

**FOUNDATION INVESTIGATION REPORT
MEDIAN SEWER
LATERAL AND CULVERT REPLACEMENTS
HIGHWAY 400
NORTH CANAL ROAD TO INNISFIL ROAD
SIMCOE COUNTY, ONTARIO
G.W.P. 83-00-00**

Geocres Number: 31D-563

Report to

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January 14, 2014
File: 19-1351-218
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Appendix E	Culvert, Headwall and Other Median Locations

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PART 1: FACTUAL INFORMATION

1 INTRODUCTION

This report presents the factual findings obtained from a foundation investigation carried out for the proposed median sewer, sewer outlets (laterals) and culvert replacements, and construction of a number of culvert headwalls along Highway 400 between North Canal Road and Innisfil Road in Simcoe County, Ontario.

The purpose of this investigation was to determine the subsurface conditions at selected locations along the alignment in order to provide borehole location plans and soil strata drawings, records of boreholes, laboratory test results, and a generalized description of the subsurface conditions. A model of the subsurface conditions was developed for locations where adequate data has been obtained from this and previous investigations.

Thurber Engineering Ltd. (Thurber) carried out this investigation as a sub-consultant to MMM Group Limited (MMM) under MTO Assignment No. 2010-E-0081.

2 SITE DESCRIPTION AND SCOPE OF FOUNDATION INVESTIGATION

The alignment covered in this report extends along Highway 400 from North Canal Road to Innisfil Road. The general locations of the proposed works are shown on the key plans on the Borehole Locations and Soil Strata drawings in Appendix C.

The project alignment straddles physiographic regions known as Schomberg Clay Plain and Peterborough Drumlin Field. The soils in the clay plain consist of interbedded silty clay and silty clay till with sand. The drumlin field consists of both eskers which are sandy and gravelly ridges, and drumlins which are mounds of silty tills with cobbles and boulders, or silts and fine sands. The surface watercourses have eroded gullies within the native soils and relatively recent fluvial sediments have been deposited in the gullies.

Regional drainage in the vicinities of the project alignment is controlled by the Humber River and its tributaries as well as Lake Simcoe. Localized drainage is facilitated by the creeks flowing within the gullies.

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

The scope of work pertinent to the foundation investigation program consists of the following:

- Replacement of approximately 13.8 km of median sewer
- Replacement of 97 sewer laterals (73 locations, 24 of which run east and west)
- Replacement of 17 culverts
- Headwalls at 3 culvert locations

As directed by MTO, Thurber has conducted a reduced site investigation program to address the proposed works. This foundation investigation program is less than what would normally be required for the detailed design of the project outlined above. Details of this reduced program, other background information and anticipated risks are detailed in our proposal letter dated March 27, 2013. The following highlights the major features of this reduced program.

- Drilling one (1) sampled borehole near the median at each sewer lateral, regardless of whether it extends across the entire highway or in only one direction
- For culvert replacements, drilling only two (2) boreholes, one on each outside shoulder
- Drilling two (2) boreholes for each culvert headwall location
- Eliminating all median sewer boreholes.

The implication of increased risks due to the reduced borehole program will be discussed in Part 2 of this report. Additional borehole and field investigations will be required to fill in the areas where there is limited or no borehole information in order to reduce the risk of encountering unanticipated ground conditions.

3 SITE INVESTIGATION AND FIELD TESTING

Site investigation and field testing for the proposed median sewer, lateral and culvert replacements, and new headwalls consisted of drilling and sampling a total of 110 boreholes. For the sewer laterals, there are a total of 73 boreholes designated as either NLAT- or SLAT- advanced to depths typically ranging from 6 to 8 m below highway grade. For the culverts, there is a total of 31 C- series boreholes advanced to depths typically ranging from 8 to 10 m below highway shoulder grade. For the culvert headwalls, two boreholes were advanced at each of the three headwall sites for a total of 6 boreholes each to a depth of about 8 m below existing ground surface. All boreholes were drilled

within the period of May 5, 2013 to June 13, 2013 by simultaneously using two drill rigs and two traffic control crews.

All boreholes for the sewer lateral and culvert replacements on the Highway 400 embankment were drilled during approved lane closure times at night on the left (fast) lanes and the outside shoulders of the northbound and southbound lanes, respectively. Lane closures and traffic control were carefully planned for drilling each borehole. Boreholes for culvert replacement on the cross roads and for headwall construction off the highway were drilled during day time with traffic control as required. Prior to commencement of drilling, utility clearances were obtained for all borehole locations.

The approximate borehole locations are shown on the Borehole Locations and Soil Strata Drawings in Appendices A to E. The coordinates and elevations of the boreholes are given on these drawings and on the individual Record of Borehole Sheets in Appendices A to E. The borehole coordinates were surveyed by MMM and provided to Thurber.

Solid and hollow stem augers were used to advance the boreholes, and soil samples were obtained at selected intervals using a 50 mm diameter split spoon sampler in conjunction with the Standard Penetration Test (SPT). Field vane tests using an MTO 'N' size vane were attempted at locations where cohesive soils of softer consistency were encountered.

Groundwater conditions in the open boreholes were observed throughout the drilling operations. As agreed with MTO, no piezometer was installed within the travelled portion of the highway and at the narrow shoulders due to safety reasons. An exception was that a standpipe piezometer was installed in a few boreholes during the first week of the field work. Standpipe piezometers were installed at selected locations off the highway to permit monitoring of groundwater levels. The piezometers consisted of 19 mm PVC pipes with slotted screens. The locations and completion details of the piezometers are shown in Table A-1 immediately preceding Appendix A. The borehole completion details are also shown in Table A-1.

Members of Thurber's engineering staff supervised the drilling and sampling operations on a full time basis. The supervisors logged the boreholes, visually examined the recovered soil samples, and transported them to Thurber's laboratory for further examination and testing.

4 LABORATORY TESTING

Visual identification and natural moisture content determination were undertaken on all recovered soil samples returned to the laboratory. At least 25% of the soil samples were subjected to grain size distribution analysis. Selected cohesive soil samples underwent Atterberg Limits tests. The results of this testing program are shown on the Records of Borehole sheets and on the accompanying figures in Appendices A to E.

5 DESCRIPTION OF SUBSURFACE CONDITIONS

This section presents a generalized summary of the subsurface conditions encountered at the borehole locations drilled for the proposed median sewer, laterals, culvert crossings and headwalls. Borehole location plans and stratigraphic profiles for selected portions along the Highway 400 centreline, where boreholes data is available, are presented on the Borehole Locations and Soil Strata Drawings in Appendices A to D, inclusive. These profiles are identified by sections and station numbers in Table 5.1 below. Stratigraphic sections for culvert replacements, borehole location plans for headwalls and other investigated locations along the highway alignment are presented in Appendix E. Records of Borehole sheets and laboratory testing data relevant to each section are also included in the appendices.

It is important to note that the soil strata drawings presented in this report are for illustrative purposes and for providing a general description of the stratigraphy at selected locations along the Highway 400 alignment. These interpretative soil strata have been developed only for areas where spacings between adjacent boreholes are considered suitable for interpolation. The factual data presented in the Record of Borehole Sheets governs any interpretation of the site conditions. It must be recognized that soil conditions may vary between and beyond the borehole locations.

In general, the soil stratigraphy encountered along the subject section of highway consists of pavement structure (asphalt on granular) and embankment fill overlying native, firm to very stiff silty clay, or clayey silt to silty clay till deposits along the southerly section of the alignment. Beyond this section, compact to dense sands and silts and dense to very dense silty sand to sandy silt till become more prominent foundation soils. Silty clay to clayey silt, sand and silt interlayers and lenses are present between and/or within the glacial till deposits. Groundwater levels observed in open boreholes and noted upon completion of drilling typically range between 2 and 6 m depths below existing grade. It is noted that these observations are very short term and subject to seasonal fluctuations, and therefore do not necessarily represent the stabilized groundwater conditions.

Table 5.1
Longitudinal and Cross Sections

Identification	Reference Alignment	Hwy. 400 Station No.	Reference Boreholes
Longitudinal Profiles – Median Sewer			
West Gwillimbury Township (South of Highway 89)			
Section 1	Hwy. 400 Centreline	11+600 to 12+250	C1-01,C1-02,C2-01,C2-02,SLAT47W-01
Section 2	Hwy. 400 Centreline	13+000 to 13+600	C4-01,C4-02,SLAT51E-01,SLAT53W-01
Section 3	Hwy. 400 Centreline	13+700 to 14+100	C3,C4, SLAT57W-01,SLAT58W-01
Section 4	Hwy. 400 Centreline	14+600 to 15+400	SLAT62-01,SLAT63W-01,SLAT65-01, SLAT67-01,C8-01,C8-02

Section 5	Hwy. 400 Centreline	17+800 to 18+600	C14-01,C14-02,SLAT18-01,SLAT23W-01
Section 6	Hwy. 400 Centreline	18+900 to 19+450	C17-01,C17-02,SLAT30W-01,SLAT31E-01, SLAT32E-01
Section 7	Hwy. 400 Centreline	21+700 to 22+210	SLAT59-01,SLAT64-01,SLAT68-01, SLAT72-01
Innisfil Township (North of Highway 89)			
Section 8	Hwy. 400 Centreline	11+400 to 12+050	NLAT51E-01,NLAT07E-01,NLAT06-01, C47-01,C47-02, NLAT11E-01
Section 9	Hwy. 400 Centreline	12+100 to 12+600	NLAT20E-01,NLAT18W-01,NLAT15-01
Section 10	Hwy. 400 Centreline	12+850 to 13+400	NLAT23AW-01,NLAT28E-01,NLAT32E-01, NLAT54-01
Section 11	Hwy. 400 Centreline	13+500 to 14+000	NLAT50W-01,NLAT46-01,NLAT41-01, NLAT37-01
Section 12	Hwy. 400 Centreline	14+100 to 14+600	C51-01,C51-02,NLAT60-01,NLAT65W-01
Section 13	Hwy. 400 Centreline	14+750 to 14+450	NLAT68W-01,NLAT70W-01,NLAT72W-01, NLAT79E-01,NLAT78-01,NLAT75-01
Section 14	Hwy. 400 Centreline	16+400 to 17+000	NLAT96W-01,NLAT99W-01,NLAT100E-01, NLAT104W-01,NLAT106W-01
Section 15	Hwy. 400 Centreline	18+350 to 19+000	NLAT124E-01,NLAT131-01,NLAT128W-01, NLAT127-01,NLAT08-01,NLAT04-01
Section 16	Hwy. 400 Centreline	19+200 to 19+800	NLAT12W-01,NLAT13E-01,NLAT14W-01, NLAT18W-01,NLAT25W-01
Cross-Sections – Culverts			
West Gwillimbury Township (South of Highway 89)			
1	Crossing Hwy.400	11+641	C1-01, C1-02
2	Crossing Hwy.400	12+031	C2-01, C2-02
4	Crossing Hwy.400	13+121	C4-01, C4-02
7	Crossing Hwy.400	14+874	C7-01, C7-02
8	Crossing Hwy.400	15+364	C8-01, C8-02
14	Crossing Hwy.400	17+818	C14-01, C14-02
17	Crossing Hwy.400	18+952	C17-01, C17-02
32	Crossing Hwy.400	24+613	C32-01, C32-02
Innisfil Township (North of Highway 89)			
HR107	Crossing	10+100	C107-01, C107-02
HR108	Crossing Hwy. 89 N-E/S Ramp	10+126	C108-01, C108-02

47	Crossing Hwy.400	12+000	C47-01, C47-02
SR102	Crossing Concession Rd. 5	13+300	C102-01, C102-02
SR103	Crossing Concession Rd. 5	13+300	C103-01, C103-02
51	Crossing Hwy.400	14+125	C51-01, C51-02
SR112	Crossing 4 th Line	14+150	C112-01, C112-02
SR113	Crossing 4 th Line	14+150	C113-01, C113-02

More detailed descriptions of the stratigraphy within these sections are presented below.

5.1 Sections 1, 2, 3 and 4 (Stations 11+600 to 15+400 West Gwillimbury)

Stratigraphic profiles, records of boreholes and laboratory test results along this portion of the highway are presented in Appendix A.

5.1.1 Pavement Structure

Pavement structure consisting of asphalt overlying granular materials was encountered in Boreholes SLAT47W-01, SLAT51E-01, SLAT53W-01, SLAT57W-01, SLAT58W-01, SLAT62-01, SLAT63W-01, SLAT65-01, SLAT67-01, SLAT18-01 and SLAT23W-01 located on the median lanes, and Boreholes C1-01, C1-02, C2-01, C2-02, C4-01, C4-02, C7-01, C7-02, C8-01 and C8-02 located on the outside shoulders.

The asphalt thickness ranged from 125 to 350 mm (most values between 200 and 350 mm) on the median lanes and ranged from 75 to 375 mm (most values between 75 and 200 mm) on the shoulders. The granular fill materials generally consisted of sand to sand and gravel ranging between 0.2 and 1.8 m in thickness. Where measured, the granulars were in a compact state as indicated by SPT 'N' values ranging from 7 to 29 blows per 0.3 m of penetration, with most values lying between 12 and 23 blows indicating a typically compact state. The moisture contents ranged from approximately 1% to 12%.

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

Grain size distribution curves for the sand to sand and gravel fill samples tested are presented on the Record of Borehole sheets and on Figures A1 to A2 of Appendix A.

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

Soil Particles	(%)
Gravel	5 to 49
Sand	42 to 90
Silt and Clay	3 to 14

5.1.2 Clayey Silt to Silty Clay Fill

Fill was encountered in Borehole SLAT67-01, SLAT18-01, C1-02, C2-01, C2-02 and C4-01 below the pavement granular materials. The fill consisted of clayey silt to silty clay with some silt layers, trace gravel with occasional cobbles, wood fibres, organics and was typically brown in colour. Where encountered, the thickness of this fill ranged from 0.8 m to 2.6 m, with base elevations between 223.5 and 260.0 m.

Recorded SPT N-values in the fill ranged from 6 to 37 blows per 0.3 m penetration indicating a firm to hard consistency.

The natural moisture contents of fill samples obtained generally ranged from approximately 3% to 23%.

Grain size distribution curves for cohesive fill samples tested are presented on the Record of Borehole sheets and on Figure A3 of Appendix A. Atterberg Limit test results are presented on Figure A12 of Appendix A.

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

Soil Particles	(%)
Gravel	0 to 10
Sand	0 to 37
Silt	47 to 74
Clay	21 to 26

Index Property	(%)
Liquid Limit	30 to 35
Plasticity Index	13 to 18

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

5.1.3 Silty Clay to Clayey Silt

Silty clay to clayey silt deposits were encountered in all but Borehole C1-02, C2-01 and C4-01 advanced within this section. These cohesive deposits consisted of brown becoming grey with depth, silty clay to clayey silt with trace to some sand and gravel, and were encountered below the fill or pavement granulars. Where fully penetrated, the deposits were 1.1 m to 7.0m thick with base elevations varying between 217.4 and 226.3 m.

Based on SPT N-values ranging from 5 to 47 blows for 0.3 m of penetration, these cohesive soils have a firm to hard consistency.

The natural moisture contents of the samples recovered from these cohesive deposits ranged from 9 to 30%, but typically between 11% and 23%.

Grain size distribution results for the cohesive till samples tested are presented on the Record of Borehole sheets and on Figures A4 to A8 of Appendix A. Atterberg Limit test results are presented on Figures A13 to A16 of Appendix A.

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

Silty Clay

Soil Particles	(%)
Gravel	0 to 7
Sand	0 to 37
Silt	38 to 66
Clay	23 to 50

Index Property	(%)
Liquid Limit	25 to 46
Plasticity Index	10 to 25

The above results show that the silty clay has low to occasional medium plasticity with a group symbol of CL and occasionally CI.

Clayey Silt

Soil Particles	(%)
Gravel	2 to 13
Sand	27 to 38
Silt	42 to 44
Clay	16 to 18

Index Property	(%)
Liquid Limit	15 to 30
Plasticity Index	5 to 15

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

5.1.4 Clayey Silt to Silty Clay Till

Clayey silt till was encountered in Boreholes C1-01, C1-02, C2-01, C2-02, C4-01, C4-02 and C7-01 advanced within this section. Silty clay till was encountered in Borehole SLAT47W-01 and SLAT63W-01. These tills are typically brown to grey in colour with trace to some sand and gravel, and were encountered below the fill or silty clay to clayey silt deposits.

Except in Borehole C2-01 where the till was fully penetrated with a thickness of 4.9 m and base elevation 219.6 m, the other boreholes were terminated within the till.

Based on SPT N-values typically ranging from 9 to 17 blows for 0.3 m of penetration, these cohesive soils have a stiff to very stiff consistency. Occasional values of 7 and 31 blows indicate the presence of firm and hard zones.

The natural moisture contents of the till samples ranged from 10% to 22%.

Grain size distribution results for the cohesive till samples tested are presented on the Record of Borehole sheets and on Figures A9 and A10 of Appendix A. Atterberg Limit test results are presented on Figures A17 to A18 of Appendix A.

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

Silty Clay Till

Soil Particles	(%)
Gravel	0 to 4
Sand	14 to 26
Silt	45 to 49
Clay	31 to 39

Index Property	(%)
Liquid Limit	19 to 38
Plasticity Index	8 to 20

Clayey Silt Till

Soil Particles	(%)
Gravel	0 to 7
Sand	31 to 39
Silt	36 to 49
Clay	19 to 21

Index Property	(%)
Liquid Limit	18 to 21
Plasticity Index	8 to 9

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

Glacial tills inherently contain cobbles and boulders.

5.1.5 Sand and Silt

In Boreholes SLAT62-01 and SLAT63W-01, a layer of grey sand and silt with trace to some gravel and clay was encountered within the silty clay to clayey silt deposits. Where encountered, these cohesionless layers were 0.8 to 1.1 m thick with base elevations varying between 223.9 and 224.6 m.

The SPT N-values recorded in the cohesionless deposits were 7 and 9 blows for 0.3 m of penetration indicating a loose condition.

These deposits were observed to be moist to wet with natural moisture contents of recovered samples measured at 10% and 12%

Grain size distribution curves for samples tested from the sand deposits are presented on the Record of Borehole sheets and on Figure A11 of Appendix A.

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

Soil Particles	(%)
Gravel	6 to 13
Sand	41 to 43
Silt	37 to 40
Clay	9 to 11

5.1.6 Water Levels

The groundwater level was observed in the boreholes during and upon completion of drilling. No piezometer was installed in the SLAT- (except for SLAT62-01, SLAT65-01, SLAT67-01 where piezometer were installed and decommissioned several days later) and C- series of boreholes located on the median lane and shoulder of the highway, respectively, as explained previously. The water levels observed in the open boreholes upon completion of drilling are summarized in Table 5.2 except otherwise noted. It is noted that boreholes not shown in the table below were dry (did not have free water level inside the borehole) upon completion.

Table 5.2 – Observed Groundwater Levels

Approx. Station	Borehole	Date	Water Level (m)	
			Depth	Elevation
West Gwillimbury				
11+641	C1-01	May 13, 2013	4.5	226.4
	C1-02	May 14, 2013	5.7	225.4
12+031	C2-01	May 13, 2013	4.9	223.4
	C2-02	May 14, 2013	4.7	223.3
13+121	C4-01	May 13, 2013	5.0	221.4
	C4-02	May 14, 2013	5.6	220.9
13+930	SLAT57W-01	May 8, 2013	3.9	224.3
14+640	SLAT62-01 (piezometer)	May 5, 2013	2.5	227.0
14+980	SLAT65-01 (piezometer)	May 5, 2013	2.5	228.3
15+150	SLAT67-01 (piezometer)	May 5, 2013	1.8	230.7
15+364	C8-01	May 15, 2013	5.9	228.5
	C8-02	May 14, 2013	8.5	225.8

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

5.2 Sections 5, 6, 7, 8 and 9 (Stations 17+800 West Gwillimbury to 12+600 Innisfil)

Stratigraphic profiles, records of boreholes and laboratory test results along this portion of the highway are presented in Appendix B.

5.2.1 Pavement Structure

Pavement structure consisting of asphalt overlying granular materials was encountered in Boreholes SLAT18-01, SLAT23W-01, SLAT30W-01, SLAT31E-01, SLAT32E-01, SLAT59-01, SLAT64-01, SLAT68-01, SLAT72-01, NLAT51E-01, NLAT07E-01, NLAT06-01, NLAT11E-01, NLAT20E-01, NLAT18W-01 and NLAT15-01 located on the median lanes, and Boreholes C14-01, C14-02, C17-01, C17-02, C47-01 and C47-02 located on the outside shoulders.

The asphalt thickness ranged from 150 to 450 mm with most values lying between 200 and 350 mm. The granular fill materials generally consisted of sand to gravelly sand with some silt ranging between 0.4 and 3.0 m in thickness, with most values lying between 0.4 and 1.5 m. The measured SPT 'N' values ranged from 17 to 45 blows per 0.3 m of penetration with most values lying between 12 and 24 blows indicating a typically compact state. The

moisture contents ranged from approximately 2% to 18% with most values lying between 2% and 8%.

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

Grain size distribution curves for the sand to gravelly sand fill samples tested are presented on the Record of Borehole sheets and on Figures B1 and B2 of Appendix B.

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

Soil Particles	(%)
Gravel	5 to 40
Sand	52 to 90
Silt and Clay	3 to 29

5.2.2 Sand and Silt Fill

Fill was encountered in Borehole SLAT18-01, NLAT07E-01, NLAT11E-01, C47-02 and NLAT20E-01 below the pavement granular materials. The fill consisted of silty sand to sand and silt with trace gravel and was typically brown in colour. Where encountered, the thickness of this fill ranged from 0.6 m to 2.2 m, with base elevations between 230.7 and 260.0 m.

Recorded SPT N-values in the fill ranged from 6 to 17 blows per 0.3 m penetration indicating a loose to compact state.

The natural moisture contents of fill samples obtained ranged from approximately 6% to 18%.

Grain size distribution curves for cohesionless fill samples tested are presented on the Record of Borehole sheets and on Figure B3 of Appendix B.

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

Soil Particles	(%)
Gravel	1 to 8
Sand	48 to 61
Silt	24 to 30
Clay	10 to 14

5.2.3 Silty Clay to Clayey Silt

Silty clay to clayey silt deposits were encountered in Boreholes C14-01, C14-02, SLAT18-01, C17-01, SLAT30W-01, NLAT51E-01, NLAT07E-01, C47-01, NLAT11E-01, NLAT20E-01 and NLAT18W-01 advanced within this section. These cohesive deposits consisted of brown becoming grey with depth, silty clay to clayey silt with trace to some sand

and gravel, and were typically encountered below the fill or pavement granulars. Where fully penetrated, the deposits were 0.6 m to 2.3 m thick with base elevations varying between 221.6 and 273.5 m. Borehole NLAT51E-01 was terminated within the silty clay which is at least 8.3 m thick and extends below Elevation 221.6 m.

Based on SPT N-values typically ranging from 7 to 26 blows for 0.3 m of penetration, these cohesive soils have a stiff to very stiff consistency. Occasional values of 5 to 6 blows and 32 blows indicated firm and hard zones.

The natural moisture contents of the samples recovered from these cohesive deposits typically ranged from 10 to 25%, with occasional values up to 38%.

Grain size distribution results for the cohesive samples tested are presented on the Record of Borehole sheets and on Figures B4 to B6 of Appendix B. Atterberg Limit test results are presented on Figures B12 to B14 of Appendix B.

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

Silty Clay

Soil Particles	(%)
Gravel	0 to 2
Sand	4 to 31
Silt	31 to 65
Clay	28 to 51

Index Property	(%)
Liquid Limit	22 to 35
Plasticity Index	10 to 18

Clayey Silt

Soil Particles	(%)
Gravel	0 to 1
Sand	21 to 48
Silt	33 to 60
Clay	17 to 19

Index Property	(%)
Liquid Limit	18 to 34
Plasticity Index	8 to 13

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

5.2.4 Sands and Silts

In all but Boreholes SLAT30W-01, SLAT59-01, SLAT64-01, SLAT68-01, SLAT72-01, NLAT51E-01 and NLAT06-01, deposits of sand and silt, sandy silt to silty sand with trace to some gravel was encountered interlayering with the silty clay to clayey silt deposits. Where fully penetrated, these cohesionless soils were 0.7 to 3.1 m thick with base elevations varying between 231.0 and 280.1 m. Where not fully penetrated in Boreholes SLAT23W-01, C17-02, SLAT31E-01, NLAT07E-01, and NLAT-15-01, these deposits have minimum thicknesses varying from 2.2 m to 6.9 m and extend below a base elevation of 223.2 m.

The SPT N-values recorded in these soils were between 4 and 39 blows for 0.3 m of penetration indicating a loose to dense state. Occasional values of greater than 50 blows indicate the presence of very dense zones.

These deposits were observed to be moist to wet with natural moisture contents of recovered samples measured at 5% and 28%.

Grain size distribution curves for samples of the sand deposits are presented on the Record of Borehole sheets and on Figures B7 to B9 of Appendix B.

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

Soil Particles	(%)
Gravel	0 to 8
Sand	36 to 71
Silt	23 to 47
Clay	8 to 16

5.2.5 Sandy Silt to Silty Sand Till

Boreholes SLAT32E-01, SLAT59-01, SLAT64-01, SLAT68-01, SLAT72-01, NLAT06-01, C47-01, C47-02 and NLAT11E-01 encountered glacial till deposits consisting of brown to grey sandy silt to silty sand with trace to some gravel and trace clay. All of these boreholes terminated within the till. The minimum thicknesses of these till deposits, where encountered, varied between 2.1 and 5.2 m.

The SPT N-values recorded in these soils varied widely between 15 blows for 0.3 m of penetration to greater than 100 blows for less than 0.3 m penetration, indicating a compact to very dense state. Most N-values ranged between 30 and 100 blows indicating a dense to very dense state. The higher blow counts may indicate the presence of cobbles and boulders.

These deposits were observed to be moist to wet with natural moisture contents of recovered samples measured at 6% and 15%.

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

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

Soil Particles	(%)
Gravel	0 to 3
Sand	13 to 63
Silt	24 to 76
Clay	9 to 16

Glacial tills inherently contain cobbles and boulders.

5.2.6 Clayey Silt Till

Clayey silt till was encountered in Boreholes SLAT32E-01 and C47-01. This till is typically brown to grey in colour with sand and trace gravel, and were encountered below the sands and silts, or silty clay to clayey silt deposits.

The till was fully penetrated in both boreholes with thickness between 1.5 and 2.2 m, and base elevations of 277.9 and 230.7 m.

Based on SPT N-values ranging from 37 to 80 blows for 0.3 m of penetration, this till in Borehole SLAT32E-01 has a hard consistency. This till in Borehole C47-01 has a very stiff consistency as indicated by an N-value of 16 blows per 0.3 m penetration.

The natural moisture contents of the till samples ranged from 7% to 10%.

Grain size distribution results for a clayey silt till sample is presented on the Record of Borehole sheets and on Figure B11 of Appendix B.

The results of laboratory gradation test are summarized below:

Clayey Silt Till

Soil Particles	(%)
Gravel	2
Sand	51
Silt	28
Clay	19

5.2.7 Water Levels

The groundwater level was observed in the boreholes during and upon completion of drilling. No piezometer was installed in the SLAT-, NLAT- and C- series of boreholes located on the median lane and shoulder of the highway, respectively, as explained previously. The water levels observed in the open boreholes upon completion of drilling are summarized in Table

5.3. It is noted that boreholes not shown in the table below were dry (did not have free water level inside the borehole) upon completion.

Table 5.3 – Observed Groundwater Levels

Approx. Station	Borehole	Date	Water Level (m)	
			Depth	Elevation
West Gwillimbury				
17+818	C14-02	May 13, 2013	3.6	251.7
18+600	SLAT23W-01	May 9, 2013	6.1	264.4
18+952	C17-01	May 12, 2013	6.0	272.0
	C17-02	May 13, 2013	5.9	272.3
Innisfil				
11+440	NLAT51E-01	May 26, 2013	8.5	222.9
11+770	NLAT07E-01	May 27, 2013	3.3	229.7
12+000	C47-01	May 31, 2013	4.3	232.5
12+000	C47-02	May 31, 2013	3.3	233.3
12+100	NLAT11E-01	May 27, 2013	3.4	235.7
12+280	NLAT20E-01	May 27, 2013	2.7	239.1
12+430	NLAT18W-01	May 28, 2013	2.5	241.7

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

5.3 Sections 10, 11, 12, 13 and 14 (Stations 12+850 to 17+000 Innisfil)

Stratigraphic profiles, records of boreholes and laboratory test results along this portion of the highway are presented in Appendix C.

5.3.1 Pavement Structure

Pavement structure consisting of asphalt overlying granular materials was encountered in Boreholes NLAT23AW-01, NLAT28E-01, NLAT32E-01, NLAT54-01, NLAT50W-01, NLAT546-01, NLAT41-01, NLAT37-01, NLAT60-01, NLAT65W-01, NLAT68W-01, NLAT70W-01, NLAT72W-01, NLAT79E-01, NLAT78-01, NLAT75-01, NLAT96W-01, NLAT99W-01, NLAT100E-01, NLAT104W-01 and NLAT106W-01 located on the median lanes, and Boreholes C51-01 and C51-02 located on the outside shoulders.

The asphalt thickness typically ranged from 200 to 350 mm with occasional values lying of 175 and 188 mm. The granular fill materials generally consisted of sand, gravelly sand to sand and gravel, occasional cobbles, trace to some fines, trace organics, and ranging between 0.4 and 1.5 m in thickness with some values greater than 2 m and occasionally up to 4.5. The measured SPT 'N' values ranged from 10 blows per 0.3 m of penetration to greater than 100 blows for less than 0.3 m penetration, with most values lying between 10 and 25 blows

indicating a typically compact state. The moisture contents ranged from approximately 1% to 18% with most values lying between 1% and 10%.

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

Grain size distribution curves for selected fill samples tested are presented on the Record of Borehole sheets and on Figures C1 to C3 of Appendix C.

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

Soil Particles	(%)
Gravel	4 to 48
Sand	47 to 88
Silt and Clay	3 to 22

5.3.2 Sand and Silt Fill

Fill was encountered in Borehole NLAT23AW-01, NLAT37-01, C51-02, NLAT96W-01 and NLAT100E-01 below the pavement granular materials. The fill consisted typically of sands and silts, trace gravel, occasional cobbles, and occasional clayey silt and was typically brown in colour. Where encountered, the thickness of this fill ranged from 0.6 m to 2.1 m, with base elevations between 251.5 and 297.8 m.

Recorded SPT N-values in the sand and silt fill ranged from 11 to 52 blows per 0.3 m penetration indicating a compact to very dense state. An occasional value of 8 blows indicates a loose zone. The clayey silt in Borehole C51-02 has a firm consistency as indicated by an N-value of 6 blows.

The natural moisture contents of sand and silt fill samples obtained ranged from approximately 3% to 13%. The clayey silt fill has a measured moisture content of 36%.

Grain size distribution curves for cohesionless fill samples tested are presented on the Record of Borehole sheets and on Figure C4 of Appendix C.

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

Soil Particles	(%)
Gravel	2 to 3
Sand	54 to 60
Silt	24 to 32
Clay	11 to 14

5.3.3 Sands and Silts

Below the fill and some cohesive tills, Boreholes NLAT23AW-01, NLAT28E-01, NLAT32E-01, NLAT41-01, C51-02, NLAT60-01, NLAT68W-01, NLAT72W-01,

NLAT79E-01, NLAT100E-01, NLAT104W-01 and NLAT106W-01 encountered deposits of sands and silts with trace to some gravel. Where fully penetrated, these cohesionless soils were 1.1 to 2.5 m thick with base elevations varying between 254.8 and 294.5 m. Where not fully penetrated, these deposits have minimum thicknesses varying between 1.1 and 7.4 m and extend below base elevations of 247.9 to 289.9 m.

The SPT N-values recorded in these soils were between 3 and 84 blows for 0.3 m of penetration, with most values ranging from 10 to 48 blows indicating a compact to dense state. Occasional values of greater than 50 blows and less than 10 blows indicate the presence of very dense and loose zones, respectively.

These deposits were observed to be moist to wet with natural moisture contents of recovered samples measured at 5% to 22%.

Grain size distribution curves for samples tested from the sand deposits are presented on the Record of Borehole sheets and on Figures C5 to C7 of Appendix C.

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

Soil Particles	(%)
Gravel	0 to 20
Sand	49 to 87
Silt	15 to 32
Clay	2 to 14

5.3.4 Sandy Silt to Silty Sand Till

With the exception of Boreholes NLAT 100E-01, NLAT23AW-01, NLAT41-01, NLAT60-01, NLAT68W-01, NLAT70W-01, NLAT72W-01 and NLAT104W-01, and underlying the sands, silts and cohesive soils, boreholes advanced within these sections were terminated in glacial till deposits consisting of sandy silt, sand and silt to silty sand with trace to some gravel and trace to some clay. In Borehole NLAT32E-01, the upper 1.5 m of silty sand till with a base elevation at 258.9 m grades into a sandy silt till with depth. In the boreholes that were terminated in the cohesionless till, the minimum thickness of the till ranges between 2.2 and 5.8 m and extend below elevations 251.2 to 293.4 m.

The SPT N-values recorded in these soils were typically between 50 blows for 0.3 m of penetration to greater than 100 blows for less than 0.3 m penetration indicating a very dense state. Occasional values of less than 50 blows indicate the presence of compact to dense zones. The high blow counts may represent the presence of cobbles and boulders.

These deposits were observed to be moist to wet with natural moisture contents of recovered samples measured at 5% to 15%.

Grain size distribution curves for samples tested from the sand deposits are presented on the Record of Borehole sheets and on Figures C8 and C9 of Appendix C.

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

Soil Particles	(%)
Gravel	0 to 10
Sand	54 to 65
Silt	20 to 35
Clay	8 to 21

Glacial tills inherently contain cobbles and boulders.

5.3.5 Silty Clay/Clayey Silt and Silty Clay/Clayey Silt Till

Silty clay to clayey silt and silty clay to clayey silt till deposits were encountered in Boreholes NLAT41-01, NLAT37-01, C51-01, C51-02, NLAT65W-01, NLAT70W-01, NLAT79E-01, NLAT78-01 and NLAT106W-01 advanced within this section. These cohesive deposits consisted of brown becoming grey with depth, silty clay to clayey silt with trace to some sand and gravel, and were typically interlayered with the sands and silts. Where fully penetrated, the deposits were 0.5 m to 3.4 m thick with base elevations varying between 276.3 and 292.2m. Borehole NLAT41-01 was terminated within the clayey silt till at Elevation 276.3 m.

Based on SPT N-values ranging from 5 to 36 blows for 0.3 m of penetration, the silty clay to clayey silt has a firm to hard consistency. The clayey silt till in Boreholes NLAT41-01 is hard throughout as indicated by 'N' values ranging from 54 blows per 0.3 m penetration to greater than 80 blows for less than 0.3 m penetration.

The natural moisture contents of the silty clay to clayey silt samples ranged from 10 to 30%. The moisture contents measured for the clayey silt till were 5% and 10%.

Grain size distribution results for the cohesive samples tested are presented on the Record of Borehole sheets and on Figures C10 to C12 of Appendix C. Atterberg Limit test results are presented on Figures C13 and C14 of Appendix C.

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

Clayey Silt to Silty Clay Till

Soil Particles	(%)
Gravel	1
Sand	38 to 41
Silt	28 to 38
Clay	23 to 30

Index Property	(%)
Liquid Limit	22
Plasticity Index	11

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

Silty Clay to Clayey Silt

Soil Particles	(%)
Gravel	0
Sand	5 to 43
Silt	26 to 44
Clay	18 to 69

Index Property	(%)
Liquid Limit	21 to 50
Plasticity Index	11 to 28

The above results show that the silty clay and clayey silt have low to intermediate plasticity with a group symbol of CL-CI.

5.3.6 Water Levels

The groundwater level was observed in the boreholes during and upon completion of drilling. No piezometer was installed in the NLAT- and C- series of boreholes located on the median lane and shoulder of the highway, respectively, as explained previously. The water levels observed in the open boreholes upon completion of drilling are summarized in Table 5.3. It is noted that boreholes not shown in the table below were dry (did not have free water level inside the borehole) upon completion.

Table 5.3 – Observed Groundwater Levels

Approx. Station	Borehole	Date	Water Level (m)	
			Depth	Elevation
Innisfil				
12+900	NLAT23AW-01	May 28, 2013	4.1	250.5
13+100	NLAT32E-01	May 29, 2013	6.1	255.1
13+350	NLAT54-01	May 29, 2013	0.9	268.1
13+810	NLAT41-01	May 28, 2013	4.4	278.1
13+970	NLAT37-01	May 31, 2013	2.4	282.9
14+125	C51-01	May 31, 2013	1.5	284.2
14+125	C51-02	May 31, 2013	2.9	282.8
14+400	NLAT60-01	May 27, 2013	3.0	284.4
14+550	NLAT65W-01	May 27, 2013	3.6	284.6
14+910	NLAT70W-01	May 17, 2013	5.2	284.9
15+030	NLAT72W-01	May 17, 2013	5.3	285.4
15+170	NLAT79E-01	May 30, 2013	4.5	286.9
15+280	NLAT78-01	May 30, 2013	5.1	287.5
16+560	NLAT99W-01	May 16, 2013	5.9	292.4
16+790	NLAT104W-01	May 16, 2013	6.4	289.5
16+980	NLAT106W-01	May 16, 2013	5.4	291.3

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

5.4 Sections 15 and 16 (Stations 18+350 to 19+800 Innisfil)

Stratigraphic profiles, records of boreholes and laboratory test results along this portion of the highway are presented in Appendix D.

5.4.1 Pavement Structure and Topsoil

Pavement structure consisting of asphalt overlying granular materials was encountered in Boreholes NLAT124E-01, NLAT131-01, NLAT128W-01, NLAT127-01, NLAT08-01, NLAT04-01, NLAT12W-01, NLAT13E-01, NLAT14W-01, NLAT118W-01 drilled through the highway embankment.

The asphalt thickness ranged from 188 to 350 mm in the boreholes. The granular fill materials generally consisted of sand, gravelly sand to sand and gravel with occasional cobbles generally ranging between 0.4 and 2.0 m in thickness. The measured SPT 'N' values ranged from 7 to 35 blows per 0.3 m of penetration indicating a loose to dense state. The moisture contents ranged from approximately 1% to 10% with most values lying between 1% and 3%.

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

Grain size distribution curves for selected fill samples tested are presented on the Record of Borehole sheets and on Figure D1 of Appendix D.

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

Soil Particles	(%)
Gravel	6 to 64
Sand	34 to 78
Silt and Clay	2 to 25

Topsoil of about 25 mm in thickness was encountered at ground surface in Borehole NLAT25W-01 located off the embankment. The thickness of the topsoil may vary between and beyond the borehole locations.

5.4.2 Silty Sand and Silty Clay Fill

Fill was encountered in Borehole NLAT131-01 and NLAT04-01 below the pavement granular materials. The fill consisted of silty sand, some clay, trace gravel and silty clay with sand, trace gravel, and was typically brown in colour. Where encountered, the thickness of this fill varied from 1.3 m to 1.5 m, with base elevations between 295.1 and 301.8 m. In Borehole NLAT25W-01, sand and silt fill was encountered below the topsoil to 2.2 m depth or to Elevation 305.0 m.

Recorded SPT N-values in the silty sand fill varied from 8 to 10 blows per 0.3 m penetration indicating a loose to compact state. The silty clay fill in Borehole NLAT04-01 has a very stiff consistency as indicated by an N-value of 17 blows per 0.3 m penetration. SPT N-values measured in the sand and silt fill ranged between 7 and 9 blows per 0.3 m penetration indicating a loose state.

The measured moisture contents of the silty sand fill samples ranged from approximately 8% to 10%. Measured values for the sand and silt fill were between 14% and 17%. The silty clay fill has a measured moisture content of 15%.

Grain size distribution curves for cohesionless fill samples tested are presented on the Record of Borehole sheets and on Figure D2 of Appendix D.

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

Soil Particles	(%)
Gravel	1 to 10
Sand	54 to 70
Silt	20 to 34
Clay	11 to 12

A grain size distribution curve for the silty clay fill sample are presented on the Record of Borehole sheets and on Figure D3 of Appendix D. Atterberg limits results are plotted on Figure D8.

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

Soil Particles	(%)
Gravel	1
Sand	39
Silt	31
Clay	29

Index Property	(%)
Liquid Limit	24
Plasticity Index	11

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

5.4.3 Sands and Silts

Boreholes advanced within these sections, except for Boreholes NLAT08-01 and NLAT14W-01, encountered deposits of brown sand, sandy silt to silty sand with trace to some gravel and trace clay. These cohesionless deposits were encountered below the pavement structure or the underlying fill. Where fully penetrated in Boreholes NLAT124E-01, NLAT127-01, NLAT128W-01, NLAT12W-01 and NLAT118W-01, the thickness of the till ranges from 0.7 to 3.0 m with base elevations ranging between 293.4 and 305.5 m. In other boreholes terminating within the sands and silts, the minimum thickness of these deposits varies between 4.4 and 4.7 m and extend below elevations 290.4 to 300.5 m.

The SPT N-values recorded in these soils were ranged between 4 and 96 blows for 0.3 m of penetration with most values lying between 16 and 59 blows indicating a compact to very dense state.

These deposits were observed to be moist to wet with natural moisture contents of recovered samples measured at 5% to 18%.

Grain size distribution curves for tested samples are presented on the Record of Borehole sheets and on Figure D4 of Appendix D.

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

Soil Particles	(%)
Gravel	2 to 8
Sand	46 to 63
Silt	21 to 38
Clay	8 to 14

5.4.4 Sandy Silt to Silty Sand Till

Underlying the pavement structure or the native sand and silts, Boreholes NLAT128W-01, NLAT127-01, NLAT08-01, NLAT12W-01, NLAT13E-01 and NLAT14W-01 encountered glacial till deposits consisting of sandy silt to silty sand with trace to some gravel and cobbles, and trace to some clay. These boreholes terminated within the till with minimum thickness ranging between 2.5 and 6.0 m and extend below elevations 293.4 to 300.1 m.

The SPT N-values recorded in these soils were typically from 52 blows for 0.3 m of penetration to greater than 50 blows for less than 0.3 m penetration indicating a dense to very dense state. Occasional values of less than 50 blows indicate the presence of compact to dense zones. The high N-values may represent the presence of cobbles and boulders.

These deposits were observed to be moist to wet with natural moisture contents of recovered samples measured at 5% to 15%.

The grain size distribution curve for a sample of the silty sand till is presented on the Record of Borehole sheets and on Figure D5 of Appendix D.

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

Soil Particles	(%)
Gravel	1 to 12
Sand	46 to 61
Silt	25 to 29
Clay	11 to 13

Glacial tills inherently contain cobbles and boulders.

5.4.5 Clayey Silt/silty clay to Clayey Silt Till

Underlying the fill or native sands and silts, clayey silt/silty clay to clayey silt till deposits were encountered in Boreholes NLAT124E-01, NLAT13E-01, NLAT14W-01 and NLAT118W-01 advanced within this section. These cohesive deposits consisted of brown becoming grey with depth, clayey silt to silty clay with trace to some sand and gravel, and were typically interlayered with the sands and silts. Where fully penetrated, the deposits were 1.5 m thick with base elevations at 302.9 and 303.6m. Boreholes NLAT124E-01 and NLAT118W-01 were terminated within the clayey silt or clayey silt till, which have minimum thicknesses of 2.9 to 4.4 m and extends below Elevations 290.5 and 301.1 m, respectively.

Based on SPT N-values ranging from 4 to 21 blows for 0.3 m of penetration, the clayey silt to silty clay has a firm to very stiff consistency. The clayey silt till in Boreholes NLAT118W-

01 is very stiff to hard as indicated by 'N' values ranging from 21 to 46 blows per 0.3 m penetration.

The natural moisture contents of these clayey silt to silty clay samples typically ranged from 10 to 21%. The moisture contents measured for the clayey silt till were between 8% and 16%.

Grain size distribution results for the cohesive samples tested are presented on the Record of Borehole sheets and on Figures D6 and D7 of Appendix C. Atterberg Limit test results are presented on Figures D9 and D10 of Appendix C.

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

Clayey Silt/Silty Clay

Soil Particles	(%)
Gravel	1 to 6
Sand	40 to 42
Silt	32 to 39
Clay	16 to 25

Index Property	(%)
Liquid Limit	19 to 28
Plasticity Index	8 to 14

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

Clayey Silt Till

Soil Particles	(%)
Gravel	2
Sand	46
Silt	32
Clay	20

Index Property	(%)
Liquid Limit	21
Plasticity Index	9

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

Glacial tills inherently contain cobbles and boulders.

5.4.6 Water Levels

The groundwater level was observed in the boreholes during and upon completion of drilling. No piezometer was installed in the NLAT- series of boreholes located on the median lane as explained previously. The water levels observed in the open boreholes upon completion of

drilling are summarized in Table 5.4. It is noted that boreholes not shown in the table below were dry (did not have free water level inside the borehole) upon completion.

Table 5.4 – Observed Groundwater Levels

Approx. Station	Borehole	Date	Water Level (m)	
			Depth	Elevation
Innisfil				
18+500	NLAT131-01	May 16, 2013	6.6	292.0
19+000	NLAT04-01	May 15, 2013	6.1	298.0
19+400	NLAT14W-01	June 3, 2013	9.5	297.9

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

5.5 Culverts, Headwalls and Other Sewer Lateral Locations

The C- series boreholes have been drilled at selected locations near the proposed culvert replacement alignments. Boreholes located on the highway shoulders, with the exception of C32-01 and C32-02, have been incorporated in the previous Sections 5.1 to 5.4.

Stratigraphic sections along the culvert centrelines are presented in Appendix E. Records of boreholes and geotechnical laboratory test results associated with the culvert replacement, headwall construction, and at locations along the highway median not covered in the previous Sections 5.1 to 5.4, are included in Appendix E.

5.5.1 Pavement Structure and Topsoil

Pavement structure consisting of asphalt overlying granular materials was encountered in the SLAT- and NLAT- series boreholes, except for NLAT90-01, on the highway embankment. The asphalt thickness on the highway ranged from 150 to 450 mm in the boreholes. On the sideroads, asphalt ranging between 175 and 450 in thickness was encountered in Boreholes C102-02, C103-01, C114-01 and C116-01.

Below the asphalt, the granular fill materials consisted of sand, gravelly sand to sand and gravel generally ranging between 0.2 and 1.5 m in thickness, with occasional values up to the range of 2.2 to 2.7 m. The fill contains occasional cobbles, trace gravel, and trace to some silt. The measured SPT 'N' values typically ranged from 12 to 28 blows per 0.3 m of penetration indicating a compact state. Occasional dense to very dense zones were present as indicated by 'N' values varying from 37 to 98 blows. The moisture contents ranged from 2% to 15% with most values lying between 2% and 5%.

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

Grain size distribution curves for selected granular samples are presented on the Record of Borehole sheets and on Figures E1 to E2 in Appendix E.

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

Soil Particles	(%)
Gravel	0 to 41
Sand	46 to 95
Silt and Clay	3 to 17

Topsoil of ranging between 50 and 200 mm in thickness was encountered at ground surface in Borehole NLAT90-01 and in the C100- series boreholes except for Boreholes C112-01 and C112-02. The thickness of the topsoil may vary between and beyond the borehole locations.

5.5.2 Peat

Fibrous peat was encountered in Boreholes C39-01HW and C39-02HW drilled for the headwalls of Culvert #39 off the highway. This material consisted of organics, roots and rootlets. The thickness varied from 2.1 to 2.2 m with base elevations varying at 224.8 to 224.9 m. The measured SPT 'N' values ranged from 1 to 7 blows per 0.3 m penetration indicating a very loose to loose state. Measured moistures contents ranged from 120% to 348%.

5.5.3 Sand, Silt and Clay Fill

Fill was encountered in Borehole SLAT83W-01, SLAT19W-01, C32-02, NLAT91W-01, NLAT108W-01, NLAT110W-01, NLAT114E-01, NLAT119E-01 below the pavement granular materials on the highway. Off the highway, fill was encountered in Boreholes C102-02, C103-01, C107-01, C107-02, C108-01, C108-02, C112-01, C112-02, C113-01, C113-02, C18-01HW, C27-01HW and C27-02HW. The fill consisted of a range of materials including silty sands, sandy to clayey silts with trace gravel, and silty clay. The cohesive fill contains roots and organic inclusions. Occasional cobbles are also noted in the cohesionless fill.

Where encountered on the highway, the thickness of this fill ranged from 0.6 m to 3.1 m, with base elevations between 232.0 and 295.7 m. Recorded SPT N-values in the sand and silt fill ranged from 7 to 31 blows per 0.3 m penetration indicating a loose to dense state. Clayey silt fill has a firm to very stiff consistency as indicated by 'N' value between 6 and 26 blows. The natural moisture contents of these fill samples from the highway embankment ranged from approximately 2% to 24%.

Where encountered off the highway, the thickness of this fill ranged from 0.4 to 4.9 m, with base elevations between 225.1 and 283.7 m. Recorded SPT N-values in the sand and silt fill ranged from 3 to 26 blows per 0.3 m penetration indicating a very loose to compact state. Clayey silt to silty clay fill has a firm to stiff consistency as indicated by 'N' value between 5 and 15 blows. The natural moisture contents of these fill samples off the highway typically ranged from 10% to 22% with occasional values up to 40%.

Grain size distribution curves for selected fill samples tested are presented on the Record of Borehole sheets and on Figures E3 to E5 of Appendix E. Atterberg Limits test results of the cohesive fills are presented on Figures E17 in Appendix E.

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

Sand and silt fill

Soil Particles	(%)
Gravel	0 to 19
Sand	0 to 80
Silt	21 to 93
Clay	5 to 13

Clayey silt to silty clay fill

Soil Particles	(%)
Gravel	0 to 3
Sand	4 to 52
Silt	31 to 54
Clay	14 to 55

Index Property	(%)
Liquid Limit	27 to 39
Plasticity Index	12 to 19

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

5.5.4 Clayey Silt to Silty Clay

Silty clay to clayey silt deposits were encountered in Boreholes SLAT41-01, SLAT44-01, SLAT06E-01, C32-01, C32-02, SLAT109W-01, NLAT40W-01, NLAT110W-01, NLAT119E-01, C102-01, C102-02, C103-01, C107-02, C112-01, C112-02 and C27-02HW. These cohesive deposits consisted of brown becoming grey with depth, silty clay to clayey silt with trace to some sand and gravel, and occasional cobbles and were encountered below the pavement and fill interlayering with the fills and sands and silts. Where fully penetrated, these deposits were 0.2 m to 3.5 m thick with base elevations varying between 224.9 and

294.3 m. Where the boreholes terminated within these deposits, the minimum thickness varied between 2.6 and 8.1 m and the base elevation ranging below 218.4 to 282.8 m.

Measured SPT N-values for these soils typically ranged from 4 to 30 blows for 0.3 m of penetration indicating a firm to very stiff consistency. Occasional hard zones were present as indicated by 'N' values of 40 and 49 blows.

The natural moisture contents of the samples recovered from these cohesive deposits ranged from 10 to 30%.

Grain size distribution results for the cohesive samples tested are presented on the Record of Borehole sheets and on Figures E6 to E8 of Appendix E. Atterberg Limit test results are presented on Figures E18 to E20 of Appendix E.

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

Clayey Silt to Silty Clay

Soil Particles	(%)
Gravel	0 to 6
Sand	0 to 53
Silt	26 to 56
Clay	15 to 61
Index Property	(%)
Liquid Limit	15 to 45
Plasticity Index	5 to 23

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

5.5.5 Sands and Silts

Boreholes SLAT41-01, SLAT06E-01, SLAT19W-01, C32-01, C32-02, SLAT109W-01, NLAT37E-01, NLAT40W-01, NLAT90-01, NLAT108W-01, NLAT110W-01, NLAT114E-01, NLAT119E-01, C107-01, C107-02, C108-01, C108-02, C112-02, C113-01, C113-02, C114-01, C116-01, C18-01HW, C18-02HW, C27-01HW, C27-02HW, C39-01HW and C39-02HW encountered deposits of sandy silts, sands and silts to silty sands with trace to some gravel, and occasional cobbles. These deposits were encountered below the fill or the silty clay layer. Where fully penetrated, these cohesionless soils were 0.6 to 4.6 m thick with base elevations varying between 234.0 and 296.6 m. Where not fully penetrated, these deposits have minimum thicknesses varying between 0.1 and 9.3 m and extend below base elevations of 216.9 to 293.1 m.

The SPT N-values recorded in these soils were typically between 10 and 47 blows for 0.3 m of penetration indicating a compact to dense state. A number of N-values of greater than 50 blows for less than 0.3 m penetration and less than 10 blows of 0.3 m penetration indicate the presence of very dense and loose zones, respectively.

These deposits were observed to be moist to wet with natural moisture contents of recovered samples measured typically at 8% to 22%, with occasional values of 2%, 4% and 36%.

Grain size distribution curves for samples tested from the sand deposits are presented on the Record of Borehole sheets and on Figures E9 to E12 of Appendix E.

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

Soil Particles	(%)
Gravel	0 to 13
Sand	18 to 90
Silt	24 to 72
Clay	4 to 25

5.5.6 Sand and Gravel

Sand and gravel to gravelly sand with trace to some silt and occasional cobbles, interlayered with the silty clay to clayey silt deposits, were encountered in Boreholes C32-01 and C32-02. The thickness of these layers ranged between 0.4 to 1.4 m with base elevations varying from 229.3 to 231.9 m. The measured SPT 'N' values ranged from 10 to 41 blows per 0.3 m penetration indicating a compact to dense state. Measured moisture contents ranged from 5% to 15%.

The grain size distribution curve for a sand and gravel sample is presented on the Record of Borehole sheet and on Figure E13 of Appendix E.

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

Soil Particles	(%)
Gravel	37
Sand	50
Silt and Clay	13

5.5.7 Clayey Silt to Silty Clay Till

Underlying the fill or sands and silts, clayey silt to silty clay till deposits were encountered in Boreholes SLAT83W-01, SLAT41-01, C113-01 and C113-02. These cohesive deposits consisted of brown becoming grey with depth, clayey silt to silty clay with trace to some sand and gravel. All four boreholes terminated within the cohesive till having minimum thicknesses of 0.2 to 3.0 m and extending below Elevations 241.7 and 280.4 m.

Based on SPT N-values ranging from 14 blows for 0.3 m of penetration to greater than 50 blows for less than 0.3 m penetration, the clayey silt to silty clay till has a stiff to hard consistency. The “refusal” blow counts infer the presence of cobbles or boulders.

The natural moisture contents of these cohesive till samples ranged from 8 to 24%.

Grain size distribution results for samples of the silty clay till are presented on the Record of Borehole sheets and on Figure E14 of Appendix E. Atterberg Limit test results are presented on Figure E21 of Appendix E.

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

Clayey Silt to Silty Clay Till

Soil Particles	(%)
Gravel	0 to 3
Sand	19 to 23
Silt	40 to 49
Clay	28 to 38

Index Property	(%)
Liquid Limit	19
Plasticity Index	8

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

Glacial tills inherently contain cobbles and boulders.

5.5.8 Sandy Silt to Silty Sand Till

Boreholes SLAT44-01, NLAT191W-01, NLAT90-01, NLAT87-01, NLAT108W-01, C112-01, C112-02, C114-01, C116-01, C18-01HW, C18-02HW, C27-01HW and C27-02HW encountered glacial till deposits consisting of sandy silt, sand and silt to silty sand with trace to some gravel and trace to some clay, and occasional cobbles and boulders. All but Boreholes SLAT44-01 and C114-01 terminated within the till with minimum thickness ranging between 1.7 and 6.4 m and the till extends below elevations 250.6 to 293.6 m.

The SPT N-values recorded in these soils ranged typically from 50 blows for 0.3 m of penetration to greater than 100 blows for less than 0.3 m penetration indicating a very dense state. The “refusal” blow counts infer the presence of cobbles or boulders. Some values of between 15 and 48 blows indicate the presence of compact to dense zones.

These deposits were observed to be moist with natural moisture contents of recovered samples measured between 6% and 10%.

Grain size distribution curves for samples tested from the sand deposits are presented on the Record of Borehole sheets and on Figures E15 to E16 of Appendix E.

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

Soil Particles	(%)
Gravel	0 to 6
Sand	45 to 76
Silt	21 to 44
Clay	5 to 15

Glacial tills inherently contain cobbles and boulders.

5.5.9 Water Levels

The groundwater level was observed in the boreholes during and upon completion of drilling. No piezometer was installed in the NLAT-, SLAT- and some C- series of boreholes located on the median lane and shoulder of the highway, respectively, as explained previously. Standpipe piezometers were installed in selected C- series boreholes off the highway. The water levels observed in the open boreholes upon completion of drilling and those measured in the standpipes are summarized in Table 5.5. It is noted that boreholes not shown in the table below were dry (did not have free water level inside the borehole) upon completion.

Table 5.5 – Observed Groundwater Levels

Approx. Station	Borehole	Date	Water Level (m)	
			Depth	Elevation
West Gwillimbury (South of Highway 89)				
On Conc. Rd. 5	C102-01 (piezometer)	August 7, 2013	0.5	224.0
		November 1, 2013	0.2	224.3
On Conc. Rd. 5	C102-02 (piezometer)	August 7, 2013	0.2	231.0
		November 1, 2013	2.0	229.2
On Conc. Rd. 5	C103-01 (piezometer)	August 7, 2013	0.9	230.3
		November 1, 2013	0.9	230.3
16+400	SLAT83W-01	May 6, 2013	5.2	243.2
19+480	C18-01HW	August 7, 2013	0.1	279.7
		November 1, 2013	0.3	279.5
20+350	C27-01HW	June 6, 2013	4.4	254.4
20+350	C27-02HW (piezometer)	August 8, 2013	1.4	257.0
		November 1, 2013	1.3	257.1
24+650	C32-02	May 15, 2013	3.7	232.1
26+550	C39-01HW (piezometer)	August 8, 2013	0.5	227.4
		November 1, 2013	0.7	227.2
26+550	C39-02HW	August 8, 2013	0.5	226.6
Innisfil (North of Highway 89)				
At Hwy. 89	C107-01	June 13, 2013	3.6	224.4
At Hwy. 89	C107-02 (piezometer)	August 7, 2013	1.8	227.0
		November 1, 2013	1.7	227.1
10+100 o/s 200 w	C108-01	May 13, 2013	3.9	223.4
10+100 o/s 200 w	C108-02 (piezometer)	August 7, 2013	0.9	225.8
		November 1, 2013	1.0	
10+200	NLAT37E-01	May 26, 2013	6.1	223.0
On 4 th Line	C112-01 (piezometer)	June 5, 2013	2.5	282.3
		August 8, 2013	0.3	284.5
		November 1, 2013	0.4	284.4
On 4 th Line	C112-02 (piezometer)	June 5, 2013	2.9	281.6
		August 8, 2013	0.0	284.5
		November 1, 2013	-0.5*	285.0
On 4 th Line	C113-01 (piezometer)	June 6, 2013	2.5	283.0
		August 7, 2013	0.8	284.7
		November 1, 2013	0.6	284.9
On 4 th Line	C113-02 (piezometer)	June 6, 2013	3.4	282.2
		August 8, 2013	0.5	285.1
		November 1, 2013	0.4	285.2
17+200	NLAT108W-01	May 16, 2013	2.1	295.8
17+400	NLAT110W-01	May 16, 2013	5.9	293.1
17+800	NLAT114E-01	May 30, 2013	3.5	294.8
18+050	NLAT119E-01	May 30, 2013	4.2	292.5

* Above ground surface

The above values in the open boreholes are very short term readings and seasonal fluctuations of the groundwater level are to be expected. The piezometric readings obtained to date likely do not represent stabilized groundwater levels. In particular, the groundwater level may be at a higher elevation after the spring snowmelt or after periods of heavy rainfall.

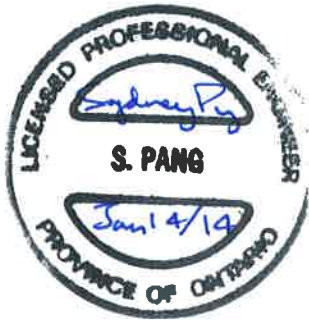
6 MISCELLANEOUS

The drilling and sampling equipment was supplied and operated by Walker Drilling Ltd. of Utopia, Ontario. Traffic control was provided by On Track Safety of Thornhill Hill, Ontario. The field work was supervised on a full time basis by Mr. L. Gilarski, Mr. J. Gurzanski and Ms. E. Siu of Thurber Engineering Ltd. Laboratory testing was carried out at Thurber's Laboratory in Oakville, Ontario.

Interpretation of the field data and preparation of the investigation report was conducted by Dr. Sydney Pang, P.Eng.

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

THURBER ENGINEERING LTD.



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



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

Table A-1 – Borehole Completion Details

Location	Details	
	Piezometer Tip Depth / Elevation (m)	Completion Details
C1-01	None Installed	Backfilled with bentonite holeplug to 1.7 m, concrete to 0.2 m, then asphalt to ground surface
C1-02	None Installed	Backfilled with bentonite holeplug to 1.7 m, cement to 0.15 m, then asphalt to ground surface.
C102-01	4.8 / 219.5	Piezometer with 1.5 m slotted screen installed with sand filter to 3.4 m, then bentonite seal from 3.4 m to ground surface.
C102-02	12.2 / 219.0	Piezometer with 1.5 m slotted screen installed with sand filter to 7.1 m, bentonite seal from 7.1 m to .15 m, then concrete to ground surface.
C103-01	12.2 / 219.0	Piezometer with 1.5 m slotted screen installed with sand filter to 9.8 m, bentonite seal from 9.8 m to 0.15 m, then concrete to ground surface.
C107-01	None Installed	Backfilled with bentonite holeplug to ground surface.
C107-02	6.1 / 221.4	Piezometer with 1.5 m slotted screen installed with sand filter to 3.8 m, then bentonite seal from 3.8 m to ground surface.
C108-01	None Installed	Backfilled with bentonite holeplug to ground surface.
C108-02	9.0 / 217.7	Piezometer with 1.5 m slotted screen installed with sand filter to 6.4 m, then bentonite seal from 6.4 m to ground surface.
C112-01	6.1 / 278.9	Piezometer with 1.5 m slotted screen installed with sand filter to 4.2 m, then bentonite seal from 4.2 m to ground surface.
C112-02	6.1 / 278.5	Piezometer with 1.5 m slotted screen installed with sand filter to 4.3 m, then bentonite seal from 4.3 m to ground surface.
C113-01	6.1 / 281.0	Piezometer with 1.5 m slotted screen installed with sand filter to 4.2 m, then bentonite seal from 4.2 m to ground surface.
C113-02	6.1 / 279.1	Piezometer with 1.5 m slotted screen installed with sand filter to 4.2 m, then bentonite seal from 4.2 m to ground surface.
C114-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
C116-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
C14-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
C14-02	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground

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		surface.
C17-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
C17-02	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
C18-01 HW	7.6 / 272.1	Piezometer with 1.5 m slotted screen installed with sand filter to 5.6 m, then bentonite seal from 5.6 m to ground surface.
C18-02 HW	None Installed	Backfilled with bentonite holeplug to ground surface.
C2-01	None Installed	Backfilled with bentonite holeplug to 1.8 m, concrete to 0.15 m, then asphalt to ground surface.
C2-02	None Installed	Backfilled with bentonite holeplug to 2.1 m, cuttings to 1.7 m, concrete to 0.15 m, then asphalt to ground surface.
C27-01 HW	None Installed	Backfilled with bentonite holeplug to ground surface.
C27-02 HW	7.6 / 250.7	Piezometer with 1.5 m slotted screen installed with sand filter to 5.8 m, then bentonite seal from 5.8 m to ground surface.
C-3	None Installed	
C32-01	9.1 / 226.5	Piezometer with 1.5 m slotted screen installed with sand filter to 7.0 m, bentonite seal from 7.0 m to 3.0 m, cuttings from 3.0 m to 0.3 m, then concrete from 0.3 m to ground surface.
C32-02	None Installed	Backfilled with bentonite holeplug to 1.8 m, concrete to 0.15 m, then asphalt to ground surface.
C39-01 HW	7.6 / 219.3	Piezometer with 1.5 m slotted screen installed with sand filter to 5.5 m, then bentonite seal from 5.5 m to ground surface.
C39-02	None Installed	Backfilled with bentonite holeplug to ground surface.
C-4	None Installed	
C4-01	None Installed	Backfilled with bentonite holeplug to 1.8 m, concrete to 0.15 m, then asphalt to ground surface.
C4-02	None Installed	Backfilled with bentonite holeplug to 1.9 m, concrete to 0.15 m, then asphalt to ground surface.
C47-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
C47-02	None Installed	Backfilled with bentonite holeplug to 2.4 m, cuttings to 1.8 m, concrete to 0.2 m, then asphalt to ground surface.
C51-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
C51-02	None Installed	Backfilled with bentonite holeplug to 1.9 m, concrete to 0.15 m, then asphalt to ground surface.
C7-01	None Installed	Backfilled with bentonite holeplug to 1.6 m, concrete to 0.15 m, then asphalt to ground surface.
C7-02	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground

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		surface.
C8-01	None Installed	Backfilled with bentonite holeplug to 1.6 m, concrete to 0.12 m, then asphalt to ground surface.
C8-02	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
NLAT04-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
NLAT06-01	None Installed	Backfilled with bentonite holeplug to 1.8 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT07E-01	None Installed	Backfilled with bentonite holeplug to 1.9 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT-08-01	None Installed	Backfilled with bentonite holeplug to 2.1 m, cuttings to 1.7 m, concrete to 0.15 m, then asphalt to ground surface.
NLAT100E-01	None Installed	Backfilled with bentonite holeplug to 2.1 m, cuttings to 2.1 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT104W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
NLAT106W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
NLAT108W-01	None Installed	Backfilled with bentonite holeplug to 0.9 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT110W-01	None Installed	Backfilled with bentonite holeplug to 1.8 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT114E-01	None Installed	Backfilled with bentonite holeplug to 1.8 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT118W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
NLAT119E-01	None Installed	Backfilled with bentonite holeplug to 2.1 m, cuttings to 1.8 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT11E-01	None Installed	Backfilled with bentonite holeplug to 2.1 m, cuttings to 1.7 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT124E-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT127-01	None Installed	Backfilled with bentonite holeplug to 1.6 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT128W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
NLAT12W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
NLAT131-01	None Installed	Backfilled with bentonite holeplug to 2.1 m, cuttings to 1.6 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT13E-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground

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		surface.
NLAT14W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
NLAT15-01	None Installed	Backfilled with bentonite holeplug to 2.2 m, cuttings to 1.8 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT18W-01	None Installed	Backfilled with bentonite holeplug to 1.8 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT20E-01	None Installed	Backfilled with bentonite holeplug to 1.8 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT23AW-01	None Installed	Backfilled with bentonite holeplug to 1.9 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT25W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, then cuttings to ground surface.
NLAT25W-02	6.2 / 296.7	Piezometer with 1.5 m slotted screen installed with sand filter to 4.3 m, then bentonite seal from 4.3 m to ground surface.
NLAT28E-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
NLAT2W-01		
NLAT32E-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
NLAT37-01	None Installed	Backfilled with bentonite holeplug to 2.1 m, cuttings to 1.9 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT37E-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
NLAT40W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
NLAT41-01	None Installed	Backfilled with bentonite holeplug to 2.4 m, cuttings to 1.8 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT46-01	None Installed	Backfilled with bentonite holeplug to 1.8 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT50W-01	None Installed	Backfilled with bentonite holeplug to 2.7 m, cuttings to 1.8 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT51E-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, concrete to 0.15 m, then asphalt to ground surface.
NLAT54-01	None Installed	Backfilled with bentonite holeplug and cuttings to 0.2 m, then asphalt to ground surface.
NLAT60-01	None Installed	Backfilled with bentonite holeplug and cuttings to 0.2 m, then asphalt to ground surface.
NLAT65W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
NLAT68W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.

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NLAT70W-01	None Installed	Backfilled with bentonite holeplug to 1.9 m, cuttings to 1.7 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT72W-01	None Installed	Backfilled with bentonite holeplug to 2.3 m, cuttings to 1.7 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT75-01	None Installed	Backfilled with bentonite holeplug to 1.8 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT78-01	None Installed	Backfilled with bentonite holeplug to 2.6 m, cuttings to 2.1 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT79E-01	None Installed	Backfilled with bentonite holeplug to 1.8 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT87-01	None Installed	Backfilled with bentonite holeplug to 2.4 m, cuttings to 1.9 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT90-01	None Installed	Backfilled with bentonite holeplug to 1.8 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT91W-01	None Installed	Backfilled with bentonite holeplug to 1.9 m, cuttings to 1.6 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT96W-01	None Installed	Backfilled with bentonite holeplug to 2.1 m, cuttings to 1.5 m, concrete to 0.2 m, then asphalt to ground surface.
NLAT99W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
SLAT06E-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
SLAT109W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.2 m, then asphalt to ground surface.
SLAT18-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, concrete and cuttings to 0.15 m, then asphalt to ground surface.
SLAT19W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
SLAT23W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
SLAT30W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.2 m, then asphalt to ground surface.
SLAT31E-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, concrete and cuttings to 0.15 m, then asphalt to ground surface.
SLAT32E-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, concrete and cuttings to 0.15 m, then asphalt to ground surface.
SLAT41-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, bentonite holeplug and cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
SLAT44-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, bentonite holeplug and cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
SLAT47W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
SLAT51E-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, bentonite holeplug and cuttings to 1.5 m, concrete to 0.15 m, then

Highway 400 Median Sewer
North Canal Road to Innisfil Road

		asphalt to ground surface.
SLAT53W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, bentonite holeplug and cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
SLAT57W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, bentonite holeplug and cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
SLAT58W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, concrete to 0.2 m, then asphalt to ground surface.
SLAT59-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, bentonite holeplug and cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
SLAT62-01	6.1 / 223.4	Piezometer with 1.5 m slotted screen installed with sand filter to 4.0 m, bentonite seal from 4.0 m to 3.0 m, cuttings from 3.0 m to 0.9 m, the concrete from 0.9 m to ground surface.
SLAT63W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
SLAT64-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, bentonite holeplug and cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
SLAT65-01	6.1 / 224.7	Piezometer with 1.5 m slotted screen installed with sand filter to 4.0 m, bentonite seal from 4.0 m to 3.0 m, cuttings from 3.0 m to 0.9 m, the concrete from 0.9 m to ground surface.
SLAT67-01	6.1 / 226.4	Piezometer with 1.5 m slotted screen installed with sand filter to 4.0 m, bentonite seal from 4.0 m to 3.0 m, cuttings from 3.0 m to 0.9 m, the concrete from 0.9 m to ground surface.
SLAT68-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, bentonite holeplug and cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
SLAT72-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, bentonite holeplug and cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.
SLAT83W-01	None Installed	Backfilled with bentonite holeplug to 3.0 m, bentonite holeplug and cuttings to 1.5 m, concrete to 0.15 m, then asphalt to ground surface.

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			

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
 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


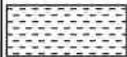



ROCK WEATHERING CLASSIFICATION

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)	Approximate Uniaxial Compressive Strength (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.

Appendix A

Sections 1, 2, 3 and 4

(Stations 11+600 to 15+400 West Gwillimbury)

RECORD OF BOREHOLE No C1-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 880 121 4 E 295 461 4 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.13 - 2013.05.13 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	WATER CONTENT (%) w _p w w _L				
								20 40 60 80 100 20 40 60 80 100					
230.9													
0.0	ASPHALT: (75mm)												
0.2	SAND and GRAVEL, trace silt and clay Compact Brown Moist (FILL)		1	AS								40 53 7 (SI+CL)	
229.6			1	SS	12		230						
1.3	Silty CLAY, trace sand, trace gravel Very Stiff to Firm Brown to mottled/Grey Moist		2	SS	18		229					0 0 64 36	
			3	SS	8		228						
			4	SS	6								
			5	SS	10		227						
226.3													
4.6	Clayey SILT, with sand, trace gravel Stiff Brown Moist (TILL)		6	SS	14		226						
							225						
	Becoming grey		7	SS	14							5 31 43 21	
							224						
			8	SS	15		223						
222.7													
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE OPEN TO 7.3m AND WATER LEVEL AT 4.5m UPON COMPLETION BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.7m, BENTONITE HOLEPLUG BENTONITE CEMENT TO 0.2m THEN ASPHALT TO SURFACE.												

+ ³, × ³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C1-02

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 880 102.9 E 295 428.5 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 05 14 - 2013 05 14 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
231.1	ASPHALT: (75mm)						231					
0.0 0.1	SAND, some to trace gravel Compact Brown Moist (FILL)		1	AS								
229.8			1	SS	28		230					
1.3	Clayey SILT, some sand, trace gravel, occasional cobbles Hard Grey Moist (FILL)		2	SS	37							10 22 47 21
228.9	Stiff		3	SS	9		229					
2.2			4	SS	9		228					
227.3	Clayey SILT, with sand, trace gravel Stiff Brown Moist (TILL)		5	SS	13		227					3 34 42 21
3.8			6	SS	15		226					
			7	SS	13		225					
			8	SS	13		224					
222.9	END OF BOREHOLE AT 8.2m. BOREHOLE OPEN TO BOTTOM AND WATER LEVEL AT 5.7m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.7m, CEMENT TO 0.15m THEN ASPHALT TO SURFACE.						223					
8.2												

ONTMT4S 1218.GPJ 2012TEMPLATE(MTO).GDT 8/7/13

METRIC

[illegible]

+ 3×3 : Numbers refer to Sensitivity

RECORD OF BOREHOLE No C2-01

2 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 880 436.0 E 295 262.4 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 05 13 - 2013 05 13 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES								
	Continued From Previous Page												
	BOREHOLE OPEN TO 6.8m AND WATER LEVEL AT 4.9m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.8m, CEMENT TO 0.15m THEN ASPHALT TO SURFACE.												

RECORD OF BOREHOLE No C2-02

1 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 880 448.9 E 295 213.3 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 05 14 - 2013 05 14 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
228.0	ASPHALT: (90mm)						228							GR SA SI CL
0.0 0.1	SAND, some to trace gravel Compact Brown Moist (FILL)		1	AS										
			1	SS	23		227							
	Some silt and clay													
226.1			2	SS	24		226							16 48 36 (SI+CL)
1.9	Clayey SILT, some sand, trace gravel Very Stiff to Stiff Brown Moist (FILL)													
			3	SS	18		225							0 22 56 22
	Occasional wood fibre Firm Brown to Dark Grey		4	SS	14		224							
223.5			5	SS	6									
4.5	Clayey SILT, some sand, some gravel Firm Brown Moist		6	SS	6		223							13 27 42 18
222.4	Clayey SILT, some sand, trace gravel Stiff Grey Moist (TILL)		7	SS	12		222							Split spoon wet
5.6														
			8	SS	9		221							
			9	SS	7		220							
219.3	Firm						219							
8.7														
218.2	END OF BOREHOLE AT 9.8m													
9.8														

Continued Next Page

+ 3, x 3: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

METRIC

[illegible]

RECORD OF BOREHOLE No SLAT47W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 880 589.8 E 295 140.9 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 05 06 - 2013 05 06 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
227.2												
0.0	ASPHALT: (125mm)											
0.1	SAND, some gravel Brown Moist (FILL)		1	AS			227					
	Loose		1	SS	7		226					
225.8												
1.4	Silty CLAY, some sand, trace gravel Very Stiff to Stiff Brown Moist		2	SS	16		225					
225.0												
2.2	Grey		3	SS	11		225					
	Some organics		4	SS	15		224					
223.5												
3.7	Silty CLAY, some sand, trace gravel Stiff Grey Moist (TILL)		5	SS	10		223					
	Inferred cobbles at 5.2m		6	SS	15		222					
			7	SS	14		221					
220.5												
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m THEN ASPHALT COLD PATCH TO GROUND SURFACE.											

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/25/13

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

RECORD OF BOREHOLE No C4-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 881 454 7 E 294 862 3 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.13 - 2013.05.13 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
226.4	ASPHALT: (75mm)													
0.0 0.1	SAND, trace gravel, trace silt and clay Compact Moist (FILL)		1	AS			226							
			1	SS	18		225							5 87 8 (SI+CL)
224.8	Silty CLAY, some sand Stiff Brown (FILL)		2	SS	13		224							
1.6	Trace gravel		3	SS	10		223							
223.6	Clayey SILT, with sand, trace gravel Stiff to Very Stiff Grey Moist (TILL)		4	SS	12		222							
2.8			5	SS	11		221							
			6	SS	16		220							7 38 36 19 Split spoon wet
			7	SS	17		219							
			8	SS	11									
218.2	END OF BOREHOLE AT 8.2m BOREHOLE OPEN TO 7.3m AND WATER LEVEL AT 5.0m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.8m, CEMENT TO 0.15m THEN ASPHALT TO SURFACE.													
8.2														

ONTMT4S 1218.GPJ 2012TEMPLATE(MTO).GDT 8/7/13

+ 3 4 x 3 : Numbers refer to 20
Sensitivity 15 5 10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C4-02

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 881 441.1 E 294 833.3 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.14 - 2013.05.14 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT		
226.5 0.0 0.1	ASPHALT: (75mm)												
	SAND, some to trace gravel Compact Moist (FILL)		1	GS			226						
226.2			1	SS	16								
1.3	Silty CLAY, some sand, trace gravel Very Stiff Brown		2	SS	22		225						
224.3													
2.2	Firm to Stiff		3	SS	5		224						
			4	SS	9		223						
			5	SS	6		222						
			6	SS	14								
220.9							221						
5.6	Clayey SILT, with sand, trace gravel Stiff Grey Moist (TILL)		7	SS	11		220						
			8	SS	9		219						
218.3													
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE OPEN TO 7.0m AND WATER LEVEL AT 5.6m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.9m, CEMENT TO 0.15m THEN ASPHALT TO SURFACE.												

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/7/13

+³, ×³: Numbers refer to
Sensitivity

20
15
10
5
0
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No SLAT51E-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 881 675 9 E 294 803 8 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 05 08 - 2013 05 08 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		<div><div>PLASTIC LIMIT</div><div>NATURAL MOISTURE CONTENT</div><div>LIQUID LIMIT</div></div> <div><div>W_P</div><div>W</div><div>W_L</div></div> <div>WATER CONTENT (%)</div>	UNIT WEIGHT <div>γ</div> kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
224.9								20	40	60	80	100			
0.0															
224.6	ASPHALT: (250mm)														
0.3	SAND, some gravel Grey Moist (FILL) Compact		1	AS											
223.7			1	SS	13		224								
1.2	Silty CLAY, trace sand Stiff to Very Stiff Grey Moist		2	SS	10		223								
			3	SS	17		222								
			4	SS	9		221								
			5	SS	12		220								
			6	SS	11										
219.7															
5.2	END OF BOREHOLE AT 5.1m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH CUTTINGS TO 3.0m, CUTTINGS AND BENTONITE HOLEPLUG TO 1.5m, CONCRETE TO 0.15m, THEN COLD PATCH TO SURFACE.														

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/26/13

RECORD OF BOREHOLE No SLAT53W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 881 768.9 E 294 788.4 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.08 - 2013.05.08 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
225.2													
0.0 224.9	ASPHALT: (250mm)												
0.3	SAND, trace silt, trace gravel Brown Moist (FILL) Compact		1	AS			225						
			1	SS	17		224						7 85 8 (SI+CL)
223.8													
1.4	Silty CLAY, some sand, trace gravel Stiff Brown Moist		2	SS	10		223						
			3	SS	10		222						1 16 59 24
			4	SS	9		221						
221.5													
3.7	Very Stiff		5	SS	22		220						0 9 65 26
			6	SS	16		219						
							218						
219.6													
5.6	Grey		7	SS	12								
			8	SS	10								
217.0													
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 3.0m, CUTTINGS AND BENTONITE HOLEPLUG TO 1.5m, CONCRETE TO 0.15m, THEN ASPHALT TO SURFACE.												

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/26/13

RECORD OF BOREHOLE No SLAT57W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 882 249.2 E 294 702.6 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.08 - 2013.05.08 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	L'LIQUID LIMIT	
228.2	ASPHALT: (250mm)											
0.0												
227.9												
0.3	SAND and GRAVEL, trace silt Grey Moist (FILL) Compact		1	AS			228					34 58 8 (SI+CL)
			1	SS	21		227					
226.8												
1.4	Clayey SILT, trace sand, trace gravel Very Stiff Brown Moist		2	SS	23		226					
			3	SS	24							
225.2												
3.0	Silty CLAY, trace sand, trace gravel Firm to Stiff Brown Moist		4	SS	6		225					
							224					Field vane pushed to 4.0m, but would not turn
			5	SS	10		223					
	Grey Moist to Wet		6	SS	15		222					Split spoon wet
221.5												
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO BOTTOM AND WATER LEVEL AT 3.9m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 3.0m, CUTTINGS AND BENTONITE HOLEPLUG TO 1.5m, CONCRETE TO 0.15m, THEN ASPHALT TO SURFACE.											

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO) GDT 8/7/13

+ 3, x 3: Numbers refer to
Sensitivity

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15
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(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No SLAT58W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 882 399.8 E 294 676.2 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.06 - 2013.05.06 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
229.2								20 40 60 80 100						
0.0	ASPHALT: (350mm)		1	AS			229							
228.8														
0.4	SAND, some gravel Compact Brown Moist (FILL)		1	SS	14									
228.0														
1.2	Silty CLAY, trace to some sand Very Stiff to Hard Brown Moist		2	SS	25		228							
			3	SS	21		227							
	Trace gravel, occasional oxide lenses		4	SS	27		226							
			5	SS	36		225							
			6	SS	31		224							
	Becoming grey													
							223							
			7	SS	15									
222.5														
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 3.0m, THEN CONCRETE AND ASPHALT COLD PATCH TO GROUND SURFACE.													

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO) GDT 8/26/13

RECORD OF BOREHOLE No SLAT62-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 882 940.5 E 294 587.3 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.05 - 2013.05.05 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L		
229.5	ASPHALT: (200mm)												
0.0													
0.2	SAND, some gravel Grey Moist (FILL)		1	AS			229						
228.7													
0.8	SAND, trace gravel Compact Brown Moist (FILL)		1	SS	12		228						
228.1													
1.4	Clayey SILT, and sand Stiff Brown Moist		2	SS	8		228						
227.3													
2.2	Trace gravel Very Stiff		3	SS	19		227						
	Becoming wet												
	50mm thick sand layer at 3.3m		4	SS	19		226						2 38 44 16
													Split spoon wet
			5	SS	15								
225.0							225						
4.5	SAND and SILT, some clay, trace gravel Loose Grey Wet		6	SS	9		225						6 43 40 11
223.9							224						
5.6	Clayey SILT, trace sand Stiff Grey Wet												
222.8			7	SS	11		223						
6.7	END OF BOREHOLE AT 6.7m BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) May 09/13 2.5 227.0												

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO) GDT 8/26/13

+ ³, × ³: Numbers refer to
Sensitivity

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15
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(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No SLAT63W-01

1 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 883 043 6 E 294 564 0 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.06 - 2013.05.06 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
229.1												
0.0	ASPHALT: (150mm)											
0.2	SAND, some gravel, trace silt and clay Compact Brown Moist (FILL)		1	AS			229					
227.8			1	SS	15		228					18 75 7 (SI+CL)
1.3	Clayey SILT, trace sand Very Stiff Brown Moist		2	SS	21							
227.0							227					
2.1	Silly CLAY, trace sand, trace gravel Firm Grey Moist		3	SS	5							
	Becoming wet		4	SS	5		226					Split spoon wet
225.4												Attempted field vane. Did not advance pass 3.4m
3.7	SAND and SILT, some gravel, trace clay Loose Grey Moist		5	SS	7		225					13 41 37 9
224.6												
4.5	Stiff		6	SS	11		224					
							223					
			7	SS	9							
							222					
			8	SS	8		221					
220.4												
8.7	Clayey SILT, some sand Stiff Grey Wet		9	SS	10		220					

Continued Next Page

Numbers refer to
Sensitivity

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15
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(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No SLAT63W-01

2 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 883 043.6 E 294 564.0 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.06 - 2013.05.06 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L		
	Continued From Previous Page							SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	WATER CONTENT (%) 20 40 60				
217.4	Clayey SILT, some sand Firm Grey Wet		10	SS	5		219						Attempted filed vane test at 11.6m, unable to turn
							218						
11.7	Silty CLAY, some sand, trace gravel Stiff Grey Wet (TILL)		11	SS	13		217						
							216						
			12	SS	11		215						3 26 49 22
							214						
213.3			13	SS	12								
15.8	END OF BOREHOLE AT 15.8m. BOREHOLE OPEN TO 15.2m WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m, THEN ASPHALT COLD PATCH TO GROUND SURFACE.												

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO) GDT 8/26/13

RECORD OF BOREHOLE No C7-01

1 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 883 184.5 E 294 555.7 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.15 - 2013.05.15 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE											
								20	40	60	80						100	20	40
229.9																			
0.0	ASPHALT: (200mm)																		
0.2	SAND, some gravel Brown Moist (FILL)		1	AS															
228.9																			
1.0	Silty CLAY, with sand, trace gravel Firm to Very Stiff Brown Moist		1	SS	6		229								1	37 38 24			
			2	SS	15		228												
			3	SS	14														
	Trace sand						227												
			4	SS	11										0	4 55 41			
	Occasional silt seams		5	SS	14		226												
	Becoming grey, occasional sand pockets		6	SS	11		225												
							224												
			7	SS	9										2	14 41 43			
			8	SS	8		222												
221.2																			
8.7	Clayey SILT, some sand, trace gravel Stiff Grey Moist (TILL)		9	SS	10		221												
220.1																			
9.8	END OF BOREHOLE AT 9.8m																		

Continued Next Page

+ 3, x 3: Numbers refer to
Sensitivity

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(%) STRAIN AT FAILURE

METRIC

[illegible]

RECORD OF BOREHOLE No C7-02

1 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 883 164.3 E 294 531.1 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.14 - 2013.05.14 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
229.8												
0.0	ASPHALT: (350mm)		1	AS								44 42 14 (SI+CL)
229.4												
0.4	SAND and GRAVEL, trace silt and clay											
229.0	Brown											
0.8	Moist		1	SS	27		229					
	(FILL)											
228.4	Silty CLAY, trace to some sand, trace gravel											
1.4	Stiff to Very Stiff		2	SS	31		228					0 11 51 38
	Brown											
	Moist											
227.6	Hard											
2.2			3	SS	28		227					
			4	SS	13							
			5	SS	27		226					0 7 54 39
			6	SS	24		225					
			7	SS	13		224					
			8	SS	14		222					2 15 52 31
			9	SS	17		221					
220.0												
9.8	END OF BOREHOLE AT 9.7m.											

Continued Next Page

+ 3 x 3

Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C7-02

2 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 883 164.3 E 294 531.1 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 05 14 - 2013 05 14 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa	WATER CONTENT (%)					
	Continued From Previous Page													
	BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m THEN ASPHALT TO SURFACE													

RECORD OF BOREHOLE No SLAT65-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 883 273 8 E 294 528 4 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.05 - 2013.05.05 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
230.8	ASPHALT: (200mm)											
0.0												
0.2	SAND, trace gravel, trace to some silt and clay Compact Grey Moist (FILL)		1	AS			230					
			2	SS	14							6 80 14 (SI+CL)
229.0			3	SS	18		229					
1.8	SILT, some clay, trace gravel Compact Brown Moist		4	SS	16		228					
227.8			5	SS	9		227					0 0 55 45
3.0	Silty CLAY Stiff Grey Moist		6	SS	9		226					
			7	SS	8		225					
			8	SS	8							
224.1	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) May 09/13 2.5 228.3											
6.7												

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO) GDT 8/26/13

+ 3, x 3; Numbers refer to
Sensitivity

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(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No SLAT67-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 863 452 7 E 294 496 7 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.05 - 2013.05.05 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
232.5												
0.0	ASPHALT: (325mm)											
232.2			1	AS								
0.3	Gravelly SAND											
232.0	(FILL)											
0.5												
	Sandy SILT, some gravel, trace clay											
	Compact		1	SS	16							
	Brown											
	Moist											
231.2	(FILL)											
1.3												
	Silly CLAY, trace sand											
	Stiff		2	SS	15							
	Brown											
	Moist											
			3	SS	11							
			4	SS	8							
			5	SS	8							
			6	SS	9							
226.9												
5.6	Firm											
			7	SS	7							
225.8												
6.7	END OF BOREHOLE AT 6.7m. BORHEOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.											
	WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) May 09/13 1.8 230.7											

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO) GDT 8/26/13

RECORD OF BOREHOLE No C8-01

1 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 883 663.2 E 294 471.6 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.15 - 2013.05.15 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
234.4												
0.0	ASPHALT: (175mm)											
0.2	SAND, some gravel Brown Moist (FILL)		1	AS			234					
233.2			1	SS	7							
1.2	Clayey SILT, some sand, trace gravel Very Stiff to Stiff Brown to Grey Moist		2	SS	17		233					3 27 40 30
			3	SS	13		232					
			4	SS	9		231					
230.6												
3.8	Silty CLAY, trace to some sand, trace gravel Firm Mottled Brown and Grey Moist		5	SS	7		230					0 7 43 50
229.9			6	SS	25							Split spoon wet
4.5	Very Stiff to Stiff						229					
			7	SS	20		228					
							227					
			8	SS	12		226					0 21 36 43
			9	SS	8		225					
224.6												
9.8	END OF BOREHOLE AT 9.8m.											

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+³, ×³: Numbers refer to Sensitivity
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 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C8-01

2 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 883 663 2 E 294 471 6 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 05 15 - 2013 05 15 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
	Continued From Previous Page													
	BOREHOLE OPEN TO BOTTOM AND WATER LEVEL AT 5.9m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.6m, CEMENT TO 0.12m THEN ASPHALT TO SURFACE.													

RECORD OF BOREHOLE No C8-02

1 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 883 652.3 E 294 445.3 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 05 14 - 2013 05 14 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
234.3												
0.0	ASPHALT: (375mm)		1	AS			234					
233.9												
0.4	SAND, trace gravel											
233.5	Brown											
0.8	Moist											
	(FILL)		1	SS	28		233					8 36 38 18
	Clayey SILT, with sand, trace gravel											
	Very Stiff		2	SS	26		232					
	Brown/Grey											
	Moist		3	SS	21		231					
231.1												
3.2	Silty CLAY, some sand, trace gravel,		4	SS	16		230					1 14 49 36
	trace organics											
	Very Stiff to Hard		5	SS	36		229					
	Brown/Grey											
	Moist		6	SS	47		228					
			7	SS	24		227					1 18 50 31
227.1												
7.2	Stiff to Firm		8	SS	9		226					
			9	SS	7		225					
224.5												
9.8	END OF BOREHOLE AT 9.7m											

Continued Next Page

+ 3 x 3 : Numbers refer to
Sensitivity

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15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C8-02

2 OF 2

METRIC

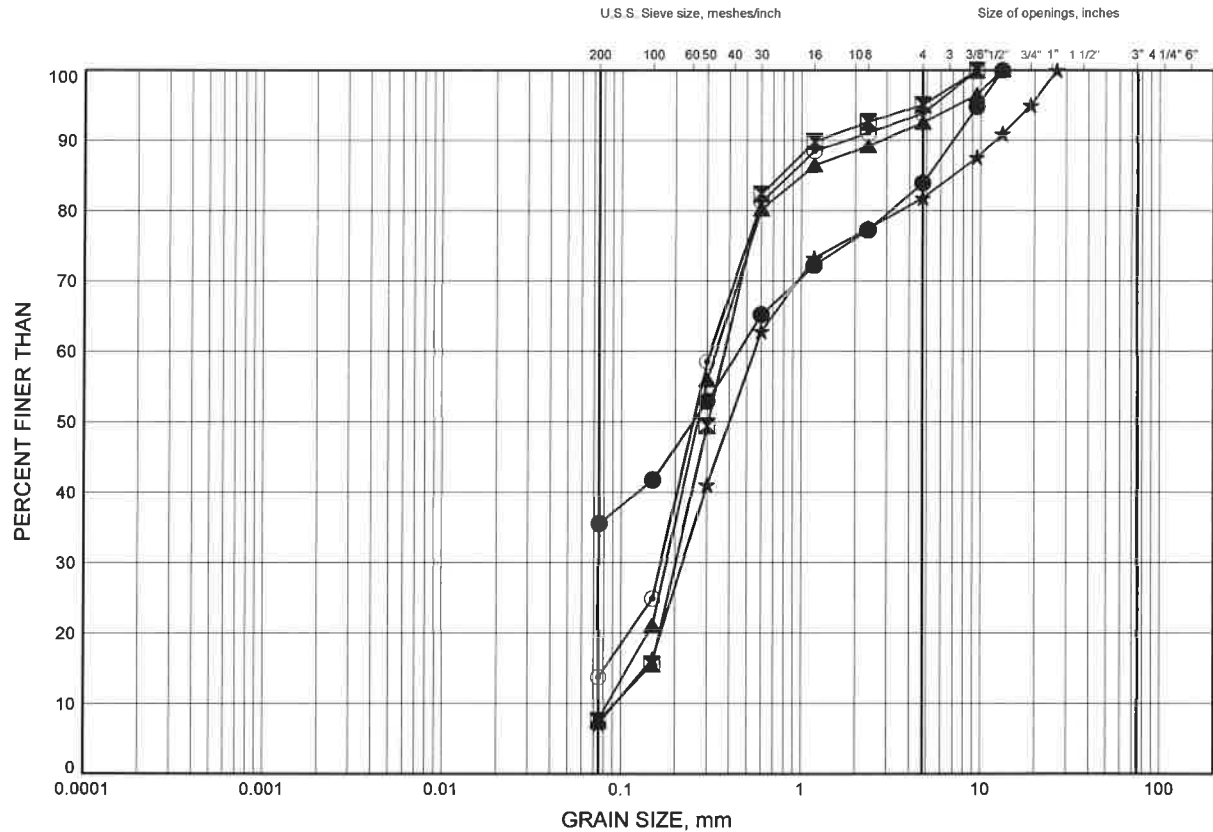
GWP# 83-00-00 LOCATION N 4 883 652.3 E 294 445.3 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 05 14 - 2013 05 14 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	W P W W L	20 40 60			
	Continued From Previous Page BOREHOLE OPEN TO 9.7m AND WATER LEVEL AT 8.5m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m THEN ASPHALT TO SURFACE.													

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE A1

SAND FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C2-02	1.71	226.29
⊠	C4-01	1.07	225.33
▲	SLAT53W-01	1.07	224.13
★	SLAT63W-01	1.07	228.03
⊙	SLAT65-01	1.07	229.73

Date August 2013
GWP# 83-00-00

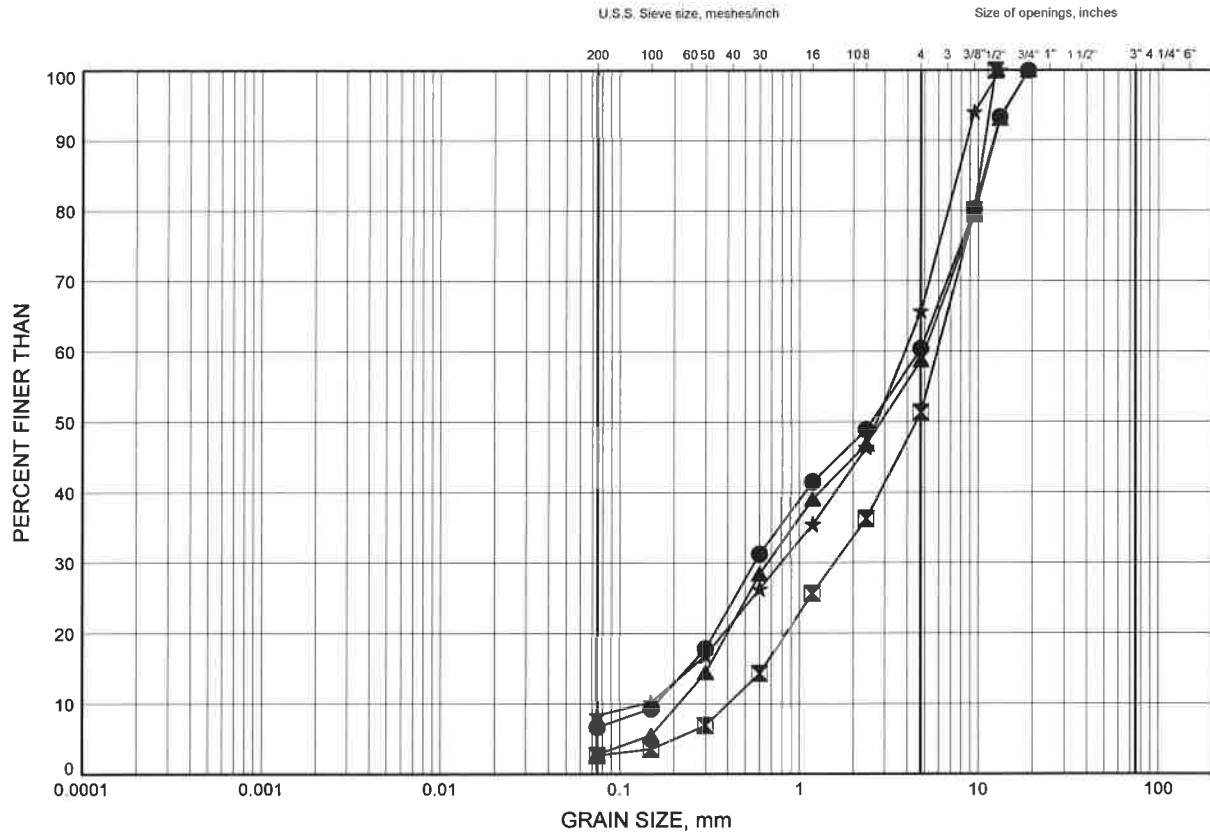


Prep'd AN
Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE A2

SAND & GRAVEL FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C1-01	0.38	230.52
⊠	C2-01	0.30	228.00
▲	C7-02	0.30	229.50
★	SLAT57W-01	0.30	227.90

GRAIN SIZE DISTRIBUTION - THURBER 1218 GPJ 8/26/13

Date August 2013
GWP# 83-00-00

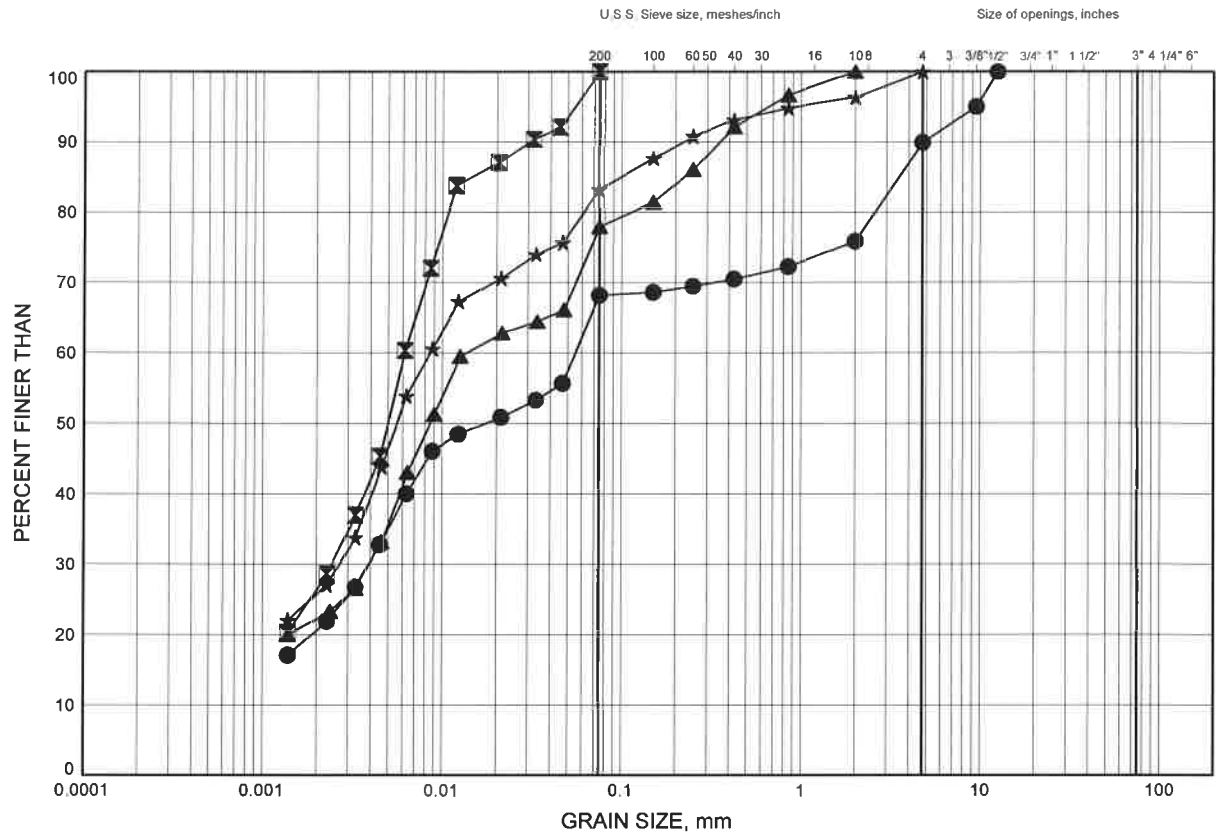


Prep'd AN
Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE A3

CLAYEY SILT/SILTY CLAY FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C1-02	1.83	229.27
■	C2-01	1.83	226.47
▲	C2-02	2.59	225.41
★	C4-01	2.59	223.81

Date August 2013
GWP# 83-00-00

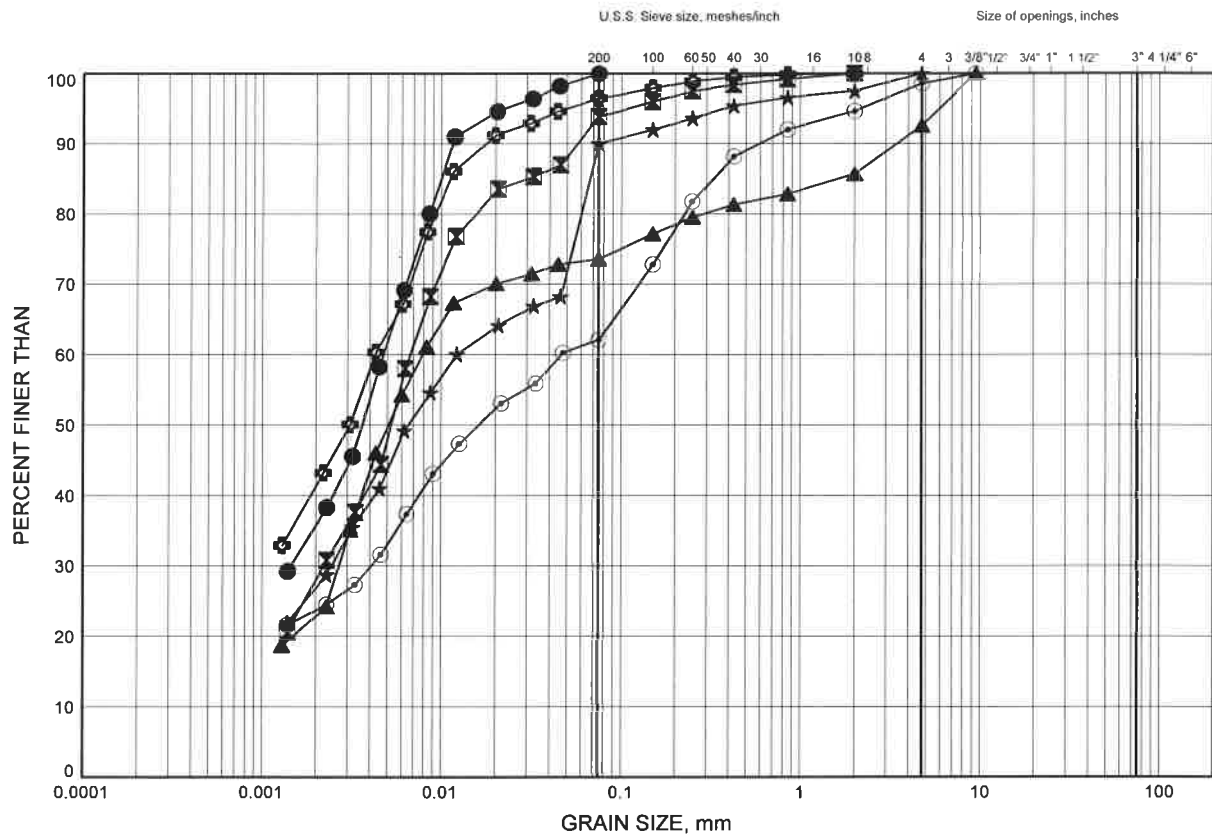


Prep'd AN
Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE A4

SILTY CLAY



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C1-01	1.83	229.07
⊠	C2-01	9.45	218.85
▲	C4-02	1.83	224.67
★	C4-02	3.35	223.15
⊙	C7-01	1.07	228.83
⊕	C7-01	3.35	226.55

Date August 2013

GWP# 83-00-00



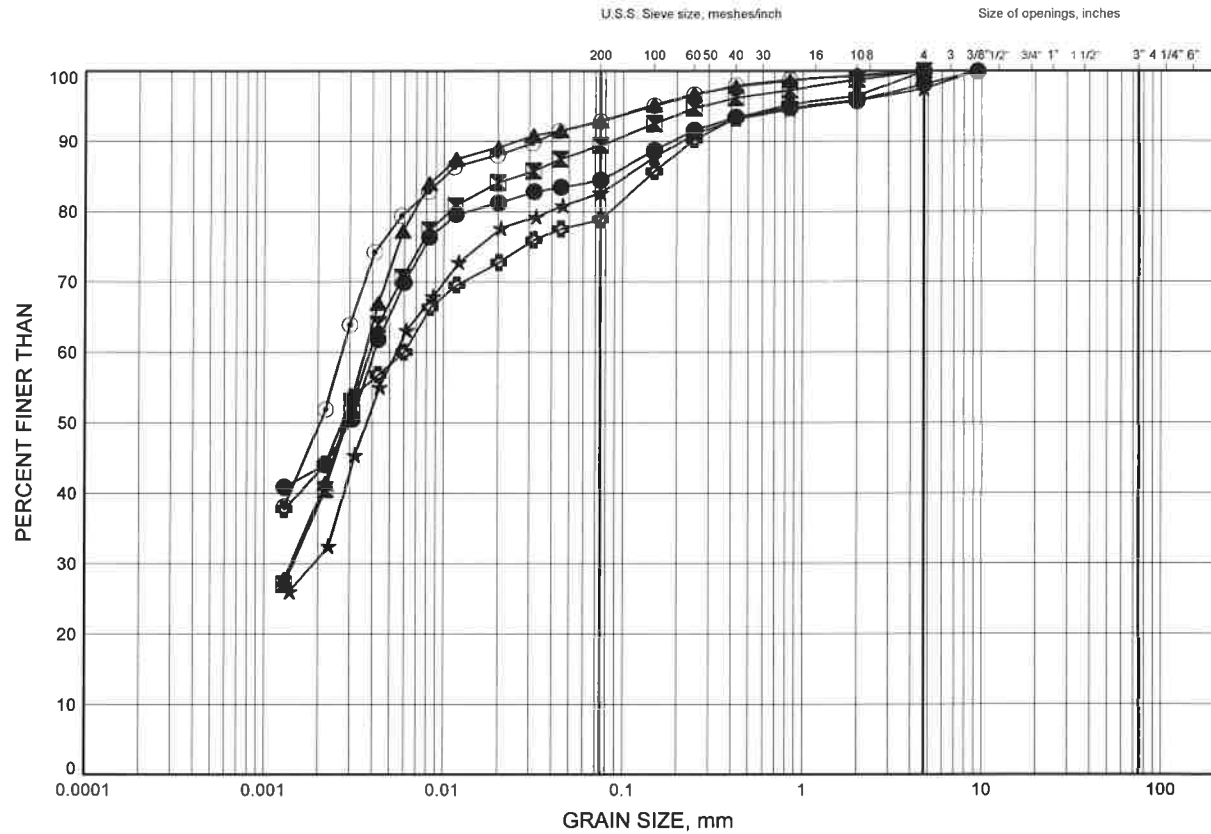
Prep'd AN

Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE A5

SILTY CLAY



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C7-01	6.40	223.50
⊠	C7-02	1.83	227.97
▲	C7-02	4.11	225.69
★	C7-02	7.92	221.88
⊙	C8-01	4.11	230.29
⊕	C8-01	7.92	226.48

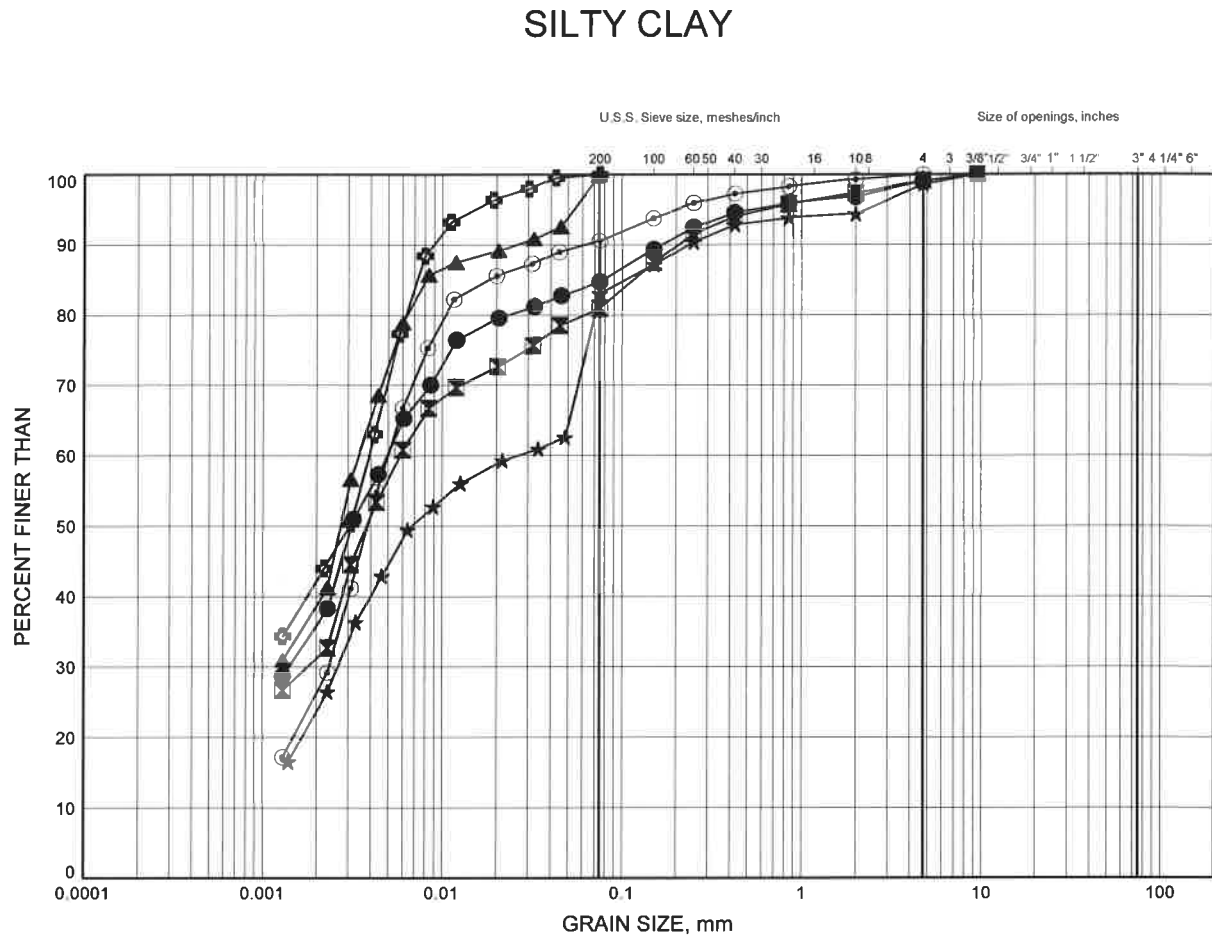
Date August 2013
GWP# 83-00-00



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Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE A6



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C8-02	4.11	230.19
⊠	C8-02	7.92	226.38
▲	SLAT51E-01	3.35	221.55
★	SLAT53W-01	2.59	222.61
⊙	SLAT53W-01	4.11	221.09
⊕	SLAT58W-01	2.59	226.61

GRAIN SIZE DISTRIBUTION - THURBER 1218 GPJ 8/26/13

Date August 2013
GWP# 83-00-00

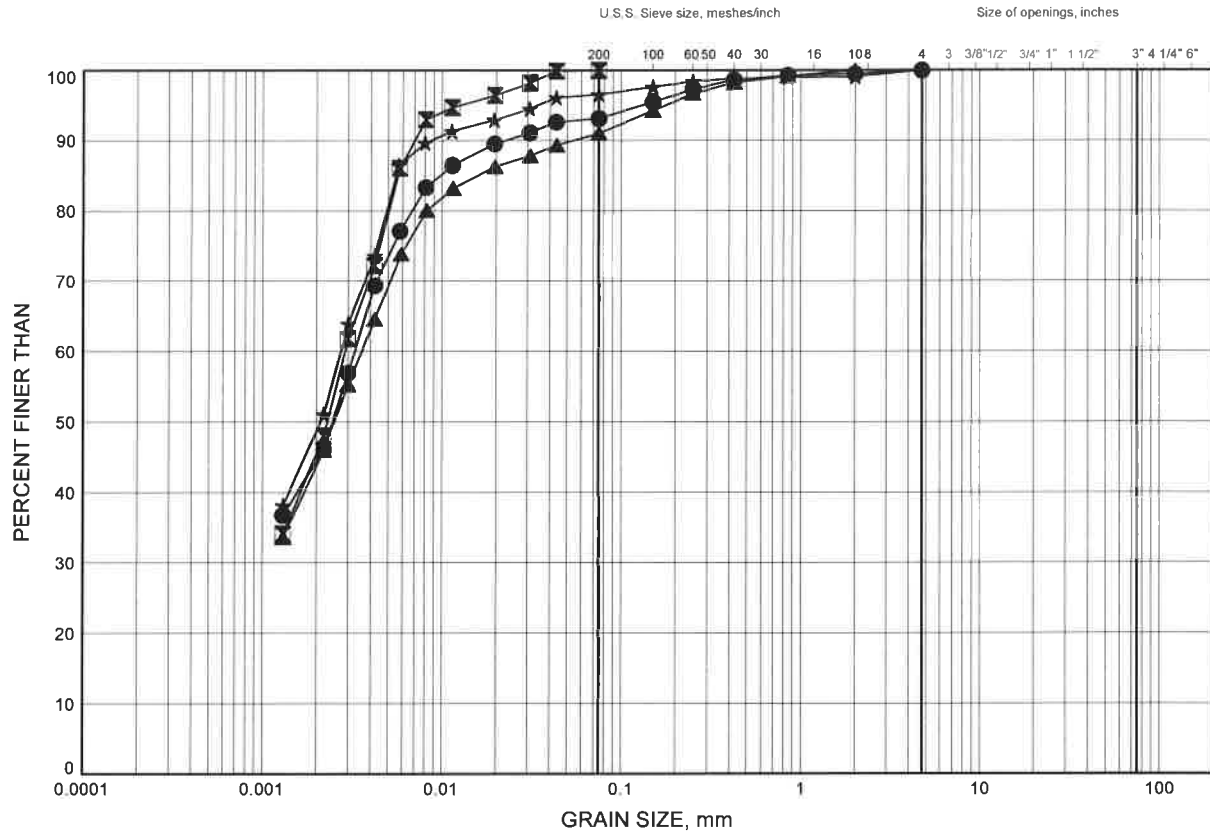


Prep'd AN
Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE A7

SILTY CLAY



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	SLAT58W-01	6.40	222.80
■	SLAT65-01	3.35	227.45
▲	SLAT67-01	1.83	230.67
★	SLAT67-01	3.35	229.15

GRAIN SIZE DISTRIBUTION - THURBER 1218 GPJ 8/13/13

Date August 2013
GWP# 83-00-00

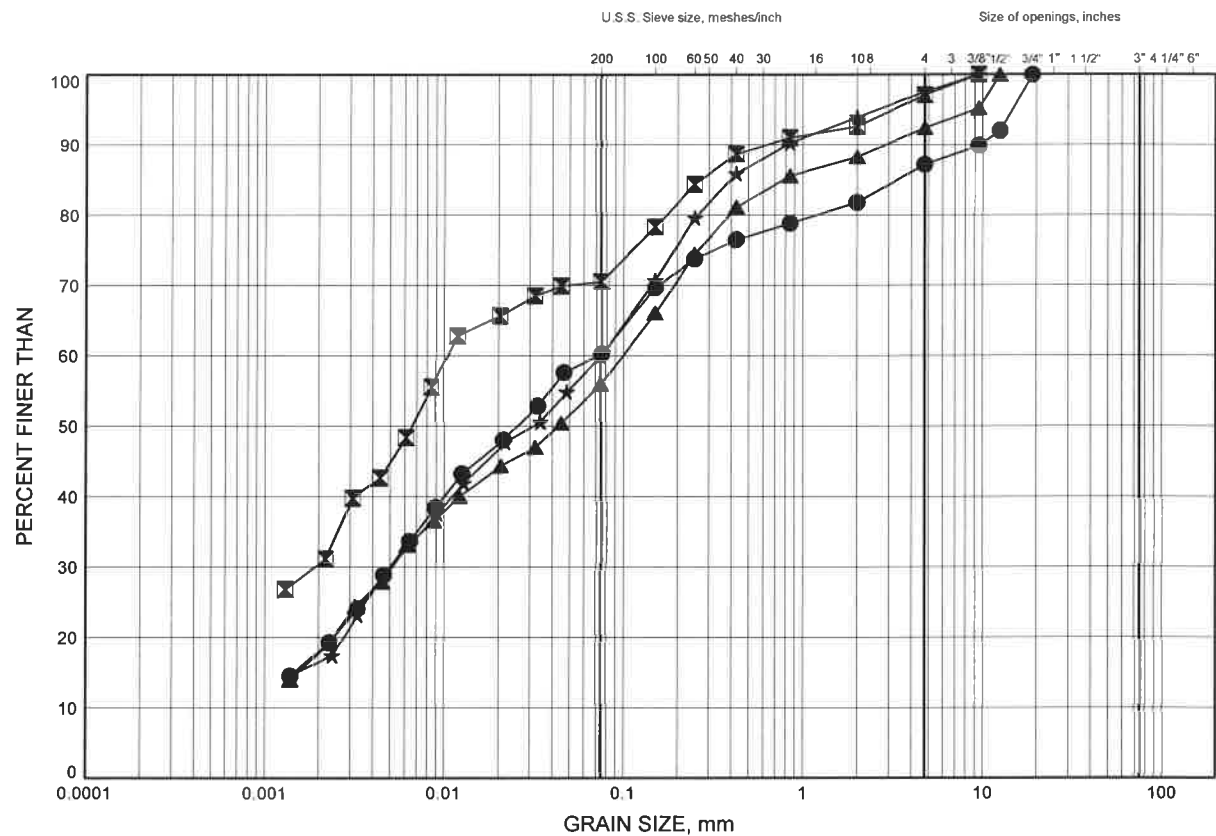


Prep'd AN
Chkd. SKP

Hwy 400 Median Sewer
GRAIN SIZE DISTRIBUTION

FIGURE A8

CLAYEY SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C2-02	4.88	223.12
■	C8-01	1.22	233.18
▲	C8-02	1.07	233.23
★	SLAT62-01	3.35	226.15

GRAIN SIZE DISTRIBUTION - THURBER 1218.GPJ 8/13/13

Date August 2013
 GWP# 83-00-00

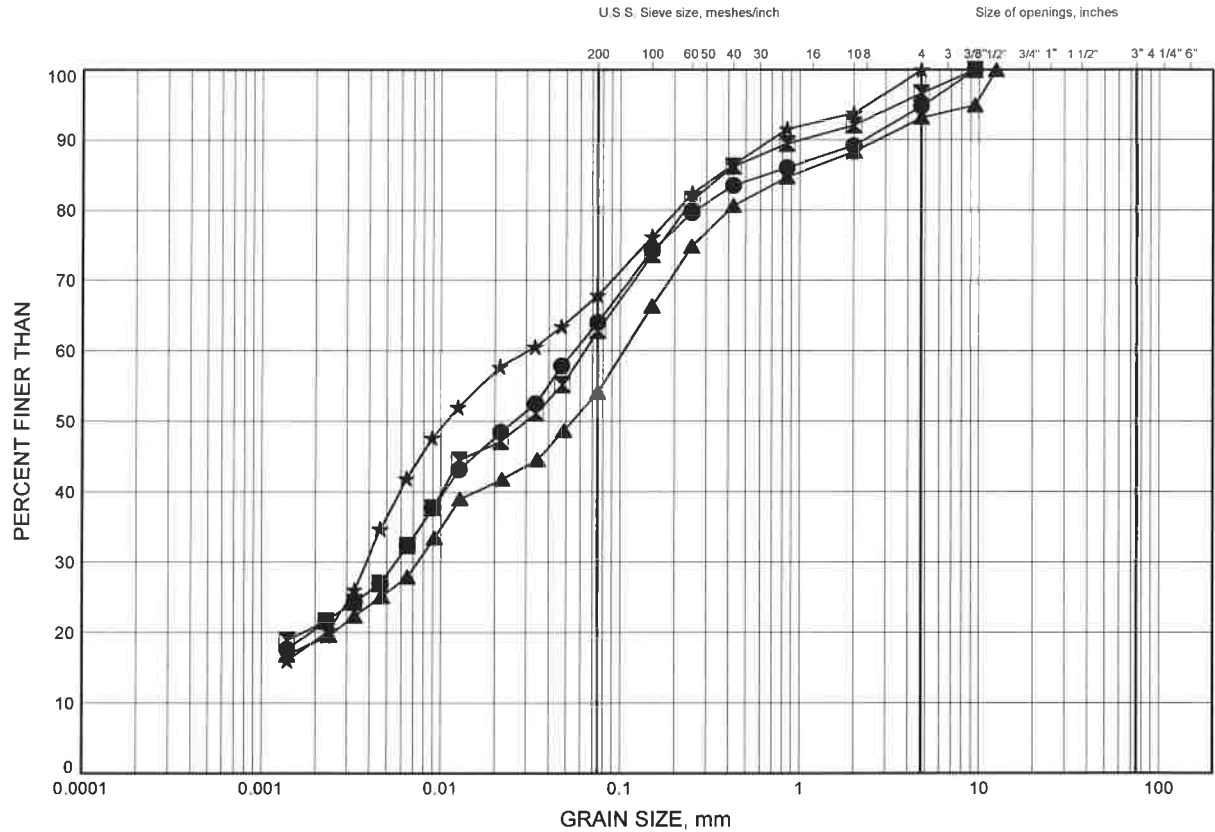


Prep'd AN
 Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE A9

CLAYEY SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C1-01	6.40	224.50
■	C1-02	4.11	226.99
▲	C4-01	4.88	221.52
★	C4-02	6.40	220.10

Date August 2013
GWP# 83-00-00

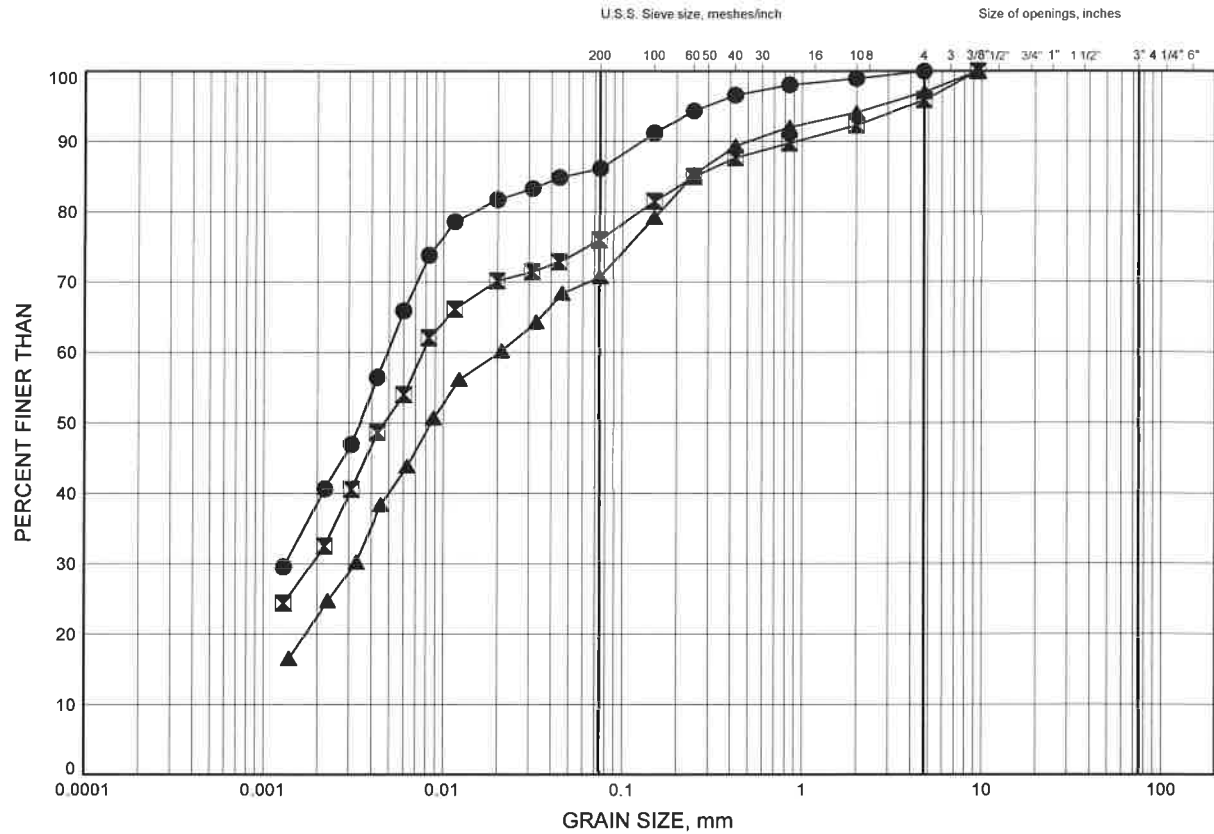


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Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE A10

SILTY CLAY TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	SLAT47W-01	4.11	223.09
⊠	SLAT47W-01	6.40	220.80
▲	SLAT63W-01	12.50	216.60

Date August 2013
GWP# 83-00-00

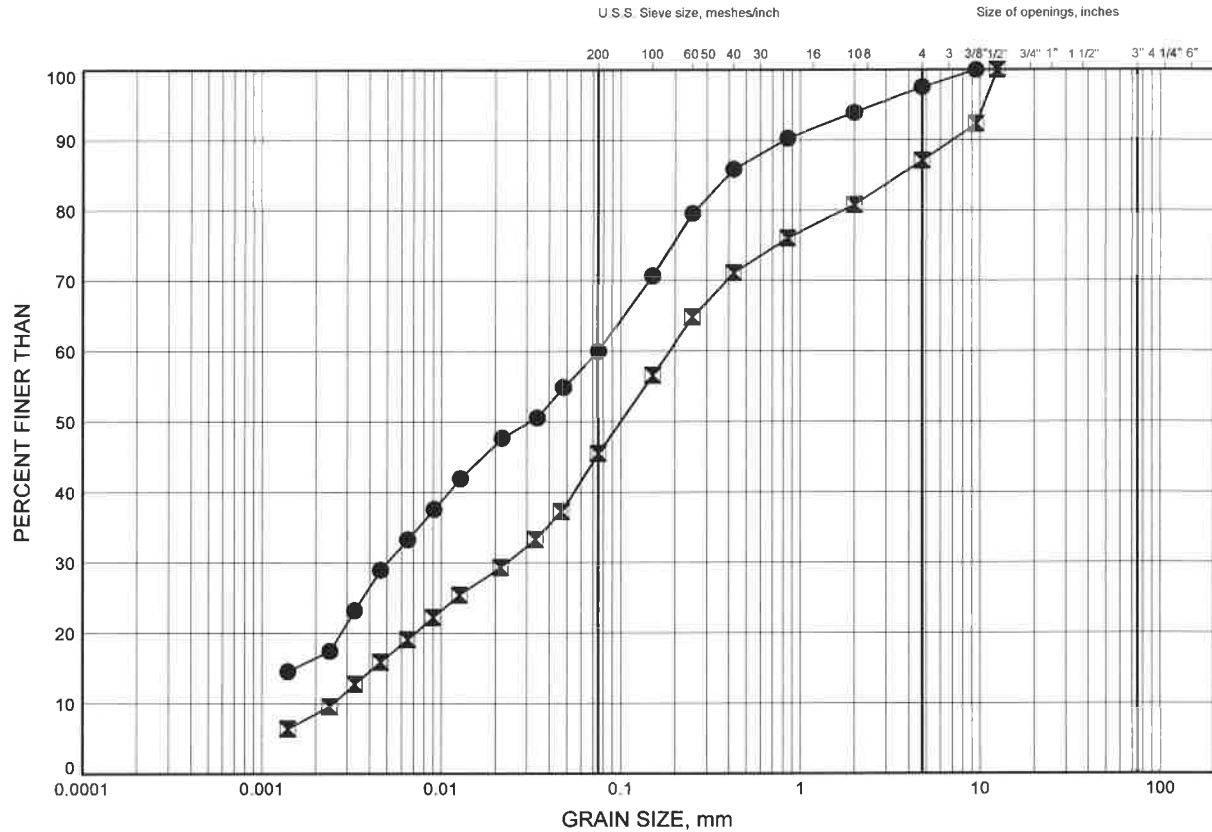


Prep'd AN
Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE A11

SAND & SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	SLAT62-01	3.35	226.15
⊠	SLAT63W-01	4.11	224.99

Date August 2013
GWP# 83-00-00

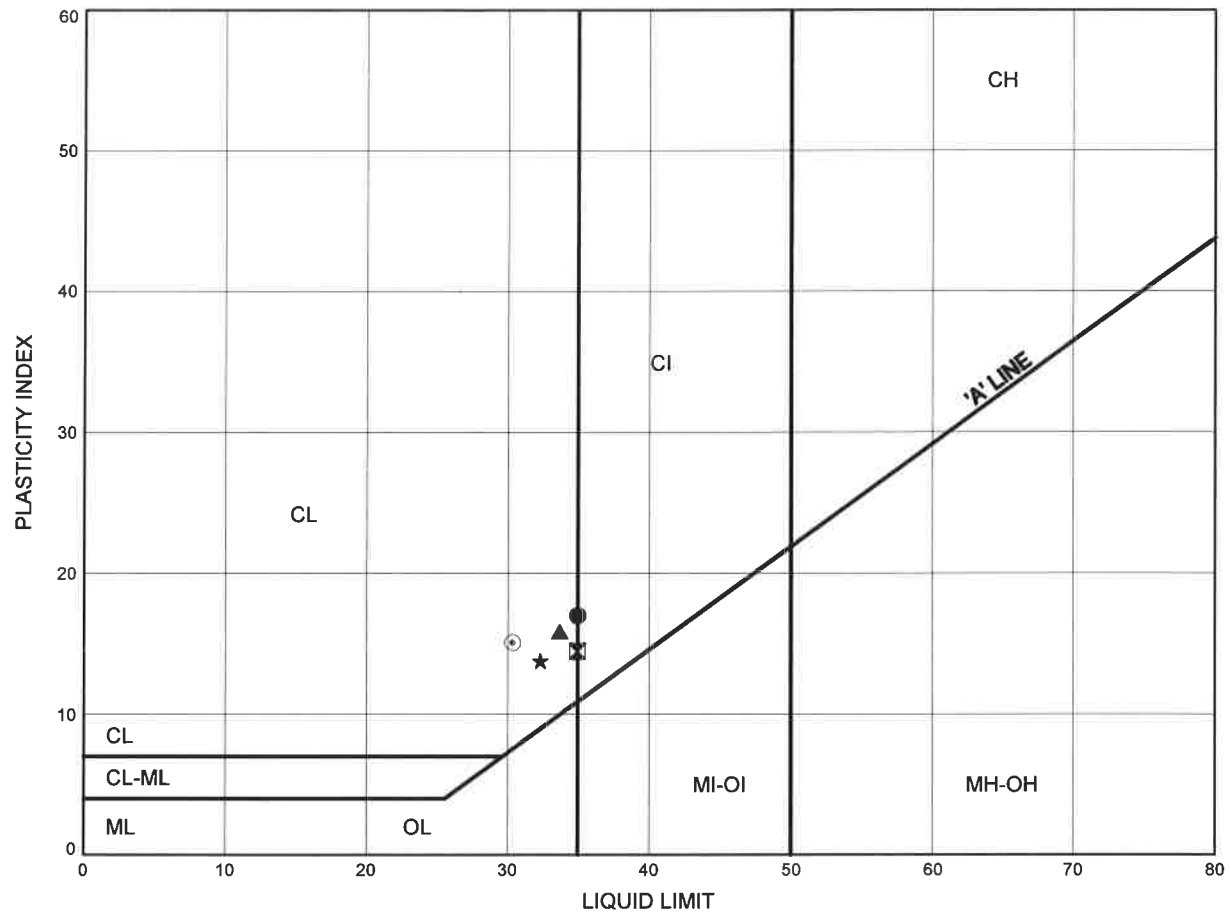


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Chkd. SKP

Hwy 400 Median Sewer ATTERBERG LIMITS TEST RESULTS

FIGURE A12

CLAYEY SILT/SILTY CLAY FILL



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C1-02	1.83	229.27
⊠	C1-02	2.59	228.51
▲	C2-01	1.83	226.47
★	C2-02	3.35	224.65
⊙	C4-01	2.59	223.81

Date August 2013
GWP# 83-00-00

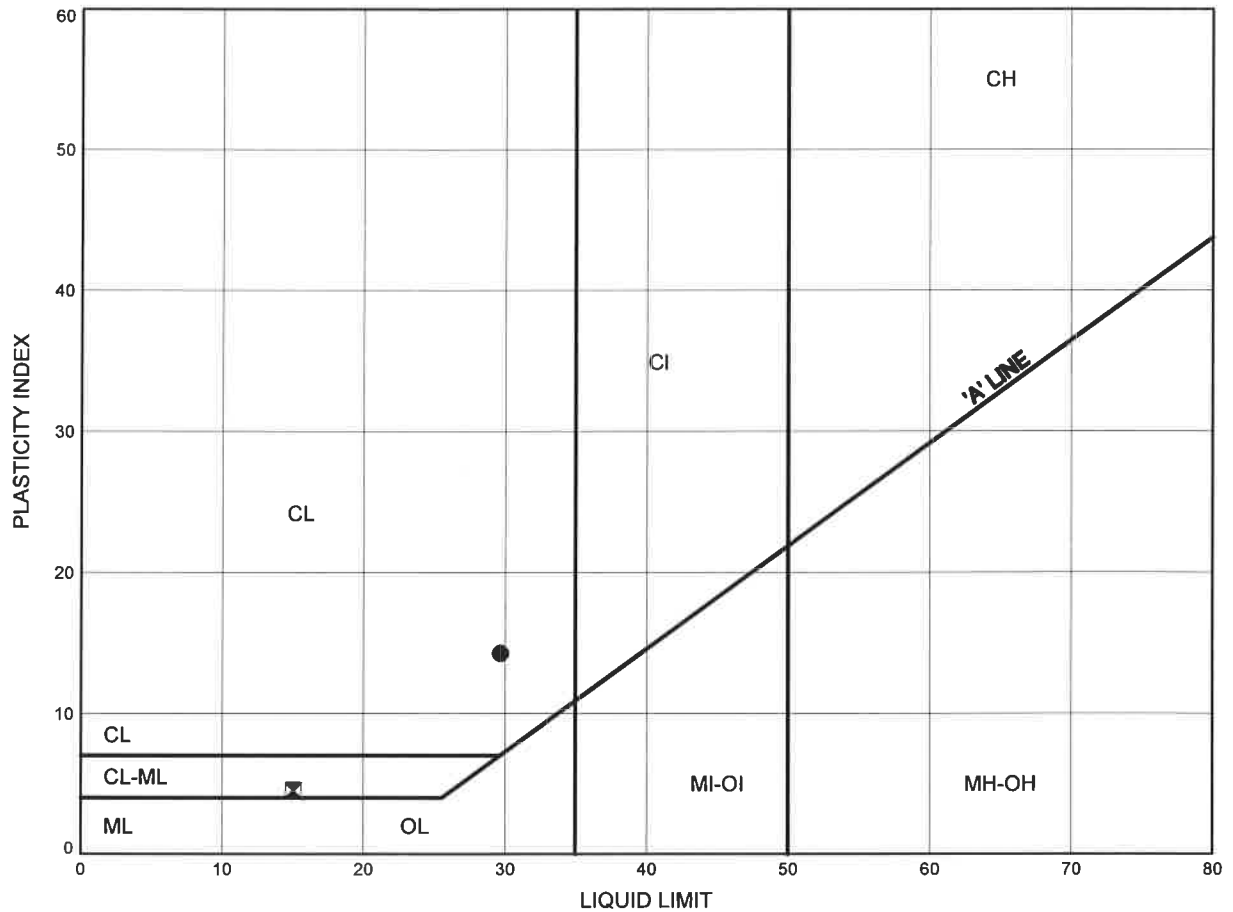


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Chkd. SKP

Hwy 400 Median Sewer ATTERBERG LIMITS TEST RESULTS

FIGURE A13

CLAYEY SILT



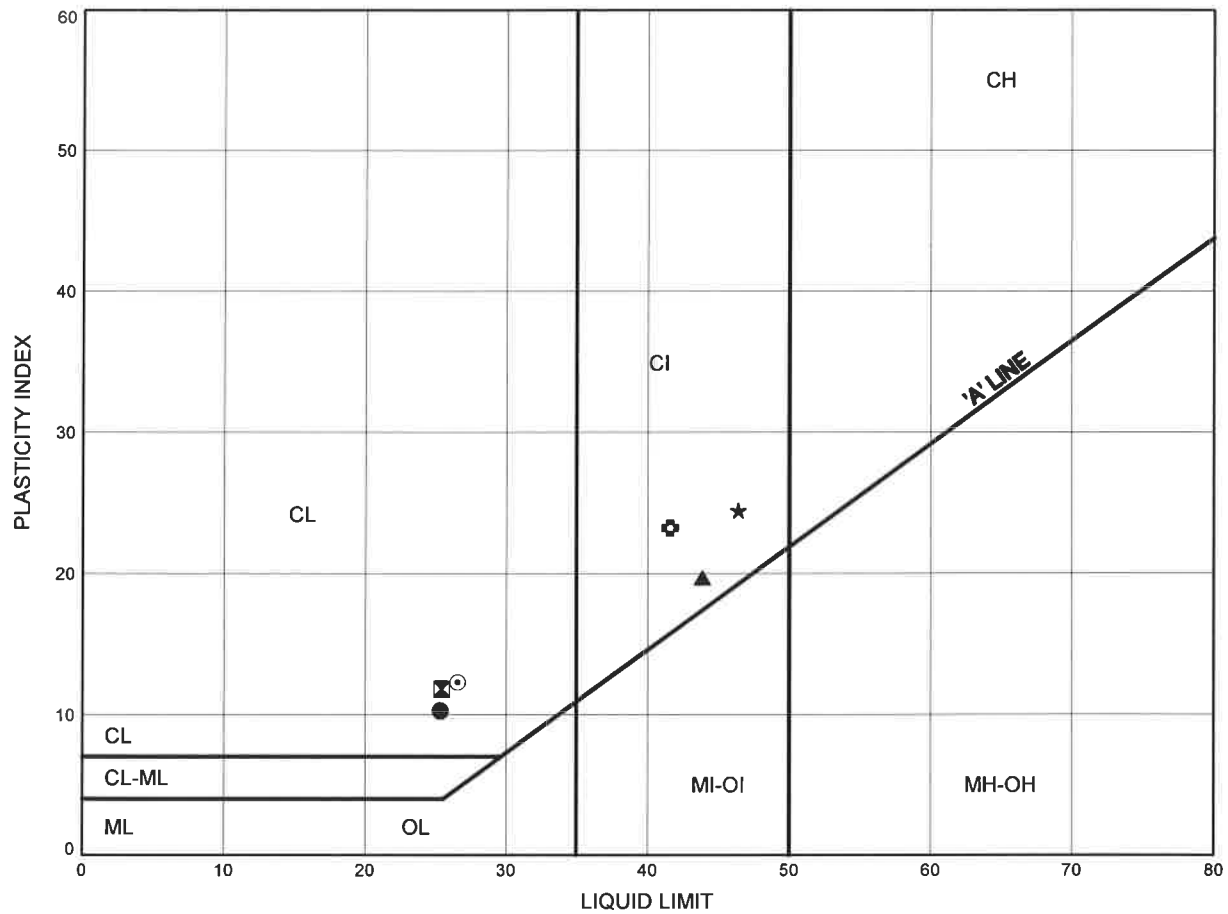
LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C2-02	4.88	223.12
⊠	SLAT62-01	3.35	226.15

Hwy 400 Median Sewer ATTERBERG LIMITS TEST RESULTS

FIGURE A14

SILTY CLAY



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C2-01	9.45	218.85
⊠	C4-02	1.83	224.67
▲	C4-02	3.35	223.15
★	C7-01	3.35	226.55
⊙	C7-01	6.40	223.50
⊕	C8-01	4.11	230.29

Date August 2013
GWP# 83-00-00

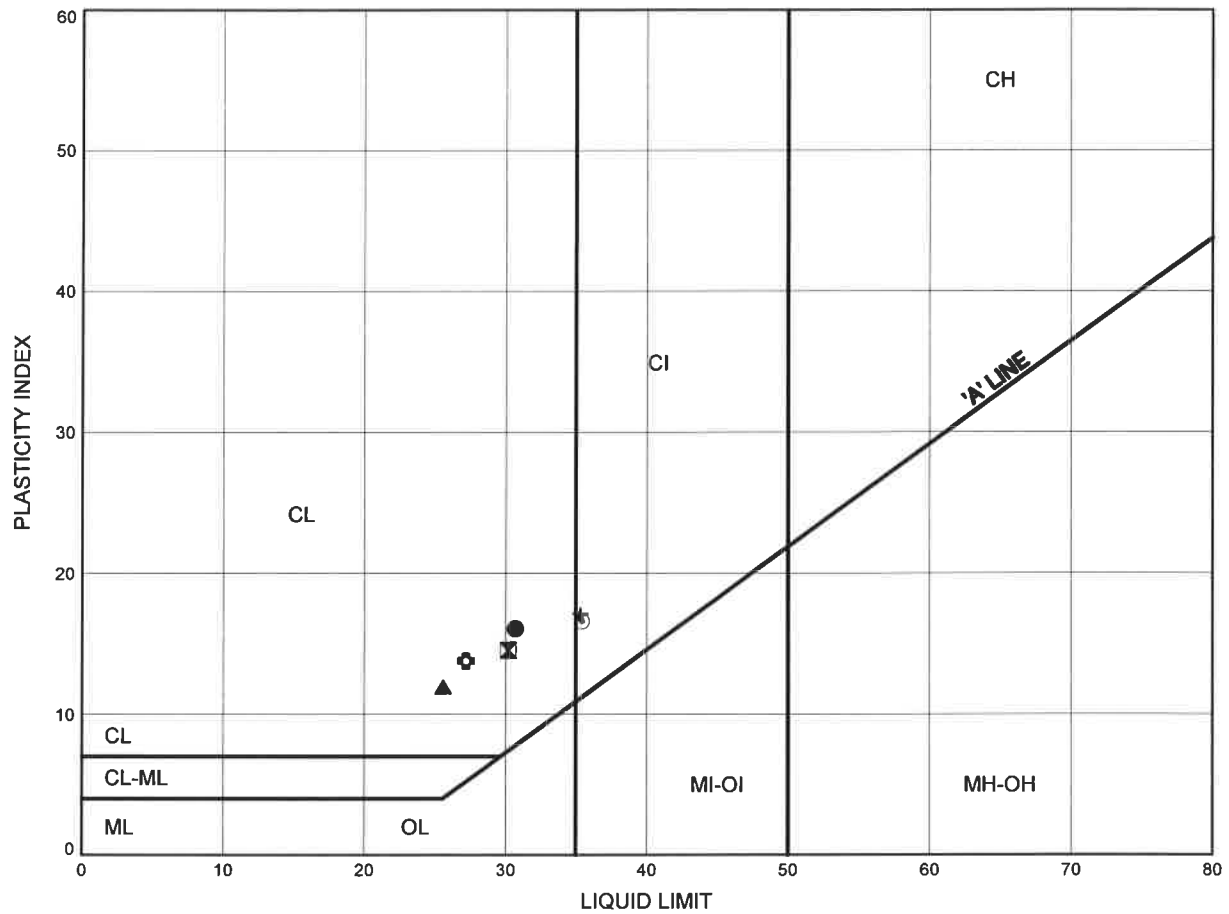


Prep'd AN
Chkd. SKP

Hwy 400 Median Sewer ATTERBERG LIMITS TEST RESULTS

FIGURE A15

SILTY CLAY



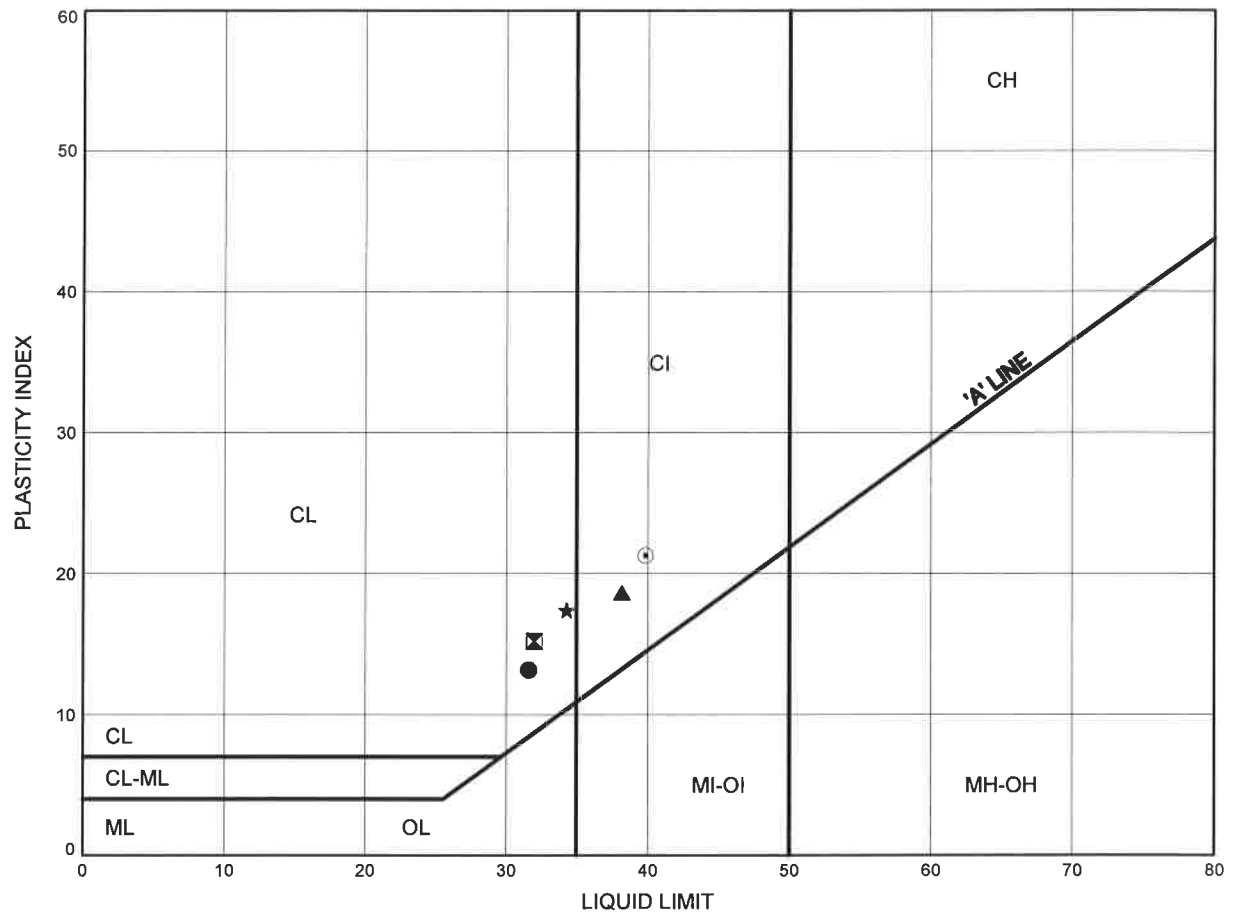
LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C8-01	7.92	226.48
⊠	C8-02	4.11	230.19
▲	C8-02	7.92	226.38
★	SLAT51E-01	3.35	221.55
⊙	SLAT53W-01	2.59	222.61
⊕	SLAT53W-01	3.35	221.85

Hwy 400 Median Sewer ATTERBERG LIMITS TEST RESULTS

FIGURE A16

SILTY CLAY



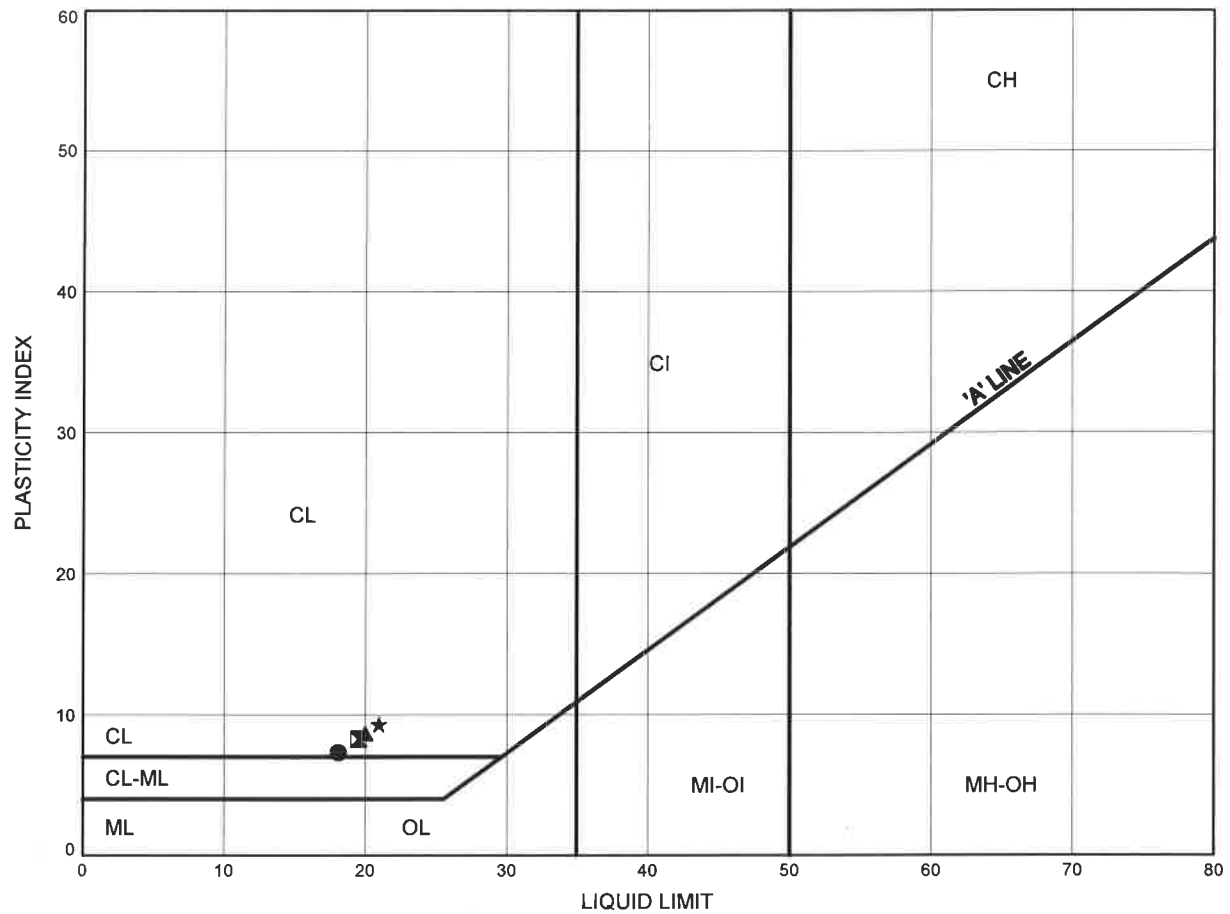
LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	SLAT58W-01	2.59	226.61
⊠	SLAT58W-01	6.40	222.80
▲	SLAT65-01	3.35	227.45
★	SLAT67-01	1.83	230.67
⊙	SLAT67-01	3.35	229.15

Hwy 400 Median Sewer ATTERBERG LIMITS TEST RESULTS

FIGURE A17

CLAYEY SILT TILL



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C1-01	6.40	224.50
⊠	C1-02	4.11	226.99
▲	C4-01	4.88	221.52
★	C4-02	6.40	220.10

Date August 2013
GWP# 83-00-00

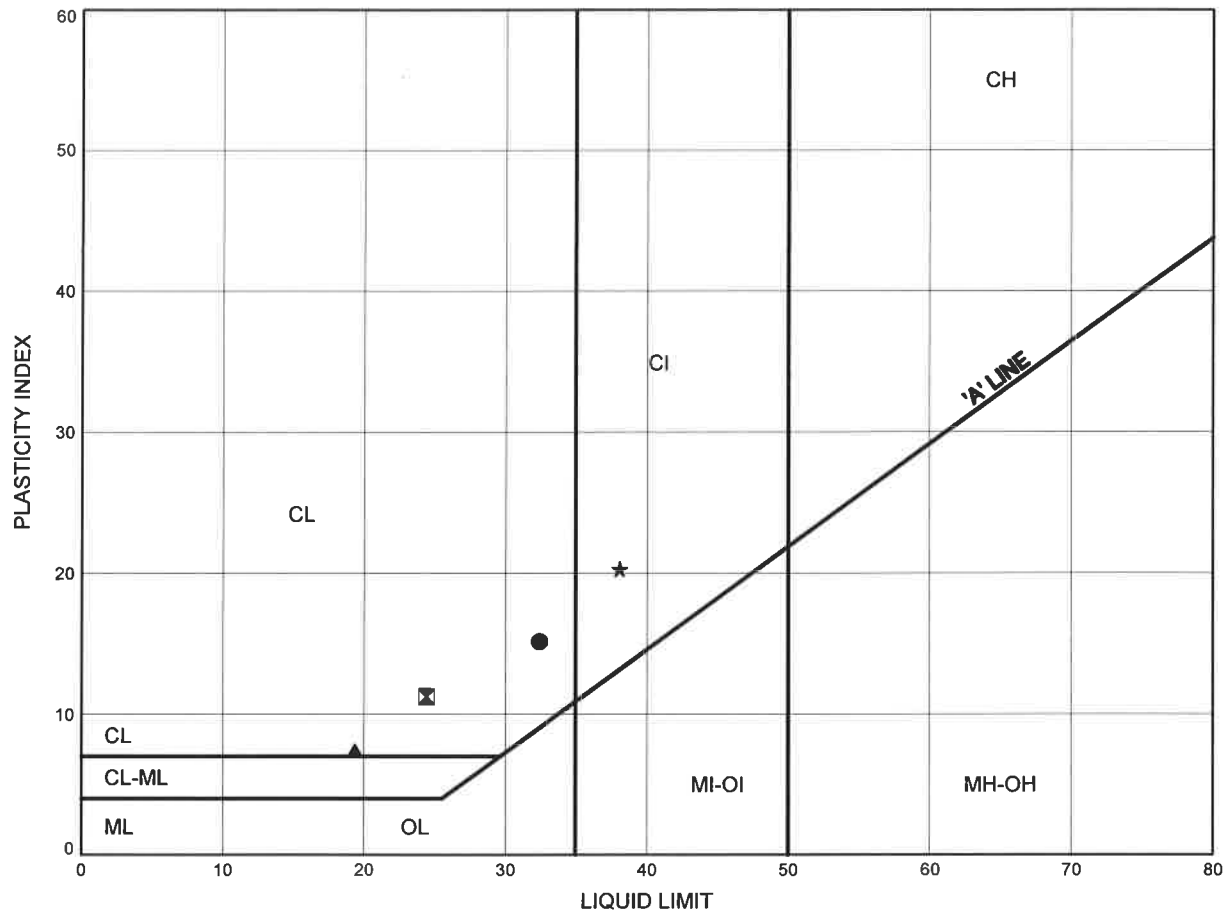


Prep'd AN
Chkd. SKP

Hwy 400 Median Sewer ATTERBERG LIMITS TEST RESULTS

FIGURE A18

SILTY CLAY TILL



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	SLAT47W-01	4.11	223.09
⊠	SLAT47W-01	6.40	220.80
▲	SLAT63W-01	12.50	216.60
★	SLAT83W-01	4.88	243.52

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






CONT No
GWP No 83-00-00
HWY 400 MEDIAN SEWER
MEDIAN SEWER
(STA. 11+600 TO 12+250)
BOREHOLE LOCATIONS AND SOIL STRATA



SHEET



KEYPLAN
LEGEND

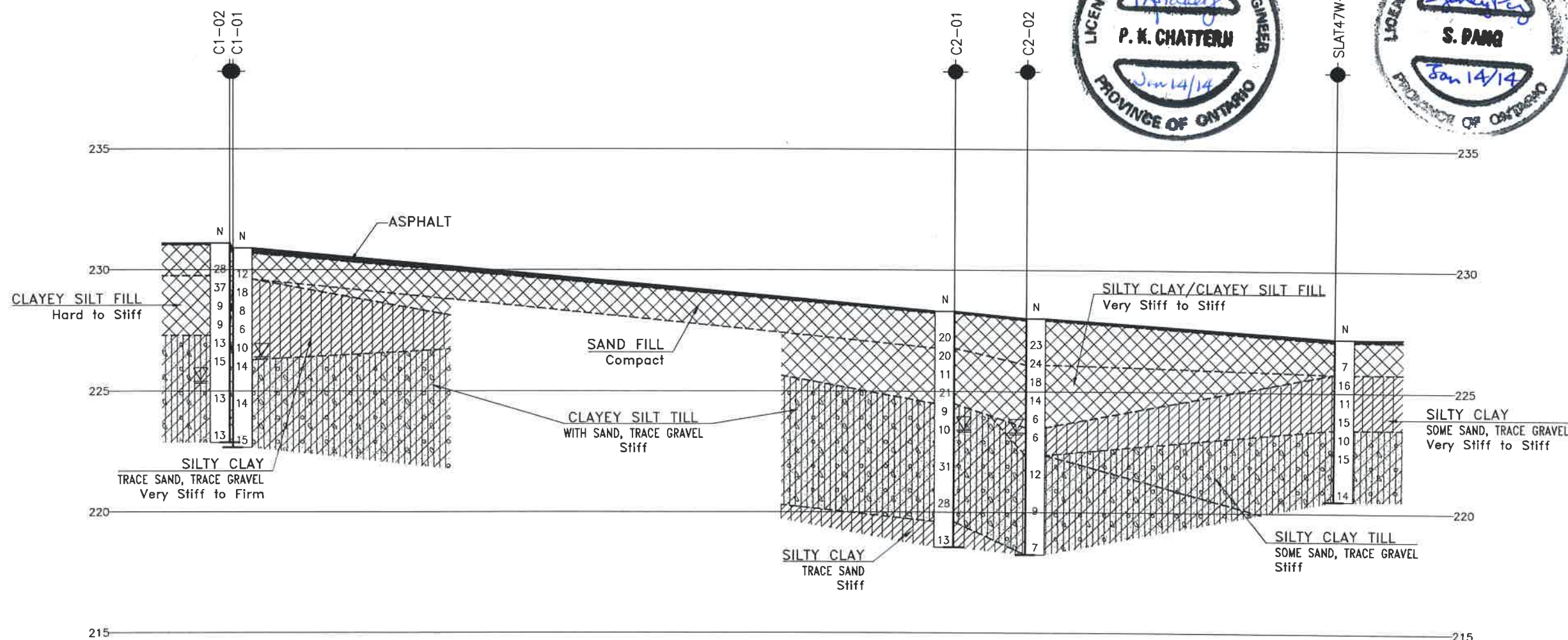
- | | |
|---|---------------------------------------|
|  | Borehole (Current Investigation) |
|  | Borehole (Previous Investigation) |
| N | Blows /0.3m (Std Pen Test, 475J/blow) |
| CONE | Blows /0.3m (60' Cone, 475J/blow) |
| PH | Pressure, Hydraulic |
|  | Water Level |
|  | Head Artesian Water |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

NO	ELEVATION	NORTHING	EASTING
C1-01	230.9	4 880 121.4	295 461.4
C1-02	231.1	4 880 102.9	295 428.5
C2-01	228.3	4 880 436.0	295 262.4
C2-02	228.0	4 880 448.9	295 213.3
SLAT47W-01	227.2	4 880 589.8	295 138.7

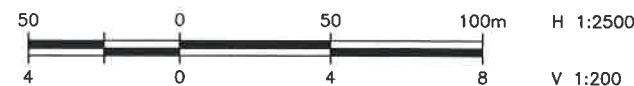
-NOTES-

- 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.

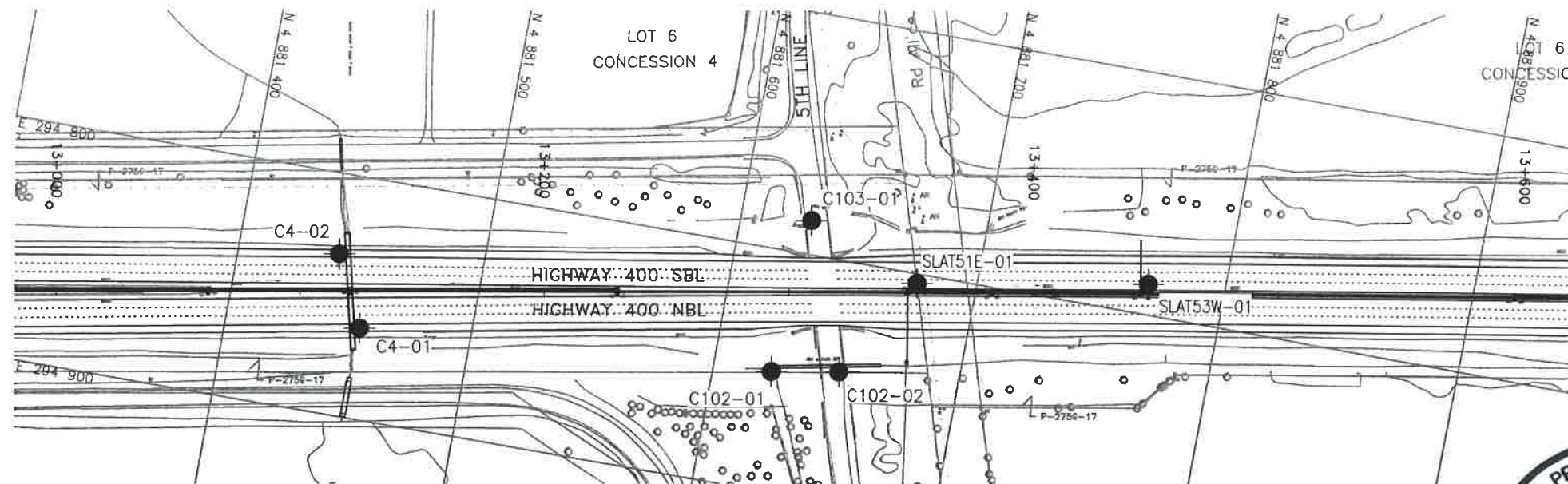
GEOCRES No. 31D-563



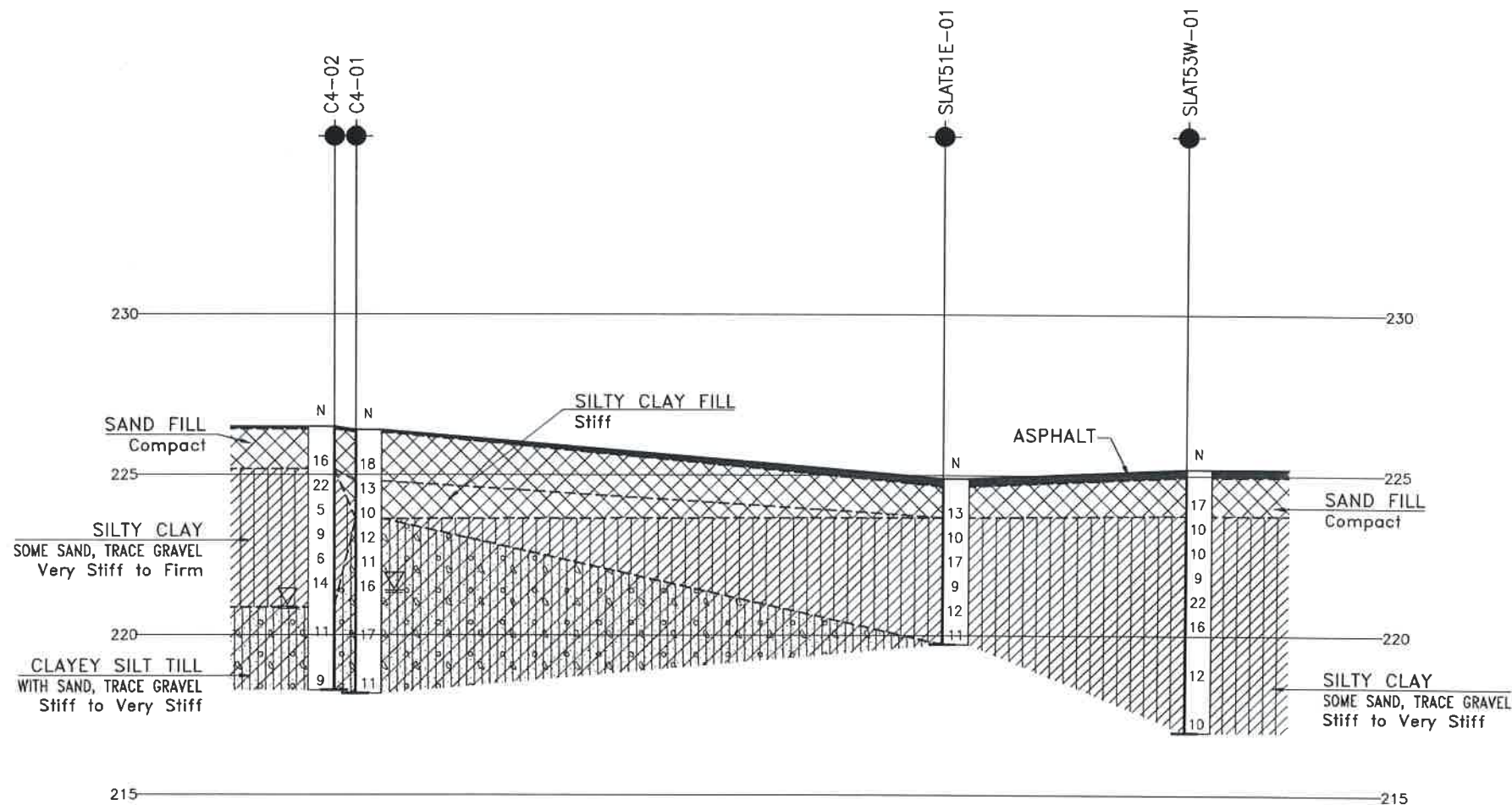
PROFILE ALONG C HWY. 400



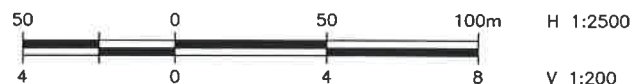
REVISIONS								
	DATE	BY	DESCRIPTION					
DESIGN	SKP	CHK	SKP	CODE	LOAD	DATE NOV. 2013		
DRAWN	AN	CHK	PKC	SITE	STRUCT	DWG	1	



PLAN



PROFILE ALONG ϕ HWY 400



METRIC

DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No
GWP No 83-00-00

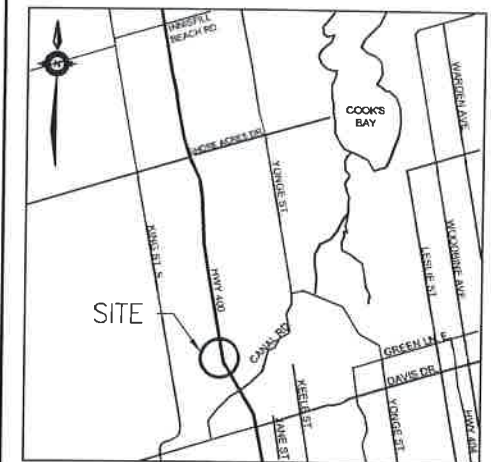
HWY 400 MEDIAN SEWER
MEDIAN SEWER
(STA. 13+000 TO 13+600)
BOREHOLE LOCATIONS AND SOIL STRATA



SHEET



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
- W Water Level
- HA Head Artesian Water
- P Piezometer
- 90% Rock Quality Designation (RQD)
- A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING
C4-01	226.4	4 881 454.7	294 862.3
C4-02	226.5	4 881 441.1	294 833.3
SLAT51E-01	224.9	4 881 675.9	294 810.8
SLAT53W-01	225.2	4 881 768.9	294 787.2

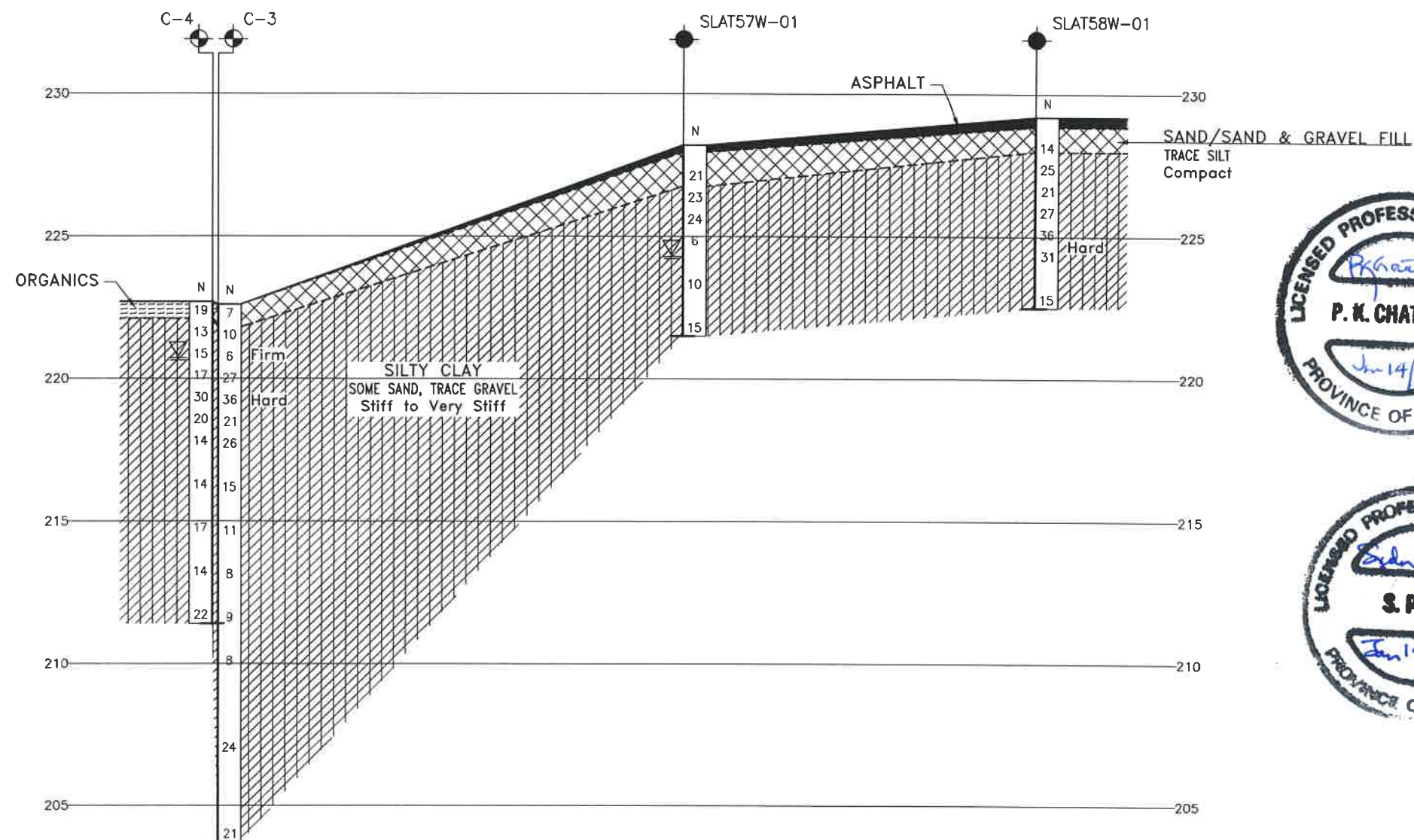
NOTES

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

GEOCRES No. 31D-563

REVISIONS	DATE	BY	DESCRIPTION
DESIGN	SKP	CHK SKP	CODE
DRAWN	AN	CHK PKC	SITE
			LOAD
			DATE
			NOV. 2013
			DWG 2

PLAN



PROFILE ALONG C_L HWY 400



H 1:2500

V 1:200

METRIC

DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No
GWP No 83-00-00

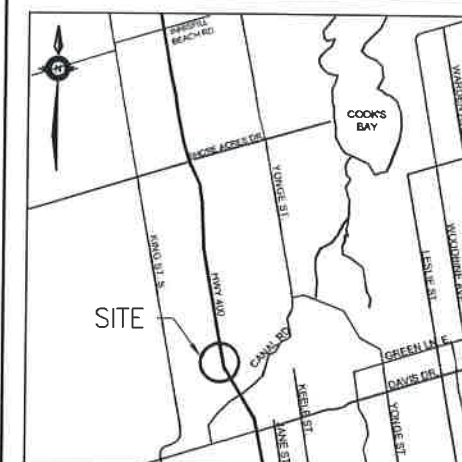
HWY 400 MEDIAN SEWER
MEDIAN SEWER
(STA. 13+700 TO 14+100)
BOREHOLE LOCATIONS AND SOIL STRATA



SHEET








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
SLAT57W-01	228.2	4 882 249.2	294 702.6
SLAT58W-01	229.2	4 882 399.8	294 676.6
C-3	222.6	4 882 055.6	294 769.6
C-4	222.7	4 882 043.3	294 714.2

-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. 31D-563

[illegible]

Appendix B

Sections 5, 6, 7, 8 and 9

(Stations 17+800 West Gwillimbury to 12+600 Innisfil)

RECORD OF BOREHOLE No C14-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 886 087 9 E 294 044 1 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.12 - 2013.05.12 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
255.5 0.0	ASPHALT: (350mm)		1	AS			255							12 59 20 9
255.1 0.4	Gravelly SAND Brown Moist (FILL)		2	SS	19		254							
254.7 0.8	Silty SAND, trace clay Compact Brown Moist		3	SS	12		253							0 21 60 19
254.0 1.5	Clayey SILT, some sand Stiff Brown Moist		4	SS	9		252							Split spoon wet
251.8 3.7	Silty CLAY, trace sand, oxidation stains throughout Very Stiff Brown/Grey Moist		5	SS	13		251							0 7 65 28
			6	SS	24		250							
			7	SS	24		249							
248.8 6.7	END OF BOREHOLE AT 6.1m. BOREHOLE OPEN AND WATER LEVEL AT BOTTOM UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m THEN ASPHALT TO SURFACE.		8	SS	22									

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/7/13

RECORD OF BOREHOLE No C14-02

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 886 058.4 E 294 020.7 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013 05 13 - 2013 05 13 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
255.3								20 40 60 80 100						
0.0	ASPHALT: (350mm)													
254.9			1	AS			255							
0.4	Gravelly SAND, trace silt													
254.5	Brown													
0.8	Moist (FILL)													
	Silty SAND, trace gravel, trace to some clay		1	SS	34		254							
253.7	Dense Brown Moist													
1.6	Clayey SILT, with sand Very Stiff to Stiff Brown Moist		2	SS	20		253							0 40 41 19
			3	SS	10									
252.2														
3.1	Silty CLAY, some sand Stiff to very Stiff Brown Moist		4	SS	12		252							
			5	SS	19		251							Split spoon wet
			6	SS	16		250							0 19 45 36
	Brown/Grey		7	SS	21		249							
248.6														
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO 6.7m AND WATER LEVEL AT 3.6m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m THEN ASPHALT TO SURFACE.													

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 9/7/13

RECORD OF BOREHOLE No SLAT18-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 886 540.9 E 293 952.2 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 05 07 - 2013 05 07 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L		
263.0	ASPHALT: (350mm)		1	AS			263						
262.6													
0.4	Gravelly SAND, trace silt Grey (FILL)												
262.2													
0.8	SAND, some silt, trace gravel Compact Brown Moist (FILL)		1	SS	29		262						7 82 11 (SI+CL)
261.5													
1.5	SILT, trace to some sand Compact Brown Moist (FILL)		2	SS	12		261						
			3	SS	13								
260.0							260						
3.0	SAND and SILT, some clay, trace gravel Loose to Compact Brown Moist		4	SS	7								6 52 30 12
			5	SS	11		259						Split spoon wet
			6	SS	12		258						
256.9							257						
6.1	Clayey SILT, some sand, trace gravel Stiff Brown Wet		7	SS	10								
256.3													
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO 5.5m WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CONCRETE AND CUTTINGS TO 0.15m, THEN ASPHALT COLD PATCH TO SURFACE.												

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO), GDT 8/26/13

RECORD OF BOREHOLE No SLAT23W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 886 834.2 E 293 895.5 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.09 - 2013.05.09 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
270.5	ASPHALT: (350mm)												
0.0													
270.1			1	AS									7 90 3
0.4	SAND, trace gravel, trace silt Brown Moist (FILL)												(SI+CL)
269.7													
0.8													
	Silly SAND Compact Brown Moist		1	SS	13								
			2	SS	12								
268.2													
2.3	SAND and SILT, trace to some silt and clay Loose Brown Moist		3	SS	9								0 45 39 16
			4	SS	5								
			5	SS	7								
			6	SS	7								
264.9													
5.6	Compact												
			7	SS	22								Split spoon wet
263.8													
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO BOTTOM AND WATER LEVEL AT 6.1m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m THEN ASPHALT TO SURFACE.												

ONTMT4S 1218.GPJ 2012TEMPLATE(MTO).GDT 8/7/13

METRIC

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT 	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES		SHEAR STRENGTH kPa						WATER CONTENT (%)		
							○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE					w _p	w	w _L
278.0 0.0	ASPHALT: (325mm)														
277.6 0.4	Gravelly SAND Brown Moist		1	AS											
277.1 0.9	Sandy SILT, trace gravel, trace clay Dense Brown Moist		1	SS	33										
			2	SS	65								Gravel in split spoon		
275.8 2.2	Clayey SILT, with sand, trace gravel Very Stiff Brown Moist		3	SS	25								1 48 33 18		
			4	SS	24										
			5	SS	17								1 42 37 20		
273.5 4.5	SAND and SILT, trace gravel, trace clay Loose to Compact Brown Moist		6	SS	7										
271.3 6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO 6.1m AND WATER LEVEL AT 6.0m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m THEN ASPHALT TO SURFACE.		7	SS	28								Split spoon wet 6 52 32 10		

+ 3 × 3: Numbers refer to Sensitivity

RECORD OF BOREHOLE No C17-02

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 887 194.1 E 293 820.1 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 05 13 - 2013 05 13 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa			WATER CONTENT (%)								
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE											
278.2							20	40	60	80	100	20	40	60	GR	SA	SI	CL	
0.0	ASPHALT: (300mm)		1	AS															
277.9																			
0.3	Gravelly SAND Brown Moist (FILL)		1	SS	35														
277.3																			
0.9	SAND and SILT, some clay, trace gravel Dense to Compact Brown Moist		2	SS	20											5	49	33	13
			3	SS	24														
275.2																			
3.0	Gravelly, trace clay		4	SS	19											33	37	22	8
274.5			5	SS	30														
3.7			6	SS	14														No sample recovery
			7	SS	11														
271.5																4	51	32	13
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO 6.1m AND WATER LEVEL AT 5.9m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m THEN ASPHALT TO SURFACE.																		

ONTMT4S 1218.GPJ 2012TEMPLATE(MTO).GDT 8/7/13

RECORD OF BOREHOLE No SLAT30W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 887 412.1 E 293 792.8 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.09 - 2013.05.09 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
279.8														
0.0	ASPHALT: (325mm)		1	AS										33 63 4 (SI+CL)
279.4														
0.4	SAND and GRAVEL, trace silt Moist (FILL)													
278.9														
0.9	Clayey SILT, trace sand Firm Brown Moist		1	SS	7									
278.3														
1.5	Silty CLAY, trace gravel Stiff to Very Stiff Brown Moist		2	SS	14									
			3	SS	17									
276.7														
3.1	Clayey SILT, trace sand, oxidation Very Stiff to Hard Brown Moist		4	SS	17									
			5	SS	21									
			6	SS	32									Split spoon wet
273.1	Auger head disconnected and left at bottom of hole (retrieval attempts unsuccessful)													
6.7	END OF BOREHOLE AT 6.8m. BOREHOLE OPEN TO BOTTOM WITH WATER AT BOTTOM UPON COMPLETION BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 3.0m, CUTTINGS TO 1.5m THEN ASPHALT COLD PATCH TO SURFACE.													

ONTMT4S 1218.GPJ 2012TEMPLATE(MTO).GDT 8/7/13

RECORD OF BOREHOLE No SLAT31E-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 887 531.1 E 293 777.5 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 05 07 - 2013 05 07 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE		WATER CONTENT (%) w _P w w _L				
280.8							20 40 60 80 100							
0.0	ASPHALT: (350mm)		1	AS										
280.4														
0.4	SAND, trace silt, trace gravel Brown Moist (FILL)		1	SS	17		280							5 88 7 (SI+CL)
279.8														
1.0	SAND and SILT, some clay, trace gravel Compact Brown Moist		2	SS	19		279							
			3	SS	19		278							4 52 31 13
			4	SS	20		277							
			5	SS	18		276							
			6	SS	21		275							
			7	SS	10									Split spoon wet
274.1														
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CONCRETE AND CUTTINGS TO 0.15m, THEN ASPHALT COLD PATCH TO SURFACE.													

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/26/13

METRIC

[illegible]

+ 3 × 3: Numbers refer to Sensitivity

RECORD OF BOREHOLE No SLAT59-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 889 951.1 E 293 410.9 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.07 - 2013.05.07 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
308.1												
0.0	ASPHALT: (200mm)											
0.2	SAND, some gravel Brown Moist (FILL) Dense		1	AS			308					
			1	SS	34		307					
306.7												
1.4	Silty SAND, trace gravel Very Dense Brown Moist (TILL)		2	SS	65		306					
			3	SS	100							
	Some gravel Wet		4	SS	50/ 0.100		305					Spill spoon wet
							304					
303.3			5	SS	50/ 0.100							
4.8	END OF BOREHOLE AT 4.8m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 3.0m, CUTTING MIXED WITH HOLEPLUG TO 1.5m, CONCRETE TO 0.15m, THEN ASPHALT COLD PATCH TO SURFACE.											

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO) GDT 8/26/13

RECORD OF BOREHOLE No SLAT64-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 890 134 8 E 293 396.4 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.07 - 2013.05.07 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
303.9												
0.0	ASPHALT: (150mm)											
0.2	SAND, some gravel Brown Moist (FILL) Compact		1	AS								
			1	SS	23		303					
			2	SS	17		302					
301.7												
2.2	Sandy SILT, trace gravel Dense to Very Dense Grey Moist (TILL)		3	SS	100/ 0.275		301					
			4	SS	43							
			5	SS	50/ 0.125		300					
			6	SS	86/ 0.100		299					
							298					
297.6			7	SS	50/ 0.050							
6.3	END OF BOREHOLE AT 6.3m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTING MIXED WITH BENTONITE HOLEPLUG TO 1.5m, CONCRETE TO 0.15m, THEN ASPHALT COLD PATCH TO SURFACE.											

ONTM74S 1218 GPJ 2012 TEMPLATE(MTO) GOT 8/28/13

RECORD OF BOREHOLE No SLAT68-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 890 297.6 E 293 394.1 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.07 - 2013.05.07 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60	W _P W W _L	WATER CONTENT (%)	GR SA SI CL		
299.1														
0.0	ASPHALT: (150mm)													
0.2	SAND, trace silt Compact Grey Moist (FILL)		1	AS			299							
			1	SS	17		298							
297.7														
1.4	Gravelly SAND, trace to some silt Dense Brown Moist (FILL)		2	SS	45		297							29 59 12 (SI+CL)
296.9														Resistance to augering
2.2	Silty SAND, trace gravel, trace to some clay Dense to Very Dense Grey Wet (TILL)		3	SS	38		296							2 59 29 10 Split spoon wet
			4	SS	100/ 0.175		295							
			5	SS	100/ 0.275									2 63 25 10
			6	SS	105									
294.1														
5.0	END OF BOREHOLE AT 5.0m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 3.0m, CUTTING MIXED WITH HOLEPLUG TO 1.5m, CONCRETE TO 0.15m, THEN ASPHALT COLD PATCH TO GROUND SURFACE.													

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO) GDT 8/26/13

RECORD OF BOREHOLE No SLAT72-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 890 470.4 E 293 385.1 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.07 - 2013.05.07 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT w _P	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE								
294.0							20	40	60	80	100					
0.0	ASPHALT: (450mm)		1	AS												GR SA SI CL
293.5																
0.5	Gravelly SAND Brown															20 76 4 (SI+CL)
293.1	Moist (FILL)		1	SS	32											
0.9	SILT, some sand, some clay, occasional oxidation stains Very Dense Brown Moist (TILL)		2	SS	69											0 13 76 11
			3	SS	91											
			4	SS	99/ 0.280											0 21 68 11
			5	SS	94											
289.6																
4.4	END OF BOREHOLE AT 4.4m BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS, CONCRETE AND COLD PATCH TO GROUND SURFACE.															

RECORD OF BOREHOLE No NLAT51E-01

1 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 896 966.1 E 291 992.3 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.26 - 2013.05.26 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	WATER CONTENT (%)			
								20 40 60 80 100	20 40 60			
231.4												
0.0	ASPHALT: (350mm)		1	AS								
231.0												
0.4	SAND, some gravel, some silt and clay Compact Brown Moist (FILL)		1	SS	19							10 75 15 (SI+CL)
229.9												
1.5	Silly CLAY, with sand Firm to Stiff Brown Moist		2	SS	5							0 31 39 30
			3	SS	8							
	Wet		4	SS	10							Split spoon wet
227.7												
3.7	Very Stiff		5	SS	26							0 4 52 44
			6	SS	24							
			7	SS	18							
			8	SS	16							
										</		

Continued Next Page

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

RECORD OF BOREHOLE No NLAT51E-01

2 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 896 966 1 E 291 992 3 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.26 - 2013.05.26 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE							
	Continued From Previous Page							20 40 60 80 100				20 40 60			
	BOREHOLE OPEN TO 9.1m AND WATER LEVEL AT 8.5m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m THEN ASPHALT COLD PATCH TO SURFACE.														

RECORD OF BOREHOLE No NLAT07E-01

1 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 897 294 2 E 291 930 3 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.27 - 2013.05.27 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	
233.0							233					
0.0	ASPHALT: (200mm)											
0.2	SAND, some to trace gravel, trace silt Compact Brown Moist (FILL)		1	AS								
			1	SS	18		232					8 84 8 (SI+CL)
231.3												
1.7	Silty SAND, trace clay, trace gravel Loose Brown to Grey Moist (FILL)		2	SS	7		231					
230.7												
2.3	Clayey SILT, with sand, some organics, roots and rootlets Firm Dark Brown Moist		3	SS	6							0 35 48 17
230.1							230					Split spoon wet
2.9	SAND and SILT, trace gravel, trace clay Loose to Compact Grey Moist		4	SS	6							
			5	SS	9		229					8 36 47 9
			6	SS	19		228					
227.4												
5.6	Sandy SILT, some clay Compact to Very Dense Grey Wet to Moist		7	SS	11		227					
							226					
			8	SS	39		225					
							224					
223.2			9	SS	53							
9.8	END OF BOREHOLE AT 9.8m.											

Continued Next Page

+ 3 x 3: Numbers refer to
Sensitivity




20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NLAT07E-01

2 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 897 294.2 E 291 930.3 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.27 - 2013.05.27 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT  SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT  W _P W W _L WATER CONTENT (%)	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										
	BOREHOLE OPEN TO 6.4m AND WATER LEVEL AT 3.3m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.9m, CEMENT TO 0.2m, ASPHALT TO SURFACE.										

RECORD OF BOREHOLE No NLAT06-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 897 402.2 E 291 909.6 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.27 - 2013.05.27 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)			
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE							W _P	W	W _L	GR
							20	40	60	80	100	20	40	60				
234.5																		
0.0	ASPHALT: (215mm)																	
0.2	SAND and GRAVEL, trace to some silt Compact Brown Moist (FILL)		1	AS			234										33 55 12 (SI+CL)	
			1	SS	22													
233.0																		
1.5	Silty SAND, some clay, trace gravel Dense Brown Moist (TILL)		2	SS	34		233										3 60 21 16	
			3	SS	42		232											
231.5																		
3.0	Compact Grey		4	SS	28		231										2 58 24 16	
230.8																		
3.7	Very Dense		5	SS	67		230											
			6	SS	50													
							229											
	Moist		7	SS	69		228											
227.8																		
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.8m, CEMENT TO 0.2m, ASPHALT TO SURFACE.																	

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/26/13

RECORD OF BOREHOLE No C47-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 897 526.4 E 291 897.1 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.31 - 2013.05.31 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					w _p w w _L		
236.8							20 40 60 80 100								
0.0	ASPHALT: (200mm)														
0.2	Gravelly SAND, trace silt Brown Moist (FILL)		1	AS											
236.0															
0.8	Sandy SILT, some clay, trace gravel Compact Brown Moist		1	SS	18										
235.3															
1.5	Silty SAND, trace gravel, trace clay Compact Brown Moist		2	SS	18										
234.5															
2.3	Clayey SILT, trace sand, organic staining Firm Brown Moist		3	SS	5										
233.7															
3.1	Silty CLAY, some sand, trace gravel Stiff Brown/Grey Moist		4	SS	15										
			5	SS	10										
232.2															
4.6	Clayey SILT, trace sand, trace gravel Very Stiff Brown Moist (TILL)		6	SS	16										
230.7															
6.1	Silty SAND, some clay, trace gravel Compact Brown Moist to Wet (TILL)		7	SS	15										
			8	SS	22										
228.6															
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE OPEN TO 7.6m AND WATER LEVEL AT 4.3m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m THEN ASPHALT TO SURFACE														

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/7/13

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

RECORD OF BOREHOLE No C47-02

1 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 897 512.7 E 291 871.2 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.31 - 2013.05.31 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					
236.6								20 40 60 80 100					
0.0	ASPHALT: (200mm)												
0.2	SAND, some gravel Compact Brown Moist (FILL)		1	AS			236						
235.6													
1.0	Silly SAND, some clay, trace gravel Compact to Loose Brown Moist (FILL)		1	SS	13								6 57 24 13
			2	SS	13		235						
			4	SS	6		234						Split spoon wet
233.6													
3.0	SAND and SILT, some clay, trace gravel Compact Dark Grey to Grey Moist to Wet Sand layer from 3.5m to 3.9m		5	SS	11		233						
			6	SS	8								4 44 41 11
			7	SS	11		232						
231.0													
5.6	Silly SAND, trace gravel, trace clay Compact Grey Moist (TILL)		8	SS	19		231						
							230						
			9	SS	25		229						
							228						
226.8			10	SS	26		227						3 59 29 9
9.8	END OF BOREHOLE AT 9.8m												

Continued Next Page

+ 3, x 3: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C47-02

2 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 897 512.7 E 291 871.2 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.31 - 2013.05.31 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
	Continued From Previous Page							20 40 60 80 100		20 40 60					
	BOREHOLE OPEN TO BOTTOM AND WATER LEVEL AT 3.3m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 2.4m, CUTTINGS TO 1.8m, CEMENT TO 0.2m THEN ASPHALT TO SURFACE.														

RECORD OF BOREHOLE No NLAT11E-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 897 661.1 E 291 860.2 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.27 - 2013.05.27 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L		
239.1													
0.0	ASPHALT: (200mm)						239						
0.2	SAND, some to trace gravel, trace to some silt Compact Brown Moist (FILL)		1	AS									
			1	SS	20		238						5 84 11 (SI+CL)
237.7													
1.4	SAND and SILT, some clay, trace gravel Compact Brown Moist (FILL)		2	SS	17		237						8 48 30 14
236.5			3	SS	10								
2.6	Silty CLAY, with sand, trace organics, trace rootlets Firm to Very Stiff Dark Brown Moist to Wet		4	SS	6		236						0 28 39 33
			5	SS	17		235						
234.6													
4.5	Sandy SILT, some clay, trace gravel Dense Brown Moist		6	SS	33		234						
233.5													
5.6	Sandy SILT, trace gravel Very Dense to Dense Grey Moist (TILL)		7	SS	93/ 0.275		233						
							232						
			8	SS	34								
230.9							231						
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE OPEN TO 6.9m AND WATER LEVEL AT 3.4m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 2.1m, CUTTINGS TO 1.7m, CEMENT TO 0.2m THEN ASPHALT TO SURFACE.												

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RECORD OF BOREHOLE No NLAT20E-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 897 805.8 E 291 833.6 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.27 - 2013.05.27 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
241.8								SHEAR STRENGTH kPa						
0.0	ASPHALT: (190mm)							○ UNCONFINED + FIELD VANE						
0.2	SAND and GRAVEL, trace silt Compact Brown Moist (FILL)		1	AS			241							40 53 7 (SI+CL)
240.5			1	SS	20									
1.3	Silty SAND, trace to some clay, trace gravel Loose Brown to Dark Grey Wet (FILL)		2	SS	7		240							1 61 28 10
239.1			3	SS	6									
2.7	Silty CLAY, some sand Firm Brown to Grey Moist to Wet		4	SS	7		239							Split spoon wet
238.1			5	SS	10		238							0 17 49 34
3.7	Occasional sand seams Stiff		6	SS	12		237							
236.2			7	SS	6		236							
5.6	Firm													
235.1														
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO BOTTOM AND WATER LEVEL AT 2.7m UPON COMPLETION BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.8m, CEMENT TO 0.2m THEN ASPHALT TO SURFACE.													

ONTM14S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/26/13

RECORD OF BOREHOLE No NLAT18W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 897 945.2 E 291 800.4 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.28 - 2013.05.28 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
244.2	ASPHALT: (200mm)											
0.0												
0.2	Gravelly SAND, trace silt Compact Brown Moist (FILL)		1	AS			244					28 64 8 (SI+CL)
			1	SS	18		243					
	Trace silt		2	SS	24		242					Split spoon wet
			3	SS	37		241					40 51 9 (SI+CL)
241.0	SAND and GRAVEL, trace silt Compact Brown Wet		4	SS	29		240					
3.2			5	SS	33		239					
240.0	Sandy SILT, trace gravel Compact Brown Moist		6	SS	4		238					
4.2												
239.6	SAND, some silt, trace gravel Loose Brown Wet											
4.6												
239.2	Clayey SILT, some sand Firm Grey Wet											
5.0												
238.1	Silty SAND, trace gravel, trace clay Compact Grey Saturated		7	SS	12							
6.1												
237.5	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO 4.2m AND WATER LEVEL AT 2.5m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.8m, CEMENT TO 0.2m, ASPHALT TO SURFACE.											
6.7												

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/7/13

RECORD OF BOREHOLE No NLAT15-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 898 089 1 E 291 780 0 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 05 27 - 2013 05 27 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				GR	SA	SI	CL
246.8								20 40 60 80 100									
0.0	ASPHALT: (200mm)																
0.2	SAND, some to trace gravel, trace to some silt Compact Brown Moist (FILL)		1	AS			246								10	77	13 (SI+CL)
245.2			1	SS	23												
1.6	Silty SAND, some clay, trace gravel Compact to Dense Brown to Grey Moist Occasional inferred cobble		2	SS	18		245										
			3	SS	24		244								2	60	23 15
	Occasional black sand pockets		4	SS	40												
							243										
			5	SS	33										3	57	25 15
	Grey		6	SS	26		242										Split spoon wet
							241										
	Very Dense		7	SS	52												
240.1																	
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 2.2m, CUTTINGS TO 1.8m, CEMENT TO 0.2m, ASPHALT TO SURFACE.																

ONTMT4S 1218.GPJ 2012TEMPLATE(MTO).GDT 8/26/13

+ ³ , × ³ : Numbers refer to
Sensitivity

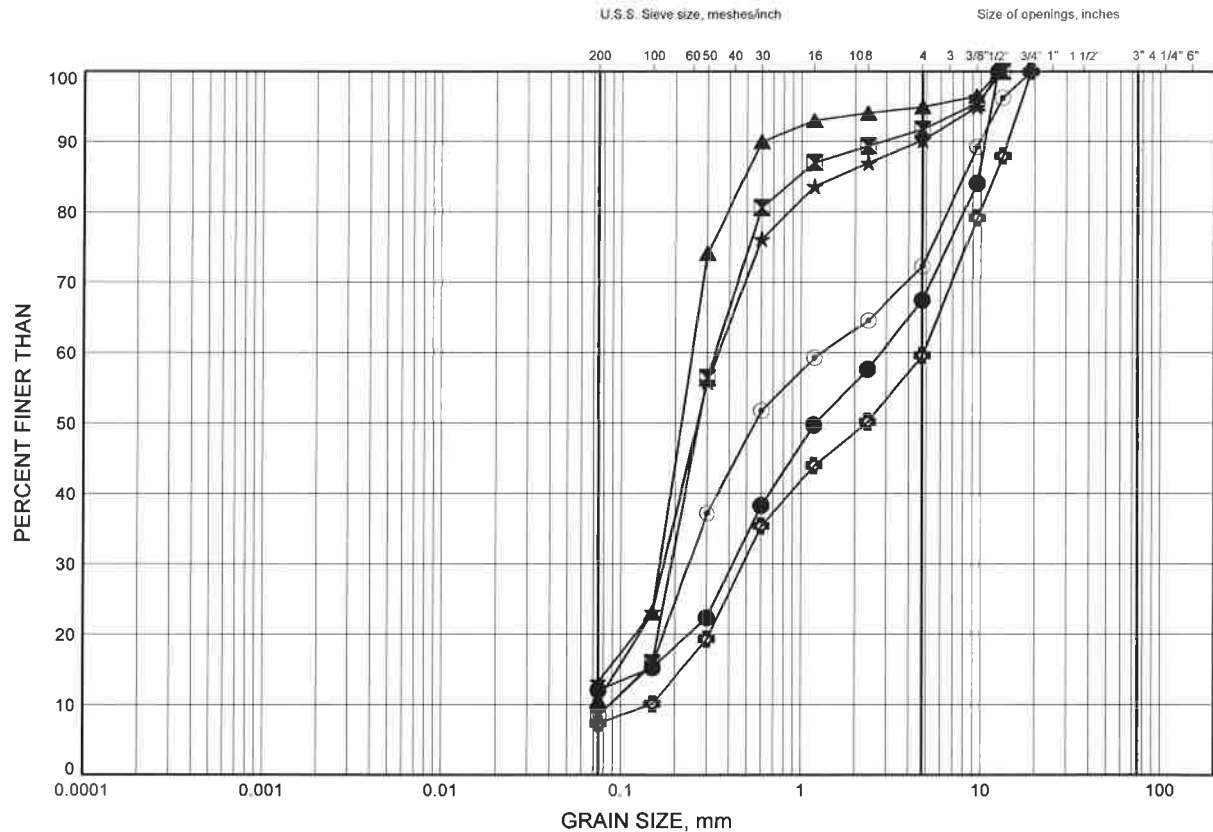
20
15
10

(%) STRAIN AT FAILURE

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE B1

SAND/GRAVELLY SAND/SAND & GRAVEL FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT06-01	0.38	234.12
⊠	NLAT07E-01	1.07	231.93
▲	NLAT11E-01	1.07	238.03
★	NLAT15-01	1.07	245.73
⊙	NLAT18W-01	0.38	243.82
⊕	NLAT20E-01	0.38	241.42

Date August 2013
GWP# 83-00-00

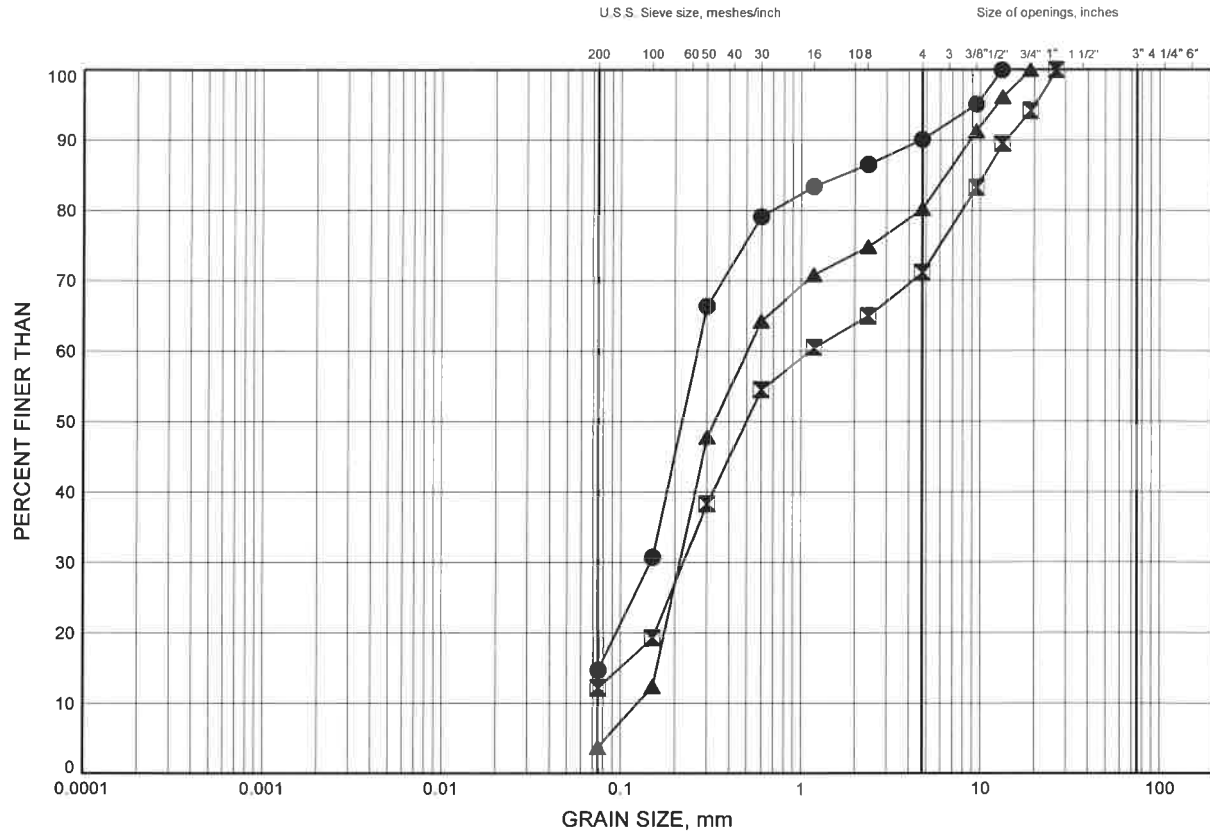


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Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE B2

SAND/GRAVELLY SAND/SAND & GRAVEL FILL



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

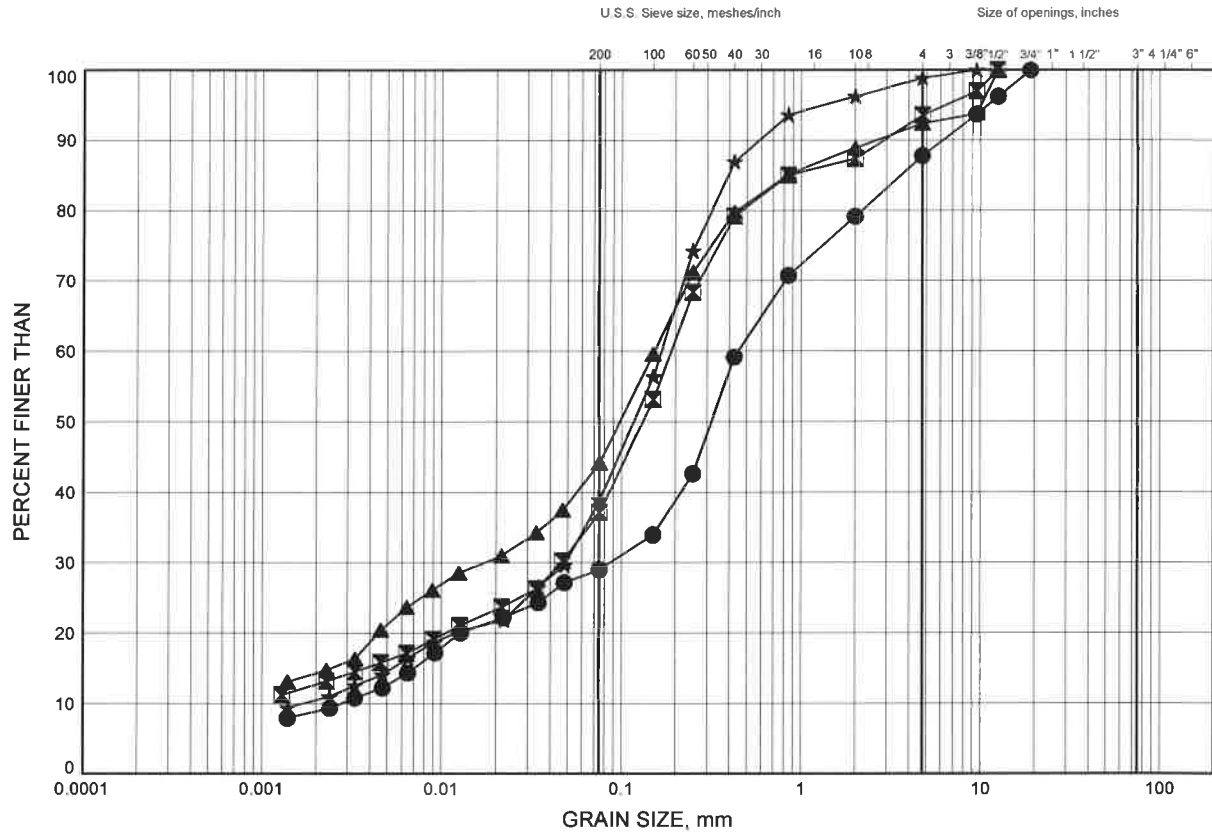
LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT51E-01	1.07	230.33
⊠	SLAT68-01	1.79	297.31
▲	SLAT72-01	0.46	293.54

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE B3

SILTY SAND/SAND & SILT FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C14-01	0.30	255.20
⊠	C47-02	1.07	235.53
▲	NLAT11E-01	1.83	237.27
★	NLAT20E-01	1.83	239.97

Date August 2013

GWP# 83-00-00



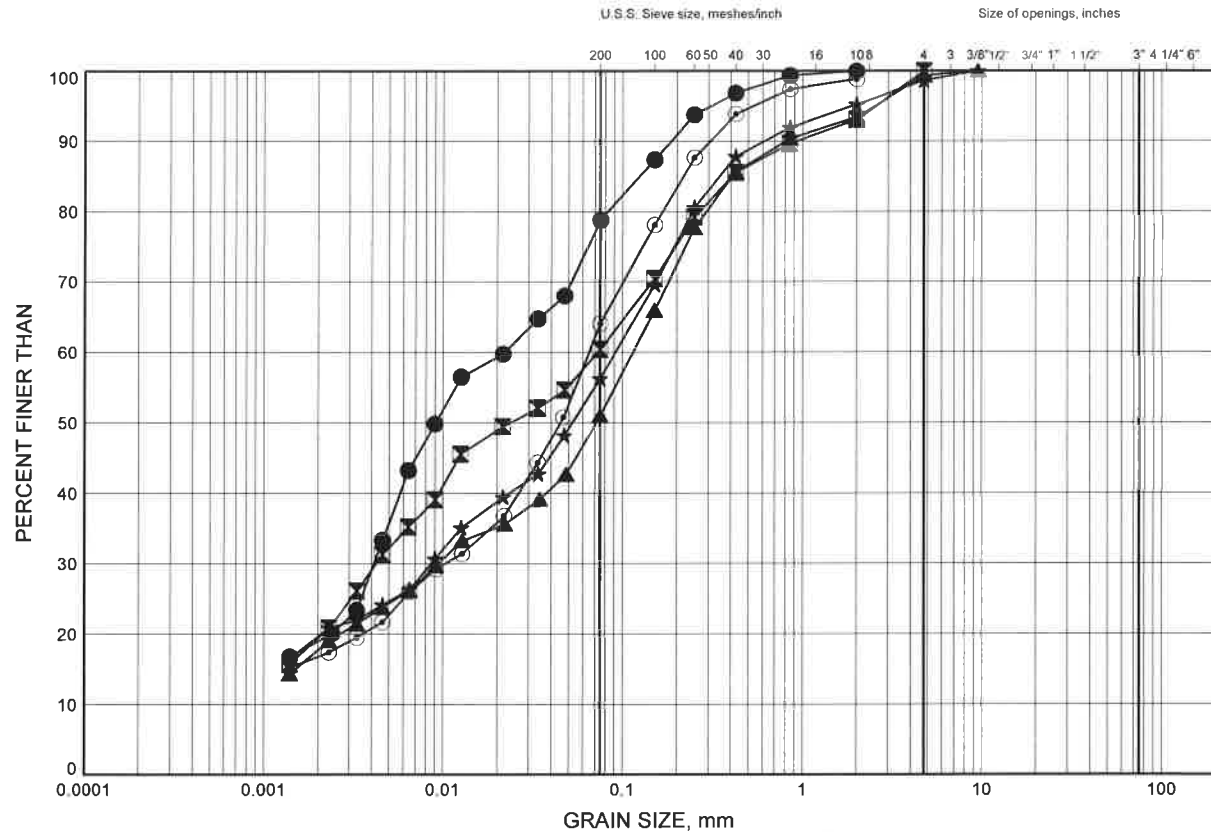
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Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE B4

CLAYEY SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C14-01	2.59	252.91
⊠	C14-02	1.83	253.47
▲	C17-01	2.59	275.41
★	C17-01	4.11	273.89
⊙	NLAT07E-01	2.59	230.41

GRAIN SIZE DISTRIBUTION - THURBER 1218 GPJ 8/13/13

Date August 2013
GWP# 83-00-00

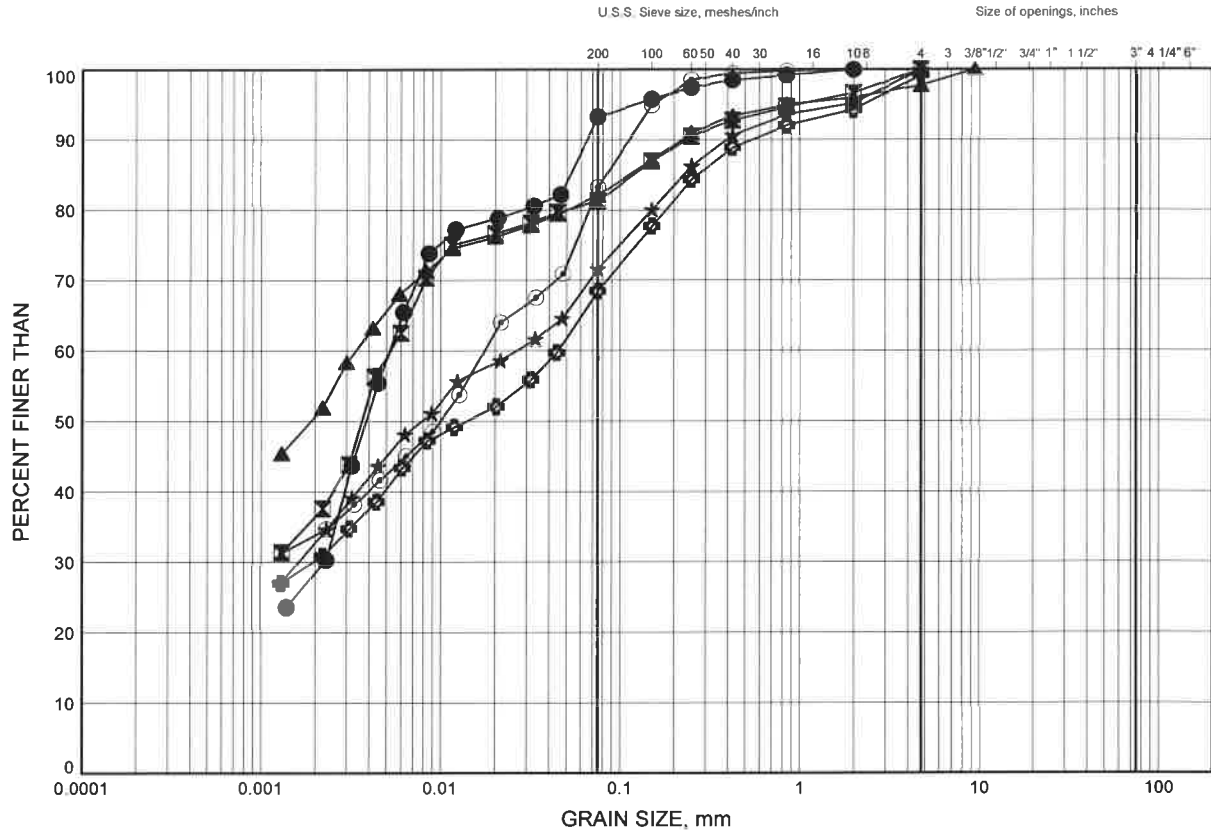


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Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE B5

SILTY CLAY



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C14-01	4.11	251.39
⊠	C14-02	4.88	250.42
▲	C47-01	3.35	233.45
★	NLAT11E-01	3.35	235.75
⊙	NLAT20E-01	4.11	237.69
⊕	NLAT51E-01	1.83	229.57

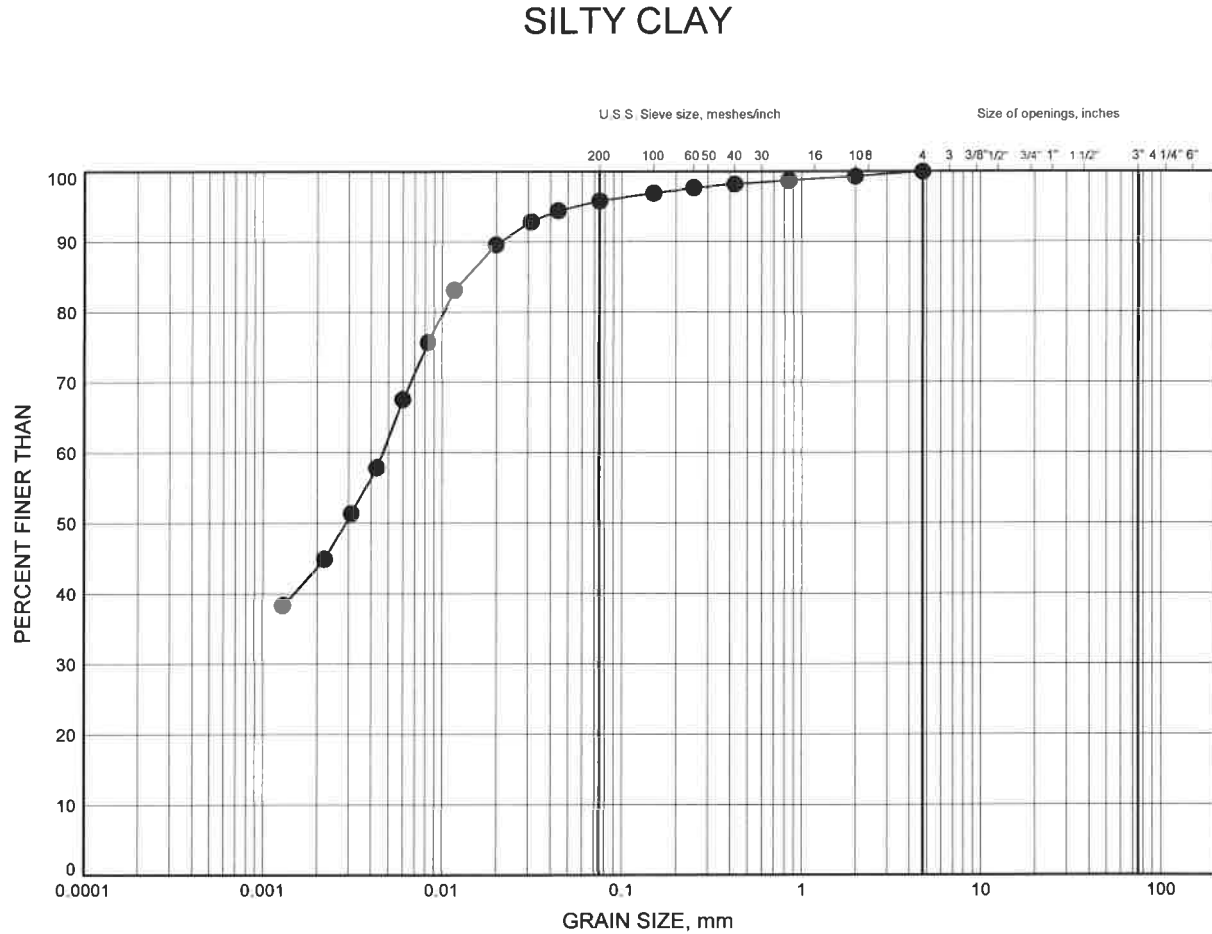
Date August 2013
GWP# 83-00-00



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Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE B6



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT51E-01	4.11	227.29

Date August 2013
GWP# 83-00-00



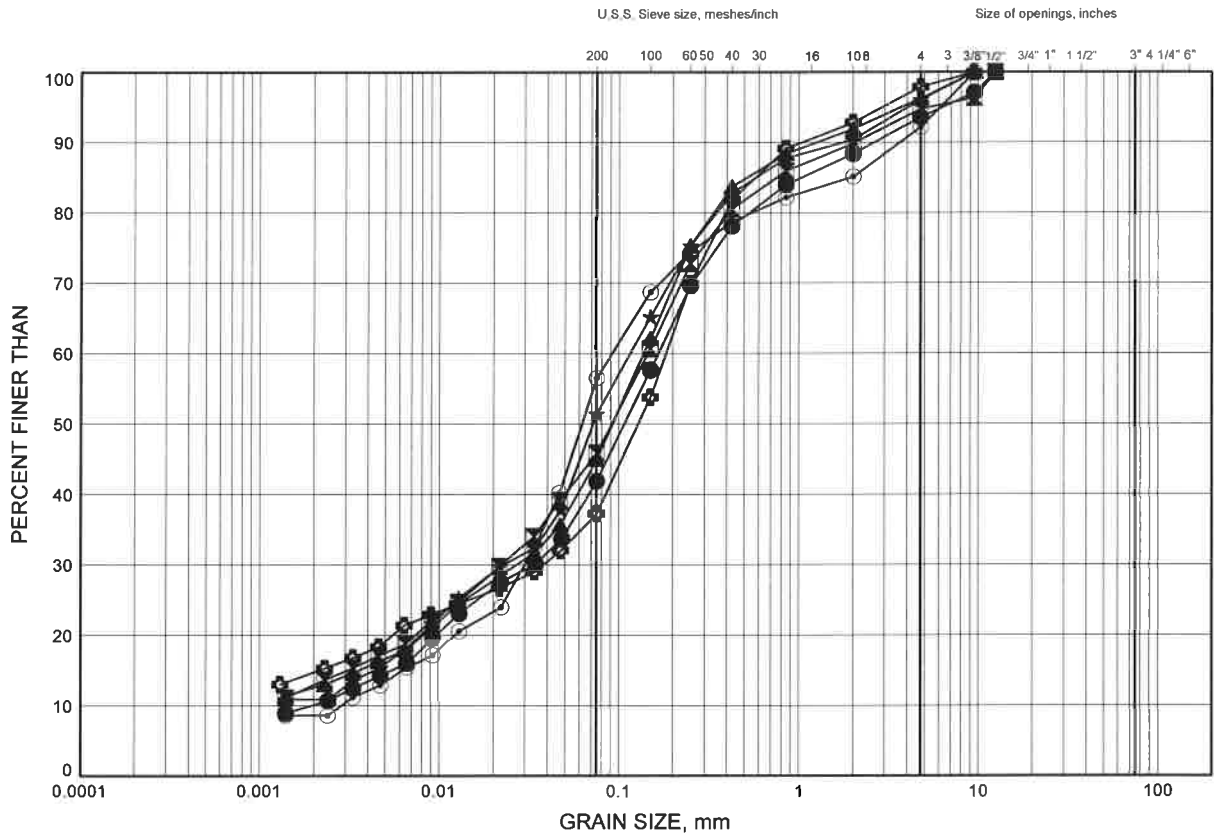
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Hwy 400 Median Sewer

GRAIN SIZE DISTRIBUTION

FIGURE B7

SAND & SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C17-01	6.40	271.60
⊠	C17-02	1.83	276.37
▲	C17-02	6.40	271.80
★	C47-02	4.11	232.49
⊙	NLAT07E-01	4.11	228.89
⊕	NLAT15-01	2.59	244.21

Date August 2013
GWP# 83-00-00

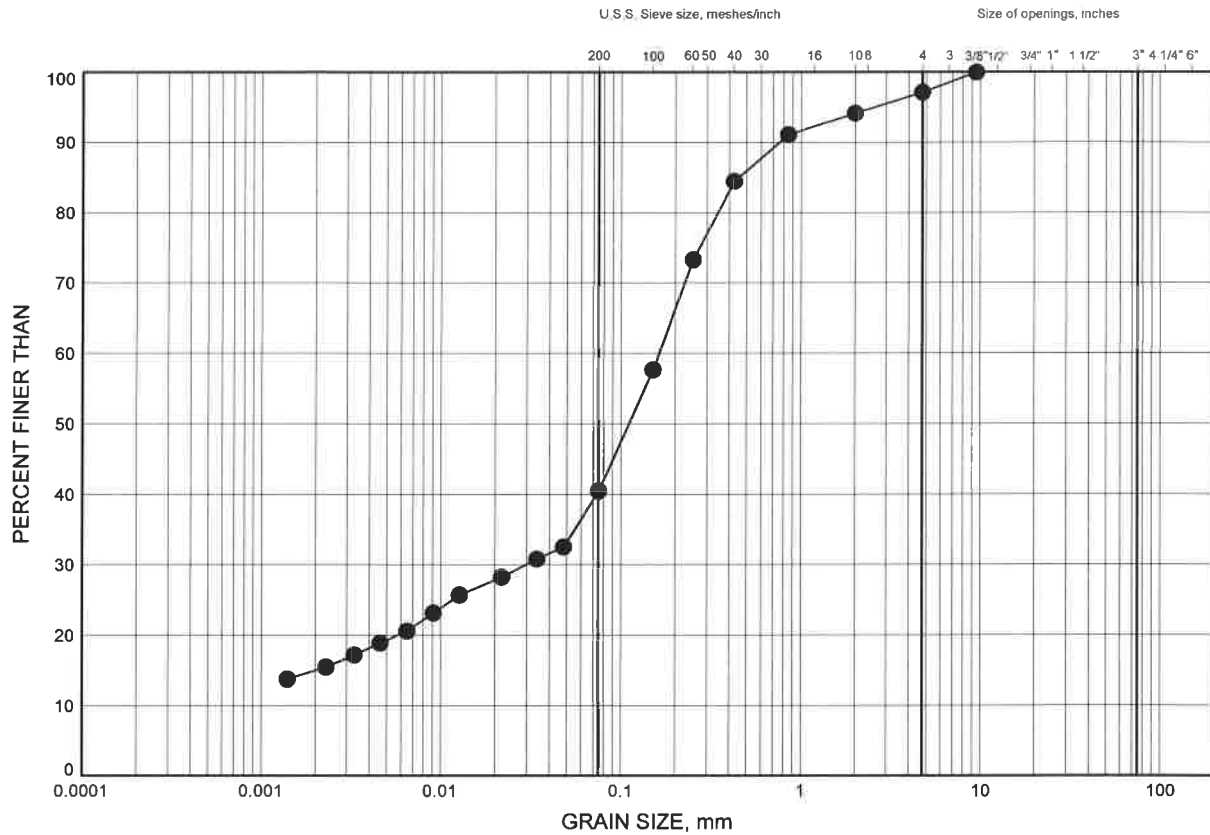


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Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE B8

SAND & SILT



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

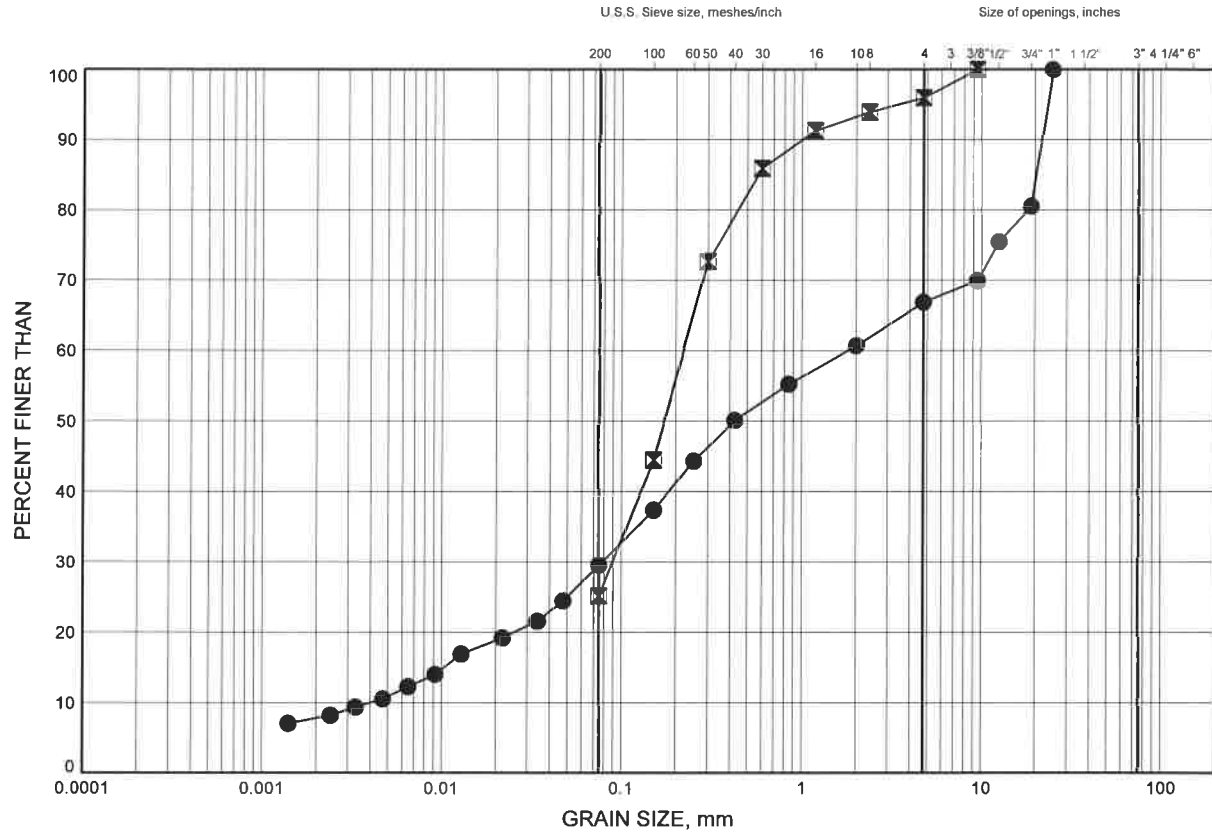
LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT15-01	4.11	242.69

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE B9

SILTY SAND



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C17-02	3.35	274.85
☒	C47-01	1.83	234.97

Date August 2013
GWP# 83-00-00

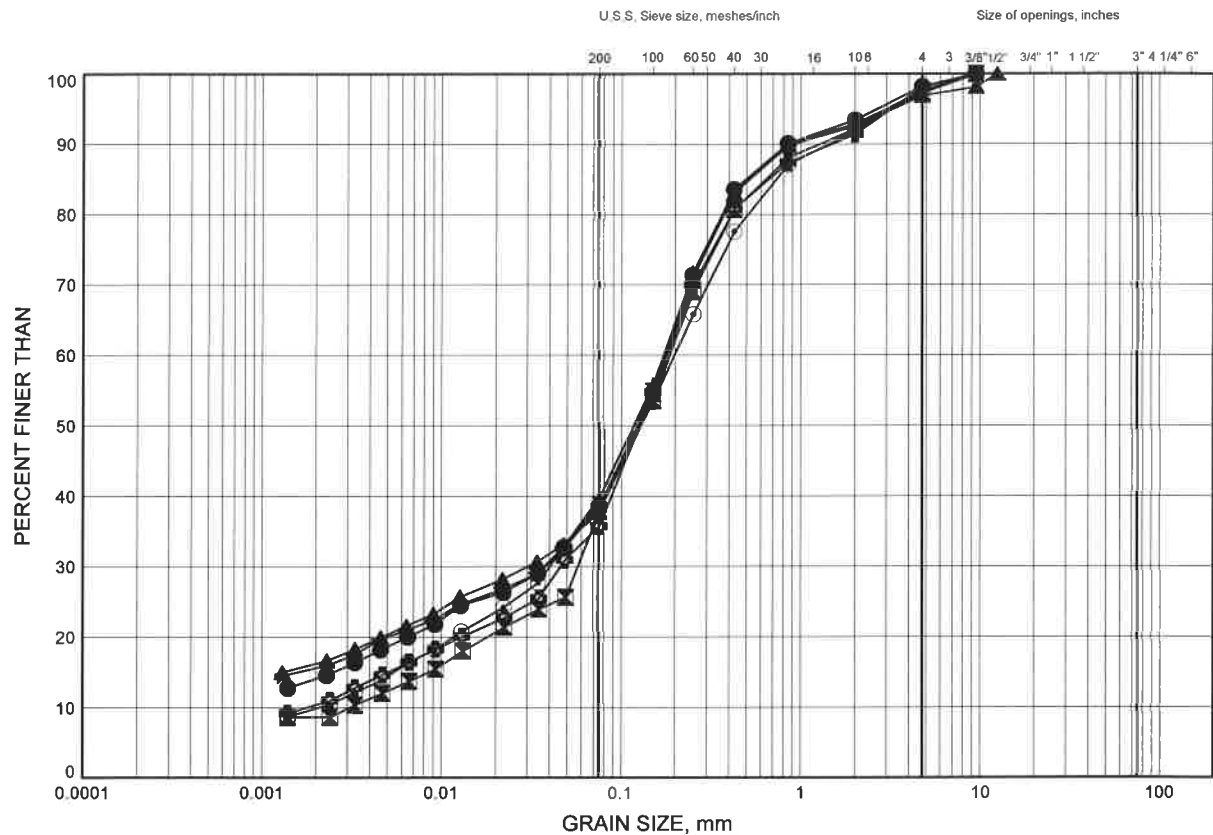


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Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE B10

SANDY SILT to SILTY SAND TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C47-01	6.40	230.40
⊠	C47-02	9.45	227.15
▲	NLAT06-01	1.83	232.67
★	NLAT06-01	3.35	231.15
⊙	SLAT68-01	2.51	296.59
⊕	SLAT68-01	4.11	294.99

Date August 2013
GWP# 83-00-00

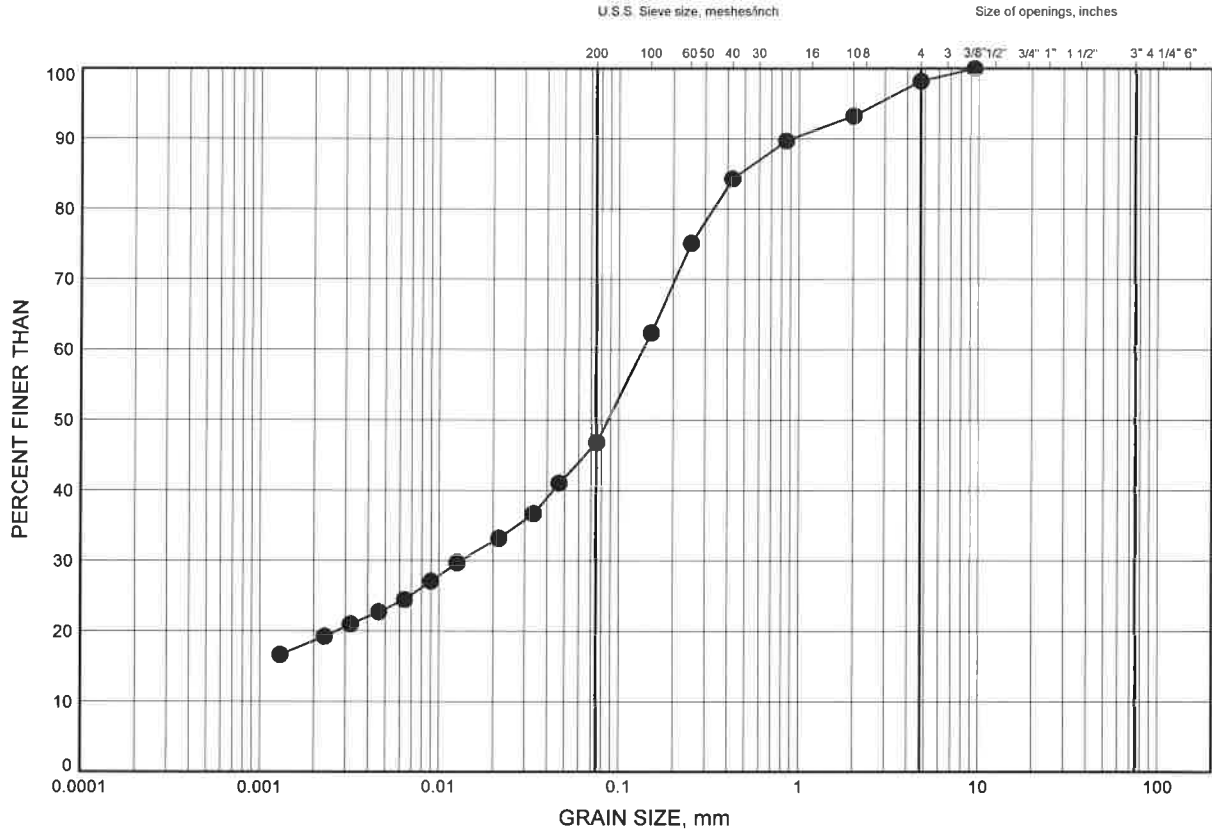


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Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE B11

CLAYEY SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	SLAT32E-01	1.83	279.87

Date August 2013
GWP# 83-00-00

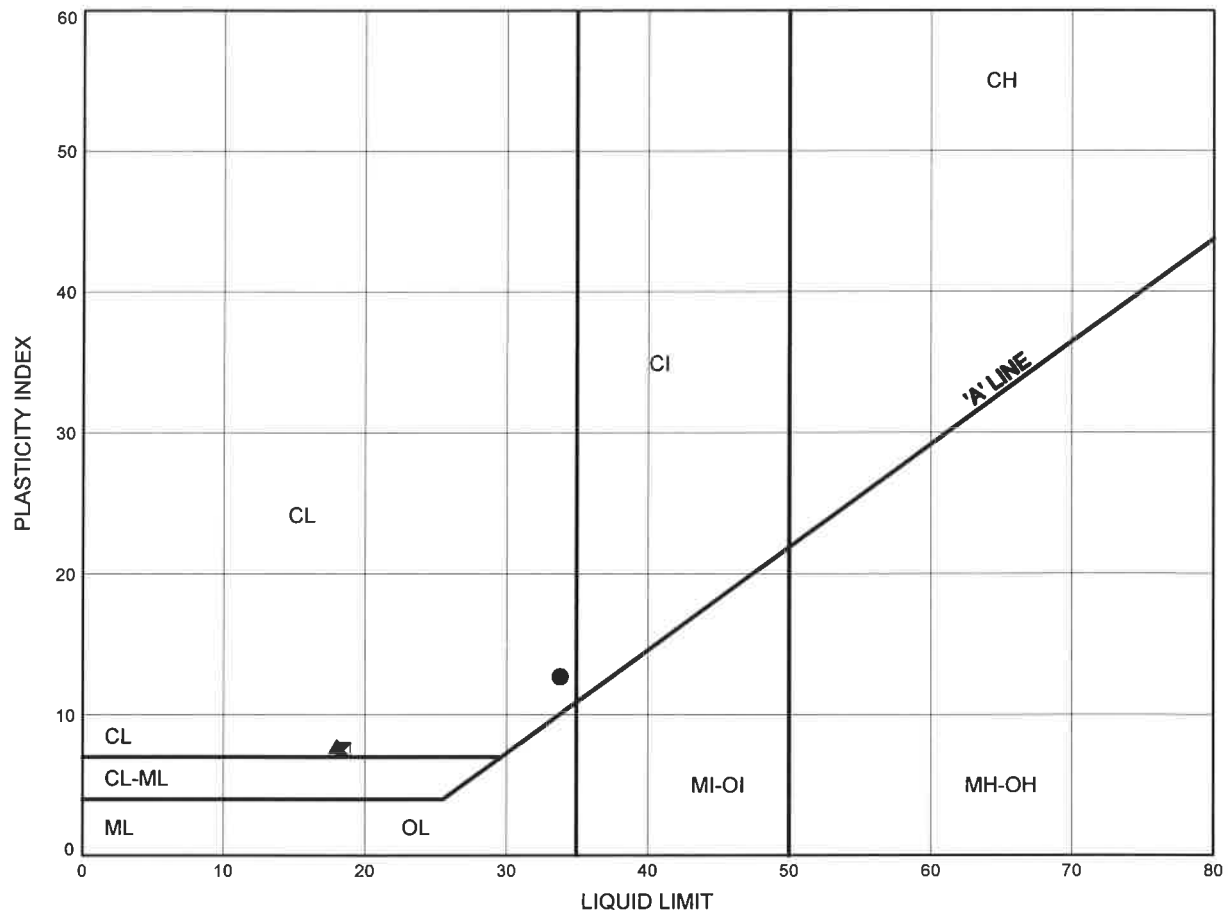


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Chkd SKP

Hwy 400 Median Sewer
ATTERBERG LIMITS TEST RESULTS

FIGURE B12

CLAYEY SILT



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C14-01	2.59	252.91
⊠	C14-02	1.83	253.47
▲	C17-01	2.59	275.41

Date August 2013

GWP# 83-00-00



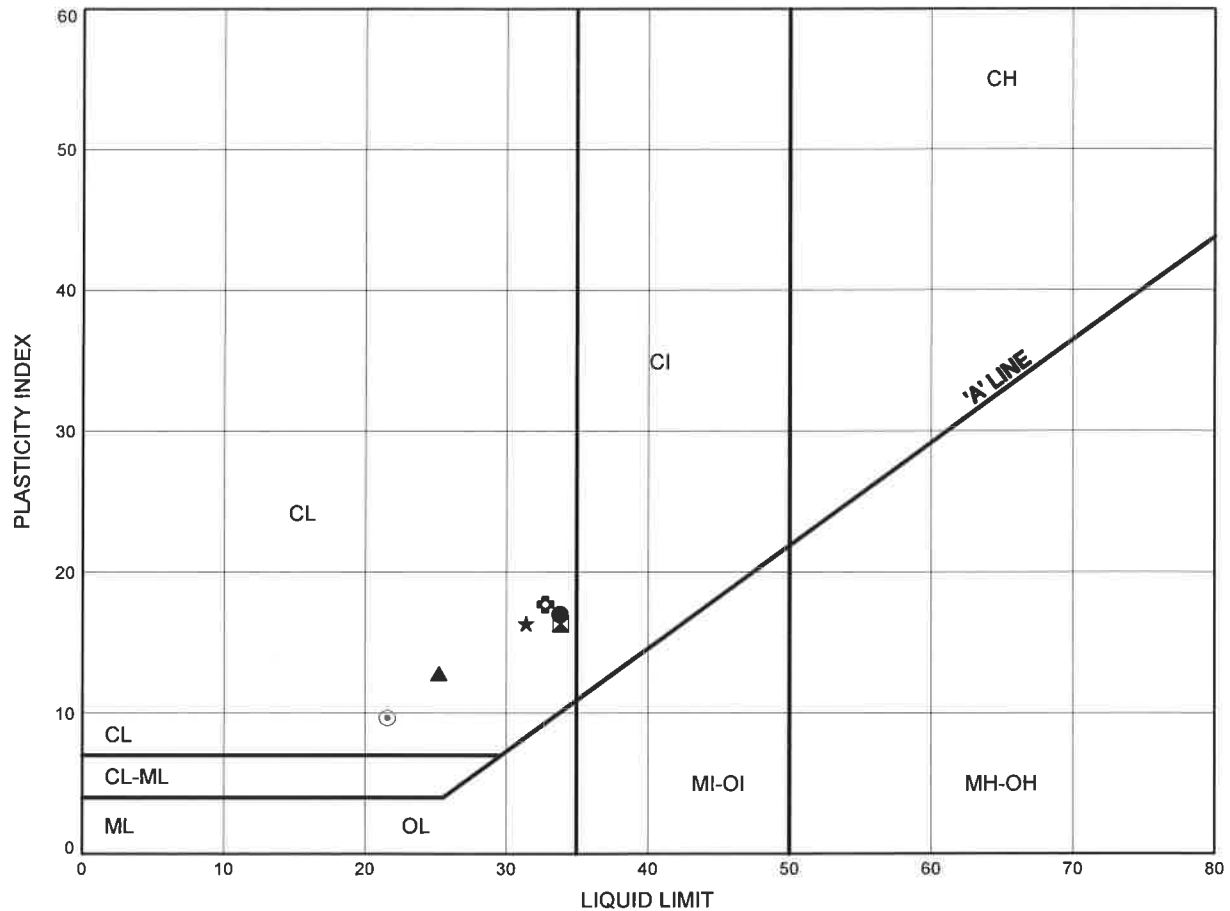
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Hwy 400 Median Sewer ATTERBERG LIMITS TEST RESULTS

FIGURE B13

SILTY CLAY



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C14-01	4.11	251.39
⊠	C14-02	4.88	250.42
▲	C47-01	3.35	233.45
★	NLAT11E-01	3.35	235.75
⊙	NLAT20E-01	4.11	237.69
⊕	NLAT51E-01	1.83	229.57

Date August 2013
GWP# 83-00-00

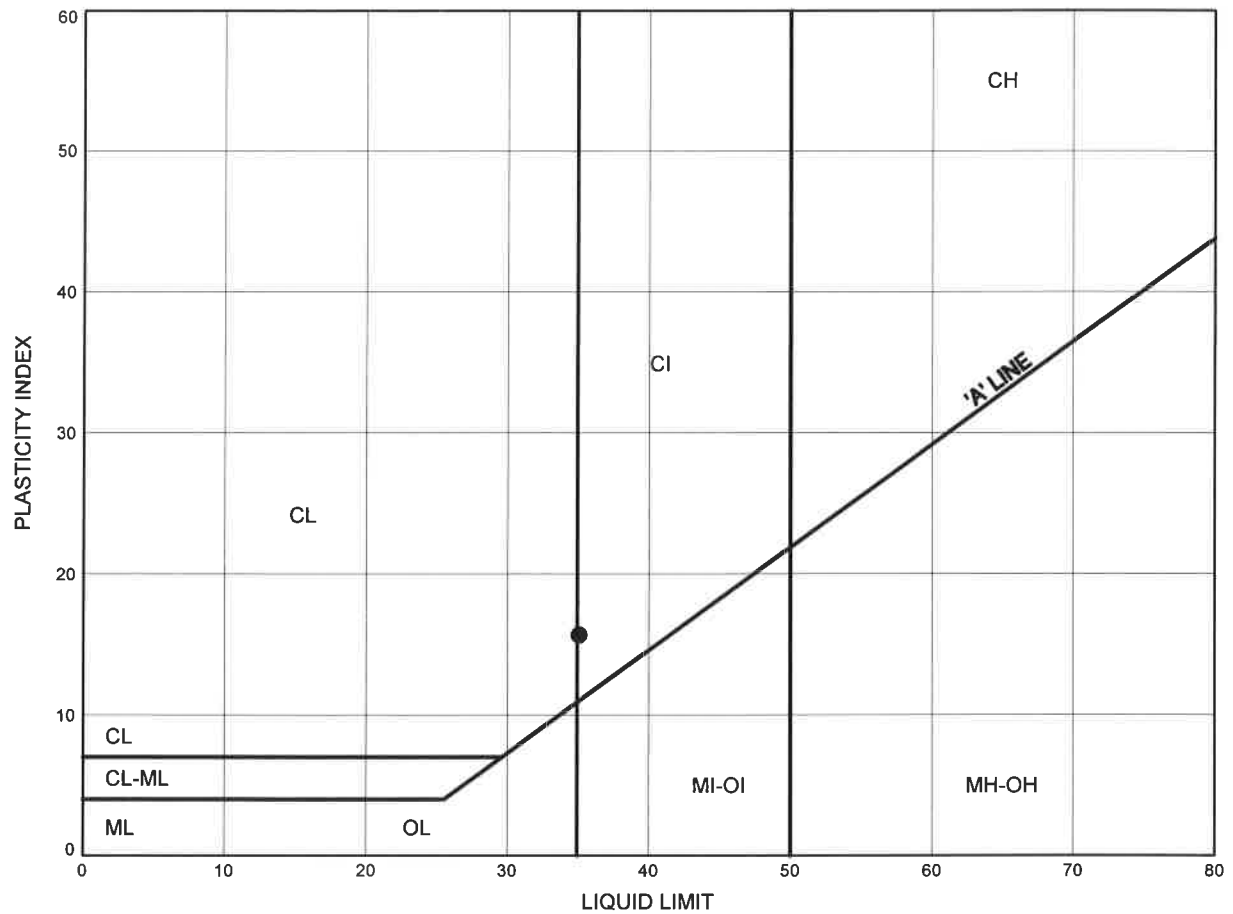


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Chkd. SKP

Hwy 400 Median Sewer ATTERBERG LIMITS TEST RESULTS

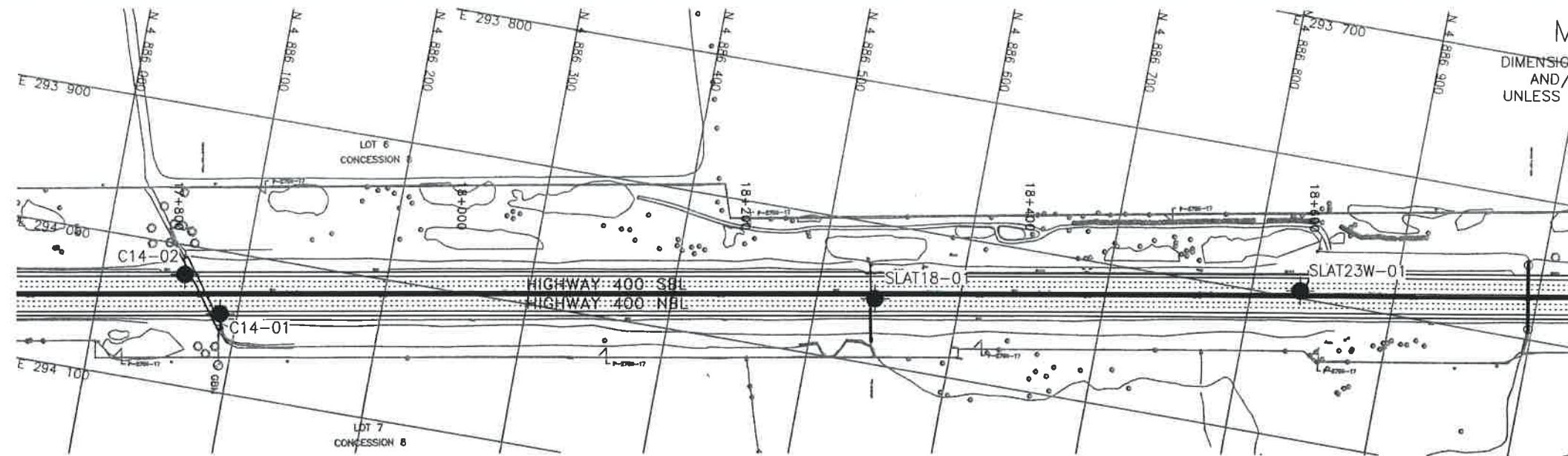
FIGURE B14

SILTY CLAY



LEGEND

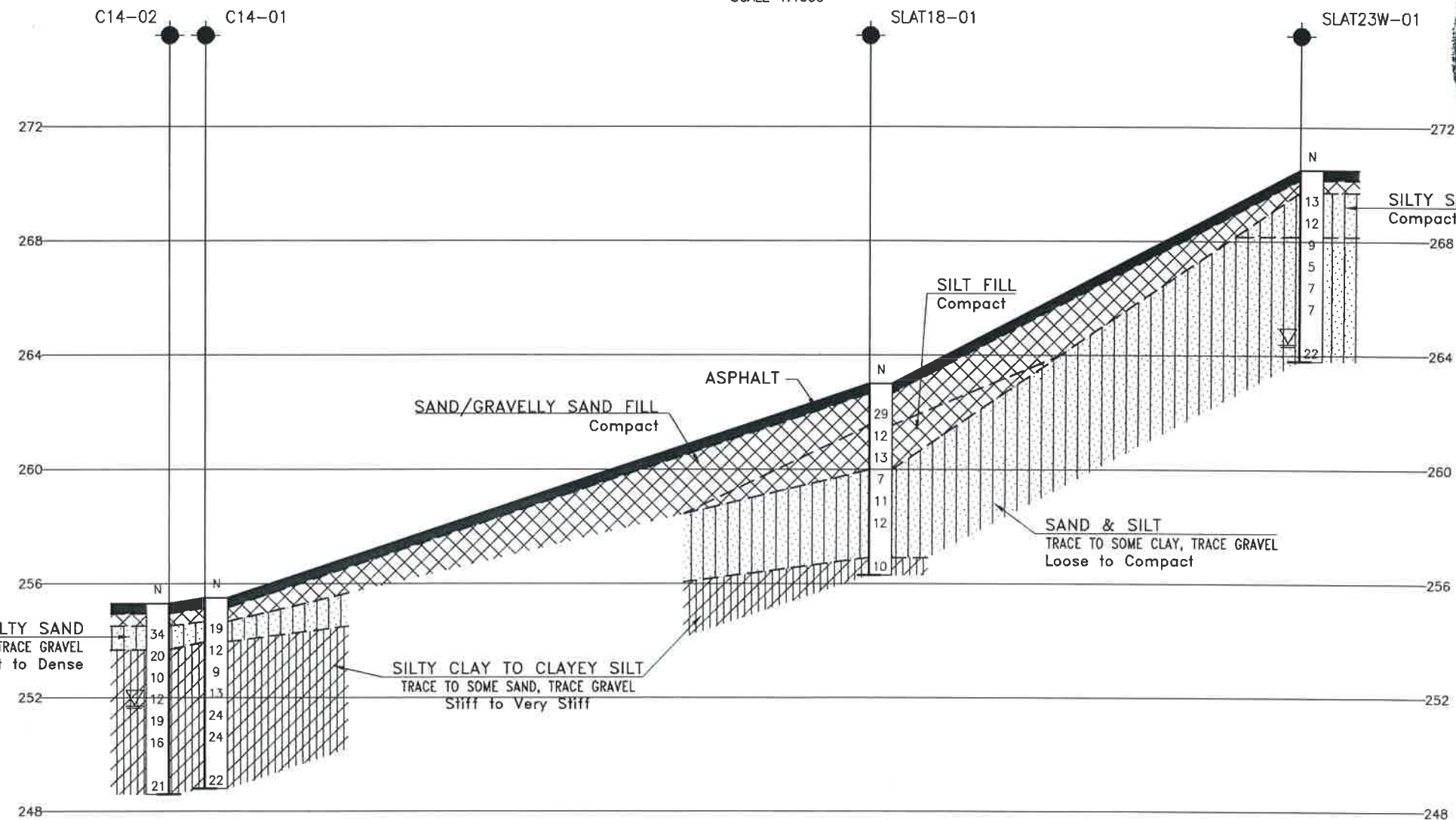
SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT51E-01	4.11	227.29



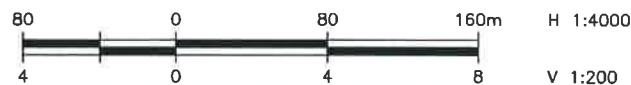
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN



PLAN



PROFILE ALONG C HWY 400



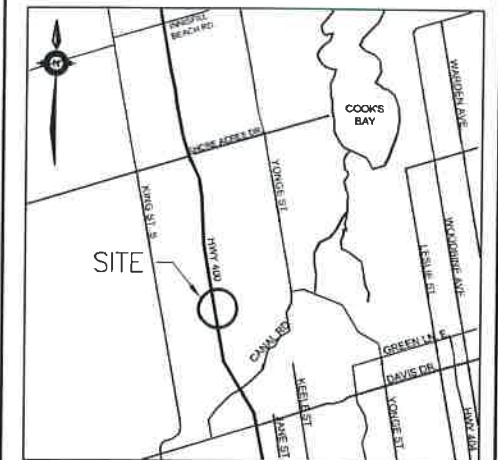
CONT No
GWP No 83-00-00

HWY 400 MEDIAN SEWER
MEDIAN SEWER
(STA. 17+800 TO 18+600)
BOREHOLE LOCATIONS AND SOIL STRATA



SHEET

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
W	Water Level
W	Head Artesian Water
P	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
C14-01	255.5	4 886 087.9	294 044.1
C14-02	255.3	4 886 058.4	294 020.7
SLAT18-01	263.0	4 886 540.9	293 953.2
SLAT23W-01	270.5	4 886 834.3	293 894.5

-NOTES-

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

GEOCRES No. 31D-563

REVISIONS	DATE	BY	DESCRIPTION
DESIGN	SKP	CHK	SKP
DRAWN	AN	CHK	PKC
CODE	LOAD	DATE	NOV. 2013
SITE	STRUCT	DWG	5

PLAN



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



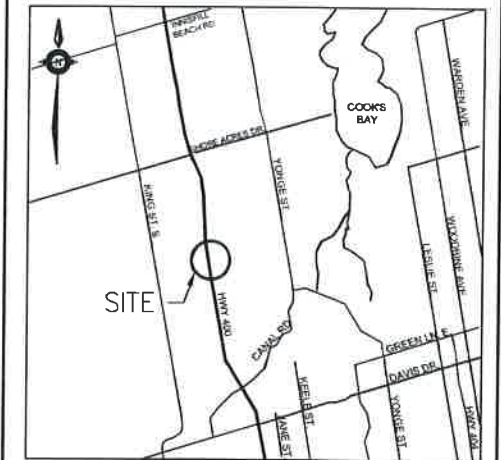
S	CONT No
	GWP No 83-00-00

HWY 400 MEDIAN SEWER
MEDIAN SEWER
(STA. 18+900 TO 19+450)
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET








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 |

[illegible]

-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. 31D-563

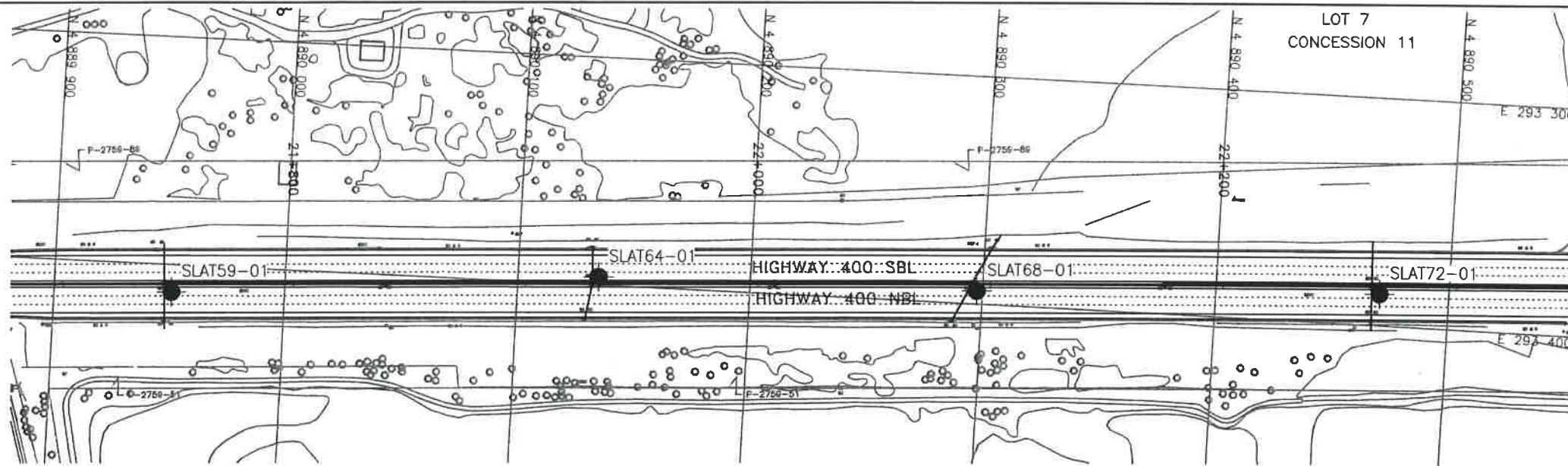
PROFILE ALONG Cℓ HWY 400



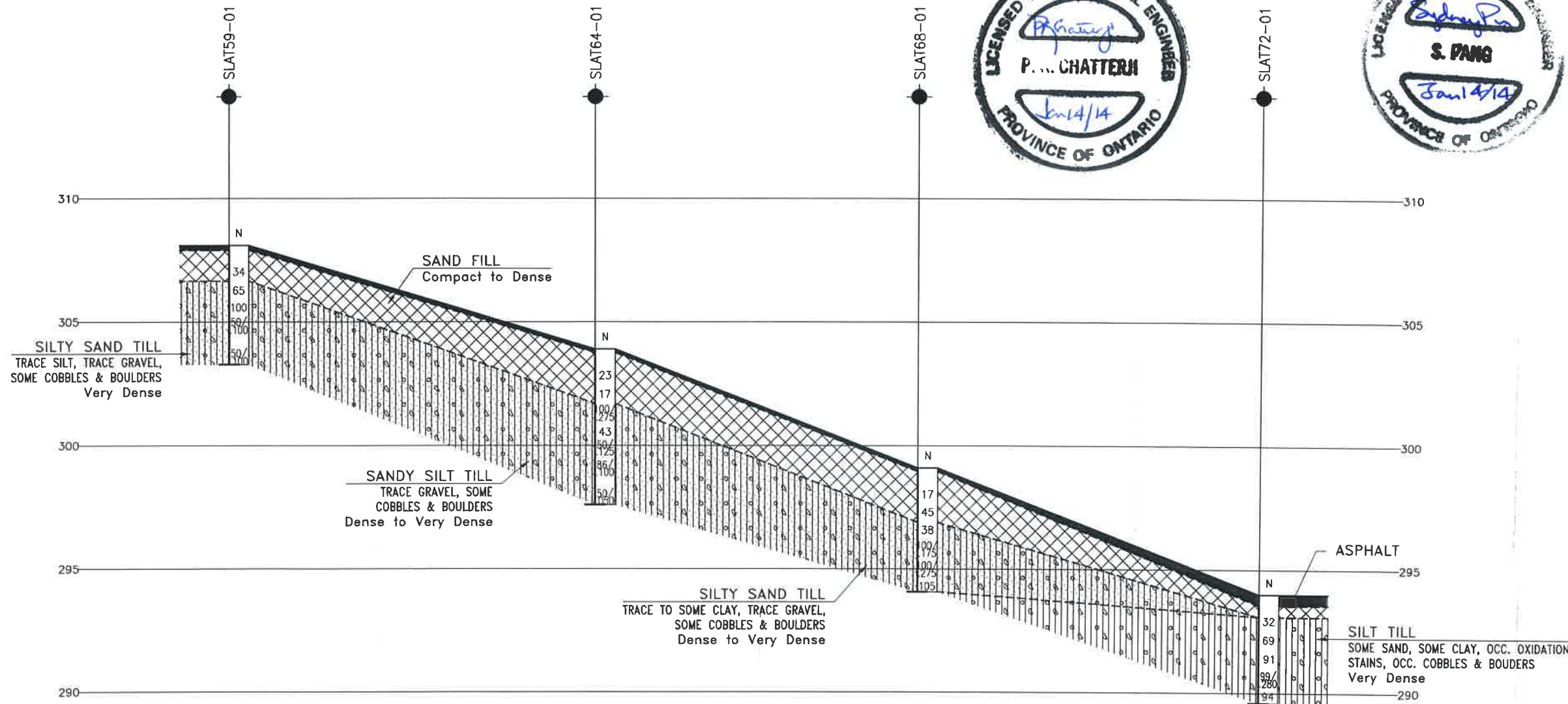
H 1:2500

V 1:200

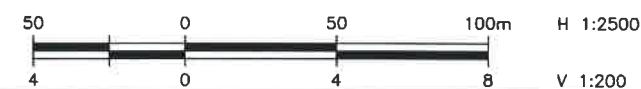
REVISIONS										
	DATE		BY		DESCRIPTION					
DESIGN	SKP	CHK	SKP	CODE	LOAD			DATE	NOV. 2013	
DRAWN	AN	CHK	PKC	SITE	STRUCT		IDWG	6		



PLAN



PROFILE ALONG CL HWY 400



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

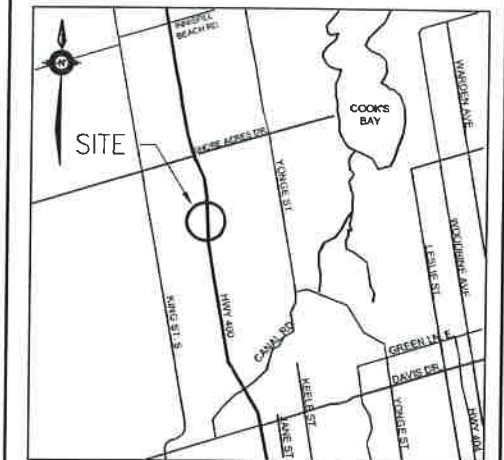
CONT No
GWP No 83-00-00

HWY 400 MEDIAN SEWER
MEDIAN SEWER
(STA. 21+700 TO 22+210)
BOREHOLE LOCATIONS AND SOIL STRATA



SHEET

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

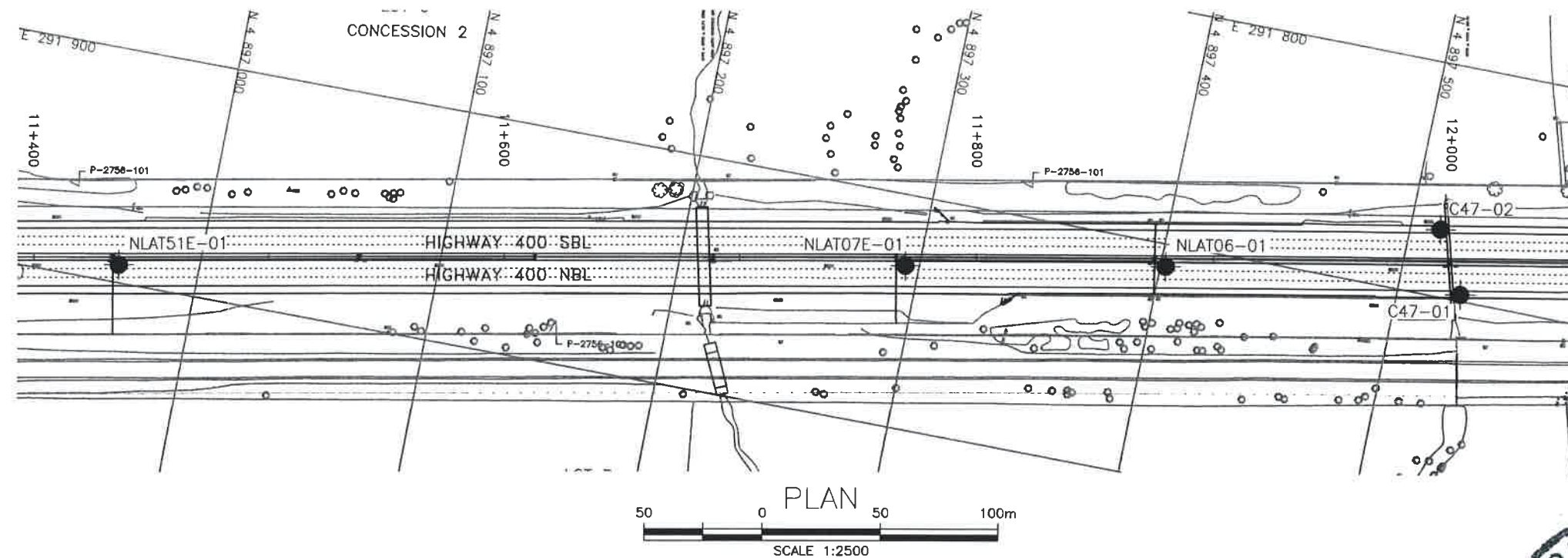
NO	ELEVATION	NORTHING	EASTING
SLAT59-01	308.1	4 889 951.1	293 411.9
SLAT64-01	303.9	4 890 134.8	293 396.4
SLAT68-01	299.1	4 890 297.6	293 394.1
SLAT72-01	294.0	4 890 470.3	293 386.1

NOTES

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- This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRES No. 31D-563

REVISIONS	DATE	BY	DESCRIPTION
DESIGN	SKP	CHK SKP	CODE
DRAWN	AN	CHK PKC	SITE
			LOAD
			STRUCT
			DWG 7
			DATE NOV. 2013



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



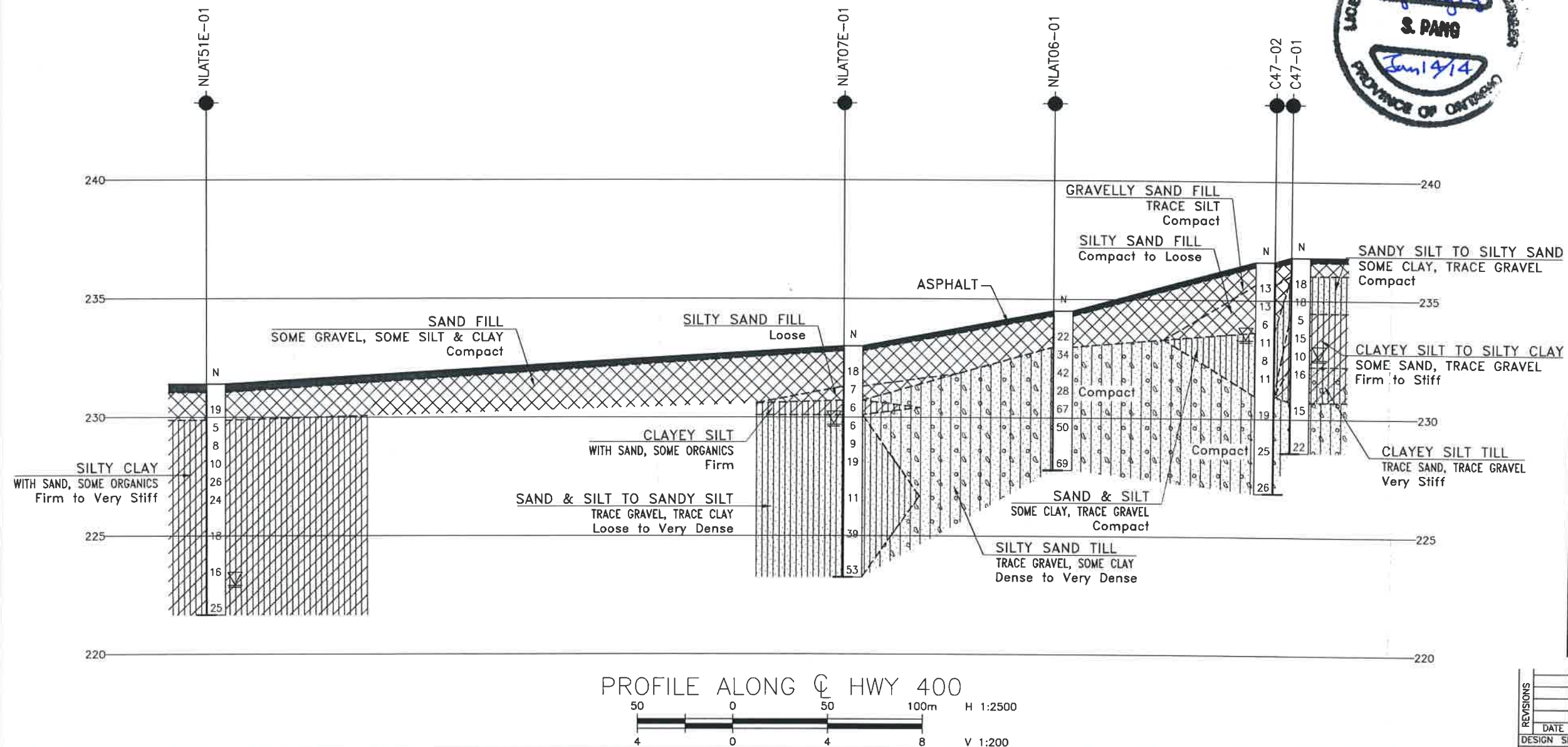
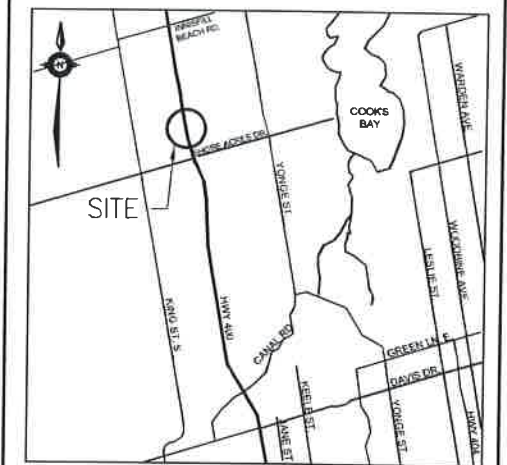
CONT No
GWP No 83-00-00

HWY 400 MEDIAN SEWER
MEDIAN SEWER
(STA. 11+400 TO 12+050)
BOREHOLE LOCATIONS AND SOIL STRATA



SHEET

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

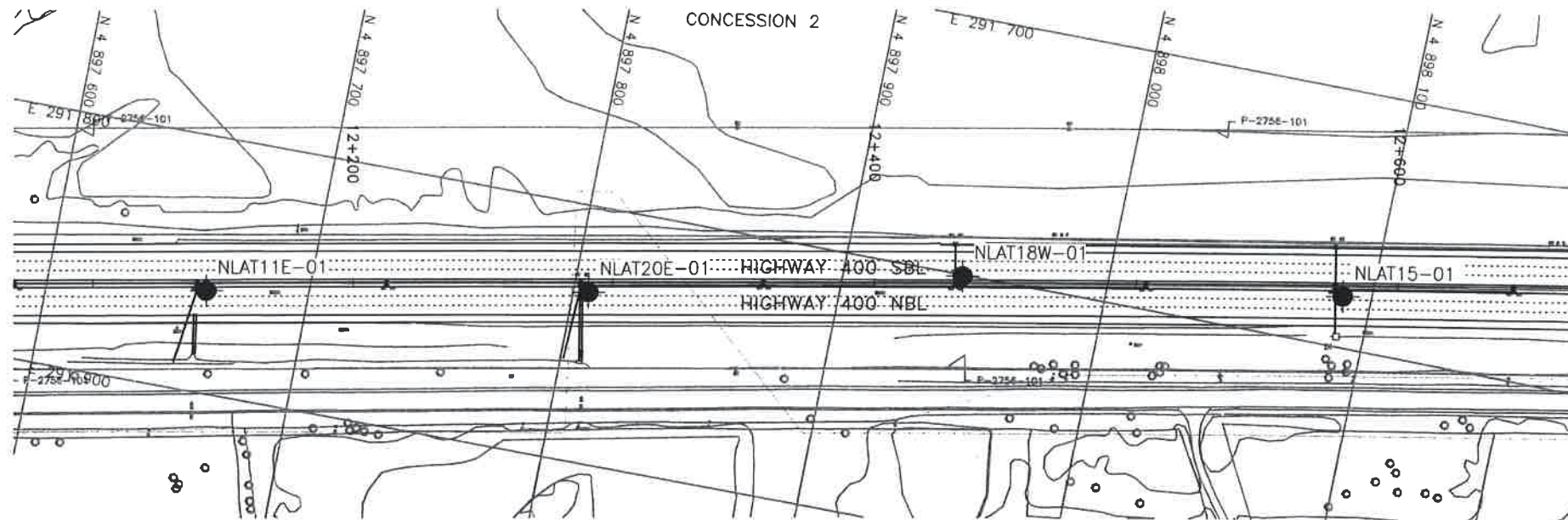
NO	ELEVATION	NORTHING	EASTING
NLAT51E-01	231.4	4 896 966.1	291 992.3
NLAT07E-01	233.0	4 897 294.2	291 930.3
NLAT06-01	234.5	4 897 402.2	291 909.6
C47-01	236.8	4 897 526.4	291 897.1
C47-02	236.6	4 897 512.7	291 871.2

NOTES

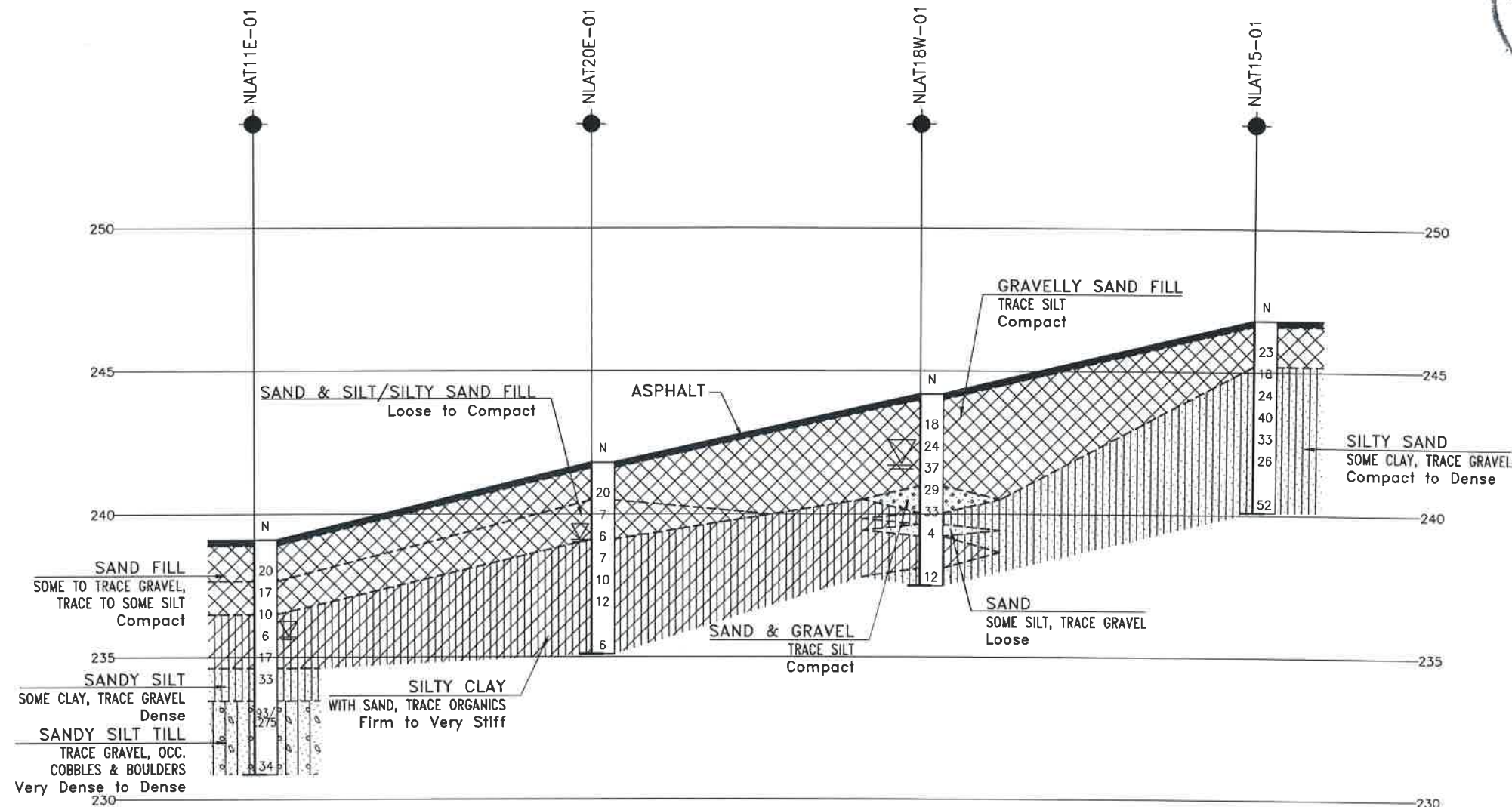
- 1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- 2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRES No. 31D-563

REVISIONS	DATE	BY	DESCRIPTION
DESIGN	SKP	CHK	SKP
DRAWN	AN	CHK	PKC
CODE	SITE	LOAD	STRUCT
DATE	NOV. 2013	DWG	B



PLAN
SCALE 1:2500



PROFILE ALONG C HWY 400

50 0 50 100m H 1:2500
4 0 4 8 V 1:200

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



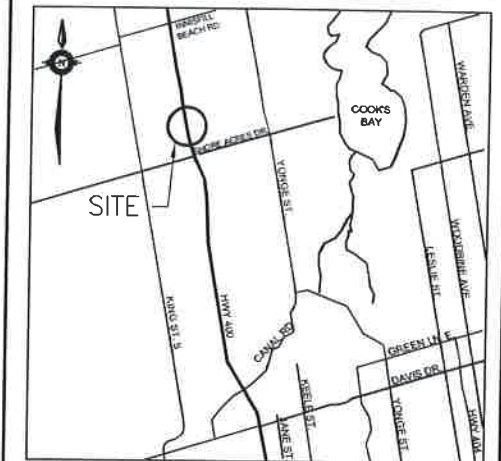
CONT No
GWP No 83-00-00

HWY 400 MEDIAN SEWER
MEDIAN SEWER
(STA. 12+100 TO 12+600)
BOREHOLE LOCATIONS AND SOIL STRATA



SHEET

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
- W Water Level
- HA Head Artesian Water
- P Piezometer
- 90% Rock Quality Designation (RQD)
- A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING
NLAT11E-01	239.1	4 897 661.2	291 860.2
NLAT20E-01	241.8	4 897 805.8	291 833.6
NLAT18W-01	244.2	4 897 945.2	291 800.4
NLAT15-01	246.8	4 898 089.1	291 780.1

NOTES

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- This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRIS No. 31D-563

REVISIONS	DATE	BY	DESCRIPTION
DESIGN	SKP	CHK	SKP
DRAWN	AN	CHK	PKC
CODE	LOAD	DATE	NOV. 2013
SITE	STRUCT	DWG	9

Appendix C

Sections 10, 11, 12, 13 and 14
(Stations 12+850 to 17+000 Innisfil)

RECORD OF BOREHOLE No C51-01

1 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 899 612.4 E 291 501.9 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 05 31 - 2013 05 31 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
285.7 0.0 0.1	ASPHALT: (100mm)		1	AS								GR SA SI CL
	SAND and GRAVEL, trace silt Compact Brown Moist (FILL)		1	SS	27		285					32 64 4 (SI+CL)
			2	SS	17		284					Split spoon wet
283.5 2.2	Silly CLAY, with sand Very Stiff to Stiff Brown Moist		3	SS	18		283					
			4	SS	13		282					0 26 26 48
			5	SS	15		281					0 25 40 35
281.2 4.5	Hard		6	SS	37		280					
280.1 5.6	SAND and SILT, trace clay, trace gravel Very Dense Brown Moist (TILL)		7	SS	90		279					
			8	SS	50/ 0.075		278					
			9	SS	92/ 0.200		277					
276.2 9.5	END OF BOREHOLE AT 9.5m. BOREHOLE OPEN TO 1.5m AND WATER LEVEL AT 1.5m UPON											

Continued Next Page

3
+ 3 x 3

Numbers refer to
Sensitivity

20
15 5
10

(%) STRAIN AT FAILURE

METRIC

[illegible]

RECORD OF BOREHOLE No C51-02

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 899 601.0 E 291 475.4 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.31 - 2013.05.31 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)					
								20 40 60 80 100	w _p w w _L						
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE									
285.7								20 40 60 80 100	20 40 60						
0.0	ASPHALT: (160mm)														
0.2	SAND, some to trace gravel Compact Brown Moist (FILL)		1	AS			285								
			1	SS	11										14 76 10 (SI+CL)
284.4															
1.3	Silty SAND, trace clay, trace gravel Loose Brown Moist (FILL)		2	SS	8		284								
283.3															
2.4	Clayey SILT, some sand, trace gravel Firm Dark Brown (FILL)		3	SS	6		283								
282.5															
3.2	Silty CLAY, trace sand Stiff Brown Moist		4	SS	11		282								0 5 26 69 Split spoon wet
			5	SS	9										
281.4															
4.3	Sandy SILT, trace gravel Loose Brown Wet to Saturated		6	SS	9		281								
280.1															
5.6	SAND and SILT, trace clay, trace gravel Dense to Very Dense Grey Moist (TILL)		7	SS	32		280								1 58 34 7
							279								
277.6			8	SS	55		278								
8.1	END OF BOREHOLE AT 8.1m. BOREHOLE OPEN TO 5.5m AND WATER LEVEL AT 2.9m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.9m, CEMENT TO 0.15m THEN ASPHALT TO SURFACE.														

RECORD OF BOREHOLE No NLAT100E-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 902 116.7 E 291 016.1 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.30 - 2013.05.30 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT		
296.6 0.0	ASPHALT: (210mm)												
0.2	SAND, some to trace gravel, trace silt Compact Brown Moist (FILL)		1	AS			296						
295.3			1	SS	21								7 88 5 (SI+CL)
1.3	Silty SAND, trace gravel Dense Brown Moist (FILL)		2	SS	34		295						
	Occasional inferred cobbles		3	SS	40		294						
293.6													
3.0	SAND, fine grained, some silt, trace clay and gravel Loose Brown Moist		4	SS	8		293						1 74 17 8
			5	SS	3								
							292						
291.6			6	SS	9								
5.0	SAND and SILT, trace gravel Loose Brown Moist						291						
			7	SS	40								
289.9	Dense						290						
6.7	END OF BOREHOLE AT 6.7m BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 2.1m, CUTTINGS TO 1.9m, CEMENT TO 0.2m THEN ASPHALT TO SURFACE.												

+ 3 x 3 : Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NLAT104W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 902 218.1 E 290 990.1 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.16 - 2013.05.16 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	20 40 60 80 100	w _p w w _L	20 40 60			
295.9 0.0	ASPHALT: (350mm)													GR SA SI CL
295.5 0.4	Gravelly SAND, some silt and clay Brown Moist		1	GS								○		19 69 12 (SI+CL)
295.1 0.8	(FILL)													
	Silly SAND, trace gravel, trace clay Compact Brown Moist		2	SS	26		295					○		
			3	SS	26		294					○		0 58 23 13
			4	SS	10							○		
292.9 3.0	Sandy SILT, trace gravel, trace clay, trace organics Compact Brown Moist		5	SS	11		293					○		1 57 29 13
			6	SS	10		292					○		
			7	SS	24		291					○		
290.3 5.6	Dense						290							
			8	SS	40		289					○		Split spoon wet
287.7 8.2	END OF BOREHOLE AT 8.2m. BOREHOLE OPEN TO 7.6m AND WATER LEVEL AT 6.4m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m THEN ASPHALT TO SURFACE.		9	SS	63		288					○		

RECORD OF BOREHOLE No NLAT106W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 902 403.5 E 290 954.2 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.16 - 2013.05.16 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	
296.7 0.0	ASPHALT: (325mm)											
296.3 0.4	Gravelly SAND, trace silt		1	AS								27 70 3 (SI+CL)
295.9 0.8	Brown Moist (FILL)											
	SAND and SILT, trace gravel, some clay Dense to Compact		1	SS	46		296					
	Brown Moist											
			2	SS	27		295					8 49 32 11
294.5 2.2	Silty CLAY, trace gravel, some sand											
	Firm to Very Stiff											
	Brown Moist		3	SS	5		294					
			4	SS	29		293					0 12 40 48
			5	SS	15		292					
292.2 4.5	Sandy SILT, some clay, trace gravel											
	Dense to Very Dense											
	Brown Moist (TILL)		6	SS	49		291					
			7	SS	85							Split spoon wet
290.0 6.7	END OF BOREHOLE AT 6.7m BOREHOLE OPEN TO 6.1m AND WATER LEVEL AT 5.4m UPON COMPLETION BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m THEN ASPHALT TO SURFACE.											

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO) GDT 8/12/13

RECORD OF BOREHOLE No NLAT23AW-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 898 385 2 E 291 716 3 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.28 - 2013.05.28 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				
								20 40 60 80 100	w _p w w _L					
254.6	0.0	ASPHALT: (200mm)						○ UNCONFINED + FIELD VANE						
	0.2	SAND, some gravel, trace silt Compact Brown Moist (FILL)	1	AS			254	● QUICK TRIAXIAL × LAB VANE						14 83 3 (SI+CL)
			1	SS	14									
			2	SS	12		253							
252.1	2.5	Sandy SILT, some clay, trace gravel Compact Dark Brown Moist (FILL)	3	SS	21		252							
251.5	3.1	Silty SAND, trace to some clay, trace gravel Compact Brown Moist	4	SS	19		251							
			5	SS	15		250							7 55 27 11 Split spoon wet
			6	SS	31		249							
			7	SS	20		248							
247.9	6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO 5.4m AND WATER LEVEL AT 4.1m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.9m, CEMENT TO 0.2m, ASPHALT TO SURFACE.												

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/12/13

RECORD OF BOREHOLE No NLAT28E-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 898 492 8 E 291 703.2 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013 05 29 - 2013 05 29 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				
							20 40 60 80 100							
							○ UNCONFINED + FIELD VANE							
							● QUICK TRIAXIAL × LAB VANE							
257.9							20 40 60 80 100							
0.0	ASPHALT: (325mm)													
257.6			1	AS										
0.3	Gravelly SAND, trace silt													
257.2	Brown													
0.7	Moist													
	(FILL)													
	SAND, trace to some silt, trace gravel		1	SS	16									
	Compact to Dense													
	Brown													
	Moist													
			2	SS	25									
			3	SS	32									
254.8														
3.1	Silty SAND, trace to some clay, trace gravel		4	SS	60									
	Very Dense													
	Brown													
	Moist													
	(TILL)													
			5	SS	52									
			6	SS	88									
			7	SS	50									
251.2														
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m, THEN ASPHALT COLD PATCH TO SURFACE.													

ONTMT4S 1218.GPJ 2012TEMPLATE(MTO).GDT 9/26/13

RECORD OF BOREHOLE No NLAT32E-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 898 597.9 E 291 682.2 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.29 - 2013.05.29 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)							
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					W _P						W	W _L
261.2							20	40	60	80	100									
0.0	ASPHALT: (350mm)		1	AS														19 78 3 (SI+CL)		
260.8																				
0.4	SAND, some gravel, trace silt Brown Moist (FILL)																			
260.4																				
0.8																				
	Silly SAND, trace clay, trace gravel Compact to Very Dense Brown Moist (TILL)		1	SS	19															
			2	SS	72													8 57 26 9		
258.9																				
2.3	SAND and SILT, some clay, trace gravel Compact Brown Moist		3	SS	21															
			4	SS	11													2 52 32 14		
257.3																				
3.9	Sandy SILT, trace gravel, trace to some clay, trace organic staining Very Dense Brown Moist (TILL)		5	SS	50/ 0.150															
			6	SS	56															

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

RECORD OF BOREHOLE No NLAT37-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 899 454.4 E 291 506.4 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.31 - 2013.05.31 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
285.3 0.0	ASPHALT: (150mm)											
0.2	SAND, some gravel Brown Moist (FILL)		1	AS			285					
284.4 0.9	SAND and SILT, trace to some clay, trace gravel Compact to Loose Brown Moist (FILL)		1	SS	11		284					3 54 32 11
			2	SS	12							
			3	SS	8		283					Split spoon wet
282.3 3.0	Silty CLAY, trace sand, trace gravel Firm Brown Moist		4	SS	6		282					0 8 26 66
281.2 4.1	Sandy SILT, trace gravel, trace clay Compact Brown Moist (TILL)		5	SS	6		281					
			6	SS	25							
279.7 5.6	Very Dense						280					
			7	SS	62		279					
278.7 6.6	END OF BOREHOLE AT 6.6m. BOREHOLE OPEN TO BOTTOM AND WATER LEVEL AT 2.4m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 2.1m, CUTTINGS TO 1.9m, CEMENT TO 0.15m THEN ASPHALT TO SURFACE.											

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/12/13

RECORD OF BOREHOLE No NLAT41-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 899 299.9 E 291 543.5 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.28 - 2013.05.28 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
282.5 0.0	ASPHALT: (200mm)												
0.2	SAND and GRAVEL, trace silt Compact Brown Moist (FILL)		1	AS			282						48 47 5 (SI+CL)
			1	SS	22								
281.1 1.4	Silty SAND, some clay, trace gravel Dense Brown Moist		2	SS	43		281						4 58 25 13
			3	SS	37		280						
279.2 3.3	SAND, trace silt, trace gravel Very Dense Brown Wet		4	SS	94/ 0.250		279						
278.6 3.9	Clayey SILT, with sand, trace gravel Hard Brown (TILL)		5	SS	54		278						1 38 38 23 Split spoon wet
			6	SS	80/ 0.225								
276.3 6.2	END OF BOREHOLE AT 6.2m. BOREHOLE OPEN TO BOTTOM AND WATER LEVEL AT 4.4m UPON COMPLETION BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 2.4m, CUTTINGS TO 1.8m, CEMENT TO 0.2m, ASPHALT TO SURFACE.		7	SS	50/ 0.125		277						

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/12/13

RECORD OF BOREHOLE No NLAT46-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 899 152.1 E 291 571.4 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 05 28 - 2013 05 28 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE	w _p w w _L									
						● QUICK TRIAXIAL × LAB VANE	20 40 60 80 100			20 40 60								
278.1																		
0.0	ASPHALT: (200mm)						278											
0.2	SAND, trace gravel, some silt and clay Compact to Dense Brown Moist (FILL)		1	AS														
			1	SS	30		277								7 71 22 (SI+CL)			
276.8	Silty SAND, some clay, trace gravel Dense to Very Dense Brown Moist (TILL)		2	SS	37													
1.3			3	SS	50/ 0.100		276											
			4	SS	50/ 0.100		275								8 54 25 13			
			5	SS	50/ 0.125		274											
			6	SS	50/ 0.150													
							273											
271.9			7	SS	50/ 0.100		272											
6.2	END OF BOREHOLE AT 6.2m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.8m, CEMENT TO 0.2m, ASPHALT TO SURFACE.																	

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/26/13

RECORD OF BOREHOLE No NLAT50W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 898 999.7 E 291 600.0 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.28 - 2013.05.28 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
273.4 0.0	ASPHALT: (213mm)												
0.2	Gravelly SAND, trace silt Compact Brown Moist (FILL)		1	AS			273						
272.1			1	SS	24								22 71 7 (SI+CL)
1.3	Silty SAND, trace to some gravel, some clay Very Dense Brown Moist (TILL)		2	SS	50/ 0.125		272						
			3	SS	55/ 0.150		271						
			4	SS	50/ 0.100		270						
			5	SS	50/ 0.125		269						
			6	SS	50/ 0.150		268						
267.2 6.2	END OF BOREHOLE AT 6.2m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOELPLUG TO 2.7m, CUTTINGS TO 1.8m, CEMENT TO 0.2m, ASPHALT TO SURFACE.		7	SS	50/ 0.100								

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/26/13

RECORD OF BOREHOLE No NLAT54-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 898 852 7 E 291 633 7 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 05 29 - 2013 05 29 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	
269.0												
0.0	ASPHALT: (300mm)						269					
268.7			1	AS								
0.3	SAND, some gravel, trace silt Brown Moist (FILL)											11 84 5 (SI+CL)
268.2												
0.8	Silty SAND, some clay, trace gravel Dense to Very Dense Brown Moist to Wet (TILL)		1	SS	43		268					
			2	SS	50/ 0.025							7 59 24 10
			3	SS	50/ 0.025		267					
			4	SS	50/ 0.100		266					
			5	SS	50/ 0.100		265					
264.4			6	SS	50/ 0.075							Split spoon wet
4.6	END OF BOREHOLE AT 4.6m. BOREHOLE OPEN TO 0.9m AND WATER LEVEL AT 0.9m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE/CUTTINGS AND ASPHALT PATCH TO SURFACE											

+ 3 . X 3 : Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NLAT60-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 899 882 3 E 291 432 8 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013 05 27 - 2013 05 27 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						PLASTIC LIMIT w _P NATURAL MOISTURE CONTENT w LIQUID LIMIT w _L
287.4							20	40	60	80	100			
0.0	ASPHALT: (325mm)		1	AS										
287.1														
0.3	SAND, trace gravel Loose Brown													
286.6	Moist (FILL)		1	SS	24									
0.8	Silty SAND, trace to some clay, trace gravel Compact to Very Dense Brown Moist		2	SS	45									0 65 25 10
			3	SS	67									Split spoon wet
			4	SS	51									2 81 15 2
	Loose		5	SS	5									
283.0														
4.4	END OF BOREHOLE AT 4.4m. BOREHOLE OPEN TO 3.0m AND WATER LEVEL AT 3.0m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE, CONCRETE AND COLD PATCH ASPHALT TO SURFACE.													

RECORD OF BOREHOLE No NLAT65W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 900 020 8 E 291 406 3 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.27 - 2013.05.27 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	
288.2 0.0	ASPHALT: (350mm)		1	AS			288					GR SA SI CL
287.8 0.4	SAND, trace silt, trace gravel Brown Moist											9 87 4 (SI+CL)
287.4 0.8	(FILL) Clayey SILT, with sand, trace gravel Hard to Very Stiff Brown Moist		1	SS	34		287					0 43 39 18
			2	SS	18							
			3	SS	29		286					
285.2 3.0	Silty SAND, trace clay, trace gravel Very Dense Brown Moist (TILL)		4	SS	52		285					8 65 20 7 Split spoon wet
			5	SS	50/ 0.150		284					
			6	SS	50/ 0.150		283					
			7	SS	9		282					
281.5 6.7	Loose END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO 3.6m AND WATER LEVEL AT 3.6m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m THEN ASPHALT COLD PATCH TO SURFACE.											

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

RECORD OF BOREHOLE No NLAT68W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 900 257.3 E 291 360.6 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 05 27 - 2013.05.27 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	
289.5	ASPHALT: (325mm)												
0.0													
289.2			1	AS									
0.3	SAND, some gravel												
288.7	Brown												
0.8	Moist												
	(FILL)												
	Silty SAND, trace gravel, trace clay		1	SS	22								
	Compact to Very Dense												
	Brown												
	Moist												
			2	SS	74								0 67 26 7
			3	SS	46								
			4	SS	58								6 59 27 8
285.8													
3.7	Loose to Compact												Split spoon wet
			5	SS	9								
			6	SS	12								
283.9													
5.6													
			7	SS	84								
282.8													
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15M THEN ASPHALT COLD PATCH TO SURFACE.												

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO) GDT 8/26/13

RECORD OF BOREHOLE No NLAT70W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 900 377.4 E 291 338.8 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.17 - 2013.05.17 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
290.1 0.0	ASPHALT: (200mm)											
0.2	SAND, some to trace gravel, trace to some silt and clay Compact Brown Moist (FILL)		1	AS			290					
			1	SS	10							4 83 13 (SI+CL)
288.7 1.4	Dense to Compact		2	SS	37		289					
			3	SS	24		288					
			4	SS	25		287					8 67 25 (SI+CL)
286.4 3.7	Trace clay, trace organics Loose		5	SS	7		286					
285.4 4.7	Clayey SILT, some sand, trace gravel Stiff Grey		6	SS	9		285					Split spoon wet
284.5 5.6	Silty SAND, trace gravel Compact to Dense Grey Moist		7	SS	30		284					
283.4 6.7	END OF BOREHOLE AT 6.7m BOREHOLE OPEN TO 5.5m AND WATER LEVEL AT 5.2m UPON COMPLETION BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.9m, CUTTINGS TO 1.7m, CEMENT TO 0.2m THEN ASPHALT TO SURFACE											

+ 3, x 3: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NLAT72W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 900 496.7 E 291 316.2 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.17 - 2013.05.17 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE								
290.7							20	40	60	80	100	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT		
0.0	ASPHALT: (188mm)															
0.2	SAND, trace to some gravel Compact Brown Moist (FILL)		1	AS												
	Occasional inferred cobbles		1	SS	21											
289.0																
1.7	SAND, some gravel, some silt Dense to Compact Brown Moist		2	SS	43											
			3	SS	39										20 61 19 (SI+CL)	
	Trace organics, trace rootlets Dark Grey		4	SS	17										Split spoon wet	
286.6			5	SS	13											
4.1	SAND and SILT, trace to some clay Compact to Loose Brown to Grey Moist		6	SS	7										2 52 34 12	
285.1																
5.6	SAND, trace silt, trace gravel Very Dense Grey Wet		7	SS	57											
284.0																
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO BOTTOM AND WATER LEVEL AT 5.3m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 2.3m, CUTTINGS TO 1.7m, CEMENT TO 0.2m THEN ASPHALT TO SURFACE.															

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

RECORD OF BOREHOLE No NLAT75-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 900 886.2 E 291 242.5 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.17 - 2013.05.17 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	
294.0	ASPHALT: (200mm)						294					
0.0												
0.2	SAND, some gravel, trace silt Compact to Very Dense Brown Moist (FILL)		1	AS								
			1	SS	20		293					13 79 8 (SI+CL)
			2	SS	79		292					
			3	SS	100/ 0.175							
291.0			4	SS	100/ 0.250		291					4 57 31 8
3.0	SAND and SILT, trace clay, trace gravel Very Dense Brown Moist (TILL) Inferred cobbles at 3.9m		5	SS	50/ 0.125		290					
			6	SS	101/ 0.225		289					
287.8			7	SS	100/ 0.150		288					
6.2	END OF BOREHOLE AT 6.2m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.8m, CEMENT TO 0.2m THEN ASPHALT TO SURFACE.											

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO), GDT 8/26/13

RECORD OF BOREHOLE No NLAT78-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 900 752.8 E 291 274.8 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.30 - 2013.05.30 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				
								20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w		
292.6												
0.0	ASPHALT: (200mm)											
0.2	SAND and GRAVEL, trace silt Compact Brown Moist (FILL)		1	AS			292					43 53 4 (SI+CL)
			1	SS	17							
290.7			2	SS	46		291					
1.9	Silty CLAY, some sand, trace gravel Hard Brown											0 24 44 32
290.2			3	SS	83		290					
2.4	SAND and SILT, some clay, trace gravel Very Dense Brown Moist (TILL)		4	SS	58/ 0.150							0 44 35 21 Split spoon wet
			5	SS	54/ 0.150		289					
			6	SS	50/ 0.100		288					
							287					
286.4			7	SS	50/ 0.125							
6.2	END OF BOREHOLE AT 6.2m. BOREHOLE OPEN TO BOTTOM AND WATER LEVEL AT 5.1m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 2.6m, CUTTINGS TO 2.1m, CEMENT TO 0.2m THEN ASPHALT TO SURFACE.											

RECORD OF BOREHOLE No NLAT79E-01

1 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 900 629.8 E 291 298.3 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.30 - 2013.05.30 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	
291.4												
0.0	ASPHALT: (200mm)											
0.2	SAND, some gravel, trace silt Compact Brown Moist (FILL)		1	AS			291					
			1	SS	19							19 72 9 (SI+CL)
290.0							290					
1.4	Dense		2	SS	38							
289.2												
2.2			3	SS	11		289					
288.4												
3.0	SAND and SILT, trace gravel Compact Brown Moist		4	SS	22		288					
287.3			5	SS	28							
4.1	Silty CLAY, with sand, trace gravel Very Stiff to Hard Brown (TILL)		6	SS	36		287					1 41 28 30
							286					
285.3												
6.1	Sandy SILT, trace gravel Very Dense Brown Moist (TILL)		7	SS	54/ 0.150		285					
							284					
			8	SS	51/ 0.150							
							283					
	Grey											
282.1			9	SS	55/ 0.150							
9.3	END OF BOREHOLE AT 9.3m. BOREHOLE OPEN TO BOTTOM AND WATER LEVEL AT 4.5m UPON COMPLETION BOREHOLE BACKFILLED WITH											

Continued Next Page

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

METRIC

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	20 40 60 80 100	20 40 60 80 100	W _P W W _L	20 40 60		
	Continued From Previous Page BENTONITE HOLEPLUG TO 1.8m, CEMENT TO 0.2m THEN ASPHALT TO SURFACE						<div> <div>○ UNCONFINED</div> <div>● QUICK TRIAXIAL</div> </div> <div> <div>+ FIELD VANE</div> <div>× LAB VANE</div> </div>						

RECORD OF BOREHOLE No NLAT96W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 901 873.7 E 291 055.4 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.17 - 2013.05.17 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
								20 40 60 80 100	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT			WATER CONTENT (%)
300.0														
0.0	ASPHALT: (175mm)						300							
0.2	SAND and GRAVEL, trace silt Compact Brown Moist (FILL)		1	AS									37 55 8 (SI+CL)	
298.7			1	SS	17		299							
1.3	Silty SAND, some clay, trace gravel, occasional inferred cobbles Very Dense Brown Moist (FILL)		2	SS	52		298						2 60 24 14	
297.8														
2.2	Silty SAND, some clay, trace gravel Very Dense Brown Moist (TILL)		3	SS	69		297							
			4	SS	76									
			5	SS	65		296						1 60 24 15	
			6	SS	94/ 0.275		295							
							294							
293.4			7	SS	91									
6.6	END OF BOREHOLE AT 6.6m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 2.1m, CUTTINGS TO 1.5m, CEMENT TO 0.2m THEN ASPHALT TO SURFACE.													

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RECORD OF BOREHOLE No NLAT99W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 901 993.7 E 291 032.4 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.16 - 2013.05.16 CHECKED BY SKP

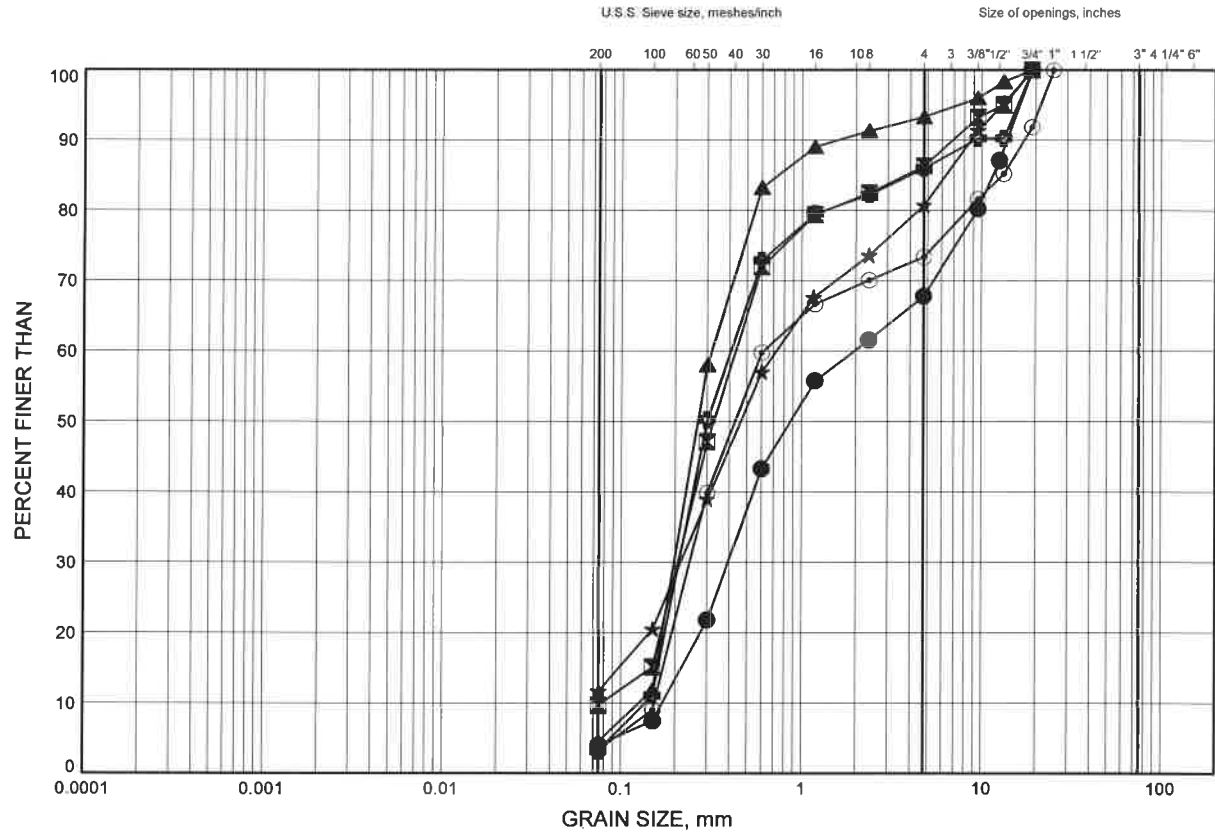
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60	w _p w w _L	GR SA SI CL			
								SHEAR STRENGTH kPa		WATER CONTENT (%)				
						○ UNCONFINED + FIELD VANE								
						● QUICK TRIAXIAL × LAB VANE								
298.3	ASPHALT: (300mm)													
0.0														
297.9	Gravelly SAND, trace silt Brown Moist (FILL)		1	AS										
0.4														
297.4	Silty SAND, some clay, trace gravel Dense to Very Dense Brown Moist (TILL)		2	SS	53									1 63 25 11
0.9														
			3	SS	49									
			4	SS	82									4 60 23 13
			5	SS	100									
			6	SS	50									
			7	SS	95									
			8	SS	50									
291.6	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO 6.1m AND WATER LEVEL AT 5.9m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m THEN ASPHALT TO SURFACE.													
6.7														

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/12/13

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE C1

SAND/SAND & 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)
●	C51-01	0.30	285.40
⊠	C51-02	1.07	284.63
▲	NLAT100E-01	1.07	295.53
★	NLAT104W-01	0.30	295.60
⊙	NLAT106W-01	0.30	296.40
⊕	NLAT23AW-01	1.07	253.53

Date August 2013

GWP# 83-00-00



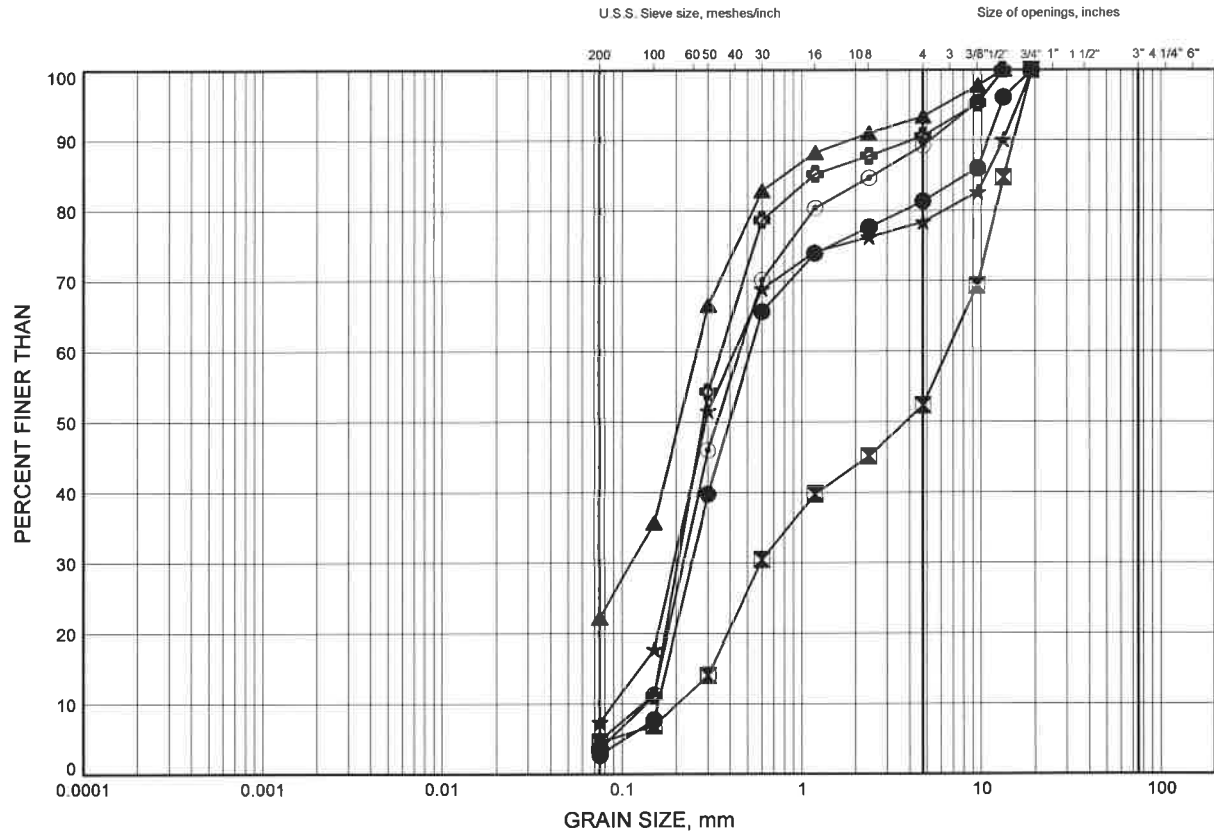
Prep'd AN

Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE C2

SAND/SAND & 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)
●	NLAT32E-01	0.30	260.90
⊠	NLAT41-01	0.38	282.12
▲	NLAT46-01	1.07	277.03
★	NLAT50W-01	1.07	272.33
⊙	NLAT54-01	0.46	268.54
⊕	NLAT65W-01	0.46	287.74

Date August 2013
GWP# 83-00-00

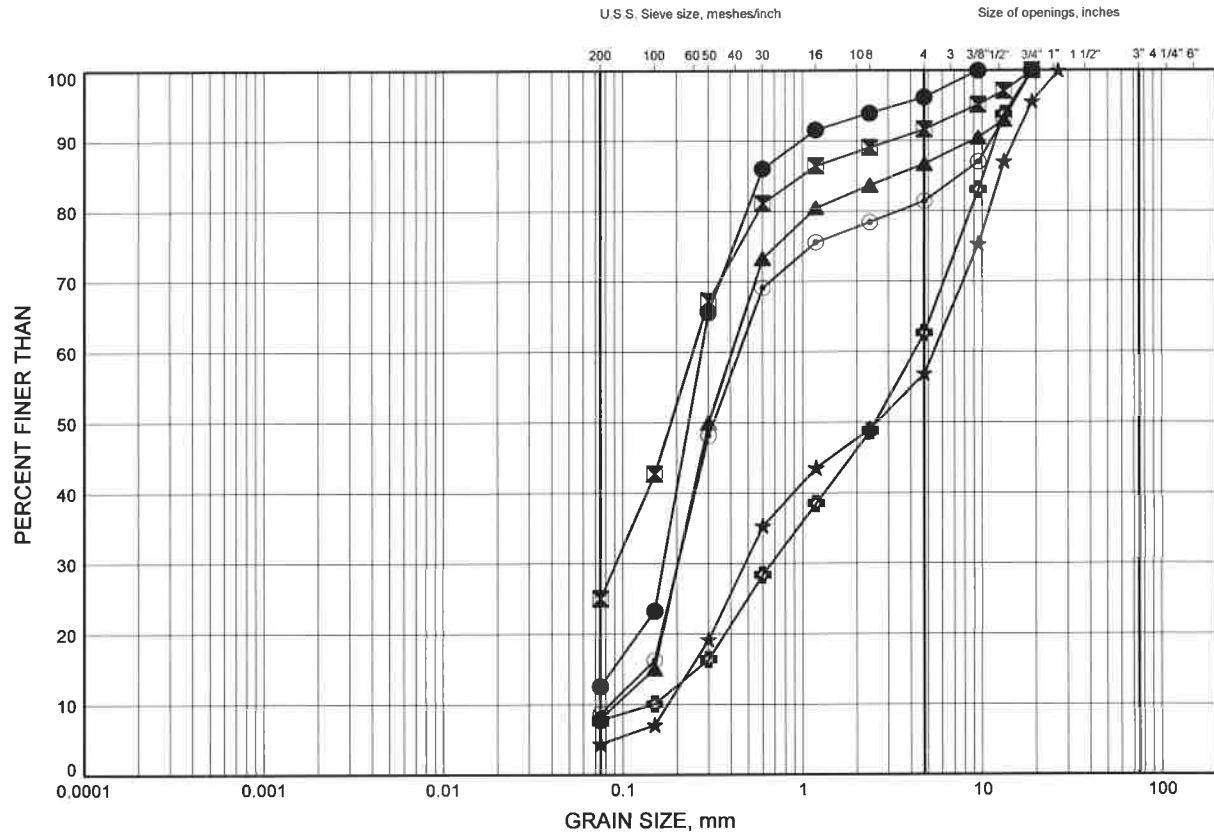


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Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE C3

SAND/SAND & 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)
●	NLAT70W-01	1.07	289.03
⊠	NLAT70W-01	3.35	286.75
▲	NLAT75-01	1.07	292.93
★	NLAT78-01	0.38	292.22
⊙	NLAT79E-01	1.07	290.33
⊕	NLAT96W-01	0.38	299.62

Date August 2013
GWP# 83-00-00

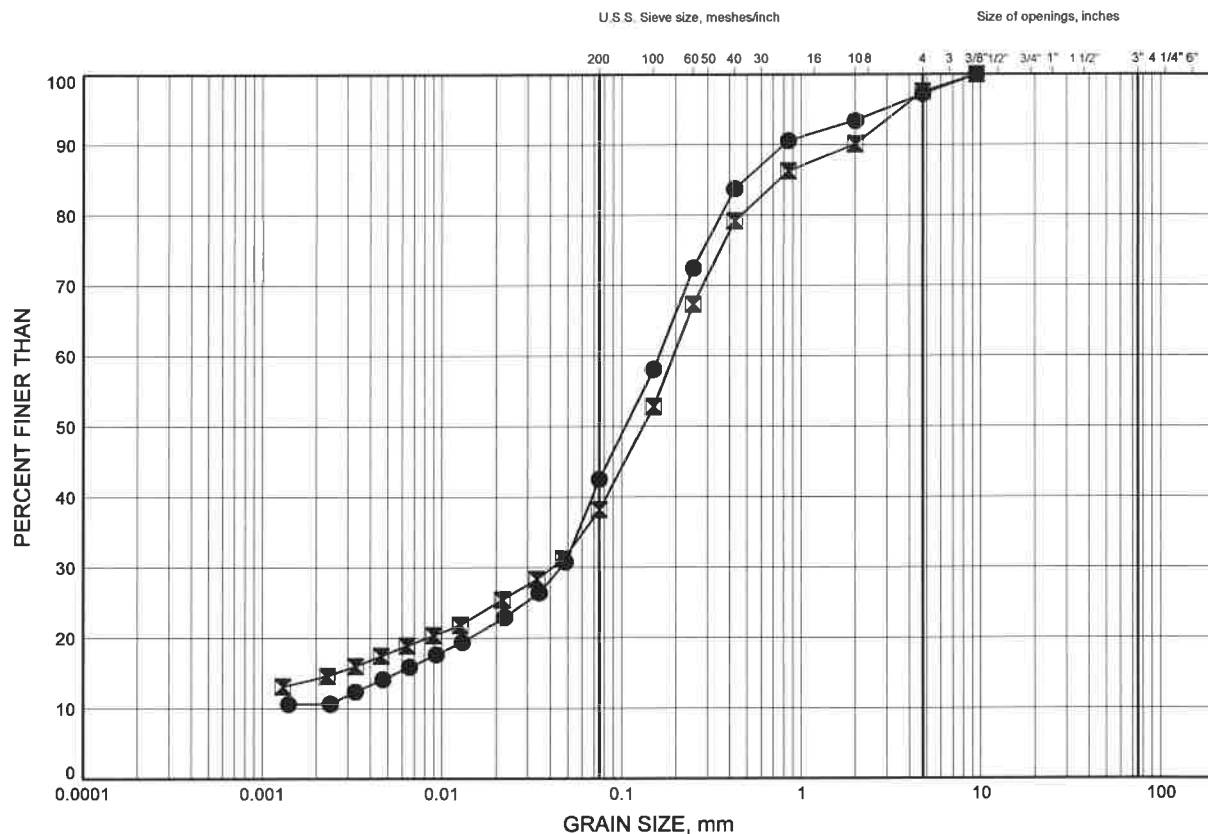


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Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE C4

SAND & SILT/SILTY SAND FILL



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

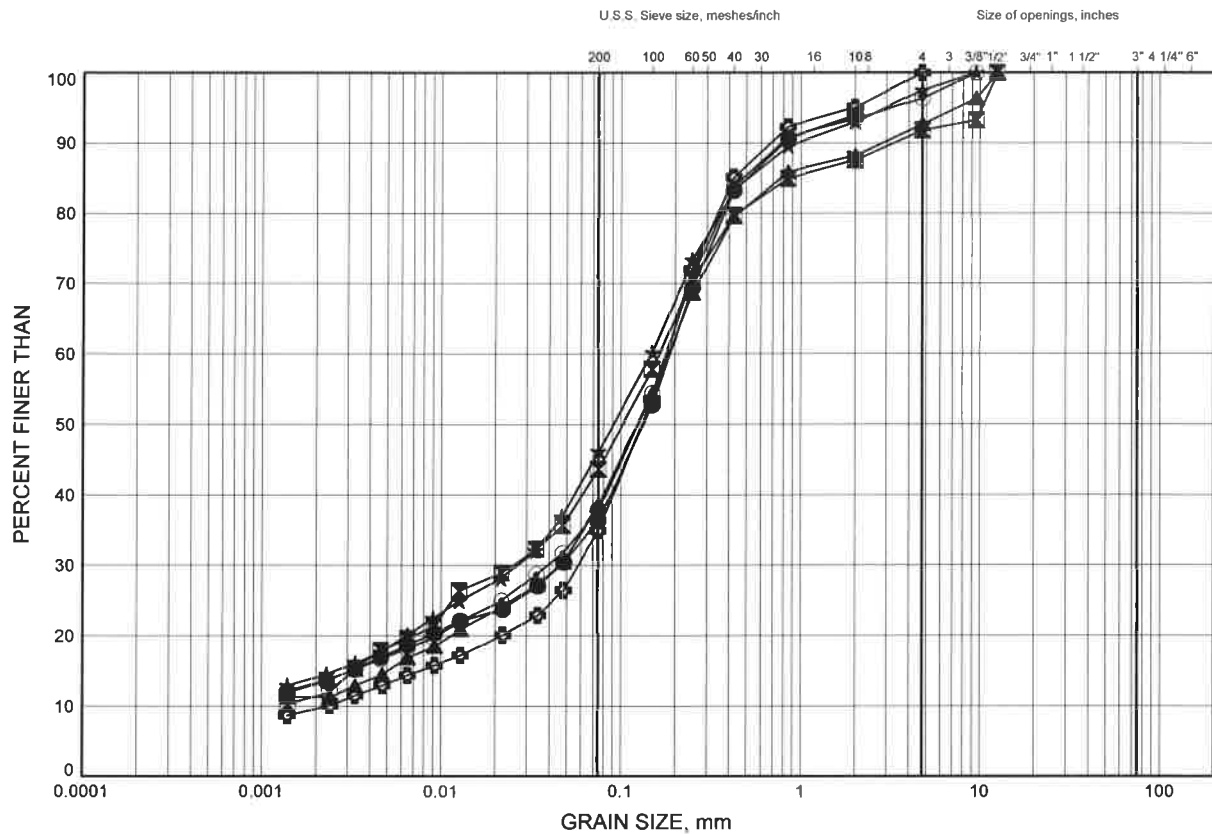
LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT37-01	1.07	284.23
⊠	NLAT96W-01	1.83	298.17

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE C5

SAND & SILT/SILTY SAND



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT104W-01	1.83	294.07
⊠	NLAT106W-01	1.83	294.87
▲	NLAT23AW-01	4.11	250.49
★	NLAT32E-01	3.35	257.85
⊙	NLAT41-01	1.83	280.67
⊕	NLAT60-01	1.07	286.33

Date August 2013

GWP# 83-00-00



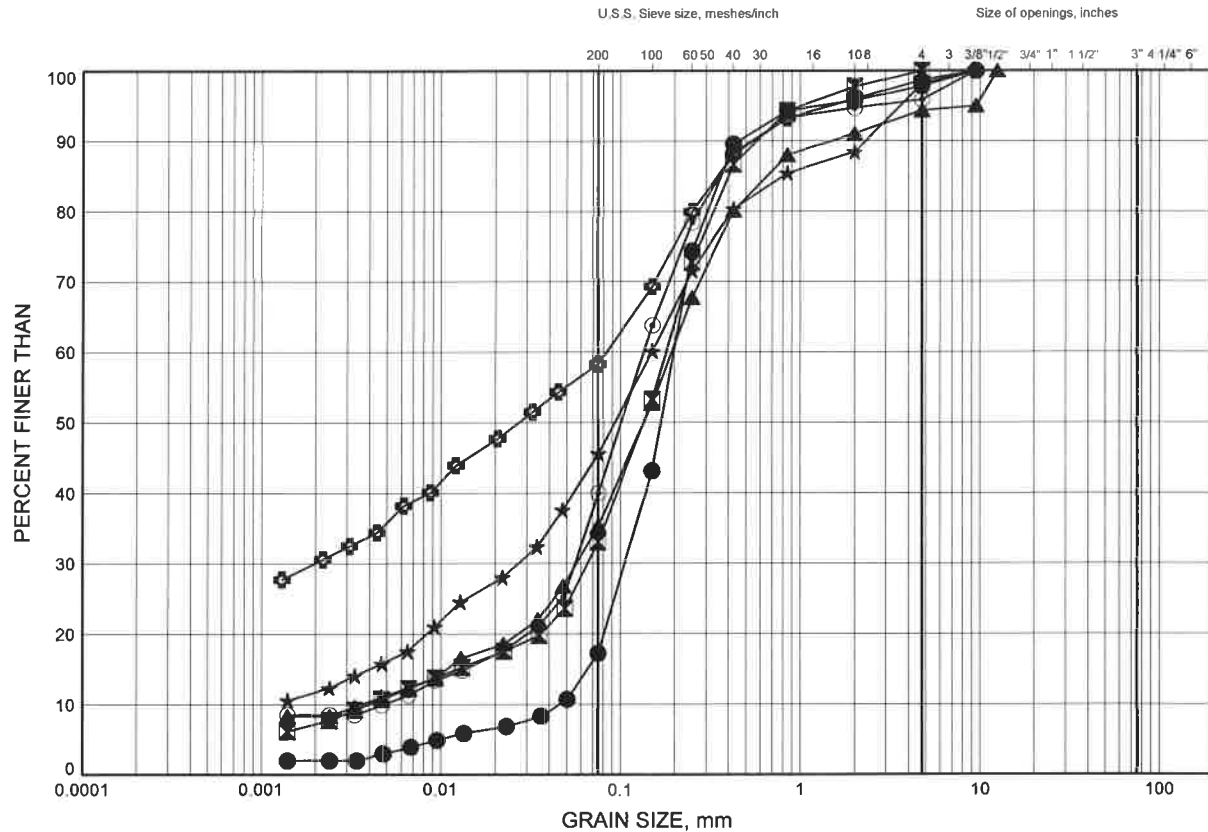
Prep'd AN

Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE C6

SAND & SILT/SILTY SAND



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT60-01	3.35	284.05
⊠	NLAT68W-01	1.83	287.67
▲	NLAT68W-01	3.35	286.15
★	NLAT72W-01	4.27	286.43
⊙	NLAT75-01	3.18	290.82
⊞	NLAT79E-01	4.19	287.21

GRAIN SIZE DISTRIBUTION - THURBER 1218.GPJ 8/26/13

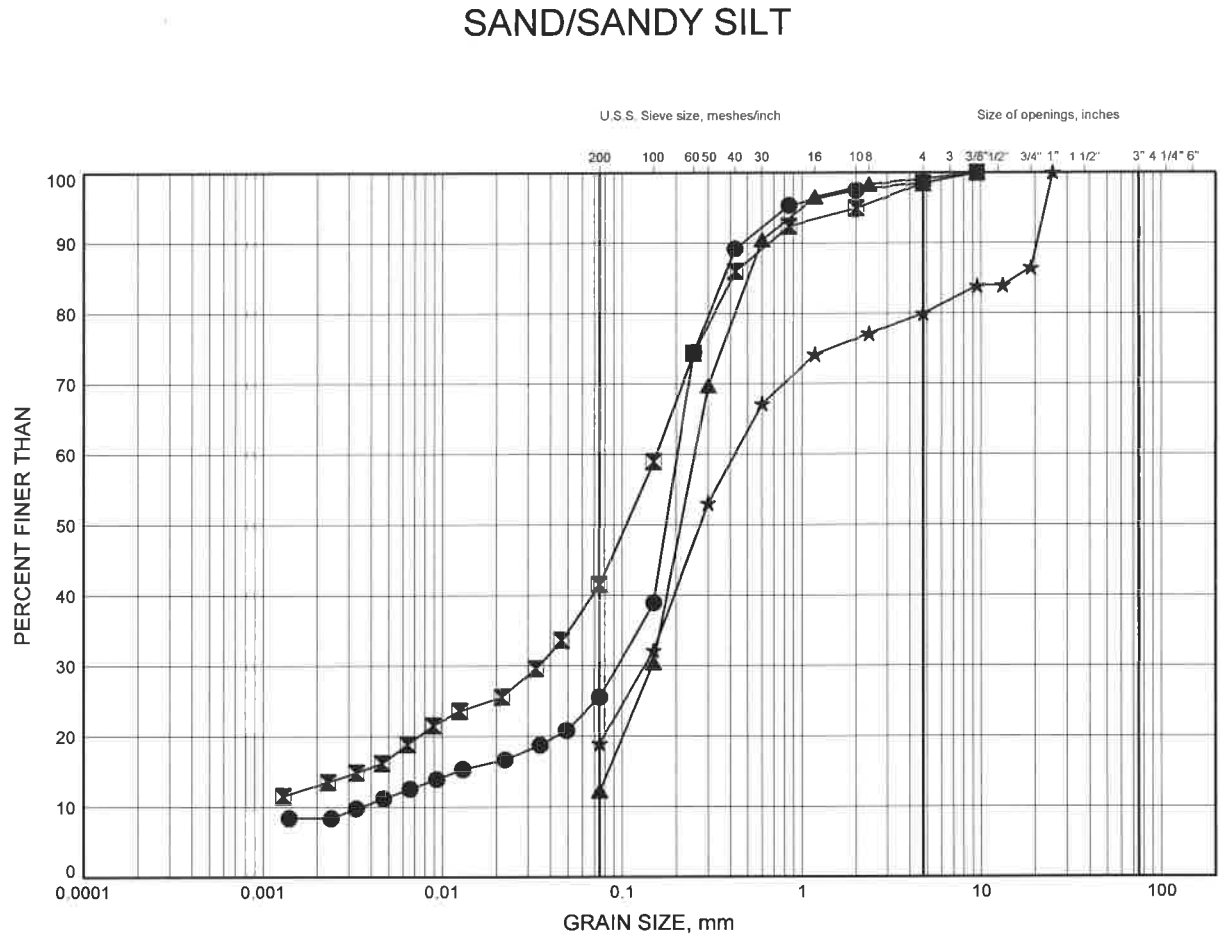
Date August 2013
GWP# 83-00-00



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Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE C7



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT100E-01	3.35	293.25
⊠	NLAT104W-01	3.35	292.55
▲	NLAT28E-01	1.83	256.07
★	NLAT72W-01	2.59	288.11

Date August 2013
GWP# 83-00-00

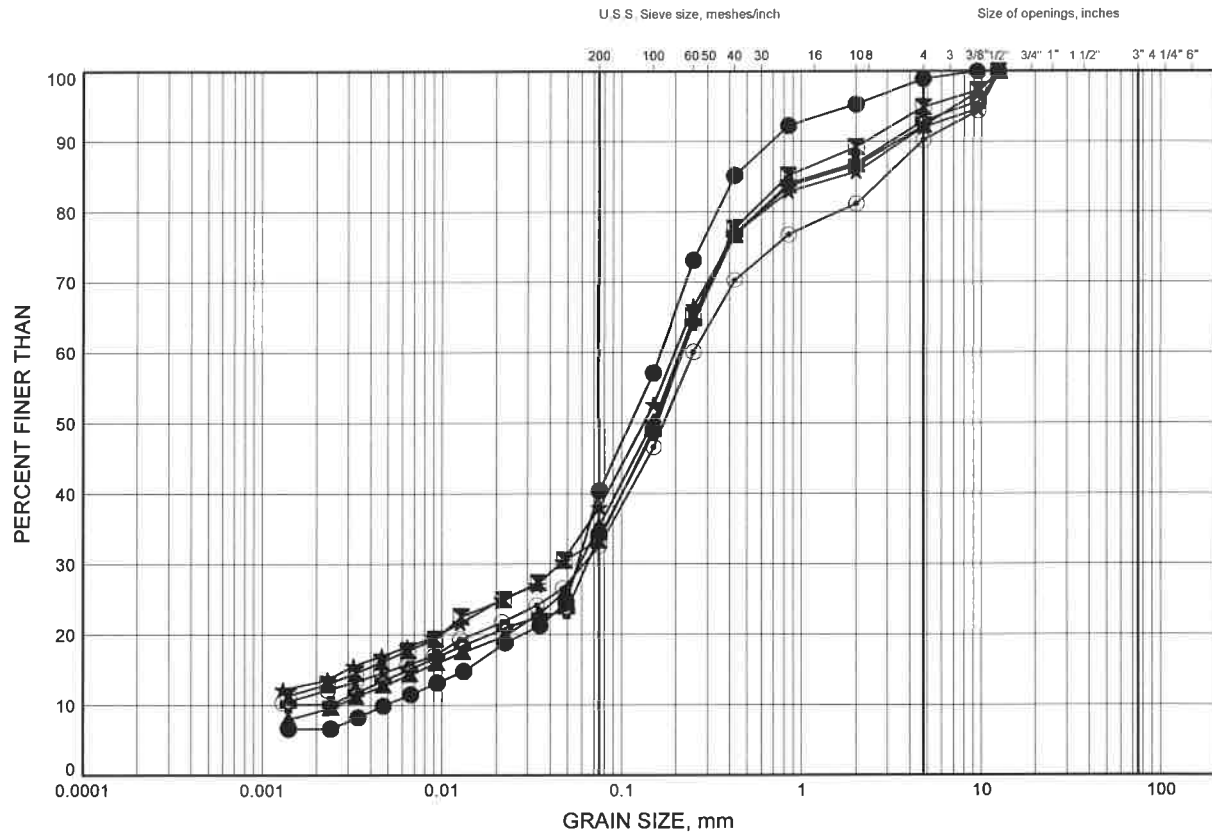


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Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE C8

SAND & SILT/SILTY SAND TILL



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

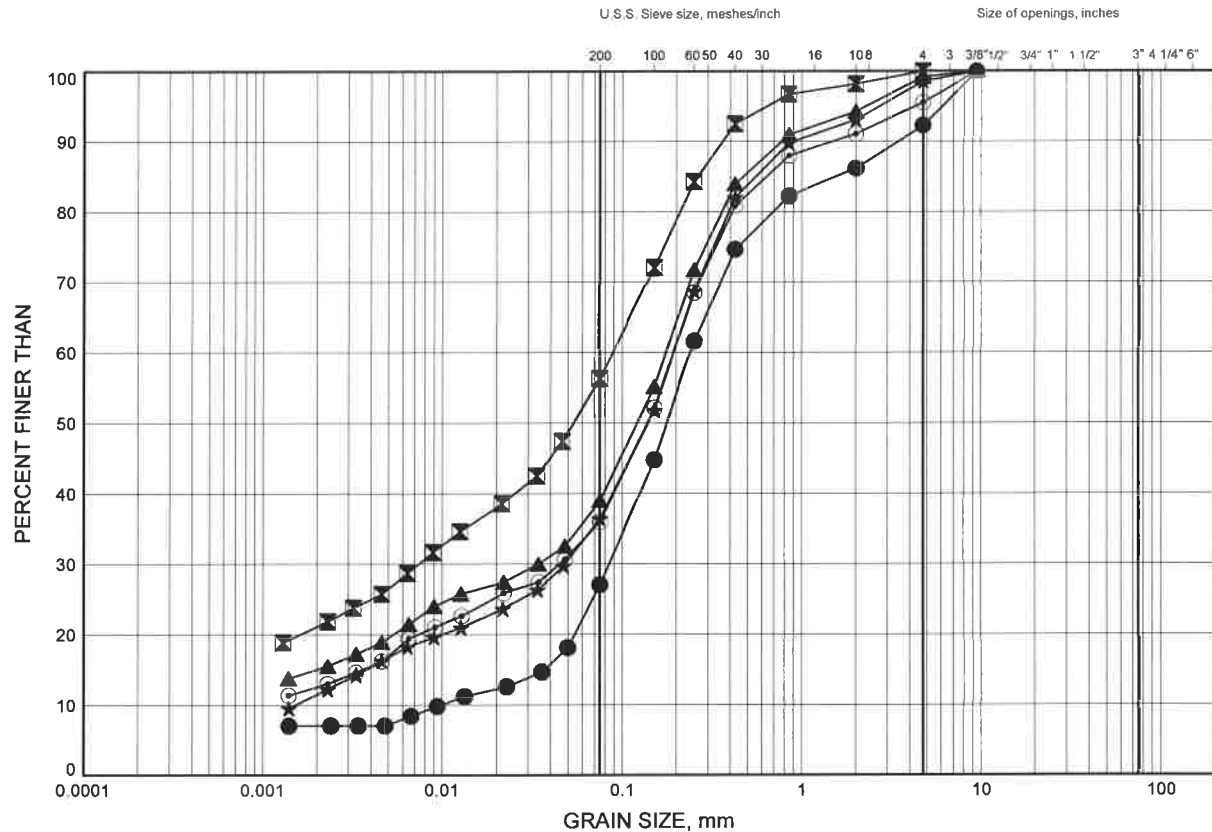
LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C51-02	6.40	279.30
⊠	NLAT28E-01	3.35	254.55
▲	NLAT32E-01	1.83	259.37
★	NLAT46-01	3.17	274.93
⊙	NLAT50W-01	2.59	270.81
⊕	NLAT54-01	1.83	267.17

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE C9

SAND & SILT/SILTY SAND TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT65W-01	3.35	284.85
⊠	NLAT78-01	3.12	289.48
▲	NLAT96W-01	4.04	295.96
★	NLAT99W-01	1.07	297.23
⊙	NLAT99W-01	2.59	295.71

GRAIN SIZE DISTRIBUTION - THURBER 1218 GPJ 8/26/13

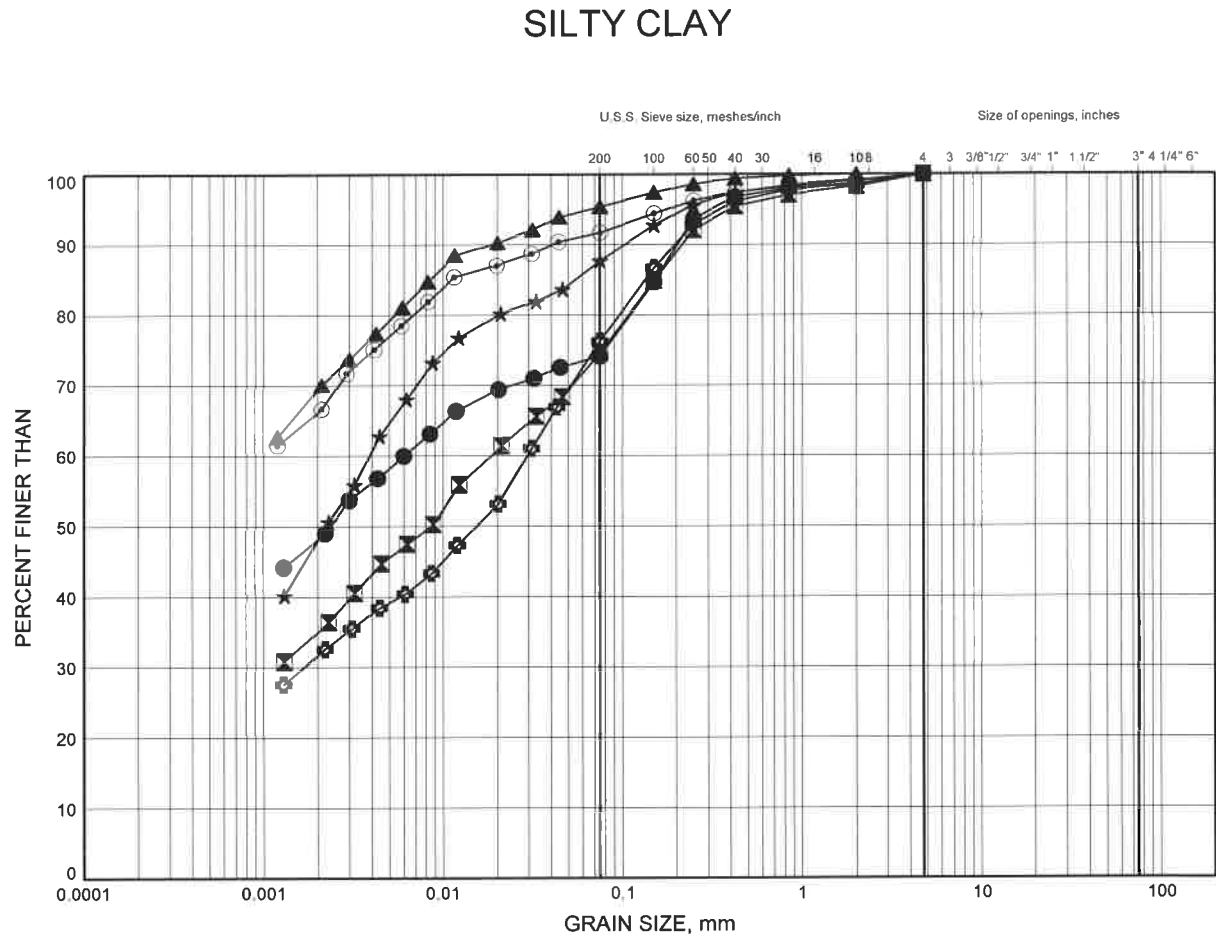
Date August 2013
GWP# 83-00-00



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Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE C10



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C51-01	3.35	282.35
⊠	C51-01	4.88	280.82
▲	C51-02	3.35	282.35
★	NLAT106W-01	3.35	293.35
⊙	NLAT37-01	3.35	281.95
⊕	NLAT78-01	1.98	290.62

GRAIN SIZE DISTRIBUTION - THURBER 1218.GPJ 8/26/13

Date August 2013
GWP# 83-00-00

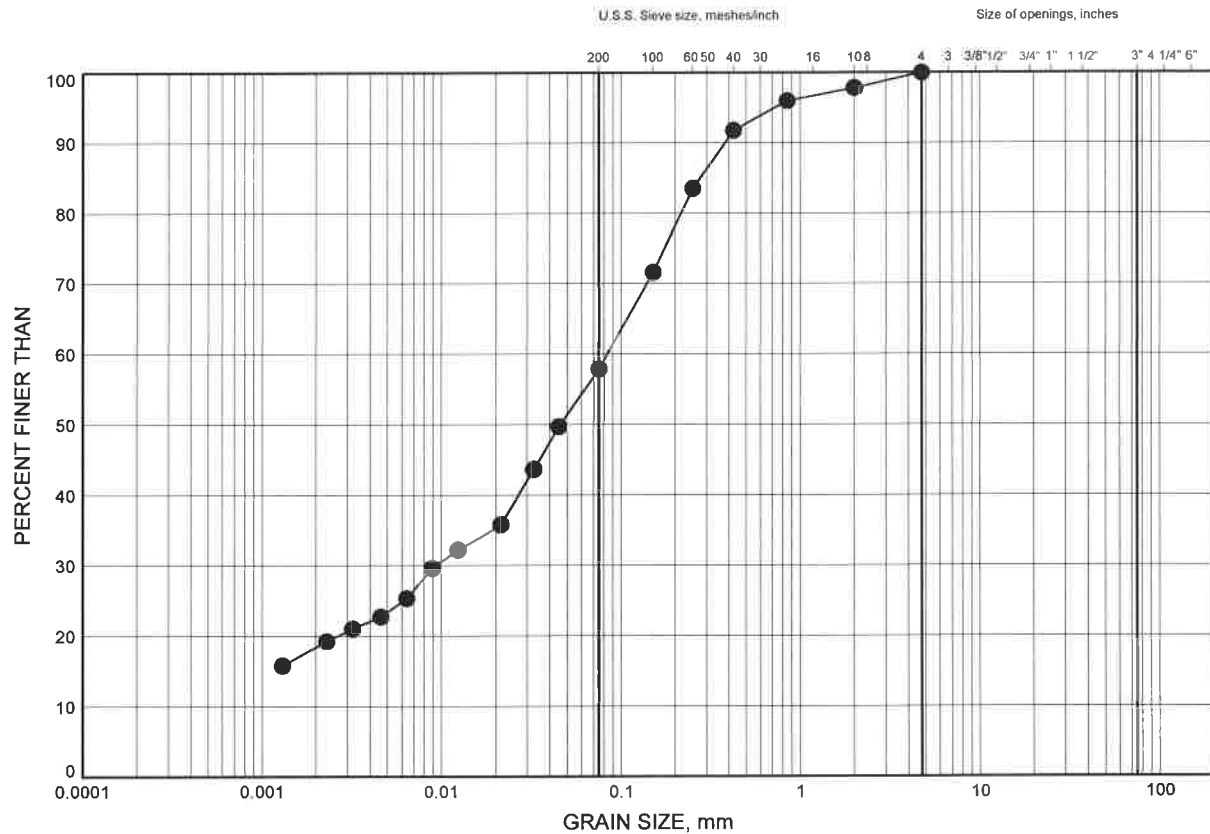


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Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE C11

CLAYEY SILT



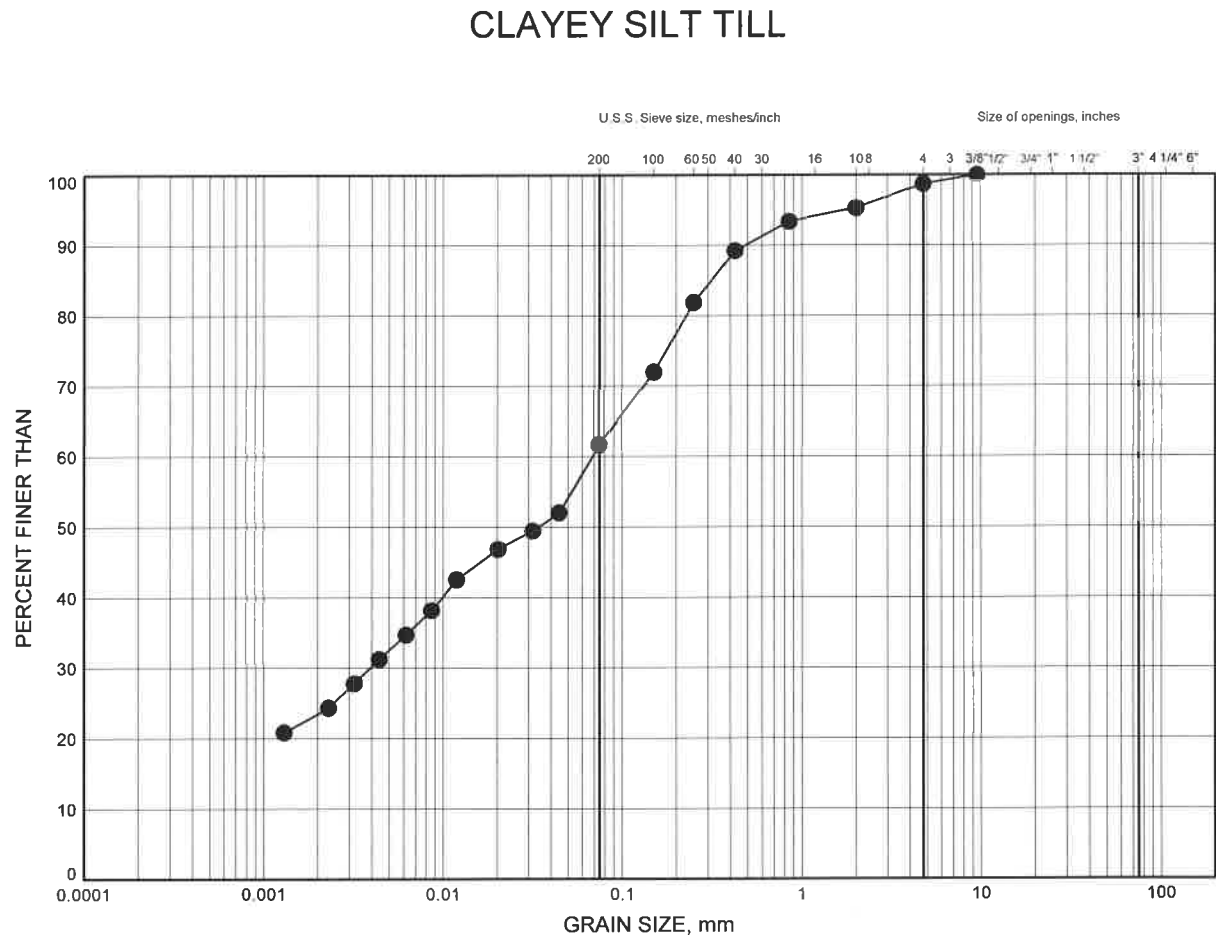
SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT65W-01	1.83	286.37

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE C12



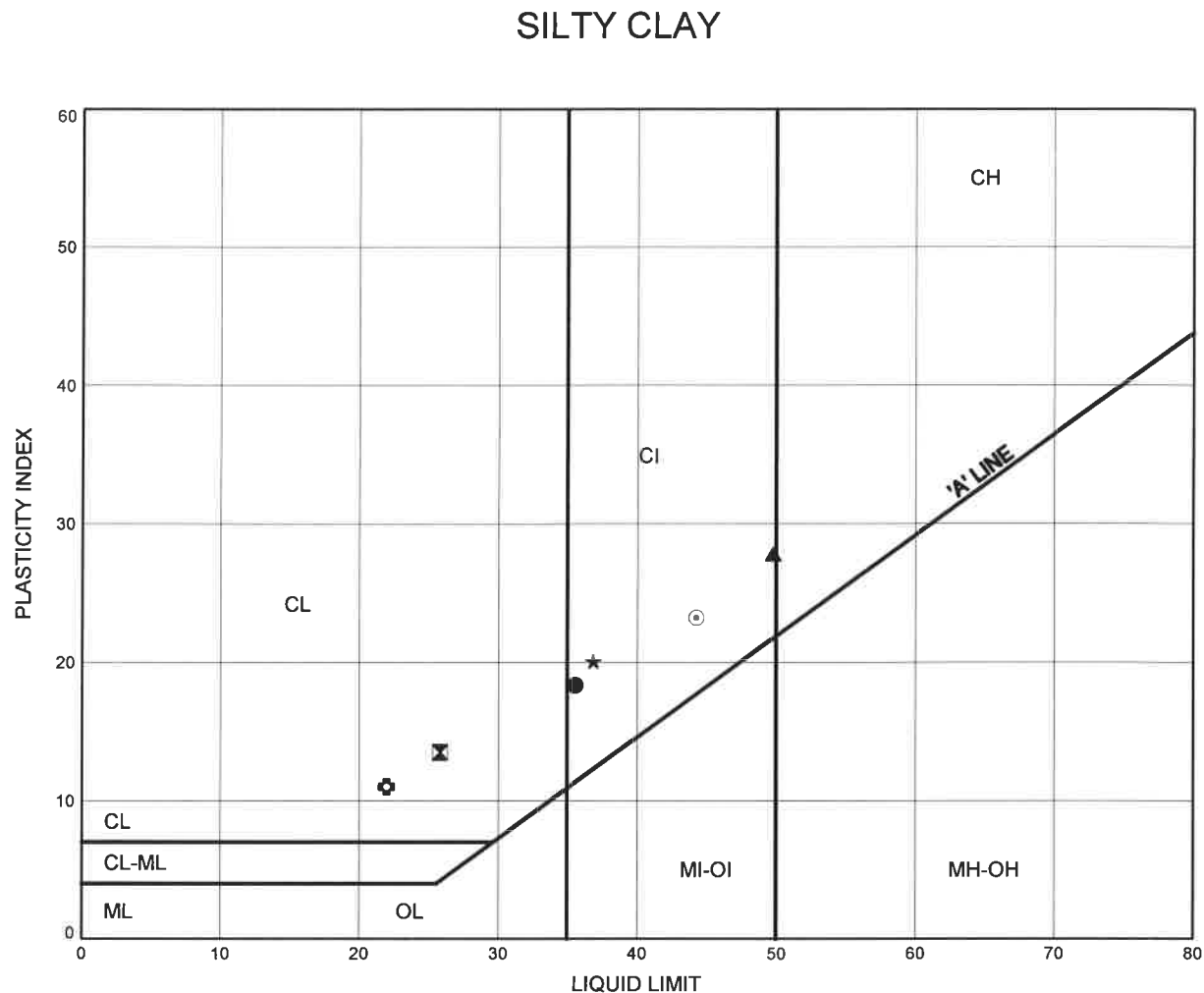
SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT41-01	4.11	278.39

Hwy 400 Median Sewer ATTERBERG LIMITS TEST RESULTS

FIGURE C13



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C51-01	3.35	282.35
⊠	C51-01	4.88	280.82
▲	C51-02	3.35	282.35
★	NLAT106W-01	3.35	293.35
⊙	NLAT37-01	3.35	281.95
⊕	NLAT78-01	1.98	290.62

Date August 2013
GWP# 83-00-00

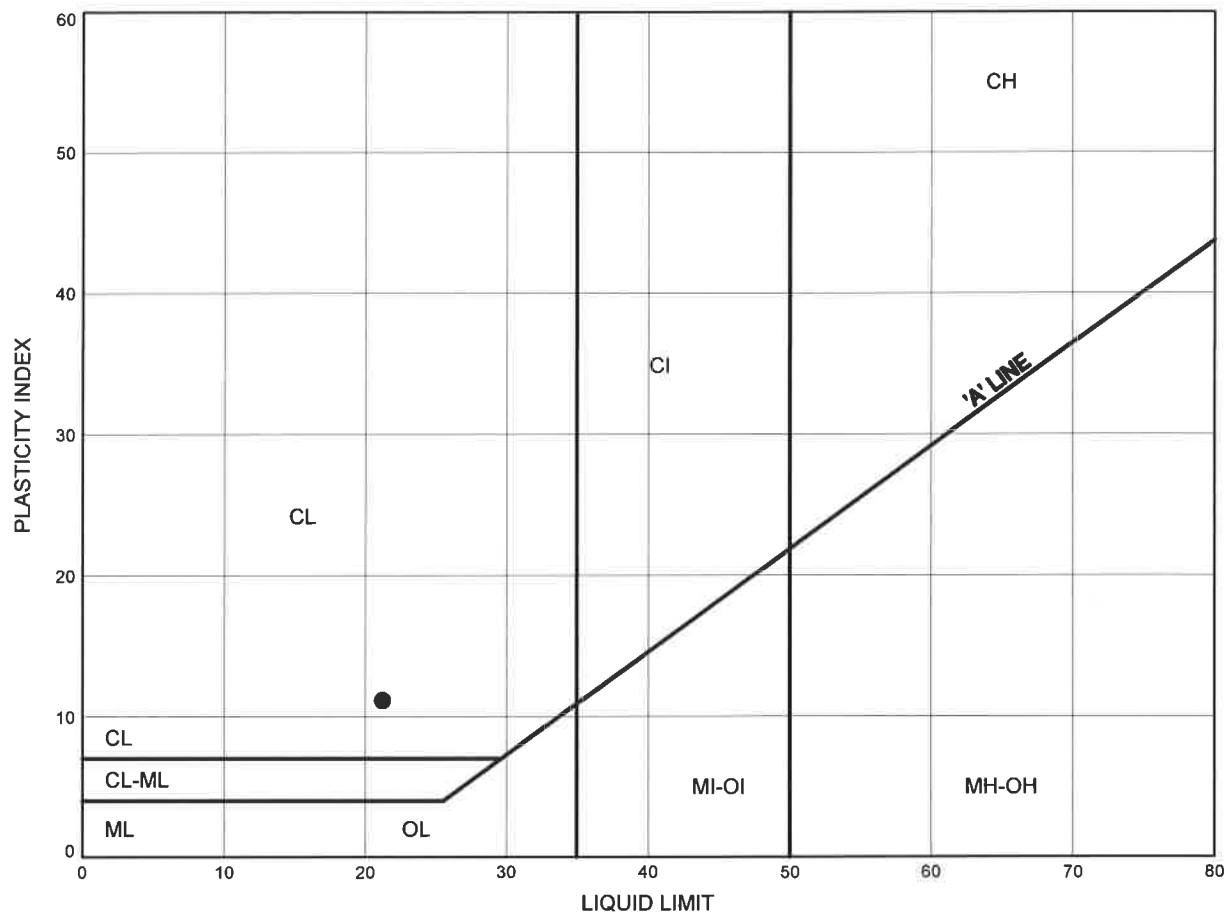


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Chkd. SKP

Hwy 400 Median Sewer ATTERBERG LIMITS TEST RESULTS

FIGURE C14

SILTY CLAY TILL



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT79E-01	4.19	287.21

Date August 2013
GWP# 83-00-00



Prep'd AN
Chkd. SKP

Appendix D

Sections 15 and 16 (Stations 18+350 to 19+800 Innisfil)

RECORD OF BOREHOLE No NLAT04-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 904 388.5 E 290 578.0 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 05 15 - 2013 05 15 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								
							20 40 60 80 100									
							○ UNCONFINED + FIELD VANE									
							● QUICK TRIAXIAL × LAB VANE									
							20 40 60 80 100									
								PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT						
								W _p	W	W _L						
								WATER CONTENT (%)								
								20 40 60								
304.1	ASPHALT: (300mm)						304									
0.0																
303.8		1	AS													
0.3																
303.3		1	SS	10												
0.8																
	Silty SAND, trace clay, trace to some gravel Compact Brown Moist															
302.5	Silty CLAY, with sand, trace gravel Very Stiff Brown Moist		2	SS	17											
1.6																
301.8	(FILL)															
2.3																
	Silty SAND, trace to some gravel, trace clay Very Dense Brown Moist		3	SS	96											
			4	SS	59											
300.4	Compact		5	SS	18											
3.7																
			6	SS	14											
298.5	Wet															
5.6																
			7	SS	36											
297.4	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO BOTTOM AND WATER LEVEL AT 6.1m UPON COMPLETION BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m THEN ASPHALT TO SURFACE.															
6.7																

ONTMT4S 1218.GPJ 2012TEMPLATE(MTO).GDT 8/13/13

RECORD OF BOREHOLE No NLAT08-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 904 238.1 E 290 605.5 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013 05 16 - 2013 05 16 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
302.4												
0.0	ASPHALT: (200mm)											
0.2	SAND, some to trace gravel, occasional cobble Dense Brown Moist (FILL)		1	AS			302					
			1	SS	35							
300.9							301					
1.5	Silty SAND, some clay, trace gravel Very Dense Brown Moist (TILL)		2	SS	99							6 58 25 11
			3	SS	88		300					
			4	SS	57		299					
	Occasional inferred cobbles		5	SS	76		298					3 61 25 11
			6	SS	69		297					
295.8			7	SS	101		296					
6.6	END OF BOREHOLE AT 6.6m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 2.1m, CUTTINGS TO 1.7m, CEMENT TO 0.15m THEN ASPHALT TO SURFACE.											

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO), GDT 8/26/13

RECORD OF BOREHOLE No NLAT118W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 904 921.3 E 290 477.0 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.15 - 2013.05.15 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
307.8	ASPHALT: (325mm)		1	AS									
0.0													
307.4													
0.4	Gravelly SAND, trace silt												
307.0	Brown												
0.8	Moist												
	(FILL)												
	Silty SAND, some clay, trace gravel		1	SS	21								20 78 2
	Compact												(SI+CL)
	Brown												
	Moist												
			2	SS	19								7 59 21 13
305.5													
2.3	Clayey SILT, with sand, trace gravel		3	SS	25								
	Very Stiff to Hard												
	Brown												
	Moist												
	(TILL)												
			4	SS	46								
			5	SS	34								2 46 32 20
			6	SS	43								
			7	SS	21								
301.1													
6.7	END OF BOREHOLE AT 6.7m												
	BOREHOLE OPEN TO BOTTOM												
	WITH NO FREE WATER UPON												
	COMPLETION.												
	BOREHOLE BACKFILLED WITH												
	BENTONITE TO 3.0m, CUTTINGS TO												
	1.5m, CONCRETE TO 0.15m THEN												
	ASPHALT TO SURFACE.												

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/26/13

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

RECORD OF BOREHOLE No NLAT124E-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 903 791.3 E 290 698.2 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.29 - 2013.05.29 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
297.2	ASPHALT: (300mm)												
0.0													
296.9													
0.3	Gravelly SAND, trace silt Brown		1	AS			297						
296.4	Moist (FILL)												
0.8	Silty SAND, some clay, trace gravel Very Dense to Compact Brown Moist		1	SS	59		296						8 63 29 (SI+CL)
			2	SS	35		295						
			3	SS	16		294						2 60 27 11
			4	SS	18		293						
293.4	Clayey SILT, with sand, trace gravel Stiff to Very Stiff Brown Moist		5	SS	12		292						4 41 39 16
3.8			6	SS	10		291						
			7	SS	21								Split spoon wet
290.5	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOELPLUG TO 3.0m, CUTTINGS TO 1.5m, CEMENT TO 0.2m THEN ASPHALT TO SURFACE.												
6.7													

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/26/13

RECORD OF BOREHOLE No NLAT127-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 904 073.6 E 290 637.6 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.16 - 2013.05.16 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
300.6												
0.0	ASPHALT: (188mm)											
0.2	SAND, some gravel Brown Moist (FILL)		1	AS			300					
299.7												
0.9	Silty SAND, trace to some clay, trace gravel Compact to Dense Brown Moist		1	SS	20		299					
			2	SS	38							3 61 26 10
298.3												
2.3	Silty SAND, some clay, trace gravel Very Dense Brown Moist (TILL)		3	SS	52		298					
			4	SS	54		297					1 60 26 13
			5	SS	59							
			6	SS	65		296					
							295					
			7	SS	52							
293.9							294					
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOELPLUG TO 1.6m, CEMENT TO 0.2m THEN ASPHALT TO SURFACE.											

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO) GDT 8/26/13

RECORD OF BOREHOLE No NLAT128W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 904 031.6 E 290 635.1 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.06.03 - 2013.06.03 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	
300.1												
0.0	ASPHALT: (200mm)											
0.2	SAND and GRAVEL, trace silt		1	AS			300					
299.3	Brown Moist (FILL)											
0.8	SAND and SILT, trace clay, trace gravel		1	SS	9		299					
298.7	Loose Brown Moist											
1.4	Very Dense		2	SS	59		298					2 52 36 8
			3	SS	62							
297.1												
3.0	Silly SAND, some clay, trace gravel Dense to Very Dense		4	SS	46		297					2 59 27 12
	Brown Moist (TILL)		5	SS	59		296					
			6	SS	55		295					
			7	SS	76		294					
293.4												
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m, THEN ASPHALT COLD PATCH TO SURFACE.											

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO) GDT 8/26/13

+ 3 x 3

Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NLAT12W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 904 658 5 E 290 526 6 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.15 - 2013.05.15 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
306.4	ASPHALT: (325mm)													
0.0														
306.1			1	AS										
0.3	SAND, trace gravel Brown													
305.6	Moist (FILL)													
0.8														
	Silty SAND, some gravel Very Dense Brown Moist		1	SS	70									
			2	SS	47									
			3	SS	12									
			4	SS	26									
302.6														
3.8	Sandy SILT, trace gravel Very Dense Brown Moist (TILL)		5	SS	52									
			6	SS	90									
300.1			7	SS	50/									
6.3	END OF BOREHOLE AT 6.3m BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m THEN ASPHALT TO SURFACE.				0.150									

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/26/13

RECORD OF BOREHOLE No NLAT131-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 903 907 5 E 290 669 9 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 05 16 - 2013 05 16 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100				
								SHEAR STRENGTH kPa				
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE				
						PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			WATER CONTENT (%)			
						w _p w w _L						
						20 40 60 80 100			20 40 60			
298.6												
0.0	ASPHALT: (200mm)											
0.2	SAND, some to trace gravel, some silt and clay Compact Brown Moist (FILL)		1	AS			298					
			1	SS	18							6 69 25 (SI+CL)
	Loose		2	SS	7		297					
296.4												
2.2	Silty SAND, some clay, trace gravel Loose Brown Moist FILL)		3	SS	8		296					2 58 28 12
			4	SS	12							
295.1												
3.5	SAND, fine grained, trace silt Loose to Compact Brown Moist		5	SS	4		295					
			6	SS	26		294					
293.0												
5.6	Trace gravel Dense Moist to Wet		7	SS	34		293					
							292					Split Spoon Wet
							291					
			8	SS	30							
290.4												
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE OPEN TO 7.3m AND WATER LEVEL AT 6.6m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 2.1m, CUTTINGS TO 1.6m, CEMENT TO 0.2m THEN ASPHALT TO SURFACE.											

+ 3 x 3 : Numbers refer to
Sensitivity

20
15 10 5
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NLAT13E-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 904 687.8 E 290 544.5 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.06.02 - 2013.06.02 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE				
306.7 0.0	ASPHALT: (200mm)											GR SA SI CL
0.2	SAND and GRAVEL, trace silt Brown Moist (FILL) Compact		1	AS		306						31 64 5 (SI+CL)
			1	SS	20							
305.1												
1.6	SILT, trace sand, trace organics Compact Dark Brown Moist		2	SS	12	305						
304.4												
2.3	Clayey SILT, with sand, trace gravel Stiff to Very Stiff Brown Moist		3	SS	10	304						3 41 34 22
			4	SS	19							
302.9												
3.8	Sandy SILT, trace clay Compact Brown Moist		5	SS	18	303						
302.1												
4.6	Silty SAND, trace clay, trace gravel Very Dense Brown Moist (TILL)		6	SS	50	302						
						301						
			7	SS	67							
300.0												
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO BOTTOM WITH NO FREE WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m, THEN ASPHALT COLD PATCH TO SURFACE.											

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO) GDT 8/26/13

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

RECORD OF BOREHOLE No NLAT14W-01

1 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 904 776 3 E 290 491 9 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 06 03 - 2013 06 03 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
307.4	ASPHALT: (350mm)											
0.0												
307.0			1	AS								
0.4	SAND and GRAVEL, trace silt											
306.6	Brown											
0.8	Moist											
	(FILL)											
	Compact		1	SS	29							
			2	SS	15							
305.1												
2.3	Silty CLAY, with sand, trace gravel											
	Firm		3	SS	7							
	Brown											
	Moist											
			4	SS	4							
303.6												
3.8	Silty SAND, some gravel, some clay											
	Compact to Very Dense		5	SS	11							
	Brown											
	Moist											
	(TILL)		6	SS	51							
			7	SS	58							
			8	SS	88							
			9	SS	85							
297.6												
9.8	END OF BOREHOLE AT 9.8m.											

Continued Next Page

+ ³, × ³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NLAT14W-01

2 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 904 776.3 E 290 491.9 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.06.03 - 2013.06.03 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
	Continued From Previous Page							20 40 60 80 100	20 40 60				kN/m ³	GR SA SI CL
	BOREHOLE OPEN TO BOTTOM AND WATER LEVEL AT 9.5m UPON COMPLETION BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m THEN ASPHALT COLD PATCH TO SURFACE.													

METRIC

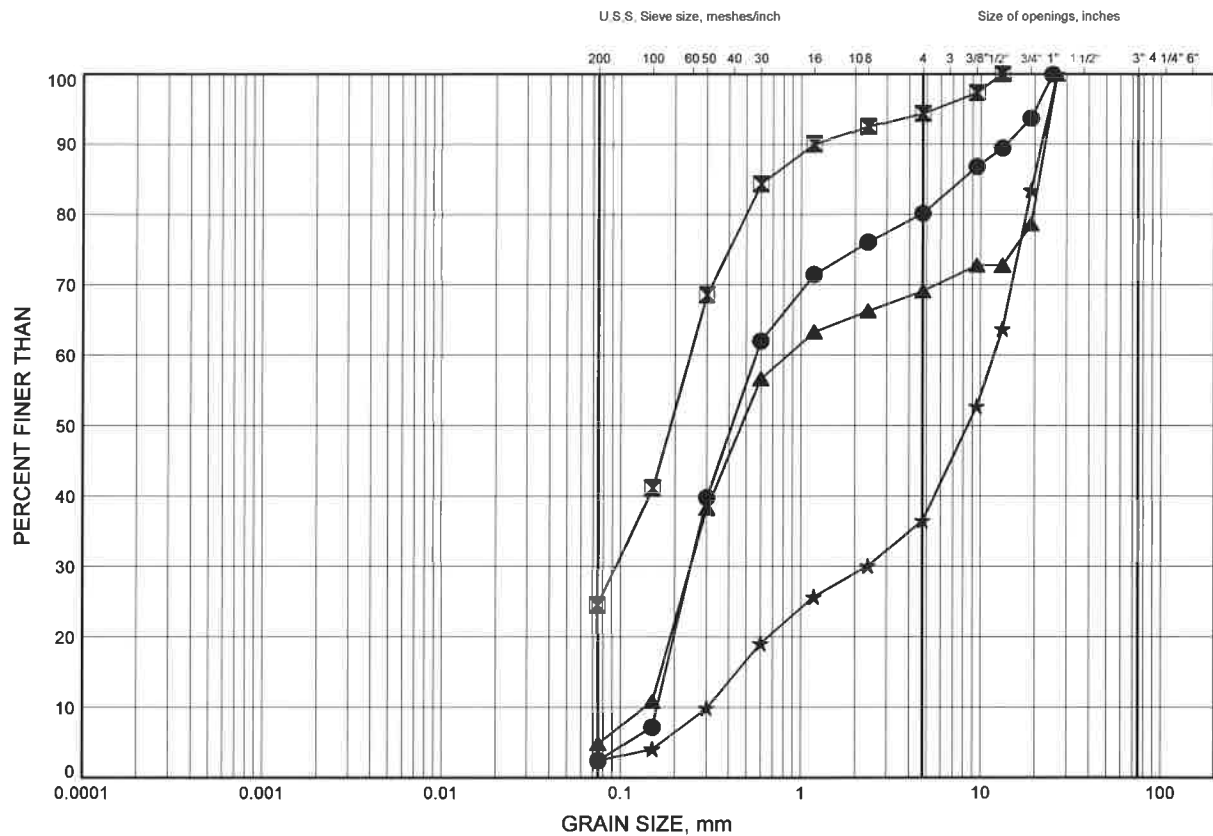
CHECKED BY SKP

+ 3, × 3: Numbers refer to Sensitivity

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE D1

SAND/SAND & 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)
●	NLAT118W-01	0.53	307.27
⊠	NLAT131-01	1.07	297.53
▲	NLAT13E-01	1.07	305.63
★	NLAT14W-01	0.53	306.87

Date August 2013
GWP# 83-00-00

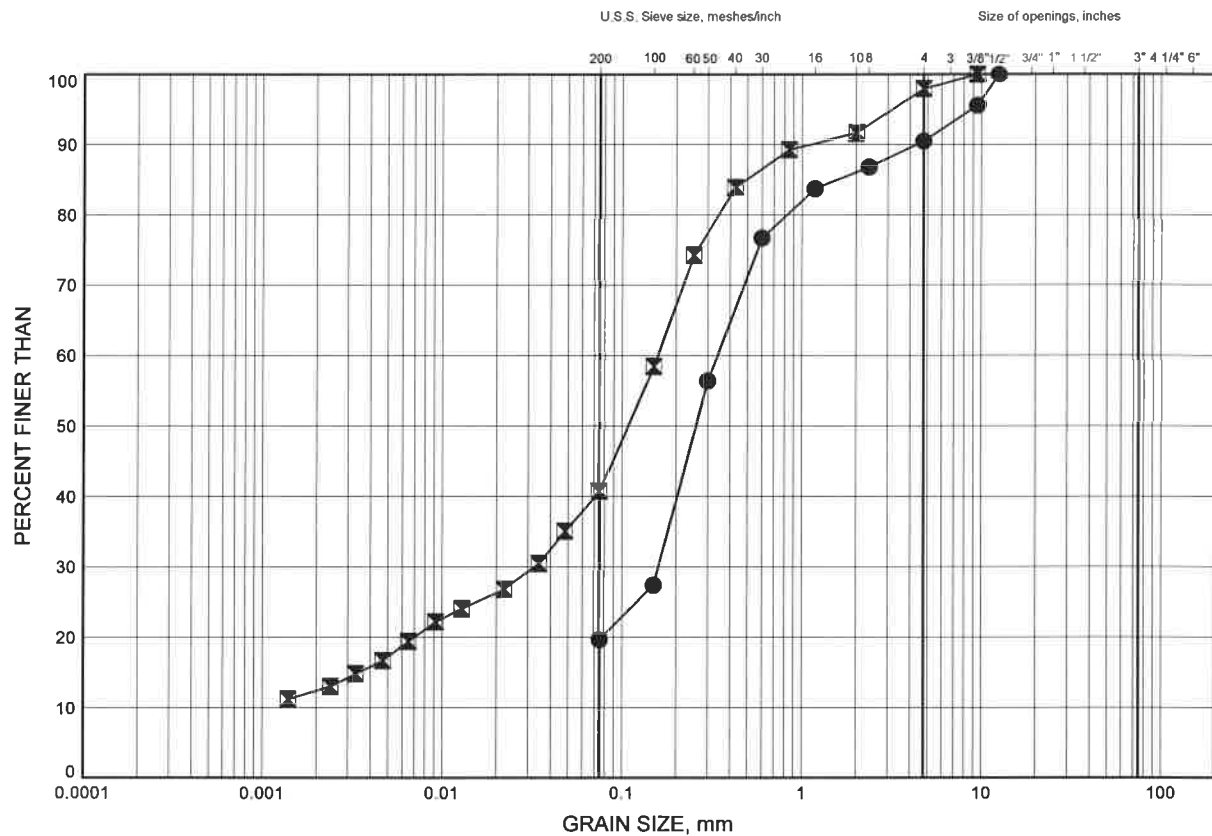


Prep'd AN
Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE D2

SAND & 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)
●	NLAT04-01	1.07	303.03
⊠	NLAT131-01	2.59	296.01

Date August 2013
GWP# 83-00-00

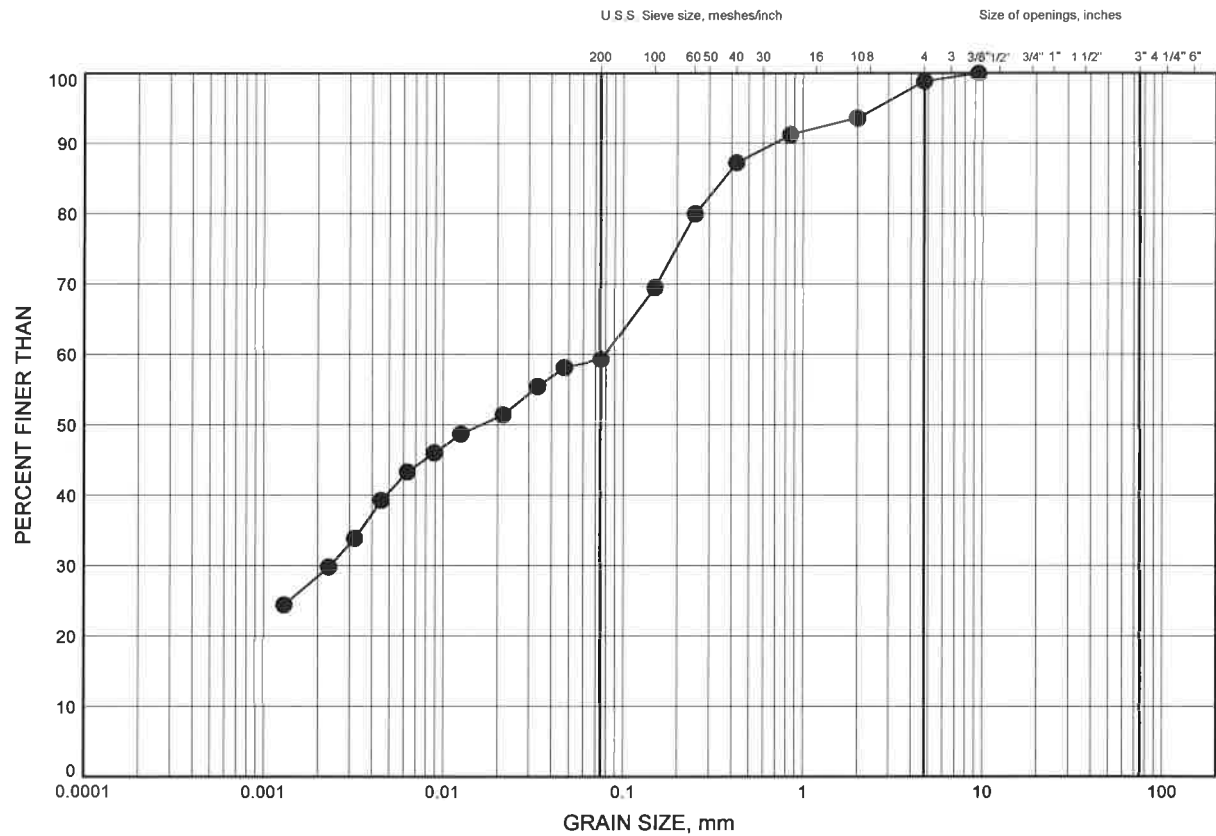


Prep'd AN
Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE D3

SILTY CLAY FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT04-01	1.83	302.27

Date August 2013

GWP# 83-00-00



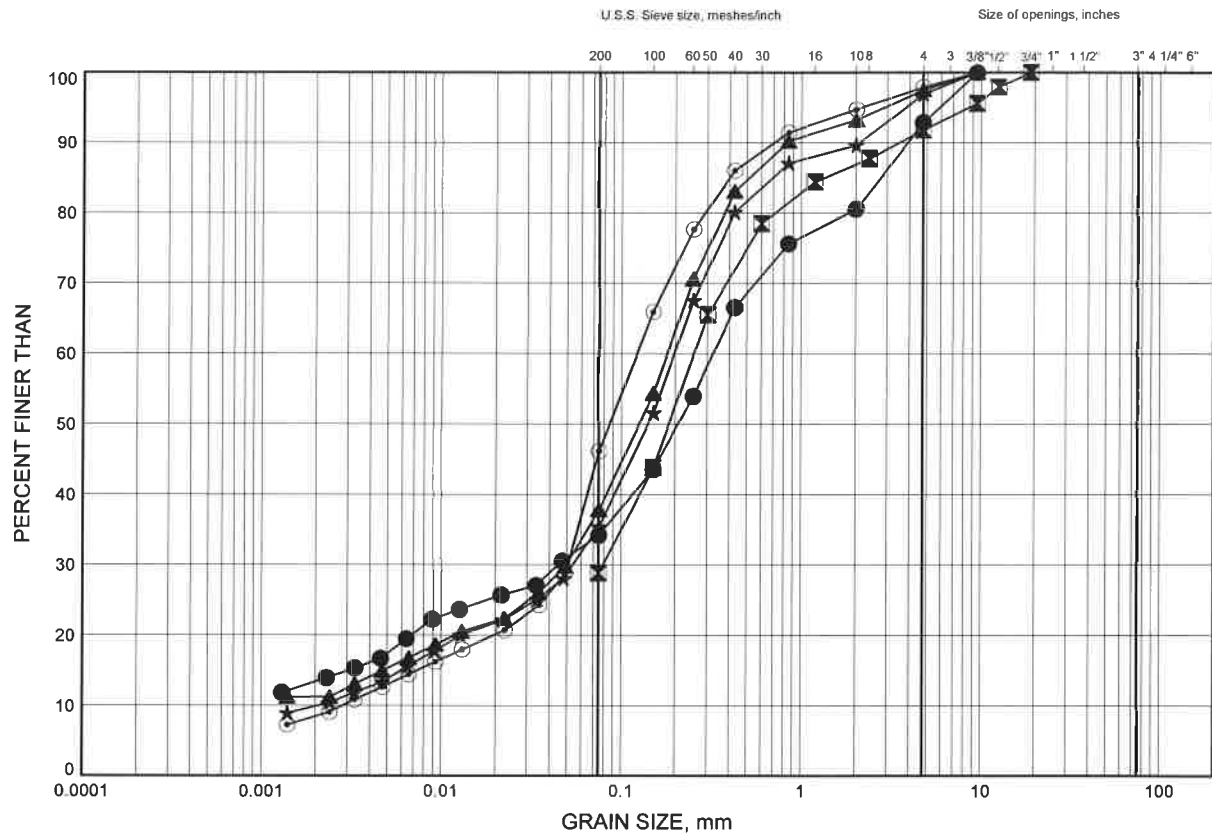
Prep'd AN

Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE D4

SAND & SILT/SILTY SAND



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT118W-01	1.83	305.97
⊠	NLAT124E-01	1.07	296.13
▲	NLAT124E-01	2.59	294.61
★	NLAT127-01	1.83	298.77
⊙	NLAT128W-01	1.83	298.27

Date August 2013

GWP# 83-00-00



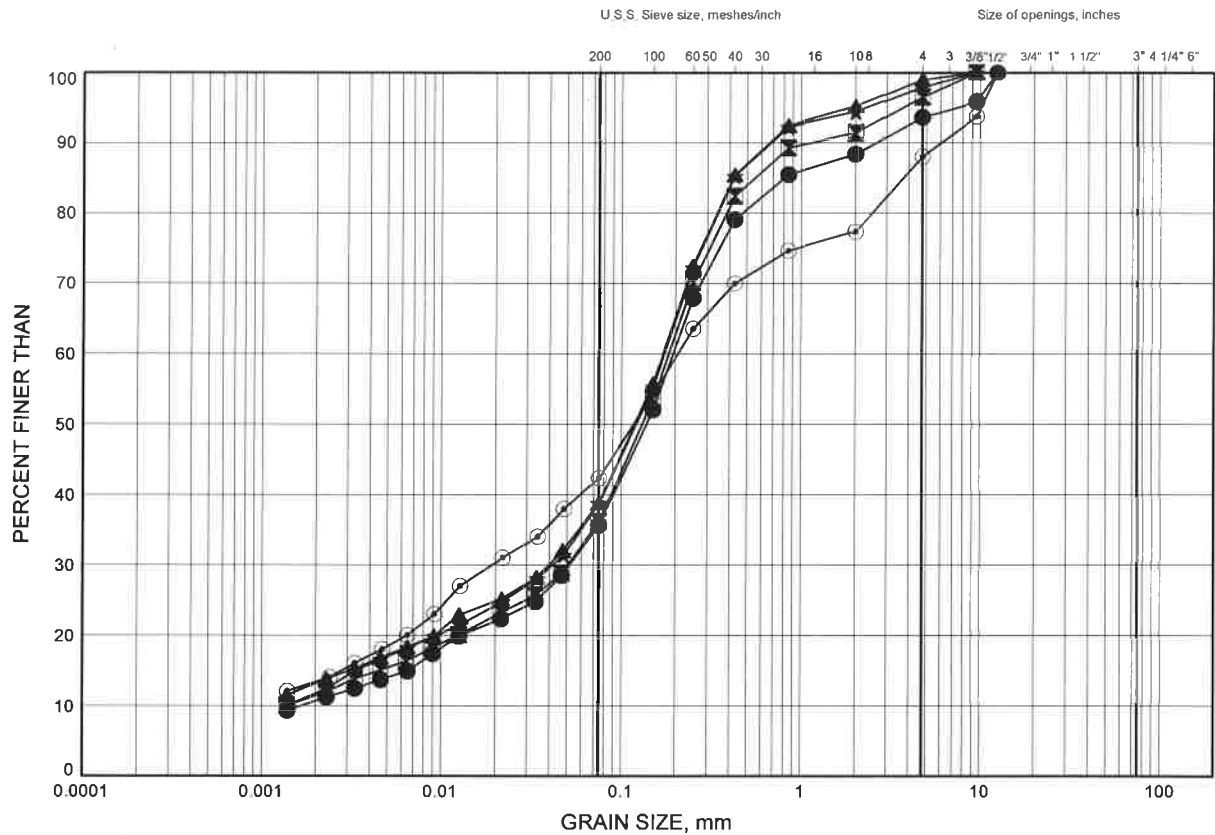
Prep'd AN

Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE D5

SILTY SAND TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT08-01	1.75	300.65
⊠	NLAT08-01	4.11	298.29
▲	NLAT127-01	3.35	297.25
★	NLAT128W-01	3.35	296.75
⊙	NLAT14W-01	4.11	303.29

Date August 2013
GWP# 83-00-00

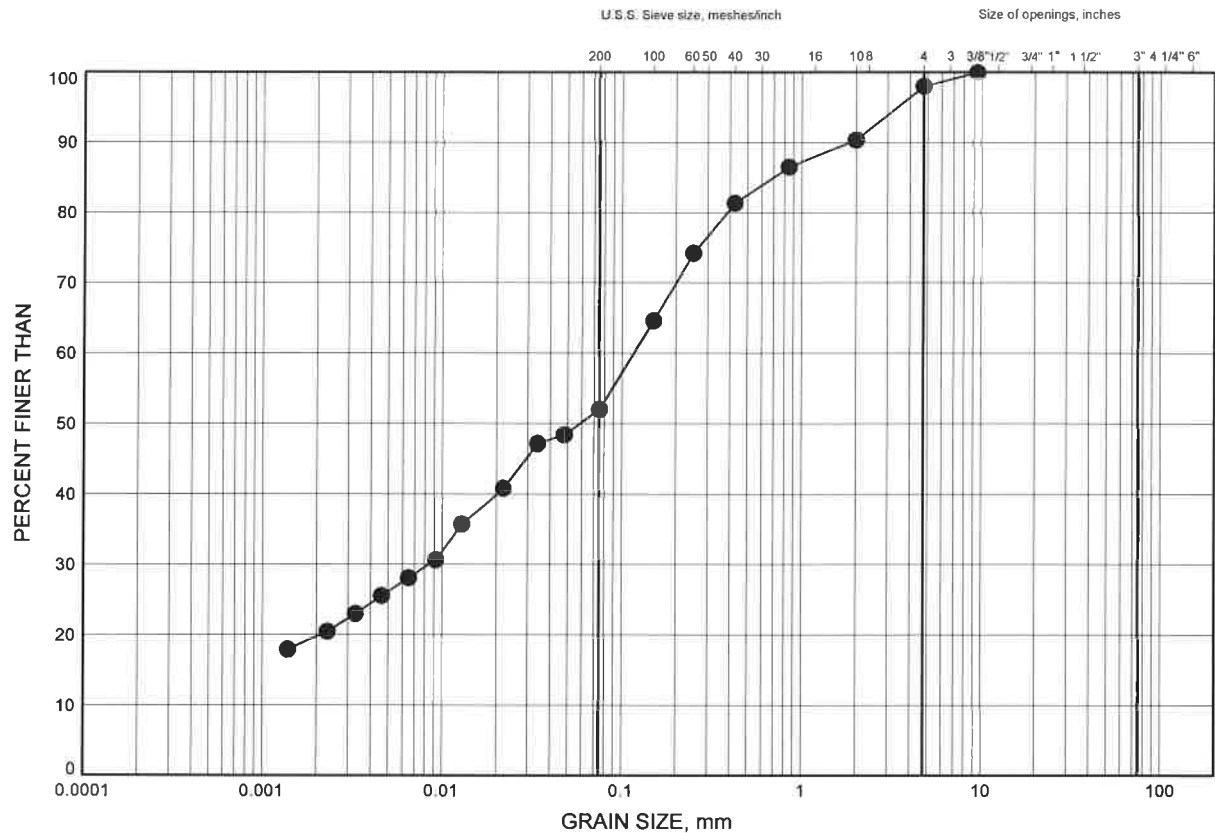


Prep'd AN
Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE D6

CLAYEY SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT118W-01	4.11	303.69

Date August 2013
GWP# 83-00-00

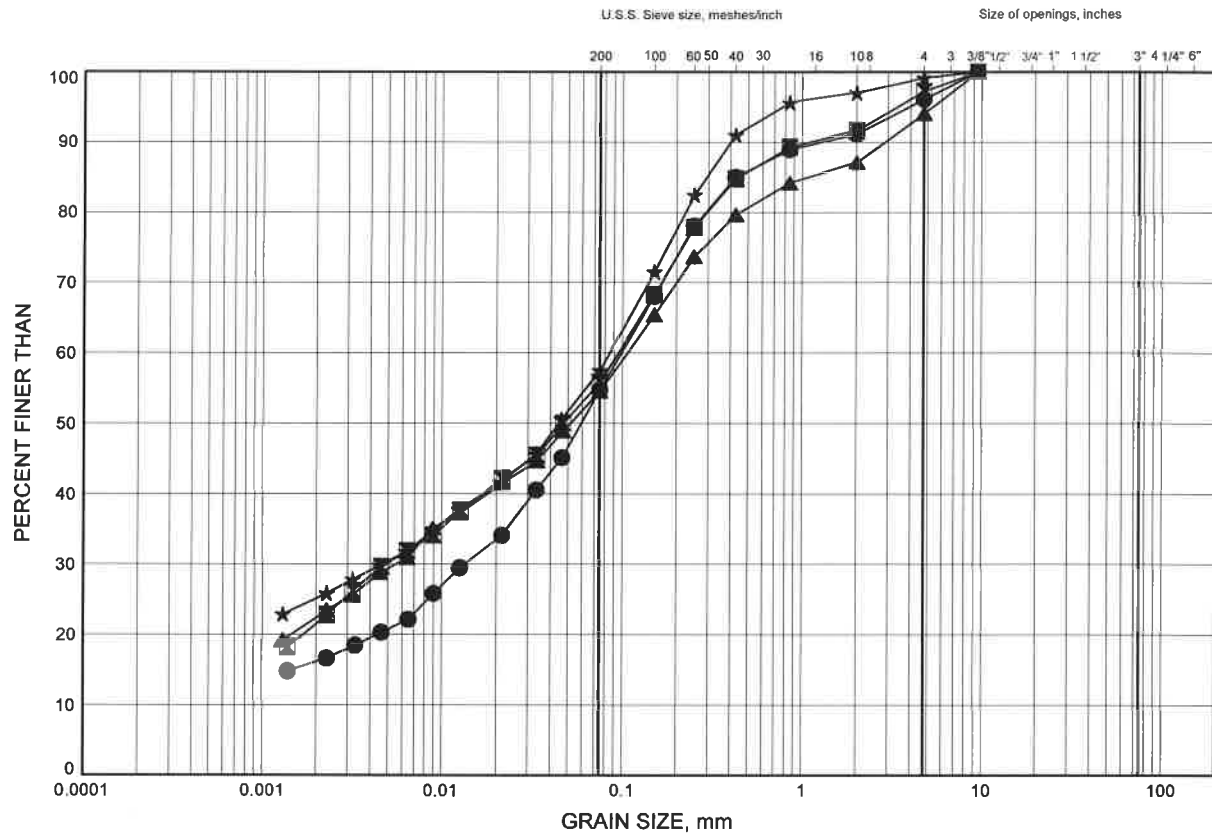


Prep'd AN
Chkd SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE D7

SILTY CLAY/CLAYEY SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT124E-01	4.11	293.09
⊠	NLAT13E-01	2.59	304.11
▲	NLAT13E-01	3.35	303.35
★	NLAT14W-01	2.59	304.81

Date August 2013
GWP# 83-00-00

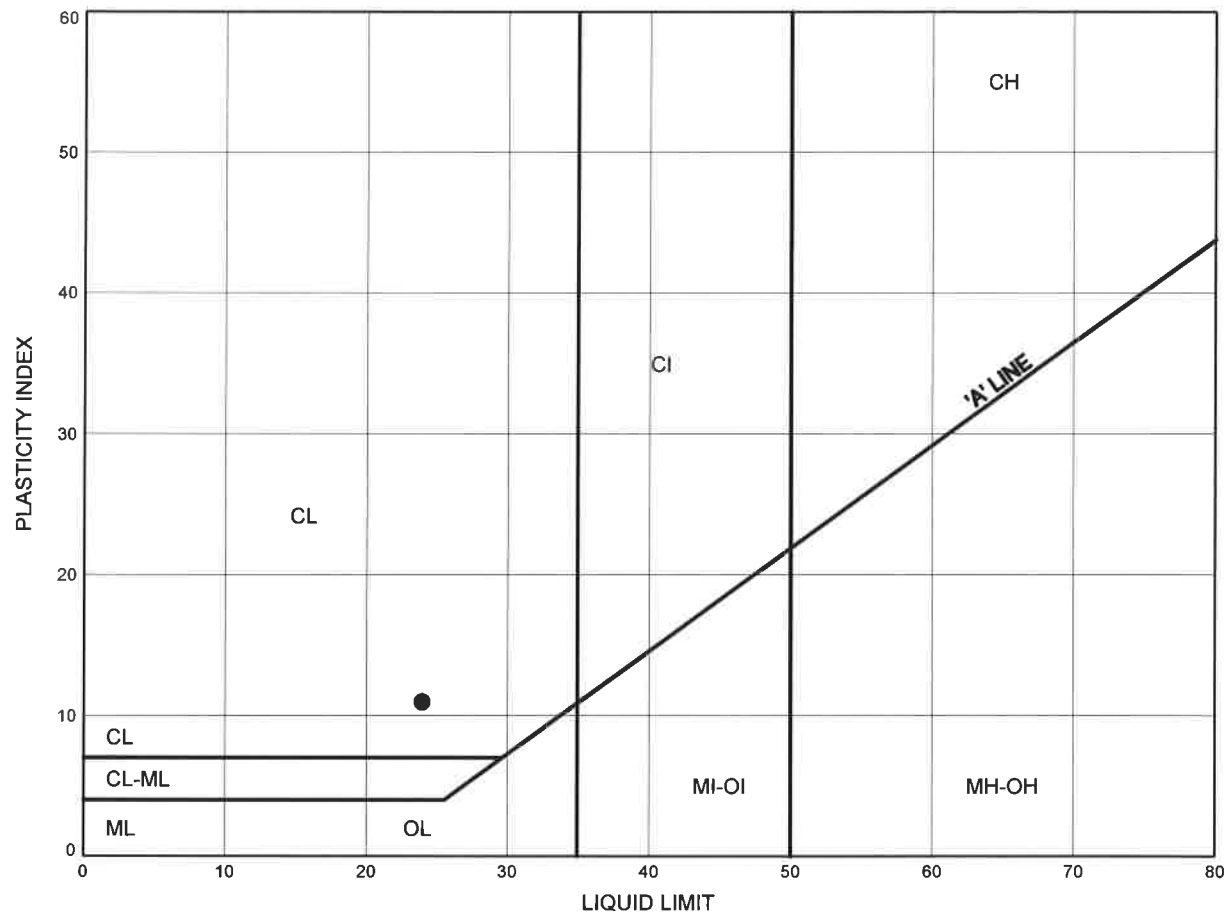


Prep'd AN
Chkd. SKP

Hwy 400 Median Sewer ATTERBERG LIMITS TEST RESULTS

FIGURE D8

SILTY CLAY FILL



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT04-01	1.83	302.27

Date August 2013
GWP# 83-00-00

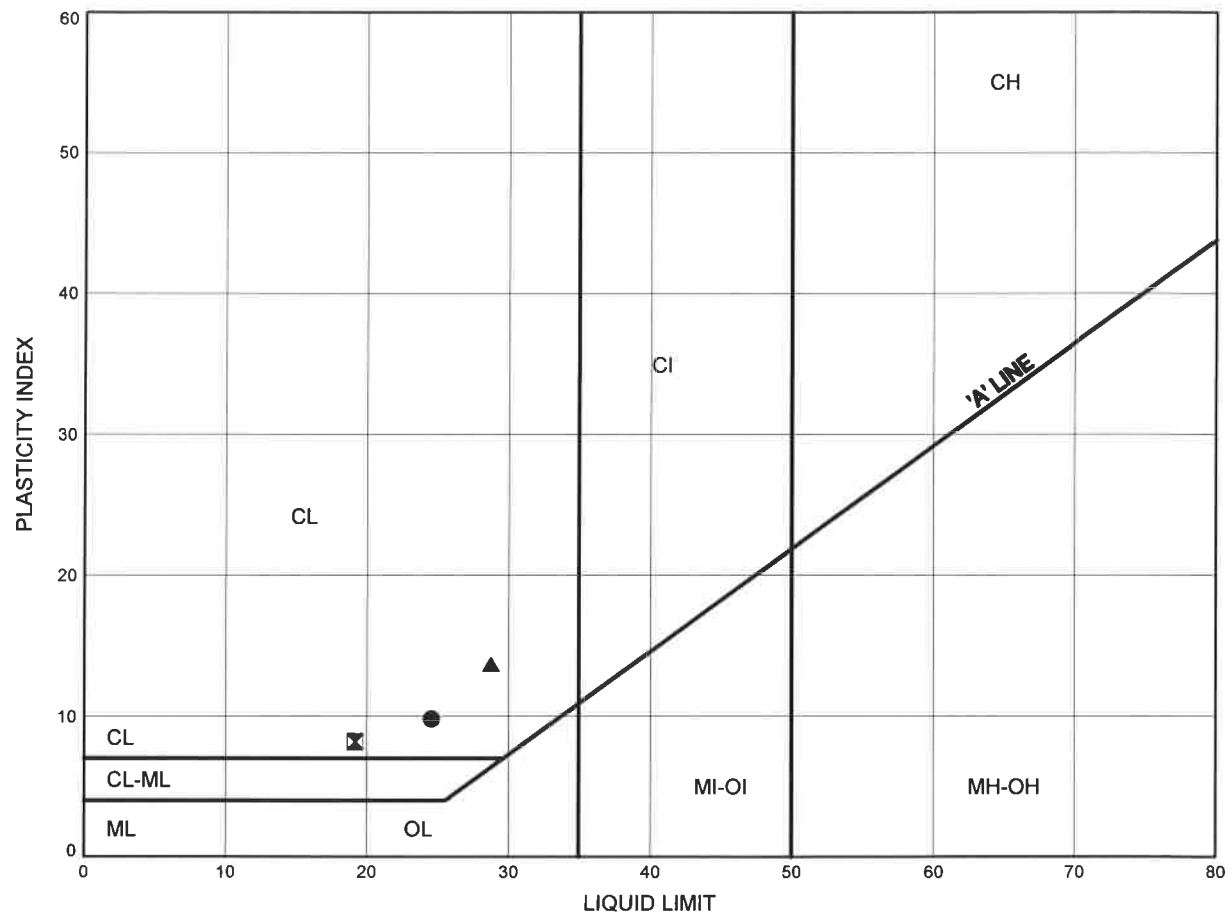


Prep'd AN
Chkd. SKP

Hwy 400 Median Sewer ATTERBERG LIMITS TEST RESULTS

FIGURE D9

SILTY CLAY/CLAYEY SILT



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT124E-01	4.11	293.09
⊠	NLAT13E-01	3.35	303.35
▲	NLAT14W-01	2.59	304.81

Date August 2013
GWP# 83-00-00

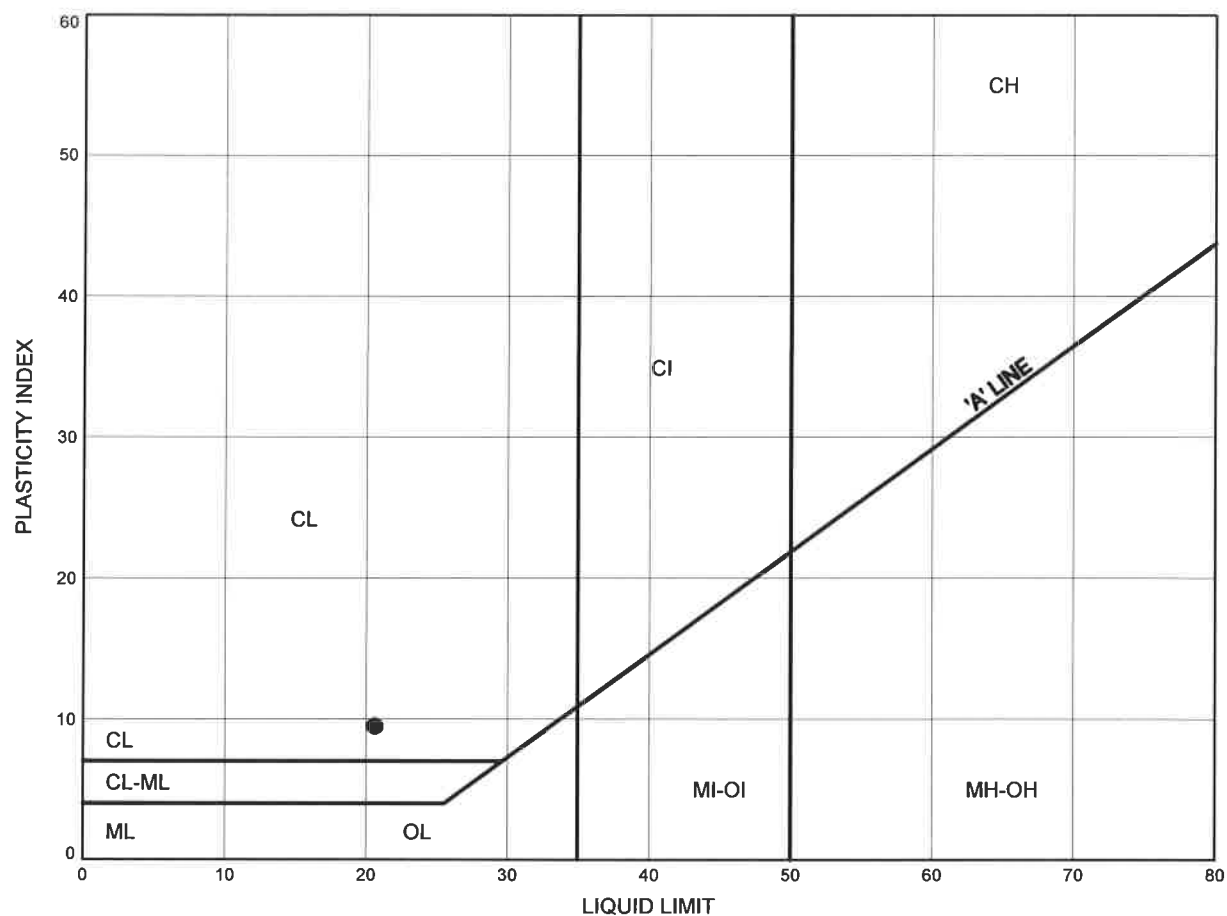


Prep'd AN
Chkd. SKP

Hwy 400 Median Sewer ATTERBERG LIMITS TEST RESULTS

FIGURE D10

CLAYEY SILT TILL



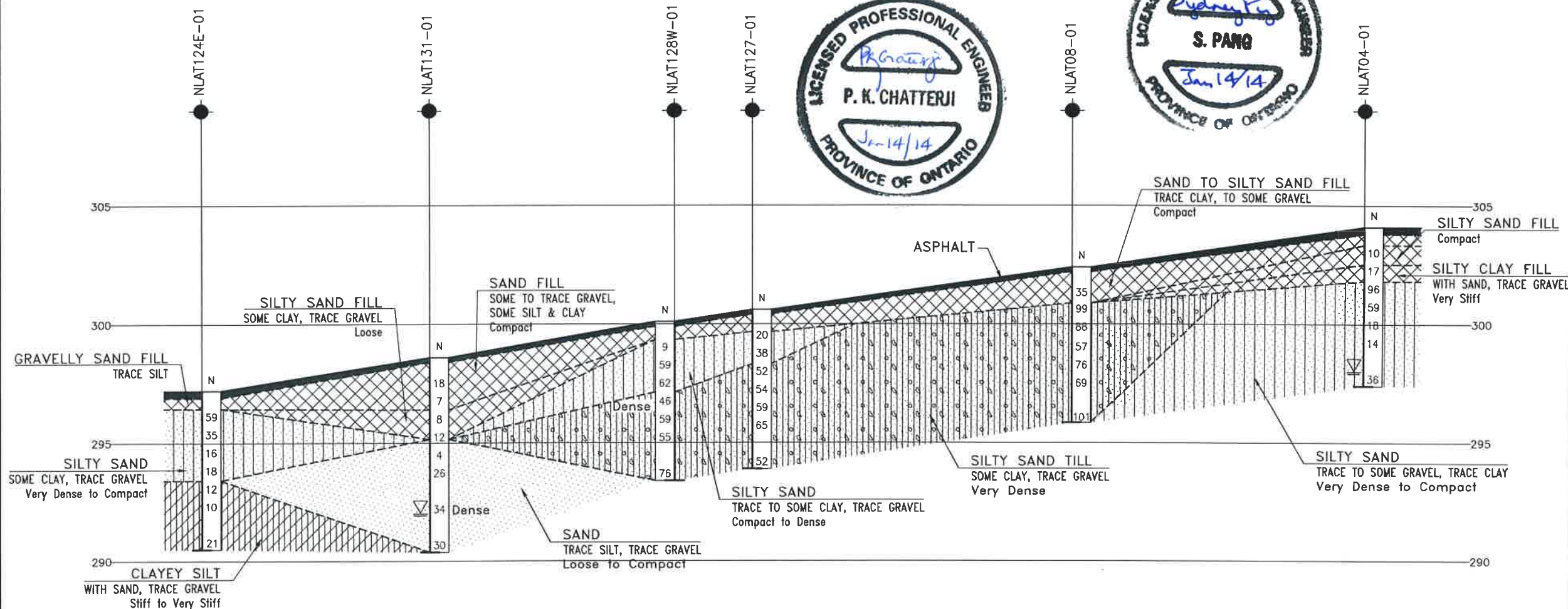
LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	NLAT118W-01	4.11	303.69

Date August 2013
GWP# 83-00-00



Prep'd AN
Chkd. SKP



PROFILE ALONG C_L HWY 400



H 1:2500

V 1:200

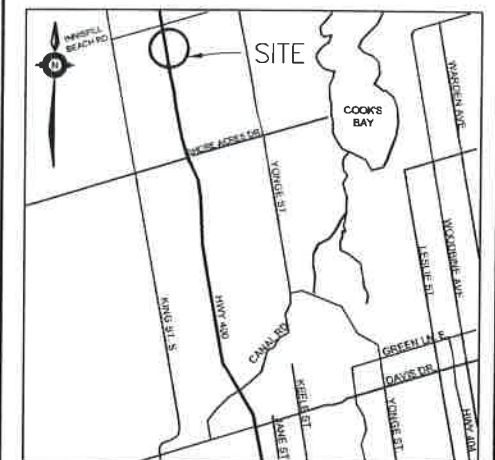
CONT No GWP No 83-00-00
HWY 400 MEDIAN SEWER MEDIAN SEWER (STA. 18+350 TO 19+000) BOREHOLE LOCATIONS AND SOIL STRATA



SHEET








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 |

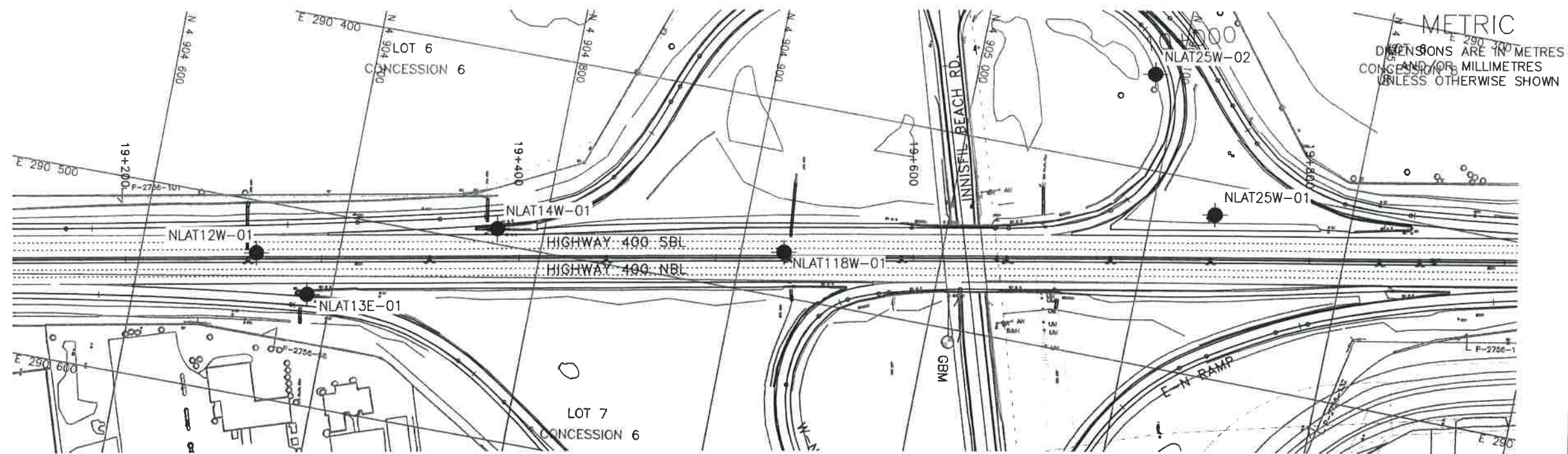
NO	ELEVATION	NORTHING	EASTING
NLAT124E-01	297.2	4 903 791.3	290 698.2
NLAT131-01	298.6	4 903 907.5	290 669.9
NLAT128W-01	300.1	4 904 031.6	290 635.1
NLAT127-01	300.6	4 904 073.6	290 637.6
NLAT08-01	302.4	4 904 238.1	290 606.5
NLAT04-01	304.1	4 904 388.5	290 578.0

-NOTES-

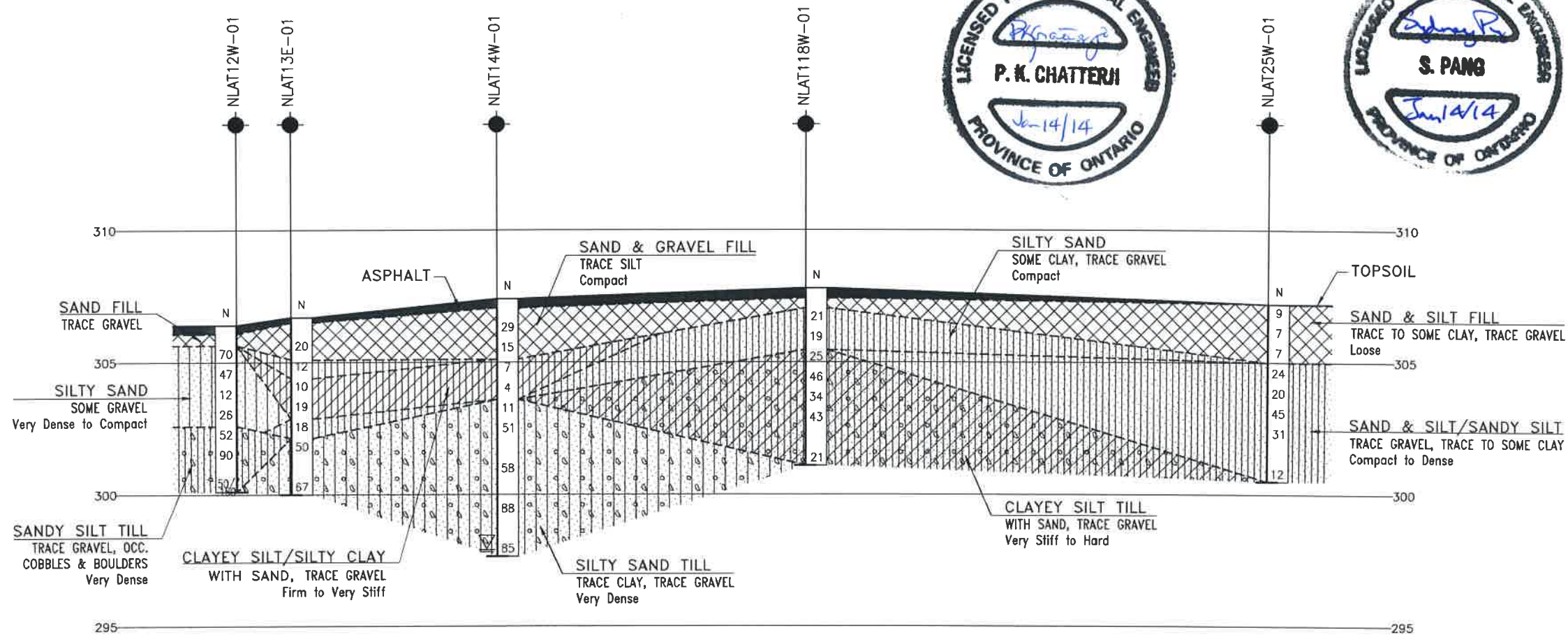
- 1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- 2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRES No. 31D-563

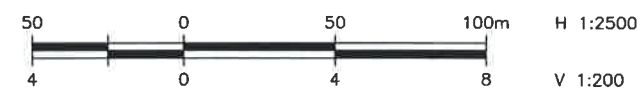
REVISIONS									
	DATE	BY							
DESIGN	SKP	CHK	SKP	CODE		LOAD		DATE	NOV. 2013
DRAWN	AN	CHK	PKC	SITE		ISTRUCT	IDWG	15	



PLAN



PROFILE ALONG C_L HWY 400



H 1:2500

V 1:200

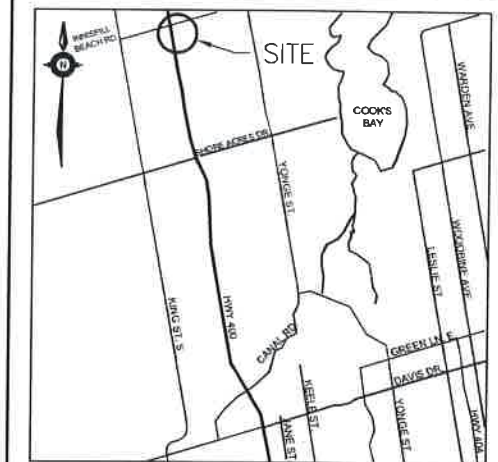
CONT No
GWP No 83-00-00

HWY 400 MEDIAN SEWER
MEDIAN SEWER
(STA. 19+200 TO 19+800)
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET








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
NLAT12W-01	306.4	4 904 658.5	290 526.6
NLAT13E-01	306.7	4 904 687.8	290 543.0
NLAT14W-01	307.4	4 904 776.3	290 491.9
NLAT118W-01	307.8	4 904 921.3	290 477.0
NLAT25W-01	307.2	4 905 131.7	290 416.4
NLAT25W-02	302.9	4 905 087.7	290 350.8

-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. 31D-563

[illegible]

Appendix E

Culvert, Headwall and Other Median Locations

RECORD OF BOREHOLE No SLAT83W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 884 709 8 E 294 270 2 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013 05 06 - 2013 05 06 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
248.4								20	40	60	80	100		
0.0	ASPHALT: (350mm)													
248.0			1	AS			248							
0.4	Gravelly SAND, trace to some silt													
247.8	Brown													
0.6	Moist (FILL)		1	SS	15									
	Clayey SILT, with sand, trace gravel, occasional black staining													
	Stiff to Very Stiff													
	Brown		2	SS	26									
	Moist (FILL)													
246.2														
2.2	Trace organic pockets		3	SS	7		246							2 37 43 18
	Firm													
			4	SS	6		245							
244.7														
3.7	Silty CLAY, some sand, trace gravel													
	Very Stiff		5	SS	17		244							
	Brown													
	Moist (TILL)		6	SS	23									0 19 44 37
242.8							243							
5.6	Stiff													
	Wet		7	SS	14		242							Split spoon wet
241.7														
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO 5.2m AND WATER LEVEL AT 5.2m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 3.0m, CUTTINGS, CONCRETE AND THEN COLD PATCH TO GROUND SURFACE.													

ONTMT4S 1218.GPJ 2012TEMPLATE(MTO).GDT 8/15/13

RECORD OF BOREHOLE No SLAT41-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 888 371.1 E 293 629.8 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.07 - 2013.05.07 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
288.6														
0.0	ASPHALT: (150mm)													
0.2	SAND, trace gravel, trace silt Grey Moist (FILL) Compact		1	AS			288							
287.3			1	SS	17									0 95 5 (SI+CL)
1.3	Clayey SILT, with sand, trace gravel Stiff Brown Moist		2	SS	10		287							1 47 38 14
			3	SS	15		286							
285.6														
3.0	SAND and SILT, trace clay, trace gravel Compact Brown Moist Coarse sand layer (25mm) at 3.3m		4	SS	24		285							5 54 37 4
			5	SS	20									Split spoon wet
			6	SS	24		284							
	Inferred cobbles													
			7	SS	24		283							
							282							
281.4														
7.2	Clayey SILT, some sand, trace gravel Very Stiff Brown Moist (TILL)		8	SS	21		281							
280.4														
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE OPEN TO BOTTOM WITH NO PONDED WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 3.0m, CUTTING MIXED WITH BENTONITE HOLEPLUG TO 1.5m, CONCRETE TO 0.15m, THEN ASPHALT COLD PATCH TO SURFACE.													

+ 3 x 3 : Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No SLAT44-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 888 521.3 E 293 603.2 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.07 - 2013.05.07 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
291.0	ASPHALT: (150mm)						291							
0.0														
0.2	Gravelly SAND, trace silt		1	AS										27 67 6
290.3	Grey													(SI+CL)
0.7	Moist (FILL)													
	Compact		1	SS	20		290							
289.6														
1.4	SAND and SILT, trace gravel, trace clay Dense to Compact		2	SS	36		289							
	Brown													
	Moist													
	(TILL)		3	SS	37		288							6 45 44 5
	Compact													
			4	SS	20		287							
			5	SS	31		286							
			6	SS	22		285							
285.4							284							
5.6	Clayey SILT, trace sand, trace gravel													
	Stiff to Firm		7	SS	10		283							Split spoon wet
	Brown													
	Wet													
			8	SS	7									
282.8														
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE OPEN TO BOTTOM WITH NO PONDED WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 3.0m, CUTTING MIXED WITH BENTONITE HOLEPLUG TO 1.5m, CONCRETE TO 0.15m, THEN ASPHALT COLD PATCH TO SURFACE.													

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/15/13

RECORD OF BOREHOLE No SLAT06E-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 891 275.9 E 293 341.0 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.08 - 2013.05.08 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE		WATER CONTENT (%) w _P w w _L				
269.7								20	40	60	80	100		
0.0	ASPHALT: (350mm)													
269.3			1	AS										
0.4	SAND and GRAVEL, trace silt													
269.0	Brown													
0.7	Moist (FILL)													
	Clayey SILT, with sand, trace gravel		1	SS	9									1 53 26 20
	Stiff to Very Stiff													
	Brown													
	Moist		2	SS	25									
267.4														
2.3	Silty CLAY, some sand, trace gravel, some organics		3	SS	4									
	Firm													
	Brown													
	Moist		4	SS	49									
	Inferred cobbles at 3.4m													
265.9														
3.8	Silty SAND, some clay, trace gravel		5	SS	15									8 51 29 12
	Compact to Dense													
	Brown													
	Moist to Wet		6	SS	35									
	Inferred cobbles													
	Inferred cobbles													
263.6														
6.1	Sandy SILT, trace gravel		7	SS	26									
	Compact													
	Brown													
263.0	Moist													
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO 6.0m WITH NO PONDED WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m, THEN ASPHALT TO SURFACE.													

ONTMT4S 1218.GPJ 2012TEMPLATE(MTO).GDT 8/15/13

RECORD OF BOREHOLE No SLAT19W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 892 651.3 E 293 271.2 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.08 - 2013.05.08 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL	× LAB VANE				
238.1							20	40	60	80	100	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	
0.0	ASPHALT: (375mm)		1	AS								w _P	w	w _L	
237.7															
0.4	Gravelly SAND, trace to some silt Very Dense Brown Moist (FILL)		1	SS	98										27 59 14 (SI+CL)
			2	SS	57										
235.9															
2.2	SAND, trace to some silt, trace gravel Compact Brown Moist (FILL)		3	SS	17										9 76 15 (SI+CL)
235.0															
3.1	Sandy SILT, trace to some gravel Compact to Very Dense Brown Moist		4	SS	23										
			5	SS	63										Split spoon wet
233.6															
4.5	Very Loose Wet		6	SS	4										
232.6															
5.5	END OF BOREHOLE AT 5.4m. BOREHOLE OPEN TO 3.0m WITH NO PONDED WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15, THEN ASPHALT COLD PATCH TO SURFACE.														

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/15/13

RECORD OF BOREHOLE No C32-01

1 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 892 816.8 E 293 281.5 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers/Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.09 - 2013.05.09 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
235.6												
0.0	ASPHALT: (225mm)											
0.2	Silty SAND, some gravel, trace clay Compact Brown Moist (FILL)		1	AS			235					
234.3			1	SS	14							16 60 21 3
1.3	Clayey SILT, some sand, trace gravel, some organics Stiff Grey Moist		2	SS	9		234					
233.3												
2.3	SAND and GRAVEL, trace to some silt Compact to Dense Grey Wet		3	SS	29		233					Split spoon wet
			4	SS	34							37 50 13 (SI+CL)
231.9							232					
3.7	Sandy SILT, some gravel Compact Grey Wet		5	SS	10							
231.1												
4.5	Clayey SILT, with sand, trace gravel Stiff Grey Wet		6	SS	9		231					2 48 34 16
230.0							230					
5.6	Sandy SILT, trace gravel Very Dense Grey Wet		7	SS	57							Resistance to split spoon advance. Borehole sloughed to 2.8m. Switched to hollow stem augers.
							229					
228.5												
7.1	Compact						228					
			8	SS	18							
							227					
			9	SS	24							
225.8							226					
9.8	END OF BOREHOLE AT 9.7m.											

Continued Next Page

+ 3 x 3: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C32-01

2 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 892 816.8 E 293 281.5 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers/Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.09 - 2013.05.09 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100	W _p	W	W _L		
	Continued From Previous Page																
	BOREHOLE WET UPON COMPLETION. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m)																

RECORD OF BOREHOLE No C32-02

1 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 892 810.9 E 293 251.1 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.15 - 2013.05.15 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
235.8												
0.0	ASPHALT: (175mm)											
0.2	SAND, some to trace gravel Compact Brown Moist (FILL)		1	AS			235					
			1	SS	28							
234.3												
1.5	Silty SAND, trace clay, trace gravel Compact Brown Moist (FILL)		2	SS	14		234					0 63 32 5
233.6												
2.2	Loose		3	SS	4		233					
			4	SS	11							0 0 93 7
232.8	Occasional inferred cobble											
3.0												
232.0												
3.8	Gravelly SAND, occasional inferred cobble Dense Brown Wet		5	SS	41		232					Split spoon wet
231.5												
4.3	Clayey SILT, with sand, trace gravel Stiff Brown to Grey Moist		6	SS	15		231					
229.7												
6.1	Gravelly SAND Compact Grey		7	SS	10		230					
229.3												
6.5	Saturated Clayey SILT, some sand, trace gravel Stiff Grey Wet						229					
	Gravelly seams											
228.0												
7.8	Sandy SILT, trace gravel Compact Grey Wet		8	SS	12		228					
			9	SS	28		227					
226.0												
9.8	END OF BOREHOLE AT 9.8m.											

Continued Next Page

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

RECORD OF BOREHOLE No C32-02

2 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 892 810.9 E 293 251.1 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.15 - 2013.05.15 CHECKED BY SKP

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa	WATER CONTENT (%)	W _p	W		
	Continued From Previous Page						20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE	20 40 60					
	BOREHOLE OPEN TO 6.3m AND WATER LEVEL AT 3.7m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.8m, CEMENT TO 0.15m THEN ASPHALT TO SURFACE.												

RECORD OF BOREHOLE No SLAT109W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 892 917.8 E 293 256.3 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.08 - 2013.05.08 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT		
235.5	ASPHALT: (350mm)												
0.0			1	AS									41 50 9
235.1													(SI+CL)
0.4	SAND and GRAVEL, trace silt Brown Moist						235						
234.6	(FILL)												
0.9	Silty SAND, some clay Loose Brown Moist		1	SS	9								
234.0							234						
1.5	Clayey SILT, with sand, trace gravel, occasional oxidized staining Firm to Very Stiff Brown Moist		2	SS	5								
			3	SS	7		233						Split spoon wet
			4	SS	14								0 29 54 17
			5	SS	16		232						
			6	SS	26		231						
							230						
	Wet		7	SS	13		229						
228.8													
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO 6.1m WITH NO PONDED WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, THEN ASPHALT COLD PATCH TO SURFACE.												

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/15/13

RECORD OF BOREHOLE No NLAT37E-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 895 779.1 E 292 386.4 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.26 - 2013.05.26 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
229.1														
0.0	ASPHALT: (450mm)		1	AS			229							31 63 6 (SI+CL)
228.6														
0.5	SAND and GRAVEL, trace silt Compact Brown Moist (FILL)		1	SS	27		228							
227.5														
1.6	Silty SAND, trace gravel Compact Brown Moist		2	SS	10		227							
226.8														
2.3	SAND and SILT, trace to some clay, trace organics Compact Brown Moist		3	SS	12		226							0 57 33 10
			4	SS	15		225							Split spoon wet
			5	SS	14		224							0 42 51 7
			6	SS	19		223							
			7	SS	29		222							
			8	SS	23		221							
220.9														
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE OPEN TO 6.1m AND WATER LEVEL AT 6.1m UPON COMPLETION. BORHEOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m THEN ASPHALT TO SURFACE													

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO) GDT 8/15/13

RECORD OF BOREHOLE No NLAT40W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 896 189.8 E 292 207.1 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.05.26 - 2013.05.26 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
228.9	ASPHALT: (350mm)													
0.0														
228.5			1	AS										
0.4	SAND, some gravel, trace silt Brown Moist (FILL)													18 75 7 (SI+CL)
228.0														
0.9	Silty SAND, trace clay Compact Brown Moist		1	SS	12		228							
			2	SS	25									
226.7							227							
2.2	Clayey SILT, with sand, trace gravel Very Stiff Brown Moist		3	SS	12		226							0 33 48 19
			4	SS	27									
225.1														
3.8	Silty SAND, trace clay Compact Brown Wet		5	SS	26		225							
			6	SS	20		224							Split spoon wet
							223							
			7	SS	29									
							222							
	Loose		8	SS	9		221							
220.7														
8.2	END OF BOREHOLE AT 8.2m BOREHOLE OPEN TO 7.0m WITH NO PONDED WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m THEN ASPHALT COLD PATCH TO SURFACE.													

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO) GDT 8/15/13

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

RECORD OF BOREHOLE No NLAT91W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 901 334.7 E 291 146.5 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.06.05 - 2013.06.05 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)		
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE × LAB VANE										
298.6 0.0	ASPHALT: (225mm)																		
0.2 297.8 0.8	SAND, trace silt, some gravel Brown Moist (FILL)		1	AS												13 81 6 (SI+CL)			
	Silty SAND, trace silt, some gravel Dense to Compact Brown Moist (FILL)		1	SS	31														
			2	SS	27											19 52 21 8			
			3	SS	27														
295.3 3.3	Silty SAND, trace clay, trace gravel Veyr Dense Brown Moist (TILL)		4	SS	15											1 68 22 9			
			5	SS	71														
	Occasional inferred cobbles		6	SS	50/ 0.075														
292.2 6.4	END OF BOREHOLE AT 6.4m. BOREHOLE OPEN TO BOTTOM WITH NO PONDED WATER UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.9m, CUTTINGS TO 1.6m, CEMENT TO 0.2m THEN ASPHALT TO SURFACE.		7	SS	52/ 0.150														

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO) GDT 8/15/13

RECORD OF BOREHOLE No NLAT90-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 901 425.9 E 291 140.2 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.17 - 2013.05.17 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)						
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa			WATER CONTENT (%)				GR	SA	SI	CL			
								○ UNCONFINED + FIELD VANE	● QUICK TRIAXIAL × LAB VANE												
299.5								20	40	60	80	100									
0.0	ORGANICS: (200mm)																				
0.2	SAND, some to trace gravel Dense Brown Moist (FILL)		1	AS																	
298.2			1	SS	32																
1.3	Silty SAND, trace gravel, trace to some clay Dense Brown Moist		2	SS	39												5	61	24	10	
297.2																					
2.3	SAND, fine grained, trace gravel Very Dense Brown Moist		3	SS	60																
296.3																					
3.2	Silty SAND, some clay, trace gravel Very Dense Brown Moist (TILL) Possible cobble/boulders		4	SS	63													0	65	24	11
			5	SS	50/ 0.125																
			6	SS	100/ 0.275																
293.2			7	SS	50/ 0.100																
6.3	END OF BOREHOLE AT 6.3m. BOREHOLE OPEN TO BOTTOM WITH NO WATER PONDED UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.8m, CEMENT TO 0.2m THEN ASPHALT TO SURFACE.																				

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO) GDT 8/15/13

+ 3 x 3

Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No NLAT87-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 901 517 8 E 291 129 9 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.30 - 2013.05.30 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
300.3													
0.0	ASPHALT: (185mm)												
0.2	SAND and GRAVEL, trace silt Compact Brown Moist (FILL)		1	AS			300						40 55 5 (SI+CL)
			1	SS	28								
298.9							299						
1.4	SAND, some silt, trace gravel, trace clay Dense to Very Dense Brown Moist (TILL)		2	SS	44								1 75 24 (SI+CL)
			3	SS	46		298						
			4	SS	77		297						3 76 21 (SI+CL)
			5	SS	50/								
					0.100								
			6	SS	56/		296						
					0.150								
							295						
294.1			7	SS	100/								
6.2	END OF BOREHOLE AT 6.2m. BOREHOLE OPEN TO BOTTOM WITH NO WATER PONDED UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 2.4m, CUTTINGS TO 1.9m, CEMENT TO 0.2m THEN ASPHALT TO SURFACE.				0.125								

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/15/13

RECORD OF BOREHOLE No NLAT108W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 902 612.9 E 290 915.3 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.16 - 2013.05.16 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
297.9														
0.0	ASPHALT: (200mm)													
0.2	SAND and GRAVEL, trace silt Compact Brown Moist (FILL)		1	AS										39 56 5 (SI+CL)
296.6			1	SS	13		297							
1.3	Silty SAND, some clay, trace gravel Compact Brown Wet (FILL)		2	SS	22		296							6 54 27 13 Split spoon wet
295.7														
2.2	Silty SAND, some clay, trace to some gravel Compact Brown Moist to Wet		3	SS	15		295							
			4	SS	11									10 48 29 13
294.2														
3.7	Dense		5	SS	35		294							
293.4														
4.5	SAND and SILT, trace gravel Very Dense Brown to Grey Moist (TILL)		6	SS	78		293							
							292							
			7	SS	70									
291.2														
6.7	END OF BOREHOLE AT 6.7m. WATER LEVEL AT 2.1m UPON COMPLETION. BOREHOLE CAVED TO 1.6m, WITH BIG VOID FROM 0.6m TO 1.6m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.9m, CEMENT TO 0.2m THEN ASPHALT TO SURFACE.													

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO) GDT 8/15/13

RECORD OF BOREHOLE No NLAT110W-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 902 816 0 E 290 876 3 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013 05 16 - 2013 05 16 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
299.0	ASPHALT: (175mm)						299					
0.0												
0.2	SAND and GRAVEL, trace silt Compact Brown Moist (FILL) Occasional inferred cobble		1	AS								
297.7			1	SS	18		298					41 56 3 (SI+CL)
1.3	SAND and SILT, some clay, trace gravel Compact Brown Moist (FILL) Trace clay		2	SS	27		297					
			3	SS	10							0 54 34 12
296.0												
3.0	Clayey SILT, some sand, trace gravel Very Stiff Brown Moist (FILL)		4	SS	17		296					
295.1												
3.9	Silty CLAY, with sand, trace gravel Very Stiff Brown Moist		5	SS	19		295					2 32 34 32
294.3												
4.7	SAND and SILT, trace gravel Compact to Dense Brown Moist to Wet		6	SS	24		294					
							293					Split spoon wet
292.3			7	SS	46							
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO BOTTOM AND WATER LEVEL AT 5.9m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.8m, CEMENT TO 0.2m THEN ASPHALT TO SURFACE.											

ONTMT4S 1218.GPJ 2012TEMPLATE(MTO).GDT 8/15/13

RECORD OF BOREHOLE No NLAT114E-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 903 202 0 E 290 809 9 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.30 - 2013.05.30 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
298.3													
0.0	ASPHALT: (200mm)												
0.2	SAND, some to trace gravel, trace silt Compact Brown Moist (FILL)		1	AS			298						
			1	SS	25								12 83 5 (SI+CL)
	Some silt						297						
			2	SS	12								
295.9													
2.4	Clayey SILT, with sand, trace organics and rootlets Firm Dark Brown Moist (FILL)		3	SS	7		296						0 42 44 14
295.3													
3.0	Silly SAND, trace gravel, some clay Loose Brown Wet		4	SS	8		295						Split spoon wet
294.6													
3.7	Dense		5	SS	35								0 59 26 15
							294						
			6	SS	32								
293.1													
5.2	END OF BOREHOLE AT 5.2m BOREHOLE OPEN TO 4.3m AND WATER LEVEL AT 3.5m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 1.8m, CEMENT TO 0.20m THEN ASPHALT TO SURFACE.												

RECORD OF BOREHOLE No NLAT119E-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 903 491.6 E 290 755.2 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.05.30 - 2013.05.30 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
296.7													
0.0	ASPHALT: (175mm)												
0.2	SAND and GRAVEL, trace silt Compact Brown Moist (FILL)		1	AS			296						37 56 7 (SI+CL)
			1	SS	18								
295.0													
1.7	SAND and SILT, trace clay, trace gravel, organic stains Loose Dark Brown (FILL)		2	SS	9		295						0 43 49 8
294.4													
2.3	Clayey SILT, some sand, trace to some gravel Firm to Sliff Brown Moist to Wet		3	SS	5		294						
			4	SS	7								
	Trace gravel		5	SS	15		293						
	Hard		6	SS	40		292						
291.6													
291.4	Sandy SILT, trace gravel Dense Brown Moist												
5.2	END OF BOREHOLE AT 5.2m BOREHOLE OPEN TO BOTTOM AND WATER LEVEL AT 4.2m UPON COMPLETION BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 2.1m, CUTTINGS TO 1.8m, CEMENT TO 0.2m THEN ASPHALT TO SURFACE												

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/15/13

+ 3 × 3

Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C102-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 881 623 8 E 294 850 4 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 06 26 - 2013 06 26 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
224.3								20 40 60 80 100						
0.0	TOPSOIL: (125mm)							○ UNCONFINED + FIELD VANE						
0.1	Clayey SILT, some sand, roots and rootlets		1	SS	7		224	● QUICK TRIAXIAL × LAB VANE						
223.5	Firm													
0.8	Brown													
	Silty CLAY, some sand, trace gravel		2	SS	25		223							0 19 45 36
	Very Stiff													
	Brown													
	Moist													
			3	SS	30		222							
	Grey													
			4	SS	15		221							
221.3														
3.0	Stiff		5	SS	11		220							0 11 49 40
			6	SS	11									
219.1														
5.2	END OF BOREHOLE AT 5.2m. BOREHOLE OPEN TO BOTTOM WITH NO PONDED WATER UPON COMPLETION. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Aug. 7/13 0.5 223.8													

+ 3 × 3 : Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C102-02

1 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 881 651.0 E 294 845.7 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 06 26 - 2013 06 26 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
231.2	ASPHALT: (225mm)											
0.0												
0.2	SAND and GRAVEL, some silt Brown Moist (FILL) Compact Some silt, trace gravel		1	AS			231					37 46 17 (SI+CL)
230.0			1	SS	12							
1.2	Silty CLAY, trace sand Stiff Brown (FILL)		2	SS	14		230					
			3	SS	11		229					
			4	SS	10		228					0 9 54 37
			5	SS	15		227					
	Occasional wood fibres						226					
225.1			6	SS	14		225					
6.1	Silty CLAY, trace sand, trace gravel Stiff to Very Stiff Brown Moist		7	SS	19		224					1 9 44 46
			8	SS	17		223					
	Grey						222					

Continued Next Page

+ 3 x 3

Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C102-02

2 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 881 651.0 E 294 845.7 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 06 26 - 2013 06 26 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
	Continued From Previous Page							SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
								WATER CONTENT (%) w _p — w — w _L						
218.4	With sand		9	SS	12		221							
							220							
			10	SS	14		219							0 27 43 30
12.8	END OF BOREHOLE AT 12.8m. BOREHOLE OPEN TO BOTTOM WITH NO PONDED WATER UPON COMPLETION. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Aug. 7/13 0.2 231.0													

RECORD OF BOREHOLE No C103-01

1 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 881 628.7 E 294 785.8 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 06 26 - 2013 06 26 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
231.2								20 40 60 80 100						
0.0	ASPHALT: (175mm)													
0.2	SAND and SILT, some gravel, trace clay Brown Moist (FILL)		1	AS			231							0 56 36 8
230.4														
0.8	Silty CLAY, trace sand, trace gravel Stiff Brown to Grey (FILL)		1	SS	11		230							
			2	SS	14									1 4 40 55
229.0	Firm						229							
2.2			3	SS	5									
228.2														
3.0			4	SS	13		228							
							227							
226.5	Silty CLAY, trace sand, trace gravel Very Stiff Mottled Brown/Grey Moist		5	SS	17		226							
4.7														
			6	SS	20		225							1 7 56 36
	Occasional brown silt seams, occasional oxide staining						224							
			7	SS	23		223							
							222							
			8	SS	19									

Continued Next Page

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

RECORD OF BOREHOLE No C103-01

2 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 881 628.7 E 294 785.8 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.06.26 - 2013.06.26 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
	Continued From Previous Page							SHEAR STRENGTH kPa						
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
								WATER CONTENT (%)						
								20	40	60	80	100		
								PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT				
								W _p	W	W _L				
218.4			9	SS	15		221							0 0 49 51
							220							
			10	SS	17		219							
12.8	END OF BOREHOLE AT 12.8m. BOREHOLE OPEN TO BOTTOM WITH NO PONDED WATER UPON COMPLETION. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Aug. 7/13 0.9 230.3													

RECORD OF BOREHOLE No C107-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 895 657 2 E 292 371.1 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 06 13 - 2013 06 13 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE					w _p w w _L		
								● QUICK TRIAXIAL × LAB VANE							
227.5							20 40 60 80 100								
0.0	TOPSOIL: (75mm)		1	SS	8								13 80 7		
0.1	SAND, some gravel, trace silt Loose to Compact Brown Moist (FILL)		2	SS	9								(SI+CL)		
	Trace organics		3	SS	11										
225.5															
2.0	SAND and SILT, trace clay Compact Grey Wet to Moist		4	SS	17								0 63 30 7		
			5	SS	18										
			6	SS	19										
			7	SS	12								0 36 57 7		
220.8															
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN TO BOTTOM AND WATER LEVEL AT 3.6m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.														

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/15/13

METRIC

[illegible]

RECORD OF BOREHOLE No C108-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 895 653.3 E 292 223.5 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.06.13 - 2013.06.13 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				W _P	W	W _L		GR	SA	SI	CL
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL	× LAB VANE	WATER CONTENT (%)							
227.3							20	40	60	80	100								
8.8	TOPSOIL: (50mm)		1	SS	12								○					0 60 30 10	
	SAND and SILT, trace to some clay, trace organics Compact Brown Moist (FILL) Grey		2	SS	26								○						
225.5			3	SS	17								○						
1.8	Sandy SILT, trace clay Compact Brown Moist to Wet Grey		4	SS	19								○						
			5	SS	20								○					0 25 69 6	
			6	SS	19								○						
			7	SS	14								○						
			8	SS	11								○						
219.1																			
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE OPEN TO BOTTOM AND WATER LEVEL AT 3.9m UPON COMPLETION. BORHEOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.																		

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/15/13

RECORD OF BOREHOLE No C108-02

1 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 895 658.8 E 292 204.4 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 06 12 - 2013 06 12 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)									
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						WATER CONTENT (%)			GR	SA	SI	CL			
226.7								20	40	60	80	100											
0.0																							
0.1	TOPSOIL: (85mm)																						
226.2	SAND, trace to some silt, trace gravel		1	SS	5																		
0.5	Loose																						
	Brown																						
	Moist																						
	(FILL)																						
	SAND and SILT, trace to some clay		2	SS	14													0	58	35	7		
	Compact																						
	Brown																						
	Moist																						
			3	SS	19																		
	Grey		4	SS	16														0	36	54	10	
	Wet																						
			5	SS	17																		
			6	SS	15																		
			7	SS	16																		
			8	SS	12																		
	Silt seam (50mm) at 8.1m																						
			9	SS	12															0	18	57	25
216.9																							
9.8	END OF BOREHOLE AT 9.8m																						

Continued Next Page

+ 3, × 3

Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C108-02

2 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 895 658.8 E 292 204.4 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 06 12 - 2013 06 12 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES								
	Continued From Previous Page												
	Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Jun. 12/13 0.3 226.4 Aug 7/13 0.9 225.8												

RECORD OF BOREHOLE No C112-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 899 632.0 E 291 453.3 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.06.05 - 2013.06.05 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
285.0								SHEAR STRENGTH kPa						
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
								WATER CONTENT (%)						
								PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W _P W W _L						
0.0	Silty SAND, trace gravel, trace roots, trace organics Loose to Compact Brown Moist (FILL)		1	SS	6		285							
283.7			2	SS	10		284							
283.8	ORGANICS, trace roots and rootlets, some sand Dark Brown													
1.4	Clayey SILT, some sand, trace gravel Very Stiff Brown Moist		3	SS	18		283							
282.6			4	SS	27		282							0 8 31 61
2.4	Silty CLAY, some sand, trace gravel Very Stiff Brown		5	SS	27		281							6 50 28 16
281.2			6	SS	33		280							
3.8	Clayey SILT, with sand, trace gravel Hard Grey Moist		7	SS	73		279							
280.5														
4.5	Silty SAND, some clay, trace gravel Very Dense Grey Moist (TILL)													
278.8			8	SS	55/									
6.2	END OF BOREHOLE AT 6.2m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Jun 05/13 2.5 282.5 Aug 7/13 0.3 284.7				0.150									

RECORD OF BOREHOLE No C112-02

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 899 686 4 E 291 444 4 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.06.05 - 2013.06.05 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				
284.6								20 40 60 80 100						
0.0	Clayey SILT, some sand, mixed with organics, trace roots and rootlets Firm to Stiff Brown to Dark Brown Moist (FILL)		1	SS	4									
			2	SS	9									
282.9														
1.7	Silty CLAY, some sand Stiff Brown		3	SS	12									0 15 29 56
282.2														
2.4	Clayey SILT, with sand, trace gravel Stiff to Very Stiff Brown Moist		4	SS	13									
			5	SS	19									6 53 26 15
280.7														
3.9	SAND, trace gravel Dense Brown Wet		6	SS	47									
279.9														
4.7	Silty SAND, some clay, trace gravel, occasional inferred cobbles Very Dense Brown Moist (TILL)		7	SS	78/ 0.275									
278.2			8	SS	50/ 0.125									1 60 24 15
6.4	END OF BOREHOLE AT 6.4m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Jun. 05/13 2.9 281.7 Aug. 7/13 0.0 284.6													

ONTMT4S 1218.GPJ 2012TEMPLATE(MTO).GDT 8/27/13

RECORD OF BOREHOLE No C113-01

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 899 651.7 E 291 513.0 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 06 05 - 2013 06 05 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL	× LAB VANE	W _P	W	W _L			
285.2							20	40	60	80	100	20	40	60		GR SA SI CL	
0.0	TOPSOIL: (50mm)																
	SAND, some silt, some gravel, trace roots and rootlets Loose Dark Brown Moist (FILL)		1	SS	7												
284.4																	
0.6																	
	Sandy SILT, trace gravel, trace to some clay Compact Grey Moist (FILL)		2	SS	18											2 30 58 10	
283.3																	
1.9																	
	Sandy SILT, trace gravel Compact to Loose Brown to Dark Brown Moist		3	SS	37												
	Sandy SILT, trace gravel Compact to Loose Brown to Dark Brown Moist		4	SS	6												
	Trace rootlets and organics																
282.2																	
3.0																	
	SAND, fine grained, trace to some silt, trace gravel Compact Brown Wet		5	SS	16											1 87 12 (SI+CL)	
	Dense		6	SS	45												
279.1																	
6.1																	
278.9	Silty CLAY, some sand, trace gravel Very Dense Grey Moist (TILL)		7	SS	50/ 0.100											3 20 40 38	
6.3																	
	END OF BOREHOLE AT 6.3m Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.																
	WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Jun. 06/13 2.5 282.7 Aug. 7/13 0.8 284.4																

ONTMT4S 1218.GPJ 2012TEMPLATE(MTO).GDT 8/27/13

RECORD OF BOREHOLE No C113-02

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 899 702.0 E 291 502.6 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2016.06.06 - 2013.06.06 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
285.2 0.0 0.1	TOPSOIL: (75mm)						285					
284.4	Clayey SILT, with sand, trace gravel, trace roots Firm		1	SS	5							3 52 31 14
284.8	Brown (FILL)											
284.8 0.9	ORGANICS, trace rootlets Dark Brown		2	SS	19		284					
283.6	Sandy SILT, trace gravel Compact											
283.6 1.6	Brown Moist (FILL)		3	SS	14							1 18 32 49
282.9	Silty CLAY, some sand, trace gravel Stiff						283					
282.9 2.3	Brown (FILL)		4	SS	26							
282.2	Sandy SILT, trace gravel Compact											
282.2 3.0	Brown Moist		5	SS	25		282					
281.1	SAND, fine grained Compact Brown Wet											
281.1 4.1	Silty CLAY, with sand, trace gravel Hard Grey Moist (TILL)		6	SS	61		281					0 23 49 28
279.0							280					
279.0 6.2	END OF BOREHOLE AT 6.2m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.		7	SS	57/							
					0.150							
	WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Jun. 06/13 3.4 281.8 Aug. 7/13 0.5 284.7											

RECORD OF BOREHOLE No C114-01

1 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 904 982.9 E 290 636.1 ORIGINATED BY JG
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.06.02 - 2013.06.02 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)	
								○ UNCONFINED	+ FIELD VANE							
								● QUICK TRIAXIAL	× LAB VANE							
302.7							20 40 60 80 100									
0.0	ASPHALT: (250mm)															
302.4																
0.3	Gravelly SAND, trace to some silt		1	AS												
	Brown															
	Moist															
301.9	(FILL)															
0.8	Dense		1	SS	48											
301.2																
1.5	SAND and SILT, some gravel, some clay, trace cobbles Dense to Very Dense Brown Moist		2	SS	37											
				3	SS	81										
				4	SS	95/ 0.280										
			5	SS	77											
298.1																
4.6	Sandy SILT, trace gravel Very Dense Brown Moist		6	SS	71											
296.6																
6.1	Silty SAND, trace to some gravel Very Dense Brown Moist (TILL) Inferred cobble/boulder at 6.4m		7	SS	50											
				8	SS	54										
293.6																
9.1	Silty CLAY, with sand, trace gravel Hard Brown Moist		9	SS	47											
292.9																
9.8	END OF BOREHOLE AT 9.8m.															

Continued Next Page

+ 3 × 3 : Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C114-01

2 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 904 982 9 E 290 636 1 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 06 02 - 2013.06.02 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
	Continued From Previous Page							20 40 60 80 100						
	BORHEOLE OPEN TO BOTTOM AND WATER LEVEL AT 9.1m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m, THEN ASPHALT COLD PATCH TO SURFACE.							20 40 60 80 100						

RECORD OF BOREHOLE No C116-01

1 OF 2

METRIC

GWP# 83-00-00 LOCATION N 4 905 082 7 E 290 644 9 ORIGINATED BY JG
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.06.02 - 2013.06.02 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
301.5								20 40 60 80 100		20 40 60				
0.0	ASPHALT: (450mm)		1	AS				○ UNCONFINED + FIELD VANE						
301.0								● QUICK TRIAXIAL × LAB VANE						
0.5	SAND and GRAVEL, trace to some silt Dense Brown Moist (FILL)		1	SS	37		301						34 53 13 (SI+CL)	
300.0														
1.5	SAND and SILT, some clay Compact to Dense Brown Moist		2	SS	26		300							
			3	SS	36		299						0 48 41 11	
298.5	Very Dense		4	SS	98/ 0.275		298							
297.8	Trace gravel		5	SS	43		297							
			6	SS	29								Split spoon wet	
295.9							296							
5.6	SAND and SILT, trace clay, trace gravel Dense to Very Dense Brown Moist (TILL)		7	SS	48		295						2 60 31 7	
			8	SS	50/ 0.125		294							
							293							
			9	SS	94/ 0.250		292							
291.9	END OF BOREHOLE AT 9.6m. BOREHOLE OPEN TO 9.1m AND													
9.6														

Continued Next Page

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

METRIC

SOIL PROFILE						
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS
<div>Continued From Previous Page</div>						
<div>WATER LEVEL AT 7.6m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 3.0m, CUTTINGS TO 1.5m, CONCRETE TO 0.15m, THEN ASPHALT COLD PATCH TO SURFACE.</div>						

RECORD OF BOREHOLE No C18-01 HW

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 887 709.2 E 293 769.5 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013 06 04 - 2013 06 04 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100					
279.7														
0.0 0.1	TOPSOIL: (75mm)													
279.2	SAND, trace silt, trace gravel, roots and rootlets Very Loose Brown (FILL)		1	SS	3									
0.5														
	SAND and SILT, trace to some clay, trace gravel, rootlets Very Loose to Compact Dark Brown to Brown Saturated to Wet		2	SS	4									
			3	SS	13									1 57 32 10
277.4														
2.3	SAND and SILT, some clay, trace gravel Very Dense Brown to Grey Moist (TILL)		4	SS	69									
			5	SS	88/ 0.275									
276.0														
3.7	Dense		6	SS	47									5 50 33 12
275.2														
4.5			7	SS	55									
			8	SS	58									5 50 32 13
			9	SS	70									
271.5														
8.2	END OF BOREHOLE AT 8.2m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV (m) Aug 07/13 0.1 279.6													

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO) GDT 8/15/13

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

RECORD OF BOREHOLE No C18-02 HW

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 887 717.3 E 293 769.1 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.06.03 - 2013.06.03 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				
								20 40 60 80 100				
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE				
						WATER CONTENT (%)						
						w _p w w _L						
280.0												
0.0	TOPSOIL: (125mm)						280					
0.1	SAND and SILT, some clay, trace gravel Loose to Very Loose Brown Moist to Wet		1	SS	6							
			2	SS	3		279					0 45 44 11
278.2												
1.8	SAND and SILT, some clay, trace gravel Very Dense Brown to Grey Moist (TILL)		3	SS	55		278					
			4	SS	92							3 50 33 14
			5	SS	85		277					
			6	SS	63		276					
			7	SS	52		275					2 50 34 14
			8	SS	75		274					
			9	SS	34		273					
271.8	Dense						272					
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE OPEN TO BOTTOM AND WATER LEVEL AT 0.1m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.											

ONTMT4S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/15/13

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

RECORD OF BOREHOLE No C27-02 HW

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 891 558 9 E 293 303.8 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.06.05 - 2013.06.05 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
258.3	TOPSOIL: (50mm)											
257.5	SAND, trace gravel, trace roots Loose Dark Brown Moist (FILL)		1	SS	7		258					
256.8	Silty SAND, some clay, trace gravel, trace rootlets Very Loose Dark Brown Moist		2	SS	4		257					
256.1	Clayey SILT, with sand Firm Brown Moist		3	SS	6		256					0 29 55 16
255.0	Sandy SILT, trace gravel, occasional inferred cobbles Dense Brown Wet		4	SS	47		255					4 48 34 14
254.0	SAND and SILT, some clay, trace gravel Very Dense Brown Moist (TILL)		5	SS	67		254					
253.0	Inferred cobbles/boulders		6	SS	50/ 0.100		253					
252.0			7	SS	50/ 0.075		252					
251.0			8	SS	50/ 0.050		251					
250.6	END OF BOREHOLE AT 7.7m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.											
WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Aug 08/13 1.4 256.9												

RECORD OF BOREHOLE No C39-01 HW

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 894 670.6 E 292 820.9 ORIGINATED BY ES
 HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2013.06.04 - 2013.06.04 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE		WATER CONTENT (%) w _P w w _L					GR	SA	Si	CL																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
226.9	PEAT, organics, roots and rootlets Very Loose to Loose Dark Brown Wet		1	SS	1								120																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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RECORD OF BOREHOLE No C39-02 HW

1 OF 1

METRIC

GWP# 83-00-00 LOCATION N 4 894 676.4 E 292 818.6 ORIGINATED BY ES
HWY 400 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2013.06.04 - 2013.06.04 CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)		
								20 40 60 80 100		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT							
								○ UNCONFINED + FIELD VANE									
								● QUICK TRIAXIAL × LAB VANE									
								20 40 60 80 100		20 40 60							
227.1	PEAT, organics, trace roots and rootlets Very Loose to Loose Dark Brown Wet		1	SS	1		227						195				
			2	SS	7		226								161		
			3	SS	3										272		
224.9					225												
2.2	SAND, trace silt Compact Grey Moist to Wet		4	SS	23								○		0 90 10 (SI+CL)		
			5	SS	18		224								○		
223.5													○				
3.6	SAND and SILT, trace clay Compact Grey Moist		6	SS	20		223								○	0 54 39 7	
			7	SS	28											○	
							222										
			8	SS	28	221								○	0 62 34 4		
							220										
			9	SS	17								○				
218.9							219										
8.2	END OF BOREHOLE AT 8.2m BOREHOLE OPEN TO 6.4m AND WATER LEVEL AT 0.5m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.																

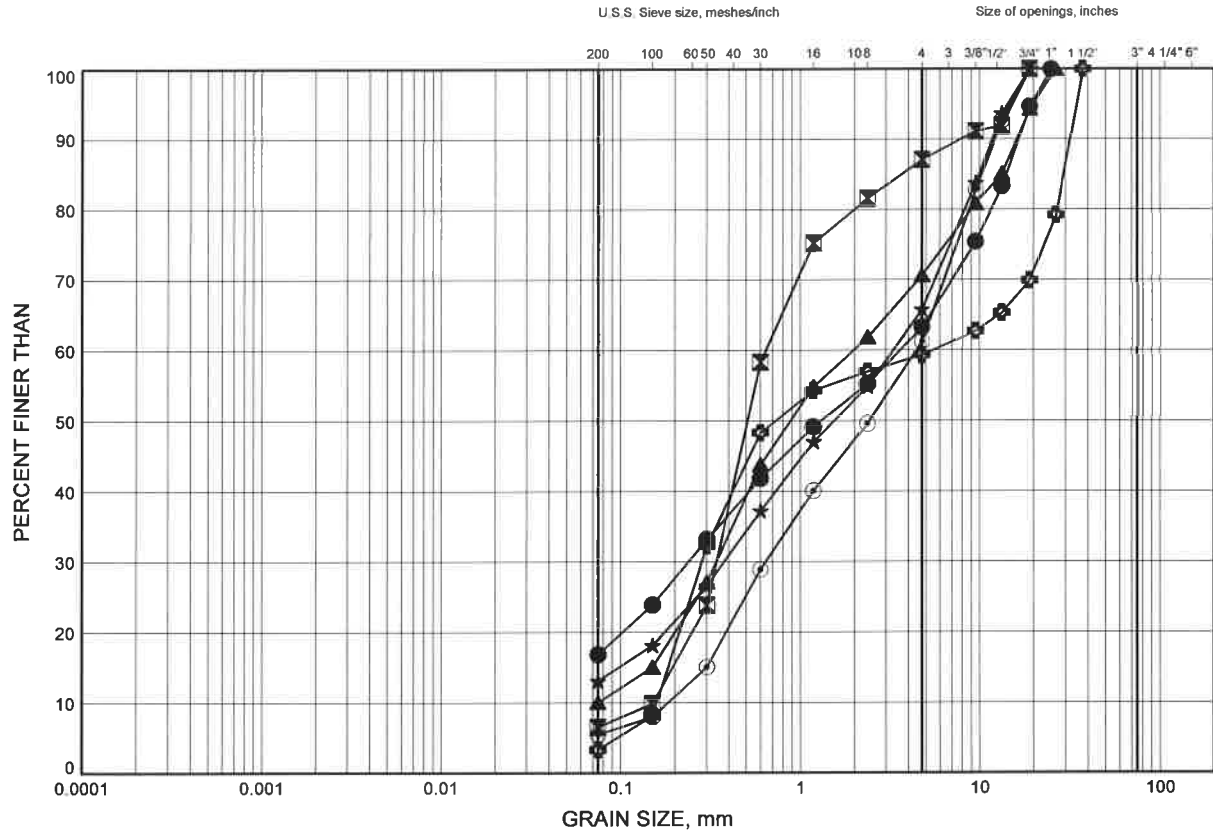
ONTM14S 1218 GPJ 2012TEMPLATE(MTO).GDT 8/15/13

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

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE E1

SAND/SAND & 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)
●	C102-02	0.38	230.82
⊠	C107-01	0.30	227.20
▲	C114-01	1.07	301.63
★	C116-01	0.53	300.97
⊙	NLAT108W-01	0.38	297.52
⊕	NLAT110W-01	1.07	297.93

GRAIN SIZE DISTRIBUTION - THURBER 1218.GPJ 8/15/13

Date August 2013
GWP# 83-00-00

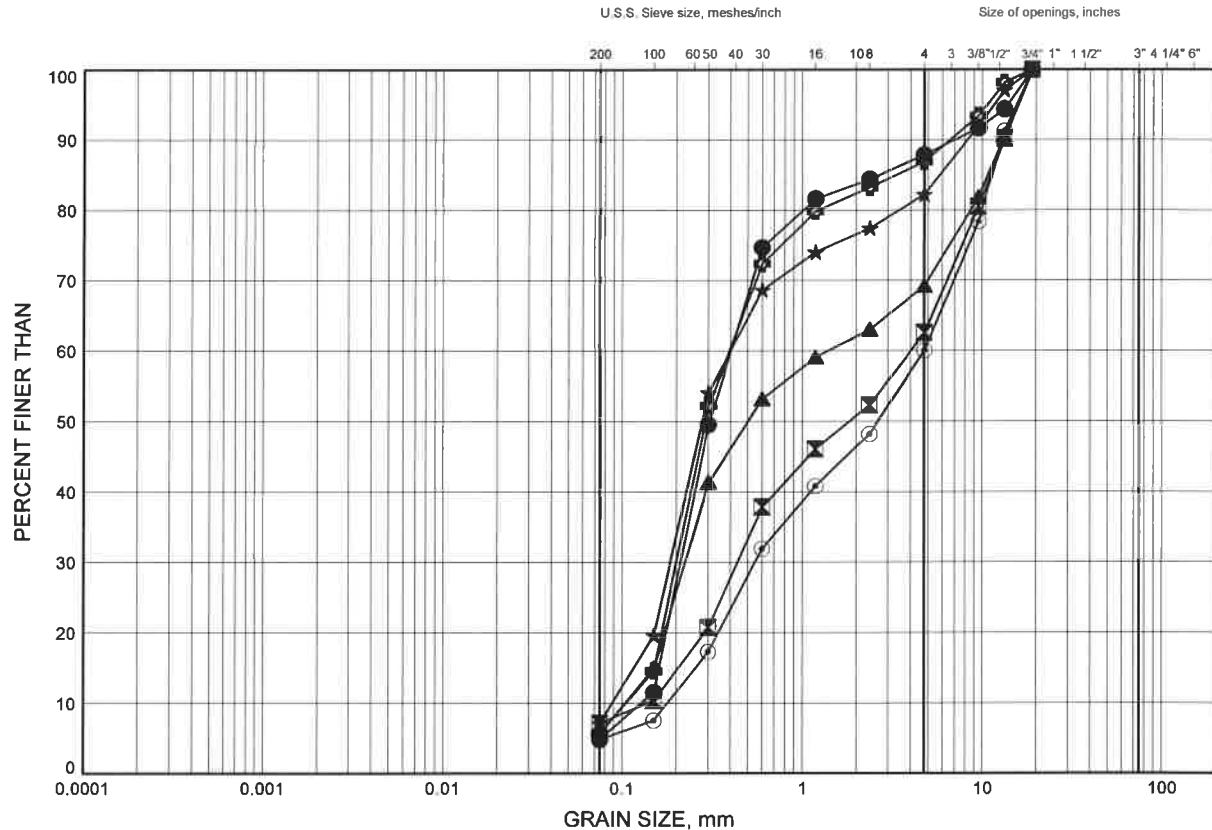


Prep'd AN
Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE E2

SAND/SAND & 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)
●	NLAT114E-01	1.07	297.23
⊠	NLAT119E-01	0.38	296.32
▲	NLAT37E-01	0.30	228.80
★	NLAT40W-01	0.46	228.44
⊙	NLAT87-01	0.38	299.92
⊕	NLAT91W-01	0.38	298.22

GRAIN SIZE DISTRIBUTION - THURBER 1218.GPJ 8/15/13

Date August 2013
GWP# 83-00-00

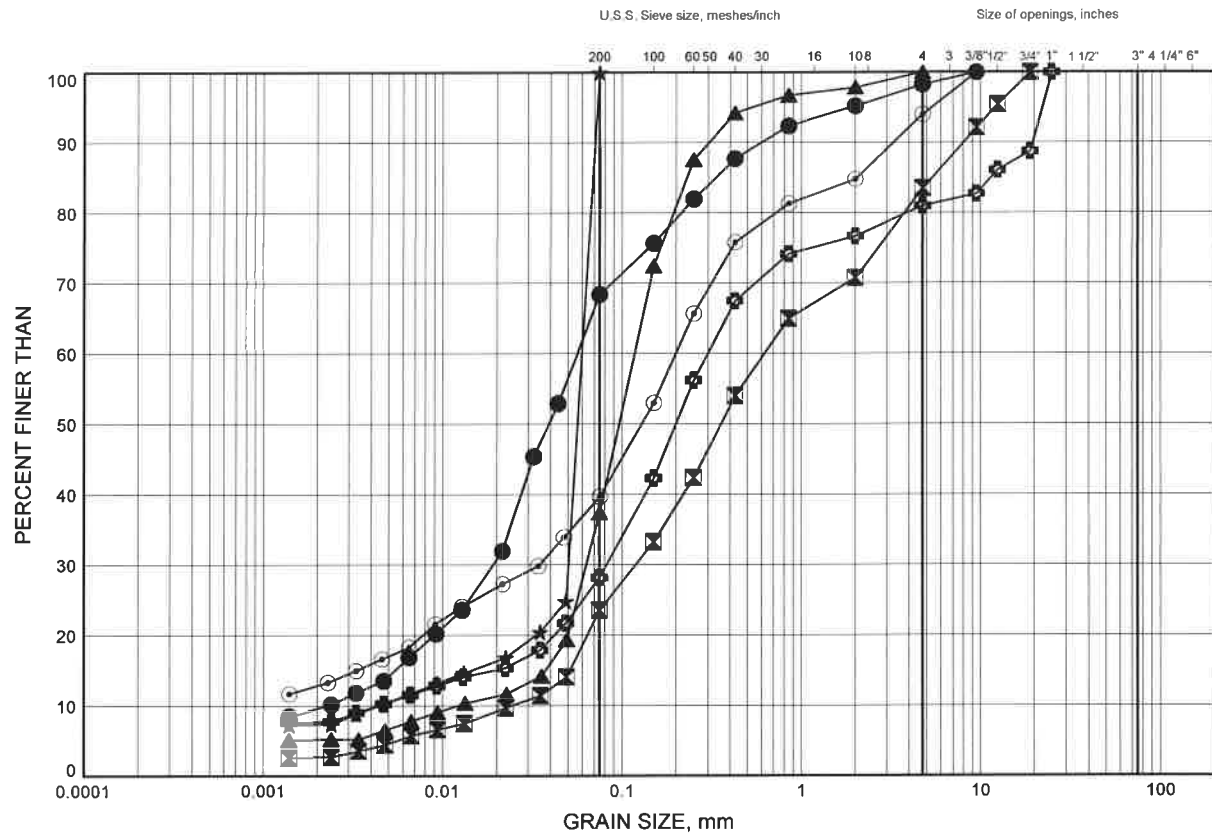


Prep'd AN
Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE E3

SILTY SAND/SANDY SILT FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C113-01	1.07	284.13
⊠	C32-01	1.07	234.53
▲	C32-02	1.83	233.97
★	C32-02	3.35	232.45
⊙	NLAT108W-01	1.83	296.07
⊕	NLAT91W-01	1.83	296.77

GRAIN SIZE DISTRIBUTION - THURBER 1218 GPJ 8/28/13

Date August 2013
GWP# 83-00-00

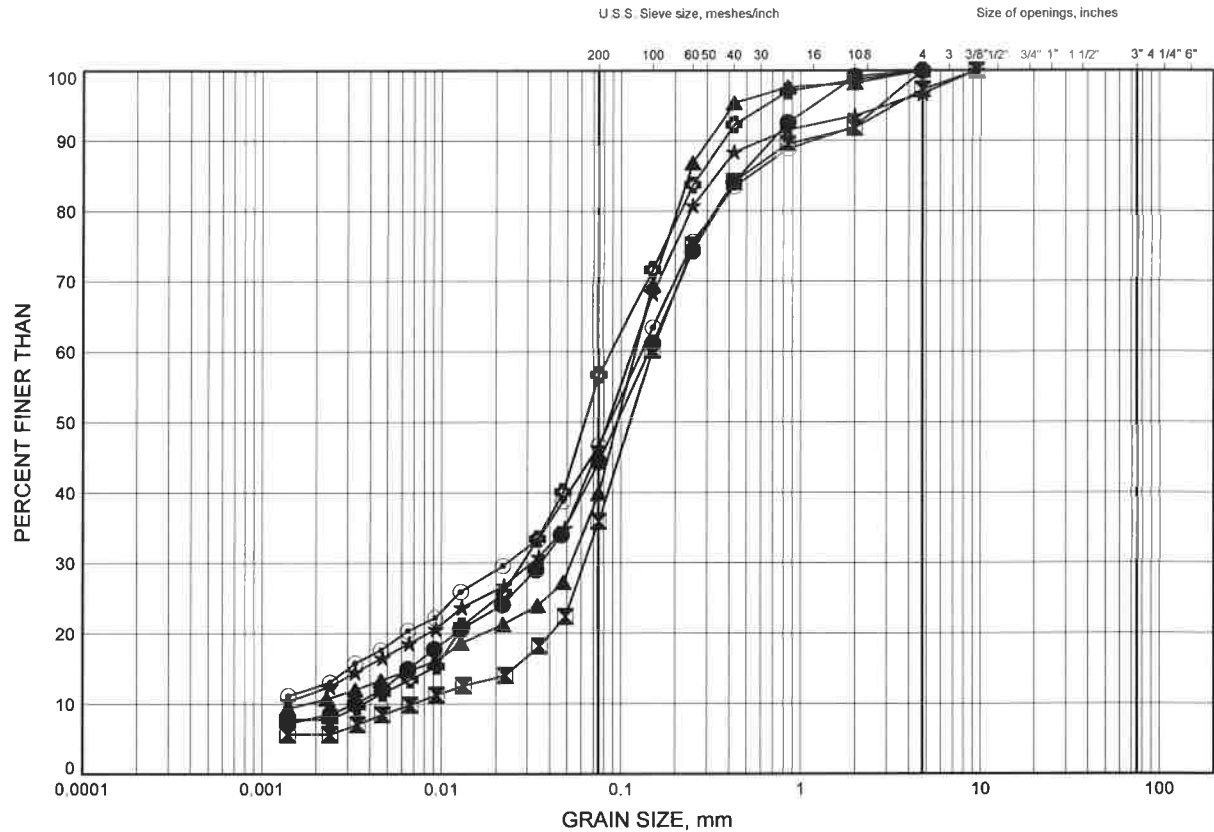


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Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE E4

SAND & SILT FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C103-01	0.38	230.82
⊠	C107-02	1.07	226.43
▲	C108-01	0.39	226.91
★	C27-01 HW	3.35	255.45
⊙	NLAT110W-01	2.59	296.41
⊕	NLAT119E-01	1.83	294.87

Date August 2013

GWP# 83-00-00



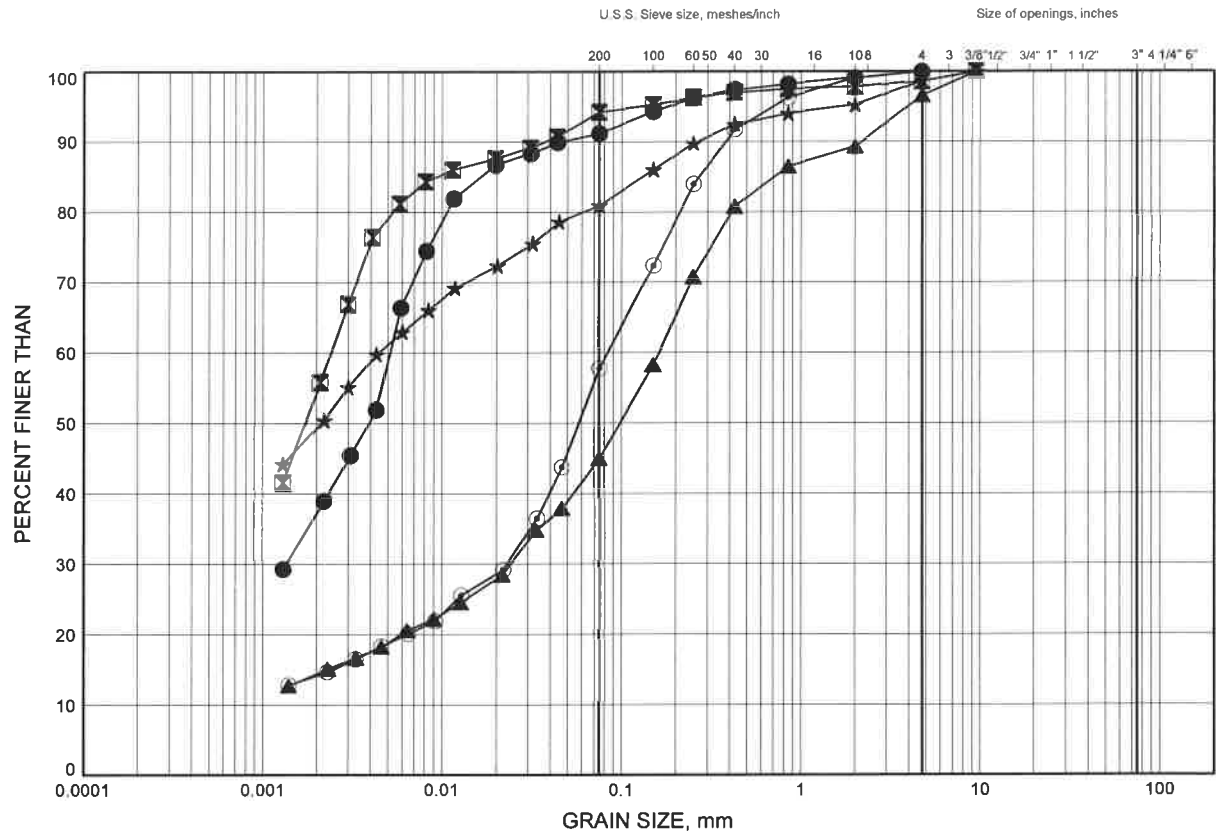
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Chkd. SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE E5

SILTY CLAY/CLAYEY SILT FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C102-02	3.35	227.85
■	C103-01	1.83	229.37
▲	C113-02	0.30	284.90
★	C113-02	1.83	283.37
○	NLAT114E-01	2.59	295.71

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GWP# 83-00-00

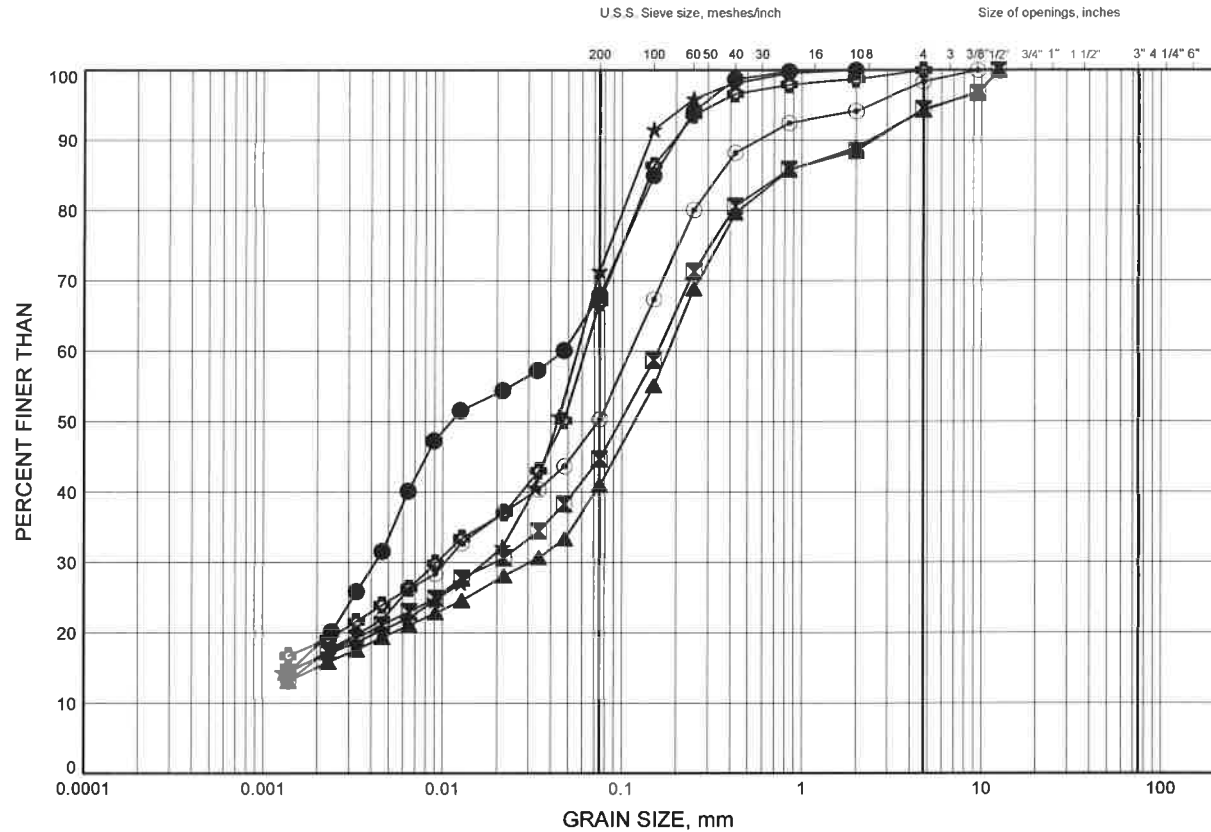


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Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE E6

CLAYEY SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C107-02	2.46	225.04
⊠	C112-01	4.11	280.89
▲	C112-02	3.35	281.25
★	C27-02 HW	1.83	256.47
⊙	C32-01	4.88	230.72
⊕	NLAT40W-01	2.59	226.31

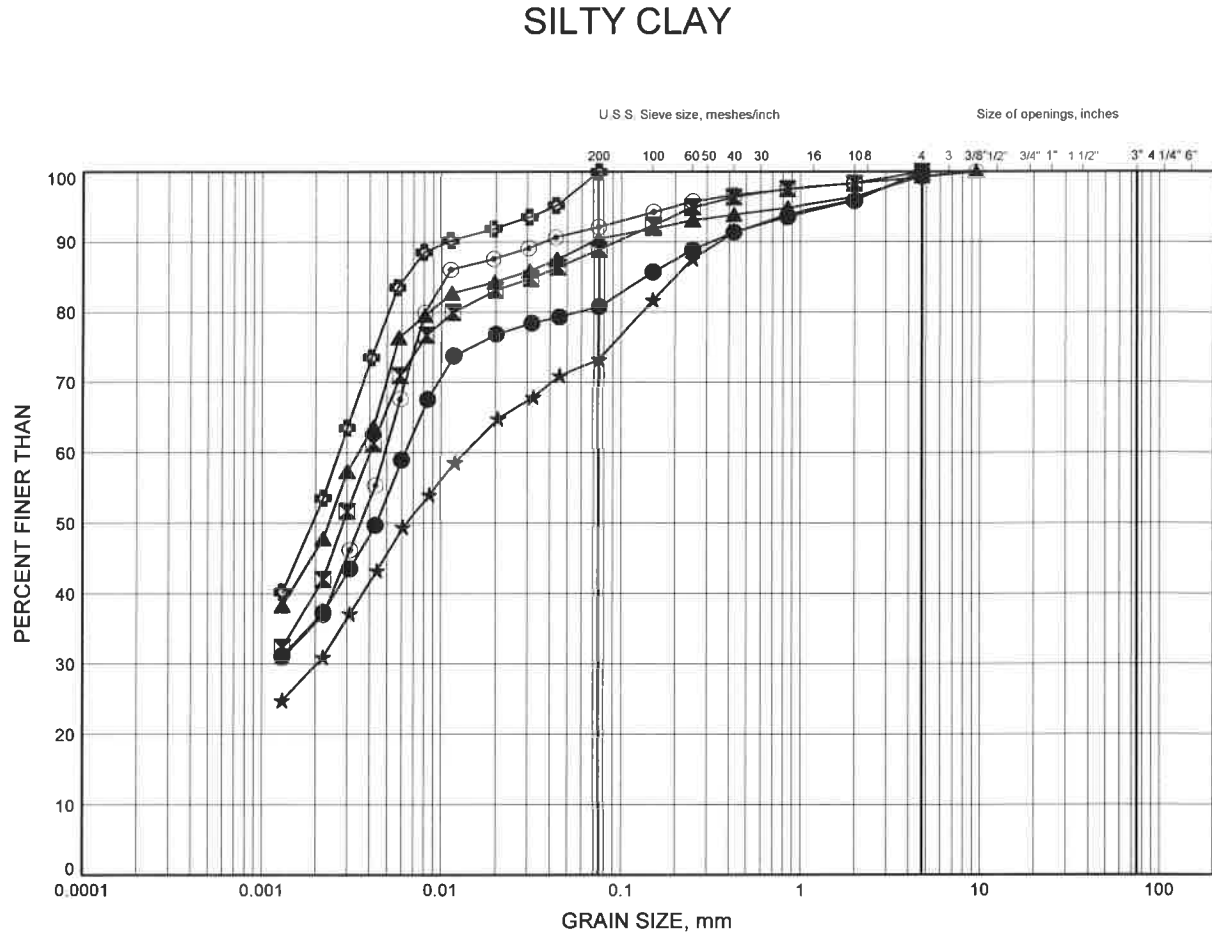
Date August 2013
GWP# 83-00-00



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Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE E7



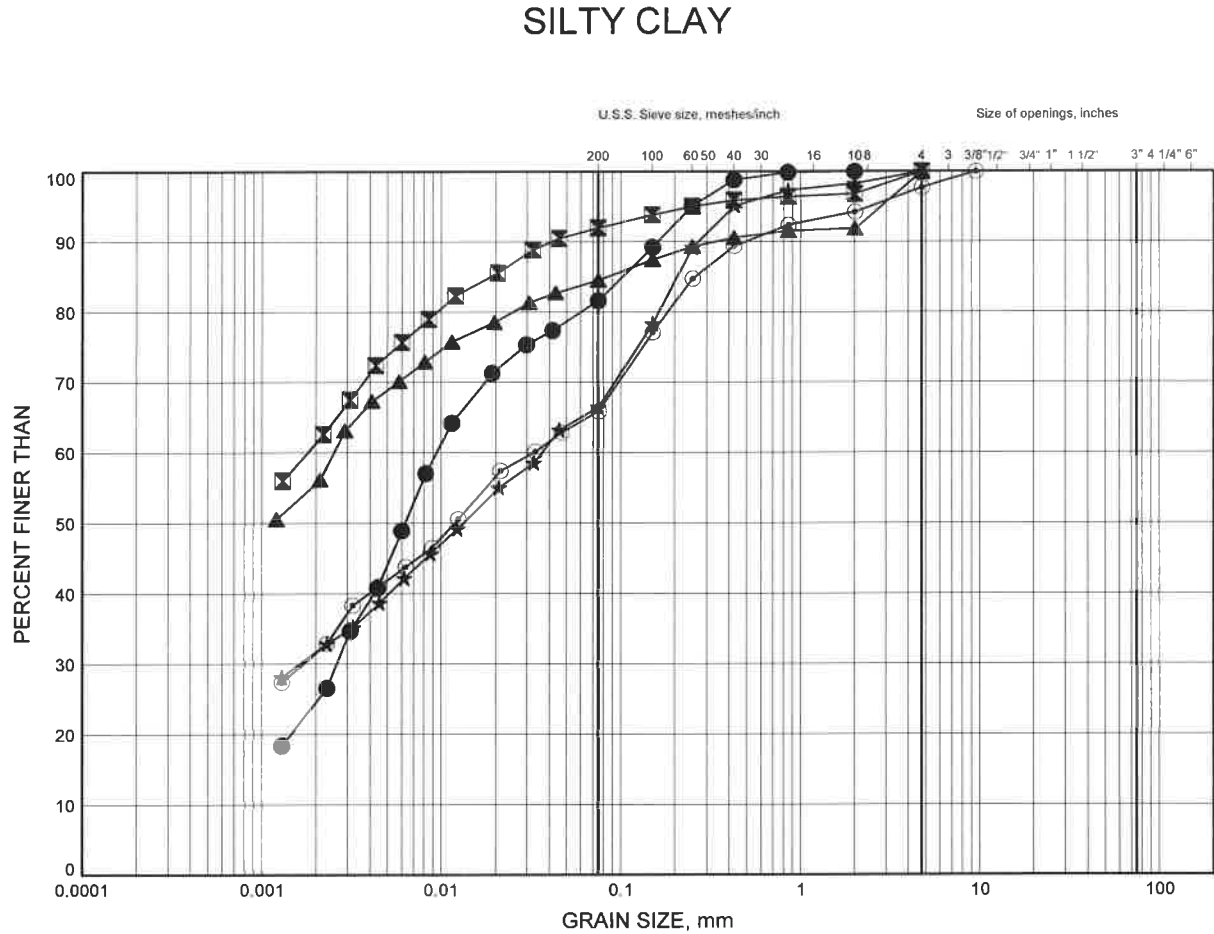
SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C102-01	1.07	223.23
⊠	C102-01	3.35	220.95
▲	C102-02	7.92	223.28
★	C102-02	12.50	218.70
⊙	C103-01	6.40	224.80
⊕	C103-01	10.97	220.23

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE E8



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C108-02	9.45	217.25
⊠	C112-01	2.59	282.41
▲	C112-02	1.83	282.77
★	C114-01	9.45	293.25
⊙	NLAT110W-01	4.11	294.89

GRAIN SIZE DISTRIBUTION - THURBER 1218.GPJ 8/27/13

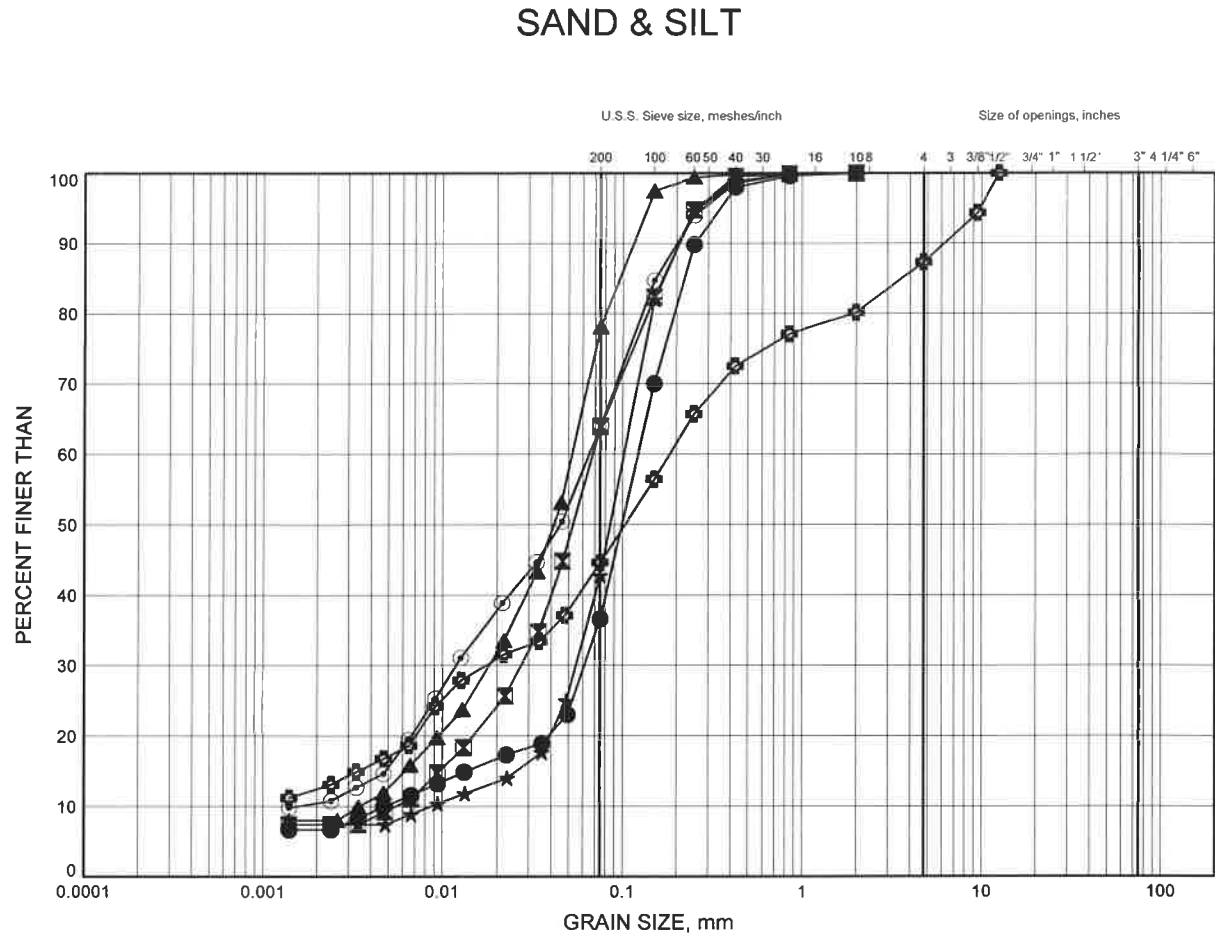
Date August 2013
GWP# 83-00-00



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Chkd SKP

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE E9



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C107-01	2.06	225.44
⊠	C107-01	6.40	221.10
▲	C107-02	4.88	222.62
★	C108-02	1.07	225.63
⊙	C108-02	2.59	224.11
⊕	C114-01	3.35	299.35

Date August 2013

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FIGURE E10

[illegible]

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

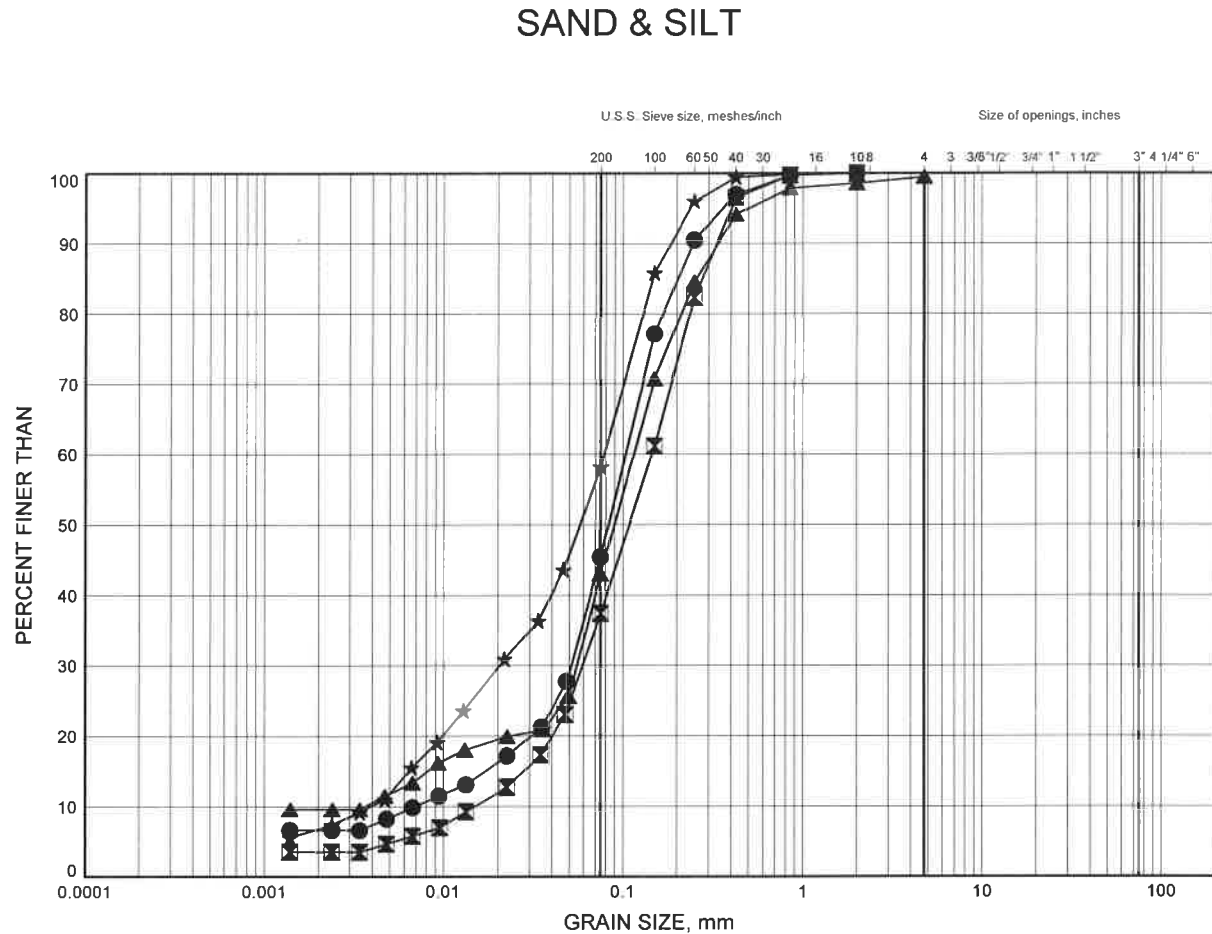
SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C116-01	2.59	298.91
☒	C18-01 HW	1.83	277.87
▲	C18-02 HW	1.07	278.93
★	C39-01 HW	2.59	224.31
⊙	C39-01 HW	4.11	222.79
⊕	C39-01 HW	7.92	218.98



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Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE E11



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C39-02 HW	4.11	222.99
⊠	C39-02 HW	6.40	220.70
▲	NLAT37E-01	2.59	226.51
★	NLAT37E-01	4.11	224.99

GRAIN SIZE DISTRIBUTION - THURBER 1218.GPJ 8/27/13

Date August 2013
GWP# 83-00-00

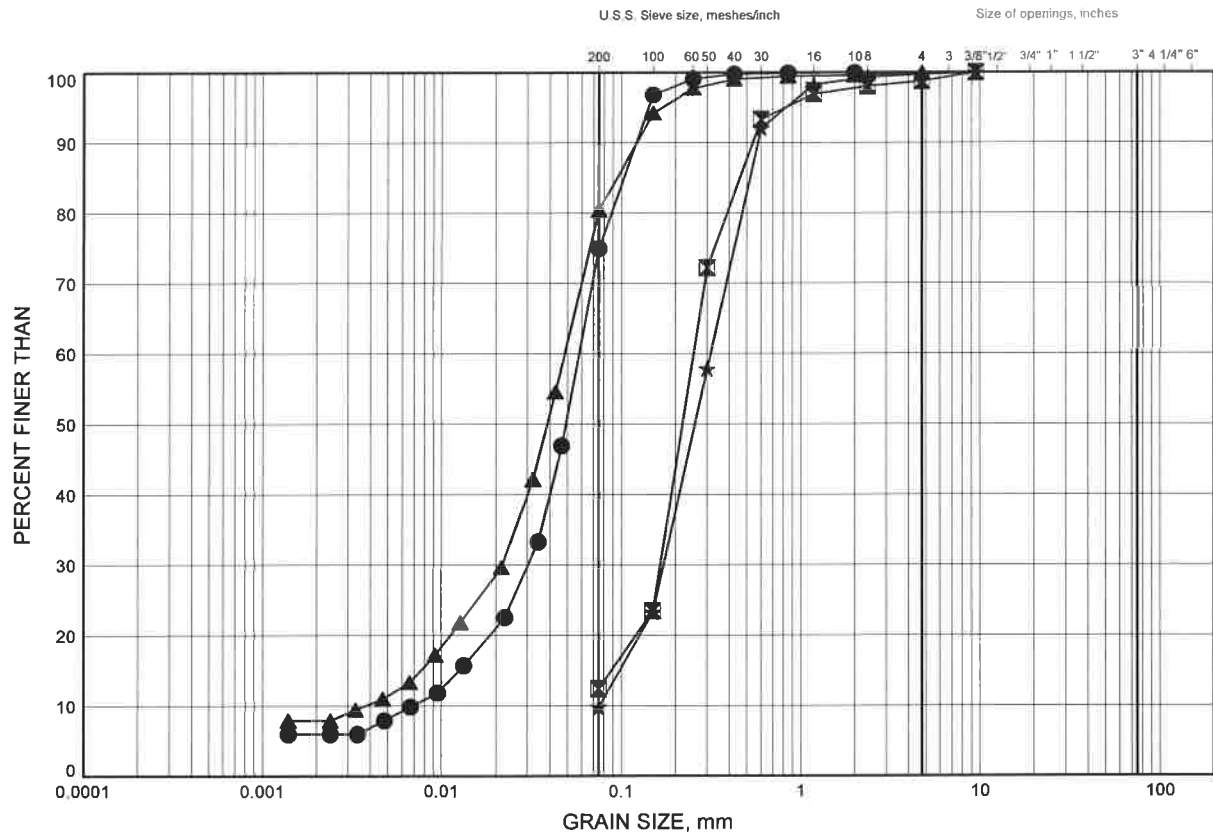


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Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE E12

SAND/SANDY SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C108-01	3.35	223.95
■	C113-01	3.30	281.90
▲	C27-01 HW	1.83	256.97
★	C39-02 HW	2.59	224.51

GRAIN SIZE DISTRIBUTION - THURBER 12/18 GPJ 8/27/13

Date August 2013
GWP# 83-00-00

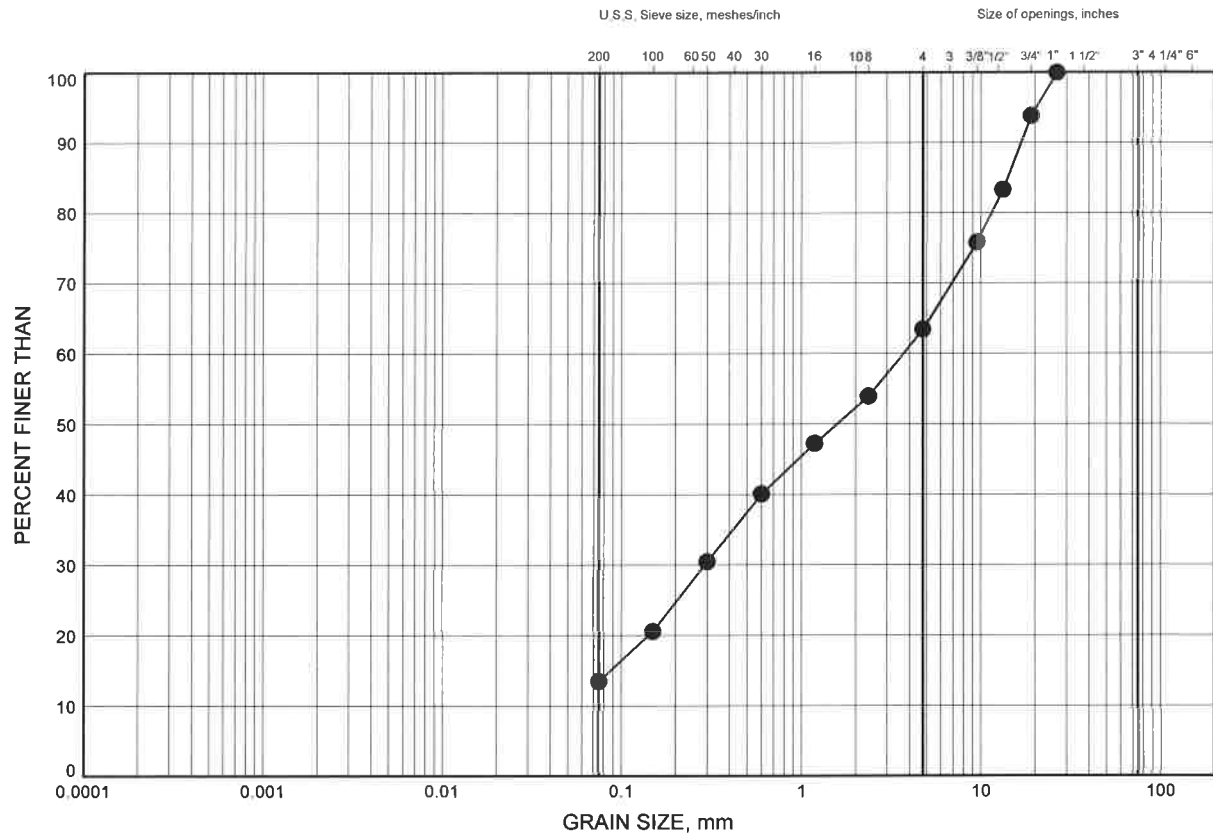


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Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE E13

SAND & GRAVEL



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

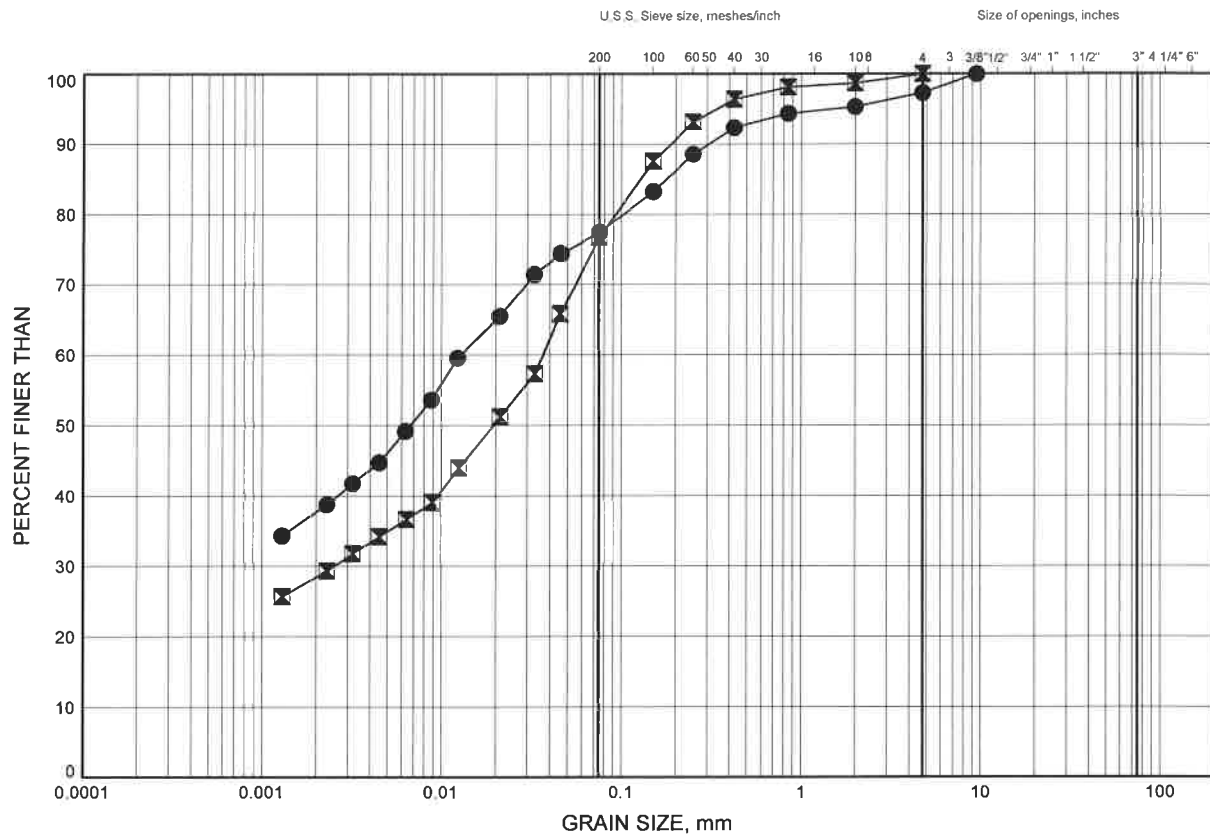
LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C32-01	3.35	232.25

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE E14

SILTY CLAY TILL



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

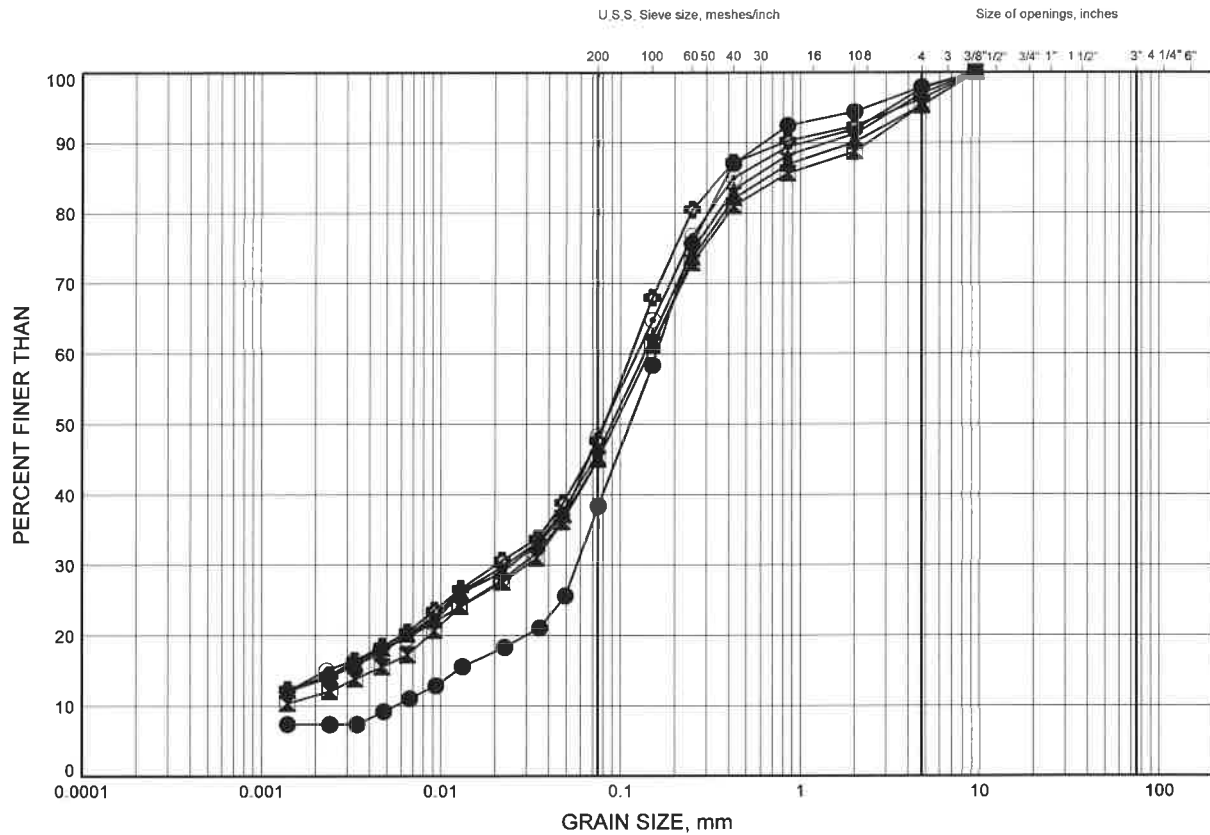
LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C113-01	6.22	278.98
◻	C113-02	4.88	280.32

Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE E15

SAND & SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C116-01	6.40	295.10
⊠	C18-01 HW	4.11	275.59
▲	C18-01 HW	6.40	273.30
★	C18-02 HW	2.59	277.41
⊙	C18-02 HW	4.88	275.12
⊕	C27-02 HW	3.28	255.02

Date August 2013
GWP# 83-00-00

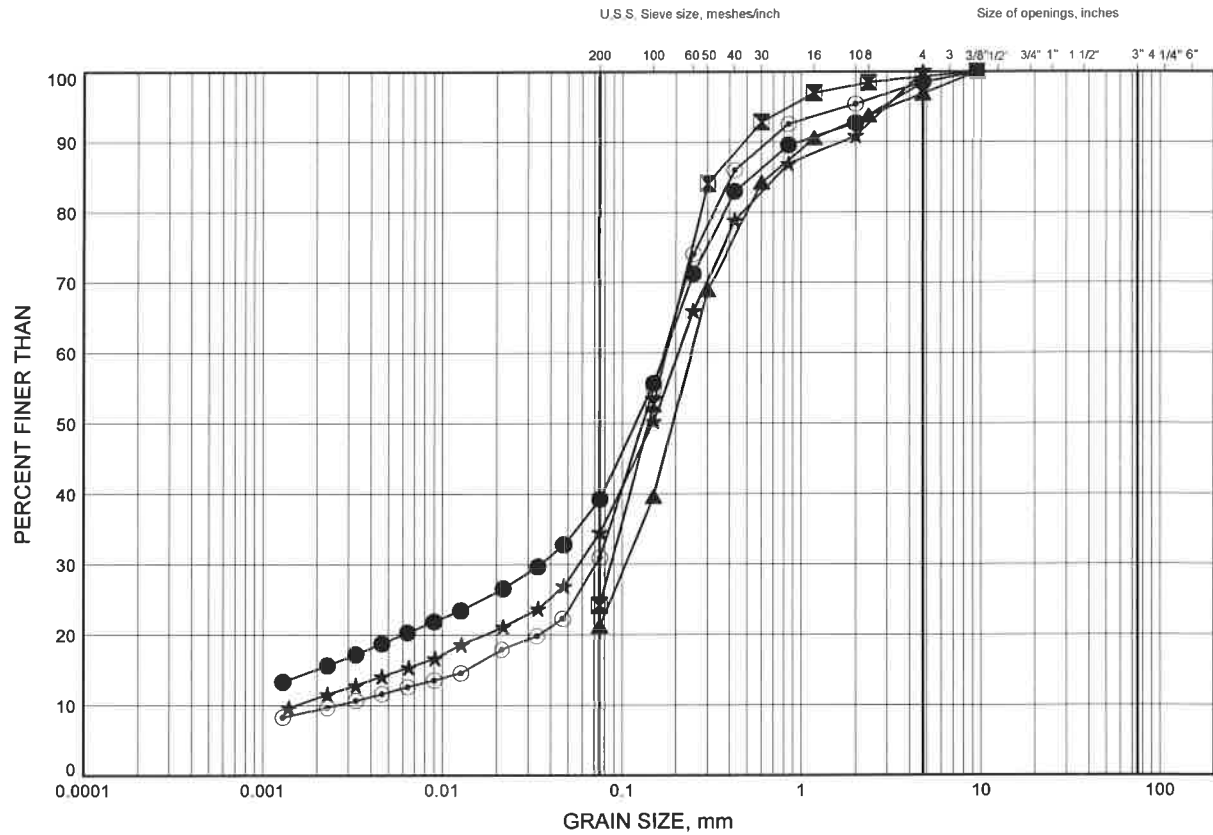


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Hwy 400 Median Sewer GRAIN SIZE DISTRIBUTION

FIGURE E16

SAND/SILTY SAND TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C112-02	6.23	278.37
⊠	NLAT87-01	1.83	298.47
▲	NLAT87-01	3.28	297.02
★	NLAT90-01	3.35	296.15
⊙	NLAT91W-01	3.35	295.25

GRAIN SIZE DISTRIBUTION - THURBER 1218 GPJ 8/27/13

Date August 2013
GWP# 83-00-00

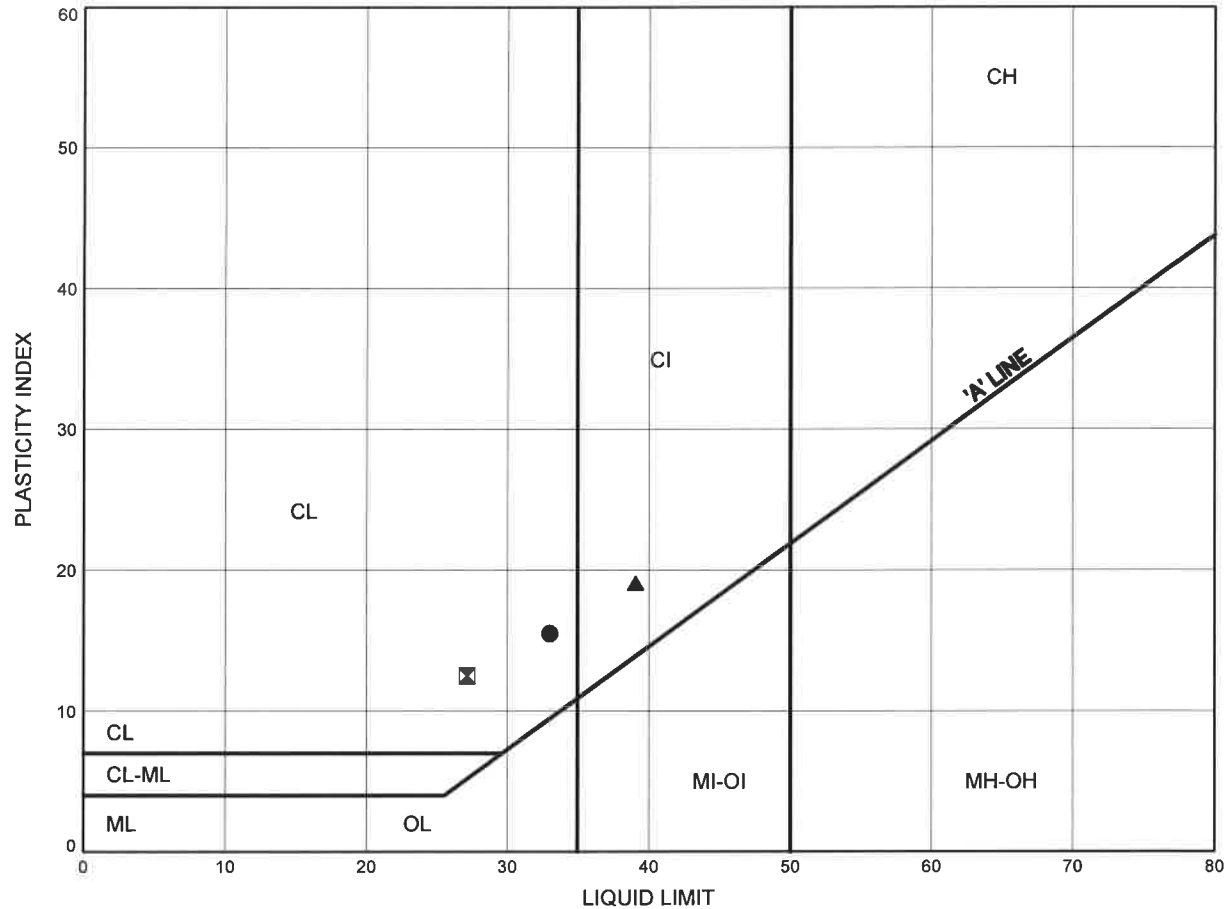


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Hwy 400 Median Sewer ATTERBERG LIMITS TEST RESULTS

FIGURE E17

SILTY CLAY FILL



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C102-02	3.35	227.85
⊠	C103-01	1.83	229.37
▲	C113-02	1.83	283.37

Date August 2013

GWP# 83-00-00



Prep'd AN

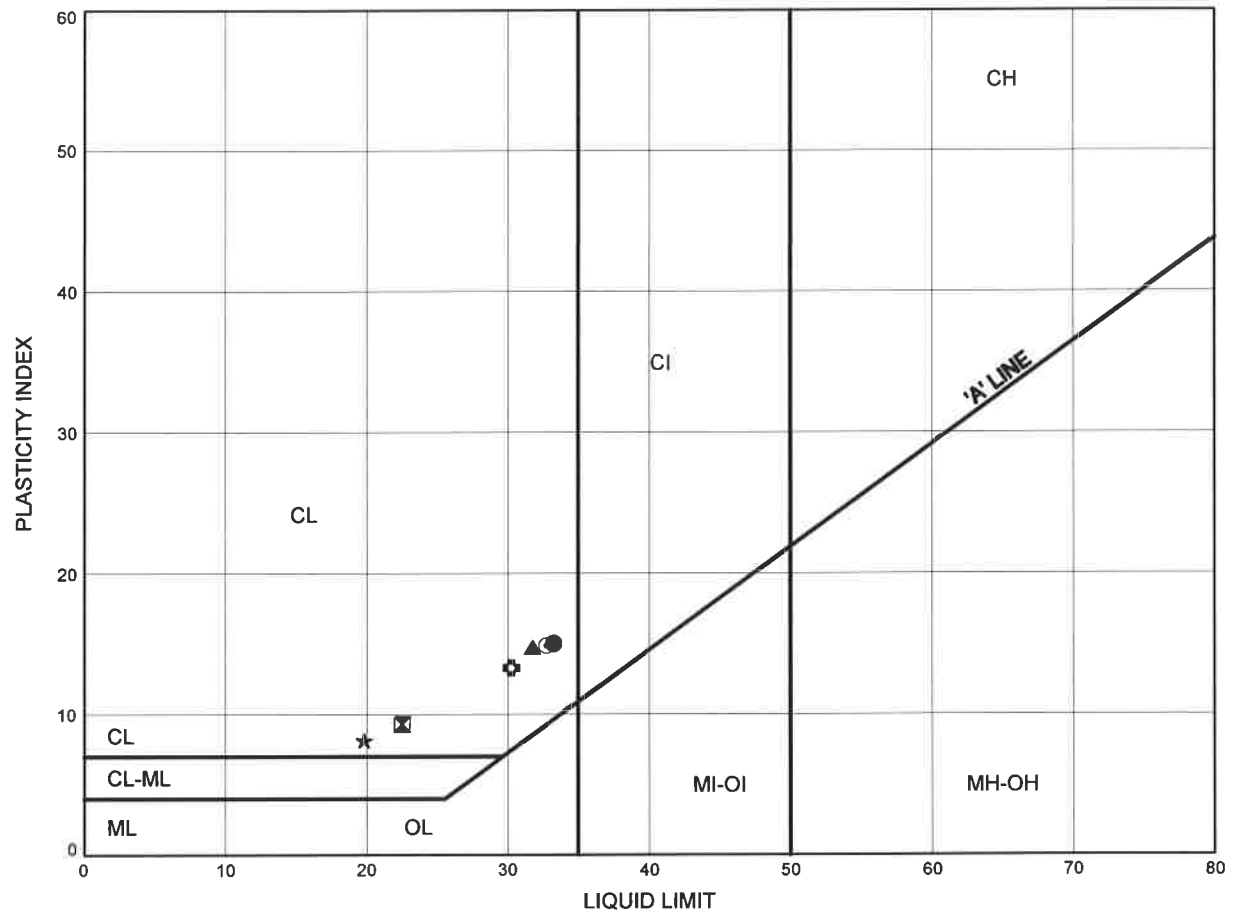
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Hwy 400 Median Sewer

ATTERBERG LIMITS TEST RESULTS

FIGURE E18

SILTY CLAY/CLAYEY SILT



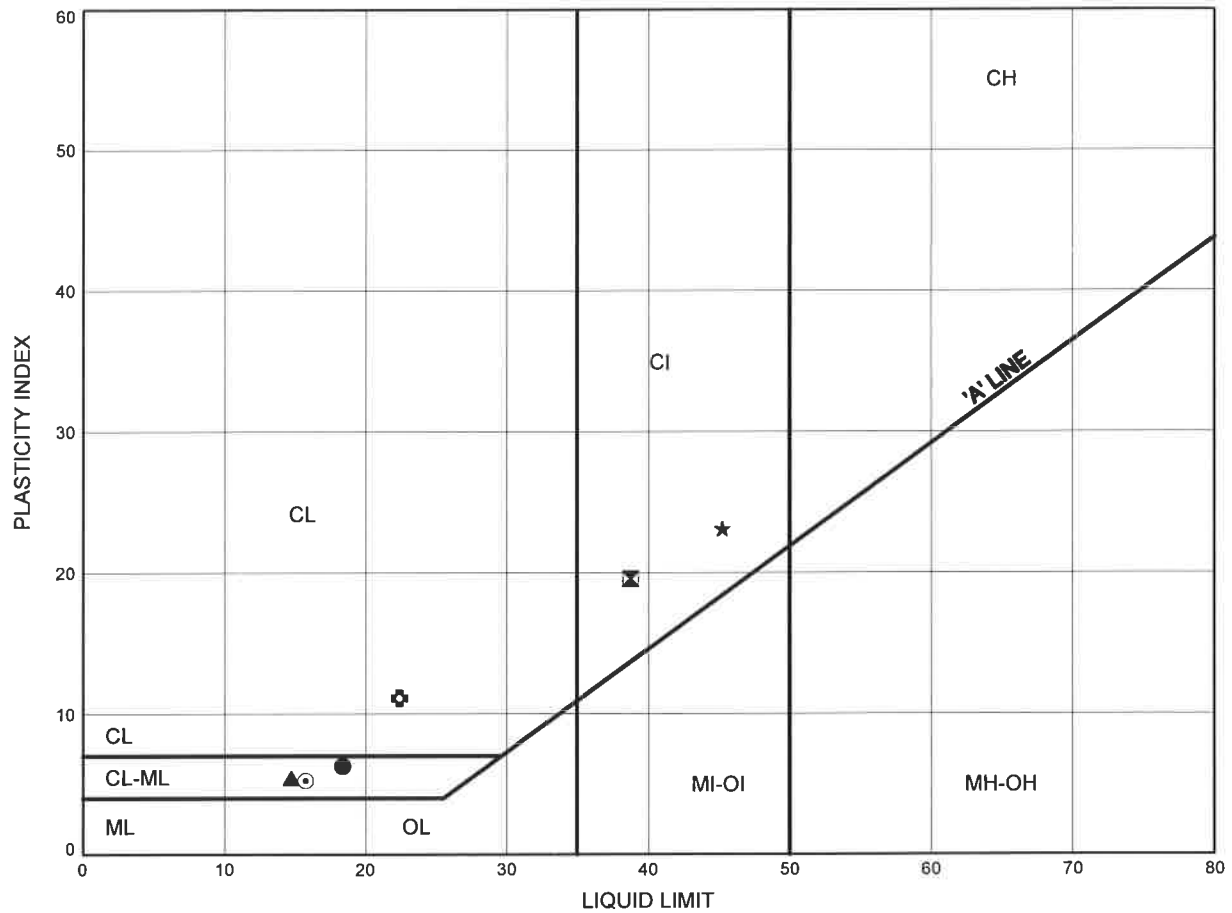
LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C102-01	1.07	223.23
⊠	C102-01	3.35	220.95
▲	C102-02	7.92	223.28
★	C102-02	12.50	218.70
⊙	C103-01	6.40	224.80
⊕	C103-01	10.97	220.23

Hwy 400 Median Sewer ATTERBERG LIMITS TEST RESULTS

FIGURE E19

SILTY CLAY/CLAYEY SILT



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C107-02	2.46	225.04
⊠	C112-01	2.59	282.41
▲	C112-01	4.11	280.89
★	C112-02	1.83	282.77
⊙	C112-02	3.35	281.25
⊕	C114-01	9.45	293.25

Date August 2013
GWP# 83-00-00

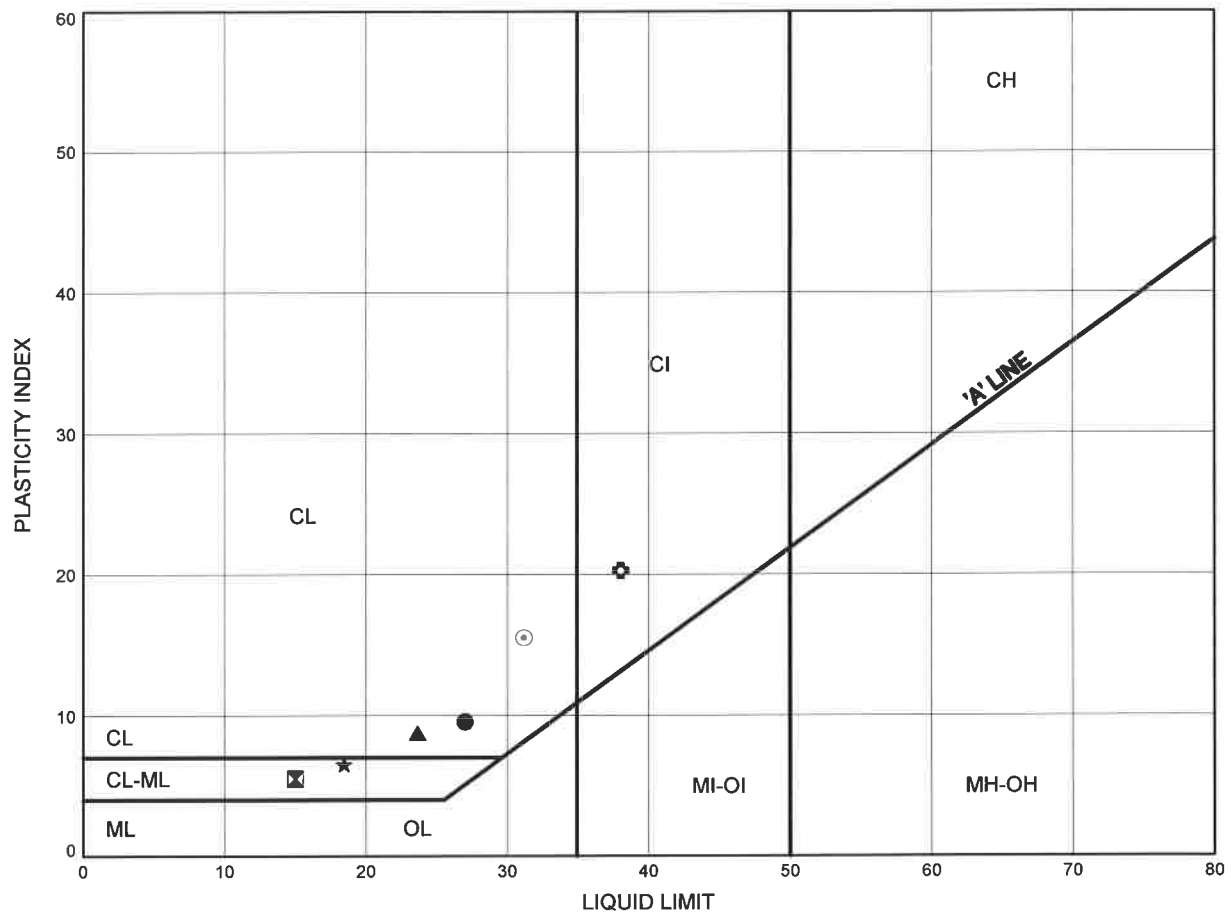


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Hwy 400 Median Sewer ATTERBERG LIMITS TEST RESULTS

FIGURE E20

SILTY CLAY/CLAYEY SILT



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C27-02 HW	1.83	256.47
⊠	C32-02	4.88	230.92
▲	NLAT40W-01	2.59	226.31
★	SLAT06E-01	1.07	268.63
⊙	SLAT06E-01	2.59	267.11
⊗	SLAT83W-01	4.88	243.52

THURBALT 1218.GPJ 8/27/13

Date August 2013
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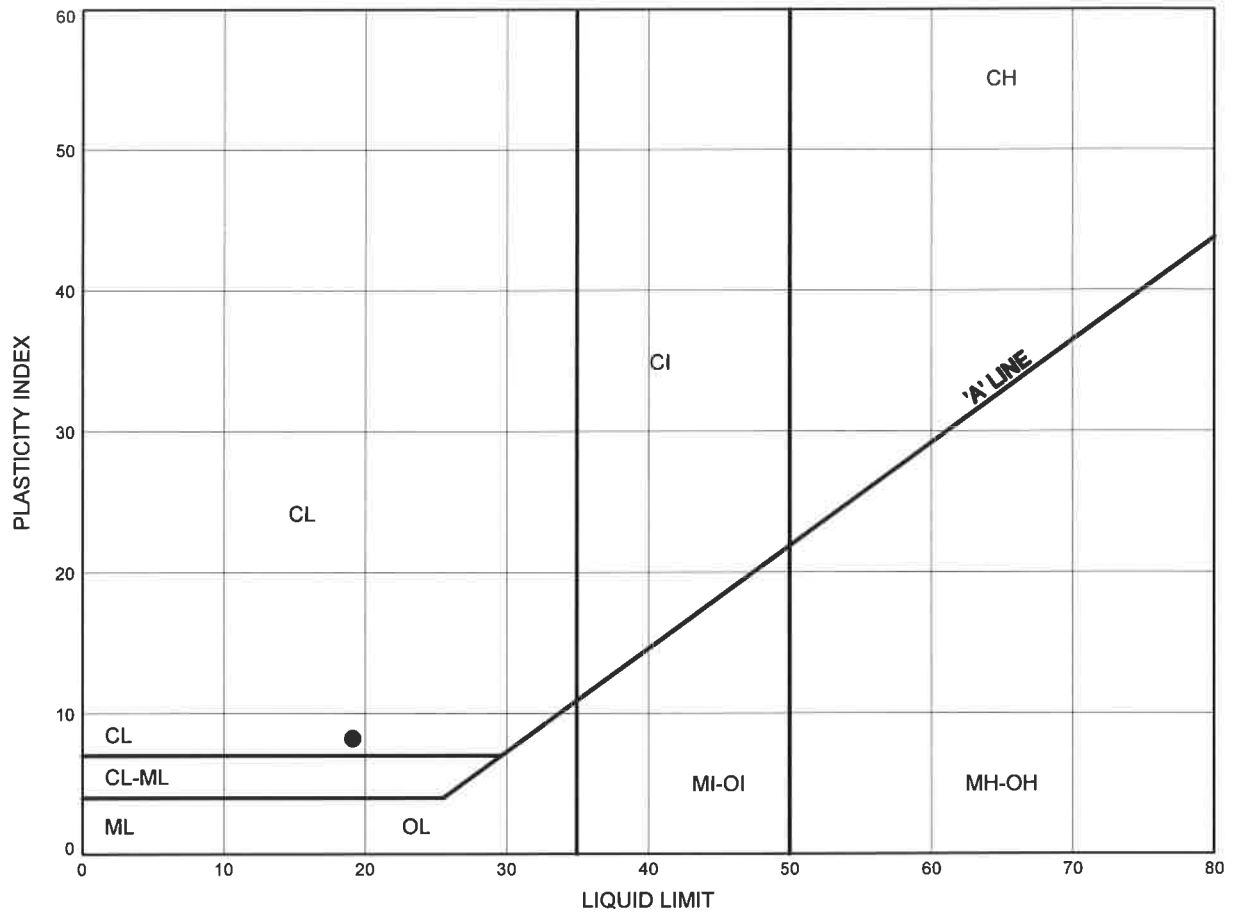


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Hwy 400 Median Sewer
ATTERBERG LIMITS TEST RESULTS

FIGURE E21

SILTY CLAY TILL



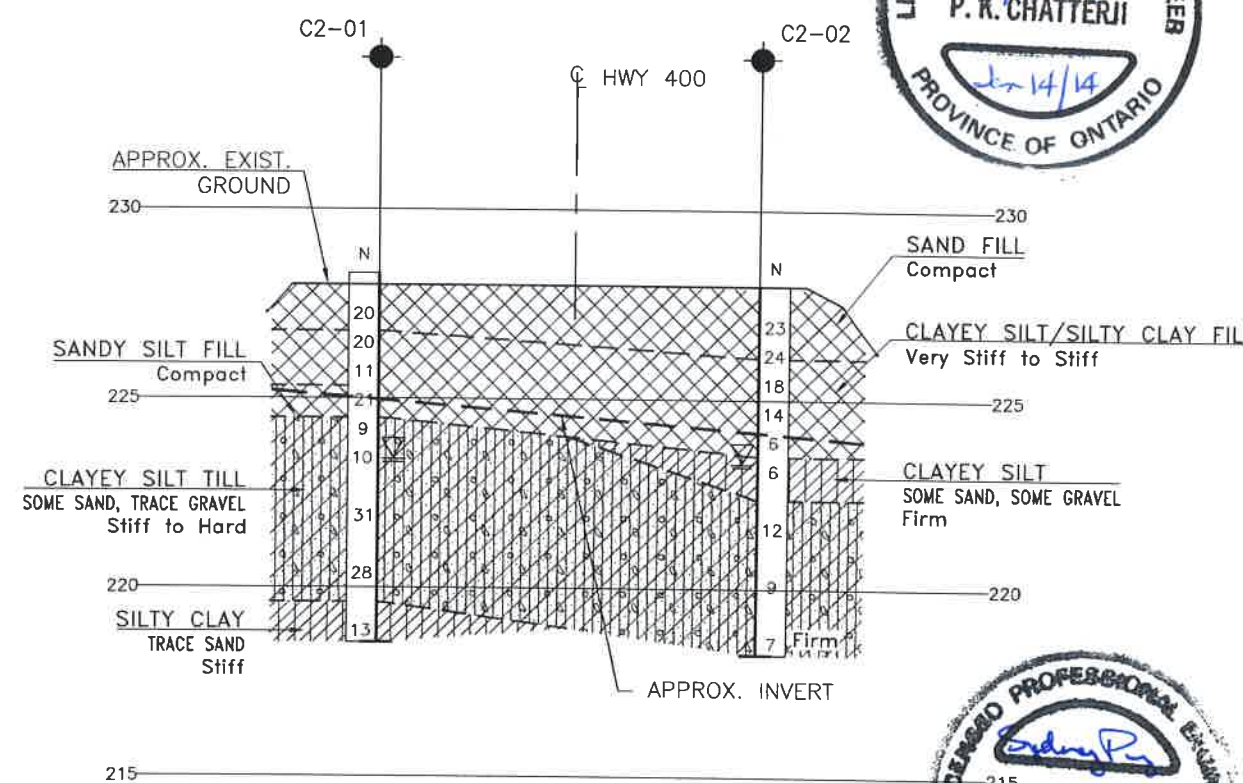
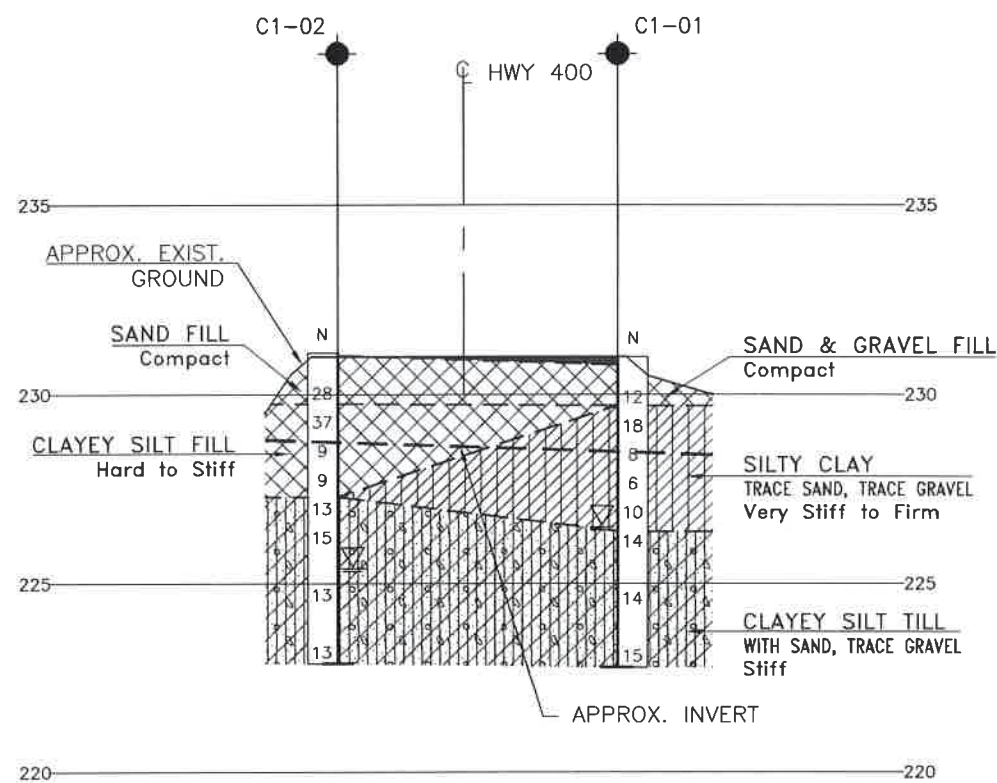
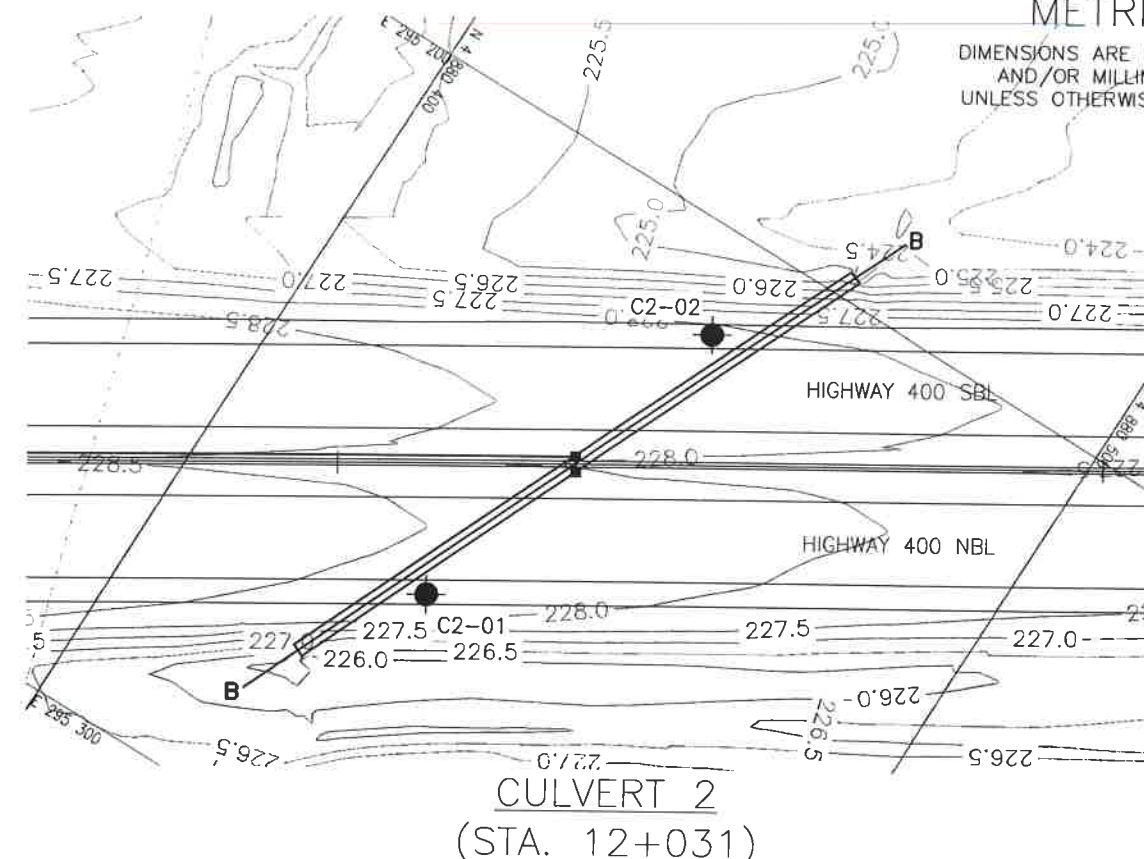
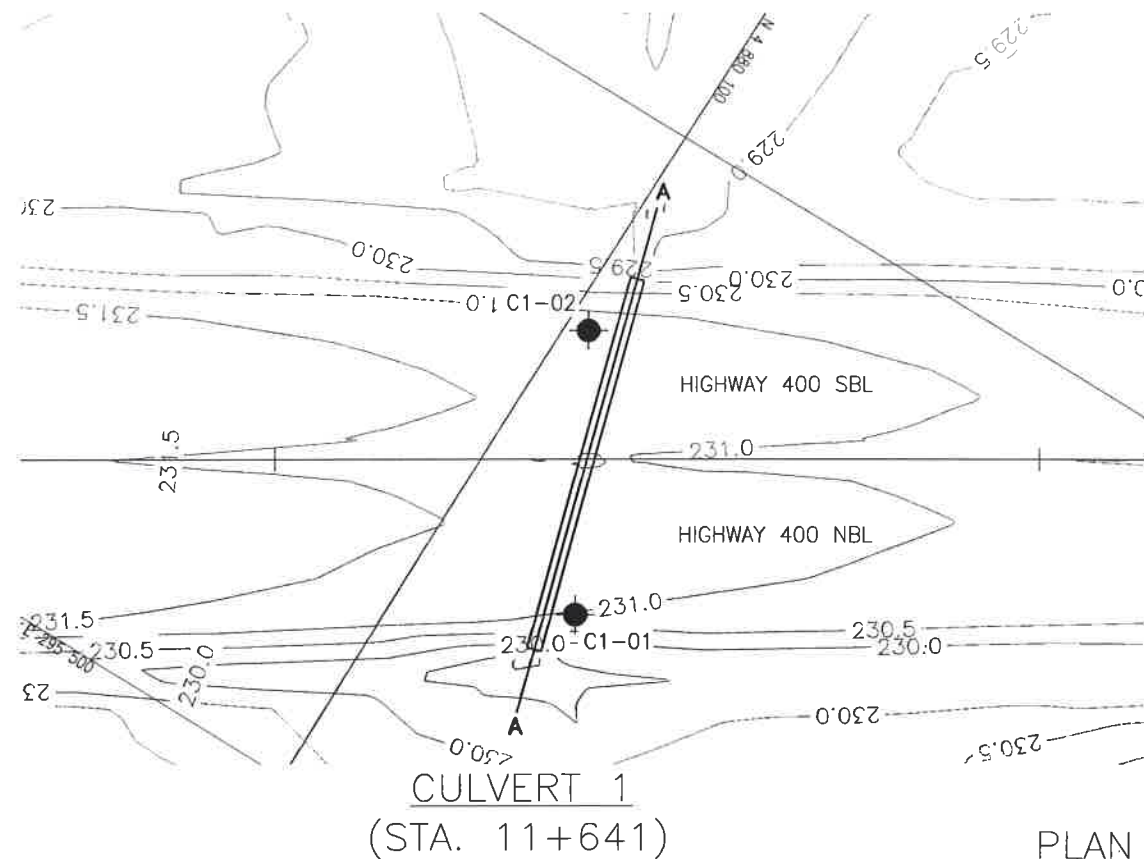
LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C113-02	4.88	280.32

Date August 2013
 GWP# 83-00-00



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CONT No
GWP No 83-00-00

HIGHWAY 400
MEDIAN SEWER
CULVERT CROSSINGS
BOREHOLE LOCATIONS AND SOIL STRATA

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
C1-01	230.9	4 880 121.4	295 461.4
C1-02	231.1	4 880 102.9	295 428.5
C2-01	228.3	4 880 436.0	295 262.4
C2-02	228.0	4 880 448.9	295 213.3

NOTES-

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

GEOCRES No. 31D-563

SHEET

DATE BY

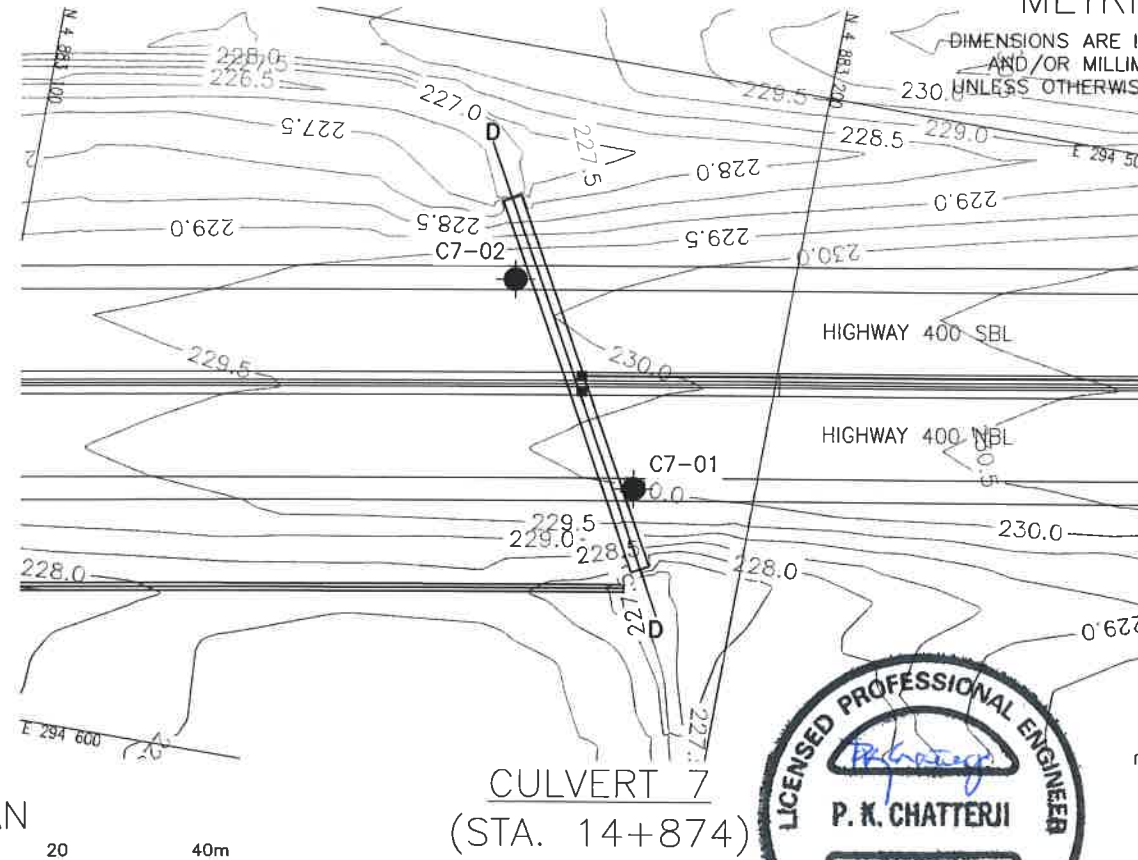
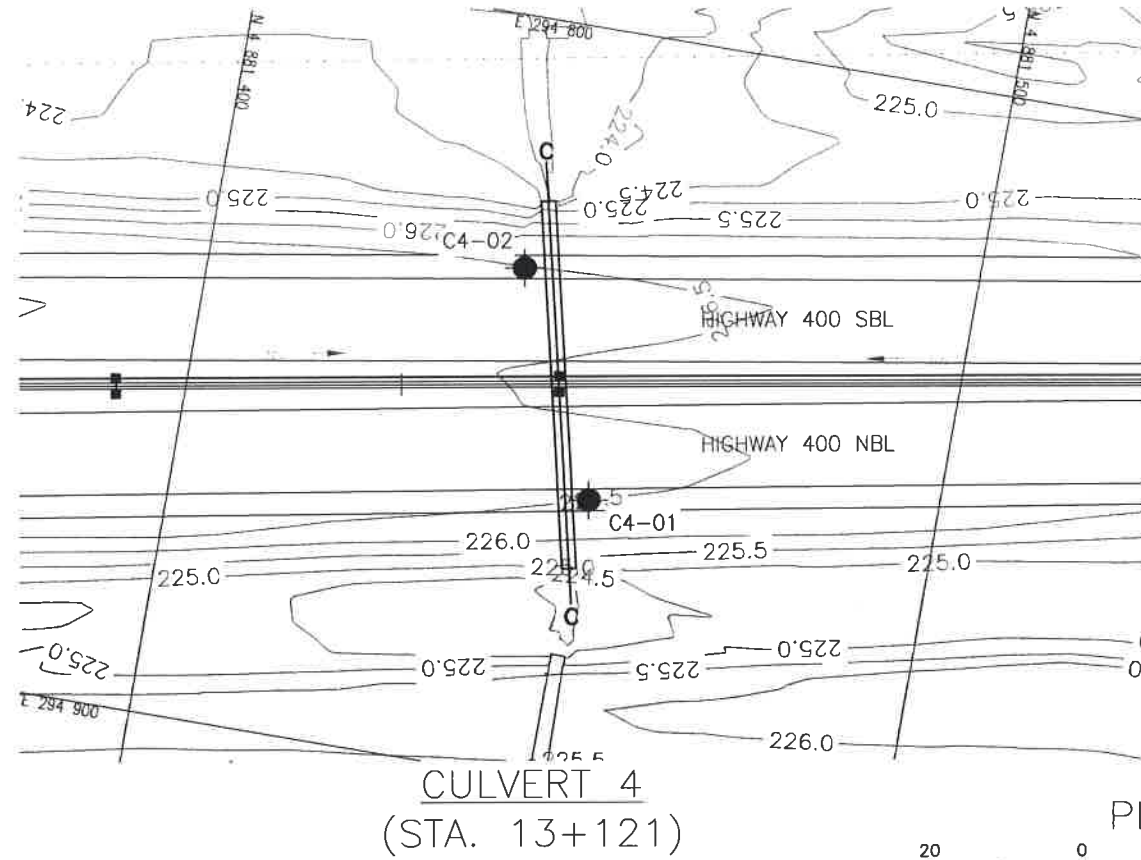
DESIGN SKP CHK SKP CODE

DRAWN AN CHK PKC SITE

DESCRIPTION

LOAD DATE NOV. 2013

STRUCT DWG 1



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

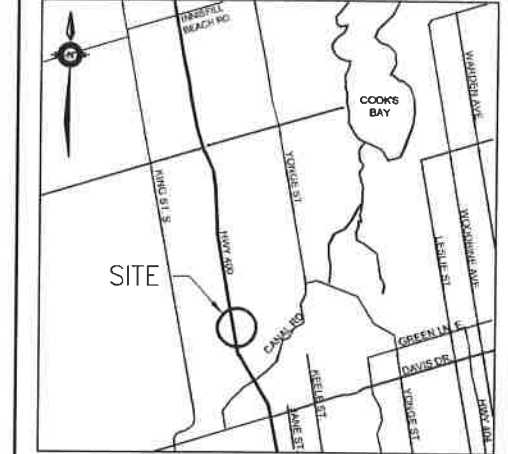
CONT No
GWP No 83-00-00

HIGHWAY 400
MEDIAN SEWER
CULVERT CROSSINGS
BOREHOLE LOCATIONS AND SOIL STRATA



SHEET

THURBER ENGINEERING LTD.



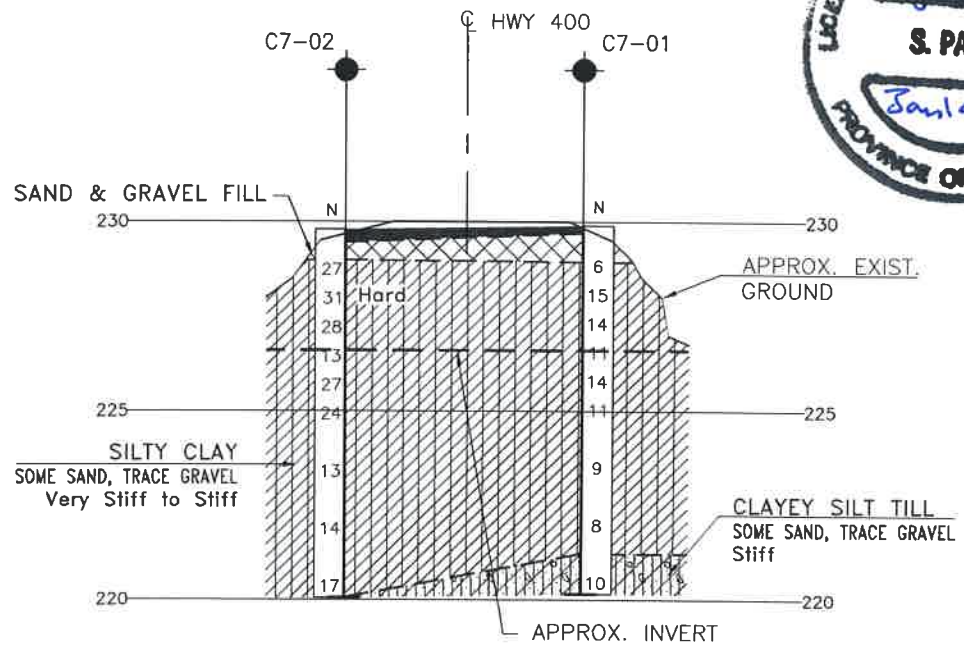
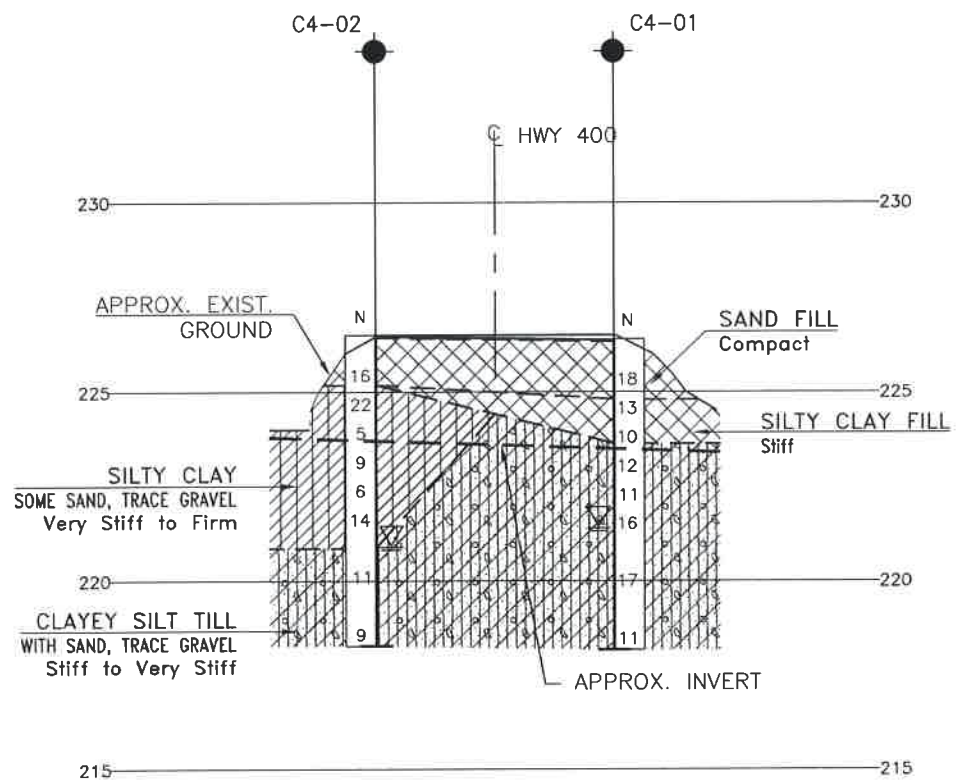
LEGEND

- ◆ 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
C4-01	226.4	4 881 454.7	294 862.3
C4-02	226.5	4 881 441.1	294 833.3
C7-01	229.9	4 883 184.5	294 555.7
C7-02	229.8	4 883 164.3	294 531.1

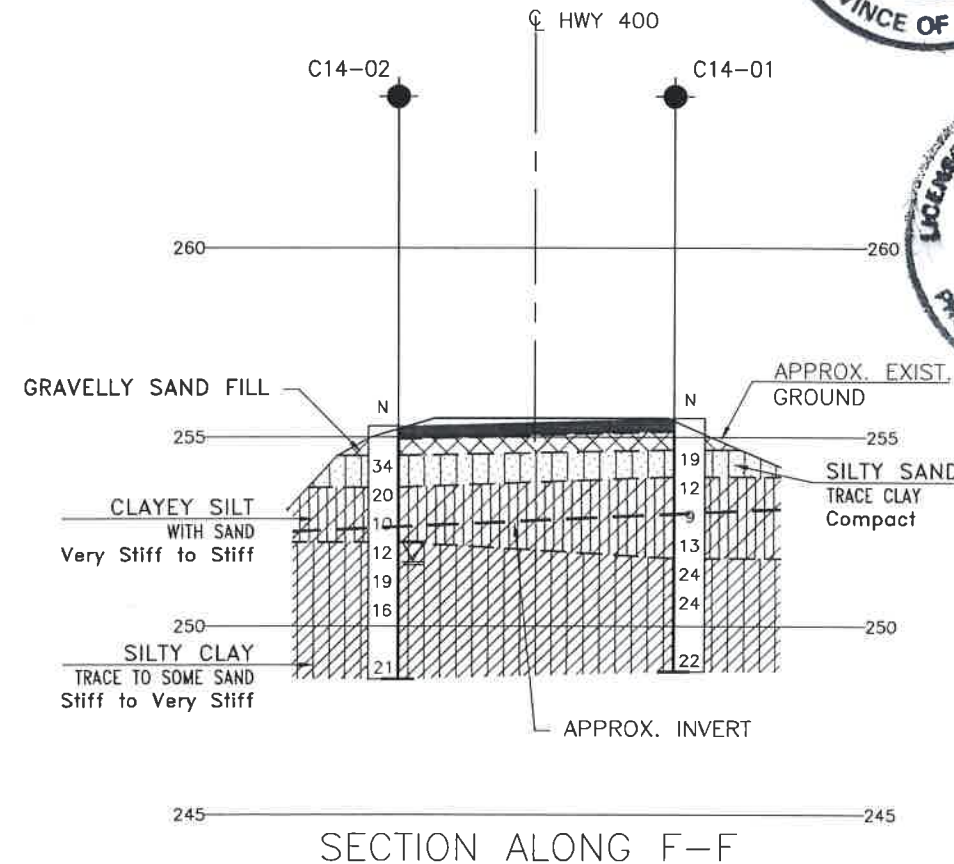
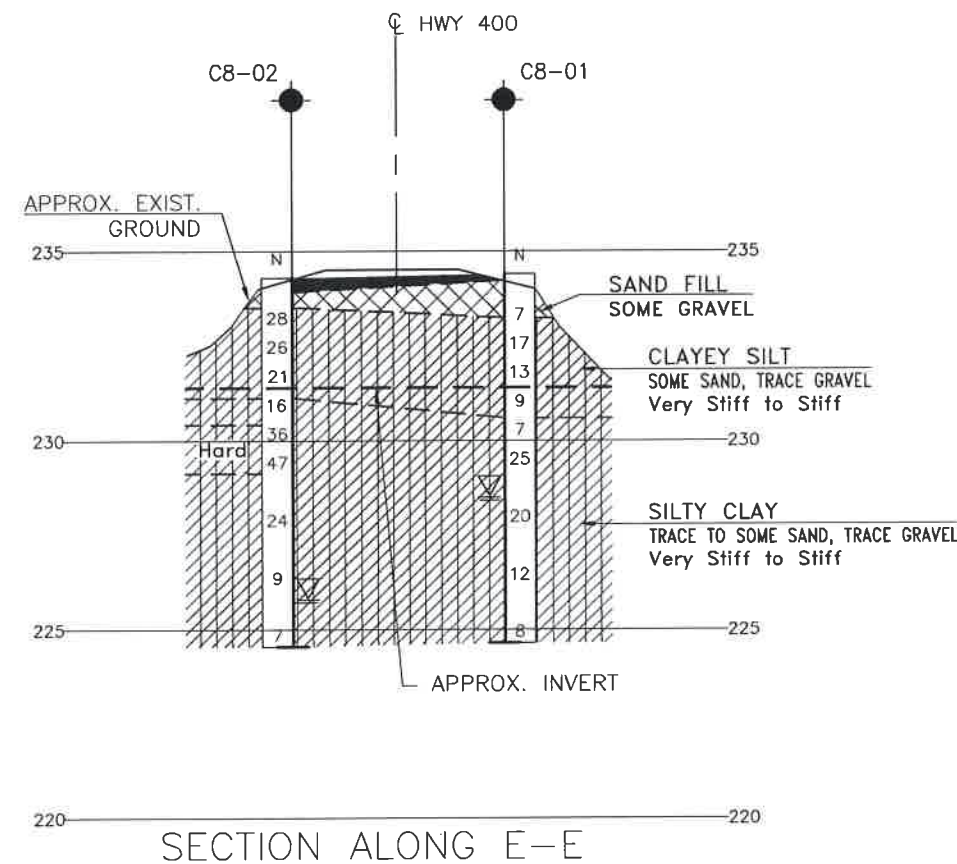
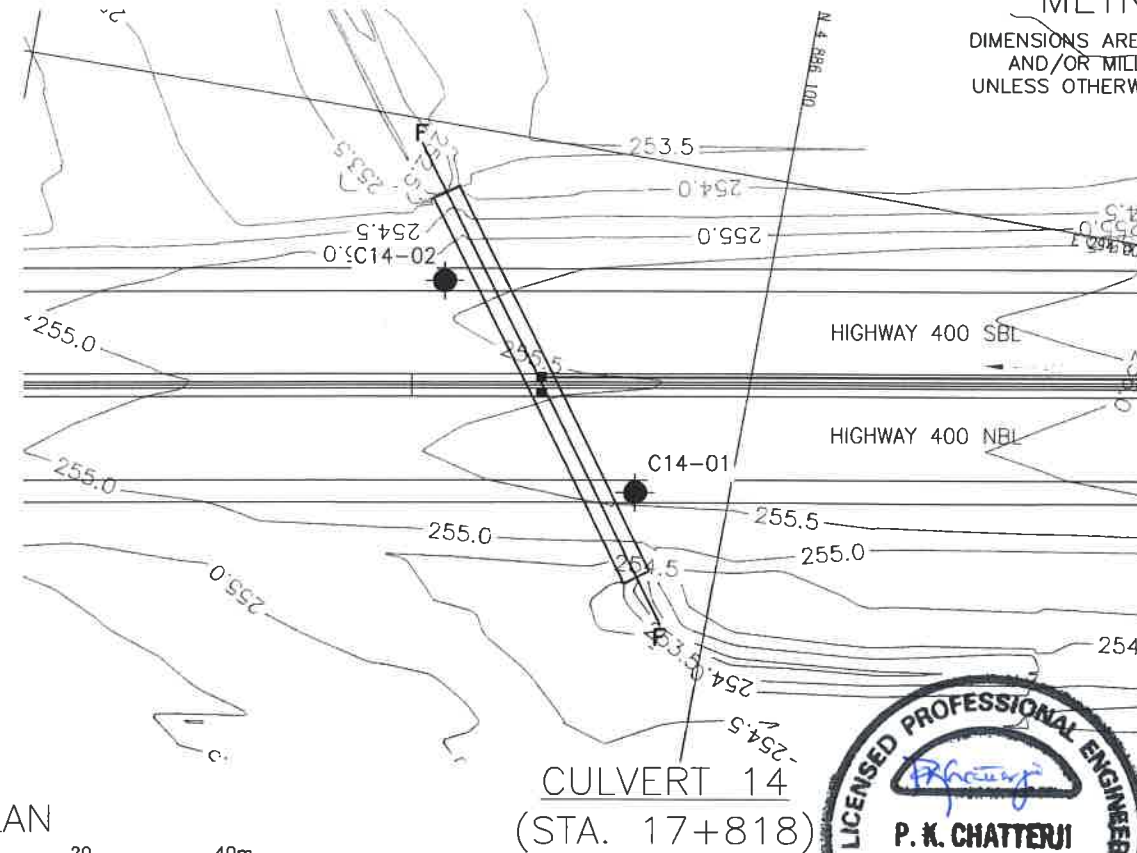
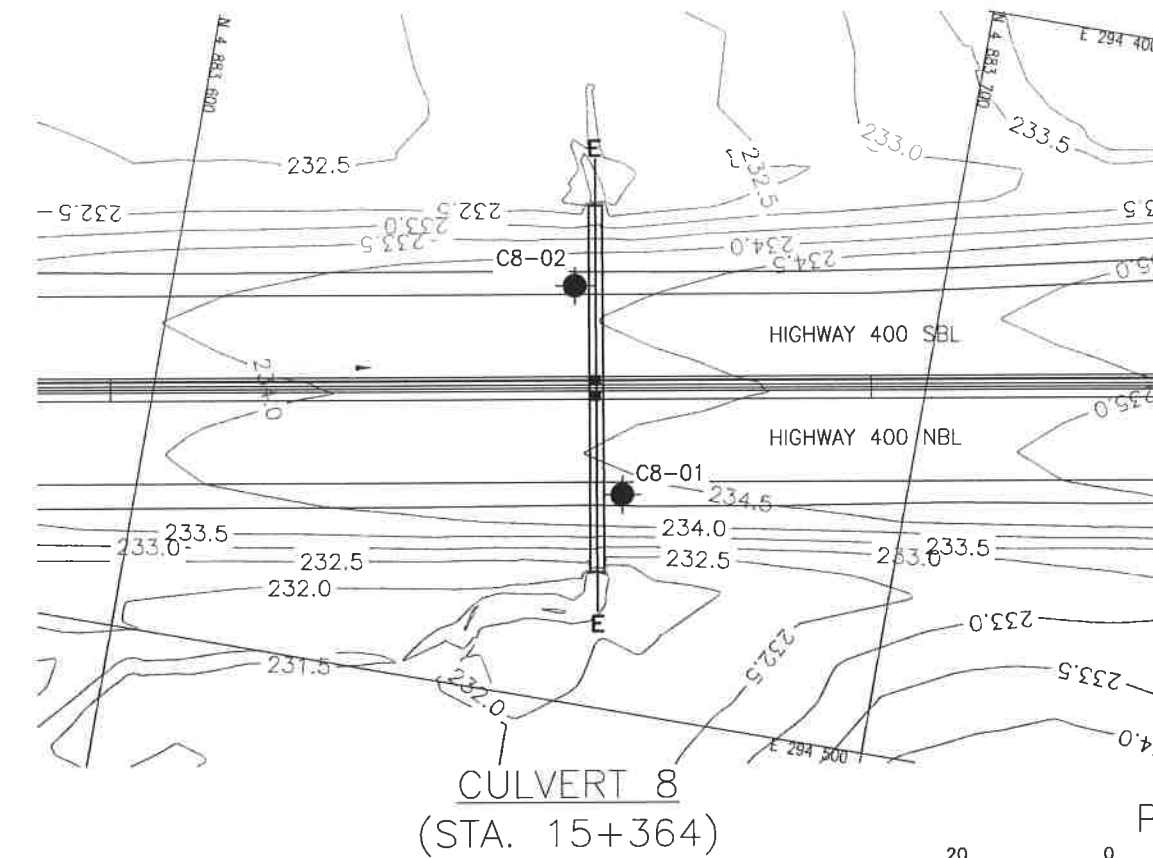
- NOTES-**
- The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
 - This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRES No. 31D-563



H 1:1000
V 1:200

REVISIONS	DATE	BY	DESCRIPTION
DESIGN	SKP	CHK	SKP
DRAWN	AN	CHK	PKC
CODE	LOAD	DATE	NOV. 2013
SITE	STRUCT	DWG	2



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CONT No
GWP No 83-00-00

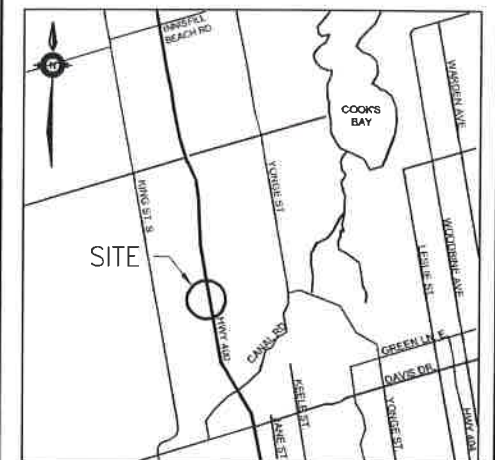
HIGHWAY 400
MEDIAN SEWER
CULVERT CROSSINGS
BOREHOLE LOCATIONS AND SOIL STRATA



SHEET



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

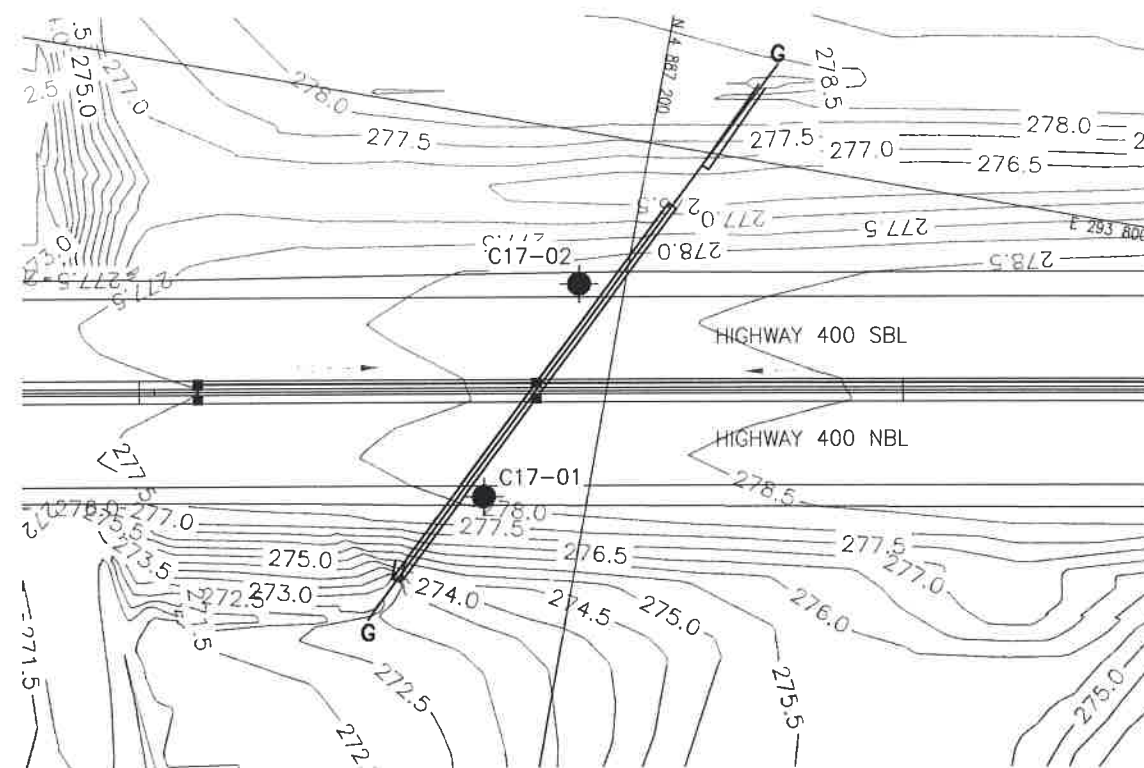
NO	ELEVATION	NORTHING	EASTING
C8-01	234.4	4 883 663.2	294 471.6
C8-02	234.3	4 883 652.3	294 445.3
C14-01	255.5	4 886 087.9	294 044.1
C14-02	255.3	4 886 058.4	294 020.7

NOTES

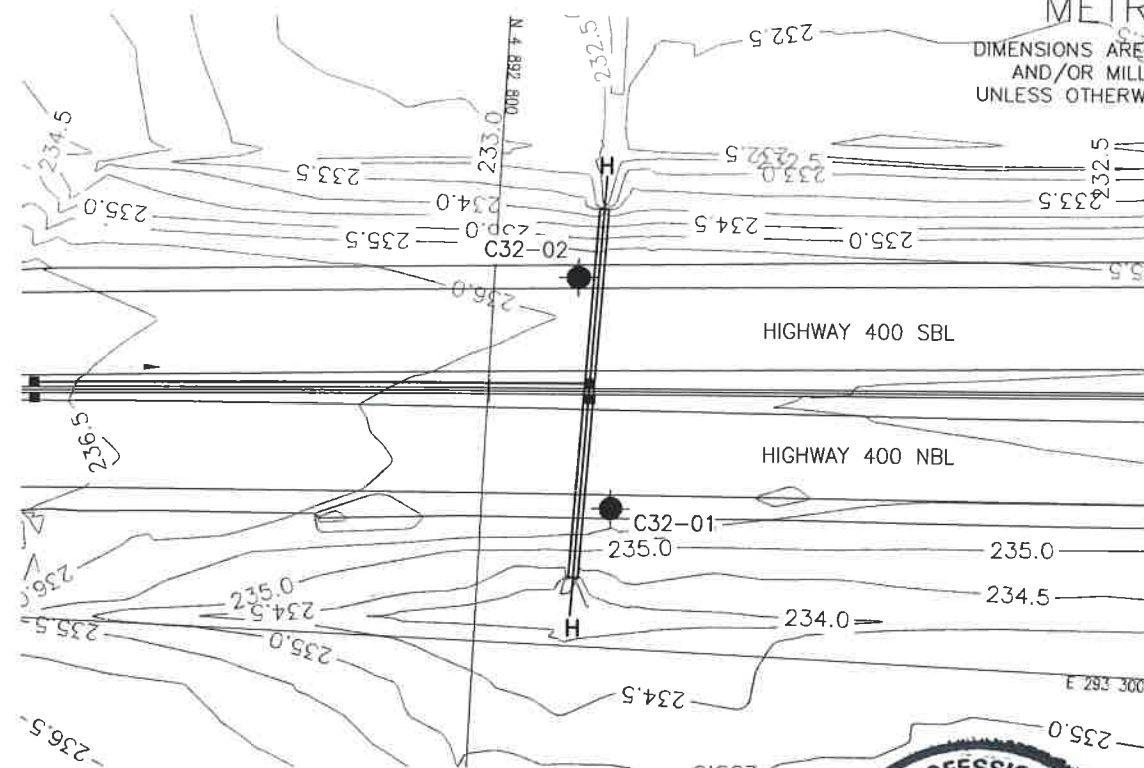
- The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRES No. 31D-563

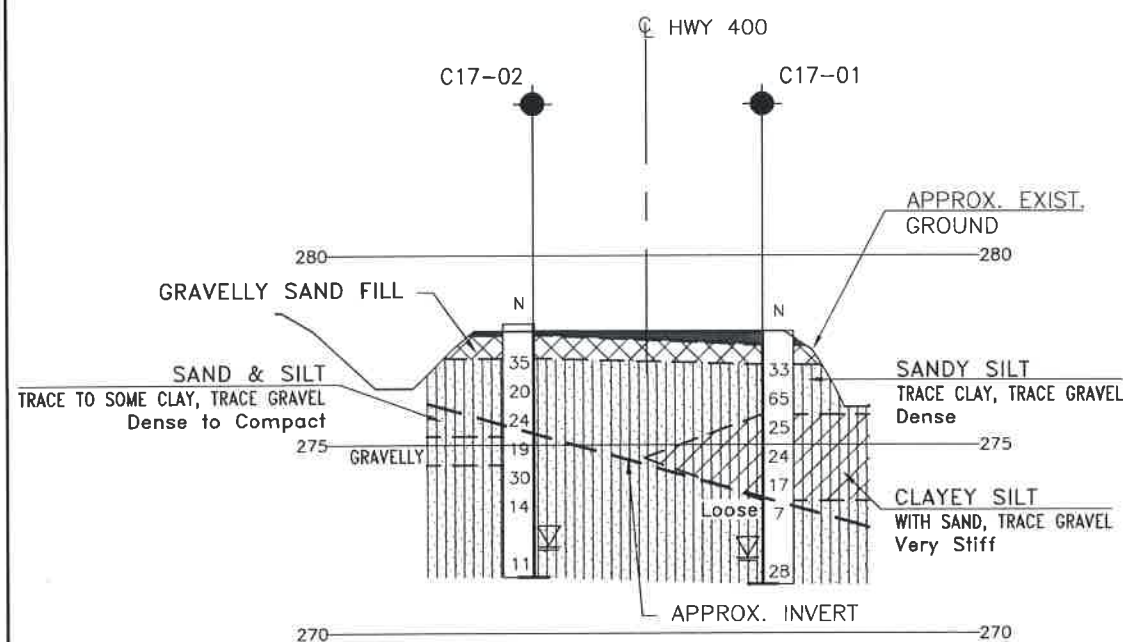
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CODE	SITE	LOAD	DATE
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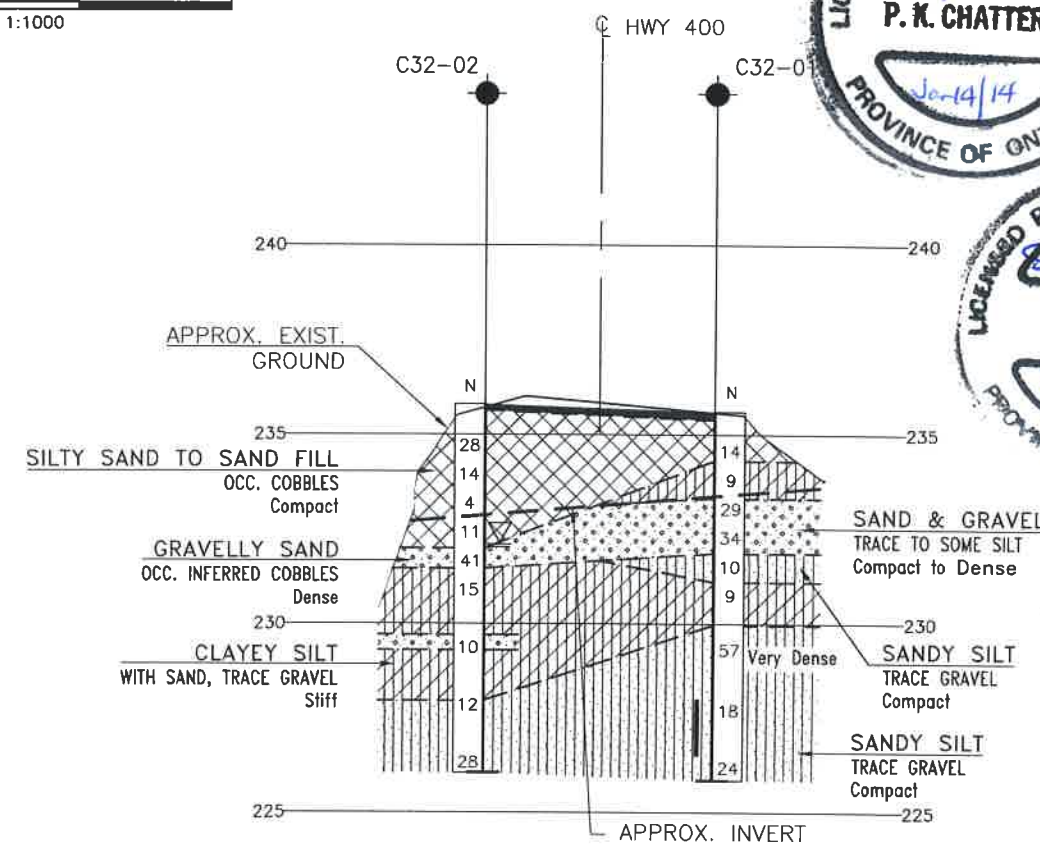
CULVERT 17
(STA. 18+952)



CULVERT 32
(STA. 24+613)



SECTION ALONG G-G



SECTION ALONG H-H



H 1:1000

V 1:200

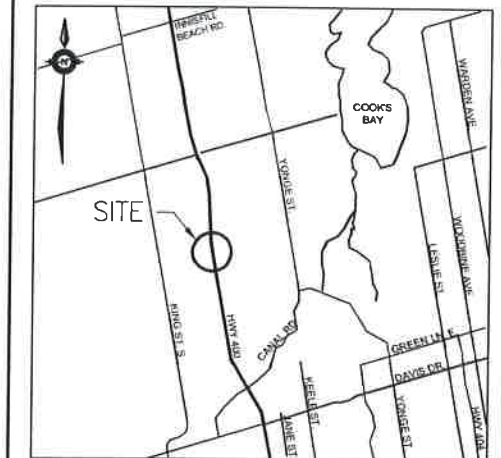
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No
GWP No 83-00-00

HIGHWAY 400
MEDIAN SEWER
CULVERT CROSSINGS
BOREHOLE LOCATIONS AND SOIL STRATA








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
C17-01	278.0	4 887 186.8	293 850.0
C17-02	278.2	4 887 194.1	293 820.1
C32-01	235.6	4 892 816.3	293 281.5
C32-02	235.8	4 892 810.9	293 251.1

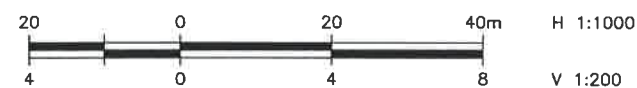
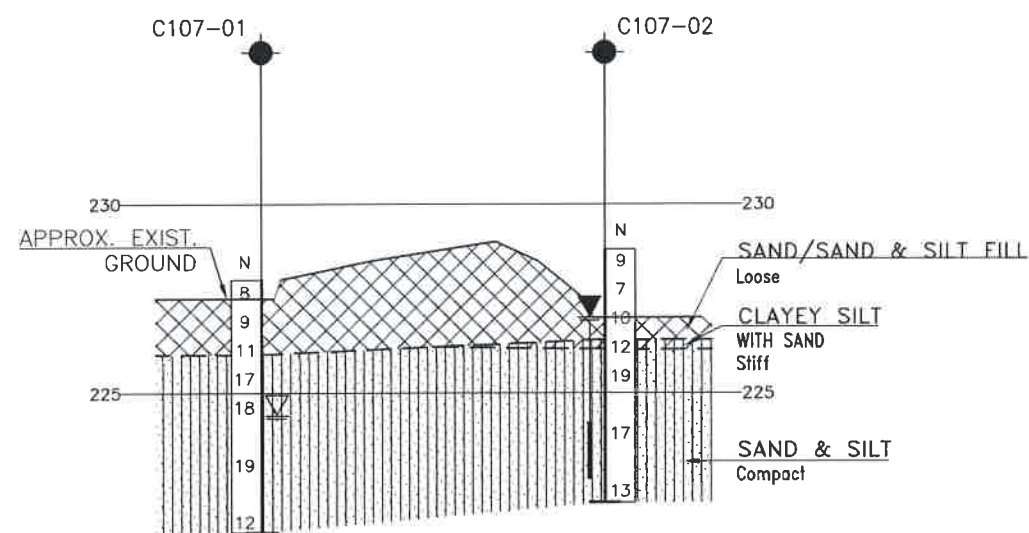
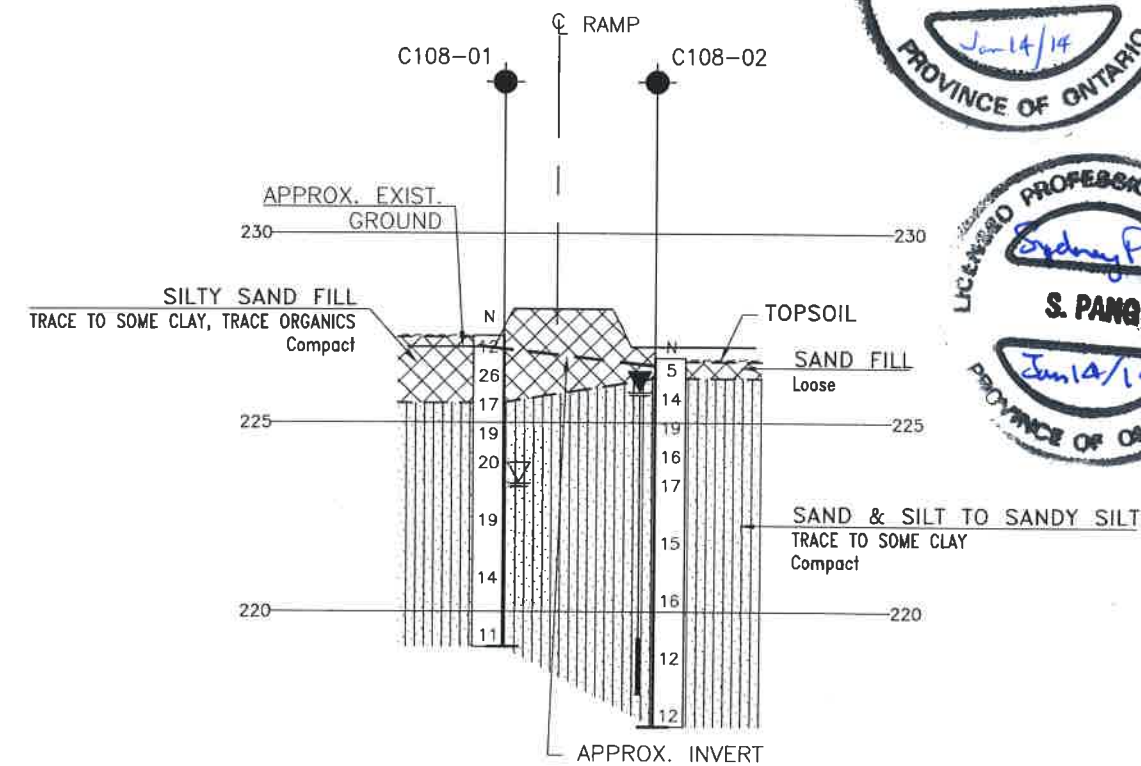
-NOTES-

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

GEOCRES No. 31D-563

REVISIONS									
	DATE	BY	DESCRIPTION						
DESIGN	SKP	CHK	SKP	CODE	LOAD	DATE	NOV. 2013		
DRAWN	AN	CHK	PKC	SITE	STRUCT	DWG	4		

CULVERT HR107
(STA. 10+100 HWY 400)

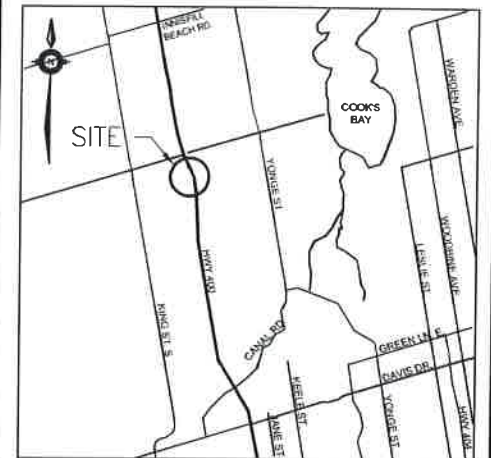


METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN






CONT No
GWP No 83-00-00

HIGHWAY 400
MEDIAN SEWER
CULVERT CROSSINGS
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET



KEYPLAN

- | | |
|---|---------------------------------------|
|  | 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 |

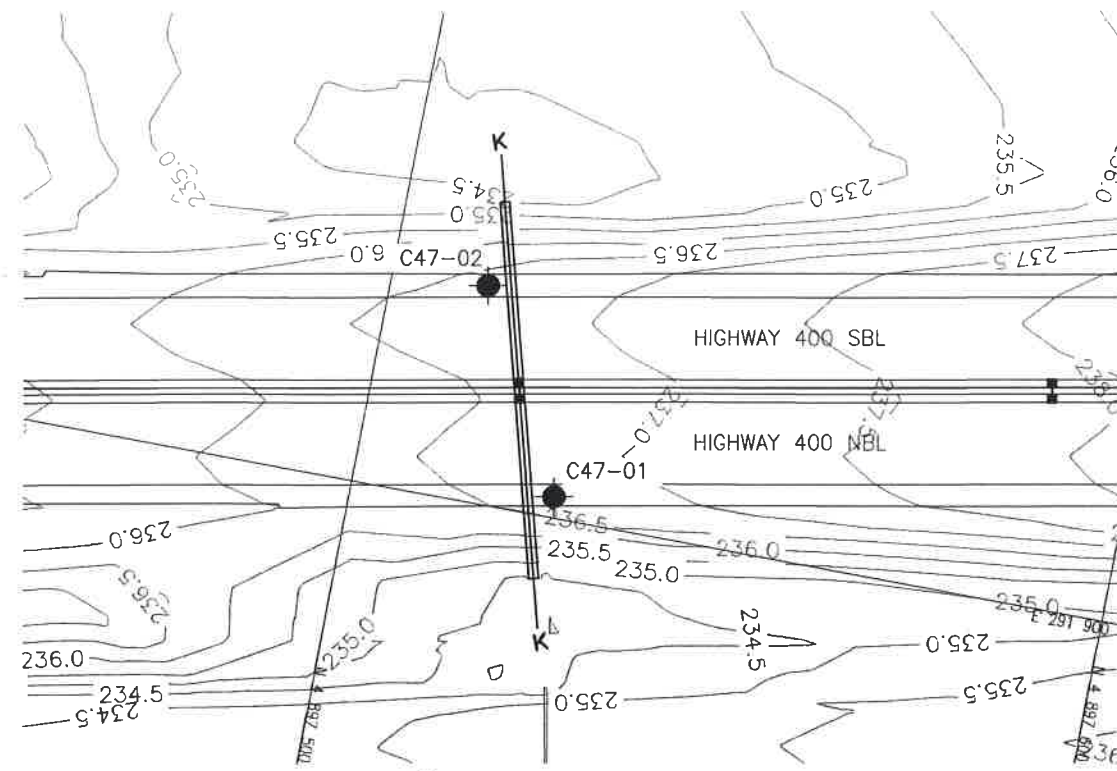
NO	ELEVATION	NORTHING	EASTING
C107-01	228.0	4 895 658.1	292 369.8
C107-02	228.8	4 895 697.3	292 351.9
C108-01	227.3	4 895 653.3	292 223.5
C108-02	226.7	4 895 658.8	292 204.4

-NOTES-

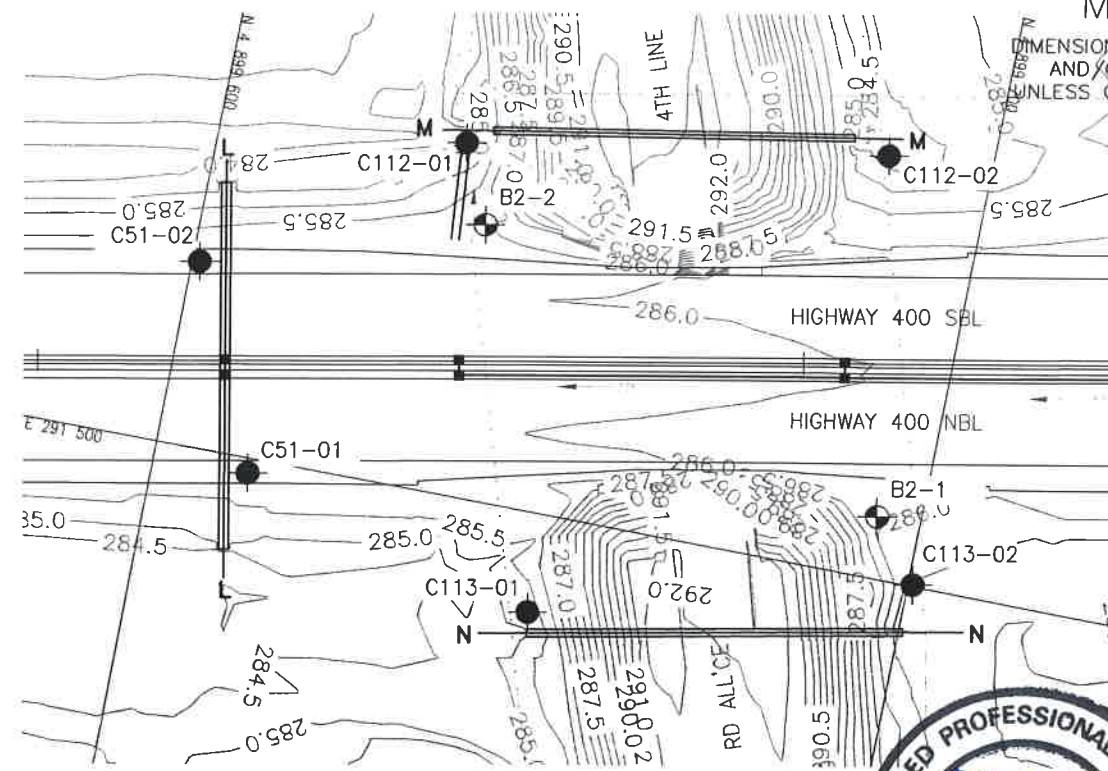
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GEOCRES No. 31D-563

[illegible]



CULVERT 47
(STA. 12+000)



CULVERT 51
(STA. 14+125)

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

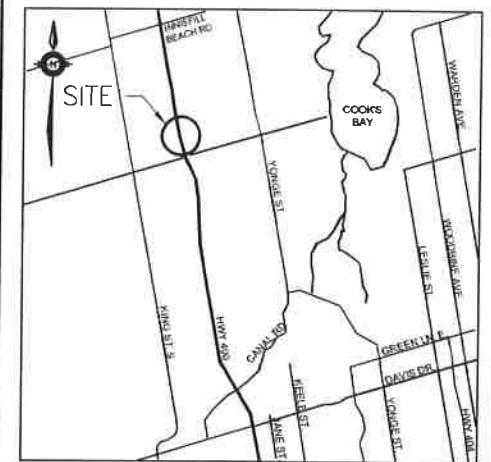
CONT No
GWP No 83-00-00

HIGHWAY 400
MEDIAN SEWER
CULVERT CROSSINGS
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET








THURBER ENGINEERING LTD.



KEYPLAN

LEGEND

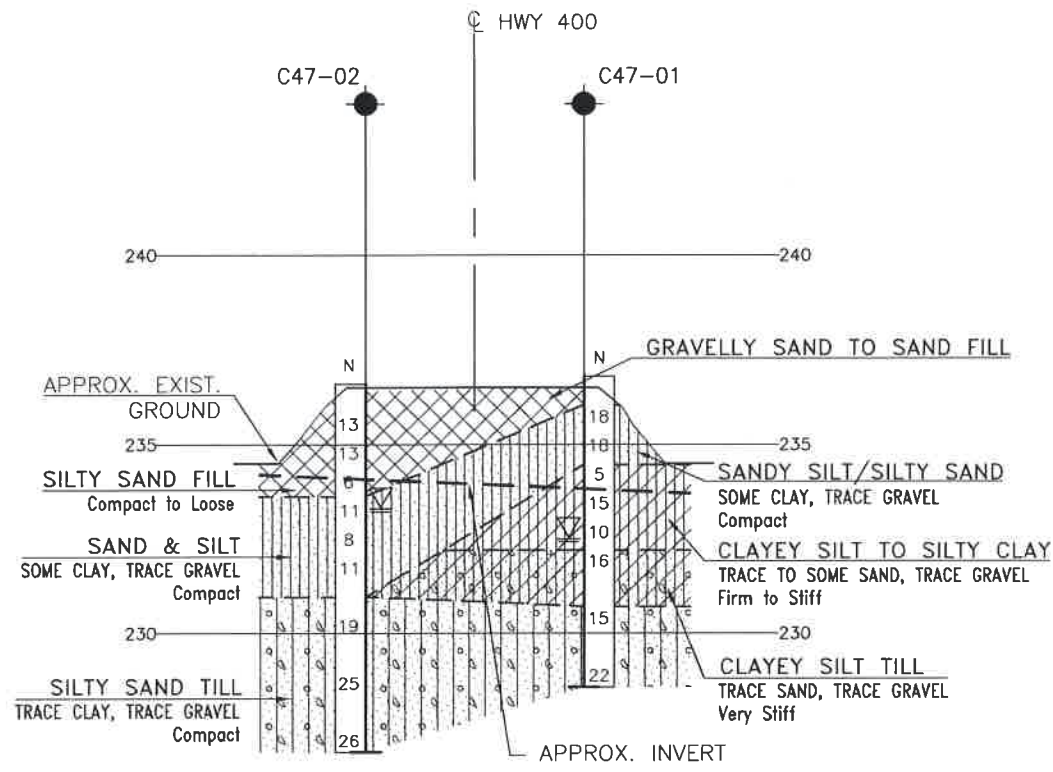
- | | |
|---|---------------------------------------|
|  | Borehole (Current Investigation) |
|  | Borehole (Previous Investigation) |
| N | Blows /0.3m (Std Pen Test, 475J/blow) |
| CONE | Blows /0.3m (60° Cone, 475J/blow) |
| PH | Pressure, Hydraulic |
|  | Water Level |
|  | Head Artesian Water |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

NO	ELEVATION	NORTHING	EASTING
C47-01	236.8	4 897 526.4	291 897.1
C47-02	236.6	4 897 512.7	291 871.2
C51-01	285.7	4 899 612.4	291 501.9
C51-02	285.7	4 899 601.0	291 475.4

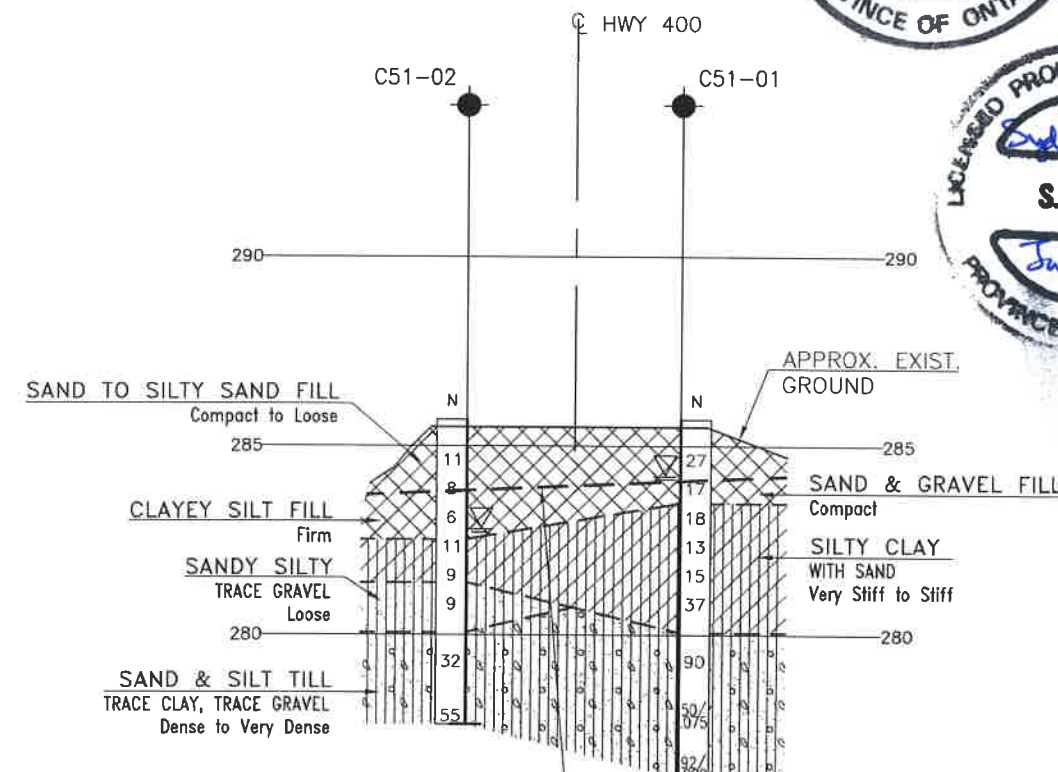
-NOTES-

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GEOCRES No. 31D-563



SECTION ALONG K-K



SECTION ALONG L-L

PLAN

20 0 20 40m

SCALE 1:1000

12345

LICENSED PROFESSIONAL ENGINEER

P. K. CHATTERJI

PROVINCE OF ONTARIO

Jan 14/14

Professional Engineer Seal for S. Pang, License No. 12027, Province of Ontario, dated June 14/14.



H 1:1000

V 1:200

[illegible]

LICENSED PROFESSIONAL ENGINEER
 P. K. CHATTERJI
 PROVINCE OF ONTARIO
 14000
 Jan 14/14

PLAN

20 0 20 40m

SCALE 1:1000

The diagram is a cross-section of a bridge structure, likely a culvert or small bridge, showing the relationship between the structure, the ground above it, and the soil layers below. Key features include:

- Topography:** The top of the structure is labeled "C 4TH LINE". The ground surface is indicated by a dashed line labeled "APPROX. EXIST. GROUND".
- Structure and Foundations:** The bridge structure is shown with two vertical lines representing the walls or piers. The base of the structure is labeled "APPROX. INVERT".
- Soil Layers:**
 - TOPSOIL:** The layer immediately above the structure.
 - SAND/SANDY SILT FILL:** A layer below the topsoil, described as "TRACE TO SOME GRAVEL Loose to Compact".
 - SAND:** A layer below the sand/sandy silt fill, described as "SOME SILT, TRACE GRAVEL Compact to Dense".
 - SANDY SILT:** A layer below the sand, described as "TRACE GRAVEL Compact".
 - SILTY CLAY/CLAYEY SILT FILL:** A layer above the structure, described as "Firm".
 - SILTY CLAY TILL WITH SAND, TRACE GRAVEL:** A layer below the sand/sandy silt fill, described as "Hard".
- Elevations:**
 - 290:** Elevation of the top of the structure.
 - 285:** Elevation of the topsoil surface.
 - 280:** Elevation of the base of the structure (approximate invert).
 - 275:** Elevation of the bottom of the structure.
- Labels and Dimensions:**
 - C113-01** and **C113-02** are labels for the structure walls.
 - 18**, **37**, **6**, **16**, **45**, **50**, **100** are dimensions or elevations on the left side.
 - 19**, **14**, **26**, **25**, **61**, **57**, **150** are dimensions or elevations on the right side.

H 1:1000

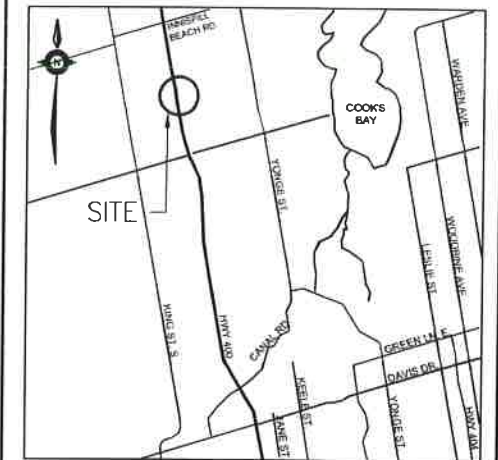
V 1:200

[illegible]

SHEET








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

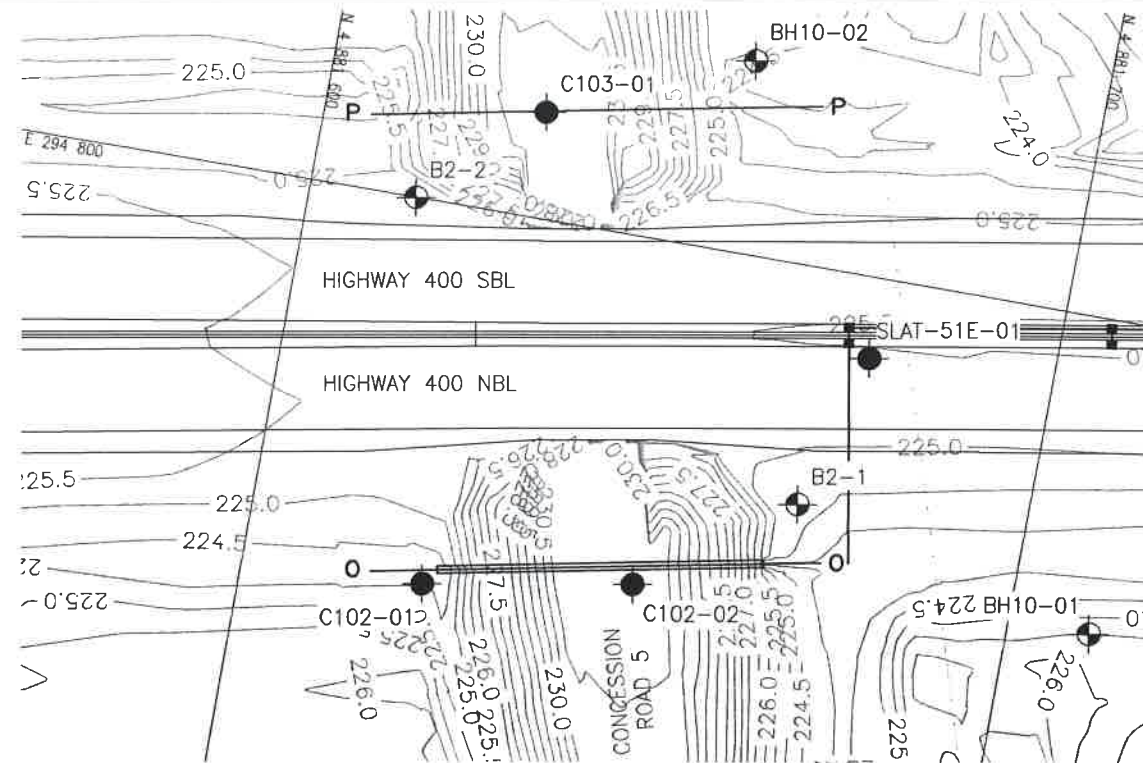
[illegible]

-NOTES-

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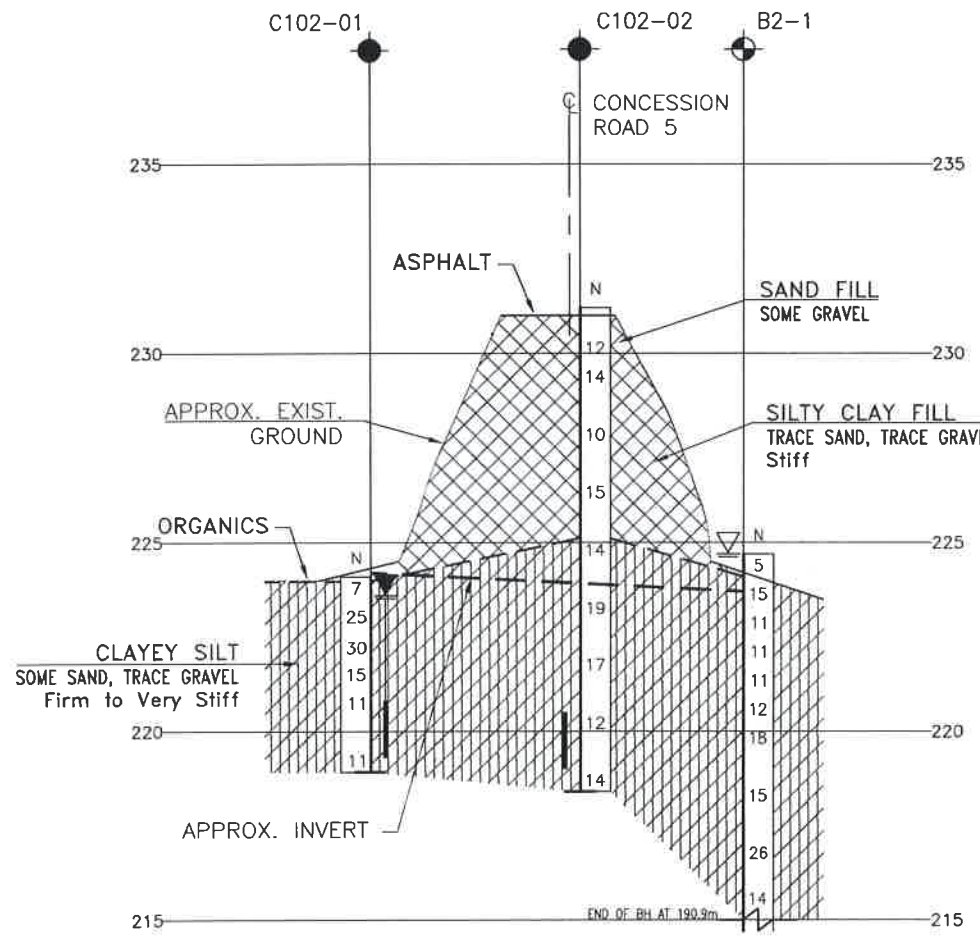
GEOCRES No. 31D-563

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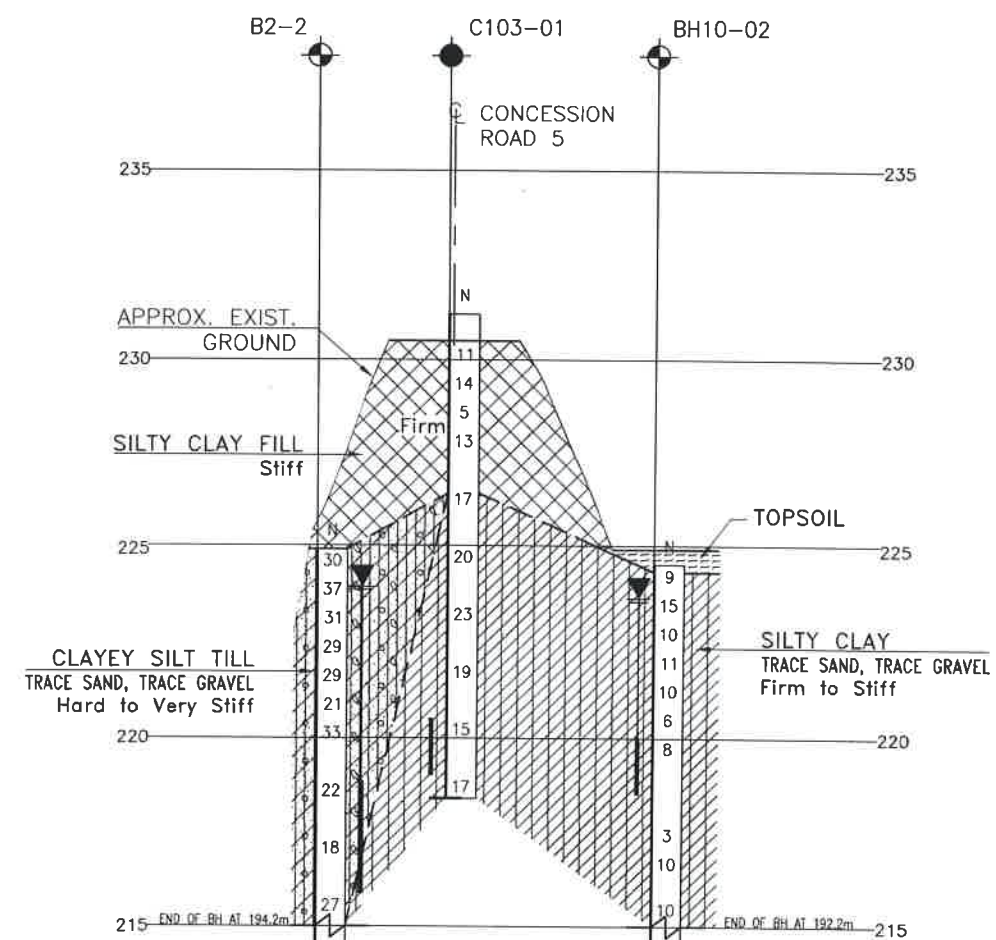
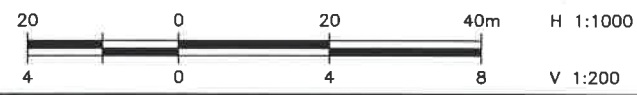


CULVERT SR102
(STA. 13+300 HWY 400)

CULVERT SR103
(STA. 13+300 HWY 400)



SECTION ALONG O-O



SECTION ALONG P-P

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



CONT No
GWP No 83-00-00

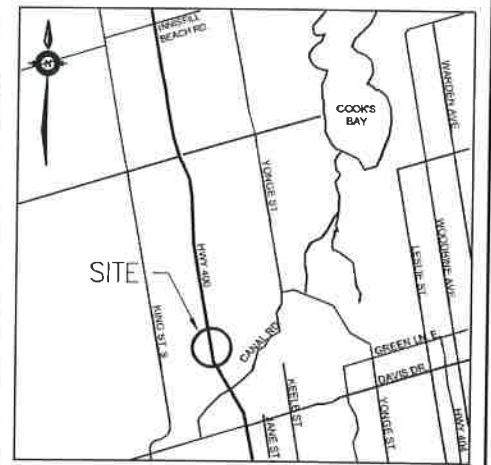
HIGHWAY 400
MEDIAN SEWER
CULVERT CROSSINGS
BOREHOLE LOCATIONS AND SOIL STRATA



SHEET



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

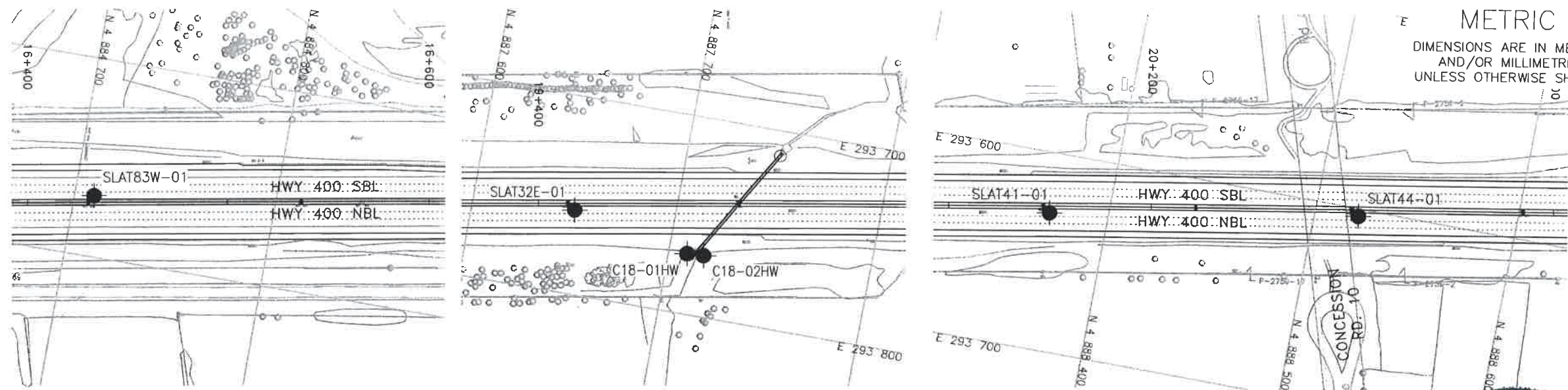
NO	ELEVATION	NORTHING	EASTING
C102-01	224.5	4 881 625.0	294 852.3
C102-02	231.3	4 881 651.2	294 845.6
C103-01	231.2	4 881 628.7	294 786.0
BH10-01	225.2	4 881 710.7	294 841.6
BH10-02	224.6	4 881 654.2	294 774.3
B2-1	224.7	4 881 670.2	294 831.5
B2-2	225.1	4 881 613.9	294 800.0

NOTES

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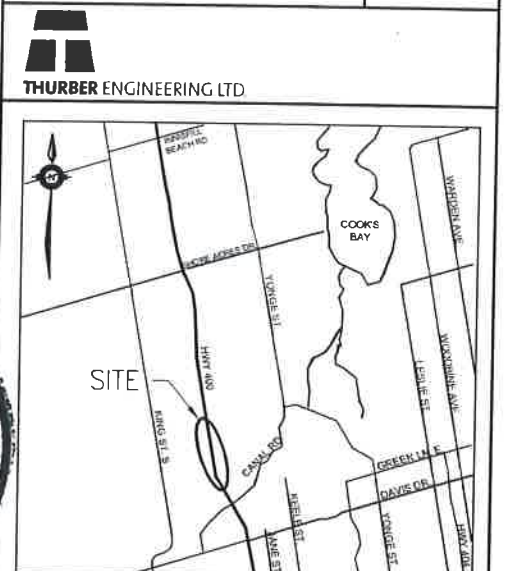
GEOCRES No. 31D-563

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

CONT No GWP No 83-00-00	SHEET
HWY 400 MEDIAN SEWER MEDIAN SEWER (STA. 16+400 TO 10+600) BOREHOLE LOCATIONS PLAN	



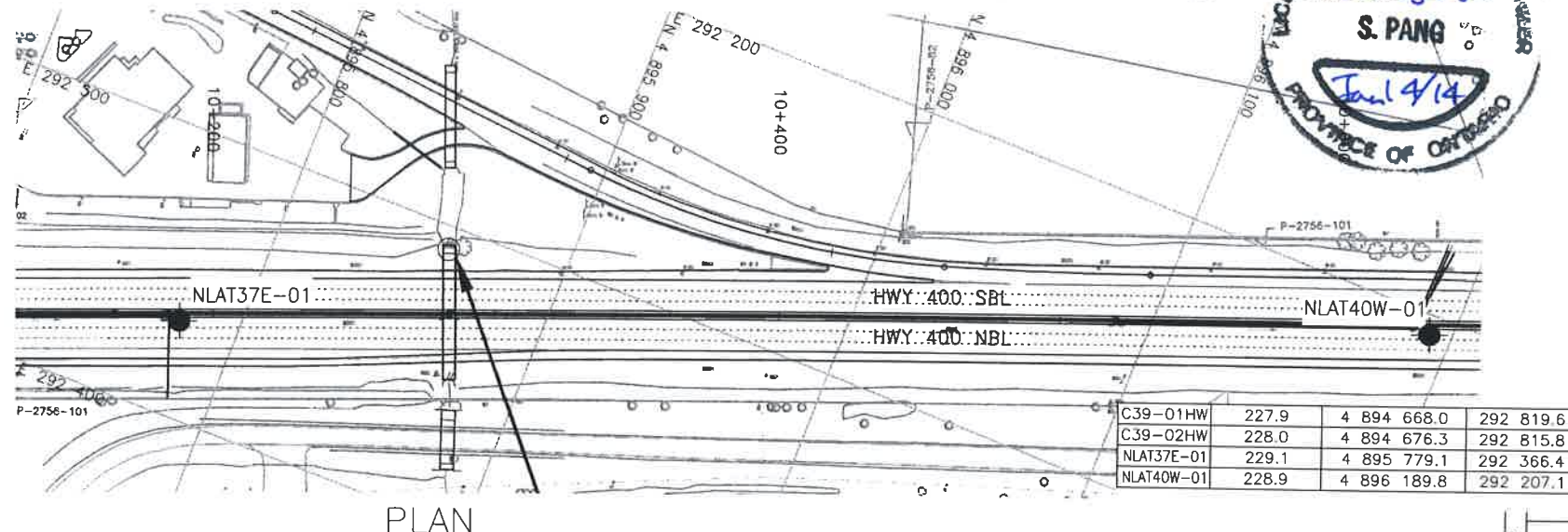
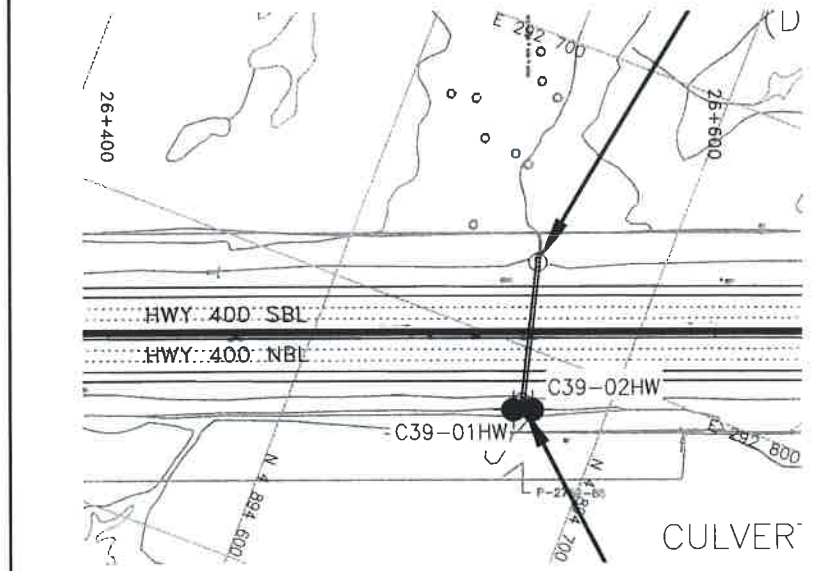
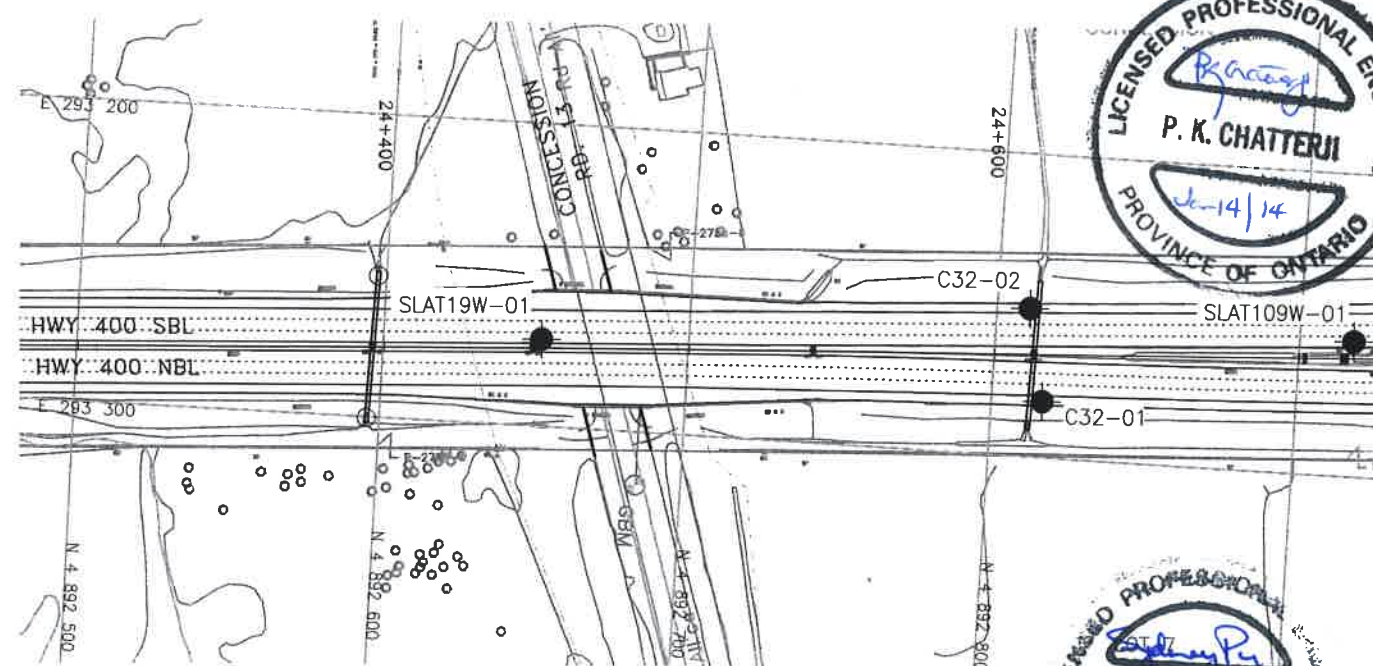
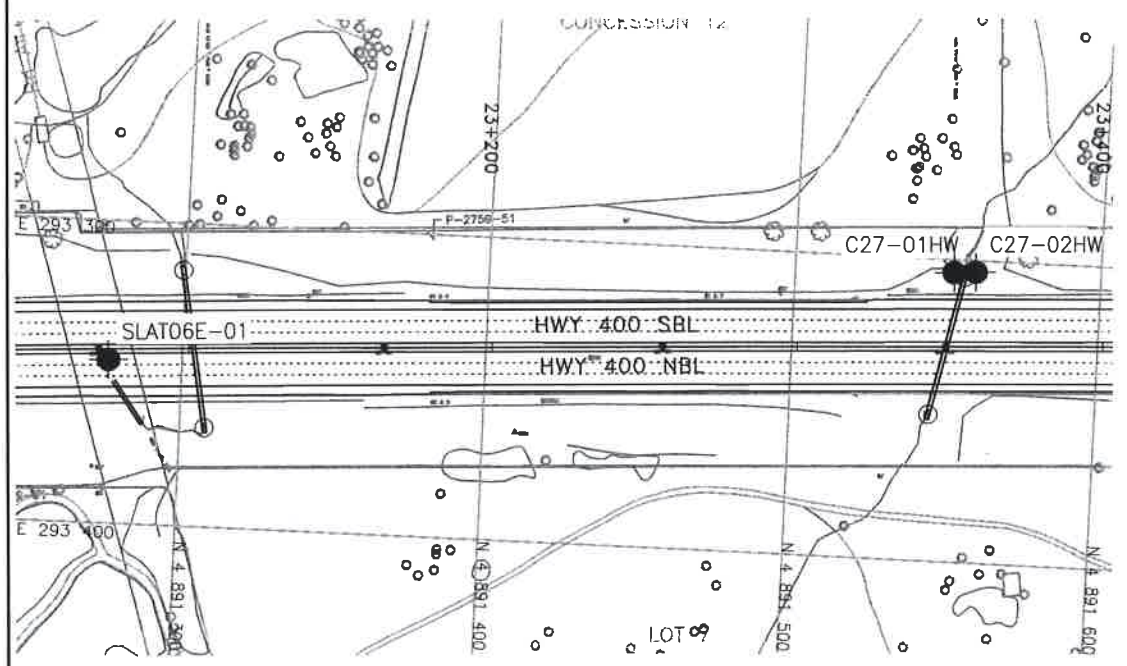
KEYPLAN
LEGEND

- ◆ 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
SLAT83W-01	248.4	4 884 709.8	294 270.2
SLAT32E-01	281.7	4 887 650.4	293 757.6
C18-01HW	279.8	4 887 708.1	293 770.1
C18-01HW	280.0	4 887 719.6	293 769.3
SLAT41-01	288.6	4 888 371.1	293 629.8
SLAT44-01	291.0	4 888 521.3	293 603.2
SLAT06E-01	269.7	4 891 275.9	293 341.0
C27-01HW	258.9	4 891 551.7	293 304.2
C27-02HW	258.4	4 891 558.2	293 303.3
SLAT19W-01	238.1	4 892 651.3	293 271.2
C32-01	235.6	4 892 816.8	293 281.5
C32-02	235.8	4 892 810.9	293 251.1
SLAT109W-01	235.5	4 892 917.8	293 256.3

- NOTES-**
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 - This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

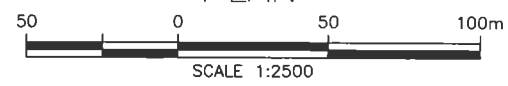
GEOCRES No. 31D-563



C39-01HW	227.9	4 894 668.0	292 819.6
C39-02HW	228.0	4 894 676.3	292 815.8
NLAT37E-01	229.1	4 895 779.1	292 366.4
NLAT40W-01	228.9	4 896 189.8	292 207.1

CULVER

PLAN



DATE	BY	DESCRIPTION
DESIGN	SKP	CHK SKP CODE
DRAWN	AN	CHK PKC SITE
		STRUCT
		DWG 9



HWY 400 MEDIAN SEWER
MEDIAN SEWER
(STA. 26+400 TO 19+800)
BOREHOLE LOCATIONS PLAN

SHEET







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
NLAT91W-01	298.6	4 901 334.7	291 146.
NLAT90-01	299.5	4 901 425.9	291 140.
NLAT87-01	300.3	4 901 517.8	291 129.
NLAT108W-01	297.9	4 902 612.9	290 915.
NLAT110W-01	299.0	4 902 816.0	290 876.
NLAT114E-01	298.3	4 903 202.0	290 809.
NLAT119E-01	296.7	4 903 491.6	290 755.
NLAT118W-01	307.8	4 904 921.3	290 477.
C114-01	302.8	4 904 983.1	290 636.
C116-01	301.5	4 905 085.3	290 645.

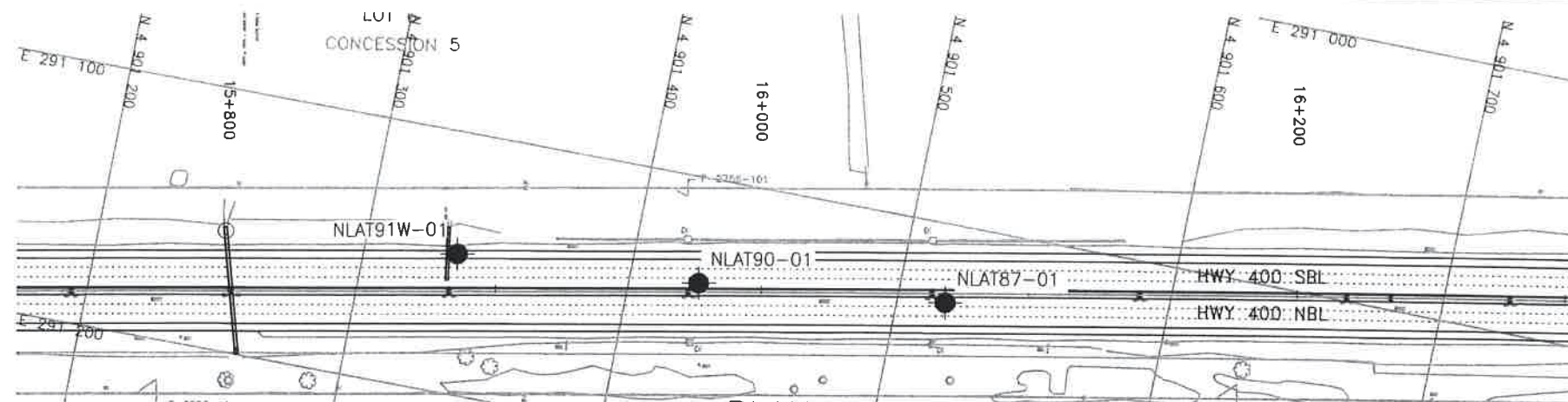
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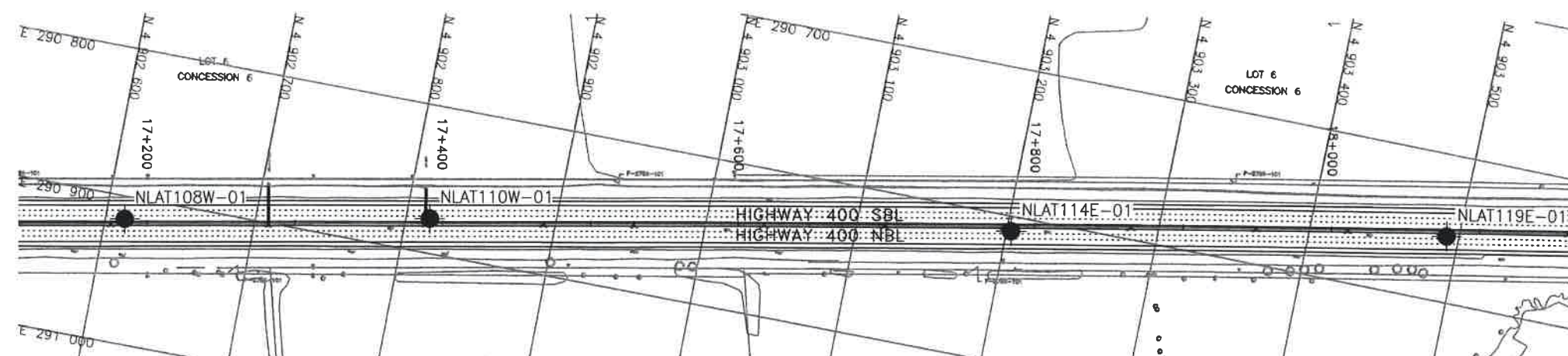
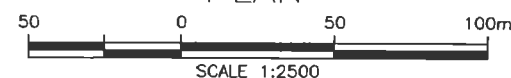
GEOCRES No. 31D-563

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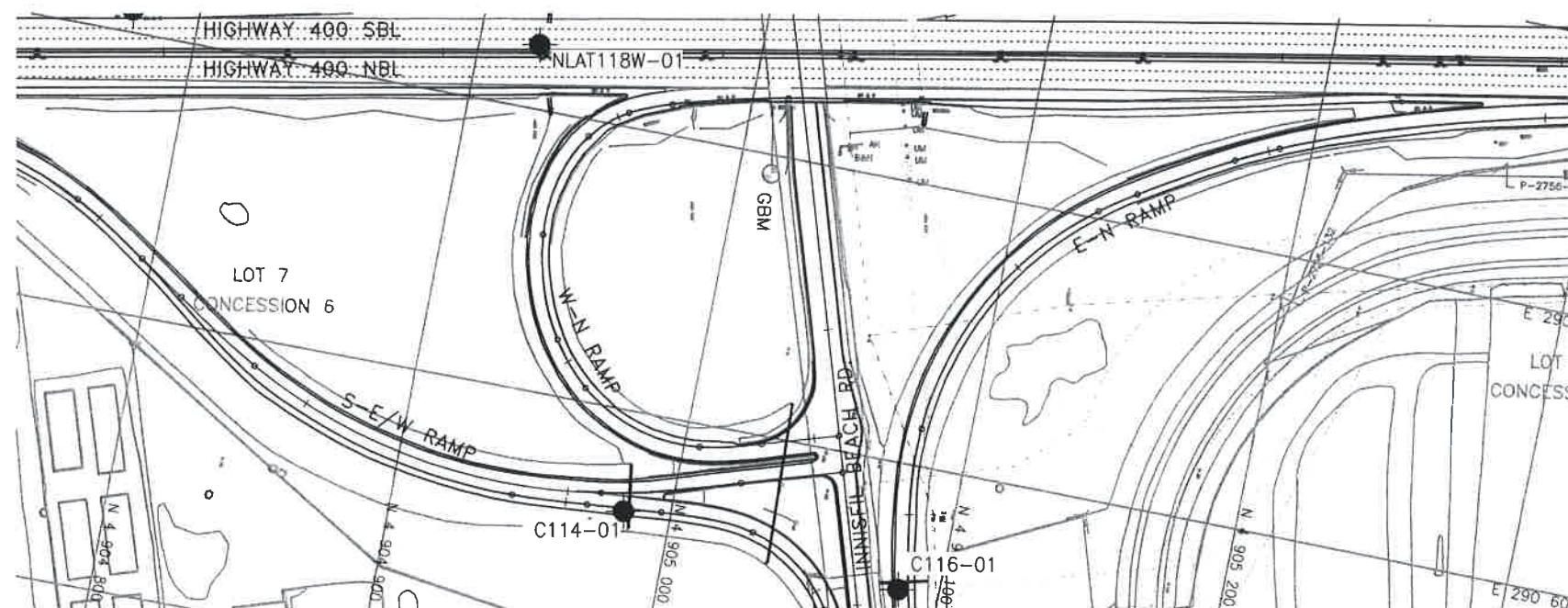
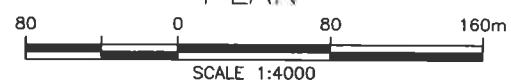
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PLAN



PLAN



PLAN

