

**FOUNDATION INVESTIGATION AND DESIGN REPORT
HIGH MAST LIGHTING POLES
HIGHWAY 400
MAJOR MACKENZIE DRIVE TO NORTH OF TESTON ROAD
TORONTO, ONTARIO
G.W.P. 2539-04-00**

GEOCRES No. 30M13-164

Submitted

To

**SNC-Lavalin
Engineers & Constructors**

Thurber Engineering Ltd.
Suite 103, 2010 Winston Park Drive
Oakville, Ontario
L6H 5R7
Tel. (905) 829-8666
Fax. (905) 829-1166
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File: 19-92-68

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PART 1 FACTUAL INFORMATION

1.0 INTRODUCTION

This report presents the factual data from a foundation investigation carried out by Thurber Engineering Ltd. (Thurber) for the detailed design of High Mast Lighting (HML) poles at locations between Major Mackenzie Drive and the service station to the north of Teston Road along Highway 400 in the Regional Municipality of York, Ontario. Thurber has been retained by SNC-Lavalin, Engineers & Constructors (SNC-Lavalin) to carry out this investigation under the Ministry of Transportation Ontario (MTO) Agreement No. 2005-E-0037.

The purpose of this investigation was to determine the subsurface conditions in areas where HML poles are proposed and, based on this data, to provide a borehole locations drawing, records of boreholes, laboratory test results and a written description of the subsurface conditions.

In addition to the boreholes drilled specifically for the HML poles, reference has been made to information on subsurface conditions contained in other foundation reports. The titles of these reports are as follows:

- Thurber Engineering Ltd. report titled “Draft Foundation Investigation and Design Report, High Embankments, Teston Road to King Road, Highway 400 Widening, Vaughan, Ontario”, G.W.P. 2539-04-00, Report to SNC-Lavalin, File No. 19-92-68, May 14, 2007 (Reference 1).



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- Thurber Engineering Ltd. report titled “Foundation Investigation and Design Report, Highway 400 Overhead Signs, Highway 400/Teston Road Interchange”, Report to McCormick Rankin, File No. 19-1351-66, January 26, 2005 (Reference 2).
 - Thurber Engineering Ltd. report titled “Foundation Investigation and Design Report, Culvert Extensions and High Fill, Highway 400/Teston Road Interchange”, Report to McCormick Rankin, File No. 19-1351-66, January 26, 2005 (Reference 3).
 - Thurber Engineering Ltd. report titled “Foundation Investigation and Design Report, Highway 400 Retaining Structure, Teston Road Interchange, Region of York, Ontario”, Report to McCormick Rankin, File No. 19-1351-66, January 26, 2005 (Reference 4).
 - Thurber Engineering Ltd. report titled “Foundation Investigation and Design Report, Highway 400 – Teston Road, Region of York, Ontario”, Report to McCormick Rankin, File No. 19-1351-66, January 26, 2005 (Reference 5).

2.0 SITE DESCRIPTION

The HML poles are to be located along the alignment of the proposed Highway 400 widening, between the interchange at Major Mackenzie Drive and the service station just north of Teston Road. This is part of a project of broader scope involving the widening of Highway 400 from Major MacKenzie Drive to King Road.

The project area is located within the physiographic region known as the South Slope of the Oak Ridges Moraine, which comprised predominantly of the Halton drift (till). The Halton till is an interbedded complex of clayey silt to silt till and sand. This till comprises a slightly hummocky till plain, into which the surface watercourses have eroded 10 to 15 m deep gullies. Relatively recent fluvial sediments have been deposited in the gullies. The Halton drift overlies bedrock at depths in the order of 100 m in the vicinity of the project area.

Drainage in the vicinity of the project area is largely controlled by the Humber River and its tributaries. Localized drainage is facilitated by the creeks flowing within the gullies.

The land use adjacent to this section of Highway 400 is largely rural and agricultural, although there is increasing residential and commercial development in recent years.



3.0 INVESTIGATION PROCEDURES

3.1 Field Investigation

It is understood that 24 high mast pole locations have been proposed to date. According to SNC-Lavalin, these locations are tentative and are subject to change in the future. The approximate locations of these poles are described in Table 1 for reporting purposes only.

A borehole investigation program for the HML was carried out between November 19 and 23, 2007 when a total of eight (8) boreholes were advanced at selected locations within the Highway 400 right-of-way in the vicinities where new HML poles are to be constructed. The borehole locations are either on the highway shoulder, in the ditch at the embankment toe or within the construction zone in the Teston Road interchange area. These boreholes were terminated at between 10.9 m and 11.3 m depths. Relevant boreholes located within the subject section of Highway 400 are also referenced in this report and attached in Appendix C. The approximate locations of all relevant boreholes are shown on the Borehole Locations Plans immediately following the text and tables.

In each borehole, soil samples were obtained with a 50 mm outside diameter split spoon sampler driven in accordance with the Standard Penetration Test (SPT). Groundwater conditions in the open boreholes were observed throughout the drilling operations. Standpipe piezometers were installed in 3 selected boreholes to facilitate longer term monitoring of the groundwater levels. The borehole completion details are shown in Table 3.1 below.

Table 3.1 – Borehole Completion Details

Borehole Number	Piezometer Tip Depth / Elevation (m)	Completion Details
HML-1	None Installed	Bentonite holeplug to 0.15 m asphalt to surface
HML-2	None Installed	Bentonite holeplug to 0.15 m asphalt to surface
HML-3	None Installed	Bentonite holeplug to surface
HML-4	10.6 / 231.7	Sand from bottom to 8.5 m, bentonite grout to surface
HML-5	None Installed	Bentonite holeplug to surface



HML-7	11.3 / 234.2	Sand from bottom to 9.2 m, bentonite grout to surface
HML-8	None Installed	Bentonite holeplug to 0.15 m, asphalt to surface
HML-9	10.7 / 235.7	Sand from 10.7 m to 8.7 m, bentonite grout to 0.15 m, asphalt to surface

The drilling investigation was supervised on a full-time basis by a member of Thurber's field staff who located the boreholes in the field, cleared borehole locations of underground utilities, directed the drilling, sampling and in-situ testing operations, and logged the boreholes. The soil samples were identified in the field, placed in appropriately labelled containers and transported back to Thurber's laboratory for further examination and testing.

Upon completion of drilling, all boreholes were backfilled with bentonite and capped with cold patch asphalt where required. Results of field sampling and testing are presented on the Records of Boreholes in Appendix A.

3.2 Laboratory Testing

Geotechnical laboratory testing consisted of natural moisture content determination and visual identification of all soil samples in accordance with the current MTO standards. Grain size distribution analysis and Atterberg Limits tests were conducted on selected samples. All laboratory test results are presented in Appendices A and B.

4.0 SUBSURFACE STRATIGRAPHY

4.1 General

This section presents a generalized summary of the subsurface conditions encountered in Boreholes HML-1, HML-2, HML-3, HML-4, HML-5, HML-7, HML-8 and HML-9. The detailed subsurface soil and groundwater conditions encountered in these boreholes are presented in the Records of Boreholes in Appendix A. Selected boreholes from References 1 to 5 are referenced in this report, but are not discussed in this section. The actual borehole data closest to an HML location governs any interpretation of the site conditions at that specific pole location. It



should be recognized that the subsurface conditions may vary between and beyond the borehole locations.

In general, the subsurface conditions encountered in the boreholes consist of pavement structure, embankment fill or topsoil overlying native silty clay, which is exposed at ground surface at some locations. The surficial soils overlie silty clay till which is itself underlain by deposits of sand and silty sand to sandy silt at some locations. Most boreholes were either dry or wet near the bottom upon completion of drilling.

4.2 Pavement Structure

Pavement structure consisting of asphalt overlying granular materials was encountered in Boreholes HML-1, HML-2, HML-8 and HML-9. The thickness of the asphalt ranges between 125 mm and 190 mm. The granular materials consist of sand to gravelly sand ranging between 1.1 m and 1.2 m in thickness. These soils are typically in a compact state as indicated by SPT 'N' values ranging between 10 and 30 blows per 0.3 m penetration. The base of the granular materials vary from Elevations 232.7 m to 245.1 m.

Figure B1 presents the grain size distribution of a sample of the gravelly sand fill. These results are summarized in the following table. The measured moisture contents of the granular fill were typically in the order of 2% to 8%.

Soil Particles	%
Gravel	26
Sand	66
Silt and Clay	8

4.3 Embankment Fill

Below the pavement structure, embankment fill was encountered in Boreholes HML-1 and HML-2. The fill is a brown silty clay with trace gravel and sand. SPT 'N' values of 23 and 20 blows per 0.3 m penetration indicate a very stiff consistency. The base of the fill was found to be at Elevations 231.8 m and 236.8 m.



Figure B2 presents the grain size distribution curve of a silty clay fill sample. These results are also summarized in the following table.

Soil Particles	%
Gravel	0
Sand	23
Silt	56
Clay	21

4.4 Silty Clay

A deposit of native cohesive silty clay was encountered below the pavement structure and fill or topsoil, or exposed at the ground surface, in all except Borehole HML-5. This soil contains trace to some sand, trace gravel, trace rootlets and topsoil staining. This deposit was 0.6 m to 2.2 m in thickness and is typically brown to dark brown in colour. The base of the silty clay was found to vary between Elevations 230.9 m and 243.4 m.

Measured SPT 'N' values range between 6 blows and 18 blows per 0.3 m penetration, indicating that the silty clay has a firm to very stiff consistency. An occasional 'N' value of 35 blows per 0.3 m penetration indicates the presence of a hard zone.

Figures B3 and B4 present the grain size distribution curves and Atterberg limits test results of silty clay samples. The test results are summarized in the tables below. Measured moisture contents of the silty clay samples generally ranged between 15% and 28%.

Soil Particles	%
Gravel	0 to 2
Sand	20 to 30
Silt	45 to 54
Clay	18 to 30

Index Property	%
Liquid Limit	26 to 35
Plastic Limit	14 to 17
Plasticity Index	12 to 18



The above results show that the silty clay is typically of low to medium plasticity with a group symbol of CL to CI.

4.5 Silty Clay Till

The silty clay described above is underlain by a silty clay till in all except Borehole HML-5 where the till is encountered at ground surface. This soil contains trace to some sand, trace gravel. This till is 2.1 m to greater than 10.5 m in thickness and is typically brown changing to grey at some locations. The base of the till was found to vary between Elevations 226.0 m and 238.7 m.

Measured SPT 'N' values generally increase with depth, ranging from 15 blows per 0.3 m penetration to greater than 50 blows for less than 0.3 m penetration, indicating that the till has a very stiff to hard consistency. The high 'N' values infer the presence of cobbles and/or boulders.

Figures B5 to B7 present the grain size distribution curves and Atterberg limits test results of silty clay till samples. The test results are summarized in the tables below. Measured moisture contents of the silty clay samples generally ranged from 8% to 15% with occasional higher values.

Soil Particles	%
Gravel	0 to 3
Sand	11 to 26
Silt	50 to 57
Clay	20 to 30

Index Property	%
Liquid Limit	24 to 29
Plastic Limit	13 to 15
Plasticity Index	11 to 14

The above results show that the silty clay has low plasticity with a group symbol of CL.



Glacial tills inherently contains cobbles and boulders, and were inferred by the refusal 'N' values recorded in the boreholes.

4.6 Sand, Silty Sand to Sandy Silt

Deposits of sands, silty sands to sandy silts were encountered below the silty clay till in Boreholes HML-1, HML-2, HML-4, HML-5 and HML-9. These deposits were not fully penetrated in any of these boreholes. Where encountered, the measured SPT 'N' values vary between 50 blows per 0.3 m penetration to greater than 50 blows for less than 0.3 m penetration, indicating very dense conditions.

Figures B8 to B10 present grain size distribution curves of silt and sand samples. These test results are summarized in the table below. Measured moisture contents of the sand and silt samples typically ranged from 6% to 25%.

Soil Particles	%
Sandy Silt	
Gravel	0
Sand	29
Silt	65
Clay	6

Soil Particles	%
Sand to Silty Sand	
Gravel	0
Sand	63 to 91
Silt and Clay	9 to 37

4.7 Groundwater Conditions

Groundwater conditions were observed during and upon completion of drilling. A majority of the boreholes were dry upon completion. Free water was found accumulating near the bottom of Boreholes HML-4, HML-7 and HML-9 upon completion.



Standpipe piezometers were installed in these three boreholes and measured water levels are presented in Table 4.1:

Table 4.1 Water Level Measurements

Borehole (Screen location)	Date	Depth (m)	Elevation (m)
HML-4 (sand)	January 31, 2008	10.2	232.2
HML-7 (silty clay)	January 31, 2008	Found destroyed	
HML-9 (sandy silt)	January 31, 2008	Could not be found (presumed destroyed)	

Previous borehole results and observations as discussed above indicate that the groundwater level is at or below 6 m to 8 m depths at the borehole locations. It should be noted that these are very short term observations and groundwater levels are subject to seasonal fluctuations and severe climatic events.

5.0 MISCELLANEOUS

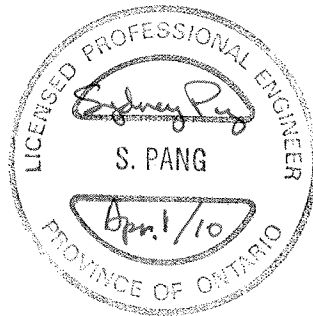
Thurber staked and/or marked the borehole locations in the field and obtained utility clearances prior to drilling. J. D. Barnes Limited surveyed the as-drilled locations, and provided northing and easting coordinates and ground surface elevations.

Walker Drilling Ltd. of Barrie, Ontario supplied the drill rig and conducted the drilling, sampling and in-situ testing operations. Traffic control during the field work was provided by Barricade Traffic Services Inc. where required.

The drilling and sampling operations in the field were supervised on a full time basis by Mr. Stephane Loranger of Thurber. Laboratory testing was carried out by Thurber in its MTO-approved Oakville laboratory.

Dr. Sydney Pang, P.Eng provided overall direction of the field operations and prepared the report. Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations projects, reviewed the report.





Sydney Pang, P.Eng.
Associate, Senior Project Engineer



P.K. Chatterji, P.Eng.
Review Principal, Designated MTO Contact



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PART 2 ENGINEERING DISCUSSION AND RECOMMENDATIONS

6.0 HML SUPPORT DESIGN RECOMMENDATIONS

6.1 General

This section of the report presents foundation recommendations for the design of the proposed HML supports.

Information on the proposed locations of the HML poles was provided to Thurber by SNC-Lavalin. It is understood that these 24 locations are tentative and are subject to change in the future. Based on the proposed design layout, a total of 8 boreholes (HML-1 to HML-5 and HML-7 to HML-9) were drilled at selected locations near these pole locations. It was envisaged that these boreholes, in addition to selected boreholes presented in References 1 to 5, would provide adequate subsurface information for detailed foundation design of the new HML poles.

Records of all available boreholes that are considered relevant to the foundation design of the HML poles are presented in Appendices A and C. Table 1 immediately following the text provides a listing of boreholes relevant to the design of each HML pole.

6.2 Foundation Design Parameters

For design of the HML pole foundation, reference should be made to the following documents.

- Ministry of Transportation, Ontario (2003) "Guidelines for the Design of High Mast Pole Foundations", Third Edition, BRO-006, Engineering Standards Branch, Bridge Office (Reference 6).



- Canadian Highway Bridge Design Code and Commentary (2006). CAN/CSA-S6-00 and S6.1-00 (Reference 7).

It is understood that a typical HML pole is supported on a single conventional augered caisson (drilled shaft). Table 1 following the text of this report presents the recommended geotechnical design parameters for the HML caisson foundations. The subsurface conditions in Boreholes HML-1 to HML-5, HML-7 to HML-9 and selected boreholes from References 1 to 5 have been interpolated and extrapolated to cover all proposed HML pole locations.

In order to take into account frost action and surficial disturbance, the ultimate lateral passive resistance in front of a caisson within the upper 1.2 m below final grade should be neglected in the foundation design. It is recommended that all topsoil and organics be neglected in determining lateral resistance.

Where downward sloping fill or native soil exists in front of a caisson, reduction of lateral passive resistance should be taken into account during design. For foundation design at the caissons, it can be assumed that full lateral resistance can only be mobilized where the width of the soil in front of or behind the caisson is equal to or greater than approximately 4 times the diameter of the caissons. For sloping ground in front of a caisson, the magnitude of the mobilized passive resistance can be estimated by interpolating between zero passive resistance at the level where the slope face intersects the pile, and full passive resistance at the level where the slope face is equal to or greater than 4 times the diameter of the caisson.

Where an unconfined compressive strength, q_u , ($q_u = 2 \times C_u$, undrained shear strength) is provided for a cohesive soil (silty clay to silty clay till), the ultimate lateral passive resistance should be calculated in conjunction with the total soil unit weight. When designing for portions of the caissons below the groundwater level in cohesionless sands and silts, the submerged soil unit weight, γ' , should be used. The required depth of the drilled shaft will be governed by lateral loads, including wind loads, acting on the pole. The length of the caisson should also be sufficient to counteract frost jacking (upward) forces.



An equivalent caisson width equal to 2 times the caisson diameter may be assumed for lateral resistance calculations. Appropriate load and resistance factors should be applied for caisson design.

6.3 Caisson Installation

Caisson installation should generally be carried out in accordance with SP 903S01.

The contract documents should contain an NSSP alerting the contract bidders of the specific aspects relating to caisson construction for HML foundation supports at this site. Suggested wordings for this NSSP are provided in Appendix D.

Caisson installation equipment must be able to dislodge, handle and remove cobbles, boulders, rock fragments, to penetrate obstructions within the fill and to drill through hard or very dense layers, where encountered.

Groundwater levels may be considered to be at or more than 8 m depth below existing ground surface. Soil sloughing and water seepage may occur in unsupported holes especially in sands and silts below the groundwater level. Temporary liners should be available to support the caisson sidewalls and to provide seepage cut-off where required. Any accumulated water may have to be pumped out from the hole prior to placing concrete.

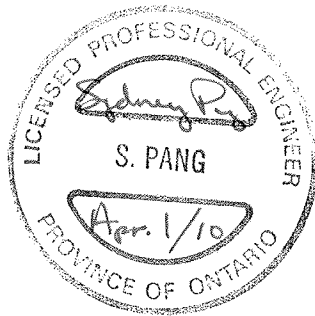
6.4 Construction Concerns

Concerns during caisson construction mainly involve the handling and removal of cobbles or boulders, or other obstructions in the fill and till, drilling through hard/very dense soils, soil sloughing and water seepage from caisson sidewalls. Recommendations on how to address these issues have been outlined in the previous section.

6.5 Construction Inspection and Testing

Caisson construction should be monitored by qualified geotechnical personnel (as per SP 903S01) to verify the soil conditions and to confirm that those conditions are consistent with the design assumptions in this report.





Sydney Pang, P.Eng.
Associate, Senior Project Engineer



P.K. Chatterji, P.Eng.
Review Principal, Designated MTO Contact



TABLE 1 FOUNDATION DESIGN PARAMETERS
HIGH MAST LIGHT (HML) FOUNDATION
HIGHWAY 400 WIDENING
MAJOR MACKENZIE TO NORTH OF TESTON

HMP Number and Approximate Location	Borehole Number	Reference Simplified Subsurface Stratigraphy for Design	Depth Below Existing Grade (m)	Foundation Design Parameters					
				q_u (kPa)	ϕ' (deg.)	γ (kN/m ³)	γ' (kN/m ³)	K_p	Groundwater Depth (m)
HMP1 (Sta. 18+680) HMP2 (Sta. 18+830) (Hwy 400 median)	HML-1	Silty Clay Fill	1.2 – 2.0	80	-	19	-	-	8 (below existing grade)
		Silty Clay	2.0 – 3.0	60	-	19	-	-	
		Silty Clay Till	3.0 – 4.0	150	-	20	-	-	
		Silty Clay Till	4.0 – 8.0	200	-	21	-	-	
		Silty Sand	8.0 – 11.0	-	35	21	11	3.7	
HMP3 (Sta. 18+980) (Hwy 400 median)	OH-1	Silty Clay Till	1.2 – 3.0	100	-	20	-	-	8 (below existing grade)
		Silty Clay/Clayey Silt Till	3.0 – 8.0	200	-	21	-	-	
		Sandy Silt	8.0 – 9.5	-	32	21	11	3.3	
HMP4 (Sta. 19+130) (Hwy 400 median)	HML-2	Silty Clay Fill	1.2 – 2.0	80	-	19	-	-	8 (below existing grade)
		Silty Clay	2.0 – 3.0	80	-	19	-	-	
		Silty Clay Till	3.0 – 4.0	150	-	20	-	-	
		Silty Clay Till	4.0 – 10.0	200	-	21	-	-	
HMP5 (Sta. 19+280) (Hwy 400 median)	HML-2 OH-3	Silty Clay/Clayey Silt	1.2 – 2.0	100	-	19	-	-	8 (below existing grade)
		Silty Clay/Clayey Silt Till	2.0 – 7.0	150	-	21	-	-	
		Sandy Silt Till	7.0 – 10.0	-	32	21	11	3.3	

Notes: This table must be read in conjunction with the report. See legend after Table 1 for symbol definitions.

In order to take into account frost action and surficial disturbance, the ultimate lateral passive resistance in front of the caisson within the upper 1.2 m below final grade should be neglected in the foundation design.

SNC-Lavalin
Highway 400 Widening High Mast Light, Major MacKenzie to North of Teston

HMP Number and Approximate Location	Borehole Number	Reference Simplified Subsurface Stratigraphy for Design	Depth Below Existing Grade (m)	Foundation Design Parameters					
				q_u (kPa)	ϕ' (deg.)	γ (kN/m ³)	γ' (kN/m ³)	K_p	Groundwater Depth (m)
HMP6 (Sta. 19+440) (Hwy 400 median)	OH-2 OH-3	Clayey Silt Silty Clay/Clayey Silt Till Sandy Silt Till	1.2 – 2.0 2.0 – 6.0 6.0 – 10.0	80	-	19	-	-	6 (below existing grade)
				200	-	21	-	-	-
				-	32	21	11	3.3	-
HMP7 (Sta. 19+590) (Hwy 400 median)	HML-3	Silty Clay Till Silty Clay Till	1.2 – 2.0 2.0 – 10.0	160	-	20	-	-	8 (below existing grade)
				200	-	21	-	-	-
HMP8 (Sta. 19+740) (Hwy 400 median)	CV-12A CV-12B	Silty Clay/Clayey Silt Till Sandy Silt Till/Silty Sand	1.2 – 5.0 5.0 – 10.0	200	-	21	-	-	6 (below existing grade)
				-	32	21	11	3.3	-
HMP9 (Sta. 19+890) (Hwy 400 median)	OH-4	Clayey Silt Clayey Silt Till Clayey Silt Till Sandy Silt Till	1.2 – 2.0 2.0 – 3.0 3.0 – 7.0 7.0 – 9.5	80	-	19	-	-	8 (below existing grade)
				160	-	20	-	-	-
				200	-	21	-	-	-
				-	32	21	11	3.3	-
HMP10 (Sta. 19+960) (offset ≈120 m west of Hwy 400 centreline)	HML-4	Silty Clay Silty Clay Till Sand	1.2 – 2.0 2.0 – 8.0 8.0 – 11.0	120	-	19	-	-	8 (below existing grade)
				200	-	21	-	-	-
				-	35	21	11	3.7	-

Notes: This table must be read in conjunction with the report. See legend after Table 1 for symbol definitions.

In order to take into account frost action and surficial disturbance, the ultimate lateral passive resistance in front of the caisson within the upper 1.2 m below final grade should be neglected in the foundation design.

HMP Number and Approximate Location	Borehole Number	Reference Simplified Subsurface Stratigraphy for Design	Depth Below Existing Grade (m)	Geotechnical Design Parameters					
				q_u (kPa)	ϕ' (deg.)	γ (kN/m ³)	γ' (kN/m ³)	K_p	Groundwater Depth (m)
HMP11 (Sta. 20+010) (Hwy 400 median)	HM-1	Clayey Silt Till	1.2 – 3.0	150	-	20	-	-	8 (below existing grade)
		Clayey Silt Till	3.0 – 7.0	200	-	21	-	-	-
		Sandy Silt Till	7.0 – 9.5	-	32	21	11	3.3	-
HMP-12 (Sta. 20+150) (Hwy 400 median)	HML-5	Silty Clay Till Sand	1.2 – 2.0	160	-	21	-	-	8 (below existing grade)
			2.0 – 11.0	-	35	21	11	3.7	-
HMP14 (Sta. 20+225) (offset \approx 70 m east of Hwy 400 centreline)	HML-5 04-1	Silty Clay Till Sand	1.2 – 3.0	160	-	21	-	-	8 (below existing grade)
			3.0 – 11.0	-	35	21	11	3.7	-
HMP13 (Sta. 20+300) (Hwy 400 median)	04-18	Silty Clay Till Sandy Silt/Sand	1.2 – 7.0	180	-	21	-	-	8 (below existing grade)
			7.0 – 11.0	-	35	21	11	3.7	-
HMP-15 (Sta. 20+300) (offset \approx 120 m east of Hwy 400 centreline)	04-1 04-19	Silty Clay Till Sandy Silt Till	1.2 – 4.0	150	-	20	-	-	8 (below existing grade)
			4.0 – 11.0	-	32	21	11	3.3	-

Notes: This table must be read in conjunction with the report. See legend after Table 1 for symbol definitions.

In order to take into account frost action and surficial disturbance, the ultimate lateral passive resistance in front of the caisson within the upper 1.2 m below final grade should be neglected in the foundation design.

SNC-Lavalin
Highway 400 Widening High Mast Light, Major MacKenzie to North of Teston

Site Number and Approximate Location	Borehole Number	Reference Simplified Subsurface Stratigraphy for Design	Depth Below Existing Grade (m)	Geotechnical Design Parameters					
				q_u (kPa)	ϕ' (deg.)	γ (kN/m ³)	γ' (kN/m ³)	K_p	Groundwater Depth (m)
HMP-16 (Sta. 20+460) (offset \approx 70 m east of (Hwy 400 centreline))	HML-7	Silty Clay	1.2 – 2.0	120	-	20	-	-	8 (below existing grade)
		Silty Clay Till	2.0 – 4.0	180	-	20	-	-	-
		Silty Clay Till	4.0 – 11.0	200	-	21	-	-	-
HMP17 (Sta. 20+450) (Hwy 400 median)	04-2 06-01E	Silty Clay Till	1.2 – 7.0	180	-	21	-	-	8 (below existing grade)
		Sandy Silt Till/Sand	7.0 – 11.0	-	32	21	11	3.3	-
HMP18 (Sta. 20+580) (Hwy 400 median)	06-02E 06-03E	Silty Clay Fill	1.2 – 4.0	50	-	19	-	-	6 (below existing grade)
		Clayey Silt/Silty Clay	4.0 – 6.0	100	-	20	-	-	-
		Sand/Silty Sand/Silt	6.0 – 9.0	-	30	20	10	3.0	-
		Silty Sand/Silt	9.0 – 11.0	-	32	21	11	3.3	-
HMP19 (Sta. 20+710) (Hwy 400 median)	06-30E 06-31E	Silty Clay Fill	1.2 – 4.0	50	-	19	-	-	6 (below existing grade)
		Silty Clay	4.0 – 6.0	160	-	20	-	-	-
		Sandy Silt Till	6.0 – 11.0	-	30	20	10	3.0	-
HMP20 (Sta. 20+840) (Hwy 400 median)	HML-8	Silty Clay	1.2 – 2.0	120	-	20	-	-	8 (below existing grade)
		Silty Clay Till	2.0 – 6.0	180	-	20	-	-	-
		Silty Clay Till	6.0 – 11.0	200	-	21	-	-	-

Notes: This table must be read in conjunction with the report. See legend after Table 1 for symbol definitions.

In order to take into account frost action and surficial disturbance, the ultimate lateral passive resistance in front of the caisson within the upper 1.2 m below final grade should be neglected in the foundation design.

SNC-Lavalin
Highway 400 Widening High Mast Light, Major MacKenzie to North of Teston

HMP Number and Approximate Location	Borehole Number	Reference Simplified Subsurface Stratigraphy for Design	Depth Below Existing Grade (m)	Geotechnical Design Parameters					
				q_u (kPa)	ϕ' (deg.)	γ (kN/m ³)	γ' (kN/m ³)	K_p	Groundwater Depth (m)
HMP21 (Sta. 20+980) (Hwy 400 median)	HML-8 HML-9	Silty Clay	1.2 – 3.0	60	-	19	-	-	6 (below existing grade)
		Silty Clay Till	3.0 – 7.0	180	-	20	-	-	
		Silty Clay Till	7.0 – 9.5	160	-	20	-	-	
		Sandy Silt	9.5 – 11.0	-	32	21	11	3.3	
HMP-22 (Sta. 21+130) (Hwy 400 median)	HML-9 06-04W	Silty Clay	1.2 – 3.0	60	-	19	-	-	6 (below existing grade)
		Silty Clay Till	3.0 – 7.0	180	-	20	-	-	
		Silty Clay Till	7.0 – 9.5	160	-	20	-	-	
		Sandy Silt	9.5 – 11.0	-	32	21	11	3.3	
HMP-23 (Sta. 21+280) (Hwy 400 median)	06-06W	Silty Clay Till	1.2 – 2.0	100	-	20	-	-	6 (below existing grade)
		Silty Clay Till	2.0 – 3.0	180	-	20	-	-	
		Silty Clay Till	3.0 – 7.0	200	-	21	-	-	
HMP24 (Sta. 21+430) HMP-25 (Sta. 21+580) (Hwy 400 median)	HM-2	Clayey Silt Till	1.2 – 5.5	200	-	21	-	-	6 (below existing grade)
		Sand	5.5 – 7.5	-	35	21	11	3.7	
		Sandy Silt	7.5 – 11.0	-	32	21	11	3.3	

Notes: This table must be read in conjunction with the report. See legend after Table 1 for symbol definitions.

In order to take into account frost action and surficial disturbance, the ultimate lateral passive resistance in front of the caisson within the upper 1.2 m below final grade should be neglected in the foundation design.

Legend:

q_u	=	unconfined compressive strength, $2 \times C_u$, undrained shear strength
ϕ'	=	angle of internal friction
γ	=	bulk unit weight
γ'	=	submerged unit weight
K_p	=	coefficient of passive earth pressure

c:\Thurber Projects 2006\19-92-68\Hwy 400 Widening\199268 Hwy 400 HML Major Mac to Teston Table 1 feb04 08.doc

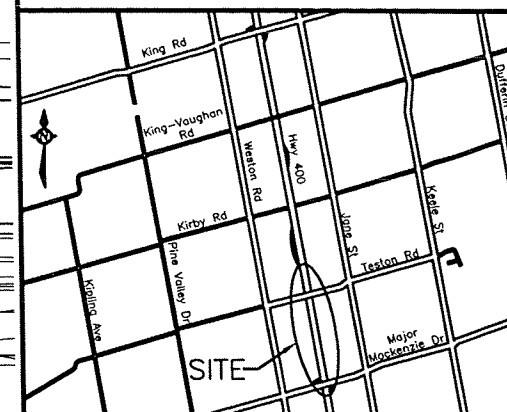
Notes: This table must be read in conjunction with the report. See legend after Table 1 for symbol definitions.
In order to take into account frost action and surficial disturbance, the ultimate lateral passive resistance in front of the caisson within the upper 1.2 m below final grade should be neglected in the foundation design.

METRIC
 DIMENSIONS ARE IN METRES
 AND/OR MILLIMETRES
 UNLESS OTHERWISE SHOWN

HIGHWAY 400
 CONT No
 GWP No 2539-04-00
 HWY 400 WIDENING
 MAJOR MACKENZIE DRIVE TO
 NORTH OF TESTON ROAD
 BOREHOLE LOCATIONS PLAN
 SHEET

SNC-LAVALIN
 Engineers & Constructors

THURBER ENGINEERING LTD.
 GEOTECHNICAL • ENVIRONMENTAL • MATERIALS

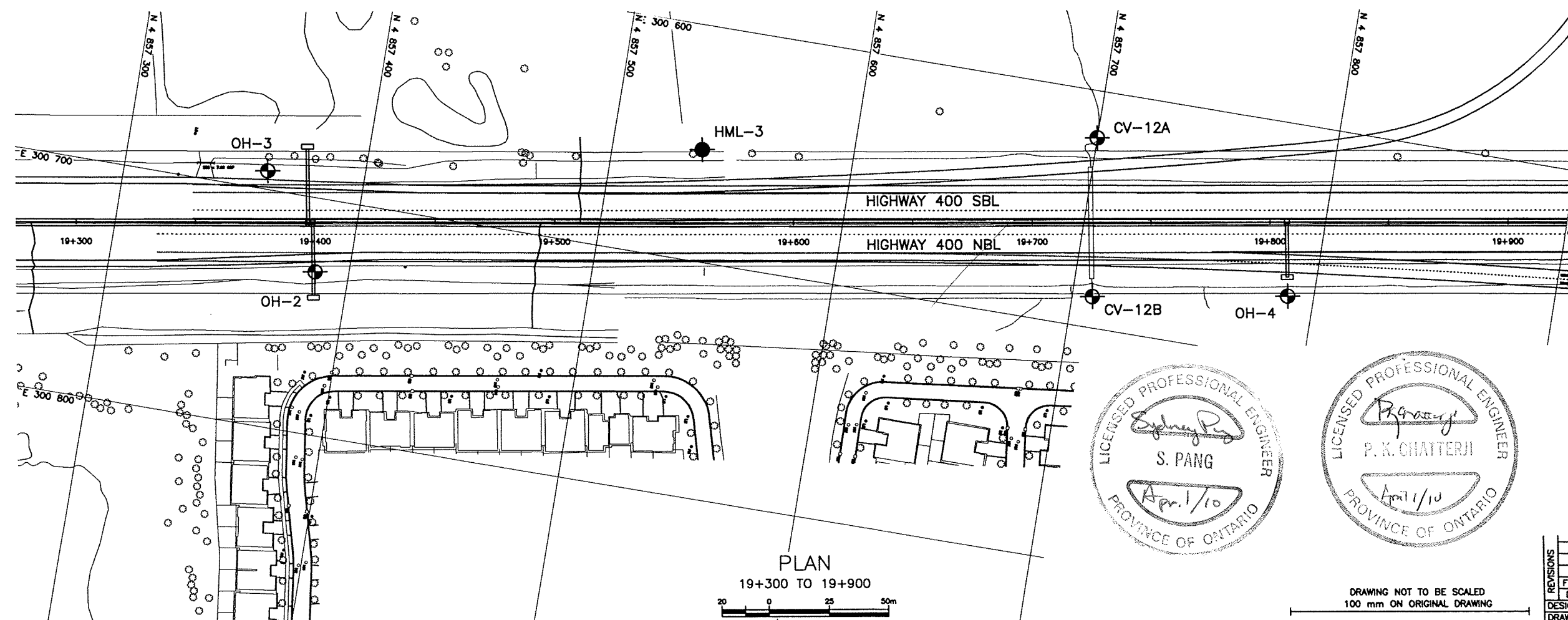
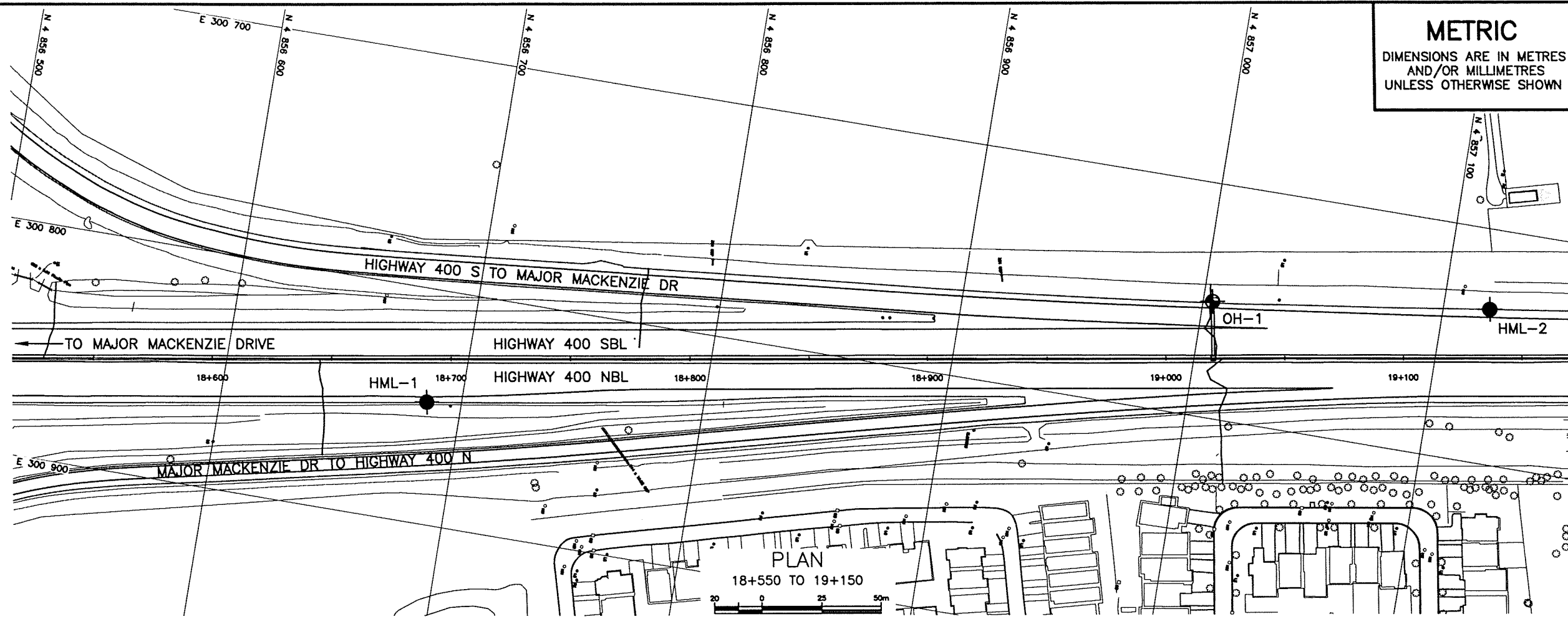


KEYPLAN
LEGEND

- ◆ Borehole (Current Investigation)
- ◇ Borehole (Previous Investigations)
- N North
- CONE Blows /0.3m (Std Pen Test, 475J/blow)
- PH Blows /0.3m (60° Cone, 475J/blow)
- Pressure, Hydraulic
- Water Level
- Head Artesian Water
- Piezometer
- 90% Rock Quality Designation (RQD)
- A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING
CV-12A	239.3	4 857 699.9	300 619.9
CV-12B	240.0	4 857 708.5	300 686.8
HML-1	233.9	4 856 685.5	300 848.3
HML-2	239.0	4 857 119.6	300 734.1
HML-3	240.1	4 857 537.1	300 652.6
OH-1	236.3	4 857 004.0	300 750.4
OH-2	240.3	4 857 386.0	300 731.2
OH-3	240.2	4 857 359.5	300 692.2
OH-4	240.3	4 857 789.2	300 672.9

- NOTES-**
- The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
 - This drawing is for subsurface information only. Surface details and features are for conceptual illustration.
- GEOCRES No. 30M13-164**



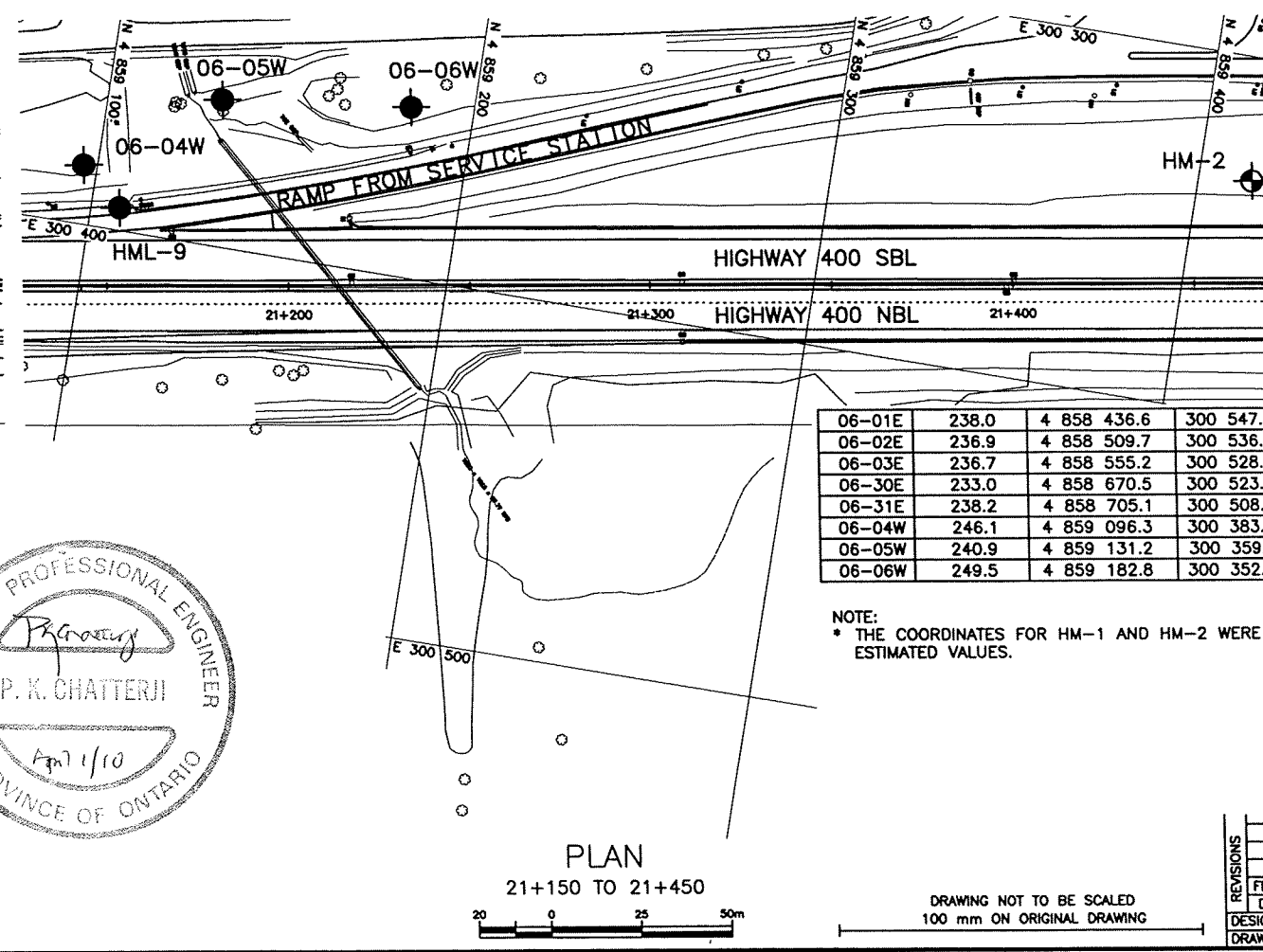
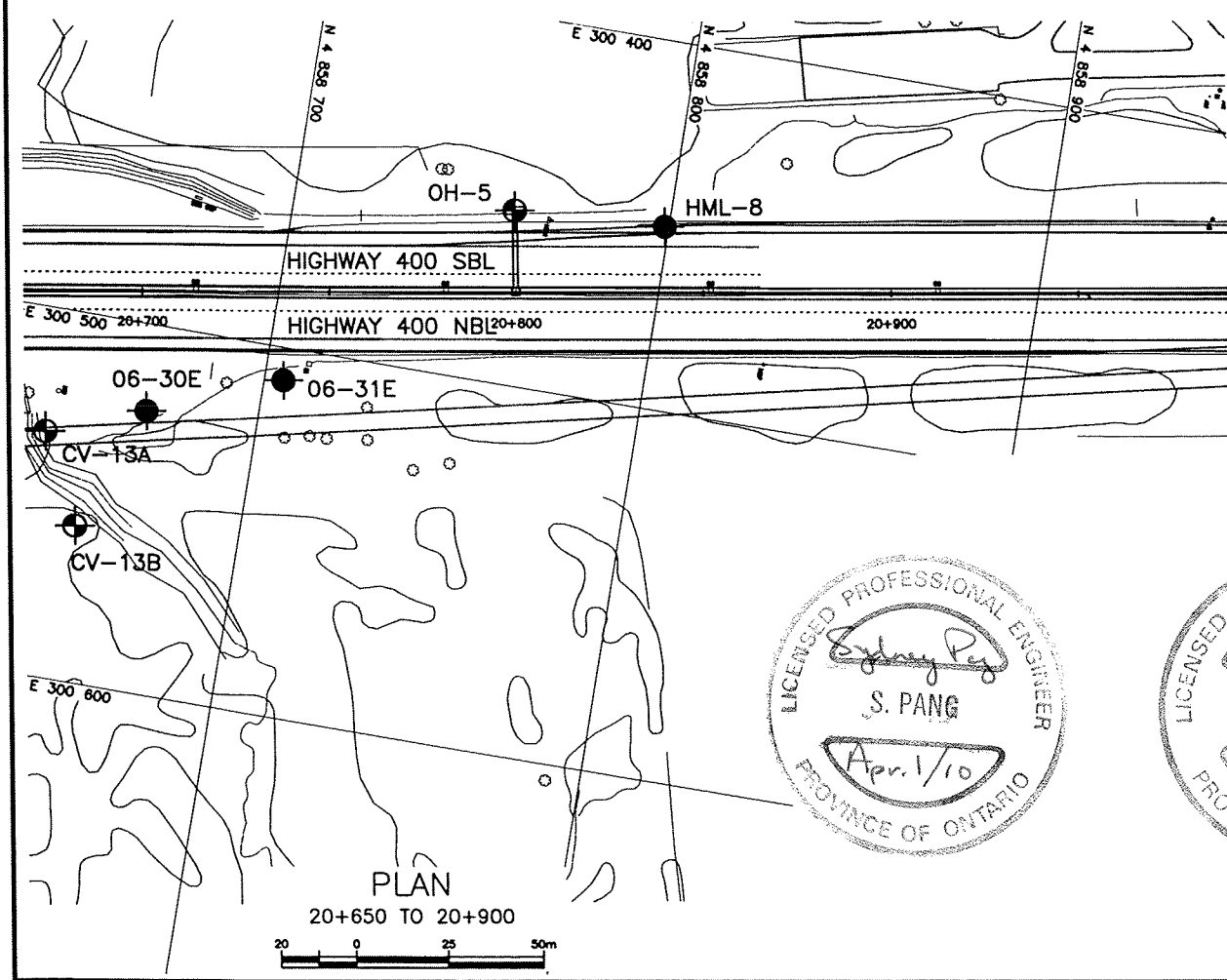
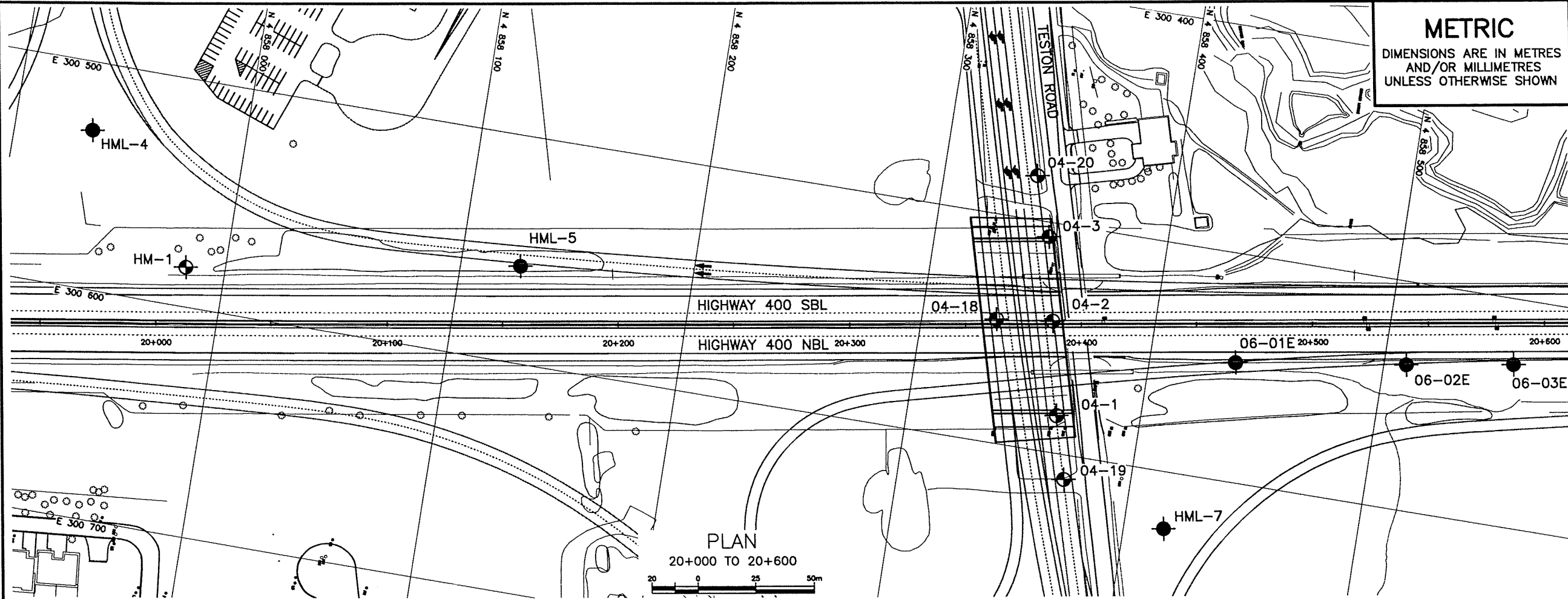
LICENSED PROFESSIONAL ENGINEER
 S. PANG
 Apr 1/10
 PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
 P. K. CHATTERJI
 Apr 1/10
 PROVINCE OF ONTARIO

DRAWING NOT TO BE SCALED
 100 mm ON ORIGINAL DRAWING

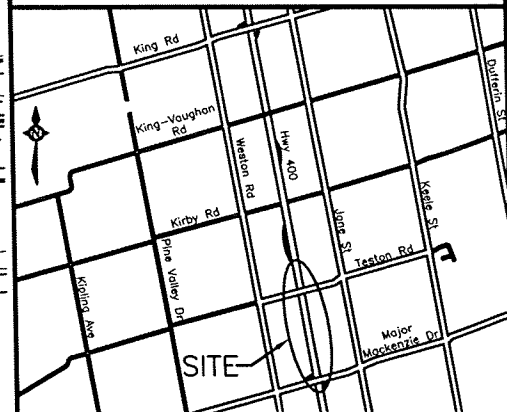
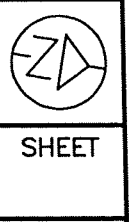
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DESIGN	SKP	CHK	PKC
DRAWN	MFA	CHK	PKC
ISSUED IN DRAFT	DATE	DATE	DATE
LOAD	DATE	DATE	DATE
STRUCT	DATE	DATE	DATE

PLAN SCALE 1:1
MAY 2010
MIN. OF TRANSPORTATION, ONTARIO



METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

HIGHWAY 400
CONT No
GWP No 2539-04-00
HWY 400 WIDENING
MAJOR MACKENZIE DRIVE TO
NORTH OF TESTON ROAD
BOREHOLE LOCATIONS PLAN



KEYPLAN

LEGEND

- Borehole (Current Investigation)
- Borehole (Previous Investigations)
- N North Arrow
- CONE Blows /0.3m (Std Pen Test, 475J/blow)
- PH Blows /0.3m (60° Cone, 475J/blow)
- Pressure, Hydraulic
- Water Level
- Head Artesian Water
- Piezometer
- 90% Rock Quality Designation (RQD)
- A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING
CV-13A	229.0	4 858 645.1	300 533.6
CV-13B	229.7	4 858 656.8	300 557.6
HM-1*	-	4 857 983.0	300 582.7
HM-2*	-	4 859 414.8	300 334.5
HML-4	242.4	4 857 933.4	300 530.1
HML-5	240.9	4 858 125.7	300 557.4
HML-7	245.5	4 858 417.3	300 624.8
HML-8	240.4	4 858 798.9	300 450.3
HML-9	246.3	4 859 107.8	300 393.7
OH-5	239.9	4 858 758.9	300 452.7
04-1	245.0	4 858 363.9	300 583.6
04-2	239.0	4 858 356.0	300 542.9
04-3	244.2	4 858 348.8	300 506.4
04-18	239.5	4 858 332.0	300 546.0
04-19	245.4	4 858 371.2	300 610.7
04-20	243.5	4 858 339.9	300 480.6

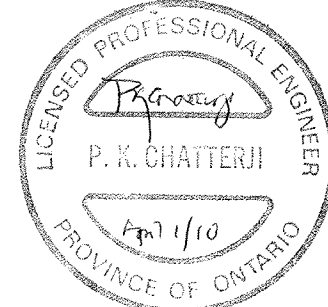
06-01E	238.0	4 858 436.6	300 547.8
06-02E	236.9	4 858 509.7	300 536.5
06-03E	236.7	4 858 555.2	300 528.8
06-30E	233.0	4 858 670.5	300 523.6
06-31E	238.2	4 858 705.1	300 508.9
06-04W	246.1	4 859 096.3	300 383.5
06-05W	240.9	4 859 131.2	300 359.1
06-06W	249.5	4 859 182.8	300 352.5

NOTE:
* THE COORDINATES FOR HM-1 AND HM-2 WERE
ESTIMATED VALUES.

NOTES-

- The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRES No. 30M13-164



REVISIONS	DATE	BY	DESCRIPTION
FEB08	SKP		ISSUED IN DRAFT
DESIGN	SKP	CHK	PKC
DRAWN	MFA	CHK	PKC
LOAD			
DATE	MAR 2010		
STRUCT			
DWG	2		

DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

Appendix A

Record of Boreholes (Present Investigation)



SYMBOLS, ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES

1. TEXTURAL CLASSIFICATION OF SOILS

CLASSIFICATION	PARTICLE SIZE	VISUAL IDENTIFICATION
Boulders	Greater than 200mm	same
Cobbles	75 to 200mm	same
Gravel	4.75 to 75mm	5 to 75mm
Sand	0.075 to 4.75mm	Not visible particles to 5mm
Silt	0.002 to 0.075mm	Non-plastic particles, not visible to the naked eye
Clay	Less than 0.002mm	Plastic particles, not visible to the naked eye

2. COARSE GRAIN SOIL DESCRIPTION (50% greater than 0.075mm)

TERMINOLOGY	PROPORTION
Trace or Occasional	Less than 10%
Some	10 to 20%
Adjective (e.g. silty or sandy)	20 to 35%
And (e.g. sand and gravel)	35 to 50%

3. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

DESCRIPTIVE TERM	UNDRAINED SHEAR STRENGTH (kPa)	APPROXIMATE SPT ⁽¹⁾ 'N' VALUE
Very Soft	12 or less	Less than 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	Greater than 200	Greater than 30

NOTE: Hierarchy of Soil Strength Prediction

- 1) Laboratory Triaxial Testing
- 2) Field Insitu Vane Testing
- 3) Laboratory Vane Testing
- 4) SPT value
- 5) Pocket Penetrometer


4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

DESCRIPTIVE TERM	SPT "N" VALUE
Very Loose	Less than 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	Greater than 50

5. LEGEND FOR RECORDS OF BOREHOLES

SYMBOLS AND ABBREVIATIONS FOR SAMPLE TYPE	SS Split Spoon Sample	WS Wash Sample	AS Auger (Grab) Sample
	TW Thin Wall Shelby Tube Sample	TP Thin Wall Piston Sample	
	PH Sampler Advanced by Hydraulic Pressure	PM Sampler Advanced by Manual Pressure	
	WH Sampler Advanced by Self Static Weight	RC Rock Core	SC Soil Core

$$\text{Sensitivity} = \frac{\text{Undisturbed Shear Strength}}{\text{Remoulded Shear Strength}}$$

 Water Level






C_{pen} Shear Strength Determination by Pocket Penetrometer

- (1) SPT 'N' Value Standard Penetration Test 'N' Value – refers to the number of blows from a 63.5kg hammer free falling a height of 0.76m to advance a standard 50 mm outside diameter split spoon sampler for 0.3 m depth into undisturbed ground.
- (2) DCPT Dynamic Cone Penetration Test – Continuous penetration of a 50 mm outside diameter, 60° conical steel point attached to "A" size rods driven by a 63.5 kg hammer free falling a height of 0.76 m. The resistance to cone penetration is the number of hammer blows required for each 0.3 m advance of the conical point into undisturbed ground.

UNIFIED SOILS CLASSIFICATION

MAJOR DIVISIONS		GROUP SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well-graded gravels or gravel-sand mixtures, little or no fines.
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines.
		GM	Silty gravels, gravel-sand-silt mixtures.
		GC	Clayey gravels, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS	SW	Well-graded sands or gravelly sands, little or no fines.
		SP	Poorly-graded sands or gravelly sands, little or no fines.
		SM	Silty sands, sand-silt mixtures.
		SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS	SILTS AND CLAYS $W_L < 50\%$	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. $(W_L < 30\%)$.
		CI	Inorganic clays of medium plasticity, silty clays. $(30\% < W_L < 50\%)$.
		OL	Organic silts and organic silty-clays of low plasticity.
	SILTS AND CLAYS $W_L > 50\%$	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity, organic silts.
	HIGHLY ORGANIC SOILS		Pt
CLAY SHALE			
SANDSTONE			
SILTSTONE			
CLAYSTONE			
COAL			

EXPLANATION OF ROCK LOGGING TERMS

ROCK WEATHERING CLASSIFICATION		SYMBOLS	
Fresh (FR)	No visible signs of weathering.		
Fresh Jointed (FJ)	Weathering limited to the surface of major discontinuities.		CLAYSTONE
Slightly Weathered (SW)	Penetrative weathering developed on open discontinuity surfaces, but only slight weathering of rock material.		SILTSTONE
Moderately Weathered (MW)	Weathering extends throughout the rock mass, but the rock material is not friable.		SANDSTONE
Highly Weathered (HW)	Weathering extends throughout the rock mass and the rock is partly friable.		COAL
Completely Weathered (CW)	Rock is wholly decomposed and in a friable condition, but the rock texture and structure are preserved.		Bedrock (general)

DISCONTINUITY SPACING		STRENGTH CLASSIFICATION			
Bedding	Bedding Plane Spacing	Rock Strength	Approximate Uniaxial Compressive Strength		Field Estimation of Hardness*
			(MPa)	(psi)	
Very thickly bedded	Greater than 2m	Extremely Strong	Greater than 250	Greater than 36,000	Specimen can only be chipped with a geological hammer
Thickly bedded	0.6 to 2m				
Medium bedded	0.2 to 0.6m	Very Strong	100-250	15,000 to 36,000	Requires many blows of geological hammer to break
Thinly bedded	60mm to 0.2m				
Very thinly bedded	20 to 60mm	Strong	50-100	7,500 to 15,000	Requires more than one blow of geological hammer to break
Laminated	6 to 20mm				
Thinly Laminated	Less than 6mm	Medium Strong	25.0 to 50.0	3,500 to 7,500	Breaks under single blow of geological hammer.
		Weak	5.0 to 25.0	750 to 3,500	Can be peeled by a pocket knife with difficulty
		Very Weak	1.0 to 5.0	150 to 750	Can be peeled by a pocket knife, crumbles under firm blows of geological pick.
		Extremely Weak (Rock)	0.25 to 1.0	35 to 150	Indented by thumbnail

TERMS	
Total Core Recovery: (TCR)	Core recovered as a percentage of total core run length.
Solid Core Recovery: (SCR)	Percent Ratio of solid core of full cylindrical shape recovered. Expressed with respect to the total length of core run.
Rock Quality Designation: (RQD)	Total length of sound core recovered in pieces 0.1m in length or larger as a percentage of total core run length.
Uniaxial Compressive Strength (UCS)	Axial stress required to break the specimen
Fracture Index: (FI)	Frequency of natural fractures per 0.3m of core run.

RECORD OF BOREHOLE No HML-1

1 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Major Mackenzie Drive to N of Teston Road N 4 856 685.46 E 300 848.28 ORIGINATED BY SLL
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2007.11.19 - 2007.11.19 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					
233.9							20 40 60 80 100						
0.0	ASPHALT: (125mm)						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
0.1	Gravelly SAND, trace silt Compact Brown Moist (FILL)		1	AS			20 40 60 80 100						
232.7			1	SS	10							26 66 8 (SI+CL)	
1.2	Silty CLAY, trace gravel, trace sand Very Stiff Brown Moist (FILL)		2	SS	23							0 23 55 21	
231.8													
2.0	Silty CLAY, trace sand, topsoil stained Firm Dark Brown Moist trace sand seams		3	SS	6								
230.9													
3.0	Silty CLAY, some sand, trace gravel, some sand seams Very Stiff Brown Moist (TILL)		4	SS	19							3 22 51 24	
	becoming Hard												
			5	SS	50/ .150							1 22 56 21	
			6	SS	96/ 275								
226.0			7	SS	50/ .125								
7.8	Silty SAND Very Dense Brown Moist												
			8	SS	90/ 275							0 63 37 (SI+CL)	

Continued Next Page

+³ . ×³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No HML-1

2 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Major Mackenzie Drive to N of Teston Road N 4 856 685.46 E 300 848.28 ORIGINATED BY SLL
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
DATUM Geodetic DATE 2007.11.19 - 2007.11.19 CHECKED BY SKP

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					WATER CONTENT (%)			
						20	40	60	80	100	W _P	W	W _L			
222.9	Silty SAND Very Dense Brown Moist Continued From Previous Page		9	SS	50/											
10.9	END OF BOREHOLE AT 10.92m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 150mm THEN ASPHALT TO SURFACE.				100											

RECORD OF BOREHOLE No HML-2

1 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Major Mackenzie Drive to N of Teston Road N 4 857 119.62 E 300 734.12 ORIGINATED BY SLL
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2007.11.20 - 2007.11.20 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT Y kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
								20 40 60 80 100						
239.0														
0.0	ASPHALT: (190mm)						239							
0.2	SAND, some gravel Compact Brown Moist (FILL)		1	AS										
			1	SS	30		238							
237.5														
1.4	Silty CLAY, trace gravel Very Stiff Brown Moist (FILL)		2	SS	20		237							
236.8														
2.2	Silty CLAY, trace gravel, trace rootlets Firm Brown Moist		3	SS	7		236							
236.0														
3.0	Silty CLAY, some sand, trace gravel, some sand seams and pockets Very Stiff Brown Moist (TILL)		4	SS	15		235							
234.4														
4.6	becoming Hard		5	SS	61		234							
							233							
			6	SS	80		232							
			7	SS	87/ 250		231							
			8	SS	57/ 125		230							

Continued Next Page

+³ ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No HML-2

2 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Major Mackenzie Drive to N of Teston Road N 4 857 119.62 E 300 734.12 ORIGINATED BY SLL
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2007.11.20 - 2007.11.20 CHECKED BY SKP

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT Y kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					WATER CONTENT (%)			
						20	40	60	80	100	W _P	W	W _L			
	Continued From Previous Page															
228.6	Silty CLAY, trace gravel, some sand, sand seams and pockets															
10.4	SAND, trace to some silt Very Dense Brown Moist		9	SS	100											
227.9																
11.1	END OF BOREHOLE AT 11.13m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 150mm THEN ASPHALT TO SURFACE.															

+³, X³: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No HML-3

2 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Major Mackenzie Drive to N of Teston Road N 4 857 537.12 E 300 652.63 ORIGINATED BY SLL
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2007.11.22 - 2007.11.22 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE							WATER CONTENT (%) w P w w L
	Continued From Previous Page						20	40	60	80	100	20	40	60	
228.9	Silty CLAY , some sand, trace gravel, with sand seams Hard Grey Moist (TILL)		9	SS	83		230								
11.1	END OF BOREHOLE AT 11.13m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.														

RECORD OF BOREHOLE No HML-4

1 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Major Mackenzie Drive to N of Teston Road N 4 857 933.44 E 300 530.14 ORIGINATED BY SLL
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2007.11.22 - 2007.11.22 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
242.4														
0.0	Silty CLAY, with sand, trace gravel, trace rootlets, some sand seams Stiff to Hard Brown Moist		1	SS	11		242							2 30 51 18
			2	SS	35		241							
240.2														
2.2	Silty CLAY, some sand, trace gravel Hard Brown Moist (TILL)		3	SS	63		240							
			4	SS	89/ 275		239							
			5	SS	50/ .150		238							
			6	SS	50/ .100		237							
			7	SS	100/ 275		236							
							235							
234.0														
8.4	SAND, some silt Very Dense Brown Moist		8	SS	50/ .125		234							
							233							

Continued Next Page

+ 3 . X 3 : Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No HML-4

2 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Major Mackenzie Drive to N of Teston Road N 4 857 933.44 E 300 530.14 ORIGINATED BY SLL
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2007.11.22 - 2007.11.22 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
	Continued From Previous Page																
231.4	SAND, some silt Very Dense Brown Moist		9	SS	50/												
10.9	END OF BOREHOLE AT 10.95m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.6m THEN AUGER CUTTINGS TO SURFACE. Piezometer installation consists of 30mm diameter schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2008.01.31 10.2 232.2				.125												

RECORD OF BOREHOLE No HML-5

1 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Major Mackenzie Drive to N of Teston Road N 4 858 125.72 E 300 557.38 ORIGINATED BY SLL
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2007.11.22 - 2007.11.22 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE								WATER CONTENT (%)
240.9	Silty CLAY, some sand, trace gravel Hard Brown Moist (TILL)		1	SS	50/ .150											
			2	SS	87/ 250											
238.7			3	SS	89/ 275											
2.1	SAND, trace to some silt Very Dense Brown Moist		4	SS	97/ 275											
			5	SS	89/ 275											
			6	SS	86/ 275											
			7	SS	83/ 275											
			8	SS	50/ .125											

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No HML-5

2 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Major Mackenzie Drive to N of Teston Road N 4 858 125.72 E 300 557.38 ORIGINATED BY SLL
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
DATUM Geodetic DATE 2007.11.22 - 2007.11.22 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE								
	Continued From Previous Page															
229.9	SAND, trace to some silt Very Dense Brown Moist		9	SS	50/		230									
11.0	END OF BOREHOLE AT 10.97m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.				.150											

RECORD OF BOREHOLE No HML-7

1 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Major Mackenzie Drive to N of Teston Road N 4 858 417.30 E 300 624.78 ORIGINATED BY SLL
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2007.11.23 - 2007.11.23 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
								○ UNCONFINED		+ FIELD VANE				
								● QUICK TRIAXIAL		x LAB VANE				
245.5						20 40 60 80 100				PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L		
0.0	TOPSOIL: (150mm)					20 40 60 80 100				WATER CONTENT (%)				
0.2	Silty CLAY, some sand, trace rootlets Very Stiff to Stiff Brown Moist		1	SS	18									
			2	SS	11									0 28 45 27
243.3														
2.2	Silty CLAY, some sand, trace gravel Very Stiff to Hard Brown Moist (TILL)		3	SS	27									
			4	SS	41									1 22 57 20
			5	SS	84/ 275									
			6	SS	82									
	Grey		7	SS	54									0 19 50 31
			8	SS	40									

Continued Next Page

+³, ×³: Numbers refer to Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No HML-7

2 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Major Mackenzie Drive to N of Teston Road N 4 858 417.30 E 300 624.78 ORIGINATED BY SLL
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2007.11.23 - 2007.11.23 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
234.2	Continued From Previous Page Silty CLAY , some sand, trace gravel Very Hard Grey Moist (TILL)		9	SS	40		235										1 26 51 22
11.3	END OF BOREHOLE AT 11.28m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE. Piezometer installation consists of 30mm diameter schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2008.01.31 FOUND DESTROYED																

ONTMT4S 9268.GPJ 3/29/10

RECORD OF BOREHOLE No HML-8

1 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Major Mackenzie Drive to N of Teston Road N 4 858 798.88 E 300 450.26 ORIGINATED BY SLL
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2007.11.19 - 2007.11.19 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					
								20 40 60 80 100					
								20 40 60 80 100					
240.4													
0.0	ASPHALT: (175mm)												
0.2	SAND, trace gravel Compact Brown Moist (FILL)		1	AS			240						
239.1			1	SS	25								
1.3	Silty CLAY, some sand, topsoil stained Stiff Dark Brown Moist		2	SS	12		239						
238.0													
2.4	Silty CLAY, some sand, trace gravel Very Stiff Brown Moist (TILL)		3	SS	23		238						
			4	SS	21		237						
	Grey		5	SS	29		236						
							235						
	becoming Hard		6	SS	41		234						
							233						
			7	SS	82		232						
			8	SS	40		231						

Continued Next Page

+ ³ . X ³ : Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No HML-8

2 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Major Mackenzie Drive to N of Teston Road N 4 858 798.88 E 300 450.26 ORIGINATED BY SLL
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2007.11.19 - 2007.11.19 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE								
	Continued From Previous Page							20	40	60	80	100				
229.1	Silty CLAY, some sand, trace gravel Hard Grey Moist (TILL)		9	SS	48		230									
11.3	END OF BOREHOLE AT 11.28m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 150mm THEN ASPHALT TO SURFACE.															

RECORD OF BOREHOLE No HML-9

1 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Major Mackenzie Drive to N of Teston Road N 4 859 107.83 E 300 393.68 ORIGINATED BY SLL
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2007.11.19 - 2007.11.19 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				
								20 40 60 80 100	PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W		
246.3												
0.0	ASPHALT: (165mm)											
0.2	SAND, trace silt Compact Brown Moist (FILL)		1	AS								
245.1			1	SS	11							
1.3	Silty CLAY, some sand, topsoil stained, trace sand seams, trace rootlets Stiff to Firm Dark Brown Moist		2	SS	9							
243.4			3	SS	6							0 22 53 24
3.0	Silty CLAY, some sand, trace gravel Very Stiff to Hard Brown Moist (TILL)		4	SS	27							
			5	SS	41							0 17 52 30
	thin sand seams		6	SS	35							
239.1												
7.2	SILT, some sand, trace clay Compact Grey Wet											
238.4			7	SS	20							
7.9	Silty CLAY, stratified Very Stiff Grey Moist											
237.9												
8.5	Silty CLAY, some sand, trace gravel Hard Grey Moist (TILL)											
236.8			8	SS	92/ 275							
9.5	Sandy SILT, trace clay Very Dense Brown											

ONTMT-4S 9268.GPJ 3/29/10

Continued Next Page

+ ³ . X ³ : Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No HML-9

2 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Major Mackenzie Drive to N of Teston Road N 4 859 107.83 E 300 393.68 ORIGINATED BY SLL
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
DATUM Geodetic DATE 2007.11.19 - 2007.11.19 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																						
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
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	Sandy SILT, trace clay Very Dense Brown Moist						236																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													</

ONTMT14S 9268.GPJ 3/29/10

Appendix B

Geotechnical Laboratory Test Results

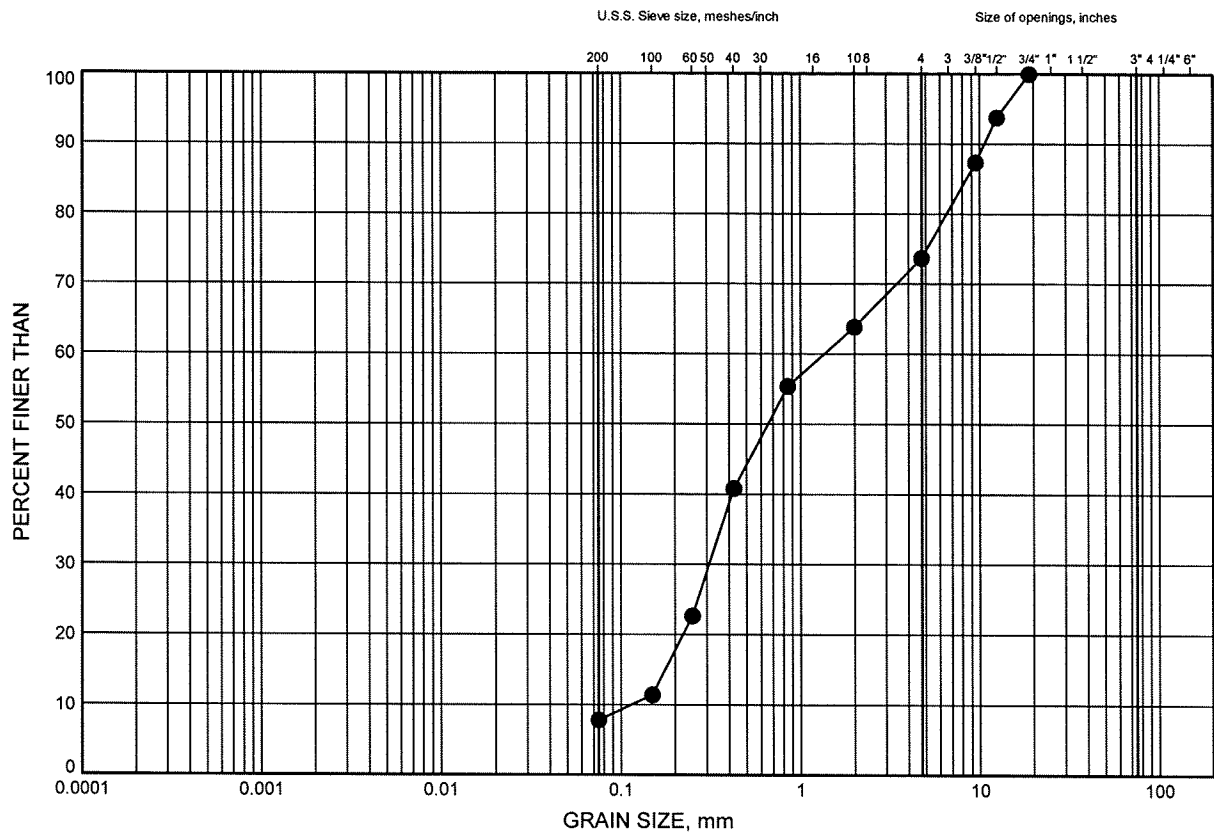
19-92-68



Widening of Hwy 400, Major Mackenzie to King Road
GRAIN SIZE DISTRIBUTION

FIGURE B1

GRAVELLY SAND FILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	HML-1	0.99	232.88

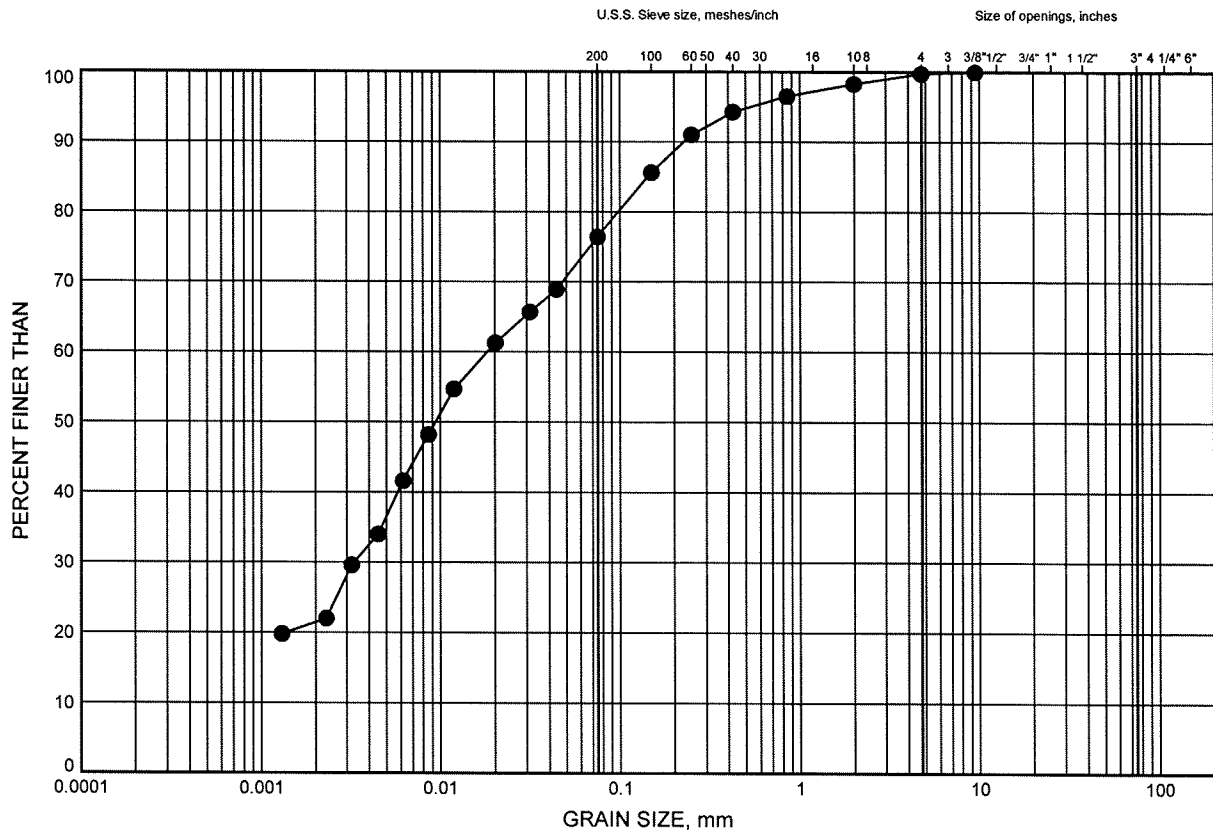


W.P.# 2539-04-00
 Prepared By MFA
 Checked By SKP

Widening of Hwy 400, Major Mackenzie to King Road
GRAIN SIZE DISTRIBUTION

FIGURE B2

SILTY CLAY FILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	HML-1	1.78	232.09

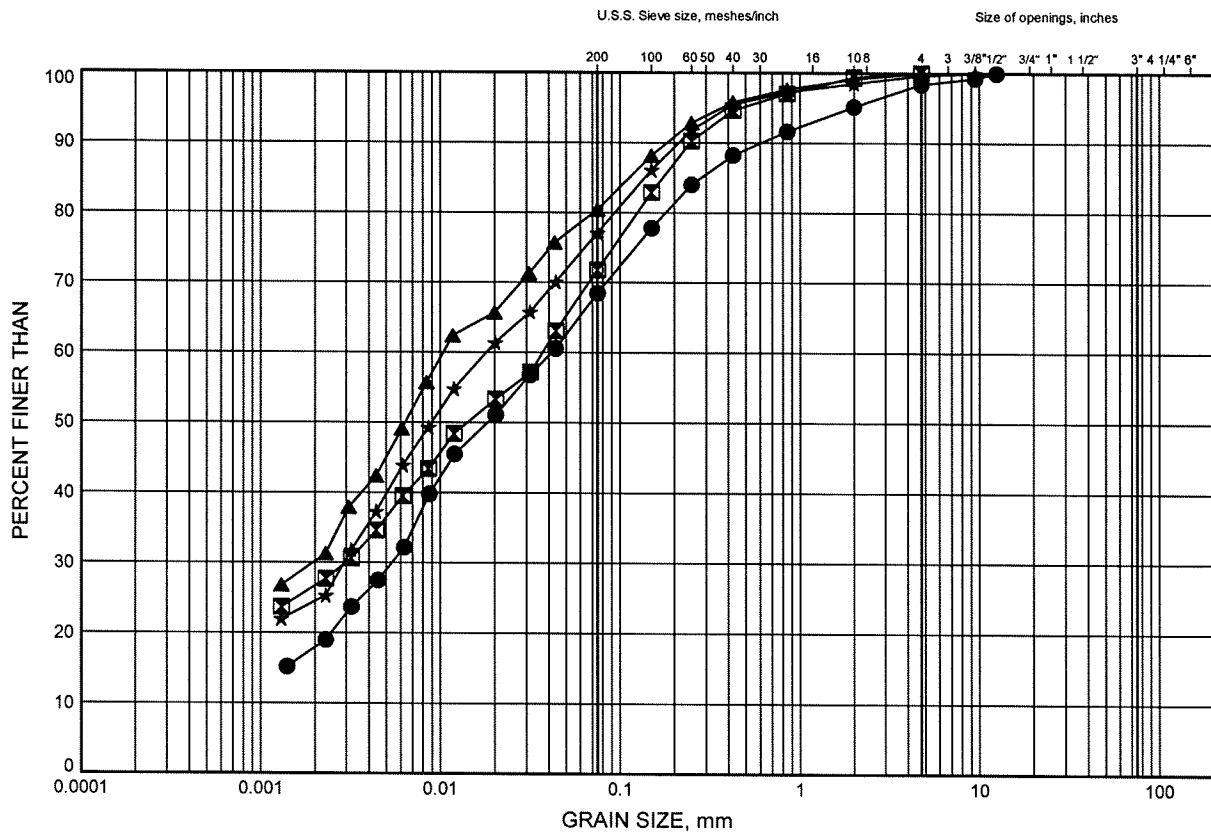


W.P.# 2539-04-00.....
 Prepared By MFA.....
 Checked By SKP.....

Widening of Hwy 400, Major Mackenzie to King Road
GRAIN SIZE DISTRIBUTION

FIGURE B3

SILTY CLAY



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

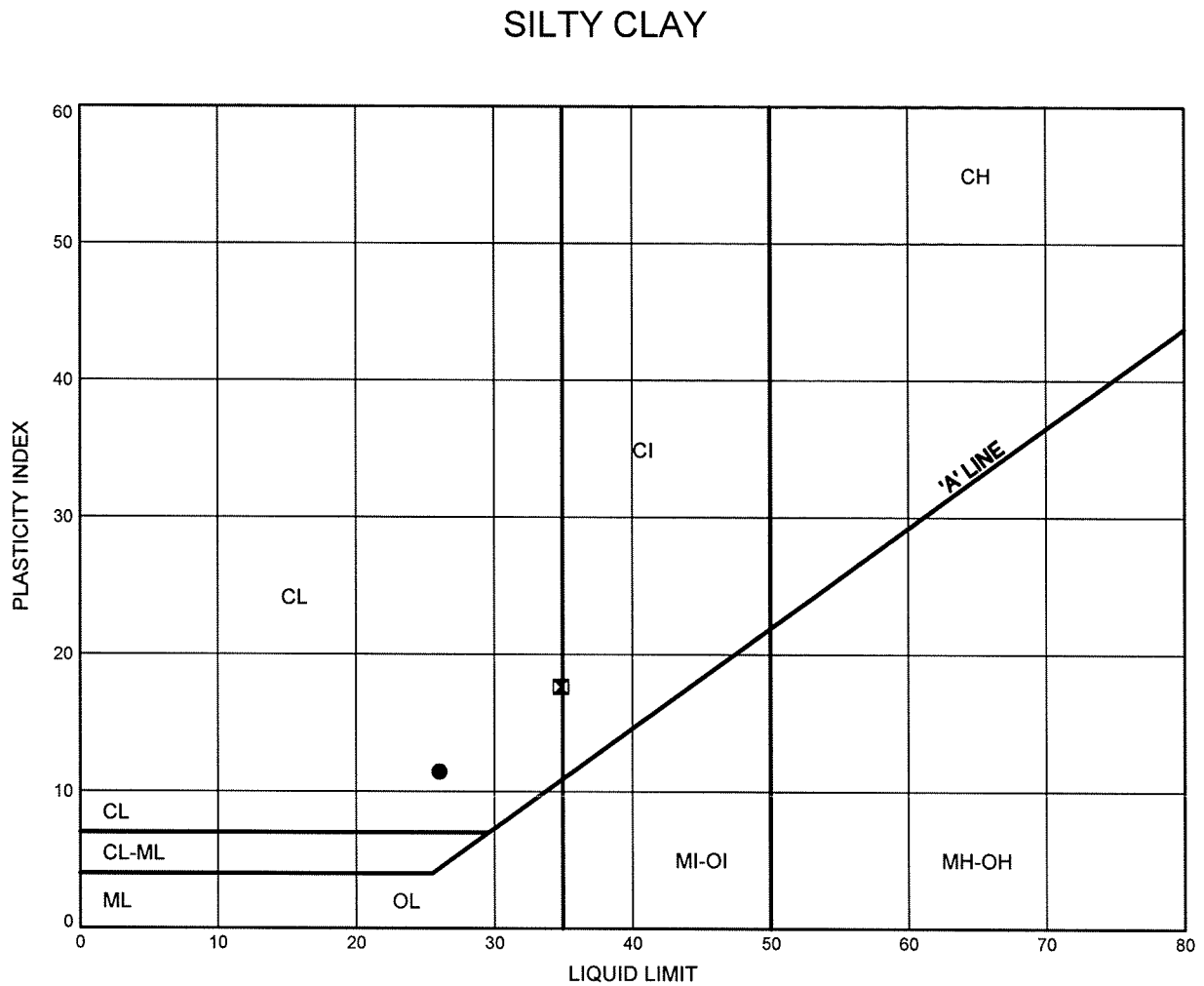
SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	HML-4	1.07	241.32
⊠	HML-7	1.83	243.68
▲	HML-8	1.83	238.58
★	HML-9	2.59	243.74



W.P.# .2539-04-00.....
 Prepared By MFA.....
 Checked By SKP.....

Widening of Hwy 400, Major Mackenzie to King Road
ATTERBERG LIMITS TEST RESULTS

FIGURE B4



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	HML-4	1.07	241.32
☒	HML-8	1.83	238.58

Date March 2010
 Project 2539-04-00

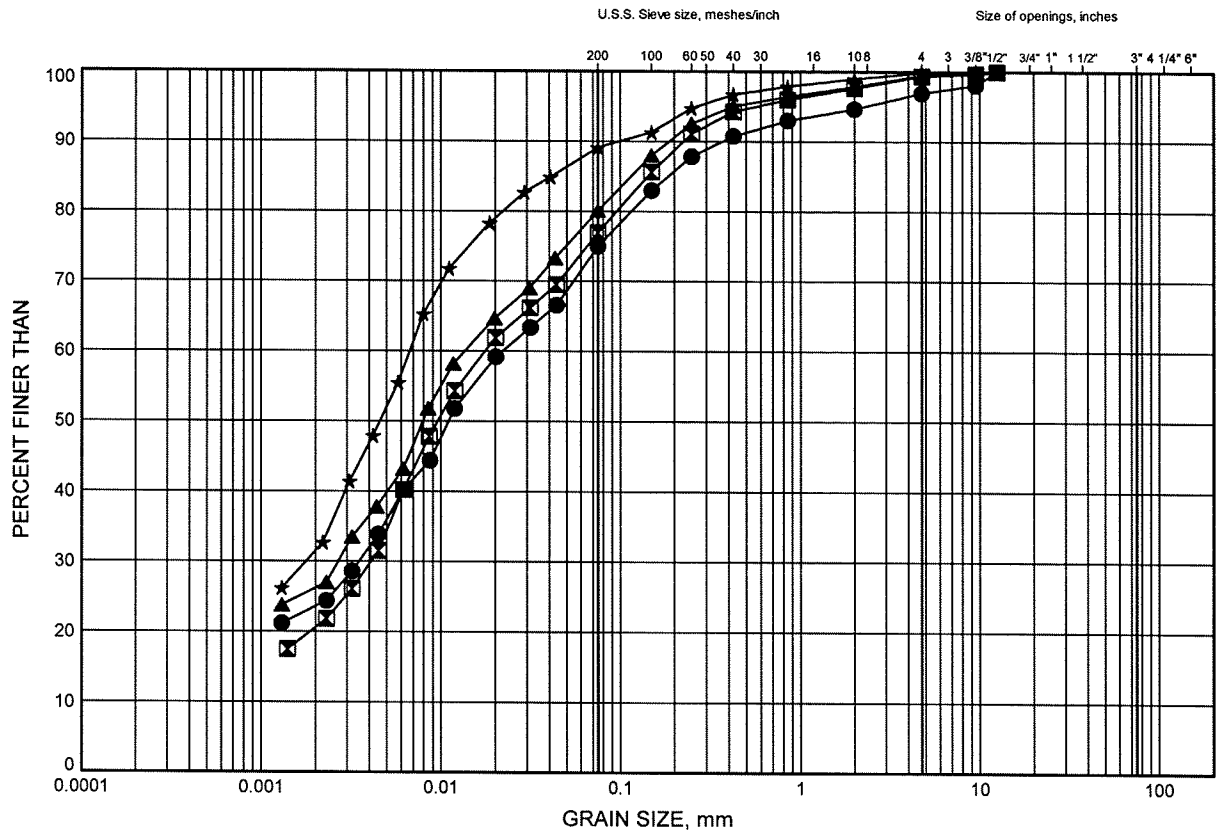


Prep'd MFA
 Chkd. SKP

Widening of Hwy 400, Major Mackenzie to King Road
GRAIN SIZE DISTRIBUTION

FIGURE B5

SILTY CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	HML-1	3.35	230.52
■	HML-1	4.72	229.15
▲	HML-3	3.28	236.79
★	HML-3	7.91	232.16

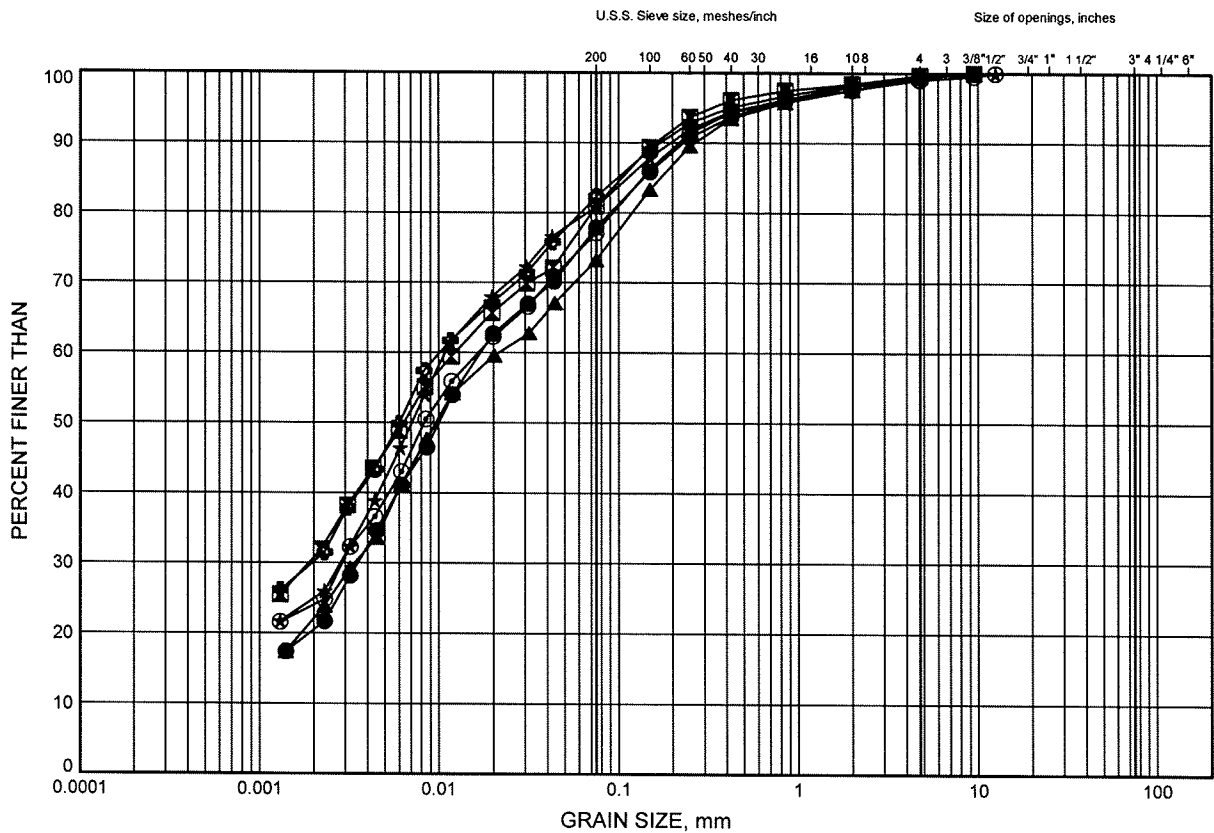


W.P.# 2539-04-00
 Prepared By MFA
 Checked By SKP

Widening of Hwy 400, Major Mackenzie to King Road
GRAIN SIZE DISTRIBUTION

FIGURE B6

SILTY CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	HML-7	3.35	242.16
⊠	HML-7	7.92	237.59
▲	HML-7	10.97	234.54
★	HML-8	3.35	237.06
⊙	HML-8	6.40	234.01
⊕	HML-9	4.88	241.45

GRAIN SIZE DISTRIBUTION - THURBER 9268 GPJ 3/30/10

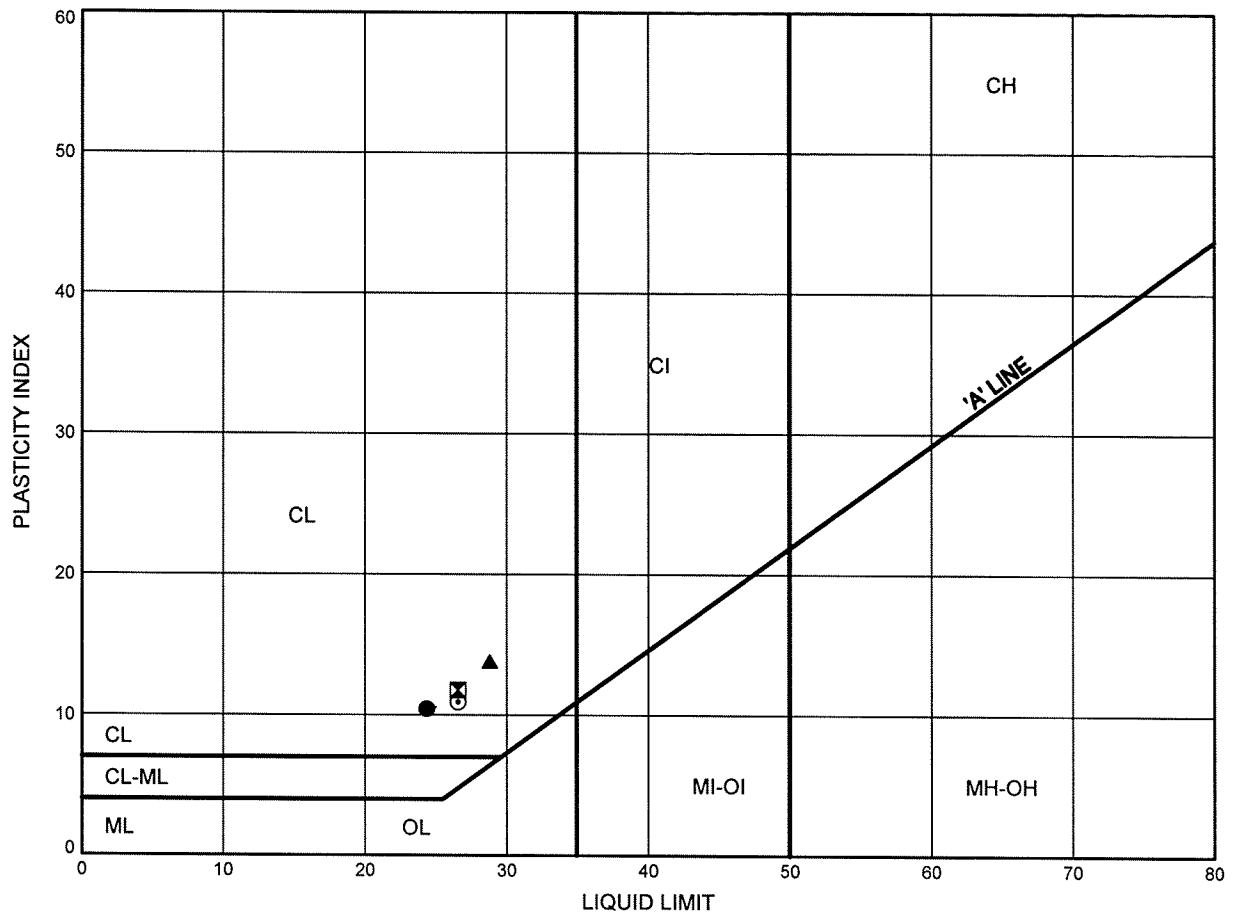
W.P.# 2539-04-00.....
Prepared By MFA.....
Checked By SKP.....



Widening of Hwy 400, Major Mackenzie to King Road
ATTERBERG LIMITS TEST RESULTS

FIGURE B7

SILTY CLAY TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	HML-1	3.35	230.52
⊠	HML-3	3.28	236.79
▲	HML-3	7.91	232.16
★	HML-7	3.35	242.16
⊙	HML-8	3.35	237.06

Date March 2010

Project 2539-04-00



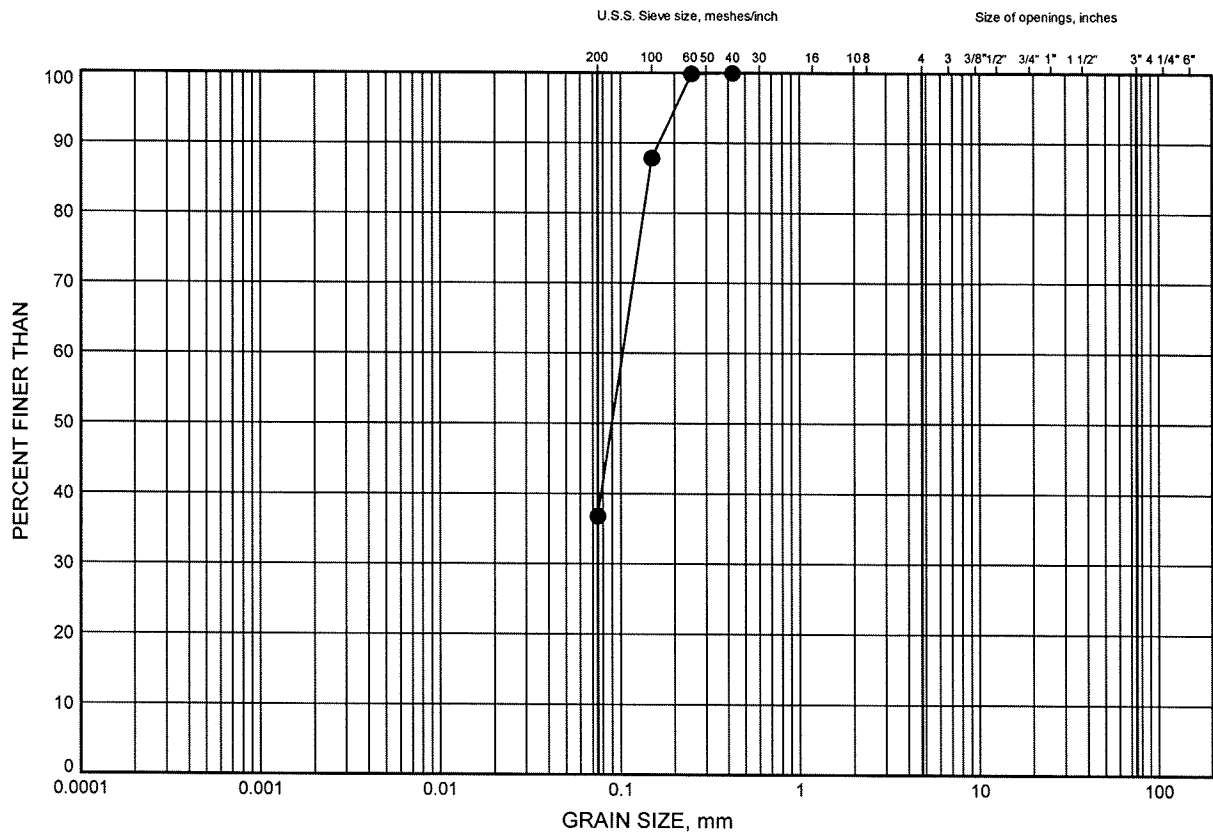
Prep'd MFA

Chkd. SKP

Widening of Hwy 400, Major Mackenzie to King Road
GRAIN SIZE DISTRIBUTION

FIGURE B8

SILTY SAND



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

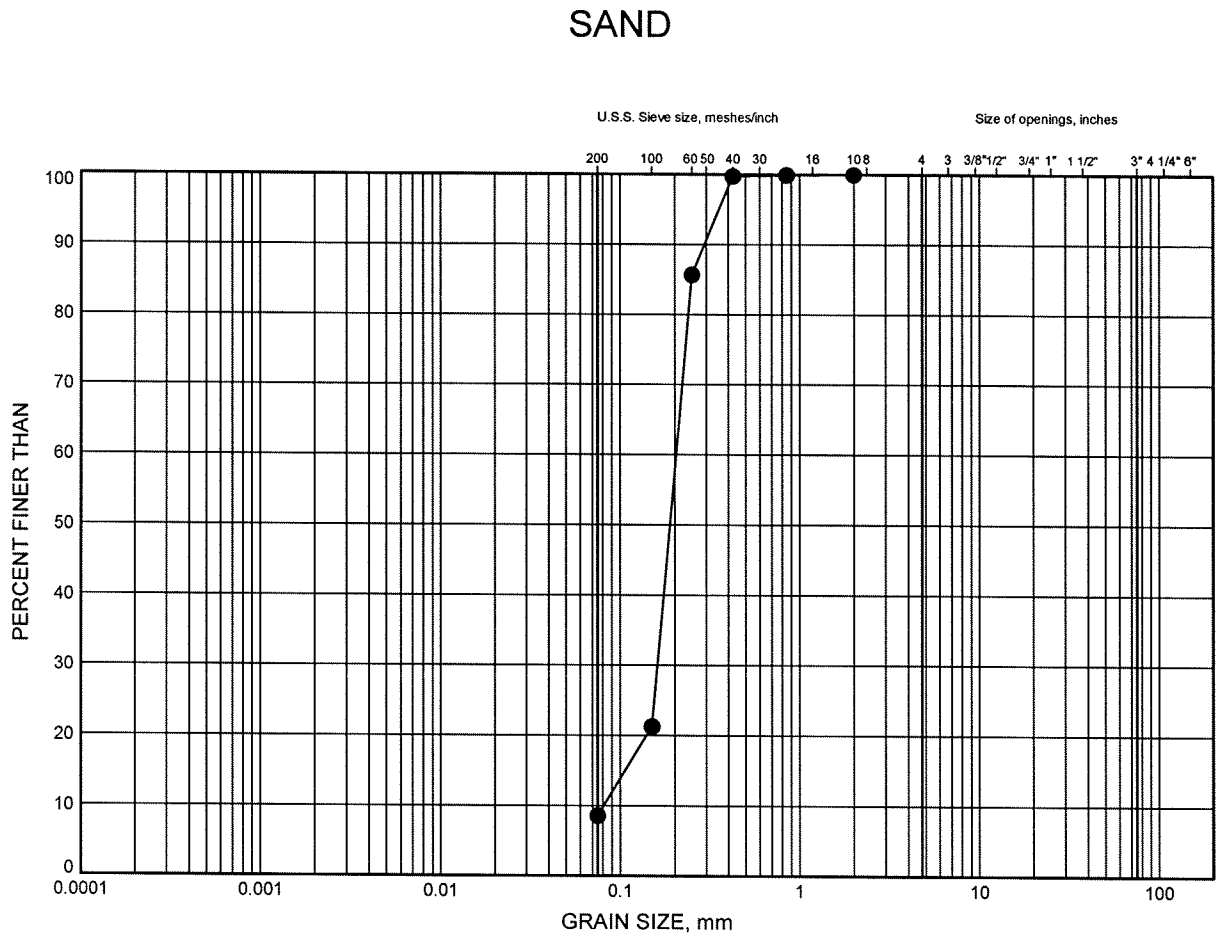
SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	HML-1	9.36	224.51



W.P.# 2539-04-00.....
Prepared By MFA.....
Checked By SKP.....

Widening of Hwy 400, Major Mackenzie to King Road
GRAIN SIZE DISTRIBUTION

FIGURE B9



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	HML-5	4.79	236.07

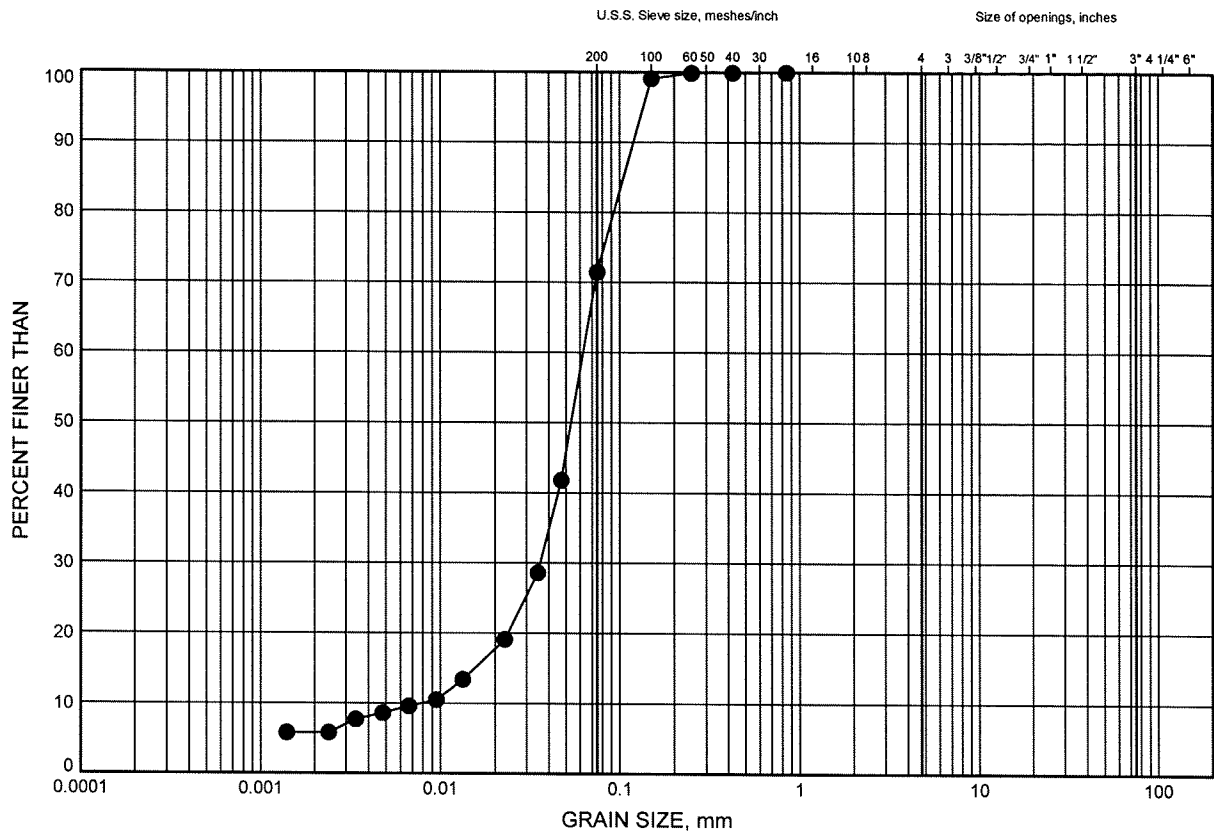


W.P.# 2539-04-00.....
 Prepared By MFA.....
 Checked By SKP.....

Widening of Hwy 400, Major Mackenzie to King Road
GRAIN SIZE DISTRIBUTION

FIGURE B10

SANDY SILT



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	HML-9	10.97	235.36



W.P.# 2539-04-00
Prepared By MFA
Checked By SKP

Appendix C

Record of Boreholes (Previous Investigations)



RECORD OF BOREHOLE No 06-01E

1 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 858 436.64 E 300 547.79 ORIGINATED BY SLL
 HWY 400 BOREHOLE TYPE Solid Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2006-12-13 - 2006-12-13 CHECKED BY TJH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)		
								20 40 60 80 100							
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE							
238.0															
237.3	TOPSOIL: (25 mm) SAND, trace silt, trace gravel Compact Brown Moist (FILL)		1	SS	17										
0.7	Silty CLAY, some sand, trace gravel Stiff Brown to Grey Moist (TILL)(CL)		2	SS	12										
	becoming Hard		3	SS	54								1 18 50 31		
			4	SS	36										
			5	SS	38										
	some sand seams		6	SS	51										
	Grey		7	SS	46										
			8	SS	46								1 27 49 23		
			9	SS	37										

Continued Next Page

+ 3, × 3: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 06-01E

2 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 858 436.64 E 300 547.79 ORIGINATED BY SLL
 HWY 400 BOREHOLE TYPE Solid Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2006-12-13 - 2006-12-13 CHECKED BY TJH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
	Continued From Previous Page							SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
227.8	Silty CLAY, some sand, trace gravel Hard							20	40	60	80	100		
10.3	SAND, with silt Very Dense Grey Wet													
227.1			10	SS	50/									
11.0	END OF BOREHOLE AT 11.0 m. BOREHOLE OPEN TO 10.31 m AND DRY UPON COMPLETION. BOREHOLE GROUTED WITH BENTONITE TO SURFACE.				150									

+ 3 . × 3 : Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 06-02E

1 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 858 509.65 E 300 536.45 ORIGINATED BY SLL
 HWY 400 BOREHOLE TYPE Solid Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2006-12-12 - 2006-12-13 CHECKED BY TJH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)		
								20 40 60 80 100							
								20 40 60 80 100							
						UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT						
236.9							237								
0.0	Silty SAND, trace gravel Loose Brown Moist (FILL)		1	SS	8										
236.3															
0.7	Silty CLAY, with sand Stiff Brown Moist (FILL)		2	SS	11		236								0 23 52 25
			3	SS	13		235								
234.7															
2.2	Silty CLAY, some sand, trace gravel Stiff Brown Moist (FILL)		4	SS	12		234								
			5	SS	13		233								
232.7															
4.2	Clayey SILT, with sand, trace rootlets and wood fragments, stained topsoil Stiff Grey Moist		6	SS	9		232								0 23 61 16
231.1															
5.8	SAND, some silt, some gravel Compact Brown Wet (saturated)		7	SS	18		231								
			8	SS	30		230								
228.3							229								
8.7	SILT, with sand, trace gravel Very Dense Grey Moist (TILL)		9	SS	70		228								
							227								

Continued Next Page

+ 3, × 3: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 06-02E

2 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 858 509.65 E 300 536.45 ORIGINATED BY SLL
HWY 400 BOREHOLE TYPE Solid Stem Auger COMPILED BY MFA
DATUM Geodetic DATE 2006-12-12 - 2006-12-13 CHECKED BY TJH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT Y kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa 20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					W P	W	W L		
	Continued From Previous Page																
226.6	SILT, with sand, trace gravel Very Dense (TILL)																
10.4	Sandy SILT, trace clay Very Dense Grey Moist		10	SS	75											0 22 69 9	
225.7																	
11.3	END OF BOREHOLE AT 11.28 m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) 20.02.07 8.9 228.0 27.03.07 8.8 228.1																

ONTM/T4S 9288.GPJ 12/04/07

METRIC

Continued Next Page

(%) STRAIN AT FAILURE

ONTMT4S 9268.GPJ 12/04/07

RECORD OF BOREHOLE No 06-03E

2 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 858 555.19 E 300 528.76 ORIGINATED BY SLL
 HWY 400 BOREHOLE TYPE Solid Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2006-12-13 - 2006-12-13 CHECKED BY TJH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
								20	40	60	80	100					
	Continued From Previous Page																
225.4	Silty SAND, trace clay Dense Grey Wet		10	SS	37		226										
11.3	END OF BOREHOLE AT 11.28 m. BOREHOLE OPEN TO 6.18 m UPON COMPLETION. BOREHOLE GROUTED WITH BENTONITE TO SURFACE. WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) 13.12.06 3.1 233.6																

RECORD OF BOREHOLE No 06-30E

1 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 858 670.49 E 300 523.55 ORIGINATED BY SLL
 HWY 400 BOREHOLE TYPE Solid Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2006-12-12 - 2006-12-12 CHECKED BY TJH

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		20	40	60	80	100		
233.0							SHEAR STRENGTH kPa						
							○ UNCONFINED + FIELD VANE						
							● QUICK TRIAXIAL × LAB VANE						
							WATER CONTENT (%)						
							20	40	60	80	100		
0.0	TOPSOIL: (125 mm)					233							
0.1	Silty CLAY, some sand, trace gravel, trace rootlets, topsoil stained Firm Brown (FILL)		1	SS	5								
			2	SS	8	232							
			3	SS	7	231							
	trace wood and leaf fragments		4	SS	5	230							
	Very Soft		5	SS	0	229							
229.0						229							
4.0	Silty CLAY, trace sand Very Stiff Brown to Grey		6	SS	22	228							
227.3						227							
5.7	Sandy SILT, trace clay, trace gravel, occasional inferred cobbles Compact Grey Moist to Wet (TILL)		7	SS	64/ 275	226							
			8	SS	29	225							
			9	SS	11	224							

Continued Next Page

+ 3 . x 3 : Numbers refer to 20
Sensitivity 15 5
10 (%) STRAIN AT FAILURE

METRIC

[illegible]

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 06-31E

1 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 858 705.10 E 300 508.88 ORIGINATED BY SLL
 HWY 400 BOREHOLE TYPE Solid Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2006-12-12 - 2006-12-12 CHECKED BY TJH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT Y kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	N° VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
238.2								20	40	60	80	100						
0.0	TOPSOIL: (100 mm)																	
0.1	Silty CLAY, trace gravel and sand seams, trace rootlets, topsoil stained Firm Brown Moist		1	SS	6	238												
			2	SS	6	237												
236.8																		
1.4	Silty CLAY, some sand, trace gravel Very Stiff to Hard Brown Moist (TILL)(CL)		3	SS	20	236										1 19 56 24		
			4	SS	21	235												
			5	SS	27	234												
			6	SS	33	233										2 14 52 32		
			7	SS	30	232												
			8	SS	24	231												
			9	SS	27	230												
	becoming Grey						229									1 20 54 25		

Continued Next Page

+ 3 . x 3 : Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 06-31E

2 OF 2

METRIC

G.W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 858 705.10 E 300 508.88 ORIGINATED BY SLL
 HWY 400 BOREHOLE TYPE Solid Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2006-12-12 - 2006-12-12 CHECKED BY TJH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100	W _P	W	W _L		
	Continued From Previous Page																
227.4	Silty CLAY, some sand, trace gravel Very Stiff to Hard Brown Moist (TILL)(CL)						228										
10.8	SAND, with silt Compact Grey		10	SS	29												
226.9	Wet																
11.3	END OF BOREHOLE AT 11.28 m. BOREHOLE OPEN UPON COMPLETION. BOREHOLE GROUTED WITH BENTONITE AND BACKFILLED WITH AUGER CUTTINGS TO SURFACE.						227										
	WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) 12.12.06 6.7 231.5																

ONTMT4S 9268.GPJ 120407

RECORD OF BOREHOLE No 06-04W

1 OF 1

METRIC

G.W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 859 096.28 E 300 383.52 ORIGINATED BY BJ
 HWY 400 BOREHOLE TYPE Solid Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2006-12-15 - 2006-12-15 CHECKED BY TJH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT Y kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
246.1														
0.0	Clayey TOPSOIL: (150 mm)						246							
0.2	Silty CLAY, some sand, trace gravel Firm to Stiff Brown (TILL)(CL)		1	SS	6									
			2	SS	9		245							0 18 53 29
	Hard		3	SS	46									
243.8							244							
2.3	Sandy SILT, some clay, trace gravel, some iron oxide staining Very Dense (TILL)		4	SS	40/ .125									
			5	SS	63		243							
241.7							242							
4.3	SILT, some sand, some clay (TILL)		6	SS	62		241							0 14 75 11
240.0							240							
6.1	Silty CLAY, trace sand, trace gravel Hard (TILL)		7	SS	38									
			8	SS	30		239							
237.8							238							
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE GROUTED WITH BENTONITE TO SURFACE.													

ONTMT4S 9258.GPJ 14/05/07

METRIC

COIL PDS05K-7				PUSHING SCREW	
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+ 3, x 3; Numbers refer to Sensitivity

RECORD OF BOREHOLE No 04-1

1 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road ORIGINATED BY GA
 HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WMSS
 DATUM Geodetic DATE 2004.02.23 - 2004.02.23 CHECKED BY SMS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				
								20 40 60 80 100	20 40 60	20 40 60		
245.0												
244.9												
0.1	TOPSOIL: (75 mm)											
244.3	Silty CLAY, some sand, trace gravel, occasional rootlets Stiff Brown		1	SS	10							
0.7	(REWORKED TILL)											
	Silty CLAY, sandy, trace gravel, occasional iron oxide staining Stiff to Hard Brown (TILL)(CL)		2	SS	11							
			3	SS	31							
			4	SS	38							
			5	SS	67							
240.9												
4.1	Sandy SILT, some clay, trace gravel, occasional iron oxide staining Hard Grey (TILL)(ML)		6	SS	83							
			7	SS	59							
			8	SS	65							
			9	SS	77							

Continued Next Page

+³ x³: Numbers refer to
Sensitivity 20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 04-1

2 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road ORIGINATED BY GA
 HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM/SS
 DATUM Geodetic DATE 2004.02.23 - 2004.02.23 CHECKED BY SMS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		SHEAR STRENGTH kPa			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L		
245.0														
234.8														
10.2	Sandy SILT Very Dense Grey Wet (ML-NONPLASTIC)		10	SS	104									0 18 71 11
233.0														
12.0	Silty CLAY, sandy, trace gravel Hard Grey (TILL)(CL)		11	SS	45									
			12	SS	60									2 26 45 27
230.1														
14.9	SAND, fine grained, trace silt, occasional iron oxide staining Very Dense Brown Moist (SP)		13	SS	102									
228.7														
16.3	SILT, trace to some sand Very Dense Grey Wet (ML-NONPLASTIC)		14	SS	110/ 279									
227.2														
17.8	SAND, fine grained, occasional iron oxide staining Very Dense Grey (SP)		15	SS	108									
226.3														
18.8	END OF BOREHOLE AT 18.75 m. BOREHOLE OPEN TO 18.75 m. Piezometer installation consists of 19 mm diameter Schedule 40 PVC pipe with a 1.52 m slotted screen. WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) 2004.02.03 16.84 228.16													

ONTMT4S 5166.GPJ 2/14/08

+ ³, x ³: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 04-2

1 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road ORIGINATED BY JL
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM/SS
 DATUM Geodetic DATE 2004.02.19 - 2004.02.19 CHECKED BY SMS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
239.0							239							
238.8	ASPHALT: (250 mm)													
0.2	SAND, fine grained Brown Moist (FILL)													
238.0			1	SS	30		238							
1.0	Silty CLAY, some sand to sandy, trace gravel, occasional iron oxide staining Hard Brown (TILL)(CL-ML)		2	SS	61									
			3	SS	64		237							
			4	SS	62		236							
			5	SS	64		235							
	(CL)		6	SS	52/		234							1 27 50 22
			7	SS	55/		233							
			8	SS	70		232							
231.9	Sandy SILT, trace clay, trace gravel, occasional iron oxide staining Brown (TILL)(ML-NONPLASTIC)						231							
7.1							230							0 30 60 10
230.5	SAND, fine grained, trace to some silt, occasional silt layers Very Dense Brown Moist (SM)													
8.5														

Continued Next Page

+ 3 . X 3 : Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

ONTMT4S 5166.GPJ 3/18/08

RECORD OF BOREHOLE No 04-2

2 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road ORIGINATED BY JL
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM/SS
 DATUM Geodetic DATE 2004.02.19 - 2004.02.19 CHECKED BY SMS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40					
239.0														
227.9			9	SS	52									
11.1	END OF BOREHOLE AT 11.13 m. BOREHOLE DRY AND OPEN TO 10.7m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE AND DRILL CUTTINGS TO 1.0m, CONCRETE BETWEEN 0.3m AND 1.0m, AND EMULSIFIED ASPHALT FROM 0 TO 0.3m.													

+³. X³. Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 04-3

1 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road ORIGINATED BY JL
 HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM/SS
 DATUM Geodetic DATE 2004.02.24 - 2004.02.24 CHECKED BY SMS

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		20	40	60	80	100	
244.2												
0.1	TOPSOIL (50 mm)		1	SS	7	244						
	Silty CLAY, some sand, trace gravel, occasional rootlets Firm to Stiff Brown (REWORKED TILL)		2	SS	8	243						
242.8												
1.4	Silty CLAY, sandy, trace gravel, occasional iron oxide staining Very Stiff to Hard Brown (TILL) (CL)		3	SS	25	242						
			4	SS	47	241						
			5	SS	63	240						
240.1												
4.1	Sandy SILT, some clay, trace gravel Hard Grey (TILL)(ML)		6	SS	69	239						
			7	SS	59	238						
			8	SS	50	237						
			9	SS	50	236						
						235						

Continued Next Page

+³ × 3³ Numbers refer to
Sensitivity

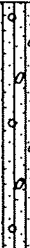

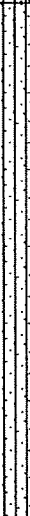




20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 04-3

2 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road ORIGINATED BY JL
 HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM/SS
 DATUM Geodetic DATE 2004.02.24 - 2004.02.24 CHECKED BY SMS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)		
								20	40	60			80	100	PLASTIC LIMIT w _p
244.2															
	Occasional iron oxide staining		10	SS	103		234								
232.5							233								
11.7	Sandy SILT, occasional iron oxide staining Very Dense Brown (ML-NONPLASTIC)		11	SS	103		232								
							231								
			12	SS	108		230								
229.0							229								
15.2	SAND, fine grained, occasional iron oxide staining Very Dense Brown (SP)		13	SS	109/ 279										
228.5															
15.7	END OF BOREHOLE AT 15.67 m. Piezometer installation consists of 19 mm diameter Schedule 40 PVC pipe with a 1.52 m slotted screen. WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) 2004.02.03 15.7 228.5														

+³ ×³: Numbers refer to Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 04-18

1 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road ORIGINATED BY JL
 HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM/SS
 DATUM Geodetic DATE 2004.02.19 - 2004.02.19 CHECKED BY SMS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)
								20 40 60 80 100					
								20 40 60 80 100					
239.8													
0.0 239.2	ASPHALT: (227 mm)												
0.3 238.4	Gravelly SAND, trace silt Brown Moist (FILL)		1	GS			239						
			1	SS	31								
1.1 238.4	Silty CLAY, some sand to sandy, trace gravel Hard Brown (TILL)(CL-ML)						238						
			2	SS	45								
			3	SS	37		237						
236.6													
2.9	Silty CLAY, some sand, trace gravel Hard Grey (TILL)(CL)		4	SS	30		236						
							235						
			5	SS	31								
							234						
			6	SS	110		233						
232.4													
7.1	Sandy SILT, fine grained Very Dense Damp (ML-NONPLASTIC)		7	SS	93/ .275		232						
231.0													
8.5	SAND, fine grained, trace to some silt, occasional silt layers Very Dense Brown Moist (SM)		8	SS	91/ .275		231						
							230						

Continued Next Page

+³, x³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

METRIC[illegible]

ONTMT4S 5166.GPJ 2/14/08

RECORD OF BOREHOLE No 04-19

1 OF 1

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road ORIGINATED BY JL
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM/SS
 DATUM Geodetic DATE 2004.03.03 - 2004.03.03 CHECKED BY SMS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
								20	40	60				
							20	40	60	80	100			
								20	40	60	80	100		
243.8														
245.8	TOPSOIL: (100 mm)													
0.1	Silty CLAY, trace to some sand, trace rootlets		1	SS	4		245							
244.7	Firm													
0.7	Brown (CL)													
	Silty CLAY, some sand to sandy, trace gravel		2	SS	15									
	Very Stiff to Hard													
	Brown (TILL)(CL)		3	SS	20		244							
			4	SS	41		243							
			5	SS	50/ .150		242							
241.3														
4.1	Sandy SILT, some clay, trace gravel						241							
	Hard													
	Grey (TILL)(ML)		6	SS	71									
240.4														
5.0	END OF BOREHOLE AT 5.03 m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENSEAL MIXED WITH CUTTINGS													

+³ × 3: Numbers refer to Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 04-20

1 OF 1

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road ORIGINATED BY JL
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY WM/SS
 DATUM Geodetic DATE 2004.03.02 - 2004.03.02 CHECKED BY SMS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)		
								20 40 60 80 100		PLASTIC LIMIT W _P NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L					
							○ UNCONFINED + FIELD VANE								
							● QUICK TRIAXIAL X LAB VANE								
244.8															
243.8															
0.1	TOPSOIL: (100 mm)		1	SS	9										
	Silty CLAY, trace to some sand, trace gravel, occasional oxide lenses, occasional rootlets														
242.8	Stiff Brown (CL) (REWORKED)		2	SS	22										
0.7	Silty CLAY, some sand, trace gravel, occasional iron oxide staining														
	Very Stiff to Hard Brown (TILL)(CL-ML)		3	SS	24										
			4	SS	46										
			5	SS	83										
239.4															
4.1	Sandy SILT, some clay, trace gravel														
	Hard Grey (TILL)(ML)		6	SS	78										
238.5												1 16 48 35			
5.0	END OF BOREHOLE AT 5.03 m. BOREHOLE OPEN AND DRY TO 4.57 m. BOREHOLE BACKFILLED WITH BENSEAL MIXED WITH AUGER CUTTINGS.														

+³, x³: Numbers refer to Sensitivity 20 15 10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No HM-1

1 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road, N 4 857 977, E 300 585 ORIGINATED BY TK
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY SL/SS
 DATUM Geodetic DATE 2004.07.19 - 2004.07.19 CHECKED BY SMS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)		
								UNCONFINED		FIELD VANE					w _p w w _L		
								● QUICK TRIAXIAL	×	LAB VANE							
242.9							20	40	60	80	100	20	40	60			
242.8	TOPSOIL: (125mm)																
0.1	Clayey SILT, some sand, occasional organics, occasional silt pockets Stiff (CL-ML)		1	SS	12												
241.4																	
1.5	Clayey, Sandy SILT, trace gravel, occasional cobbles Very Stiff Brown to Grey (TILL)(CL-ML)		2	SS	29												
	Hard		3	SS	50/ .152												
			4	SS	50/ .127												
			5	SS	50/ .127												
235.7																	
7.2	Sandy SILT, trace clay Very Dense Brown (TILL)(ML)		6	SS	50/ .127												
233.8																	
9.1	SAND, trace silt, fine grained Very Dense		7	SS	50/ .152												
233.5	Brown (SP)																
9.5	END OF BOREHOLE AT 9.5 m.																

ONTMT4S 5166A.GPJ 3/20/08

Continued Next Page

+³ ×³: Numbers refer to
Sensitivity

20
15
10
5
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No HM-1

2 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road, N 4 857 977, E 300 585 ORIGINATED BY TK
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY SL/SS
 DATUM Geodetic DATE 2004.07.19 - 2004.07.19 CHECKED BY SMS






SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					W _p	W	W _L		
							20	40	60	80	100						
242.9	BOREHOLE OPEN TO 9.1 m AND DRY. BOREHOLE BACKFILLED WITH BENSEAL.																

ONTMT4S 5165A.GPJ 2/14/08

+³, ×³: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

METRIC

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE				
250.0							20 40 60 80 100	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT			
0.0								W _P	W	W _L			
249.8	Silty SAND, trace gravel, trace clay, occasional organic pockets Compact Brown		1	SS	17								
0.2	Clayey, Sandy SILT, trace gravel, occasional iron oxide staining Hard Brown (TILL) (CL-ML)												
	becoming Grey		3	SS	72/ 254								
244.5													
5.5	SAND, some to trace silt, trace gravel Very Dense Grey Wet (SP)												
242.4													
7.6	Sandy SILT, some clay to clayey, trace gravel, occasional cobbles Very Dense Grey (TILL)(ML-NONPLASTIC)		6	SS	54								
					</								

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+ 3, X 3: Numbers refer to Sensitivity

RECORD OF BOREHOLE No HM-2

2 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road, N 4 859 416, E 300 343 ORIGINATED BY TK
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY SL/SS
 DATUM Geodetic DATE 2004.07.19 - 2004.07.19 CHECKED BY SMS

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		SHEAR STRENGTH kPa		W _P	W	W _L		
250.0							20 40 60 80 100						
239.3							20 40 60 80 100						
10.7	SAND, trace silt Very Dense		8	SS	92	239							
238.9	Grey Wet (SP)												
11.1	END OF BOREHOLE AT 11.1 m. Piezometer installation consists of 19 mm diameter Schedule 40 PVC pipe with a 1.52 m slotted screen. WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) 2004.08.05 10.7 239.3												

RECORD OF BOREHOLE No OH-1

1 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road, N 4 857 004, E 300 750 ORIGINATED BY TK
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY SL/SS
 DATUM Geodetic DATE 20.07.04 - 20.07.04 CHECKED BY MA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)			
								○ UNCONFINED		+ FIELD VANE							× LAB VANE		
								20	40	60							80	100	20
236.3 0.0	Clayey, Sandy SILT, some organics, trace gravel Very Stiff Dark Brown		1	SS	23														
234.8																			
1.5	Clayey, Sandy SILT, trace gravel, occasional cobbles Stiff Brown (TILL)(ML)		2	SS	8										0 23 53 24				
	becoming Hard		3	SS	50/ .127														
			4	SS	50/ .127														
			5	SS	50/ .127														

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+ 3, x 3: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

METRIC

[illegible]

RECORD OF BOREHOLE No OH-2

1 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road, N 4 857 386, E 300 731 ORIGINATED BY TK
 HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SL/SS
 DATUM Geodetic DATE 16.07.04 - 16.07.04 CHECKED BY SMS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					
								20 40 60 80 100					
								20 40 60 80 100					
240.3													
0.0	Clayey, Sandy SILT, occasional organic layers Firm Brown		1	SS	6		240						
238.8							239						
1.5	Clayey, Sandy SILT, trace gravel Hard Brown (TILL)(CL-ML)		2	SS	34		238						0 17 55 28
			3	SS	85/ 150		237						
							236						
	Becoming Grey		4	SS	77		235						3 22 45 31
234.2													
6.1	Sandy SILT, trace gravel Very Dense Grey (TILL)(ML-NONPLASTIC)		5	SS	50/ .150		234						
							233						
			6	SS	50/ .100		232						
			7	SS	50/ .100		231						
230.5													
9.8	END OF BOREHOLE AT 9.8 m.												

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+ ³ x ³ : Numbers refer to Sensitivity
 20
 15 10 5
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OH-2

2 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road, N 4 857 386, E 300 731 ORIGINATED BY TK
 HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SL/SS
 DATUM Geodetic DATE 16.07.04 - 16.07.04 CHECKED BY SMS

SOIL PROFILE		SAMPLES				GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	*N VALUES			20	40	60	80	100	W _p	W	W _L		
	BOREHOLE DRY AND OPEN TO 8.8 m. BOREHOLE BACKFILLED WITH BENSEAL.																

RECORD OF BOREHOLE No OH-3

1 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road, N 4 857 359, E 300 692 ORIGINATED BY TK
 HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SU/SS
 DATUM Geodetic DATE 15.07.04 - 15.07.04 CHECKED BY SMS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)		
								20 40 60 80 100		20 40 60 80 100		20 40 60			W _P	W	W _L
240.2 0.0	Clayey SILT, some sand, trace gravel, occasional organics Stiff Brown		1	SS	12												
238.7																	
1.5	Clayey, Sandy SILT, trace gravel, occasional iron oxide staining Hard Brown to Grey (TILL)(CL-ML)		2	SS	31												
					3	SS	86										
			4	SS	86/ .279												
			5	SS	70												
232.6																	
7.6	Sandy SILT, trace gravel, occasional iron oxide staining Very Dense Brown to Grey (TILL)(ML-NONPLASTIC)		6	SS	71												
			7	SS	61												
230.5																	
9.8	END OF BOREHOLE AT 9.8 m.																

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+ 3 . x 3 : Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No OH-3

2 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road, N 4 857 359, E 300 692 ORIGINATED BY TK
 HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY SUSS
 DATUM Geodetic DATE 15.07.04 - 15.07.04 CHECKED BY SMS

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			*N* VALUES	20	40	60	80	100	W _P	W		
	BOREHOLE DRY AND OPEN TO 8.2 m. BOREHOLE BACKFILLED WITH BENSEAL.															

RECORD OF BOREHOLE No OH-4

1 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road, N 4 857 789, E 300 673 ORIGINATED BY TK
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY SU/SS
 DATUM Geodetic DATE 16.07.04 - 16.07.04 CHECKED BY SMS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
240.3														
0.0	Clayey SILT, trace to some sand, occasional organic pockets, trace rootlets Firm Dark Brown		1	SS	7		240							
238.7							239							
1.5	Clayey SILT, some sand to sandy, trace gravel, occasional iron oxide staining, occasional cobbles Very Stiff to Hard Brown (TILL)(CL-ML)		2	SS	22		238							
			3	SS	50/ .150		237							
			4	SS	50/ .076		236							
			5	SS	88/ 254		235							
							234							
							233							
232.6			6	SS	50/ .127		232							
7.6	Sandy SILT, trace clay, trace to some gravel, occasional iron oxide staining Very Dense Brown to Grey (TILL)(ML-NONPLASTIC)		7	SS	50/ .127		231							
231.0														
9.3	END OF BOREHOLE AT 9.3 m. BOREHOLE OPEN TO 8.5 m AND DRY. BOREHOLE BACKFILLED WITH													

Continued Next Page

+ ³ , × ³ : Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

METRIC

SOIL PROFILE				DYNAMIC CONCENTRATION	
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+ 3, x 3: Numbers refer to Sensitivity

RECORD OF BOREHOLE No OH-5

2 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road, N 4 858 759, E 300 453 ORIGINATED BY TK
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY SL/SS
 DATUM Geodetic DATE 14.07.04 - 14.07.04 CHECKED BY SMS

SOIL PROFILE		SAMPLES				GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100	W _p	W	W _L		
	BOREHOLE OPEN TO 9.8 m. BOREHOLE WET AT 8.1 m. BOREHOLE BACKFILLED WITH BENSEAL.																

RECORD OF BOREHOLE No CV-12A

1 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road, N 4 857 700, E 300 620 ORIGINATED BY TK
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY SL/SS
 DATUM Geodetic DATE 15.07.04 - 15.07.04 CHECKED BY SMS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
239.3 0.0	Clayey, SILT, some sand, trace gravel, occasional organic layer Stiff Brown		1	SS	11									
238.5 0.8	Clayey, Sandy, SILT, trace gravel Hard Brown (TILL)(CL-ML)													
			2	SS	37									
			3	SS	86/ 254									
	Becoming Grey		4	SS	79/ 279									
233.2 6.1	Sandy SILT, trace gravel, Very Dense Grey (TILL)(ML-NONPLASTIC)		5	SS	87/ 279									
231.5 7.8	Silty SAND to Sandy SILT, trace gravel, occasional cobbles Very Dense Grey Moist		6	SS	50/ .127									
			7	SS	50/ .102									
229.6 9.8	END OF BOREHOLE AT 9.8 m.													

Continued Next Page

+ 3 . X 3 : Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No CV-12A

2 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teslon Road, N 4 857 700, E 300 620 ORIGINATED BY TK
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY SL/SS
 DATUM Geodetic DATE 15.07.04 - 15.07.04 CHECKED BY SMS

SOIL PROFILE		SAMPLES				GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT Y kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100	W _P	W	W _L		
	BOREHOLE OPEN TO 9.8 m. BOREHOLE WET AT 6.6 m. BOREHOLE BACKFILLED WITH BENSEAL.																

ONTMT4 5166A GPJ 09/09/04

+ 3 . x 3 : Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No CV-12B

1 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road, N 4 857 709, E 300 687 ORIGINATED BY TK
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY SL/SS
 DATUM Geodetic DATE 16.07.04 - 16.07.04 CHECKED BY SMS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT Y kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
240.0 0.0	Clayey, Sandy, SILT, trace gravel, trace organics Very Stiff Dark Brown		1	SS	17		240							
238.5							239							
1.5	Clayey, Sandy SILT, trace gravel, occasional iron oxide staining Hard Brown to Grey (TILL)(CL-ML)		2	SS	56		238							
							237							
			3	SS	50/ .150		236							
235.4							235							
4.6	Sandy SILT, trace clay, trace gravel, occasional cobbles Very Dense Grey (TILL)(ML)		4	SS	50/ .102		234							
							233							
			5	SS	89		232							
							231							
			6	SS	50/ .279									
			7	SS	50/ .127									

Continued Next Page

+ 3, x 3: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No CV-12B

2 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road, N 4 857 709, E 300 687 ORIGINATED BY TK
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY SL/SS
 DATUM Geodetic DATE 16.07.04 - 16.07.04 CHECKED BY SMS

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20 40 60 80 100	20 40 60 80 100	W _P W W _L	20 40 60		
229.3						230							
10.7	Sandy SILT, fine grained		8	SS	50/								
229.1	Very Dense												
11.0	Grey (ML-NONPLASTIC) END OF BOREHOLE AT 11.0 m. Piezometer installation consists of 19 mm diameter Schedule 40 PVC pipe with a 1.52 m slotted screen. WATER LEVEL READINGS: DATE DEPTH 05/08/04 10.8 (m)				.127								

RECORD OF BOREHOLE No CV-13A

1 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road, N 4 858 645, E 300 534 ORIGINATED BY TK
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY SL/SS
 DATUM Geodetic DATE 14.07.04 - 14.07.04 CHECKED BY SMS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
229.0	Clayey SILT, some sand, some gravel, some organic pockets Stiff Brown		1	SS	8							
227.0	Sandy SILT, trace clay, trace gravel, occasional cobbles Compact Grey (TILL)(ML-NONPLASTIC)		2	SS	15							
2.0	Becoming Dense to Very Dense		3	SS	15							
			4	SS	39							
			5	SS	50/ .229							
221.4	Silty SAND, fine grained, trace gravel, occasional cobbles Very Dense Grey (SM)		6	SS	50/ .279							
220.4	SILT, trace sand Very Dense Grey (ML-NONPLASTIC)		7	SS	65							
219.2	END OF BOREHOLE AT 9.8 m.											

Continued Next Page

+³ ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

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RECORD OF BOREHOLE No CV-13A

2 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teslon Road, N 4 858 645, E 300 534 ORIGINATED BY TK
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY SL/SS
 DATUM Geodetic DATE 14.07.04 - 14.07.04 CHECKED BY SMS





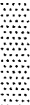

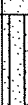


SOIL PROFILE			SAMPLES				GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT Y kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	20			40	60	80	100	W _P	W	W _L			
	BOREHOLE OPEN TO 9.8 m. BOREHOLE WET AT 2.1 m. BOREHOLE BACKFILLED WITH BENSEAL.																	

RECORD OF BOREHOLE No CV-13B

1 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road, N 4 858 657, E 300 558 ORIGINATED BY TK
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY SL/SS
 DATUM Geodetic DATE 15.07.04 - 15.07.04 CHECKED BY SMS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT Y kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL								
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)												
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	20 40 60 80 100	20 40 60												
229.7	Clayey SILT, some sand, some organics, trace rootlets, occasional silt pockets Soft Dark Brown		1	SS	3		229															
0.0																						
228.9	Silty SAND, trace clay, occasional silt layers Dense Grey						228															
0.7																						
227.7	Clayey SILT, some sand to sandy, trace gravel, occasional silt layers, occasional cobbles Hard Grey (TILL)(CL)		2	SS	41		227															
2.0																						
			3	SS	48										226							
4	SS	75		225																		
			5	SS	33		224															
223.1	SAND, trace to some silt Dense Brown (SP/SM)						223															
6.6																						
221.7	Silty SAND, trace gravel Dense to Very Dense Grey (SM)		6	SS	34		222															
8.0																						
			7	SS	73		221															
219.9	END OF BOREHOLE AT 9.8 m.						220															
9.8																						
Continued Next Page																						

Continued Next Page

+ 3 . x 3 : Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No CV-13B

2 OF 2

METRIC

G.W.P. _____ LOCATION Hwy 400 / Teston Road, N 4 858 657, E 300 558 ORIGINATED BY TK
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY SL/SS
 DATUM Geodetic DATE 15.07.04 - 15.07.04 CHECKED BY SMS

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT Y kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			*N* VALUES	SHEAR STRENGTH kPa					WATER CONTENT (%)			
						20	40	60	80	100	W _P	W	W _L			
	Piezometer installation consists of 19 mm diameter Schedule 40 PVC pipe with a 1.52 m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) 15/07/04 1.8 05/08/04 0.6															

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Appendix D
List of Special Provisions
and
Suggested Text for NSSP



List of Special Provisions Referenced in this Report

SP 903S01

Suggested Text for NSSP on:

“Augered Caisson Construction for High Mast Lighting (HML) Pole Foundations”

The Contractor is advised that variable types of subsurface materials may be encountered at the locations of the HML foundations. For additional information regarding subsurface conditions, the Contractor is referred to the Foundation Investigation Report.

For bidding purposes, the Contractor shall assume the following:

1. The subsurface conditions at an augered caisson location are the same as those encountered in the borehole closest to the subject caisson location.
2. Cobbles, boulders and rock fragments may be encountered within the glacial till deposits. Obstructions including rubble, cobbles and boulders may also be present within the embankment fills. The soil matrix is anticipated to become harder or denser with depth. Caisson installation equipment must be able to dislodge, handle, remove or otherwise penetrate these obstructions and hard/very dense layers.
3. Water seepage and/or soil sloughing into the caisson hole will occur from existing fill and cohesionless soils at some locations. The cohesionless soils would be susceptible to disturbance under conditions of unbalanced hydrostatic head. Temporary liners shall be available on site, or be made available on very short notice, to support the caisson sidewalls and provide seepage cut-off where required. All concrete should be placed in the dry.

The Contractor is responsible for constructing the HML foundations without disturbing the material at the sides or bases of the foundations.

