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REPORT ON

Conceptual Design for Andrew Lake Pit Dewatering Structure, Kiggavik Project

Submitted to:
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REPORT

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1.0 INTRODUCTION

1.1 Purpose and Scope

AREVA Resources Canada Inc. (AREVA) is preparing an Environmental Impact Statement for the Kiggavik Project in Nunavut. The proposed Kiggavik Project includes mining development at the Kiggavik and Sissons sites. Figure 1 presents a general site location plan showing the Kiggavik and Sissons sites, which are located approximately 80 to 90 km west of the community of Baker Lake.

At the Sissons site, AREVA proposes to develop the Andrew Lake open pit. Figure 2 presents a site plan for the Sissons site showing the Andrew Lake pit limit. The south west portion of this pit extends into Andrew Lake and a structure is required to allow this end of the lake to be dewatered for the proposed pit development. AREVA requested that Golder Associates Ltd. (Golder) undertake an investigation to characterize the Andrew Lake lakebed sediments, review existing geotechnical conditions and prepare a conceptual design for the dewatering structure required to support development of the Andrew Lake Pit.

This report presents a summary of the review of existing geotechnical information for the site, the results of the lakebed sediment investigation including laboratory testing carried out in 2010, and the conceptual design of the Andrew Lake Pit dewatering structure.

The reader is referred to the Study Limitations which precede the text and forms an integral part of this report.

2.0 GEOTECHNICAL CHARACTERIZATION

Geotechnical characterization of the foundation conditions to support the conceptual design for the Andrew Lake Pit dewatering structure has been based on a review of available geotechnical information for the Sissons and Kiggavik site areas, as well as sampling and laboratory testing of lakebed sediments collected from Andrew Lake by Golder in 2010.

The data review included results from geotechnical investigations carried out in 1988, 2009 and 2010, and a report prepared by EBA Engineering Ltd. (EBA) presenting the results of a geophysical survey carried out along the north end of the Andrew Lake in 2009.

2.1 Geotechnical Investigations

A brief summary of the results of the geotechnical investigations are presented in the follow sections.

2.1.1 1988 Investigations

In 1988, geotechnical investigations were conducted at the Kiggavik site for the purpose of evaluating the subsurface conditions for waste dump foundations, overburden stripping within the open pit area and haul road design. A total of 12 shallow boreholes were drilled using a flight auger coring rig. These boreholes were logged, samples were collected and laboratory testing was carried out on 16 samples. Appendix A includes a summary of the borehole logs and laboratory test results from this investigation.

2.1.2 2009 and 2010 Investigations

In 2009, geotechnical investigations included 5 shallow test pits which were hand excavated and sampled at the Sissons site for the purpose of evaluating the suitability of the subsurface soils for use in underground paste backfill. Five deep boreholes were drilled and logged near the Andrew Lake Pit, four in 2009 and one in 2010. Figure 2 presents the locations of these shallow test pits and the boreholes. Table 2-1 presents a summary of the test pit and borehole locations. Samples collected from the test pits were sent for laboratory testing. Appendix A includes a summary of the borehole logs and laboratory testing results for the test pit samples.

Table 2-1: Summary of 2009 and 2010 Borehole and Test Pit Locations

Test Hole ID	Type	Northing (m)	Easting (m)	Depth (m)	Samples	
					From (m)	To (m)
AND09-02	Borehole	7,134,809	553,319	299	-	-
AND09-03	Borehole	7,134,574	553,312	307	-	-
END09-02	Borehole	7,135,934	554,542	487	-	-
END09-11	Borehole	7,135,895	554,602	439	-	-
AND-10-03	Borehole	7,134,733	552,678	337	-	-
END-OB-09-1	Test Pit	7,136,044	554,601	0.3	0.20	0.30
END-OB-09-2	Test Pit	7,136,018	554,754	0.3	0.20	0.30
END-OB-09-3	Test Pit	7,135,994	554,680	0.3	0.20	0.30
END-OB-09-4	Test Pit	7,135,838	554,607	0.3	0.20	0.30
END-OB-09-5A	Test Pit	7,135,932	554,636	0.3	0.05	0.25
END-OB-09-5B	Test Pit	7,135,932	554,636	0.3	0.25	0.30

2.1.3 2009 Ground Penetrating Radar Investigation

In 2009, ground penetrating radar (GPR) surveys were conducted by EBA to collect stratigraphic data at the north end of Andrew Lake on the Sissons site. The results are presented in EBA 2009 and Figure 2 presents the GPR survey lines along which data was collected in the area of the proposed dewatering structure. Two survey tracks were conducted parallel to and a series of 4 survey tracks were conducted perpendicular to the north shore of Andrew Lake.

It was noted by EBA field staff at the time of the investigation (April 2009) that ice on Andrew Lake in the area of the surveys was frozen down to the lakebed surface and that no distinct ice-water interface was observed in the radar data. The reflection amplitudes and material velocities calculated from diffraction events suggest frozen materials within the area covered by the investigation, which is consistent with that expected in areas where the lake ice freezes to the lakebed.

Summary records of GPR surveys are provided in Appendix A.

2.1.4 2010 Lakebed Sediments Investigation

In 2010, Golder undertook a lakebed sediment investigation for the purpose of characterizing the soft lakebed sediments and water depth in the area of the proposed Andrew Lake Pit dewatering structure. Working from a boat in the lake on August 17, 2010, water depths and sediment thicknesses were measured and where possible, lakebed sediment samples were collected at a total of 24 locations. Samples were returned to the Golder Burnaby laboratory and testing was undertaken on 7 of the samples collected. Figure 2 presents the test locations on the site plan.

A summary of the water depth, sediment thickness and samples collected are presented in Table 2-2. In the area of the proposed dewatering structure at the time of the survey, the lake depth ranged from 0.2 m to 0.75 m with an average depth of 0.6 m. The sediment thickness ranged from 0.05 m to 0.5 m with an average thickness of 0.3 m.

Table 2-2: Summary of 2010 Lakebed Soundings and Sediment Sample Locations

Sounding ID	Location	Northing (m)	Easting (m)	Water Depth on August 17, 2010 (m)	Sediments Thickness[2] (m)
SD01	Andrew Lake	7134728	552855	0.54	0.31
SD02	Andrew Lake	7134594	552889	0.71	0.32
SD03	Andrew Lake	7134492	552952	0.71	0.27
SD04	Andrew Lake	7134431	553008	0.68	0.54
SD05	Andrew Lake	7134381	553050	0.63	0.20
SD06[1]	Andrew Lake	7134329	553096	0.43	0.04
SD07	Andrew Lake	7134344	553184	0.38	0.32
SD08[1]	Andrew Lake	7134328	553199	0.21	0.17
SD09[1]	Andrew Lake	7134338	553144	0.41	0.50
SD10[1]	Andrew Lake	7134357	553094	0.47	0.32
SD11	Andrew Lake	7134386	553084	0.61	0.34
SD12	Andrew Lake	7134759	552864	0.42	0.04
SD13	Andrew Lake	7134716	552881	0.63	0.05
SD14	Andrew Lake	7134678	552863	0.52	0.43
SD15	Andrew Lake	7134641	552856	0.71	0.25
SD16	Andrew Lake	7134624	552875	0.58	0.38
SD17	Andrew Lake	7134613	552890	0.64	0.14
SD18	Andrew Lake	7134547	552886	0.69	0.35
SD19	Andrew Lake	7134531	552910	0.75	0.22
SD20	Andrew Lake	7134520	552934	0.62	0.35
SD21	Andrew Lake	7134459	552942	0.63	0.22
SD22	Andrew Lake	7134447	552971	0.62	0.37
SD23	Andrew Lake	7134414	553008	0.62	0.31
SD24	Andrew Lake	7134390	553017	0.62	0.16

Notes: 1) Unable to collect sediment sample.

2) Field crew recorded the sediment thickness as the maximum distance that the sampling tool could be advance while working from the boat.

2.1.5 2010 Lakebed Sediments Laboratory Testing

Laboratory testing was carried out on selected samples obtained during the lakebed sampling program. A total of 7 sieves, 5 hydrometers, 2 Atterberg Limit determinations, 7 moisture contents, and 5 organic matter contents were conducted. A summary of the laboratory test results are presented in Table 2-3.

Laboratory testing results are included in Appendix B.

Table 2-3: Summary of 2010 Laboratory Testing Results

Sounding ID	Grain Size Distribution (by weight)			Plastic Limit	Water Content (%)	Organic Matter (%)
	Gravel	Sand	Fines (Silt and Clay)			
SD01	0.0	91.5	8.5	N/T	19.9	0.6
SD02	0.2	90.5	9.3	N/T	20.7	0.6
SD03	2.2	91.5	6.3	N/T	23.6	N/T
SD04	0.8	89.0	10.2	Non Plastic	26.3	2.3
SD05	0.7	91.9	7.4	N/T	24.1	1.1
SD11	0.9	90.1	9.0	Non Plastic	29.6	1.9
SD12	0.2	78	21.8	N/T	44.8	N/T

N/T = not tested

2.2 Subsurface Conditions

The following provides a summary of the subsurface soil and bedrock conditions inferred for the Andrew Lake Pit dewatering structure based on the results of the previous and current site investigations.

2.2.1 Soil Conditions

Based on the results of the 2010 lakebed sampling program, the lakebed sediments encountered consisted of soft, SAND to silty SAND with trace gravel, non-plastic and with low organic matter content. Based on the review of the available geotechnical data within the project area, the soils encountered typically ranged from very loose to loose SAND, some gravel, trace clay to very loose to loose SILT and SAND, trace clay containing boulders and cobbles.

Review of the 1988, 2009 and 2010 drilling records indicates that the soil thickness ranges from 5 m to 15 m within the project area. The soil depth inferred from the GPR surveys indicates a soil thickness that ranges of 5 m to 12 m within the area covered by the survey. Results from the 2009 GPR surveys inferred that frozen ground extends under the north end of Andrew Lake in the area of the GPR investigations.

2.2.2 Bedrock Conditions

Foundation bedrock conditions have been inferred based on five boreholes located at the Sissons site which includes AND09-02, AND09-03, END09-02, and END09-03 drilled in 2009 and AND-10-03 drilled in 2010. The boreholes were drilled with an inclination of between 60 and 85 degrees.

The near surface bedrock encountered in within Andrew Lake Pit and the End Grid area was classified as fresh to moderately weathered, weak to strong, fine to coarse grained, red to grey, metasediment. The near surface bedrock encountered southwest of Andrew Lake Pit was classified as fresh to slightly weathered, very strong to extremely strong, fine to medium crystalline, pink-grey, well banded granitic gneiss. The records of borehole logs are provided in Appendix A.

2.2.3 Lakebed Bathymetry

Bathymetry of the Andrew Lake has been updated based on the water depth soundings collected during the August 2010 investigation. Figure 2 includes the updated Andrew Lake lakebed bathymetry data based on water level estimates prepared by Golder Saskatoon Geoscience group.

3.0 DESIGN BASIS

3.1 Introduction

The general design basis for construction of the Andrew Lake dewatering structure through shallow water which is expected to be less than 1 m in depth includes:

- Maintaining a suitable setback between the open pit limit and the dewatering structure;
- Meeting or exceeding the required safety factors for stability and hydrotechnical design criteria according to the consequence classification as set out in Canadian Dam Association (CDA), 2007; and
- Manageable seepage into the open pit.

Figure 3 presents two alignment options which have been considered for the Andrew Lake Pit dewatering structure. A design basis for the structure has been prepared and summarized in the following sections. Using the design basis, a conceptual design of the dewatering structure, which is applicable for either of the alignment options, has been prepared. A preliminary quantity summary and cost estimate has been prepared for the two alignment options.

3.2 Dam Consequence Classification

The Canadian Dam Association (CDA) Dam Safety Guidelines (CDA, 2007) ranks water retaining dams according to the consequences of a hypothetical dam failure. Potential life loss, economic losses, environmental losses and cultural losses are considered in the classification. Table 3-1 presents the Dam Classification categories according to CDA (2007).

Table 3-1: Dam Classification (CDA 2007, Table 2-1)

Dam Class	Population at Risk	Incremental Losses		
		Loss of Life	Environmental and Cultural Values	Infrastructure and Economics
Low	None	0	Minimal short-term loss No long-term loss	Low economic losses; area contains limited infrastructure or services
Significant	Temporary Only	Unspecified	No significant loss or deterioration of fish or wildlife habitat Loss of marginal habitat only Restoration or compensation in kind highly possible	Losses to recreational facilities, seasonal workplaces, and infrequently used transportation routes
High	Permanent	10 or Fewer	Significant loss or deterioration of *important* fish or wildlife habitat Restoration or compensation in kind highly possible	High economic losses affecting infrastructure, public transportation, and commercial facilities

Dam Class	Population at Risk	Incremental Losses		
		Loss of Life	Environmental and Cultural Values	Infrastructure and Economics
Very High	Permanent	100 or Fewer	Significant loss or deterioration of *critical* fish or wildlife habitat Restoration or compensation in kind possible but impractical	Very high economic losses affecting important infrastructure or services (*e.g.*, highway, industrial facility, storage facilities for dangerous substances)
Extreme	Permanent	More than 100	Major loss of *critical* fish or wildlife habitat Restoration or compensation in kind impossible	Extreme losses affecting important infrastructure or services (*e.g.*, hospital, major industrial complex, major storage facilities for dangerous substances)

See CDA, 2007 for additional notes regarding this table.

The proposed Andrew Lake Pit dewatering structure is considered to be classified as a Significant consequence of failure structure based on the following assessment:

- **Population at Risk:** Temporary Only (site personnel);
- **Loss of Life:** Unspecified;
- **Environmental and Cultural Values:** Loss of marginal habitat only / Restoration or compensation in kind highly possible; and
- **Infrastructure and Economics:** Low economic losses; area contains limited infrastructure or services.

3.3 Design Earthquake and Seismic Hazard

Based on the 2007 CDA Dam Safety Guidelines dams shall be designed based on an Earthquake Design Ground Motion (EDGM). Selection of the EDGM is based on the consequence of failure of the dam. For a Significant consequence of failure structure, the suggested design earthquake has an annual exceedance probability (AEP) of 1 in 1,000 years.

A query of the Earthquake Canada website using the Andrew Lake site coordinates of 7,134,500 m Northing and 553,000 m Easting, resulted in the peak ground accelerations for several return periods as summarized in Table 3-2. Details of the Seismic Hazard Calculation are included in Appendix C.

Table 3-2: 2005 National Building Code Seismic Hazard Calculation for Sissons Site

Nominal Return Period (years)	Probability of Exceedance per Annum	Peak Ground Acceleration (g)
1 in 475	0.0021	0.021
1 in 1000	0.001	0.035
1 in 2475	0.000404	0.059

3.4 Design Criteria

The key design criteria for the conceptual design of the Andrew Lake Pit dewatering structure are summarized in Table 3-3.

Table 3-3: Dewatering Structure Key Design Criteria

Description	Assessment	Reference / Comments
Dam Classification	Significant consequence of failure structure.	Using CDA 2007 Dam Classification Table 2-1
Freeboard	2.0 m above normal lake elevation.	See Section 3.5
Roadway Width	20 m (minimum)	■ For haul truck double lane traffic the minimum width is three times the width of the widest haulage vehicle. (NWT and Nunavut, 1995). ■ Assumes construction using CAT 785D - 150 Ton - 6.63 m width.
Safety Berm	2.3 m (minimum) height	■ A shoulder barrier of at least three-quarters the height of the largest tire on any vehicle using the road is required. (NWT and Nunavut, 1995). ■ Assumes construction using CAT 785D - 150 Ton, with Caterpillar 33.00R51 - 3.0 m diameter tires.
Design Earthquake	For Significant consequence of failure structure the suggested design earthquake has an annual exceedance probability (AEP) of 1/1,000 years.	CDA, 2007, Section 6.3 and 6.5
Slope Stability	FoS = 1.5 on static conditions FoS = 1.0 on pseudostatic conditions	CDA, 2007, Section 6.6
Seepage and Drainage Control	Seepage exit gradients should be within acceptable limits for the embankment and foundation materials. Manageable seepage reporting to open pit.	

3.5 Freeboard

Freeboard is the minimal vertical distance between the normal still water surface elevation in the reservoir (lake) and the top of the containment structure. This safety margin is maintained at all time in order to restrict overtopping of the containing structure by large waves, including due consideration of wind and wave setup, and wave run up. (CDA 2007).

Based on the Significant classification, the crest level should be set so that the structure is protected against the most critical of the following cases:

- No overtopping by 95% of the waves caused by the most critical wind with a frequency of 1/1000 year when the reservoir (lake) is at its maximum normal elevation; and
- No overtopping by 95% of the waves caused by the most critical wind when the reservoir is at its maximum extreme level during the passage of the Inflow Design Flood.

Additional considerations for the freeboard are:

- Freeboard should be sufficient to prevent heave of the crest due to frost action (CDA 2007, page 71);
- Final freeboard, including camber, should be sufficient to accommodate expected settlement of the crest and cracks caused by frost action (CDA 2007, page 71); and
- The dam (dyke) should be designed to retain the reservoir safely despite any cracking that may be induced by arching, settlement, or hydraulic fracturing (CDA 2007, page 71).

For this conceptual design a freeboard of 2 m has been provided to meet the above criteria. The freeboard requirements should be reviewed as part of the detailed design stage.

3.6 Slope Stability

The CDA (2007) Dam Safety Guidelines adopted as design criteria present the minimum factors of safety against slope stability failure (see Table 3-3) for static and pseudostatic loading using the EDGM. Detailed slope stability analysis was not undertaken for the current conceptual design. The maximum water depth is less than 1 m, and the rockfill shell which forms the dam crest is greater than 50 m width. Slope stability analyses should be undertaken as part of the detailed design stage.

4.0 CONCEPTUAL DESIGN

4.1 Alignment Options

Figure 3 presents the two alignment options which have been considered for the Andrew Lake Pit dewatering structure.

Alignment Option 1 takes advantage of topographic highs located near the northeast end of Andrew Lake. Option 1 is closer to the pit and therefore a lake area of 133,000 m^2 is required to be dewatered. Alignment Option 1 requires an approximate length of 650 m to be constructed through the lake and 400 m will be constructed over land, for a total length around 1050 m. The Alignment Option 1 will not interfere with the natural outlet to Andrew Lake and thus, a diversion ditch will not be required.

Alignment Option 2 takes advantage of a naturally narrow section of Andrew Lake, farther west of Alignment Option 1. Option 2 is further away from the pit than Option 1 and requires 235,000 m^2 of the lake to be dewatered. Option 2 requires approximately 350 m of the structure to be built through the lake and an additional 200 m will be constructed over land, for a total length of 550 m. There are no naturally topographic high spots southeast of Andrew Lake near the Alignment Option 2, and therefore careful consideration will need to be given to the location and design of the south abutment. The natural inlet to Andrew Lake is currently situated to the east side (downstream) of Option 2 and will need to be redirected to the west side (upstream) side of Option 2 to prevent inflow into the pit and preserve the natural flow paths between the lakes. The natural outlet is currently situated on the east (downstream) side of Option 2. A diversion ditch will need to be constructed to preserve the natural flow paths between the lakes. Included on Figure 3 are two diversion channel alignment options, labelled A and B, and one of these channels would be required to be constructed along with dewatering structure alignment Option 2.

Table 4-1 presents a comparison of the alignment options.

Table 4-1: Comparison of Alignment Options

Item	Alignment Option 1	Alignment Option 2
Total Structure Length (m)	1050	550
Lake Length (m)	650	350
Abutment Length (m)	400	200
Diversion Channel Length (m)	n/a	655 Option A channel 615 Option B channel
Lake Area Lost (m^2)	133,000	235,000

4.2 Design Concept

The conceptual design of the Andrew Lake Pit dewatering structure consists of rockfill platform placed through Andrew Lake along the selected alignment. A trench would then be excavated through the rockfill and a granular filter material would be placed underwater on the downstream face of the excavation based on material compatibility between the rockfill and till zones. Till would be placed as trench backfill under water in the excavation to act as a low hydraulic conductivity core of the structure. Selected crushed rockfill would be placed as a thermal cap over the till to promote consolidation of the till core and to reduce the thermal variation in the till zone.

Figure 4 presents a typical cross section and construction sequence for the dewatering structure. The following provides a brief description of key stages of the dewatering structure construction.

Rockfill Embankment and Trench Excavation

- Sediment control silt curtains are deployed into lake around the rockfill embankment area.
- A rockfill embankment would be advanced along the alignment with an initial crest elevation of 167 m at a width of about 50 m. The crest width of the embankment is greater than the minimum 34 m for two way truck traffic (including safety berms) so that the embankment provides both a working platform and a running surface for the large mine haul trucks during construction.
- A large excavator would be used for the trench excavation removing rockfill and lakebed soils from the embankment crest to an approximate depth of 1 m below lakebed and exposing competent foundation soils for the till zone along the alignment. The excavation would have a minimum base width of 5 m. The downstream slope of the excavation includes a bench to allow stable placement of a filter zone.

Filter Zone

- A granular filter material would be placed on the downstream face of the excavation to prevent movement of the finer till core materials into the rockfill, or into zones of open boulders present in the lakebed materials.

Till Core

- Following filter placement, the excavation would be backfilled with a select till material to form a till core zone. The till core material would be advanced along the structure's centerline, parallel with the Filter material.
- The minimum width of continuous till core material at the base of the excavation would be 5 m to minimize seepage through the structure.
- Till core material would be placed to 2 m above water level to provide sufficient freeboard.
- Rockfill would be placed to an elevation of 170 m over the till core zone to help consolidate the till material and to reduce the thermal variation in the till zone.

Schedule

Depending on the alignment option selected, construction of the dewatering structure is estimated to take between 4 and 8 weeks to complete. Construction would be scheduled to be undertaken during the open water season in the summer months of July and August. The construction should to begin in July, following melting of the ice cover from Andrew Lake to allow for the deployment of the sediment curtains. By July, the active layer is expected to begin to develop and the lakebed sediments begin to thaw which will allow for excavation to the design depth.

The dewatering structure construction should be completed before September so that the till and granular materials can be placed before freezing conditions begin at site. This also gives the till core zone time to consolidate under the load of the thermal cap before the winter freeze up.

Following the completion of the dewatering structure construction, it is anticipated that dewatering of the Andrew Lake downstream of the structure will be completed before the winter freeze up. This will allow for maximum frost penetration into the exposed lakebed on the downstream side during the following winter.

4.3 Construction Materials

Mine haul trucks will be used to deliver the following construction materials:

Rockfill

Rockfill used in the dewatering structure construction may be produced by mining operations or quarried specifically for construction of the dewatering structure and should be Non Potentially Acid Generating (NPAG). Potentially Acid Generating (PAG) materials should be avoided during construction due to the limited depth of water the structure will be built in.

Granular Filter

The granular filter material must prevent loss of till core material into the rockfill or boulder/cobble zones within the lakebed till. The filter will be designed based on criteria in Fell et al. (2005), and the U.S. Army Corps (2004), and will meet filtration criteria against the till core specification. Depending on the crushing and screening plant available on site, processing of run-of-mine rock through the crushing plant may be carried out to reduce material handling requirements. The granular filter shall be constructed of NPAG rock.

Till Core

It is anticipated that a well graded till with a maximum particle size of 150 mm and fines content between 20% and 40% will have a sufficiently low hydraulic conductivity to minimize the seepage through the dewatering structure. The till core material will be comprised of select natural till material excavated during construction.

4.4 Seepage

The Andrew Lake dewatering structure is proposed to be constructed in shallow water which is expected to be less than 1 m in depth. There will be a very low hydraulic head on this structure following dewatering of the lake to access the open pit area.

Mitigation options for potential seepage through the foundation soils or fractured foundation bedrock would include the following:

- Pumping: a sump could be constructed at the downstream toe between the dike and the pit. Seepage water would be seasonally pumped for management; and/or
- Selective grouting through the cut-off wall.

Seepage mitigation measures will be further developed as part of the detail design stage.

5.0 QUANTITY AND COST ESTIMATE

To allow for an alignment selection to be carried out, preliminary quantities and conceptual cost estimates have been prepared for the two alignments options presented on Figure 3 and using the typical cross section shown on Figure 4. To estimate the cost of construction, assumptions were made for the cost of excavation, material handling and material placement based on past experiences with other similar projects. The material quantities and conceptual costs are considered to be accurate for a concept screening level with an accuracy range of about -50% to +100%. The cost estimate is for the earthworks only and does not include sediment control, water management, environmental management, fish out or habitat compensation. A summary of the quantity and cost estimation for each dewatering structure option is presented in Table 5-1.

Table 5-1: Summary of Quantity and Cost Estimation for Dewatering Structure Alignment Options

		Alignment Option 1		Alignment Option 2			
				Diversion Channel A		Diversion Channel B	
Item	**Unit Cost, Load Haul +Place Material ($/m^3)**	**Quantity (m^3)**	**Cost ($)**	**Quantity (m^3)**	**Cost ($)**	**Quantity (m^3)**	**Cost ($)**
Initial Rockfill with safety berms	3	91,300	273,900	53,760	161,280	53,760	161,280
Trench Excavation (Rockfill)	5	22,100	110,500	9,480	47,400	9,480	47,400
Trench Excavation (Lakebed Soils) (2x effort of rockfill excavation)	10	4,100	41,000	3,480	34,800	3,480	34,800
Production and placement of filter zone	30	3,700	111,000	1,680	50,400	1,680	50,400
Till	3	39,600	118,800	17,520	52,560	17,520	52,560
Surcharge Rockfill (Thermal Cap)	3	28,400	85,200	12,600	37,800	12,600	37,800
Diversion Channel (see Golder 2010a)		n/a			258,000		243,000
Total		189,200 m^3	$ 740,400	98,520 m^3	$ 642,240	98,520 m^3	$ 627,240

5.1 Selected Alignment

Based on the preliminary quantities and conceptual cost estimates presented in Table 5-1, Golder recommends that the alignment Option 1 for the Andrew Lake Pit dewatering structure be selected and advanced through to the next phase of design.

Alignment Option 1 is approximately twice the length of Option 2 and would require nearly twice the material to construct. Alignment Option 2 requires the construction of a diversion channel and when this is factored in the estimated cost of construction for Option 2 is close to the estimate for Alignment Option 1.

Alignment Option 2 requires nearly twice the lake area to be dewatered to support the development of the Andrew Lake Pit over Option 1. The cost of this additional area of lake to be dewatered in terms of lost fish habitat compensation has not been included in the estimate comparison. However, preliminary discussions on construction requirements for fish habitat compensation would be expected to increase the cost estimate for Option 2 over that of Option 1.

6.0 PROPOSED SITE INVESTIGATION PROGRAM

A site investigation program is recommended to advance the Andrew Lake pit dewatering structure design to the next stage.

The water depth in the lake along the proposed alignment is approximately 0.5 m to 0.7 m and the lake bed sediment thickness is estimated to be 0.2 m to 0.4 m according to the findings of the 2010 lake sediment investigation. Soil thickness is estimated to be 4 m to 6 m. Access to the proposed drillhole locations would be from lake ice during winter.

The geotechnical site investigation program is proposed for the following purposes:

- Determine the soil thickness along the optimized alignment;
- Geotechnical core logging to define near surface bedrock conditions;
- Measurement of ground temperature conditions at the abutments with depth and time; and
- Soil sampling for laboratory testing and characterization.

The following presents a recommended site investigation program.

- Review of available geologic mapping for the area;
- A drilling program from lake ice during winter along dike alignment Option #1 as shown in Figure 2. Five boreholes are proposed along the alignment by diamond drill coring;
- Sample collection of the foundation soils for a laboratory testing program;
- Installation of one thermistor at each abutment; and
- Packer test to obtain the hydraulic conductivity of the unfrozen bedrock (if encountered).

7.0 CONCLUSIONS AND RECOMMENDATIONS

A conceptual design for the Andrew Lake Pit dewatering structure has been prepared following the design basis presented and based on a review of the geotechnical characterization data for the foundation conditions in the project area. Two alignment options were considered. Based on a preliminary cost estimate and minimum area of lake dewatering required, alignment Option 1 has been recommended to be selected for detailed design study.

To advance alignment Option 1 to a detailed design study, the following additional work is required:

- The dewatering structure's alignment and geometry should be optimized based on the ultimate size, shape, and location of Andrew Lake Pit;
- A geotechnical investigation should be conducted along the optimized alignment to sample and obtain the foundation material properties;
- A geotechnical investigation should be conducted to confirm the material properties and quantity of till material available for this construction; and
- Ground temperature conditions with depth and time should be determined in the abutment areas of proposed dewatering structure through the installation of thermistor strings in boreholes.

8.0 CLOSURE

We trust that this report is sufficient for your needs at this time. Should you have any questions, or require additional information, please do not hesitate to contact us.

GOLDER ASSOCIATES LTD.

REGISTERED PROFESSIONAL ENGINEER
J.C. CUNNING
LICENSEE
NWT/NU
Aug 27/14

Ben Wickland, Ph.D., P.Eng.
Associate, Senior Geotechnical Engineer

John Cunning, P.Eng.
Principal, Senior Geotechnical Engineer

JB/JCC/BW/aw/rs/jc/it

o:\final\2012\1362\12-1362-0158\1213620158-004-r-rev2-3000\1213620158-004-r-rev2-3000-conceptual design for andrew lake dewatering structure 27aug_14.docx

THE ASSOCIATION OF PROFESSIONAL ENGINEERS, GEOLOGISTS and GEOPHYSICISTS OF THE NORTHWEST TERRITORIES
PERMIT NUMBER
P 049
GOLDER ASSOCIATES LTD.
August 2014

REFERENCES

EBA Engineering Consultants Ltd., 2010. AREVA Resources Road and Mine Infrastructure, Andrew Lake Dyke Survey, submitted to AREVA Resources Canada Inc., EBA File: V33101016.400.009, dated January 2010.

Golder Associates Ltd., 1988. Mining Geotechnical Aspects of the Proposed Kiggavik Uranium Operations Volume I and II, submitted to Urangesellschaft Canada Ltd., Report 882-1421/881-1814G, dated August 1989.

Golder Associates Ltd., 2009. Assessment of Potential Sources for Paste Backfill Material, submitted to AREVA Resources Canada Inc., Report 09-1426-0001, dated November 2, 2010.

NWT and Nunavat, 1995, Mine Health and Safety Regulations, R-125-95.

LEGEND

- Community
- Proposed Kiggavik - Sissons Location

150 0 150

SCALE 1:7,500,000 KILOMETRES

REFERENCE

Communities obtained from Geogratis. Other base data obtained from ESRI.
Projection: UTM Zone 14 Datum: NAD 83

PROJECT

AREVA

AREVA RESOURCES CANADA INC.
KIGGAVIK PROJECT

TITLE

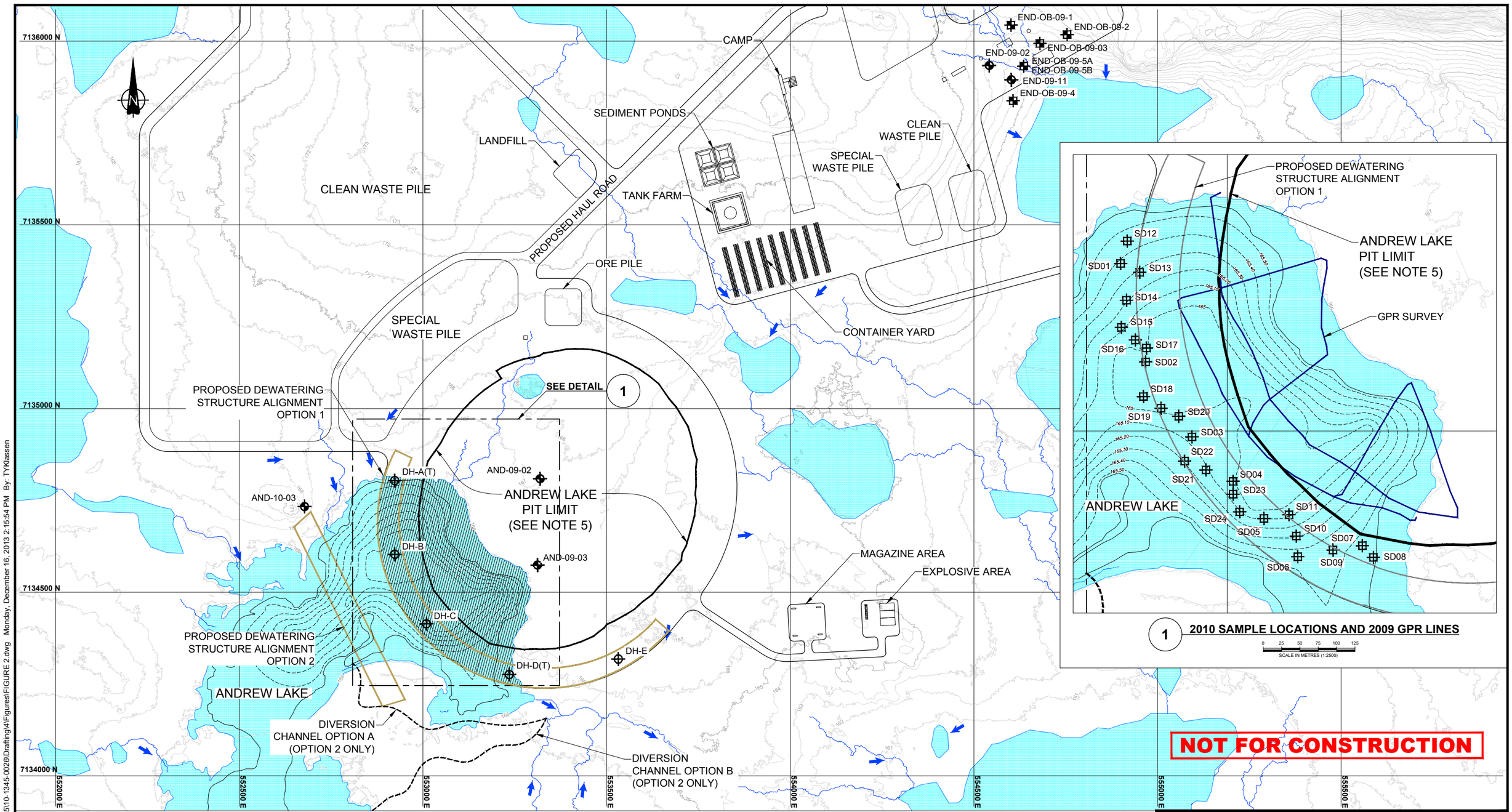
GENERAL SITE LOCATION

Golder Associates
Greater Vancouver Office, B.C.

PROJECT No. 10-1345-0026			PHASE No. 4	
DESIGN	JB	11JAN11	SCALE AS SHOWN	REV. 0
GIS	CDB	11JAN11		
CHECK				
REVIEW				

FIGURE 1

N:\Bur-Graphics\Projects\2010\1345\10-1345-0026\GIS\projects\4\figure-01_general-site-location.mxd



LEGEND

- MINOR CONTOUR
- MAJOR CONTOUR
- BATHYMETRY CONTOUR
- PROPOSED INFRASTRUCTURE
- PROPOSED PIT OUTLINE
- CREEK
- WATER BODY
- PROPOSED DEWATERING AREA FOR ALIGNMENT OPTION 1
- FLOW DIRECTION
- SD12 — 2010 SAMPLE LOCATION
- AND-10-03 — BORE HOLE LOCATION
- END-OB-09-2 — TEST PIT LOCATION
- DH-B — PROPOSED DRILLHOLE FOR NEXT STAGE

NOTES

1) ALL UNITS IN METRES UNLESS OTHERWISE STATED.
2) TOPOGRAPHIC CONTOURS GENERATED FROM LIDAR SURVEY (SUMMER 2008 & 2009).
3) CONTOURS SHOWN AT 1m INTERVAL.
4) ELEVATIONS ARE REFERENCED TO GEODETIC DATUM; NAD83 UTM, ZONE 14.
5) ANDREW LAKE PIT DESIGN PROVIDED BY AREVA (09OCT11).
6) ANDREW LAKE BATHYMETRY CONTOURS BASED ON WATER LEVEL ESTIMATES BY GOLDER SASKATOON GEOSCIENCE GROUP. SHOWN AT 0.1m INTERVAL.

DH #	EASTING	NORTHING	COLLAR EL. (m)	DEPTH (m)
DH-A(T)*	552923	7134805	165.6	15
DH-B	552923	7134603	165.0	12
DH-C	553010	7134414	165.1	12
DH-D(T)*	553235	7134276	165.8	15
DH-E	553532	7134318	166.5	12
(T)* = DRILLHOLE WITH THERMISTOR INSTALLATION				

PROJECT
AREVA RESOURCES CANADA INC.
KIGGAVIK PROJECT
NUNAVUT

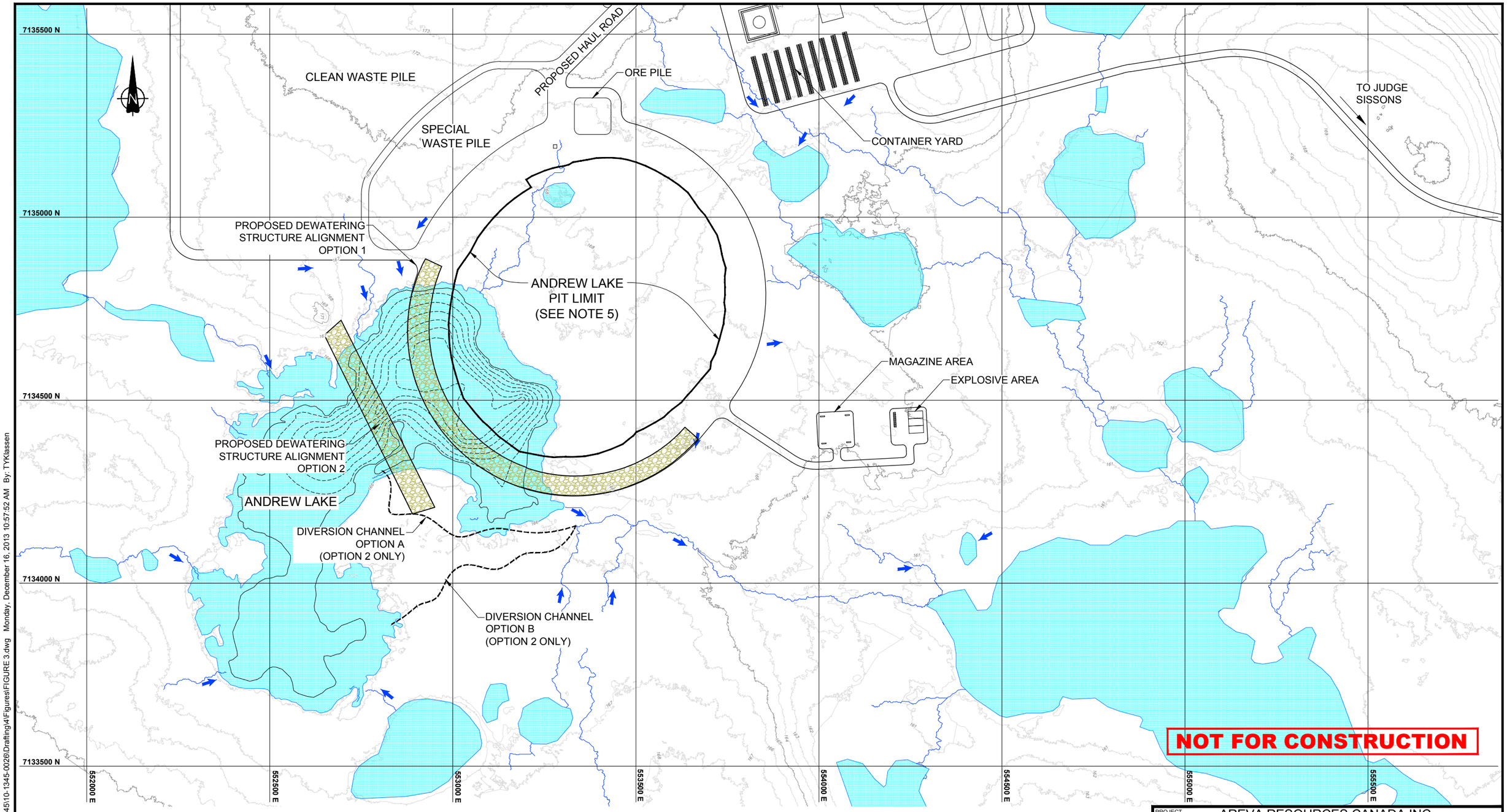
TITLE
SISSONS SITE PLAN AND SITE INVESTIGATION LOCATIONS

Golder Associates

PROJECT No.		10-1345-0026	PHASE	4	TASK
DESIGN	JV	03NOV10	FILE No.		FIGURE 2.dwg
CADD	MSH	11MAR11	SCALE	AS SHOWN	REV. 1
CHECK					
REVIEW					

FIGURE 2

Drawing File: N:\Bur-Graphics\Projects\2010\1345\10-1345-0026\Drafting\4\Figures\FIGURE 2.dwg Monday, December 16, 2013 2:15:54 PM By: TYKlassen



LEGEND

- MINOR CONTOUR
- MAJOR CONTOUR
- BATHYMETRY CONTOUR
- PROPOSED INFRASTRUCTURE
- PROPOSED PIT OUTLINE
- WATER BODY
- DEWATERING STRUCTURE
- CREEK
- FLOW DIRECTION

NOTES

1) ALL UNITS ARE IN METRES UNLESS OTHERWISE STATED.
2) TOPOGRAPHIC CONTOURS GENERATED FROM LIDAR SURVEY (SUMMER 2008 & 2009)
3) CONTOURS SHOWN AT 1m INTERVAL.
4) ELEVATIONS ARE REFERENCED TO GEODETIC DATUM; NAD83 UTM, ZONE 14.
5) ANDREW LAKE PIT DESIGN PROVIDED BY AREVA (09OCT11).
6) ANDREW LAKE BATHYMETRY CONTOURS BASED ON WATER LEVEL ESTIMATES BY GOLDER SASKATOON GEOSCIENCE GROUP. SHOWN AT 0.1m INTERVAL.

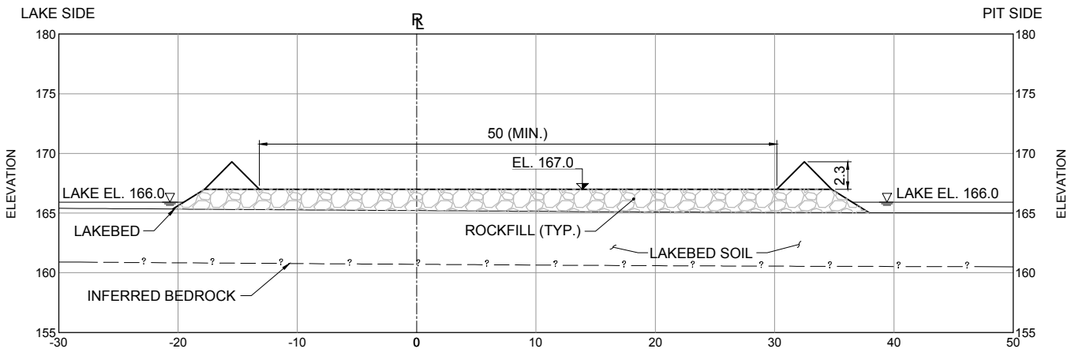
PROJECT
AREVA RESOURCES CANADA INC.
KIGGAVIK PROJECT
NUNAVUT

TITLE
ANDREW LAKE PIT DEWATERING STRUCTURE ALIGNMENT OPTIONS 1 AND 2

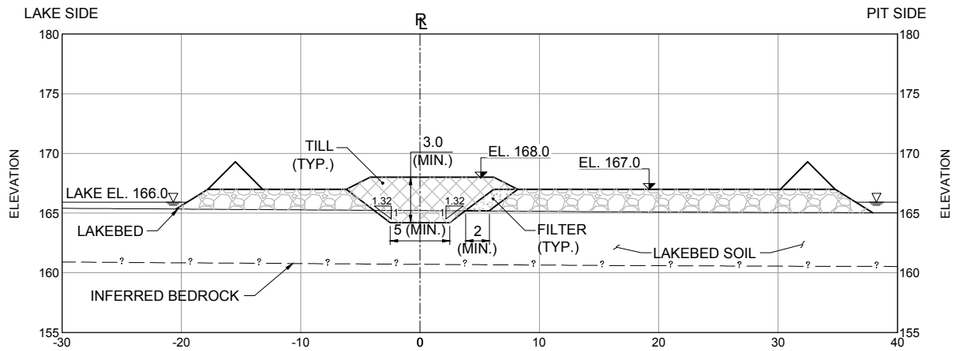
PROJECT No.		10-1345-0026	PHASE	4	TASK
DESIGN	JV	03NOV10	FILE No.		FIGURE 3.dwg
CADD	MSH	11MAR11	SCALE	AS SHOWN	REV. 0
CHECK					
REVIEW					

FIGURE 3

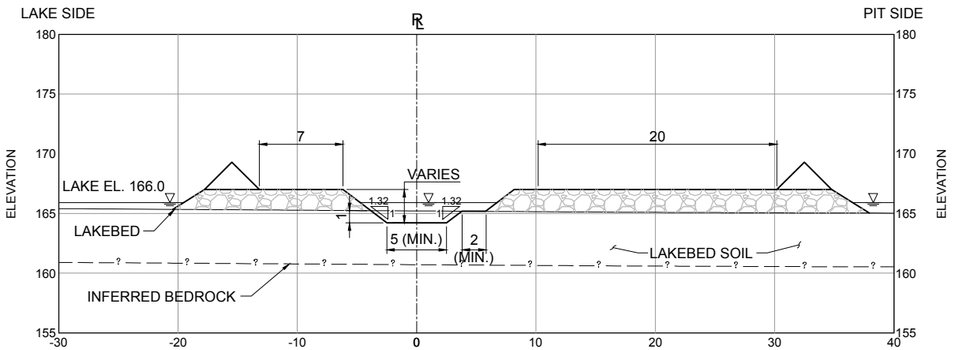
Drawing File: N:\Bur-Graphics\Projects\2010\1345\10-1345-0026\Drafting\4\Figures\FIGURE 3.dwg Monday, December 16, 2013 10:57:52 AM By: TYKlassen



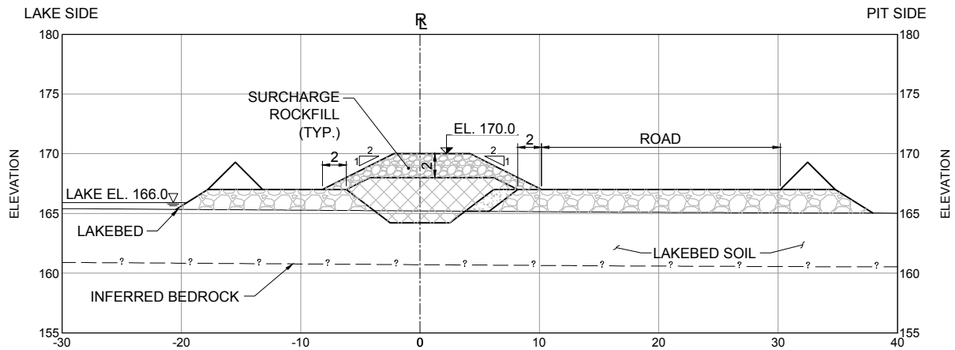
1 INITIAL ROCKFILL PLACEMENT



3 TILL PLACEMENT



2 TRENCH EXCAVATION



4 SURCHARGE ROCKFILL PLACEMENT

LEGEND

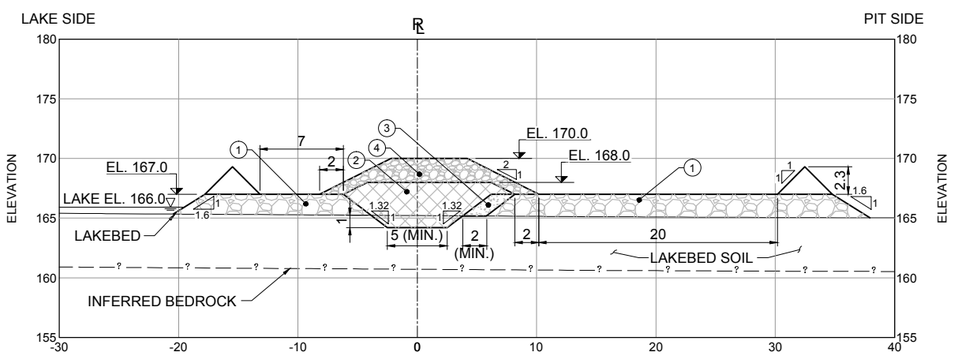
- DESIGN
- ASSUMED LAKEBED
- INFERRED BEDROCK

MATERIAL LEGEND

1. ROCKFILL
2. TILL
3. GRANULAR MATERIAL (FILTER)
4. SURCHARGE ROCKFILL

NOTES

1) ALL DIMENSIONS AND ELEVATIONS ARE IN METRES UNLESS OTHERWISE NOTED



TYPICAL CROSS-SECTION

NOT FOR CONSTRUCTION

SCALE IN METRES (SCALE 1:500)

PROJECT: AREVA RESOURCES CANADA INC.
KIGGAVIK PROJECT
NUNAVUT

TITLE: **CONCEPTUAL DESIGN CONSTRUCTION SEQUENCE AND TYPICAL CROSS-SECTION**

PROJECT No.		10-1345-0026	PHASE	4	TASK
DESIGN	JV	03NOV10	FILE No.		FIGURE 4.dwg
CADD	MSH	11MAR11	SCALE	AS SHOWN	REV. 0
CHECK					
REVIEW					

FIGURE 4

Drawing File: N:\Bur-Graphics\Projects\2010\1345\10-1345-0026\Drafting\4\Figures\FIGURE 4.dwg Monday, December 16, 2013 10:54:55 AM By: TYKlassen

APPENDIX A

Previous Investigation Results

RECORD OF BOREHOLE BH88-MZ1

SHEET 1 OF 1

LOCATION MAIN ZONE 7,146,675.8N X 565,371.7E

BORING DATE 13 JULY 1988

DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ●, rem.V.- ⊕ U.- O)	HYDRAULIC CONDUCTIVITY, k, CM/SEC; WATER CONTENT, PERCENT (Wp, W, Wl; 20, 40, 60, 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		176.10							Frost Depth Indicator
		TOPSOIL - dark brown organic Sandy Silt, wet		176.00							
		SAND- fine to medium subrounded sand, trace silt, medium brown, loose, moist		0.10	1	AS	-				THAWED
		PERMAFROST @ 0.70m 0.70 to 0.80m - Nbe			2	AS	-				
				175.30							
1	MOBILE B-40 MOBILE AUGERS	SAND TILL - fine to coarse Sand, some fine Gravel, subrounded, some Silt, trace Clay, non-plastic (SM)		0.80	3	AS CAREL	-		o	M,H	09 AUG 1988 0.87m 31 AUG 1988 1.01m
		PERMAFROST 0.80 to 1.25m - Vs, 1-3mm thick, clear, hard 1.45 to 1.70m - Vs to Vr, 2-3mm thick, hard, light brown									b = 1920kg/cm d = 1552kg/cm
		from 1.45 to 1.70m SANDY GRAVEL TILL - fine to coarse subrounded Gravel, fine to coarse Sand, some Silt, trace Clay, non-plastic (GM)			4	AS CAREL	-		o	M,H	FROZEN b = 1640kg/cm d = 1064kg/cm
2		1.70 to 2.30m Cobbles and Boulders			5	AS CAREL	-		o	M,H	
				173.80							
		End of Borehole Auger refusal in boulders and cobbles		2.30							2.30m
3											
4											
5											

16 (0 / 10) 6 PERCENT AXIAL STRAIN AT FAILURE

DEPTH SCALE

1 : 25

Golder Associates

LOGGED R.W.M.

CHECKED

881 PF

RECORD OF BOREHOLE BH88-MZ2

SHEET 1 OF 1

LOCATION MAIN ZONE 7,146,729.3N X 565,152.8E

BORING DATE 13/07/88

DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ● rem.V.- ⊕ U.- O)	HYDRAULIC CONDUCTIVITY, k, CM/SEC / WATER CONTENT, PERCENT (Wp, W, Ws; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	MOBILE B-40 MOBILE AUGERS	Ground Surface		178.40							
		TOPSOIL - dark brown organic Silt		178.30							
				0.10							
		SANDY SILT TILL - some fine to coarse subrounded Sand, fine and coarse Gravel, some Clay, non-plastic (ML)			1	AS	-				
		No PERMAFROST			2	AS	-		O	M, H	
1				177.00							
		End of Borehole Auger refusal in boulders or cobbles		1.40							
2											
3											
4											
5											

16 (0 / 10) 6 PERCENT AXIAL STRAIN AT FAILURE

DEPTH SCALE 1 : 25

LOGGED R.W.M.

CHECKED

Golder Associates

RECORD OF BOREHOLE BH88-CZ1

SHEET 1 OF 1

LOCATION CENTRE ZONE 7,146,959.7N X 565,843.8 BORING DATE 12 JULY 1988 DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ● rem.V.- ⊕ U.- O)	HYDRAULIC CONDUCTIVITY, k, CM/SEC / WATER CONTENT, PERCENT (Wp W Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	MOBILE B-40 MOBILE AUGERS	Ground Surface		180.90							
		TOPSOIL - black, organics		180.80							
		SILTY SAND TILL - fine to coarse subrounded Sand, some fine and coarse subrounded Gravel, some Clay, non-plastic (SM)		0.10	1	AS	-				
		PERMAFROST @ 0.90m 0.90 to 1.12m - Vs, 2-4mm thick, clear, hard			2	AS	-		O	M,H	
1		@ 1.13 to 1.80m abundant cobbles and boulders			3	AS CREL	-		O	M,H	b = 2109kg/cm d = 1717kg/cm
					4	AS	-		O	M,H	
				179.05							
2		End of Borehole Auger refusal in cobbles or boulders		1.85							
3											
4											
5											

0 15 10 6 PERCENT AXIAL STRAIN AT FAILURE

881 PF

DEPTH SCALE 1 : 25

Golder Associates

LOGGED R.W.M.

CHECKED

RECORD OF BOREHOLE BH88-1WD1

SHEET 1 OF 1

LOCATION WASTE DUMP 7,146,381.2N X 665,538.7E BORING DATE 12 JULY 1988 DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ● rem.V.- ⊕ U.- O)	HYDRAULIC CONDUCTIVITY, k, CM/SEC / WATER CONTENT, PERCENT (Wp, W, Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	MOBILE B-40 / MOBILE AUGERS	Ground Surface		174.10							
		TOPSOIL - black organic Silt, damp		174.00							
		SILTY SAND TILL - fine to coarse subrounded Sand, some fine subrounded Gravel, some Clay, non-plastic (SM)		0.10	1	AS	-				
		PERMAFROST @ 0.50m 0.60m to 1.25m - Nbn (Est'd)			2	AS	-		O	M, H	
		End of Borehole Auger refusal in boulders or cobbles		172.85 1.25							
1											
2											
3											
4											
5											

0 / 16 ◆ 6 PERCENT AXIAL STRAIN AT FAILURE / 10

DEPTH SCALE 1 : 25

Golder Associates

LOGGED R.W.M.

CHECKED

PR. 881-

RECORD OF BOREHOLE BH88-1WD2

SHEET 1 OF 1

LOCATION WASTE DUMP 7,146,358.3N X 565,891.8E BORING DATE 12 JULY 1988 DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ● rem.V.- ⊕ U.- O)	HYDRAULIC CONDUCTIVITY, k, CM/SEC / WATER CONTENT, PERCENT (Wp, W, Wl; 20, 40, 60, 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	MOBILE B-40 MOBILE AUGERS	Ground Surface		173.70							
		TOPSOIL - black organcs, Silt		173.60							
		sand and gravel, medium to coarse subrounded sand and gravel, trace silt, medium brown		0.10	1	AS	-				
1		0.95 to 1.25m SAND AND GRAVEL			2	AS	-				
		PERMAFROST @ 1.00m 1.00 to 1.70m - Nbe		172.40							
		GRAVELLY SAND TILL - fine to coarse subrounded Sand, fine and coarse subrounded Gravel, trace Silt, trace Clay, non-plastic (SP)		1.30	3	AS	-		o	M, H	
		@ 1.50m cobbles encountered		172.00							
		End of Borehole Auger refusal in boulders and cobbles		1.70							
2											
3											
4											
5											

0
15 6 PERCENT AXIAL STRAIN AT FAILURE
10

DEPTH SCALE 1 : 25

Golder Associates

LOGGED R.W.M.

CHECKED

RECORD OF BOREHOLE BH88-2WD1

SHEET 1 OF 1

LOCATION WASTE DUMP 7,147,586.1N X 565,791.0E

BORING DATE 12 JULY 1988

DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ● rem.V.- ⊕ U.- O)	HYDRAULIC CONDUCTIVITY, k, CM/SEC / WATER CONTENT, PERCENT (Wp, W, Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		196.20							
	MOBILE B-40 MOBILE AUGERS	TOPSOIL - black organics, Silt		196.10							
		gravelly till, fine to coarse subrounded sand and gravel, silty damp with abundant cobbles throughout		0.10	1	AS	-				
1					2	AS	-				
		PERMAFROST @ 1.00m (Est'd)		195.00							
		End of Borehole Auger refusal in boulders and cobbles		1.20							
2											
3											
4											
5											

0 16 10 6 PERCENT AXIAL STRAIN AT FAILURE

DEPTH SCALE 1 : 25

Golder Associates

LOGGED R.W.M.

CHECKED

RECORD OF BOREHOLE BH88-1MHR1

SHEET 1 OF 1

LOCATION MINE HAUL ROAD 7,147,471.7N X 565,346.2E BORING DATE 12 JULY 1988 DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ● rem.V.- ⊕ U.- O)	HYDRAULIC CONDUCTIVITY, k, CM/SEC / WATER CONTENT, PERCENT (Wp, W, Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	MOBILE B-40 MOBILE AUGERS	Ground Surface		203.20							
		TOPSOIL - black, organic Silt, moist		203.10							
		SILTY SAND TILL - fine to coarse subrounded Sand, some fine and coarse subrounded Gravel, some Clay, low plastic, medium reddish brown, moist (SM-SC)		0.10	1	AS	-				
		PERMAFROST not observed			2	AS	-				
1		@ 0.92m abundant cobbles									
		@ 0.52 to 0.97m till, mottled medium reddish brown to dark brown			3	AS	-		o	M,H	
		@ 0.92 to 1.52m occasional cobbles		201.68							
		End of Borehole Auger refusal on boulders or cobbles		1.52							
2											
3											
4											
5											

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m

SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ● rem.V.- ⊕ U.- O)

HYDRAULIC CONDUCTIVITY, k, CM/SEC

WATER CONTENT, PERCENT (Wp, W, Wl; 20 40 60 80)

0 15 10 5 PERCENT AXIAL STRAIN AT FAILURE

DEPTH SCALE 1 : 25

Golder Associates

LOGGED R.W.M.

CHECKED

RECORD OF BOREHOLE BH88-1MHR2

SHEET 1 OF 1

LOCATION MINE HAUL ROAD 7,147,853.9N X 585,206.8E BORING DATE 12 JULY 1988 DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ● rem.V.- ⊕ U.- O)	HYDRAULIC CONDUCTIVITY, k, CM/SEC / WATER CONTENT, PERCENT (Wp, W, Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	MOBILE B-40 MOBILE AUGERS	Ground Surface		208.30							
		SILTY SAND - fine Sand, trace Clay, light brown, wet		0.00							
				207.85							
		SANDY TILL - fine to coarse subrounded sand, fine to coarse subrounded gravel		0.45	1	AS	-				
1		PERMAFROST @ 0.70m 0.70 to 1.45m - Nbe (Est'd)			2	AS	-		O		
				206.85							
		End of Borehole Auger refusal in boulders or cobbles		1.45							
2											
3											
4											
5											

0 16 10 6 PERCENT AXIAL STRAIN AT FAILURE

DEPTH SCALE 1 : 25

Golder Associates

LOGGED R.W.M.

CHECKED

RECORD OF BOREHOLE BH88-1MHR3

SHEET 1 OF 1

LOCATION MINE HAUL ROAD 7,147,879.5N X 585,176.0E BORING DATE 11 JULY 1988 DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m; SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ●, rem.V.- ⊕ U.- O)	HYDRAULIC CONDUCTIVITY, k, CM/SEC; WATER CONTENT, PERCENT (Wp, W, Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		209.70							
	MOBILE B-40 / MOBILE AUGERS	TOPSOIL - dark grey, black organics, wet		209.60							
		GRAVELLY SAND TILL - fine to coarse subangular Sand, fine and coarse subangular Gravel, some Silt, trace Clay, low plastic, moist (SM-SC)		0.10	1	AS	-		o		
1		@0.60 to 1.35m increasing Sand content									
		PERMAFROST @ 1.00m 1.00 to 1.35m - Nbn 1.46 to 1.95m - permafrost melted by augers			2	AS	-				
		@ 1.46m abundant cobbles			3	AS	CORREL		o	M,H	bf = 1324kg/cum d = 1074kg/cum
					4	AS	-		o		
2		End of Borehole Auger refusal in cobbles or boulders		207.75 1.95							
3											
4											
5											

0 16 6 10 PERCENT AXIAL STRAIN AT FAILURE

DEPTH SCALE 1 : 25

Golder Associates

LOGGED R.W.M.

CHECKED

RECORD OF BOREHOLE BH88-1MHR5

SHEET 1 OF 1

LOCATION MINE HAUL ROAD M 7,148,415.2N X 664,828.4E BORING DATE 11 JULY 1988 DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ● rem.V.- ⊕ U.- O)	HYDRAULIC CONDUCTIVITY, k, CM/SEC / WATER CONTENT, PERCENT (Wp, W, Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0		Ground Surface		222.00							
	MOBILE B-40 MOBILE AUGERS	TOPSOIL - dark brown organic Silt		221.90							
		SAND TILL - fine to coarse subrounded Sand, some fine and coarse Gravel, subrounded, some Silt, some Clay, medium reddish brown, moist (SM-SC)		0.10	1	AS	-				
		PERMAFROST @ 0.60m 0.60 to 0.90m - Nbn 0.90 to 1.35m - Nbe (Est'd) 1.35 to 2.60m - Nbn and Nbe									
1					2	AS	-		O	M, H	
		abundant cobbles @ 1.35m									
		1.35 to 2.60m GRAVELLY SAND TILL, fine to medium subrounded sand, fine, trace coarse subrounded gravel, some Silt									
2					3	AS	-				
				219.40							
		End of Borehole Auger refusal in boulders or cobbles		2.60							
3											
4											
5											

0 16 10 5 PERCENT AXIAL STRAIN AT FAILURE

DEPTH SCALE 1 : 25

Golder Associates

LOGGED R.W.M.

CHECKED

RECORD OF BOREHOLE BH88-1MHR6

SHEET 1 OF 1

LOCATION MINE HAUL ROAD 7,148,877.6N X 564,460.7E BORING DATE 11 JULY 1988 DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ● rem.V.- ⊕ U.- O)	HYDRAULIC CONDUCTIVITY, k, CM/SEC / WATER CONTENT, PERCENT (Wp W Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	MOBILE B-40 MOBILE AUGERS	Ground Surface		239.40							
		TOPSOIL - reddish brown organic till		239.30							
		SILTY SAND TILL - fine to coarse subrounded Sand, some fine and coarse subrounded Gravel, trace Clay, moist, lower moisture content 0.48 to 1.25m		0.10	1	AS	-				
		PERMAFROST @ 0.70m 0.70 to 2.80m - Nbn			2	AS	-				
1		1.25 to 2.80m increased gravel content									
		GRAVELLY SAND TILL - fine to coarse Sand, fine and coarse Gravel, some Silt, some Clay, low plastic (SM-SC)			3	AS	-		o	M,H	
2				236.60							
		End of Borehole Auger refusal in boulders or cobbles		2.80							
3											
4											
5											

0
16 ⊕ 6 PERCENT AXIAL STRAIN AT FAILURE
10

DEPTH SCALE 1 : 25

Golder Associates

LOGGED R.W.M.

CHECKED

RECORD OF BOREHOLE BH88-1MHR4

SHEET 1 OF 1

LOCATION MINE HAUL ROAD 7,148,212.5N X 564,965.1E

BORING DATE 11 JULY 1988

DATUM GEODETIC

SAMPLER HAMMER, 63.5kg, DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg, DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: BLOWS/0.3M	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m / SHEAR STRENGTH Cu, kPa (nat.V.- + Q.- ● rem.V.- ⊕ U.- O)	HYDRAULIC CONDUCTIVITY, k, CM/SEC / WATER CONTENT, PERCENT (Wp, W, Wl; 20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
0	MOBILE B-40 / MOBILE AUGERS	Ground Surface		214.70							
		TOPSOIL - dark grey to black organic silt		214.60							
		SILTY SAND TILL - fine to coarse subrounded sand, trace fine to coarse subrounded gravel, medium reddish brown, damp to 0.70m		0.10							
		PERMAFROST @ 0.70m (Est'd) 0.70 to 1.52m - Nbn			1	AS	-				
1											
		End of Borehole Auger refusal in boulders or cobbles		213.18 1.52							
2											
3											
4											
5											

16 (0 / 10) 6 PERCENT AXIAL STRAIN AT FAILURE

DEPTH SCALE 1 : 25

Golder Associates

LOGGED R.W.M.

CHECKED

TABLE 6 SUMMARY OF LABORATORY TEST RESULTS MINE AND DUMP OVERBURDEN

Borehole No.	Sample No.	Depth (m)	Grain Size Distribution - % Gravel	Sand	Silt	Clay	Plasticity W	Wp	Ip	Unified Class'n	W%	*Other Tests
MAIN ZONE												
BH88-MZ1	AS3 (CRREL)	0.70-1.25	13	73	1	13	Non-Plastic			SM	23.7	γ_{bf}1920 γ_d1552
			SAND TILL, some Gravel, some Clay, trace Silt									
BH88-MZ1	AS3 (CRREL)	1.49-1.60	40	30	24	6	Non-Plastic			GM	54.2	γ_{bf}1640 γ_d1064
			SANDY GRAVEL TILL, some Silt, trace Clay									
BH88-MZ1	AS5	1.67-2.30	21	48	22	9	Non-Plastic			SM	9.0	Nil
			SAND TILL, some Gravel, some silt, trace Clay									
BH88-MZ2	AS2	0.51-1.25	17	32	40	11	Non-Plastic			ML	10.5	Nil
			SANDY SILT TILL, some Gravel, some Clay									
CENTRE ZONE												
BH88-CZ1	AS2	0.42-0.92	16	43	30	11	Non-Plastic			SM	6.4	Nil
			SILTY SAND TILL, some Gravel, some Clay									
BH88-CZ1	AS3 (CRREL)	0.92-1.14	30	39	21	10	Non-Plastic			SM	22.8	γ_{bf}2109 γ_d1717
			GRAVELLY SAND TILL, some Silt, some Clay									
BH88-CZ1	AS4	1.13-1.85	15	44	30	11	Non-Plastic			SM	6.6	Nil
			SILTY SAND TILL, some Gravel, some Clay									
WASTE DUMPS												
BH88-1WD1	AS2	0.53-1.29	17	45	25	13	Non-Plastic			SM	7.7	Nil
			SILTY SAND TILL, some Gravel, some Clay									
BH88-1WD2	AS3	1.25-1.50	35	56	5	4	Non-Plastic			SP	4.4	Nil
			GRAVELLY SAND TILL, trace Silt, trace Clay									

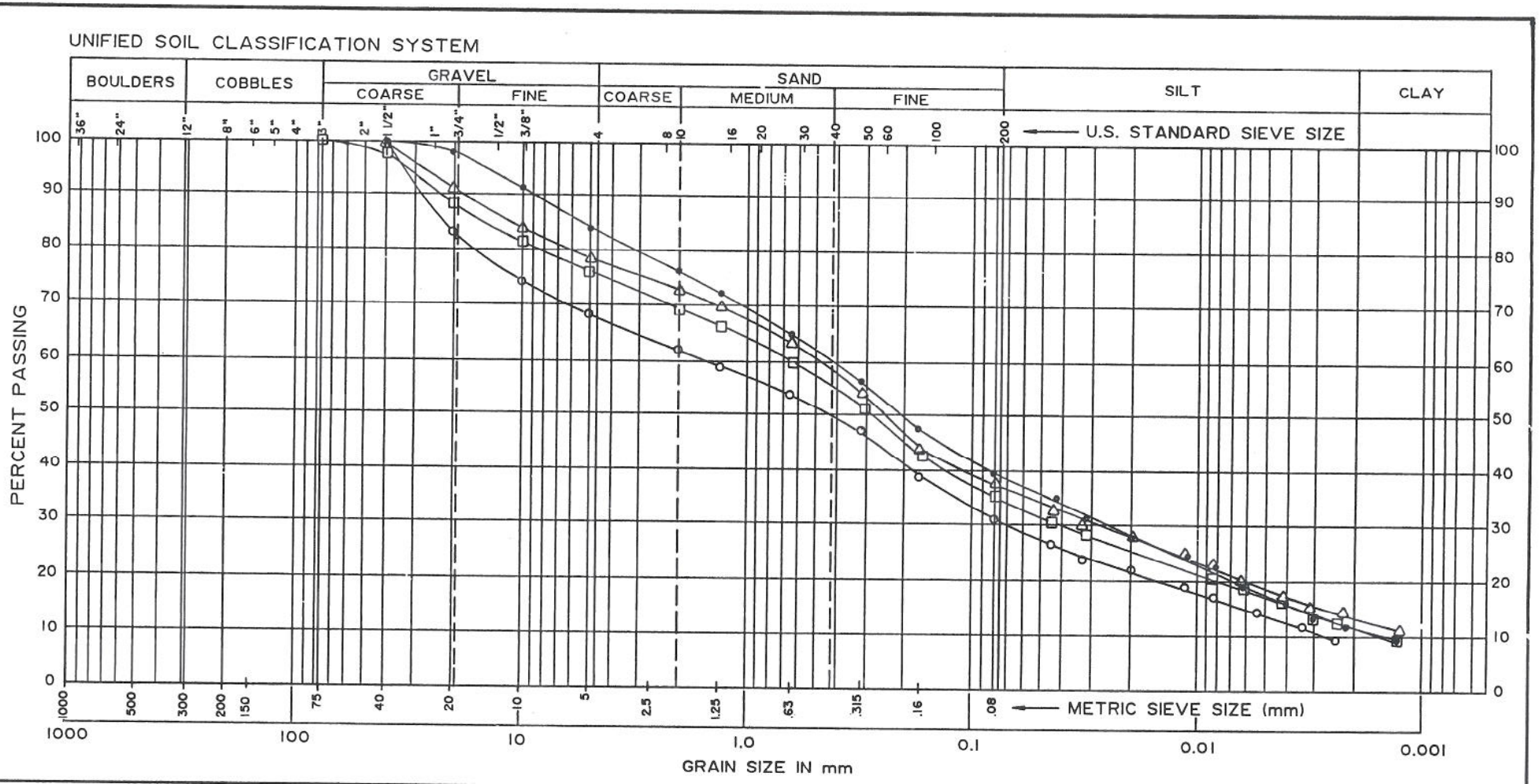
* Other Tests - γ_{bf} = Bulk Frozen Density (kg/cu.m). γ_d = Dry Density (kg/cu.m)
Gs = Specific Gravity Soil Solids

TABLE 7 SUMMARY OF LABORATORY TEST RESULTS - MINE HAUL ROAD

Borehole No.	Sample No.	Depth (m)	Grain Size Distribution - % Gravel	Sand	Silt	Clay	Plasticity Wl	Wp	Ipa	Unified Class'n	W%	*Other Tests
BH88-1MHR1	AS3	0.92-1.50	17	45	26	12 SILTY SAND TILL, some clay, some Gravel	Not Tested			SM-SC	9.5	Nil
BH88-1MHR2	AS2	0.90-1.45	Not Tested								13.1	Nil
BH88-1MHR3	AS1	0.00-0.60	Not Tested								9.2	Nil
BH88-1MHR3	AS3 (CRREL)	1.35-1.46	32	38	22	8 GRAVELLY SAND TILL, some Silt, trace Clay	Not Tested			SM-SC	23.2	γ_{bf} 1324 γ_d 1074
BH88-1MHR3	AS4	1.45-1.95	Not Tested								8.4	Nil
BH88-1MHR5	AS2	0.92-1.35	22	41	24	13 SAND TILL, some Silt, some Gravel, some Clay	Not Tested			SM-SC	10.5	Nil
BH88-1MHR6	AS3	1.25-2.80	25	41	22	12 GRAVELLY SAND TILL, some Silt, some Clay	Not Tested			SM-SC	9.1	Nil

* Other Tests - γ_{bf} = Bulk Frozen Density (kg/cu.m), γ_d = Dry Density (kg/cu.m.),

Gs = Specific Gravity Soil Solids



REMARKS: SILTY SAND TILL

Hole No.:	SYMBOL	BH No.	Sa. No.	DEPTH (m)	I_P	UNIFIED CLASS.
Sample No.:	∘	BH88-IMHR1	AS3	0.92-1.50	NOT	SM-SC
	o	BH88-IMHR3	CRREL	1.35-1.46	TESTED	SM-SC
Depth (m):	△	BH88-IMHR5	AS2	0.92-1.35	↓	SM-SC
	□	BH88-IMHR6	AS3	1.25-2.80		SM-SC
Dwn.:						
Revw'd.:						
Date:						

Unified Soil Classification:

URANGESELLSCHAFT CANADA LIMITED
KIGGAVIK PROJECT

GRAIN SIZE DISTRIBUTION

MINE HAUL ROAD

Golder Associates

Project No. 881-1814D

Figure **2**

PROJECT: 09-1362-0613 AREVA KIGGAVIK
LOCATION: ANDREW LAKE N 7134809.000 E 553319.000
G.S. ELEVATION: 167.07m (Estimated based on LiDAR Data)
DATUM: NAD 83, Zone 14
INCLINATION: -65
AZIMUTH: 330

RECORD OF DRILLHOLE: AND09-02

DRILLING DATE: July 15-21, 2009
DRILLING CONTRACTOR: BOART LONGYEAR
LOGGED: MC/JW/MG/EAM
CHECKED: EAM

DEPTH SCALE METRES	DESCRIPTION	ELEV. DEPTH (mAH)	RUN NUMBER
	DRILL BLOCK=2.22mAGS	167.07	
0	OVERBURDEN (0.00-11.00m) Fine to coarse SAND, with some PEBBLES and GRAVEL, fragments of COBBLES/BOULDERS	0.00	
10	Casing Depth = 14.00m	157.10	
15	HEMATITE ALTERED METASEDIMENT (11.00-25.40m) Moderately weathered, strong foliation (contorted) with high density microdefecting infilled with quartz (2mm to 25 mm thick), dark red with white, fine grained, moderate porosity, weak, at 18 m rock becoming less microdefected, but slightly desilicified/leached and medium strong	11.00	1 2 3 4 5 6
25	SILT (25.40-26.81m) Completely weathered, reddish brown, assumed washout of lost core	144.05	7
	METASEDIMENT (26.91-50.00m) Moderately weathered, faint foliation, microdefecting with quartz veining, faintly porous, medium strong, beige red to brick red	142.68 26.91	8 9 10 11 12 13 14 15 16 17 18
50	METASEDIMENT - FAULT (50.00-57.15m) Slightly weathered, mostly reddish brown with white and medium to dark grey, very high density microdefecting (looks crushed but still quite intact), slightly porous, weak, fine grained	121.75 50.00	19 20 21
60	HEMATITE ALTERED GRANITE (57.15-58.50m) Fresh, massive, reddish brown, very minor microdefecting/quartz veining, faintly porous, medium strong, fine grained	115.27 114.05 58.50	22 23 24 25 26
70	ALTERED METASEDIMENT (58.50-70.17m) Slightly weathered, strong foliation (slightly contorted), reddish brown and dark green with some beige (leached) zones, fine grained, slightly porous, weak	103.47 70.17	27 28 29
75	HEMATITE ALTERED GRANITE (70.17-97.10m) Slightly weathered, massive with moderate density microdefecting (few quartz veins), reddish brown, slightly porous and pitted, fine crystalline, medium strong		30 31 32 33 34 35 36 37 38
90	- at 91.00m; areas of broken core coincide with areas of increased leaching	79.07	
95	CHLORITE MUSCOVITE SCHIST (97.10-107.67m) Green and red, strong foliation, frequent quartz veins parallel to foliation, banded hematite alteration, high chlorite and muscovite content QUARTZ Vein at 103.14-103.26m; fresh, very strong	97.10 69.49	39 40 41 42 43
110	HEMATITE ALTERED METASEDIMENT (107.67-118.65m) Moderately altered, strong foliation, beige to reddish brown, slightly porous, weak	107.67 59.54	44 45 46 47
120	DISTURBED SYENITE (118.65-122.06m) Slightly weathered, brecciated texture, light brown light green and white, faintly porous, micro and medium crystalline, medium strong	118.65 56.45	48 49
125	LEACHED METASEDIMENT (122.06-135.37m) Moderately weathered, strong foliation, medium to high density microdefecting with quartz veining, beige with medium grey and white, leached, slightly porous, weak rock	122.06 45.24	50 51 52 53 54
135	LEACHED SCHIST (134.42-154.06m) Slightly to completely weathered and leached, strong foliation, beige with some reddish brown, slightly pitted, fine grained, weak to extremely weak	134.42	55 56 57
140	*CONTINUED NEXT PAGE*		

DISCONTINUITY DATA: CORE RECOVERY (TOTAL CORE %, R.Q.D. %); FRACTURE INDEX PER 0.25m; Dip Direction; DIP w.r.t. CORE AXIS; (Jcon) JOINT CONDITION; (Jr) JOINT ROUGHNESS; (Ja) JOINT ALTERATION; (Jn) NUMBER OF FRACTURE SETS; BROKEN CORE / LOST CORE; ROCK STRENGTH INDEX (R6-R0); WEATHERING INDEX (W0-W6); HYDRAULIC CONDUCTIVITY K, m/sec

INSTALLATION DETAILS/ ABANDONMENT DETAILS: No Installation

ELEVATION (masl Vertical)

DEPTH SCALE
1 : 400

SHEET 1 OF 3

DRILLHOLE: AND09-02

Golder Associates

SASK-ROCK-KIGGAVIK 09-1362-0613-DRILLHOLES.GPJ GAL-SASK.GDT 2/11/09 SIB

PROJECT: 09-1362-0613 AREVA KIGGAVIK
LOCATION: ANDREW LAKE N 7134809.000 E 553319.000
G.S. ELEVATION: 167.07m (Estimated based on LiDAR Data)
DATUM: NAD 83, Zone 14
INCLINATION: -65
AZIMUTH: 330

RECORD OF DRILLHOLE: AND09-02

DRILLING DATE: July 15-21, 2009
DRILLING CONTRACTOR: BOART LONGYEAR

LOGGED: MC/JW/MG/EAM
CHECKED: EAM

DEPTH SCALE METRES | DESCRIPTION | STRATA PLOT | ELEV. DEPTH (mAH) | RUN NUMBER | CORE RECOVERY: TOTAL CORE % | R.Q.D. % | FRACTURE INDEX PER 0.25m | DISCONTINUITY DATA: Dip Direction | DIP w.r.t. CORE AXIS | (Jcon) JOINT CONDITION | (Jr) JOINT ROUGHNESS | (Ja) JOINT ALTERATION | (Jn) NUMBER OF FRACTURE SETS | BROKEN CORE / LOST CORE | ROCK STRENGTH INDEX (R6-R0) | WEATHERING INDEX (W0-W6) | HYDRAULIC CONDUCTIVITY K, m/sec | INSTALLATION DETAILS/ ABANDONMENT DETAILS | ELEVATION (masl Vertical)

LEACHED SCHIST (134.42-154.06m)
Slightly to completely weathered and leached, strong foliation, beige with some reddish brown, slightly pitted, fine grained, weak to extremely weak *(continued)*

27.44

GNEISS (154.06-169.05m)
Slightly weathered, strong foliation, some quartz veins (< 20mm) throughout, non porous, red and green, medium to strong

154.06

13.86

METASEDIMENT (169.05-230.34m)
Highly chlorite altered, thinly foliated, green, some quartz veining, hematite alteration more pervasive after 169.75m

169.05

- from 176.00-177.57m; becoming reddish greenish white, highly bleached to white

- at 204.00m; disseminated metallic hematite, Increase in silica content make the rock more brittle/rubblized

- at 216.00m; dark purplish red, intensive quartz veining

- at 223.80-224.60m; potential fault zone or clay seam, characterized by rubble

-41.69

230.34

PELITIC GNEISS (230.34-255.00m)
Red becoming grey and white, thinly foliated, medium crystalline, sparse healed fracturing, becomes more mafic with depth

- at 241.00m; green and red banded, frequent veining both concordant and discordant to foliation, mica content is variable, alteration is likely chloritic and K-feldspar

- at 253.00m; core is very degradable, high chlorite content

-64.04

255.00

DISTURBED CHLORITIC SCHIST (255.00-264.00m)
Slightly weathered, strong foliation, very disturbed - high density microdefecting/quartz veining, medium to dark greenish grey, fine grained, faintly porous

-72.20

264.00

SYENITIC GNEISS (264.00-330.00m)
Fresh, strong foliation, black pink and grey, fine to medium crystalline, faint (sometimes moderate) porosity, very strong, occasional sulphides in rock and on discontinuity surfaces

CONTINUED NEXT PAGE

BROKEN CORE / LOST CORE: 139.95; 139.70; 153.87; 154.68; 154.96; 155.40; 156.00; 158.20; 158.40; 159.46; 159.55; 165.81; 166.00; 167.15; 168.00; 171.04; 171.12; 173.16; 174.25; 178.42; 178.80; 184.63; 184.68; 187.58; 187.73; 196.62; 196.80; 196.93; 197.12; 198.70; 198.76; 209.07; 209.43; 210.00; 212.13; 213.00; 218.82; 223.86; 224.00; 229.13; 230.08; 230.26; 231.39; 231.61; 250.65; 250.82; 256.88; 256.98; 263.89; 264.80

INSTALLATION DETAILS/ ABANDONMENT DETAILS: No Installation

DEPTH SCALE
1 : 400

Golder Associates

DRILLHOLE: AND09-02

SASK-ROCK-KIGGAVIK 09-1362-0613-DRILLHOLES.GPJ GAL-SASK.GDT 2/11/09 SIB

PROJECT: 09-1362-0613 AREVA KIGGAVIK
LOCATION: ANDREW LAKE N 7134809.000 E 553319.000
G.S. ELEVATION: 167.07m (Estimated based on LiDAR Data)
DATUM: NAD 83, Zone 14
INCLINATION: -65
AZIMUTH: 330

RECORD OF DRILLHOLE: AND09-02

DRILLING DATE: July 15-21, 2009
DRILLING CONTRACTOR: BOART LONGYEAR

LOGGED: MC/JW/MG/EAM
CHECKED: EAM

DEPTH SCALE METRES | DESCRIPTION | STRATA PLOT | ELEV. DEPTH (mAH) | RUN NUMBER | CORE RECOVERY: TOTAL CORE % | R.Q.D. % | FRACTURE INDEX PER 0.25m | DISCONTINUITY DATA: Dip Direction | DIP w.r.t. CORE AXIS | (Jcon) JOINT CONDITION | (Jr) JOINT ROUGHNESS | (Ja) JOINT ALTERATION | (Jn) NUMBER OF FRACTURE SETS | BROKEN CORE | LOST CORE | ROCK STRENGTH INDEX (R6-R0) | WEATHERING INDEX (W0-W6) | HYDRAULIC CONDUCTIVITY K, m/sec | INSTALLATION DETAILS/ ABANDONMENT DETAILS | ELEVATION (masl Vertical)

SYENITIC GNEISS (264.00-330.00m)
Fresh, strong foliation, black pink and grey, fine to medium crystalline, faint (sometimes moderate) porosity, very strong, occasional sulphides in rock and on discontinuity surfaces *(continued)*

- at 309.50m; K-feldspar alteration becomes pervasive

- at 320.00m; K-feldspar alteration becomes intermittent

-132.01 | 330.00

END OF HOLE = 330m

No Installation

DEPTH SCALE
1 : 400

Golder Associates

DRILLHOLE: AND09-02

SASK-ROCK-KIGGAVIK 09-1362-0613-DRILLHOLES.GPJ GAL-SASK.GDT 2/11/09 SIB

PROJECT: 09-1362-0613 AREVA KIGGAVIK
LOCATION: ANDREW LAKE N 7134574.000 E 533312.000
G.S. ELEVATION: 166.21m (Estimated based on LiDAR Data)
DATUM: NAD 83, Zone 14
INCLINATION: -70
AZIMUTH: 284

RECORD OF DRILLHOLE: AND09-03

DRILLING DATE: July 22-28, 2009
DRILLING CONTRACTOR: BOART LONGYEAR

LOGGED: EAM/JW/MC/MG/GY
CHECKED: EAM

DEPTH SCALE METRES	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (mAH)	RUN NUMBER
	DRILL BLOCK=2.28mAGS		166.21	
0	OVERBURDEN (0.00-7.50m) Boulders, sandy, silty, clayey till like material with some core stone recovered from casing Casing Depth = 8.00m		0.00 159.16	
10	GRANITE (7.50-18.90m) Blackish whitish red, coarsely crystalline, minor microfracturing present that is moderately to sub vertically dipping		7.50	1 2 3 4 5
20	METASEDIMENT (18.90-20.55m) Green, foliated, weak to moderate chlorite alteration, banded quartz, moderately porous, medium-strong to weak rock	MS	18.90 146.90	6
	GRANITE DYKE (20.55-21.19m) Blackish whitish red, coarsely crystalline, minor microfracturing present, that is moderately to sub vertically dipping		145.63	7
30	METASEDIMENT (21.90-51.00m) Grey, foliation is less well defined than above and variable, weak chlorite alteration - frequent quartz veining both parallel and not parallel to foliation	MS	21.90	8 9 10 11 12 13 14 15 16 17 18
50	CHLORITIC METASEDIMENT (51.00-71.53m) Slightly weathered, strong foliation with high density microdefecting usually with thin quartz infilling, dark greenish grey with medium orange brown weathering, faint to moderate porosity, medium strong	MS	118.29 51.00	19 20 21 22 23 24 25
70	HEMATITE ALTERED METASEDIMENT (71.53-106.54m) Moderately weathered, moderate remnant foliation, reddish brown and beige, hematitic paleoweathering and some leached zones, fine grained, moderately porous to pitted, strong, contains many fractures parallel to core axis, veining is abundant, microfractures with alteration halos are also abundant and easily broken.	MS	98.99 71.53	26 27 28 29 30 31 32 33 34 35 36 37 38
105	CHLORITE - HEMATITE METASEDIMENT (106.54-112.02m) Slightly weathered, strong foliation, reddish brown and dark green with some white, fine grained, faintly porous, chloritic and hematitic alteration in bands along foliation planes, low to medium density microdefects with frequent quartz infilling, medium strong	MS	66.10 106.54	39 40 41 42
115	FAULT ZONE - CHLORITE - HEMATITE METASEDIMENT (112.02-117.00m) Crushed rock and gouge zones with washed zones		60.95 112.02 56.27 117.00	43
120	CHLORITE - HEMATITE METASEDIMENT (117.00-129.56m) Slightly weathered, strong foliation, reddish brown dark green with some white, fine grained, faintly porous, chloritic and hematitic alteration in bands along foliation planes, with higher density microdefecting frequent quartz infilling, and weak	MS		44 45 46 47 48 49 50 57 58 59
130	SYENITE DYKE (129.56-129.98m) Moderately weathered massive reddish and orange brown, pitted, fine crystalline, medium strong		44.46 129.98	
140	*CONTINUED NEXT PAGE*			

DISCONTINUITY DATA: CORE RECOVERY (TOTAL CORE %, R.Q.D. %); FRACTURE INDEX PER 0.25m; Dip Direction; DIP w.r.t. CORE AXIS; (Jcon) JOINT CONDITION; (Jr) JOINT ROUGHNESS; (Ja) JOINT ALTERATION; (Jn) NUMBER OF FRACTURE SETS

BROKEN CORE / LOST CORE

ROCK STRENGTH INDEX (R6-R0)

WEATHERING INDEX (W0-W6)

HYDRAULIC CONDUCTIVITY K, m/sec

INSTALLATION DETAILS/ ABANDONMENT DETAILS

1	17.30 17.40
2	25.18 25.70 25.70 26.03 28.80 28.95
3	51.09 51.12 52.72 52.80 55.60 55.88 68.14 68.44 73.67 74.29 77.34 77.64 78.55 79.48 79.63 80.31
4	GROUT & PVC TS 2722 87.00 87.56 90.00 92.80 93.00 92.78 100.45 100.59
5	108.36 108.39 112.02 112.11 112.51 113.75 114.01 113.75 115.03 116.57 115.92 116.57 116.98 121.72 121.92 125.53 125.66 130.99 130.92 131.32

ELEVATION (masl Vertical)

DEPTH SCALE 1 : 400

SHEET 1 OF 3

DRILLHOLE: AND09-03

SASK-ROCK-KIGGAVIK 09-1362-0613-DRILLHOLES.GPJ GAL-SASK.GDT 2/11/09 SIB

PROJECT: 09-1362-0613 AREVA KIGGAVIK
LOCATION: ANDREW LAKE N 7134574.000 E 533312.000
G.S. ELEVATION: 166.21m (Estimated based on LiDAR Data)
DATUM: NAD 83, Zone 14
INCLINATION: -70
AZIMUTH: 284

RECORD OF DRILLHOLE: AND09-03

DRILLING DATE: July 22-28, 2009
DRILLING CONTRACTOR: BOART LONGYEAR
LOGGED: EAM/JW/MC/MG/GY
CHECKED: EAM

DEPTH SCALE METRES | DESCRIPTION | STRATA PLOT | ELEV. DEPTH (mAH) | RUN NUMBER | CORE RECOVERY: TOTAL CORE % | R.Q.D. % | FRACTURE INDEX PER 0.25m | DISCONTINUITY DATA: Dip Direction | DIP w.r.t. CORE AXIS | (Jcon) JOINT CONDITION | (Jr) JOINT ROUGHNESS | (Ja) JOINT ALTERATION | (Jn) NUMBER OF FRACTURE SETS | BROKEN CORE / LOST CORE | ROCK STRENGTH INDEX (R6-R0) | WEATHERING INDEX (W0-W6) | HYDRAULIC CONDUCTIVITY K, m/sec | INSTALLATION DETAILS/ ABANDONMENT DETAILS | ELEVATION (masl Vertical)

SHEARED METASEDIMENT (129.98-141.86m)
Moderately weathered, weak foliation, medium bluish to greenish grey with whites, medium density microdefecting with quartz veining, fine grained, non to faintly porous, some brecciated/ductile zones *(continued)*

SYENITE DYKE (141.86-143.37m)
Moderately weathered, massive reddish brown and brown, pitted, fine crystalline, strong

METASEDIMENT (143.37-148.36m)
Moderately weathered, weak foliation, medium bluish to greenish grey with whites, medium density microdefecting with quartz veining, fine grained, non to faintly porous, some brecciated/ductile zones

SHEARED METASEDIMENT (148.36-150.19m)
Moderately weathered , weak foliation, red with quartz veins, non to faintly porous, some ductile zones

METASEDIMENT - FAULT (150.19-171.00m)
Moderately weathered, highly foliated and sheared, deformed quartz veins, presence of gouge, weak to very weak

HEMATITE ALTERED METASEDIMENT (171.00-199.29m)
Slightly weathered, very high density microdefects with quartz infilling (1 mm to 6 mm), reddish brown and white, moderate porosity, fine grained, medium strong

HEMATITE ALTERED METASEDIMENT - FAULT (199.29-206.00m)
Slightly weathered, intact highly strained rock with brecciated zones (not healed), reddish brown transitioning to greenish grey, moderately porous, weak

PELITIC GNEISS (206.00-208.03m)
Fresh, strongly foliated with white quartz veins, red, grey and beige, fine grained, strong

SYENITIC GNEISS (208.03-296.50m)
Fresh, strong foliation, orange black and white, non to faintly porous, medium crystalline, medium strong

- from 259.00-261.00m; occasional healed quartz veins approximately 1 to 4 mm wide

CONTINUED NEXT PAGE

Broken core / lost core: 146.83–147.22; 150.10–151.98; 178.98–179.09; 194.65–194.82; 201.94–202.48; 248.04–248.30

INSTALLATION DETAILS: GROUT & PVC; 6, 7, 8, 9, 10

DEPTH SCALE 1 : 400

DRILLHOLE: AND09-03

Golder Associates

SASK-ROCK-KIGGAVIK 09-1362-0613-DRILLHOLES.GPJ GAL-SASK.GDT 2/11/09 SIB

PROJECT: 09-1362-0613 AREVA KIGGAVIK
LOCATION: ANDREW LAKE N 7134574.000 E 533312.000
G.S. ELEVATION: 166.21m (Estimated based on LiDAR Data)
DATUM: NAD 83, Zone 14
INCLINATION: -70
AZIMUTH: 284

RECORD OF DRILLHOLE: AND09-03

DRILLING DATE: July 22-28, 2009
DRILLING CONTRACTOR: BOART LONGYEAR

LOGGED: EAM/JW/MC/MG/GY
CHECKED: EAM

DEPTH SCALE METRES | DESCRIPTION | STRATA PLOT | ELEV. DEPTH (mAH) | RUN NUMBER | CORE RECOVERY: TOTAL CORE % | CORE RECOVERY: R.Q.D. % | FRACTURE INDEX PER 0.25m | DISCONTINUITY DATA: Dip Direction | DIP w.r.t. CORE AXIS | (Jcon) JOINT CONDITION | (Jr) JOINT ROUGHNESS | (Ja) JOINT ALTERATION | (Jn) NUMBER OF FRACTURE SETS | BROKEN CORE / LOST CORE | ROCK STRENGTH INDEX (R6-R0) | WEATHERING INDEX (W0-W6) | HYDRAULIC CONDUCTIVITY K, m/sec | INSTALLATION DETAILS/ ABANDONMENT DETAILS | ELEVATION (masl Vertical)

SYENITIC GNEISS (208.03-296.50m)
Fresh, strong foliation, orange black and white, non to faintly porous, medium crystalline, medium strong *(continued)*

- at 285.00m; increased pitting of core

- from 288.50-289.40m; alteration of rock causing grey/green discolouration and pitting, increased fractures

-112.41

ALTERED SYENITIC GNEISS (296.50-303.58m)
Altered, faintly porous, banded K-feldspar alteration, quartz veining continues, microfractures are abundant
- at 299.00m; rock appears bleached, slightly weathered and highly porous
- at 299.50m; weathering and pitting increases
- from 300.00-309.26m; possible FAULT ZONE

296.50

-119.06

SYENITIC GNEISS (303.58-308.26m)
Fresh, with abundant shears at variable angles

303.58

-123.46

BLEACHED SYENITIC GNEISS (308.26-313.95m)
Bleached, no longer degradable, slightly weathered, medium strong, pitted and altered, trace amount of microfractures

308.26

-128.81

SYENITIC GNEISS (313.95-321.15m)
Red, black, highly microfractured and quartz veining, staining and alteration along joint surfaces

313.95

-135.57

BLEACHED SYENITIC GNEISS (321.15-327.00m)
Bleached white-black-pink, microfractures and quartz veining, moderately porous, medium strong with small weak sections

321.15

-141.07

END OF HOLE = 327m

327.00

Broken core / lost core: 302.76–303.00; 305.05–305.18; 307.31–307.41; 308.26–308.63; 315.87–315.97; 318.16–318.29

INSTALLATION DETAILS: GROUT & PVC; VW 9036; VAN RUTH PLUG; OPEN HOLE

DEPTH SCALE
1 : 400

Golder Associates

SHEET 3 OF 3
DRILLHOLE: AND09-03

SASK-ROCK-KIGGAVIK 09-1362-0613-DRILLHOLES.GPJ GAL-SASK.GDT 2/11/09 SIB

PROJECT: 09-1362-0613 AREVA KIGGAVIK
LOCATION: END GRID LAKE N 7135933.830 E 554542.320
G.S. ELEVATION: 167.72m (Estimated based on LiDAR Data)
DATUM: NAD 83, Zone 14
INCLINATION: -80
AZIMUTH: 150

RECORD OF DRILLHOLE: END09-02

DRILLING DATE: June 8-14, 2009
DRILLING CONTRACTOR: BOART LONGYEAR

LOGGED: EMS/GY/AE/TF/JW
CHECKED: EAM

DEPTH SCALE METRES	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (mAH)	RUN NUMBER	CORE RECOVERY: TOTAL CORE %	CORE RECOVERY: R.Q.D. %	FRACTURE INDEX PER 0.25m	DISCONTINUITY DATA: Dip Direction	DIP w.r.t. CORE AXIS	(Jcon) JOINT CONDITION	(Jr) JOINT ROUGHNESS	(Ja) JOINT ALTERATION	(Jn) NUMBER OF FRACTURE SETS	BROKEN CORE / LOST CORE	ROCK STRENGTH INDEX (R6-R0)	WEATHERING INDEX (W0-W6)	HYDRAULIC CONDUCTIVITY K, m/sec	INSTALLATION DETAILS/ ABANDONMENT DETAILS	ELEVATION (masl Vertical)
0	TOP OF DRILL HEAD		167.72																165
	OVERBURDEN (0.00-6.00m) Clay rich muddy soil with peat (organic) and small angular metasediment pieces (5-30mm), soil is brown, rock fragments are grey Casing Depth = 6.00m (approx)		0.00 161.81															No Installation	
5	METASEDIMENT (6.00-27.00m) Brick red with white splotches with quartz and other hydrothermal veining, foliation present	MS	6.00	1										7.55–7.79; 8.75–9.00; 9.41–9.45; 10.39–10.42; 11.42–11.63; 13.78–13.86; 18.00–18.03; 20.33–20.39; 20.45					
10				2															
15				3															
20				4															
25				5															
				6															
			141.13	7															
30	METASEDIMENT (27.00-81.42m) Moderately weathered, massive with some distinguishable foliation, red to grey with white to pink veining and inclusions, less quartz veining, fine to coarse grained, medium strong rock	MS	27.00	8										30.46–30.50; 32.77–32.80; 32.80–33.00					
				9															
35				10															
				11															
40				12										36.25–36.30					
				13															
45				14										44.90–45.00					
	- breccia at 47.00-48.00m; up to 2 cm light red pieces, matrix is white clay, core falls apart when handled			15										47.49–47.54; 47.54–48.00					
50				16										48.57–49.32; 48.97–49.52					
				17															
55				18															
				19										56.87–56.89; 56.89–56.94					
60				20															
				21															
65	- at 65.37m; blocky (broken rock/sand/clay)			22										62.47–62.63; 62.63–63.00; 65.17–65.37; 65.37–65.47					
				23															
70				24–31										69.25–69.33					
				32															
75				33										72.68–73.30; 73.30–73.87; 75.51					
				34															
80				35										77.93–77.95; 77.95–78.00; 78.28					
			87.54	36															
	METASEDIMENT (81.42-87.00m) Slightly weathered, thickly laminated to thinly bedded foliation visible, grey to red to light red blotches of rock, slightly less quartz veining, fine to medium grained	MS	81.42	37–40										83.66–83.86; 83.86–84.13					
85				41															
			82.04	42															
	LOST CORE (87.00-88.80m) washout		87.00 80.27	43										87.00–88.80					
90	METASEDIMENT (88.80-108.00m) Slightly to moderately weathered, massive, foliation difficult to distinguish , white to light red with some grey sections, fine to medium grained. White sections very weak, light red-grey sections medium strong, no quartz veins	MS	88.80	44–45										89.38–89.95					
				46															
95				47–50										95.93–95.98					
				51															
				52–56															
100				57															
				58–59															
105	- Possible FAULT infilled with as much as 16 cm of clay. Core below 106.36m is coated with a thick layer of hematite rich (red) clay.			60–65										101.08–101.12; 106.36–106.41; 107.34–108.00					
			61.36	66															
110	METASEDIMENT (108.00-126.00m) Hematite and chlorite altered, core has soft soapy texture, slightly mottled, joint surface feel very soft and soapy, and are smooth to polished	MS	108.00	67–71															
115																			
120														122.80–122.83					
				72															
125			43.63																
	METASEDIMENT (126.00-150.00m) Brittle, hematite altered, rock seems porous and dry, breaks readily along microfractures when handled, foliation visible		126.00	73–74															
130														131.91–132.00					
				75															
135				76										134.92–135.00; 137.83–137.88					
				77															
140	*CONTINUED NEXT PAGE*																		

DEPTH SCALE
1 : 400

Golder Associates

DRILLHOLE: END09-02

SASK-ROCK-KIGGAVIK 09-1362-0613-DRILLHOLES.GPJ GAL-SASK.GDT 2/11/09 SIB

PROJECT: 09-1362-0613 AREVA KIGGAVIK
LOCATION: END GRID LAKE N 7135933.830 E 554542.320
G.S. ELEVATION: 167.72m (Estimated based on LiDAR Data)
DATUM: NAD 83, Zone 14
INCLINATION: -80
AZIMUTH: 150

RECORD OF DRILLHOLE: END09-02

DRILLING DATE: June 8-14, 2009
DRILLING CONTRACTOR: BOART LONGYEAR

LOGGED: EMS/GY/AE/TF/JW
CHECKED: EAM

DEPTH SCALE METRES | DESCRIPTION | STRATA PLOT | ELEV. DEPTH (mAH) | RUN NUMBER | CORE RECOVERY: TOTAL CORE % / R.Q.D. % | FRACTURE INDEX PER 0.25m | DISCONTINUITY DATA: Dip Direction / DIP w.r.t. CORE AXIS / (Jcon) JOINT CONDITION / (Jr) JOINT ROUGHNESS / (Ja) JOINT ALTERATION / (Jn) NUMBER OF FRACTURE SETS | BROKEN CORE / LOST CORE | ROCK STRENGTH INDEX (R6-R0) | WEATHERING INDEX (W0-W6) | HYDRAULIC CONDUCTIVITY K, m/sec | INSTALLATION DETAILS/ ABANDONMENT DETAILS | ELEVATION (masl Vertical)

METASEDIMENT (126.00-150.00m)
Brittle, hematite altered, rock seems porous and dry, breaks readily along microfractures when handled, foliation visible *(continued)*

20.00

METASEDIMENT (150.00-171.00m)
Slightly weathered, massive to thickly laminated foliation, grey with red and white bleached sections (<10%), little veining, fine grained, medium strong (grey colour rock) to weak (white to red coloured rock)

-0.68

METASEDIMENT (171.00-211.00m)
Altered, veins and microfractures present, but competent rock, several fractures not open possibly due to dried clay cement
- becomes more porous at 173.00m
- core surface pocked, hematite altered at 174 m and bleaching is erratic and offset by microfractures, minimal quartz veins
- becomes more competent below 177.00m
- foliation visible below 180.00m

-40.07

METASEDIMENT (211.00-241.83m)
Moderately chlorite altered, quartz veins and microfractures

- degradation with freeze/thaw likely below 228.00m

- grey white below 231.00m

-70.44

Mineralized METASEDIMENT (241.83-393.00m)
Blotchy red and grey to dark grey, altered, highly fractured, mineralized, potential degradation with freeze/thaw, possible healed breccia sections

CONTINUED NEXT PAGE

INSTALLATION DETAILS: No Installation

DEPTH SCALE
1 : 400

Golder Associates

DRILLHOLE: END09-02

SASK-ROCK-KIGGAVIK 09-1362-0613-DRILLHOLES.GPJ GAL-SASK.GDT 2/11/09 SIB

PROJECT: 09-1362-0613 AREVA KIGGAVIK
LOCATION: END GRID LAKE N 7135933.830 E 554542.320
G.S. ELEVATION: 167.72m (Estimated based on LiDAR Data)
DATUM: NAD 83, Zone 14
INCLINATION: -80
AZIMUTH: 150

RECORD OF DRILLHOLE: END09-02

DRILLING DATE: June 8-14, 2009
DRILLING CONTRACTOR: BOART LONGYEAR

LOGGED: EMS/GY/AE/TF/JW
CHECKED: EAM

DEPTH SCALE METRES | DESCRIPTION | STRATA PLOT | ELEV. DEPTH (mAH) | RUN NUMBER | CORE RECOVERY: TOTAL CORE % | R.Q.D. % | FRACTURE INDEX PER 0.25m | DISCONTINUITY DATA: Dip Direction | DIP w.r.t. CORE AXIS | (Jcon) JOINT CONDITION | (Jr) JOINT ROUGHNESS | (Ja) JOINT ALTERATION | (Jn) NUMBER OF FRACTURE SETS | BROKEN CORE | LOST CORE | ROCK STRENGTH INDEX (R6-R0) | WEATHERING INDEX (W0-W6) | HYDRAULIC CONDUCTIVITY K, m/sec | INSTALLATION DETAILS/ ABANDONMENT DETAILS | ELEVATION (masl Vertical)

Mineralized METASEDIMENT
(241.83-393.00m)
Blotchy red and grey to dark grey, altered, highly fractured, mineralized, potential degradation with freeze/thaw, possible healed breccia sections *(continued)*

No Installation

METASEDIMENT (393.00-495.00m)
Green grey, some veining and microfractures, slight foliation

-219.31
393.00

CONTINUED NEXT PAGE

DEPTH SCALE
1 : 400

Golder Associates

SHEET 3 OF 4
DRILLHOLE: END09-02

SASK-ROCK-KIGGAVIK 09-1362-0613-DRILLHOLES.GPJ GAL-SASK.GDT 2/11/09 SIB

PROJECT: 09-1362-0613 AREVA KIGGAVIK
LOCATION: END GRID LAKE N 7135933.830 E 554542.320
G.S. ELEVATION: 167.72m (Estimated based on LiDAR Data)
DATUM: NAD 83, Zone 14
INCLINATION: -80
AZIMUTH: 150

RECORD OF DRILLHOLE: END09-02

DRILLING DATE: June 8-14, 2009
DRILLING CONTRACTOR: BOART LONGYEAR

LOGGED: EMS/GY/AE/TF/JW
CHECKED: EAM

DEPTH SCALE METRES | DESCRIPTION | STRATA PLOT | ELEV. DEPTH (mAH) | RUN NUMBER | CORE RECOVERY: TOTAL CORE % | R.Q.D. % | FRACTURE INDEX PER 0.25m | DISCONTINUITY DATA: Dip Direction | DIP w.r.t. CORE AXIS | (Jcon) JOINT CONDITION | (Jr) JOINT ROUGHNESS | (Ja) JOINT ALTERATION | (Jn) NUMBER OF FRACTURE SETS | BROKEN CORE / LOST CORE | ROCK STRENGTH INDEX (R6-R0) | WEATHERING INDEX (W0-W6) | HYDRAULIC CONDUCTIVITY K, m/sec | INSTALLATION DETAILS/ ABANDONMENT DETAILS | ELEVATION (masl Vertical)

METASEDIMENT (393.00-495.00m)
Green grey, some veining and microfractures, slight foliation *(continued)*

- at 444 m veinlet composed of quartz, feldspar, and epidote with some hematite alteration around veinlets
- from 446.50-451.50m; hematite and clay alteration

447.54
447.64

No Installation

-319.76

END OF HOLE = 495m
495.00

DEPTH SCALE
1 : 400

Golder Associates

DRILLHOLE: END09-02

SASK-ROCK-KIGGAVIK 09-1362-0613-DRILLHOLES.GPJ GAL-SASK.GDT 2/11/09 SIB

PROJECT: 09-1362-0613 AREVA KIGGAVIK
LOCATION: END GRID LAKE N 7135895.000 E 554602.000
G.S. ELEVATION: 166.71m (Estimated based on LiDAR Data)
DATUM: NAD 83, Zone 14
INCLINATION: -85
AZIMUTH: 10

RECORD OF DRILLHOLE: END09-11

DRILLING DATE: August 19-22, 2009
DRILLING CONTRACTOR: BOART LONGYEAR
LOGGED: MC/JW/EAM/EB
CHECKED: EAM

DEPTH SCALE METRES	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (mAH)	RUN NUMBER
0	TOP OF DRILL HEAD		166.71	
0	OVERBURDEN (0.00-5.70m) Gravelly SILT with some sand and occasional cobbles, trace clay		0.00	
5	Casing Depth = 6.00m (approx)		161.03	
5	HEMATITE Altered METASEDIMENT (5.70-103.72m) Strong foliation, medium to high density with quartz infilling, dark red with beige leached spots (<30%), fine grained, slightly porous	MS	5.70	1
35	- leached zone at 33.40-35.85m; moderate remnant foliation, beige to light pink, fine grained, faintly porous	MS		10
55	- QUARTZ Vein at 55.25-55.75m; massive, white, microcrystalline, vuggy, faint remnant foliation (contorted)	MS		17
75	- moderate foliation, dark red with beige (<30% leached), fine grained, faintly porous, low density microfracturing	MS		25
100	BRECCIATED DUCTILE SHEAR ZONE (103.70-108.44m) Healed breccia texture (somewhat ductile) with clasts approximately 2 to 5 mm, moderately degradable, reddish brown and dark brown, non to faintly porous		63.38 103.72	36 37
110	HEMATITE Altered METASEDIMENT (108.44-230.00m) Moderate foliation, low density microfracturing with quartz veining, reddish brown with beige (slight leaching), faintly porous, fine grained	MS	58.68 108.44	39 40
115	- at 117.00m quartz veining becomes quite intensive	MS		42
130	- ductile and contorted deformation, moderately leached, moderate to high density microdefecting but lacks quartz veining, reddish brown, beige and pale grey - strong foliation, reddish brown with beige (<30% bleached), low density microdefecting with some intact quartz veining, fine grained, faint to slight porosity	MS		48 50 51
140	*CONTINUED NEXT PAGE*			52

CORE RECOVERY: TOTAL CORE %; R.Q.D. %
FRACTURE INDEX PER 0.25m
DISCONTINUITY DATA: Dip Direction; DIP w.r.t. CORE AXIS; (Jcon) JOINT CONDITION; (Jr) JOINT ROUGHNESS; (Ja) JOINT ALTERATION; (Jn) NUMBER OF FRACTURE SETS
BROKEN CORE / LOST CORE
ROCK STRENGTH INDEX (R6-R0)
WEATHERING INDEX (W0-W6)
HYDRAULIC CONDUCTIVITY K, m/sec
INSTALLATION DETAILS/ ABANDONMENT DETAILS: No Installation
ELEVATION (masl Vertical)

BROKEN CORE / LOST CORE intervals (m):
13.03–13.19; 14.28–15.40; 16.54–17.80; 19.93–20.03; 21.16–21.69; 23.62–24.15; 25.59–25.65; 25.82–27.08; 28.43–28.54; 34.07–35.56; 35.65–41.03; 41.22–41.59; 41.59–41.89; 46.70–47.20; 51.00–51.96; 52.21–52.40; 52.96–55.40; 55.50–57.20; 57.25–58.28; 58.71–59.25; 59.78–65.21; 65.59–65.92; 66.00–71.05; 71.16–71.32; 72.76–77.23; 80.10–80.60; 81.74–81.82; 83.07–83.14; 83.24–83.63; 108.82–108.94; 111.03–111.11; 116.74–116.88

PROJECT: 09-1362-0613 AREVA KIGGAVIK
LOCATION: END GRID LAKE N 7135895.000 E 554602.000
G.S. ELEVATION: 166.71m (Estimated based on LiDAR Data)
DATUM: NAD 83, Zone 14
INCLINATION: -85
AZIMUTH: 10

RECORD OF DRILLHOLE: END09-11

DRILLING DATE: August 19-22, 2009
DRILLING CONTRACTOR: BOART LONGYEAR
LOGGED: MC/JW/EAM/EB
CHECKED: EAM

DESCRIPTION

HEMATITE Altered METASEDIMENT (108.44-230.00m)
Moderate foliation, low density microfracturing with quartz veining, reddish brown with beige (slight leaching), faintly porous, fine grained *(continued)*

- faint remnant foliation with high density microdefecting and quartz veining, reddish brown with beige and white, faint to slight porosity, fine grained and microcrystalline
- at 159.00m there is less quartz veining

- foliated (approximately 0 degrees to core axis), red and white, fine grained, moderately porous, pervasive hematite alteration, frequent quartz veining causing localized zones of brecciation

- leaching becomes more intense at 214.00m

CHLORITE Altered METASEDIMENT (230.00-270.00m)
Foliated and veined, light green, fine grained, highly porous, chlorite altered
- 233.90-234.46m; possible healed FAULT sub parallel to core axis

- 237.25-238.56m; healed FAULT sub parallel to core axis 1-2 cm thick

- foliated and veined, light green, fine grained, highly porous, chlorite altered

- at 253.00-256.00m; chlorite alteration decreases and hematite and clay alteration increases causing rock to become degradable

METASEDIMENT (270.00-301.30m)
Foliated at 60 degrees to core axis, green, fine grained, moderately porous

- frequent sericite altered veins with hematite halos which increase frequency at 273.50m
- 276.00-277.00m; chlorite alteration is intense

CONTINUED NEXT PAGE

ELEV. DEPTH (mAH)	RUN NUMBER
-62.41 / 230.00	83
-102.26 / 270.00	101

BROKEN CORE / LOST CORE: 147.03–147.35; 152.85–153.57; 153.78–155.43; 158.15–158.49; 158.49–159.10; 170.52–170.72; 186.07–186.23; 200.24–201.00; 202.12–202.18; 239.05–243.00; 243.88–244.01; 246.10–246.16; 248.34–249.00; 249.00–249.20; 255.06–255.82; 264.68–265.08; 266.30–266.46; 266.90–267.73; 268.07–269.57; 269.67–270.00

INSTALLATION DETAILS/ ABANDONMENT DETAILS: No Installation

DEPTH SCALE
1 : 400

Golder Associates

SASK-ROCK-KIGGAVIK 09-1362-0613-DRILLHOLES.GPJ GAL-SASK.GDT 2/11/09 SIB

PROJECT: 09-1362-0613 AREVA KIGGAVIK
LOCATION: END GRID LAKE N 7135895.000 E 554602.000
G.S. ELEVATION: 166.71m (Estimated based on LiDAR Data)
DATUM: NAD 83, Zone 14
INCLINATION: -85
AZIMUTH: 10

RECORD OF DRILLHOLE: END09-11

DRILLING DATE: August 19-22, 2009
DRILLING CONTRACTOR: BOART LONGYEAR

LOGGED: MC/JW/EAM/EB
CHECKED: EAM

DEPTH SCALE METRES	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (mAH)	RUN NUMBER
280	METASEDIMENT (270.00-301.30m) Foliated at 60 degrees to core axis, green, fine grained, moderately porous *(continued)* - at 284.50m; chlorite content starts to increase	MS		104 105 106 107 108 109 110 111 112 113 114
300	Leached METASEDIMENT (301.30-313.46m) Pink, leached hematite paleo weathering, many small veins and microfractures, some localized chloritized zones within	MS	-133.44 301.30	115 116 117 118 119
310	CHLORITE Altered METASEDIMENT (312.46-318.00m) Light green, most structure is no longer visible due to alteration, few microfractures still visible, some minor leached hematitic zones interspersed throughout	MS	-144.56 312.46	120 121 122
320	Leached METASEDIMENT (318.00-339.00m) Hematitic, leached, thinly foliated, many healed microfractures visible, some minor chloritic zones throughout - 318.34-318.90m; highly silicified, stronger, abundant quartz veins and microfractures - banded, magnetic Iron Formation at 330.70-331.20m	MS	-150.08 318.00	123 124 125 126 127 128 129 130 131 132
340	CHLORITE Altered METASEDIMENT (339.00-344.56m) Green, some very thin foliation still visible, some microfracturing, high sericite content within matrix, localized leached hematitic zones	MS	-171.00 339.00	133 134
350	Mineralized MEATSEDIMENT (344.36-372.52m) Fresh, foliated and abundant microfracturing, grey, fine grained, faintly porous - hematite altered, high mineralization, fractures most commonly occur along foliation fresh, foliated and abundant microfracturing, grey, fine grained, faintly porous - 355.25-355.75m; healed brecciated area - banded hematite alteration, veinlets and content increasing after 361.00m	MS	-176.34 344.36	135 136 137 138 139 140 141 142 143
370	- light green, clay altered, with abundant hematite veinlets - soft, clay rich	MS	-204.39	144 145 146 147
375	CHLORITE Altered METASEDIMENT (375.52-376.14m) Foliated, chlorite and hematite altered, light green to dark green, clay and chlorite rich, - FAULTED, fractured, soft	MS	372.52 -208.00 376.14	148 149 150 151 152 153
380	METASEDIMENT (376.14-441.00m) Grey, foliated, microveined	MS		154 155 156 157 158 159 160 161 162 163 164 165 166 167
420	*CONTINUED NEXT PAGE*			

CORE RECOVERY: TOTAL CORE %; R.Q.D. %
FRACTURE INDEX PER 0.25m
DISCONTINUITY DATA: Dip Direction; DIP w.r.t. CORE AXIS; (Jcon) JOINT CONDITION; (Jr) JOINT ROUGHNESS; (Ja) JOINT ALTERATION; (Jn) NUMBER OF FRACTURE SETS
BROKEN CORE / LOST CORE: 281.72, 281.90, 284.62, 285.05, 286.29, 287.14, 286.80, 287.62, 293.30, 297.00, 299.72, 300.33, 302.76, 303.00, 314.81, 315.00, 317.45, 318.00, 323.32, 337.86, 337.93, 341.80, 342.00, 359.17, 359.50, 369.12, 369.26, 369.51, 370.75, 370.93, 371.76, 392.46, 392.60, 414.07
ROCK STRENGTH INDEX (R6-R0)
WEATHERING INDEX (W0-W6)
HYDRAULIC CONDUCTIVITY K, m/sec
INSTALLATION DETAILS/ ABANDONMENT DETAILS: No Installation
ELEVATION (masl Vertical)

DEPTH SCALE
1 : 400

Golder Associates

DRILLHOLE: END09-11

SASK-ROCK-KIGGAVIK 09-1362-0613-DRILLHOLES.GPJ GAL-SASK.GDT 2/11/09 SIB

PROJECT: 09-1362-0613 AREVA KIGGAVIK
LOCATION: END GRID LAKE N 7135895.000 E 554602.000
G.S. ELEVATION: 166.71m (Estimated based on LiDAR Data)
DATUM: NAD 83, Zone 14
INCLINATION: -85
AZIMUTH: 10

RECORD OF DRILLHOLE: END09-11

DRILLING DATE: August 19-22, 2009
DRILLING CONTRACTOR: BOART LONGYEAR

LOGGED: MC/JW/EAM/EB
CHECKED: EAM

DEPTH SCALE METRES | DESCRIPTION | STRATA PLOT | ELEV. DEPTH (mAH) | RUN NUMBER | CORE RECOVERY: TOTAL CORE % | R.Q.D. % | FRACTURE INDEX PER 0.25m | DISCONTINUITY DATA: Dip Direction | DIP w.r.t. CORE AXIS | (Jcon) JOINT CONDITION | (Jr) JOINT ROUGHNESS | (Ja) JOINT ALTERATION | (Jn) NUMBER OF FRACTURE SETS | BROKEN CORE | LOST CORE | ROCK STRENGTH INDEX (R6-R0) | WEATHERING INDEX (W0-W6) | HYDRAULIC CONDUCTIVITY K, m/sec | INSTALLATION DETAILS/ ABANDONMENT DETAILS | ELEVATION (masl Vertical)

METASEDIMENT (376.14-441.00m)
Grey, foliated, microveined *(continued)*

MS

168
169
170
171
172
173
174

-272.61

No Installation

END OF HOLE = 441m

441.00

DEPTH SCALE
1 : 400

Golder Associates

SHEET 4 OF 4
DRILLHOLE: END09-11

SASK-ROCK-KIGGAVIK 09-1362-0613-DRILLHOLES.GPJ GAL-SASK.GDT 2/11/09 SIB

Geotechnical Log

PROJECT : Kiggavik	**NORTHING : 7134733.2**	**EASTING : 552677.5**

HOLE ID: AND-10-03

SITE : Andrew Lake	**ELEVATION : 167.3m**	**DIP : -60**	**AZIMUTH : N125**
DRILLING CONTRACTOR:	**Boart Longyear**	**LOGGED BY:**	**Bibek Shrestha**
DRILLING TYPE:	**Diamond**	**CHECKED BY:**	

Hole Diameter:	NQ	Core Diameter:	NQ
Drilling Date:	31/07/2010 - 08/08/2010		
Logging Date:	02/08/2010 - 03/08/2010		

RUN	Depth (m)	Graphic Log	LITHOLOGY	TCR (%)	RQD (%)	FF/Run	IRS	WI	Description	BC	LC	Discontinuity Data Jcon	Jn	Jr	Ja
1	0		Overburden (not retrieved with the available drilling techniques												
2	3														
3	6														
	9.00														
4	9.90		Pink-grey, fine to medium crystalline, strong to extremely	100	90	4.8	R5/R6	W2				26	6	3	1
5	12		strong, fairly fresh to slightly weathered, well banded granitic gneiss	100	98	3.0	R6	W1	Pyrite coating and carbonate infill in joints			27	6	2	2
6	15			100	100	1.3	R5	W1	~4cm Qz VN at 17.40m @30TCA			26	4	2	1
7	18			100	91	8.7	R4/R5	W2	Possible structural feature (RZ) characterized by crushed rock with silt/clay			26	12	3	2
8	21			100	92	3.0	R5	W2	as a infilling material from 19.13-19.46m BC: 19.13-19.23m			26	9	3	2
9	24			98	95	2.7	R5	W1	LC: 19.23-19.46m ~2cm Qz VN at 25.90m @17TCA			25	6	2	1
10	27			97	97	1.7	R5	W1/W2				25	6	2	1
11	30.00			100	93	3.7	R5	W1/W2	In General, Qz VN is common throughout			26	12	3	1
12	33			100	89	3.7	R5	W1/W2				25	6	3	2
13	36			99	99	3.0	R5	W1	~2-3cm Qz VN at 36.82m @15TCA Prominent Qz VN			26	9	2	2
14	39.00			100	86	6.0	R4/R5	W1/W2	at 38.62-38.91m @14TCA BC: 10cm between 40.60-40.80m and 5cm			25	12	2	2
15	42			100	100	2.7	R5	W1	between 41.00-41.20m			25	6	2	2
16	45			100	100	1.7	R5/R6	W1				27	3	2	1
17	48.00			97	92	3.7	R4/R5	W2	BC: 50.63-50-73m			25	4	2	2
18	51														
19	54														
20	57														
	60														

Overburden
Granitic gneiss
Quartzite
Intrusive
Metasediment

JN = Joint
FLT = Fault
SH = Shear
VN = Vein
FR = Fracture

PL = Planar
CU = Curved
UN = Undulating (wavy)
ST = Stepped
IR = Irregular

SL = Slickensided, PO = Polished
SM = Smooth, RO = Rough
VRO = Very Rough
Lost Core (LC)
Broken Core (BC)

Jcon = Joint Condition
Jn = Joint Set Number
Jr = Joint Roughness Number
Ja = Joint Alteration Number
(All are average value per run)

Geotechnical Log

PROJECT : Kiggavik	**NORTHING : 7134733.2**	**EASTING : 552677.5**

HOLE ID: AND-10-03

SITE : Andrew Lake	**ELEVATION : 167.3m**	**DIP : -60**	**AZIMUTH : N125**
DRILLING CONTRACTOR:	**Boart Longyear**	**LOGGED BY:**	**Bibek Shrestha**
DRILLING TYPE:	**Diamond**	**CHECKED BY:**	

Hole Diameter:	NQ	Core Diameter:	NQ
Drilling Date:	31/07/2010 - 08/08/2010		
Logging Date:	02/08/2010 - 03/08/2010		

RUN	Depth (m)	Graphic Log	LITHOLOGY	TCR (%)	RQD (%)	FF/Run	IRS	WI	Description	BC	LC	Discontinuity Data Jcon	Jn	Jr	Ja
1	0		Overburden (not retrieved with the available drilling techniques												
2	3														
3	6														
	9.00														
4	9.90		Pink-grey, fine to medium crystalline, strong to extremely	100	90	4.8	R5/R6	W2				26	6	3	1
5	12		strong, fairly fresh to slightly weathered, well banded granitic gneiss	100	98	3.0	R6	W1	Pyrite coating and carbonate infill in joints			27	6	2	2
6	15			100	100	1.3	R5	W1	~4cm Qz VN at 17.40m @30TCA			26	4	2	1
7	18			100	91	8.7	R4/R5	W2	Possible structural feature (RZ) characterized by crushed rock with silt/clay			26	12	3	2
8	21			100	92	3.0	R5	W2	as a infilling material from 19.13-19.46m BC: 19.13-19.23m			26	9	3	2
9	24			98	95	2.7	R5	W1	LC: 19.23-19.46m ~2cm Qz VN at 25.90m @17TCA			25	6	2	1
10	27			97	97	1.7	R5	W1/W2				25	6	2	1
11	30.00			100	93	3.7	R5	W1/W2	In General, Qz VN is common throughout			26	12	3	1
12	33			100	89	3.7	R5	W1/W2				25	6	3	2
13	36			99	99	3.0	R5	W1	~2-3cm Qz VN at 36.82m @15TCA Prominent Qz VN			26	9	2	2
14	39.00			100	86	6.0	R4/R5	W1/W2	at 38.62-38.91m @14TCA BC: 10cm between 40.60-40.80m and 5cm			25	12	2	2
15	42			100	100	2.7	R5	W1	between 41.00-41.20m			25	6	2	2
16	45			100	100	1.7	R5/R6	W1				27	3	2	1
17	48.00			97	92	3.7	R4/R5	W2	BC: 50.63-50-73m			25	4	2	2
18	51														
19	54														
20	57														
	60														

Overburden
Granitic gneiss
Quartzite
Intrusive
Metasediment

JN = Joint
FLT = Fault
SH = Shear
VN = Vein
FR = Fracture

PL = Planar
CU = Curved
UN = Undulating (wavy)
ST = Stepped
IR = Irregular

SL = Slickensided, PO = Polished
SM = Smooth, RO = Rough
VRO = Very Rough
Lost Core (LC)
Broken Core (BC)

Jcon = Joint Condition
Jn = Joint Set Number
Jr = Joint Roughness Number
Ja = Joint Alteration Number
(All are average value per run)

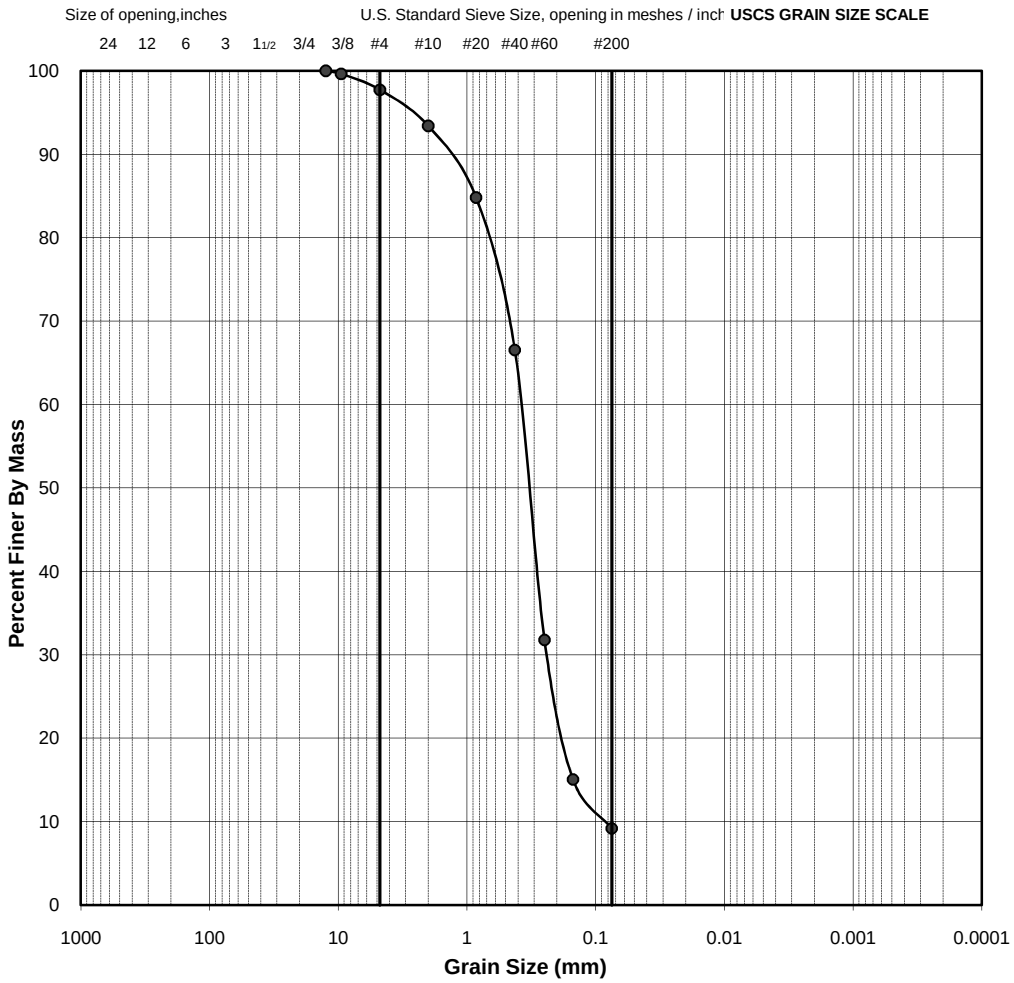
Golder Associates Ltd. - Burnaby Laboratory
4280 Still Creek Drive
Burnaby, B.C. Canada V5C 6C8

PARTICLE SIZE ANALYSIS OF SOILS

Reference
ASTM C136-06 & C117-04

Project No.:	09-1426-0001/4000	**Borehole:**	**END-0B-09**
Client:	Areva	**Sample No.:**	1
Project:	Kiggavik	**Depth (m):**	0.30
Location:	Nunavut	**Lab ID No:**	140
Remarks:		**Other:**	
		Material Specification:	NONE
		Method:	SPLIT, WASHED
		Date Tested:	8/7/2009

Sieve Size (USS)	(mm)	Passing %
3.5"	87.5	100.0
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	100.0
1"	25.0	100.0
3/4"	19.0	100.0
1/2"	12.5	100.0
3/8"	9.5	99.6
#4	4.8	97.7
#10	2.0	93.4
#20	0.9	84.8
#40	0.4	66.5
#60	0.3	31.8
#100	0.2	15.0
#200	0.1	9.2



** The test data given herein pertain to the sample provided only. This report constitutes a testing service only. Interpretation of the data can be provided upon request.*

EB/TD	August 7, 2009	LP	August 11,2009
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd. - Burnaby Laboratory
4280 Still Creek Drive
Burnaby, B.C. Canada V5C 6C6

PARTICLE SIZE ANALYSIS OF SOILS

Reference
ASTM D 422-63 (2007)

Project No.:	09-1426-0001/4000	**Borehole:**	**END-0B-09**
Client:	Areva	**Sample No.:**	2
Project:	Kiggavik	**Depth (m):**	0.20-0.30
Location:	Nunavut	**Lab ID No:**	140

Specific Gravity (assumed): 2.76

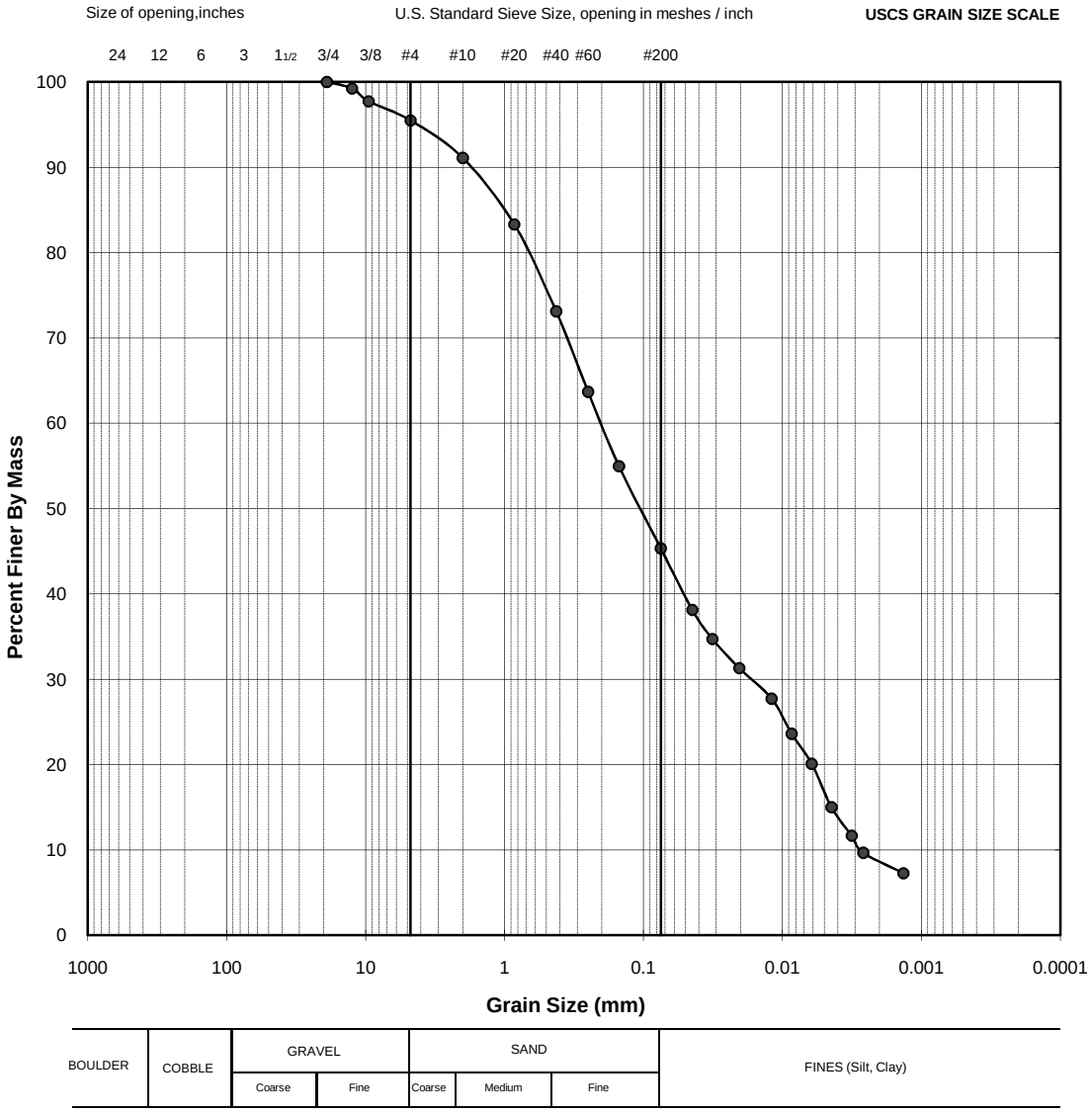
Other

Remarks:

Dispersion Method: Stirring

Dispersion Period (min): 0.00

Sieve Size (USS)	Sieve Size (mm)	% Passing
3.5"	87.50	100.0
3"	75.00	100.0
2"	50.00	100.0
1.5"	37.50	100.0
1"	25.00	100.0
3/4"	19.00	100.0
1/2"	12.50	99.2
3/8"	9.50	97.7
#4	4.75	95.5
#10	2.00	91.1
#20	0.850	83.3
#40	0.425	73.1
#60	0.250	63.7
#100	0.150	55.0
#200	0.075	45.3
-	0.0445	38.1
-	0.0319	34.7
-	0.0204	31.3
-	0.0119	27.7
-	0.0086	23.6
-	0.0062	20.1
-	0.0044	15.0
-	0.0032	11.7
-	0.0026	9.7
-	0.0013	7.3



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TESTED BY	DATE	CHECKED BY	DATE
EB	Aug 9, 2009	LP	August 11,2009

Golder Associates Ltd. - Burnaby Laboratory
4280 Still Creek Drive
Burnaby, B.C. Canada V5C 6C6

PARTICLE SIZE ANALYSIS OF SOILS

Reference
ASTM D 422-63 (2007)

Project No.:	09-1426-0001/4000	**Borehole:**	**END-0B-09**
Client:	Areva	**Sample No.:**	3
Project:	Kiggavik	**Depth (m):**	0.20-0.30
Location:	Nunavut	**Lab ID No:**	140

Specific Gravity (assumed): 2.76

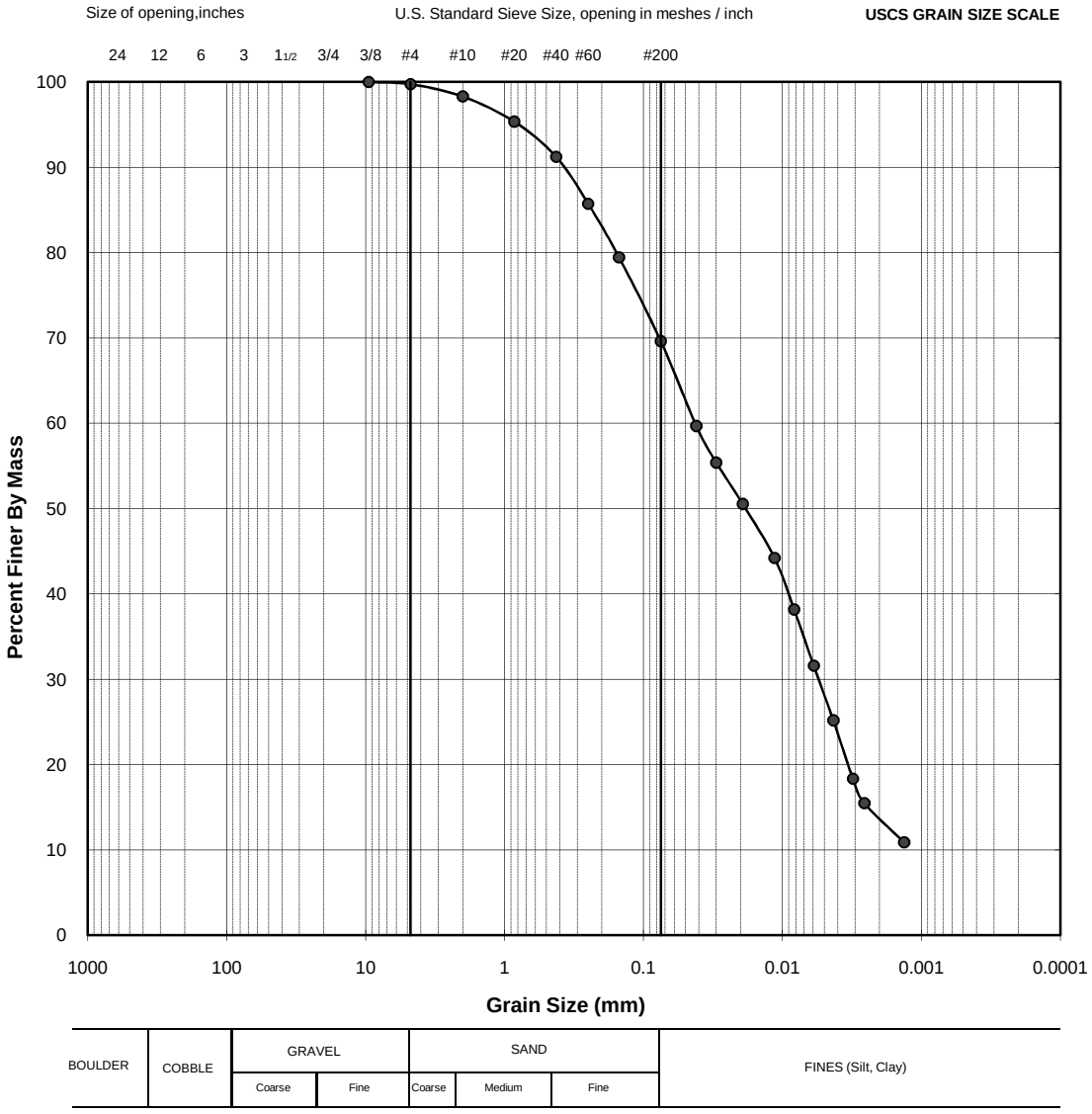
Other

Remarks:

Dispersion Method: Stirring

Dispersion Period (min): 0.00

Sieve Size (USS)	Sieve Size (mm)	% Passing
3.5"	87.50	100.0
3"	75.00	100.0
2"	50.00	100.0
1.5"	37.50	100.0
1"	25.00	100.0
3/4"	19.00	100.0
1/2"	12.50	100.0
3/8"	9.50	100.0
#4	4.75	99.7
#10	2.00	98.3
#20	0.850	95.3
#40	0.425	91.2
#60	0.250	85.7
#100	0.150	79.4
#200	0.075	69.6
-	0.0416	59.7
-	0.0299	55.4
-	0.0193	50.5
-	0.0114	44.2
-	0.0082	38.2
-	0.0059	31.6
-	0.0043	25.2
-	0.0031	18.3
-	0.0026	15.5
-	0.0013	10.9



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TESTED BY	DATE	CHECKED BY	DATE
EB	Aug 9, 2009	LP	August 11,2009

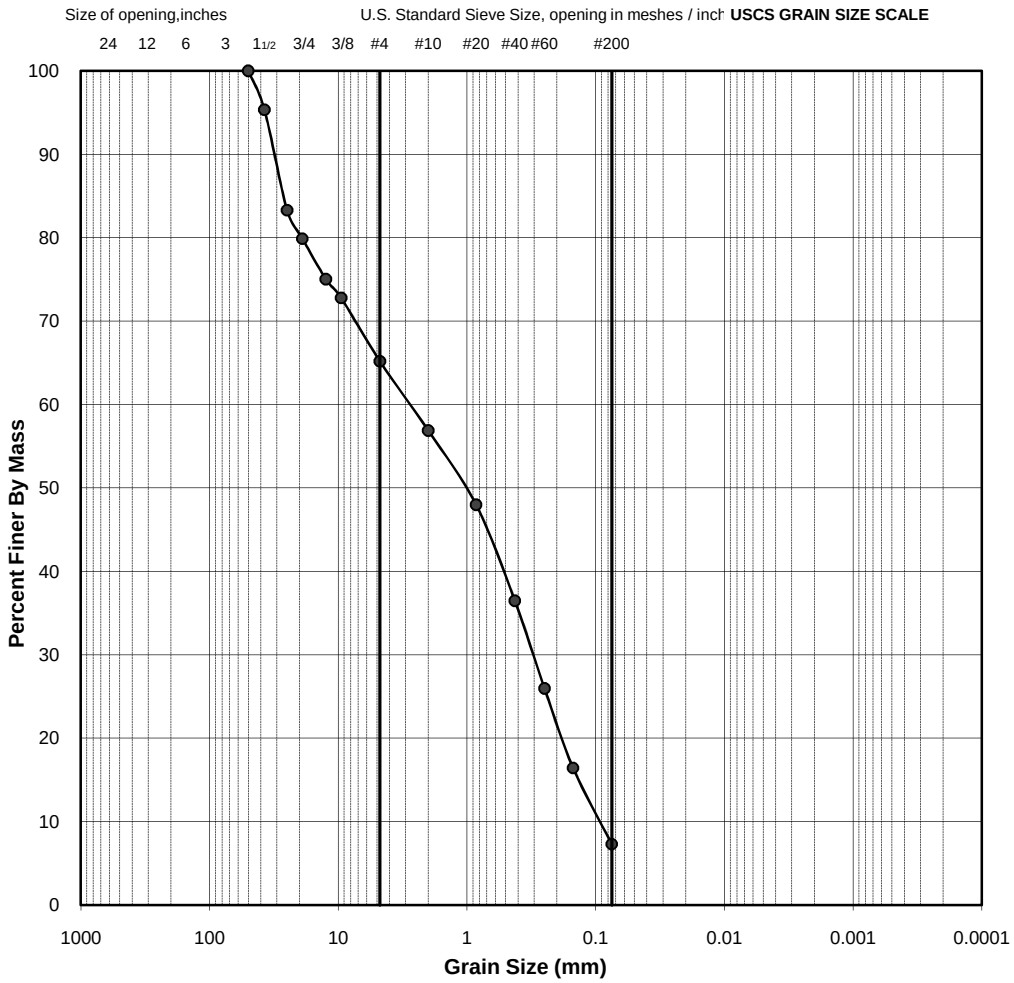
Golder Associates Ltd. - Burnaby Laboratory
4280 Still Creek Drive
Burnaby, B.C. Canada V5C 6C8

PARTICLE SIZE ANALYSIS OF SOILS

Reference
ASTM C136-06 & C117-04

Project No.:	09-1426-0001/4000	**Borehole:**	**END-0B-09**
Client:	Areva	**Sample No.:**	4
Project:	Kiggavik	**Depth (m):**	0.20-0.30
Location:	Nunavut	**Lab ID No:**	140
Remarks:		**Other:**	
		Material Specification:	NONE
		Method:	SPLIT, WASHED
		Date Tested:	8/7/2009

Sieve Size (USS)	(mm)	Passing %
3.5"	87.5	100.0
3"	75.0	100.0
2"	50.0	100.0
1.5"	37.5	95.4
1"	25.0	83.3
3/4"	19.0	79.9
1/2"	12.5	75.0
3/8"	9.5	72.8
#4	4.8	65.2
#10	2.0	56.9
#20	0.9	48.0
#40	0.4	36.5
#60	0.3	26.0
#100	0.2	16.4
#200	0.1	7.3



** The test data given herein pertain to the sample provided only. This report constitutes a testing service only. Interpretation of the data can be provided upon request.*

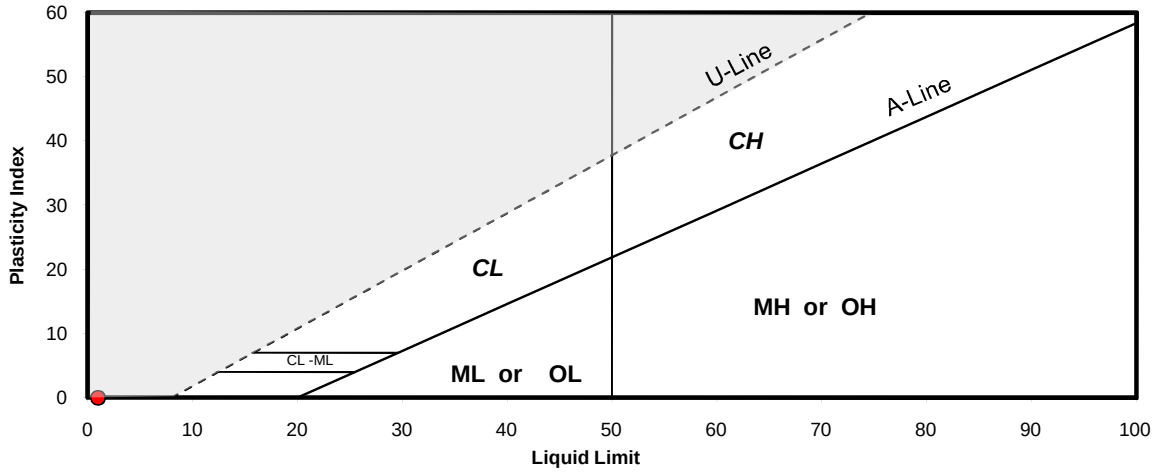
EB/TD	August 7, 2009	LP	August 11,2009
TESTED BY	DATE	CHECKED BY	DATE

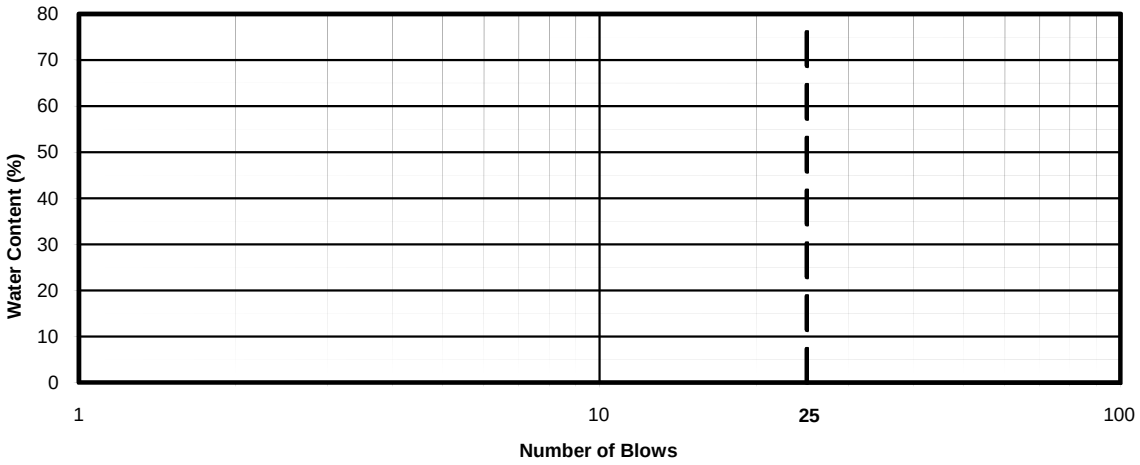
Golder Associates Ltd. - Burnaby Laboratory
4280 Still Creek Drive
Burnaby, B.C. Canada V5C 6C6

Liquid Limit, Plastic Limit and Plasticity Index of Soils

Reference: ASTM D 4318-05

Project No.:	09-1426-0001/4000	**Borehole:**	**END-0B-09**
Client:	Areva	**Sample No.:**	2
Project:	Kiggavik	**Depth (m):**	0.20-0.30
Location:	Nunavut	**Lab ID No.:**	140
Method:	A-Multi Point	**Preparation Method:**	Air-Dried
Sample Description:		**Classification Definition**	





Test Summary		Remarks
Percent passing #40 Sieve (%)		**Non-Plastic sample**
Liquid Limit	**N/A**	
Plastic Limit	**Non Plastic**	
Plasticity Index	**N/A**	
Natural water content (%)	**11**	
Liquidity Index	**N/A**	

** The test data given herein pertain to the sample provided only. This report constitutes a testing service only.*

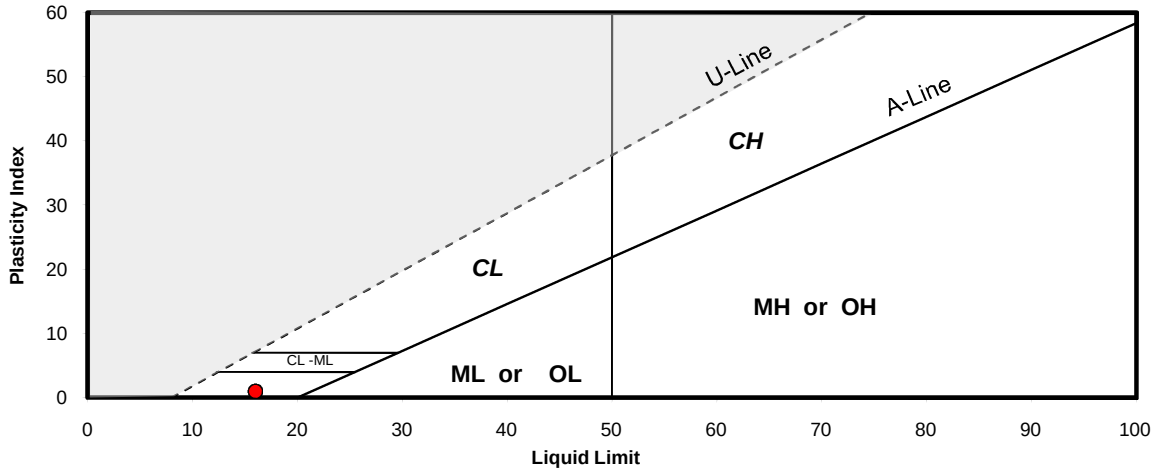
EB	August 9, 2009	LP	August 11,2009
TESTED BY	DATE	CHECKED BY	DATE

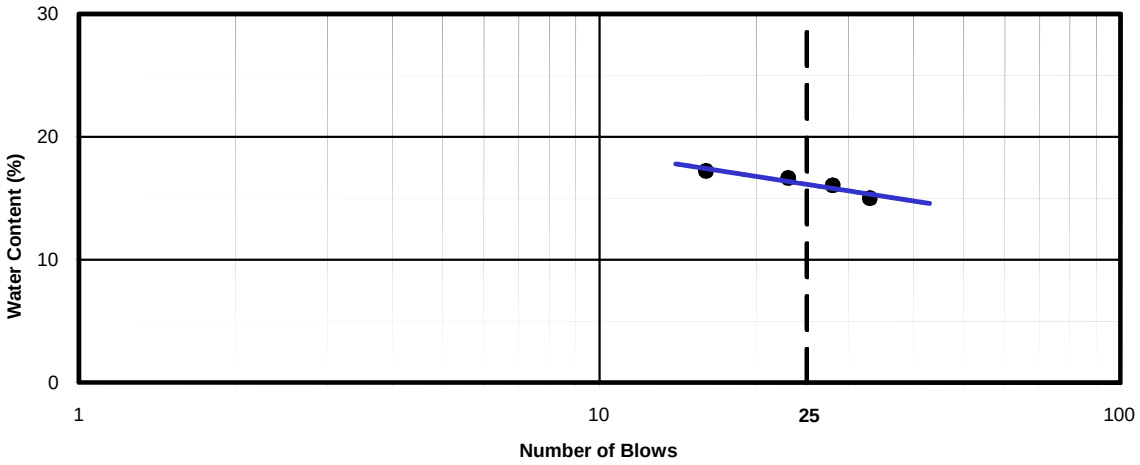
Golder Associates Ltd. - Burnaby Laboratory
4280 Still Creek Drive
Burnaby, B.C. Canada V5C 6C6

Liquid Limit, Plastic Limit and Plasticity Index of Soils

Reference: ASTM D 4318-05

Project No.:	09-1426-0001/4000	**Borehole:**	**END-0B-09**
Client:	Areva	**Sample No.:**	3
Project:	Kiggavik	**Depth (m):**	0.20-0.30
Location:	Nunavut	**Lab ID No.:**	140
Method:	A-Multi Point	**Preparation Method:**	Air-Dried
Sample Description:	ML	**Classification Definition**	*Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity*





Test Summary		Remarks
Percent passing #40 Sieve (%)		
Liquid Limit	**16**	
Plastic Limit	**15**	
Plasticity Index	**1**	
Natural water content (%)	**15**	
Liquidity Index	**0.0**	

** The test data given herein pertain to the sample provided only. This report constitutes a testing service only.*

EB	August 9, 2009	LP	August 11,2009
TESTED BY	DATE	CHECKED BY	DATE

GENERAL TESTING RESULTS

Project #: 09-1362-0613 Phase: 1000
Short Title: Areva / 2009 Kiggavik Geotech / Baker Lake, Nunavut
Tested by: G.P. Date: September 2, 2009

Sample Identification				Laboratory Test Results										
Borehole #	Sample #	Depth (m)	Sample Type	Water Content (%)	Plastic Limit	Liquid Limit	Plasticity Index	% Passing #200	SHT Group Index	Specific Gravity	Dry Density (kg/m^3)	Pocket Pentrometer (kPa)	Lab Vane (kPa)	
RM1-09-01	SL1492	0.13-0.37	CS	18.2	18	24	6							

1721 8th Street E.,
Saskatoon, Saskatchewan, S7H 0T4

Reviewed by:_____

Laboratory Determination of Water Content of Soil and Rock

ASTM D 2216-05

Project #: 09-1426-0001/4000
Short Title: Kiggavik
Client: Areva
Location: Nunavut
Lab ID: 140

Borehole	END-0B-09	END-0B-09	END-0B-09	END-0B-09		
Sample Number	1	2	3	4		
Depth (m)	0.30	0.20-0.30	0.20-0.30	0.20-0.30		
Mass of Dry Soil (g)	346.7	468.5	373.0	1842.2		
Water Content W (%)	**22.5**	**10.5**	**15.0**	**3.1**		

Borehole						
Sample Number						
Depth (m)						
Mass of Dry Soil (g)						
Water Content W (%)						

Borehole						
Sample Number						
Depth (m)						
Mass of Dry Soil (g)						
Water Content W (%)						

Borehole						
Sample Number						
Depth (m)						
Mass of Dry Soil (g)						
Water Content W (%)						

Borehole						
Sample Number						
Depth (m)						
Mass of Dry Soil (g)						
Water Content W (%)						

EB/TD	August 7, 2009	LP	August 11,2009
TESTED BY	DATE TESTED	CHECKED BY	DATE CHECKED

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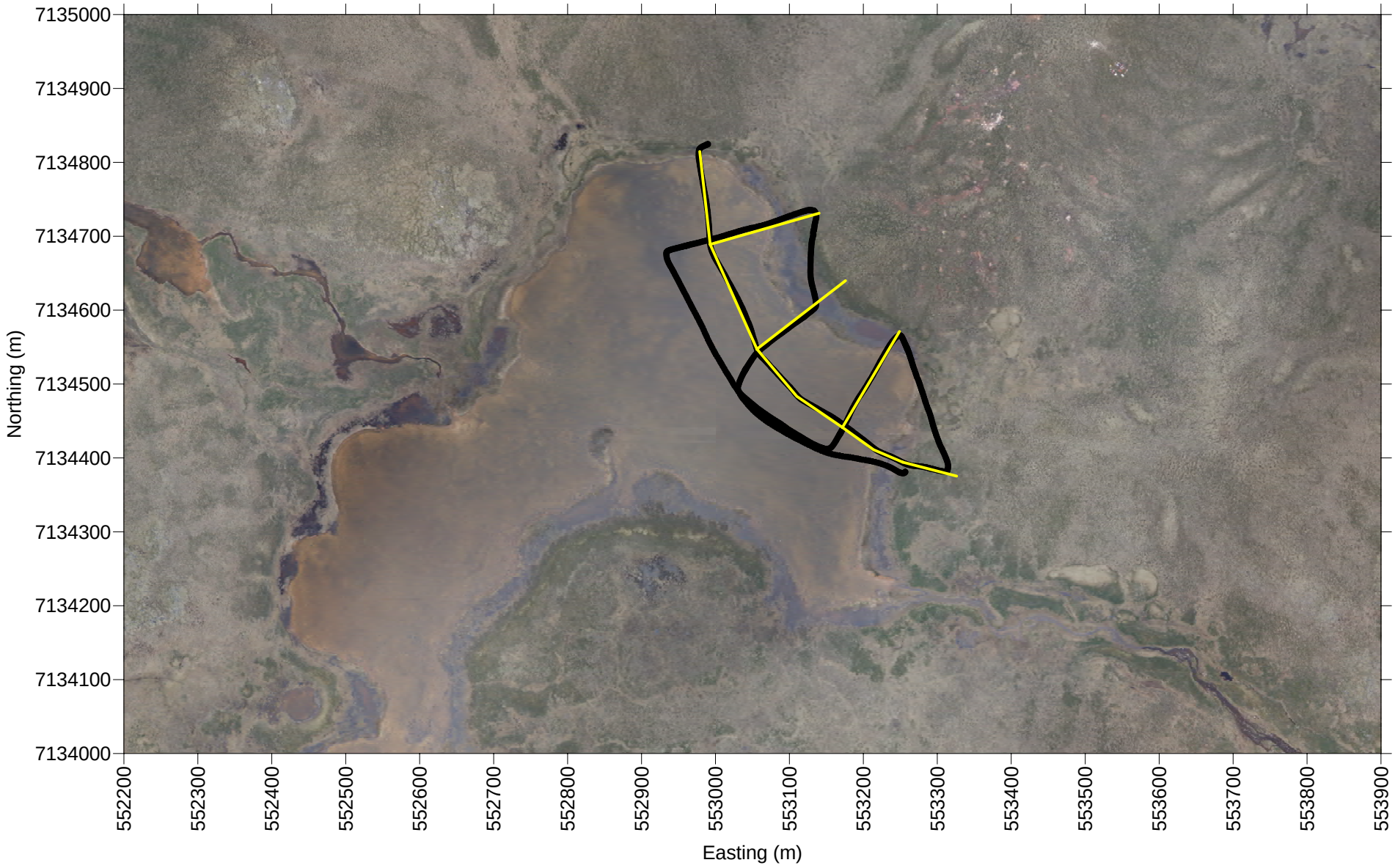
* The test data given herein pertain to the sample provided only. This report constitutes a testing service only.

Summary Records of EBA GPR Surveys



N

Scale (1:7500)
NAD83
UTM Zone 14

LEGEND

Collected GPR Tracks

Proposed GPR Tracks

CLIENT

AREVA

EBA Engineering Consultants Ltd.

Areva Sissons Project
2008-2009 Subsurface GPR Survey

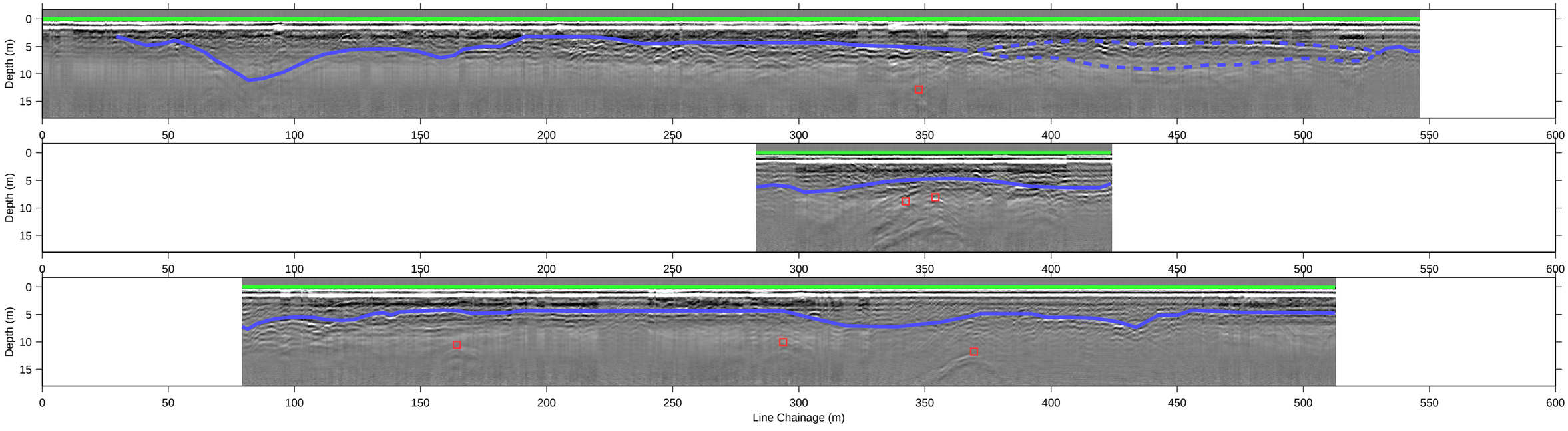
GPR Survey Coverage
Andrew Lake Proposed Dyke Location

PROJECT NO.	DWN	CKD	REV
V33101016	RJM	NSP	0

OFFICE	DATE
CGY-EBA	Nov 27, 2009

Figure D1

NAD83
UTMz14
1:1575



LEGEND

- Ice/Ground Surface
- Bedrock Surface
- Uncertain Bedrock Surface
- Bedrock Anomaly

CLIENT

AREVA

Areva Sissons Project
2008–2009 Subsurface GPR Survey

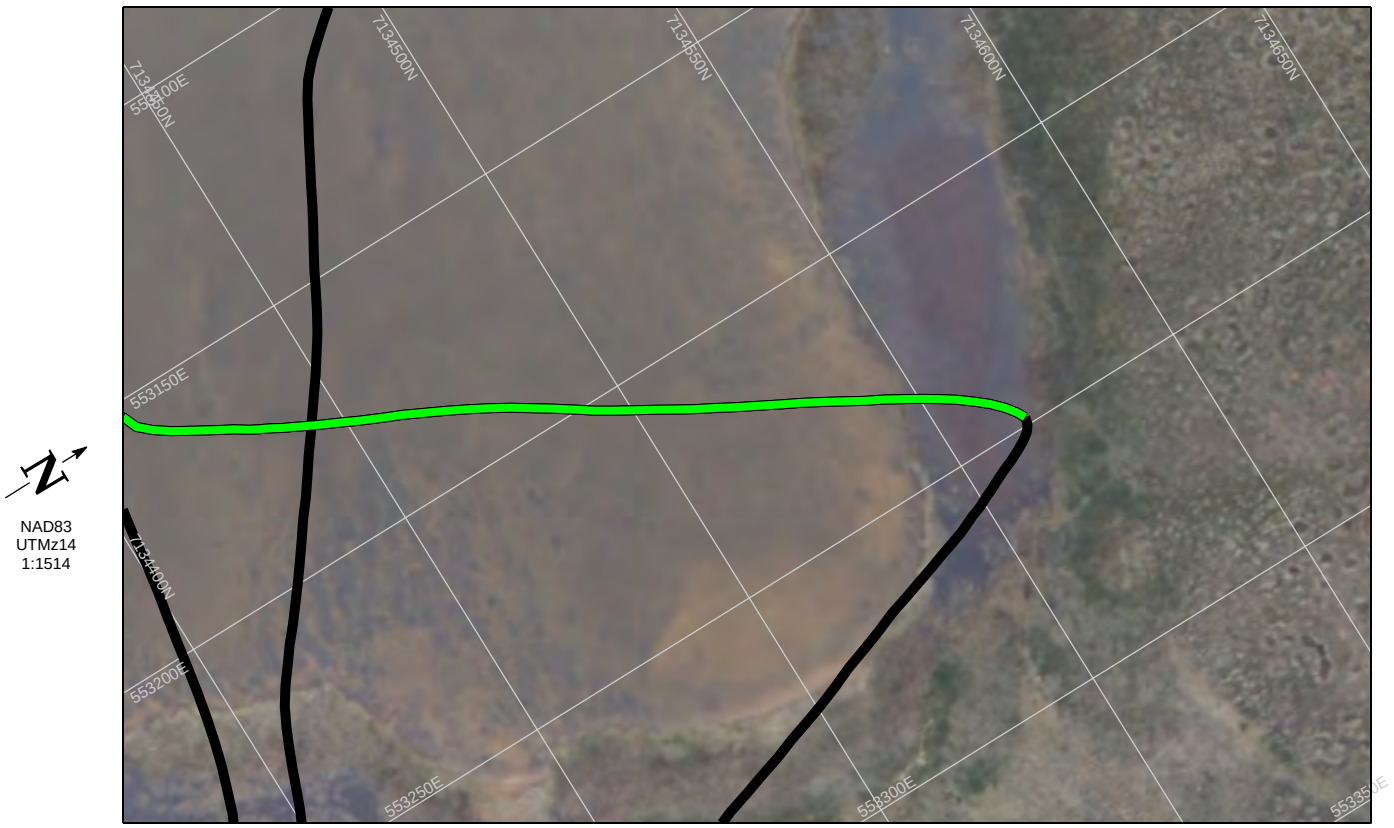
Proposed Andrew Lake Dyke Location
GPR Profiles

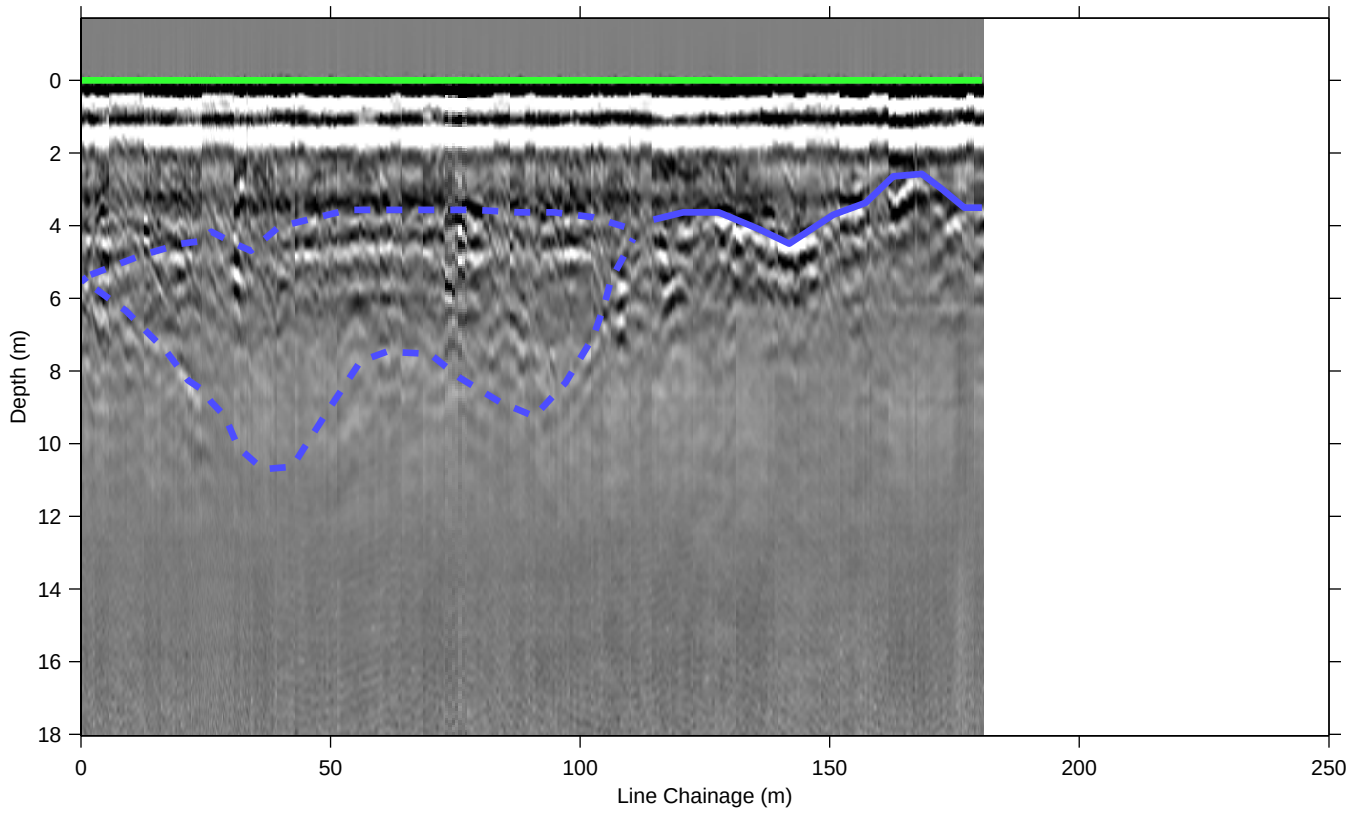
EBA Engineering Consultants Ltd.

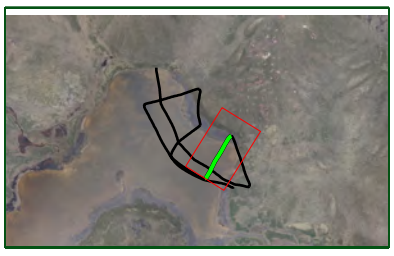
Project No.	DWN	CHKD	REV
V33101016	RJM	NSP	0

OFFICE	DATE
Calgary	Nov. 30, 2009

Figure D2







CLIENT

AREVA

Areva Sissons Project
2008–2009 Subsurface GPR Survey

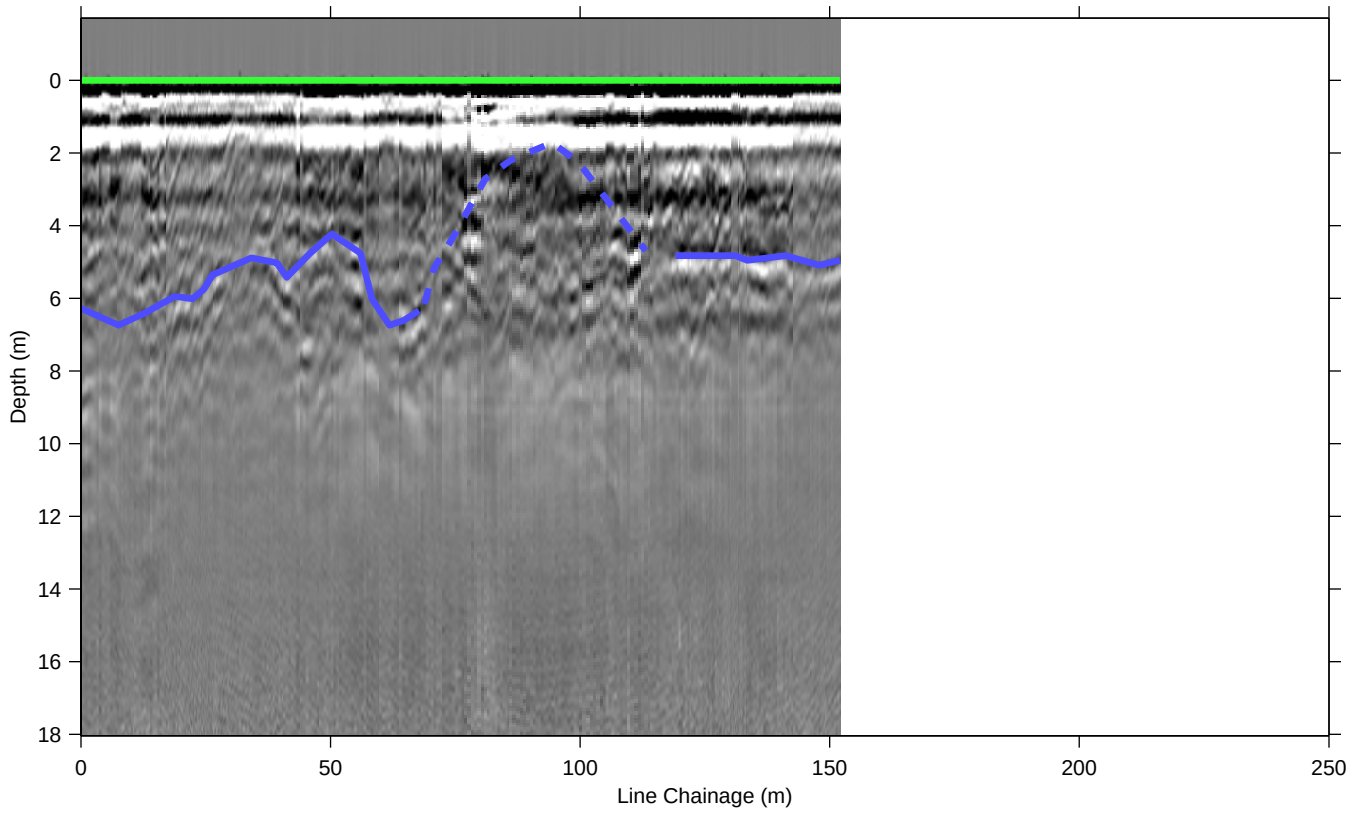
Proposed Andrew Lake Dyke Location
GPR Profiles

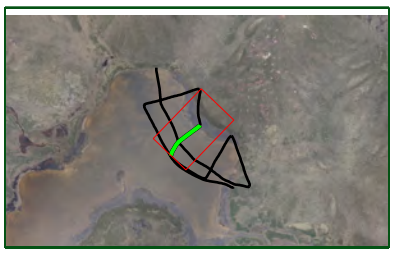
EBA Engineering Consultants Ltd.

Project No.	DWN	CHKD	REV
V33101016	RJM	NSP	0

OFFICE	DATE
Calgary	Nov. 30, 2009

Figure D3





CLIENT

AREVA

Areva Sissons Project
2008–2009 Subsurface GPR Survey

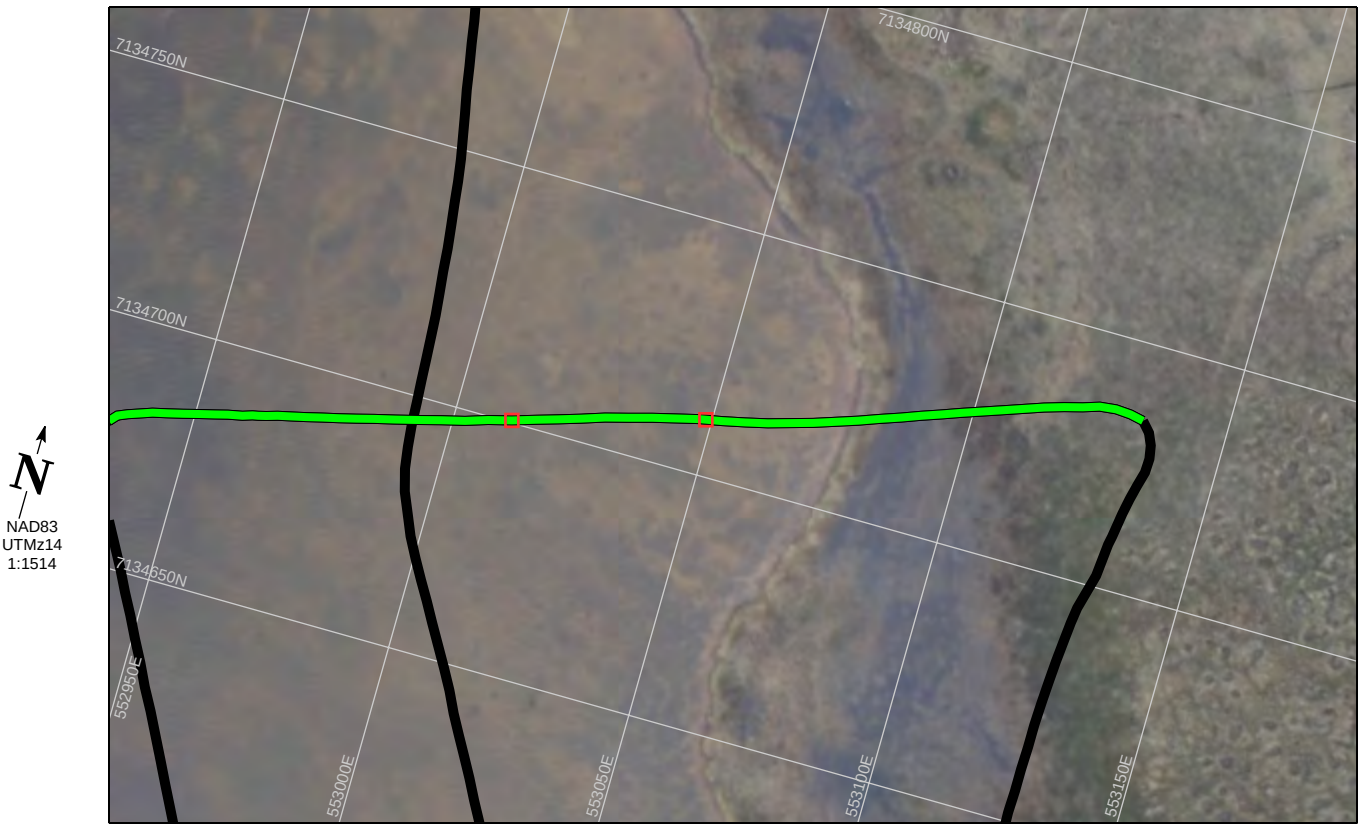
Proposed Andrew Lake Dyke Location
GPR Profiles

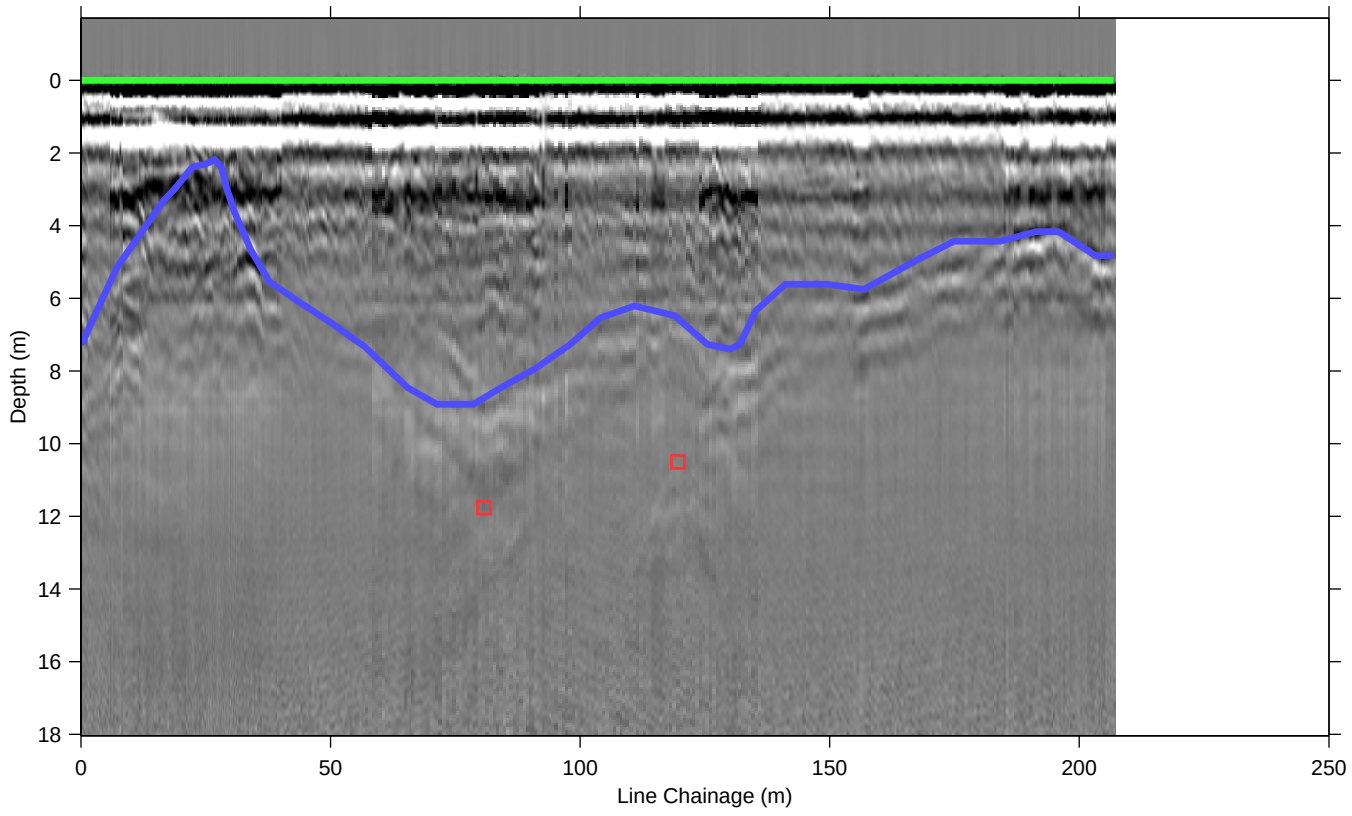
EBA Engineering Consultants Ltd.

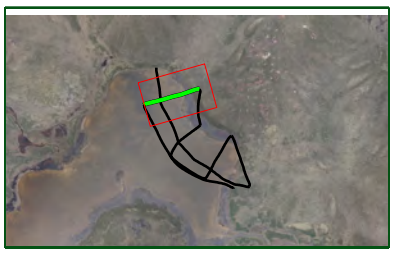
Project No.	DWN	CHKD	REV
V33101016	RJM	NSP	0

OFFICE	DATE
Calgary	Nov. 30, 2009

Figure D4







CLIENT

AREVA

EBA Engineering Consultants Ltd.

Areva Sissons Project
2008–2009 Subsurface GPR Survey

Proposed Andrew Lake Dyke Location
GPR Profiles

Project No.	DWN	CHKD	REV
V33101016	RJM	NSP	0

OFFICE	DATE
Calgary	Nov. 30, 2009

Figure D5

APPENDIX B

2010 Investigation Results

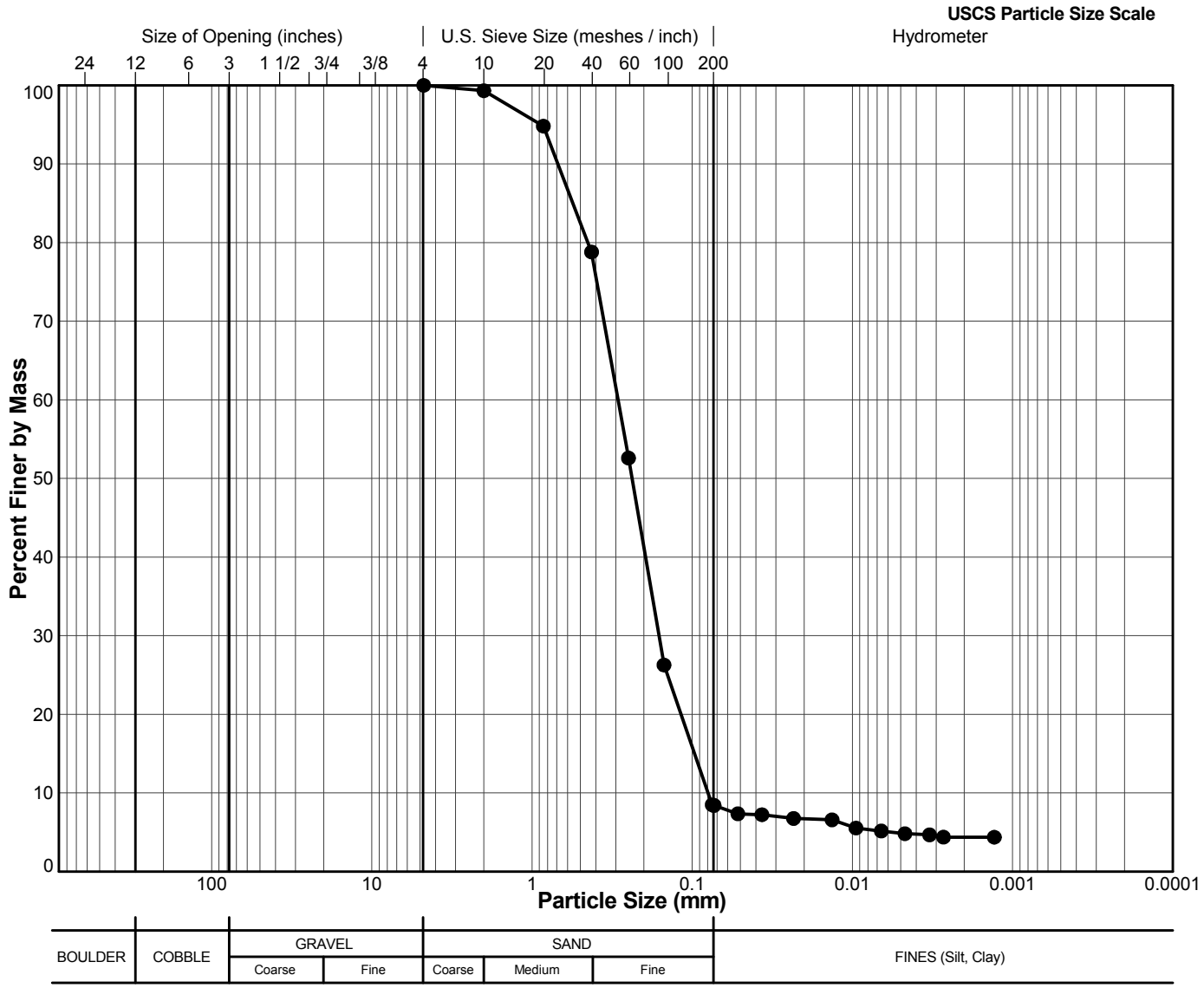
PARTICLE SIZE ANALYSIS OF SOILS

Reference(s)
ASTM D 422-63 (2007)

Client: Areva	**Sample Location:** SD
Project: Kiggavik	**Sample No.:** 01
Location: Nunavut	**Depth Interval (m):** N/A
Project No.: 10-1345-0026	**Lab Schedule No.:** 217

Other Remarks: **N/A**

Specific Gravity (assumed): 2.65	**Shape: N/A**
Max. Particle Size Passing (mm): 4.75	**Hardness: N/A**
Method: Split, Washed	**Dispersion Method: Air-Jet Cup**
Hydrometer ID: BURNABY - 87024	**Dispersion Period (min): 5**



EB/KG	**10/20/2010**	**LP**	**10/20/2010**
Tech	Date	Checked	Date

File:O:\ACTIVE_2010\1345\10-1345-0026 AREVA KIGGAVIK\GINT\10-1345-0026 KIGGAVIK.GPJ Output Form:_LAB_PARTICLE SIZE (SINGLE) Template:BC REGION TEMPLATE BETA 1.GDT Library:BC REGION LIBRARY.GLB JBieber 02/21/11

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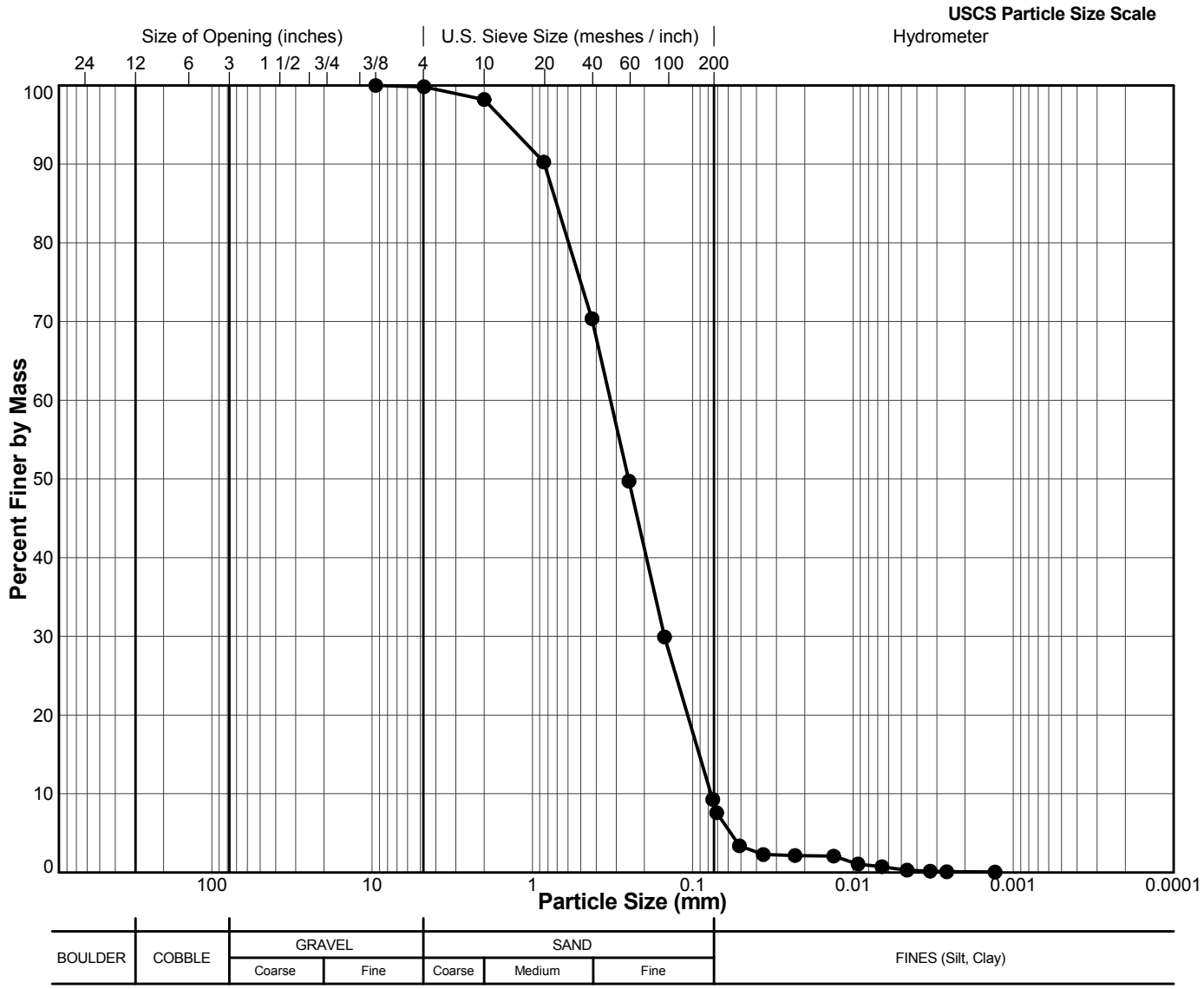
PARTICLE SIZE ANALYSIS OF SOILS

Reference(s)
ASTM D 422-63 (2007)

Client: Areva	**Sample Location:** SD
Project: Kiggavik	**Sample No.:** 02
Location: Nunavut	**Depth Interval (m):** N/A
Project No.: 10-1345-0026	**Lab Schedule No.:** 217

Other Remarks: **N/A**

Specific Gravity (assumed): 2.65	**Shape: N/A**
Max. Particle Size Passing (mm): 9.5	**Hardness: N/A**
Method: Split, Washed	**Dispersion Method: Air-Jet Cup**
Hydrometer ID: BURNABY - 541360	**Dispersion Period (min): 5**



EB/KG	**10/20/2010**	**LP**	**10/20/2010**
Tech	Date	Checked	Date

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PARTICLE SIZE ANALYSIS OF SOILS

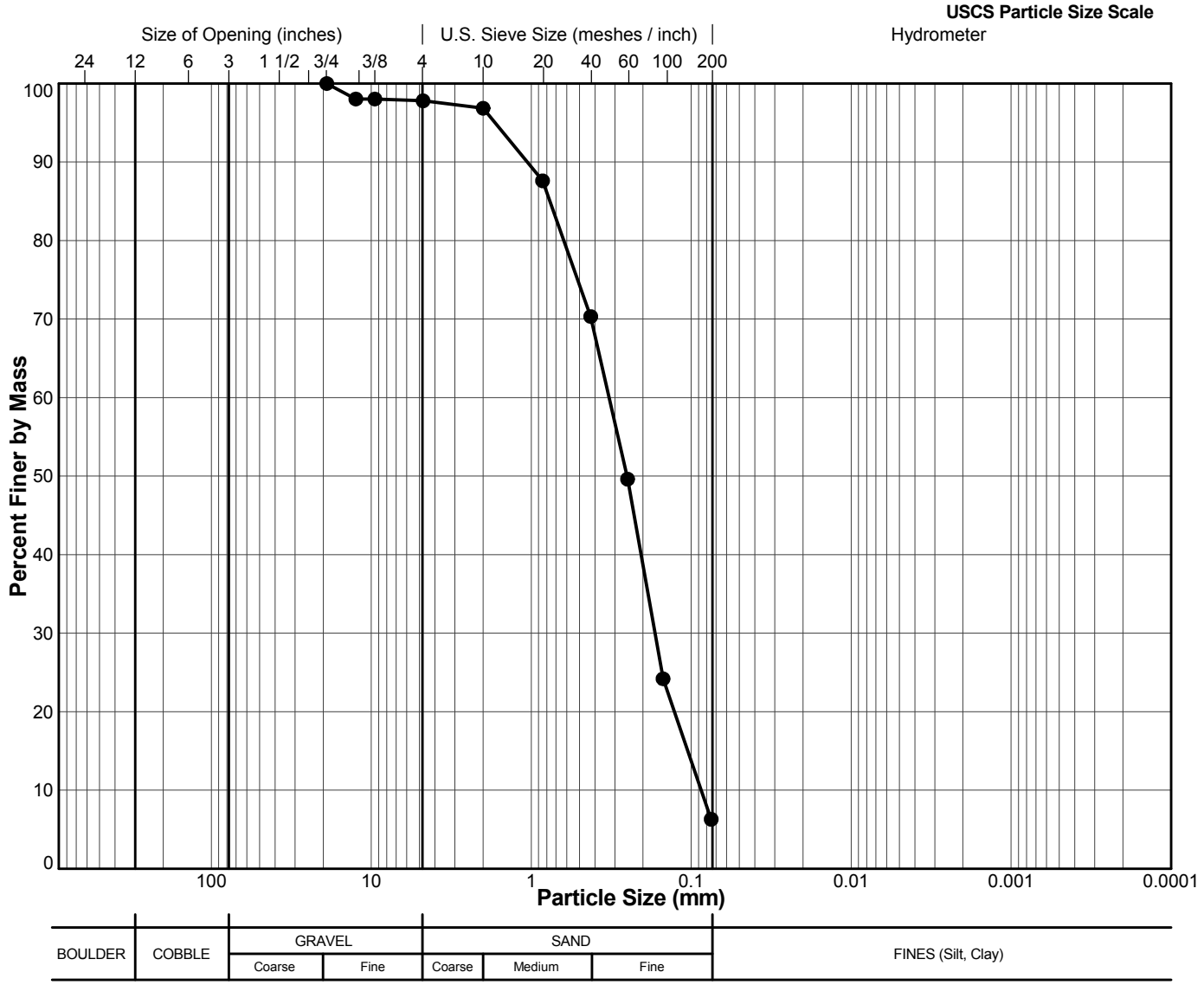
Reference(s)
ASTM D 422-63 (2007)

Client: Areva	**Sample Location:** SD
Project: Kiggavik	**Sample No.:** 03
Location: Nunavut	**Depth Interval (m):** N/A
Project No.: 10-1345-0026	**Lab Schedule No.:** 217

Other Remarks: **N/A**

Specific Gravity (assumed): 2.65	**Shape: N/A**
Max. Particle Size Passing (mm): 19	**Hardness: N/A**

Method: Combined, Washed



EB/KG	**10/20/2010**	**LP**	**10/20/2010**
Tech	Date	Checked	Date

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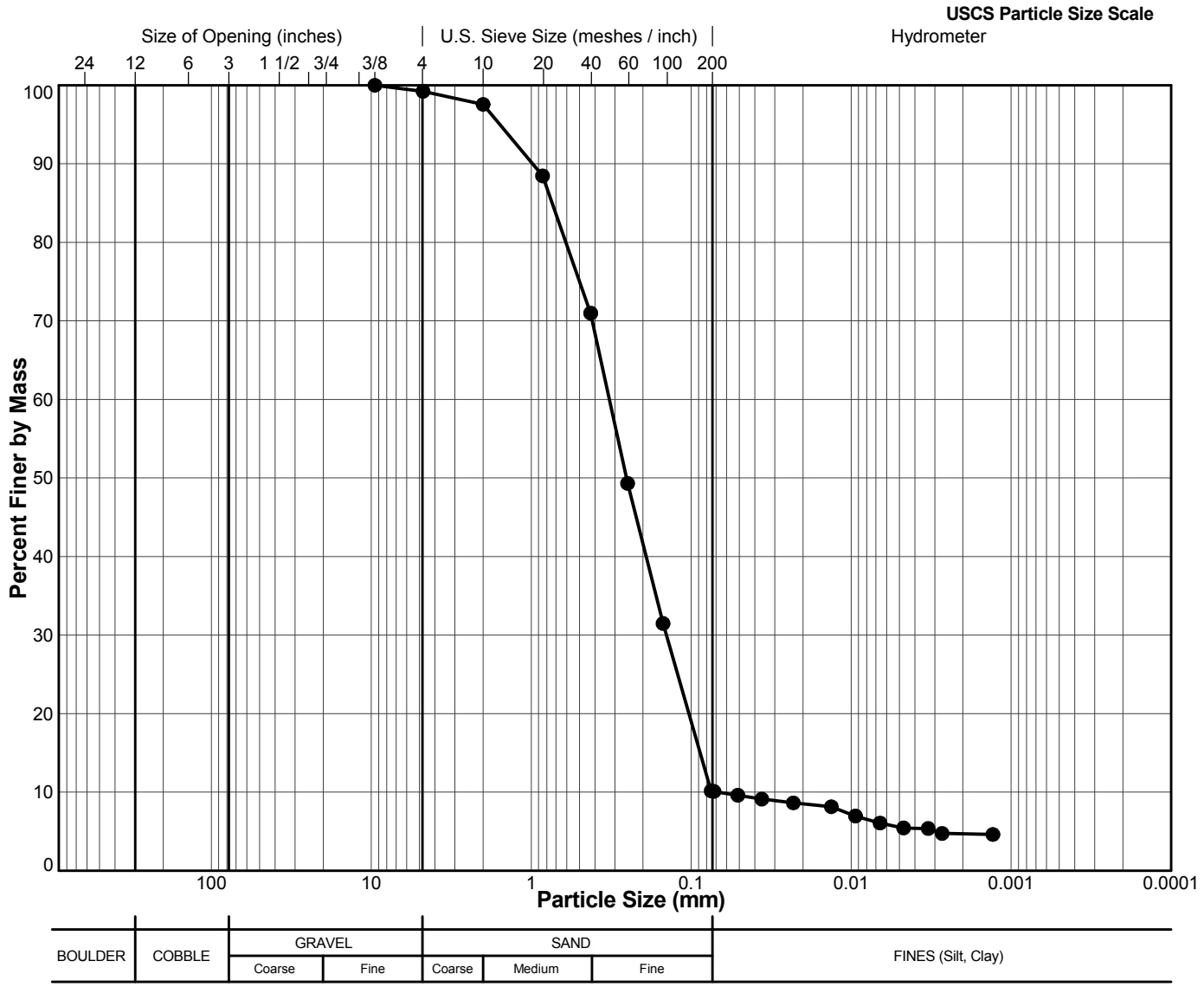
PARTICLE SIZE ANALYSIS OF SOILS

Reference(s)
ASTM D 422-63 (2007)

Client: Areva	**Sample Location:** SD
Project: Kiggavik	**Sample No.:** 04
Location: Nunavut	**Depth Interval (m):** N/A
Project No.: 10-1345-0026	**Lab Schedule No.:** 217

Other Remarks: **N/A**

Specific Gravity (assumed): 2.65	**Shape: N/A**
Max. Particle Size Passing (mm): 9.5	**Hardness: N/A**
Method: Split, Washed	**Dispersion Method: Air-Jet Cup**
Hydrometer ID: BURNABY - 87024	**Dispersion Period (min): 5**



EB/KG	**10/20/2010**	**LP**	**10/20/2010**
Tech	Date	Checked	Date

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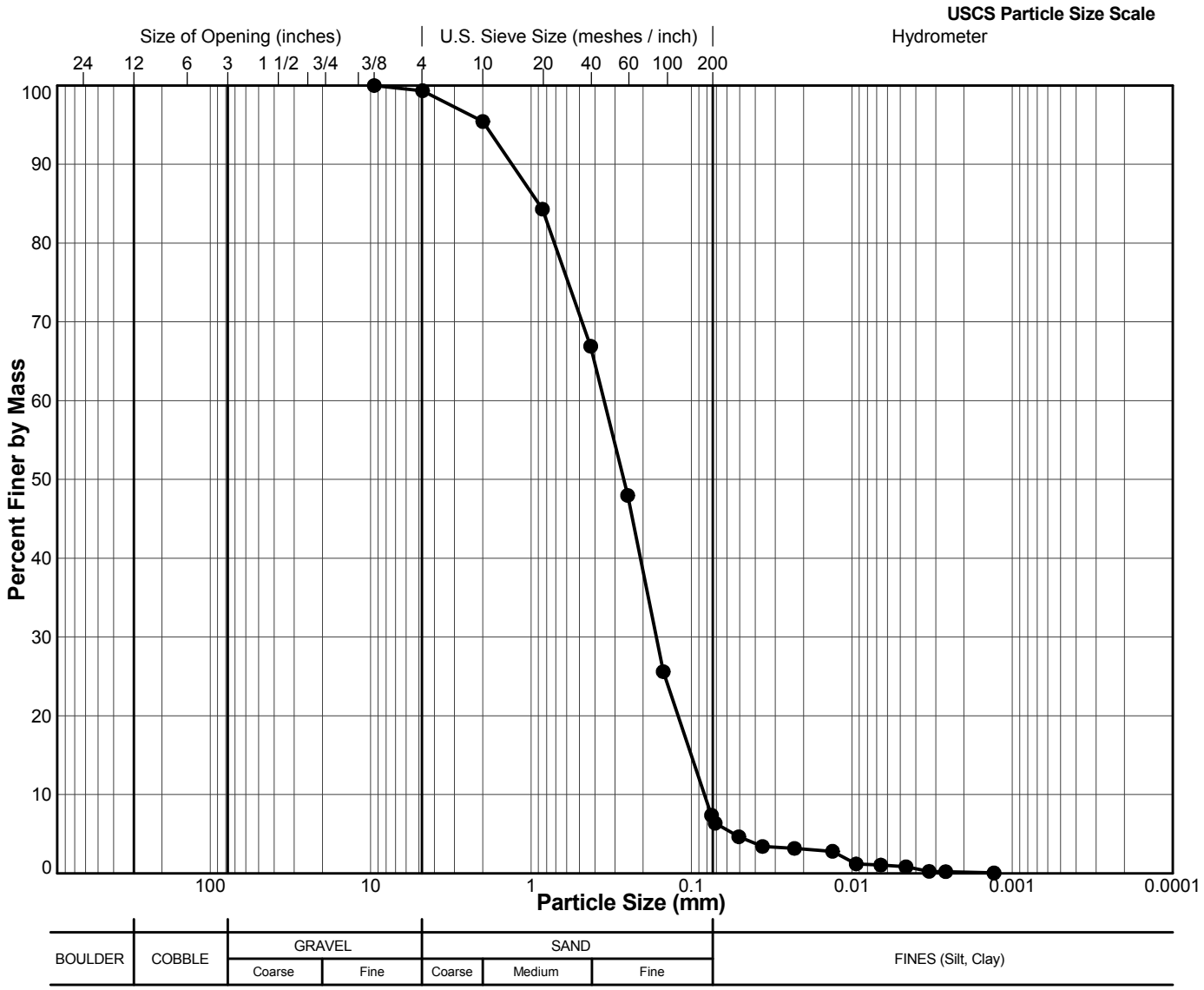
PARTICLE SIZE ANALYSIS OF SOILS

Reference(s)
ASTM D 422-63 (2007)

Client: Areva	**Sample Location:** SD
Project: Kiggavik	**Sample No.:** 05
Location: Nunavut	**Depth Interval (m):** N/A
Project No.: 10-1345-0026	**Lab Schedule No.:** 217

Other Remarks: **N/A**

Specific Gravity (assumed): 2.65	**Shape: N/A**
Max. Particle Size Passing (mm): 9.5	**Hardness: N/A**
Method: Split, Washed	**Dispersion Method: Air-Jet Cup**
Hydrometer ID: BURNABY - 541360	**Dispersion Period (min): 5**



EB/KG	**10/20/2010**	**LP**	**10/20/2010**
Tech	Date	Checked	Date

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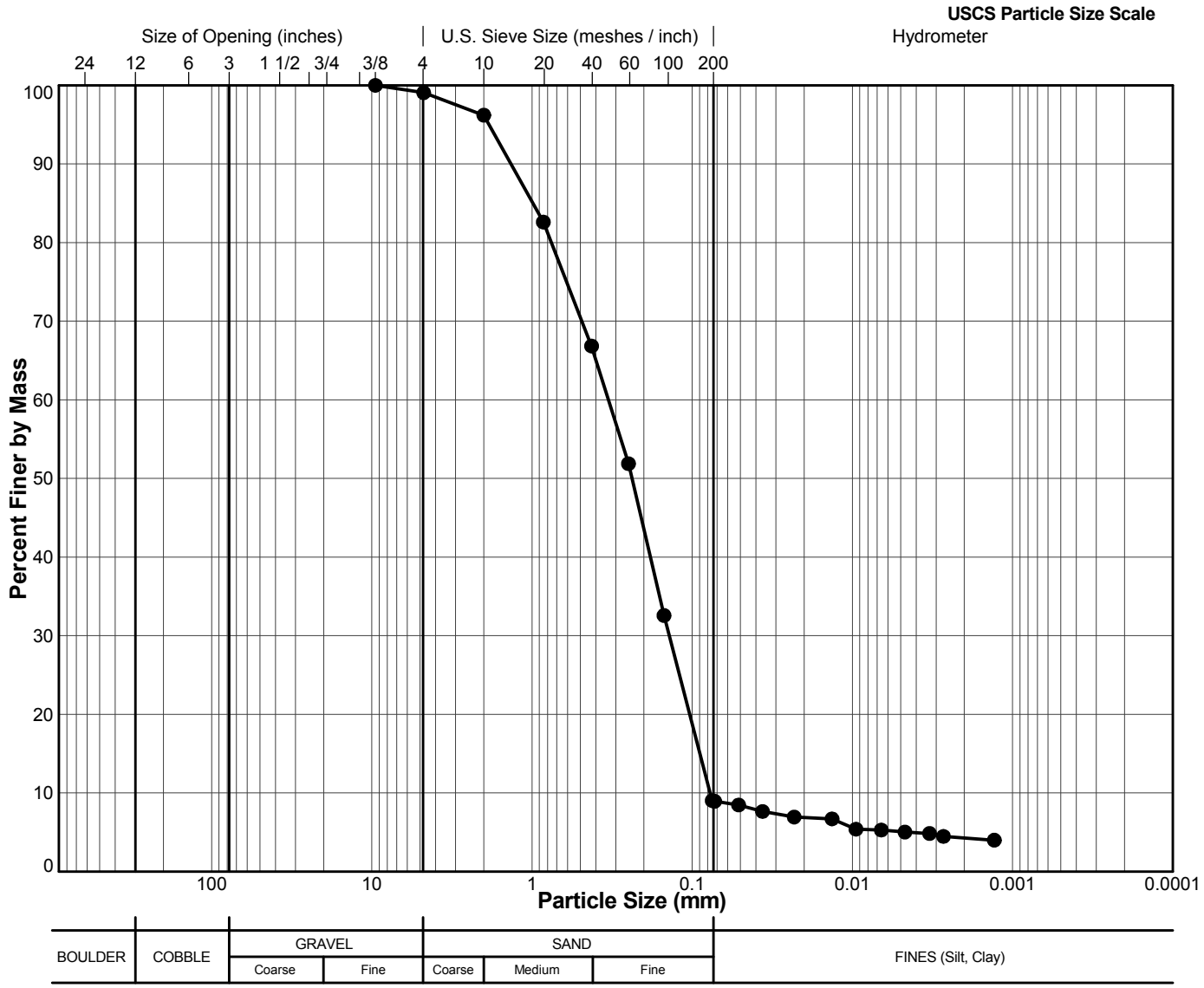
PARTICLE SIZE ANALYSIS OF SOILS

Reference(s)
ASTM D 422-63 (2007)

Client: Areva	**Sample Location:** SD
Project: Kiggavik	**Sample No.:** 11
Location: Nunavut	**Depth Interval (m):** N/A
Project No.: 10-1345-0026	**Lab Schedule No.:** 217

Other Remarks: **N/A**

Specific Gravity (assumed): 2.65	**Shape: N/A**
Max. Particle Size Passing (mm): 9.5	**Hardness: N/A**
Method: Split, Washed	**Dispersion Method: Air-Jet Cup**
Hydrometer ID: BURNABY - 87024	**Dispersion Period (min): 5**



EB/KG	**10/20/2010**	**LP**	**10/20/2010**
Tech	Date	Checked	Date

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PARTICLE SIZE ANALYSIS OF SOILS

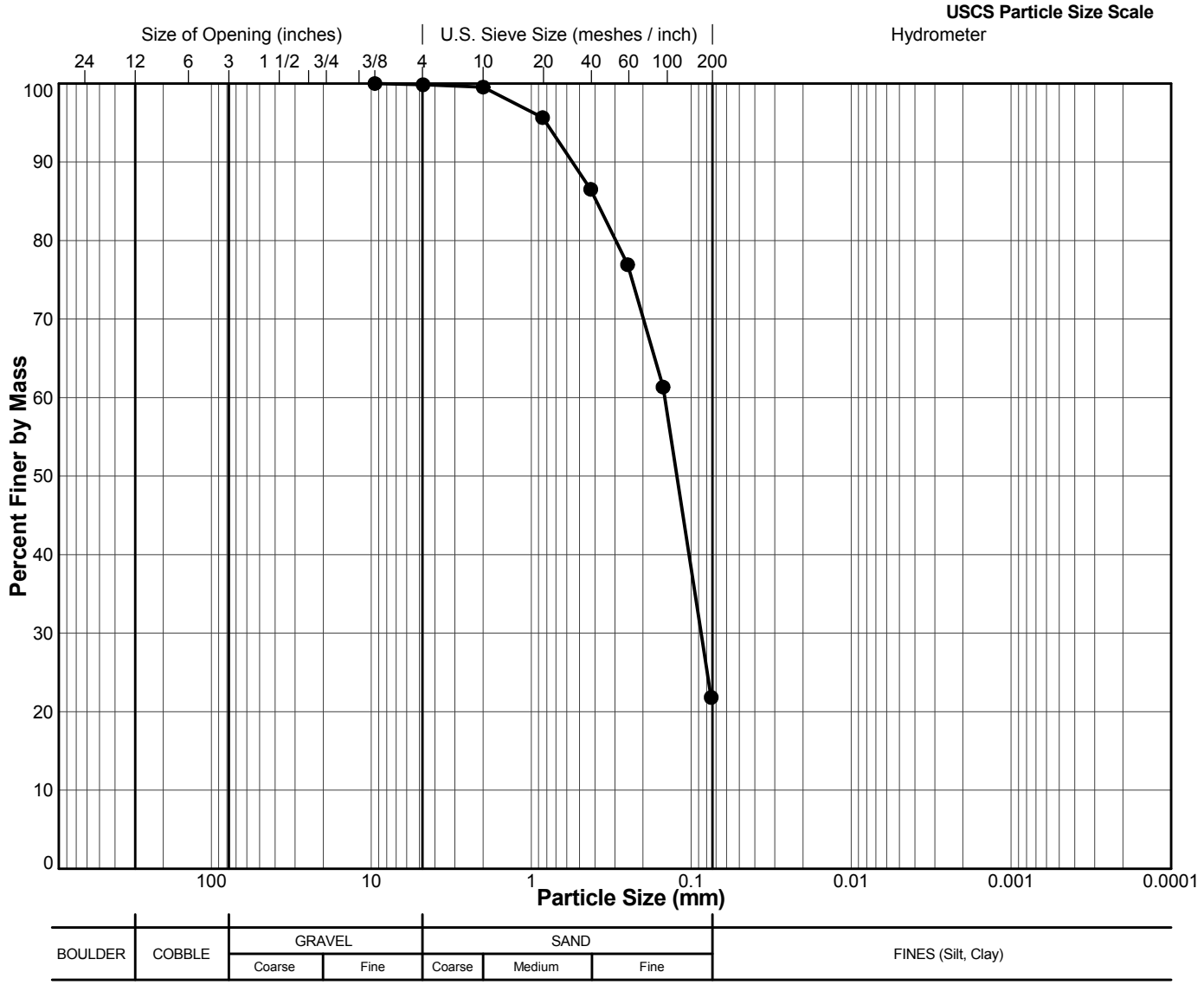
Reference(s)
ASTM D 422-63 (2007)

Client: Areva	**Sample Location:** SD
Project: Kiggavik	**Sample No.:** 12
Location: Nunavut	**Depth Interval (m):** N/A
Project No.: 10-1345-0026	**Lab Schedule No.:** 217

Other Remarks: **N/A**

Specific Gravity (assumed): 2.65	**Shape: N/A**
Max. Particle Size Passing (mm): 9.5	**Hardness: N/A**

Method: Combined, Washed



EB/KG	**10/20/2010**	**LP**	**10/20/2010**
Tech	Date	Checked	Date

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LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS

Reference(s)
ASTM D 4318-05

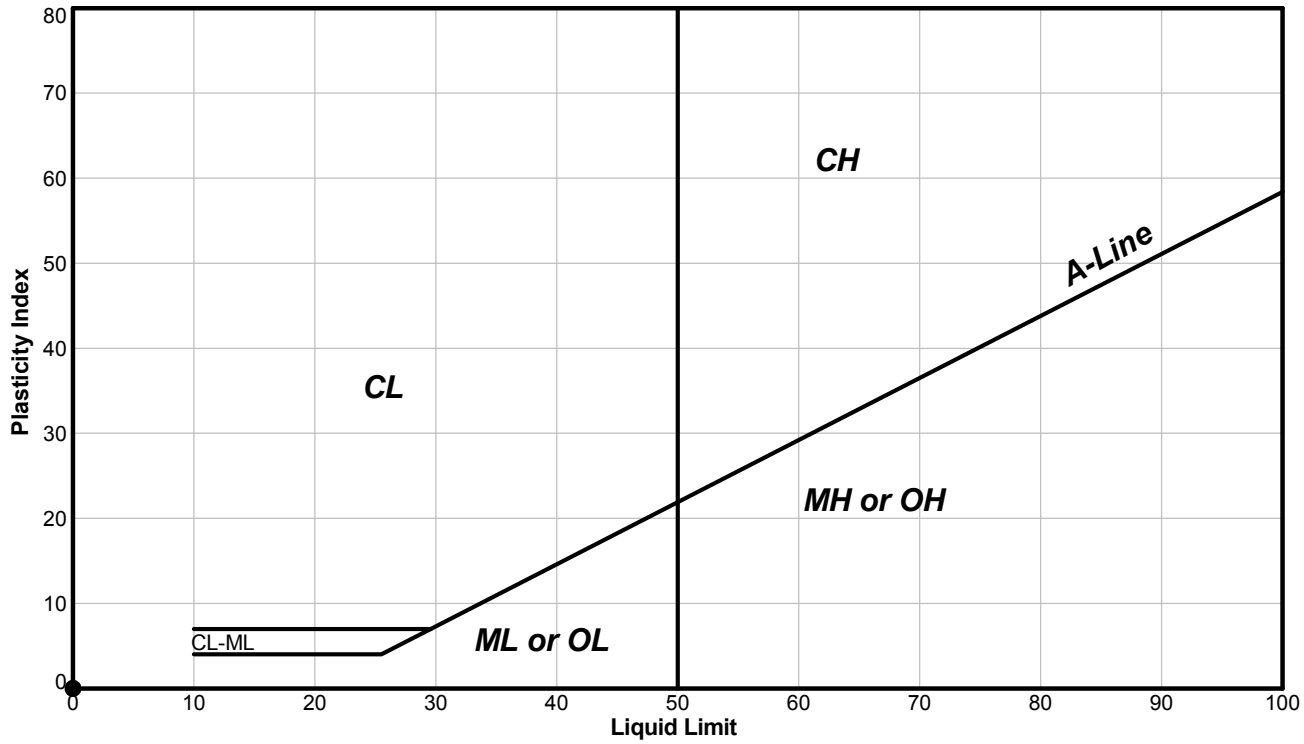
Client: Areva	**Sample Location:** SD
Project: Kiggavik	**Sample No.:** 04
Location: Nunavut	**Depth Interval (m):** N/A
Project No.: 10-1345-0026	**Lab Schedule No.:** 217

Classification and Definition: **Non-Plastic Soil (NP).**

Other Remarks: **N/A**

Test Method: A-Multi Point	**Preparation Method: Nonplastic Soil (NP)**

PLASTICITY CHART



Sym.	Sample Location	Sample Number	Depth (m)	Bottom (m)	Percent Passing #40 Sieve (%)	Liquid Limit	Plastic Limit	Plasticity Index	Natural Water Content (%)	Liquidity Index
●	SD	04	0.00	0.00	71	NP	NP	NP	26.3	NP

Note: The test data given herein pertain to the sample provided only. This report constitutes a testing service only.

EB	10/18/2010	LP	10/18/2010
Tech	Date	Checked	Date

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LIQUID LIMIT, PLASTIC LIMIT AND PLASTICITY INDEX OF SOILS

Reference(s)
ASTM D 4318-05

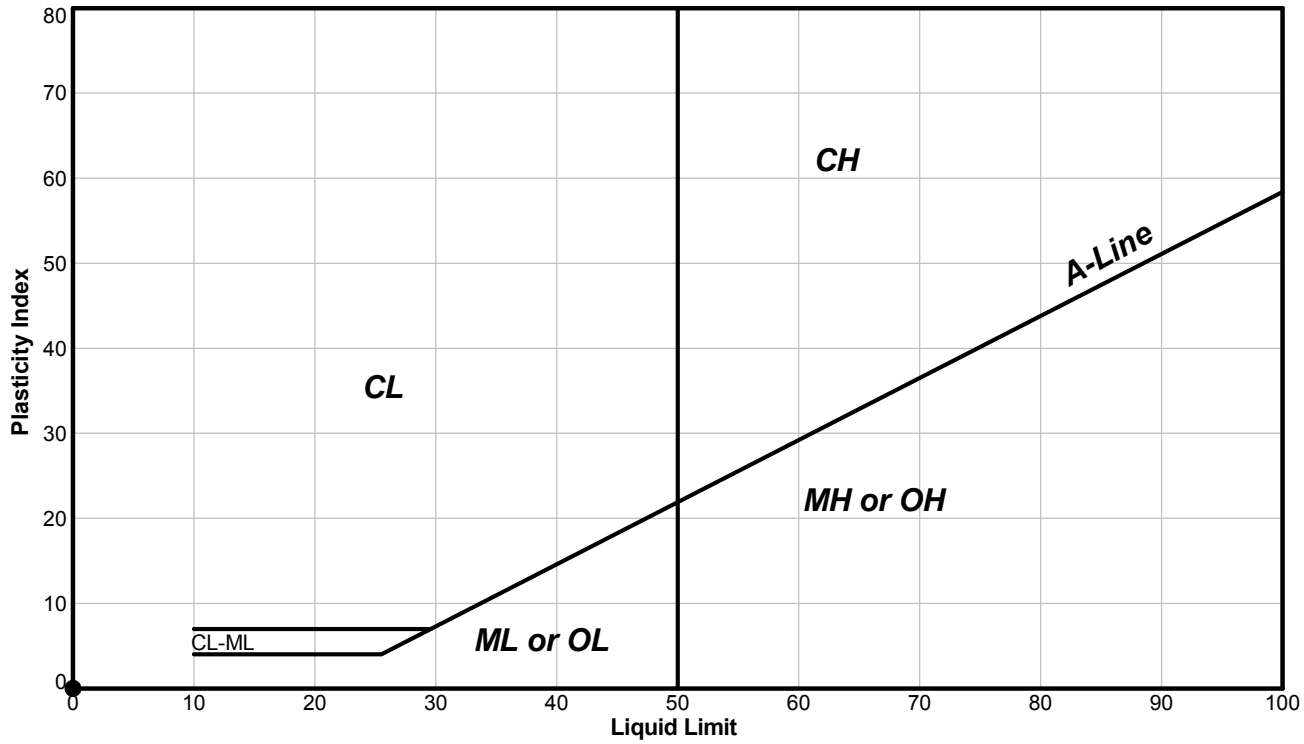
Client: Areva	**Sample Location:** SD
Project: Kiggavik	**Sample No.:** 11
Location: Nunavut	**Depth Interval (m):** N/A
Project No.: 10-1345-0026	**Lab Schedule No.:** 217

Classification and Definition: **Non-Plastic Soil (NP).**

Other Remarks: **N/A**

Test Method: A-Multi Point | **Preparation Method: Nonplastic Soil (NP)**

PLASTICITY CHART



Sym.	Sample Location	Sample Number	Depth (m)	Bottom (m)	Percent Passing #40 Sieve (%)	Liquid Limit	Plastic Limit	Plasticity Index	Natural Water Content (%)	Liquidity Index
●	SD	11	0.00	0.00	67	NP	NP	NP	29.6	NP

Note: The test data given herein pertain to the sample provided only. This report constitutes a testing service only.

EB	10/18/2010	LP	10/18/2010
Tech	Date	Checked	Date

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WATER CONTENT DETERMINATION

Reference(s)
ASTM D 4959

Client:	Areva	**Project No.:**	10-1345-0026
Project:	Kiggavik	**Lab Schedule No.:**	217
Location:	Nunavut		

Sample Location	Sample No.	Sample Interval		Water Content (%)
		Depth (m)	Bottom (m)	
SD	**01**	0.00	0.00	**19.9**
SD	**02**	0.00	0.00	**20.7**
SD	**03**	0.00	0.00	**23.6**
SD	**04**	0.00	0.00	**26.3**
SD	**05**	0.00	0.00	**24.1**
SD	**11**	0.00	0.00	**29.6**
SD	**12**	0.00	0.00	**44.8**

LP	10/22/2010	
Checked	Date	

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4280 Still Creek Drive
Burnaby,B.C. Canada V5C 6C8

Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

Reference
ASTM D 2974-07

Project No.:	10-1345-0026	**Borehole**	**N/A**
Client:	Areva	**Sample No.:**	SD 01
Project:	Kiggavik	**Depth (m):**	N/A
Location:	Nunavut	**Lab Sch No:**	217

Method:	C	**Other Remarks:**
Oven Temperature	50 degrees Centigrade	
Furnace Temperature	440 degrees Centigrade	
Moisture Determination	As-received mass	

Moisture Content %	19.9	
% Passing #4	100.0	
Trial #	1	2
Ash Content %	99.4	99.4
Organic Matter %	0.6	0.6
UCS Description	Slightly Organic	
Average Organic Matter %	**0.6**	

** The test data given herein pertain to the sample provided only. This report constitutes a testing service only. Interpretation of the data can be provided upon request.*

EB	October 18. 2010	LP	October 22,2010
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd. - Burnaby Laboratory
4280 Still Creek Drive
Burnaby,B.C. Canada V5C 6C8

Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

Reference
ASTM D 2974-07

Project No.:	10-1345-0026	**Borehole**	**N/A**
Client:	Areva	**Sample No.:**	SD 02
Project:	Kiggavik	**Depth (m):**	N/A
Location:	Nunavut	**Lab Sch No:**	217

Method:	C	**Other Remarks:**
Oven Temperature	50 degrees Centigrade	
Furnace Temperature	440 degrees Centigrade	
Moisture Determination	As-received mass	

Moisture Content %	20.7	
% Passing #4	99.8	
Trial #	1	2
Ash Content %	99.5	99.4
Organic Matter %	0.5	0.6
UCS Description	Slightly Organic	
Average Organic Matter %	**0.6**	

** The test data given herein pertain to the sample provided only. This report constitutes a testing service only. Interpretation of the data can be provided upon request.*

EB	October 18, 2010	LP	October 22,2010
TESTED BY	DATE	CHECKED BY	DATE

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4280 Still Creek Drive
Burnaby,B.C. Canada V5C 6C8

Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

Reference
ASTM D 2974-07

Project No.:	10-1345-0026	**Borehole**	**N/A**
Client:	Areva	**Sample No.:**	SD 04
Project:	Kiggavik	**Depth (m):**	N/A
Location:	Nunavut	**Lab Sch No:**	217

Method:	C	**Other Remarks:**
Oven Temperature	50 degrees Centigrade	
Furnace Temperature	440 degrees Centigrade	
Moisture Determination	As-received mass	

Moisture Content %	26.3	
% Passing #4	99.2	
Trial #	1	2
Ash Content %	97.7	97.7
Organic Matter %	2.3	2.3
UCS Description	Slightly Organic	
Average Organic Matter %	**2.3**	

** The test data given herein pertain to the sample provided only. This report constitutes a testing service only. Interpretation of the data can be provided upon request.*

EB	October 19, 2010	LP	October 22,2010
TESTED BY	DATE	CHECKED BY	DATE

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Burnaby,B.C. Canada V5C 6C8

Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

Reference
ASTM D 2974-07

Project No.:	10-1345-0026	**Borehole**	**N/A**
Client:	Areva	**Sample No.:**	SD 05
Project:	Kiggavik	**Depth (m):**	N/A
Location:	Nunavut	**Lab Sch No:**	217

Method:	C	**Other Remarks:**
Oven Temperature	50 degrees Centigrade	
Furnace Temperature	440 degrees Centigrade	
Moisture Determination	As-received mass	

Moisture Content %	24.1	
% Passing #4	99.3	
Trial #	1	2
Ash Content %	98.9	98.9
Organic Matter %	1.1	1.1
UCS Description	Slightly Organic	
Average Organic Matter %	**1.1**	

** The test data given herein pertain to the sample provided only. This report constitutes a testing service only. Interpretation of the data can be provided upon request.*

EB	October 19, 2010	LP	October 22,2010
TESTED BY	DATE	CHECKED BY	DATE

Golder Associates Ltd. - Burnaby Laboratory
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Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

Reference
ASTM D 2974-07

Project No.:	10-1345-0026	**Borehole**	**N/A**
Client:	Areva	**Sample No.:**	SD 11
Project:	Kiggavik	**Depth (m):**	N/A
Location:	Nunavut	**Lab Sch No:**	217

Method:	C	**Other Remarks:**
Oven Temperature	50 degrees Centigrade	
Furnace Temperature	440 degrees Centigrade	
Moisture Determination	As-received mass	

Moisture Content %	29.6	
% Passing #4	99.1	
Trial #	1	2
Ash Content %	98.1	98.1
Organic Matter %	1.9	1.9
UCS Description	Slightly Organic	
Average Organic Matter %	**1.9**	

** The test data given herein pertain to the sample provided only. This report constitutes a testing service only. Interpretation of the data can be provided upon request.*

EB	October 20, 2010	LP	October 22,2010
TESTED BY	DATE	CHECKED BY	DATE

APPENDIX C

Seismic Hazard Calculation

2005 National Building Code Seismic Hazard Calculation

INFORMATION: Eastern Canada English (613) 995-5548 français (613) 995-0600 Facsimile (613) 992-8836
Western Canada English (250) 363-6500 Facsimile (250) 363-6565

Requested by: Justin Bieber, February 07, 2011

Site Coordinates: 64.3322 North 97.9033 West

User File Reference:

National Building Code ground motions:
2% probability of exceedance in 50 years (0.000404 per annum)

Sa(0.2)	Sa(0.5)	Sa(1.0)	Sa(2.0)	PGA (g)
0.116	0.056	0.023	0.006	0.059

Notes. Spectral and peak hazard values are determined for firm ground (NBCC 2005 soil class C - average shear wave velocity 360-750 m/s). Median (50th percentile) values are given in units of g. 5% damped spectral acceleration (Sa(T), where T is the period in seconds) and peak ground acceleration (PGA) values are tabulated. Only 2 significant figures are to be used. ***These values have been interpolated from a 10 km spaced grid of points. Depending on the gradient of the nearby points, values at this location calculated directly from the hazard program may vary. More than 95 percent of interpolated values are within 2 percent of the calculated values.***

Ground motions for other probabilities:

Probability of exceedance per annum	0.010	0.0021	0.001
Probability of exceedance in 50 years	40%	10%	5%
Sa(0.2)	0.015	0.044	0.069
Sa(0.5)	0.008	0.024	0.036
Sa(1.0)	0.003	0.009	0.014
Sa(2.0)	0.001	0.002	0.004
PGA	0.007	0.021	0.035

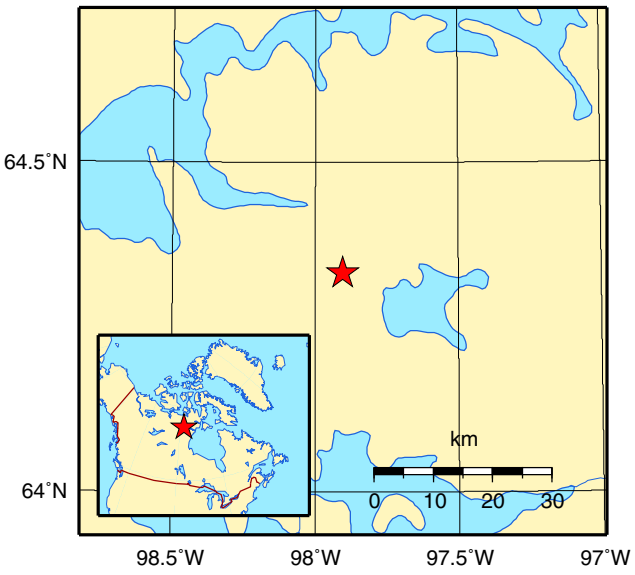
References

National Building Code of Canada 2005 NRCC no. 47666; sections 4.1.8, 9.20.1.2, 9.23.10.2, 9.31.6.2, and 6.2.1.3
Appendix C: Climatic Information for Building Design in Canada - table in Appendix C starting on page C-11 of Division B, volume 2

User's Guide - NBC 2005, Structural Commentaries NRCC no. 48192
Commentary J: Design for Seismic Effects

Geological Survey of Canada Open File xxxx
Fourth generation seismic hazard maps of Canada: Grid values to be used with the 2005 National Building Code of Canada (in preparation)

See the websites *www.EarthquakesCanada.ca* and *www.nationalcodes.ca* for more information



Aussi disponible en français

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