

**FOUNDATION INVESTIGATION REPORT  
STORMWATER MANAGEMENT POND #2  
HIGHWAY 400 WIDENING  
MAJOR MACKENZIE DRIVE TO KING ROAD  
YORK REGION, ONTARIO  
G.W.P. 192-00-00 AND 2539-04-00  
ASSIGNMENT NOS. 2005-E-0036 AND -0037**

**GEOCRES Number: 30M13-191**

**Report to**

**SNC-Lavalin Inc.**

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**PART 1: FACTUAL INFORMATION**

**1 INTRODUCTION**

This report presents the factual findings obtained from a foundation investigation carried out at the location of the proposed Stormwater Management Pond #2 (SWMP2) on the west side of Highway 400 and just south of the Humber Arch Culvert. This pond is part of a Ministry of Transportation Ontario (MTO) Highway 400 widening project that includes accommodation of the ultimate 10-lane configuration including one HOV lane in each direction, while the current MTO right-of-way is to be maintained.

The purpose of this investigation was to determine the subsurface conditions in the vicinity of the pond and the surrounding slopes, provide borehole location plans and soil strata drawings, records of boreholes, laboratory test results, and a generalized description of the subsurface conditions. A model of the subsurface conditions was developed for the pond area based on data obtained from this and previous investigations.

Thurber Engineering Ltd. (Thurber) carried out this investigation as a sub-consultant to SNC-Lavalin Inc. (SLI) under MTO Assignment Nos. 2005-E-0036 and 0037.

**2 SITE DESCRIPTION**

The highway alignment east of the pond construction extends along Highway 400 from north of Major Mackenzie Drive northerly to just north of the King Road Underpass. The general location of SWMP2 covered in this report is shown on the key plans on the Borehole Locations and Soil Strata drawings in Appendix C.

The pond is to be located within a patch of gently sloping land some 150 m to the south of the Humber Arch Culvert on the west side of Highway 400. At the time of the field work, the site had a thin cover of grass and occasional shrubs. Beyond the crest of the Humber River valley slopes, there is modest vegetation of small trees and shrubs.

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 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 till 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 SITE INVESTIGATION AND FIELD TESTING**

The site investigation and field testing for SWM2 was carried out during the period of February 1 to 4, 2010 inclusive. The current program consisted of drilling and sampling four (4) boreholes.

Information obtained from other reports of this Highway 400 widening project and previous investigations along the alignment have been utilized where appropriate. These reports are listed as follows:

- Thurber report titled “Foundation Investigation Report, High Embankments, Teston Road to King Road, Highway 400 Widening, Vaughan, Ontario, G.W.P. 2539-04-00, Assignment 2005-E-0036”, GEOCREs No. 30M13-178, File:19-92-68, dated April 6, 2010 (Reference 1).
- Thurber report titled “Draft Foundation Investigation Report, Proposed Culvert Extensions and New Culvert, Highway 400 Widening, Major MacKenzie Drive to King Road, York Region, Ontario”, File: 19-92-68, dated October 22, 2010 (Reference 2).
- AMEC report titled “Final Foundation Investigation Report, Proposed Humber River Arch Culvert Extension, Highway 400 Interim Widening, Vaughan, Ontario”, W.P. 192-00-00, Central Region, File: TT22852B, dated September, 2003 (Reference 3).

The boreholes for the SWMP2 investigation program were initially marked and/or staked in the field by Thurber, and their locations temporarily established using Thurber’s in-house GPS survey unit. Prior to commencement of drilling, utility clearances were obtained for all borehole locations. The as-drilled borehole locations and elevations have subsequently been tied in by J.D. Barnes Ltd. and the survey data provided to Thurber. Approximate borehole locations are shown on the Borehole Locations and Soil Strata drawings in Appendix C.

A track mounted drill rig was used to undertake the drilling, sampling and in-situ testing operations.

The depths of the boreholes ranged from approximately 15.8 m to 20.4 m below existing ground surface. Hollow and solid stem augers were used to advance the boreholes. Soil samples were obtained at selected intervals using a 50 mm outside diameter split spoon sampler in conjunction with Standard Penetration Tests (SPT).

Groundwater conditions in the open boreholes were observed throughout the drilling operations. Standpipe piezometers of 19 mm in diameter were installed in selected boreholes for monitoring of groundwater levels. The installation details are presented on the Record of Boreholes in Appendix A. Details of borehole grouting and piezometer sealing for this investigation are presented in Table 1 immediately following the text. All boreholes were backfilled in general accordance with the terms of reference of this project.

A member of Thurber's technical staff supervised the drilling and sampling operations on a full time basis. The supervisor logged the boreholes, secured the soil samples in labelled and sealed containers, which were then transported to Thurber's laboratory for further examination and testing.

#### **4 LABORATORY TESTING**

Visual identification and natural moisture content determination was undertaken on all recovered soil samples delivered to the laboratory. Selected soil samples were subjected to grain size distribution analysis. Selected cohesive soil samples underwent Atterberg Limits testing. The results of this testing program are shown on the Record of Borehole sheets in Appendix A and on the accompanying figures in Appendix B.

#### **5 DESCRIPTION OF SUBSURFACE CONDITIONS**

Details of the encountered soil stratigraphy are presented on Record of Borehole sheets, and on the "Borehole Locations and Soil Strata" drawings in Appendices A and C, respectively. A general description of the stratigraphy established at Boreholes 10-01 to 10-04 is presented in the following paragraphs. It should be noted that the subsurface conditions vary between and beyond the borehole locations.

Results of grain size distribution analyses conducted on selected samples of various types of soils from this investigation are presented in Figures B1 to B5 in Appendix B. Results of Atterberg Limits tests carried out on selected cohesive soil samples are shown on the plasticity charts on Figure B6 in Appendix B. The Borehole Locations and Soil Strata Drawings in Appendix C present the inferred subsurface conditions in the pond area.

##### **5.1 Topsoil**

Topsoil of thicknesses ranging from 100 mm to 180 mm was encountered in Boreholes 10-01 to 10-04. Topsoil thickness may vary between and beyond the borehole locations.

##### **5.2 Fill**

A surficial layer of gravel fill was encountered beneath the topsoil in Borehole 10-03. The thickness and base elevation of the fill are 0.3 m and 266.6 m, respectively.

### 5.3 Clayey Silt

A surficial layer of clayey silt containing some sand and trace gravel was encountered in Boreholes 10-01 and 10-02. The thickness and base elevation of these deposits are summarized in Table 5.3.1 below:

**Table 5.3.1 Clayey Silt Thickness and Base Elevation**

Borehole Number	Clayey Silt	
	Thickness (m)	Base Elevation (m)
10-01	1.2	262.1
10-02	3.0	261.3

This soil is brown in colour and has a stiff to very stiff consistency as indicated by SPT 'N' values ranging from 9 to 22 blows per 0.3 m penetration. Measured moisture contents ranged between 12% and 22%.

Figure B1 presents the grain size distribution curve of a clayey silt sample. The test results are summarized in the tables below.

Soil Particles	%
Gravel	1
Sand	17
Silt	62
Clay	20

### 5.4 Silts and Sands

Deposits of cohesionless soils with varying proportions of silts and sands with trace of clay were encountered in Boreholes 10-01 to 10-04. The thickness and base elevation of these soils in the boreholes are summarized in Table 5.4.1:

**Table 5.4.1 Silt and Sand Thickness and Base Elevation**

Borehole Number	Silts and Sands Thickness (m)	Base Elevation (m)
10-01	5.9 (upper)	256.2
	1.4 (lower)	248.7
10-02	3.6	256.6
10-03	4.6	253.7
10-04	2.1	256.2

These soils are typically grey in colour with occasional brown zones at shallow depths, non-plastic, and in a typically compact state as indicated by SPT 'N' values ranging between 12

and 29 blows per 0.3 m penetration. Measured moisture contents were typically between 15% and 22%, with a lower value of 8% measured in Borehole 10-01.

Figures B2 and B3 present the grain size distribution curves of selected samples of silt, sandy silt and silty sand. The test results are summarized in the tables below.

#### Silt

Soil Particles	%
Gravel	0
Sand	5 – 13
Silt	82 – 85
Clay	5 – 10

#### Sandy Silt to Silty Sand

Soil Particles	%
Gravel	0 – 1
Sand	35 – 71
Silt and Clay	28 – 65

### 5.5 Clayey Silt Till

Clayey silt till containing some sand and trace gravel was encountered in Boreholes 10-01, 10-02, 10-03 and 10-04. An occasional zone of silty clay till was contacted in Boreholes 10-03. None of the boreholes fully penetrated the clayey silt till deposit. The thickness and base elevation of this till deposit are summarized in Table 5.5.1:

**Table 5.5.1 Clayey Silt Till Thickness and Base Elevation**

Borehole Number	Minimum Thickness (m)	Borehole Termination Elevation (m)
10-01	6.1 (upper)	250.1
	5.6 (lower)	243.1
10-02	1.1 (upper)	260.2
	8.1 (lower)	248.5
10-03	8.3 (upper)	258.3
	7.1 (lower)	246.6
10-04	6.7 (upper)	258.3
	6.9 (lower)	249.3

This till is typically brown at shallow depth becoming grey with depth. Its consistency is typically very stiff to hard as indicated by SPT ‘N’ values ranging between 18 and 64 blows per 0.3 m penetration. Occasional ‘N’ values between 11 and 15 blows were also measured

indicating the presence of stiff zones. Measured moisture contents were typically between 15% and 22%.

Figure B4 presents the grain size distribution curves of clayey silt till samples. The test results are summarized in the table below.

Soil Particles	%
Gravel	0 – 3
Sand	3 – 31
Silt	46 – 82
Clay	12 - 26

Figure B5 presents the grain size distribution curve of a silty clay till sample. The test results are summarized in the table below.

Soil Particles	%
Gravel	0
Sand	19
Silt	51
Clay	30

Figure B6 presents Atterberg limits test results of some clayey silt till and silty clay till samples.

Index Property	%
Liquid Limit	22 – 24
Plasticity Index	7 – 10

The above results show that these cohesive tills have low plasticity with a group symbol of CL.

Glacial tills inherently contain cobbles and boulders, although such obstructions were not encountered in the boreholes.

## 5.6 Groundwater

Free water was encountered in Boreholes 10-02 and 10-04 at 4.3 and 7.3 m depths, respectively, upon completion of drilling. A standpipe piezometer was installed in each of Boreholes 10-01 and 10-03. All the observed water levels are presented in Table 5.8.1:



**Table 5.6.1 Water Level Measurements**

<b>Borehole (Screen location)</b>	<b>Date</b>	<b>Depth (m)</b>	<b>Elevation (m)</b>
10-01 (piezometer screen at clayey silt till)	February 4, 2010	7.3	256.2
	April 9, 2010	7.1	256.4
10-02 (open borehole)	February 2, 2010	4.3*	260.0*
10-03 (piezometer screen at clayey silt till / sandy silt)	February 4, 2010	7.9	259.1
	April 9, 2010	6.4	260.6
10-04 (open borehole)	February 3, 2010	7.3*	257.8*

\* May not be stabilized.

Based on the piezometer readings, the groundwater levels were noted to vary between Elevations 256 and 260 m. The groundwater levels are expected to vary seasonally and are subject to climatic events.

## **6 MISCELLANEOUS**

Thurber Engineering Ltd. (Thurber) selected the borehole locations in the field relative to existing site features with consideration of access restraints, terrain conditions, utility locations and previous site investigation data.

Walker Drilling Ltd of Utopia, Ontario conducted the drilling, sampling and in-situ testing operations. Barricade Traffic Services Inc. (BTS) provided temporary highway lane and shoulder closure during the unloading and loading of the drill rig. Mr. Stephane Loranger of Thurber supervised the drilling and sampling operations in the field on a full time basis.

Dr. Sydney Pang, P.Eng. directed the field operations and prepared this report.

Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations projects, reviewed the report.

THURBER ENGINEERING LTD.



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



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

**Table A1**  
**Borehole Completion Details**

<b>Borehole</b>	<b>Piezometer Tip Depth/ Elevation (m)</b>	<b>Completion Details</b>
10-01	11.2 / 252.3	Piezometer with 3 m slotted screen installed with sand filter to 7.5 m (Elevation 256.0 m), bentonite seal to 1.5 m depth, then soil cuttings to surface.
10-02	None installed	Bentonite to 1.9 m, soil cuttings to surface.
10-03	10.3 / 256.7	Piezometer with 3 m slotted screen installed with sand filter to 4.0 m (Elevation 259.2 m), bentonite seal to 0.2 m depth, then soil cuttings to surface.
10-04	None installed	Borehole caved to 7.4 m, then bentonite to surface.

## **Appendix A**

### **Record of Borehole Sheets**

**19-92-68**

**Table A1**  
**Borehole Completion Details**

<b>Borehole</b>	<b>Piezometer Tip Depth/ Elevation (m)</b>	<b>Completion Details</b>
10-01	11.2 / 252.3	Piezometer with 3 m slotted screen installed with sand filter to 7.5 m (Elevation 256.0 m), bentonite seal to 1.5 m depth, then soil cuttings to surface.
10-02	None installed	Bentonite to 1.9 m, soil cuttings to surface.
10-03	10.3 / 256.7	Piezometer with 3 m slotted screen installed with sand filter to 4.0 m (Elevation 259.2 m), bentonite seal to 0.2 m depth, then soil cuttings to surface.
10-04	None installed	Borehole caved to 7.4 m, then bentonite to surface.

## 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 <sup>(1)</sup> '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<sub>pen</sub>


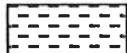



Shear Strength Determination by Pocket Penetrometer

- (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

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

<b>DISCONTINUITY SPACING</b>		<b>STRENGTH CLASSIFICATION</b>			
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.
<b>TERMS</b>		Weak	5.0 to 25.0	750 to 3,500	Can be peeled by a pocket knife with difficulty
Total Core Recovery: (TCR)	Core recovered as a percentage of total core run length.	Very Weak	1.0 to 5.0	150 to 750	Can be peeled by a pocket knife, crumbles under firm blows of geological pick.
Solid Core Recovery: (SCR)	Percent Ratio of solid core of full cylindrical shape recovered. Expressed with respect to the total length of core run.	Extremely Weak (Rock)	0.25 to 1.0	35 to 150	Indented by thumbnail
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 10-01

1 OF 3

METRIC

W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 863 411.7 E 299 597.1 ORIGINATED BY SLL  
 HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2010.02.01 - 2010.02.01 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 <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)						
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						WATER CONTENT (%)			GR	SA	SI	CL
								○ UNCONFINED      + FIELD VANE						w <sub>p</sub> w      w <sub>L</sub>						
								● QUICK TRIAXIAL      x LAB VANE												
263.5							20	40	60	80	100	20	40	60						
0.0	TOPSOIL: (150mm)																			
0.2	Clayey SILT, some sand, trace gravel Stiff Brown Moist																			
262.1				1	SS	10											1	17	62	20
1.4	SILT, trace sand, trace clay Compact Brown Moist  Becoming grey			2	SS	12														
				3	SS	15											0	5	85	10
				4	SS	21														
259.4																				
4.1	Sandy SILT, trace clay Compact Grey Moist  Becoming wet			5	SS	25											0	35	60	5
				6	SS	28														
256.2																				
7.3	Clayey SILT, some sand, trace gravel Very Stiff to Hard Grey Moist (TILL)			7	SS	28														
				8	SS	46											0	12	65	23

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+<sup>3</sup> X<sup>3</sup>: Numbers refer to  
Sensitivity

20  
15  
10

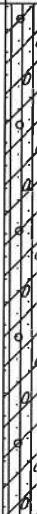



(%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No 10-01

2 OF 3

METRIC

W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 863 411.7 E 299 597.1 ORIGINATED BY SLL  
 HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2010.02.01 - 2010.02.01 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 <sup>3</sup>	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      x LAB VANE	20   40   60   80   100	20   40   60				
Continued From Previous Page														
250.1 13.4	Clayey SILT, some sand, trace gravel Hard Grey Moist (TILL)		9	SS	42		253							
							252							
							251							
	Sandy SILT Compact Grey Moist to Wet		10	SS	49									
					250									
					249									
248.7 14.8	Clayey SILT, trace sand, trace gravel Hard Grey Moist (TILL)		11	SS	24									
							248							
							247							
							246							
							245							
			12	SS	43									
			13	SS	59									
			14	SS	32									

Continued Next Page

+<sup>3</sup>, X<sup>3</sup>: Numbers refer to  
Sensitivity

20  
15  
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 10-01

3 OF 3

METRIC

W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 863 411.7 E 299 597.1 ORIGINATED BY SLL  
HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN  
DATUM Geodetic DATE 2010.02.01 - 2010.02.01 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 <sup>3</sup>	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 <sub>p</sub> w      w <sub>L</sub>							
	Continued From Previous Page		15	SS	18			20	40	60	80	100	20	40	60		
243.1																	
20.4	END OF BOREHOLE AT 20.4m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 3.0m slotted screen.  WATER LEVEL READINGS: DATE      DEPTH (m)      ELEV. (m) 02.04.10      7.3      256.2 04.09.10      7.1      256.4						243										

# RECORD OF BOREHOLE No 10-02

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 863 381.3 E 299 602.3 ORIGINATED BY SLL  
 HWY 400 BOREHOLE TYPE Solid Stem Augers/Hollow Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2010.02.01 - 2010.02.02 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	
264.3												
0.0	TOPSOIL, with roots and rootlets (150mm)						264					
0.2	Clayey SILT, some sand seams Stiff to Very Stiff Brown Moist		1	SS	9		263					
			2	SS	12		262					
			3	SS	22		261					
261.3	Clayey SILT, trace gravel, with sand seams Very Stiff Brown Moist (TILL)		4	SS	27		260					
260.2	SAND, some silt Compact Brown Moist		5	SS	29		259					
4.1			6	SS	26		258					
							257					
256.6	Clayey SILT, some sand, trace gravel Very Stiff to Hard Grey Moist (TILL)		7	SS	20		256					
7.7			8	SS	32		255					

Continued Next Page

+<sup>3</sup> . X<sup>3</sup> : Numbers refer to  
Sensitivity

20  
15  
10

(%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No 10-02

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 863 381.3 E 299 602.3 ORIGINATED BY SLL  
 HWY 400 BOREHOLE TYPE Solid Stem Augers/Hollow Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2010.02.01 - 2010.02.02 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT  γ  kN/m <sup>3</sup>	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						
	Clayey SILT, some sand, trace gravel Hard Grey Moist (TILL)		9	SS	34								
			10	SS	56								
			11	SS	40								
			12	SS	40								
248.5													
15.8	END OF BOREHOLE AT 15.8m. BOREHOLE OPEN TO 8.0m, AND WATER LEVEL AT 4.3m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.9m, THEN CUTTINGS TO SURFACE.												

+<sup>3</sup>, x<sup>3</sup>: Numbers refer to  
Sensitivity

20  
15  
10

(%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No 10-03

1 OF 3

METRIC

W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 863 351.0 E 299 639.9 ORIGINATED BY SLL  
 HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2010.02.02 - 2010.02.02 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT $\gamma$ kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	
267.0												
0.0	TOPSOIL, trace roots and rootlets (100mm)						267					
0.1												
266.6	GRAVEL Brown Moist (FILL)											
0.4												
	Clayey SILT, some sand, trace gravel Very Stiff to Hard Brown Moist (TILL)		1	SS	19		266					
			2	SS	26		265					
	Becoming grey		3	SS	42		264					
264.0	Silty CLAY (TILL)		4	SS	41		263					
3.0	With sand seams						262					
262.9			5	SS	36		261					
4.1			6	SS	36		260					
			7	SS	12		259					
258.3	Sandy SILT, trace clay Compact Grey Moist to Wet		8	SS	13		258					
8.7												

Continued Next Page

+ <sup>3</sup> . X <sup>3</sup> : Numbers refer to  
Sensitivity

20  
15  
10

(%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No 10-03

2 OF 3

METRIC

W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 863 350.1 E 299 639.9 ORIGINATED BY SLL  
 HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2010.02.02 - 2010.02.02 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT w <sub>P</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	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
	Continued From Previous Page							20 40 60 80 100										
256.8	Silty SAND, trace clay, trace gravel Compact Grey Wet						257								1 71 28 (SI+CL)			
10.2			9	SS	17		256											
							255											
			10	SS	27													
253.7	Clayey SILT, some sand, trace gravel, with sand seams Hard Grey Moist (TILL)						254											
13.3			11	SS	35		253											
							252											
			12	SS	37		251											
							250											
			13	SS	48													
							249											
			14	SS	64		248											

Continued Next Page

+<sup>3</sup> . X<sup>3</sup>: Numbers refer to  
Sensitivity

20  
15  
10

(%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No 10-03

3 OF 3

METRIC

W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 863 350.1 E 299 639.9 ORIGINATED BY SLL  
 HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2010.02.02 - 2010.02.02 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 $\gamma$ kN/m <sup>3</sup>	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				
	Continued From Previous Page		15	SS	48	247							
246.6													
20.4	END OF BOREHOLE AT 20.4m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.  WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 02.04.10 7.9 259.1 04.09.10 6.4 260.6												



# RECORD OF BOREHOLE No 10-04

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 863 319.9 E 299 593.4 ORIGINATED BY SLL  
HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN  
DATUM Geodetic DATE 2010.02.03 - 2010.02.03 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT      NATURAL MOISTURE      LIQUID CONTENT      LIMIT			UNIT WEIGHT  γ  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)			GR	SA	SI	CL	
265.1							20	40	60	80	100	w <sub>P</sub>	w	w <sub>L</sub>						
0.0	TOPSOIL, with roots and rootlets: (180mm)						20	40	60	80	100									
0.1	Clayey SILT, some sand, trace gravel, with sand seams Very Stiff to Hard Brown Moist (TILL)		1	SS	19															
			2	SS	41															
			3	SS	38															
			4	SS	42															
			5	SS	15															
			6	SS	38															
258.3																				
6.8	SILT, some sand, trace gravel Compact Grey Wet																			
			7	SS	14															
256.2																				
8.9	Clayey SILT, some sand, trace gravel, with wet sand seams Very Stiff to Hard Grey Moist (TILL)		8	SS	25															

ONTMT4S 9268.GPJ 1/26/11

Continued Next Page

+<sup>3</sup>, ×<sup>3</sup>: Numbers refer to  
Sensitivity


20  
15 10 5  
(%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No 10-04

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 863 319.9 E 299 593.4 ORIGINATED BY SLL  
 HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2010.02.03 - 2010.02.03 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	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								
	Continued From Previous Page						● QUICK TRIAXIAL      × LAB VANE									
	Clayey SILT, trace gravel, with wet sand seams															
	Hard															
	Grey															
	Moist															
	(TILL)															
			9	SS	51											
			10	SS	59											
			11	SS	11											
			12	SS	46											
249.3																
15.8	END OF BOREHOLE AT 15.8m. BOREHOLE CAVED TO 7.4m, AND WATER LEVEL AT 7.3m. BOREHOLE BACKFILLED WITH HOLEPLUG TO SURFACE.															

# RECORD OF BOREHOLE No 06-16W

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 863 460.9 E 299 639.1 ORIGINATED BY SLL  
 HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM  
 DATUM Geodetic DATE 2007.01.08 - 2007.01.08 CHECKED BY TJH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ kN/m <sup>3</sup>	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							
263.1							20 40 60 80 100									
0.0	TOPSOIL: (200 mm)															
0.2	Silty SAND Very Loose Brown Wet (FILL)		1	SS	3											
261.9			2	SS	21											
1.1	Silty CLAY, trace sand, with thin silty sand seams Very Stiff to Stiff Brown Moist (CL)		3	SS	25									0 6 49 45		
			4	SS	13											
260.2																
2.9	Clayey SILT, occasional sand seams Very Stiff Grey Wet		5	SS	17											
258.7																
4.3	SILT, trace sand, trace clay, trace gravel Dense Moist (ML-NP)		6	SS	39									1 7 86 6		
257.0	inferred boulder or cobble at 5.72 to 5.82 m															
6.1	SAND, trace to some silt, trace clay Very Dense Brown Moist gravel seams at 6.25 to 6.28 m		7	SS	63											
255.7																
7.3	compact		8	SS	22									0 81 19 (SI+CL)		
254.5																
8.5			9	SS	51											

Continued Next Page

+<sup>3</sup>, X<sup>3</sup>: Numbers refer to  
Sensitivity

20  
15  
10

(%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No 06-16W

2 OF 2

METRIC

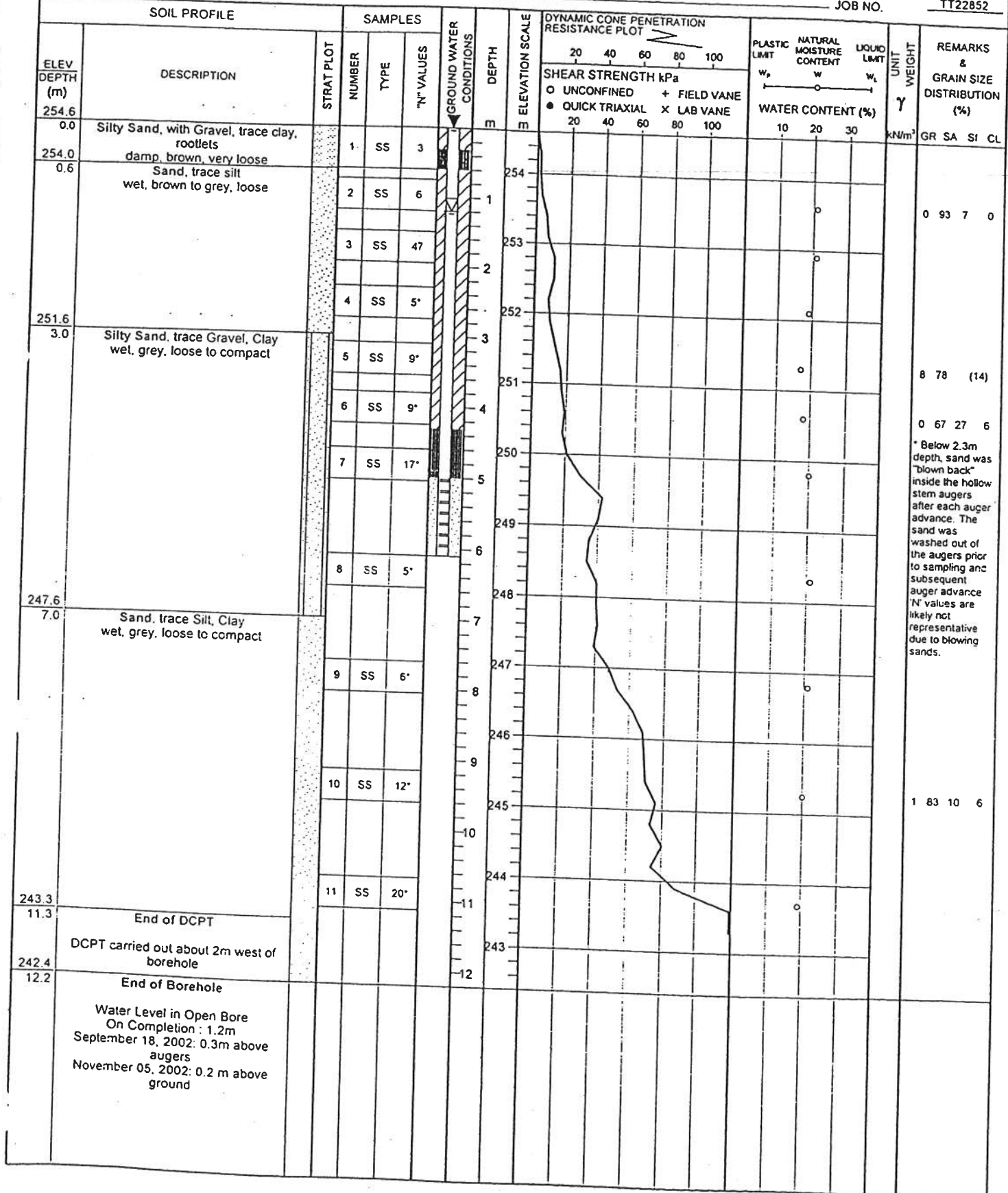
W.P. 2539-04-00 LOCATION Hwy 400, Teston Road to King Road N 4 863 460.9 E 299 639.1 ORIGINATED BY SLL  
 HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM  
 DATUM Geodetic DATE 2007.01.08 - 2007.01.08 CHECKED BY TJH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT  $\gamma$ kN/m <sup>3</sup>	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 (%)				
							20 40 60 80 100	20 40 60				
Continued From Previous Page												
252.7	SAND, trace to some silt, trace clay Very Dense					253						
10.4	Clayey SILT, some sand, trace gravel Hard Grey Wet		10	SS	56	252						
251.9												
11.1	SAND, some silt Very Dense Grey Wet					251						
250.7												
12.4	Clayey SILT, trace sand, trace gravel Hard Grey Wet (TILL)		11	SS	63	250						
			12	SS	39	249						
			13	SS	10	248						
247.2												
15.8	END OF BOREHOLE AT 15.85 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 7.3 255.8 27.03.07 7.2 255.9											

# RECORD OF BOREHOLE No HR2

amec

W.P. 192-00-00 LOCATION 4863525.9N 299615.6E 1 OF 1  
 DIST HWY 400 BOREHOLE TYPE Hollow Stem Augering ORIGINATED BY IH  
 DATUM Geodetic DATE 17 September 2002 - 17 September 2002 COMPILED BY IH  
 PROJECT HWY 400 Widening, Vaughan, Ontario CHECKED BY AD  
 JOB NO. TT22852



+3, X3: Numbers refer to

0.3% STRENGTH

# RECORD OF BOREHOLE No HR3

amec

W.P. 192-00-00 LOCATION 4863514.9N 299615.6E 1 OF 1  
 DIST HWY 400 BOREHOLE TYPE Hollow Stem Augering ORIGINATED BY IH  
 DATUM Geodetic DATE 17 September 2002 - 18 September 2002 COMPILED BY IH  
 PROJECT HWY 400 Widening, Vaughan, Ontario CHECKED BY AD  
 JOB NO. TT22852

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	DEPTH m	ELEVATION SCALE m	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w <sub>p</sub>	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH (m)	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES				SHEAR STRENGTH kPa						
254.7									20 40 60 80 100						
0.0	Sand, with Gravel, some Organics, Rootlets		1	SS	3			254	○ UNCONFINED + FIELD VANE						
254.0	damp, brown to grey, very loose		2	SS	8		1	254	● QUICK TRIAXIAL x LAB VANE						
0.7	Sand, with Gravel moist, grey, loose														
253.3															
1.4	Sand, trace Silt wet, grey, loose to dense		3	SS	17		2	253							0 91 9 0
			4	SS	50		3	252							
			5	SS	6*		4	251							
			6	SS	7*		5	250							
250.3	Silty Sand, trace Clay wet, grey, loose to compact		7	SS	5*		6	249							
4.4							7	248							
			8	SS	20*		8	247							0 70 24 6
							9	246							
			9	SS	13*		10	245							
							11	244							0 77 15 8
			10	SS	19*		12	243							
243.1															
11.6	CLAYEY SILT, with Sand, trace gravel (TILL)														
242.5	moist, grey, hard														
12.2	End of DCPT														
242.0	DCPT carried out about 2m west of borehole		12	SS	60										
12.7	End of Borehole														
	Water Level in Open Bore On Completion : 0.9 m														

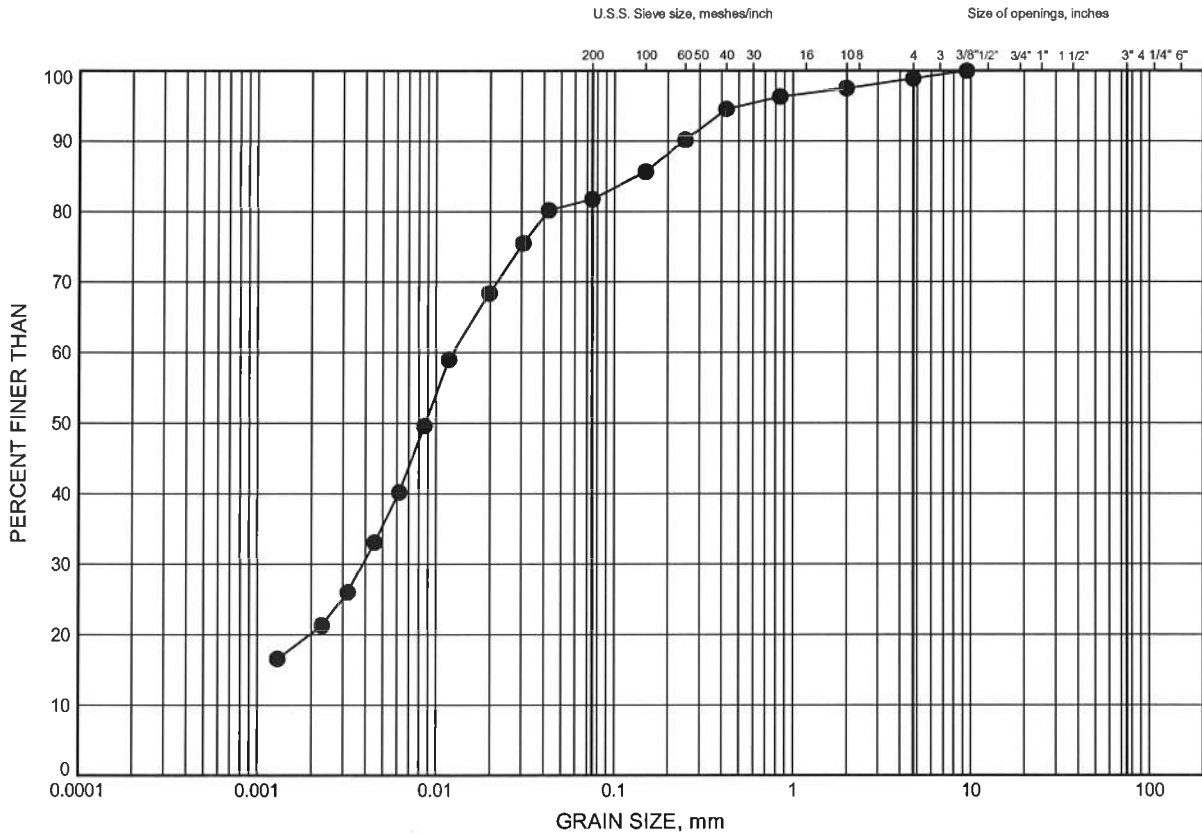
## **Appendix B**

### **Laboratory Test Results**

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

FIGURE B1

CLAYEY SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	10-01	1.07	262.43



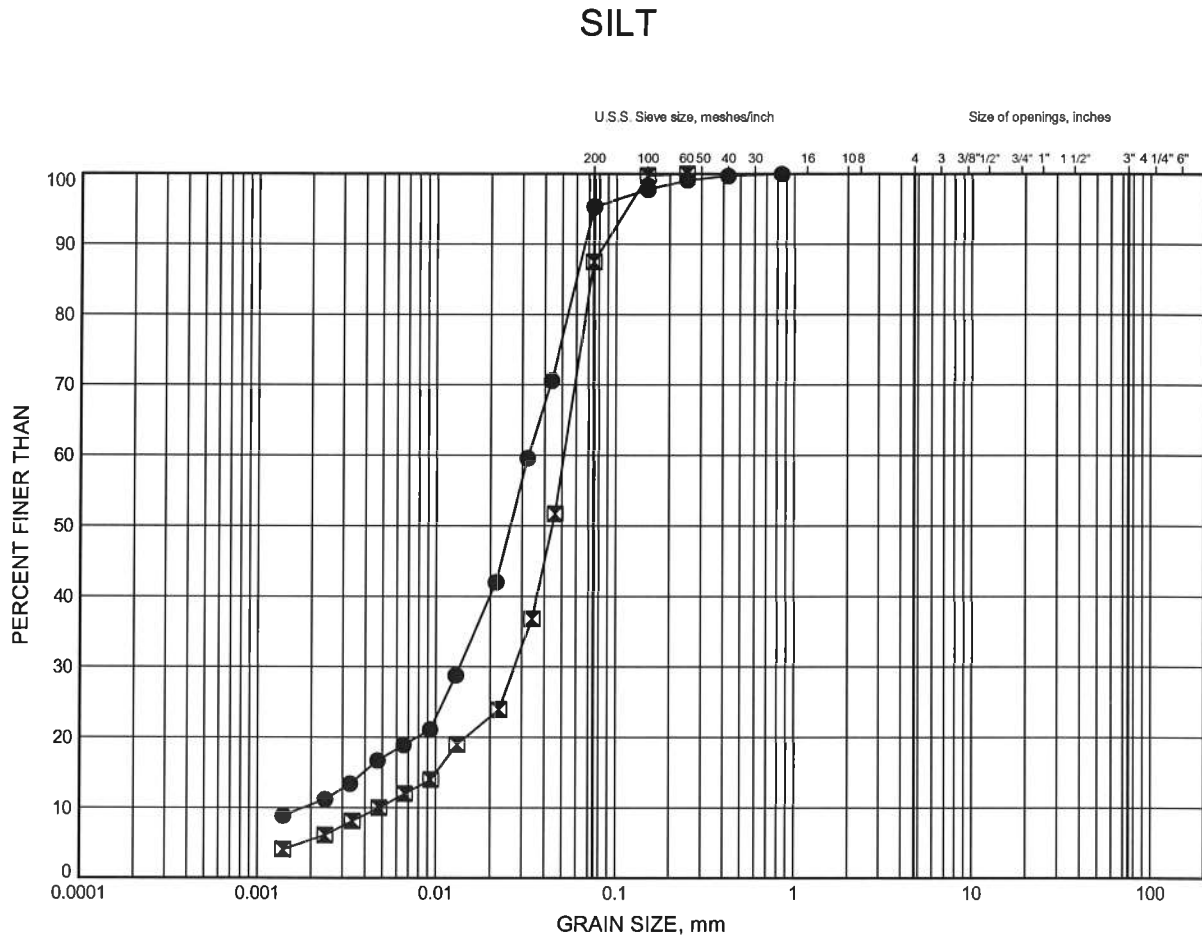
W.P.# 2539-04-00  
Prepared By AN  
Checked By .SKP



# Widening of Hwy 400, Major Mackenzie to King Road

## GRAIN SIZE DISTRIBUTION

FIGURE B2



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

### LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	10-01	2.59	260.91
⊠	10-04	7.92	257.18

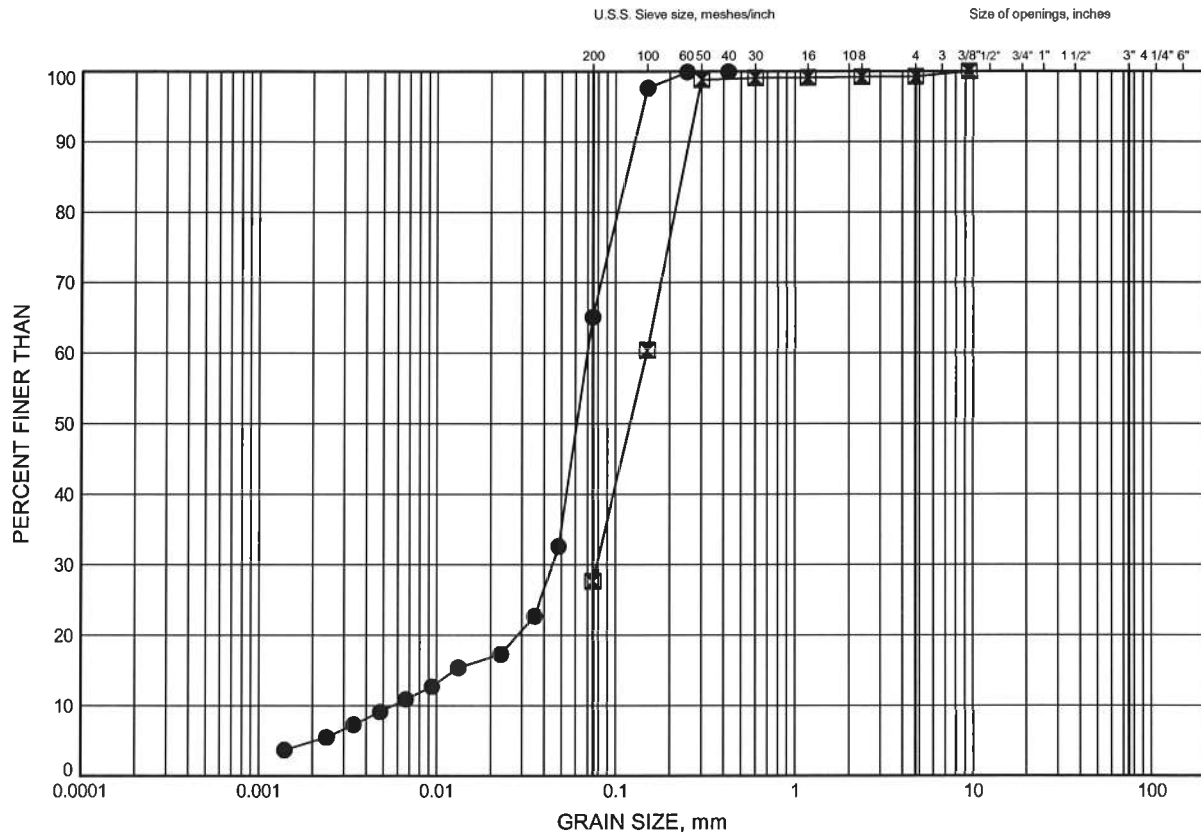


W.P.# 2539-04-00  
 Prepared By .AN.  
 Checked By .SKP.

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

FIGURE B3

**SANDY SILT/SILTY SAND**



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

**LEGEND**

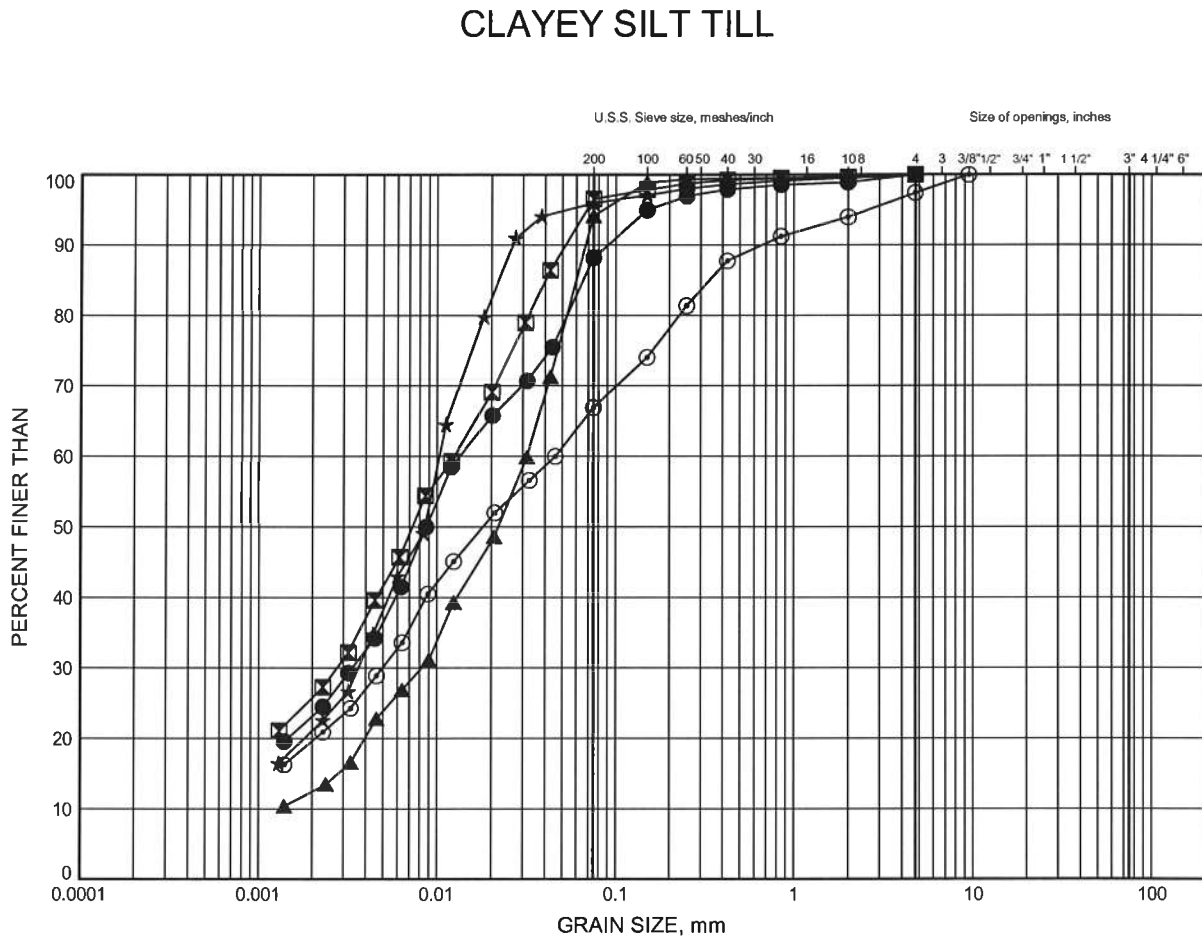
SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	10-01	4.88	258.62
⊠	10-03	10.97	256.03



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

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

FIGURE B4



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

**LEGEND**

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	10-01	9.45	254.05
⊠	10-01	15.54	247.96
▲	10-01	18.59	244.91
★	10-03	7.92	259.08
⊙	10-04	4.88	260.22

GRAIN SIZE DISTRIBUTION - THURBER 9268.GPJ 1/26/11

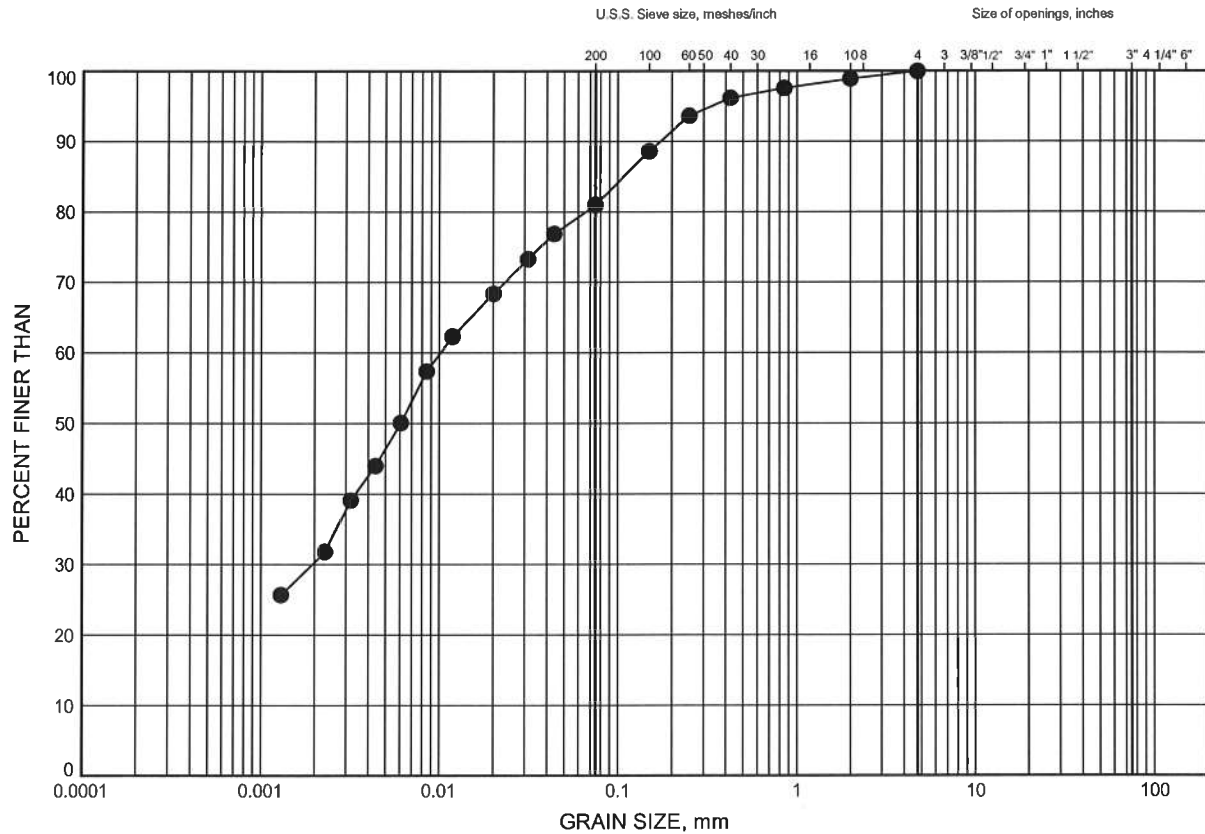
W.P.# .2539-04-00.....  
Prepared By .AN.....  
Checked By .SKP.....



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)
●	10-03	3.35	263.65



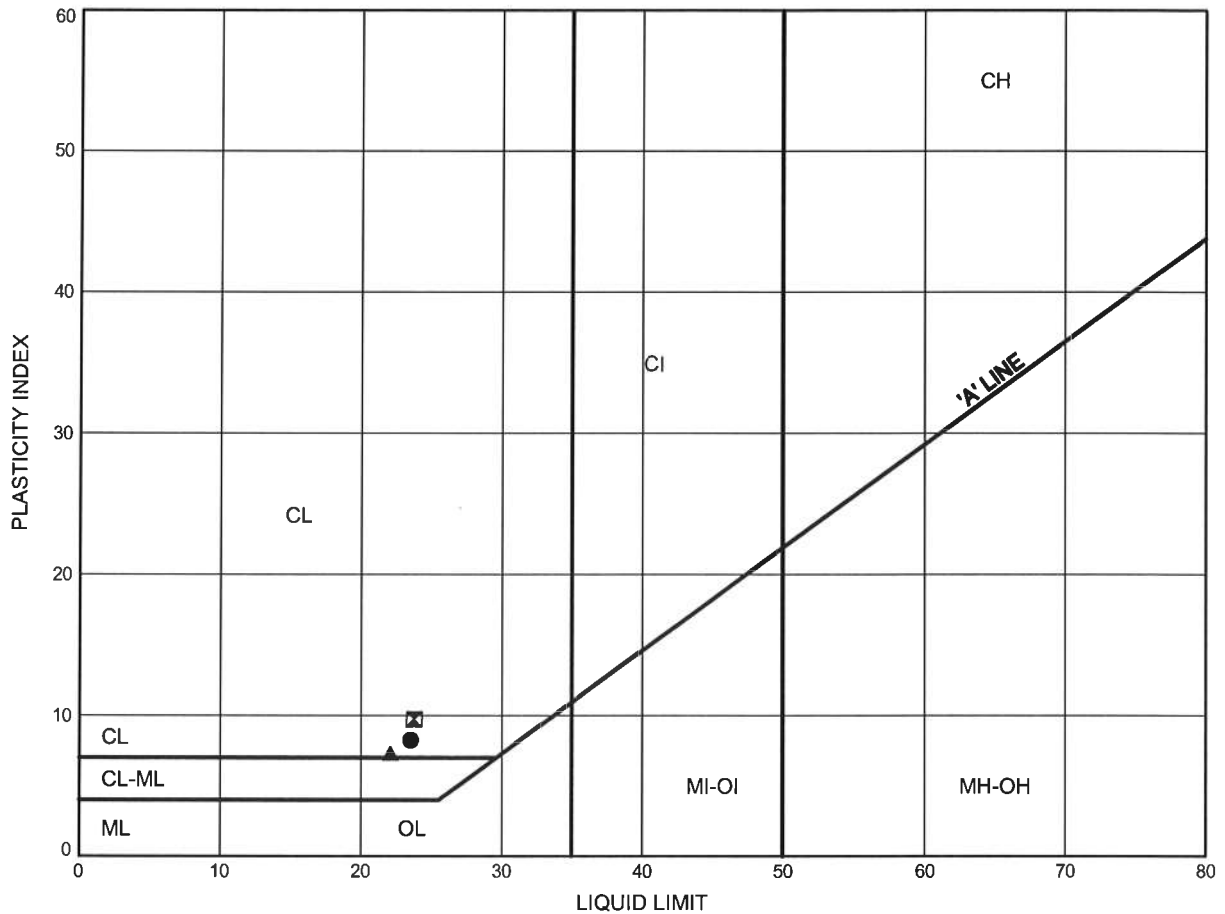
THURBER

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

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

FIGURE B6

**CLAYEY SILT/SILTY CLAY TILL**



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	10-01	9.45	254.05
⊠	10-03	3.35	263.65
▲	10-04	4.88	260.22

Date February 2011  
 Project 2539-04-00



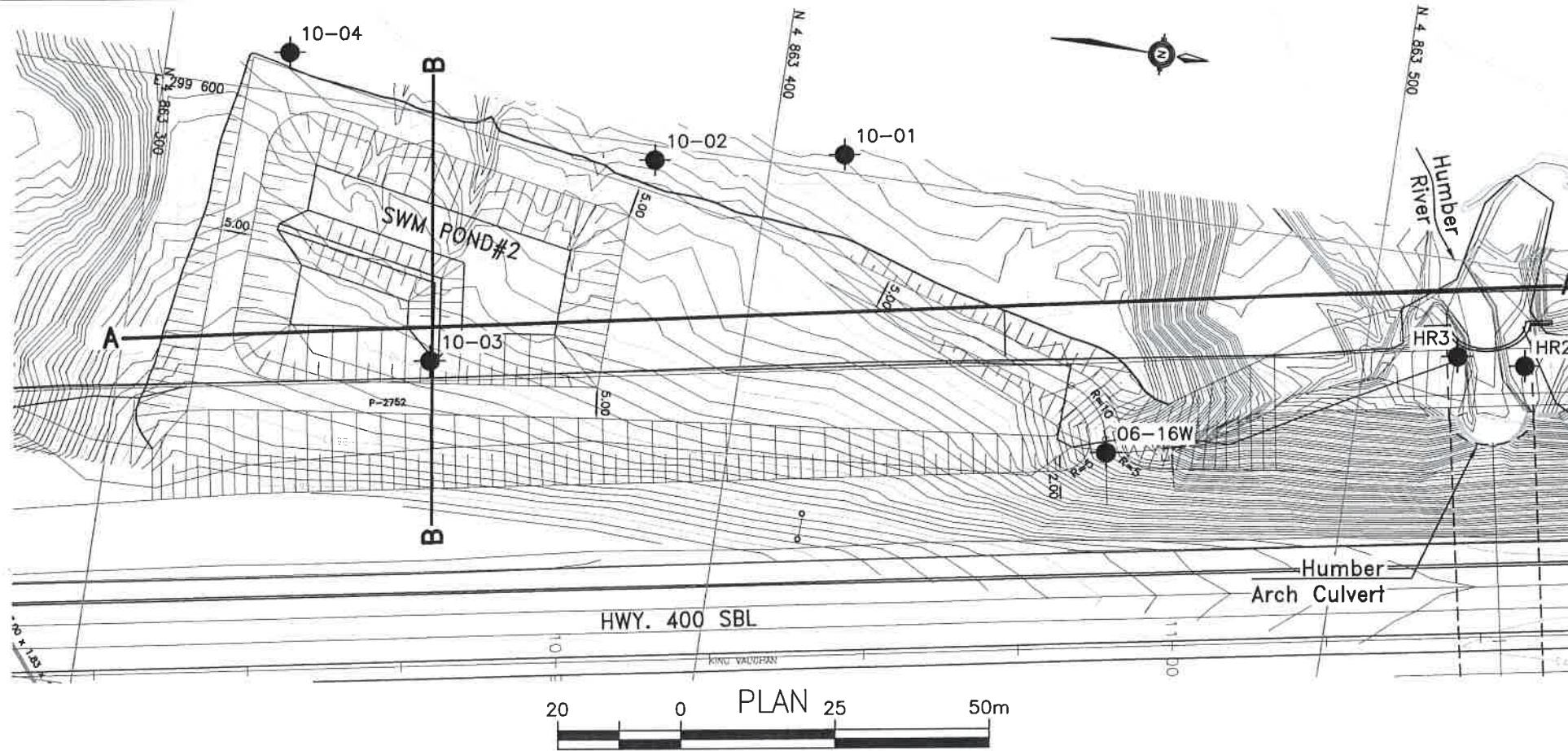
Prep'd AN  
 Chkd. SKP

## **Appendix C**

### **Borehole Locations and Soil Strata Drawings**

**19-92-68**



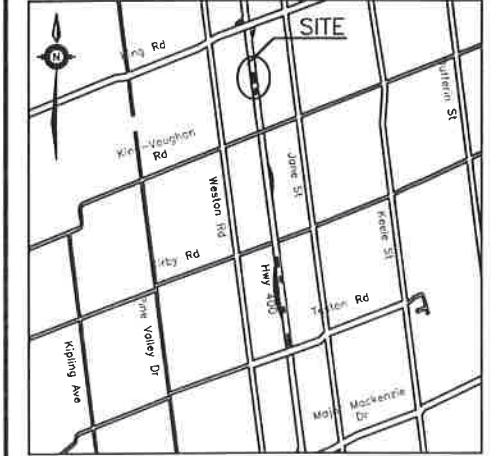


**METRIC**  
DIMENSIONS ARE IN METRES  
AND/OR MILLIMETRES  
UNLESS OTHERWISE SHOWN



CONT No  
WP No 2539-04-00

STORMWATER  
MANAGEMENT POND # 2  
BOREHOLE LOCATIONS AND SOIL STRATA



KEYPLAN

LEGEND

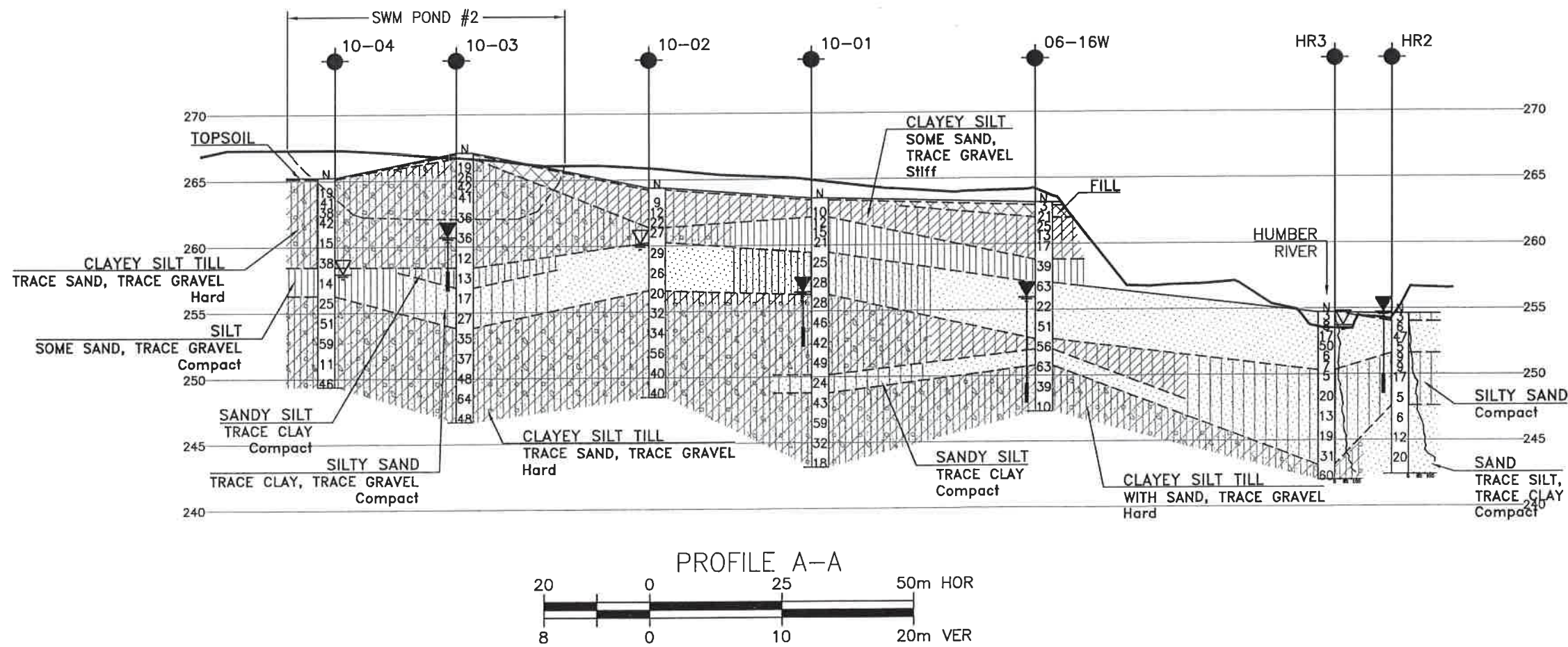
- Borehole
- Borehole and Cone
- N Blows /0.3m (Std Pen Test, 475J/blow)
- CONE Blows /0.3m (60° Cone, 475J/blow)
- PH Pressure, Hydraulic
- Water Level
- Head Artesian Water
- Piezometer
- 90% Rock Quality Designation (RQD)
- A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING
06-16W	263.1	4 863 460.9	299 639.1
10-01	263.5	4 863 411.7	299 597.1
10-02	264.3	4 863 381.3	299 602.3
10-03	267.0	4 863 350.1	299 639.9
10-04	265.1	4 863 319.9	299 593.4
10-05	263.2	4 863 277.2	299 659.2
HR2	254.6	4 863 525.9	299 615.6
HR3	254.7	4 863 514.9	299 615.6

-NOTES-

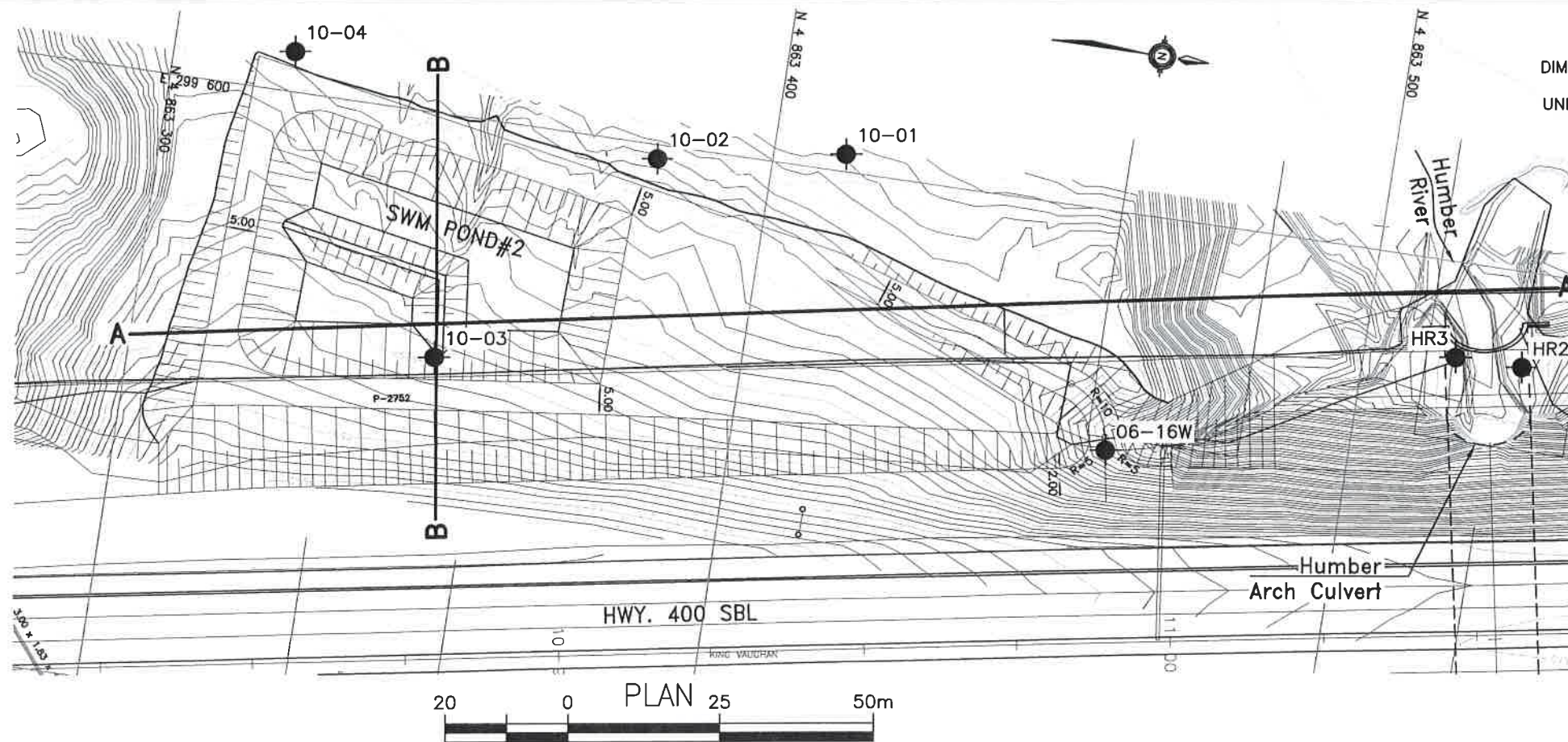
- The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRES No. 30M13-191



REVISIONS	DATE	BY	DESCRIPTION
DESIGN	SKP	CHK	SKP
DRAWN	AN	CHK	SITE
LOAD	STRUCT	DWG	DATE
DATE	MAR. 2012		





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

CONT No  
WP No 2539-04-00

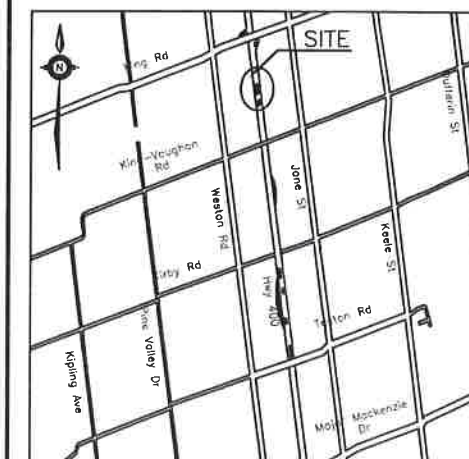


STORMWATER  
MANAGEMENT POND # 2  
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET








**THURBER ENGINEERING LTD.**



## KEYPLAN

### LEGEND

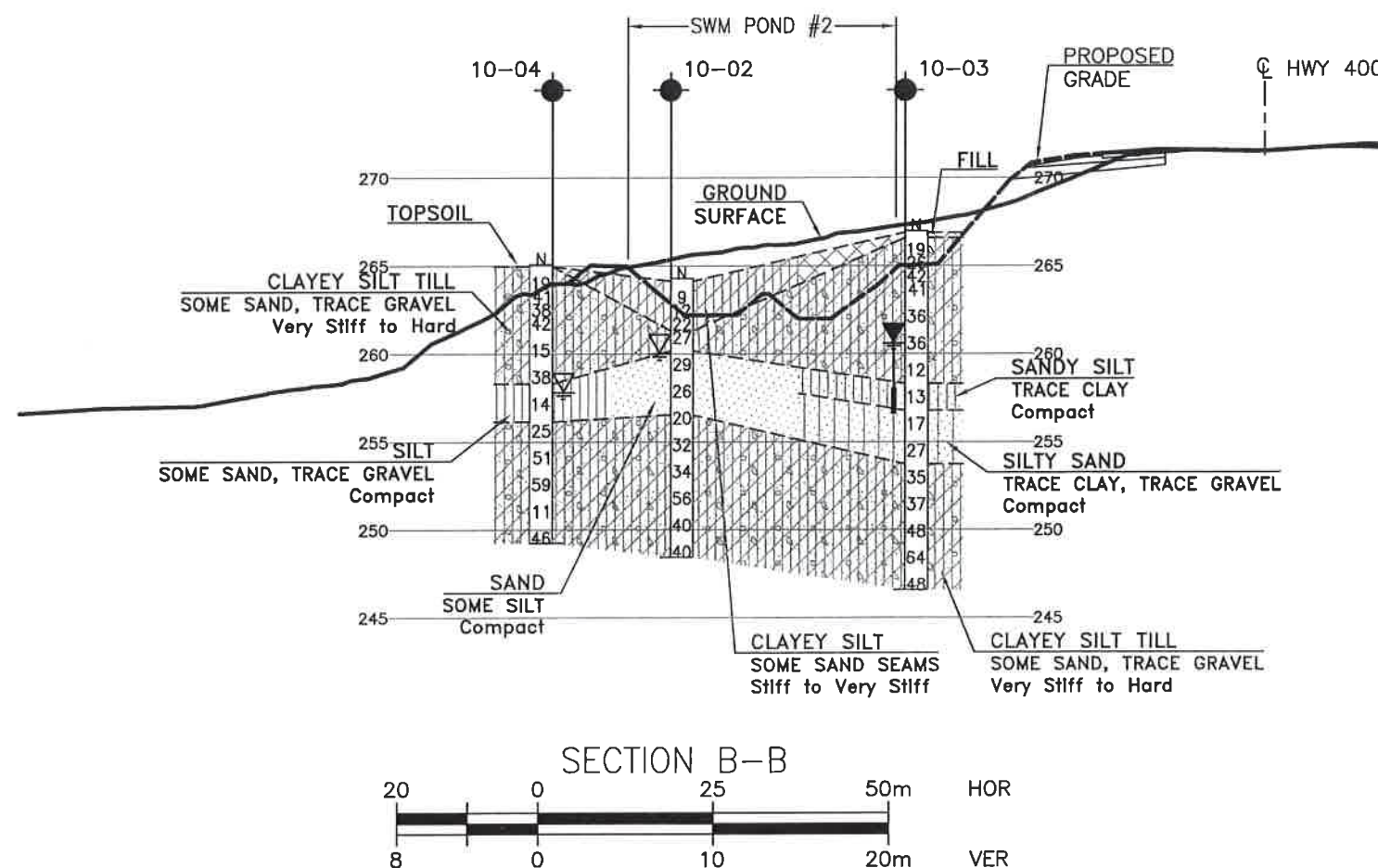
- |   |                                       |
|---|---------------------------------------|
|  | Borehole                              |
|  | Borehole and Cone                     |
| N   | Blows /0.3m (Std Pen Test, 475J/blow) |
| CONE  | Blows /0.3m (60° Cone, 475J/blow)     |
| PH  | Pressure, Hydraulic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

NO	ELEVATION	NORTHING	EASTING
10-02	264.3	4 863 381.3	299 602.3
10-03	267.0	4 863 350.1	299 639.9
10-04	265.1	4 863 319.9	299 593.4

**-NOTES-**

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

GEOCRES No.



REVISIONS									
	DATE	BY						DESCRIPTION	
	DESIGN	SKP	CHK	SKP	CODE			LOAD	DATE MAR. 2012
	DRAWN	AN	CHK		SITE			STRUCT	DWG