FOUNDATION INVESTIGATION REPORT
MUNICIPAL SERVICE ROAD
OVER MAGNETAWAN RIVER SOUTH CROSSING
HIGHWAY 11, HIGHWAY 518 WEST TO HIGHWAY 520
G.W.P. 480-93-00, W.P. 5403-04-01, SITE 44-426

Geocres Number: 31E-224

Report to

Marshall Macklin Monaghan

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PART 1: FACTUAL INFORMATION

1 INTRODUCTION

This report presents the factual findings obtained from a foundation investigation conducted at the site of a proposed bridge to carry Municipal Service Road over the south crossing of Magnetawan River, south of the village of Katrine, Ontario. A previous, preliminary investigation had been carried out at the structure location by Shaheen & Peaker Limited (S&P) and the factual data from that investigation has been incorporated in the current assignment.

The purpose of the investigation was to explore the subsurface conditions at the site and, based on the data obtained, to provide a borehole location plan, borehole logs, stratigraphic profile and cross-sections, and a written description of the subsurface conditions. A model of the subsurface conditions was developed through considering a combination of the data from the previous S&P investigation and the data obtained in the course of the present investigation. This model describes the geotechnical conditions influencing design and construction of the foundations and approach embankments for the underpass structure.

Thurber carried out the investigation as a sub-consultant to Marshall Macklin Monaghan, under the Ministry of Transportation Ontario (MTO) Agreement Number 5005-A-000285.

2 SITE DESCRIPTION

The site is located approximately 45 m west of the existing Highway 11 alignment at the south crossing of Magnetawan River, approximately 800 m south of Three Mile Lake Road/Doe Lake Road in Katrine. Municipal Service Road will run essentially parallel to the four-laned Highway 11 at this location. The bridge will be constructed near Municipal Service Road Station 8+400, and Highway 11 Station 11+240, Armour Township.

The general site area is located within the physiographic region known as the Canadian Shield, characterized by Pre-Cambrian bedrock typically occurring as rounded knobs and ridges where exposed. Locally however, the site lies in the valley of the Magnetawan River, which is underlain by relatively deep deposits of ice-contact and glacio-fluvial sands and gravels.

The Magnetawan River channel is approximately 24 m wide at the site and the maximum channel depth, based on contour data, is approximately 5 m. The water level in the river in May 2003 was

near elevation 294, about 1 m below the top of riverbank. The ground surface is relatively flat adjacent to the channel, and begins to slope upward a distance of some 150 m south and 75 m north of the river. No global stability problems were observed along the riverbanks.

The bridge area typically comprises grassed pasture and woodland. The surrounding uplands adjacent to the river valley are heavily forested.

3 SITE INVESTIGATION AND FIELD TESTING

Thurber carried out site investigation and field testing at the proposed location of the bridge between September 23 and October 21, 2004. Preliminary investigation was carried out by S&P between May 22 and 31, 2001.

The current site investigation consisted of drilling and sampling six boreholes (boreholes 426-1, 426-3, 426-4, 426-7, 426-8 and 426-10) to depths of 35.9 to 46.9 m at the abutments and piers, and to depths of 9.8 and 10.1 m at the approaches. All boreholes except borehole 426-1 were supplemented by dynamic cone penetration testing. The approximate locations of the boreholes are shown on the Borehole Locations and Soil Strata Drawing in Appendix G.

Prior to the start of drilling, the borehole locations were staked in the field and utility clearances were obtained.

Hollow stem augers and rotary wash boring techniques with casing were used to advance the boreholes. Samples were obtained using a split spoon sampler in conjunction with Standard Penetration Testing (SPT). Where soft to firm cohesive soils were encountered, the undrained shear strength was evaluated by in situ vane testing.

The positions of the principal boreholes considered in the preparation of this report, relative to the structure site are as shown in Table 3.1.

Table 3.1 – Borehole Locations Relative to Structure

Location on Structure	Boreholes Considered in Design
South Approach	426-1, RT1/1A*
South Abutment	426-3, RT2*
South Pier	426-4
North Pier	426-7, RT3*
North Abutment	426-8, RT4*
North Approach	426-10

* Boreholes drilled by S&P in 2001

The coordinates and elevations of the boreholes are given on the Borehole Locations and Soil Strata Drawing and on the individual Record of Borehole Sheets in Appendix A.

A standpipe piezometer, consisting of 19 mm PVC pipe with slotted tip, was installed in each borehole to monitor groundwater levels. A shallow piezometer was installed at the north pier in the course of the preliminary investigation.

The completion details for the piezometers are shown in Table 3.2.

Table 3.2 – Piezometer Details

Piezometer Location	Piezometer Details	
	Tip Depth/ Elevation	Completion Details
BH 426-1	9.1/286.0	Piezometer with 1.5 m tip installed at bottom of borehole. Sand filter to 7.0, bentonite seal to 6.4, grout to 0.6 and bentonite seal to surface.
BH 426-3	34.3/260.8	Piezometer with 1.5 m tip installed at bottom of borehole. Sand filter to 32.8, bentonite grout to 2.1 and bentonite seal to the surface.
BH 426-4	39.6/255.6	Piezometer with 1.5 m tip installed at bottom of borehole. Sand filter to 37.0, bentonite grout to 1.2 and bentonite seal to the surface.
BH 426-7	37.6/257.9	Piezometer with 1.5 m tip installed at bottom of borehole. Sand filter to 34.7, bentonite grout to 3.7 and bentonite seal to the surface.
BH 426-8	44.2/251.1	Piezometer with 1.5 m tip installed at bottom of borehole. Sand filter to 42.4, bentonite grout to 3.7 and bentonite seal to the surface.
BH 426-10	9.8/285.6	Piezometer with 1.5 m tip installed at bottom of borehole. Sand filter to 6.1, bentonite grout to 0.6 and bentonite seal to the surface.

A member of Thurber's engineering staff supervised the drilling and sampling operations on a full time basis. The inspector logged the boreholes and the recovered samples and processed them for transport to Thurber's Oakville office.

4 LABORATORY TESTING

All recovered soil samples were subjected to visual identification and to natural moisture content determination. The results of this testing are shown on the Record of Borehole sheets in Appendix A.

Selected samples were subjected to gradation analysis (sieve and hydrometer) and Atterberg Limits testing. The results are shown on the Record of Borehole sheets in Appendix A and on the charts in Appendix B. A total of 27 samples were selected for this testing.

5 DESCRIPTION OF SUBSURFACE CONDITIONS

5.1 General

Reference is made to the Record of Borehole sheets in Appendix A and to the Record of Borehole sheets prepared by S&P included in Appendix C. Details of the encountered soil stratigraphy are presented in these appendices and on the attached Borehole Locations and Soil Strata Drawing. An overall description of the stratigraphy is given in the following paragraphs however the factual data presented in the borehole logs governs any interpretation of the site conditions.

The soil stratigraphy encountered at this site is consistent with that encountered in much of the Highway 11 corridor between Huntsville and North Bay. Typically, this comprises bedrock mantled by sand and gravel containing cobbles and boulders, which is overlain by glacial outwash soils deposited in glacio-fluvial and glacio-lacustrine environments. Locally, the surface soils have been reworked and re-deposited by the Magnetawan River.

In general terms, the site was found to be underlain by a thin veneer of topsoil underlain by a thick deposit of silty sand to sandy silt, interrupted by discontinuous layers of silt, clayey silt and silty clay in the upper 10 m, and by layers of sand and gravel with cobbles and boulders at greater depth. The boreholes were terminated in very dense sand/sand and gravel deposits; the bedrock surface was not contacted within the exploration depth.

More detailed descriptions of the individual strata are presented below.

5.2 Topsoil

Topsoil was identified surficially in all boreholes except borehole RT2 drilled near the south abutment and borehole 04-8 drilled at the north abutment. The topsoil thickness was established only at the borehole locations and ranged from 50 to 400 mm. The topsoil thickness may vary between and beyond the borehole locations and the data is not intended for the purpose of estimating quantities.

5.3 Silty Sand to Sandy Silt

Non-cohesive silty sand to sandy silt was encountered below the topsoil in all boreholes and formed the predominant soil type at the site. Material grading to sandy silt was generally restricted to the upper 10 m of the boreholes, and within this depth, the sand deposit was interrupted by discontinuous layers of silt, clayey silt and silty clay. At greater depth, sand and gravel layers were encountered within the silty sand to sand deposit. Cobbles and boulders were also encountered occasionally.

Standard Penetration Test (SPT) N-values in the silty sand to sandy silt were typically less than 10 blows/0.3 m penetration to depths of 10 to 15 m, with occasional values of up to 21 blows/0.3 m. These values indicate a loose to very loose condition with compact zones. Below these depths, the sand became typically compact to dense with N-values ranging

from 3 to 65 blows/0.3 m, generally 11 to 34 blows/0.3 m penetration. Very dense sand with N-values exceeding 50 blows/0.15 m penetration was contacted below an interbedded sand and gravel layer at depths of about 29.6 to 36.6 m (elevation 265.7 to 258.6 m).

Grain size distribution results for the silty sand to sandy silt are reported on the Record of Borehole sheets and plotted in Figures B1 to B3 of Appendix B. Grain size results from the preliminary investigation are included in Appendix C.

Moisture contents ranged from 10 to 38%, with the higher values recorded in the upper zone potentially containing organic material. Typically, the moisture contents ranged from 15 to 25%.

Boreholes 426-4 and 426-7 drilled at the piers and borehole 426-8 drilled at the north abutment were terminated in very dense sand at depths of 37.6 to 46.9 m (elevation 257.9 to 248.4 m). Approach borehole 426-10 was terminated in silt and sand at 9.8 m depth.

5.4 Clayey Silt to Silty Clay

A discontinuous layer of cohesive clayey silt was encountered within the sand deposit in boreholes RT1A, RT3 and RT4. In borehole RT1A on the south side of the river, the clayey silt layer was 0.7 m thick and encountered at 5.3 m depth (elevation 290.3 m). In boreholes RT3 and RT4 on the north side of the river, the clayey silt was 1.5 and 2.5 m thick, with an upper boundary at depths of 2.2 and 0.7 m (elevation 292.7 and 294.4 m). A very soft to very stiff consistency is indicated by SPT values of 1 to 22 blows/0.3 m penetration. Grain size results and Atterberg Limits plots for this material, from the preliminary study, are included in Appendix C.

In approach borehole 426-1 drilled at the south limit of the study area, silty clay was encountered below a sand layer at 2.2 m depth (elevation 292.9 m). SPT N-values in this material generally increased with depth from 1 to 9 blows/0.3 m penetration. The undrained shear strength of the clay determined by in situ vane testing also increased with depth, from 80 to 150 kPa, indicating a stiff to very stiff consistency. The sensitivity ranged from 3.2 to 3.5.

Grain size distribution results for the clay in borehole 426-1 are provided on the Record of Borehole sheet and in Figure B4 of Appendix B. The results of Atterberg Limits testing (Figure B7 of Appendix B) classify the soil as medium plastic (CI). Moisture contents ranged between 32 and 42%.

5.5 Silt

Non-cohesive silt strata were encountered within the silty sand/sandy silt in the upper 3.0 to 10.1 m of all boreholes except boreholes 426-1 and RT2. The silt layers ranged from 0.8 to 4.9 m in thickness and were contacted at depths of 0.3 to 7.3 m (elevation 295.0 to 287.9 m). In borehole RT1/1A, drilling was terminated at 9.6 m depth, 3.6 m into the silt, and the full thickness of this layer was not determined.

SPT N-values obtained in the silt generally ranged from 3 to 18 blows/0.3 m penetration, indicating a very loose to compact condition. In borehole 426-10, the N-values ranged from 6 to 46 blows/0.3 m, indicating a loose to dense condition. The measured natural moisture contents ranged from 16 to 34%, typically 16 to 24%. The soil is generally described as brown or grey in colour.

Grain size distributions for this silt are reported on the Record of Borehole sheets and are plotted in Figure B5 in Appendix B. Grain size results from the preliminary study are included in Appendix C as well.

5.6 Sand and Gravel

A layer of sand and gravel to gravelly sand was encountered within the sand deposit in all boreholes advanced at the abutment and pier locations. The upper boundary of the primary, possibly continuous layer of sand/gravel was contacted at depths of 20.4 to 28.7 m (elevation 274.9 to 266.4 m). Two additional layers were encountered at depths of 16.8 and 35.1 m (elevation 278.3 and 260.0 m) in borehole 426-3, and an isolated upper layer was also encountered in borehole 426-8 at 4.0 m depth (elevation 291.3 m). The thickness of the sand and gravel layer ranged from 1.8 to 6.1 m where fully penetrated. Boreholes 426-3, RT2 and RT3 were terminated in sand/gravel after penetrating 0.8 to 6.2 m into this layer.

The sand and gravel layer contained cobbles and boulders which may have influenced the results of SPT testing. N-values obtained in these layers ranged from 9 blows/0.3 m to greater than 50 blows/.075 m of penetration, indicating a typically compact to very dense condition. However, it is possible that the sampler was driving on the cobbles and boulders in many cases, and the resulting high SPT values may be unrepresentative. The isolated layer of sand and gravel at 4.0 m depth in borehole 426-8 was very loose with a N-value of 2 blows/0.3 m obtained.

The results of grain size distribution analyses conducted on samples of the sand and gravel deposit, including the gravelly sand zones, are presented on Figure B6 of Appendix B and in Appendix C. The samples excluded particle sizes greater than about 30 mm. Moisture contents ranged from 5 to 19%.

5.7 Bedrock

Bedrock was not contacted within the exploration depths of 9.6 to 46.9 m during the investigation.

5.8 Depths to Refusal

The depths at which effective refusal was encountered, defined as an SPT value exceeding 100 blows for 0.3 m of penetration or bedrock, are shown in Table 5.1.

Table 5.1 – Refusal Depths (Elevations)

Location	Borehole	Refusal Depth (Elevation), m	Material
South Abutment	426-3	32.6 (262.5)	Gravelly Sand
South Pier	426-4	36.6 (258.6)	Sand
North Pier	426-7	27.0 (268.5)	Gravelly Sand
North Abutment	426-8	29.6 (265.7)	Sand

5.9 Water Levels

The initial and final groundwater depths and elevations measured in the piezometers installed in the boreholes are shown in Table 5.2.

Table 5.2 – Groundwater Depths and Elevations

Location	Borehole	Date	Water Level (m)	
			Depth	Elevation
South Approach	426-1	November 11, 2004	0.1	295.0
South Abutment	426-3	October 21, 2004	0.1	295.0
		November 11, 2004	0.0	295.1
		December 8, 2004	0.2	294.9
South Pier	426-4	October 21, 2004	0.0	295.2
		November 11, 2004	0.0	295.2
		December 8, 2004	0.2	295.0
North Pier	RT3	June 1, 2001	0.5	294.4
	426-7	November 11, 2004	0.2	295.3
		December 8, 2004	0.3	295.2
North Abutment	426-8	September 30, 2004	0.2	295.1
		November 11, 2004	0.0	295.3
		December 8, 2004	0.1	295.2
North Approach	426-10	September 30, 2004	1.4	294.0
		November 11, 2004	0.7	294.7
		December 8, 2004	0.7	294.7

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, and will be influenced by the water level in the Magnetawan River.

6 MISCELLANEOUS

Marshall Macklin Monaghan completed field layout for the site investigation and provided borehole coordinates and ground surface elevations.

All-Terrain Drilling Limited supplied and operated the drilling and sampling equipment used for the current investigation. Full time supervision of the field activities, including obtaining utility clearances, was carried out by Mr. Stephane Loranger of Thurber.

Interpretation of the field data and preparation of the investigation report was conducted by Mr. Murray Anderson, P.Eng. Overall supervision of the field program and review of the report was performed by Mr. Alastair E. Gorman, P.Eng. The report was also reviewed by Dr. P.K. Chatterji, Ph.D., a Designated Principal Contact for MTO Foundations Projects.

Thurber Engineering Ltd.
Murray R. Anderson, P.Eng., M.Eng.
Senior Geotechnical Engineer

Alastair E. Gorman, P.Eng., M.Sc.
Senior Foundations Engineer

P.K. Chatterji, P.Eng., Ph.D.
Review Principal.

Appendix A

Record of Borehole Sheets

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THURBER

RECORD OF BOREHOLE No 426-1 1 OF 2 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-1 N 5 047 512.3 E 316 636.4 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM

DATUM Geodetic DATE 01.10.04 - 01.10.04 CHECKED BY MA

SOIL PROFILE ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
295.1											
0.0 / 294.8	**TOPSOIL**						295				
0.3 / 293.7	**SAND**, trace silt Very Loose Brown Moist		1	SS	3		294		○		
1.4 / 292.9	Silty **SAND** Very Loose Grey Wet		2	SS	3		293		○		
2.2	Silty **CLAY**, trace sand Firm to Very Stiff Grey Moist		3	SS	1		292		○		
			4	SS	2		291	3.2	○		0 2 53 45
			5	SS	6		290	3.4	○		
			6	SS	7		289		○		
			7	SS	9		288	3.4	○		0 0 63 36
			8	SS	6		287	>>3.5			
							286		○		

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+ ³, × ³: Numbers refer to Sensitivity

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

ONTM4TS 2316(426).GPJ 07/01/05

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 426-1 2 OF 2 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-1 N 5 047 512.3 E 316 636.4 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM

DATUM Geodetic DATE 01.10.04 - 01.10.04 CHECKED BY MA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
285.0											
10.1	END OF BOREHOLE AT 10.13 m. Piezometer installation consists of 19 mm diameter Schedule 40 PVC pipe with a 1.52 m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) 11.11.04 0.05						285				

$+^3$, $\times^3$: Numbers refer to Sensitivity

$\frac{20}{15}\oplus\frac{5}{10}$ (%) STRAIN AT FAILURE

ONTMT4S 2316(426).GPJ 07/01/05

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 426-3 1 OF 4 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-3 N 5 047 531.5 E 316 633.0 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers/NW Casing COMPILED BY WM

DATUM Geodetic DATE 04.10.04 - 07.10.04 CHECKED BY MA

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
295.1								20 40 60 80 100	20 40 60		
0.0 / 294.7	**TOPSOIL**, sandy, some rootlets Dark Brown						295				
0.4 / 293.7	**SAND**, fine grained, trace silt Compact Brown Moist		1	SS	10		294		○		
1.4 / 292.1	**SILT**, some sand to sandy Loose to Compact Grey Wet		2	SS	5		293		○		0 13 79 8
			3	SS	15				○		
3.0	**SAND**, fine grained, trace silt to silty Compact to Loose Grey Wet		4	SS	13		292		○		
			5	SS	7		291		○		
			6	SS	6		290		○		0 57 43 (SI+CL)
			7	SS	7		289		○		
			8	SS	7		288		○		
							287		○		
							286				

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+ ^{3}, × ^{3}: Numbers refer to Sensitivity

15 ⊕ 5 (20 / 10) (%) STRAIN AT FAILURE

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THURBER

RECORD OF BOREHOLE No 426-3 2 OF 4 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-3 N 5 047 531.5 E 316 633.0 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers/NW Casing COMPILED BY WM

DATUM Geodetic DATE 04.10.04 - 07.10.04 CHECKED BY MA

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE) 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
			9	SS	8		285		○		0 94 6 (SI+CL)
	becoming compact		10	SS	21		284		○		
282.9											
12.2	**SAND**, trace silt, trace to some gravel Compact Grey Wet						283				
			11	SS	11		282		○		
			12	SS	17		281		○		
	occasional cobbles						280				
278.3			13	SS	11		279		○		
16.8	**SAND and GRAVEL**, trace silt, occasional cobbles Dense to Compact Grey Wet						278				
			14	SS	45		277		○		36 61 3 (SI+CL)
			15	SS	18		276		○		

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+ ^{3}, × ^{3}: Numbers refer to Sensitivity

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

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Ministry of Transportation
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THURBER

RECORD OF BOREHOLE No 426-3 3 OF 4 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-3 N 5 047 531.5 E 316 633.0 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers/NW Casing COMPILED BY WM

DATUM Geodetic DATE 04.10.04 - 07.10.04 CHECKED BY MA

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
274.8	200 mm cobble encountered						275				
20.3	**SAND**, trace silt, trace gravel Compact to Loose Grey Wet		16	SS	15						
							274				
							273				
							272				
			17	SS	3				○		
	occasional cobbles and boulders						271				
							270				
							269				
	170 mm boulder encountered										
			18	SS	26		268		○		
	becoming compact										
266.4							267				
28.7	Gravelly **SAND**, trace silt, occasional cobbles and boulders Very Dense Grey Wet						266				

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+ ³, × ³: Numbers refer to Sensitivity

20
15 ⊕ 5
10
(%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 426-3 4 OF 4 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-3 N 5 047 531.5 E 316 633.0 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers/NW Casing COMPILED BY WM

DATUM Geodetic DATE 04.10.04 - 07.10.04 CHECKED BY MA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
			19	SS	86		265		○		15 77 8 (SI+CL)
262.1			20	SS	101		264		○		
33.0	Silty **SAND**, some gravel Very Dense Grey Wet		21	SS	100/.100		263		○		12 49 39 (SI+CL)
260.0							262				
35.1	**SAND and GRAVEL**, some silt Very Dense Grey Wet		22	SS	100/.050		261		○		
259.2							260		○		
35.9	END OF BOREHOLE AT 35.86 m. Piezometer installation consists of 19 mm diameter Schedule 40 PVC pipe with a 1.52 m slotted screen.										

WATER LEVEL READINGS:

DATE	DEPTH (m)
21.10.04	0.08
11.11.04	0.00
08.12.04	0.16

+ ³, × ³: Numbers refer to Sensitivity

20 / 15 5 / 10 (%) STRAIN AT FAILURE

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THURBER

RECORD OF BOREHOLE No 426-3A 1 OF 2 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-3A N 5 047 532.5 E 316 633.5 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Dynamic Cone Penetration Test (DCPT) COMPILED BY WM

DATUM Geodetic DATE 08.10.04 - 08.10.04 CHECKED BY MA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L / WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
295.1											
0.0	DCPT from surface.						295				
							294				
							293				
							292				
							291				
							290				
							289				
							288				
							287				
							286				

Continued Next Page

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 426-3A 2 OF 2 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-3A N 5 047 532.5 E 316 633.5 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Dynamic Cone Penetration Test (DCPT) COMPILED BY WM

DATUM Geodetic DATE 08.10.04 - 08.10.04 CHECKED BY MA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
							285	20 40 60 80 100	20 40 60		
							284	○ UNCONFINED + FIELD VANE	w_P w w_L		
							283	● QUICK TRIAXIAL × LAB VANE			
							282	20 40 60 80 100			
							281				
280.2										γ kN/m^3	GR SA SI CL
14.9	END OF DCPT AT 14.91 m.										

$+^3$, $\times^3$: Numbers refer to Sensitivity

$15\text{-}\frac{20}{10}\text{-}5$ (%) STRAIN AT FAILURE

ONTMT4S 2316(426).GPJ 07/01/05

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 426-4 1 OF 5 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-4 N 5 047 548.4 E 316 607.9 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers/HW Casing, NW Casing COMPILED BY WM

DATUM Geodetic DATE 18.10.04 - 20.10.04 CHECKED BY MA

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
295.2											
0.0	**TOPSOIL**						295				
0.2	**SAND and SILT**, trace clay Loose to Very Loose Brown Wet		1	SS	6				○		0 50 47 3
			2	SS	2		294		○		
293.0											
2.2	**SILT**, some sand Compact Brown to Grey Wet		3	SS	11		293		○		0 18 76 6
292.2											
3.0	Silty **SAND**, fine grained Compact to Loose Grey Wet		4	SS	14		292		○		
			5	SS	7		291		○		0 76 24 (SI+CL)
			6	SS	7		290		○		
287.9							289				
7.3	**SILT**, some sand Very Loose to Loose Grey Wet		7	SS	3		288		○		0 16 79 5
			8	SS	7		287		○		
							286				

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$+^3$, $\times^3$: Numbers refer to Sensitivity

15 (20, 10, 5) (%) STRAIN AT FAILURE

ONTMT4S 2316(426).GPJ 07/01/05

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 426-4 2 OF 5 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-4 N 5 047 548.4 E 316 607.9 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers/HW Casing, NW Casing COMPILED BY WM

DATUM Geodetic DATE 18.10.04 - 20.10.04 CHECKED BY MA

SOIL PROFILE ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
285.1											
10.1	**SAND**, fine grained, trace to some silt Compact to Loose Grey Wet		9	SS	16		285		○		
							284				
			10	SS	4		283		○		
							282				
			11	SS	7		281		○		
			12	SS	4		280		○		
	Becoming Compact						279				
			13	SS	10		278		○		
276.9											
18.3	**SAND**, trace silt, trace to some gravel, occasional cobbles and boulders Very Dense to Compact Grey Wet		14	SS	65		277		○		
							276				

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+ ³, × ³: Numbers refer to Sensitivity

15 (20 / 10) 5 (%) STRAIN AT FAILURE

ONTMT4S 2316(426).GPJ 07/01/05

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THURBER

RECORD OF BOREHOLE No 426-4 3 OF 5 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-4 N 5 047 548.4 E 316 607.9 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers/HW Casing, NW Casing COMPILED BY WM

DATUM Geodetic DATE 18.10.04 - 20.10.04 CHECKED BY MA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	w_P w w_L	γ kN/m^3	GR SA SI CL
							275	20 40 60 80 100	20 40 60		
							274				
			15	SS	27		273				
							272				
							271				
			16	SS	33		270		○		
							269				
268.7							268				
26.5	Gravelly **SAND**, with cobbles and boulders Compact Grey Wet		17	SS	13		267		○		
							266				

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$+^3$, $\times^3$: Numbers refer to Sensitivity

$15 \oplus^{20}_{10} 5$ (%) STRAIN AT FAILURE

ONTMT4S 2316(426).GPJ 07/01/05

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THURBER

RECORD OF BOREHOLE No 426-4 4 OF 5 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-4 N 5 047 548.4 E 316 607.9 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers/HW Casing, NW Casing COMPILED BY WM

DATUM Geodetic DATE 18.10.04 - 20.10.04 CHECKED BY MA

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
263.5			18	SS	100/ .125		265		○		19 72 9 (SI+CL)
31.7	**SAND**, some silt, occasional cobbles and boulders Compact to Very Dense Grey Wet		19	SS	17		264				
			20	SS	77		263		○		0 87 13 (SI+CL)
			21	SS	50/ .075		262				
			22	SS	100/ .100		261		○		
255.5			23	SS	100/		260				
39.7	END OF BOREHOLE AT 39.70 m. Piezometer installation consists of 19				.075		259		○		
							258				
							257		○		
							256				
									○		

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+ ³, × ³: Numbers refer to Sensitivity

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S 2316(426).GPJ 07/01/05

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THURBER

RECORD OF BOREHOLE No 426-4 5 OF 5 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-4 N 5 047 548.4 E 316 607.9 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers/HW Casing, NW Casing COMPILED BY WM

DATUM Geodetic DATE 18.10.04 - 20.10.04 CHECKED BY MA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
	mm diameter Schedule 40 PVC pipe with a 1.52 m slotted screen.										
	WATER LEVEL READINGS: DATE DEPTH (m) 21.10.04 0.03 11.11.04 0.0 08.12.04 0.21										

$+^3$, $\times^3$: Numbers refer to Sensitivity

$15 \overset{20}{\oplus} 5$ $\underset{10}{}$ (%) STRAIN AT FAILURE

ONTMT4S 2316(426).GPJ 07/01/05

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THURBER

RECORD OF BOREHOLE No 426-4A 1 OF 2 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-4A N 5 047 549.9 E 316 607.9 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Dynamic Cone Penetration Test (DCPT) COMPILED BY WM

DATUM Geodetic DATE 21.10.04 - 21.10.04 CHECKED BY MA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
295.2								20 40 60 80 100	20 40 60	γ kN/m^3	GR SA SI CL
0.0	DCPT started from surface.						295				
							294				
							293				
							292				
							291				
							290				
							289				
							288				
							287				
							286				

O UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE

W_P W W_L

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$+^3$, $\times^3$: Numbers refer to Sensitivity

$\frac{20}{15}\oplus\frac{5}{10}$ (%) STRAIN AT FAILURE

ONTM4TS 2316(426).GPJ 07/01/05

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THURBER

RECORD OF BOREHOLE No 426-4A 2 OF 2 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-4A N 5 047 549.9 E 316 607.9 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Dynamic Cone Penetration Test (DCPT) COMPILED BY WM

DATUM Geodetic DATE 21.10.04 - 21.10.04 CHECKED BY MA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa	WATER CONTENT (%)	UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100; ○ UNCONFINED + FIELD VANE; ● QUICK TRIAXIAL × LAB VANE; 20 40 60 80 100	PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L; 20 40 60	γ kN/m^3	GR SA SI CL
							285				
							284				
							283				
							282				
281.0											
14.2	END OF DCPT AT 14.12 m.										

$+^3$, $\times^3$: Numbers refer to Sensitivity

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S 2316(426).GPJ 07/01/05

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THURBER

RECORD OF BOREHOLE No 426-7 1 OF 4 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-7 N 5 047 594.1 E 316 598.0 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers/NW Casing COMPILED BY WM

DATUM Geodetic DATE 29.09.04 - 30.09.04 CHECKED BY MA

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
295.5											
0.0	**TOPSOIL**, sandy, some rootlets										
0.2	Sandy **SILT**, trace rootlets, occasional topsoil staining Loose Brown Moist		1	SS	6		295				
			2	SS	6		294		○		
293.3											
2.2	**SAND and SILT**, fine grained, trace clay Loose Grey Wet		3	SS	8		293				
			4	SS	6		292		○		0 55 43 3
291.5											
4.0	**SILT**, trace sand, trace clay Very Loose Grey Wet		5	SS	3		291		○		0 4 90 6
289.7							290				
5.8	Silty **SAND**, fine grained Loose to Compact Grey Wet		6	SS	4		289		○		
			7	SS	9		288		○		
			8	SS	5		287				
							286				

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+ ³, × ³: Numbers refer to Sensitivity

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S 2316(426).GPJ 07/01/05

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 426-7 2 OF 4 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-7 N 5 047 594.1 E 316 598.0 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers/NW Casing COMPILED BY WM

DATUM Geodetic DATE 29.09.04 - 30.09.04 CHECKED BY MA

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE; 20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
283.0			9	SS	11		285				
			10	SS	11		284				0 81 19 (SI+CL)
12.5	**SAND and SILT**, occasional clay pockets Compact Grey Wet		11	SS	16		283				
280.0			12	SS	12		282				0 48 42 10
15.5	**SAND**, some silt, trace gravel Grey Compact Wet		13	SS	21		281				
			14	SS	20		280				
			15	SS	17		279				
							278				
							277				
							276				

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+ ³, × ³: Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

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RECORD OF BOREHOLE No 426-7 3 OF 4 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-7 N 5 047 594.1 E 316 598.0 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers/NW Casing COMPILED BY WM

DATUM Geodetic DATE 29.09.04 - 30.09.04 CHECKED BY MA

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
							275				
			16	SS	21		274		○		
							273				
							272				
			17	SS	14		271		○		0 89 10 (SI+CL)
							270				
269.6											
25.9	Gravelly **SAND**, occasional cobbles Very Dense Grey Wet						269				
			18	SS	50/.150		268		○		
							267				
							266				

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$+^3$, $\times^3$: Numbers refer to Sensitivity

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S 2316(426).GPJ 07/01/05

Ministry of Transportation
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THURBER

RECORD OF BOREHOLE No 426-7 4 OF 4 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-7 N 5 047 594.1 E 316 598.0 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers/NW Casing COMPILED BY WM

DATUM Geodetic DATE 29.09.04 - 30.09.04 CHECKED BY MA

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
			19	SS	50/.100		265				
263.5							264				
32.0	**SAND**, some silt, trace gravel, occasional cobbles Very Dense Grey Wet		20	SS	50/.150		263		○		
							262				
							261				
							260				
			21	SS	100/.200		259		○		6 78 16 (SI+CL)
257.9			22	SS	100/.150		258		○		
37.6	END OF BOREHOLE AT 37.64 m. Piezometer installation consists of 19 mm diameter Schedule 40 PVC pipe with a 1.52 m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) 11.11.04 0.22 08.12.04 0.32										

$+^3$, $\times^3$: Numbers refer to Sensitivity

$15\frac{20}{10}5$ (%) STRAIN AT FAILURE

ONTMT4S 2316(426).GPJ 07/01/05

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 426-7A 1 OF 2 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-7A N 5 047 595.6 E 316 598.0 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Dynamic Cone Penetration Test (DCPT) COMPILED BY WM

DATUM Geodetic DATE 30.09.04 - 30.09.04 CHECKED BY MA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L / WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH 295.5	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
0.0	DCPT from 1.22 m.						295 294 293 292 291 290 289 288 287 286				

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+ ^{3}, × ^{3}: Numbers refer to Sensitivity

20
15 ⊕ 5 (%) STRAIN AT FAILURE
10

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THURBER

RECORD OF BOREHOLE No 426-7A 2 OF 2 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-7A N 5 047 595.6 E 316 598.0 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Dynamic Cone Penetration Test (DCPT) COMPILED BY WM

DATUM Geodetic DATE 30.09.04 - 30.09.04 CHECKED BY MA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100; ○ UNCONFINED + FIELD VANE; ● QUICK TRIAXIAL × LAB VANE; 20 40 60 80 100	w_P w w_L; 20 40 60	γ kN/m³	GR SA SI CL
							285				
							284				
							283				
							282				
							281				
280.3											
15.2	END OF DCPT AT 15.21 m.										

+ ³, × ³: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

ONTMT4S 2316(426).GPJ 07/01/05

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 426-8 1 OF 5 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-8 N 5 047 611.4 E 316 573.1 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers/NW Casing COMPILED BY WM

DATUM Geodetic DATE 23.09.04 - 28.09.04 CHECKED BY MA

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
295.3											
0.0 / 295.0	**SAND**, trace gravel, trace silt Brown Moist (FILL)						295				
0.3	**SILT**, some sand, trace clay Loose Brown Wet		1	SS	3				o		
			2	SS	3		294				
			3	SS	6		293		o		
			4	SS	6		292		o		1 18 73 8
291.3											
4.0	**SAND and GRAVEL**, trace silt Very Loose Brown Wet		5	SS	2		291		o		
289.5							290				
5.8	Silty **SAND**, fine grained Loose to Compact Grey Wet		6	SS	6		289		o		
							288				
			7	SS	6		287		o		
							286				

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+ ^{3}, × ^{3}: Numbers refer to Sensitivity

$\frac{20}{15 \oplus 5}$ (%) STRAIN AT FAILURE
10

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THURBER

RECORD OF BOREHOLE No 426-8 2 OF 5 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-8 N 5 047 611.4 E 316 573.1 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers/NW Casing COMPILED BY WM

DATUM Geodetic DATE 23.09.04 - 28.09.04 CHECKED BY MA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
			8	SS	10		285		○		0 71 29 (SI+CL)
			9	SS	14		284		○		
			10	SS	9		283		○		
	occasional silt layers		11	SS	15		282		○		
			12	SS	13		281		○		0 72 28 (SI+CL)
			13	SS	11		280		○		
			14	SS	23		279		○		
							278				
							277				
							276				

Continued Next Page

$+^3$, $\times^3$: Numbers refer to Sensitivity

$15 \oplus \frac{20}{10} 5$ (%) STRAIN AT FAILURE

ONTMT4S 2316(426).GPJ 07/01/05

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 426-8 3 OF 5 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-8 N 5 047 611.4 E 316 573.1 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers/NW Casing COMPILED BY WM

DATUM Geodetic DATE 23.09.04 - 28.09.04 CHECKED BY MA

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
274.9							275				
20.4	Gravelly **SAND**, occasional cobbles Very Dense Grey Wet		15	SS	67				○		25 64 11 (SI+CL)
							274				
							273				
							272				
			16	SS	50/ .075				○		
270.6							271				
24.7	**SAND**, trace gravel, trace silt, occasional silty sand layers Compact to Very Dense Grey Wet						270				
							269				
			17	SS	11				○		8 82 10 (SI+CL)
							268				
							267				
							266				
			18	SS	60/ .125						

Continued Next Page

$+^3$, $\times^3$: Numbers refer to Sensitivity

$\frac{20}{15 \oplus 5}$ (%) STRAIN AT FAILURE
10

ONTM4TS 2316(426).GPJ 07/01/05

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 426-8 4 OF 5 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-8 N 5 047 611.4 E 316 573.1 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers/NW Casing COMPILED BY WM

DATUM Geodetic DATE 23.09.04 - 28.09.04 CHECKED BY MA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
			19	SS	50/.125		265		○		
							264				
							263				
			20	SS	50/.100		262		○		
							261				
							260				
257.8							259				
37.5	Silty **SAND**, some gravel, occasional cobbles Very Dense Grey Wet		21	SS	50/.150		258		○		
							257				
							256				

Continued Next Page

$+^3$, $\times^3$: Numbers refer to Sensitivity

$15 \oplus^{20}_{10} 5$ (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 426-8 5 OF 5 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-8 N 5 047 611.4 E 316 573.1 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers/NW Casing COMPILED BY WM

DATUM Geodetic DATE 23.09.04 - 28.09.04 CHECKED BY MA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
							255				
							254				
			22	SS	50/.075				○		4 55 40 1
							253				
							252				
							251				
			23	SS	50/.100				○		
							250				
							249				
248.4											
46.9	END OF BOREHOLE AT 46.94 m. Piezometer installation consists of 19 mm diameter Schedule 40 PVC pipe with a 1.52 m slotted screen.										

WATER LEVEL READINGS:

DATE	DEPTH (m)
29.09.04	0.62
30.09.04	0.18
11.11.04	0.00
08.12.04	0.11

+ ³, × ³: Numbers refer to Sensitivity

15 (20 / 10) 5 (%) STRAIN AT FAILURE

ONTMT4S 2316(426).GPJ 07/01/05

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 426-8A 1 OF 2 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-8A N 5 047 612.9 E 316 573.1 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Dynamic Cone Penetration Test (DCPT) COMPILED BY WM

DATUM Geodetic DATE 28.09.04 - 28.09.04 CHECKED BY MA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
295.3 / 0.0	DCPT from 1.52 m.						295 294 293 292 291 290 289 288 287 286				

Continued Next Page

+ ³, × ³: Numbers refer to Sensitivity

20 / 15 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S 2316(426).GPJ 07/01/05

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 426-8A 2 OF 2 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-8A N 5 047 612.9 E 316 573.1 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Dynamic Cone Penetration Test (DCPT) COMPILED BY WM

DATUM Geodetic DATE 28.09.04 - 28.09.04 CHECKED BY MA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L / WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
							285				
							284				
							283				
							282				
							281				
							280				
							279				
278.3											
17.0	END OF DCPT AT 17.04 m.										

$+^3$, $\times^3$: Numbers refer to Sensitivity

$\frac{20}{15 \oplus 5}$ (%) STRAIN AT FAILURE
10

ONTMT4S 2316(426).GPJ 07/01/05

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 426-10 1 OF 2 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-10 N 5 047 630.7 E 316 569.1 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM

DATUM Geodetic DATE 29.09.04 - 29.09.04 CHECKED BY MA

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
295.4											
0.0	**TOPSOIL**										
0.1	**SAND,** trace silt Brown Moist										
294.8							295				
0.6	**SILT,** trace clay, trace sand, occasional iron oxide staining Compact to Dence Grey Wet		1	SS	11				○		
			2	SS	46		294		○		
			3	SS	21		293		○		
			4	SS	14		292		○		0 4 91 6
291.1											
4.3	**SILT,** some sand Loose Grey Wet		5	SS	6		291		○		
289.9											
5.5	**SILT and SAND** Loose Grey Wet		6	SS	5		289		○		
			7	SS	6		288		○		0 41 57 2
			8	SS	WH		287 286				
285.6											
9.8	END OF BOREHOLE AT 9.75 m.										

Continued Next Page

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

15 $\frac{20}{10}$ 5 (%) STRAIN AT FAILURE

ONTMT4S 2316(426).GPJ 07/01/05

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 426-10 2 OF 2 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-10 N 5 047 630.7 E 316 569.1 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Hollow Stem Augers COMPILED BY WM

DATUM Geodetic DATE 29.09.04 - 29.09.04 CHECKED BY MA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100; ○ UNCONFINED + FIELD VANE; ● QUICK TRIAXIAL × LAB VANE; 20 40 60 80 100	w_P w w_L; 20 40 60	γ kN/m³	GR SA SI CL
	Piezometer installation consists of 19 mm diameter Schedule 40 PVC pipe with a 1.52 m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) 29.09.04 2.34 30.09.04 1.37 11.11.04 0.74 08.12.04 0.71										

+ ³, × ³: Numbers refer to Sensitivity

20 / 15 / 10 / 5 (%) STRAIN AT FAILURE

ONTMT4S 2316(426).GPJ 07/01/05

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 426-10A 1 OF 2 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-10A N 5 047 630.7 E 316 569.1 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Dynamic Cone Penetration Test (DCPT) COMPILED BY WM

DATUM Geodetic DATE 29.09.04 - 29.09.04 CHECKED BY MA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
295.4								20 40 60 80 100	20 40 60	γ kN/m^3	GR SA SI CL
0.0	DCPT from 1.52 m.						295	○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	w_P w w_L		
							294				
							293				
							292				
							291				
							290				
							289				
							288				
							287				
							286				

Continued Next Page

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

20
15 ⊕ 5
10
(%) STRAIN AT FAILURE

ONTMT4S 2316(426).GPJ 07/01/05

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 426-10A 2 OF 2 METRIC

W.P. 5403-04-01 LOCATION Municipal Service Road, 426-10A N 5 047 630.7 E 316 569.1 ORIGINATED BY SL

HWY 11 BOREHOLE TYPE Dynamic Cone Penetration Test (DCPT) COMPILED BY WM

DATUM Geodetic DATE 29.09.04 - 29.09.04 CHECKED BY MA

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
								20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	w_P w w_L WATER CONTENT (%) 20 40 60	γ kN/m³	GR SA SI CL
							285				
							284				
							283				
282.0											
13.4	END OF DCPT AT 13.39 m.										

+ ³, × ³: Numbers refer to Sensitivity

20
15 ⊕ 5
10
(%) STRAIN AT FAILURE

ONTMT4S 2316(426).GPJ 07/01/05

Appendix B

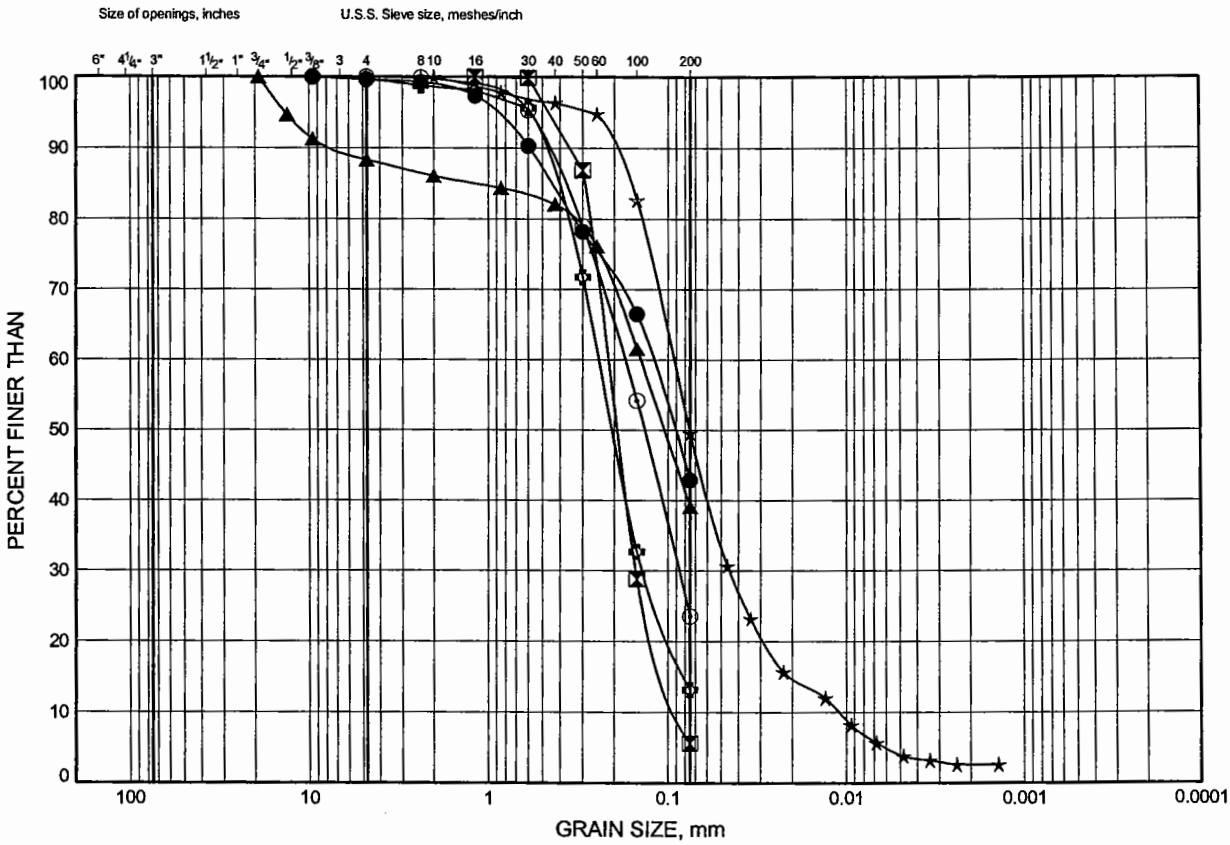
Laboratory Test Results

Hwy 11 Katrine

GRAIN SIZE DISTRIBUTION

FIGURE B1

Sand to Sandy Silt



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	426-3	6.40	288.70
⊠	426-3	10.21	284.89
▲	426-3	34.27	260.83
★	426-4	1.07	294.13
⊙	426-4	4.88	290.32
✿	426-4	33.83	261.37

Date January 2005

Project 5403-04-01

THURBER

Prep'd HS

Chkd. MA

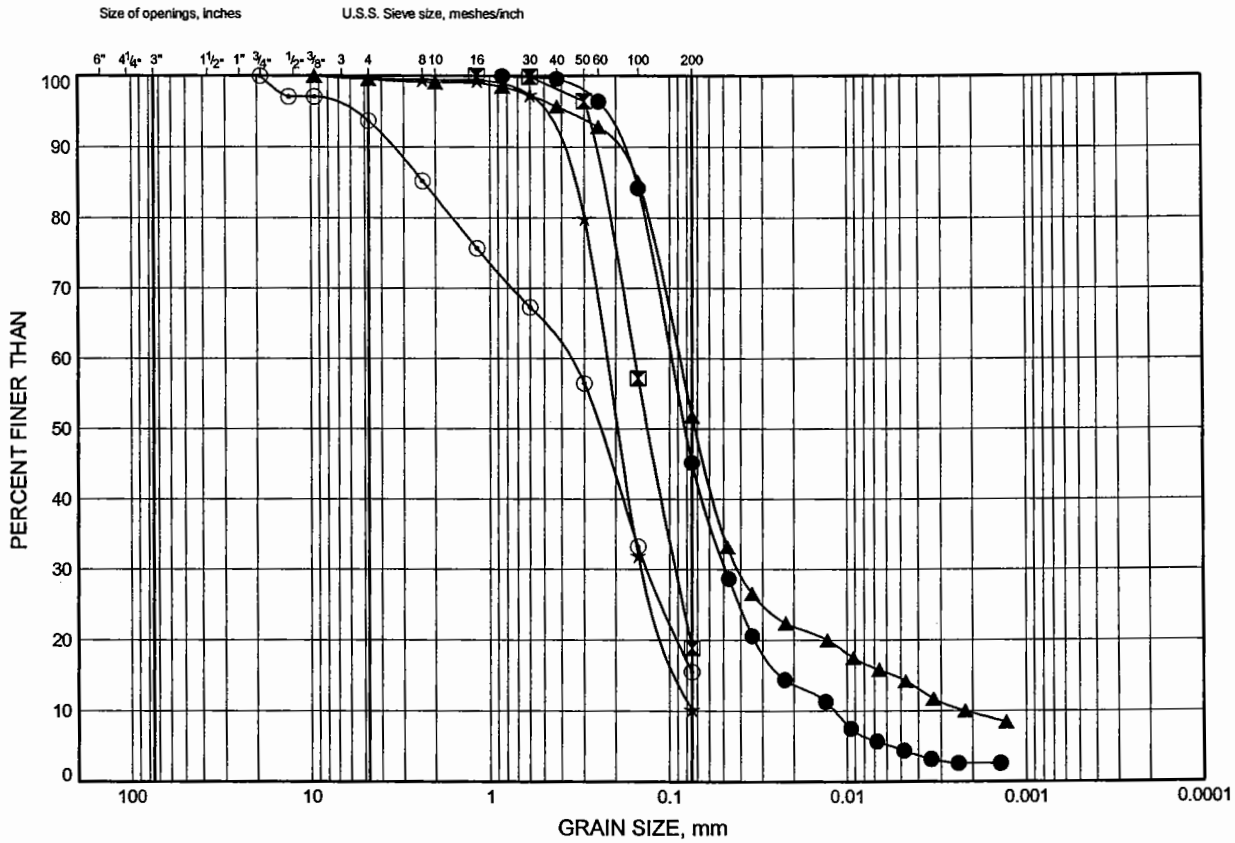
THURBGSD 2316(426).GPJ 07/01/05

Hwy 11 Katrine

GRAIN SIZE DISTRIBUTION

FIGURE B2

Sand to Sandy Silt



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	426-7	3.35	292.15
⊠	426-7	11.89	283.61
▲	426-7	14.94	280.56
★	426-7	24.08	271.42
⊙	426-7	36.12	259.38

Date January 2005

Project 5403-04-01

THURBER

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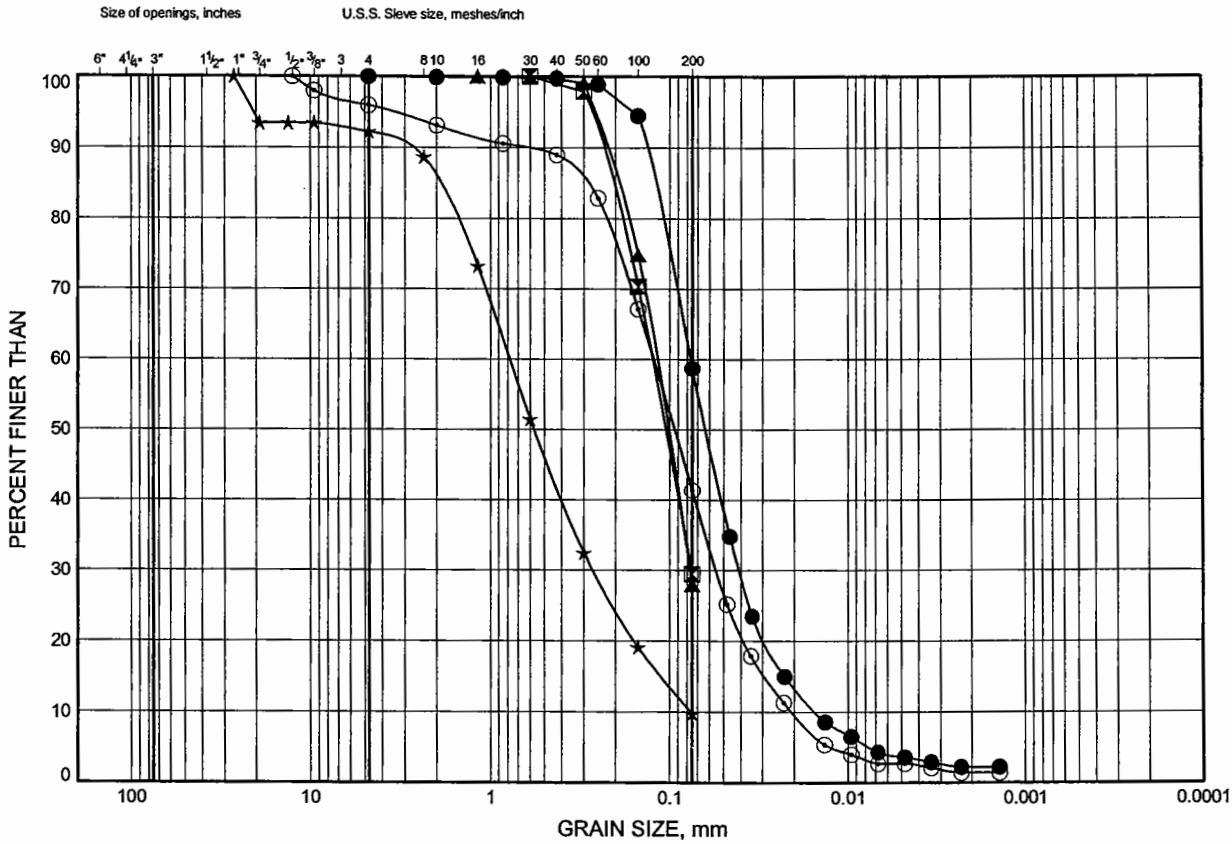
THURBGSD 2316(426).GPJ 07/01/05

Hwy 11 Katrine

GRAIN SIZE DISTRIBUTION

FIGURE B3

Sand to Sandy Silt



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	426-10	7.92	287.48
⊠	426-8	10.06	285.24
▲	426-8	16.15	279.15
★	426-8	26.82	268.48
⊙	426-8	41.86	253.44

Date January 2005

Project 5403-04-01

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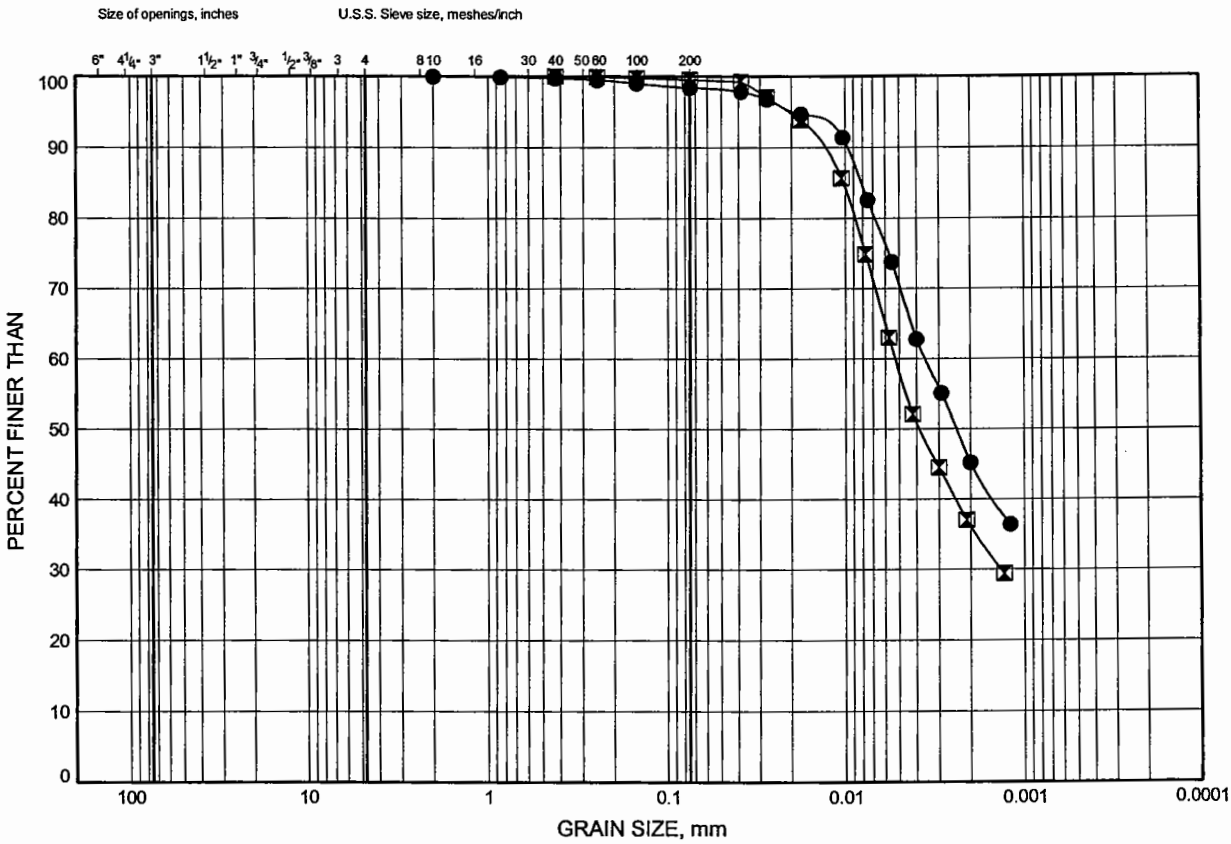
THURBGSD 2316(426).GPJ 07/01/05

Hwy 11 Katrine

GRAIN SIZE DISTRIBUTION

FIGURE B4

Clay



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	426-1	3.35	291.75
⊠	426-1	7.92	287.18

Date January 2005

Project 5403-04-01

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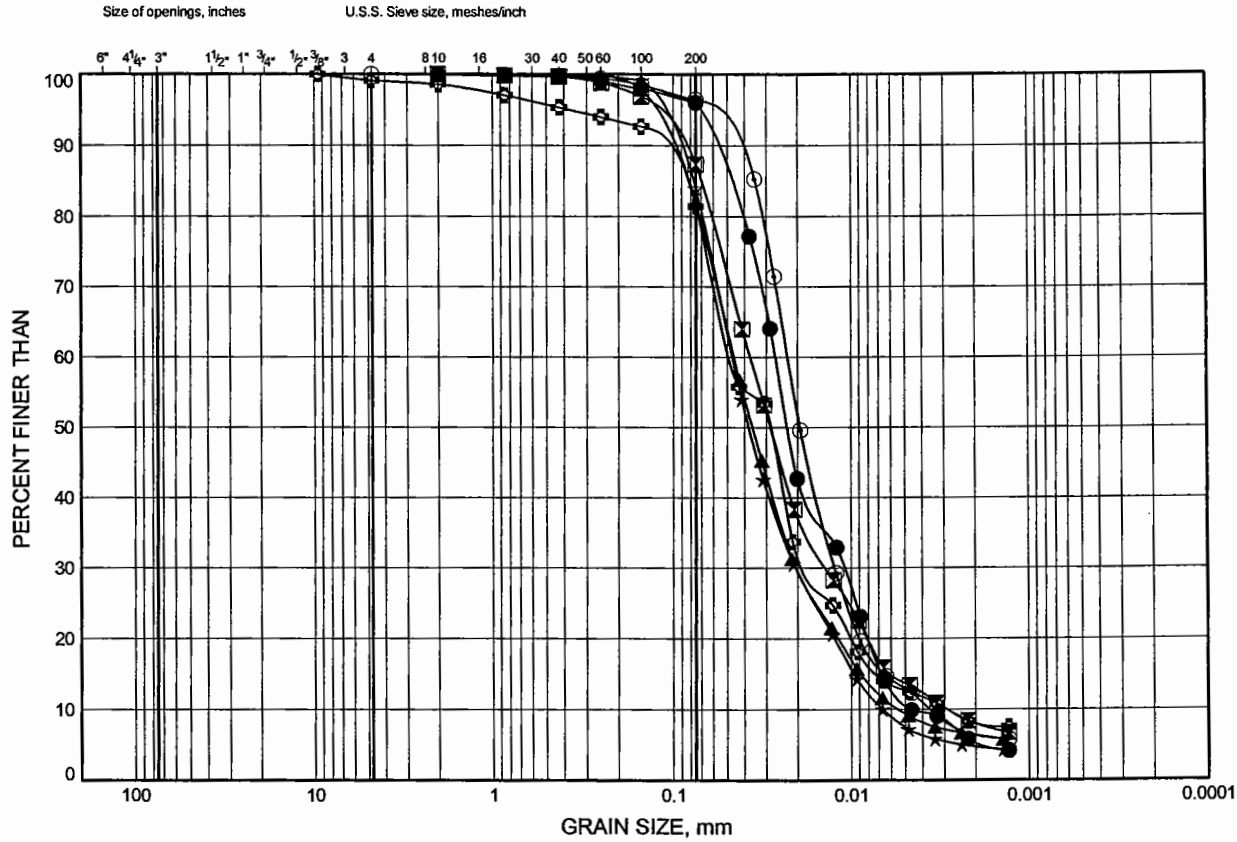
THURBGSD 2316(426).GPJ 07/01/05

Hwy 11 Katrine

GRAIN SIZE DISTRIBUTION

FIGURE B5

Silt



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	426-10	3.35	292.05
⊠	426-3	1.83	293.27
▲	426-4	2.59	292.61
★	426-4	7.92	287.28
⊙	426-7	4.88	290.62
✿	426-8	3.35	291.95

Date January 2005

Project 5403-04-01

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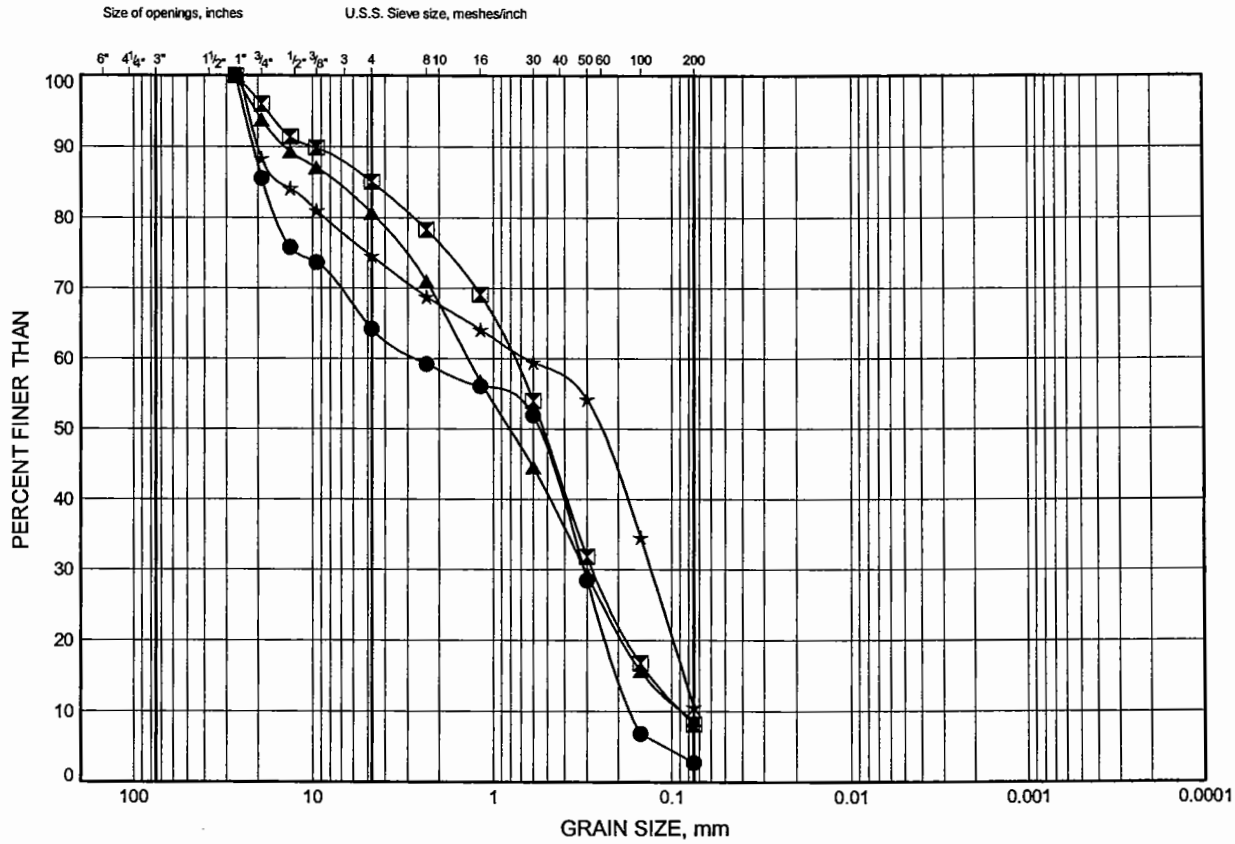
THURBGSD 2316(426).GPJ 07/01/05

Hwy 11 Katrine

GRAIN SIZE DISTRIBUTION

FIGURE B6

Sand and Gravel to Gravelly Sand



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	426-3	17.83	277.27
⊠	426-3	30.02	265.08
▲	426-4	30.63	264.57
★	426-8	20.73	274.57

Date January 2005

Project 5403-04-01

THURBER

Prep'd HS

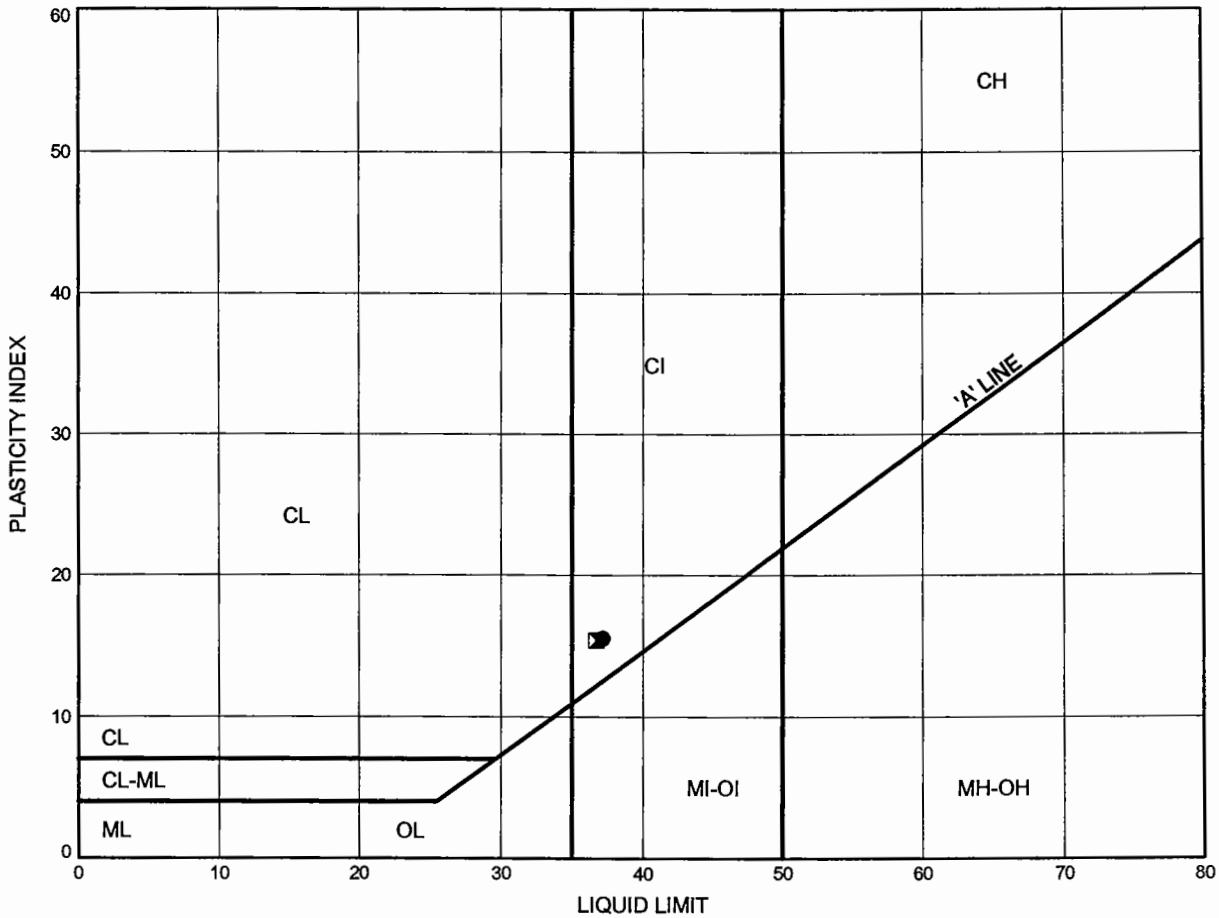
Chkd. MA

THURBGSD 2316(426).GPJ 07/01/05

Hwy 11 Katrine

ATTERBERG LIMITS TEST RESULTS

FIGURE B7



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	426-1	3.35	291.75
⊠	426-1	7.92	287.18

Date January 2005

Project 5403-04-01

THURBER

Prep'd HS

Chkd. MA

THURBALT 2316(426).GPJ 07/01/05

Appendix C

Data From Shaheen & Peaker Report

RECORD OF BOREHOLE No RT1 1 OF 1 METRIC

W.P. 314-99-00 LOCATION Municipal Service Rd. Crossing over Magnetawan River-Coords N 5 047 521.2; E 316 637.1 ORIGINATED BY R.A

DIST 52 HWY 11 BOREHOLE TYPE Hollow Stem Augering COMPILED BY G.T

DATUM Geodetic DATE 25.05.01 CHECKED BY LSR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
295.6	Ground Surface										
0.0	100 mm **Topsoil**		1	SS	4		295				
	loose to very loose moist		2	SS	5						
	SILTY FINE SAND with organic matter to 2.2 m, layered		3	SS	4	▼*	294				
	wet loose to compact		4	SS	11		293				0 60 (40)
			5	SS	8						
	brown		6	SS	8		292				
	grey		7	SS	1**		291				**SS7: Low N-value probably due to hydrostatic uplift
290.3											
5.3	End of borehole Borehole abandoned because of sand backup in hollow stem augers For continuation of BH RT1 see BH RT1A Ground water not stabilized on completion of boring *Ground water level estimated from moisture condition of soil samples										

+³, ×³: Numbers refer to Sensitivity

15 (20 10 5) (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No RT1A 1 OF 1 METRIC

W.P. 314-99-00 LOCATION Municipal Service Rd. Crossing over Magnetawan River-Coords N 5 047 519.9; E 316 637.9 ORIGINATED BY R.A

DIST 52 HWY 11 BOREHOLE TYPE Hollow Stem Augering COMPILED BY G.T

DATUM Geodetic DATE 31.05.01 CHECKED BY LSR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
295.6	Ground Surface										
0.0	Augered to 4.6 m without sampling For soil profile see Borehole RT1 SS1 through SS7						295 294 293 292				
291.0											
4.6 290.3	SILTY FINE SAND ; with dark grey organic layers, loose, brown, wet		1	SS	9		291				
5.3 289.6	CLAYEY SILT firm, grey, wet		2	SS	6		290				0 18 62 20
6.0	clayey laminations SILT some fine sand, loose to compact, grey, wet		3	TW	PH		289			19.0	
			4	SS	9						0 16 84 0
			5	SS	18		288 287				
286.0			6	SS	7		286				
9.6	End of borehole Water used for washboring and drilling mud used for counter-balancing hydrostatic uplift Ground Water level not stabilized upon completion of boring BH RT1A drilled 1.3 m S and 0.8 m E of BH RT1										

$+^{3}$, $\times^{3}$: Numbers refer to Sensitivity

$15 \oplus^{20}_{10} 5$ (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No RT2 1 OF 3 METRIC

W.P. 314-99-00 LOCATION Municipal Service Rd. Crossing over Magnetawan River-Coords N 5 047 540.6; E 316 630.7 ORIGINATED BY R.A

DIST 52 HWY 11 BOREHOLE TYPE Hollow Stem Augering, Washboring, NQ Rock Coring & D.C.P.T. COMPILED BY G.T

DATUM Geodetic DATE 28.05.01 to 30.05.01 CHECKED BY LSR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
295.1	Ground Surface										
0.0	rootlets ------ damp ---- wet		1	SS	5	▼	295				
			2	SS	4		294				
			3	SS	3		293				0 70 30 0
			4	SS	1		293				
			5	SS	2		292				
	brown grey organic silt layers ----- grey		6	SS	6		291				
			7	SS	6		290				
			8	SS	7		290				
	SILTY FINE SAND with silt layers, very loose to loose		9	SS	6		289				
			10	SS	4		288				
			11	SS	8		287				
			12	SS	5		286				0 45 (55) HST Augering Washboring
			13	SS	7		285				
			14	SS	10		284				
							283				
							282				
280.1							281				
15.0											

Continued Next Page

+³, ×³: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No RT2 2 OF 3 METRIC

W.P. 314-99-00 LOCATION Municipal Service Rd. Crossing over Magnetawan River-Coords N 5 047 540.6; E 316 630.7 ORIGINATED BY R.A

DIST 52 HWY 11 BOREHOLE TYPE Hollow Stem Augering, Washboring, NQ Rock Coring & D.C.P.T. COMPILED BY G.T

DATUM Geodetic DATE 28.05.01 to 30.05.01 CHECKED BY LSR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
280.1							280	20 40 60 80 100	20 40 60		
15.0	**SILTY FINE SAND** compact, grey wet gravelly		15	SS	16		279		o		0 89 11 0
			16	SS	58		278		o		
							277				
							276				
							275				
							274				
							273				
							272				
270.3			17	SS	10		271		o		
24.8	**GRAVELLY SAND** with silt, cobbles and boulders very dense, grey, wet		18	NQ			270				May 28 --- May 29
			19	NQ							
			20	SS	17		269				May 29 --- May 30
			21	NQ							
			22	NQ			268				
	D.C.P.T. from 28.0 m to 28.2 m (150 blows)		23	SS	9						
266.9			24	SS	66/20		267		o		27 71 2 0
28.2	End of borehole Water used for washboring and drilling mud used for counter-balancing hydrostatic uplift Ground water level not stabilized upon completion										

Continued Next Page

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

$\frac{20}{15}\oplus\frac{5}{10}$ (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No RT2 3 OF 3 METRIC

W.P. 314-99-00 LOCATION Municipal Service Rd. Crossing over Magnetawan River-Coords N 5 047 540.6; E 316 630.7 ORIGINATED BY R.A

DIST 52 HWY 11 BOREHOLE TYPE Hollow Stem Augering, Washboring, NQ Rock Coring & D.C.P.T. COMPILED BY G.T

DATUM Geodetic DATE 28.05.01 to 30.05.01 CHECKED BY LSR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	WATER CONTENT (%) 20 40 60	kN/m³	GR SA SI CL
	*Ground water level estimated from moisture condition of SS sampler and soil samples Dynamic Cone Penetration Test performed from 18.6 m to 24.4 m and Soil stratigraphy inferred only										

$+^3$, $\times^3$: Numbers refer to Sensitivity

20 / 15 5 / 10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No RT3 1 OF 3 METRIC

W.P. 314-99-00 LOCATION Municipal Service Rd. Crossing over Magnetawan River-Coords N 5 047 598.9; E 316 591.2 ORIGINATED BY R.A

DIST 52 HWY 11 BOREHOLE TYPE Hollow Stem Augering, Washboring, NQ Rock Coring & D.C.P.T. COMPILED BY G.T

DATUM Geodetic DATE 22.05.01 to 24.05.01 CHECKED BY LSR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
294.9 Ground Surface											
0.0	80 mm Topsoil		1	SS	24		294				
	SILTY FINE SAND, layered, very loose to loose, brown, moist, ---- wet, grey, cobbles		2	SS	4						
			3	SS	8		293				
292.7	traces of organic matter										
2.2	CLAYEY SILT some sand traces of organic matter, very soft to stiff grey wet		4	SS	9		292				0 13 74 13
291.2			5	SS	3						
3.7	SILT some fine sand laminated, loose to very loose grey wet		6	SS	5		291				
289.7			7	SS	4		290				0 13 87 0
5.2			8	SS	4						
	SILTY FINE SAND with silt layers, grey wet		9	SS	3		289				Hollow Stem Augering
			10	SS	6		288				Washboring
			11	SS	4		287				
	very loose to loose ---- compact		12	SS	1		286				• SS12: Low N-value probably due to hydrostatic uplift
			13	SS	13		285				
			14	SS	15		284				
			15	SS	28		283				
279.9							282				
15.0							281				0 83 17 0
							280				

Continued Next Page

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No RT3 2 OF 3 METRIC

W.P. 314-99-00 LOCATION Municipal Service Rd. Crossing over Magnetawan River-Coords N 5 047 598.9; E 316 591.2 ORIGINATED BY R.A

DIST 52 HWY 11 BOREHOLE TYPE Hollow Stem Augering, Washboring, NQ Rock Coring & D.C.P.T. COMPILED BY G.T

DATUM Geodetic DATE 22.05.01 to 24.05.01 CHECKED BY LSR

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
279.9								
15.0			16	SS	11		279	
	SILTY FINE SAND with silt layers compact to dense grey wet		17	SS	23		278	
			18	SS	34		277	0 67 33 0 May 22 ------ May 23
			19	SS	30		276	
			20	SS	7*		275	*SS20: Low N-value probably due to hydrostatic uplift
271.6	probable lower boundary of silty sand deposit						274	
23.3	**GRAVELLY SAND** with cobbles and boulders, dense to very dense, grey, wet		21	SS	60/13		273	May 23 ----- May 24
			22	ND			272	
265.4			23	SS	33		271	
29.5	End of borehole						270	
264.9							269	
							268	
							267	
							266	
							265	

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

SHEAR STRENGTH kPa
O UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L
WATER CONTENT (%) 20 40 60

UNIT WEIGHT γ kN/m^3

30.0 Continued Next Page

+^{3}, ×^{3}: Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No RT3 3 OF 3 METRIC

W.P. 314-99-00 LOCATION Municipal Service Rd. Crossing over Magnetawan River-Coords N 5 047 598.9; E 316 591.2 ORIGINATED BY R.A

DIST 52 HWY 11 BOREHOLE TYPE Hollow Stem Augering, Washboring, NQ Rock Coring & D.C.P.T. COMPILED BY G.T

DATUM Geodetic DATE 22.05.01 to 24.05.01 CHECKED BY LSR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
264.9											
264.7											
30.2	End of Dynamic Cone Penetration Test Dynamic Cone Penetration Test performed from 21.3 m to 26.8 m, Soil stratigraphy inferred only Dynamic Cone Penetration Test performed from 29.6 m to 30.2 m Piezometer installed to 6.7 m Stabilized ground water level in piezometer at 0.5 m (May 29, 30 and June 01/2001)										

$+^3$, $\times^3$: Numbers refer to Sensitivity

20 / 15 5 / 10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No RT4 1 OF 1 METRIC

W.P. 314-99-00 LOCATION Municipal Service Rd. Crossing over Magnetawan River-Coords N 5 047 616.9; E 316 583.3 ORIGINATED BY R.A

DIST 52 HWY 11 BOREHOLE TYPE Hollow Stem Augering COMPILED BY G.T

DATUM Geodetic DATE 24.05.01 CHECKED BY LSR

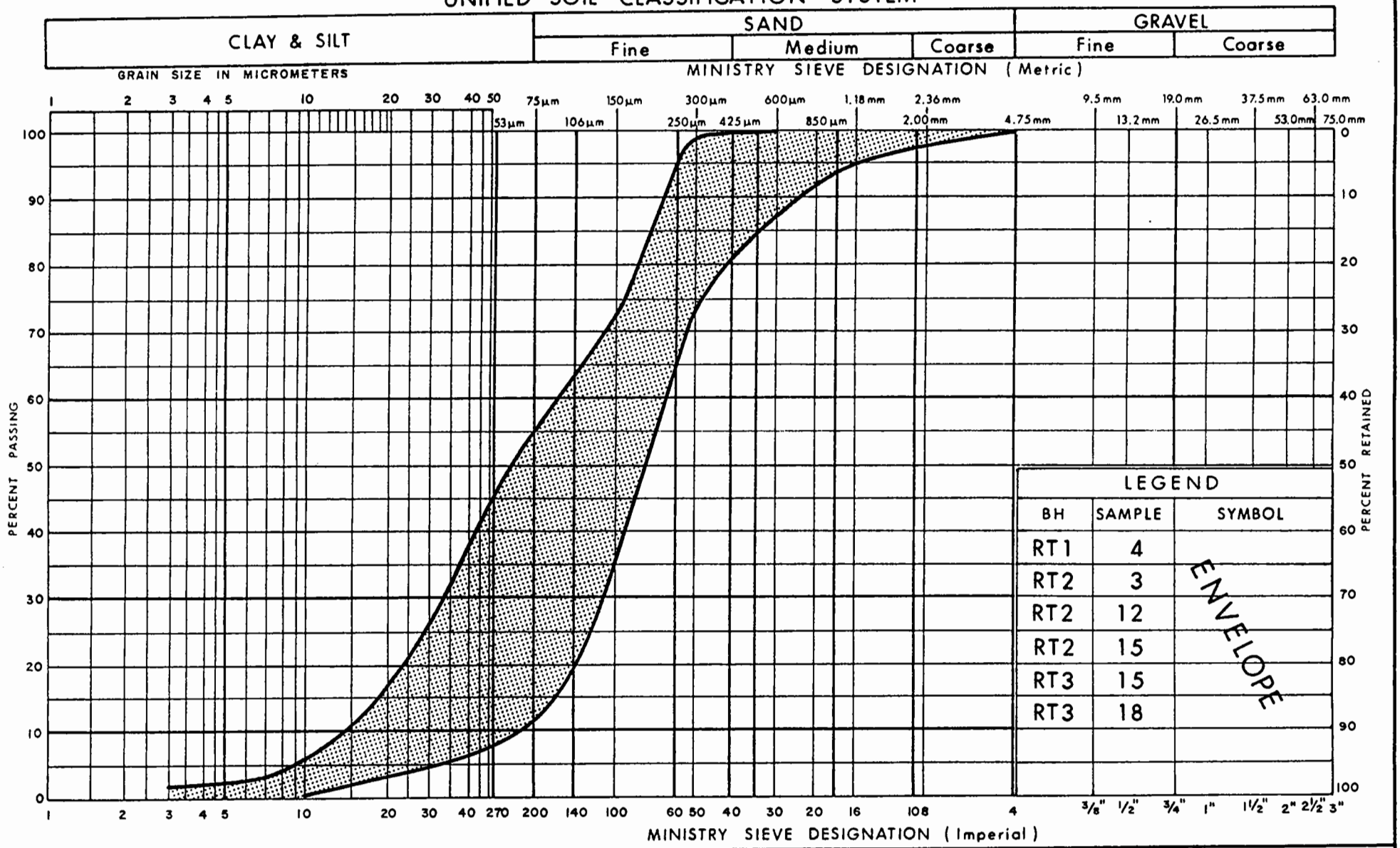
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
295.1	Ground Surface						295				
0.0 / 294.4	50 mm Topsoil **SILTY FINE SAND** compact, brown, damp		1	SS	10				○		
0.7	very soft stiff with organic matter **CLAYEY SILT** trace sand and gravel, grey, wet very stiff		2	SS	1	▼*	294		○		
			3	SS	12		293		○		0 17 73 10
			4	SS	22				○		
291.9			5	TW	PH		292		○		
3.2	**SILT** trace fine sand, loose, grey, wet		6	SS	6				○	19.6	0 5 95 0
			7	SS	3 **		291		○		
	with sand		8	SS	5		290		○		0 43 56 1
289.2											
5.9	**SILTY FINE SAND** very loose to loose grey, wet		9	SS	5		289		○		** SS7, SS12 and SS13 Low N-value probably due to hydrostatic uplift
			10	SS	4		288		●		
			11	SS	6		287		○		
			12	SS	2 **				○		
285.5			13	SS	3 **		286		○		
9.6	End of borehole Ground water level not stabilized on completion of boring *Ground water level estimated from moisture condition of SS sampler and soil samples										

$+^3$, $\times^3$: Numbers refer to Sensitivity

$\frac{20}{15 \oplus 5}$ (%) STRAIN AT FAILURE
10

78 12 M

UNIFIED SOIL CLASSIFICATION SYSTEM



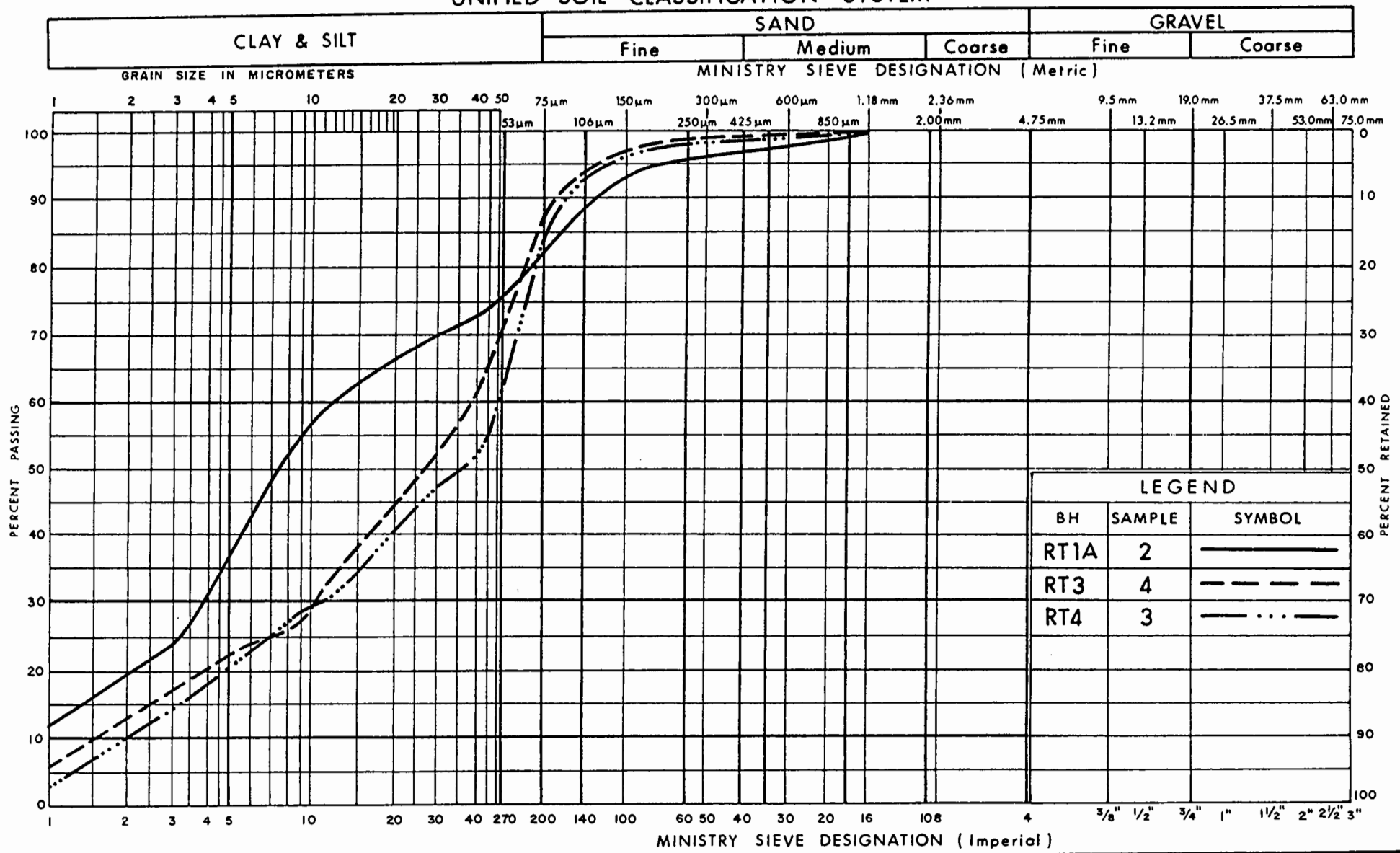
Ministry of Transportation
Ontario

GRAIN SIZE DISTRIBUTION
SILTY FINE SAND

FIG No 1
W P 314-99-00
SPT 1010A

78 12 M

UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of Transportation
Ontario

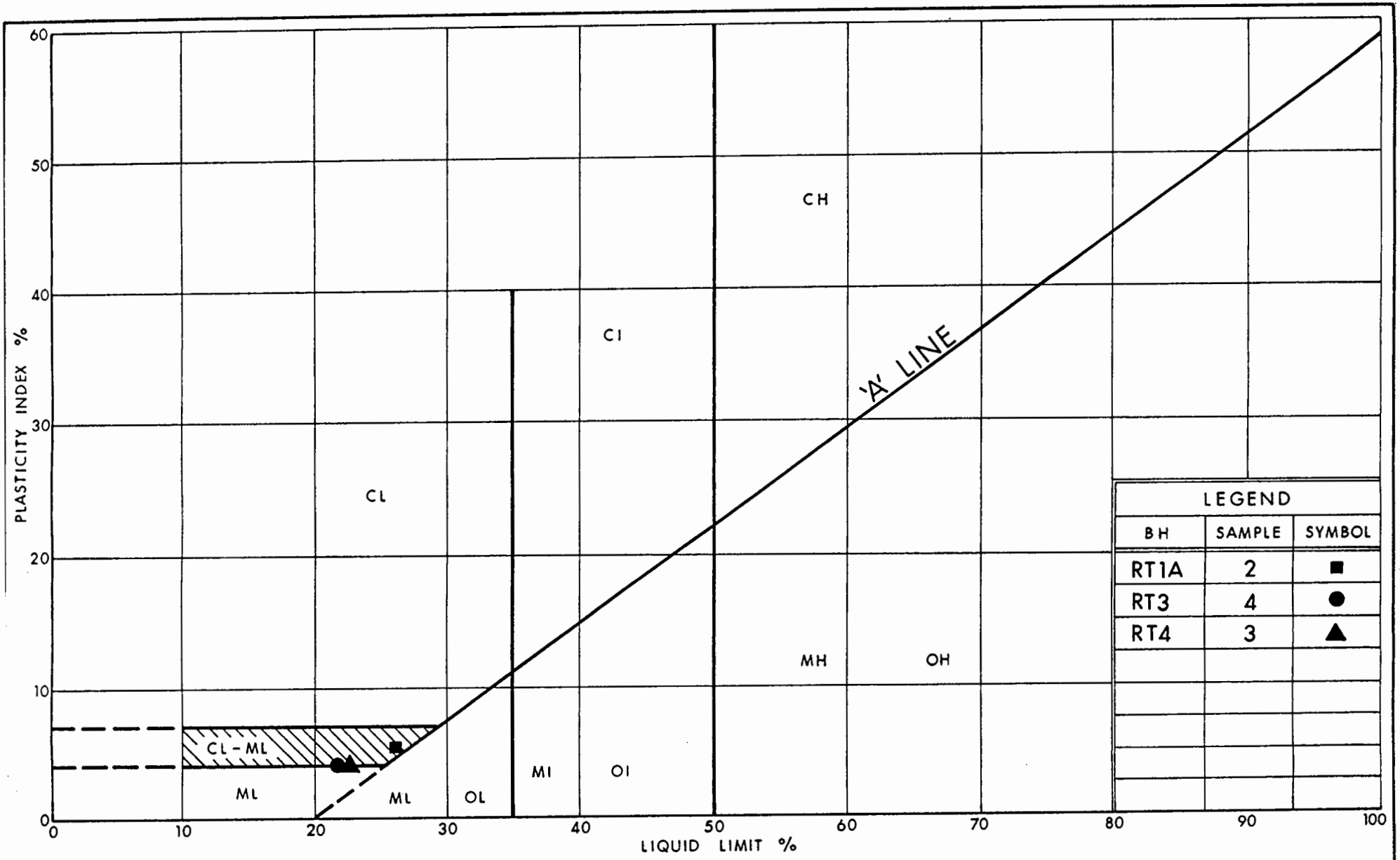
GRAIN SIZE DISTRIBUTION

CLAYEY SILT, TRACE FINE SAND

FIG No 2

W P 314-99-00

SPT 1010A



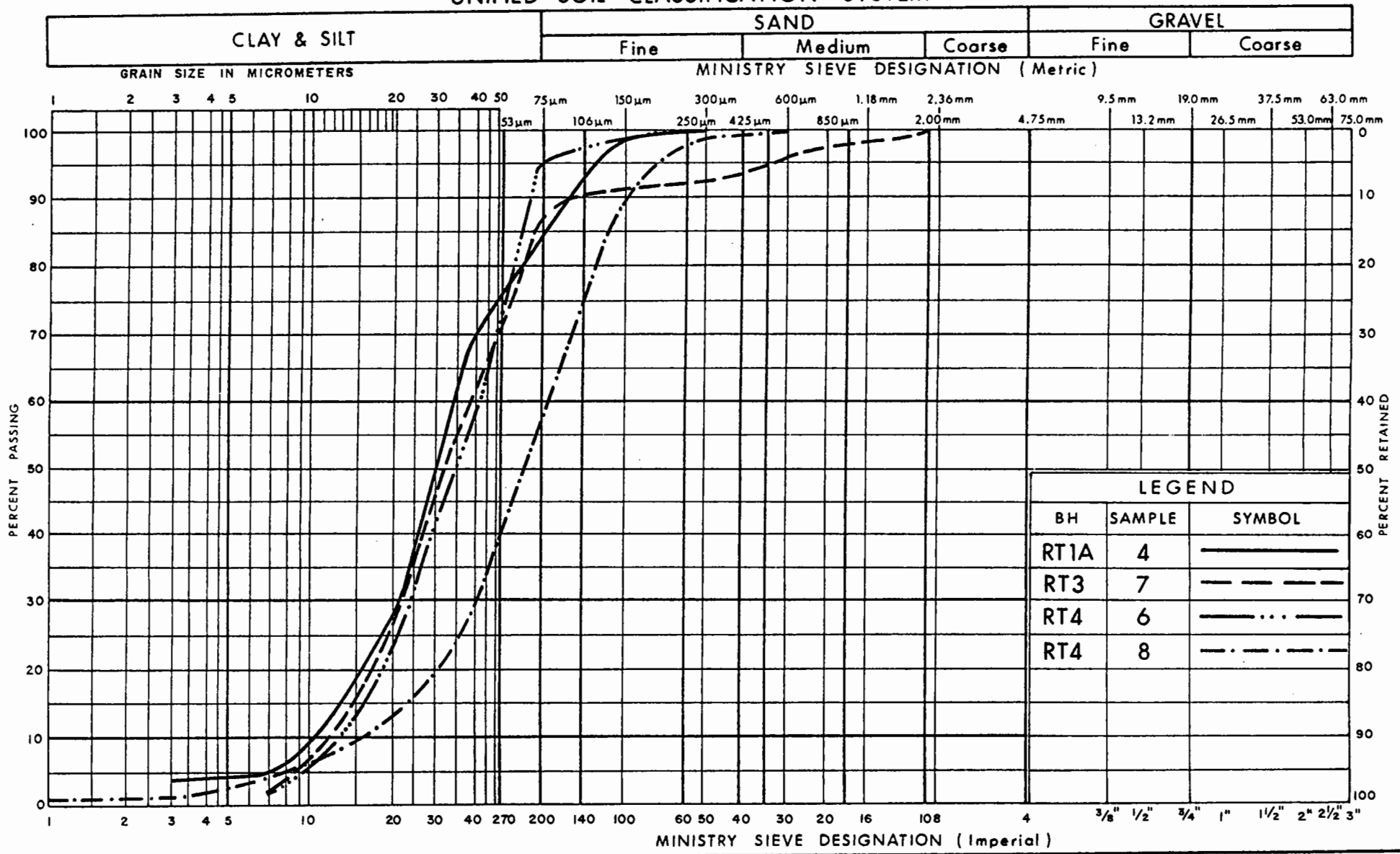
Ministry of Transportation
Ontario

PLASTICITY CHART
CLAYEY SILT, TRACE FINE SAND

FIG No 3
W P 314-99-00
SPT 1010A

78 12 M

UNIFIED SOIL CLASSIFICATION SYSTEM



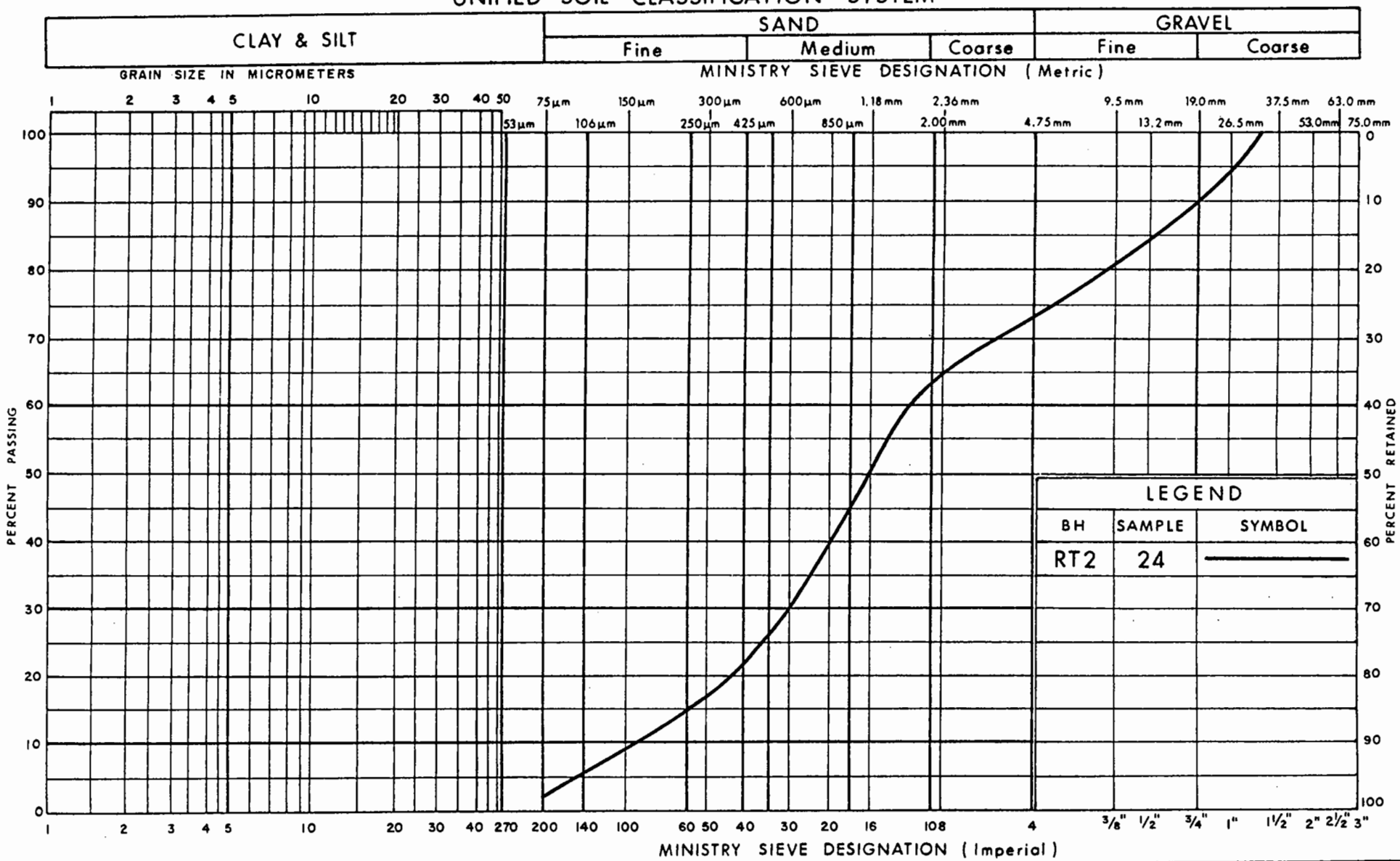
Ministry of Transportation
Ontario

GRAIN SIZE DISTRIBUTION

SILT, SOME FINE SAND

FIG No 4
W P 314-99-00
SPT 1010A

UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of Transportation
Ontario

GRAIN SIZE DISTRIBUTION
GRAVELLY SAND

FIG No 5
W P 314-99-00
SPT 1010A

Appendix D

Drawings

METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

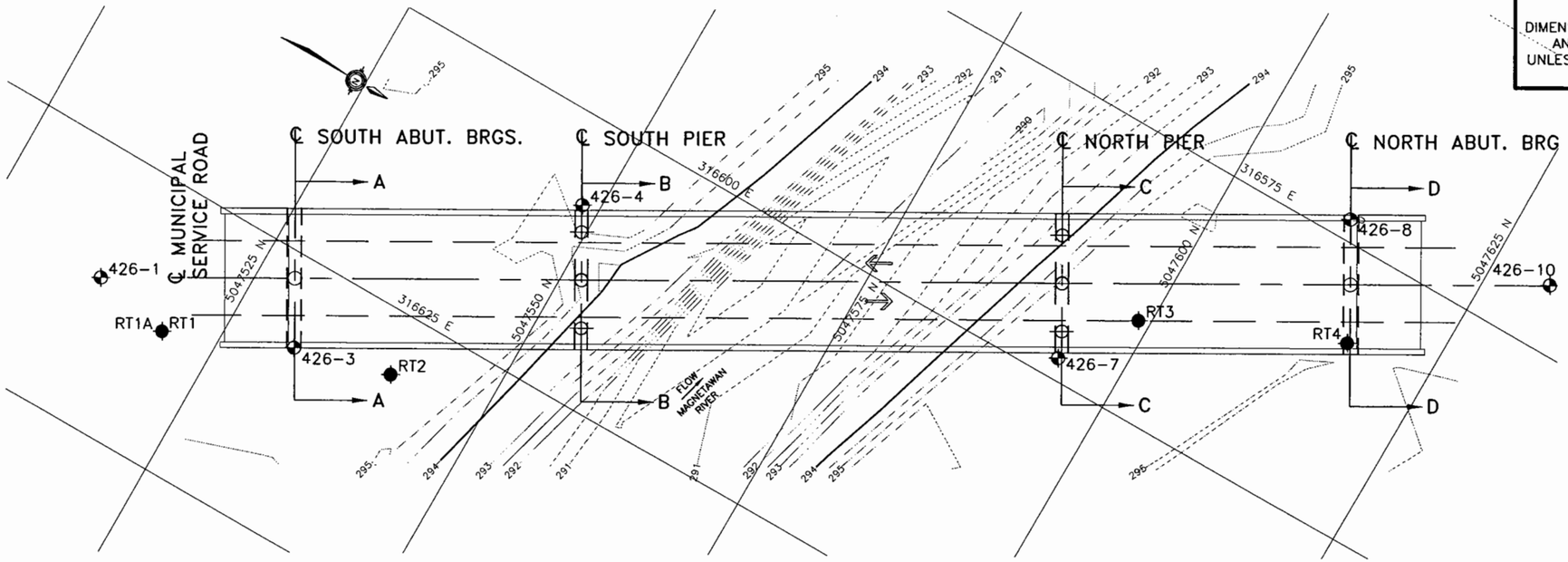
HWY 11
CONT No 2006-5148
WP No 5403-04-01

MAGNETAWAN RIVER SOUTH CROSSING
MUNICIPAL SERVICE ROAD
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET 651

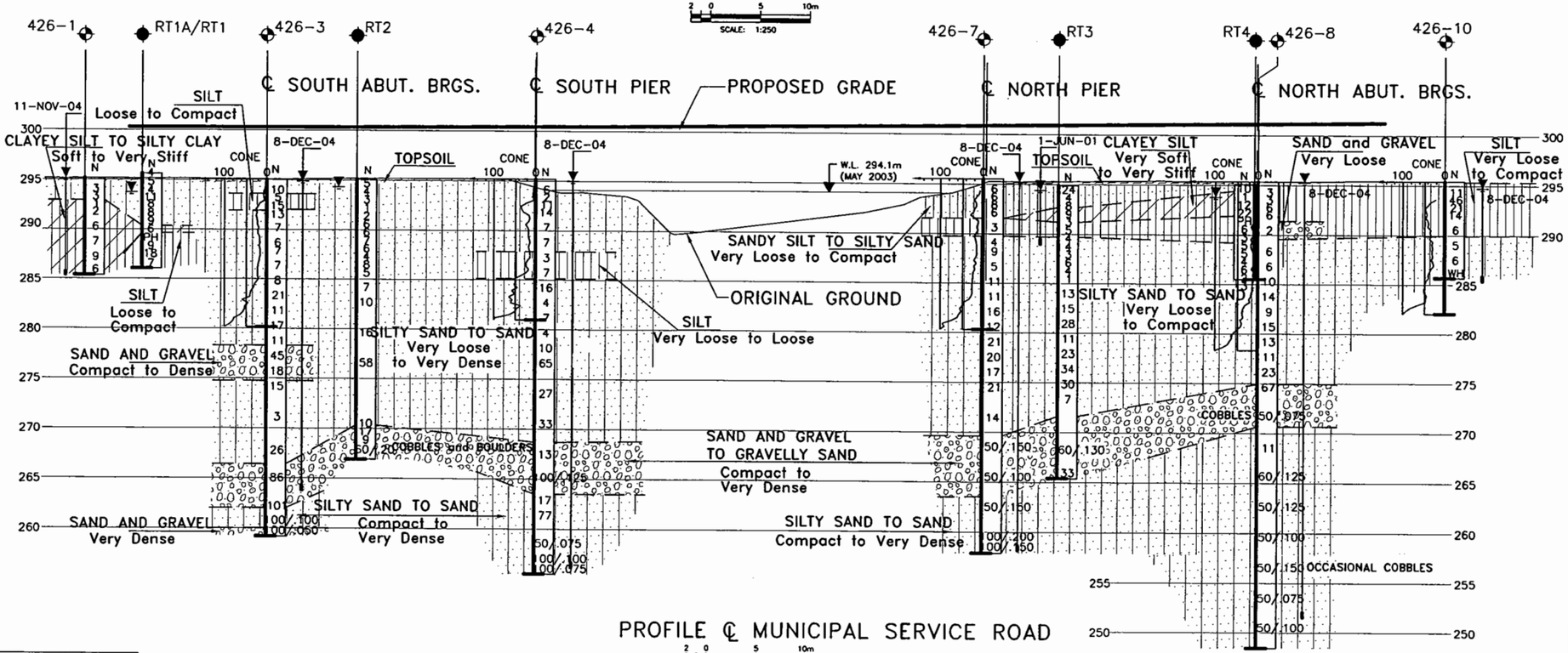
Marshall Macklin Monaghan
PROJECT MANAGERS • ENGINEERS • SURVEYORS • PLANNERS

THURBER ENGINEERING LTD.



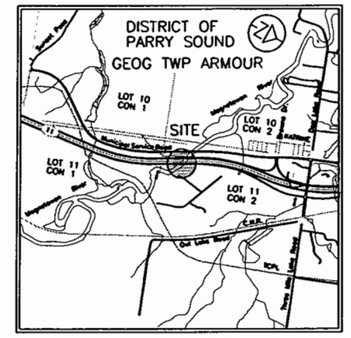
PLAN

SCALE: 1:250



PROFILE ℄ MUNICIPAL SERVICE ROAD

SCALE: 1:250



KEY PLAN

0 500m 1km

LEGEND

	BoreHole by THURBER
	Dynamic Cone Penetration Test (cone)
	BoreHole by SHAHEEN & PEAKER LIMITED
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
	WL
	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)

NO	ELEVATION	NORTHING	EASTING
426-1	295.1	5047512.3	316636.4
426-3	295.1	5047531.5	316633.0
426-4	295.2	5047548.4	316607.9
426-7	295.5	5047594.1	316598.0
426-8	295.3	5047611.4	316573.1
426-10	295.4	5047630.7	316569.1
RT1A	295.6	5047519.9	316637.9
RT2	295.1	5047540.6	316630.7
RT3	294.9	5047598.9	316591.2
RT4	295.1	5047616.9	316583.3

NOTE

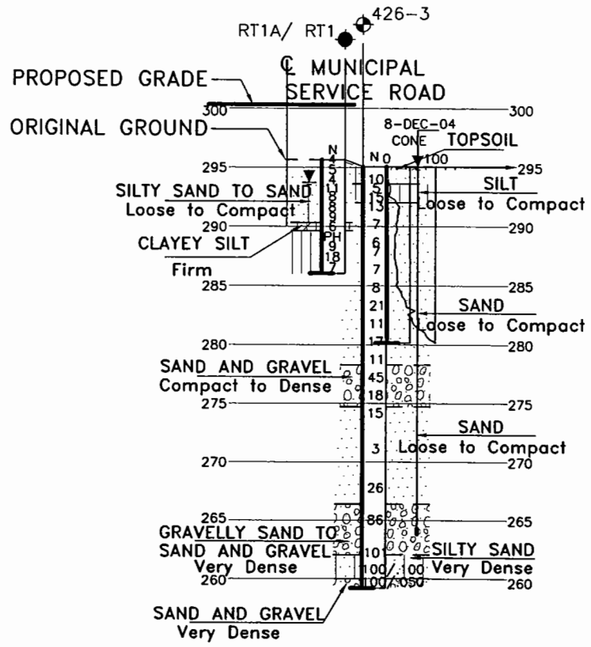
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

VCP : HCP No. 112
EL. 298.289
19mmø x 1.52m IRON BAR
2.3 LT 2.9km N OF HWY 518
24.9 LT STA: 11+177.031

DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

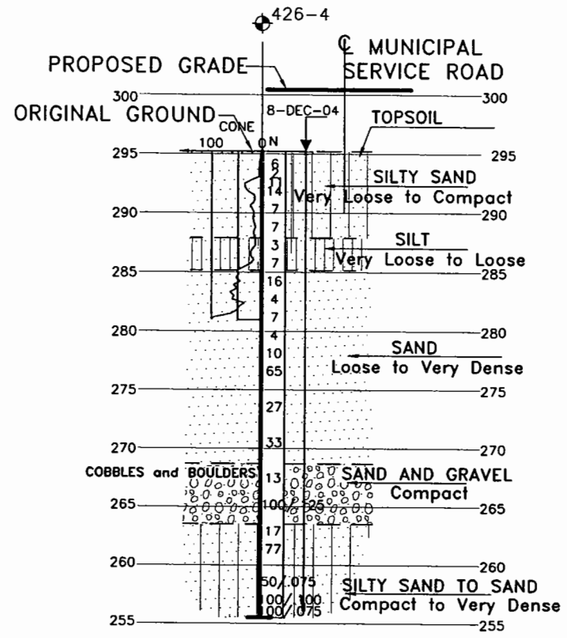
REVISIONS	DATE	BY	DESCRIPTION

DESIGN MA	CHK AEG	CODE CHBDC 2000	LOAD CL-625-ONT	DATE JAN , 2005	
DRAWN HS	CHK MA	SITE 44-426	STRUCT .	SCHEME .	DWG 2



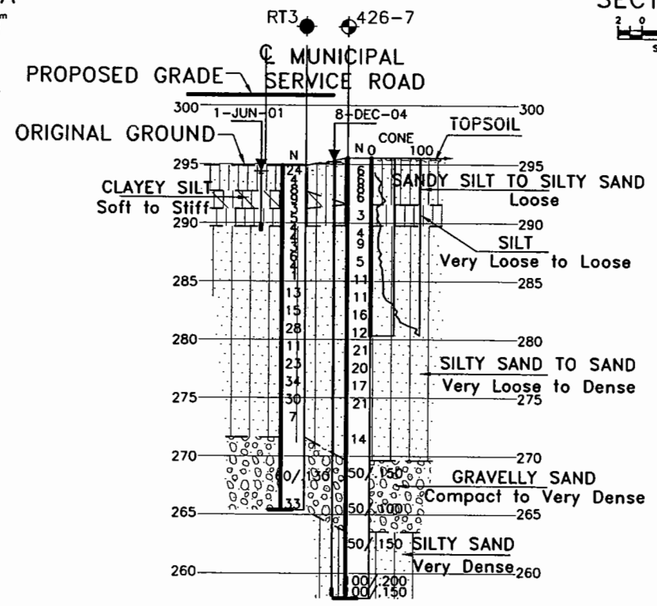
SECTION A-A

SCALE: 1:250



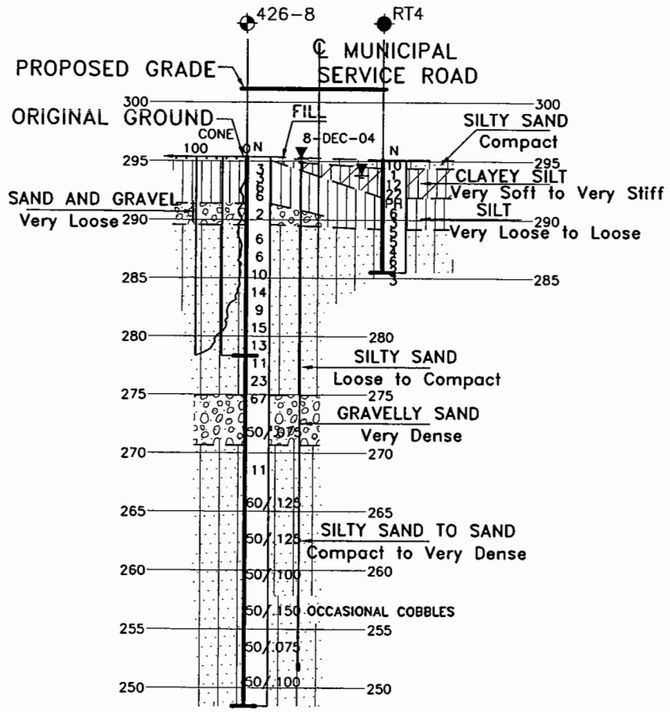
SECTION B-B

SCALE: 1:250



SECTION C-C

SCALE: 1:250



SECTION D-D

SCALE: 1:250

DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

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

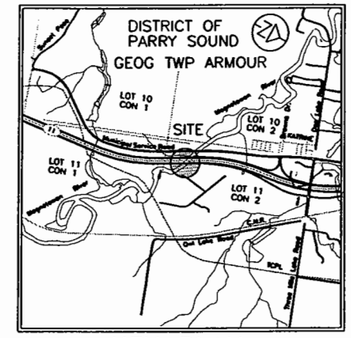
HWY 11
CONT No 2006-5148
WP No 5403-04-01

MAGNETAWAN RIVER SOUTH CROSSING
MUNICIPAL SERVICE ROAD
SOIL STRATA

SHEET 652

Marshall Macklin Monaghan
PROJECT MANAGERS • ENGINEERS • SURVEYORS • PLANNERS

THURBER ENGINEERING LTD.



KEY PLAN

0 500m 1km

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⊕	BoreHole by THURBER
⊕	Dynomic Cone Penetration Test (cone)
●	BoreHole by SHAHEEN & PEAKER LIMITED
N	Blows /0.3m (Std Pen Test,475J/blow)
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▼	WL
	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)

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19mmø x 1.52m IRON BAR
2.3 LT 2.9km N OF HWY 518
24.9 LT STA: 11+177.031

REVISIONS

DATE	BY	DESCRIPTION

DESIGN MA	CHK AEG	CODE CHBDC 2000	LOAD CL-625-ONT	DATE JAN , 2005	
DRAWN HS	CHK MA	SITE 44-426	STRUCT .	SCHEME .	DWG 3