

**FOUNDATION INVESTIGATION REPORT  
PROPOSED SEWER PIPE CROSSINGS  
HWY 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: 30M13-196**

**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 locations of the proposed sewer crossings under the Highway 400 right-of-way between Major MacKenzie Drive and King Road. This investigation is part of an on-going project which involves widening of the highway to accommodate additional lanes of traffic. It is understood that the Ministry of Transportation Ontario (MTO) requires the design to accommodate the ultimate 10-lane configuration including one HOV lane in each direction, within the current MTO right-of-way.

The purpose of this investigation was to determine the subsurface conditions near the locations of the sewer crossings in order to provide borehole locations 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 each crossing location 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. (SNC-Lavalin) under MTO Assignment Nos. 2005-E-0036 and 0037.

**2 PROJECT AND SITE DESCRIPTION**

The alignment covered in this report extends along Highway 400 from north of Major Mackenzie Drive northerly to south of the King Road Underpass. The general location of each of the relevant sewer crossings is shown on the key plans on the Borehole Locations and Soil Strata drawings in Appendix C.

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 vicinities of the project areas 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**

Site investigation and field testing for the proposed sewer crossings consisted of drilling and sampling sixteen (16) boreholes, designated as 11T-01, 11T-02, 11T-05, 11T-06, 11T-07, 11T-08 to 11T-18 to depths ranging from 9.6 to 17.4 m below the ground surface. At each of the sewer crossing locations, one borehole was drilled near each end of the proposed pipe as specified in the terms of reference. All boreholes were drilled within the period of October 18, 2011 to December 1, 2011.

All boreholes were drilled during approved lane closure times in the right of way and on the outside shoulders of the northbound and southbound lanes of Highway 400. Lane closures and traffic control were carefully planned for drilling each borehole. Prior to commencement of drilling, utility clearances were obtained for all borehole locations.

The approximate borehole locations are shown on the Borehole Locations and Soil Strata Drawings in Appendix C. The coordinates and elevations of the boreholes are given on these drawings and on the individual Record of Borehole Sheets in Appendix A. The borehole coordinates were surveyed using a Trimble Pathfinder ProXRT differential GPS, and the approximate ground surface elevations were determined using topographic drawings provided by SNC-Lavalin. It is understood that all as-drilled borehole locations will be surveyed by professional surveyors to be arranged by SNC-Lavalin.

Solid stem augers were used to advance the boreholes, and soil samples were obtained at selected intervals using a 50 mm diameter split spoon sampler in conjunction with the Standard Penetration Test (SPT).

Groundwater conditions in the open boreholes were observed throughout the drilling operations. Nine standpipe piezometers were installed at selected locations to permit monitoring of groundwater levels. The piezometers consisted of 19 mm PVC pipes with slotted screens. The locations and completion details of the piezometers are shown in Table A-1 in Appendix A. The borehole completion details are also shown in Table A-1.

A member of Thurber's engineering staff supervised the drilling and sampling operations on a full time basis. The supervisor logged the boreholes, visually examined the recovered soil samples, and transported them 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 returned to the laboratory. At least 25% of the recovered soil samples were subjected to grain size distribution analysis. Selected cohesive soil samples underwent Atterberg Limits tests.

The results of this testing program are shown on the Records of Borehole sheets in Appendix A and on the accompanying figures in Appendix B.

## **5 DESCRIPTION OF SUBSURFACE CONDITIONS**

This section presents a generalized summary of the subsurface conditions encountered at the borehole locations drilled for the proposed sewer crossings. Reference is made to the Record of Borehole sheets in Appendix A. Stratigraphic profiles for each crossing are also presented on the Borehole Locations and Soil Strata Drawings in Appendix C. An overall description of the stratigraphy encountered in the boreholes is given in the following paragraphs. However, the factual data presented in the Record of Borehole Sheets governs any interpretation of the site conditions. It must be recognized that soil conditions may vary between and beyond borehole locations.

In general terms, the soil stratigraphy encountered along this stretch of the highway consists of pavement structure and embankment fill overlying native clayey silt to silty clay till deposits which is underlain by silt and sand till. Occasional sand deposits were also encountered in the boreholes. More detailed descriptions of the individual stratum are presented below.

### **5.1 Pavement Structure**

Pavement structure consisting of asphalt overlying granular fill materials was encountered in Boreholes 11T-02, 11T-06, 11T-08, 11T-09, 11T-11, 11T-14, and 11T-16. Asphalt was present at ground surface in boreholes drilled on the median shoulder of the travelled portion of the highway. The asphalt thickness ranged from 150 mm to 225 mm. The listed boreholes were drilled on the median shoulder, therefore the asphalt thicknesses do not necessarily represent the conditions under the travelled lanes of the highway.

The granular fill consisted of sand and gravel and was found to range between 1.0 m and 1.5 m in thickness, with base elevations varying between 229.7 and 271.2 m. These soils were in a compact state as indicated by SPT 'N' values ranging from 11 to 29 blows per 0.3m of penetration. The moisture contents ranged from 2% to 12%.

The thickness of the pavement structure may vary between and beyond the borehole locations.

### **5.2 Topsoil**

Dark brown to black topsoil was present at most of the boreholes drilled in the highway right of way. Topsoil was encountered in Boreholes 11T-05, 11T-07, 11T-10, 11T-12, 11T-13, 11T-15 and 11T-17. The topsoil thickness ranged from 50 mm to 225 mm. The thickness of the topsoil may vary between and beyond the borehole locations.

### **5.3 Fill**

Fill was encountered in Borehole 11T-01 from the surface, 11T-02, 11T-09 and 11T-16 below the pavement structure and 11T-07 below the topsoil. The fill consisted of clayey silt

to occasional silty clay with varying proportions of sand, trace gravel, trace roots and was brown in colour. The thickness of the fill ranged from 0.6 m to 4.4 m, with base elevations between 227.8 and 248.2 m.

Recorded SPT N-values in the cohesive fill ranged from 7 to 13 blows per 0.3 m penetration indicating a firm to stiff consistency.

The natural moisture contents of the fill samples obtained generally ranged from approximately 10% to 27%.

Grain size distribution curves for fill samples tested are presented on the Record of Borehole sheets and on Figure B1 of Appendix B. Atterberg Limit test results are presented on Figure B13 of Appendix B.

The results of the laboratory gradation and Atterberg Limits tests are summarized as follows:

<b>Soil Particles</b>	<b>(%)</b>
Gravel	0 to 2
Sand	20 to 25
Silt	50 to 56
Clay	19 to 27

<b>Index Property</b>	<b>(%)</b>
Liquid Limit	26 to 27
Plasticity Index	11 to 12

The above results show that the clayey silt fill is of low plasticity with group symbol of CL.

#### **5.4 Clayey Silt to Silty Clay Till**

Clayey silt to silty clay till was encountered in all of the boreholes except for 11T-05, 11T-13, 11T-14, 11T-15 and 11T-16. The cohesive till consisted of brown clayey silt to silty clay with some sand and trace gravel and was encountered below the pavement, surficial soils and fill in most of the boreholes. The till deposits were encountered at depths ranging from 0.1 m to 5.6 m, and were observed to be 3.6 m to 9.0 m thick where fully penetrated with base elevations varying between 219.4 and 245.2 m. Boreholes 11T-08, 11T-09, 11T-11 and 11T-12 were terminated within the till and a minimum thickness range from 5.7 to 11.1 m was observed.

Based on SPT N-values ranging from 8 blows for 0.3 m of penetration to greater than 100 blows for less than 0.3 m penetration, the clayey silt to silty clay till is described as stiff to hard, but typically very stiff to hard.

The natural moisture contents of the samples recovered from cohesive till deposits ranged from 5% to 32%, but typically ranged between 10% and 20%.

Grain size distribution results for the cohesive till samples tested are presented on the Record of Borehole sheets and on Figures B2 to B7 of Appendix B. Atterberg Limit test results are presented on Figures B14 to B16 of Appendix B.

The results of laboratory gradation and Atterberg Limits tests are summarized as follows:

<b>Soil Particles</b>	<b>(%)</b>
Gravel	0 to 2
Sand	3 to 35
Silt	33 to 72
Clay	14 to 57

<b>Index Property</b>	<b>(%)</b>
Liquid Limit	19 to 33
Plasticity Index	8 to 19

The above results show that the clayey silt/silty clay till has low plasticity with a group symbol of CL. A sample at a depth of 2.6 m in Borehole 11T-02 consists of a silty clay till of very high plasticity and group symbol of CH.

Occasional cobbles were encountered in the glacial till in the boreholes. Glacial tills inherently contain cobbles and boulders.

### **5.5 Sand and Silt to Sandy Silt Till**

Sand and silt to sandy silt till was encountered below and within the clayey silt to silty clay till deposits in all boreholes except for 11T-01, 11T-08, 11T-09, 11T-11, 11T-12, 11T-14, and 11T-15. The cohesionless till consisted of brown sand and silt to sandy silt, trace to some clay, and trace gravel with occasional sand seams. The cohesionless till deposits were encountered at depths ranging from 3.7 to 10.4 m, and were observed to be 3.5 m to 4.6 m thick where fully penetrated with base elevations varying between 231.3 and 241.7 m. Boreholes 11T-02, 11T-05, 11T-07, 11T-10, 11T-13, 11T-16, 11T-17 and 11T-18 were terminated within the till and a minimum thickness range from 0.7 to 5.2 m was observed.

The sandy silt till is described as compact to very dense, based on SPT N-values ranging from 16 blows per 0.3 m penetration to greater than 100 blows per 0.3 m penetration. In general, this till deposit is in a dense to very dense state.

The natural moisture contents of the samples recovered from the sand and silt till deposits ranged from 5% to 22%.

Grain size distribution curves for the till samples tested are presented on the Record of Borehole sheets and on Figures B8 to B9 of Appendix B.

The results of laboratory gradation and Atterberg Limits tests are summarized as follows:

<b>Soil Particles</b>	<b>(%)</b>
Gravel	0 to 1
Sand	12 to 61
Silt	28 to 82
Clay	3 to 14

Occasional cobbles were encountered in the cohesionless till in the boreholes. Cohesionless tills inherently contain cobbles and boulders.

### **5.6 Silty Sand to Sandy Silt**

In Boreholes 11T-01, 11T-05, 11T-13, 11T-14 and 11T-15, cohesionless deposits ranging in composition from sand with some silt to silt, some sand were encountered within or above the glacial till layers. These deposits were encountered at depths from 0.1 m to 10.7 m below the ground surface and extended to depths ranging from 6.1 m up to the full depth of the boreholes at 15.8 m. The base of these deposits were at elevations 216.1 to 258.4 m.

The SPT N-values recorded in the cohesionless deposits ranged from 5 to greater than 100 blows for 0.3 m of penetration, indicating that the deposits are loose to very dense; with a typically compact condition.

These deposits were observed to be moist to wet, with natural moisture contents of recovered samples ranging from 4% to 23% and typically greater than 15%.

Grain size distribution curves for samples tested from the sand deposits are presented on the Record of Borehole sheets and on Figure B10 of Appendix B.

The results of the laboratory gradation tests are summarized as follows:

<b>Soil Particles</b>	<b>(%)</b>
Gravel	0
Sand	11 to 76
Silt	21 to 85
Clay	2 to 22

### **5.7 Silty Clay and Clayey Silt**

Silty clay and clayey silt were encountered in the Boreholes 11T-05, 11T-13, 11T-14, 11T-15, 11T-16, 11T-17 and 11T-18. The silty clay and clayey silt deposits were encountered at depths ranging from ground surface to 7.2 m, and were observed to be 0.4 m to 6.0 m thick. The base elevation of the deposit ranged from 223.3 m to 261.3 m.

Based on SPT N-values ranging from 6 blows for 0.3 m of penetration to 24 blows per 0.3 m penetration, the silty clay and clayey silt is described as firm to very stiff.

The natural moisture contents of the samples recovered from the silty clay and clayey silt deposits ranged from 12% to 33%.



Grain size distribution curves for the silt and clay samples tested are presented on the Record of Borehole sheets and on Figures B11 to B12 of Appendix B. Atterberg Limit test results are presented on Figure B18 of Appendix B.

The results of laboratory gradation and Atterberg Limits tests are summarized as follows:

<b>Soil Particles</b>	<b>(%)</b>
Gravel	0 to 4
Sand	1 to 28
Silt	23 to 80
Clay	17 to 45

<b>Index Property</b>	<b>(%)</b>
Liquid Limit	19 to 31
Plasticity Index	6 to 15

The above results show that the silty clay to clayey silt is of low plasticity with a group symbol of CL.

## 5.8 Water Levels

The groundwater level was observed in the boreholes during and upon completion of drilling. Nine standpipe piezometers were installed to monitor water levels after completion of drilling. The water levels measured in the piezometers and open boreholes upon completion of drilling are summarized in Table 5.1.

**Table 5.1 – Measured Groundwater Levels**

<b>Station</b>	<b>Borehole</b>	<b>Date</b>	<b>Water Level (m)</b>	
			<b>Depth</b>	<b>Elevation</b>
18+438	11T-01	December 9, 2011	10.5	219.6
	11T-02	November 7, 2011	5.8	225.6
20+885	11T-05	December 9, 2011	6.2	231.0
21+286	11T-07	December 9, 2011	-	-
21+825	11T-09	November 9, 2011	6.9	244.9
	11T-10	December 9, 2011	5.8	243.1
23+775	11T-12	December 9, 2011	3.2	271.1
10+999	11T-13	December 9, 2011	7.8	257.6
20+688	11T-15	December 9, 2011	4.5	227.5
10+079 (ramp)	11T-17	December 9, 2011	10.4	236.9
	11T-18	December 9, 2011	10.9	234.4

The above table indicates that the groundwater levels along this stretch of Highway 400 range from Elevations 219.6 m to 271.1 m corresponding to depths between 3.2 and 10.9 m.

The above values are short-term readings and seasonal fluctuations of the groundwater level are to be expected. In particular, the groundwater level may be at a higher elevation after the spring snowmelt or after periods of heavy rainfall.

## **6 MISCELLANEOUS**

The drilling and sampling equipment was supplied and operated by DBW Drilling of Ajax, Ontario, Kodiak Environmental Ltd, of Oakville, Ontario and Walker Drilling Ltd. of Utopia, Ontario. Traffic control was provided by Barricade Traffic Services of Concord, Ontario. The field work was supervised on a full time basis by Mr. Ryan Kromer, Mr. Adam Schneider, Mr. Jason Mei, Mr. Stephane Loranger and Mr. Mubashar Tahir of Thurber Engineering Ltd. Laboratory testing was carried out at Thurber's Laboratory in Oakville, Ontario.

Supervision of the field program was conducted by Mr. Lukasz Gilarski, E.I.T. Interpretation of the field data and preparation of the investigation report was conducted by Mr. Lukasz Gilarski, E.I.T. and Dr. Sydney Pang, P.Eng.

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

THURBER ENGINEERING LTD.

Lukasz Gilarski, E.I.T.  
Project Manager



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



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

## **Appendix A**

### **Record of Borehole Sheets**

## 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

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


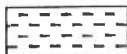



 Water Level  
 Shear Strength Determination by Pocket Penetrometer

- (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 (MPa) (psi)	Field Estimation of Hardness*	
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.
TERMS		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 11T-01

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 856 427.7 E 300 851.1 ORIGINATED BY JM  
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2011.11.10 - 2011.11.10 CHECKED BY LPG

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>	
231.0												
0.0	Clayey SILT, some sand, trace gravel, trace roots Stiff Brown Moist (FILL)		1	AS			231					
			1	SS	12		230					
229.6												
1.4	Clayey SILT, with sand Stiff Brown Moist (FILL)		2	SS	12		229					0 23 50 27
228.7												
2.3	Clayey SILT, with sand, trace gravel Very Stiff to Hard Brown Moist (TILL)		3	SS	20		228					
			4	SS	39							0 29 49 21
							227					
			5	SS	100/ 0.275		226					
			6	SS	100		225					1 24 54 21
							224					
			7	SS	71		223					
222.4												
8.6	Silty CLAY, some sand, trace gravel Hard Brown Moist (TILL)		8	SS	52		222					1 13 59 28

Continued Next Page

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

20  
15 10 5  
(%) STRAIN AT FAILURE

ONTMT4S 9268.GPJ 5/10/12



RECORD OF BOREHOLE No 11T-01

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 856 427.7 E 300 851.1 ORIGINATED BY JM  
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
DATUM Geodetic DATE 2011.11.10 - 2011.11.10 CHECKED BY LPG

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			20 40 60 80 100	20 40 60 80 100					
	Continued From Previous Page													
220.3							221							
10.7														
220.0	SAND, trace silt		9	SS	65/									
220.0	Very Dense													
11.0	Brown				0.150									
11.0	Moist													
	END OF BOREHOLE AT 11.0m. BOREHOLE OPEN TO 11.0m AND DRY. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.  WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Dec09/11 10.5 220.5													

ONTMT4S 9268.GPJ 5/10/12

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

20  
15 5  
10 (%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No 11T-02

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 856 430.7 E 300 875.7 ORIGINATED BY JM  
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
DATUM Geodetic DATE 2011.11.07 - 2011.11.07 CHECKED BY LPG

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	20 40 60 80 100	20 40 60 80 100		
231.3	0.0	ASPHALT: (150mm)										
0.2	SAND and GRAVEL Compact Brown Moist (FILL)		1	AS			231					
			1	SS	17		230					
229.6	1.7	Silty CLAY, occasional sand, occasional gravel Firm Grey Moist (FILL)	2	SS	8		229					
229.0	2.3	Silty CLAY, some sand, trace gravel Firm to Stiff Brown Moist (TILL)	3	SS	9		228					0 10 33 58
			4	SS	8		227					
227.2	4.1	Clayey SILT, with sand, trace gravel Stiff Brown Moist (TILL)	5	SS	11		226					
225.7	5.6	Becoming hard	6	SS	53		225					1 26 53 20
			7	SS	100/ 0.225		224					
222.9	8.4	Silty CLAY, some sand, trace gravel Hard Brown Moist (TILL)	8	SS	73		223					
							222					0 15 54 31

Continued Next Page

+<sup>3</sup> × 3<sup>3</sup> Numbers refer to  
Sensitivity 20  
15 5  
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11T-02

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 856 430.7 E 300 875.7 ORIGINATED BY JM  
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
DATUM Geodetic DATE 2011.11.07 - 2011.11.07 CHECKED BY LPG

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 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
	Continued From Previous Page													
221.1														
10.2	SAND and SILT, trace clay Very Dense Brown						221							
220.4	Moist (TILL)		9	SS	50/									0 59 38 3
10.9	END OF BOREHOLE AT 10.9m AND WATER LEVEL AT 5.8m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG FROM 10.9m TO 1.5m, CUTTINGS FROM 1.5m TO 0.15m THEN ASPHALT TO SURFACE.				0.075									

ONTMT4S 9268.GPJ 5/10/12

# RECORD OF BOREHOLE No 11T-05

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 858 839.4 E 300 428.7 ORIGINATED BY RK  
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2011.10.19 - 2011.10.19 CHECKED BY LPG

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			w <sub>p</sub>	w	w <sub>L</sub>								
								○ UNCONFINED      + FIELD VANE								WATER CONTENT (%)					
								● QUICK TRIAXIAL      × LAB VANE													
235.4							20	40	60	80	100	20	40	60		GR	SA	SI	CL		
0.0		TOPSOIL, some sand, some rootlets: (50mm) Dark Brown Moist		1	SS	9									○						
		Sandy SILT, some clay, trace rootlets Loose to Compact Brown Wet		2	SS	10									○						
				3	SS	8									10			0	34	51	15
				4	SS	28									○						
232.5		Some gravel																			
3.0		Clayey SILT		5	SS	23									○						
															○						
231.7				6	SS	29									○						
3.7																					
		Becoming grey Wet		7	SS	5									○						
229.3																					
6.1		SAND and SILT, trace clay Dense Grey Wet (TILL)		8	SS	34									○						
228.2																					
7.2		Sandy SILT, trace gravel, trace clay, occasional sand seam Very Dense Grey Wet (TILL)		9	SS	100									○						

Continued Next Page

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

20  
15  
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11T-05

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 858 839.4 E 300 428.7 ORIGINATED BY RK  
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2011.10.19 - 2011.10.19 CHECKED BY LPG

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	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
	Continued From Previous Page																
224.2			11	SS	45		225									0 26 65 9	
11.3	END OF BOREHOLE AT 11.3m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.  WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Dec09/11 6.2 229.2																

ONTMT4S 9268.GPJ 5/10/12

# RECORD OF BOREHOLE No 11T-06

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 858 845.2 E 300 463.2 ORIGINATED BY JM  
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2011.11.08 - 2011.11.08 CHECKED BY LPG

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	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
241.5	ASPHALT: (200mm)													
0.0														
0.2	SAND and GRAVEL Compact Brown Moist (FILL)		1	AS			241							
			1	SS	16									
240.2														
1.3	Clayey SILT, some sand, trace gravel Very Stiff to Hard Brown Moist (TILL)		2	SS	17		240							0 20 55 24
			3	SS	25		239							
			4	SS	48		238							
			5	SS	64		237							1 14 63 22
235.9														
5.6	SILT, some sand, trace gravel, trace clay Dense to Very Dense Brown Moist (TILL)		6	SS	48		236							
							235							
	Becoming wet													
			7	SS	61		234							0 12 82 6
							233							
			8	SS	47		232							

Continued Next Page

+ 3, x 3 Numbers refer to  
Sensitivity

20  
15 5  
10 (%) STRAIN AT FAILURE

ONTMT4S 9268.GPJ 5/10/12

RECORD OF BOREHOLE No 11T-06

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 858 845.2 E 300 463.2 ORIGINATED BY JM  
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
DATUM Geodetic DATE 2011.11.08 - 2011.11.08 CHECKED BY LPG

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		
	Continued From Previous Page							SHEAR STRENGTH kPa						
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE						
								WATER CONTENT (%)						
								20	40	60	80	100		
231.3														
10.2	Clayey SILT, with sand, trace gravel Hard Grey Moist (TILL)						231							
			9	SS	71									2 21 53 24
230.2														
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN TO 11.3m AND DRY. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG FROM 11.3m TO 1.5m, CUTTINGS FROM 1.5m TO 0.2m THEN ASPHALT TO SURFACE.													

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

20  
15 5  
10 (%) STRAIN AT FAILURE





# RECORD OF BOREHOLE No 11T-07

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 859 240.4 E 300 365.1 ORIGINATED BY JM  
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2011.11.10 - 2011.11.10 CHECKED BY LPG

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 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					WATER CONTENT (%) w <sub>p</sub> w w <sub>L</sub>				
Continued From Previous Page																	
238.1			9	SS	54		239										
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN TO 11.3m AND DRY. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.  WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m)																

ONTMT4S 9268.GPJ 5/10/12

# RECORD OF BOREHOLE No 11T-08

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 859 246.8 E 300 394.7 ORIGINATED BY JM  
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2011.11.09 - 2011.11.09 CHECKED BY LPG

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 (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)		
248.5							20	40	60	80	100								
0.0	ASPHALT: (225mm)																		
0.2	SAND and GRAVEL Compact Brown Moist (FILL)		1	AS															
			1	SS	29														
247.0																			
1.4	Clayey SILT, some sand, trace gravel Hard Grey Moist (TILL)		2	SS	32											2 18 55 25			
			3	SS	45														
			4	SS	55														
			5	SS	77											0 12 66 22			
			6	SS	43											1 30 45 23			
			7	SS	100/ 0.225														
			8	SS	90														
							</												

Continued Next Page

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

20  
15 5  
10 (%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No 11T-08

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 859 246.8 E 300 394.7 ORIGINATED BY JM  
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2011.11.09 - 2011.11.09 CHECKED BY LPG

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					
	Continued From Previous Page												
237.2	Becoming grey		9	SS	51	238							0 35 45 20
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN TO 11.3m AND DRY. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS FROM 11.3m TO 1.5m, CUTTINGS FROM 1.5m TO 0.2m THEN ASPHALT TO SURFACE.												

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

20  
15  
10

(%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No 11T-09

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 859 767.2 E 300 305.7 ORIGINATED BY JM  
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
DATUM Geodetic DATE 2011.11.09 - 2011.11.09 CHECKED BY LPG

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>	
251.2												
0.0	ASPHALT: (225mm)											
0.2	SAND and GRAVEL Compact Brown Moist (FILL)		1	AS			251					
250.0			1	SS	16							
1.2	Clayey SILT, with sand, trace gravel Firm to Stiff Brown Moist (FILL)		2	SS	7		250					
			3	SS	13		249					
			4	SS	10		248					
			5	SS	11		247					
245.6							246					
5.6	Silty CLAY, with sand, trace gravel, occasional roots Very Stiff to Hard Grey/Brown Moist (TILL)		6	SS	20		245					
			7	SS	35		244					
	Becoming grey		8	SS	34		243					
							242					

Continued Next Page

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

20  
15  
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11T-09

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 859 767.2 E 300 305.7 ORIGINATED BY JM  
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
DATUM Geodetic DATE 2011.11.09 - 2011.11.09 CHECKED BY LPG

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 (%)					
	Continued From Previous Page													
239.9			9	SS	42		241							1 24 44 31
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN TO 11.3m AND WATER LEVEL AT 6.9m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS FROM 11.3m TO 1.5m, CUTTINGS FROM 1.5m TO 0.2m THEN ASPHALT TO SURFACE.						240							

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

20  
15  
10  
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11T-10

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 859 775.6 E 300 336.5 ORIGINATED BY RK  
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
DATUM Geodetic DATE 2011.10.18 - 2011.10.18 CHECKED BY LPG

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT Y kN/m <sup>3</sup>	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		
249.0												
0.0												
0.1	TOPSOIL, clayey, some rootlets: (100mm) Black Moist		1	AS								
	Clayey SILT, with sand, trace gravel, occasional cobbles Very Stiff to Hard Brown to Greyish Brown Moist (TILL)		2	SS	17							
			3	SS	54							
			4	SS	46							
			5	SS	65							
			6	SS	74							
245.3												
3.7	Sandy SILT, trace clay, trace gravel Very Dense Brown Moist (TILL)		7	SS	73							
	Becoming wet		8	SS	65							
			9	SS	53							
241.8												
7.2	Clayey SILT, with sand, trace gravel Hard Brown Moist (TILL)		10	SS	32							
			11	SS	37							

Continued Next Page

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

RECORD OF BOREHOLE No 11T-10

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 859 775.6 E 300 336.5 ORIGINATED BY RK  
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
DATUM Geodetic DATE 2011.10.16 - 2011.10.18 CHECKED BY LPG

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			20 40 60 80 100	20 40 60 80 100					
238.8	Continued From Previous Page													
10.2	Sandy SILT, some sand, trace gravel Dense Grey Moist (TILL)		12	SS	39									1 16 72 11
237.7														
11.3	END OF BOREHOLE AT 11.3m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.  WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Dec09/11 5.8 243.2													

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

20  
15 5  
10  
(%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No 11T-11

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 861 694.3 E 299 971.7 ORIGINATED BY JM  
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2011.11.07 - 2011.11.07 CHECKED BY LPG

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 ○ UNCONFINED    + FIELD VANE ● QUICK TRIAXIAL    x LAB VANE						
272.4								20 40 60 80 100						
0.0	ASPHALT: (225mm)													
0.2	SAND and GRAVEL Compact Brown Moist (FILL)		1	AS			272							
			1	SS	11									
271.1														
1.3	Clayey SILT, with sand, trace gravel Firm Brown Moist (TILL)		2	SS	5		271							1 22 63 14
			3	SS	5		270							
							269							
268.3														
4.1	Silty CLAY, some sand, trace gravel Very Stiff to Hard Brown Moist (TILL)		4	SS	25		268							2 20 47 31
							267							
	Becoming grey		5	SS	29		266							
			6	SS	32		265							1 13 46 40
							264							
			7	SS	33		263							

Continued Next Page

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

20  
15  
10

(%) STRAIN AT FAILURE



# RECORD OF BOREHOLE No 11T-11

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 861 694.3 E 299 971.7 ORIGINATED BY JM  
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2011.11.07 - 2011.11.07 CHECKED BY LPG

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					
	Continued From Previous Page												
261.1	Very Stiff		8	SS	16	262							0 35 40 25
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN TO 11.3m AND DRY. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS FROM 11.3m TO 1.5m, CUTTINGS FROM 1.5m TO 0.2m THEN ASPHALT TO SURFACE.												

ONTMT4S 9268.GPJ 5/10/12

RECORD OF BOREHOLE No 11T-12

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 661 698.4 E 300 004.5 ORIGINATED BY MAT  
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
DATUM Geodetic DATE 2011.10.21 - 2011.10.21 CHECKED BY LPG

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 (%)	
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE						W <sub>p</sub>	W
274.1								20 40 60 80 100								
0.0	TOPSOIL: (150mm)															
0.2	Silty CLAY, trace to some sand Very Stiff to Hard Brown Moist (TILL)		1	SS	6											
			2	SS	36									0 3 61 35		
			3	SS	31											
			4	SS	55											
			5	SS	24									0 18 52 29		
			6	SS	21											
			7	SS	17											
			8	SS	23									0 22 59 19		
			9	SS	24											
			10	SS	32									0 15 47 37		

Continued Next Page

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

20  
15  
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11T-12										2 OF 2		METRIC	
W.P. 2539-04-00		LOCATION N 4 861 698.4 E 300 004.5				ORIGINATED BY MAT							
HWY 400		BOREHOLE TYPE Solid Stem Augers				COMPILED BY AN							
DATUM Geodetic		DATE 2011.10.21 - 2011.10.21				CHECKED BY LPG							
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT w <sub>p</sub> — w — w <sub>L</sub>	WATER CONTENT (%) 20 40 60	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								
	Continued From Previous Page												
262.9			11	SS	46		264						
11.3	END OF BOREHOLE AT 11.3m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.  WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Dec09/11 3.2 270.9						263						

ONTMT4S 9268.GPJ 5/10/12

# RECORD OF BOREHOLE No 11T-13

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 661 461.0 E 299 636.6 ORIGINATED BY SLL  
 HWY 400 BOREHOLE TYPE Tripod/NW Casing COMPILED BY AN  
 DATUM Geodetic DATE 2011.12.01 - 2011.12.02 CHECKED BY LPG

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 (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL	x LAB VANE				
263.3							20	40	60	80	100				
0.0	TOPSOIL, with roots and rootlets														
0.2	Black Moist (225mm)														
	Silty CLAY, with sand, trace gravel, with roots and rootlets Stiff to Very Stiff Brown Moist to Wet		1	SS	14										
			2	SS	16										4 28 23 45
			3	SS	11										
			4	SS	13										
259.2															
4.1	SAND, some silt, trace gravel Dense to Very Dense Brown Moist		5	SS	34										
			6	SS	59										
256.3															
7.0	Silty SAND, some clay Dense to Very Dense Brown Moist (TILL)		7	SS	44										
			8	SS	20										0 61 28 11
			9	SS	51										
253.7															
9.6	END OF BOREHOLE AT 9.6m. Piezometer installation consists of														

Continued Next Page

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

20  
15  
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11T-13

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 861 461.0 E 299 636.6 ORIGINATED BY SLL  
HWY 400 BOREHOLE TYPE Tripod/NW Casing COMPILED BY AN  
DATUM Geodetic DATE 2011.12.01 - 2011.12.02 CHECKED BY LPG

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 (%)			
	Continued From Previous Page												
	19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.												
	WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Dec09/11 7.8 255.3												

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# RECORD OF BOREHOLE No 11T-14

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 863 471.4 E 299 667.6 ORIGINATED BY JM  
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2011.11.07 - 2011.11.07 CHECKED BY LPG

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT		NATURAL MOISTURE CONTENT		LIQUID LIMIT		UNIT WEIGHT  kN/m <sup>3</sup>	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		w <sub>p</sub>	w	w <sub>L</sub>	WATER CONTENT (%)					
								○ UNCONFINED	+ FIELD VANE				● QUICK TRIAXIAL	× LAB VANE				
								20	40				60	80	100			20
267.7	0.0	ASPHALT: (200mm)															GR SA SI CL	
0.2		SAND and GRAVEL Compact Brown Moist (FILL)	1	AS			267											
266.5			1	SS	16													
1.2		Silty CLAY, with sand, trace gravel Very Stiff Brown Moist	2	SS	16		266										1 23 44 32	
			3	SS	18		265											
			4	SS	17		264										1 22 57 19	
			5	SS	14		263											
			6	SS	6		262										0 24 52 25	
260.5		Firm					261											
7.2		SAND, some silt to silty, trace clay Compact to Dense Brown Moist	7	SS	33		260											
			8	SS	30		259										0 76 21 2	
							258											

Continued Next Page

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

RECORD OF BOREHOLE No 11T-14

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 863 471.4 E 299 667.6 ORIGINATED BY JM  
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
DATUM Geodetic DATE 2011.11.07 - 2011.11.07 CHECKED BY LPG

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					W <sub>p</sub> — W — W <sub>L</sub>					
						20	40	60	80	100	20	40	60			
	Continued From Previous Page															
256.4			9	SS	28											
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE OPEN TO 11.3m AND DRY. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS FROM 11.3m TO 1.5m, CUTTINGS FROM 1.5m TO 0.15m THEN ASPHALT TO SURFACE.															

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

20  
15 5  
10 (%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No 11T-15

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 858 655.7 E 300 456.6 ORIGINATED BY RK  
 HWY 400 BOREHOLE TYPE Solid Stem Augers/Coring COMPILED BY AN  
 DATUM Geodetic DATE 2011.10.19 - 2011.10.19 CHECKED BY LPG

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 (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL						× LAB VANE
								WATER CONTENT (%)								
232.6						20	40	60	80	100	20	40	60		GR SA SI CL	
0.0	TOPSOIL, clayey Black Moist (50mm)		1	SS	8											
	Clayey SILT, some sand seams, trace gravel Firm Dark Brown Moist		2	SS	8											
231.2																
1.4	SAND and SILT, trace clay Compact Light Brown Moist		3	SS	16											
			4	SS	17										0 46 50 4	
229.7																
2.9	SILT, trace to some sand, trace clay Compact to Dense Light Brown to Brown Moist to Wet		5	SS	25											
			6	SS	41											
			7	SS	45										0 11 85 4	
226.5	Becoming grey		8	SS	30											
225.4	Silty CLAY, trace sand Very Stiff Grey Moist		9	SS	23										0 1 61 37	
223.9	SILT, trace to some sand, trace clay Loose Grey Wet		10	SS	2											
8.7																

Continued Next Page

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

20  
15 5  
10 (%) STRAIN AT FAILURE

ONTMT4S 9268.GPJ 5/10/12



# RECORD OF BOREHOLE No 11T-15

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 858 655.7 E 300 456.6 ORIGINATED BY RK  
 HWY 400 BOREHOLE TYPE Solid Stem Augers/Coring COMPILED BY AN  
 DATUM Geodetic DATE 2011.10.19 - 2011.10.19 CHECKED BY LPG

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 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
222.4	Continued From Previous Page													
10.2	SAND, fine, some silt to silty Compact Grey Wet		11	SS	11		222							
							221							
			12	SS	10		220							
							219							
			13	SS	17		218							
							217							
216.7	END OF SAMPLING AT 15.8m AND START DCPT		14	SS	11		216							
15.8														
215.2	END OF BOREHOLE AT 17.4m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.													
17.4	WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Dec09/11 4.5 228.1													

ONTMT4S 9268.GPJ 5/10/12

+ 3, × 3: Numbers refer to  
Sensitivity

20  
15 5  
10 (%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No 11T-16

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 858 664.3 E 300 494.2 ORIGINATED BY JM  
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2011.11.08 - 2011.11.08 CHECKED BY LPG

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 (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				
								○ UNCONFINED	+ FIELD VANE			
								● QUICK TRIAXIAL	x LAB VANE			
237.9							20 40 60 80 100	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT		
0.0	ASPHALT: (200mm)							W <sub>P</sub>	W	W <sub>L</sub>		GR SA SI CL
0.2	SAND and GRAVEL Compact Brown Moist (FILL)		1	AS					○			
			1	SS	29				c			
236.5												
1.4	Clayey SILT, with sand, trace gravel Stiff Brown Moist (FILL)		2	SS	13				○			2 25 53 19
			3	S	12				○			
234.9												
3.0	Silty CLAY Firm		4	SS	7				⊢			0 20 53 27
233.8												
4.1			5	SS	12				○			
232.3												
5.6	Clayey SILT, trace sand Very Stiff Brown Moist		6	SS	23				⊢			0 3 80 17
230.7												
7.2	SILT and SAND, some clay Compact to Very Dense Brown Moist (TILL)		7	SS	16				○			
			8	SS	45				○			0 31 55 14

Continued Next Page

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

RECORD OF BOREHOLE No 11T-16

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 858 664.3 E 300 494.2 ORIGINATED BY JM  
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
DATUM Geodetic DATE 2011.11.08 - 2011.11.08 CHECKED BY LPG

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					
	Continued From Previous Page												
226.6			9	SS	85	227							
11.3	END OF BOREHOLE AT 11.3m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS FROM 11.3m TO 1.5m, CUTTINGS FROM 1.5m TO 0.2m THEN ASPHALT TO SURFACE.												

ONTMT4S 9268.GPJ 5/10/12

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

20  
15 5  
10 (%) STRAIN AT FAILURE

# RECORD OF BOREHOLE No 11T-17

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 859 197.8 E 300 375.5 ORIGINATED BY MAT  
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
 DATUM Geodetic DATE 2011.10.21 - 2011.10.21 CHECKED BY LPG

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 (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)			
								○ UNCONFINED	+ FIELD VANE							● QUICK TRIAXIAL	× LAB VANE	
247.4							20	40	60	80	100				GR SA SI CL			
0.0	TOPSOIL, with grass (200mm)																	
0.2																		
246.8	Silty CLAY, trace roots Stiff Brown Moist		1	SS	11													
0.6																		
	Silty CLAY, trace to some sand Hard Brown Moist (TILL)		2	SS	42										0 20 53 27			
			3	SS	64													
			4	SS	68													
			5	SS	80													
			6	SS	38										0 7 65 28			
			7	SS	67													
			8	SS	64										2 27 52 20			
240.2																		
7.2	Sandy SILT, some clay, trace gravel Very Dense Grey Moist (TILL)		9	SS	100/ 0.225													

Continued Next Page

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

20  
15  
10  
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11T-17

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 859 197.8 E 300 375.5 ORIGINATED BY MAT  
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
DATUM Geodetic DATE 2011.10.21 - 2011.10.21 CHECKED BY LPG

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						
	Continued From Previous Page										
236.1	Grey		11	SS	80		237				
11.3	END OF BOREHOLE AT 11.3m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.  WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Dec09/11 10.4 237.0										

ONTMT4S 9268.GPJ 5/10/12

RECORD OF BOREHOLE No 11T-18

1 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 859 159.2 E 300 357.0 ORIGINATED BY ACS  
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
DATUM Geodetic DATE 2011.11.15 - 2011.11.15 CHECKED BY LPG

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			SHEAR STRENGTH kPa							WATER CONTENT (%)	
								20 40 60 80 100	20 40 60							
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE										
247.5																
0.0	Silty CLAY, some sand, trace organics Stiff to Very Stiff Brown Moist		1	SS	10		247							0 18 58 24		
			2	SS	24											
246.0							246									
1.4	Silty CLAY, some sand, trace gravel Hard Brown Moist (TILL)		3	SS	47		245									
			4	SS	62											
			5	SS	42		244									
			6	SS	55											
			7	SS	45		243						1 16 54 29			
241.9							242									
5.6	Very Stiff		8	SS	28		241									
							240							0 10 57 33		
240.3			9	SS	37		239									
7.2			10	SS	33		238									

Continued Next Page

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

20  
15  
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 11T-18

2 OF 2

METRIC

W.P. 2539-04-00 LOCATION N 4 859 159.2 E 300 357.0 ORIGINATED BY ACS  
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN  
DATUM Geodetic DATE 2011.11.15 - 2011.11.15 CHECKED BY LPG

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					
Continued From Previous Page													
237.1	SAND and SILT, trace clay Dense Brown Moist to Wet (TILL)		11	SS	46		237						0 49 46 4
10.4							236						
							235						
234.7	END OF BOREHOLE AT 12.8m. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.												
12.8	WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Dec09/11 10.9 236.6												

ONTMT4S 9268.GPJ 5/10/12

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

20  
15 5  
10 (%) STRAIN AT FAILURE

**Table A-1 – Borehole Completion Details**

Location	Details	
	Piezometer Tip Depth / Elevation (m)	Completion Details
11T-01	11.0 /	Piezometer with 1.5 m slotted screen installed with sand filter to 8.8 m, bentonite seal from 8.8 m to 1.4 m, and cuttings to surface.
11T-02	None Installed	Backfilled with bentonite holeplug to 1.5 m, cuttings to 0.15 m, then asphalt to ground surface.
11T-05	11.0 /	Piezometer with 1.5 m slotted screen installed with sand filter to 6.5 m, then bentonite seal from 6.5 m to ground surface.
11T-06	None Installed	Backfilled with bentonite holeplug to 1.5 m, cuttings to 0.2 m, then asphalt to ground surface.
11T-07	11.3 /	Piezometer with 1.5 m slotted screen installed with sand filter to 9.1 m, bentonite seal from 9.1 m to 1.5 m, and cuttings from 1.5 m to ground surface.
11T-08	None Installed	Backfilled with bentonite holeplug and cuttings to 1.5 m, cuttings to 0.2 m, then asphalt to ground surface.
11T-09	None Installed	Backfilled with bentonite holeplug and cuttings to 1.5 m, cuttings to 0.2 m, then asphalt to ground surface.
11T-10	11.3 /	Piezometer with 1.5 m slotted screen installed with sand filter to 7.3 m, bentonite seal from 7.3 m to ground surface.
11T-11	None Installed	Backfilled with bentonite holeplug and cuttings to 1.5 m, cuttings to 0.2 m, then asphalt to ground surface.
11T-12	11.3 /	Piezometer with 1.5 m slotted screen installed with sand filter to 9.1 m, bentonite seal from 9.1 m to 6.4 m, cuttings from 6.4 m to 3.7 m, bentonite holeplug from 3.7 m to 0.6 m, then cuttings to ground surface.
11T-13	9.6 /	Piezometer with 1.5 m slotted screen installed with sand filter to 7.0 m then bentonite seal from 7.0 m to ground surface.
11T-14	None Installed	Backfilled with bentonite holeplug and cuttings to 1.5 m, cuttings to 0.15 m, then asphalt to ground surface.
11T-15	8.4 /	Piezometer with 1.5 m slotted screen installed with sand filter to 3.0 m, then bentonite seal to ground surface.
11T-16	None Installed	Backfilled with bentonite holeplug and cuttings to 1.5 m, cuttings to 0.2 m, then asphalt to ground surface.
11T-17	11.3 /	Piezometer with 1.5 m slotted screen installed with sand filter to 8.8 m, bentonite seal from 8.8 m to 3.7 m, then cuttings to ground surface.
11T-18	12.2 /	Piezometer with 1.5 m slotted screen installed with sand filter to 6.7 m, then bentonite seal to ground surface.

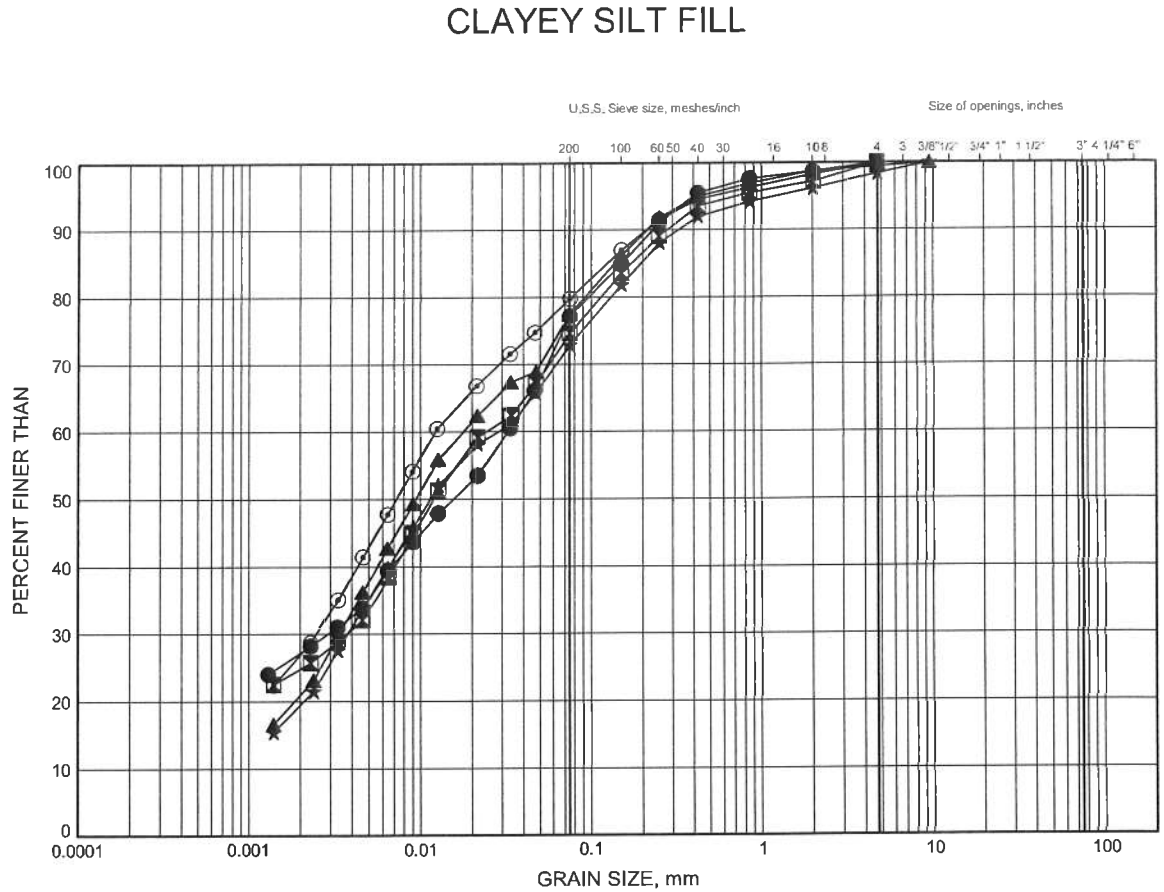


## **Appendix B**

### **Laboratory Test Results**

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

FIGURE B1



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

**LEGEND**

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11T-01	1.83	229.18
⊠	11T-09	2.59	248.61
▲	11T-09	4.88	246.32
★	11T-16	1.83	236.08
⊙	11T-16	3.35	234.56

Date May 2012

W.P.# 2539-04-00



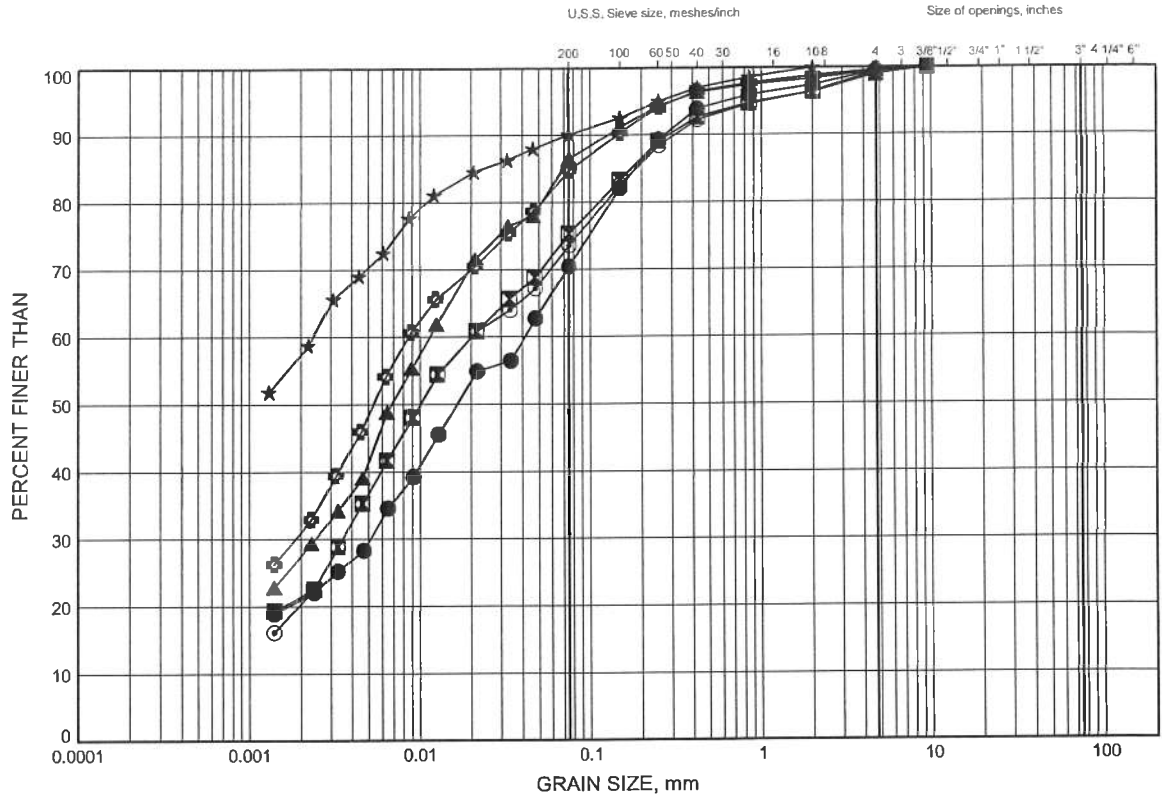
Prep'd MFA

Chkd. SKP

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

FIGURE B2

**CLAYEY SILT/SILTY CLAY TILL**



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

**LEGEND**

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11T-01	3.35	227.66
⊠	11T-01	6.32	224.69
▲	11T-01	9.45	221.56
★	11T-02	2.59	228.73
⊙	11T-02	6.40	224.92
⊞	11T-02	9.42	221.90

GRAIN SIZE DISTRIBUTION - THURBER 9268.GPJ 5/10/12

Date May 2012  
W.P.# 2539-04-00



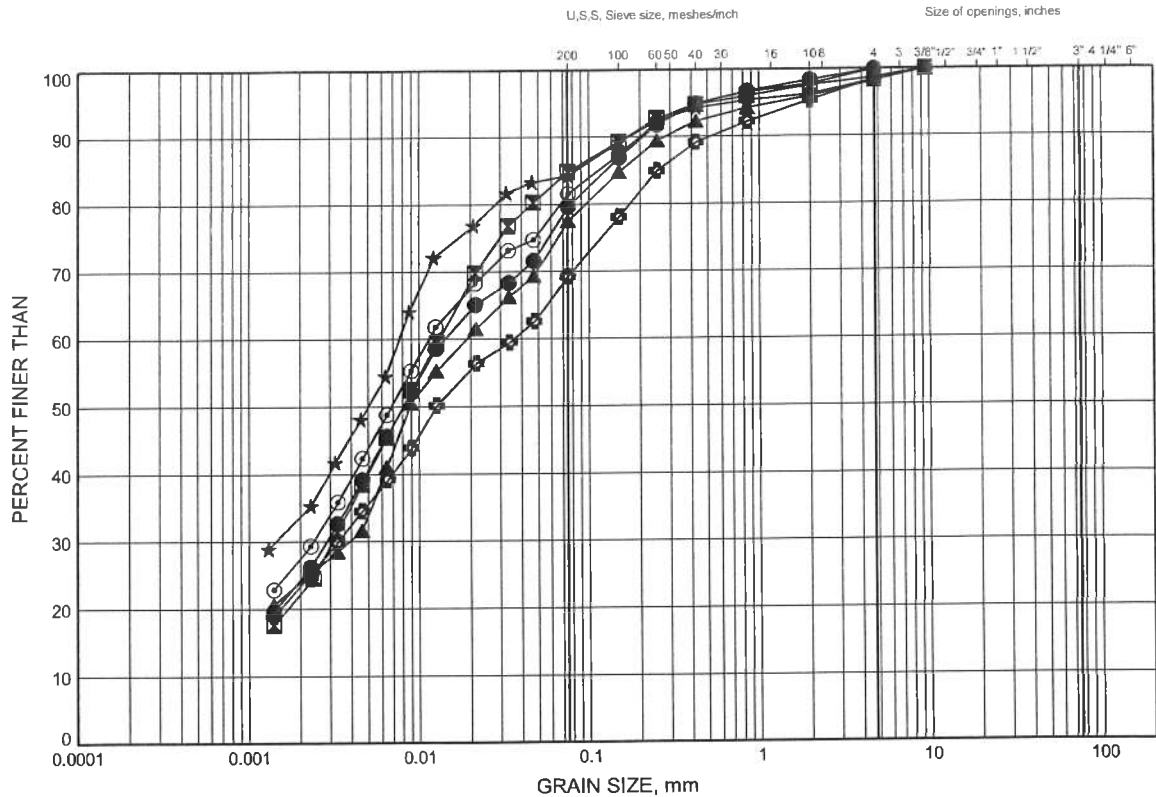
Prep'd MFA  
Chkd. SKP

Widening of Hwy 400, Major Mackenzie to King Road

## GRAIN SIZE DISTRIBUTION

FIGURE B3

### CLAYEY SILT/SILTY CLAY TILL



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

### LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11T-06	1.83	239.68
⊠	11T-06	4.88	236.63
▲	11T-06	10.97	230.54
★	11T-07	1.78	247.62
⊙	11T-07	3.28	246.12
⊕	11T-07	6.40	243.00

Date May 2012

W.P.# 2539-04-00



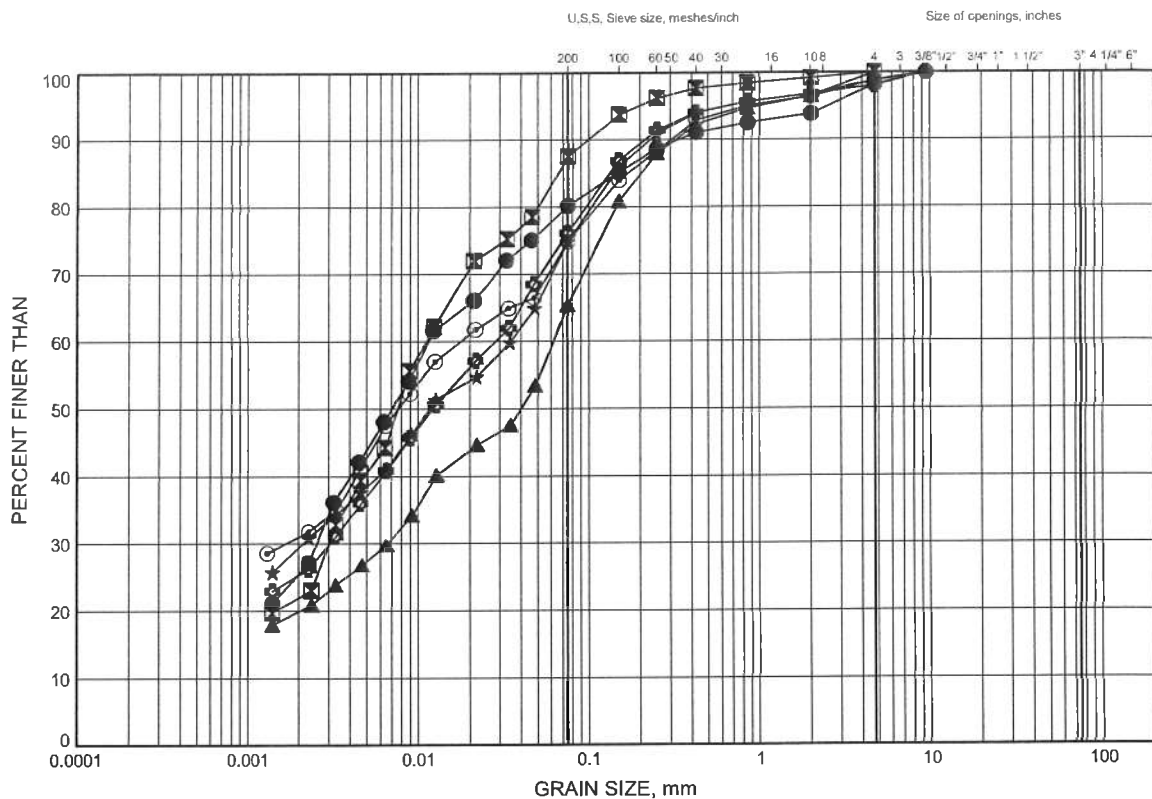
Prep'd MFA

Chkd. SKP

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

FIGURE B4

**CLAYEY SILT/SILTY CLAY TILL**



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

**LEGEND**

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11T-08	1.83	246.67
⊠	11T-08	4.88	243.62
▲	11T-08	10.97	237.52
★	11T-09	7.92	243.27
⊙	11T-09	10.97	240.22
⊕	11T-10	2.74	246.25

GRAIN SIZE DISTRIBUTION - THURBER 9268.GPJ 5/10/12

Date May 2012

W.P.# 2539-04-00



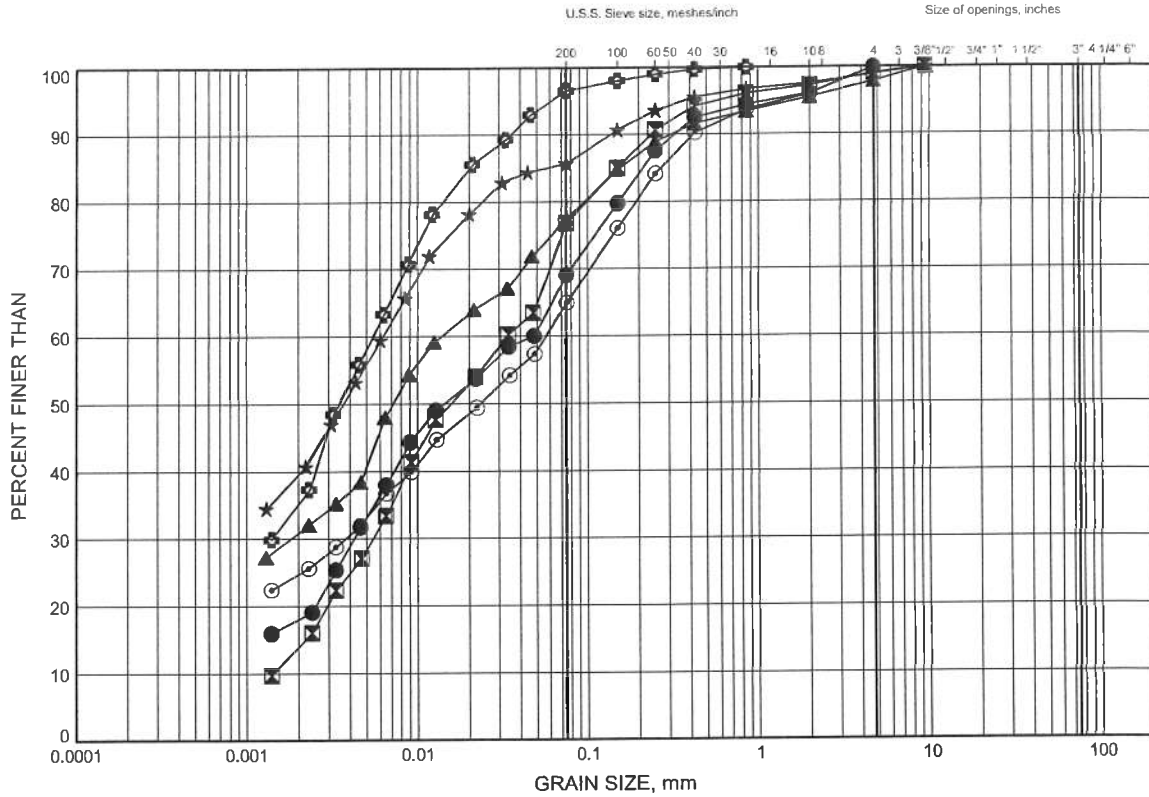
Prep'd MFA

Chkd. SKP

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

**FIGURE B5**

**CLAYEY SILT/SILTY CLAY TILL**



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

**LEGEND**

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11T-10	7.92	241.07
⊠	11T-11	1.83	270.57
▲	11T-11	4.88	267.52
★	11T-11	7.92	264.47
⊙	11T-11	10.97	261.42
⊕	11T-12	1.07	273.06

Date May 2012

W.P.# 2539-04-00



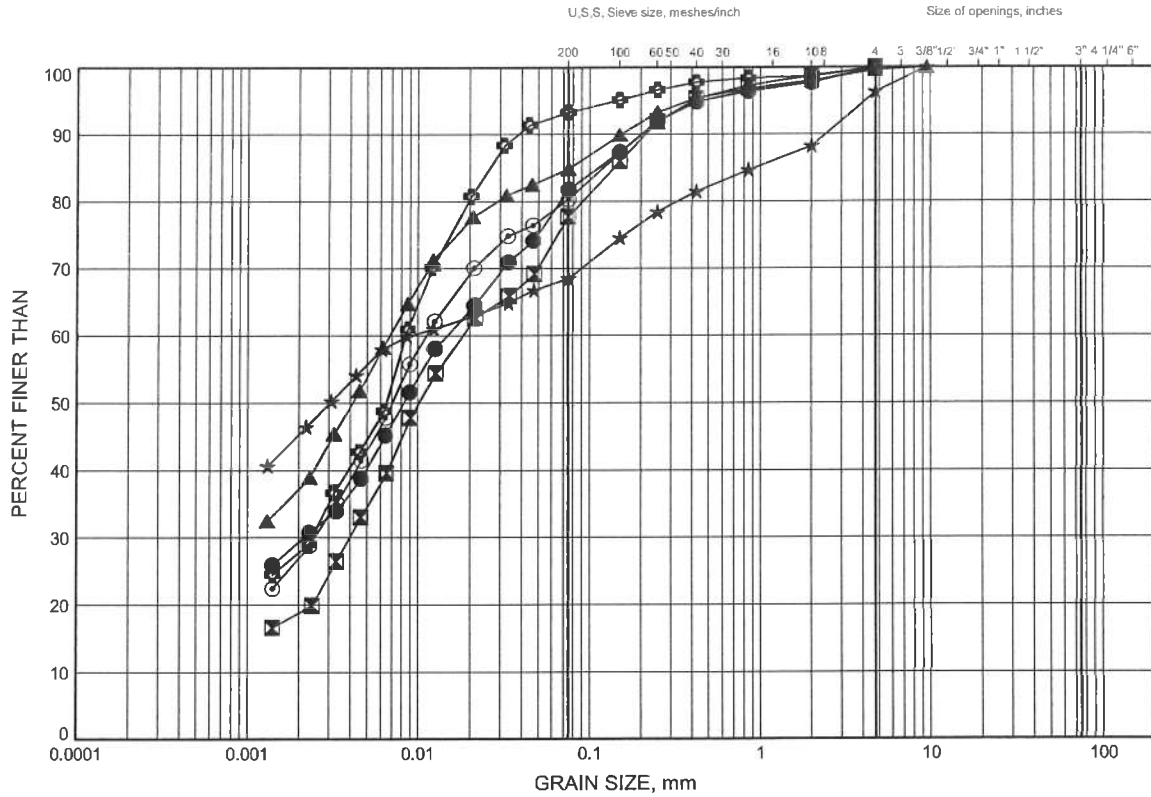
Prep'd MFA

Chkd. SKP

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

FIGURE B6

**CLAYEY SILT/SILTY CLAY TILL**



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

**LEGEND**

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11T-12	3.35	270.78
⊠	11T-12	6.40	267.73
▲	11T-12	9.45	264.68
★	11T-13	1.75	261.57
⊙	11T-17	1.07	246.34
⊕	11T-17	4.11	243.30

Date May 2012

W.P.# 2539-04-00

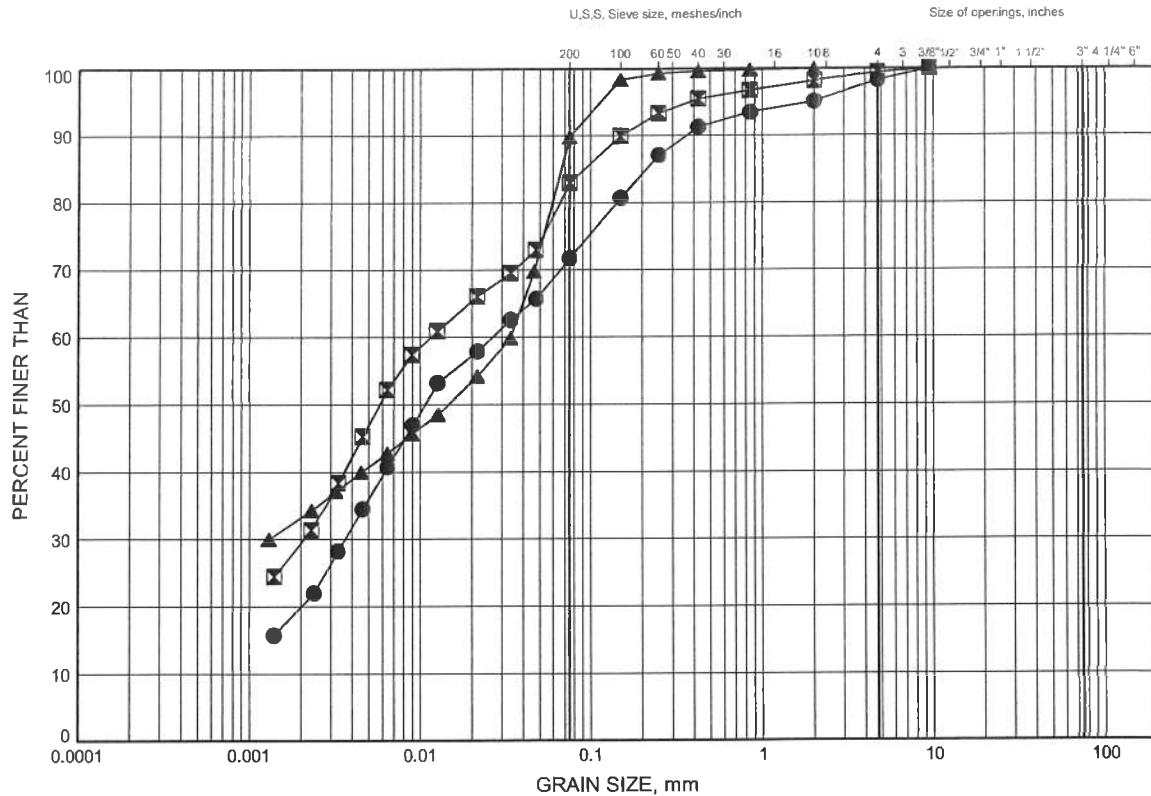


Prep'd MFA

Chkd. SKP

## GRAIN SIZE DISTRIBUTION

CLAYEY SILT/SILTY CLAY TILL



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

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11T-17	6.40	241.01
⊠	11T-18	4.88	242.62
▲	11T-18	7.92	239.57

W.P.# 2539-04-00

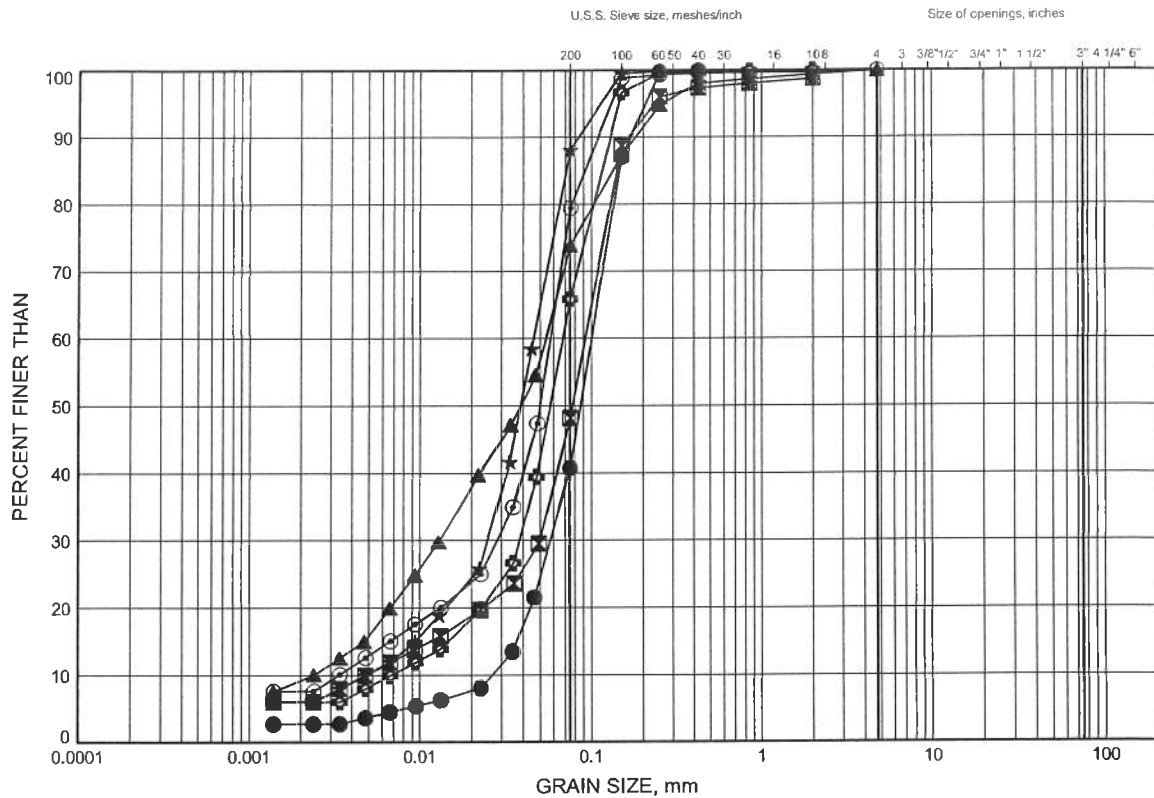


Chkd. SKP



## GRAIN SIZE DISTRIBUTION

## SAND &amp; SILT to SANDY SILT TILL



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

## LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11T-02	10.78	220.54
⊠	11T-05	6.40	229.04
▲	11T-05	10.97	224.47
★	11T-06	7.92	233.59
⊙	11T-07	9.35	240.05
⊕	11T-10	4.88	244.12

Date May 2012

W.P.# 2539-04-00

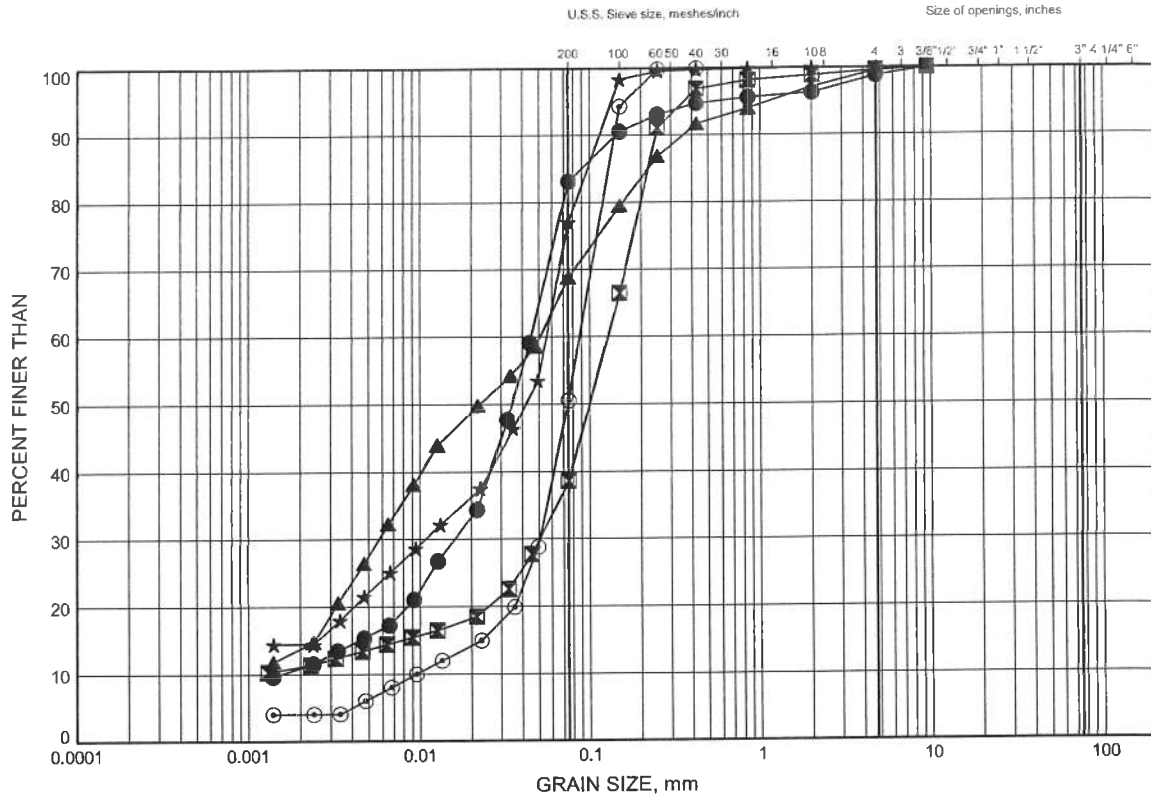


Prep'd MFA

Chkd. SKP

## GRAIN SIZE DISTRIBUTION

## SAND &amp; SILT to SANDY SILT TILL



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

## LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11T-10	10.97	238.02
⊠	11T-13	8.15	255.17
▲	11T-16	9.45	228.46
★	11T-17	9.45	237.96
⊙	11T-18	10.97	236.52

Date May 2012

W.P.# 2539-04-00

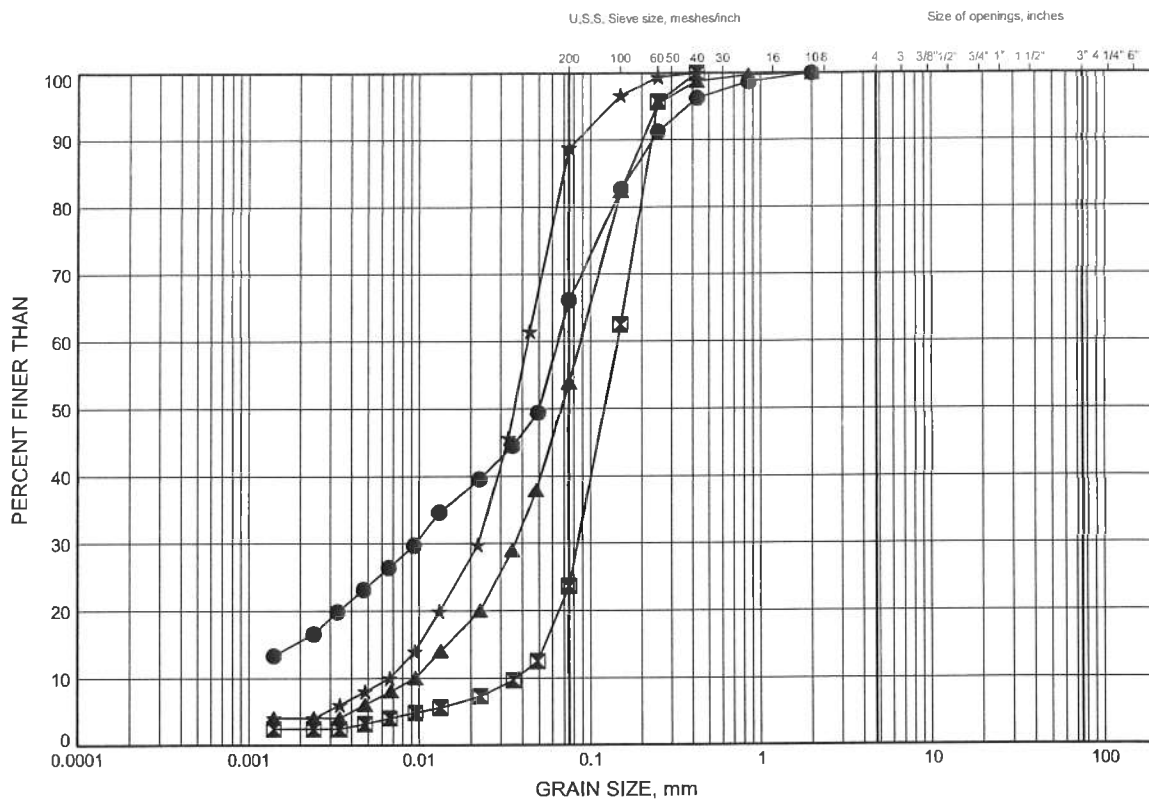


Prep'd MFA

Chkd. SKP

## GRAIN SIZE DISTRIBUTION

## SANDY SILT to SAND &amp; SILT



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

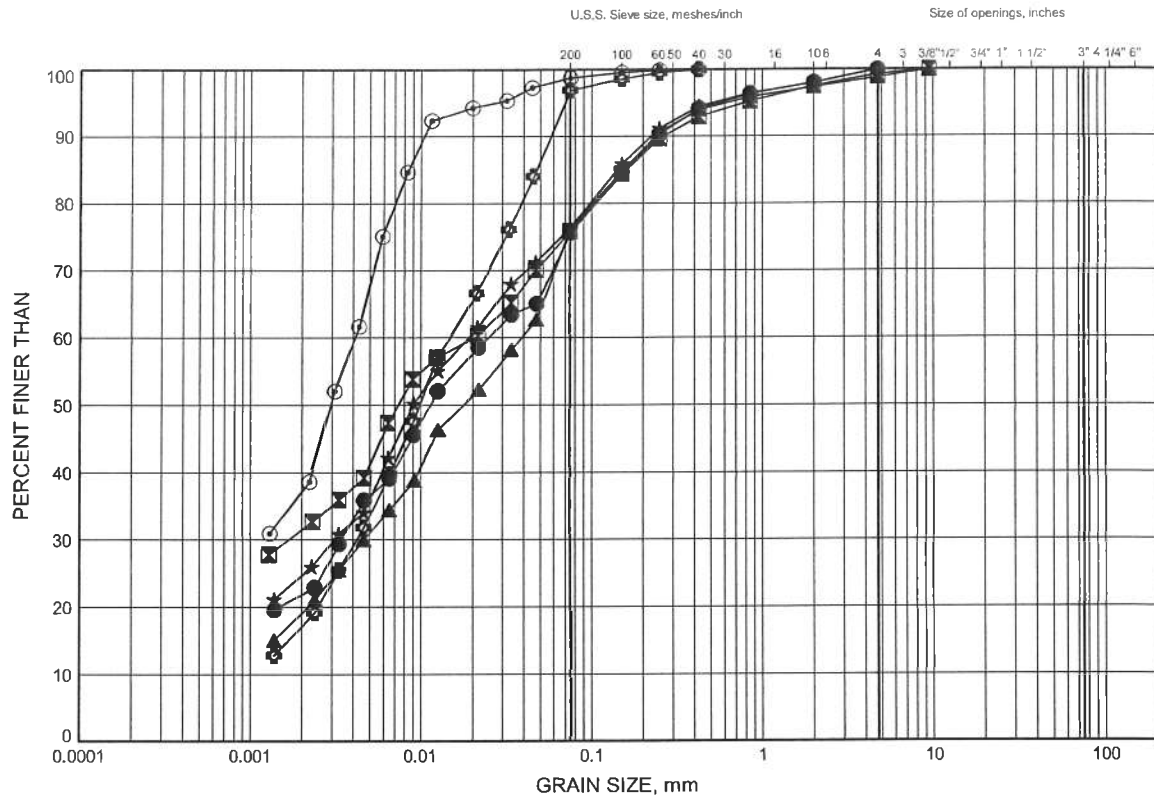
## LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11T-05	1.83	233.61
⊠	11T-14	9.45	258.25
▲	11T-15	2.59	230.01
★	11T-15	4.88	227.72

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

FIGURE B11

**SILTY CLAY to CLAYEY SILT**



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

**LEGEND**

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11T-05	3.43	232.01
⊠	11T-14	1.83	265.87
▲	11T-14	3.35	264.34
★	11T-14	6.40	261.30
⊙	11T-15	7.92	224.67
⊕	11T-16	6.40	231.51

GRAIN SIZE DISTRIBUTION - THURBER 9266.GPJ 5/10/12

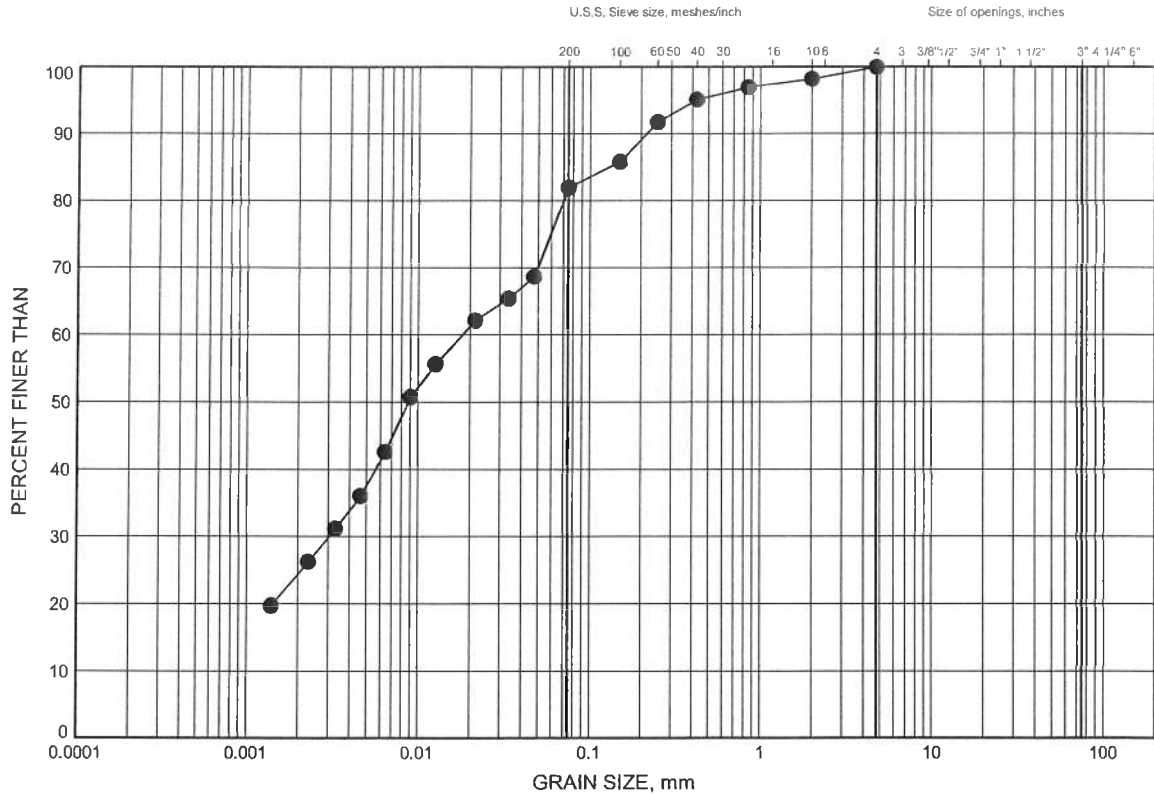
Date May 2012  
W.P.# 2539-04-00



Prep'd MFA  
Chkd. SKP

## GRAIN SIZE DISTRIBUTION

SILTY CLAY to CLAYEY SILT



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

## LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11T-18	1.07	246.43

Date May 2012

W.P.# 2539-04-00



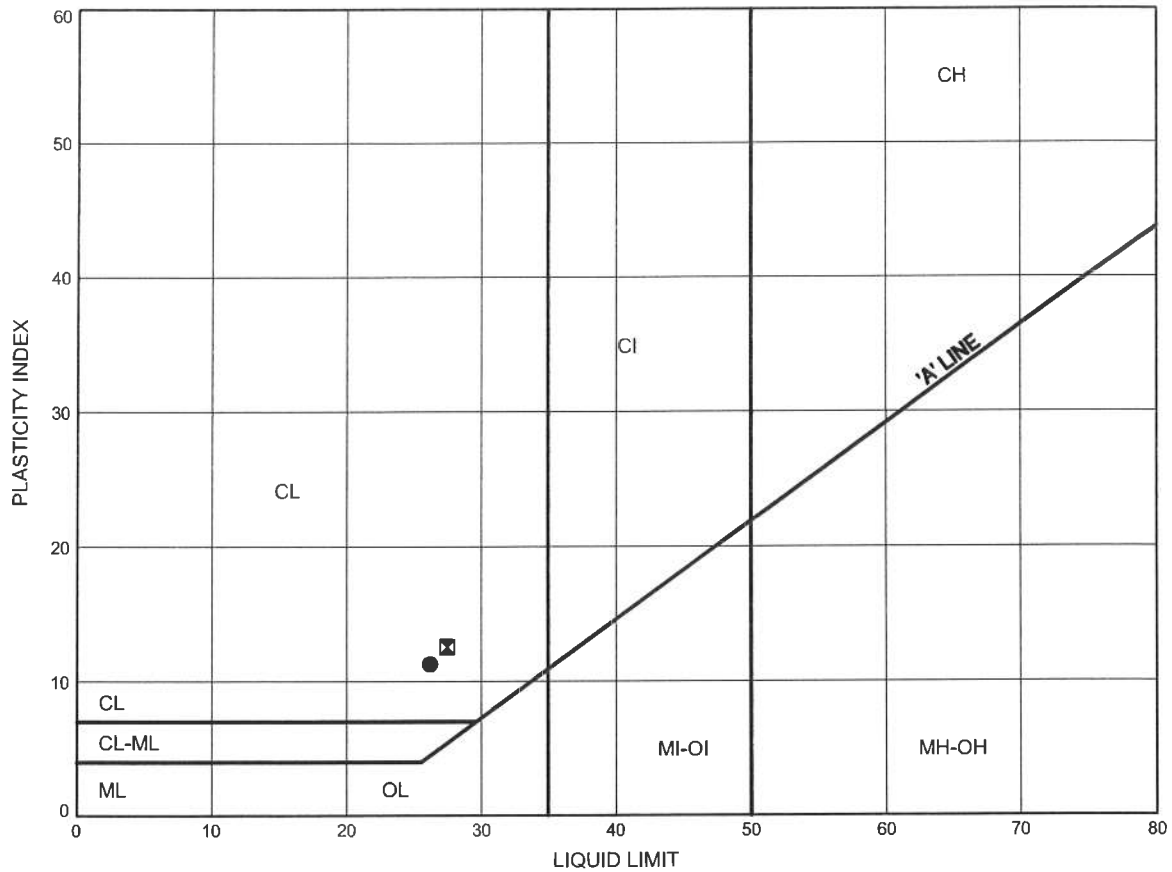
Prep'd MFA

Chkd. SKP

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

FIGURE B13

**CLAYEY SILT FILL**



**LEGEND**

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11T-09	4.88	246.32
⊠	11T-16	3.35	234.56

Date May 2012  
W.P.# 2539-04-00

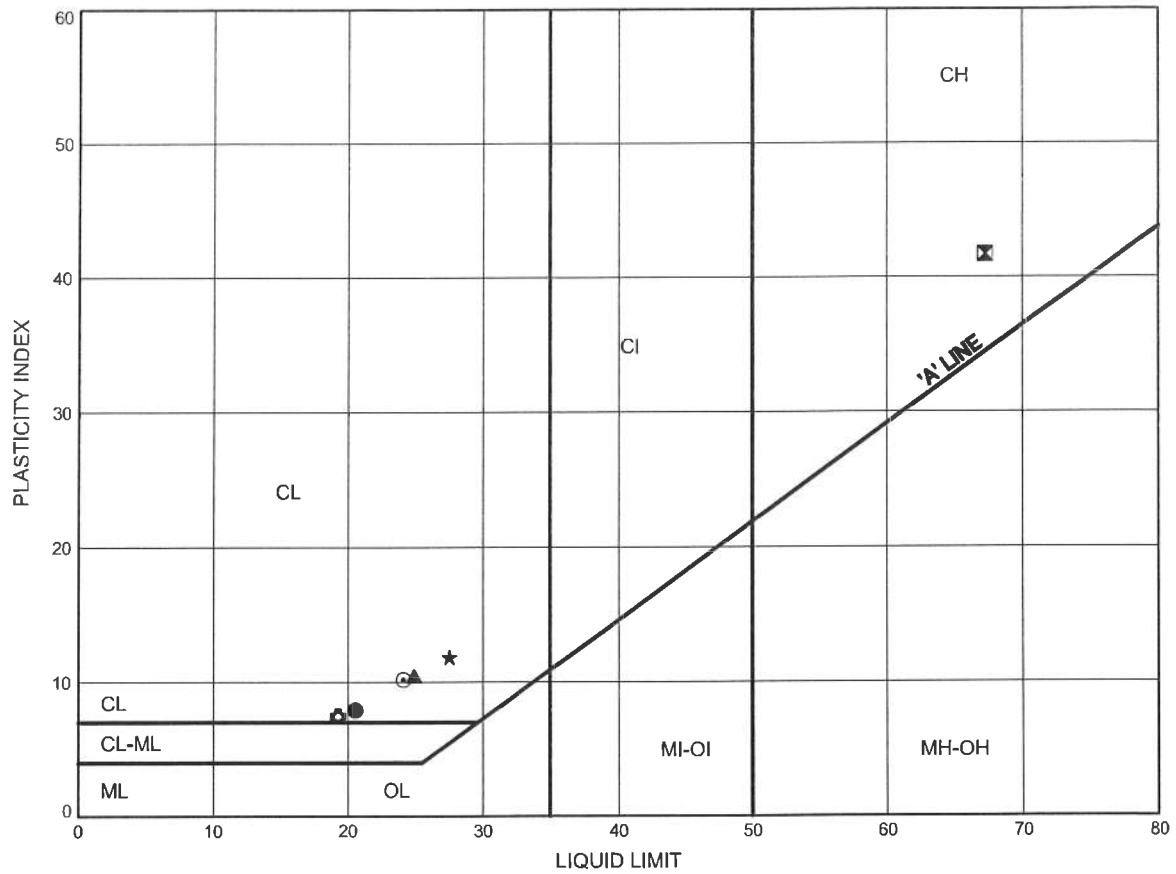


Prep'd MFA  
Chkd. SKP

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

FIGURE B14

**CLAYEY SILT/SILTY CLAY TILL**



**LEGEND**

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11T-01	3.35	227.66
⊠	11T-02	2.59	228.73
▲	11T-02	6.40	224.92
★	11T-06	1.83	239.68
⊙	11T-07	6.40	243.00
⊕	11T-09	10.97	240.22

Date May 2012

W.P.# 2539-04-00



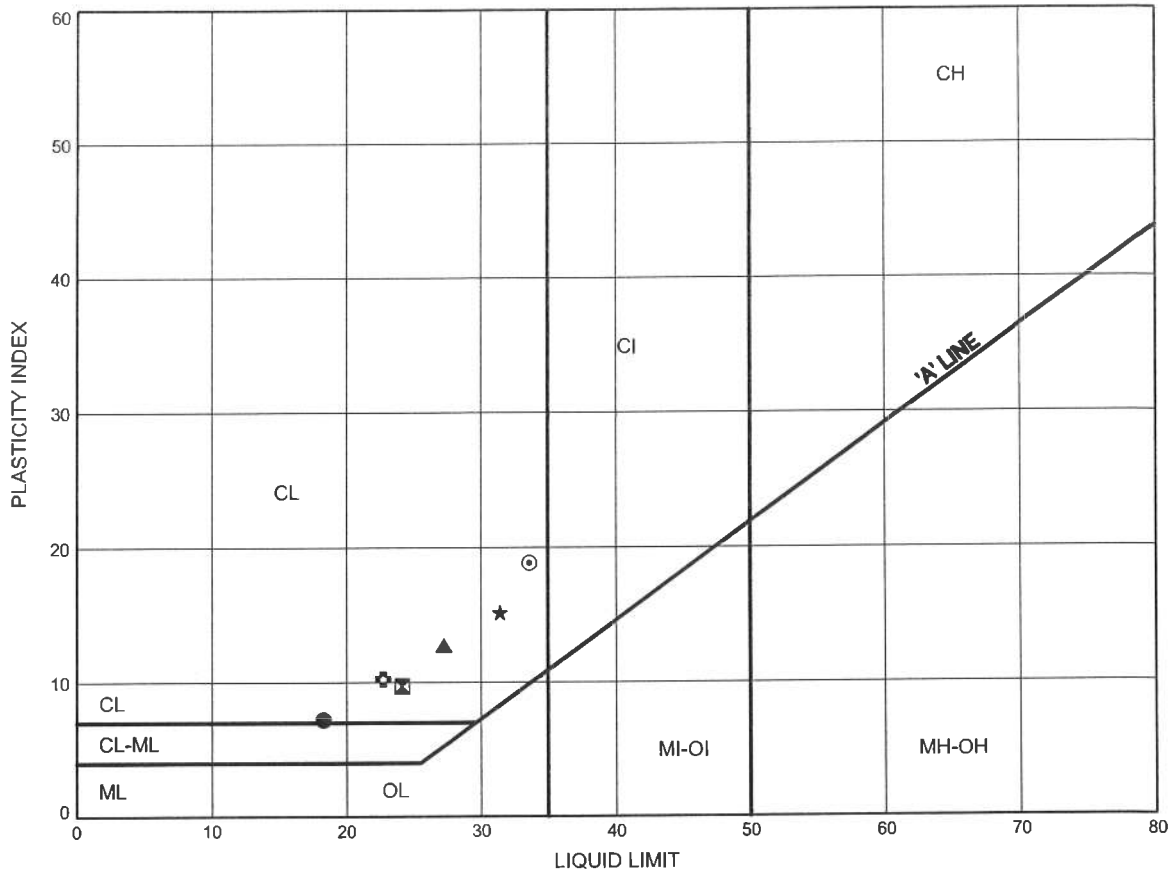
Prep'd MFA

Chkd. SKP

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

FIGURE B15

**CLAYEY SILT/SILTY CLAY TILL**



**LEGEND**

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11T-10	7.92	241.07
⊠	11T-11	1.83	270.57
▲	11T-11	4.88	267.52
★	11T-11	7.92	264.47
⊙	11T-11	10.97	261.42
⊕	11T-12	3.35	270.78

Date May 2012  
W.P.# 2539-04-00



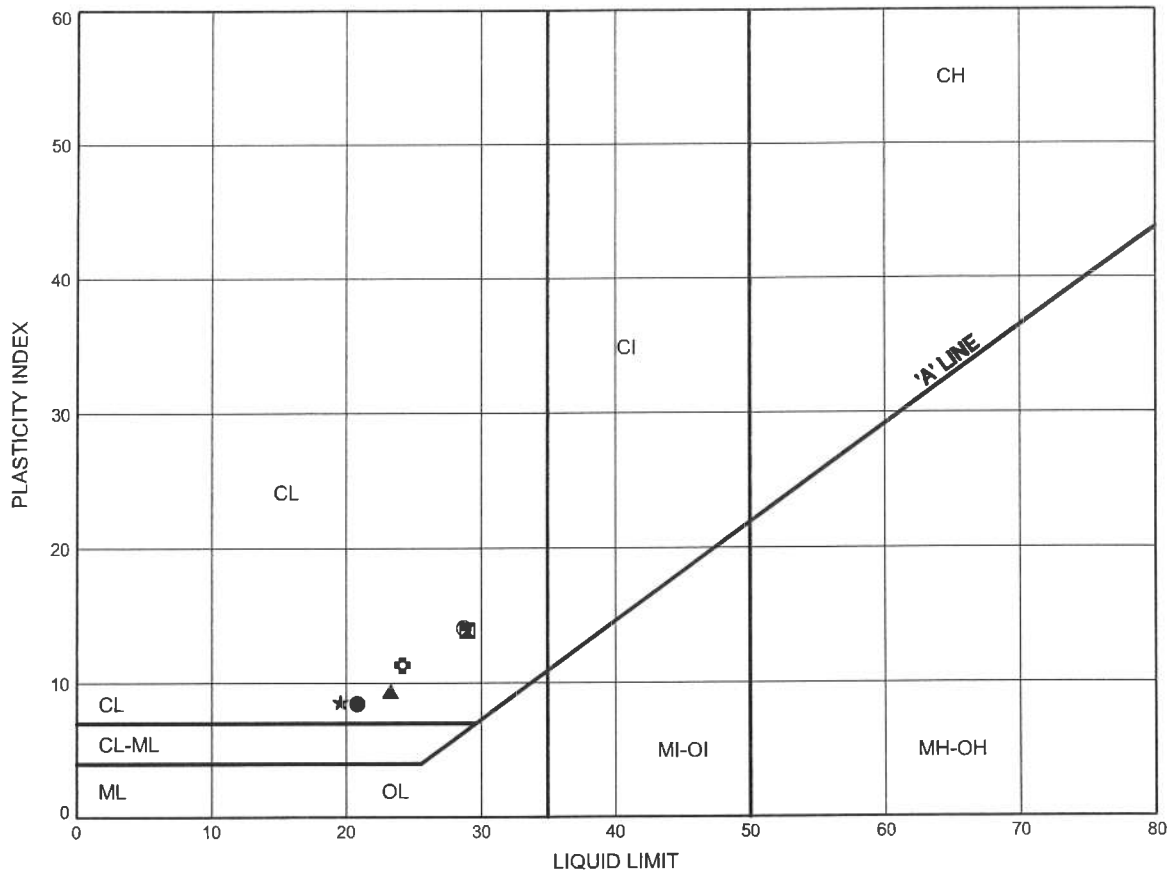
Prep'd MFA  
Chkd. SKP



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

FIGURE B16

**CLAYEY SILT/SILTY CLAY TILL**



**LEGEND**

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11T-12	6.40	267.73
⊠	11T-12	9.45	264.68
▲	11T-17	4.11	243.30
★	11T-17	6.40	241.01
⊙	11T-18	4.88	242.62
⊕	11T-18	7.92	239.57

Date May 2012

W.P.# 2539-04-00



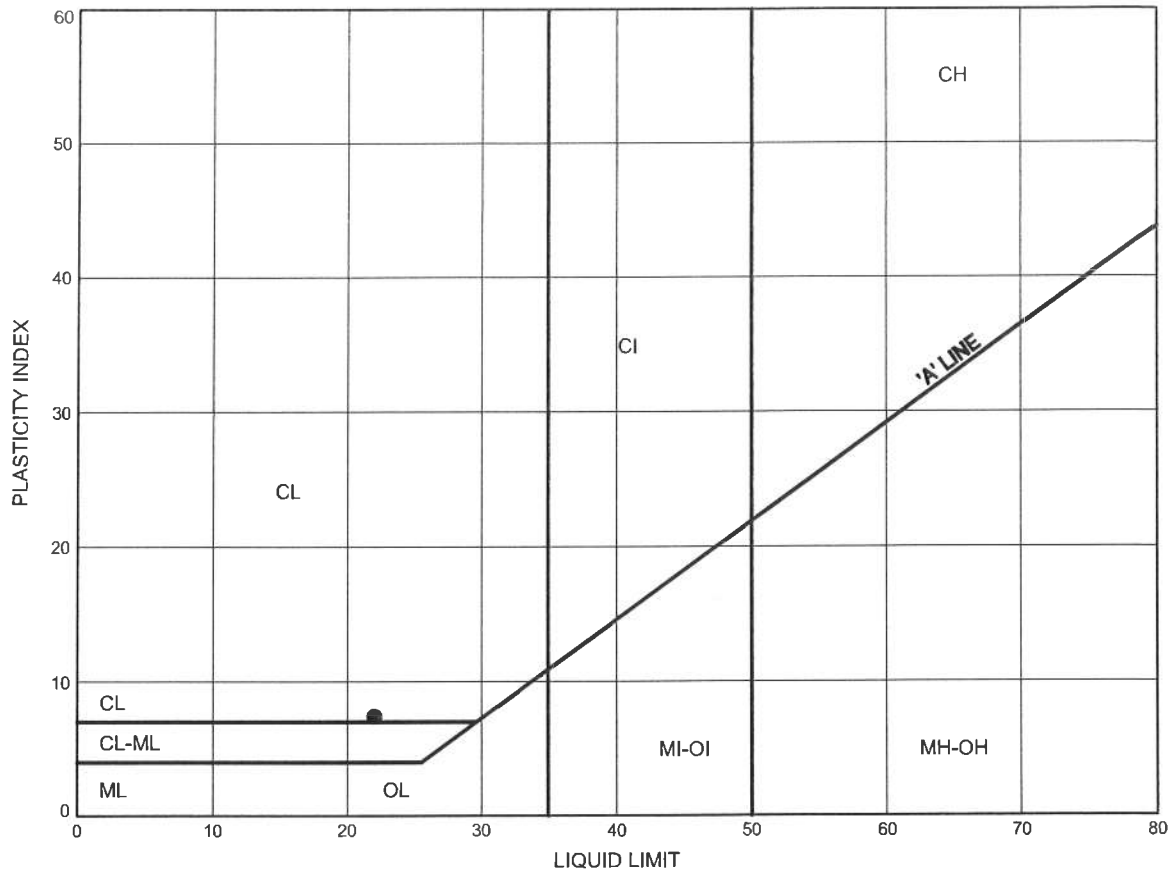
Prep'd MFA

Chkd. SKP

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

FIGURE B17

**SANDY SILT, Some Clay**



**LEGEND**

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11T-05	1.83	233.61

Date May 2012

W.P.# 2539-04-00



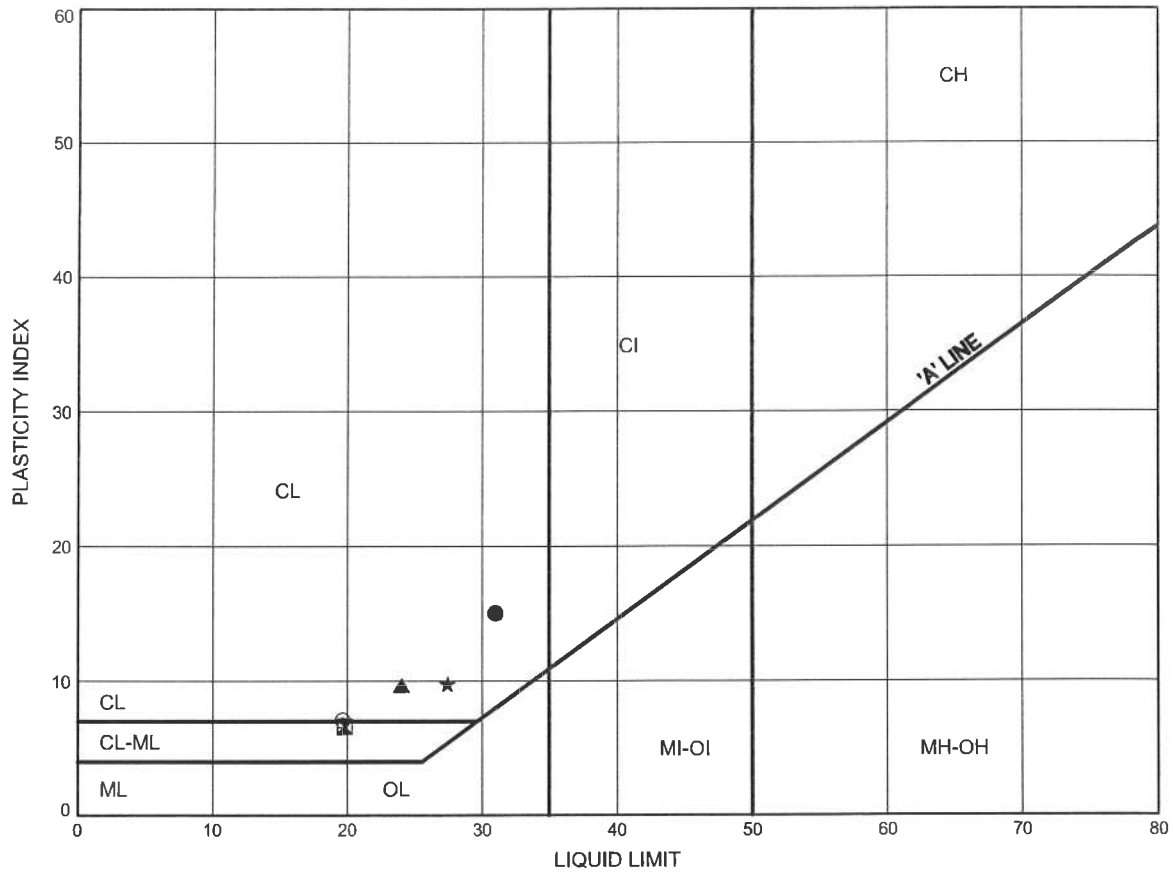
Prep'd MFA

Chkd. SKP

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

FIGURE B18

SILTY CLAY to CLAYEY SILT



**LEGEND**

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	11T-13	1.75	261.57
⊠	11T-14	3.35	264.34
▲	11T-14	6.40	261.30
★	11T-15	7.92	224.67
⊙	11T-16	6.40	231.51

Date May 2012

W.P.# 2539-04-00

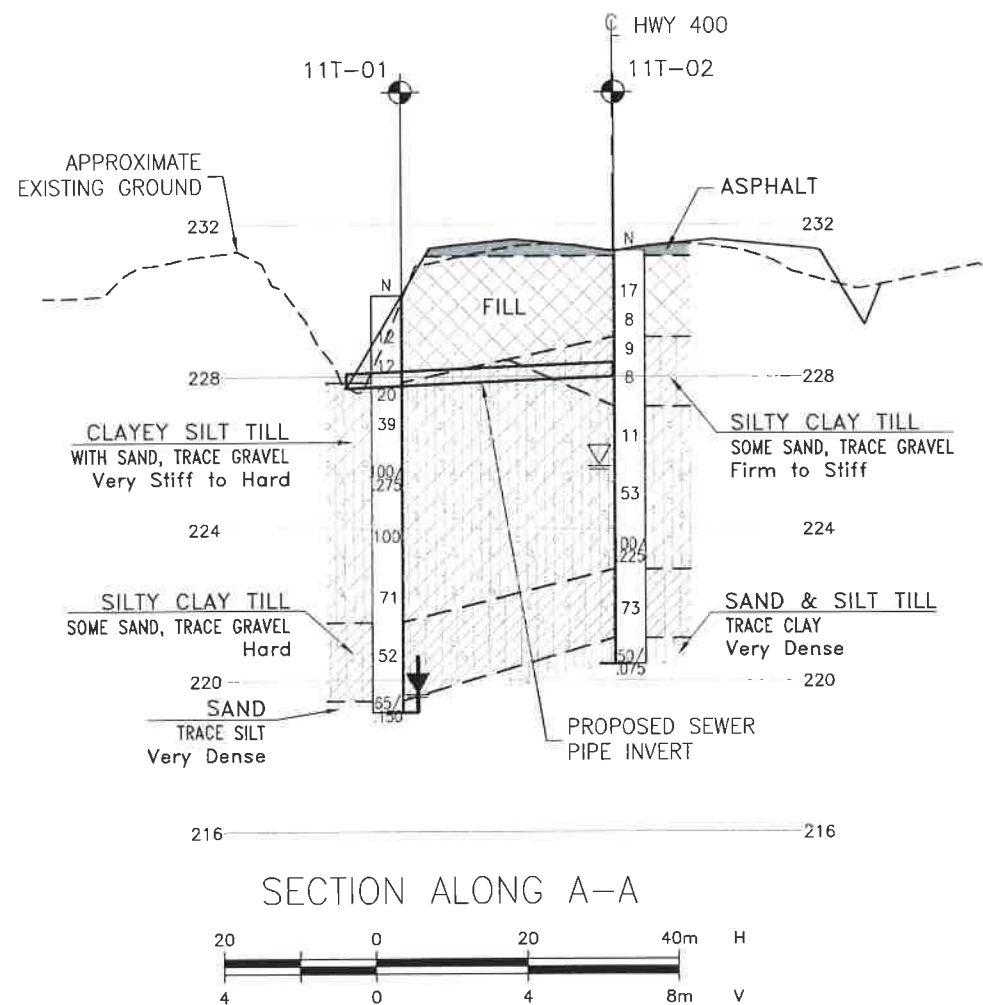
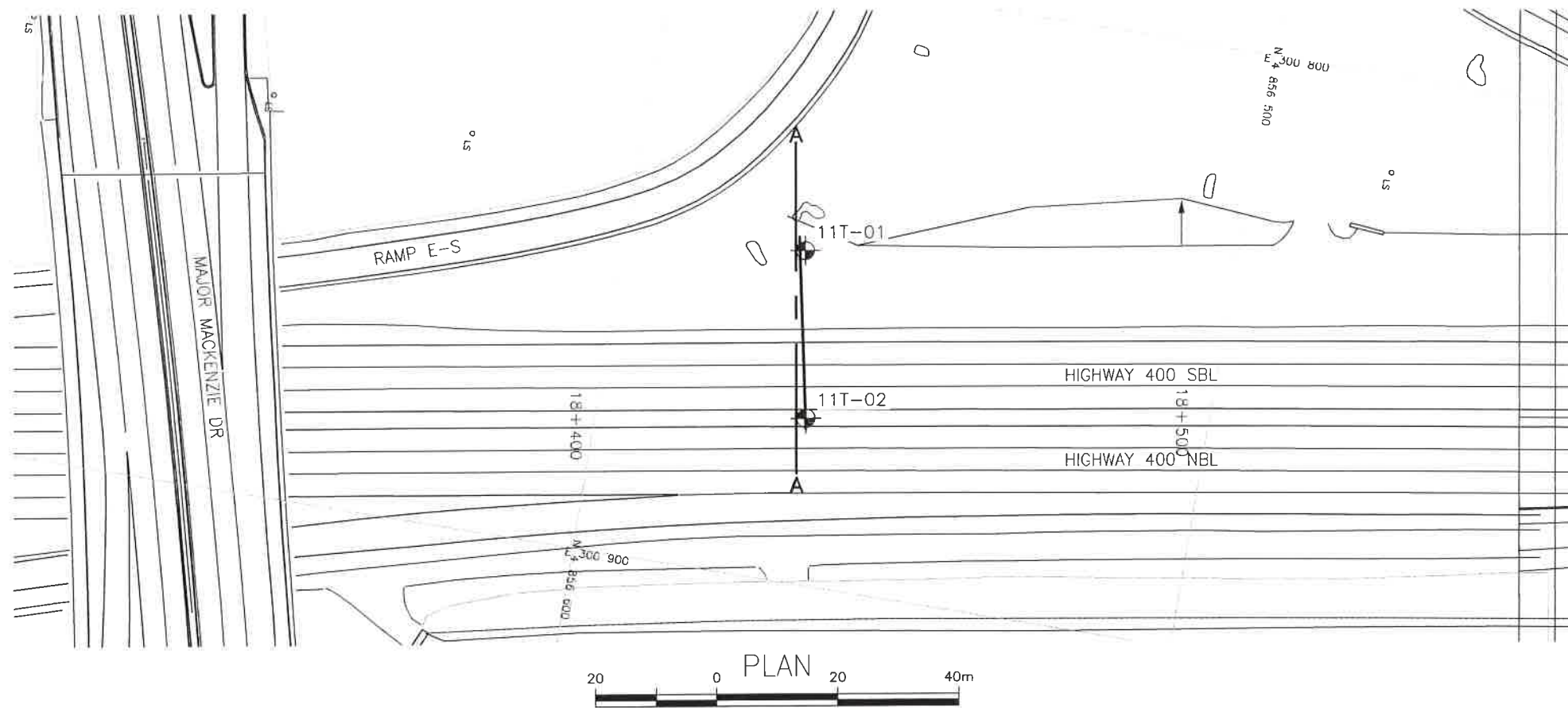


Prep'd MFA

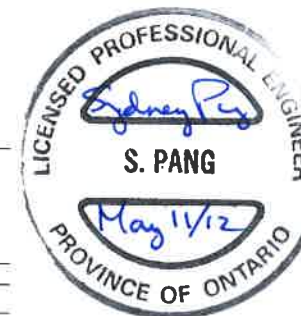
Chkd. SKP

## **Appendix C**

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



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



GWP No 192-00-00  
& 2539-04-00

SEWER PIPE  
CROSSINGS  
BOREHOLE LOCATIONS AND SOIL STRATA



**KEYPLAN**

**LEGEND**

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

NO	ELEVATION	NORTHING	EASTING
11T-01	230.1	4 856 429.7	300 844.9
11T-02	231.3	4 856 434.4	300 872.5

**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. 30M13-196**

DATE	BY	DESCRIPTION
DESIGN	LPG	CHK LPG
DRAWN	AN	CHK SKP
		SITE
		STRUCT
		DWG



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

A circular professional engineer seal for the Province of Ontario. The outer ring contains the text "LICENSED PROFESSIONAL ENGINEER" at the top and "PROVINCE OF ONTARIO" at the bottom. In the center, the name "P. K. CHATTERJI" is printed. Handwritten in blue ink over the seal are the signature "P. K. Chatterji" and the date "May 11/12".

GWP No 192-00-00  
& 2539-04-00

# SEWER PIPE CROSSINGS

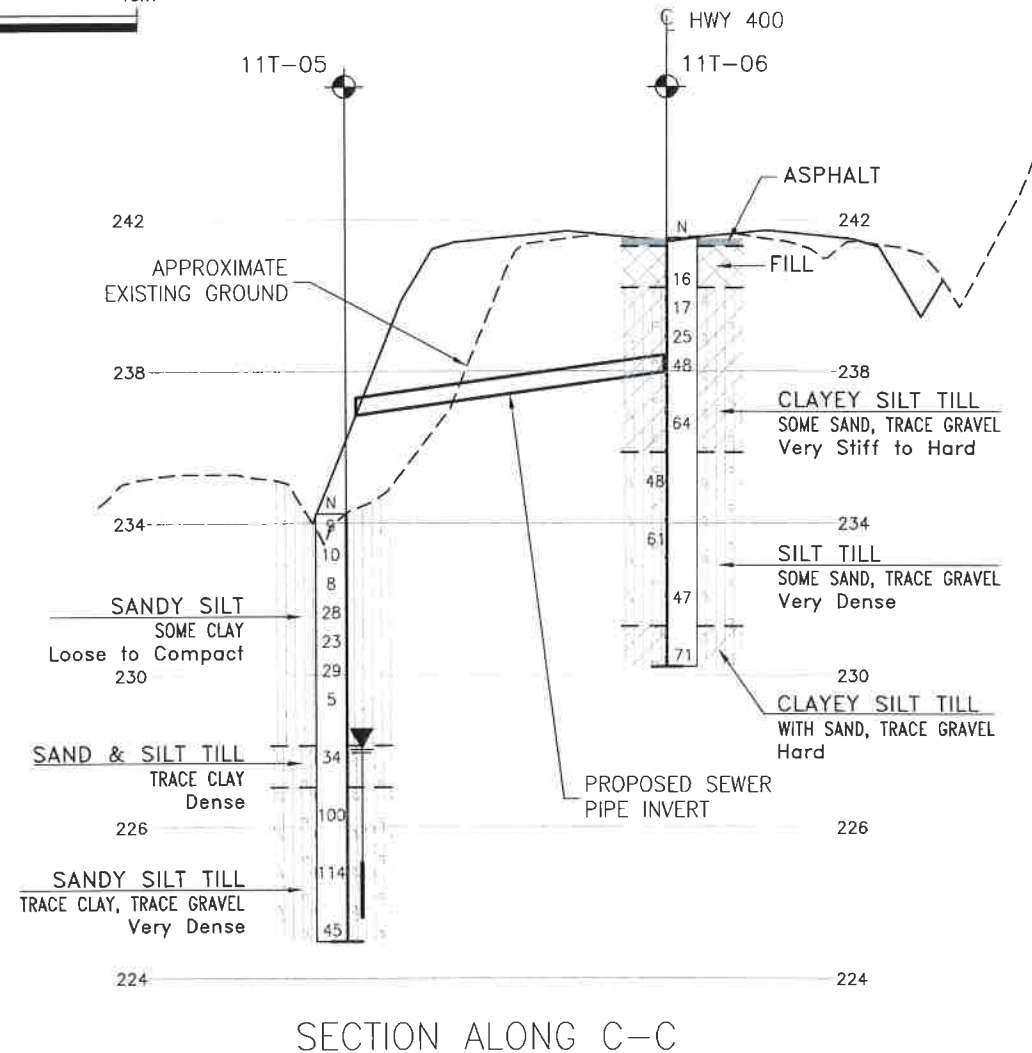
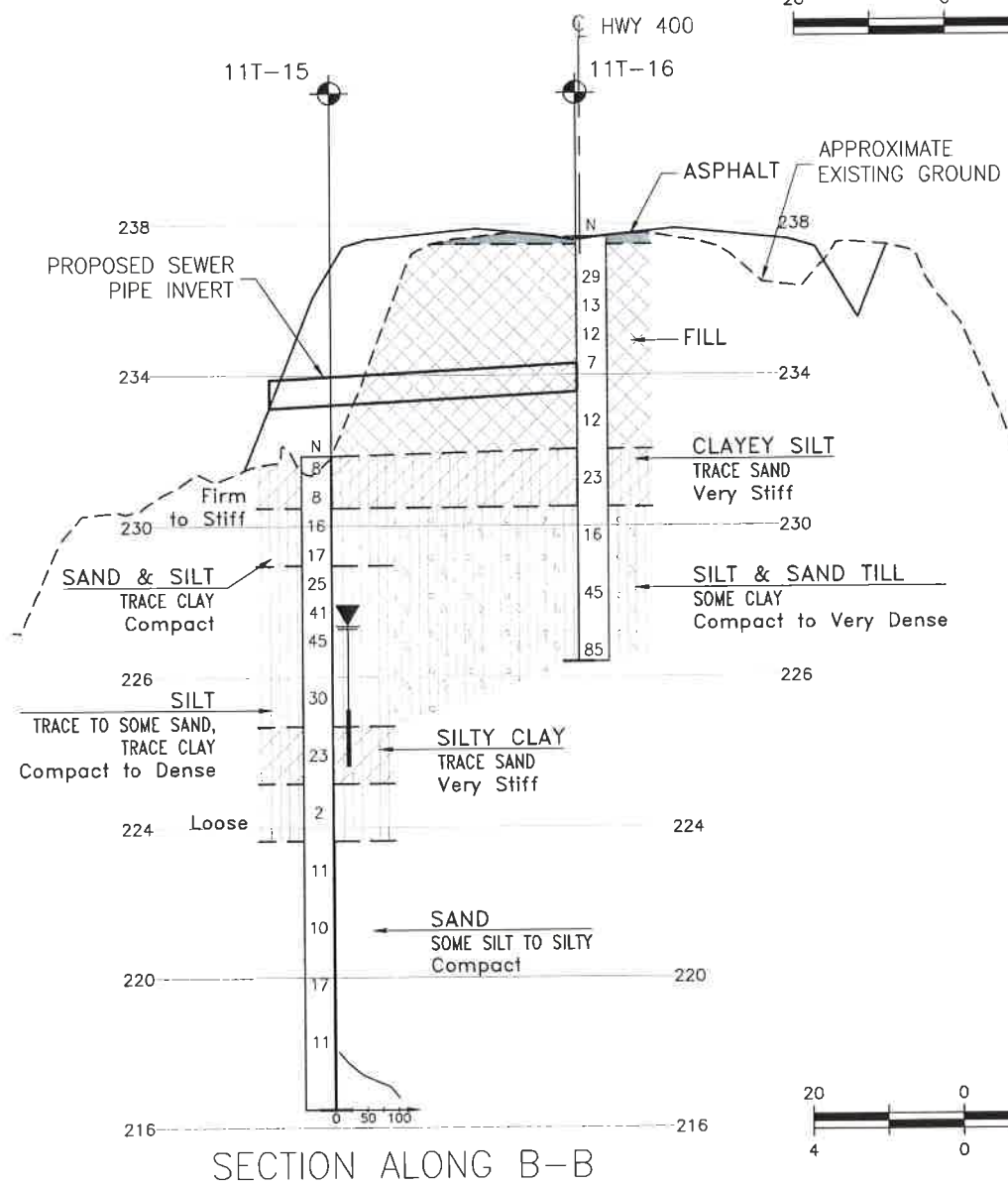
## BOREHOLE LOCATIONS AND SOIL STRATA



**SNC-LAVALIN**



**THURBER** ENGINEERING LTD.



NO	ELEVATION	NORTHING	EASTING
11T-05	234.2	4 858 839.3	300 418.3
11T-06	241.5	4 858 846.4	300 460.0
11T-15	231.8	4 858 654.4	300 459.2
11T-16	237.7	4 858 659.8	300 491.4

### -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. 30M13-196

REVISIONS								
	DATE	BY			DESCRIPTION			
DESIGN	LPG	CHK	LPG	CODE	LOAD		DATE	MAY 2012
DRAWN	AN	CHK	SKP	SITE	STRUCT	DWG		



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

GWP No 192-00-00  
& 2539-04-00

## SEWER PIPE CROSSINGS

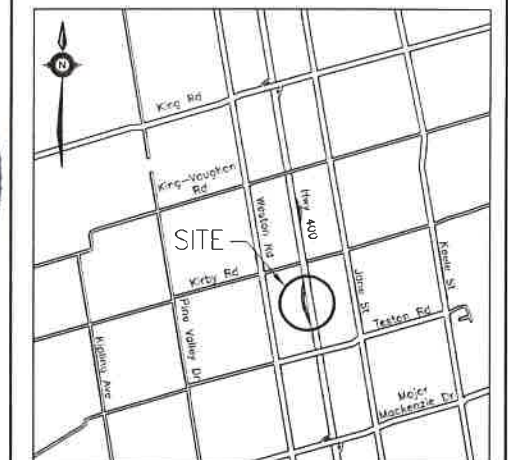
### BOREHOLE LOCATIONS AND SOIL STRATA







**SNC-LAVALIN**



**THURBER** ENGINEERING LTD.



KEYPLAN  
LEGEND

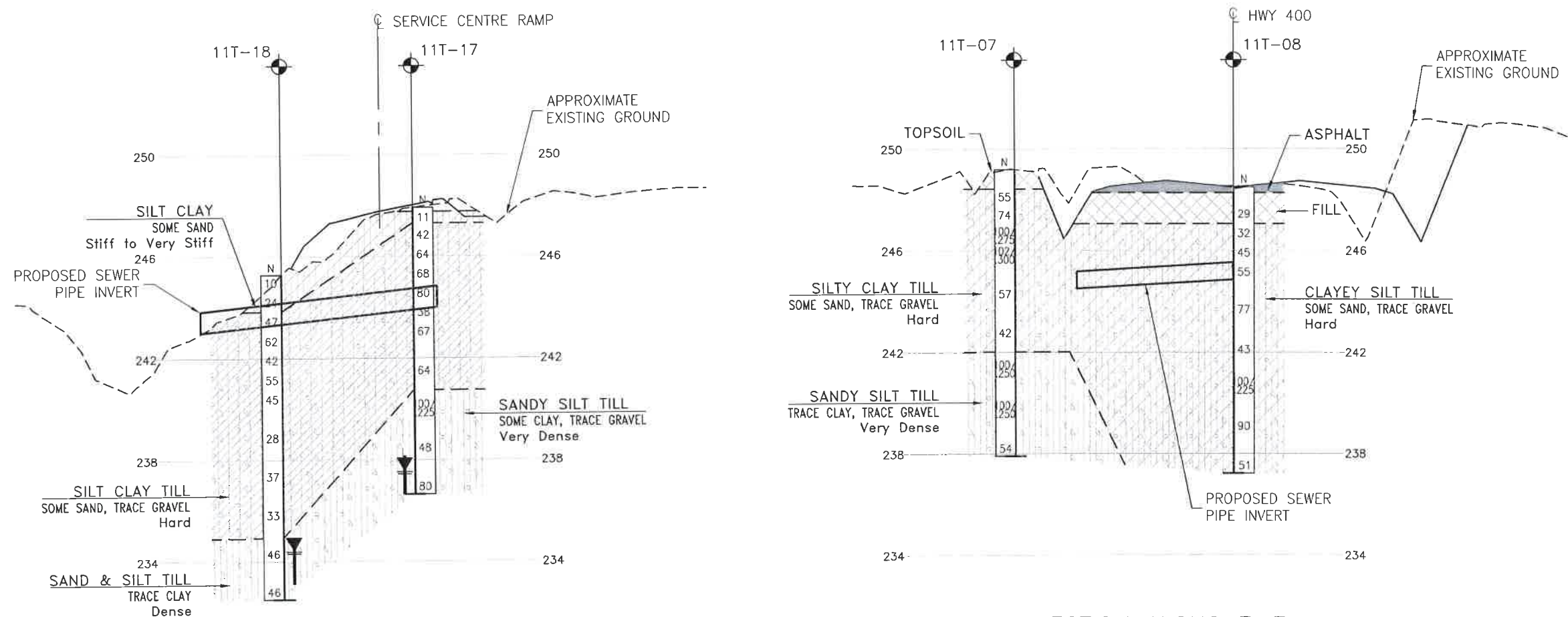
- |   |                                       |
|---|---------------------------------------|
|  | Borehole (Previous Investigation)     |
|  | Borehole (Current Investigation)      |
| N   | Blows /0.3m (Std Pen Test, 475J/blow) |
| CONE  | Blows /0.3m (60° Cone, 475J/blow)     |
| PH  | Pressure, Hydraulic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

NO	ELEVATION	NORTHING	EASTING
11T-07	249.2	4 859 234.4	300 350.0
11T-08	248.5	4 859 241.7	300 392.5
11T-17	247.9	4 859 197.4	300 376.1
11T-18	245.3	4 859 154.9	300 364.1

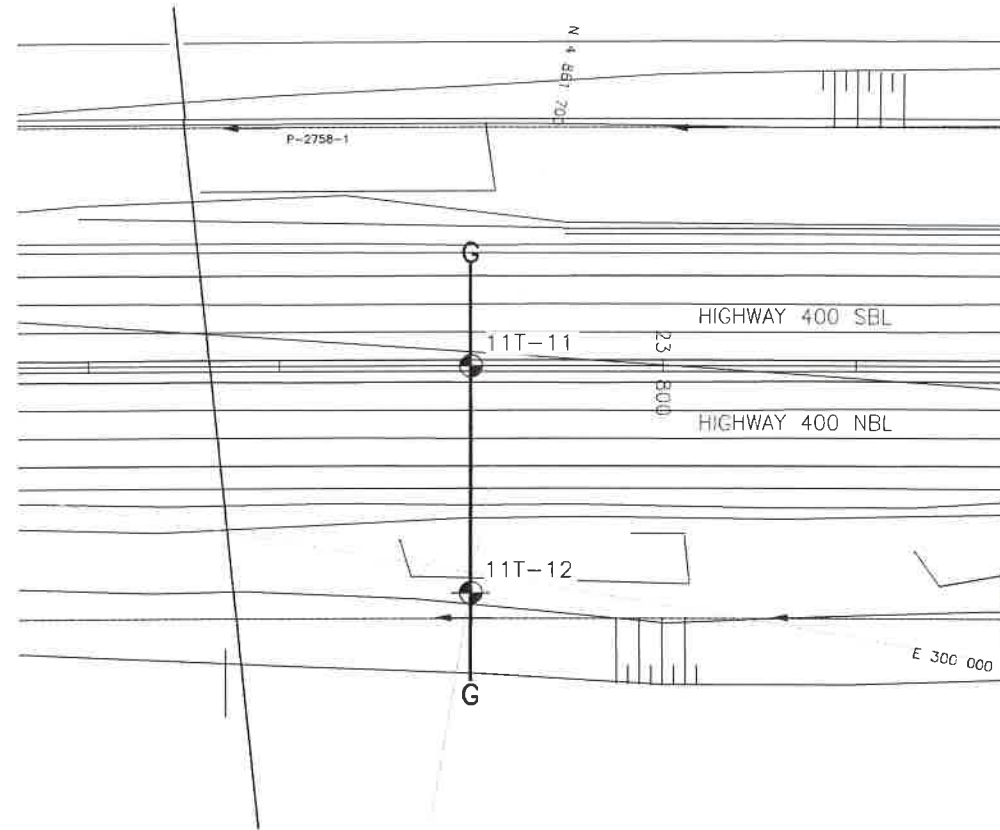
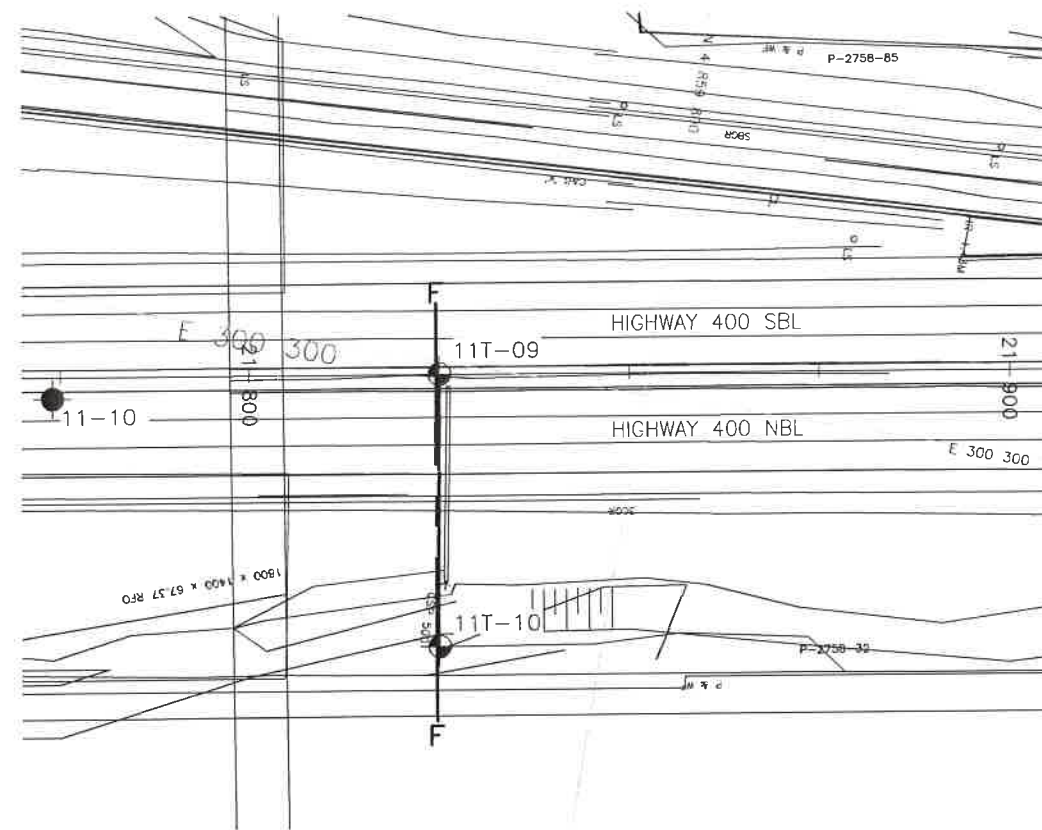
**-NOTES-**

- 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. 30M13-196**

[illegible]





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

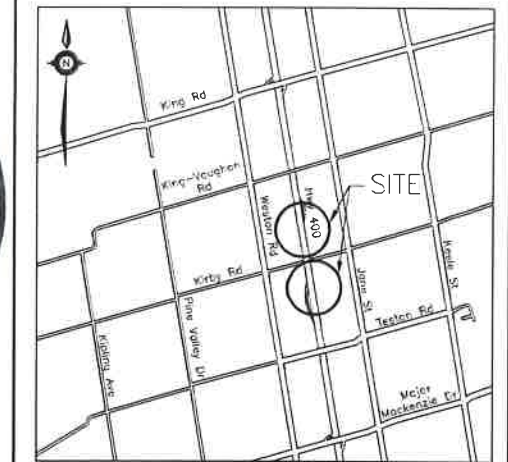


GWP No 192-00-00  
& 2539-04-00

SEWER PIPE  
CROSSINGS  
BOREHOLE LOCATIONS AND SOIL STRATA

**SNC-LAVALIN**

**THURBER ENGINEERING LTD.**



**KEYPLAN**

**LEGEND**

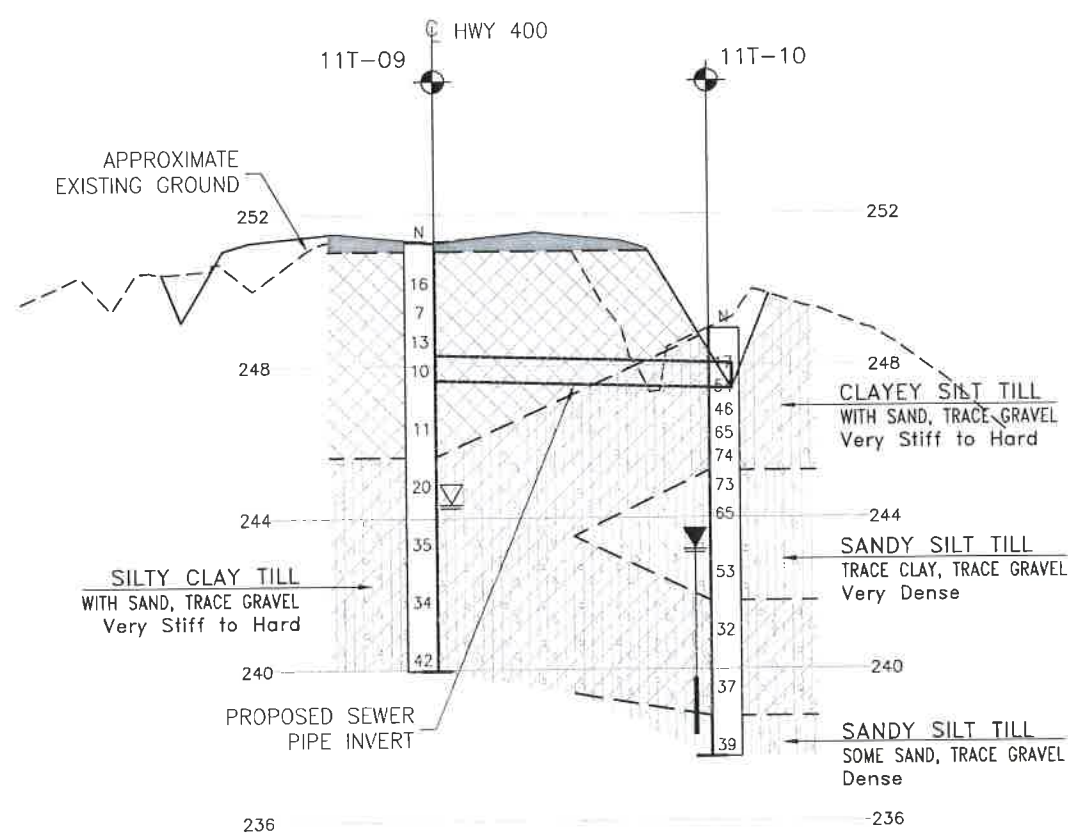
●	Borehole (Previous Investigation)
●	Borehole (Current Investigation)
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level
↑	Head Artesian Water
⊥	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
11T-09	251.3	4 859 773.0	300 301.6
11T-10	248.9	4 859 779.0	300 337.1
11T-11	272.5	4 861 695.1	299 973.0
11T-12	274.1	4 861 700.1	300 002.6

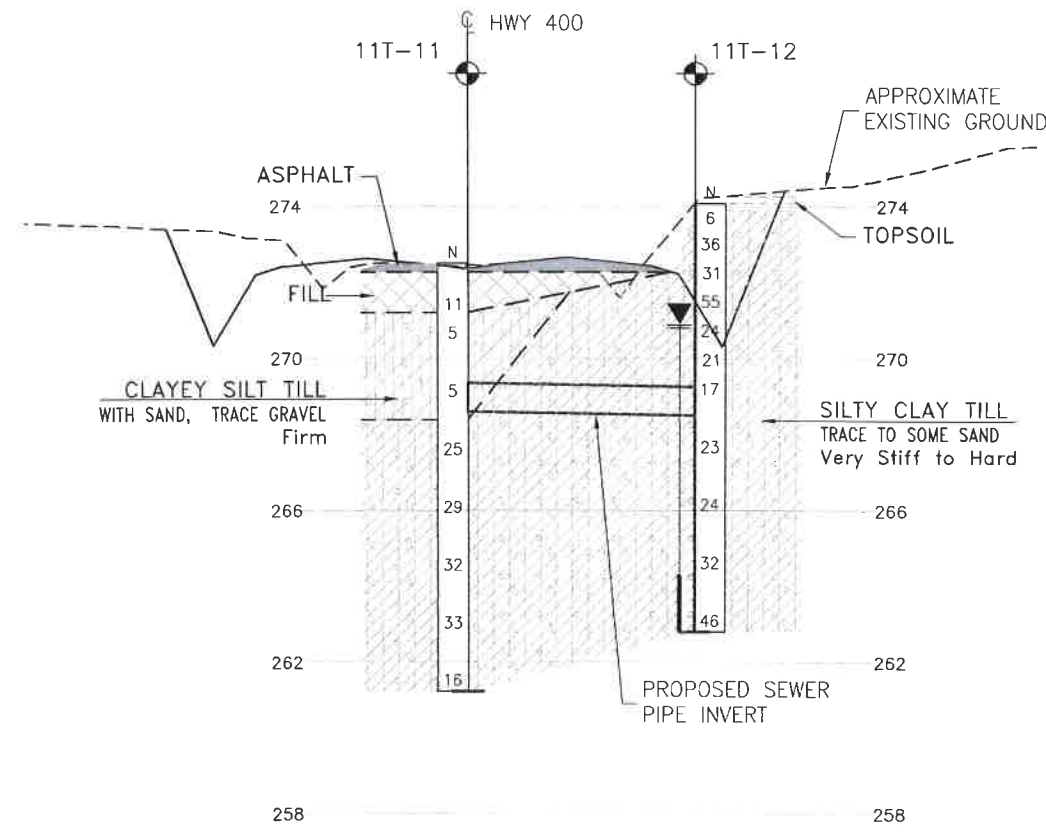
**-NOTES-**

- 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. 30M13-196**



SECTION ALONG F-F

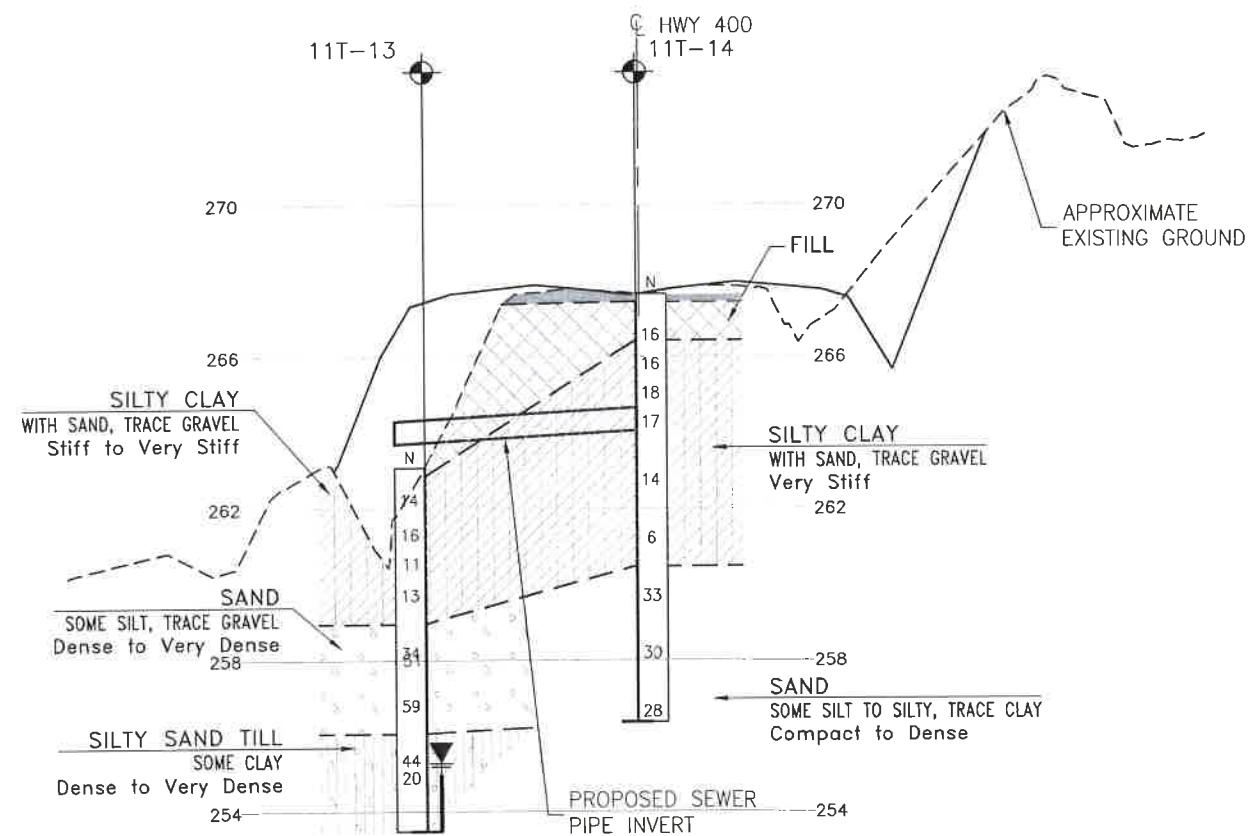
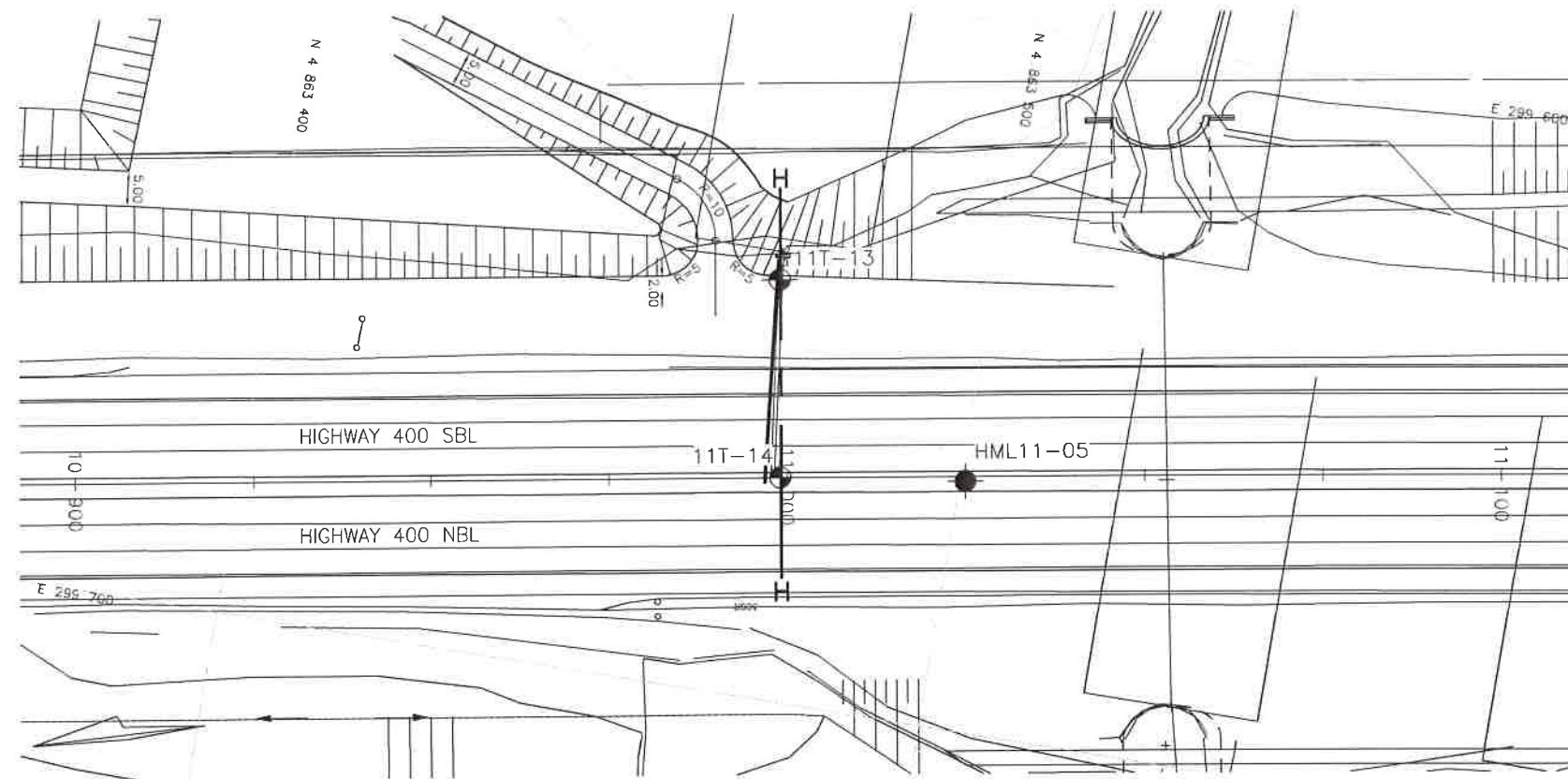


SECTION ALONG G-G



DATE	BY	DESCRIPTION
DESIGN	LPG	CHK LPG
DRAWN	AN	CHK SKP
		SITE
		STRUCT
		DWG





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



GWP No 192-00-00 & 2539-04-00
----------------------------------






# SEWER PIPE CROSSINGS

## BOREHOLE LOCATIONS AND SOIL STRATA



## KEYPLAN

### LEGEND

	Borehole (Previous Investigation)
	Borehole (Current Investigation)
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
11T-13	263.1	4 863 470.4	299 641.0
11T-14	267.6	4 863 475.1	299 668.6

-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. 30M13-196

REVISIONS									
	DATE	BY	DESCRIPTION						
DESIGN	LPG	CHK	LPG	CODE	LOAD	DATE MAY 2012			
DRAWN	AN	CHK	SKP	SITE	STRUCT	DWG			