THURBER ENGINEERING LTD.

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FOUNDATION INVESTIGATION REPORT
PROPOSED 600 MM WATERMAIN RELOCATION
HIGHWAY 401 LESLIE STREET INTERCHANGE
TORONTO, ONTARIO
G.W.P. 2061-13-00

GEOCRES No. 30M14-460

Report

to

WSP / MMM Group

Date: February 1, 2017
File: 12371

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THURBER

60 YEARS

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FOUNDATION INVESTIGATION REPORT
PROPOSED 600 MM WATERMAIN RELOCATION
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PART 1: FACTUAL INFORMATION

1. INTRODUCTION

This report presents the factual data obtained from a foundation investigation carried out by Thurber Engineering Ltd. (Thurber) along the proposed alignment of the relocation of a 600 mm watermain that will cross under Highway 401 at the Leslie Street Interchange in the City of Toronto, Ontario. Thurber carried out the investigation as a sub-consultant to WSP / MMM Group under MTO Agreement Number 2013-E-0032.

The purpose of this investigation was to explore the subsurface conditions at the site and, based on the data obtained, to provide a borehole location plan and soil strata drawing with stratigraphic profile, records of boreholes, laboratory test results and written descriptions of the subsurface conditions. A model of the subsurface conditions was developed for the site based on the data obtained from the present investigation.

2. SITE DESCRIPTION

The site is located at the southwest and northwest quadrants of the Highway 401 and Leslie Street interchange in the City of Toronto, Ontario. It is understood that the existing 600 mm diameter watermain is to be relocated prior to commencing the proposed interchange reconstruction works. The proposed watermain alignment is over 400 m in length and comprises open cut and trenchless sections, including a crossing under the Highway 401 mainlines and other crossings under existing interchange ramps. It is noted that the Highway 401 mainlines at this location are elevated by a series of bridges supported on deep foundations, and that the ground surface above the watermain is actually the top of pavement of the existing Oriole GO parking lot.

The site lies within an area of industrial and commercial lands. In general, the terrain is slightly

undulating and decreases in elevation in a southerly direction toward Lake Ontario.

According to Physiography of Southern Ontario by L.J Chapman and D.F. Putnam, 1984, the project site is located within the physiographic region known as the South Slope. The South Slope is a smooth and drumlinized till plain that has formed as a result of glacial action and deposition of till materials just south of the Oak Ridges Moraine. The South Slope contains a variety of soils that have developed over till. The depth of the overburden in the general area can be expected to be more than 50 m. Within and adjacent to the Don River valley, the site area is underlain by glacio-lacustrine sands, silts, silty clay and glacial till deposits.

3. INVESTIGATION PROCEDURES

The field investigation for this project was carried out between October 19 and November 13, 2016. A total of eleven (11) boreholes, denoted as Boreholes WM16-01 to WM16-11, were drilled along the proposed watermain alignment. The approximate locations of the boreholes are shown on the Borehole Locations and Soil Strata Drawings provided in Appendix D.

A track-mounted Diedrich D50T drill rig supplied and operated by DBW Drilling Limited of Toronto, Ontario, and a track-mounted Diedrich D50T drill rig supplied and operated by Walker Drilling Ltd. out of Utopia, Ontario, were used. The boreholes were advanced using hollow stem and solid stem augers to depths of between 12.8 m and 18.9 m below existing ground surface elevation (Elev. 122.6 m to Elev. 132.6 m). In all boreholes, soil samples were obtained at selected intervals with a 50 mm outside diameter split spoon sampler driven in conjunction with the Standard Penetration Test (SPT).

The field investigation was supervised on a full time basis by a member of Thurber's technical staff who marked/staked the boreholes in the field, arranged for the clearance of subsurface utilities, directed the drilling, sampling and in-situ testing operations, logged the boreholes and processed the recovered soil samples for transport to Thurber's laboratory for further examination and testing.

Groundwater conditions were observed in the open boreholes throughout the drilling operations. Monitoring wells were installed in six of the boreholes (Boreholes WM16-01, WM16-04, WM16-06, WM16-07, WM16-10, and WM16-11) to permit monitoring of the groundwater levels at the site. Each monitoring well consisted of a 50 mm diameter PVC pipe, with a slotted screen sealed at selected depths within the boreholes. The boreholes, in which no monitoring wells were installed, were backfilled in general accordance with Ontario Regulation 903.

Details of the monitoring well installations and borehole completion are summarized as follows:

Borehole Number	Monitoring Well Installations			Completion Details
	Sand Screen Depth (m)	Sand Screen Elevation (m)	Filter Strata	
WM16-01	4.0 - 7.6	137.4 – 133.8	Sand, Sand and Silt	Backfilled with bentonite holeplug to 7.6 m then filter sand from 7.6 m to 4.0 m, then bentonite holeplug from 4.0 m to 0.2 m, then cement to surface.
WM16-02	None Installed			Bentonite holeplug and cuttings to 0.2 m, then asphalt to surface.
WM16-03	None Installed			Bentonite holeplug and cuttings to surface.
WM16-04	5.5 – 9.1	135.4 – 131.8	Sand and Silt to Silty Sand	Backfilled with bentonite holeplug to 9.1 m, then filter sand to 5.5 m, then bentonite holeplug to surface.
WM16-05	None Installed			Bentonite holeplug and cuttings to 0.1 m, then asphalt to surface.
WM16-06	5.5 – 12.2	135.4 – 128.7	Silt Silty Clay	Backfilled with filter sand from 12.2 to 5.5 m, bentonite holeplug from 5.5 to 4.5 m, then bentonite holeplug and cuttings to 0.3 m, then cement to surface.
WM16-07	4.6 – 9.1	136.9 – 132.4	Sand	Backfilled with bentonite holeplug and cuttings to 9.1 m, then filter sand to 4.6 m, then bentonite holeplug to 4.0 m, then bentonite holeplug and cuttings to 0.3 m, then filter sand from 0.3 m to surface
WM16-08	None Installed			Bentonite holeplug and cuttings to surface
WM16-09	None Installed			Bentonite holeplug and cuttings to surface
WM16-10	7.5 – 12.2	130.7 – 126.0	Silty Clay, Silt	Backfilled with filter sand to 7.5 m, then bentonite holeplug to 6.7 m, then bentonite holeplug and cuttings to 0.3 m, then filter sand to surface
WM16-11	7.6 – 12.2	130.5 – 125.9	Silty Clay	Backfilled with filter sand to 7.6 m, then bentonite holeplug to 0.3 m then cement to surface.

4. LABORATORY TESTING

The recovered soil samples were subjected to Visual Identification (VI) and to natural moisture content determination. Selected samples were also subjected to grain size distribution analyses (hydrometer and/or sieve) and Atterberg Limits testing, where appropriate. Laboratory testing results are summarized on the Record of Borehole sheets included in Appendix A and are presented on the figures included in Appendix B.

Selected soil samples were submitted to AGAT Laboratories and SGS Canada, both CALA accredited analytical laboratories in Ontario, for analytical testing of Petroleum Hydrocarbons (PHCs), Volatile Organic Compounds (VOCs) including BTEX, Metals and Inorganics (M&I), TCLP (leachate) metals, and corrosivity parameters. The results are included in Appendix C.

5. DESCRIPTION OF SUBSURFACE CONDITIONS

Details of the encountered soil stratigraphy are presented on the Record of Borehole sheets included in Appendix A. A general description of the stratigraphy, based on the conditions encountered in the boreholes, is given in the following paragraphs. However, the factual data presented on the Record of Borehole sheets takes precedence over this general description and must be used for interpretation of the site conditions. It should be recognized and expected that soil conditions may vary between and beyond borehole locations.

In general, the subsurface conditions encountered in the boreholes beneath the pavement structure and topsoil generally consisted of varying thicknesses of embankment fills consisting of sands and silts, underlain by native sand and silt deposits, which were in turn underlain by native silty clay. Descriptions of the individual strata are presented below.

5.1 Pavement Structure

An asphalt pavement structure was encountered in boreholes WM16-01 to WM16-03, WM16-05, WM16-06, and WM16-11. The pavement structure at the existing parking lots consisted of approximately 90 mm to 150 mm overlying approximately 0.6 to 1.4 m of granular base. The existing pavement structure encountered in boreholes on the existing Hwy 401 ramps consisted of approximately 200 mm to 300 mm of asphalt over approximately 0.5 to 1.2 m of granular base. A 150 mm thick buried layer of asphalt was noted at 1.4 m depth in Borehole 16-01.

The road and pavement granular base materials generally consisted of gravelly sand to sand and gravel, trace silt, and was brown in colour. SPT ‘N’ values ranged from 22 to 46 blows for 0.3 m penetration of the sampler indicating the base material is generally compact to dense. Measured

moisture contents in the gravelly sand to sand and gravel fill varied between 2 percent and 4 percent.

The results of grain size distribution analyses carried out on selected samples of the sand and gravel to gravelly sand are presented on the Record of Borehole sheets included in Appendix A and on Figures B1 of Appendix B. The results of the grain size distribution analyses are summarized below:

Soil Particle	Percentage (%)
Gravel	28 to 46
Sand	49 to 58
Silt and Clay	5 to 14

5.2 Topsoil/Soil Mixed with Organics

Topsoil and surficial soil mixed with organics were encountered in Boreholes WM16-04, WM16-07, WM16-09, and WM16-10 and ranged in thickness from 75 mm to 400 mm. The thickness of topsoil and soil mixed with organics may vary between and beyond borehole locations.

5.3 Fill

Embankment fill was encountered in all boreholes with the exception of WM16-01 and WM16-11. The fill generally consisted of sand and silt to sand, some clay, trace gravel, and was brown in colour. The fill extended to depths of approximately 1.5 m to 4.5 m below existing ground surface (Elev. 136.7 to Elev. 141.7 m)

SPT ‘N’ values within the sand and silt to sand fill ranged from 2 to 60 blows per 0.3 m penetration of the sampler, though typical values were between 12 and 35 indicating a compact to dense condition. Measure moisture contents within the sand and silt to sand fill varied between 2 percent and 20 percent.

The results of grain size distribution analyses carried out on selected samples of the sand and silt to silty sand fill are presented on the Record of Borehole sheets included in Appendix A and on Figure B2 of Appendix B. The results of the grain size distribution analyses are summarized below:

Soil Particle	Percentage (%)
Gravel	0 to 12
Sand	37 to 71
Silt	21 to 41
Clay	8 to 16

5.4 Sand and Silt to Sandy Silt

Native sand and silt to sandy silt was encountered in Boreholes WM16-01 to WM16-04, and WM16-11 beneath the fill deposits. These deposits generally contained some clay, trace gravel and was brown in colour. These layers were approximately 2.9 m to 4.6 m thick and extended to depths ranging from 3.7 m to 8.1 m below existing ground surface elevation (Elev. 133.7 to Elev. 137.3 m).

SPT 'N' values within the sand and silt to sandy silt ranged from 1 to 32 blows for 0.3 m penetration of the sampler. Typical values fell between 7 to 27 blows indicating the material was loose to compact. Measured moisture values in the deposit varied between 7 percent and 19 percent.

The results of grain size distribution analyses carried out on selected samples of the sand and silt to sandy silt are presented on the Record of Borehole sheets included in Appendix A and on Figure B3 of Appendix B. The results of the grain size distribution analyses are summarized below:

Soil Particle	Percentage (%)
Gravel	0
Sand	30 to 46
Silt	35 to 50
Clay	15 to 23

5.5 Silty Sand to Sand

Silty sand to sand deposits were encountered in all boreholes. In Boreholes WM16-01 to WM16-04, and WM16-11, the silty sand and sand was encountered beneath the sand and silt to sandy silt deposits, and in Boreholes WM16-05 to WM16-10, the silty sand to sand was encountered beneath the fill deposits. These deposits generally contained some silt, trace gravel, trace clay, and trace organics in some boreholes. The soils were generally brown to grey in colour. Where

fully penetrated the deposit was approximately 1.1 m to 7.3 m thick (base Elev. 130.3 to 136.8m). Borehole WM16-02 was terminated in the sand at 12.8 m depth (Elev. 132.6 m).

SPT 'N' values in the silty sand to sand ranged from 0 to 43 blows per 0.3 m penetration, indicating the material is very loose to dense. Measured moisture content in the deposit varied between 3 percent and 27 percent. A higher moisture content value of 37 percent was measured in Borehole WM16-02 and was likely the result of organic content in the sample.

The results of grain size distribution analyses carried out on selected samples of the silty sand to sand are presented on the Record of Borehole sheets included in Appendix A and on Figures B4 and B5 of Appendix B. The results of the grain size distribution analyses are summarized below:

Soil Particle	Percentage (%)
Gravel	0 to 2
Sand	61 to 85
Silt	11 to 35
Clay	2 to 9

5.6 Silt

Silt was encountered in Boreholes WM16-05, WM16-06, and WM16-08 to WM16-10 beneath the sand and silty sand deposits. The silt generally contained trace to some sand, trace clay and was brown to grey in colour. The silt deposits ranged in thickness from approximately 2.3 m to 5.0 m and extended to depths of approximately 7.8 m to 9.5 m below existing ground surface elevation (Elev. 133.4 to 130.4 m).

SPT 'N' values in the silt ranged from 4 to 9 blows for 0.3 m penetration indicating that the material was loose. Measure moisture contents in the silt varied between 27 percent and 33 percent.

The results of grain size distribution analyses carried out on selected samples of the silt are presented on the Record of Borehole sheets included in Appendix A and on Figure B6 of Appendix B. The results of the grain size distribution analyses are summarized below:

Soil Particle	Percentage (%)
Gravel	0
Sand	6 to 13
Silt	76 to 84
Clay	5 to 11

5.7 Silty Clay

Silty clay was encountered in every borehole with the exception of borehole WM16-02. The silty clay was encountered beneath the sand and silt deposits and extended to the maximum depth drilled of 18.9 m below existing ground surface elevation (Elev. 122.6 m). The silty clay generally contains trace to some sand, trace gravel, and was grey in colour.

SPT 'N' values in the silty clay ranged from 0 to 6 blows for 0.3 m penetration of the sampler. Field vane shear tests (VST) conducted in the silty clay measured in-situ undrained shear strengths ranging from 20 kPa to 78 kPa. Based on the SPT and VST data, the consistency of the silty clay ranged between soft and stiff. Measured moisture contents in the silty clay varied between 14 percent and 44 percent.

The results of grain size distribution analyses and Atterberg Limit tests conducted on selected samples of the silty clay, are presented on the Record of Borehole sheets included in Appendix A and on Figures B7 and B8 of Appendix B. The results of the grain size distribution and Atterberg Limits are summarized below:

Soil Particle	Percentage (%)
Gravel	0 to 4
Sand	9 to 35
Silt	31 to 47
Clay	32 to 44
Soil Property	**Percentage (%)**
Liquid Limit	24 to 31
Plasticity Index	12 to 17

The results of the Atterberg Limits testing indicate the silty clay is of low plasticity with group symbol CL.

5.8 Groundwater Conditions

Groundwater conditions were observed during drilling operations and groundwater levels were measured in the open boreholes upon completion of drilling. Monitoring wells were installed in Boreholes WM16-01, WM16-04, WM16-06, WM16-07, WM16-10, and WM16-11 to monitor the groundwater level at the site. The groundwater levels measured in the open boreholes and in the monitoring wells are summarized below.

Borehole	Date	Water Level (m)		Remark
		Depth	Elevation	
WM16-01	November 9, 2016	1.0	140.4	Open borehole
	December 21, 2016 January 4, 2017	3.7 2.8	137.7 138.6	Monitoring Well
WM16-02	October 27, 2016	8.8	136.6	Open borehole
WM16-03	October 28, 2016	5.5	135.6	Open borehole
WM16-04	November 9, 2016	2.9	138.0	Open borehole
	December 21, 2016 January 4, 2017	4.2 3.5	136.7 137.4	Monitoring Well
WM16-05	November 2, 2015	4.5	137.0	Open borehole
WM16-06	November 9, 2016	1.1	139.8	Open borehole
	December 21, 2016 January 4, 2017	2.8 3.1	138.1 137.8	Monitoring Well
WM16-07	November 9, 2016	3.0	138.5	Open borehole
	December 21, 2016 January 4, 2017	4.5 2.1	137.0 139.4	Monitoring Well
WM16-08	October 26, 2016	4.9	135.6	Open borehole
WM16-09	October 26, 2016	5.0	135.6	Open borehole
WM16-10	November 9, 2016	1.4	136.8	Open borehole
	December 21, 2016 January 4, 2017	3.8 1.9	134.4 136.3	Monitoring Well
WM16-11	November 13, 2016 January 23, 2017	10.7 1.7	127.4 136.4	Monitoring Well

The above readings indicate that the groundwater level along the watermain alignment is at approximately 1 to 4 m depth below existing ground surface.

The groundwater levels above are short-term readings and seasonal fluctuations of the groundwater levels are to be expected. In particular, the groundwater levels may be at a higher elevation after periods of significant or prolonged precipitation.

6. MISCELLANEOUS

Thurber marked the borehole locations in the field and obtained subsurface utility clearances prior to drilling.

DBW Drilling Limited of Toronto, Ontario, and Walker Drilling Ltd. of Utopia, Ontario supplied and operated the drilling, sampling and in-situ testing equipment for the field investigation. The field investigation was supervised on a full time basis either by Mr. Cory Zanatta, EIT or Ms. Eckie Siu of Thurber. Overall supervision of the field program was provided by Dr. Sydney Pang, P.Eng. of Thurber.

The coordinates and ground surface elevations at the borehole locations were provided by MMM Group Limited.

Routine laboratory testing was carried out at Thurber's geotechnical laboratory. Interpretation of the field data and preparation of this report was carried out by Mr. Cory Zanatta, EIT. The report was reviewed by Dr. Sydney Pang, P.Eng. and Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations Projects.

THURBER

60 YEARS

Thurber Engineering Ltd.

Cory Zanatta, EIT
Geotechnical Engineer-in-Training

Sydney Pang, P.Eng.
Associate, Senior Foundations 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[(1)] 'N' VALUE
Very Soft	12 or less	Less than 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	Greater than 200	Greater than 30

NOTE: Hierarchy of Soil Strength Prediction

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

4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

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

5. LEGEND FOR RECORDS OF BOREHOLES

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

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

▼ Water Level

C_{pen} Shear Strength Determination by Pocket Penetrometer

(1) SPT 'N' Value Standard Penetration Test 'N' Value – refers to the number of blows from a 63.5kg hammer free falling a height of 0.76m to advance a standard 50 mm outside diameter split spoon sampler for 0.3 m depth into undisturbed ground.

(2) DCPT Dynamic Cone Penetration Test – Continuous penetration of a 50 mm outside diameter, 60° conical steel point attached to "A" size rods driven by a 63.5 kg hammer free falling a height of 0.76 m. The resistance to cone penetration is the number of hammer blows required for each 0.3 m advance of the conical point into undisturbed ground.

EXPLANATION OF ROCK LOGGING TERMS

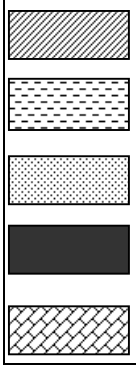
ROCK WEATHERING CLASSIFICATION

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

DISCONTINUITY SPACING

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

SYMBOLS



CLAYSTONE

SILTSTONE

SANDSTONE

COAL

BEDROCK

STRENGTH CLASSIFICATION

Rock Strength	**Approximate Uniaxial Compressive Strength (MPa)**	**(psi)**	**Field Estimation of Hardness***
Extremely Strong	Greater than 250	Greater than 36,000	Specimen can only be chipped with a geological hammer
Very Strong	100-250	15,000 to 36,000	Requires many blows of geological hammer to break
Strong	50-100	7,500 to 15,000	Requires more than one blow of geological hammer to break
Medium Strong	25.0 to 50.0	3,500 to 7,500	Breaks under single blow of geological hammer.
Weak	5.0 to 25.0	750 to 3,500	Can be peeled by a pocket knife with difficulty
Very Weak	1.0 to 5.0	150 to 750	Can be peeled by a pocket knife, crumbles under firm blows of geological pick.
Extremely Weak (Rock)	0.25 to 1.0	35 to 150	Indented by thumbnail

TERMS

Total Core Recovery: (TCR)	Core recovered as a percentage of total core run length
Solid Core Recovery:(SCR)	Percent Ratio of solid core of full cylindrical shape recovered. Expressed with respect to the total length of core run
Rock Quality Designation:(RQD)	Total length of sound core recovered in pieces 0.1m in length or larger as a % 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.

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	Peat and other highly organic soils.
CLAY SHALE			
SANDSTONE			
SILTSTONE			
CLAYSTONE			
COAL			

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No C15-03 1 OF 1 METRIC

W.P. 2061-13-00 LOCATION N 4 847 404.7 E 315 778.3 ORIGINATED BY ES

HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2015.12.21 - 2015.12.21 CHECKED BY MEF

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
141.4	GROUND SURFACE										
0.0	**ASPHALT:** (50mm)										
0.0	**SAND**, trace gravel Dense Brown Moist (FILL)		1	GS			141		○		
			1	SS	30				○		
			2	SS	36		140		○		
	Compact		3	SS	11		139		○		
138.4											
3.0	Sandy **SILT**, trace clay, occasional cobbles Compact to Loose Brown Moist		4	SS	17		138		○		
			5	SS	8		137		○		
			6	SS	8		136		○		
135.7											
5.7	Silty **CLAY**, trace to some sand, trace gravel Stiff Brown Moist		7	SS	9		135		○		
134.7											
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO 0.1m, THEN CEMENT TO SURFACE.										

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

20
15 5
10
(%) STRAIN AT FAILURE

ONTMT4S MTO-12371.GPJ 2015TEMPLATE(MTO).GDT 1/6/17

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No C15-04 1 OF 1 METRIC

W.P. 2061-13-00 LOCATION N 4 847 345.1 E 315 812.3 ORIGINATED BY ES

HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2015.12.21 - 2015.12.21 CHECKED BY MEF

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
140.4	GROUND SURFACE										
0.0 / 0.1	**ASPHALT:** (100mm)										
	SAND, some gravel Brown Damp		1	GS			140				
139.6 / 0.8	(FILL)										
	Silty **CLAY**, some sand, trace gravel, topsoil stained Very Stiff Brown to Dark Brown Moist		1	SS	18		139				
138.8 / 1.6	(FILL)										
	SAND, trace gravel, trace silt Compact Brown		2	SS	22						
138.1 / 2.3	Moist (FILL)						138				
	Silty **SAND**, trace clay Compact Brown Moist		3	SS	15						
			4	SS	24		137				
			5	SS	22	▽					
			6	SS	14		136				
							135				
133.7			7	SS	12		134				
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN AND WATER LEVEL AT 4.5m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO 0.1m, THEN CONCRETE TO SURFACE.										

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

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

ONTMT4S MTO-12371.GPJ 2015TEMPLATE(MTO).GDT 1/6/17

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-01 1 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 476.4 E 315 673.6 ORIGINATED BY CZ

HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.10.20 - 2016.10.20 CHECKED BY SKP

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
141.4	GROUND SURFACE										
0.0	**ASPHALT:** (150mm)										
0.2	**SAND** and **GRAVEL**, trace silt Compact Brown Moist (FILL)		1	SS	24		141				46 49 5 (SI+CL)
139.8	150mm ashpalt layer at 1.4m depth						140				
1.6	**SAND** and **SILT**, some clay, trace gravel Dense to Compact Brown Moist		2	SS	32						
			3	SS	20		139				
	Becoming Grey		4	SS	10	▼	138				0 46 35 19
137.7											
3.7	Loose to Very Loose		5	SS	8		137				
			6	SS	1		136				
135.3											
6.1	**SAND**, some silt, trace clay, trace gravel Very Loose Grey Wet		7	SS	3		135				
			8	SS	2		134				0 74 20 6
132.9	300mm organic layer at 8.2m depth						133				
8.5	Silty **CLAY**, some sand Soft to Firm Grey Wet		9	SS	1		132				0 17 39 44

Continued Next Page

+ ³, × ³: Numbers refer to Sensitivity

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

ONTMT4S MTO-12371.GPJ 2015TEMPLATE(MTO).GDT 1/6/17

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-01 2 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 476.4 E 315 673.6 ORIGINATED BY CZ

HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.10.20 - 2016.10.20 CHECKED BY SKP

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
	Continued From Previous Page										
	Silty **CLAY**, some sand Firm to Stiff Grey Wet						131	3.0			
			10	SS	1		130	1.5	○		
			11	SS	3		129		○		
128.6											
12.8	END OF BOREHOLE AT 12.8m. BOREHOLE CAVED TO 7.0m UPON COMPLETION OF DRILLING. Well installation consists of 50mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS DATE DEPTH(m) ELEV.(m) 2016.11.09 1.0 140.4 2016.12.21 3.7 137.7										

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

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

ONTMT4S MTO-12371.GPJ 2015TEMPLATE(MTO).GDT 1/6/17

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-02 1 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 449.6 E 315 703.5 ORIGINATED BY ES

HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.10.27 - 2016.10.27 CHECKED BY SKP

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
145.4	GROUND SURFACE										
0.0	**ASPHALT:** (200mm)										
0.2	Gravelly **SAND**, trace silt Dense Brown Moist (FILL)		1	GS			145				
			1	SS	46						28 58 14 (SI+CL)
144.0							144				
1.4	**SAND** and **SILT**, some clay, some gravel Compact to Very Dense Brown Moist (FILL)		2	SS	16						
			3	SS	35		143				12 37 40 11
			4	SS	58		142				
141.7											
3.7	**SAND** and **SILT**, some clay Compact Brown Moist		5	SS	21						0 44 40 16
			6	SS	27		141				
							140				
			7	SS	14		139				
							138				
137.3			8	SS	26						
8.1	**SAND**, some silt, trace gravel Compact Grey Moist to Wet					▽	137				
			9	SS	29		136				

Continued Next Page

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

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

ONTMT4S MTO-12371.GPJ 2015TEMPLATE(MTO).GDT 1/6/17

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-02 2 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 449.6 E 315 703.5 ORIGINATED BY ES

HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.10.27 - 2016.10.27 CHECKED BY SKP

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						
	Continued From Previous Page										
	SAND, some silt, trace gravel Loose to Compact Grey Wet						135				
	Occasional wood fibres		10	SS	5				○		
							134				
132.6			11	SS	17		133		○		
12.8	END OF BOREHOLE AT 12.8m. WATER LEVEL AT 8.8m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO 0.2m, THEN ASPHALT TO SURFACE.										

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

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

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-03 1 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 450.2 E 315 727.5 ORIGINATED BY ES

HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.10.28 - 2016.10.28 CHECKED BY SKP

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 (20 40 60 80 100): ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	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
141.1	GROUND SURFACE						141				
0.0	**ASPHALT:** (150mm)										
0.2	**SAND**, trace gravel Brown Moist		1	GS					○		
140.3	(FILL)						140				
0.8	**SAND** and **SILT**, some clay Compact to Loose Brown Moist (FILL)		1	SS	13				○		
			2	SS	8		139		○		
			3	SS	8				○		
138.1							138				
3.0	**SAND** and **SILT** Compact Brown Moist		4	SS	15				○		0 41 44 15
137.1							137				
4.0	Sandy **SILT**, some clay, trace organics, trace rootlets Compact Grey Moist		5	SS	20				○		
			6	SS	17	▽			○		0 30 50 20
135.0							136				
6.1	**SAND**, fine grained, some silt, trace gravel Very Loose Grey Moist		7	SS	0		135		○		
			8	SS	2		134		○		
							133				
	Trace organics		9	SS	0		132		○		

Continued Next Page

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

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

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-03 2 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 450.2 E 315 727.5 ORIGINATED BY ES

HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.10.28 - 2016.10.28 CHECKED BY SKP

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 (20 40 60 80 100): ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	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
	Continued From Previous Page						131			
130.3										
10.8	Silty **CLAY**, trace sand, trace gravel Soft to Firm Grey Moist		10	SS	0		130		○	
								+ 1.7		
							129			
128.3			11	SS	4				○	
12.8	END OF BOREHOLE AT 12.8m. WATER LEVEL AT 5.5m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO SURFACE.									

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

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

ONTMT4S MTO-12371.GPJ 2015TEMPLATE(MTO).GDT 1/6/17

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-04 1 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 428.6 E 315 759.2 ORIGINATED BY CZ

HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.10.19 - 2016.10.19 CHECKED BY SKP

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
140.9	GROUND SURFACE								
0.0	**TOPSOIL:** (100mm)								
0.1	**SAND** and **SILT**, some clay Compact to Dense Brown Moist (FILL)		1	SS	10		140		
			2	SS	35		139		0 48 37 15
138.3			3	SS	13		138		
2.6	**SAND** and **SILT**, some clay, trace gravel Dense to Compact Brown Moist		4	SS	31		137		
			5	SS	18	▼	136		0 39 41 20
			6	SS	16		135		
135.3									
5.6	Loose		7	SS	7		134		
133.7									
7.2	Silty **SAND**, trace clay, trace gravel Very Loose to Compact Grey Moist		8	SS	0		133		2 62 31 5
			9	SS	22		132		
							131		

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

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

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

Continued Next Page

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

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

ONTMT4S MTO-12371.GPJ 2015TEMPLATE(MTO).GDT 1/6/17

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-04 2 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 428.6 E 315 759.2 ORIGINATED BY CZ

HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.10.19 - 2016.10.19 CHECKED BY SKP

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
130.8	Continued From Previous Page										
10.1	Silty **CLAY**, with sand, trace gravel Soft to Firm Grey Wet										
			10	SS	1		130				
							129				
128.1			11	SS	2						2 35 31 32
12.8	END OF BOREHOLE AT 12.8m. Well installation consists of 50mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.										

WATER LEVEL READINGS

DATE	DEPTH(m)	ELEV.(m)
2016.11.09	2.9	138.0
2016.12.21	4.2	136.7

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

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

ONTMT4S MTO-12371.GPJ 2015TEMPLATE(MTO).GDT 1/6/17

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-05 1 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 397.0 E 315 793.6 ORIGINATED BY ES

HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.11.01 - 2016.11.02 CHECKED BY SKP

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/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
141.5	GROUND SURFACE										
0.0	**ASPHALT:** (100mm)										
0.1	**SAND**, trace gravel Brown Moist (FILL)		1	GS			141		○		
140.5			1	SS	22				○		
1.0	**SAND** and **SILT**, some clay, trace gravel Compact Brown Moist (FILL)		2	SS	19		140		○		
			3	SS	17		139		○		2 42 41 15
	75mm organic layer at 1.9m		4	SS	20		138		○		
137.0			5	SS	13	▽			○		
4.5	Silty **SAND**, trace clay Compact Brown Wet		6	SS	23		137		○		0 61 35 4
135.9							136				
5.6	**SILT**, trace sand, trace to some clay Loose Grey Saturated		7	SS	8		135		○		Augering with drilling mud (quick gel) 0 6 84 10
133.4			8	SS	4		134		○ ○		
8.1	Silty **CLAY**, some sand Firm Grey Wet						133				
	Trace gravel		9	SS	6		132		○		

Continued Next Page

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

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

ONTMT4S MTO-12371.GPJ 2015TEMPLATE(MTO).GDT 1/6/17

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-05 2 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 397.0 E 315 793.6 ORIGINATED BY ES

HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.11.01 - 2016.11.02 CHECKED BY SKP

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						
	Continued From Previous Page										
	Silty **CLAY**, some sand Firm Grey Wet						131	2.5	○		
			10	SS	4						
							130	2.8			
128.7			11	SS	5		129		○		
12.8	END OF BOREHOLE AT 12.8m. WATER LEVEL AT 4.5m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO 0.1m, THEN ASPHALT TO SURFACE.										

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

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

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-06 1 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 358.5 E 315 818.9 ORIGINATED BY ES

HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.11.02 - 2016.11.02 CHECKED BY SKP

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
140.9	GROUND SURFACE										
0.0	**ASPHALT:** (90mm)										
0.1	**SAND**, trace gravel Brown Moist		1	GS					○		
140.1	(FILL)						140				
0.8	**SAND** and **SILT**, some clay, trace gravel Very Dense Brown Moist		1	SS	60				○		
139.2	(FILL)						139				
1.7	**SAND**, fine grained, trace gravel, mixed with organics Dense Dark Brown to Brown Moist		2	SS	41				○		
138.7	(FILL)						138				
2.2	Silty **SAND**, fine grained, trace clay Dense to Compact Brown Moist to Wet		3	SS	43	▽			○		
			4	SS	29				○		
			5	SS	17		137		○		0 66 30 4
			6	SS	17		136		○		
135.3											
5.6	**SILT**, some sand, some clay Loose Grey Wet		7	SS	8		135		○		0 13 76 11
133.0			8	SS	4		134		○		
7.9	Silty **CLAY**, trace sand, trace gravel Firm Grey Wet						133				
							132	+ 2.8			
			9	SS	6		131		e		0 9 47 44

Continued Next Page

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

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

ONTMT4S MTO-12371.GPJ 2015TEMPLATE(MTO).GDT 1/6/17

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-06 2 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 358.5 E 315 818.9 ORIGINATED BY ES

HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.11.02 - 2016.11.02 CHECKED BY SKP

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
	Continued From Previous Page										
	Silty **CLAY**, trace sand, trace gravel Firm to Soft Grey Wet							2.8			
			10	SS	0		130		○		
								2.8			
128.1			11	SS	1		129		○		
12.8	END OF BOREHOLE AT 12.8m. Well installation consists of 50mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS DATE DEPTH(m) ELEV.(m) 2016.11.09 1.1 139.8 2016.12.21 2.8 138.1										

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

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

ONTMT4S MTO-12371.GPJ 2015TEMPLATE(MTO).GDT 1/6/17

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-07 1 OF 3 METRIC

W.P. 2061-13-00 LOCATION N 4 847 321.4 E 315 822.2 ORIGINATED BY ES

HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.10.25 - 2016.10.25 CHECKED BY SKP

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 + 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
141.5	GROUND SURFACE										
0.0 / 141.1	**TOPSOIL**, some clay, trace gravel, roots and rootlets Compact Dark Brown Moist		1	SS	16		141				
0.4	Silty **SAND**, some clay, trace gravel Compact to Dense Brown Moist (FILL)		2	SS	30						6 50 28 16
	Occasional organic seams		3	SS	45		140				
139.2											
2.3	**SAND**, fine grained, some silt to silty, trace gravel Compact Brown Moist to Wet		4	SS	14		139				
			5	SS	26		138				0 80 18 2
			6	SS	21	▼					0 84 14 2
			7	SS	14		137				
			8	SS	13		136				
135.5											
6.0	Loose to Very Loose		9	SS	5		135				
	Saturated		10	SS	2		134				
							133				
131.9			11	SS	4		132				
9.6	Silty **CLAY**, some sand, trace gravel Soft to Firm Grey										

Continued Next Page

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

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

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-07 2 OF 3 METRIC

W.P. 2061-13-00 LOCATION N 4 847 321.4 E 315 822.2 ORIGINATED BY ES

HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.10.25 - 2016.10.25 CHECKED BY SKP

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
	Continued From Previous Page										
	Silty **CLAY**, some sand, trace gravel Soft to Firm Grey Wet						131	3.5			
			12	SS	2						4 21 41 34
							130	2.8			
			13	SS	1		129				
								2.5			
			14	SS	3		128				
							127	2.5			
	Trace gravel		15	SS	2		126				
								2.3			
			16	SS	3		125				
							124	2.0			
122.6			17	SS	0		123				
18.9	END OF BOREHOLE AT 18.9m. Well installation consists of 50mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.										

Continued Next Page

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

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

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-07 3 OF 3 METRIC

W.P. 2061-13-00 LOCATION N 4 847 321.4 E 315 822.2 ORIGINATED BY ES

HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.10.25 - 2016.10.25 CHECKED BY SKP

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
	Continued From Previous Page										
	WATER LEVEL READINGS DATE DEPTH(m) ELEV.(m) 2016.11.09 3.0 138.5 2016.12.21 4.5 137.0										

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

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

ONTMT4S MTO-12371.GPJ 2015TEMPLATE(MTO).GDT 1/6/17

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-08 1 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 279.3 E 315 827.5 ORIGINATED BY ES

HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.10.26 - 2016.10.26 CHECKED BY SKP

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/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
140.5	GROUND SURFACE										
0.0	Silty **SAND**, some clay, trace gravel, trace organics Dense to Compact Brown Moist (FILL)		1	SS	36		140		○		3 57 24 16
139.0			2	SS	16		139		○		
1.5	**SAND**, fine grained, trace silt Compact Brown Moist		3	SS	22		138		○		
			4	SS	21		137		○		
136.8			5	SS	12				○		
3.7	**SILT**, trace sand, trace clay Loose Brown Wet		6	SS	9		136		○		Split spoon sampler wet 0 10 83 7
			7	SS	6	▽	135		○		
			8	SS	5		134		○		
			9	SS	9		133		○		
131.8							132				
8.7	Silty **CLAY**, some sand, trace gravel Soft to Firm Grey Wet		10	SS	0		131		○		

Continued Next Page

+ ³, × ³: Numbers refer to Sensitivity

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

ONTMT4S MTO-12371.GPJ 2015TEMPLATE(MTO).GDT 1/6/17

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-08 2 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 279.3 E 315 827.5 ORIGINATED BY ES

HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.10.26 - 2016.10.26 CHECKED BY SKP

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
	Continued From Previous Page										
	Silty **CLAY**, some sand, trace gravel Soft to Firm Grey Wet						130	2.5			
			11	SS	2				○		
							129	3.5			
127.7			12	SS	2		128		○		
12.8	END OF BOREHOLE AT 12.8m. WATER LEVEL AT 4.9m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO SURFACE.										

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

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

ONTMT4S MTO-12371.GPJ 2015TEMPLATE(MTO).GDT 1/6/17

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-09 1 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 227.2 E 315 832.5 ORIGINATED BY ES

HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.10.26 - 2016.10.26 CHECKED BY SKP

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 (20 40 60 80 100) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	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
140.6	GROUND SURFACE										
0.0	Clayey **SILT**, some sand, trace gravel, mixed with organics Stiff Dark Brown Moist (FILL)		1	SS	47		140				
0.2	Silty **SAND**, trace clay, trace gravel, trace organics Compact to Very Loose Brown Moist (FILL)		2	SS	19						
			3	SS	3		139				0 71 21 8
			4	SS	2		138				
137.6											
3.0	**SAND**, fine grained, some silt Compact Brown Moist to Wet		5	SS	19		137				
			6	SS	17						
			7	SS	14	▽	136				0 85 11 4
135.0											
5.6	**SILT**, trace clay, trace sand Loose Brown Saturated		8	SS	9		135				
			9	SS	5		134				
			10	SS	2		133				
131.1							132				
9.5	Silty **CLAY**, some sand, trace gravel Soft to Firm Grey						131				

Continued Next Page

+ ³, × ³: Numbers refer to Sensitivity

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

ONTMT4S MTO-12371.GPJ 2015TEMPLATE(MTO).GDT 1/6/17

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-09 2 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 227.2 E 315 832.5 ORIGINATED BY ES

HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.10.26 - 2016.10.26 CHECKED BY SKP

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
	Continued From Previous Page										
	Silty **CLAY**, some sand, trace gravel Soft to Firm Grey Wet							3.0			
			11	SS	2		130		○		
							129	2.7			
127.8			12	SS	2		128		○		
12.8	END OF BOREHOLE AT 12.8m. WATER LEVEL AT 5.0m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO SURFACE.										

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

15 20 10 5 (%) STRAIN AT FAILURE

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Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-10 1 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 174.1 E 315 837.6 ORIGINATED BY ES

HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.10.27 - 2016.10.27 CHECKED BY SKP

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
138.2	GROUND SURFACE								
0.0	**TOPSOIL:** (75mm)								
0.1	**SAND**, trace to some silt, trace clay, trace gravel Compact Brown Moist (FILL)		1	SS	12		138		
			2	SS	12		137		
136.7									
1.5	**SAND**, fine grained, some silt, trace clay Compact Brown Moist to Wet		3	SS	25				
			4	SS	11		136		0 80 18 2
134.7			5	SS	13		135		
3.5	**SILT**, trace to some sand, trace clay Loose Brown Wet		6	SS	6		134		0 10 83 7
			7	SS	5				0 12 83 5
			8	SS	6		133 132		
130.4							131		
7.8	Silty **CLAY**, some sand, trace gravel Soft to Firm Grey Wet		9	SS	1		130		
			10	SS	0		129		

DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100

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

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

+2.7

Continued Next Page

+³, ×³: Numbers refer to Sensitivity

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

ONTMT4S MTO-12371.GPJ 2015TEMPLATE(MTO).GDT 1/6/17

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-10 2 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 174.1 E 315 837.6 ORIGINATED BY ES

HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.10.27 - 2016.10.27 CHECKED BY SKP

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	20 40 60	γ kN/m³	GR SA SI CL
	Continued From Previous Page										
	Silty **CLAY**, some sand, trace gravel Soft to Firm Grey Wet						128	2.4			
			11	SS	1		127	2.8			
125.4			12	SS	1		126				
12.8	END OF BOREHOLE AT 12.8m. Well installation consists of 50mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.										

WATER LEVEL READINGS

DATE	DEPTH(m)	ELEV.(m)
2016.11.09	1.4	136.8
2016.12.21	3.8	134.4

SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE

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

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

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-11 1 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 132.2 E 315 834.8 ORIGINATED BY TM

HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.11.13 - 2016.11.13 CHECKED BY SKP

ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	"N" VALUES	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
138.1	GROUND SURFACE				
0.0 / 137.8	**ASPHALT:** (300mm)	1	SS	38	
0.3 / 137.3	Gravelly **SAND**, trace silt Dense Brown				
0.8 / 135.9	Moist (FILL) **SAND** and **SILT**, some clay, trace gravel Compact Brown Moist	2	SS	25	
		3	SS	15	0 37 40 23
2.2 / 135.1	Loose	4	SS	8	
3.0 / 134.4	Compact	5	SS	10	
3.7 / 132.5	**SAND**, some silt, trace clay Loose Brown Moist	6	SS	7	Split spoon sampler wet 0 74 17 9
		7	SS	7	
5.6	Silty **CLAY**, some sand, trace gravel Very Soft to Firm Grey Wet	8	SS	2	
		9	SS	1	
		10	SS	0	

ELEVATION SCALE: 138, 137, 136, 135, 134, 133, 132, 131, 130, 129

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

1.8

Continued Next Page

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

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

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Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No WM 16-11 2 OF 2 METRIC

W.P. 2061-13-00 LOCATION N 4 847 132.2 E 315 834.8 ORIGINATED BY TM

HWY 401 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN

DATUM Geodetic DATE 2016.11.13 - 2016.11.13 CHECKED BY SKP

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						
	Continued From Previous Page										
	Silty **CLAY**, some sand, trace gravel Soft to Firm Grey Wet						128	2.7			
			11	SS	2		127	1.7			
125.3			12	SS	1		126				
12.8	END OF BOREHOLE AT 12.8m. BOREHOLE OPEN UPON COMPLETION OF DRILLING. WATER LEVEL AT 10.7m UPON COMPLETION. Well installation consists of 50mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS DATE DEPTH(m) ELEV.(m) 2017.01.23 1.7 136.4										

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

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

ONTMT4S MTO-12371.GPJ 2015TEMPLATE(MTO).GDT 2/1/17

THURBER

60 YEARS

Appendix B

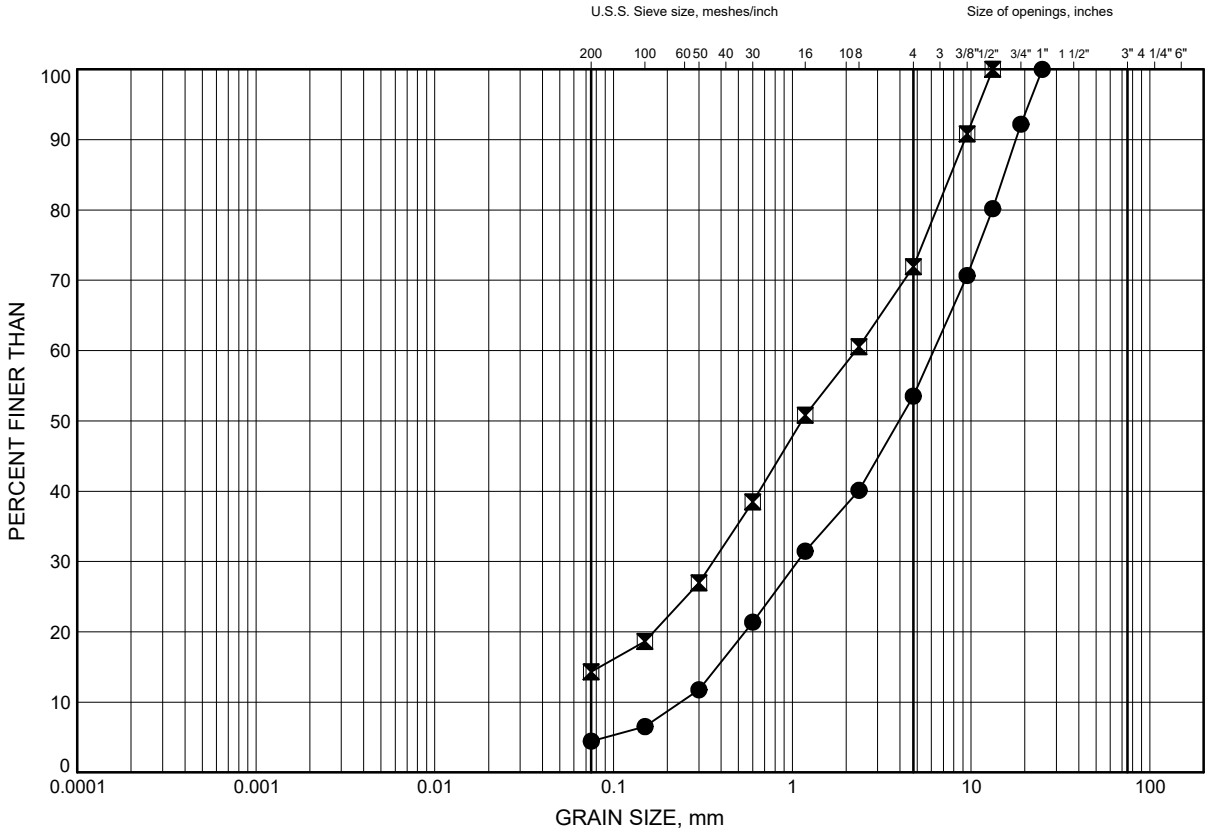
Geotechnical Laboratory Test Results

Relocated Watermain Crossing Hwy 401 at Leslie

GRAIN SIZE DISTRIBUTION

FIGURE B1

SAND and GRAVEL / Gravelly SAND FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	WM 16-01	1.07	140.33
⊠	WM 16-02	1.07	144.33

Date December 2016

W.P. 2061-13-00

THURBER

Prep'd AN

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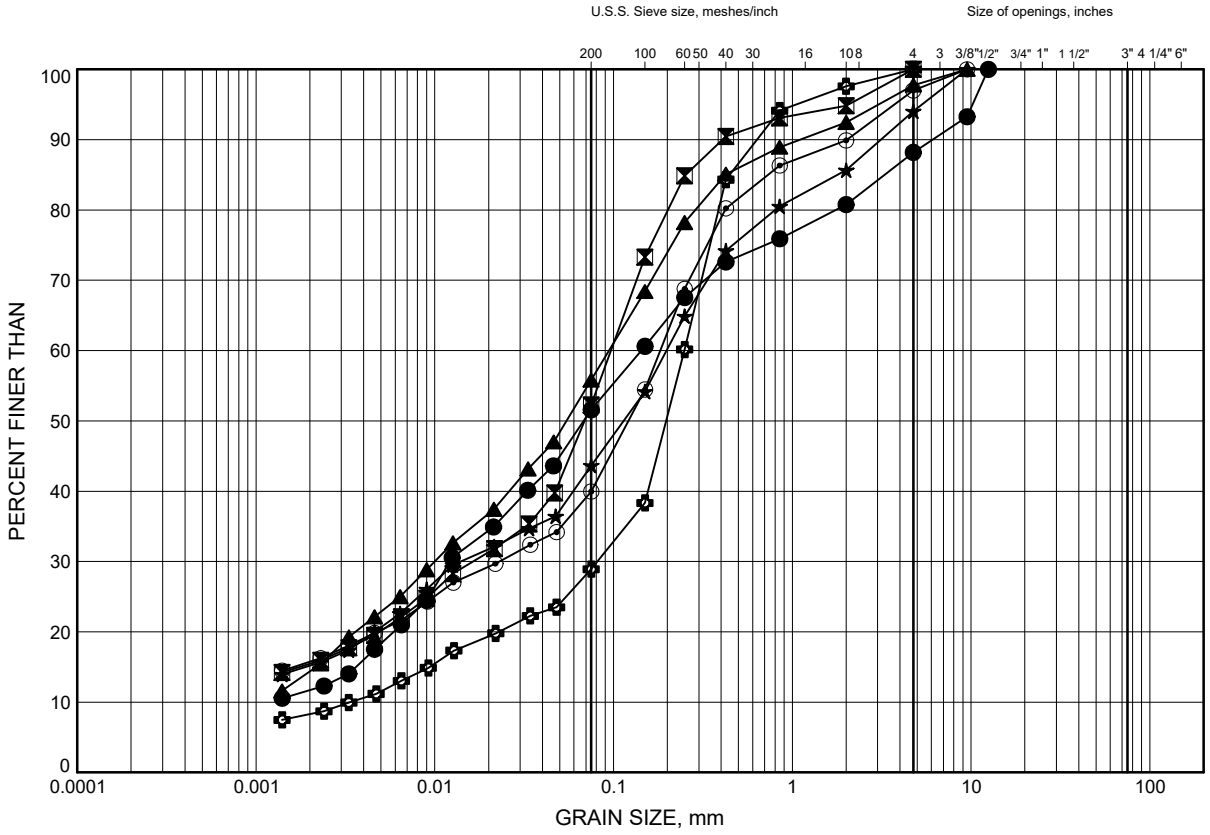
GRAIN SIZE DISTRIBUTION - THURBER MTO-12371.GPJ 12/21/16

Relocated Watermain Crossing Hwy 401 at Leslie

GRAIN SIZE DISTRIBUTION

FIGURE B2

SAND and SILT / Silty SAND FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	WM 16-02	2.59	142.81
⊠	WM 16-04	1.83	139.07
▲	WM 16-05	2.59	138.91
★	WM 16-07	1.07	140.43
⊙	WM 16-08	0.30	140.20
✿	WM 16-09	1.83	138.77

Date December 2016

W.P. 2061-13-00

THURBER

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Chkd. SKP

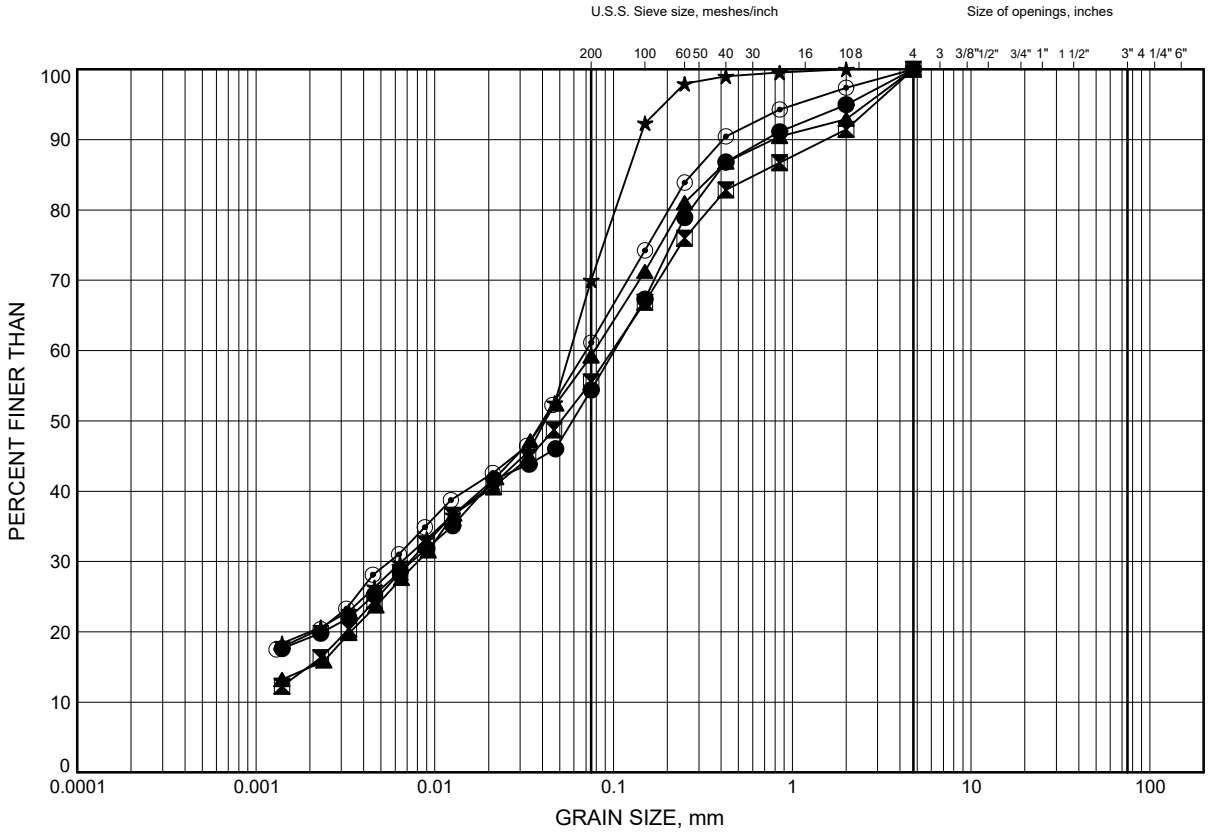
GRAIN SIZE DISTRIBUTION - THURBER MTO-12371.GPJ 12/21/16

Relocated Watermain Crossing Hwy 401 at Leslie

GRAIN SIZE DISTRIBUTION

FIGURE B3

SAND and SILT / Sandy SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	WM 16-01	3.35	138.05
⊠	WM 16-02	4.11	141.29
▲	WM 16-03	3.35	137.75
★	WM 16-03	4.88	136.22
⊙	WM 16-04	4.11	136.79

Date December 2016

W.P. 2061-13-00

THURBER

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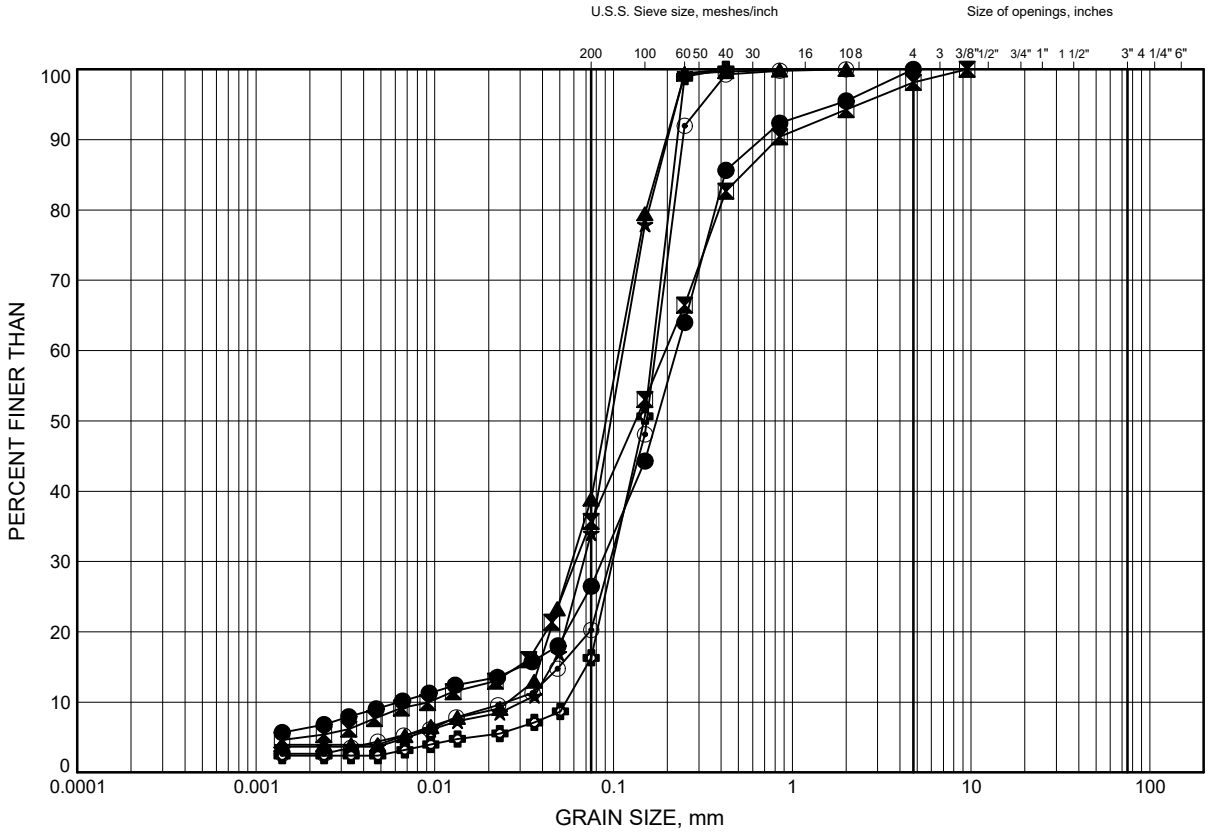
GRAIN SIZE DISTRIBUTION - THURBER MTO-12371.GPJ 12/22/16

Relocated Watermain Crossing Hwy 401 at Leslie

GRAIN SIZE DISTRIBUTION

FIGURE B4

SAND / Silty SAND



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	WM 16-01	7.92	133.48
⊠	WM 16-04	7.92	132.98
▲	WM 16-05	4.88	136.62
★	WM 16-06	4.11	136.79
⊙	WM 16-07	3.35	138.15
✿	WM 16-07	4.11	137.39

Date December 2016

W.P. 2061-13-00

THURBER

Prep'd AN

Chkd. SKP

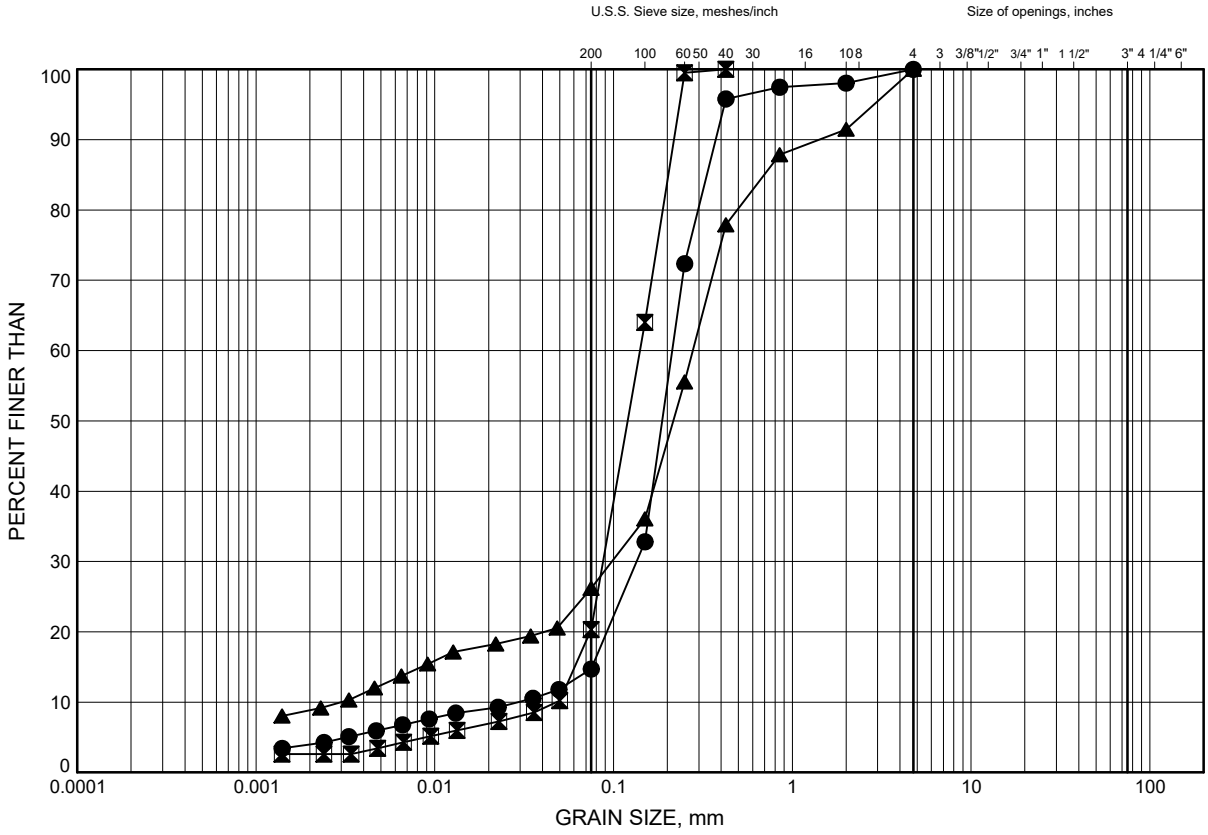
GRAIN SIZE DISTRIBUTION - THURBER MTO-12371.GPJ 12/22/16

Relocated Watermain Crossing Hwy 401 at Leslie

GRAIN SIZE DISTRIBUTION

FIGURE B5

SAND / Silty SAND



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	WM 16-09	4.88	135.72
⊠	WM 16-10	2.59	135.61
▲	WM 16-11	4.11	133.99

Date December 2016

W.P. 2061-13-00

THURBER

Prep'd AN

Chkd. SKP

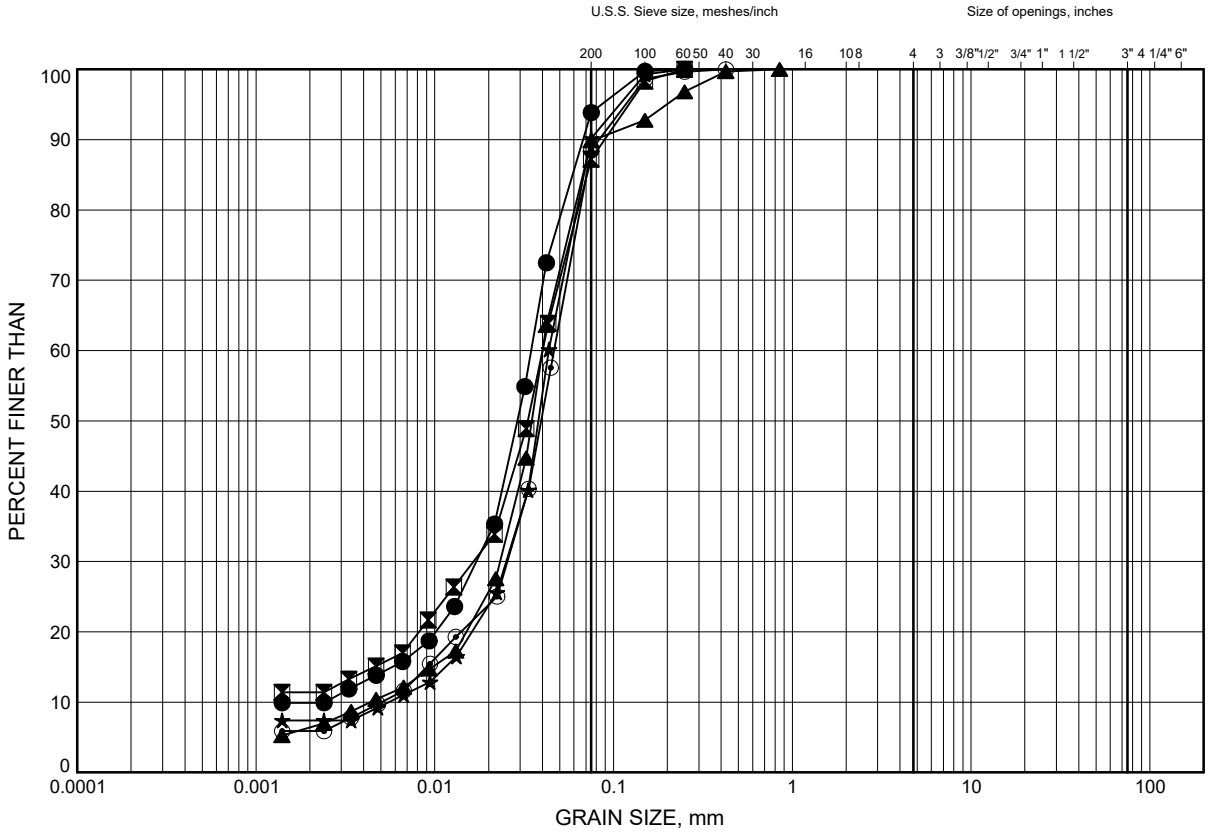
GRAIN SIZE DISTRIBUTION - THURBER MTO-12371.GPJ 12/22/16

Relocated Watermain Crossing Hwy 401 at Leslie

GRAIN SIZE DISTRIBUTION

FIGURE B6

SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	WM 16-05	6.40	135.10
⊠	WM 16-06	6.40	134.50
▲	WM 16-08	4.11	136.39
★	WM 16-10	4.11	134.09
⊙	WM 16-10	4.88	133.32

Date December 2016

W.P. 2061-13-00

THURBER

Prep'd AN

Chkd. SKP

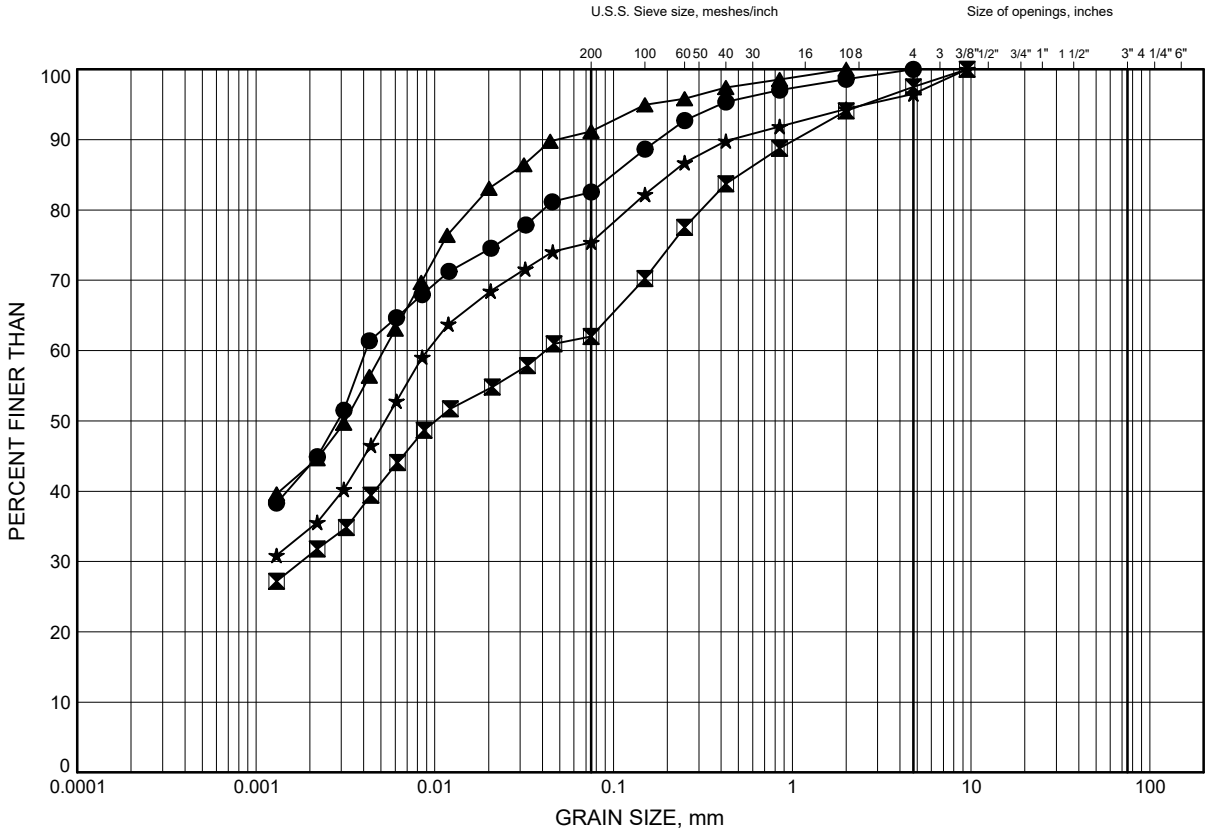
GRAIN SIZE DISTRIBUTION - THURBER MTO-12371.GPJ 12/21/16

Relocated Watermain Crossing Hwy 401 at Leslie

GRAIN SIZE DISTRIBUTION

FIGURE B7

Silty CLAY



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	WM 16-01	9.45	131.95
⊠	WM 16-04	12.50	128.40
▲	WM 16-06	9.45	131.45
★	WM 16-07	10.97	130.53

Date December 2016

W.P. 2061-13-00

THURBER

Prep'd AN

Chkd. SKP

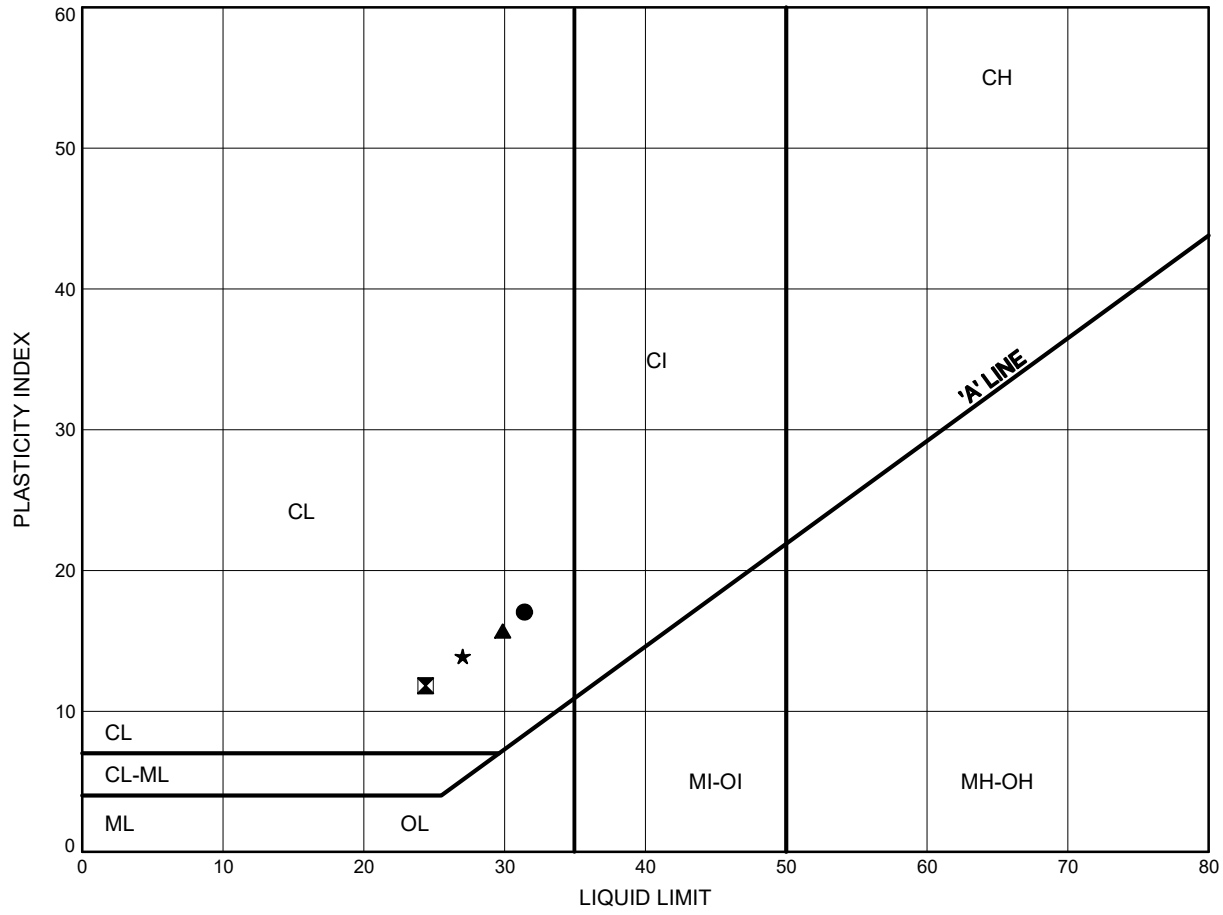
GRAIN SIZE DISTRIBUTION - THURBER MTO-12371.GPJ 12/21/16

Relocated Watermain Crossing Hwy 401 at Leslie

ATTERBERG LIMITS TEST RESULTS

FIGURE B8

Silty CLAY



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	WM 16-01	9.45	131.95
⊠	WM 16-04	12.50	128.40
▲	WM 16-06	9.45	131.45
★	WM 16-07	10.97	130.53

Date December 2016

W.P. 2061-13-00

THURBER

Prep'd AN

Chkd. SKP

THURBALT MTO-12371.GPJ 12/21/16

Appendix C

Environmental Laboratory Test Results

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
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http://www.agatlabs.com

CLIENT NAME: THURBER ENGINEERING LTD
SUITE 103, 2010 WINSTON PARK DRIVE
OAKVILLE, ON L6H5R7
(905) 829-8666

ATTENTION TO: Cory Zanatta

PROJECT: 12371

AGAT WORK ORDER: 16T151944

TRACE ORGANICS REVIEWED BY: Inga Kuzmina, Trace Organics Lab Manager

DATE REPORTED: Oct 31, 2016

PAGES (INCLUDING COVER): 10

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 16T151944

PROJECT: 12371

CLIENT NAME: THURBER ENGINEERING LTD

ATTENTION TO: Cory Zanatta

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - PHCs F1 - F4 (-BTEX) (Soil)

DATE RECEIVED: 2016-10-21

DATE REPORTED: 2016-10-31

					SAMPLE DESCRIPTION:	16-01 SS1	16-04 SS2
					SAMPLE TYPE:	Soil	Soil
					DATE SAMPLED:	2016-10-20	2016-10-19
Parameter	Unit	G / S: A	G / S: B	RDL		7951431	7951434
F1 (C6 to C10)	µg/g	25	55	5		<5[<A]	<5[<A]
F1 (C6 to C10) minus BTEX	µg/g	25	55	5		<5[<A]	<5[<A]
F2 (C10 to C16)	µg/g	10	230	10		<10[<A]	<10[<A]
F3 (C16 to C34)	µg/g	240	1700	50		150[<A]	<50[<A]
F4 (C34 to C50)	µg/g	120	3300	50		360[A-B]	<50[<A]
Gravimetric Heavy Hydrocarbons	µg/g	120	3300	50		NA[<A]	NA[<A]
Moisture Content	%			0.1		7.1	6.9
Surrogate	**Unit**	**Acceptable Limits**					
Terphenyl	%	60-140				130	138

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use, B Refers to Table 3: Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils

7951431-7951434 Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified without the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.

Certified By:

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 16T151944

PROJECT: 12371

CLIENT NAME: THURBER ENGINEERING LTD

ATTENTION TO: Cory Zanatta

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2016-10-21

DATE REPORTED: 2016-10-31

			SAMPLE DESCRIPTION:		16-01 SS1	16-04 SS2
			SAMPLE TYPE:		Soil	Soil
			DATE SAMPLED:		2016-10-20	2016-10-19
Parameter	Unit	G / S: A	G / S: B	RDL	7951431	7951434
Dichlorodifluoromethane	µg/g	0.05	16	0.05	<0.05[<A]	<0.05[<A]
Vinyl Chloride	ug/g	0.02	0.032	0.02	<0.02[<A]	<0.02[<A]
Bromomethane	ug/g	0.05	0.05	0.05	<0.05[<A]	<0.05[<A]
Trichlorofluoromethane	ug/g	0.25	4	0.05	<0.05[<A]	<0.05[<A]
Acetone	ug/g	0.5	16	0.50	<0.50[<A]	<0.50[<A]
1,1-Dichloroethylene	ug/g	0.05	0.064	0.05	<0.05[<A]	<0.05[<A]
Methylene Chloride	ug/g	0.05	1.6	0.05	<0.05[<A]	<0.05[<A]
Trans- 1,2-Dichloroethylene	ug/g	0.05	1.3	0.05	<0.05[<A]	<0.05[<A]
Methyl tert-butyl Ether	ug/g	0.05	1.6	0.05	<0.05[<A]	<0.05[<A]
1,1-Dichloroethane	ug/g	0.05	0.47	0.02	<0.02[<A]	<0.02[<A]
Methyl Ethyl Ketone	ug/g	0.5	70	0.50	<0.50[<A]	<0.50[<A]
Cis- 1,2-Dichloroethylene	ug/g	0.05	1.9	0.02	<0.02[<A]	<0.02[<A]
Chloroform	ug/g	0.05	0.47	0.04	<0.04[<A]	<0.04[<A]
1,2-Dichloroethane	ug/g	0.05	0.05	0.03	<0.03[<A]	<0.03[<A]
1,1,1-Trichloroethane	ug/g	0.05	6.1	0.05	<0.05[<A]	<0.05[<A]
Carbon Tetrachloride	ug/g	0.05	0.21	0.05	<0.05[<A]	<0.05[<A]
Benzene	ug/g	0.02	0.32	0.02	<0.02[<A]	<0.02[<A]
1,2-Dichloropropane	ug/g	0.05	0.16	0.03	<0.03[<A]	<0.03[<A]
Trichloroethylene	ug/g	0.05	0.55	0.03	<0.03[<A]	<0.03[<A]
Bromodichloromethane	ug/g	0.05	1.5	0.05	<0.05[<A]	<0.05[<A]
Methyl Isobutyl Ketone	ug/g	0.5	31	0.50	<0.50[<A]	<0.50[<A]
1,1,2-Trichloroethane	ug/g	0.05	0.05	0.04	<0.04[<A]	<0.04[<A]
Toluene	ug/g	0.2	6.4	0.05	<0.05[<A]	<0.05[<A]
Dibromochloromethane	ug/g	0.05	2.3	0.05	<0.05[<A]	<0.05[<A]
Ethylene Dibromide	ug/g	0.05	0.05	0.04	<0.04[<A]	<0.04[<A]
Tetrachloroethylene	ug/g	0.05	1.9	0.05	<0.05[<A]	<0.05[<A]
1,1,1,2-Tetrachloroethane	ug/g	0.05	0.087	0.04	<0.04[<A]	<0.04[<A]
Chlorobenzene	ug/g	0.05	2.4	0.05	<0.05[<A]	<0.05[<A]
Ethylbenzene	ug/g	0.05	1.1	0.05	<0.05[<A]	<0.05[<A]
m & p-Xylene	ug/g			0.05	<0.05	<0.05

Certified By:

AGAT Laboratories

5835 COOPERS AVENUE
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FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 16T151944

PROJECT: 12371

CLIENT NAME: THURBER ENGINEERING LTD

ATTENTION TO: Cory Zanatta

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2016-10-21

DATE REPORTED: 2016-10-31

			SAMPLE DESCRIPTION:		16-01 SS1	16-04 SS2
			SAMPLE TYPE:		Soil	Soil
			DATE SAMPLED:		2016-10-20	2016-10-19
Parameter	**Unit**	**G / S: A**	**G / S: B**	**RDL**	**7951431**	**7951434**
Bromoform	ug/g	0.05	0.61	0.05	<0.05[<A]	<0.05[<A]
Styrene	ug/g	0.05	34	0.05	<0.05[<A]	<0.05[<A]
1,1,2,2-Tetrachloroethane	ug/g	0.05	0.05	0.05	<0.05[<A]	<0.05[<A]
o-Xylene	ug/g			0.05	<0.05	<0.05
1,3-Dichlorobenzene	ug/g	0.05	9.6	0.05	<0.05[<A]	<0.05[<A]
1,4-Dichlorobenzene	ug/g	0.05	0.2	0.05	<0.05[<A]	<0.05[<A]
1,2-Dichlorobenzene	ug/g	0.05	1.2	0.05	<0.05[<A]	<0.05[<A]
Xylene Mixture	ug/g	0.05	26	0.05	<0.05[<A]	<0.05[<A]
1,3-Dichloropropene	µg/g	0.05	0.059	0.04	<0.04[<A]	<0.04[<A]
n-Hexane	µg/g	0.05	46	0.05	<0.05[<A]	<0.05[<A]
Surrogate	**Unit**		**Acceptable Limits**			
Toluene-d8	% Recovery		50-140		112	94
4-Bromofluorobenzene	% Recovery		50-140		98	92

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: A Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use, B Refers to Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition - Soil - Industrial/Commercial/Community Property Use - Coarse Textured Soils

7951431-7951434 The sample was analysed using the high level technique. The sample was extracted using methanol, a small amount of the methanol extract was diluted in water and the purge & trap GC/MS analysis was performed. Results are based on the dry weight of the soil.

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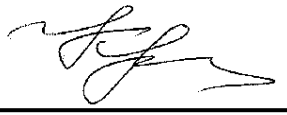

AGAT Laboratories

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Guideline Violation

AGAT WORK ORDER: 16T151944

PROJECT: 12371

CLIENT NAME: THURBER ENGINEERING LTD

ATTENTION TO: Cory Zanatta

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	GUIDEVALUE	RESULT
7951431	16-01 SS1	ON T1 S RPI/ICC	O. Reg. 153(511) - PHCs F1 - F4 (-BTEX) (Soil)	F4 (C34 to C50)	120	360

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Quality Assurance

CLIENT NAME: THURBER ENGINEERING LTD

AGAT WORK ORDER: 16T151944

PROJECT: 12371

ATTENTION TO: Cory Zanatta

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Oct 31, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - VOCs (Soil)															
Dichlorodifluoromethane	7939569		< 0.05	< 0.05	NA	< 0.05	97%	50%	140%	106%	50%	140%	96%	50%	140%
Vinyl Chloride	7939569		< 0.02	< 0.02	NA	< 0.02	106%	50%	140%	110%	50%	140%	91%	50%	140%
Bromomethane	7939569		< 0.05	< 0.05	NA	< 0.05	108%	50%	140%	104%	50%	140%	108%	50%	140%
Trichlorofluoromethane	7939569		< 0.05	< 0.05	NA	< 0.05	103%	50%	140%	107%	50%	140%	110%	50%	140%
Acetone	7939569		< 0.50	< 0.50	NA	< 0.50	98%	50%	140%	104%	50%	140%	101%	50%	140%
1,1-Dichloroethylene	7939569		< 0.05	< 0.05	NA	< 0.05	102%	50%	140%	117%	60%	130%	78%	50%	140%
Methylene Chloride	7939569		< 0.05	< 0.05	NA	< 0.05	115%	50%	140%	118%	60%	130%	87%	50%	140%
Trans- 1,2-Dichloroethylene	7939569		< 0.05	< 0.05	NA	< 0.05	103%	50%	140%	99%	60%	130%	83%	50%	140%
Methyl tert-butyl Ether	7939569		< 0.05	< 0.05	NA	< 0.05	82%	50%	140%	104%	60%	130%	80%	50%	140%
1,1-Dichloroethane	7939569		< 0.02	< 0.02	NA	< 0.02	92%	50%	140%	117%	60%	130%	84%	50%	140%
Methyl Ethyl Ketone	7939569		< 0.50	< 0.50	NA	< 0.50	97%	50%	140%	102%	50%	140%	96%	50%	140%
Cis- 1,2-Dichloroethylene	7939569		< 0.02	< 0.02	NA	< 0.02	105%	50%	140%	96%	60%	130%	90%	50%	140%
Chloroform	7939569		< 0.04	< 0.04	NA	< 0.04	118%	50%	140%	114%	60%	130%	81%	50%	140%
1,2-Dichloroethane	7939569		< 0.03	< 0.03	NA	< 0.03	85%	50%	140%	110%	60%	130%	85%	50%	140%
1,1,1-Trichloroethane	7939569		< 0.05	< 0.05	NA	< 0.05	86%	50%	140%	106%	60%	130%	92%	50%	140%
Carbon Tetrachloride	7939569		< 0.05	< 0.05	NA	< 0.05	78%	50%	140%	107%	60%	130%	85%	50%	140%
Benzene	7939569		< 0.02	< 0.02	NA	< 0.02	100%	50%	140%	112%	60%	130%	116%	50%	140%
1,2-Dichloropropane	7939569		< 0.03	< 0.03	NA	< 0.03	112%	50%	140%	112%	60%	130%	112%	50%	140%
Trichloroethylene	7939569		< 0.03	< 0.03	NA	< 0.03	84%	50%	140%	114%	60%	130%	104%	50%	140%
Bromodichloromethane	7939569		< 0.04	< 0.04	NA	< 0.05	91%	50%	140%	116%	60%	130%	101%	50%	140%
Methyl Isobutyl Ketone	7939569		< 0.50	< 0.50	NA	< 0.50	97%	50%	140%	105%	50%	140%	98%	50%	140%
1,1,2-Trichloroethane	7939569		< 0.04	< 0.04	NA	< 0.04	114%	50%	140%	115%	60%	130%	86%	50%	140%
Toluene	7939569		< 0.05	< 0.05	NA	< 0.05	113%	50%	140%	116%	60%	130%	111%	50%	140%
Dibromochloromethane	7939569		< 0.03	< 0.03	NA	< 0.05	111%	50%	140%	107%	60%	130%	82%	50%	140%
Ethylene Dibromide	7939569		< 0.04	< 0.04	NA	< 0.04	103%	50%	140%	113%	60%	130%	104%	50%	140%
Tetrachloroethylene	7939569		< 0.05	< 0.05	NA	< 0.05	112%	50%	140%	110%	60%	130%	117%	50%	140%
1,1,1,2-Tetrachloroethane	7939569		< 0.04	< 0.04	NA	< 0.04	112%	50%	140%	102%	60%	130%	116%	50%	140%
Chlorobenzene	7939569		< 0.05	< 0.05	NA	< 0.05	117%	50%	140%	97%	60%	130%	108%	50%	140%
Ethylbenzene	7939569		< 0.05	< 0.05	NA	< 0.05	107%	50%	140%	118%	60%	130%	109%	50%	140%
m & p-Xylene	7939569		< 0.05	< 0.05	NA	< 0.05	117%	50%	140%	101%	60%	130%	102%	50%	140%
Bromoform	7939569		< 0.03	< 0.03	NA	< 0.05	100%	50%	140%	108%	60%	130%	105%	50%	140%
Styrene	7939569		< 0.05	< 0.05	NA	< 0.05	81%	50%	140%	114%	60%	130%	87%	50%	140%
1,1,2,2-Tetrachloroethane	7939569		< 0.05	< 0.05	NA	< 0.05	115%	50%	140%	113%	60%	130%	101%	50%	140%
o-Xylene	7939569		< 0.05	< 0.05	NA	< 0.05	115%	50%	140%	99%	60%	130%	109%	50%	140%
1,3-Dichlorobenzene	7939569		< 0.05	< 0.05	NA	< 0.05	85%	50%	140%	111%	60%	130%	93%	50%	140%
1,4-Dichlorobenzene	7939569		< 0.05	< 0.05	NA	< 0.05	84%	50%	140%	111%	60%	130%	93%	50%	140%
1,2-Dichlorobenzene	7939569		< 0.05	< 0.05	NA	< 0.05	81%	50%	140%	113%	60%	130%	104%	50%	140%
1,3-Dichloropropene	7939569		< 0.04	< 0.04	NA	< 0.04	95%	50%	140%	95%	60%	130%	96%	50%	140%
n-Hexane	7939569		< 0.05	< 0.05	NA	< 0.05	101%	50%	140%	95%	60%	130%	85%	50%	140%

AGAT Laboratories
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Quality Assurance

CLIENT NAME: THURBER ENGINEERING LTD

AGAT WORK ORDER: 16T151944

PROJECT: 12371

ATTENTION TO: Cory Zanatta

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis (Continued)

RPT Date: Oct 31, 2016			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - PHCs F1 - F4 (-BTEX) (Soil)															
F1 (C6 to C10)	7949223		< 5	< 5	NA	< 5	74%	60%	130%	87%	85%	115%	83%	70%	130%
F2 (C10 to C16)	7951395		< 10	< 10	NA	< 10	93%	60%	130%	96%	80%	120%	73%	70%	130%
F3 (C16 to C34)	7951395		< 50	< 50	NA	< 50	98%	60%	130%	99%	80%	120%	81%	70%	130%
F4 (C34 to C50)	7951395		< 50	< 50	NA	< 50	94%	60%	130%	99%	80%	120%	97%	70%	130%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By:

AGAT Laboratories

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CANADA L4Z 1Y2
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Method Summary

CLIENT NAME: THURBER ENGINEERING LTD

AGAT WORK ORDER: 16T151944

PROJECT: 12371

ATTENTION TO: Cory Zanatta

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
F1 (C6 to C10)	VOL-91-5009	CCME Tier 1 Method, SW846 5035	P &T GC / FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	CCME Tier 1 Method, SW846 5035	P & T GC / FID
F2 (C10 to C16)	VOL-91-5009	CCME Tier 1 Method	GC / FID
F3 (C16 to C34)	VOL-91-5009	CCME Tier 1 Method	GC / FID
F4 (C34 to C50)	VOL-91-5009	CCME Tier 1 Method	GC / FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	CCME Tier 1 Method	GRAVIMETRIC ANALYSIS
Moisture Content	VOL-91-5009	CCME Tier 1 Method, SW846 5035,8015	BALANCE
Terphenyl	VOL-91-5009		GC/FID
Dichlorodifluoromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Vinyl Chloride	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Bromomethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Trichlorofluoromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Acetone	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1-Dichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methylene Chloride	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Trans- 1,2-Dichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methyl tert-butyl Ether	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1-Dichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Cis- 1,2-Dichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Chloroform	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1,1-Trichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Benzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,2-Dichloropropane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Trichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Bromodichloromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methyl Isobutyl Ketone	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1,2-Trichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Toluene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Dibromochloromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Ethylene Dibromide	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Tetrachloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1,1,2-Tetrachloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Chlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Ethylbenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
m & p-Xylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Bromoform	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Styrene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1,2,2-Tetrachloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
o-Xylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,3-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Xylene Mixture	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,3-Dichloropropene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
n-Hexane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS

AGAT Laboratories

5835 COOPERS AVENUE
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Method Summary

CLIENT NAME: THURBER ENGINEERING LTD

AGAT WORK ORDER: 16T151944

PROJECT: 12371

ATTENTION TO: Cory Zanatta

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Toluene-d8	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS

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Project : 12371 401 & Leslie

17-January-2017

Thurber Engineering Ltd
Attn : Cory Zanatta

2010 Winston Park Dr
Oakville, ON
L6H 5R7,

Phone: 905-829-8666 x 240
Fax:

Date Rec. : 10 January 2017
LR Report: **CA14160-JAN17**
Reference: 12371 Cory Zanatta

Copy: #1

CERTIFICATE OF ANALYSIS
Final Report

Analysis	1: Date Extracted / Digested	2: Date Analyzed	3: Analysis Approval Date	4: Analysis Approval Time	5: Table 3 Residential / Parkland / Institutional Property Use	6: Table 3 Industrial/Commercial/Community Property Use	7: Schedule 4 Limits	8: RL	9: 16-01 SS1	10: 16-01 SS4	11: 16-01 SS6	12: 16-02 SS4
Sample Date & Time									01-Nov-16	01-Nov-16	01-Nov-16	01-Nov-16
Corrosivity Index [none]	16-Jan-17	16-Jan-17	16-Jan-17	15:21					---	4	---	---
pH [no unit]	12-Jan-17	12-Jan-17	13-Jan-17	09:04					---	8.74	---	---
Soil Redox Potential [mV]	12-Jan-17	12-Jan-17	13-Jan-17	10:08					---	297	---	---
Sulphide [%]	13-Jan-17	13-Jan-17	13-Jan-17	14:01					---	< 0.02	---	---
Moisture Content [%]	13-Jan-17	16-Jan-17	16-Jan-17	09:11	---	---	---	---	---	---	16.9	6.1
Sulphate [µg/g]	12-Jan-17	12-Jan-17	13-Jan-17	15:00					---	35	---	---
Conductivity [uS/cm]	16-Jan-17	16-Jan-17	16-Jan-17	15:33					---	133*	---	---
Resistivity (calculated) [Ohms.cm]	16-Jan-17	16-Jan-17							---	7520	---	---
Sample weight [g]	12-Jan-17	13-Jan-17	13-Jan-17	11:14	---	---	---	---	100	---	---	---
Ext Fluid [#1 or #2]	12-Jan-17	13-Jan-17	13-Jan-17	11:14	---	---	---	---	2	---	---	---
Ext Volume [mL]	12-Jan-17	13-Jan-17	13-Jan-17	11:14	---	---	---	---	2000	---	---	---
Final pH	12-Jan-17	13-Jan-17	13-Jan-17	11:14	---	---	---	---	5.72	---	---	---
Mercury [mg/L]	16-Jan-17	16-Jan-17	16-Jan-17	09:42	---	---	2.5*	0.00001	< 0.00001	---	---	---
Arsenic [mg/L]	16-Jan-17	16-Jan-17	16-Jan-17	15:36	---	---	5*	0.01	< 0.01	---	---	---
Silver [mg/L]	16-Jan-17	16-Jan-17	16-Jan-17	15:36	---	---	100*	0.08	< 0.08	---	---	---
Barium [mg/L]	16-Jan-17	16-Jan-17	16-Jan-17	15:36	---	---	500*	0.0009	0.498	---	---	---

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Project : 12371 401 & Leslie

LR Report : **CA14160-JAN17**

Analysis	1: Date Extracted / Digested	2: Date Analyzed	3: Analysis Approval Date	4: Analysis Approval Time	5: Table 3 Residential / Parkland / Institutional Property Use	6: Table 3 Industrial/Commercial/Community Property Use	7: Schedule 4 Limits	8: RL	9: 16-01 SS1	10: 16-01 SS4	11: 16-01 SS6	12: 16-02 SS4
Boron [mg/L]	16-Jan-17	16-Jan-17	16-Jan-17	15:36	---	---	0.5	0.005	0.084	---	---	---
Cadmium [mg/L]	16-Jan-17	16-Jan-17	16-Jan-17	15:36	---	---	5*	0.001	0.002	---	---	---
Chromium [mg/L]	16-Jan-17	16-Jan-17	16-Jan-17	15:36	---	---	5	0.001	0.012	---	---	---
Lead [mg/L]	16-Jan-17	16-Jan-17	16-Jan-17	15:36	---	---	1	0.007	0.011	---	---	---
Selenium [mg/L]	16-Jan-17	16-Jan-17	16-Jan-17	15:36	---	---	10*	0.01	< 0.01	---	---	---
Uranium [mg/L]	16-Jan-17	16-Jan-17	16-Jan-17	15:36	---	---		0.1	< 0.1	---	---	---
INORGANIC PARAMETERS	***	***	***	***	***	***	***	***	***	***	***	***
METALS	***	***	***	***	***	***	***	***	***	***	***	***
Barium [µg/g]	13-Jan-17	13-Jan-17	16-Jan-17	15:36	390*	670*	---	0.01	---	---	39	17
Beryllium [µg/g]	13-Jan-17	13-Jan-17	16-Jan-17	15:36	(5) 4	(10) 8	---	0.02	---	---	0.23	0.09
Boron [µg/g]	13-Jan-17	13-Jan-17	16-Jan-17	15:36	120	120	---	1	---	---	2	2
Cadmium [µg/g]	13-Jan-17	13-Jan-17	16-Jan-17	15:36	1.2*	1.9*	---	0.02	---	---	0.07	0.03
Chromium [µg/g]	13-Jan-17	13-Jan-17	16-Jan-17	15:36	160*	160*	---	0.5	---	---	13*	6.8*
Cobalt [µg/g]	13-Jan-17	13-Jan-17	16-Jan-17	15:36	22	(100) 80	---	0.01	---	---	5.0	3.3
Copper [µg/g]	13-Jan-17	13-Jan-17	16-Jan-17	15:36	(180) 140	(300) 230	---	0.1	---	---	9.8	7.1
Lead [µg/g]	13-Jan-17	13-Jan-17	16-Jan-17	15:36	120*	120*	---	0.1	---	---	5.6*	1.9
Molybdenum [µg/g]	13-Jan-17	13-Jan-17	16-Jan-17	15:36	6.9	40	---	0.1	---	---	0.2	0.2
Nickel [µg/g]	13-Jan-17	13-Jan-17	16-Jan-17	15:36	(130) 100	(340) 270	---	0.1	---	---	11	6.7
Silver [µg/g]	13-Jan-17	13-Jan-17	16-Jan-17	15:36	(25) 20	(50) 40	---	0.01	---	---	0.02	0.01
Thallium [µg/g]	13-Jan-17	13-Jan-17	16-Jan-17	15:36	1	3.3	---	0.02	---	---	0.08	0.04
Uranium [µg/g]	13-Jan-17	13-Jan-17	16-Jan-17	15:36	23*	33*	---	0.002	---	---	0.36	0.23
Vanadium [µg/g]	13-Jan-17	13-Jan-17	16-Jan-17	15:36	86	86	---	3	---	---	19	14
Zinc [µg/g]	13-Jan-17	13-Jan-17	16-Jan-17	15:36	340	340	---	0.7	---	---	25	10
HYDRIDES	***	***	***	***	***	***	***	***	***	***	***	***
Antimony [µg/g]	13-Jan-17	13-Jan-17	16-Jan-17	15:36	7.5	(50) 40	---	0.8	---	---	< 0.8	< 0.8
Arsenic [µg/g]	13-Jan-17	13-Jan-17	16-Jan-17	15:36	18*	18*	---	0.5	---	---	1.8	1.2
Selenium [µg/g]	13-Jan-17	13-Jan-17	16-Jan-17	15:36	2.4*	5.5*	---	0.7	---	---	< 0.7	< 0.7
ORPs	***	***	***	***	***	***	***	***	***	***	***	***
Mercury [µg/g]	12-Jan-17	13-Jan-17	13-Jan-17	13:29	(1.8) 0.27	(20) 3.9	---	0.05	---	---	< 0.05	< 0.05
Water Soluble Boron [µg/g]	12-Jan-17	13-Jan-17	13-Jan-17	13:29	1.5	2	---	0.5	---	---	< 0.5	< 0.5
Sodium Adsorption Ratio [---]	13-Jan-17	13-Jan-17	13-Jan-17	15:34	5	12	---	0.2	---	---	3.4	9.1
SAR Calcium [mg/L]	13-Jan-17	13-Jan-17	13-Jan-17	15:34	---	---	---	0.09	---	---	26	29
SAR Magnesium [mg/L]	13-Jan-17	13-Jan-17	13-Jan-17	15:34	---	---	---	0.02	---	---	1.7	4.1

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Project : 12371 401 & Leslie

LR Report : **CA14160-JAN17**

Analysis	1: Date Extracted / Digested	2: Date Analyzed	3: Analysis Approval Date	4: Analysis Approval Time	5: Table 3 Residential / Parkland / Institutional Property Use	6: Table 3 Industrial/Commercial/Community Property Use	7: Schedule 4 Limits	8: RL	9: 16-01 SS1	10: 16-01 SS4	11: 16-01 SS6	12: 16-02 SS4
SAR Sodium [mg/L]	13-Jan-17	13-Jan-17	13-Jan-17	15:34	---	---	---	0.15	---	---	65	199
Conductivity [mS/cm]	13-Jan-17	13-Jan-17	16-Jan-17	11:09	0.7	1.4	---	0.002	---	---	0.66	1.4
pH [no unit]	13-Jan-17	13-Jan-17	13-Jan-17	13:40	---	---	---	0.05	---	---	7.43	8.00
Chloride [µg/g]	12-Jan-17	12-Jan-17	13-Jan-17	15:00	NA	NA	---	0.4	---	35	---	---
Chromium VI [µg/g]	12-Jan-17	13-Jan-17	17-Jan-17	14:12	(10) 8	(10) 8	---	0.2	---	---	< 0.2	< 0.2
Free Cyanide [µg/g]	11-Jan-17	12-Jan-17	16-Jan-17	10:44	0.051	0.051	---	0.05	---	---	< 0.05	< 0.05

Analysis	13: 16-02 SS5	14: 16-03 SS1	15: 16-04 SS1	16: 16-04 SS5	17: 16-05 SS4	18: 16-05 SS6	19: 16-06 SS4	20: 16-06 SS5	21: 16-07 SS5	22: 16-07 SS7	24: 16-08 SS6	25: 16-08 SS7
Sample Date & Time	01-Nov-16	01-Nov-16	01-Nov-16	01-Nov-16	01-Nov-16	01-Nov-16	01-Nov-16	01-Nov-16	01-Nov-16	01-Nov-16	01-Nov-16	01-Nov-16
Corrosivity Index [none]	---	---	---	11	---	11	---	14	---	---	12	---
pH [no unit]	---	---	---	7.51	---	8.15	---	8.53	---	---	9.09	---
Soil Redox Potential [mV]	---	---	---	294	---	271	---	268	---	---	246	---
Sulphide [%]	---	---	---	< 0.02	---	< 0.02	---	< 0.02	---	---	< 0.02	---
Moisture Content [%]	---	9.0	---	---	9.3	---	13.7	---	4.0	---	---	---
Sulphate [µg/g]	---	---	---	25	---	38	---	32	---	---	17	---
Conductivity [uS/cm]	---	---	---	977*	---	1410*	---	889*	---	---	633*	---
Resistivity (calculated) [Ohms.cm]	---	---	---	1020	---	709	---	1130	---	---	1580	---
Sample weight [g]	100	---	100	---	---	---	---	---	---	100	---	100
Ext Fluid [#1 or #2]	2	---	2	---	---	---	---	---	---	2	---	2
Ext Volume [mL]	2000	---	2000	---	---	---	---	---	---	2000	---	2000
Final pH	5.68	---	5.71	---	---	---	---	---	---	5.63	---	5.67
Mercury [mg/L]	< 0.00001	---	< 0.00001	---	---	---	---	---	---	< 0.00001	---	< 0.00001
Arsenic [mg/L]	< 0.01	---	0.01	---	---	---	---	---	---	< 0.01	---	< 0.01
Silver [mg/L]	< 0.08	---	< 0.08	---	---	---	---	---	---	< 0.08	---	< 0.08
Barium [mg/L]	0.447	---	0.306	---	---	---	---	---	---	0.0941	---	0.294
Boron [mg/L]	0.075	---	0.490	---	---	---	---	---	---	0.121	---	0.146
Cadmium [mg/L]	0.001	---	0.001	---	---	---	---	---	---	< 0.001	---	< 0.001

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Project : 12371 401 & Leslie

LR Report : **CA14160-JAN17**

Analysis	13: 16-02 SS5	14: 16-03 SS1	15: 16-04 SS1	16: 16-04 SS5	17: 16-05 SS4	18: 16-05 SS6	19: 16-06 SS4	20: 16-06 SS5	21: 16-07 SS5	22: 16-07 SS7	24: 16-08 SS6	25: 16-08 SS7
Chromium [mg/L]	< 0.001	---	0.002	---	---	---	---	---	---	0.002	---	0.001
Lead [mg/L]	< 0.007	---	< 0.007	---	---	---	---	---	---	0.052	---	< 0.007
Selenium [mg/L]	< 0.01	---	< 0.01	---	---	---	---	---	---	< 0.01	---	< 0.01
Uranium [mg/L]	< 0.1	---	< 0.1	---	---	---	---	---	---	< 0.1	---	< 0.1
INORGANIC PARAMETERS	***	***	***	***	***	***	***	***	***	***	***	***
METALS	***	***	***	***	***	***	***	***	***	***	***	***
Barium [µg/g]	---	33	---	---	52	---	17	---	8.5	---	---	---
Beryllium [µg/g]	---	0.22	---	---	0.32	---	0.15	---	0.09	---	---	---
Boron [µg/g]	---	3	---	---	5	---	3	---	2	---	---	---
Cadmium [µg/g]	---	0.03	---	---	0.07	---	0.03	---	0.03	---	---	---
Chromium [µg/g]	---	10*	---	---	11*	---	6.0*	---	7.8*	---	---	---
Cobalt [µg/g]	---	4.4	---	---	4.9	---	2.6	---	1.6	---	---	---
Copper [µg/g]	---	8.5	---	---	9.6	---	6.3	---	4.4	---	---	---
Lead [µg/g]	---	3.8	---	---	5.0	---	2.7	---	1.9	---	---	---
Molybdenum [µg/g]	---	0.3	---	---	0.2	---	0.2	---	0.9	---	---	---
Nickel [µg/g]	---	9.1	---	---	10	---	5.7	---	4.3	---	---	---
Silver [µg/g]	---	0.02	---	---	0.02	---	0.02	---	< 0.01	---	---	---
Thallium [µg/g]	---	0.08	---	---	0.11	---	0.04	---	0.03	---	---	---
Uranium [µg/g]	---	0.40	---	---	0.52	---	0.30	---	0.28	---	---	---
Vanadium [µg/g]	---	17	---	---	18	---	11	---	8	---	---	---
Zinc [µg/g]	---	18	---	---	21	---	13	---	8.4	---	---	---
HYDRIDES	***	***	***	***	***	***	***	***	***	***	***	***
Antimony [µg/g]	---	< 0.8	---	---	< 0.8	---	< 0.8	---	< 0.8	---	---	---
Arsenic [µg/g]	---	1.7	---	---	1.7	---	1.4	---	1.1	---	---	---
Selenium [µg/g]	---	< 0.7	---	---	< 0.7	---	< 0.7	---	< 0.7	---	---	---
ORPs	***	***	***	***	***	***	***	***	***	***	***	***
Mercury [µg/g]	---	< 0.05	---	---	< 0.05	---	< 0.05	---	< 0.05	---	---	---
Water Soluble Boron [µg/g]	---	< 0.5	---	---	< 0.5	---	< 0.5	---	< 0.5	---	---	---
Sodium Adsorption Ratio [---]	---	6.2	---	---	4.9	---	13*	---	1.0	---	---	---
SAR Calcium [mg/L]	---	24	---	---	67	---	12	---	12	---	---	---
SAR Magnesium [mg/L]	---	5.1	---	---	8.1	---	1.1	---	0.98	---	---	---
SAR Sodium [mg/L]	---	128	---	---	160	---	175	---	14	---	---	---
Conductivity [mS/cm]	---	0.81	---	---	1.4	---	1.1	---	0.15	---	---	---

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Project : 12371 401 & Leslie
LR Report : **CA14160-JAN17**

Analysis	13: 16-02 SS5	14: 16-03 SS1	15: 16-04 SS1	16: 16-04 SS5	17: 16-05 SS4	18: 16-05 SS6	19: 16-06 SS4	20: 16-06 SS5	21: 16-07 SS5	22: 16-07 SS7	24: 16-08 SS6	25: 16-08 SS7
pH [no unit]	---	8.14	---	---	7.92	---	8.05	---	8.15	---	---	---
Chloride [µg/g]	---	---	---	810	---	1100	---	770	---	---	430	---
Chromium VI [µg/g]	---	< 0.2	---	---	< 0.2	---	< 0.2	---	< 0.2	---	---	---
Free Cyanide [µg/g]	---	< 0.05	---	---	< 0.05	---	< 0.05	---	< 0.05	---	---	---

Deanna Edwards, B.Sc, C.Chem
Project Specialist
Environmental Services, Analytical

OnLine LIMS

000087674

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CCME Method Compliance: Analyses were conducted using analytical procedures that comply with the Reference Method for the CWS for Petroleum Hydrocarbons in Soil and have been validated for use at the SGS laboratory, Lakefield, ON site.

Quality Compliance: Instrument performance / calibration quality criteria were met and extraction and analysis limits for holding times were met.
nC6 and nC10 response factors within 30% of response factor for toluene: YES
nC10, nC16 and nC34 response factors within 10% of the average response for the three compounds: YES
C50 response factors within 70% of nC10 + nC16 + nC34 average: YES
Linearity is within 15%: YES

F4G - gravimetric heavy hydrocarbons cannot be added to the C6 to C50 hydrocarbons.
The results for F4 and F4G are both reported and the greater of the two values is to be used in application to the CWS PHC.

Hydrocarbon results are expressed on a dry weight basis.

Corrosivity Index is based on the American Water Works Corrosivity Scale according to AWWA C-105. An index greater than 10 indicates the soil matrix may be corrosive to cast iron alloys.

Temperature of Sample upon Receipt 19 degrees C
Cooling Agent Not Present
Custody Seal Not Present

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LR Report : **CA14160-JAN17**

Method Descriptions

Parameter	SGS Method Code	Reference Method Code
Anions by IC	ME-CA-[ENV]IC-LAK-AN-001	EPA300/MA300-Ions1.3
Carbon/Sulphur	ME-CA-[ENV]ARD-LAK-AN-020	ASTM E1915-07A
Conductivity	ME-CA-[ENV]EWL-LAK-AN-006	EPA 6010/SM 2510
Conductivity	ME-CA-[ENV]EWL-LAK-AN-006	SM 2510
Cyanide by SFA	ME-CA-[ENV]SFA-LAK-AN-005	SM 4500
Hexavalent Chromium by IC	ME-CA-[ENV]IC-LAK-AN-008	EPA218.6/EPA3060A
Mercury by CVAAS	ME-CA-[ENV]SPE-LAK-AN-004	EPA 7471A/EPA 245
Mercury by CVAAS	ME-CA-[ENV]SPE-LAK-AN-004	EPA 7471A/SM 3112B
Metals in aqueous samples - ICP-OES	ME-CA-[ENV]SPE-LAK-AN-003	MOE 4696e01/EPA 6010
Metals in aqueous samples - ICP-OES	ME-CA-[ENV]SPE-LAK-AN-003	SM 3030/EPA 200.7
Metals in Soil - Aqua-regia/ICP-MS	ME-CA-[ENV]SPE-LAK-AN-005	EPA 3050/EPA 200.8
Moisture	ME-CA-[ENV]GC-LAK-AN-010	CCME Tier 1
pH	ME-CA-[ENV]EWL-LAK-AN-001	SM 4500
Sodium adsorption ratio (SAR)	ME-CA-[ENV]ARD-LAK-AN-021	MOE 4696e01/EPA 6010
Water Soluble Boron	ME-CA-[ENV] SPE-LAK-AN-003	O.Reg. 153/04

SGS Canada Inc.
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Lakefield - Ontario - KOL 2HO
Phone: 705-652-2000 FAX: 705-652-6365

Project : 12371 401 & Leslie
LR Report : **CA14160-JAN17**

Quality Control Report

Inorganic Analysis												
Parameter	Reporting Limit	Unit	Method Blank		RPD	Acceptance Criteria	LCS / Spike Blank			Matrix Spike / Reference Material		
							Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
						%		Low	High		Low	High
Anions by IC - QCBatchID: DIO0138-JAN17												
Chloride	0.4	µg/g	<0.4		5	20	95	80	120	99	75	125
Sulphate	0.4	µg/g	<0.4		1	20	97	80	120	91	75	125
Carbon/Sulphur - QCBatchID: ECS0029-JAN17												
Sulphide	0.02	%	<0.02		ND	20	110	80	120			
Conductivity - QCBatchID: EWL0172-JAN17												
Conductivity	0.002	mS/cm	<0.002		0	10	99	90	110	NA		
Cyanide by SFA - QCBatchID: SKA5019-JAN17												
Free Cyanide	0.05	µg/g	<0.05		ND	20	101	80	120	104	75	125
Hexavalent Chromium by IC - QCBatchID: DIO0112-JAN17												
Chromium VI	0.2	µg/g	<0.2		ND	20	94	80	120	98	75	125
Mercury by CVAAS - QCBatchID: EHG0012-JAN17												
Mercury	0.05	µg/g	<0.05		ND	20	100	80	120	108	70	130
Metals in aqueous samples - ICP-OES - QCBatchID: ESG0041-JAN17												
SAR Calcium	0.09	mg/L	<0.09		3	20	99	80	120	94	70	130
SAR Magnesium	0.02	mg/L	<0.02		1	20	97	80	120	98	70	130
SAR Sodium	0.15	mg/L	<0.15		5	20	97	80	120	83	70	130
Metals in aqueous samples - ICP-OES - QCBatchID: ESG0042-JAN17												
Arsenic	0.01	mg/L	< 0.01		ND	20	101	90	110	100	70	130
Barium	0.0009	mg/L	< 0.0009		7	20	102	90	110	NV	70	130
Boron	0.005	mg/L	< 0.005		6	20	103	90	110	97	70	130
Cadmium	0.001	mg/L	< 0.001		6	20	102	90	110	99	70	130
Chromium	0.001	mg/L	< 0.002		ND	20	103	90	110	86	70	130
Lead	0.007	mg/L	< 0.007		ND	20	103	90	110	106	70	130
Selenium	0.01	mg/L	< 0.01		ND	20	101	90	110	117	70	130
Silver	0.08	mg/L	< 0.08		ND	20	100	90	110	106	70	130
Uranium	0.1	mg/L	< 0.1		ND	20	101	90	110	NV	70	130
Metals in Soil - Aqua-regia/ICP-MS - QCBatchID: EMS0038-JAN17												
Antimony	0.8	µg/g	<0.8		ND	20	100	70	130	106	70	130
Arsenic	0.5	µg/g	<0.5		14	20	100	70	130	95	70	130
Barium	0.01	µg/g	<0.01		11	20	96	70	130	92	70	130
Beryllium	0.02	µg/g	<0.02		ND	20	106	70	130	114	70	130
Boron	1	µg/g	<1		ND	20	90	70	130	109	70	130
Cadmium	0.02	µg/g	<0.02		15	20	103	70	130	101	70	130
Chromium	0.5	µg/g	<0.5		2	20	101	70	130	98	70	130
Cobalt	0.01	µg/g	<0.01		2	20	102	70	130	99	70	130
Copper	0.1	µg/g	<0.1		4	20	100	70	130	92	70	130

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Inorganic Analysis												
Parameter	Reporting Limit	Unit	Method Blank		RPD	Acceptance Criteria	LCS / Spike Blank			Matrix Spike / Reference Material		
							Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
						%		Low	High		Low	High
Lead	0.1	µg/g	<0.1		10	20	98	70	130	101	70	130
Molybdenum	0.1	µg/g	<0.1		ND	20	101	70	130	107	70	130
Nickel	0.1	µg/g	<0.1		5	20	105	70	130	98	70	130
Selenium	0.7	µg/g	<0.7		ND	20	100	70	130	90	70	130
Silver	0.01	µg/g	<0.01		ND	20	102	70	130	97	70	130
Thallium	0.02	µg/g	<0.02		ND	20	98	70	130	105	70	130
Uranium	0.002	µg/g	<0.002		9	20	96	70	130	NV	70	130
Vanadium	3	µg/g	<3		4	20	102	70	130	99	70	130
Zinc	0.7	µg/g	<0.7		16	20	105	70	130	90	70	130
pH - QCBatchID: ARD0034-JAN17												
pH	0.05	no unit			0	20	100	80	120			
Water Soluble Boron - QCBatchID: ESG0031-JAN17												
Water Soluble Boron	0.5	µg/g	<0.5		ND	20	97	80	120	NV	70	130

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Regulation Exceedances

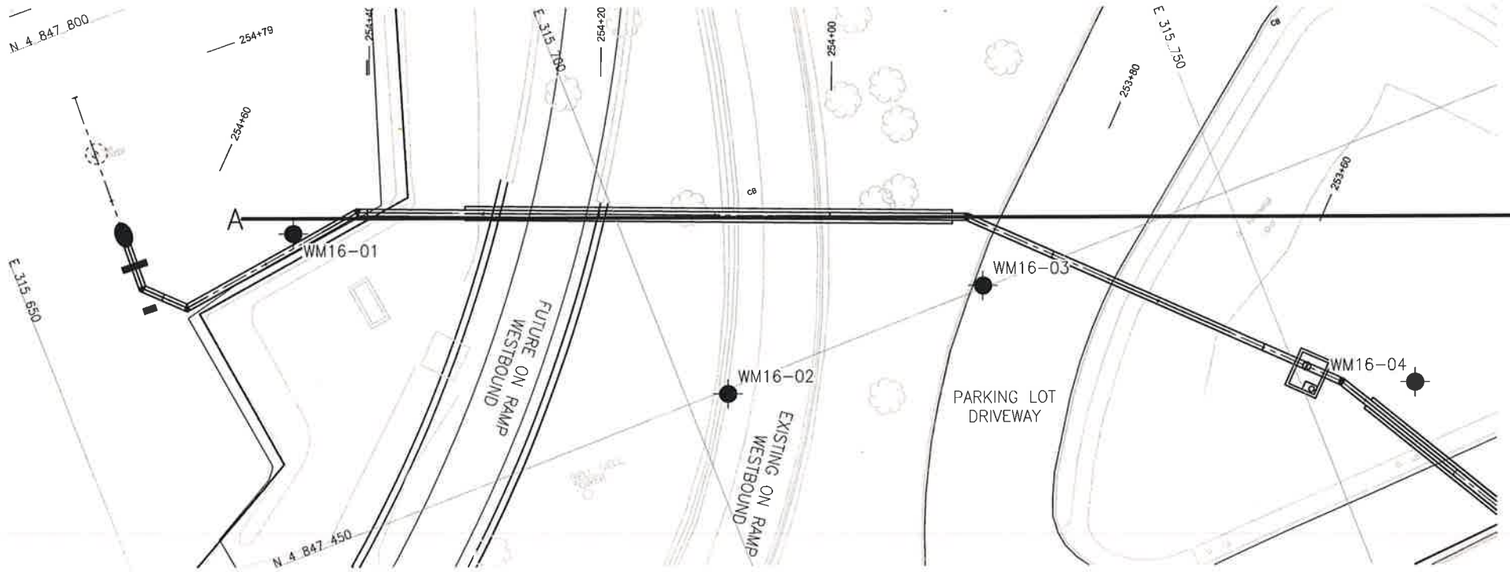
SAMPLEID PARAMETER	REG153 / SOIL / FINE TABLE 3 INDUSTRIAL/COMMERCIAL UNDEFINED
16-01 SS4 : Conductivity [uS/cm]	133 [limit: 1.4]
16-04 SS5 : Conductivity [uS/cm]	977 [limit: 1.4]
16-05 SS6 : Conductivity [uS/cm]	1410 [limit: 1.4]
16-06 SS4 : Sodium Adsorption Ratio [---]	13 [limit: 12]
16-06 SS5 : Conductivity [uS/cm]	889 [limit: 1.4]
16-08 SS6 : Conductivity [uS/cm]	633 [limit: 1.4]

OnLine LIMS

000087674

Appendix D

Borehole Locations and Soil Strata Drawings



PLAN

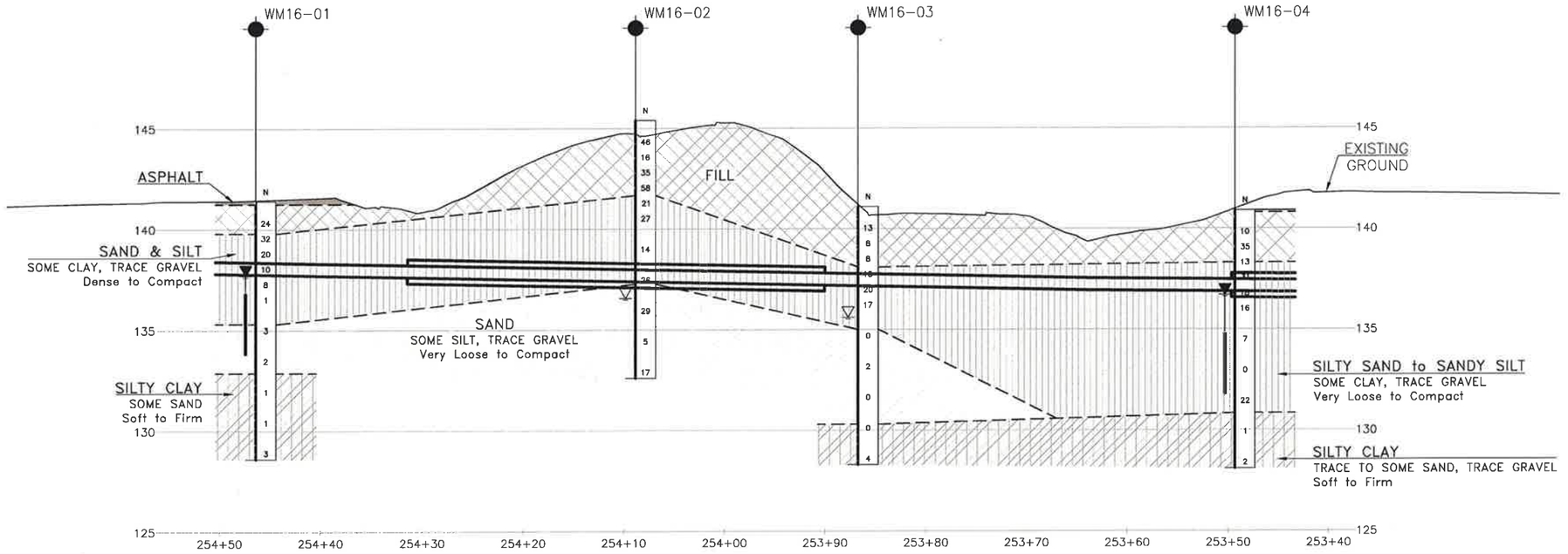
10 0 10 20m

METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
Feb 1/17
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
E. PANG
Feb 1/2017
PROVINCE OF ONTARIO



PROFILE ALONG A–A'

10 0 10 20m H

5 0 5 10m V

CONT No 2016-2048
WP No 2061-13-00

HIGHWAY 401 &
LESLIE STREET
RELOCATED WATERMAIN CROSSING
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET 89

MMM GROUP

THURBER ENGINEERING LTD.

KEYPLAN

LEGEND

●	Borehole (Current Investigation)
⊕	Borehole (Previous 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
WM16-01	141.4	4 847 476.4	315 673.6
WM16-02	145.4	4 847 449.6	315 703.5
WM16-03	141.1	4 847 450.2	315 727.5
WM16-04	140.9	4 847 428.6	315 759.2
WM16-05	141.5	4 847 397.0	315 793.6
WM16-06	140.9	4 847 358.5	315 818.9
WM16-07	141.5	4 847 321.4	315 822.2
WM16-08	140.5	4 847 279.3	315 827.5
WM16-09	140.6	4 847 227.2	315 832.5
WM16-10	138.2	4 847 174.1	315 837.6
WM16-11	138.1	4 847 132.2	315 834.8

-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. 30M14-460

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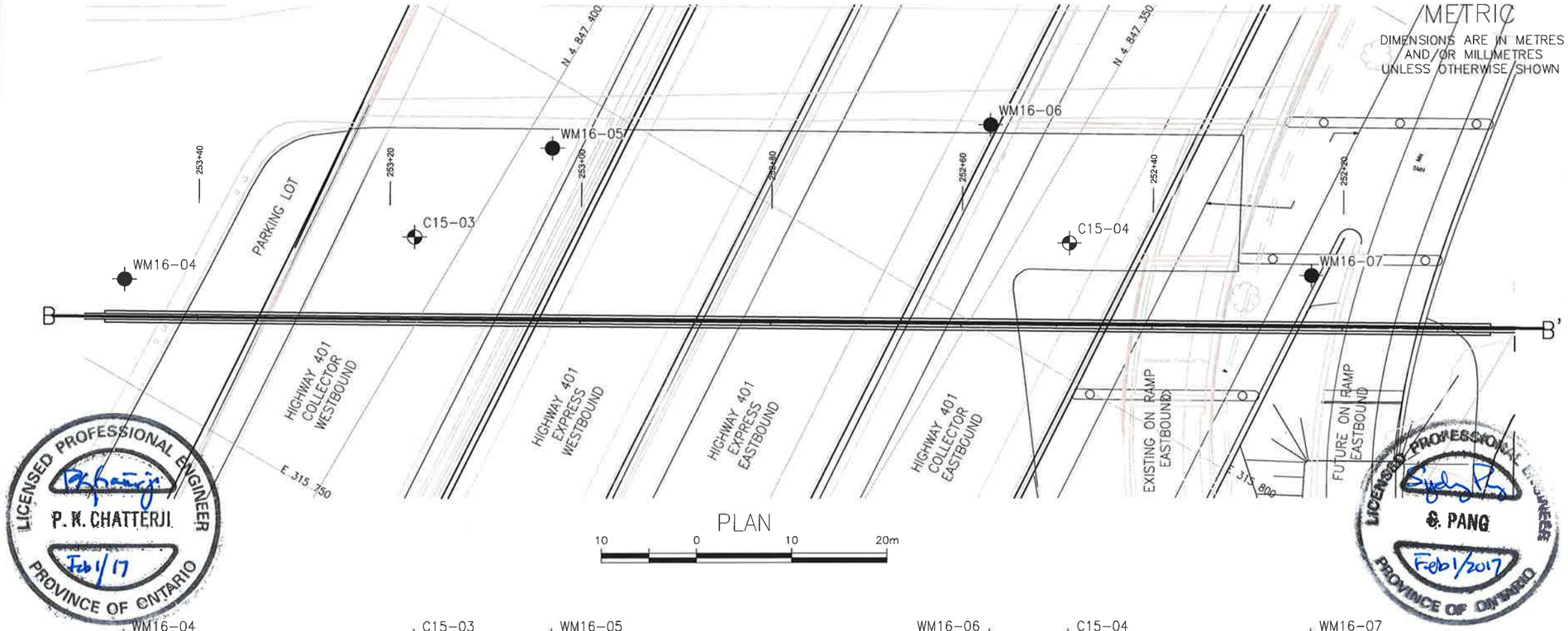

PLAN
10 0 10 20m

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Feb 1/2017
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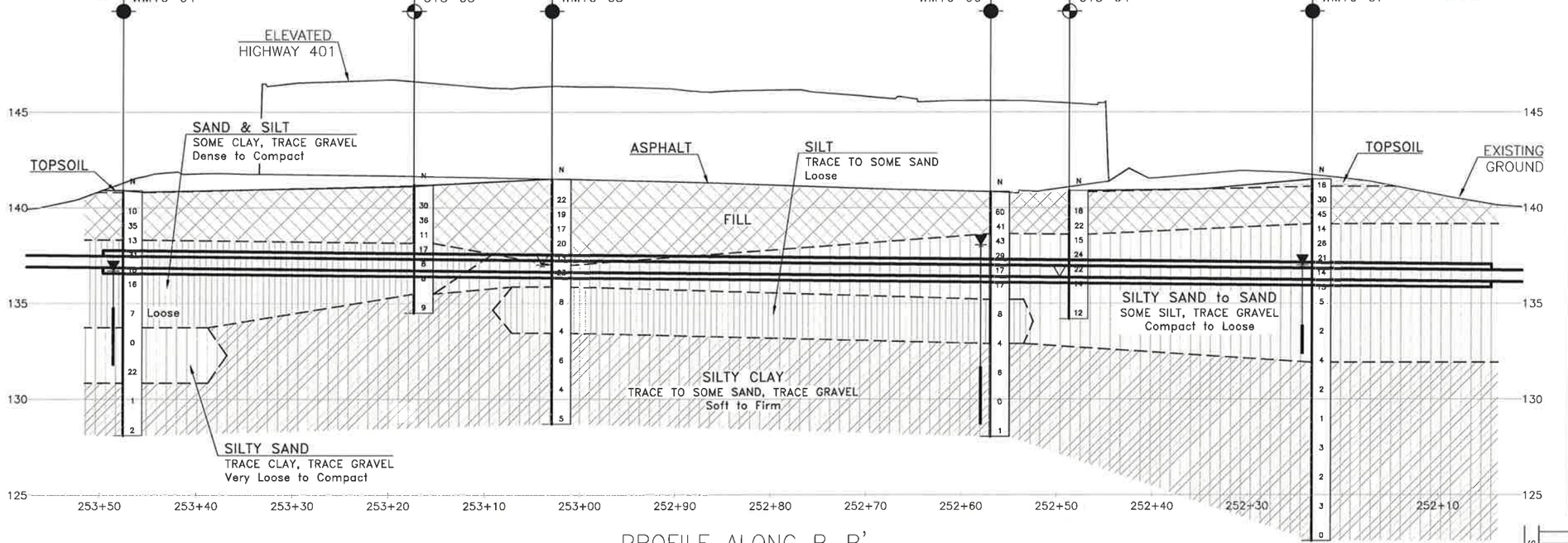


PROFILE ALONG B–B'
10 0 10 20m H
5 0 5 10m V

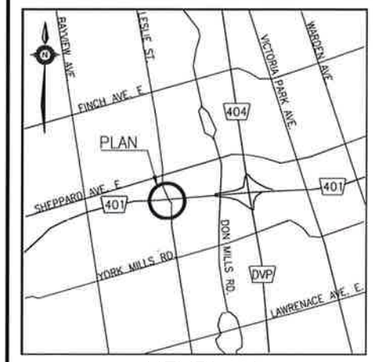
CONT No 2016-2048
WP No 2061-13-00

HIGHWAY 401 &
LESLIE STREET
RELOCATED WATERMAIN CROSSING
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET
90

MMM GROUP

THURBER ENGINEERING LTD.



KEYPLAN

LEGEND

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	Borehole (Previous Investigation)
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C15–03	141.4	4 847 404.7	315 778.3
C15–04	140.4	4 847 345.1	315 812.3
WM16–01	141.4	4 847 476.4	315 673.6
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MINISTRY OF TRANSPORTATION, ONTARIO

METRIC

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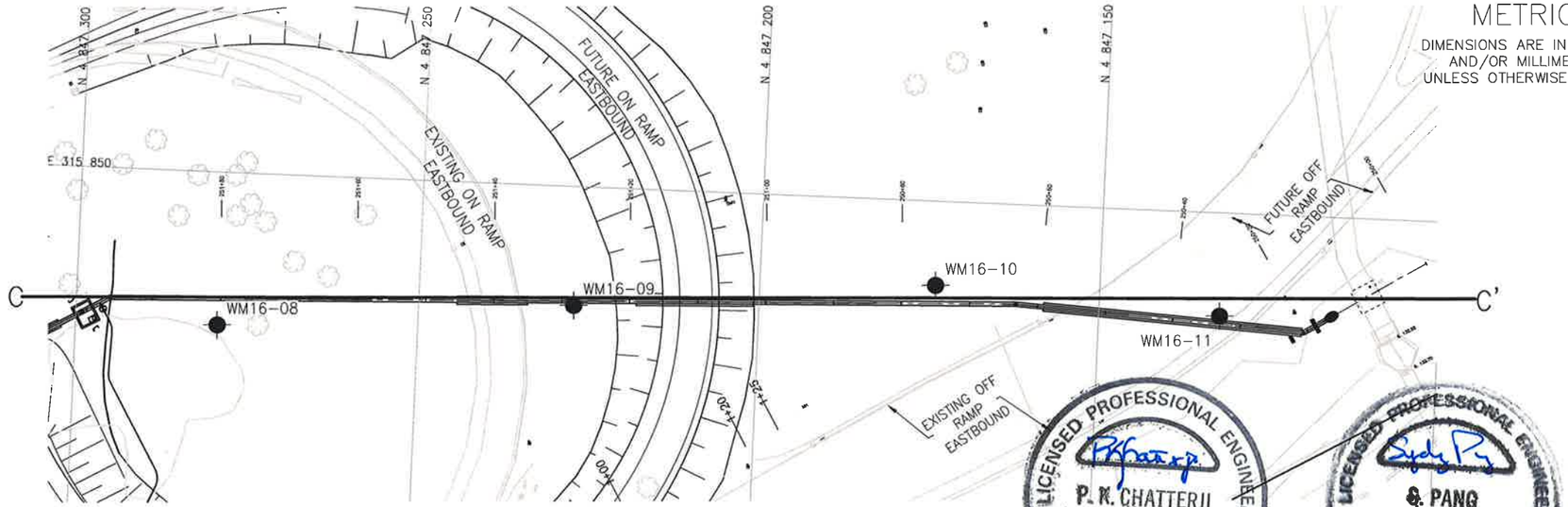
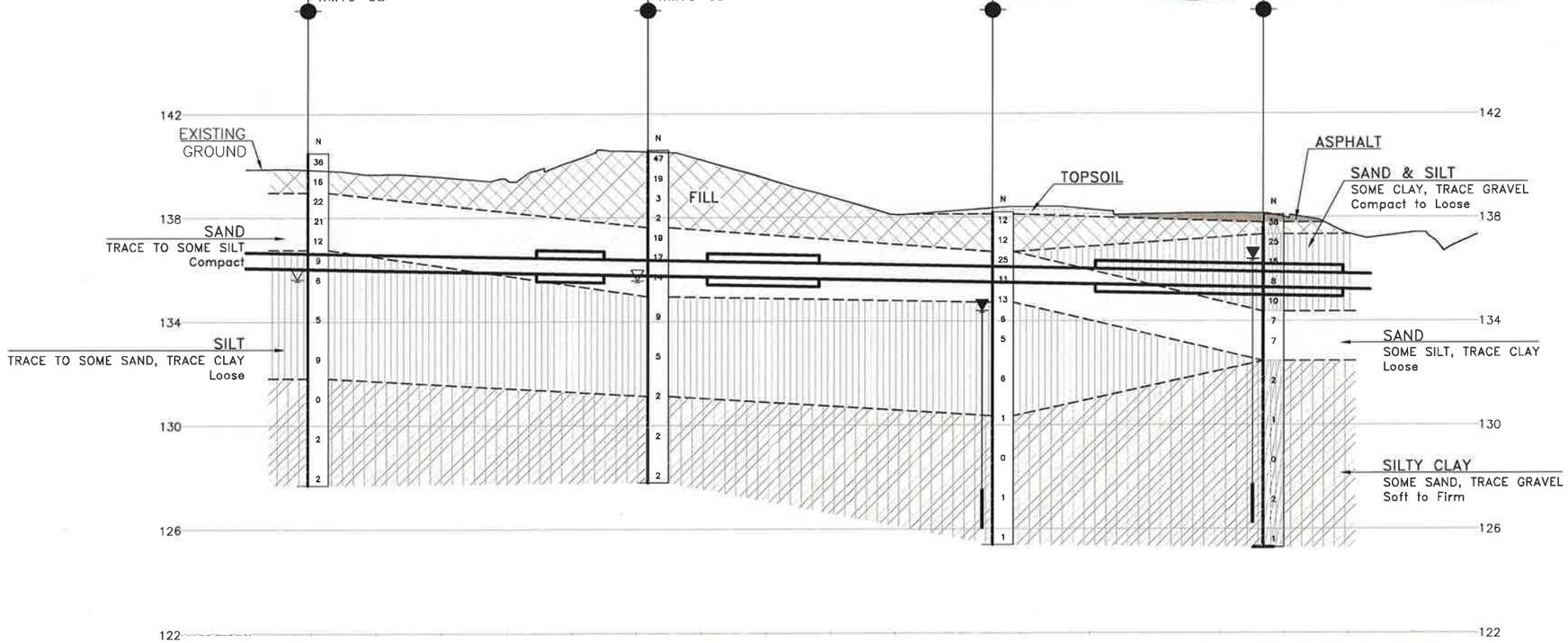


PLAN

16 0 16 32m



PROFILE ALONG C–C'

16 0 16 32m H

4 0 4 16m V

LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
Feb 1/2017
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
S. PANG
Feb. 1/2017
PROVINCE OF ONTARIO

CONT No 2016–2048
WP No 2061–13–00

HIGHWAY 401 & LESLIE STREET RELOCATED WATERMAIN CROSSING
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET 91

MMM GROUP

THURBER ENGINEERING LTD.

KEYPLAN

LEGEND

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⊕	Borehole (Previous Investigation)
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WM16-09	140.6	4 847 227.2	315 832.5
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GEOCRES No. 30M14-460

REVISIONS		
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