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PROJECT No. 13-1121-0186

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GROUNDWATER IMPACT STUDY PROPOSED RESIDENTIAL DEVELOPMENT, KELLAM LANDS 4789 BANK STREET, OTTAWA, ONTARIO

This report presents the results of a groundwater impact study carried out for the proposed residential development site to be located at 4789 Bank Street, in Ottawa, Ontario. The groundwater impact study is required by the City of Ottawa (City) prior to draft plan approval.

The purpose of this groundwater impact study was to determine the general soil and groundwater conditions across this site, by means of existing on-site borehole information and data from nearby sites, and to address possible construction-related impacts to private water supply wells. The on-site information was enhanced with published mapping and publicly available information. The water well records in the Ministry of the Environment and Climate Change (MOECC) Water Well Information System (WWIS) for nearby water wells were used to provide further information regarding hydrogeological conditions in the area and identify where nearby water well users are taking their water.

1.0 DESCRIPTION OF PROJECT AND SITE

A residential subdivision is planned to be developed on a site located on the east side of Bank Street, opposite Findlay Creek Drive, and south of Analdea Drive, in Ottawa, Ontario. The approximate location of the site is shown on the Key Map insert provided on the Site Plan, Figure 1.

The following is known about the site and project (Figure 1):

- The site is currently undeveloped, is approximately rectangular in shape and measures about 300 metres by 950 metres in plan area.
- The site will be developed as a conventional residential development with mixed use commercial at the west end and a park at the southeast corner of the property.
- The development will be serviced with municipal sewer and water.





2.0 GEOLOGY

The following sections describe the published local geology and hydrogeology in the vicinity of the site.

2.1 Surficial Geology

The surficial geology in the vicinity of the site is shown on Figure 2. The upper overburden material mapped within the development is glacial till (Unit 1a). The upper overburden material mapped beneath the eastern-most portion of the development is nearshore deposits of gravel, sand and boulders (Units 5a and 5b). This generally agrees with the site-specific data gathered by Golder Associates from test pits and boreholes completed within the development site (Golder Associates, 2013) and boreholes completed along the trunk sanitary sewer alignment (Golder Associates, 2010). These investigations found that the subsurface conditions on the site generally consist of sandy and silty soil underlain by a deposit of glacial till, which in turn overlies bedrock.

The locations of the test pits and boreholes is shown on Figure 1 and the test pit and borehole logs are provided in Attachment A.

Based on the data collected by Golder Associates, the bedrock surface typically exists at depths ranging from about 1.5 to 6.6 metres below the existing ground surface, increasing in depth from the west to the east. Published mapping indicates the bedrock surface to be at depths in the range of 2 to 50 metres below the ground surface in the vicinity of the site (Figure 3).

2.2 Bedrock Geology

The Ontario Geological Survey bedrock geology mapping indicates that the Queenston, Carlsbad, Lindsay, Nepean and March Formations are present in the area of the site (Figure 4). The Queenston, Carlsbad and Lindsay Formations generally consist of interbedded shale, siltstone and limestone. The Nepean Formation consists of quartz sandstone and the March Formation consists of interbedded sandstone, sandy dolostone and dolostone (Williams, 1991). Although not shown on Figure 4, the Oxford Formation, consisting of dolostone with subordinate shaley and sandy interbeds, has also been found near the site.

The site-specific bedrock geology in the vicinity of the site has been interpreted based on test pit and borehole information gathered for the development site, the Sundance Village Subdivision and associated trunk sanitary servicing (immediately north of the development site), the Findlay Creek Village Subdivision (located immediately west of the development site), and the installation of the stormwater management pond (SWMP) north of Blais Road and south of the development site. The following summarizes the review of the available site-specific bedrock information:

- All boreholes completed into the bedrock within the Findlay Creek Village Subdivision and adjacent Leitrim Wetland encountered an upper bedrock unit consisting of dolostone or dolomitic limestone. This bedrock unit is interpreted to be the Oxford Formation.
- Shale bedrock was observed in all of the test pits completed to bedrock in the Sundance Village Subdivision.
- From boreholes completed into bedrock along the trunk sanitary sewer alignment and in the vicinity of the SWMP, and as observed during installation of the trunk sewer, the upper bedrock unit changes from dolostone to shale going east from Bank Street. Based on a review of the available bedrock core, the shale unit is interpreted to be the Carlsbad Formation.



3.0 HYDROGEOLOGY

3.1 Regional Hydrogeology

The clay and glacial till deposits in the area of the development are generally not capable of supplying sufficient quantities of groundwater to be considered an aquifer. As a result, the principal aquifer within the vicinity of the site is considered to be the underlying bedrock formations.

The Nepean, March and Oxford Formations are considered to be highly transmissive aquifers, and generally provide an adequate resource for domestic water supplies. Groundwater flow in these formations is controlled predominately by fractures, as the primary porosity has been reduced by cementation.

The Queenston, Carlsbad and Lindsay Formations are generally known as relatively poor water producers from both a quantity and quality perspective. As such, very little testing of the hydraulic properties of these formations has been completed.

3.2 Site Specific Hydrogeology

A number of hydrogeological investigations have been completed on and nearby the site. Monitoring wells were sealed into various boreholes to allow for hydraulic response testing and measurements of the groundwater level. Estimates of hydraulic conductivity in monitoring wells where testing was completed as well as measured groundwater levels are provided in the following table.

Borehole Number	Geologic Unit	Ground Surface Elevation (masl)	Groundwater Depth (m)	Groundwater Elevation (masl)	Date of Measurement	Estimated Hydraulic Conductivity (m/s)
13-2	Silty Sand	94.55	0.48	94.07	Oct. 23, 2013	Not measured
13-7	Glacial Till	92.19	0.93	91.26	Oct. 23, 2013	Not measured
13-12	Glacial Till	89.99	0.98	89.01	Oct. 23, 2013	Not measured
10-1 A	Dolomitic Limestone	93.66	3.17	90.49	Sep. 28, 2010	2.2 x 10⁻ ⁶
10-1 B	Dolomitic Limestone	93.66	3.72	89.94	Feb. 16, 2010	9.3 x 10⁻ ⁶
10-2	Sand/Glacial Till	90.45	0.04	90.41	Mar. 29, 2010	2.8 x 10 ⁻⁶
10-3	Silt	90.30	0.05	90.25	Mar. 29, 2010	3.5 x 10 ⁻⁷
10-103	Glacial Till / Shale Bedrock	93.49	0.17	93.32	Sep. 28, 2010	3.4 x 10⁻ ⁶
10-108 A	Shale Bedrock	89.54	0.06	89.48	Sep. 28, 2010	9.7 x 10 ⁻⁶
10-108 B	Glacial Till	89.54	0.70	88.84	Sep. 28, 2010	4.1 x 10 ⁻⁸

Water levels across the area surrounding the site range from 0 to 3.7 metres depth. It should be noted that groundwater levels are expected to fluctuate seasonally. Higher groundwater levels are expected during wet periods of the year, such as spring.



4.0 POTENTIAL IMPACTS TO EXISTING GROUNDWATER USERS

Municipal water service within the vicinity of the site is provided in the area of Bank Street from Leitrim Road to Rideau Road, the west end of Blais Road, Sundance Village Subdivision and Findlay Creek Village Subdivision. It is expected that the majority of wells recorded in the WWIS database in this area are no longer in use and the houses/businesses are connected to the municipal supply; however, it is possible that there could still be a limited number of water supply wells still in use. It is considered that the only potential for the proposed development to affect any wells that are still in use would be temporarily in association with temporary pumping from service trenches.

In the MOECC Water Well Information System (WWIS) database, one water supply well was located within 100 metres of the site. The WWIS indicates that the well was constructed to be used as domestic water supply. Details regarding the water supply well are presented in the following table. Refer to Figure 1 for the reported well location.

Well ID	Depth of Well (m)	Depth to Static Water Level (m)		Available Drawdown (m)	Type of Well	
1514809	90.8	7.6	90.8	83.2	Bedrock	

From the available well record, the water supply well obtains water from the bedrock aquifer. The available drawdown in the well, calculated as the difference between the static water level and the depth of the well) was 83.2 metres. A temporary drawdown due to construction dewatering from service trenches at the site could temporarily reduce the available drawdown in the well, but not likely to the degree that could negatively impact water supply. It is understood that there are no structures or land uses planned for the site that would permanently lower the groundwater levels in the area surrounding the site (i.e., deep drained foundations).

Based on the comparatively small amount of drawdown that would be required in service trenches compared to the available drawdown in the well, the installation of site services is not expected to adversely affect performance of any remaining wells in service within 100 metres of the site. In addition, installation of a deep trunk sanitary sewer was completed in 2011, east-west across the site and north to the Sundance Village Subdivision. At that time, there were no well interference complaints. Since the proposed service trenches on the site would be shallower than the trunk sanitary sewer trench constructed in 2011, impacts to existing groundwater users associated with temporary pumping from service trenches are not anticipated.

Prior to construction at the site, it is recommended that a well survey be completed at residences with wells located within approximately 100 metres of the property boundary. Information to be collected during the well survey could include the depth of the well, type of pump, and static water level. Water quality samples could be collected and analyzed for a typical suite of parameters (i.e. the 'subdivision package' as per MOECC Procedure D-5-5).

5.0 LIMITATIONS AND USE OF MEMORANDUM

This technical memorandum was prepared for the exclusive use of Claridge Homes Corporation. The technical memorandum, which specifically includes all tables, figures and appendices, is based on data gathered by Golder Associates Ltd., and information provided to Golder Associates Ltd. by others. The information provided by others has not been independently verified or otherwise examined by Golder Associates Ltd. to determine the accuracy or completeness. Golder Associates Ltd. has relied in good faith on this information and does not accept responsibility for any deficiency, misstatements, or inaccuracies contained in the information as a result of omissions, misinterpretation or fraudulent acts.



The services performed as described in this technical memorandum were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions, subject to the time limits and financial and physical constraints applicable to the services.

Any use which a third party makes of this technical memorandum, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Golder Associates Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made, or actions taken based on this technical memorandum.

6.0 CLOSURE

We trust this submission satisfies the requirements for a groundwater impact study of the proposed Claridge Kellam Lands residential development, in Ottawa, Ontario. If you have any questions regarding this report, please contact the undersigned.

GOLDER ASSOCIATES LTD.



Attachment A – Borehole Logs

REFERENCES

- Golder Associates Ltd., 2010. Report on Geotechnical Investigation, Proposed Trunk Sewers Detailed Design, Sundance Village Development, Ottawa, Ontario. Report No. 10-1121-0014, October 2010.
- Golder Associates Ltd., 2013. Report on Geotechnical Investigation, Proposed Residential Development, East of Bank Street and South of Analdea Drive, Ottawa, Ontario. Report No. 13-1121-0186, November 2013.
- Williams, D.A., 1991. Paleozoic Geology of the Ottawa-St Lawrence Lowland, Southern Ontario; Ontario Geological Survey, Open File Report 5770, 292p.







25mm IF THIS MEASUL









25mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE H





ATTACHMENT A

Borehole Logs





METHOD OF SOIL CLASSIFICATION

The Golder Associates Ltd. Soil Classification System is based on the Unified Soil Classification System (USCS)																		
Organic or Inorganic	Soil Group	Туре	of Soil	Gradation or Plasticity	Cu	$=\frac{D_{60}}{D_{10}}$		$Cc = \frac{(D)}{D_{10}}$	$(xD_{60})^2$	Organic Content	USCS Group Symbol	Group Name						
ss) 5 mm)	of m()	Gravels with	Poorly Graded		<4		≤1 or ≩	:3		GP	GRAVEL							
	/ELS , mass action 4.75 r	fines (by mass)	Well Graded		≥4		1 to 3	3		GW	GRAVEL							
by ma	SOILS an 0.07	GRA 50% by arse fr er than	Gravels with	Below A Line			n/a				GM	SILTY GRAVEL						
aANIC t ≤30%	AINED rger th	larg c (×	fines (by mass)	Above A Line			n/a			<20%	GC	CLAYEY GRAVEL						
INORG	SE-GR/ ss is la	of is mm)	Sands with	Poorly Graded		<6		≤1 or 2	≥3	≥30%	SP	SAND						
ganic (COARS by ma	JDS / mass action n 4.75	fines (by mass)	Well Graded		≥6		1 to 3	3		SW	SAND						
(O	(>50%	SAN 50% by barse fr ller that	Sands with	Below A Line			n/a				SM	SILTY SAND						
	Ŭ		fines (by mass)	Above A Line			n/a				SC	CLAYEY SAND						
Organic	Soil			Loboratory		Field Indicators				O mmenda	11000 0000	Brimony						
or Inorganic	or Type of Soil Inorganic Group		of Soil	Tests	Dilatancy	Dry Strength	Shine Test	Thread Diameter	Toughness (of 3 mm thread)	Content	Symbol	Name						
s) 5 mm)				- plot		Linuid Linuit	Rapid	None	None	>6 mm	N/A (can't roll 3 mm thread)	<5%	ML	SILT				
	5 mm)	LED SOILS aller than 0.075 mm SILTS SILTS below A-Line below A-Line		Slow	None to Low	Dull	3mm to 6 mm	None to low	<5%	ML	CLAYEY SILT							
by mas	ILS II 0.07		SILTS SILTS -Plastic or PI below A-L	ow A-L Plastic art bel		Slow to very slow	Low to medium	Dull to slight	3mm to 6 mm	Low	5% to 30%	OL	ORGANIC SILT					
ANIC ≤30%	JED SC aller th			- Plasti bel on Chε	bel G o G	Liquid Limit	Slow to very slow	Low to medium	Slight	3mm to 6 mm	Low to medium	<5%	МН	CLAYEY SILT				
NORG	-GRAIN	(Nor		250	None	Medium to high	Dull to slight	1 mm to 3 mm	Medium to high	5% to 30%	ОН	ORGANIC SILT						
Janic C	FINE- y mass	(250% by mass CLAYS (Pl and LL plot	lot	lot	ot	ot	ot	lot art	art	Liquid Limit <30	None	Low to medium	Slight to shiny	~ 3 mm	Low to medium	0%	CL	SILTY CLAY
(Org	=50% b		d LL p A-Line sity Ch: slow)	Liquid Limit 30 to 50	None	Medium to high	Slight to shiny	1 mm to 3 mm	Medium	to 30%	CI	SILTY CLAY						
			(Plar C	above Plasti b	Liquid Limit ≥50	None	High	Shiny	<1 mm	High	(see Note 2)	СН	CLAY					
NIC NIC	>30% >30%	Peat and mineral soil mixtures							30% to 75%		SILTY PEAT, SANDY PEAT							
Predominant OC OU OL OL May contain may contain mineral soil, fil amorphous			antly peat, tain some il, fibrous or ous peat						75% to 100%	PT	PEAT							
40 Dual Symbol — A dual symbol is two symbols separated																		



Dual Symbol — A dual symbol is two symbols separated by a hyphen, for example, GP-GM, SW-SC and CL-ML.

For non-cohesive soils, the dual symbols must be used when the soil has between 5% and 12% fines (i.e. to identify transitional material between "clean" and "dirty" sand or gravel.

For cohesive soils, the dual symbol must be used when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart (see Plasticity Chart at left).

Borderline Symbol — A borderline symbol is two symbols separated by a slash, for example, CL/CI, GM/SM, CL/ML. A borderline symbol should be used to indicate that the soil has been identified as having properties that are on the transition between similar materials. In addition, a borderline symbol may be used to er indicates a range of similar soil types within a stratum.





ABBREVIATIONS AND TERMS USED ON RECORDS OF **BOREHOLES AND TEST PITS**

Μ

MH

MPC

SPC

OC

 SO_4

UC

UU

γ

1.

V (FV)

PARTICLE SIZES OF CONSTITUENTS

Soil	Particle Size	Millimetres	Inches
Constituent	Description		(US Std. Sieve Size)
BOULDERS	Not Applicable	>300	>12
COBBLES	Not Applicable	75 to 300	3 to 12
GRAVEL	Coarse	19 to 75	0.75 to 3
	Fine	4.75 to 19	(4) to 0.75
SAND	Coarse	2.00 to 4.75	(10) to (4)
	Medium	0.425 to 2.00	(40) to (10)
	Fine	0.075 to 0.425	(200) to (40)
SILT/CLAY	Classified by plasticity	<0.075	< (200)

MODIFIERS FOR SECONDARY AND MINOR CONSTITUENTS

Percentage by Mass	Modifier		
>35	Use 'and' to combine major constituents (<i>i.e.</i> , SAND and GRAVEL, SAND and CLAY)		
> 12 to 35	Primary soil name prefixed with "gravelly, sandy, SILTY, CLAYEY" as applicable		
> 5 to 12	some		
≤ 5	trace		

PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split-spoon sampler for a distance of 300 mm (12 in.).

Cone Penetration Test (CPT)

An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm² pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (qt), porewater pressure (u) and sleeve frictions are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); Nd:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

- Sampler advanced by hydraulic pressure PH:
- PM: Sampler advanced by manual pressure
- WH: Sampler advanced by static weight of hammer
- WR: Sampler advanced by weight of sampler and rod

Compactness ²					
Term	SPT 'N' (blows/0.3m) ¹				
Very Loose	0 - 4				
Loose	4 to 10				
Compact	10 to 30				
Dense	30 to 50				
Very Dense	>50				
 SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects. Definition of compactness descriptions based on SPT 'N' ranges from 					

from Terzaghi and Peck (1967) and correspond to typical average $N_{\rm 60}$ values.

Field Moisture Condition				
Term	Description			
Dry	Soil flows freely through fingers.			
Moist	Soils are darker than in the dry condition and may feel cool.			
Wet	As moist, but with free water forming on hands when handled.			
Wet	As moist, but with free water forming on hands when handled.			

SAMPLES	
AS	Auger sample
BS	Block sample
CS	Chunk sample
DO or DP	Seamless open ended, driven or pushed tube sampler – note size
DS	Denison type sample
FS	Foil sample
RC	Rock core
SC	Soil core
SS	Split spoon sampler – note size
ST	Slotted tube
то	Thin-walled, open – note size
ТР	Thin-walled, piston – note size
WS	Wash sample
SOIL TESTS	3
w	water content
PL, w _p	plastic limit
LL, w _L	liquid limit
С	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test ¹
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement ¹
D _R	relative density (specific gravity, Gs)
DS	direct shear test
GS	specific gravity

COHESIVE SOILS

sieve analysis for particle size

Modified Proctor compaction test

Standard Proctor compaction test

unconfined compression test

concentration of water-soluble sulphates

Tests which are anisotropically consolidated prior to shear are

unconsolidated undrained triaxial test

field vane (LV-laboratory vane test)

organic content test

unit weight

shown as CAD, CAU.

combined sieve and hydrometer (H) analysis

Consistency				
Term	Undrained Shear Strength (kPa)	SPT 'N' ¹ (blows/0.3m)		
Very Soft	<12	0 to 2		
Soft	12 to 25	2 to 4		
Firm	25 to 50	4 to 8		
Stiff	50 to 100	8 to 15		
Very Stiff	100 to 200	15 to 30		
Hard	>200	>30		

SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects: approximate only.

Water Content				
Term	Description			
w < PL	Material is estimated to be drier than the Plastic Limit.			
w ~ PL	Material is estimated to be close to the Plastic Limit.			
w > PL	Material is estimated to be wetter than the Plastic Limit.			





Unless otherwise stated, the symbols employed in the report are as follows:

I.	GENERAL	(a) w	Index Properties (continued)
π In x log ₁₀ g t	3.1416 natural logarithm of x x or log x, logarithm of x to base 10 acceleration due to gravity time	w _I or LL w _p or PL I _p or PI W _s I _L I _C e _{max} e _{min}	liquid limit plastic limit plasticity index = $(w_l - w_p)$ shrinkage limit liquidity index = $(w - w_p) / I_p$ consistency index = $(w_l - w) / I_p$ void ratio in loosest state void ratio in densest state density index = $(e_{w_l} - e_{p_l}) / (e_{w_l} - e_{p_l})$
II.	STRESS AND STRAIN	U	(formerly relative density)
$\begin{array}{c} \gamma \\ \Delta \\ \epsilon \\ \epsilon_v \\ \eta \\ \upsilon \\ \sigma \\ \sigma' \end{array}$	shear strain change in, e.g. in stress: $\Delta \sigma$ linear strain volumetric strain coefficient of viscosity Poisson's ratio total stress effective stress ($\sigma' = \sigma - u$)	(b) h q v i k	Hydraulic Properties hydraulic head or potential rate of flow velocity of flow hydraulic gradient hydraulic conductivity (coefficient of permeability) seepage force per unit volume
σ′ _{vo} σ ₁ , σ ₂ ,	initial effective overburden stress principal stress (major, intermediate,		
σ ₃ σ _{oct}	mean stress or octahedral stress = $(\sigma_1 + \sigma_2 + \sigma_3)/3$ shear stress	C _c C _r	compression index (normally consolidated range) recompression index (over-consolidated range)
u E G K	porewater pressure modulus of deformation shear modulus of deformation bulk modulus of compressibility	$\begin{array}{c} C_s \\ C_\alpha \\ m_\nu \\ C_\nu \end{array}$	swelling index secondary compression index coefficient of volume change coefficient of consolidation (vertical direction)
III.	SOIL PROPERTIES	c _h Τ _v U σ' _p	coefficient of consolidation (horizontal direction) time factor (vertical direction) degree of consolidation pre-consolidation stress
(a) $\rho(\gamma)$ $\rho_{d}(\gamma_{d})$ $\rho_{w}(\gamma_{w})$ $\rho_{s}(\gamma_{s})$ γ' D _R e n S	Index Properties bulk density (bulk unit weight)* dry density (dry unit weight) density (unit weight) of water density (unit weight) of solid particles unit weight of submerged soil $(\gamma' = \gamma - \gamma_w)$ relative density (specific gravity) of solid particles (D _R = ρ_s / ρ_w) (formerly G _s) void ratio porosity degree of saturation	ΟCR (d) τ _p , τ _r φ΄ δ μ c' c _u , s _u p c' c _u , s _u p q u S _t	over-consolidation ratio = σ'_p / σ'_{vo} Shear Strength peak and residual shear strength effective angle of internal friction angle of interface friction coefficient of friction = tan δ effective cohesion undrained shear strength ($\phi = 0$ analysis) mean total stress ($\sigma_1 + \sigma_3$)/2 mean effective stress ($\sigma'_1 + \sigma'_3$)/2 ($\sigma_1 - \sigma_3$)/2 or ($\sigma'_1 - \sigma'_3$)/2 compressive strength ($\sigma_1 - \sigma_3$) sensitivity
* Densi where accele	ty symbol is ρ . Unit weight symbol is γ $\gamma = \rho g$ (i.e. mass density multiplied by eration due to gravity)	Notes: 1 2	$\label{eq:compressive} \begin{array}{l} \tau = c' + \sigma' \mbox{ tan } \phi' \\ \mbox{shear strength} = (\mbox{compressive strength})/2 \end{array}$





WEATHERINGS STATE

Fresh: no visible sign of rock material weathering.

Faintly weathered: weathering limited to the surface of major discontinuities.

Slightly weathered: penetrative weathering developed on open discontinuity surfaces but only slight weathering of rock material.

Moderately weathered: weathering extends throughout the rock mass but the rock material is not friable.

Highly weathered: weathering extends throughout rock mass and the rock material is partly friable.

Completely weathered: rock is wholly decomposed and in a friable condition but the rock and structure are preserved.

BEDDING THICKNESS

Description	Bedding Plane Spacing
Very thickly bedded	Greater than 2 m
Thickly bedded	0.6 m to 2 m
Medium bedded	0.2 m to 0.6 m
Thinly bedded	60 mm to 0.2 m
Very thinly bedded	20 mm to 60 mm
Laminated	6 mm to 20 mm
Thinly laminated	Less than 6 mm

JOINT OR FOLIATION SPACING

Description	Spacing
Very wide	Greater than 3 m
Wide	1 m to 3 m
Moderately close	0.3 m to 1 m
Close	50 mm to 300 mm
Very close	Less than 50 mm

GRAIN SIZE

<u>Size*</u>
Greater than 60 mm
2 mm to 60 mm
60 microns to 2 mm
2 microns to 60 microns
Less than 2 microns

Note: * Grains greater than 60 microns diameter are visible to the naked eye.

CORE CONDITION

Total Core Recovery (TCR)

The percentage of solid drill core recovered regardless of quality or length, measured relative to the length of the total core run.

Solid Core Recovery (SCR)

The percentage of solid drill core, regardless of length, recovered at full diameter, measured relative to the length of the total core run.

Rock Quality Designation (RQD)

The percentage of solid drill core, greater than 100 mm length, as measured along the centerline axis of the core, relative to the length of the total core run. RQD varies from 0% for completely broken core to 100% for core in solid segments.

DISCONTINUITY DATA

Fracture Index

A count of the number of naturally occuring discontinuities (physical separations) in the rock core. Mechanically induced breaks caused by drilling are not included.

Dip with Respect to Core Axis

The angle of the discontinuity relative to the axis (length) of the core. In a vertical borehole a discontinuity with a 90° angle is horizontal.

Description and Notes

4

MB Mechanical Break

An abbreviation description of the discontinuities, whether naturally occurring separations such as fractures, bedding planes and foliation planes and mechanically separated bedding or foliation surfaces. Additional information concerning the nature of fracture surfaces and infillings are also noted.

Abb	reviations		
JN	Joint	PL	Planar
FLT	Fault	CU	Curved
SH	Shear	UN	Undulating
VN	Vein	IR	Irregular
FR	Fracture	Κ	Slickensided
SY	Stylolite	PO	Polished
BD	Bedding	SM	Smooth
FO	Foliation	SR	Slightly Rough
СО	Contact	RO	Rough
AXJ	Axial Joint	VR	Very Rough
ΚV	Karstic Void		

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RECORD OF BOREHOLE: 13-1

SHEET 1 OF 1 DATUM: Geodetic

LOCATION: N 5020559.0 ;E 375921.5

SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: Oct. 7, 2013

F	щ	qo		SOIL PROFILE			SA	MPL	ES	DYNAMIC PEN RESISTANCE,	IETRA1 BLOW	'ION S/0.3m)	HYDF	AULIC C		FIVITY,		_ 0	
	H SCAL TRES	METH			РГОТ	ELEV/	ER).30m	20	40 1	60	80		10 ⁻⁶	10 ⁻⁵ 1	0 ⁻⁴ 1	0 ⁻³	TIONAL	OR STANDPIPE
	MEI	RING		DESCRIPTION	RATA I	DEPTH	NUMBI	ТҮРЕ	D/S/VC	SHEAR STREI Cu, kPa	NGTH	nat V. ⊣ rem V. ∉	- Q - ● 9 U - ○		VATER ('p		PERCE	NT WI	ADDI -AB. T	INSTALLATION
		B	4		STF	(m)	-		BLG	20	40	60	80		20	40 E	50 E	0		
F	- 0		+	TOPSOIL	EEE	96.38														
F			ŀ	(SM) - SILTY SAND, some gravel;	Ĩ	0.23														-
E				compact																-
F																				
F	- 1						1	50 DO	8											
F			Ê																	-
-		er	ow Ste					50	07											
F	- 2	ler Aug	m (Holl				2	DO	27											-
F		Pov	nm Dia	(SM) SILTY SAND, some gravel: brown		94.09														-
-			200	with cobbles and boulders, (GLACIAL TILL): non-cohesive, moist, dense		2.20	3	50	35					0					мн	
-				,, · · · · · · , · · · · · · · ·				00												-
F	- 3																			-
E							4	50 DO	35											-
Ē																				-
E	- 4		_	End of Borebole		92.42	5	50 DO	>50											-
Ē				Auger Refusal																
F																				Borehole dry upon completion of drilling
F																				Oct. 7, 2013
-	- 5																			-
E																				-
E																				
E	6																			
F	0																			-
F																				-
-																				-
F	- 7																			-
-																				-
F																				-
Wſ/																				-
13 SL	- 8																			-
1/12/																				
DT 1																				-
MIS.C	- 9																			
GAL-																				
3.GPJ																				
21018																				-
13112	- 10																			-
S 001		I			1	1		I			1		1	1	1	1	I		L	l
IS-BH	DE 1 ·	PTF 50	H S(CALE					((/)G	olde	r							L(CH	DGGED: DG
Σ	(.	50								AS	JUCI	acs								

RECORD OF BOREHOLE: 13-2

BORING DATE: Oct. 7 and 8, 2013

SHEET 1 OF 1

DATUM: Geodetic

LOCATION: N 5020642.9 ;E 376050.4 SAMPLER HAMMER, 64kg; DROP, 760mm

LE			SOIL PROFILE			SA	MPL	ES	DYNAMIC PENE RESISTANCE, E	ETRAT BLOW	10N S/0.3m	ľ,	HYDRAU	JLIC CO	ONDUCT	TIVITY,		۲C NG	PIEZOMETER
DEPTH SCA METRES	ODING MET		DESCRIPTION	RATA PLOT	ELEV. DEPTH	NUMBER	TYPE	-OWS/0.30m	20 40 SHEAR STRENG Cu, kPa	0 GTH	60 € nat V. + rem V. ⊕	30 Q - ● U - ○	10 ⁻⁶ WA ⁻ Wp H	10 TER CO	D ⁵ 10 DNTENT OW	0 ⁻⁴ 1	0 ⁻³ NT WI	ADDITIONA LAB. TESTIN	OR STANDPIPE INSTALLATION
- 0	ă	ň	GROUND SURFACE	ST	94.55			В	20 40	0	<u>60 8</u>	30	20	4	06	80 8	30		
	Auger	(Hollow Stem)	(ML) - SANDY SILT; grey brown; non-cohesive, moist		0.00 94.32 0.23	-													Bentonite Seal
1	Power	200mm Diam	(SM) - SILTY SAND, some gravel; grey brown; non-cohesive, moist, dense		93.71 0.84 93.25 1.30	1	50 DO	37											Silica Sand
2			Find of Borehole Auger Refusal		1.47														- -
																			W.L. in Standpipe at Elev. 94.07 m on Oct. 23, 2013
3																			-
4																			-
5																			-
6																			
0																			
7																			-
8																			-
9																			-
10																			-
DEI	PTI 50	H S	CALE	1	1	1	<u>I</u>	. (G	olde	r	1	<u> </u>		1	I	1	L(CH	DGGED: DG ECKED: WAM

RECORD OF BOREHOLE: 13-3

BORING DATE: Oct. 8, 2013

SHEET 1 OF 1

DATUM: Geodetic

LOCATION: N 5020787.5 ;E 376022.5 SAMPLER HAMMER, 64kg; DROP, 760mm

SCALE		METHOD	SOIL PROFILE	LOT		SA 22	MPL	ES 30m	DYNAMIC PE RESISTANCE 20	NETRAT , BLOW 40	10N S/0.3m 60 8	30	HYDRA 10	ULIC C k, cm/s	ONDUC1 0 ^{.5} 1	TIVITY, 0 ⁻⁴ 10 ⁻³	ONAL	PIEZOMETER OR
DEPTH 5 METR		BORING N	DESCRIPTION	STRATA PL	ELEV. DEPTH (m)	NUMBEF	TYPE	BLOWS/0.3	SHEAR STRE Cu, kPa 20	NGTH	nat V. + rem V. ⊕	Q - ● U - ○	W/ Wp 2	ATER C		PERCENT WI 60 80	ADDITIC LAB. TES	STANDPIPE INSTALLATION
_ (_	GROUND SURFACE		96.38	3												
		0	TOPSOIL (CI) - SILTY CLAY; brown; cohesive, w>PL, very stiff		0.00	3												
- 1 - 1 	1	Diam (Hollow Stem	(SM) - SILTY SAND; brown; non-cohesive, moist, loose		95.34	1	50 DO	6										-
- - - - - -	2	200mm	Weathered SHALE BEDROCK		1.52	2 2	50 DO 50 DO	56 >50										-
Ē	+		End of Borehole		93.8	,												
-			Auger Refusal															Borehole dry
- :	3																	upon completion
F																		Oct. 8, 2013
-																		
F																		
- 4	4																	-
-																		
E																		
E																		
Ē																		
- 6	5																	-
E																		
E																		
-																		
- 6	6																	-
E																		
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÷.																		
- 7	7																	-
E																		
F					1													
≥-																		
SL/J	8																	-
/13					1													
1/12					1													
1																		
S.G					1													
₩ <u></u>	9																	-
L GA					1													
GPJ																		
0186					1													
1510	0																	_
131	Ĭ																	
001	_				1	1				_		1	1		1	I I		1
Н Н D)EP	TH S	CALE					(olde	r						L	OGGED: DG
SIM 1	: 5	0							V Aš	soci	ates						CH	IECKED: WAM

RECORD OF BOREHOLE: 13-4

BORING DATE: Oct. 8, 2013

SHEET 1 OF 1

DATUM: Geodetic

LOCATION: N 5020723.9 ;E 376152.8 SAMPLER HAMMER, 64kg; DROP, 760mm

	,	g	SOIL PROFILE			SA	MPLE	ES		TION /S/0.3m	\ \	HYDR/		ONDUCT	IVITY,		(0	
	RES	ИЕТНС		LOT		ъ		30m	20 40	60 8	во	1) ⁻⁶ 1	0 ⁻⁵ 10) ⁻⁴ 1() ⁻³	STING	PIEZOMETER
ΠΕα	METE	SING N	DESCRIPTION	ATA PI	ELEV.	JMBE	TYPE	NS/0.:	SHEAR STRENGTH Cu, kPa	nat V. + rem V. ⊕	• Q - ● • U - O	w	ATER C		PERCE	νт	DDITI B. TE	STANDPIPE INSTALLATION
	5	BOF		STR/	(m)	N		BLO/	20 40	60 8	80	2 W	0 4	0 6	0 8	WI O	Ρ	
	0	_	GROUND SURFACE		92.37													
Ē			(SM) SILTY SAND, some gravel; brown.		92.19 0.18													
Ē		Stem)	with cobbles and boulders, (GLACIAL TILL); non-cohesive, moist, compact															
Ē		uger ollow 5																
F	1	ower A liam (H			X	1	50	26										
F		0mm []					DO	20										-
Ē		50					50											
F			End of Borehole	163	90.59 1.78	2	DÖ	>50										
F	2		Auger Refusal															Borehole dry
Ē																		of drilling Oct. 8, 2013
Ē																		
-																		-
F	3																	-
Ē																		
E																		-
F	4																	
Ē																		
E																		-
-																		- - -
E	5																	-
F																		
F																		
Ē	6																	-
Ē																		
E																		
Ē																		
F	7																	-
Ē																		
Ē																		
WC/																		
13 SI	8																	-
11/12/																		
- TOS																		
-MIS.(9																	-
GAL																		
6.GPJ																		
21018																		
13112	10																	
001			1	1	1							I						
S-BHS	DE	PTH S	SCALE						Gold	er							LC	DGGED: DG
Ĭ	1:4	50							V ASSOC	lates							CH	EURED: WAM

RECORD OF BOREHOLE: 13-5

BORING DATE: Oct. 8, 15 and 16, 2013

SHEET 1 OF 2

DATUM: Geodetic

LOCATION: N 5020864.4 ;E 376156.1 SAMPLER HAMMER, 64kg; DROP, 760mm

E: Oct. 8, 15 and 16, 2013

	щ		ЧОР	SOIL PROFILE			SA	MPL	ES	DYNAMIC PENET RESISTANCE, BL	RATION OWS/0.3m	ì	HYDR	AULIC C k, cm/s	ONDUCT	TIVITY,		٥∟	
	SCAL		METH		гот		R		.30m	20 40	60	80	1	0 ⁻⁶ 1	0 ⁻⁵ 1	0-4 10)-3	TONAL	
	MET		RING	DESCRIPTION	ATA F	ELEV.	JMBE	TYPE	WS/0	SHEAR STRENGT Cu, kPa	"H nat V. rem V	+ Q-● ⊕ U-C		ATER C		PERCEN	T	AB. TE	INSTALLATION
	Ö		BOF		STR/	(m)	ž	Ľ	BLO	20 40	60	80	W	p — 20	 10 6	N	νι ο	۲A	
				GROUND SURFACE		93.08													
E	- 0			TOPSOIL (SM) SILTY SAND, some gravel: brown		0.00													
Ē				with shale fragments, cobbles and															-
-				non-cohesive, moist to wet, compact to															-
Ē				very dense															
F	- 1		(ma)				1	50 DO	17				0						
F		jer	llow S																-
-		ler Au	m (Ho																
-		Pow	m Dia				2	50	68										:
E	- 2		200m																-
E																			
F								50											<u> </u>
-							3	DO	39										
F	- 3					90.01													-
F				Moderately weathered, thinly bedded, black SHALE BEDROCK		3.07													-
-						-	C1	NQ											
-		Drill	Core					RC											-
-	- 1	Rota	Ŋ			-													-
-	-					-	C2	NQ	DD										
-				End of Porcholo		88.66		RC											
E																			W.L. in -
-	_																		Elev. 90.64 m upon completion
Ē	- 5																		Oct. 16, 2013
-																			-
-																			
Ē																			
-	- 6																		-
-																			-
-																			
-																			
-	- 7																		-
Ē																			-
Ē																			
5-																			
- I SL/JI	- 8																		-
2/13																			-
11/1																			
MIS.(- 9																		
GAL-I																			
P L L L																			
186.0																			:
1210	- 10																		
1 131																			
HS 00		рт	TH S	CALE							_							10	DGGED: DG
AIS-B.	1:	50									der ciate	5						СН	ECKED: WAM
2											-ALIEL	~							

PF LC	ROJEC DCATIC CLINA	T: 13-1121-0186 DN: N 5020864.4 ;E 376156.1 TION: -90° AZIMUTH:	R	ECC	RD	0	FD DRILL DRILL	RIL ING D/ RIG: ING CO	LHC ATE: C	DLE Dct. 8, 1 CTOR:	5 and 2	13-5 16, 2013						:	SHEET 2 OF 2 DATUM: Geodetic
DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION Continued from previous page	ELEV DEPTI (m)		FLUSH COLOUR RETURN	JN FLT SHR VN CJ TOTA CORE 8289	- Joint - Fault - Shear - Vein - Conjuga COVERY	ate R.Q.I % % &&& %	BD - Bedd FO - Folia CO - Contr OR - Ortho CL - Cleav FRAC D. INDE2 PER 0.3 m w CL - Cleav	ing tion act gonal /age F. B Angle	PL - F CU- C UN- L ST - S IR - Ir DISC DIPw.rt CORE AXIS	Planar Curved Jndulating Stepped regular ONTINUITY TYPE AND : DESCRI	PO- Po K - Si SM- Si Ro - R MB- M 7 DATA 7 DATA	olished lickensic mooth ough lechanic	al Breat HYD COND K, 9 9 0	BR NO1 abbi of al ak sym DRAULI DUCTIV cm/sec 0 0 0	- Bro re: For reviatior bbreviat bols. C Dia ITY Poi : I (2	ken Rock additional s refer to lis ions & metral nt Load RN ndex - C MPa) AV	WATER LEVELS INSTRUMENTATION G.
- - - - - - - - - - - - - - - - - - -	Rotary Drill NQ Core	Moderately weathered, thinly bedded, black SHALE BEDROCK		C1	100														
		End of Drillhole	<u></u> <u></u> <u>88.</u> 4.4																W.L. in open hole at Elev. 90.64 m upon completion of drilling Oct. 16, 2013
DE 1 :	PTH S	GCALE	_11			Ć		Gol	der	05		1	1		1	<u></u>		 C	LOGGED: DG HECKED: WAM

RECORD OF BOREHOLE: 13-6

BORING DATE: Oct. 8, 2013

SHEET 1 OF 1

DATUM: Geodetic

LOCATION: N 5020797.4 ;E 376289.0 SAMPLER HAMMER, 64kg; DROP, 760mm

ш	DO	SOIL PROFILE			SA	MPLI	ES	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3	III 3m د	HYDR/	AULIC CO	ONDUCT	IVITY,	.0	
SCAL RES	METH		LOT		ц.		.30m	20 40 60	80	10) ⁻⁶ 1() ⁻⁵ 1(0 ⁻⁴ 10 ⁻³	IONAL	PIEZOMETER
EPTH MET	RING	DESCRIPTION	ATA F	ELEV. DEPTH	UMBE	TYPE	WS/0	SHEAR STRENGTH nat Cu, kPa rem	t V. + Q - ● n V. ⊕ U - O	W	ATER CO		PERCENT	ADDIT AB. TE	INSTALLATION
	BO		STR	(m)	z		BLC	20 40 60	80	2	0 4	0 6	0 80	<u> </u>	
— o	\vdash	GROUND SURFACE	223	90.46										-	
-		(ML) - sandy CLAYEY SILT: brown:		90.18											
-		cohesive, w~PL, very stiff													
-															
- 1 -					1	50 DO	5								-
-															
-						50									
_ 2		Ê (MI) - CLAYEY SILT: grev: cobesive		<u>88.48</u> 1.98	2	DÖ	10								
-	er	שי>PL, stiff to very stiff													
-	/er Aug				3	50	4								¥ :
-	Pow			87.57		DO									
— 3 —		(SM) SILTY SAND, some gravel; grey, with cobbles and boulders, (GLACIAL		2.89	\vdash										
-		HLL), Holl-collesive, wei, compact		L.	4	50 DO	26			0					
-				X											
- 4															-
-				ž	5	50 DO	27								
-				85.89											
-		with shale fragments, cobbles and boulders. (GLACIAL TILL)		4.57	6	50 DO	>50								-
- 5 -		non-cohesive, wet, very dense		85.41 5.05	-										
-		Auger Refusal													W.L. in open hole at Elev. 88.02 m
-															upon completion of drilling
- 6															
-															
-															
-															
- - 7 -															-
-															
-															
L/JM															
/13 S															
11/12															
GDT															
P I															-
U GA															
86.GF															
12101															
131.															_
1200 1200	рть	H SCALE		,						-					OGGED: DG
	50						(Golder	es					СН	ECKED: WAM

RECORD OF BOREHOLE: 13-7

BORING DATE: Oct. 9, 2013

SHEET 1 OF 1

DATUM: Geodetic

LOCATION: N 5020942.3 ;E 376283.2 SAMPLER HAMMER, 64kg; DROP, 760mm

S		ТНОВ	SOIL PROFILE	F		SA	MPL	ES	DYNAMIC PENETRA RESISTANCE, BLO	ATION WS/0.3m	HYDRAU k	LIC CONDUCTIVIT	Y,	NAL	PIEZOMETER
ETRE		E ME	DESCRIPTION	A PLO	ELEV.	BER	H	s/0.30r	20 40 SHEAR STRENGTH	60 80 nat V. + Q - ●	10 ^{-o} WAT	10 ⁻⁵ 10 ⁻⁴ ER CONTENT PEF	10 ⁻³ CENT	DITION TEST	
N				TRAT	DEPTH (m)	NUN	₽	DWS	Cu, kPa	rem V. ⊕ U - O	Wp H	−−−⊖W	- wi	ADI	INSTALLATION
		<u> </u>		°,				m	20 40	60 80	20	40 60	80		
0	-		TOPSOIL	EEE	92.19										×
1		v Stem)	(SM) SILTY SAND, some gravel; brown, with cobbles and boulders, (GLACIAL TILL); non-cohesive, moist, compact		0.15	1	50 DO	21							Native Backfill
	Power Auger	(Diam Hollov													Bentonite Seal
2		200mm	(SM) SILTY SAND, some gravel: grev.		90.12 2.07	2	50 DO	35			0				Silica Sand
			with shale fragments, cobbles and boulders, (GLACIAL TILL); non-cohesive, wet, dense			3	50 DO	>50							Standpipe
3			End of Borehole Auger Refusal		89.37 2.82										
															W.L. in Standpipe at Elev. 91.26 m on Oct. 23, 2013
4															
5															
6															
7															
8															
9															
10															
DE	' PT	гн s	CALE						Cold	er				L	DGGED: DG

RECORD OF BOREHOLE: 13-8

SHEET 1 OF 2 DATUM: Geodetic

LOCATION: N 5020878.4 ;E 376388.2

SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: Oct. 9 and 11, 2013

				SA	MPI	ES	DYNAMIC PENETR	ATION	\	HYDRAULI	C CONDUCT	IVITY,		
ETHOI		L L					RESISTANCE, BLO	NS/0.3m	×,	4, 0	2m/s) ⁻⁴ 10 ⁻³	TING	PIEZOMETER
G ME		A PLC	ELEV.	BER	끮	\$/0.30	SHEAR STRENGTH	nat V. +	Q - ●	WATE		PERCENT	TES	STANDPIPE
MINC N	DESCRIPTION	RAT/	DEPTH	MUM	ĮΣ	OWS	Cu, kPa	rem V. 🕀	Ū- Ö	Wp H	OW	WI	ADC LAB.	INSTALLATION
<u> </u>		STI	(m)	<u> </u>		BL	20 40	<u>60 8</u>	30	20	40 6	0 80		
0		EZE	91.20								_			
	(SP) - SAND, some gravel; grey brown;		0.15											
	non-conesive, moist, compact to dense													1
														1
Ê														
v Ster				1	50 DO	20								1
Auger														1
ower Diam (4 -											
			11 -	2	50	48				0				1
2														Ψ
			88.91											
	 (SM) - SILTY SAND, some gravel; grey, with shale fragments, non-cohesive, wet, 		2.29		50									
	very dense			3	ĎŎ	81								
	(SM) - SILTY SAND, some gravel; grev.	ØX	88.33	-										
3	with cobbles and boulders, (GLACIAL TILL); non-cohesive, wet, dense to very													
	dense													
4				4	50 DO	>50								
bi Bi														
shbor V casi														
N Na					50									
5			5	5	DO	45								
					50									
				6	DO	99								
	Mada and a local distribution of the state of		85.26											
•	black SHALE BEDROCK		. 5.94 -											
Drill				C1	NQ	DD	,							
Rotary NQ C			-		RC									
			84.32											
7	End of Borehole		6.88											
														W.L. in open hole at
														Elev. 89.22 m upon completion
														of drilling Oct. 11, 2013
8														
			1											
			1											
9														
Ĭ			1											
			1											
0														
)EPTH S	SCALE						Cold	er					LC)GGED: DG
1 : 50							VASSO	liates					CHI	ECKED: WAM

F	ROJEC	CT: 13-1121-0186	RECOR	RD			13-8		S	HEET 2 OF 2
I	NCLINA	JN: N 5020878.4 ;E 376388.2 .TION: -90° AZIMUTH:			DRILLING DRILL RIC DRILLING	CONTRACTOR:	10 11, 2013		D	ATUM: Geodetic
DEPTH SCALE MFTRES	DRILLING RECORD	DESCRIPTION	SXWBOLIC LOG STANDALIC LOG DEDLH (W).	FLUSH COLOUR RETURN	JN - Joint FLT - Fault SHR- Shear VN - Vein CJ - Conjugate RECOVERY TOTAL SOLID CORE % 88878 88678 8	BD-Bedding FO-Foliation CO-Contact OR-Orthogonal CL-Cleavage FRACT. .0.D. INDEX % PER B Angle 0.3 m .000000000000000000000000000000000000	PL - Planar CU- Curved UN- Undulating ST - Stepped IR - Irregular DISCONTINUIT DIP w.r.t. CORE AXIS S & S	PO- Polished K - Slickensided SM- Smooth Ro - Rough MB- Mechanical Breat r DATA COND SURFACE JCON Jr Ja 6 9 9	BR - Broken Rock NOTE: For additional abbrevkalions refer to list of abbrevkalions & k symbols. RAULIC Diametral UCTIVITYPoint Loade_MC m/sec index / c/ m/sec (MPa) Avc	NOTES WATER LEVELS INSTRUMENTATION
-	Rotary Drill WB NQ Core NW	Continued from previous page Moderately weathered, thinly bedded, black SHALE BEDROCK	85.26							
	р 7 В 9	End of Drillhole	6.88							W.L. in open hole at Elev. 89.22 m upon completion of drilling Oct. 11, 2013
- - - - - - - - - - - - - - - - - - -	1									
	3									
	5									
C 1	EPTH	SCALE		(A G	older			L	OGGED: DG

RECORD OF BOREHOLE: 13-9

BORING DATE: Oct. 9, 2013

SHEET 1 OF 1

DATUM: Geodetic

LOCATION: N 5021017.6 ;E 376413.7 SAMPLER HAMMER, 64kg; DROP, 760mm

		Q	SOIL PROFILE			SA	MPL	ES	DYNAMIC PE		TION)	HYDR			TVITY,		(1)	
CALE	ES	ETHO		10		~		Б	20	40	60	80	1	к, сти:	s 10 ⁻⁵ 1	D ⁻⁴ 1()-3	STING	PIEZOMETER OR
PTH S	AETR	NG M	DESCRIPTION	LA PL	ELEV.	MBEF	Ϋ́Ε	S/0.3	SHEAR STR	ENGTH	nat V.	+ Q- •	w	ATER C	CONTENT	PERCEI	NT	DITIO	STANDPIPE INSTALLATION
DEF	2	BORII		TRAT	DEPTH (m)	Ñ	ŕ	LOW	Cu, kPa		rem V.	⊕ U-O	W	p	W		NI	AD	
			GROUND SURFACE	S					20	40	60	80	2	20	<u>40 6</u>	0 8	0		
F	0		TOPSOIL	E	90.39														
F			(SM) - SILTY SAND; brown;		0.18														-
F			non-conesive, wet																-
E																			-
<u> </u>	1		(ML) - CLAYEY SILT; grey brown;		0.91		50												-
F			non-cohesive, moist, very stiff		1	1	DO	18											
E						_													-
F																			:
F					ł	2	50 DO	10						0				мн	
F	2		(SM) SILTY SAND, some gravel: grev		88.29 2.10														
E		1 mot	with cobbles and boulders, (GLACIAL			-													¥ i
F		Iger	dense			3	50	39											:
F		ver AL																	-
E	3	Po																	-
E		-000					50												
F						4	DO	26											
Ē																			-
E	4																		-
-						5	50 DO	36											:
F																			
E			(SM) SILTY SAND, some gravel; grey,		85.82 4.57	6	50	>50											-
F			with shale fragments, cobbles and boulders, (GLACIAL TILL);			Ľ	DO	-50											
-	5		non-cohesive, wet, very dense																-
E						-	50												-
F			End of Borehole	- 268/	84.88 5.51	/	DO	>50											-
-			Auger Refusal																W.L. in gen hole at
F	6																		Elev. 88.10 m upon completion
F																			Oct. 9, 2013
-																			
E																			-
E_	7																		-
F																			-
E																			
F																			:
Wr/-																			
3 SI	8																		-
/12/1																			:
н Т																			-
GD -																			
-WI	9																		
GA																			
GPJ																			
0186																			-
1121	10																		-
1 13																			
00 SH	חבי	оти	SCALE															17)GGED DG
IS-BI	1.1	50								blot	er iatee	!						СН	ECKED: WAM
≥										JUC	LILLO	,						5.1	

RECORD OF BOREHOLE: 13-10

BORING DATE: Oct. 10, 2013

SHEET 1 OF 1

DATUM: Geodetic

LOCATION: N 5021001.3 ;E 376535.1 SAMPLER HAMMER, 64kg; DROP, 760mm

щ	Τ	DD	SOIL PROFILE			SA	MPL	ES	DYNAMIC PI RESISTANC	ENETRAT	TION S/0.3m	ì	HYDRAUL k,	_IC CC cm/s	NDUCT	IVITY,	<u>ں</u>	
I SCAL	N L L	METH		PLOT		R		.30m	20	40	60 8	30	10 ⁻⁶	10	⁵ 10	0 ⁻⁴ 10 ⁻³	FIONAL ESTIN	OR STANDPIPE
DEPTH	ME	RING	DESCRIPTION	SATA I	DEPTH	NUMBI	ТҮРЕ	0/S/VC	SHEAR STR Cu, kPa	ENGTH	nat V. + rem V. ⊕	Q - ● U - ○	WAT Wo H	ER CO			ADDI AB. T	INSTALLATION
	_	BO		STF	(m)	2		BLG	20	40	60 8	30	20	4	0 6	0 80	_	
-	0		GROUND SURFACE	EZE	90.38					_	_						 	
E			(CI) - SILTY CLAY; grey brown;		0.10													
F																		
E																		
-	1				89.31	1	50	10										-
Ē			(ML) - CLAYEY SILT; grey brown; non-cohesive, moist to wet, very stiff		1.07	·	DO											
F																		
-					1	2	50	14										
-	2	(me)				1	DO	14										-
E		ger bllow S			1													<u> </u>
-		wer Au am (Ho			87.79		50	47					0				мн	
-		D Po	(SM) - SILTY SAND, some gravel; grey, with shale fragments, cobbles and		2.59		DO											
F	3	200	boulders, (GLACIAL TILL); non-cohesive, wet, compact to very															-
Ē			dense		8	4	50	22										
E							DO											
F																		
F	4					5	50	61										-
-							DO											
-																		
-					85.48	6	50 DO	>50										
	5		End of Borehole Auger Refusal		4.90													-
-																		W.L. in open hole at
-																		upon completion of drilling
-																		Oct. 10, 2013
-	6																	-
-																		
-																		
-																		
-	1																	-
-																		
-																		
L/JM	8																	_
13 S	Ĭ																	
1/12																		
, TÖ																		
MIS.C	9																	-
GAL-																		
GPJ																		
0186.																		
31121	10																	-
BHS 0	DEF	PTH S	SCALE					1	Â.	1.0 ⁷	N 74						LC	OGGED: DG
MIS-F	1:5	50								SOCI	ates						СН	ECKED: WAM

RECORD OF BOREHOLE: 13-11

BORING DATE: Oct. 9, 2013

SHEET 1 OF 1

DATUM: Geodetic

LOCATION: N 5021099.3 ;E 376532.5 SAMPLER HAMMER, 64kg; DROP, 760mm

щ			SOIL PROFILE			SA	MPL	.ES	DYNAMIC PENETRATION RESISTANCE, BLOWS/0	N \ .3m ເ	HYDRAULIC C	ONDUCTIVITY,	. (7)	
SCAL		METH		LOT		ц.		30m	20 40 60	80	10 ⁻⁶ 1	0 ⁻⁵ 10 ⁻⁴ 10 ⁻³	IONAL	
EPTH		RING	DESCRIPTION	ATA F	ELEV. DEPTH	UMBE	TYPE	WS/0	SHEAR STRENGTH na Cu, kPa rer	t V. + Q - ● m V. ⊕ U - ○	WATER C		ADDIT AB. TE	INSTALLATION
ā		<u>B</u>		STR	(m)	z		BLO	20 40 60	80	20 4	0 60 80	<u>د</u> ۲	
- 0		_	GROUND SURFACE	===	90.48									
			(ML) - SANDY SILT; grey brown;	ĨĨ	0.15									
			non-conesive, moist, loose to compact		· · ·									
- 1						1	50	20						
						ľ	DO				Ű			
					- 2 	2	50	4						
2														
					88.19									
			grey; non-cohesive, wet, loose to			3	50	12						¥
		em)												
3	ger	llow St												-
	ver Au	m (Ho				4	50	11						
	Po	mm Di												
		200												
4						5	50 DO	6						
			(ML) - CLAYEY SILT, some sand; grey;		4.57	-								
_			non-cohesive, wet		Į	6	50 DO	3						
5					Į									
			(SM) SILTY SAND, some gravel; grey,		85.15 5.33									
			boulders, (GLACIAL TILL);			7	50 DO	14						
6			non-conesive, wet, compact to dense											
						⊢	50							
					83.90	8	DO	49						
			End of Borehole Auger Refusal	- 10/1/1	6.58									W.L. in
7			°											open hole at Elev. 88.04 m upon completion
														of drilling Oct. 9, 2013
8														
9														
10														
	L			I	1		<u> </u>				1			
DE	EPT	ΤΗ S	CALE						Golder				L	DGGED: DG
1:	50								N Associat	les			CH	ECKED: WAM

LOCATION: N 5020904.7 ;E 376603.9

RECORD OF BOREHOLE: 13-12

SHEET 1 OF 1

BORING DATE: Oct. 9 and 10, 2013

DATUM: Geodetic PENETRATION TEST HAMMER, 64kg; DROP, 760mm

SA	AMF	PLEF	R HAMMER, 64kg; DROP, 760mm						PENETRATION TEST	HAMMER	, 64kg; DROP, 760mm
щ			SOIL PROFILE			SA	MPL	ES	DYNAMIC PENETRATION \ HYDRAULIC CONDUCTIVITY, RESISTANCE, BLOWS/0.3m \ k, cm/s	.0	
I SCAL RES		ME		PLOT		к		.30m	$\begin{bmatrix} 20 & 40 & 60 & 80 \\ 2 & 40 & 60 & 80 \end{bmatrix} 10^{-6} 10^{-5} 10^{-4} 10^{-3}$	TONAL	
DEPTH		DAING	DESCRIPTION	SATA F	DEPTH	NUMBE	TYPE	0/S/VC	SHEAR STRENGTH nat V. + Q - ● Cu, kPa rem V. ⊕ U - ○ Wn → W + Wi	ADDIT AB. TI	INSTALLATION
		ž		STF	(m)	2		BLO			
- 0	-		TOPSOIL	EEE	89.99 0.00						Native Backfill
Ē			(SM) - SILTY SAND, very fine; brown; non-cohesive, wet		0.15	1	GRAE	a			
-			(SP) SAND, some low plasticity fines;	्रि	0.53						Sentonite Sear
			(SM/ML) SILTY SAND to sandy SILT;	्रः सिर्धः	89.08		50				
Ē			grey; non-cohesive, wet, compact			2	DO	28	8		
E											
-					¢.	3	50 DO	20	o		
- 2											
-											
-		Ê				4	50 DO	23	3		Native Backfill
- 3	e	ow Ster									🛛 🗮 🖓 -
-	ver Aug	am (Hol				5	50	20	o		
E	Po	Dmm Di	(11)		86.33						
È,		20((ML) - sandy SIL1; grey; non-cohesive, wet, very loose		3.00						
- 4					85.72	6	50 DO	4	۱ ۱		
E			(SM) SILTY SAND, some gravel; grey, with cobbles and boulders, (GLACIAL TILL): non-cohesive wet compact		4.27						
E						7	50	22	2		
- 5						Ĺ	DO				- Bentonite Seal
E						-					
-						8	50 DO	20	0		Silica Sand
- 6											
-						9	50 DO	>50	50		Standpipe
-			End of Borehole		83.44 6.55						ie ie
			Auger Refusal								
- '											W.L. in Standpipe at Elev. 89.01 m
-											011 Oct. 23, 2013
≥-											
8 _ R											-
1/12/1											
9											
l GAL											
86.GP.											
12101.											
3 21 DE	EPT	нs	CALE						A	L	OGGED: DG
	50								Golder	C⊦	IECKED: WAM

TABLE 1

RECORD OF TEST PITS

<u>Test Pit Number</u> (Elevation)	<u>Depth</u> (metres)	Description
10-A	0.00 - 0.30	TOPSOIL
	0.30 – 2.20	Brown SILTY SAND, some gravel, trace clay, with cobbles and boulders (GLACIAL TILL)
	2.20	Refusal on grey DOLOMITIC LIMESTONE BEDROCK
		 Note 1: Test pit excavated just north of borehole 10-102. Note 2: Boulders and cobbles were encountered within the glacial till (maximum boulder dimension: about 0.7 metres x 1.5 metres). Note 3: Water seepage at about 1.7 metres depth. Note 4: A test pit was also excavated just to the south of borehole 10-102. Refusal encountered at about 1.6 metres depth on a probable large boulder.
10-B	0.00 - 0.30	TOPSOIL
	0.30 – 0.55	Brown CLAYEY SILT, some sand
	0.55 – 2.20	Brown fine to coarse SAND, trace to some silt
	2.20 – 2.70	Grey SILTY SAND, some gravel, trace clay, with cobbles and boulders (GLACIAL TILL)
	2.70	Refusal on black weathered SHALE BEDROCK
		Note 1: Test pit excavated just east of borehole 10-104. Note 2: Water seepage at about 1.0 metres depth.

Project No. 10-1121-0014

TABLE 1

RECORD OF TEST PITS

<u>Test Pit Number</u> (Elevation)	<u>Depth</u> (metres)	Description
10-C	0.00 - 0.05	TOPSOIL
	0.05 - 0.50	Brown SILT, trace to some sand
	0.50 – 3.20	Grey brown medium to coarse SAND, with gravel and cobbles
	3.20 – 4.50	Grey SILTY SAND, some gravel, trace clay, with cobbles and boulders (GLACIAL TILL)
	4.50	Refusal on probable weathered SHALE BEDROCK
		 Note 1: Test pit excavated just south of borehole 10-2. Note 2: Unable to excavate further due to water inflow and considerable sloughing of excavation side walls. Note 3: Water inflow at about 3.8 metres depth.
10-D	0.00 – 0.30	TOPSOIL
	0.30 – 1.70	Brown SILTY SAND
	1.70 – 1.90	Brown SILTY SAND, some gravel, trace clay, with cobbles and boulders (GLACIAL TILL)
	1.90	Refusal on grey DOLOMITIC LIMESTONE BEDROCK
		Note 1: Test pit excavated just north of borehole 10-101. Note 2: Test pit dry upon completion

Project No. 10-1121-0014

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

RECORD OF BOREHOLE: 10-1

BORING DATE: Jan. 26 & Sept. 16-17, 2010

SHEET 1 OF 3

DATUM: Geodetic

Unit DESCRIPTION Unit	OMETE	PIEZON	UC NC		IVITY,	ONDUCT	ULIC C k, cm/s	HYDRA	λ,	N .3m	ETRAT BLOWS	MIC PEN	DYNA RESIS	.ES	AMPL	S			SOIL PROFILE	пон	
go LUELCHYTUR go go promive go convertient minitive Go minitive go minitive go minitive go minitive go go <thgo< th=""> <thgo< th=""> go</thgo<></thgo<>	OR NDPIP	OF	TEST) ³) ⁻⁵ 1 ∟ ⊃NT⊑NIT		10	0 - 🛋) 8 atV –	0 	20 I R STPFI	SHEA	3/0.3m	Щ	3ER	ELEV.	V PLO	DE000:27:21	U WE	
Bit Iso Iso <thiso< th=""> <thiso< th=""> <thiso< th=""></thiso<></thiso<></thiso<>	LLATI	INSTALL	LAB.	vi				Wp	U - O	m V. ⊕	ып	a	Cu, kF	OWS-	ĮΥ		DEPTH	RATA	DESCRIPTION	NINC	
Image: Product Subscription (matter in the second			_	»	0 8	0 6	4	20)) 8	0	20		В	_		(m)	STF		ĭ I	
Intervention Compact to compact to town SLT, some Image: Compact to compact to compact town SLT, some Image: Compact to compact to compact to town SLT, some Image: Compact to compact to town SLT, some Image: Compact to compact to town SLT, some Image: Compact town SLT, so			\downarrow													6	93.6	===	D SURFACE	-	┝
Loose to compact trown SILT. some 1 3 1 50 a 1 50 a 1 50 a 1 50 a a a b a 1 50 a b a b a 1 a b b a b a																0	0.0		NL)		
Image: Same draw of trace day Im																6	0.3	TTT	compact brown SILT, some		
Image: Second																			ace clay		
Image: Solution of the sector of th																					
Image: Second														8	50 DO	1					'
Image: Compact to dense grey SANDY SILT to SULY SAND, some gravel, race day, with coboles and boulders (GLACIAL 2.90/10 4.90/25 2.90/10 4.90/25 2.90/10 4.90/25 2.90/10 4.90/25 4.90/25 2.90/10 4.90/25 4.90/25 2.90/10 4.90/25															-	_					
1 1																-					
Production Production <td></td> <td></td> <td>ин</td> <td></td> <td></td> <td></td> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>10</td> <td>50 DO</td> <td>2</td> <td></td> <td></td> <td></td> <td>tem)</td> <td></td>			ин				0							10	50 DO	2				tem)	
Presh thinky bedded grey DOLOMITIC UMESTONE BEDROCK, with black shale interbeds Solution (Cal MC) Model (Cal MC) Mod	ll and	Native Backfill a	1																	low S	2 Ja
1 1 3 00 49 with cobbies and boulders (GLACIAL 4 00 25 4 00 25 5 00 16 6 00 16 9 10 16 9 10 16 10 16 16 </td <td></td> <td>Bentonite mix</td> <td>E</td> <td></td> <td>-</td> <td>7 9</td> <td>91.3</td> <td>6759</td> <td>t to dense arev SANDY SILT to</td> <td>n. (Hol</td> <td>er Auc</td>		Bentonite mix	E												-	7 9	91.3	6759	t to dense arev SANDY SILT to	n. (Hol	er Auc
Image: Sector of the sector														49	50	3			AND, some gravel, trace clay,	n Diar	Pow
Presh thinky bedded grey DOLOMITIC LIMESTONE BEDROCK, with black shale interbeds 4 $\frac{50}{100}$ 100 C1 NC DD 100 100 100 C1 NC DD 100 100 100 C1 NC DD 100 100 100 Bertonite Si C1 NC DD 100 100 C2 NC DD 100 100 100 100 Bertonite Si C1 NC DD 100 100 100 Bertonite Si C1 NC DD 100 100 100 100 Bertonite Si C1 NC DD 100 100 100 100 Bertonite Si C1 NC DD 100 100 100 100 Bertonite Si C1 NC DD 100 100 100 100 100 100 Bertonite Si DD 100 100 100 100 100 100 100 100 Bertonite Si 100																				200mr	
4 50 25 5 50 16 Fresh thinly bedded grey DOLOMITIC LIMESTONE BEDROCK, with black shale interbeds 88.04 60 C1 NC D0 C1 NC D0 C2 NC D0 E D0 E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E E <td>5</td> <td></td> <td>3</td>	5																				3
Image: state interbeds I	¥														50		1				
Fresh thinly bedded grey DOLOMITIC 4.62 50 50 100 Fresh thinly bedded grey DOLOMITIC 4.62 50 100 100 100 LIMESTONE BEDROCK, with black 60 100 100 100 100 100 V C1 NC 00 100 100 100 100 100 UNESTONE BEDROCK, with black C1 NC 00 100 100 100 100 100 C1 NC 00 00 100 <														25	DO	4					
s 5 50 16 0 16 0 16 0 16 </td <td>$\overline{\Delta}$</td> <td></td> <td>1</td> <td></td> <td></td> <td></td> <td></td>	$\overline{\Delta}$																1				
Bentonite Sc																					1
Image: state interbeds 100<			ИH						C					16	DO	5	1				
Presh thinly bedded grey DOLOMITC LIMESTONE BEDROCK, with black shale interbeds															-						
LIMESTONE BEDROCK, with black shale interbeds C1 NC DD C1 NC DD C2	al	Bentonite Seal	E											>100	50 DO	4 <u>6</u> 2	89.0 4.6		inly bedded grey DOLOMITIC	$\left \right $	\vdash
		Silica Sand	ę																ONE BEDROCK, with black terbeds		
NO ON CONTRACTOR CONTR															NO	~					1
C2 NQ DD C2 NQ C2 NQ DD C2 NQ C2 NQ C2 NQ DD C2 NQ C2															RC						
C2 NG DD HIT SIG SG		20mm Diana Di																			
	en 'B'	#10 Slot Screen	3 #												-	-					
																					3
														DD	NQ	C2					
Bentonite Se															RC	-					
Bentonite Se																					/_
Bentonite Se																				2 Core	IN Dri
Bentonite Se															1					ž	Rota
	al	Bentonite Seal	E																		
																					3
														DD	NQ RC	СЗ					
Silica Sand		Silica Sand	ξ																		
C NQ DD 32mm Diam	PVC	32mm Diam. PV	5												NQ						
Image: Weight of the second	en 'A'	#10 Slot Screen	#												RC	4					
				-								T			Τ-	- F '	T	1	CONTINUED NEXT PAGE		Έ
														L	1		1	1			
TH SCALE LOGGED: C	G.	DGGED: D.G.	LO								olde	FG	Ê							ΉS	EPT

RECORD OF BOREHOLE: 10-1

SHEET 2 OF 3 DATUM: Geodetic

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: Jan. 26 & Sept. 16-17, 2010

						-			-											
ų	2		SOIL PROFILE	1.		SA	MPL	.ES	DYNAM RESIS	AIC PEI	NETRA , BLOW	TION /S/0.3m	,	HYI	DRAULIC (k, cm/s	CONDUC	TIVITY	3	βF	PIEZOMETER
IRES	L L V	⊒ ⊒		PLOT		Ĥ		0.3m	2	0	40	60	80		10 ⁻⁶	10 ⁻⁵ 1	10 ⁻⁴	10 ⁻³		OR
E E		P I	DESCRIPTION	ATA F	DEPTH	MBE	TYPE	WS/(SHEAF Cu, kPa	R STRE	NGTH	nat V. rem V.	+ Q-(⊕ U-(WATER C	ONTEN	T PERC	CENT	DDIT B. T	INSTALLATION
				STR/	(m)	ĩ	ľ	BLO	2	0	40	60	80		20	40 0	60	- WI 80	< ₹	
^			CONTINUED FROM PREVIOUS PAGE							-	Ť	T	1					Ť		
0			Fresh thinly bedded grey DOLOMITIC				10													
			shale interbeds	Ħ		C4	RC	DD												
				Ħ			1													
	=																			
	ary Dr	2 Core																		32mm Diam. PVC #10 Slot Screen 'A'
	Rot	ž		H		C5	NQ													
							RC) - E
2		Ч	End of Borehole		81.62											*******				l Carley
			Note:		1															W/L in screen 'A'
			Probable void or mud seam encountered between 8.1m and 8.7m depth.		1															at Elev. 90.49m on Sept. 28, 2010
			F -																	
3																				
																				W.L. in screen 'B'
																				Feb. 16, 2010
7																				
8																				
9																				
					1															
0					1															
ЭЕ	PT	НS	CALE						Â	Pc	പപ	Ar							L	OGGED: D.G.
1:	50								J	As	SOC	iātes	5						CH	IECKED:

	PRO	DJEC.	T: 10-1121-0014		RE	EC	OF	RD	C)F	D	R	ILI	LH	0	L	E:		1	0-	-1				Sł	HEET 3 OF 3	
		CATIC	IN: See Site Plan TON: -90° AZIMUTH:							DF	RILL RILL RILL	_ING _ RIG	DA E: C	TE: ME	Ja 55 2AC	in. 2	6& R∙∎	Se	pt. 1	16-'	17, 2010 Drilling				DA	ATUM: Geodetic	
DEPTH SCALE	IVIE LIKES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. DEPTH (m)	RUN No.	PENETRATION RATE (m/min)	FLUSH COLOUR % RETURN	FR/ CL- SH- VN- I COF 08 09	FX-F CLE/ SHE VEIN RECO TAL RECO		CTURE GE RY SOLID ORE %	F-F, J-J(P-P S-S	AULT DINT POLISH BLICKE R.Q.D. %		IDED FRAC INDE PER (SM R-F ST- O PL- CT. CT. CT. CT. CT. CT. CT. CT. CT. CT.	-STE -PLA DIP CORE	OOTH GH PPE NAR DIS w.r.t. E AXIS		FL-FLEXURED UE-UNEVEN W-WAVY C-CURVED DNTINUITY DATA TYPE AND SURFACE DESCRIPTION	BC MI B-	OKEN CH. BI DING DING DING	2 DIAMETRAL	6 INDEX (MPa)	NOTES WATER LEVELS INSTRUMENTATION	1
	5 6 7 8 9 9 10 11 12 12 13 13	Rotary Drill NQ Core NACOre	BEDROCK SURFACE Fresh thinly bedded grey DOLOMITIC LIMESTONE BEDROCK, with black shale interbeds		<u>89.04</u> 4.62	1 2 3A 3B 3C 4 5																				Bentonite Seal Silica Sand 32mm Diam. PVC #10 Slot Screen 'B' Bentonite Seal Silica Sand 32mm Diam. PVC #10 Slot Screen 'A' #10 Slot Screen 'A'	
	DEF 1 : 5	PTH S	CALE					(G		Ķ	G	010 500	deı cið	r vto	<u>es</u>									L(CH	ogged: D.G. Ecked:	

RECORD OF BOREHOLE: 10-2

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: Jan. 26-27, 2010

SHEET 1 OF 1

DATUM: Geodetic

ES	ETHC	GOILTROTILL	Ъ		SA		ES E	RESISTANCE, B	OWS/0.3m	`,	k, cm/s 10 ⁻⁶ 1	0 ⁻⁵ 10 ⁻⁴ 10		PIEZOMETE
METR	BORING M	DESCRIPTION	STRATA PL(ELEV. DEPTH (m)	NUMBER	ТҮРЕ	BLOWS/0.3	SHEAR STRENG Cu, kPa	TH nat V. + Q rem V. ⊕ U	- •	WATER C Wp		ADDITIO	STANDPIP
0		GROUND SURFACE Black sandy silt, with organic matter (TOPSOIL) Loose grey brown SILT, some sand, trace clay		90.45 0.00 90.15 0.30										
1				88.93	1	50 DO	4				0			Native Backfill and Bentonite mix
2		Compact brown fine SAND, trace silt		88.16	2	50 DO	15							Bentonite Seal
3		Compact grey fine SAND, some silt	N. N. N.	2.29	3	50 DO	15							Silica Sand
r Auger	. (Hollow Stem)	Compact to very dense grey SILTY SAND, some gravel and shale fragments, trace clay, with cobbles and boulders (GLACIAL TILL)		3.05	4	50 DO	13				0		МН	32mm Diam. PVC #10 Slot Screen
4	200mm Diam.				5	50 DO	18							
5		Highly weathered to weathered black SHALE BEDROCK		85.60 4.85	6	50 DO	>100							Bentonite Seal
					7	50 DO	>100							
6					8	50 DO	>100							Caved Material
7				82.08	9	50 DO	>100							
8		End of Borehole		7.47										W.L. in screen at Elev. 90.41m on Mar. 29, 2010
9														
10														

RECORD OF BOREHOLE: 10-3

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: Jan. 27, 2010

SHEET 1 OF 1

DATUM: Geodetic

	ПОВ	SOIL PROFILE			SA	MPL	ES	DYNAMIC PENETRA RESISTANCE, BLOV	TION /S/0.3m		HYDRAULIC C k, cm/s	ONDUCTI	/ITY,	AL	PIEZOMETE
	RING MET	DESCRIPTION	VATA PLOI	ELEV. DEPTH	IUMBER	түре	OWS/0.3m	20 40 I I SHEAR STRENGTH Cu, kPa	60 80 nat V. + Q rem V. ⊕ U	- • - 0	10 ⁻⁶ 1 WATER CO	0 ⁵ 10 ⁴	ERCENT	ADDITION. AB. TESTI	OR STANDPIP INSTALLATIO
	ВО		STF	(m)	Z		BL	20 40	60 80		20 4	0 60	80		
0		GROUND SURFACE Black sandy silt, with organic matter	EEE	90.30 0.00					_						<u> </u>
1		(TOPSOIL) Compact grey brown SILT, some sand, trace clay		<u>89.77</u> 0.53	1	50 DO	11								Native Backfill and Bentonite mix
2				88.01	2	50 DO	12								
3	Stem)	Very loose to loose grey SILT, some sand and clay, with occasional gravel		2.29	3	50 DO	6								Bentonite Seal Silica Sand
	Power Auger)mm Diam. (Hollow				4	50 DO	4				o			мн	32mm Diam, PVC
4	200			85.73	5	50 DO	2								#10 Slot Screen
5		Compact dark grey SANDY SILT to SILTY SAND, some gravel and shale fragments, trace clay (GLACIAL TILL)		4.57	6	50 DO	25								Silica Sand Bentonite Seal
6					7	50 DO	18				0			мн	Caved Material
-		Highly weathered to weathered black SHALE BEDROCK		84.05 6.25 83.59 6.71	8	50 DO 50 DO	>100 >100								Bentonite Seal
7															W.L. in screen at Elev. 90.25m on Mar. 29, 2010
8															
9															
10															

RECORD OF BOREHOLE: 10-101

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: Sept. 17, 2010

SHEET 1 OF 1

DATUM: Geodetic

щ		0	SOIL PROFILE			SA	MPLE	s	DYNAMIC PEN RESISTANCE	IETRAT BLOWS	ION 5/0.3m	ì	HYDRA	ULIC Co	ONDUCT	rivity,		ں ا	
SCAL		METH		LOT		ĸ).3m	20	40	60	80	10	-6 10	0 ⁻⁵ 1	0 ⁻⁴ 1	0 ⁻³	IONAL	
EPTH		RING	DESCRIPTION	ATAF	ELEV. DEPTH	UMBE	ТҮРЕ	D/S/C	SHEAR STRE	IGTH	nat V rem V. 6	+ Q-● ∌ U-O	WA	TER CO		PERCE	NT	ABDIT AB. TE	INSTALLATION
ā		BÖ		STR	(m)	z		BLO	20	10	60	80	20 20) 4	0 6	50 E	0	د ۲	
-	0		GROUND SURFACE Black sandy silt, with organic matter	====	94.24 0.00														
Ē			(TOPSOIL)		93.96														
Ē			BROWN SAINDY SILT		0.20	1	GRAB												
Ē		em)																	
-	1	low St																	-
E	ver Auc	щ. Н																	
Ē	Pov	m Dia	SILTY SAND, with cobbles and boulders		92.79 1.45														
-		200m	(GLACIAL TILL)																
F	2																		-
F																			
F			End of Borehole		91.75 2.49		$\left \right $												
Ē			Auger Refusal																
F	3		Soil stratigraphy inferred from limited																-
Ē			Samping																
-																			
-																			-
-	4																		
F																			
E																			
Ē	5																		_
F																			
Ē																			
-																			
-	6																		-
Ē																			
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-																			
-	7																		-
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AIS.G																			
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1 10																			
HS 00		ГН Q	CALE																
IIS-B	: 50)							E	olde Soci	r ates							СН	ECKED:

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

RECORD OF BOREHOLE: 10-102

BORING DATE: Sept. 17, 2010

SHEET 1 OF 1

DATUM: Geodetic

Signal Part Description Signal Part Description Signal Part Description Signal Part Sign	EZOMETER	F	NG		VITY,	NDUCTI	C COl n/s	AULIC k, cm/	HYDR		m	ATIO	ENET	MIC P TANC	DYNA RESIS	.ES	MPL	SA			LE	SOIL PROFIL		D H O H	
Occurse Auge Image Image <t< th=""><th>OR TANDPIPE STALLATIO</th><th>11</th><th>ADDITION, LAB. TESTI</th><th>3 T /I</th><th>4 10 PERCEN ∎ V</th><th>10 ITENT I OW 60</th><th>10⁻⁵</th><th>0⁻⁶ /ATER p </th><th>1 W W</th><th>Q-● U-O</th><th>8(V. + IV. ⊕ 8(</th><th>60 H na re</th><th>40 ENGT 40</th><th>20 R STR a 20</th><th>SHEAI Cu, kP</th><th>BLOWS/0.3m</th><th>түре</th><th>NUMBER</th><th>ELEV. DEPTH (m)</th><th>STRATA PLOT</th><th></th><th>DESCRIPTION</th><th></th><th>BORING MET</th><th></th></t<>	OR TANDPIPE STALLATIO	11	ADDITION, LAB. TESTI	3 T /I	4 10 PERCEN ∎ V	10 ITENT I OW 60	10 ⁻⁵	0 ⁻⁶ /ATER p	1 W W	Q-● U-O	8(V. + IV. ⊕ 8(60 H na re	40 ENGT 40	20 R STR a 20	SHEAI Cu, kP	BLOWS/0.3m	түре	NUMBER	ELEV. DEPTH (m)	STRATA PLOT		DESCRIPTION		BORING MET	
0 Dec toom and and all the organic Employed (SPS)(1) Dec toom and all the organic Employed (SPS)(1) Employed (SPS)(1								Ĩ											94.30			SURFACE	GROUND SI		
1 1 <td></td> <td>0.00</td> <td>EEE</td> <td>nic</td> <td>n sandy silt, with organ</td> <td>Dark brown</td> <td></td> <td></td>																			0.00	EEE	nic	n sandy silt, with organ	Dark brown		
1 Image: Intercent city, with cockless and bouldeer. Image: Imag																	1		94.00	and the second s	e gravel	WID SANDY SILT SOME	Dense brow	╎┝	
1 a a a a b b a b																\$	GRAE	1 (0.00		lders	with cobbles and bould TILL)	trace clay, v (GLACIAL T	Ê	
2 Image: Controls 2.7 Image: Controls 2.7 3 End of Screinole 2.7 Image: Controls 2.7 4 Note: sampling 1mage: Controls 2.7 Image: Controls 1mage: Controls 6 Note: sampling 1mage: Controls 1mage: Controls 1mage: Controls 1mage: Controls 7 Image: Controls 1mage: Controls 1mage: Controls 1mage: Controls 1mage: Controls 8 Image: Controls 1mage: Controls 1mage: Controls 1mage: Controls 1mage: Controls 1mage: Controls 9 Note: sampling 1mage: Controls 1mage: Controls 1mage: Controls 1mage: Controls 1mage: Controls 8 Image: Controls 1mage: Controls 1mage: Controls 1mage: Controls 1mage: Controls 1mage: Controls 1mage: Controls 8 Image: Controls 1mage: Controls 1mage: Controls 1mage: Controls 1mage: Controls 1mage: Controls 9 Image: Controls 1mage: Controls 1mage: Controls 1mage: Controls 1mage: Controls 1mage: Controls 1mage: Control 1mage: Contro																								Hollow Ster	1
2 1 2 2 2 3 4 End of borehole Auge Relatal 2.27 1 1 1 5 Noil stratigophy inferred from limited sampling 1 1 1 1 1 6 1																	-							mm Diam. (c
a End of Borehole Auger Partial 2.57																33	50 DO	2						200	2
2 End of Solehole Auger Relation 2.57 3 Note: Sa stationary inferred from limited sampling 1 4 1 1 5 1 6 1 7 1 8 1 9 1																			91.73						
- -	dayuaaa	Porchel																	2.57			ehole usal	End of Bore Auger Refu		
	ary upon n of	completi drilling																			nited	raphy inferred from lim	Soil stratigra		3
																									4
																									5
																									6
7 8 9 1 10																									
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9 10																									8
9 10																									
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10																									
																									10
															<u>a</u>										

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

RECORD OF BOREHOLE: 10-103

BORING DATE: Sept. 17, 2010

SHEET 1 OF 1

DATUM: Geodetic

ĻĒ			SOIL PROFILE			S/	AMPL	.ES	DYNAMIC PENE RESISTANCE, E	TRATI	ON /0.3m	$\sum_{i=1}^{n}$	HYDRAULIC k, cm/	CONDUC [®]	FIVITY,	Şr Gr	PIEZOMETER
PTH SCA METRES		ING MET	DESCRIPTION	TA PLOT	ELEV.	MBER	ΥPE	WS/0.3m	20 40 I I SHEAR STRENO) GTH	60 80 ⊥ nat V. + rem V ⊕		10 ⁻⁶ WATER	10 ⁻⁵ 1 CONTENT	0 ⁻⁴ 10 PERCEN		OR STANDPIPE INSTALLATION
B		BOR		STRA	(m)	'''		BLO	20 40)	<u>50 8</u>	2 2	Wp	40 0	50 8	wi ₹₹	
- 0			GROUND SURFACE Black sandy silt, with organic matter		93.4 0.0	9	-	-									
- 1		stem)	(TOPSOIL) Compact to very dense SILTY SAND, some gravel, trace clay, with cobbles and boulders (GLACIAL TILL)		93.1 0.3	1 B 1	50 DO	13									-¥- Bentonite Seal
- 2	Power Auger	200mm Diam. (Hollow S				2	50 DO	>50									Silica Sand
			Highly weathered to weathered black SHALE BEDROCK		91.3 2.1 90.4	³ 3	50 DO	>50					0				50mm Diam. PVC #10 Slot Screen
- 3-			End of Borehole Auger Refusal		3.0	0	DO	- 30							******		W.L. in screen at Elev. 93.32m on Sept. 28, 2010
- 4																	
- 5																	
- 6																	
- 7																	
- 8																	
- 9																	
- 10																	
DEF	PT	ΉS	CALE					(G	olde	r,					L	OGGED: D.G.

PROJECT: 10-1121-0014 LOCATION: See Site Plan

RECORD OF BOREHOLE: 10-104

SHEET 1 OF 1

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: Sept. 20, 2010

щ		DD	SOIL PROFILE			SA	MPL	.ES	DYNAMIC PEN RESISTANCE,	ETRA ^T BLOW	FION S/0.3m	$\sum_{i=1}^{n}$	HYDRA	ULIC C k, cm/s	ONDUC	FIVITY,		ں	
SCAL		METH		LOT		Ř		J.3m	20 4	0	60	30	10	-6 1	0 ⁻⁵ 1	0 ⁻⁴ 1	0 ⁻³	IONAL	
EPTH MET		RING	DESCRIPTION	ATA F	DEPTH	UMBE	TYPE	D/S/VC	SHEAR STREN Cu, kPa	GTH	nat V. + rem V. €	Q - ● U - O	WA	TER C		PERCE	NT	ABDIT AB. TE	INSTALLATION
		BOI		STR	(m)	z		BLO	20 4	0	60	30	20) 4	10 6	50 E	0	2	
- (, _	_	GROUND SURFACE	===	92.04						_								
-			(TOPSOIL)		91.74														
-			Grey brown CLAYEY SILT		0.30														
			Loose brown fine to medium SAND,	<u> </u>	91.38 0.66														¥.
- 1			trace silt	2			50												
						ľ	DO	3											
		v Sterr	Compact grey fine SAND, trace silt		90.36 1.68		50												
2	Auder	Hollov	,		89.97	2	DO	24											
	ower	Diam.	Grey SILTY SAND, some gravel, trace clay, with cobbles and boulders		2.07														
		0mm	(GLACIAL TILL)																
		20																	
1	3				3														
			Probable bighly weathered to weathered		88.84														
			Shale Bedrock																
					-														
2	1				07.02														
	F	-	End of Borehole		4.11														
			Note:																W.L. in borehole at 0.6m depth below
			Soil stratigraphy inferred from limited sampling																ground surface upon completion of drilling
Ę	5																		Grinnig
e	5																		
7	,																		
٤	3																		
ę																			
10)																		
D	EP1	THS	CALE					ł	(# G	bld	er.							L	JGGED: D.G.
1	. 50								V ASS	UCI	ates							CH	EUNED.

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

RECORD OF BOREHOLE: 10-105

BORING DATE: Sept. 20, 2010

SHEET 1 OF 1

DATUM: Geodetic

J	6	3	SOIL PROFILE			SA	MPL	.ES	DYNAMIC PENETRA RESISTANCE BLOV	TION VS/0.3m	$\sum_{i=1}^{n}$	HYDRAULIC	CONDUC	TIVITY,	.0	
RES		H H		LOT		æ		3m	20 40	60 8	30	10-6	10 ⁻⁵ 1	0 ⁻⁴ 10 ⁻³	ONAL	PIEZOMETER OR
METF		ב צ	DESCRIPTION	TA PI	ELEV.	MBEI	ΥPE	NS/0.	SHEAR STRENGTH	nat V. +	Q - ●	WATER	CONTENT	PERCENT	B. TEL	STANDPIPE INSTALLATION
) 1		22		STRA	(m)	NN	-	BLO	00, 10		0-0-0	Wp 🛏			E A	
			GROUND SURFACE		92.51					00 2	30	20	40	80		
0			Black sandy silt, with organic matter		0.00											
					92.15											
			some gravel, trace silt		0.36											
1						1	50	24								
					1		DO	24								
					90.99											
			Brown to dark grey SANDY SILT, some gravel, trace clay, with cobbles and		1.52											
			boulders (GLACIAL TILL)		1	2	DO	28								
2		Ê														
		w Ste														
	Auger	Hollo														
	ower	iam. (Ś											
3	ď.	D m m														Σ
		200			Ś.											
					e e											
4																
					87 79											
			Probable highly weathered to weathered		4.72											
5			Shale Deulock													
					87.18											
			End of Borehole Auger Refusal		5.33											
			Note:													W.L. in borehole at 3 1m depth below
6			Soil stratigraphy inferred from limited sampling													ground surface upon completion of
																drilling
7																
8																
9																
5																
0																
DE	PTI	нs	CALE		•	•										OGGED: D.G.
1:	50							1	U Gold	er iates					CH	IECKED:

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

RECORD OF BOREHOLE: 10-106

BORING DATE: Sept. 20, 2010

SHEET 1 OF 1

DATUM: Geodetic

		QC	SOIL PROFILE			SAM	IPLES	DYNAMIC PER		0N 0.3m	<u>\</u>	HYDRAU	JLIC CC	NDUCT	IVITY,		. (D	
SCALE		METH		LOT		ж	and	20	40 6	60 8	30	10 ⁻⁶	10	⁻⁵ 1(D ⁻⁴ 10) ⁻³	STINC	PIEZOMETER
PTH	ME	NG N	DESCRIPTION	NTA PI	ELEV.	IMBEI	WS/0	SHEAR STRE Cu. kPa	NGTH r	⊨ natV. + emV.⊕	Q - ● U - O	WAT	FER CO	NTENT	PERCEN	ΝT	DDITI B. TE	STANDPIPE INSTALLATION
DE		BOR		STRA	(m)	N		20	40 6	in 1. C	80	Wp 20	4(NI D	₹₹	
			GROUND SURFACE		90.13			20						, 0		0		
E	0		Black sandy silt, with organic matter (TOPSOIL)		0.00													
F			Stiff grey brown CLAYEY SILT trace		89.77 0.36													
-			sand															
-																		
-	1																	-
-																		
Ē																		
-						1	50 2											
-	2	(tem)																-
E		ger ollow S																
-		m. (Ho			87.54													∇
E		m Dia	Compact grey SILTY SAND, some gravel, trace clay, with cobbles and		2.59													-
<u> </u>	3	200n	boulders (GLACIAL TILL)															
-							50											
-						2	2											
-																		
-	4																	_
-																		
-																		:
Ē																		
F	5		End of Borehole	- 2122	85.18 4.95			-										
Ē			Auger Refusal															W L in borehole at
E			Note: Soil stratigraphy inferred from limited															2.6m depth below ground surface
-			sampling															upon completion of drilling
E	6																	_
-																		
-																		
F																		
E	7																	-
F																		
-																		
5																		
- 10 -	2																	
12/8/	0																	
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GAL-																		:
GB	9																	-
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1210(10																	
101	10																	-
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RECORD OF BOREHOLE: 10-107

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: Sept. 20, 2010

SHEET 1 OF 1

DATUM: Geodetic

щ	Τ	QO	SOIL PROFILE			SA	MPL	ES	DYNAMIC PEN RESISTANCE.	ETRA BLOW	FION S/0.3m	<u>\</u>	HYDR	AULIC (CONDUC	TIVITY,		<u>ں</u>	
SCAL		METH		LOT		ъ		.3m	20 4	40	60	80	1	0-6	10 ⁻⁵ 1	0-4 1	0 ⁻³	STIN	PIEZOMETER OR
METI		ING	DESCRIPTION	VTA P	ELEV.	JMBE	ΓYPE	WS/0	SHEAR STREM	I GTH	nat V	- Q- ● 9 U- O	N	ATER C	ONTENT	PERCE	NT	B. TE	STANDPIPE INSTALLATION
DE		BOR		STRA	(m)	٦٢	-	BLO	20	40	60	80	W	p 📕 🚽	40 VV	60 8	WI 30	ΓA	
	_		GROUND SURFACE		89.62								-						
E			Black silty clay, with organic matter (TOPSOIL)		0.00														
F			Brown to grey brown CLAYEY SILT,	- UUU	89.26 0.36														
E			trace sand		1	1 (GRAE												Σ
F					1														
Ē	1				1														
ŧ					1														
-							1												
-		2				2	50 DO	5											
E	2	v Sterr			1														
-		(Hollov	Stiff grey CLAYEY SILT		87.33														
-		Diam.				3	50 DO	3											
_		0mm [Grev SILTY SAND with cobbles and		86.75														
	3	50	boulders (GLACIAL TILL)		2.01														-
-																			
-																			
-																			
-	4																		-
_																			
-																			
-			Probable highly weathered to weathered	200	84.82 4.80														
-	5		Shale Bedrock		4.93														-
			Auger Refusal																W.L. in borehole at 0.6m depth below
			Note: Soil stratigraphy inferred from limited																ground surface upon completion of
-			sampling																drilling
	6																		-
	7																		-
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-																			
	8																		-
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D)EP	THS	SCALE					ļ	G	old	er							L	OGGED: D.G.
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LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

RECORD OF BOREHOLE: 10-108

BORING DATE: Sept. 21-22, 2010

SHEET 1 OF 1

DATUM: Geodetic

S	ETHOD	╞	SOIL PROFILE	1		SA	MPL	ES E	RESISTANCE, BLO	VS/0.3m	\	k, cm/s	⁵ 10 ⁻⁴	, 10 ⁻³	TING	
	NG M		DESCRIPTION	TA PL(ELEV.	MBER	ΥΡΕ	VS/0.3	SHEAR STRENGTH	nat V. + Q -	e w	ATER CO	NTENT PERC	ENT	3. TES	STANDPIPE
-	30RII			TRAT	DEPTH (m)	ΝŇ	F	BLOV	Cu, KPa	rem v. ⊕ U-	~ w		-0 ^W	WI	L A B	
┥		+	GROUND SURFACE	S			$\left \right $		20 40	60 80	2	0 40	0 60	80		
0	Τ	╉	Dark brown silty clay, with organic matter	EEE	89.54									-		<u> </u>
1			Very stiff grey brown CLAYEY SILT, trace sand		0.20	1	50 DO	9								Ţ
2			Stiff grey CLAYEY SILT, trace sand		<u>87.71</u> 1.83	2	50 DO	6			F	э o			мн	Native Backfill and Bentonite
							50									
3						3	DO	3								
	_	w Stem)	Compact grey SILTY SAND, some		86.19 3.35	4	50 DO	8								Bentonite Seal
	Power Auge	Diam. (Holld	graver, trace ciay, with coobles and boulders (GLACIAL TILL)			<u> </u>										Silica Sand 50mm Diam. PVC
4		200mm [5	50 DO	13			o					#10 Slot Screen 'B' Silica Sand
		╞	Highly weathered to weathered black SHALE BEDROCK		84.97 4.57		50									Bentonite Seal
5					- - - -	6	DÖ	18								Native Backfill
6						7	50 DO	>100			0					Bentonite Seal
																Silica Sand
7					82.07											50mm Diam. PVC #10 Slot Screen 'A'
ſ		T	End of Borehole Auger Refusal		7.47											
8																W.L. in screen 'A' at Elev. 89.48m on Sept. 28, 2010
9																W.L. in screen 'B' at Elev. 88.84m on Sept. 28, 2010
10																

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

RECORD OF BOREHOLE: 10-109

BORING DATE: Sept. 23, 2010

SHEET 1 OF 1

DATUM: Geodetic

Щ	0	n P	SOIL PROFILE			SA	MPL	ES	DYNAMIC P RESISTANC	ENETRA E, BLOW	ГІОN 'S/0.3m	Ž	HYDRA	ULIC C k, cm/s	ONDUCT	IVITY,		JG	PIEZOMETER
EPTH SCA METRES		KING ME I	DESCRIPTION	ATA PLOT	ELEV. DEPTH	IUMBER	TYPE	DWS/0.3m	20 I SHEAR STR Cu, kPa	40 ENGTH	60 nat V. + rem V. €	80 - Q - ● 9 U - O	10 W/	⁻⁶ 1 ATER C	0 ⁻⁵ 10 DNTENT) ⁴ 1 PERCEI	0 ⁻³	ADDITION/ AB. TESTII	OR STANDPIPE INSTALLATION
Δ	6	22		STR	(m)	z		BLO	20	40	60	80	20	0 4	10 6	ا 8 0	0	L_	
- 0			GROUND SURFACE		89.60					_									
			(TOPSOIL)		89.37														
			Very stiff to stiff grey brown to grey CLAYEY SILT, occasional sand seam.		0.23														
			trace gravel		1	1	GRAB												
					1														
1																			
					1														
					1	2	50	5											
2					1	-	DO	Ũ											
		em)																	
	er	ts No			1														
	er Aug	. (Holl			1														
3	Powe	Diam			86.45														
		00mr	(GLACIAL TILL)		3.15														
		2																	
4																			
5																			
	\vdash		End of Borehole	1/12	83.76 5.84														
6			Auger Refusal																
			Note: Soil stratigraphy inferred from limited																
			sampling																
7																			
8																			
٥																			
J																			
10																			
	1			-	1	I						<u> </u>					I	1	
DE	EPT	ΗS	CALE					ł		Golde	er							L	DGGED: D.G.
1:	50								VJAS	SOC i	ates							CH	ECKED:

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

RECORD OF BOREHOLE: 10-110

BORING DATE: Sept. 22, 2010

SHEET 1 OF 1

DATUM: Geodetic

щ		DD	SOIL PROFILE		S	AMPL	LES	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m	HYDRAULIC CONDUCTIVITY, k, cm/s	ر ۱۵
SCAL		METH		LOT	К).3m	20 40 60 80	10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴ 10 ⁻³	
EPTH		RING	DESCRIPTION		TH B	TYPE	0/S/Q	SHEAR STRENGTH nat V. + Q - ● Cu, kPa rem V. ⊕ U - O		INSTALLATION
D		BO		u) STR) z		BLO	20 40 60 80	20 40 60 80	L
_	0		GROUND SURFACE	9	0.06					
	1		TOPSOIL) Very stiff brown to grey brown CLAYEY SILT, trace sand and gravel).18 	GRA	в			
	2				2	50 DO	21	1		<u>∑</u>
	3 4 5 6	Power Auger 200mm Diam (Hollow Stem)	SANDY SILT, with cobbles and boulders (GLACIAL TILL)		5.71 3.35					
	7		Probable highly weathered to weathered Shale Bedrock		<u>3.35</u> 5.71					
[210014-1000.GPJ GAL-MIS.GDT 12/8/10 JM	9		End of Borehole Auger Refusal Note: Soil stratigraphy inferred from limited sampling							W.L. in borehole at 1.2m depth below ground surface upon completion of drilling
101										
00 SHB-SIM	DEP	тн 0	SCALE					Golder		LOGGED: D.G. CHECKED:

RECORD OF BOREHOLE: 10-111

LOCATION: See Site Plan

SAMPLER HAMMER, 64kg; DROP, 760mm

BORING DATE: Sept. 23, 2010

SHEET 1 OF 1

DATUM: Geodetic

	ДŎ	SO	IL PROFILE			SA	AMPI	LES	DYNA RESIS		NETRATI , BLOWS	ON /0.3m	$\overline{\boldsymbol{\lambda}}$	HYDR	AULIC C k, cm/s	ONDUCT	IVITY,		<u>ہ</u> ۔	DIEZOMETER
TRES	METH			PLOT		К		0.3m		20	40	60 8	30	1	0 ⁻⁶ 1	0 ⁻⁵ 10	0 ⁻⁴ 1	0-3	TIONA	
ME	RING	DESCRIPT	ION	RATA	DEPTH		TYPE	0WS/	SHEA Cu, kP	R STREI 'a	NGTH	nat V. + rem V. €	Q - ● U - O	W			PERCE	NT	ADDI AB. T	INSTALLATION
	BO			STR	(m)	z		B		20	40	<u>60 8</u>	30	2	20 4	<u>40 6</u>	ء	30		
0		GROUND SURFACE	organic matter	833	90.3	4														
		(TOPSOIL) Stiff brown to grey brown			90.1 0.2	1 3														
		trace gravel, occasional	sand seam		1															
					1	1	GRA	в							0					
1					1															Σ
					1															
					1		-													
					1	2	50	6							0					
2					1															
					1															
	ē	Stem			1															
	Auger				1															
3	ower /	Jam. (1															
					1															
	č	Ň			1															
					1															
4					86.2	3														
		(GLACIAL TILL)	les and boulders		4.1															
5																				
						-														
		Probable highly weather	red to weathered		5.4	9														
		End of Borehole			84.5 5.8	0			-											
6		Auger Refusal																		W/L in borobolo at
		Note: Soil stratigraphy inferred	d from limited																	1.1m depth below ground surface
		sampling																		upon completion of drilling
7																				
ļ																				
9																				
-																				
0																				
<u></u>		SCALE																		
ا⊐ر 	⊡ H 50	JUALE						ł	(尹	ĘĢ	olde	r								JGGED: D.G.
: (JU								V	7ASS	SOCI	ALCS .							CH	EUKED: