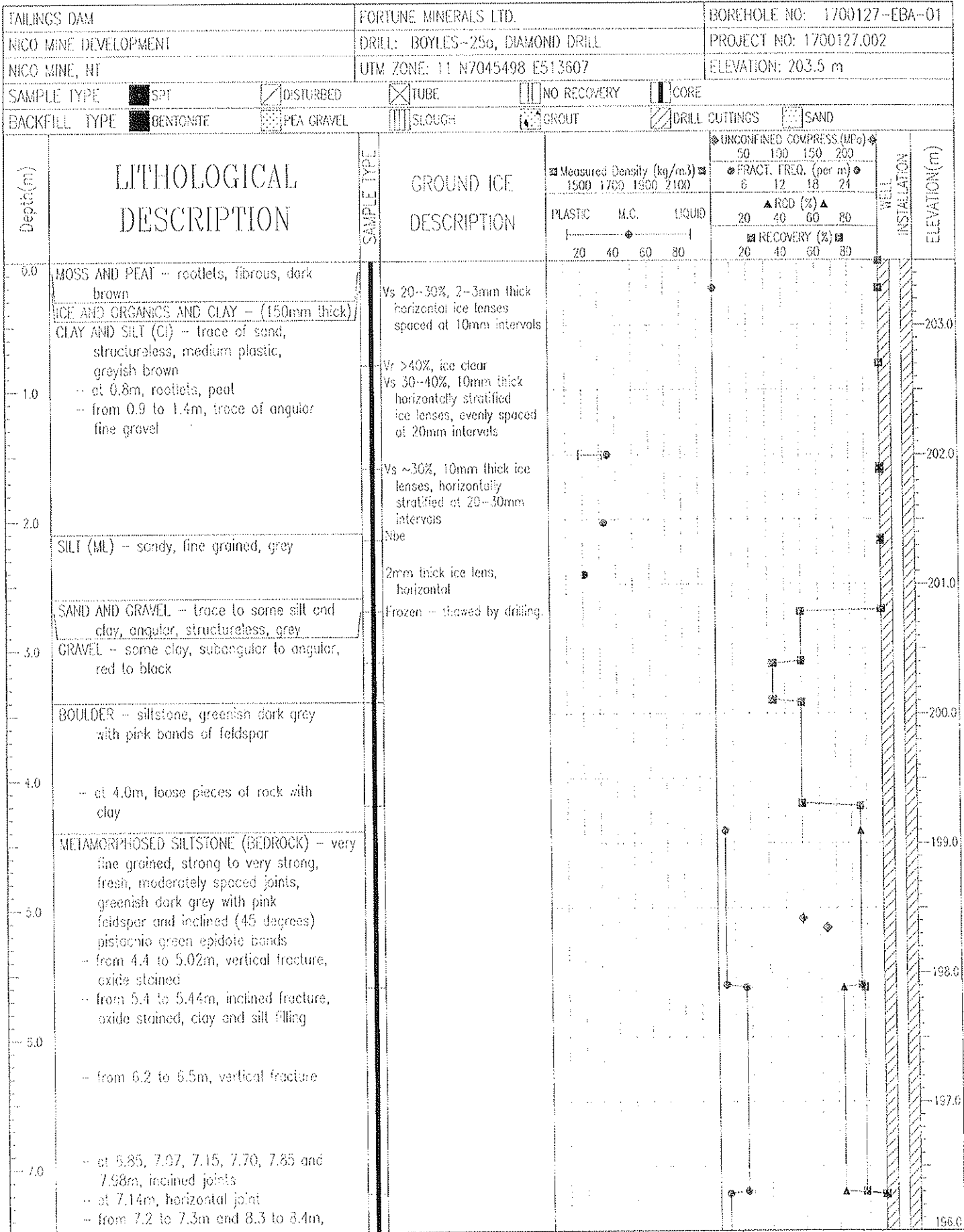
$$\rho \text{ (lb}_m\text{/ft}^3\text{)} = 9.807 \text{ (N/kg)} \cdot \frac{Mg}{m^3} \cdot \frac{m^3}{m^3} = 9.807 \cdot \frac{Mg}{m^3}$$

$$\rho \text{ (lb}_m\text{/ft}^3\text{)} = 6.243 \text{ (kg/m}^3\text{)} \cdot \frac{Mg}{m^3} \cdot \frac{m^3}{m^3} = 6.243 \cdot \frac{Mg}{m^3}$$
3. The inverse of the coefficient of heat transfer (c<sub>f</sub>) is "thermal resistance" or the "R" value.
4. kg/m<sup>2</sup> is not a valid SI stress unit.
5. Hydraulic conductivity is a proportionality coefficient defined in Darcy's Law:  $q = k \frac{dh}{dx}$  where  $q$  = velocity of flow,  $\frac{dh}{dx}$  = hydraulic gradient.
6. All conversion factors have been rounded to four significant figures.

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**APPENDIX B.1**

**TAILINGS RETENTION DAM**  
**BOREHOLES ALONG THE PROPOSED ALIGNMENT**



EBA ENGINEERING CONSULTANTS LTD.  
Edmonton, Alberta

LOGGED BY: VER

REVIEWED BY: VER

Fig. No: 1700127-01

COMPLETION DEPTH: 15.3 m

COMPLETE: 04/59/27

Page 1 of 3

TAILINGS DAM		FORTUNE MINERALS LTD.		BOREHOLE NO: 1700127-EBA-01					
NICO MINE DEVELOPMENT		DRILL: BOYLES-25a, DIAMOND DRILL		PROJECT NO: 1700127.002					
NICO MINE, NT		UTM ZONE: 11 N7045498 E513607		ELEVATION: 203.5 m					
SAMPLE TYPE <input checked="" type="checkbox"/> SPT		<input checked="" type="checkbox"/> DISTURBED		<input checked="" type="checkbox"/> TUBE					
<input checked="" type="checkbox"/> CORE		<input type="checkbox"/> NO RECOVERY		<input type="checkbox"/> CORE					
BACKFILL TYPE <input checked="" type="checkbox"/> BENTONITE		<input type="checkbox"/> PEA GRAVEL		<input type="checkbox"/> SLOUGH					
<input type="checkbox"/> GROUT		<input checked="" type="checkbox"/> DRILL CUTTINGS		<input type="checkbox"/> SAND					
Depth(m)	LITHOLOGICAL DESCRIPTION	SAMPLE TYPE	GROUND ICE DESCRIPTION	Measured Density (kg/m <sup>3</sup> )		UNCONFINED COMPRESS. (MPa)		WELL INSTALLATION	ELEVATION(m)
				1500 1700 1900 2100	6 12 18 24	50 100 150 200			
				PLASTIC	M.C.	LIQUID	ROD (%)		
				20 40 60 80		20 40 60 80	20 40 60 80		
8.0	mechanically fragmented zones METAMORPHOSED SILTSTONE - (continued)								196.0
9.0	- at 8.94, 8.96, 9.12, 9.19, 9.49, 9.50, 9.52, 9.70, 10.06, 10.30, 10.35, 10.48, 10.73 and 10.82m, horizontal joints, infilled with calcite								195.0
10.0	- from 8.4 to 8.62m, mechanically fragmented zone								194.0
	- from 9.66 to 9.76m, inclined joint								193.0
11.0	- at 11.00, 12.00, 12.30, 12.73, 13.53 and 13.93m, horizontal joints								192.0
12.0	- from 11.8 to 12.0m, inclined joint								191.0
13.0	- at 13.1 and 13.3m, two closely spaced inclined joints, calcite filling								190.0
14.0									189.0
15.0									
EBA ENGINEERING CONSULTANTS LTD. Edmonton, Alberta				LOGGED BY: VER REVIEWED BY: VER Fig. No: 1700127-01		COMPLETION DEPTH: 15.3 m COMPLETE: 04/09/27		Page 2 of 3	

TAILINGS DAM	FORTUNE MINERALS LTD.	BOREHOLE NO: 1700127-EBA-01
NICO MINE DEVELOPMENT	DRILL: BOYLES-250, DIAMOND DRILL	PROJECT NO: 1700127.002
NICO MINE, NT	UTM ZONE: 11 N7045498 E513607	ELEVATION: 203.5 m

SAMPLE TYPE	<input checked="" type="checkbox"/> SPT	<input type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> TUBE	<input type="checkbox"/> NO RECOVERY	<input type="checkbox"/> CORE	
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND

Depth(m)	LITHOLOGICAL DESCRIPTION	SAMPLE TYPE	GROUND ICE DESCRIPTION	Measured Density (kg/m <sup>3</sup> )		UNCONFINED COMPRESS. (MPa)		FRACT. FREQ. (per m)		WELL INSTALLATION	ELEVATION(m)
				1500	1700	1500	2100	50	100		
15.0	<p>METAMORPHOSED SILTSTONE - (continued)</p> <p>- at 15.1m, horizontal joint, calcite filling</p> <p>END OF BOREHOLE (15.30 metres)</p> <p>Notes: 50mm PVC pipe (casing for ground temperature cable) was installed; however, ground temperature cable was not installed in the pipe due to an ice plug in the casing at a depth of 8.34m.</p>										188.0
16.0											187.0
17.0											186.0
18.0											185.0
19.0											184.0
20.0											183.0
21.0											182.0
22.0											181.0

<b>EBA ENGINEERING CONSULTANTS LTD.</b> Edmonton, Alberta	LOGGED BY: VER REVIEWED BY: VER Fig. No: 1700127-01	COMPLETION DEPTH: 15.3 m COMPLETE: 04/09/27 Page 3 of 3
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TAILINGS DAM		FORTUNE MINERALS LTD.		BOREHOLE NO: 1700127-EBA-02							
NICO MINE DEVELOPMENT		DRILL: BOYLES-25c, DIAMOND DRILL		PROJECT NO: 1700127.002							
NICO MINE, NT		UTM ZONE: 11 N7045538 E513625		ELEVATION: 204.6 m							
SAMPLE TYPE <input checked="" type="checkbox"/> SPT		<input checked="" type="checkbox"/> DISTURBED		<input checked="" type="checkbox"/> TUBE							
<input checked="" type="checkbox"/> NO RECOVERY		<input checked="" type="checkbox"/> CORE									
BACKFILL TYPE <input checked="" type="checkbox"/> BENTONITE		<input checked="" type="checkbox"/> PEA GRAVEL		<input checked="" type="checkbox"/> SLOUGH							
<input checked="" type="checkbox"/> GROUT		<input checked="" type="checkbox"/> DRILL CUTTINGS		<input checked="" type="checkbox"/> SAND							
Depth(m)	LITHOLOGICAL DESCRIPTION	SAMPLE TYPE	GROUND ICE DESCRIPTION	Measured Density (kg/m <sup>3</sup> )		UNCONFINED COMPRESS. (MPa)	FRACT. FREQ. (per m)	ROD (%)	RECOVERY (%)	BACKFILL DETAILS	ELEVATION(m)
				1500 1700 1900 2100	50 100 150 200						
0.0	BOULDER - siltstone, greenish block with pink feldspar veins										204.0
1.0											
2.0	CLAY AND SILT (CL) - low plastic, greyish brown		Vr 20-30%, 1-2mm thick ice lenses, randomly oriented								203.0
2.5	SILT (ML) - trace of sand and clay, sand: very fine grained, structureless, non plastic, greyish brown		Vr <5%								
3.0	SAND (SM) - some silt, fine grained, structureless, compact, reddish brown		Frozen - thawed by drilling.								
3.5	- from 2.7 to 2.95m, poor recovery										
3.5	- at 2.95m, rhyolite cobble										
3.5	COBBLES, GRAVEL AND BOULDERS - matrix washed away during drilling										
4.0											
5.0	METAMORPHOSED SILTSTONE (BEDROCK) - very fine grained, very strong, moderately to closely spaced, greenish dark grey with pink feldspar and pistachio green epidote bands										
5.5	- at 4.42m, horizontal joint, calcite filling										
6.0	- at 4.59, 4.68, 4.82, 4.88 and 5.7m, inclined joints, calcite filling and slightly oxidized										
6.5	- at 6.0, 6.16 and 6.6m, horizontal joints, infilled with calcite										
7.0	- at 7.02, 7.08 and 7.18m, inclined joints, clay and calcite filling										
7.3	END OF BOREHOLE (7.30 metres)										
EBA ENGINEERING CONSULTANTS LTD.				LOGGED BY: VER		COMPLETION DEPTH: 7.3 m					
Edmonton, Alberta				REVIEWED BY: VER		COMPLETE: 04/09/30					
				Fig. No: 1700127-02				Page 1 of 1			

TAILINGS DAM		FORTUNE MINERALS LTD.		BOREHOLE NO: 1700127-EBA-03	
NICO MINE DEVELOPMENT		DRILL: BOYLES-250, DIAMOND DRILL		PROJECT NO: 1700127.002	
NICO MINE, NT		UTM ZONE: 11 N7045608 E513634		ELEVATION: 213 m	
SAMPLE TYPE		DISTURBED		NO RECOVERY	
BACKFILL TYPE		PEA GRAVEL		DRILL CUTTINGS	
SPT		TUBE		CORE	
BENTONITE		SLOUGH		GROUT	
SAND					

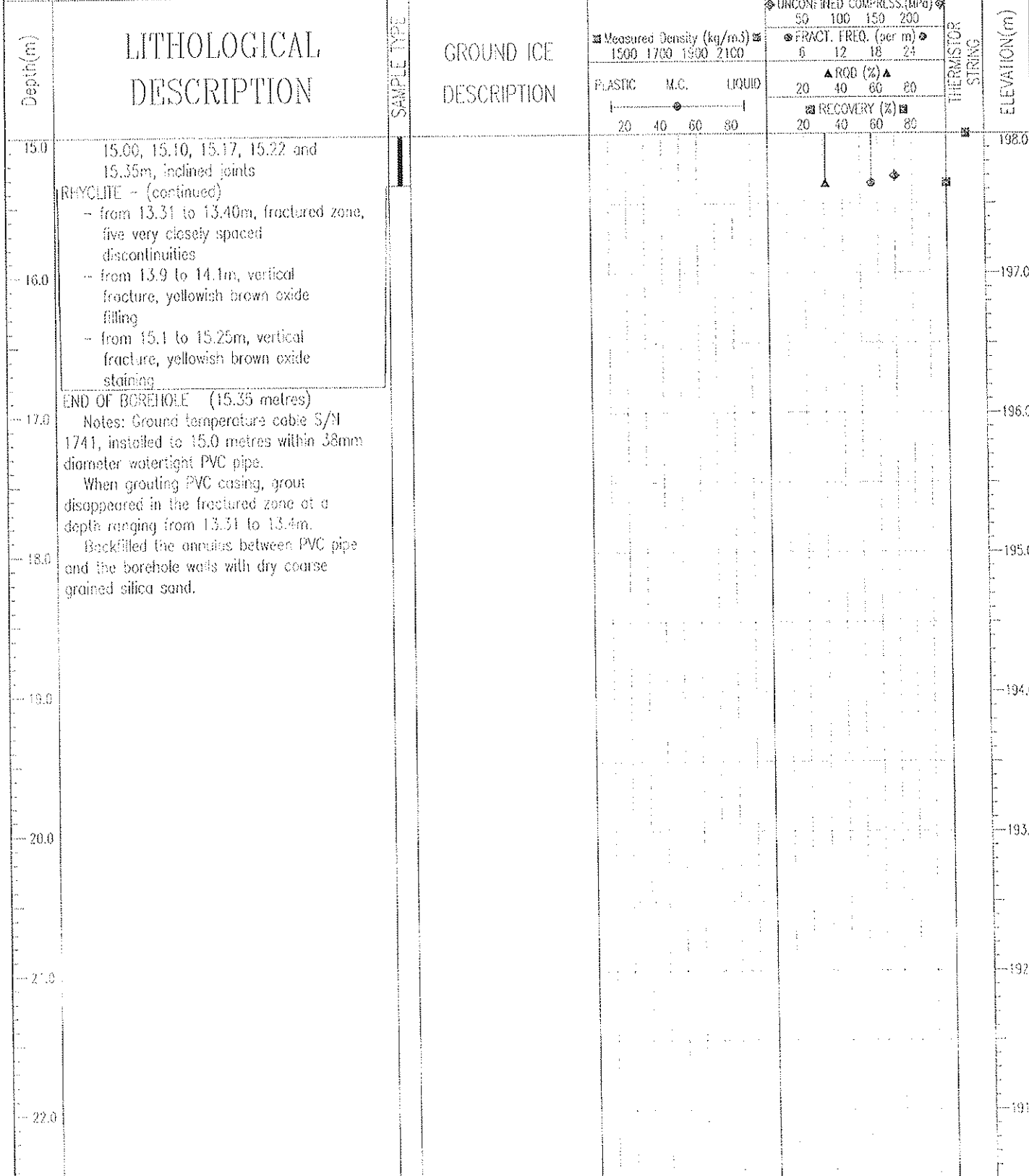
Depth (m)	LITHOLOGICAL DESCRIPTION	SAMPLE TYPE	GROUND ICE DESCRIPTION	Measured Density (kg/m <sup>3</sup> )		UNCONFINED COMPRESS. (MPa)		FRACT. FREQ. (per m)		ROD (%)		THERMISTOR STRING	ELEVATION (m)
				1500	1700	1900	2100	50	100	150	200		
0.0	MOSS AND LICHEN - (20mm thick) BOULDERS, COBBLES AND GRAVEL - (300mm thick) METAMORPHOSED SILTSTONE (BEDROCK) - very fine grained, medium strong to extremely strong, fresh, moderately to closely spaced discontinuities, greenish dark grey with pink feldspar and pistachio green epidote bands - at 0.35, 0.48, 0.64, 0.93 and 1.0m, horizontal joints, oxide stained, calcite filling - at 0.68m, inclined joint, oxide stained - from 0.68 to 1.08m, vertical fracture, infilled with calcite - at 1.08, 1.13, 1.18 and 1.23m, inclined joints, oxide stained - at 1.26m, horizontal joint, oxide stained - at 1.3m, horizontal joint, pink filling - at 1.53, 1.7, 2.24 and 2.26m, inclined joints, pink and oxide stained - at 2.75, 2.86, 3.22 and 3.69m, inclined joints, oxide staining infilled with calcite - at 4.17m, horizontal joint infilled with calcite - at 4.32m, inclined joint infilled with calcite - at 4.42 and 4.45m, horizontal joints infilled with calcite - at 4.52, 4.67, 5.18, 5.88, 5.98, 6.06, 6.15, 6.20, 6.38 and 6.68m, inclined joints - at 5.33, 5.38, 5.65, 5.77, 6.80, 6.94, 7.13 and 7.25m, horizontal joints, white calcite filling and reddish brown oxide staining - from 7.2 to 7.5m, vertical fractures, reddish brown oxide staining											213.0	
1.0													212.0
2.0													211.0
3.0													210.0
4.0													209.0
5.0													208.0
6.0													207.0
7.0													206.0

EBA ENGINEERING CONSULTANTS LTD. Edmonton, Alberta		LOGGED BY: VER	COMPLETION DEPTH: 15.25 m
		REVIEWED BY: VER	COMPLETE: 04/10/91
		Fig. No: 1700127-03	Page 1 of 3

TAILINGS DAM		FORTUNE MINERALS LTD.		BOREHOLE NO: 1700127-EBA-03					
NICO MINE DEVELOPMENT		DRILL: BOYLES-25a, DIAMOND DRILL		PROJECT NO: 1700127.002					
NICO MINE, NT		UTM ZONE: 11 N7045608 E513634		ELEVATION: 213 m					
SAMPLE TYPE <input checked="" type="checkbox"/> SPT <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> TUBE <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE									
BACKFILL TYPE <input checked="" type="checkbox"/> BENTONITE <input type="checkbox"/> PEA GRAVEL <input type="checkbox"/> SLOUGH <input type="checkbox"/> GRGUT <input checked="" type="checkbox"/> DRILL CUTTINGS <input type="checkbox"/> SAND									
Depth(m)	LITHOLOGICAL DESCRIPTION	SAMPLE TYPE	GROUND ICE DESCRIPTION	UNCONFINED COMPRESS.(MPa)				THERMISTOR STRING	ELEVATION(m)
				Measured Density (kg/m <sup>3</sup> )	FRACT. FREQ. (per m)		RECOVERY (%)		
				1500 1700 1900 2100	5 12 18 24	20 40 60 80			
				PLASTIC M.C. LIQUID					
				20 40 60 80	20 40 60 80				
8.0	METAMORPHOSED SILTSTONE - (continued) - from 7.5 to 10.6m, no visible feldspar bands - from 7.5 to 8.26m, vertical fracture, reddish brown oxide staining - at 8.3m, 9.37, 9.40, 9.60, 9.75, 10.19 and 10.45m, horizontal joints							205.0	
9.0								204.0	
10.0	- from 10.03 to 10.14m, very closely spaced inclined joints							203.0	
11.0	- at 10.73m, 700mm thick pink feldspar band							202.0	
12.0	- at 11.48, 11.95, 12.08, 12.37 and 12.61m, inclined joints, white calcite and reddish brown oxide fillings - from 11.93 to 12.28m, vertical quartz vein - at 12.5m, horizontal joint							201.0	
13.0	RHYOLITE (INTRUSION) - partly glassy texture, fresh, medium strong to very strong, conchoidal fracture, closely spaced discontinuities with black and yellowish brown staining, burgundy pink with scattered greenish black tiny grains of biotite							200.0	
14.0	- at 13.00, 13.13, 13.24, 13.46, 13.61, 13.64, 13.80, 13.84, 13.92, 14.10, 14.18 and 14.38m, horizontal joints - at 12.74, 12.81, 13.07, 13.19, 13.50, 13.55, 13.71, 13.89, 13.96, 13.98, 14.04, 14.06, 14.25, 14.27, 14.51, 14.66, 14.73, 14.79, 14.83, 14.92,							199.0	
15.0								198.0	
EBA ENGINEERING CONSULTANTS LTD. Edmonton, Alberta				LOGGED BY: VER REVIEWED BY: VER Fig. No: 1700127-03		COMPLETION DEPTH: 15.25 m COMPLETE: 04/10/01 Page 2 of 3			

TAILINGS DAM		FORTUNE MINERALS LTD.		BOREHOLE NO: 1700127-EBA-03	
NICO MINE DEVELOPMENT		DRILL: BOYLES-25a, DIAMOND DRILL		PROJECT NO: 1700127.002	
NICO MINE, NT		UTM ZONE: 11 N7045608 E513634		ELEVATION: 213 m	
SAMPLE TYPE	<input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> TUBE	<input type="checkbox"/> NO RECOVERY	<input type="checkbox"/> CORE
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS <input type="checkbox"/> SAND



EBA ENGINEERING CONSULTANTS LTD.  
Edmonton, Alberta

LOGGED BY: VLR  
REVIEWED BY: VLR  
Fig. No: 1700127-03

COMPLETION DEPTH: 15.25 m  
COMPLETE: 04/10/01

TAILING DAM		FORTUNE MINERALS LTD.		BOREHOLE NO: 1700127--EBA-04					
NICO MINE DEVELOPMENT		DRILL: BOYLES--25a, DIAMOND DRILL		PROJECT NO: 1700127.002					
NICO MINE, NT		UTM ZONE: 11 N7045450 E513593		ELEVATION: 203.5 m					
SAMPLE TYPE		DISTURBED		NO RECOVERY					
BACKFILL TYPE		PEA GRAVEL		GROUT					
SPT		TUBE		CORE					
BENTONITE		SLOUGH		DRILL CUTTINGS					
SAND									
Depth(m)	LITHOLOGICAL DESCRIPTION	SAMPLE TYPE	GROUND ICE DESCRIPTION	Measured Density (kg/m <sup>3</sup> )		UNCONFINED COMPRESS. (MPa)		BACKFILL DETAILS	ELEVATION(m)
				1500 1700 1900 2100	FRACT. FREQ. (per m)	50 100 150 200			
				PLASTIC	M.C.	LIQUID	FRACT. FREQ. (per m)		
				20 40 60 80			6 12 18 24		
							ROD (%)		
							20 40 60 80		
							RECOVERY (%)		
							20 40 60 80		
0.0	PEAT - woody, scattered woody chunks, roots, coarse fibrous, brown - fine to coarse fibrous, dark brown		V <sub>x</sub> <15%						203.0
1.0									
2.0	SILT (OH) - clayey, some sand, organic, structureless, high plastic, dark greyish brown		V <sub>s</sub> 20-30%, 5-10mm thick horizontal ice lenses spaced to 20mm intervals, ice clear						202.0
3.0	- grey		V <sub>s</sub> 10-20%, 2-3mm thick ice lenses, evenly spaced at 10-20mm intervals, ice clear						201.0
4.0	- (ML), some clay, trace of sand, non plastic		V <sub>s</sub> , V <sub>r</sub> 15-20%, 30mm thick horizontal ice lenses, 2-3mm thick subvertical and inclined ice lenses, ice clear to whitish						200.0
5.0	SILT AND SAND (ML) - trace of clay, sand: fine grained, non plastic		At 2.7m, >25m thick subhorizontal ice lens						
6.0	GRAVEL - sandy, clayey, angular, poor recovery		At 2.9m, V <sub>s</sub> , V <sub>r</sub> 10-15%, 5-20mm thick, horizontal, inclined and vertical ice lenses, ice clear						199.0
7.0	BOULDERS, COBBLES AND GRAVEL - matrix washed away during drilling		At 3.5m, 5mm thick inclined and horizontal ice lenses, spaced at 50-60mm intervals						198.0
8.0	- sandy		At 4.05m, V <sub>s</sub> <10%						197.0
			Frozen - thawed by drilling.						196.0

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Edmonton, Alberta

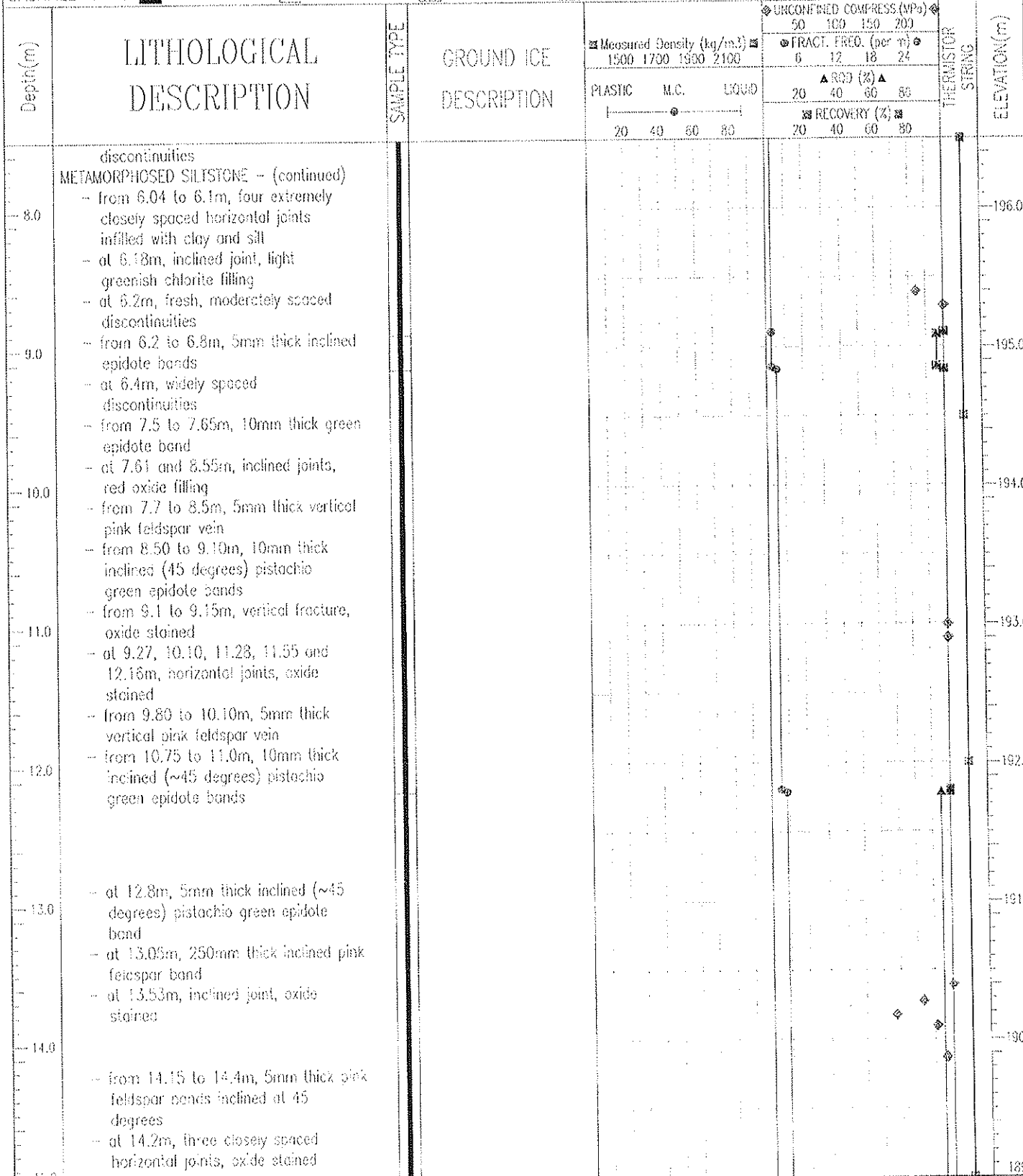
LOGGED BY: VER  
REVIEWED BY: VER  
Fig. No: 1700127-04

COMPLETION DEPTH: 10.8 m  
COMPLETE: 04/10/03





TAILINGS DAM	FORTUNE MINERALS LTD.	BOREHOLE NO: 1700127-EBA-05
NICO MINE DEVELOPMENT	DRILL: BOYLES-250, DIAMOND DRILL	PROJECT NO: 1700127.002
NICO MINE, NT	UTM ZONE: 11 N7045406 E513584	ELEVATION: 204 m
SAMPLE TYPE	<input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> DISTURBED
	<input checked="" type="checkbox"/> TUBE	<input type="checkbox"/> NO RECOVERY
	<input type="checkbox"/> CORE	
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL
	<input type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT
	<input checked="" type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND



EBA ENGINEERING CONSULTANTS LTD.  
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LOGGED BY: VER	COMPLETION DEPTH: 15.3 m
REVIEWED BY: VER	COMPLETE: 04/10/05
Fig. No: 1700127-05	Page 2 of 3

TAILINGS DAM		FORTUNE MINERALS LTD.		BOREHOLE NO: 1700127--EBA--05	
NICO MINE DEVELOPMENT		DRILL: BOYLES--25c, DIAMOND DRILL		PROJECT NO: 1700127.002	
NICO MINE, NT		UTM ZONE: 11 N7045406 E513584		ELEVATION: 204 m	
SAMPLE TYPE <input checked="" type="checkbox"/> SPT		<input checked="" type="checkbox"/> DISTURBED		<input checked="" type="checkbox"/> TUBE	
<input checked="" type="checkbox"/> NO RECOVERY		<input checked="" type="checkbox"/> CORE			
BACKFILL TYPE <input checked="" type="checkbox"/> BENTONITE		<input checked="" type="checkbox"/> PEA GRAVEL		<input checked="" type="checkbox"/> SLOUGH	
<input checked="" type="checkbox"/> GROUT		<input checked="" type="checkbox"/> DRILL CUTTINGS		<input checked="" type="checkbox"/> SAND	
Depth (m)	LITHOLOGICAL DESCRIPTION	SAMPLE TYPE	GROUND ICE DESCRIPTION	UNCONFINED COMPRESS. (kPa)	
				50 100 150 200	
				Measured Density (kg/m <sup>3</sup> )	
				1500 1700 1900 2100	
				PLASTIC M.C. LIQUID	
				20 40 60 80	
					FRACT. FREQ. (per m)
					5 12 18 24
					RGD (%)
					20 40 60 80
					RECOVERY (%)
					20 40 60 80
					TEMPERATURE STRING
					ELEVATION (m)
15.0	METAMORPHOSED SILTSTONE - (continued) - at 14.45 and 14.54m, horizontal joints, calcite filling - at 14.66 and 14.93m, inclined joints, calcite filling				
16.0	END OF BOREHOLE (15.30 metres) Note: Ground temperature cable S/N 1742, installed to 15.0 metres within 38mm diameter watertight PVC pipe.				
17.0					
18.0					
19.0					
20.0					
21.0					
22.0					
EBA ENGINEERING CONSULTANTS LTD. Edmonton, Alberta			LOGGED BY: VER	REVIEWED BY: VER	COMPLETION DEPTH: 15.3 m
			Fig. No: 1700127-05		COMPLETE: 04/19/05
					Page 3 of 3

FALLINGS DAM		FORTUNE MINERALS LTD.		BOREHOLE NO: 1700127-EBA-06					
NICO MINE DEVELOPMENT		DRILL: BOYLES-25G, DIAMOND DRILL		PROJECT NO: 1700127.002					
NICO MINE, NT		UTM ZONE: 11 N7045319 E513556		ELEVATION: 210 m					
SAMPLE TYPE <input checked="" type="checkbox"/> SPT		<input checked="" type="checkbox"/> DISTURBED		<input checked="" type="checkbox"/> TUBE					
<input checked="" type="checkbox"/> NO RECOVERY		<input checked="" type="checkbox"/> CORE							
BACKFILL TYPE <input checked="" type="checkbox"/> BENTONITE		<input checked="" type="checkbox"/> PEA GRAVEL		<input checked="" type="checkbox"/> SLOUGH					
<input checked="" type="checkbox"/> GROUT		<input checked="" type="checkbox"/> DRILL CUTTINGS		<input checked="" type="checkbox"/> SAND					
Depth (m)	LITHOLOGICAL DESCRIPTION	SAMPLE TYPE	GROUND ICE DESCRIPTION	Measured Density (kg/m <sup>3</sup> )		UNCONFINED COMPRESS. (MPa)		SLOTTED PIEZOMETER	ELEVATION (m)
				1500 1700 1900 2100	50 100 150 200	FRACT. FREQ. (per m)	6 12 18 24		
				PLASTIC	U.C.	LIQUID	20 40 60 80	▲ ROD (%) ▲	20 40 60 80
								RECOVERY (%)	20 40 60 80
0.0	MOSS AND LICHEN - roots, (50mm thick) BOULDERS, COBBLES AND GRAVEL - matrix washed away during drilling								210.0
1.0									209.0
2.0									208.0
3.0									207.6
4.0									206.0
5.0	METAMORPHOSED SILYSTONE (BEDROCK) - very fine grained, highly weathered to fresh, very closely to moderately spaced joints, weak (within highly weathered intervals) to very strong, pinkish and greenish dark grey with numerous inclined (45 degrees) pistachio green epidote and pink feldspar bands								205.0
6.0	- from 4.35 to 4.56m, moderately weathered, 20-30mm thick inclined epidote and feldspar bands								204.0
7.0	- at 4.43 and 4.49m, inclined joints with green crust-like chlorite filling								203.0
	- from 4.58 to 4.72m, highly weathered								
	- from 4.72 to 4.9m, moderately weathered								
	- at 4.73, 4.78 and 4.89m, inclined joints with yellow limonite and red oxide fillings (4.73 and 4.78m) and								
EBA ENGINEERING CONSULTANTS LTD. Edmonton, Alberta				LOGGED BY: VER REVIEWED BY: VER Fig. No: 1700127-06		COMPLETION DEPTH: 15 m COMPLETE: 0-/13/07		Page 1 of 2	

TAILINGS DAM		FORTUNE MINERALS LTD.		BOREHOLE NO: 1700127-EBA-06			
NICO MINE DEVELOPMENT		DRILL: BOYLES-25a, DIAMOND DRILL		PROJECT NO: 1700127.002			
NICO MINE, NT		UTM ZONE: 11 N7045319 E513556		ELEVATION: 210 m			
SAMPLE TYPE		<input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> TUBE	<input type="checkbox"/> NO RECOVERY	<input type="checkbox"/> CORE	
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND
Depth (m)	LITHOLOGICAL DESCRIPTION	SAMPLE TYPE	GROUND ICE DESCRIPTION	Measured Density (kg/m <sup>3</sup> )		UNCONFINED COMPRESS. (MPa)	
				1500 1700 1900 2100	6 12 18 24	50 100 150 200	
				PLASTIC	M.C.	LIQUID	
				20 40 60 80	20 40 60 80	20 40 60 80	
						FRACT. FREQ. (per m)	
						20 40 60 80	
						RECOVERY (%)	
						20 40 60 80	
8.0	green chlorite filling (4.89m) METAMORPHOSED SILTSTONE -- (continued) -- from 4.9 to 7.5m, slightly weathered, moderately spaced discontinuities -- at 5.03, 5.08, 5.7, 5.82, 6.1, 6.57, 6.61 and 6.79m, inclined joints with chlorite, calcite, limonite and oxide fillings -- from 5.13 to 5.7m, fragmented zone, numerous closely spaced discontinuities -- from 6.0 to 7.5m, vertical fracture, oxide staining and chlorite filling -- from 7.68 to 8.17m, inclined joint, oxide, calcite and chlorite fillings -- at 7.81, 7.92, 9.12, 9.2, 9.3, 9.49 and 9.53m, horizontal joints, infilled with chlorite and oxide -- at 7.95, 8.23 and 8.43m, inclined joints, infilled with oxide, calcite and chlorite -- from 9.32 to 9.42m, inclined joint, oxide stained -- at 9.55, 10.00, 10.22, 10.47, 11.12 and 11.61m, horizontal joints, oxide, chlorite and calcite fillings -- at 9.82, 9.84, 10.08, 10.16, 10.53, 10.6 to 10.88, 10.91, 11.26, 11.88, 11.9, 12.07, 12.41 to 12.55m, inclined joints infilled with calcite, chlorite and oxide -- from 9.95 to 10.37m, vertical fracture, oxide, calcite and chlorite filling						
9.0							
10.0							
11.0							
12.0							
13.0							
14.0							
15.0	END OF BOREHOLE (15.00 metres)						
				LOGGED BY: VER		COMPLETION DEPTH: 15 m	
				REVIEWED BY: VER		COMPLETE: 04/10/07	
				Fig. No: 1700127-06		Page 2 of 2	

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**APPENDIX B.2**

**PROCESS PLANT FACILITIES  
BOREHOLES AT THE PROPOSED FOOTPRINTS**

PROCESS PLANT		FORTUNE MINERALS LTD.		BOREHOLE NO: 1700127-MC-01				
NICO MINE DEVELOPMENT		DRILL: BOYLES-25a, DIAMOND DRILL		PROJECT NO: 1700127.002				
NICO MINE, NT		UTM ZONE: 11 N7046092 E512436		ELEVATION: 229.5 m				
SAMPLE TYPE	<input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> TUBE	<input type="checkbox"/> NO RECOVERY	<input type="checkbox"/> CORE			
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND		
Depth(m)	LITHOLOGICAL DESCRIPTION	SAMPLE TYPE	GROUND ICE DESCRIPTION	Measured Density (kg/m <sup>3</sup> )		UNCONFINED COMPRESS (MPa)	SLOTTED PIPEFOOTER	ELEVATION(m)
				1500 1700 1900 2100	FRACT. FREQ. (per m)	50 100 150 200		
				PLASTIC	M.C.	LIQUID		
				20 40 60 80				
0.0	QUARTZ AND FELDSPAR PORPHYRY (BEDROCK) - coarse grained, slightly weathered to fresh, very strong, moderately spaced discontinuities, reddish brown (when wet) or gray (when dry), mottled appearance due to occurrence of quartz grains (to 10mm diameter) and inclusions of altered siltstone (greenish black spots on the core wall)							229.0
1.0	- from 0.0 to 0.45m, vertical fracture, oxide stained and infilled with silt and clay							228.0
2.0	- at 0.32, 0.38 and 0.41m, horizontal joints, oxide, silt and clay filling							227.0
3.0	- at 0.51, 0.63, 0.95, 1.03, and 1.16 to 1.28m, inclined joints, oxide, biotite alteration and chlorite filling							226.0
4.0	- at 1.34m, horizontal joint, clay and silt filling							225.0
5.0	- at 1.51, 1.73, 2.15 and 2.39m, horizontal joints, oxide stained							224.0
6.0	- at 1.76, 2.12, 2.34, 2.40 to 2.50, 2.56 to 2.74, 2.80 and 2.84m, inclined joints, biotite alteration, chlorite filling							223.0
7.0	- from 2.84 to 3.1m, fragmented zone, infilled with clay, weathered							222.5
	- at 3.20, 3.43 and 3.60m, inclined joints, biotite alteration, oxide staining, chlorite filling							
	METAMORPHOSED SILTSTONE (BEDROCK) - fresh, strong to very strong, closely to widely spaced discontinuities, greenish black (when wet) and greenish grey (when dry) with inclined and subhorizontal pink feldspar and green epidote bands							
	- at 3.65 to 4.0m, closely spaced discontinuities							
	- at 3.67m, inclined joint, oxide and chlorite filling							
	- at 3.85m, five closely spaced joints, oxide and chlorite filling							
	- at 4.0m, widely spaced discontinuities							
	- at 4.93, 5.90 and 6.52m, inclined joints, chlorite and calcite filling							
	- at 5.75m, inclined (40 degrees) zone of pyrite mineralization associated with 5mm thick feldspar band							
EBA ENGINEERING CONSULTANTS LTD.				LOGGED BY: VER	COMPLETION DEPTH: 10 m			
Edmonton, Alberta				REVIEWED BY: VER	COMPLETE: 04/10/14			
				Fig. No: 1700127-11	Page of 2			

PROCESS PLANT		FORTUNE MINERALS LTD.		BOREHOLE NO: 1700127-MC-01	
NICO MINE DEVELOPMENT		DRILL: BOYLES-25c, DIAMOND DRILL		PROJECT NO: 1700127.002	
NICO MINE, NT		UTM ZONE: 11 N7046092 E512436		ELEVATION: 229.5 m	
SAMPLE TYPE		<input checked="" type="checkbox"/> SPI <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> TUBE <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE			
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE <input type="checkbox"/> PEA GRAVEL <input type="checkbox"/> SLOUGH <input type="checkbox"/> GROUT <input checked="" type="checkbox"/> DRILL CUTTINGS <input type="checkbox"/> SAND			
Depth (m)	LITHOLOGICAL DESCRIPTION	SAMPLE TYPE	GROUND ICE DESCRIPTION	<input checked="" type="checkbox"/> Measured Density (kg/m <sup>3</sup> ) 1500 1700 1900 2100	
				<input type="checkbox"/> UNCONFINED COMPRESS. (MPa) 50 100 150 200	
				<input type="checkbox"/> FRACT. FREQ. (per m) 6 12 18 24	
				<input type="checkbox"/> PLASTIC <input type="checkbox"/> M.C. <input type="checkbox"/> LIQUID 20 40 60 80	
				<input type="checkbox"/> RECOVERY (%) 20 40 60 80	
				<input type="checkbox"/> ROD (%) 20 40 60 80	
				<input type="checkbox"/> SLOTTED PIEZOMETER	
				ELEVATION (m)	
8.0	METAMORPHOSED SLTSTONE - (continued) - at 7.22, 7.36, 8.07, 8.52, 8.58 and 8.95m, inclined joints, chlorite and calcite filling				222.0
9.0	- from 8.76 to 9.13m, vertical fracture, oxide staining and chlorite filling				221.0
10.0	END OF BOREHOLE (10.00 metres) Standpipe piezometer installed to 10.0m				220.0
11.0					219.0
12.0					218.0
13.0					217.0
14.0					216.0
15.0					215.0
EBA ENGINEERING CONSULTANTS LTD. Edmonton, Alberta				LOGGED BY: VER REVIEWED BY: VER Fig. No: 1700127-11	
				COMPLETION DEPTH: 10 m COMPLETE: 04/10/11 Page 2 of 2	

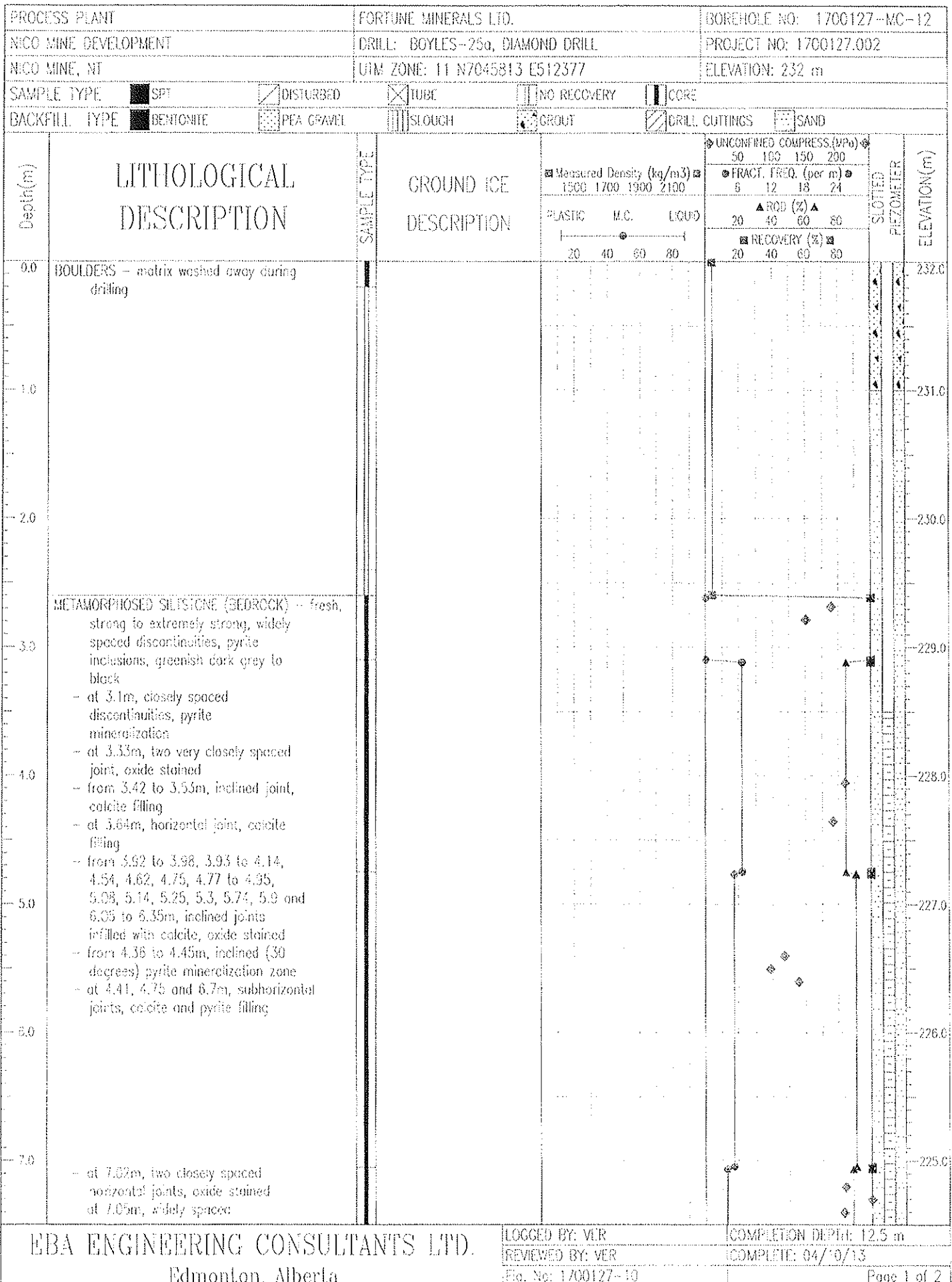
PROCESS PLANT		FORTUNE MINERALS LTD.		BOREHOLE NO: 1700127-MC-05			
NICO MINE DEVELOPMENT		DRILL: BOYLES--250, DIAMOND DRILL		PROJECT NO: 1700127.002			
NICO MINE, N.W.T.		UTM ZONE: 11 N7045872 E512418		ELEVATION: 231 m			
SAMPLE TYPE		<input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> TUBE	<input type="checkbox"/> NO RECOVERY	<input type="checkbox"/> CORE	
BACKFILL TYPE		<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input checked="" type="checkbox"/> DRILL CUTTINGS	<input type="checkbox"/> SAND
Depth (m)	LITHOLOGICAL DESCRIPTION	SAMPLE TYPE	GROUND ICE DESCRIPTION	Measured Density (kg/m <sup>3</sup> )		UNCONFINED COMPRESS. (MPa)	
				1500 1700 1900 2100	PLASTIC	V.C.	LIQUID
						FRACT. FREQ. (per m)	
						6 12 18 24	
						ROD (%)	
						20 40 60 80	
						RECOVERY (%)	
						20 40 60 80	
						BACKFILL DETAILS	
						ELEVATION (m)	
0.0	BOULDERS					231.0	
1.0	<p><b>RHYOLITE (BEDROCK)</b> - faintly weathered, strong to very strong, partly glassy texture, closely spaced discontinuities, greyish pink</p> <ul style="list-style-type: none"> <li>- from 0.84 to 1.0m, subvertical fracture, greenish black staining</li> <li>- at 1.09, horizontal joint, oxide stained</li> <li>- from 1.09 to 1.34m, inclined joint, oxide stained</li> <li>- at 1.32, 1.42, 1.56 and 1.6m, horizontal joints, biotite alteration</li> <li>- from 1.53 to 1.60m, vertical fracture, biotite alteration</li> <li>- at 1.86, 2.07 to 2.27, 2.44 and 2.49m, inclined joints, greenish black and oxide staining, limonite filling</li> </ul>					230.0	
2.0						229.0	
3.0							228.0
4.0							227.0
5.0	<p><b>METAMORPHOSED SILTSTONE (BEDROCK)</b> - faintly weathered, medium strong to very strong, closely spaced discontinuities, greenish dark grey with pink feldspar and pistachio green epidote bands</p> <ul style="list-style-type: none"> <li>- at 2.62, 2.83, 2.87, 3.15, 3.37, 3.53, 3.84, 3.94, 4.0 to 4.2, 4.28 and 4.55m, inclined joints, limonite, calcite and oxide filling</li> <li>- at 3.8m, 20mm thick inclined (45 degrees) quartz band</li> <li>- at 4.65m, widely spaced discontinuities</li> <li>- at 5.12 to 5.23, 5.89 to 6.00 and 6.65 to 6.73m, inclined joints, calcite filling</li> <li>- at 6.78m, horizontal joint, calcite filling</li> <li>- from 6.82 to 6.91m, inclined joint, calcite filling</li> </ul>					226.0	
6.0						225.0	
7.0							224.0

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LOGGED BY: VER  
REVIEWED BY: VER  
Fig. No: 1700127-09

COMPLETION DEPTH: 10 m  
COMPLETE: 04/10/12

PROCESS PLANT		FORTUNE MINERALS LTD.		BOREHOLE NO: 1700127-MC-05				
NICO MINE DEVELOPMENT		DRILL: BOYLES-25a, DIAMOND DRILL		PROJECT NO: 1700127.002				
NICO MINE, N.W.T.		UTM ZONE: 11 N7045872 E512418		ELEVATION: 231 m				
SAMPLE TYPE	<input checked="" type="checkbox"/> SPT	<input type="checkbox"/> DISTURBED	<input checked="" type="checkbox"/> TUBE	<input type="checkbox"/> NO RECOVERY	<input type="checkbox"/> CORE			
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input type="checkbox"/> PEA GRAVEL	<input type="checkbox"/> SLOUGH	<input type="checkbox"/> GROUT	<input type="checkbox"/> DRILL CUTTINGS <input type="checkbox"/> SAND			
Depth(m)	LITHOLOGICAL DESCRIPTION	SAMPLE TYPE	GROUND ICE DESCRIPTION	UNCONFINED COMPRESS. (MPa)				ELEVATION(m)
				Measured Density (kg/m <sup>3</sup> )	FRACT. FREQ. (per m)			
				1500 1700 1900 2100	5 12 18 24			
				PLASTIC M.C. LIQUID	ROD (%)			
				20 40 60 80	20 40 60 80			
8.0	METAMORPHOSED SILTSTONE - (continued)						223.0	
	- from 6.91 to 7.3m, pink feldspar bands							
	- at 7.3m, horizontal joint, hematite occurrence and malachite staining on fracture planes							
	- from 7.3 to 7.75m, pink potassium feldspar band with biotite veins, in-situ brecciated, hematite occurrence and malachite staining on fracture planes							
9.0	- at 7.41, 7.47, 7.56, 7.62 and 7.70m, inclined joints, hematite and malachite staining on fracture planes						222.0	
	- at 7.75m, horizontal joint, hematite and malachite staining on fracture planes							
10.0	- at 7.75m, closely spaced discontinuities						221.0	
	- from 7.75 to 8.66m, subhorizontal and subvertical pink feldspar bands							
11.0	- at 7.84, 7.97, 8.06, 8.11, 9.28 and 9.42m, horizontal joints, calcite filling						220.0	
	- from 8.84 to 8.89, 8.97 to 9.06 and 9.62 to 9.71m, inclined joints, calcite filling							
12.0	END OF BOREHOLE (10.00 metres)						219.0	
13.0							218.0	
14.0							217.0	
15.0							216.0	
EBA ENGINEERING CONSULTANTS LTD.				LOGGED BY: VER		COMPLETION DEPTH: 10 m		
Edmonton, Alberta				REVIEWED BY: VER		COMPLETE: 04/10/12		
				Fig. No: 1700127-09		Page 2 of 2		

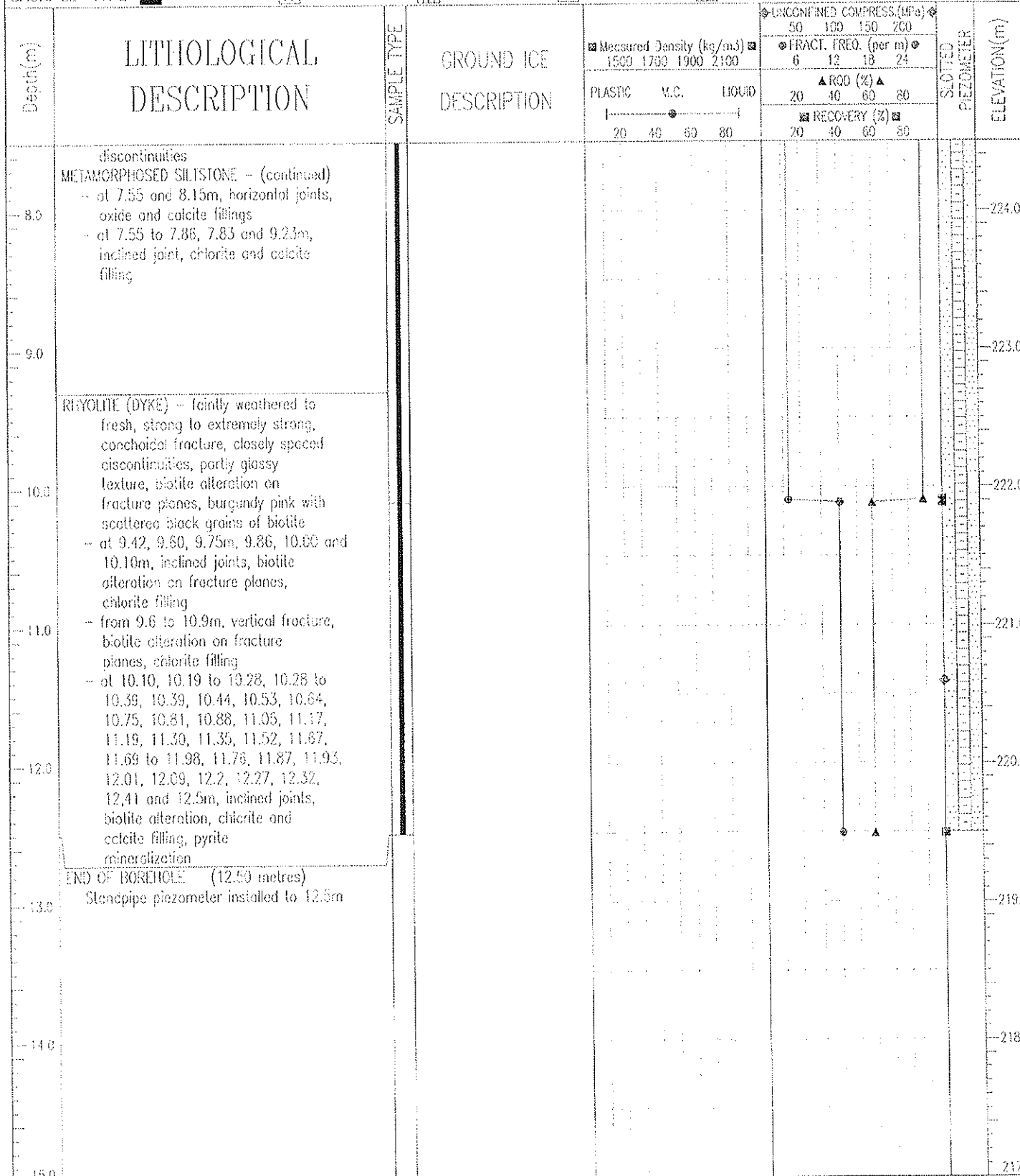


EBA ENGINEERING CONSULTANTS LTD.  
Edmonton, Alberta

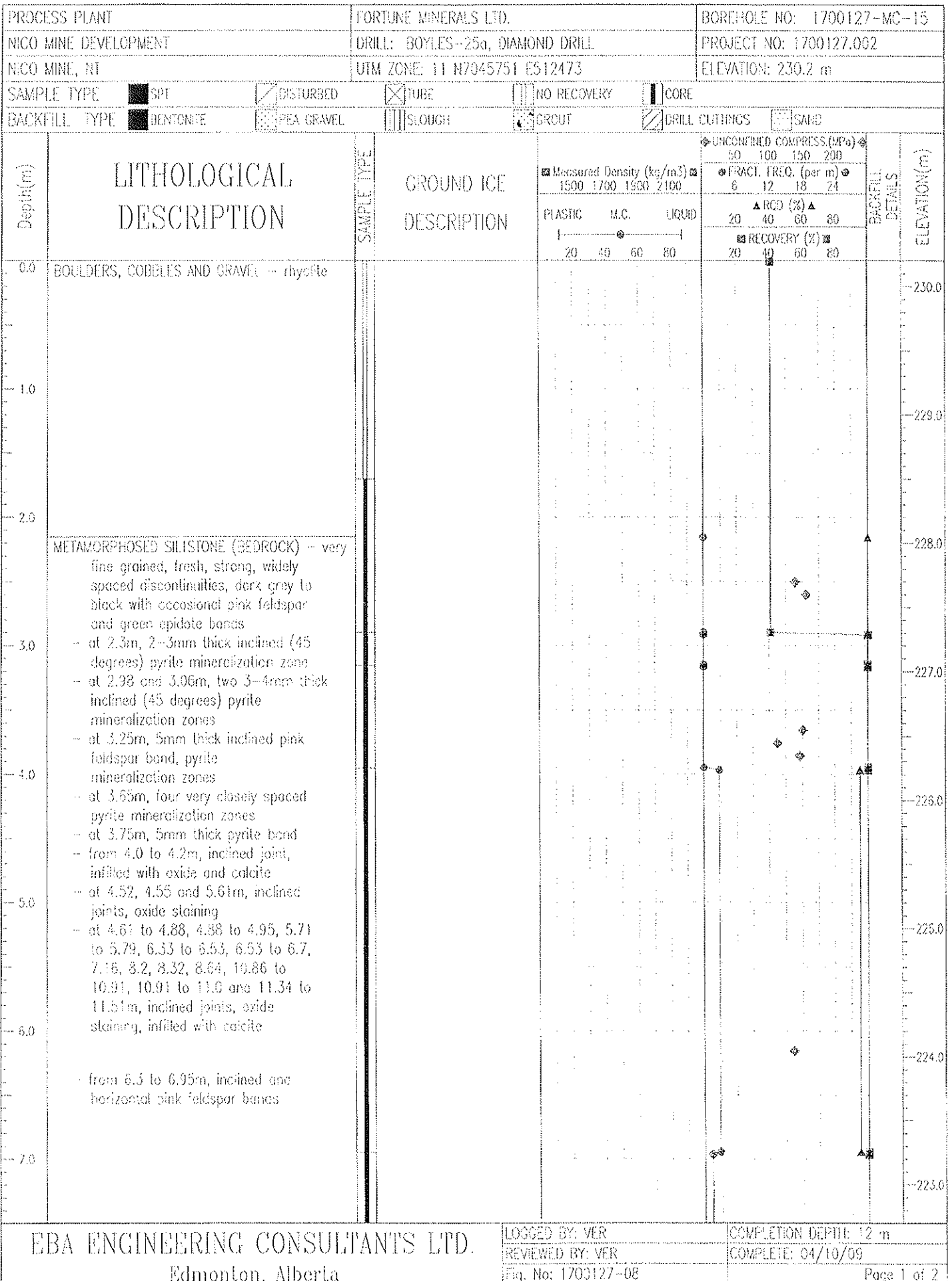
LOGGED BY: VLR  
REVIEWED BY: VLR  
Fig. No: 1700127-10

COMPLETION DEPTH: 12.5 m  
COMPLETE: 04/10/13

PROCESS PLANT	FORTUNE MINERALS LTD.	BOREHOLE NO: 1700127-MC-12
NICO MINE DEVELOPMENT	DRILL: BOYLES-250, DIAMOND DRILL	PROJECT NO: 1700127.002
NICO MINE, NT	UTM ZONE: 11 N7046813 E512377	ELEVATION: 232 m
SAMPLE TYPE	<input checked="" type="checkbox"/> SPT <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> TUBE <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> CCRE	
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE <input type="checkbox"/> PEA GRAVEL <input type="checkbox"/> SLOUGH <input type="checkbox"/> GROUT <input checked="" type="checkbox"/> DRILL CUTTINGS <input type="checkbox"/> SAND	



EBA ENGINEERING CONSULTANTS LTD. Edmonton, Alberta	LOGGED BY: VER	COMPLETION DEPTH: 12.5 m
	REVIEWED BY: VER	COMPLETE: 04/10/13
	Fig. No: 1700127-10	Page 2 of 2

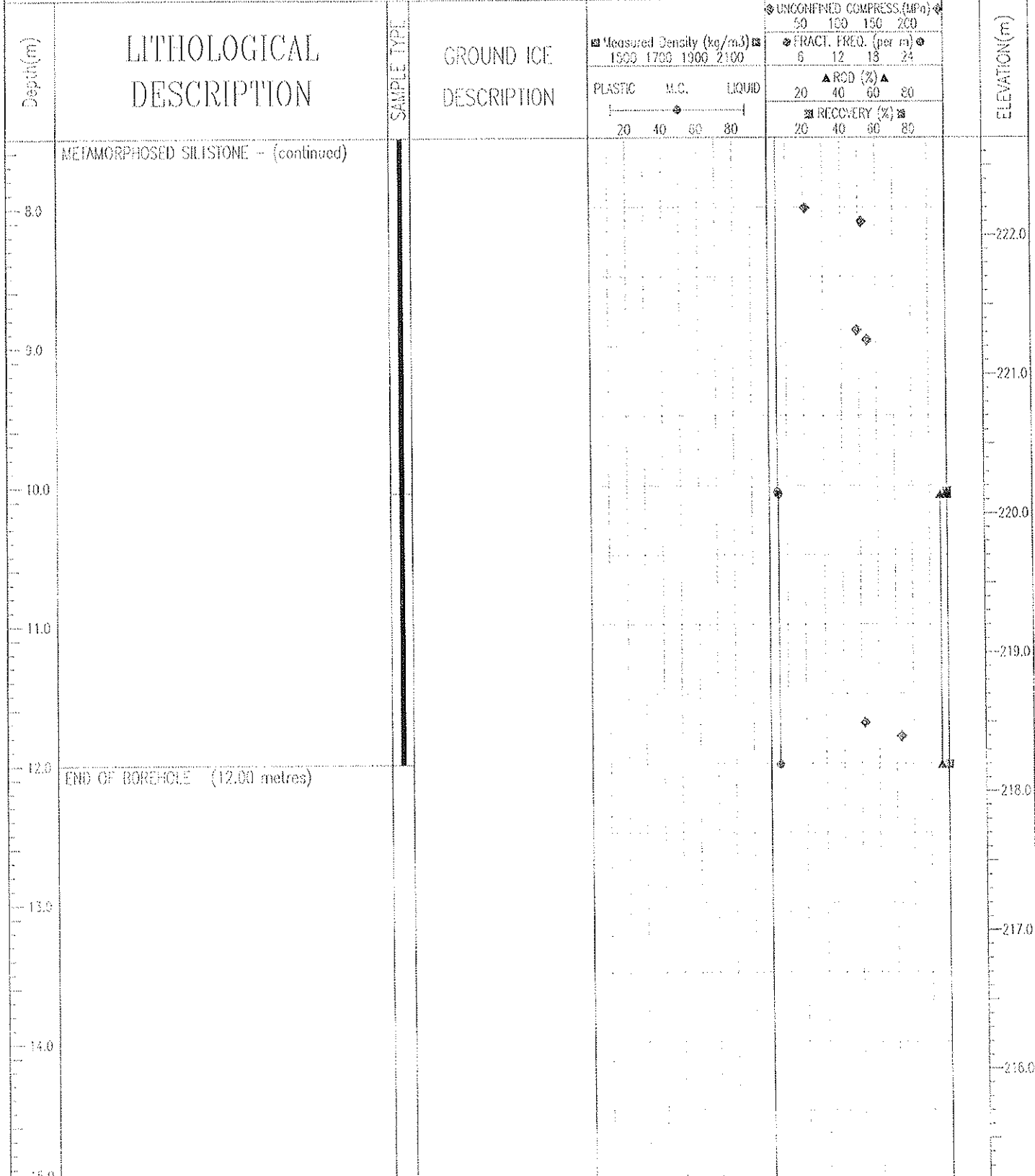


EBA ENGINEERING CONSULTANTS LTD.  
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LOGGED BY: VER  
REVIEWED BY: VER  
Fig. No: 1700127-08

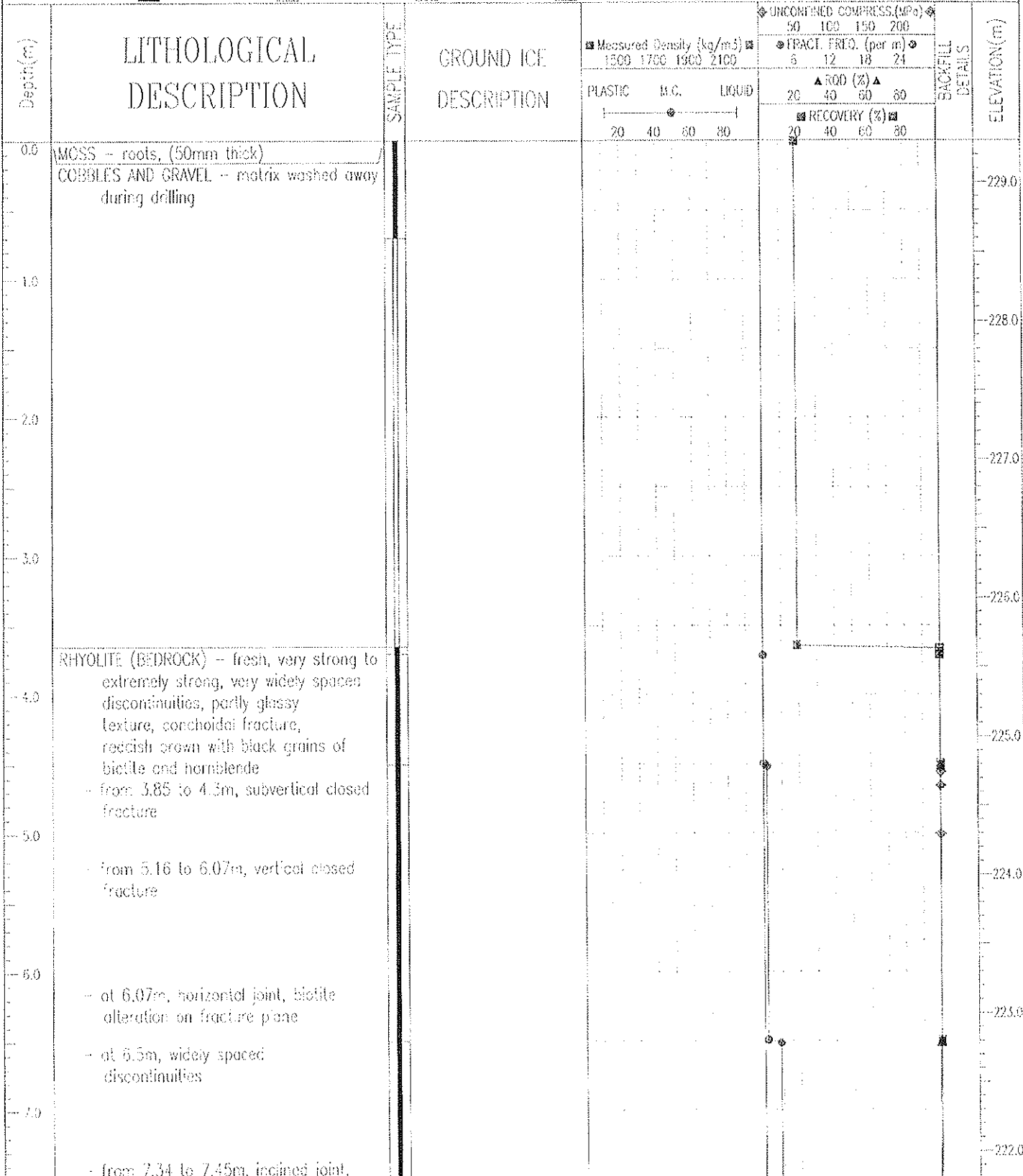
COMPLETION DEPTH: 12 m  
COMPLETE: 04/10/09

PROCESS PLANT	FORTUNE MINERALS LTD.	BOREHOLE NO: 1700127-MC-15
NICO MINE DEVELOPMENT	DRILL: BOYLES-25a, DIAMOND DRILL	PROJECT NO: 1700127.002
NICO MINE, NT	UTM ZONE: 11 N7045751 E512473	ELEVATION: 230.2 m
SAMPLE TYPE	<input checked="" type="checkbox"/> SPI <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> TUBE <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE <input type="checkbox"/> PEA GRAVEL <input type="checkbox"/> SLOUGH <input type="checkbox"/> GROUT <input checked="" type="checkbox"/> DRILL CUTTINGS <input type="checkbox"/> SAND	



EBA ENGINEERING CONSULTANTS LTD. Edmonton, Alberta	LOGGED BY: VER	COMPLETION DEPTH: 12 m
	REVIEWED BY: VER	COMPLETE: 04/16/09
	Fig. No: 1700127-08	Page 2 of 2

PROCESS PLANT	FORTUNE MINERALS LTD.	BOREHOLE NO: 1700127-MC-17
NICO MINE DEVELOPMENT	DRILL: BOYLES-25a, DIAMOND DRILL	PROJECT NO: 1700127.002
NICO MINE, NT	UTM ZONE: 11 N7045712 E512538	ELEVATION: 229.5 m
SAMPLE TYPE	<input checked="" type="checkbox"/> SPT	<input checked="" type="checkbox"/> DISTURBED
	<input checked="" type="checkbox"/> TUBE	<input checked="" type="checkbox"/> NO RECOVERY
	<input checked="" type="checkbox"/> CORE	
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE	<input checked="" type="checkbox"/> PEA GRAVEL
	<input checked="" type="checkbox"/> SLOUGH	<input checked="" type="checkbox"/> GROUT
	<input checked="" type="checkbox"/> DRILL CUTTINGS	<input checked="" type="checkbox"/> SAND

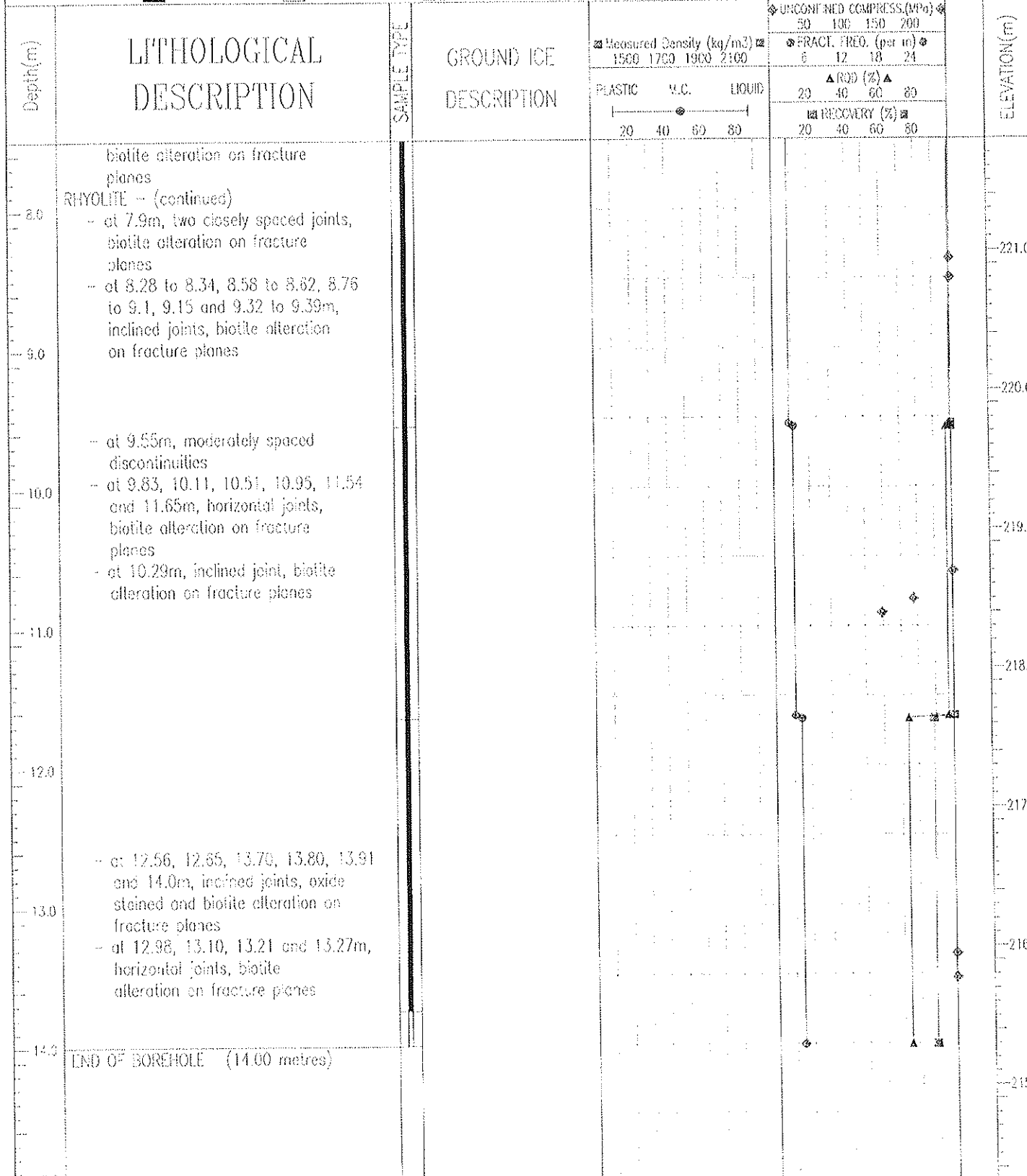


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LOGGED BY: VER  
 REVIEWED BY: VER  
 Fig. No: 1700127-07

COMPLETION DEPTH: 14 m  
 COMPLETE: 04/10/11  
 Page 1 of 2

PROCESS PLANT	FORTUNE MINERALS LTD.	BOREHOLE NO: 1700127-MC-17
NICO MINE DEVELOPMENT	DRILL: BOYLES-25a, DIAMOND DRILL	PROJECT NO: 1700127.002
NICO MINE, NT	UTM ZONE: 11 N7045712 E512538	ELEVATION: 229.3 m
SAMPLE TYPE	<input checked="" type="checkbox"/> SPT <input checked="" type="checkbox"/> DISTURBED <input checked="" type="checkbox"/> TUBE <input type="checkbox"/> NO RECOVERY <input type="checkbox"/> CORE	
BACKFILL TYPE	<input checked="" type="checkbox"/> BENTONITE <input type="checkbox"/> PEA GRAVEL <input type="checkbox"/> SLOUGH <input type="checkbox"/> GROUT <input type="checkbox"/> DRILL CUTTINGS <input type="checkbox"/> SAND	



EBA ENGINEERING CONSULTANTS LTD.  
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LOGGED BY: VLR

REVIEWED BY: VLR

Fig. No: 1700127-07

COMPLETION DEPTH: 14 m

COMPLETE: 04/10/11

Page 2 of 2

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**APPENDIX C**  
**LABORATORY TESTING RESULTS**

Table C.1  
SUMMARY OF LABORATORY SOIL TEST RESULTS  
NICO TAILINGS RETENTION DAM

Borehole	Depth		Moisture Content (% dry weight)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Clay (%)	Silt (%)	Sand (%)	Gravel (%)
	From (m)	To (m)								
EBA-01	0.08	0.35	401.4							
EBA-01	1.40	1.60	35.2	32	18	14	33	61	6	0
EBA-01	1.95	2.10	32.9							
EBA-01	2.25	2.60	21.1				69		31	0
EBA-02	1.62	1.92	20.2	25	16	9	23	49	28	0
EBA-02	2.10	2.30	22.9				5	88	7	0
EBA-02	2.30	2.50	16.9				17		83	0
EBA-04	0.18	0.36	675.0							
EBA-04	1.00	1.26	411.0							
EBA-04	1.45	1.82	87.5	50	35	15	23	65	12	0
EBA-04	2.50	2.70	29.5							
EBA-04	3.25	3.50	32.9				15	81	4	0
EBA-04	3.80	4.00	30.9							
EBA-04	4.20	4.40	29.7				2	58	40	0
EBA-05	0.23	0.35	29.0							
EBA-05	0.42	0.55	70.9							
EBA-05	1.13	1.40	42.1	30	20	10	24	53	23	0
EBA-05	2.30	2.40	46.6				7	78	15	0
EBA-05	2.70	2.82	23.0				30		70	0

SUMMARY OF LABORATORY POINT LOAD STRENGTH TESTING ON INTACT ROCK CORE SAMPLES  
NICO TAILINGS RETENTION DAM AND PROCESS PLANT FACILITIES

Test No.	Borehole	Depth (m)	Rock Type	Sample Dimensions		UCS (MPa)	Rock Strength
				Dia (mm)	Length (mm)		
142	EBA-01	5.08	Metamorphosed Siltstone	63.5	130	124.8	Very Strong
143	EBA-01	5.15	Metamorphosed Siltstone	63.5	130	160.8	Very Strong
139	EBA-01	7.70	Metamorphosed Siltstone	63.5	130	136.8	Very Strong
140	EBA-01	7.80	Metamorphosed Siltstone	63.5	130	98.4	Strong
141	EBA-01	7.86	Metamorphosed Siltstone	63.5	130	141.6	Very Strong
137	EBA-01	10.53	Metamorphosed Siltstone	63.5	130	175.2	Very Strong
138	EBA-01	10.63	Metamorphosed Siltstone	63.5	130	108.0	Very Strong
135	EBA-01	13.20	Metamorphosed Siltstone	63.5	130	170.4	Very Strong
136	EBA-01	13.30	Metamorphosed Siltstone	63.5	130	117.6	Very Strong
132	EBA-01	14.80	Metamorphosed Siltstone	63.5	130	129.6	Very Strong
133	EBA-01	14.90	Metamorphosed Siltstone	63.5	130	110.4	Very Strong
134	EBA-01	15.00	Metamorphosed Siltstone	63.5	130	124.8	Very Strong
61	EBA-02	5.05	Metamorphosed Siltstone	63.5	130	177.6	Very Strong
62	EBA-02	5.15	Metamorphosed Siltstone	63.5	130	182.4	Very Strong
63	EBA-02	6.70	Metamorphosed Siltstone	63.5	130	216.0	Very Strong
64	EBA-02	6.80	Metamorphosed Siltstone	63.5	130	175.2	Very Strong
65	EBA-02	6.90	Metamorphosed Siltstone	63.5	130	182.4	Very Strong
50	EBA-03	1.80	Metamorphosed Siltstone	63.5	130	208.8	Very Strong
51	EBA-03	1.90	Metamorphosed Siltstone	63.5	130	288.0	Extremely Strong
48	EBA-03	3.80	Metamorphosed Siltstone	63.5	130	211.2	Very Strong
49	EBA-03	3.90	Metamorphosed Siltstone	63.5	130	184.8	Very Strong
53	EBA-03	6.45	Metamorphosed Siltstone	63.5	130	208.8	Very Strong
54	EBA-03	6.55	Metamorphosed Siltstone	63.5	130	52.8	Strong
55	EBA-03	9.90	Metamorphosed Siltstone	63.5	130	165.6	Very Strong
56	EBA-03	10.00	Metamorphosed Siltstone	63.5	130	156.0	Very Strong
57	EBA-03	11.50	Metamorphosed Siltstone	63.5	130	187.2	Very Strong
58	EBA-03	11.70	Metamorphosed Siltstone	63.5	130	240.0	Very Strong
59	EBA-03	11.80	Metamorphosed Siltstone	63.5	130	170.4	Very Strong
60	EBA-03	14.57	Rhyolite	63.5	130	45.6	Medium Strong
52	EBA-03	15.30	Rhyolite	63.5	130	175.2	Very Strong
88	EBA-04	8.60	Metamorphosed Siltstone	63.5	130	84.0	Strong
89	EBA-04	8.70	Metamorphosed Siltstone	63.5	130	76.8	Strong
90	EBA-04	8.80	Metamorphosed Siltstone	63.5	130	96.0	Strong
91	EBA-04	8.90	Metamorphosed Siltstone	63.5	130	57.6	Strong
92	EBA-04	9.15	Metamorphosed Siltstone	63.5	130	60.0	Strong
93	EBA-04	9.40	Metamorphosed Siltstone	63.5	130	76.8	Strong
94	EBA-04	9.60	Metamorphosed Siltstone	63.5	130	91.2	Strong
95	EBA-04	9.75	Metamorphosed Siltstone	63.5	130	64.8	Strong
36	EBA-05	6.50	Metamorphosed Siltstone	63.5	130	194.4	Very Strong
37	EBA-05	6.60	Metamorphosed Siltstone	63.5	130	288.0	Extremely Strong
38	EBA-05	6.60	Metamorphosed Siltstone	63.5	130	211.2	Very Strong
39	EBA-05	6.70	Metamorphosed Siltstone	63.5	130	480.0	Extremely Strong
40	EBA-05	11.00	Metamorphosed Siltstone	63.5	130	624.0	Extremely Strong
41	EBA-05	11.10	Metamorphosed Siltstone	63.5	130	456.0	Extremely Strong
42	EBA-05	13.60	Metamorphosed Siltstone	63.5	130	528.0	Extremely Strong
43	EBA-05	13.72	Metamorphosed Siltstone	63.5	130	208.8	Very Strong
44	EBA-05	13.82	Metamorphosed Siltstone	63.5	130	168.0	Very Strong
45	EBA-05	13.90	Metamorphosed Siltstone	63.5	130	228.0	Very Strong
47	EBA-05	14.13	Metamorphosed Siltstone	63.5	130	240.0	Very Strong
24	EBA-06	4.95	Metamorphosed Siltstone	63.5	130	64.8	Strong
25	EBA-06	5.90	Metamorphosed Siltstone	63.5	130	91.2	Strong
26	EBA-06	6.60	Metamorphosed Siltstone	63.5	130	57.6	Strong
27	EBA-06	8.52	Metamorphosed Siltstone	63.5	130	91.2	Strong
28	EBA-06	8.59	Metamorphosed Siltstone	63.5	130	110.4	Very Strong
29	EBA-06	11.40	Metamorphosed Siltstone	63.5	130	43.2	Medium Strong
30	EBA-06	11.48	Metamorphosed Siltstone	63.5	130	84.0	Strong
31	EBA-06	11.58	Metamorphosed Siltstone	63.5	130	64.8	Strong
32	EBA-06	13.08	Metamorphosed Siltstone	63.5	130	175.2	Very Strong
33	EBA-06	13.20	Metamorphosed Siltstone	63.5	130	194.4	Very Strong

**SUMMARY OF LABORATORY POINT LOAD STRENGTH TESTING ON INTACT ROCK CORE SAMPLES  
NICO TAILINGS RETENTION DAM AND PROCESS PLANT FACILITIES**

Test No.	Borehole	Depth (m)	Rock Type	Sample Dimensions		UCS (MPa)	Rock Strength
				Dia (mm)	Length (mm)		
34	EBA-06	13.94	Metamorphosed Siltstone	63.5	130	31.2	Medium Strong
35	EBA-06	14.04	Metamorphosed Siltstone	63.5	130	151.2	Very Strong
108	MC-01	0.70	Quartz and Feldspar Porphyry	63.5	130	194.4	Very Strong
109	MC-01	0.80	Quartz and Feldspar Porphyry	63.5	130	151.2	Very Strong
112	MC-01	1.85	Quartz and Feldspar Porphyry	63.5	130	204.0	Very Strong
114	MC-01	1.92	Metamorphosed Siltstone	63.5	130	146.4	Very Strong
110	MC-01	4.30	Metamorphosed Siltstone	63.5	130	122.4	Very Strong
111	MC-01	4.40	Metamorphosed Siltstone	63.5	130	134.4	Very Strong
117	MC-01	6.72	Metamorphosed Siltstone	63.5	130	151.2	Very Strong
118	MC-01	6.90	Metamorphosed Siltstone	63.5	130	151.2	Very Strong
115	MC-01	9.83	Metamorphosed Siltstone	63.5	130	122.4	Very Strong
116	MC-01	9.93	Metamorphosed Siltstone	63.5	130	122.4	Very Strong
119	MC-05	1.70	Rhyolite	63.5	130	84.0	Strong
120	MC-05	1.78	Rhyolite	63.5	130	184.8	Very Strong
121	MC-05	3.65	Metamorphosed Siltstone	63.5	130	110.4	Very Strong
122	MC-05	3.80	Metamorphosed Siltstone	63.5	130	199.2	Very Strong
123	MC-05	4.83	Metamorphosed Siltstone	63.5	130	211.2	Very Strong
124	MC-05	4.95	Metamorphosed Siltstone	63.5	130	160.8	Very Strong
125	MC-05	5.10	Metamorphosed Siltstone	63.5	130	43.2	Medium Strong
126	MC-05	8.30	Metamorphosed Siltstone	63.5	130	139.2	Very Strong
127	MC-05	8.50	Metamorphosed Siltstone	63.5	130	38.4	Medium Strong
128	MC-05	8.55	Metamorphosed Siltstone	63.5	130	211.2	Very Strong
130	MC-05	8.68	Metamorphosed Siltstone	63.5	130	151.2	Very Strong
131	MC-05	8.85	Metamorphosed Siltstone	63.5	130	148.8	Very Strong
11	MC-12	2.58	Metamorphosed Siltstone	63.5	130	189.6	Very Strong
12	MC-12	2.78	Metamorphosed Siltstone	63.5	130	151.2	Very Strong
13	MC-12	4.05	Metamorphosed Siltstone	63.5	130	211.2	Very Strong
14	MC-12	4.35	Metamorphosed Siltstone	63.5	130	192.0	Very Strong
15	MC-12	5.40	Metamorphosed Siltstone	63.5	130	117.6	Very Strong
16	MC-12	5.50	Metamorphosed Siltstone	63.5	130	96.0	Strong
17	MC-12	5.60	Metamorphosed Siltstone	63.5	130	139.2	Very Strong
20	MC-12	7.20	Metamorphosed Siltstone	63.5	130	211.2	Very Strong
21	MC-12	7.30	Metamorphosed Siltstone	63.5	130	648.0	Extremely Strong
22	MC-12	7.40	Metamorphosed Siltstone	63.5	130	208.8	Very Strong
23	MC-12	11.40	Rhyolite	63.5	130	432.0	Extremely Strong
96	MC-15	2.50	Metamorphosed Siltstone	63.5	130	139.2	Strong
97	MC-15	2.60	Metamorphosed Siltstone	63.5	130	156.0	Strong
98	MC-15	3.65	Metamorphosed Siltstone	63.5	130	151.2	Strong
99	MC-15	3.75	Metamorphosed Siltstone	63.5	130	112.8	Strong
100	MC-15	3.85	Metamorphosed Siltstone	63.5	130	146.4	Strong
101	MC-15	6.15	Metamorphosed Siltstone	63.5	130	136.8	Strong
102	MC-15	8.00	Metamorphosed Siltstone	63.5	130	52.8	Strong
103	MC-15	8.10	Metamorphosed Siltstone	63.5	130	129.6	Strong
104	MC-15	8.88	Metamorphosed Siltstone	63.5	130	122.4	Strong
105	MC-15	8.95	Metamorphosed Siltstone	63.5	130	136.8	Strong
106	MC-15	11.70	Metamorphosed Siltstone	63.5	130	129.6	Strong
107	MC-15	11.80	Metamorphosed Siltstone	63.5	130	182.4	Strong
1	MC-17	4.55	Rhyolite	63.5	130	480.0	Extremely Strong
2	MC-17	4.65	Rhyolite	63.5	130	432.0	Extremely Strong
3	MC-17	5.00	Rhyolite	63.5	130	528.0	Extremely Strong
4	MC-17	8.35	Rhyolite	63.5	130	552.0	Extremely Strong
5	MC-17	8.45	Rhyolite	63.5	130	576.0	Extremely Strong
6	MC-17	10.60	Rhyolite	63.5	130	696.0	Extremely Strong
7	MC-17	10.80	Rhyolite	63.5	130	194.4	Very Strong
8	MC-17	10.90	Rhyolite	63.5	130	148.8	Very Strong
9	MC-17	13.35	Rhyolite	63.5	130	552.0	Extremely Strong
10	MC-17	13.52	Rhyolite	63.5	130	540.0	Extremely Strong





# EBA Engineering Consultants Ltd.

## GRAIN SIZE DISTRIBUTION

Project: NICO Site Geotechnical Evaluation

Project Number: 1700127.002

Client: Fortune Minerals Limited

Attention: Mr. Robin Goad

Date Tested: December 6, 2004

Borehole Number: EBA-02

Depth: 1.62-1.92 m

Sample Number: n/a

Lab Number: 3792-5

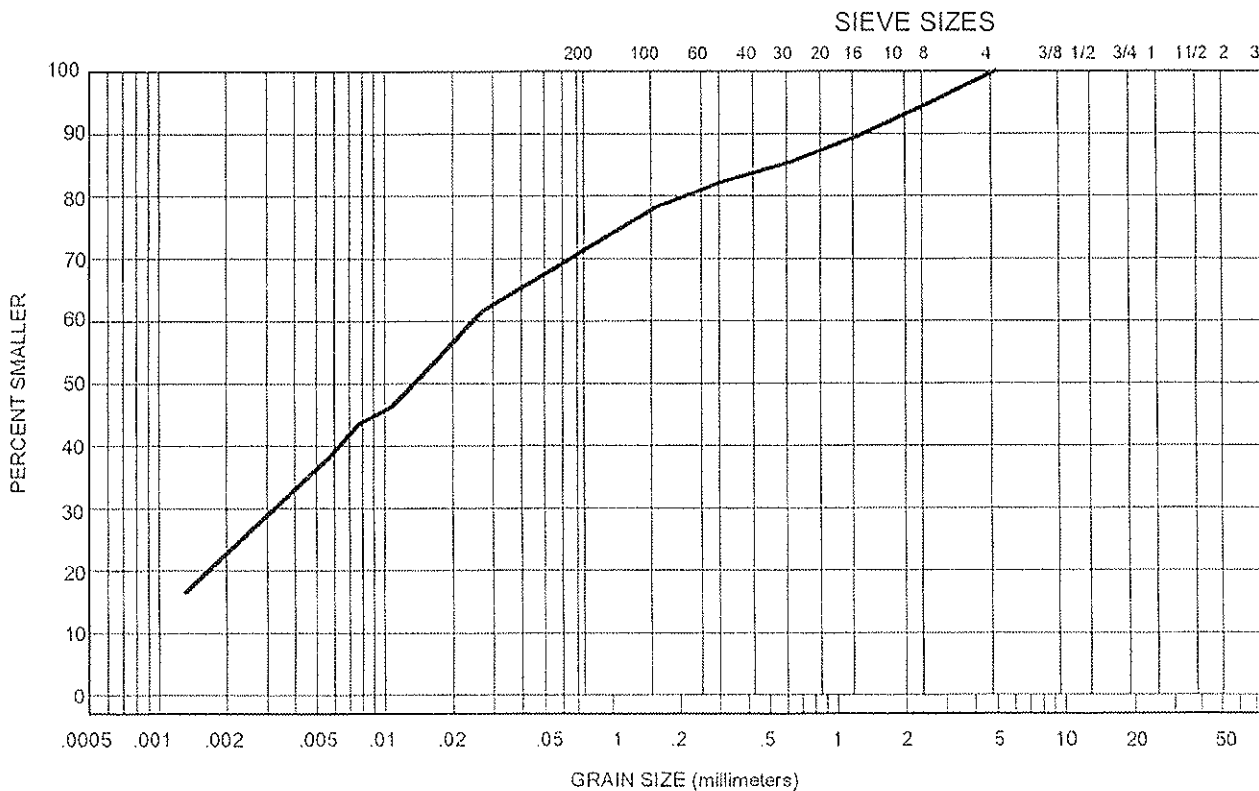
Soil Description: CLAY AND SILT, sandy, low plastic.

Natural Moisture Content: 20.2%

Remarks: LL=25%, PL=16%, PI=9%; USC = "CL"

SIEVE	PERCENTAGE PASSING
40	
25	
20	
16	
12.5	
10	
5	100
2.5	95
1.25	90
0.63	85
0.315	82
0.16	78
0.08	72

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



Reviewed By: \_\_\_\_\_ P.Eng.

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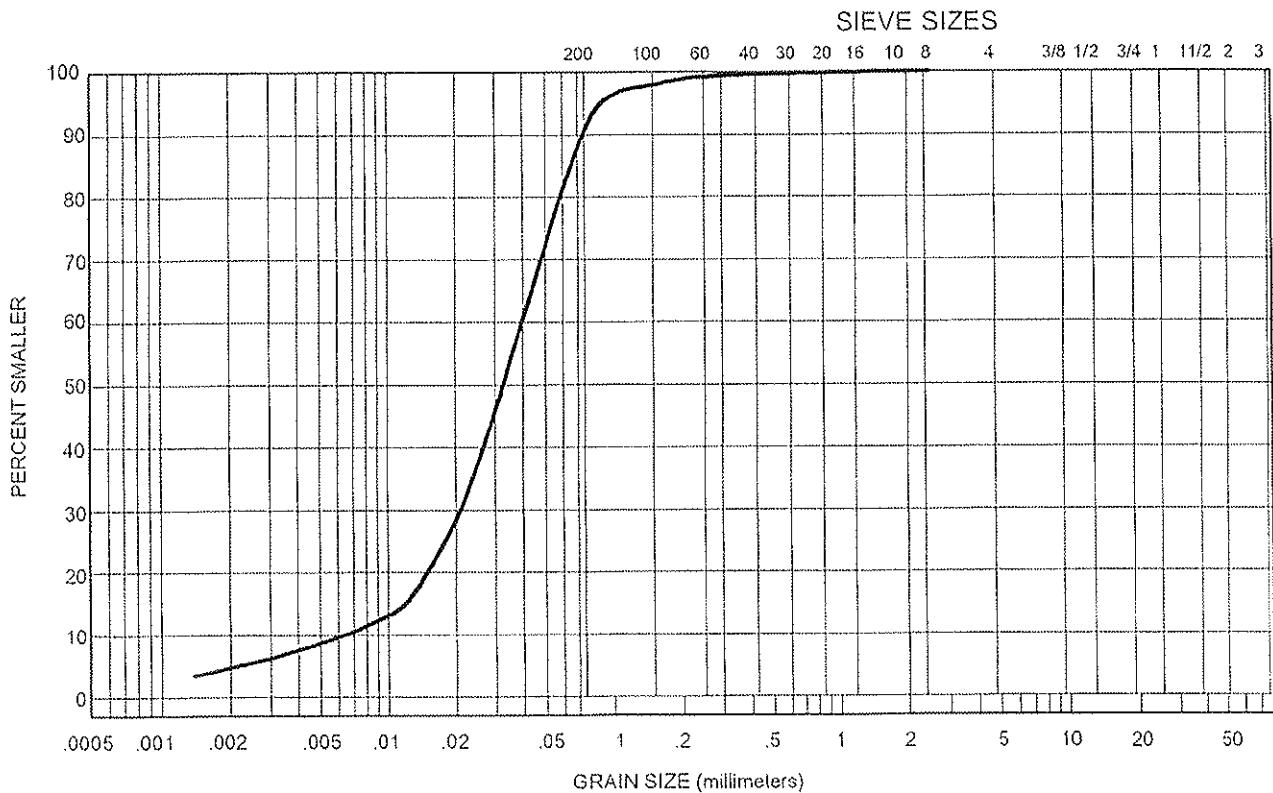
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## GRAIN SIZE DISTRIBUTION

Project: NICO Site Geotechnical Evaluation  
 Project Number: 1700127.002  
 Client: Fortune Minerals Limited  
 Attention: Mr. Robin Goad  
 Date Tested: December 6, 2004  
 Borehole Number: EBA-02  
 Depth: 2.10-2.30 m  
 Sample Number: n/a  
 Lab Number: 3792-6  
 Soil Description: SILT, trace sand, trace clay.  
 Natural Moisture Content: 22.9%  
 Remarks: Nonplastic; USC = "ML"

SIEVE	PERCENTAGE PASSING
40	
25	
20	
16	
12.5	
10	
5	
2.5	
1.25	
0.63	100
0.315	99
0.16	98
0.08	93

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



Reviewed By: \_\_\_\_\_ P.Eng.

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## GRAIN SIZE DISTRIBUTION

Project: NICO Site Geotechnical Evaluation

Project Number: 1700127.002

Client: Fortune Minerals Limited

Attention: Mr. Robin Goad

Date Tested: December 3, 2004

Sample Location: EBA-02

Depth: 2.30-2.50 m

Sample Number: n/a

Lab Number: 3792-7

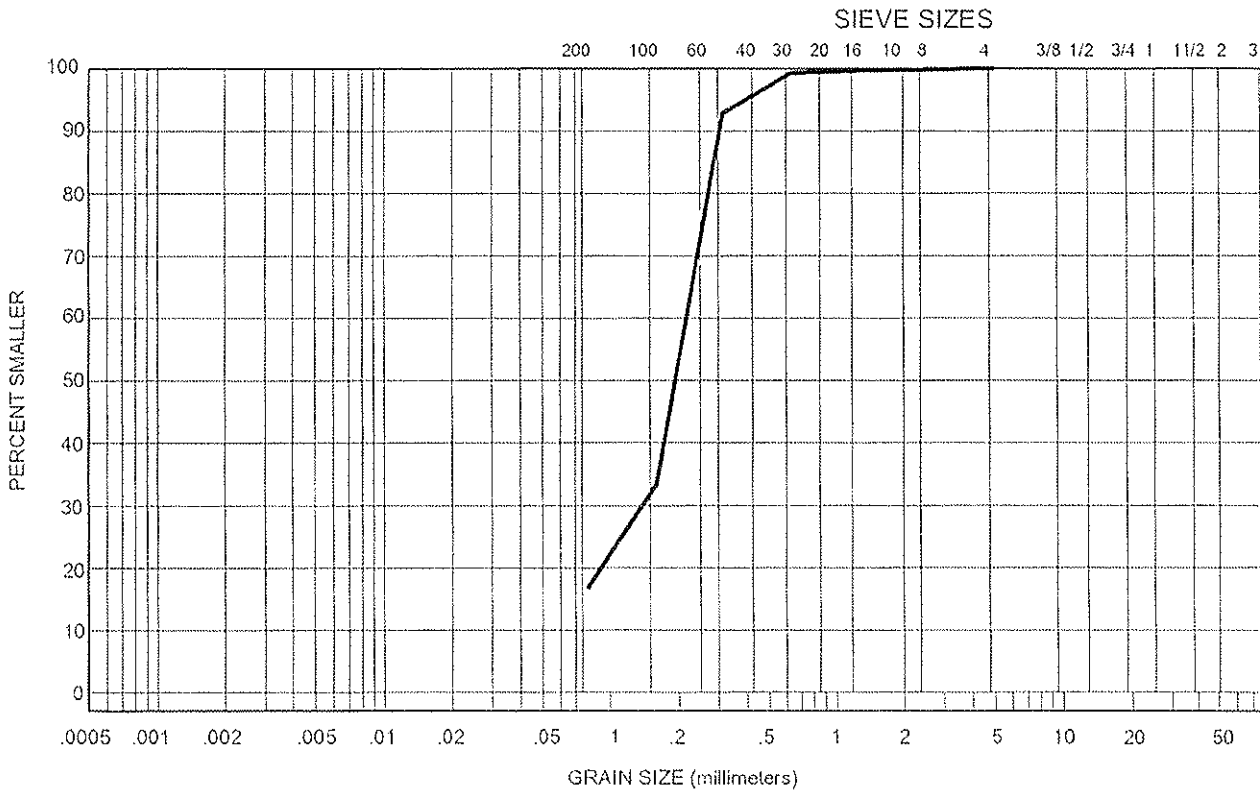
Soil Description: SAND, some silt

Natural Moisture Content: 16.9%

Remarks: USC = "SM"

SIEVE	PERCENTAGE PASSING
40	
25	
20	
16	
12.5	
10	
5	
2.5	
1.25	
0.63	99
0.315	93
0.16	33
0.08	17

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



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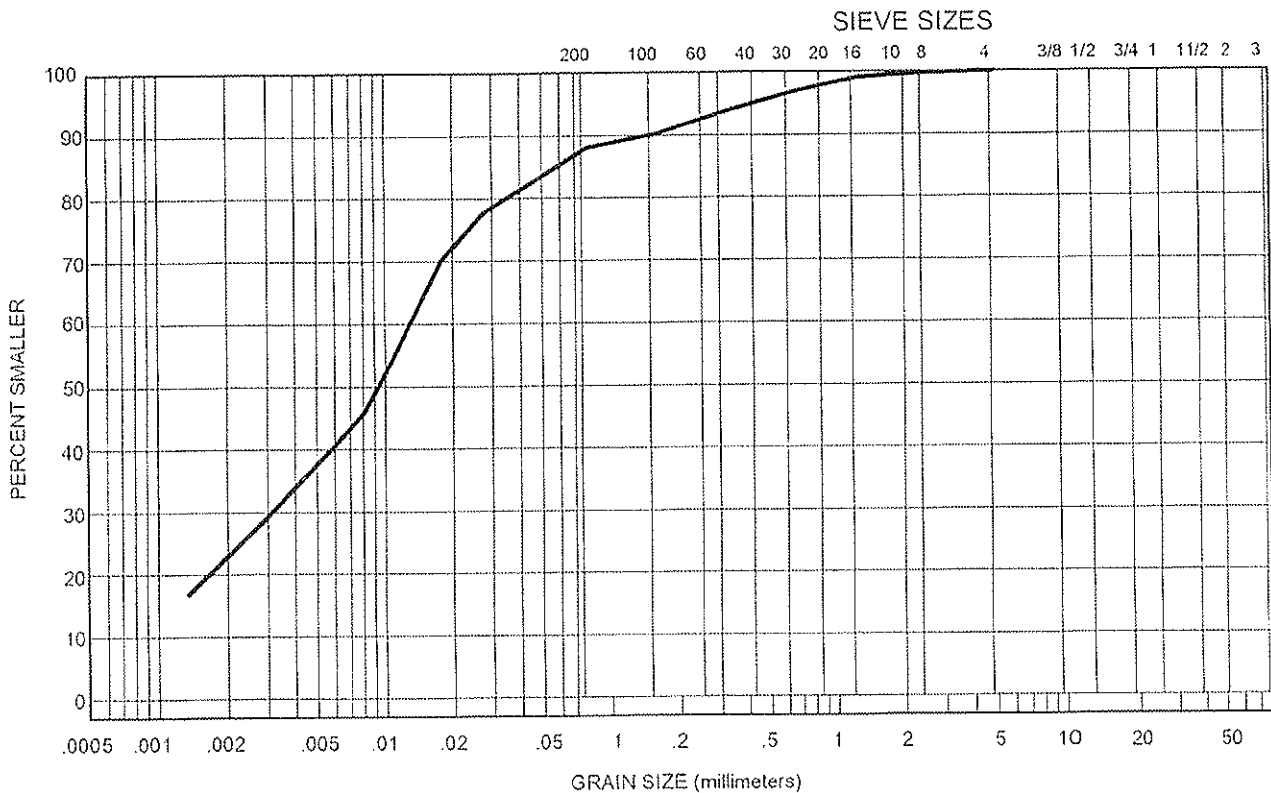
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## GRAIN SIZE DISTRIBUTION

Project: NICO Site Geotechnical Evaluation  
 Project Number: 1700127.002  
 Client: Fortune Minerals Limited  
 Attention: Mr. Robin Goad  
 Date Tested: December 6, 2004  
 Borehole Number: EBA-04  
 Depth: 1.45-1.82 m  
 Sample Number: n/a  
 Lab Number: 3792-10  
 Soil Description: SILT, clayey, some sand, organic, high plastic.  
 Natural Moisture Content: 87.5%  
 Remarks: Highly organic material, LL=50%, PL=35%, PI=15%; USC = "OH"

SIEVE	PERCENTAGE PASSING
40	
25	
20	
16	
12.5	
10	
5	
2.5	100
1.25	99
0.63	97
0.315	94
0.16	90
0.08	88

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



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# EBA Engineering Consultants Ltd.

## GRAIN SIZE DISTRIBUTION

Project: NICO Site Geotechnical Evaluation

Project Number: 1700127.002

Client: Fortune Minerals Limited

Attention: Mr. Robin Goad

Date Tested: December 6, 2004

Borehole Number: EBA-04

Depth: 3.25-3.50 m

Sample Number: n/a

Lab Number: 3792-12

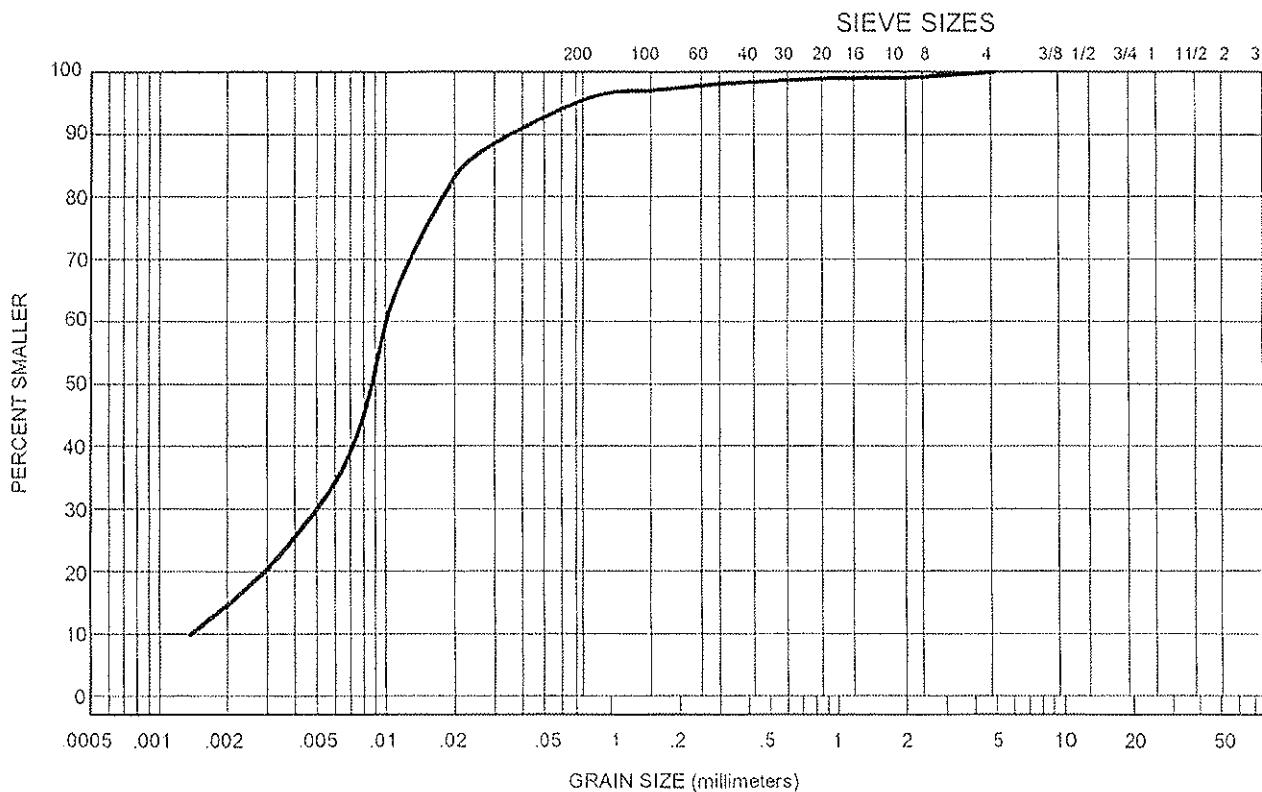
Soil Description: SILT, some clay, trace sand, nonplastic.

Natural Moisture Content: 32.9%

Remarks: Nonplastic; USC = "ML"

SIEVE	PERCENTAGE PASSING
40	
25	
20	
16	
12.5	
10	
5	100
2.5	99
1.25	99
0.63	99
0.315	98
0.16	97
0.08	96

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



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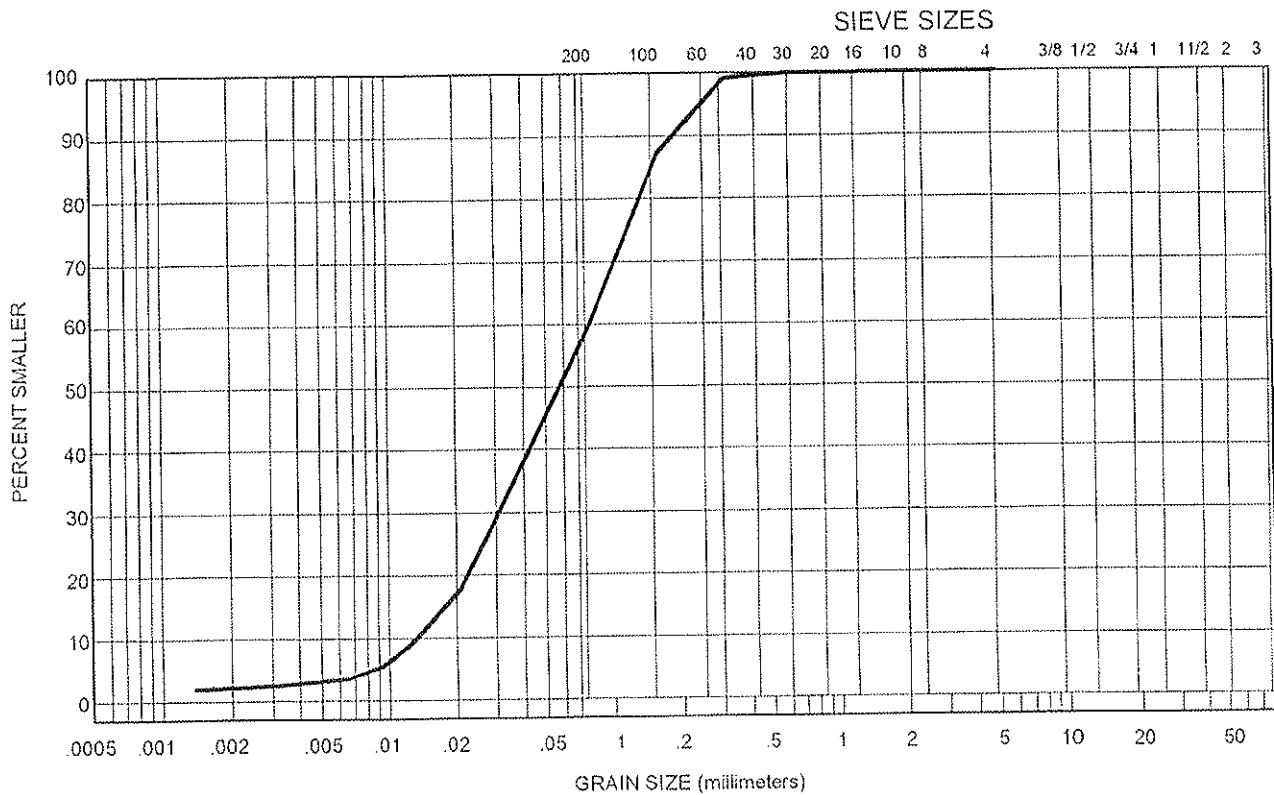
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## GRAIN SIZE DISTRIBUTION

Project: NICO Site Geotechnical Evaluation  
 Project Number: 1700127.002  
 Client: Fortune Minerals Limited  
 Attention: Mr. Robin Goad  
 Date Tested: December 6, 2004  
 Borehole Number: EBA-04  
 Depth: 4.20-4.40 m  
 Sample Number: n/a  
 Lab Number: 3792-14  
 Soil Description: SILT and SAND, trace clay, nonplastic.  
 Natural Moisture Content: 29.7%  
 Remarks: Nonplastic; USC = "ML"

SIEVE	PERCENTAGE PASSING
40	
25	
20	
16	
12.5	
10	
5	
2.5	
1.25	
0.63	100
0.315	99
0.16	87
0.08	60

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



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## GRAIN SIZE DISTRIBUTION

Project: NICO Site Geotechnical Evaluation

Project Number: 1700127.002

Client: Fortune Minerals Limited

Attention: Mr. Robin Goad

Date Tested: December 6, 2004

Borehole Number: EBA-05

Depth: 1.13-1.40 m

Sample Number: n/a

Lab Number: 3792-17

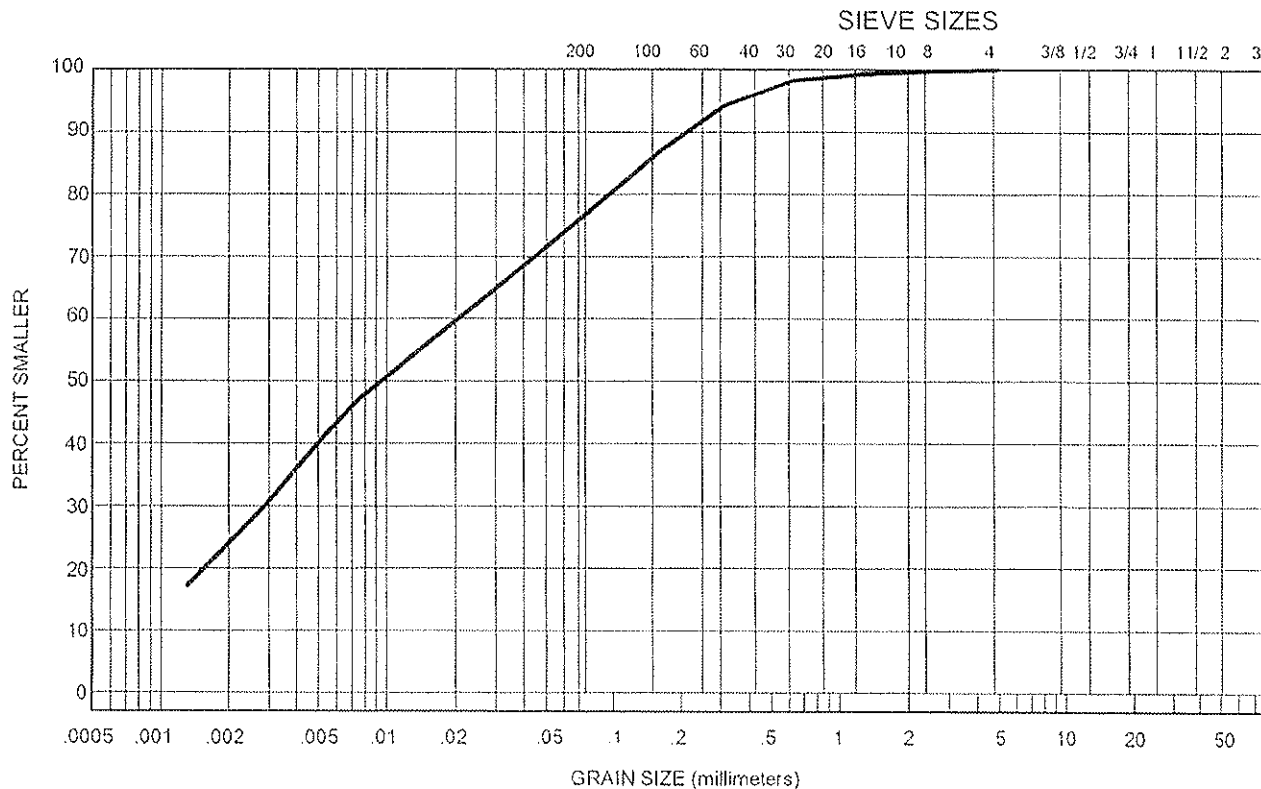
Soil Description: CLAY AND SILT, sandy, low plastic.

Natural Moisture Content: 42.1%

Remarks: LL=30%, PL=20%, PI=10%; USC = "CL"

SIEVE	PERCENTAGE PASSING
40	
25	
20	
16	
12.5	
10	
5	
2.5	100
1.25	99
0.63	98
0.315	94
0.16	87
0.08	77

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



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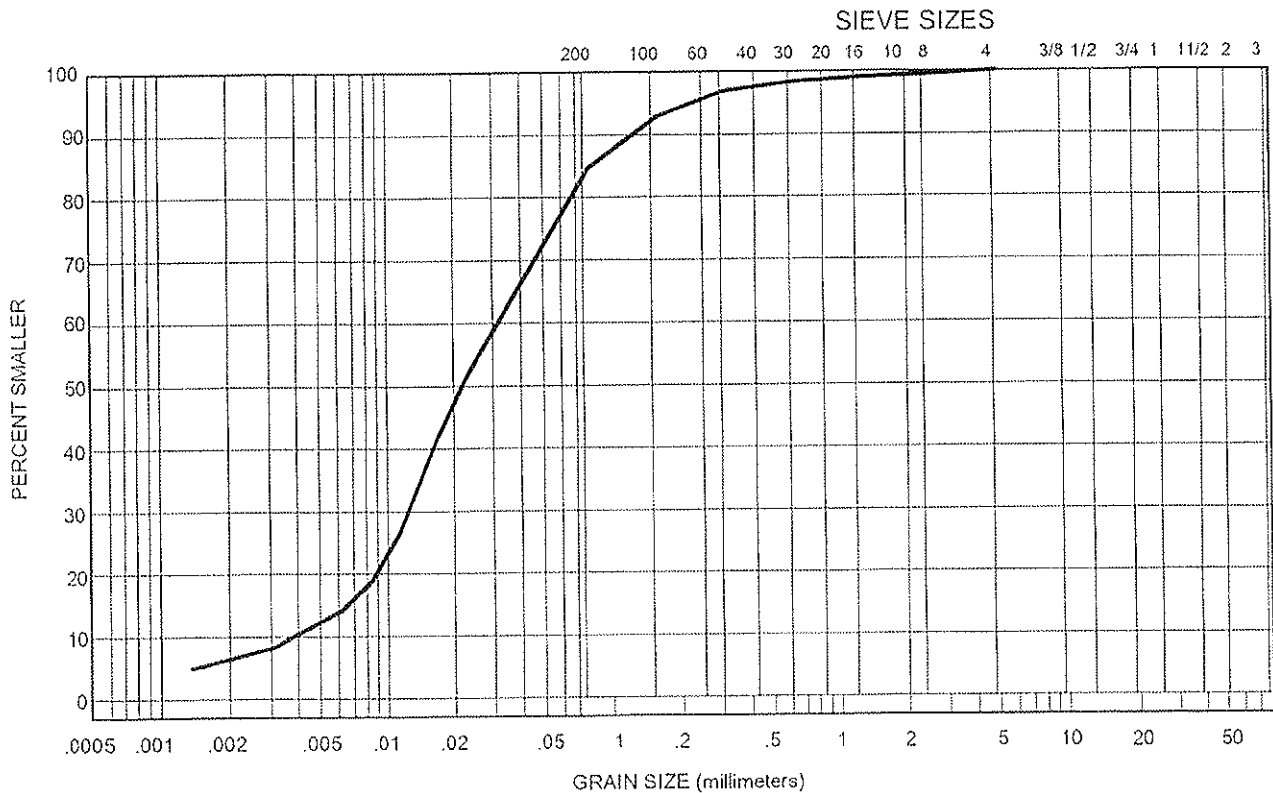
# EBA Engineering Consultants Ltd.

## GRAIN SIZE DISTRIBUTION

Project: NICO Site Geotechnical Evaluation  
 Project Number: 1700127.002  
 Client: Fortune Minerals Limited  
 Attention: Mr. Robin Goad  
 Date Tested: December 6, 2004  
 Borehole Number: EBA-05  
 Depth: 2.30-2.40 m  
 Sample Number: n/a  
 Lab Number: 3792-18  
 Soil Description: SILT, some sand, trace clay, nonplastic.  
 Natural Moisture Content: 46.6%  
 Remarks: Nonplastic; USC = "ML"

SIEVE	PERCENTAGE PASSING
40	
25	
20	
16	
12.5	
10	
5	100
2.5	99
1.25	99
0.63	98
0.315	97
0.16	93
0.08	85

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



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# EBA Engineering Consultants Ltd.

## GRAIN SIZE DISTRIBUTION

Project: NICO Site Geotechnical Evaluation

Project Number: 1700127.002

Client: Fortune Minerals Limited

Attention: Mr. Robin Goad

Date Tested: December 3, 2004

Borehole Number: EBA-05

Depth: 2.70-2.82 m

Sample Number: n/a

Lab Number: 3792-19

Soil Description: SAND, silty.

Natural Moisture Content: 23.0%

Remarks: USC = "SM"

SIEVE	PERCENTAGE PASSING
40	
25	
20	
16	
12.5	
10	
5	
2.5	
1.25	
0.63	100
0.315	99
0.16	68
0.08	30

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



Reviewed By: \_\_\_\_\_ P.Eng.

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## EBA Engineering Consultants Ltd.

### RELATIVE DENSITY AND ABSORPTION OF AGGREGATE

Project: NICO Site Geotechnical Evaluation  
Project No.: 1700127.002  
Client: Fortune Minerals Limited  
Attention: Mr. Robin Goad

Location: NICO Site  
BH No: EBA-04-04, EBA-04-01  
Date Tested: 17-Dec-04

Borehole #	EBA-04-04	EBA-04-01
Depth, m	4.20-4.40	1.40-1.60
Descripon	Sand	Silt
Mass SSD		
Mass oven dry	438.4	283.8
Temperature	20	20
Mass pycnometer & Water	664.5	689.2
Mass Pycno. & Sample & water	939.3	868.3
Bulk Sp Gravity		
Bulk Sp Gr (SSD)		
Apparent Sp. Gravity	2.680	2.711
Absorption		

# EBA Engineering Consultants Ltd.

## CONSTANT HEAD PERMEABILITY TEST

## TAILINGS DAM GEOTECHNICAL EVALUATION

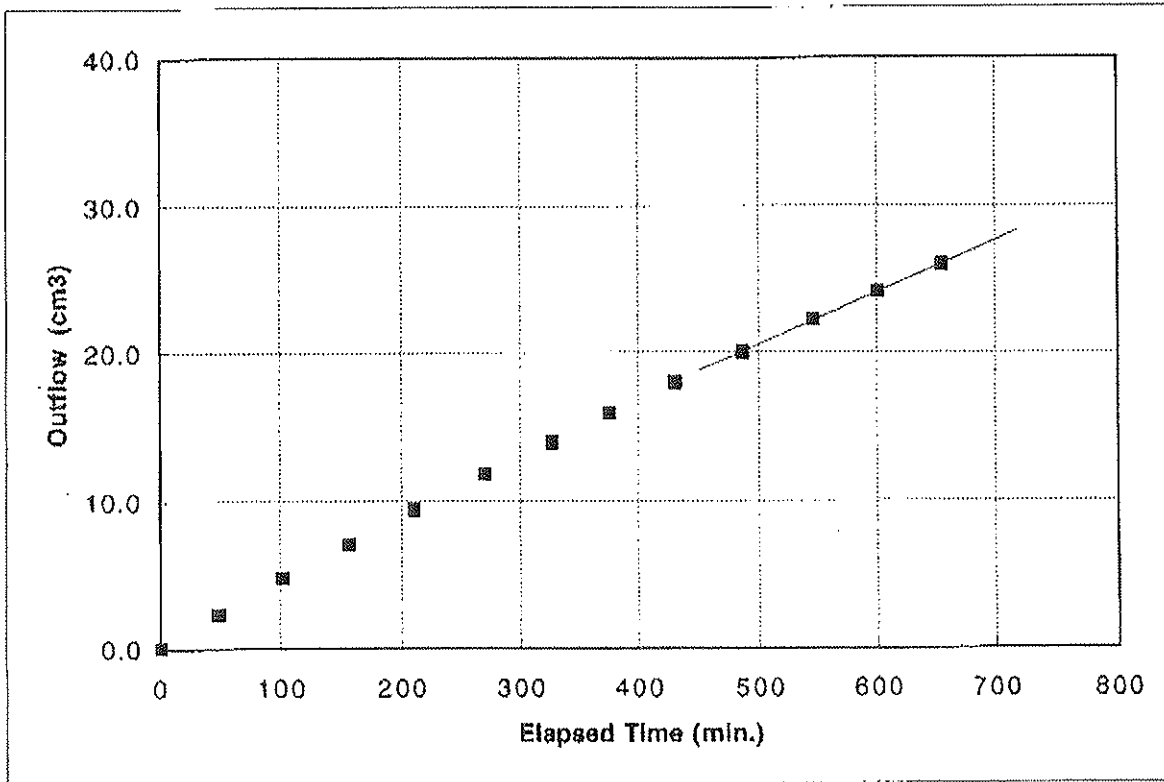
Job Number: 1700127.002  
 Sample No.: 732 BH1,2,4,5 (Composite)

Date: 04-12-14  
 Test No: P-1

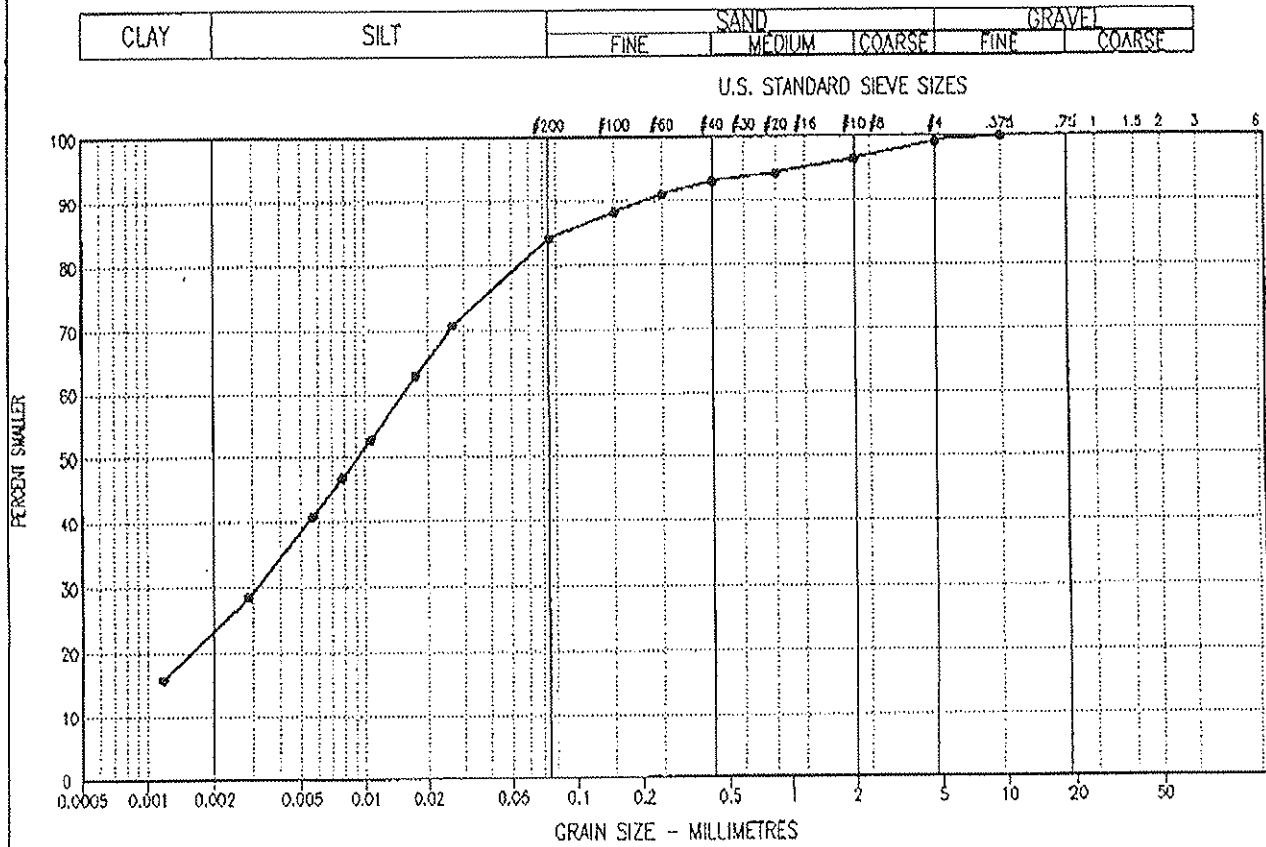
Time	Buret (cc)	Elap. (min)	Outflow (cc)
6:38	13.0	0	0.0
7:26	15.3	48	2.3
8:20	17.8	102	4.8
9:15	20.1	157	7.1
10:09	22.4	211	9.4
11:08	24.8	270	11.8
12:05	22.7	327	13.9
12:55	20.7	377	15.9
13:50	18.6	432	18.0
14:45	16.6	487	20.0
15:44	14.4	546	22.2
16:39	12.5	601	24.1
17:33	10.6	655	26.0

Diameter= 71.18 mm  
 Height= 25.48 mm  
 Volume= 101.39 cm<sup>3</sup>  
 Head Diff.= 2 psi  
 Q= 0.00060 cm<sup>3</sup>/sec  
 I= 55.21  
 A= 39.79 cm<sup>2</sup>

**K= 2.71E-07 cm/sec**



## PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (ft)	DESCRIPTION				Cu	Cc	U.S.C
			CLAY %	SILT %	SAND %	GRAVEL %			
●—●	1,2,4,5	0.00	22.0	62	15	1	-	-	

Project: 0701-1700127.002

Date Tested: 04/12/10

BY: KP

Tested in accordance with ASTM D422 unless otherwise noted.

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**ATTERBERG LIMIT TEST RESULTS**  
(LABORATORY DATA REPORT)

Project: Tailings Dam Eval. Borehole Number: 1, 2, 4 & 5  
 Address: \_\_\_\_\_ Depth: \_\_\_\_\_  
 Sample Number: 732  
 Project Number: 1700127.002 Sample Description: \_\_\_\_\_  
 Date Tested: 04.12.13 By: KP

**LIQUID LIMIT**  
(ASTM Designation D 423)

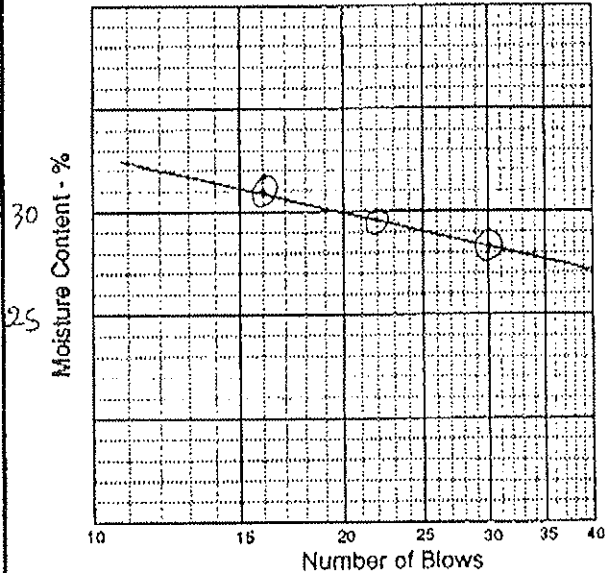
Trial Number	1	2	3
Tare Number	007	K24	G25
Number of Blows	30	22	16
Mass of Wet Soil & Tare g	48.73	49.48	52.16
Mass of Dry Soil & Tare g	38.82	39.04	40.69
Mass of Tare g	3.63	3.68	3.66
Mass of Dry Soil g	35.19	35.36	37.03
Mass of Moisture g	4.97	10.44	11.47
MOISTURE CONTENT %	28.3	29.5	31.0

**PLASTIC LIMIT**  
(ASTM Designation D 424)

Trial Number	1	2
Tare Number	28	M26
Mass of Wet Soil & Tare g	11.41	11.25
Mass of Dry Soil & Tare g	10.29	10.14
Mass of Tare g	3.67	3.69
Mass of Dry Soil g	6.62	6.45
Mass of Moisture g	1.12	1.11
MOISTURE CONTENT %	16.9	17.2

**SHRINKAGE LIMIT**  
(ASTM Designation D 427)

Trial Number	1	2	3
Tare Number			
Mass of Wet Soil & Tare g			
Mass of Dry Soil & Tare g			
Mass of Tare g			
Mass of Dry Soil g Wo			
Mass of Moisture g			
MOISTURE CONTENT % w			
Volume of Tare V			
Volume of Dry Soil Vo			
Volume of Shrinkage			
Shrinkage Limit SL			
Shrinkage Ratio R			
Volumetric Shrinkage Vs			
Linear Shrinkage Ls			



Remarks: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Liquid Limit: 29  
 Plastic Limit: 17  
 Plasticity Index: 12

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### SAMPLE INFORMATION

Project: Tailings Dam Geotech. Eval.

Borehole Number: 1, 2, 4 & 5 Composite

Address: \_\_\_\_\_

Depth: \_\_\_\_\_ (SQ. # 732)

Project Number: 1700127.002

Test Number: P-1

Date Tested: 09.12.14 By: S.K.

Sample Description: CLAY & SILT,

Test Apparatus: Permeability

some sand, frc. rootlets

Machine Number: 130

Sample Description		
	Diameter (mm)	Height (mm)
1		
2		
3		
4		
Mean	71.12	25.40

Rate of Strain: \_\_\_\_\_ mm% / minute

Normal Stress: \_\_\_\_\_ kPa

Cell Pressure: \_\_\_\_\_ kPa

Back Pressure: \_\_\_\_\_ kPa

Head Differential: \_\_\_\_\_ kPa

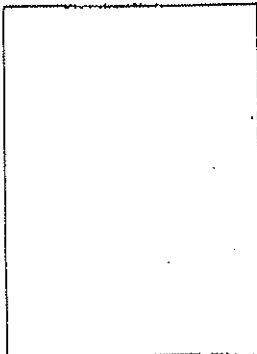
Swelling Pressure: \_\_\_\_\_ kPa

$J_{max} = 1.795 \text{ Mg/m}^3 @ 16.2\% \text{ Opt. MC.}$   $V = 100.90 \text{ cm}^3$

	Trimming	Initial	Final
Tare Number			
Mass of Wet Soil & Tare g		207.95	220.72
Mass of Dry Soil & Tare g			184.13
Mass of Tare g			6.69
Mass of Dry Soil g		177.44	177.44
Mass of Moisture g			
Moisture Content %		17.19	20.62
Wet Density $\text{Mg/m}^3$		2.061	2.111
Dry Density $\text{Mg/m}^3$		1.759	1.750

97.5 % SPD

Sketch and Remarks:



Final Dia. = 71.18 mm  
 Ht. = 25.40 mm  
 $A = 39.79 \text{ cm}^2$   
 $V = 101.39 \text{ cm}^3$

Angle of Shear: \_\_\_\_\_

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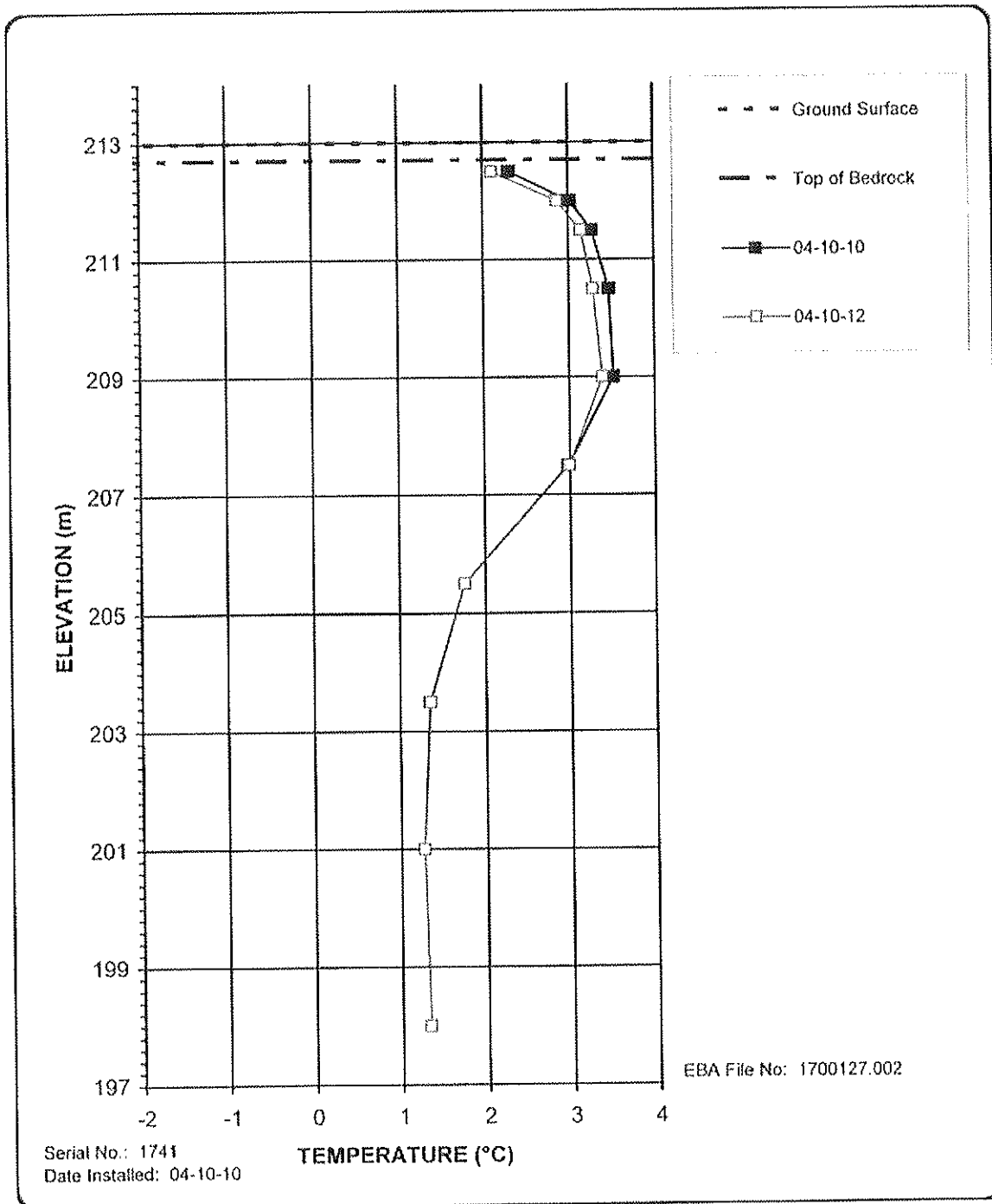
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**APPENDIX D**  
**GROUND TEMPERATURE MEASUREMENTS**

GROUND ELEVATION: appx. 213.0m

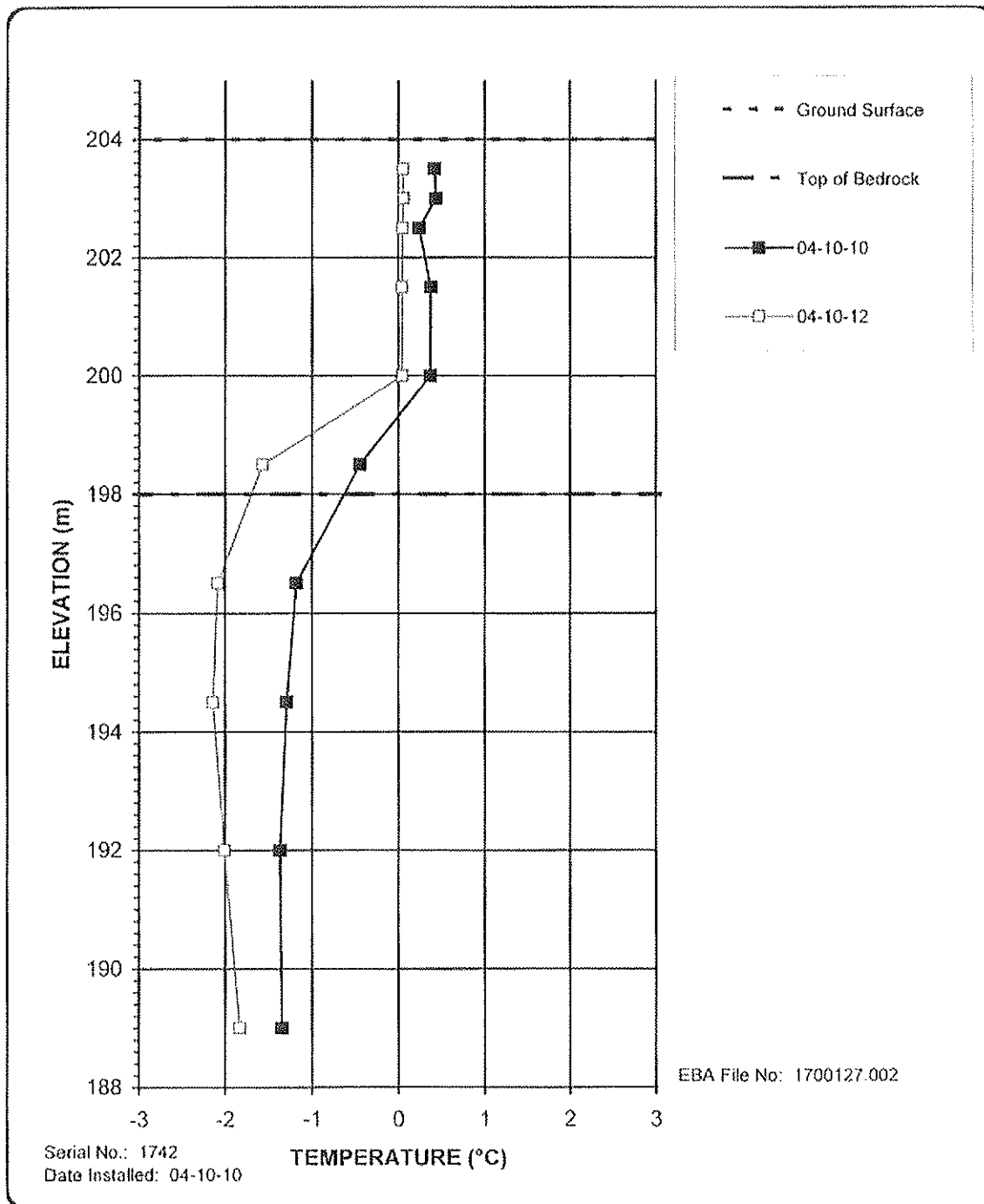


**Note:** Surface elevations were derived from a digital topographic map. The actual elevations may be +/- 2m.

Ground Temperature Profile  
Proposed Tailings Retention Dam  
Vertical GTC EBA-04-03



GROUND ELEVATION: approx. 204.0 m



Note: Surface elevations were derived from a digital topographic map. The actual elevations may be +/- 2m.

Ground Temperature Profile  
Proposed Tailings Retention Dam  
Vertical GTC EBA-04-05



# EBA Engineering Consultants Ltd.

## THERMISTOR STRING CALIBRATION

Project: Nico Mine  
 Client: \_\_\_\_\_  
 Date: 04-10-01  
 Job No.: 1700127.002

EBA Thermistor String #: 1741  
 Client String number: \_\_\_\_\_  
 Location of Installation: \_\_\_\_\_  
 Calibration Temperature: 0.02

	Depth of Thermistor <input type="checkbox"/> feet <input checked="" type="checkbox"/> meters	Color of Wire	Plug Letter	Calibration Resistance (Kilo-Ohms)			Temperature (deg C)	Calibration Factor (add deg C)
				Trial 1	Trial 2	Trial 3		
1	0.5	Black	A	16.29	16.30	16.30	0.03	-0.01
2	1.0	Purple	B	16.32	16.33	16.33	-0.01	0.03
3	1.5	Tan	C	16.36	16.37	16.37	-0.06	0.08
4	2.5	Grey	D	16.36	16.36	16.36	-0.04	0.06
5	4.0	Red	E	16.34	16.35	16.35	-0.03	0.05
6	5.5	Brown	F	16.32	16.33	16.33	-0.01	0.03
7	7.5	Pink	G	16.33	16.34	16.34	-0.02	0.04
8	9.5	Blue	H	16.33	16.33	16.33	-0.01	0.03
9	12.0	Green	J	16.32	16.33	16.33	-0.01	0.03
10	15.0	Yellow	K	16.34	16.35	16.35	-0.03	0.05
11		Silver	L					
12		Orange	N					
13		Orange/White	P					
14		Black/White	R					
15		Brown/White	S					
16		Red/White	T					
	Common	White	M					

Lead Length: 2.0m

Date Shipped: \_\_\_\_\_

Carrier: \_\_\_\_\_



# EBA Engineering Consultants Ltd.

## THERMISTOR STRING CALIBRATION

Project: Nico Mine  
 Client: \_\_\_\_\_  
 Date: 04-10-01  
 Job No.: 1700127.002

EBA Thermistor String #: 1742  
 Client String number: \_\_\_\_\_  
 Location of Installation: \_\_\_\_\_  
 Calibration Temperature: 0.02

	Depth of Thermistor <input type="checkbox"/> feet <input checked="" type="checkbox"/> meters	Color of Wire	Plug Letter	Calibration Resistance (Kilo-Ohms)			Temperature (deg C)	Calibration Factor (add deg C)
				Trial 1	Trial 2	Trial 3		
1	0.5	Black	A	16.33	16.34	16.34	-0.02	0.04
2	1.0	Purple	B	16.32	16.32	16.32	0.00	0.02
3	1.5	Tan	C	16.31	16.32	16.32	0.00	0.02
4	2.5	Grey	D	16.35	16.36	16.36	-0.04	0.06
5	4.0	Red	E	16.34	16.34	16.34	-0.02	0.04
6	5.5	Brown	F	16.31	16.32	16.32	0.00	0.02
7	7.5	Pink	G	16.33	16.34	16.34	-0.02	0.04
8	9.5	Blue	H	16.33	16.33	16.33	-0.01	0.03
9	12.0	Green	J	16.32	16.32	16.32	0.00	0.02
10	15.0	Yellow	K	16.34	16.34	16.34	-0.02	0.04
11		Silver	L					
12		Orange	N					
13		Orange/White	P					
14		Black/White	R					
15		Brown/White	S					
16		Red/White	T					
	Common	White	M					

Lead Length: 2.0m

Date Shipped: \_\_\_\_\_  
 Carrier: \_\_\_\_\_

