

**FOUNDATION INVESTIGATION REPORT
CULVERT REPLACEMENTS
HIGHWAY 7
BROCK ROAD TO HIGHWAY 12
PICKERING / WHITBY
G.W.P. No. 2075-08-00**

GEOCRES Number: 30M14-319

Report to

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PART 1: FACTUAL INFORMATION

1 INTRODUCTION

This report presents the factual data obtained from a foundation investigation conducted by Thurber Engineering Ltd. (Thurber) at the locations of a number of culverts where the replacement of existing culverts are required along Highway 7 from Brock Road in the City of Pickering, Ontario to Highway 12 in the Town of Whitby, Ontario.

The purpose of this investigation was to obtain subsurface information at the culvert locations and, based on the data obtained, to provide borehole location plans, stratigraphic profiles, records of boreholes, laboratory test results, and a written description of the subsurface conditions. A model of the subsurface conditions was developed from the data obtained at each culvert location during the course of the present investigation.

Thurber was retained by the MMM Group Ltd. (MMM) to carry out this foundation investigation under the Ministry of Transport Ontario (MTO) Agreement Number 2006-E-0064.

In preparation of this report and in addition to the boreholes drilled for the extension of the existing culvert at West Lynde Creek (Culvert C13), general reference has been made to the following documents:

- Thurber Engineering report titled "Preliminary Foundation Investigation and Design Report – Culvert Extension at West Lynde Creek, Highway 7 Widening, from Brock Road to Highway 12, Town of Whitby, Ontario", G.W.P. No. 2110-05-00, dated September 21, 2007 (Reference 1)

A copy of the borehole logs sheets provided in Reference 1 are provided in Appendix C.

2 SITE DESCRIPTION

The culvert sites are located within an approximately 13 km section of Highway 7 between Brock Road and Highway 12. The west section of the project lies in the City of Pickering and the east section in the Town of Whitby, Ontario.

Currently, all of the culverts are open frame type with the exception of Culvert C20 which is a box culvert. The extensions on Culverts C04, C17, C11, C12, C13, C21, C24 and C25 are box type extensions while Culverts C05 and C17 have been extended with pipe culvert sections.

The grade of the existing Highway 7 in the vicinities of the culverts ranges between approximate Elevations 145 m and 193 m. The embankment fill heights at the culverts vary from approximately 1 m to 6 m.

The culvert sites are located in rural areas adjacent to agricultural fields, forests and residential dwellings. There is moderate vegetation cover in the areas surrounding most of the culvert locations.

The site is situated in the Physiographic area known as the South Slope, which lies between the Oak Ridges Moraine and the Iroquois Plain and typically is characterized by overburden composed of sand and silt, underlying or overlying glacial till sheets. Lacustrine clay deposited by Lake Iroquois, is often encountered between or overlying the till sheets. The bedrock is composed of black bituminous shale of the Whitby formation.

3 SITE INVESTIGATION AND FIELD TESTING

This borehole investigation and field testing program was carried out from between August 11, 2008 and September 5, 2008, from between October 8, 2008 and October 24, 2008, from November 24, 2008 to December 12, 2008 and on January 6, 2009. The program consisted of drilling and sampling 42 boreholes to depths ranging from 6.3 m to 17.4 m (El. 131.0 to 182.1 m). Three boreholes were drilled at each culvert location. The boreholes were positioned so that one borehole was advanced through the paved shoulder of the road and two boreholes were drilled in the ditches adjacent to each end of the culverts.

Prior to the start of drilling, the borehole locations were marked/staked in the field and utility clearances were obtained by representatives of Thurber. The drilled boreholes were subsequently surveyed by MMM.

The boreholes advanced through the paved shoulder were drilled and sampled using a truck mounted drill rig. A track mounted drill rig was used to drill and sample the boreholes where access through the MTO lands was conventional. In areas where access was unconventional and/or inaccessible through MTO lands, the boreholes were drilled and sampled in the ditches using a light duty, low overhead track mounted drill rig.

Solid and hollow stem augers were used to advance the boreholes. Soil samples were obtained at selected intervals using a 50 mm diameter split spoon sampler in conjunction with Standard Penetration Testing (SPT). Groundwater conditions in the open boreholes were observed throughout the drilling operations. The details of piezometer installations and borehole completion are summarized in Table 3.1.

Table 3.1
Borehole Completion and Piezometer Installation Details

Borehole Number	Piezometer Installations			Completion Details
	Screen Depth (m)	Screen El. (m)	Sand Filter Stratum	
C01-A	3.0 – 4.5	157.6 – 156.1	Sand	Sand to 2.4 m, bentonite holeplug to ground surface
C01-B	9.9 – 11.4	155.8 – 154.3	Sand	Sand to 8.5 m, bentonite holeplug to 1.5 m, sand to 0.5 m, concrete to surface
C01-C	5.3 – 6.8	154.5 – 153.0	Sand / Gravel	Sand to 4.6 m, bentonite holeplug to ground surface
C04-A	3.0 – 4.5	144.5 – 143.0	Sand	Sand to 2.1 m, bentonite holeplug to ground surface
C04-B	4.5 – 6.0	143.8 – 142.3	Silt / Sand	Sand to 4.0 m, bentonite holeplug to 0.5 m, concrete to surface
C04-C	3.0 – 4.5	144.2 – 142.7	Sand	Sand to 2.4 m, bentonite holeplug to ground surface
C05-A	2.7 – 4.2	163.6 – 162.1	Sand and Silt Till	Sand to 2.1 m, bentonite holeplug to ground surface
C05-B	6.1 - 7.6	165.1 – 163.6	Sand and Silt Till	Sand to 5.8 m, bentonite holeplug to 0.5 m, concrete to surface
C05-C	None Installed			Bentonite grout to surface
C07-A	10.7 – 12.2	138.7 – 137.2	Clayey Silt	Sand to 9.8 m, bentonite holeplug to ground surface
C07-B	4.5 – 6.0	146.3 – 144.8	Sand and Silt Till	Sand to 4.0 m, bentonite holeplug to 0.5 m, concrete to surface
C07-C	7.5 – 9.0	141.5 – 139.9	Sand and Silt Till	Sand to 7.0 m, bentonite holeplug to ground surface
C11-A	4.5 – 6.0	147.6 – 146.1	Sand and Silt Till	Sand to 4.3 m, bentonite holeplug to ground surface
C11-B	6.1 - 7.6	149.2 – 147.7	Sand and Silt Till	Sand to 5.2 m, bentonite holeplug to 0.5 m, concrete to surface
C11-C	None Installed			Bentonite holeplug to 0.2 m, cuttings to surface
C12-A	2.1 – 3.6	150.9 – 149.4	Sand and Silt Till	Sand to 1.5 m, bentonite holeplug to ground surface
C12-B	6.1 - 7.6	150.2 – 148.7	Silty Sand	Sand to 5.8 m, bentonite holeplug to ground surface
C12-C	6.1 - 7.6	145.9 – 144.3	Sand and Silt Till	Sand to 5.5 m, bentonite holeplug to 0.2 m, drill cuttings to ground surface
C13-A	3.0 – 4.5	160.1 – 158.5	Sand and Silt Till	Sand to 2.4 m, bentonite holeplug to ground surface
C13-B	None Installed			Bentonite holeplug mixed with cuttings to 0.15 m, asphalt cement to surface
C13-C	7.5 – 9.0	155.0 – 153.4	Sand and Silt with Clay	Sand to 7.1 m, bentonite holeplug to 0.1 m, drill cuttings to ground surface

Borehole Number	Piezometer Installations			Completion Details
	Screen Depth (m)	Screen El. (m)	Sand Filter Stratum	
C17-A	3.0 – 4.5	167.5 – 166.0	Sand and Silt Till	Sand to 2.2 m, bentonite holeplug to ground surface
C17-B	None Installed			Bentonite holeplug mixed with cuttings to 0.45 m, asphalt cement to surface
C17-C	4.7 – 6.2	164.2 – 162.7	Silty Sand	Sand to 4.4 m, bentonite holeplug to ground surface
C18-A	3.0 – 4.5	143.1 – 141.6	Sand and Silt Till	Sand to 2.7 m, bentonite holeplug to 0.2 m, concrete to surface
C18-B	10.7 – 12.2	137.1 – 135.6	Sand and Silt Till	Sand to 7 m, bentonite holeplug to 3.0 m, sand to 0.4 m, concrete to surface
C18-C	4.5 – 6.0	140.3 – 138.8	Sand and Silt Till	Sand to 4.0 m, bentonite holeplug to 0.3 m, cuttings to ground surface
C19-A	3.8 – 5.3	141.4 – 139.9	Silty Sand	Sand to 3.5 m, bentonite holeplug to ground surface
C19-B	4.5 – 6.0	143.2 – 141.7	Silty Sand	Sand to 4.3 m, bentonite holeplug to 1.1 m, sand to 0.6 m, bentonite to 0.3 m concrete to surface
C19-C	4.3 – 4.6	141.0 – 140.7	Silty Sand	Sand to 3.0 m, bentonite holeplug to ground surface
C20-A	4.5 – 6.0	141.9 – 140.4	Sand and Silt Till	Sand to 4 m, bentonite holeplug to ground surface
C20-B	4.5 – 6.0	144.2 – 142.7	Sandy Silt	Sand to 4.0 m, bentonite holeplug to 0.2 m, concrete to surface
C20-C	2.5 – 4.0	143.3 – 141.8	Sand	Sand to 1.8 m, bentonite holeplug to 0.2 m, cuttings to ground surface
C21-A	4.9 – 6.4	151.2 – 149.6	Sandy Silt	Sand to 4.1 m, bentonite holeplug to ground surface
C21-B	6.1 - 7.6	152.9 – 151.4	Sand and Silt Till	Sand to 3.7 m, bentonite holeplug to 0.9 m, sand filter to 0.2 m, concrete to surface
C21-C	6.1 - 7.6	149.7 – 148.1	Silty Sand	Sand to 5.5 m, bentonite holeplug to 3.7 m, cuttings to ground surface
C24-A	None Installed			Holeplug to ground surface
C24-B	7.5 – 9.1	188.9 – 187.4	Silt with Clay	Sand to 7.0 m, bentonite holeplug to 0.9 m, sand filter to 0.2 m, concrete to surface
C24-C	6.1 - 7.6	190.7 – 189.2	Silt	Sand to 5.8 m, bentonite holeplug to ground surface
C25-A	None Installed			Bentonite holeplug mixed with cuttings to ground surface
C25-B	None Installed			Bentonite holeplug mixed with cuttings to ground surface
C25-C	4.5 – 6.0	188.5 – 187.0	Silty Sand	Sand to 4.0 m, bentonite holeplug to ground surface

Results of field drilling and sampling are presented on the Record of Borehole sheets in Appendix A.

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

4 LABORATORY TESTING

All recovered soil samples were subjected to Visual Identification (VI) and to natural moisture content determination. Selected soil samples were subjected to grain size distribution analyses (sieve and hydrometer) and Atterberg Limits testing when appropriate. The results of this laboratory testing program are shown on the Record of Borehole sheets in Appendix A and on the figures in Appendix B.

5 DESCRIPTION OF SUBSURFACE CONDITIONS

5.1 General

Reference is made to the Record of Borehole sheets in Appendix A for details of the soil stratigraphy encountered in the boreholes. Stratigraphic profiles for the thirteen (13) culvert replacement locations and the location of the single culvert subject to further evaluation are presented on the Borehole Locations and Soil Strata Drawings in Appendix D for illustrative purposes. An overall description of the stratigraphy is given in the following paragraphs; however, the factual data presented in the record of boreholes governs any interpretation of the site conditions.

In general, the subsurface conditions encountered in the boreholes located on the highway shoulder consist of asphalt and granular fill overlying a layer of fill material of variable thickness which is in turn underlain by native sand and silt deposits and sand and silt till. Boreholes located in the side ditches encountered a layer of organic topsoil of variable thickness overlying native sand and silt deposits and sand and silt till. More detailed descriptions of the individual stratum are presented below.

5.2 Topsoil and Peat

Topsoil and organic peat was encountered in the boreholes drilled in the ditches adjacent to the existing culvert extensions throughout the site. The combined thickness of the organic soils (topsoil and peat) was found to range from approximately 25 to 2,030 mm in thickness. Deposits of topsoil and peat of note observed during drilling are the following:

- Sta. 24+197 (C11-A; 900 mm);
- Sta. 24+582 (C12-C; 655 mm);
- Sta. 25+229 (C13-C; 650 mm);

- Sta. 11+300 (C18-C; 600 mm);
- Sta. 12+520 (C20-A/C; 600 mm);
- Sta. 13+289 (C21-A/C; 1,295/550 mm);
- Sta. 18+480 (C25-A; 2,030 mm)

Topsoil and peat thickness may vary between and beyond the borehole locations.

A layer of buried organic peat was encountered in Borehole C11-C at a depth ranging from 1.0 to 1.7 m below the ground surface (El. 150.7 to 150.0 m). The SPT N-value obtained from within the peat material was observed as 1 blow for 0.3 m of penetration. The single moisture content from the organic peat was 45%.

5.3 Pavement

A layer of asphalt between 50 and 150 mm in thickness was encountered at ground surface in all the boreholes drilled through the paved shoulder of the highway (boreholes indicated with a B designation) with the exception of culvert C12-B which was advanced through a gravel shoulder and C25-B which encountered a 150 mm thick surficial layer of concrete cement. The asphalt and concrete cement was then underlain by a granular fill. The depth of the granular fill ranged from 0.6 to 3.6 m below the ground surface.

The borehole location may have had an impact on the observed depth of the granular pavement material. Drilling in close proximity to the existing culvert in some areas may reflect the granular backfill to the culvert and not the actual pavement structure.

The granular fill ranges from sand to sand and gravel with traces silt and clay. Occasional to frequent cobbles were encountered within the fill. Hydrocarbon odours were observed in several samples recovered from the granular fill in Boreholes C11-B and C17-B. The SPT N-values in the granular fill ranged from 17 to 65 blows per 0.3 m of penetration indicating a compact to very dense relative density. The moisture content in the granular fill deposits varied from 2 to 21%.

The result of laboratory test carried out on eight (8) samples of the granular fill was as follows:

Gravel %	13 to 38
Sand %	47 to 70
Silt & Clay %	13 to 39

The grain size distribution curves for the samples tested are shown in Figures B1 to B5, Appendix B.

5.4 Fill

Embankment fill was encountered below the pavement structure in all 'B' series boreholes except Boreholes C12-B and C25-B, where a granular fill was encountered from the ground surface or immediately below the concrete pavement comprised the full depth of the fill. Fill was also encountered in Boreholes C01-A, C01-C, C05-A, C11-C, C13-A, C17-A, C19-A, C20-A, C25-A and C25-C either from ground surface or immediately below the organic topsoil.

The composition of the fill varies widely throughout the site ranging from a Sand to a Silty Sand / Sandy Silt to Clayey Silt and Silty Clay. Typically the fill is comprised of brown silty sand with traces of clay and gravel. Atterberg limits testing indicate that the fill is typically a low plasticity silt (ML). Where encountered, the fill was found extending to depths of 1.0 to 6.4 m depth (El 143.9 to 195.2 m). In some locations the fill contains topsoil, roots and cobbles. A hydrocarbon odour was detected in several samples recovered from the fill material in Boreholes C04-B, C05-B and C07-B.

SPT N-values measured in the cohesionless fill typically range from 6 to greater than 100 blows per 0.3 m penetration indicating a loose to very dense state. The water contents of the recovered fill samples ranged widely from between 2% and 42%.

Grain size analyses conducted on samples of the fill are presented on Figures B1 to B5 in Appendix B. The results of grain size analyses carried out on sixteen (16) samples are tabulated below. The results of Atterberg limits testing on three (3) samples of the fill are tabulated below and are shown on Figure B24 in Appendix B.

Gravel %	1 to 16
Sand %	27 to 73
Silt %	20 to 57 (where hydrometer was conducted)
Clay %	9 to 20 (where hydrometer was conducted)
Silt & Clay %	12 (sieve analysis only)
Liquid Limit %	18 to 36
Plastic Limit %	11 to 24

Auger grinding was occasionally noted while advancing the augers through the fill material and may be reflective of the presence of cobbles within the fill and should be anticipated.

5.5 Sands and Silts

A cohesionless deposit comprised of sand, sand and gravel, silty sand to sandy silt was encountered in all of the Boreholes drilled at culverts C01, C04, C24 and C25, and in Boreholes C05-C, C07-C, C11-A, C12-A, C12-C, C17-C, C18-A, C18-C, C19-A, C20-B and

C20-C. Where encountered, the cohesionless deposit was contacted immediately below the topsoil and surficial fill. The depth to this layer ranged from 0.1 to 5.9 m below the ground surface. The elevations of the top of this deposit throughout the site ranged from El. 144.3 to 193.6 m.

The thickness of this cohesionless deposit varies from 0.5 to over 12 m in all of the boreholes. SPT N-values in the cohesionless deposit varied widely from 2 blows for 0.3 m penetration to 100 blow for 0.275 mm of penetration. SPT values of less than 10 were not frequent and as a result, the layer can be described as compact to very dense. N-values greater than 50 may reflect the presence of cobbles or boulders.

Moisture contents in the sand, silty sand to sandy silt deposits varied widely from 6 to 61%, though were typically between 8 to 20%.

Grain size distribution results on samples of the cohesionless deposit are presented on the Record of Borehole sheets and Figures B6 to B9 of Appendix B. A single Atterberg limits test was carried out on an apparently cohesive sample and is presented on the Record of Borehole sheets and Figure B25 of Appendix B. The results of laboratory tests carried out on twenty six (26) samples of the cohesionless deposit were as follows:

Gravel %	0 to 76
Sand %	6 to 90
Silt %	3 to 66 (where hydrometer was conducted)
Clay %	6 to 30 (where hydrometer was conducted)
Silt & Clay %	3 to 28 (sieve analysis only)
Liquid Limit %	21
Plastic Limit %	11

5.6 Silt to Clayey Silt

Below the granular deposit, layers of a grey silt with some clay to clayey silt was encountered in the three boreholes drilled at culvert C04, C24 and in Boreholes C19-B, C25-A and C25-C. The surface of this deposit was found to range in depth from between 4.8 to 12.2 m below the ground surface. Boreholes C19-A, C24-A, B and C, and C25-A and C were all terminated in the silt at depths ranging from 10.7 to 15.8 m.

SPT N-values measured within these deposits ranged between 8 blows per 0.3 m penetration to greater than 100 blows for 0.125 m penetration, indicating a loose to very dense state.

The measured water contents of samples recovered from the fine grained silt typically ranged from 15 to 22%.

Grain size analyses conducted on six (6) samples of the silt are presented on the Record of Borehole Log Sheets and Figure B10, respectively, in Appendix B. The results are summarized in the following table.

Gravel %	0 to 1
Sand %	3 to 37
Silt %	56 to 86
Clay %	7 to 23

5.7 Silty Clay

Several boreholes drilled at culverts to the west end of the proposed highway alignment were terminated in a grey silty clay material. The cohesive silty clay deposit was encountered in all three of the boreholes drilled at culvert C4 as well as in Boreholes C01-A, C01-B, C05-B, C07-A, C11-B, C21-A and C21-C. Several boreholes central to the proposed highway alignment encountered a similar cohesive deposit either immediately below the topsoil (Boreholes C04-C, C07-A and C21-A) or interbedded in the sand and silt till to silty sand till (Borehole C21-C).

The cohesive deposit was encountered at depths ranging from 0.1 to 16.8 m below the ground surface, or at elevations ranging from El. 138.4 to 154.7 m.

SPT N-values measured within these deposits ranged from 5 blows per 0.3 m penetration to greater than 100 blows for 0.1 m penetration, indicating a firm to hard consistency. Typically the N-values were from between 9 to 25 blows for 0.3 m of penetration indicating a stiff to very stiff consistency. N-values greater than 50 may reflect the presence of cobbles or boulders.

The measured water contents of samples recovered from the silty clay ranged from 8% to 36%, though were typically between 20 and 25%.

Grain size analyses conducted on eleven (11) samples of the silty clay are presented on the Record of Borehole Log Sheets and Figures B11 and B12 in Appendix B. Atterberg limits testing on eleven (11) samples indicated that the plasticity of the clay ranges from low to high plasticity (CL - CH). The results of the Atterberg limits testing may be found on the Record of Borehole Log Sheets and Figures B26 to B27 in Appendix B. The results are summarized in the following table.

Gravel %	0 to 5
Sand %	5 to 34
Silt %	22 to 54
Clay %	26 to 74

Liquid Limit % 24 to 55

Plastic Limit % 13 to 22

5.8 Sand and Silt Till to Silty Sand Till

In all boreholes except Boreholes C01-A and B, C04-A and B, C24-A and B; and C25-A and C a cohesionless till was encountered below the upper sand and silt. The till is comprised of brown sand and silt till to silty sand till with some clay. The cohesionless till was encountered immediately below the topsoil in Boreholes C13-C, C19-C and C21-C or below the sand and silt in most other borehole locations. The till was frequently interbedded with sand, silty clay and silt to sandy silt layers. Auger grinding was noted in several boreholes indicating the likely presence of cobbles or boulders common to ice contact glacial soils.

The surface of the sand and silt till to silty sand till was encountered at depths ranging from 0.1 to 7.6 m, though was typically from between 1.3 to 3.0 and again from 6.1 to 7.6 m below the ground surface. Over half of the forty two boreholes (25) were terminated in the cohesionless till. The elevations of the top of the glacial till ranged from 139.6 to 190.9 m and the base of the till varied from between 131.5 to 178.4 m.

SPT test results conducted in the silt/sand till deposit varied widely from 1 to greater than 50 blows for 0.025 m of penetration indicating a very loose to very dense condition. Typically the deposit is dense to very dense as the number of N-values less than 10 blows/0.3 m of penetration was generally isolated within this deposit and the lower N-values were typically encountered in the upper part of the till.

Moisture contents from this deposit ranged from 3 to 40% though were typically from 6 to 12%.

The results of grain size distribution analyses conducted on sixty-eight (68) samples are presented on the Record of Borehole Sheets and Figures B13 to B23. Atterberg limits testing indicated that the till is essentially cohesionless. The results of the Atterberg limits testing may be found on the Record of Borehole Log Sheets and Figures B28 to B31 in Appendix B. The results are summarized below.

Gravel %	0 to 13
Sand %	20 to 77
Silt %	26 to 62 (where hydrometer was conducted)
Clay %	5 to 26 (where hydrometer was conducted)
Silt & Clay %	20 (sieve analysis only)
Liquid Limit %	15 to 22
Plastic Limit %	6 to 13

5.9 Groundwater Conditions

Standpipe type piezometers were installed in all but seven of the boreholes following completion of drilling. In addition to a selected number of piezometers intended as part of the foundation investigation, a number of additional piezometers were installed at the request of MMM Group as part of their hydrogeological investigation at the various creek locations.

Details of the individual piezometers are provided on the Record of Borehole Sheets and in Table 3.1. Groundwater levels were monitored following completion of the drilling program. The measured groundwater levels in the standpipe piezometers are presented below.

Table 5.1
Groundwater Levels

Borehole ID	Date of Reading	Water Level Depth (m)	Water Level El. (m)
C01-A	January 6, 2009	0.33	160.27
	February 11, 2009	1.08	159.52
C01-B	October 17, 2008	1.96	163.74
	February 11, 2009	0.87	164.83
C01-C	January 6, 2009	0.62	159.28
	February 11, 2009	0.50	159.40
C04-A	October 17, 2008	1.57	146.03
	November 21, 2008	1.38	146.22
	January 6, 2009	1.11	146.49
	February 11, 2009	0.98	146.62
C04-B	February 11, 2009	2.02	146.38
C04-C	October 17, 2008	1.96	145.24
	November 21, 2008	1.29	145.91
	January 6, 2009	0.87	146.33
	February 11, 2009	0.79	146.41
C05-A	October 17, 2008	1.17	165.13
	November 21, 2008	1.24	165.06
	January 6, 2009	2.01	164.29
	February 11, 2009	2.09	164.21
C05-B	October 17, 2008	5.42	165.78
	February 11, 2009	4.33	166.87
C07-A	October 17, 2008	+0.75	150.05
	February 11, 2009	3.45	145.85
C07-B	February 11, 2009	3.80	147.10
C07-C	February 11, 2009	3.13	145.97
C11-A	January 6, 2009	0.26	151.94
	February 11, 2009	3.80	148.40
C11-B	February 11, 2009	2.03	153.27
C12-A	October 17, 2008	0.79	152.31
	November 21, 2008	0.62	152.48
	January 6, 2009	0.29	152.81
	February 11, 2009	1.67	151.43
C12-B	October 17, 2008	4.96	151.34
	February 11, 2009	1.88	154.42
C12-C	January 6, 2009	0.36	151.64
C13-A	November 21, 2008	0.34	162.76
	January 6, 2009	Frozen	-
	February 11, 2009	2.82	160.28

+ Artesian condition in BH C07-A

Borehole ID	Date of Reading	Water Level Depth (m)	Water Level El. (m)
C13-C	January 6, 2009	4.04	158.56
	February 11, 2009	4.19	158.41
C17-A	October 17, 2008	1.48	169.02
	November 21, 2008	2.13	168.37
	January 6, 2009	4.17	166.33
	February 11, 2009	4.22	166.28
C17-C	January 6, 2009	1.23	167.67
	February 11, 2009	1.69	167.21
C18-A	January 6, 2009	1.31	144.89
	February 11, 2009	1.23	144.97
C18-B	October 17, 2008	2.00	145.80
	February 11, 2009	2.06	145.74
C18-C	January 6, 2009	4.32	140.58
	February 11, 2009	3.76	141.14
C19-A	October 17, 2008	0.44	144.76
	November 21, 2008	1.43	143.77
	January 6, 2009	1.98	143.22
	February 11, 2009	1.57	143.63
C19-B	October 17, 2008	2.65	145.15
	February 11, 2009	2.88	144.92
C19-C	January 6, 2009	3.87	141.43
	February 11, 2009	1.34	143.96
C20-A	January 6, 2009	1.13	145.37
	February 11, 2009	0.99	145.51
C20-B	October 17, 2008	3.90	144.90
	February 11, 2009	2.23	146.57
C20-C	January 6, 2009	2.42	143.38
	February 11, 2009	1.97	143.83
C21-A	January 6, 2009	1.59	154.41
	February 11, 2009	1.40	154.60
C21-B	October 17, 2008	0.94	158.06
	February 11, 2009	2.62	156.38
C21-C	January 6, 2009	3.08	152.72
	February 11, 2009	1.73	154.07
C24-C	January 6, 2009	1.77	194.73
	February 11, 2009	1.70	194.80
C25-C	January 6, 2009	0.52	192.48
	February 11, 2009	3.11	189.89

Where surface water is present, the groundwater level should be assumed to coincide with the local surface water level. Local high water levels and the effects of heavy rainfalls must also be taken into consideration.

6 MISCELLANEOUS

Thurber staked and/or marked the borehole locations in the field and obtained utility clearances prior to drilling. MMM subsequently surveyed the as-drilled locations, and provided the northing and easting coordinates and ground surface elevations.

DBW Drilling of Ajax, Ontario supplied and operated a truck-mounted D-90 and a track-mounted CME 55 drill rig to carry out part of the drilling, sampling and in-situ testing operations within the roadway and ditches. Groundwork Drilling of Etobicoke, Ontario supplied and operated a truck-mounted BOA-5M drill rig to carry out part of the drilling, sampling and insitu testing operations for boreholes drilled within the roadway. Strong Soil Search Inc. of Claremont, Ontario supplied and operated a track-mounted CME 55 drill rig to carry out the drilling, sampling and in-situ testing operations for a total of 3 boreholes within the ditches. Kodiak Environmental Ltd. of Oakville, Ontario supplied and operated a light-duty, track-mounted drill rig to carry out the drilling, sampling and in-situ testing operations for the boreholes deemed to possess unconventional access through MTO lands.

The drilling and sampling operations in the field were supervised on a full time basis by Mr. Stephane Loranger, Ms. Eckie Siu, Mr. Shane Aziz, Mr. Keli Shi, Mr. Jason Mei and Mr. Ligang Hao of Thurber. Laboratory testing was carried out by Thurber in its MTO-approved laboratory.

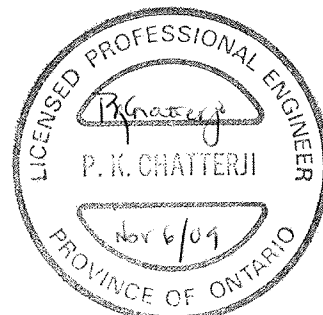
Overall direction of the field program was provided by Mr. David Elwood, P.Eng. Interpretation of the field data and preparation of this report was completed by Mr. David Elwood, P.Eng. The report was reviewed by Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations Projects.

Thurber Engineering Ltd.

Alastair Gorman, P.Eng.
Associate, Senior Project Engineer



Report Reviewed by:
P. K. Chatterji, P.Eng.,
Review Principal, Designated MTO Contact



Appendix A

Record of Borehole Sheets

SYMBOLS, ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES

1. TEXTURAL CLASSIFICATION OF SOILS

CLASSIFICATION	PARTICLE SIZE	VISUAL IDENTIFICATION
Boulders	Greater than 200mm	same
Cobbles	75 to 200mm	same
Gravel	4.75 to 75mm	5 to 75mm
Sand	0.075 to 4.75mm	Not visible particles to 5mm
Silt	0.002 to 0.075mm	Non-plastic particles, not visible to the naked eye
Clay	Less than 0.002mm	Plastic particles, not visible to the naked eye

2. COARSE GRAIN SOIL DESCRIPTION (50% greater than 0.075mm)

TERMINOLOGY	PROPORTION
Trace or Occasional	Less than 10%
Some	10 to 20%
Adjective (e.g. silty or sandy)	20 to 35%
And (e.g. sand and gravel)	35 to 50%

3. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

DESCRIPTIVE TERM	UNDRAINED SHEAR STRENGTH (kPa)	APPROXIMATE SPT ⁽¹⁾ 'N' VALUE
Very Soft	12 or less	Less than 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	Greater than 200	Greater than 30

NOTE: Hierarchy of Soil Strength Prediction

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

4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

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

5. LEGEND FOR RECORDS OF BOREHOLES

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

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



Water Level

C_{pen}






Shear Strength Determination by Pocket Penetrometer

- (1) SPT 'N' Value Standard Penetration Test 'N' Value – refers to the number of blows from a 63.5kg hammer free falling a height of 0.76m to advance a standard 50 mm outside diameter split spoon sampler for 0.3 m depth into undisturbed ground.
- (2) DCPT Dynamic Cone Penetration Test – Continuous penetration of a 50 mm outside diameter, 60° conical steel point attached to "A" size rods driven by a 63.5 kg hammer free falling a height of 0.76 m. The resistance to cone penetration is the number of hammer blows required for each 0.3 m advance of the conical point into undisturbed ground.

UNIFIED SOILS CLASSIFICATION

MAJOR DIVISIONS		GROUP SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well-graded gravels or gravel-sand mixtures, little or no fines.
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines.
		GM	Silty gravels, gravel-sand-silt mixtures.
		GC	Clayey gravels, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS	SW	Well-graded sands or gravelly sands, little or no fines.
		SP	Poorly-graded sands or gravelly sands, little or no fines.
		SM	Silty sands, sand-silt mixtures.
		SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS	SILTS AND CLAYS $W_L < 50\%$	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. ($W_L < 30\%$).
		CI	Inorganic clays of medium plasticity, silty clays. ($30\% < W_L < 50\%$).
		OL	Organic silts and organic silty-clays of low plasticity.
	SILTS AND CLAYS $W_L > 50\%$	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity, organic silts.
	HIGHLY ORGANIC SOILS		Pt
CLAY SHALE			
SANDSTONE			
SILTSTONE			
CLAYSTONE			
COAL			

EXPLANATION OF ROCK LOGGING TERMS

ROCK WEATHERING CLASSIFICATION		SYMBOLS			
Fresh (FR)	No visible signs of weathering.	    	CLAYSTONE		
Fresh Jointed (FJ)	Weathering limited to the surface of major discontinuities.		SILTSTONE		
Slightly Weathered (SW)	Penetrative weathering developed on open discontinuity surfaces, but only slight weathering of rock material.		SANDSTONE		
Moderately Weathered (MW)	Weathering extends throughout the rock mass, but the rock material is not friable.		COAL		
Highly Weathered (HW)	Weathering extends throughout the rock mass and the rock is partly friable.		Bedrock (general)		
Completely Weathered (CW)	Rock is wholly decomposed and in a friable condition, but the rock texture and structure are preserved.				
DISCONTINUITY SPACING		STRENGTH CLASSIFICATION			
Bedding	Bedding Plane Spacing	Rock Strength	Approximate Uniaxial Compressive Strength (MPa) (psi)	Field Estimation of Hardness*	
Very thickly bedded	Greater than 2m	Extremely Strong	Greater than 250	Greater than 36,000	Specimen can only be chipped with a geological hammer
Thickly bedded	0.6 to 2m				
Medium bedded	0.2 to 0.6m	Very Strong	100-250	15,000 to 36,000	Requires many blows of geological hammer to break
Thinly bedded	60mm to 0.2m				
Very thinly bedded	20 to 60mm	Strong	50-100	7,500 to 15,000	Requires more than one blow of geological hammer to break
Laminated	6 to 20mm				
Thinly Laminated	Less than 6mm	Medium Strong	25.0 to 50.0	3,500 to 7,500	Breaks under single blow of geological hammer.
TERMS		Weak	5.0 to 25.0	750 to 3,500	Can be peeled by a pocket knife with difficulty
Total Core Recovery: (TCR)	Core recovered as a percentage of total core run length.	Very Weak	1.0 to 5.0	150 to 750	Can be peeled by a pocket knife, crumbles under firm blows of geological pick.
Solid Core Recovery: (SCR)	Percent Ratio of solid core of full cylindrical shape recovered. Expressed with respect to the total length of core run.	Extremely Weak (Rock)	0.25 to 1.0	35 to 150	Indented by thumbnail
Rock Quality Designation: (RQD)	Total length of sound core recovered in pieces 0.1m in length or larger as a percentage of total core run length.				
Uniaxial Compressive Strength (UCS)	Axial stress required to break the specimen				
Fracture Index: (FI)	Frequency of natural fractures per 0.3m of core run.				

RECORD OF BOREHOLE No C01-A

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 864 798.97 E 337 522.62 ORIGINATED BY LH
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.12.10 - 2008.12.10 CHECKED BY DE

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			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100					
160.6	Geodetic														
0.0	Clayey SILT, some sand, trace gravel, trace rootlets Firm Dark Brown (FILL)		1	SS	6		160								4 53 29 14
159.3			2	SS	6										
1.4	SAND fine, trace gravel, trace silt, mixed with organics, gas odour Compact Brown Wet		3	SS	12		159								
			4	SS	30		158								
	Medium sand layer Dense		5	SS	43		157								1 73 26 (SI+CL)
			6	SS	42										
			7	SS	38		156								
			8	SS	39		155								
							154								
153.0	SAND and GRAVEL, trace silt Dense Brown Wet		9	SS	76		153								47 40 12 (SI+CL)
7.6							152								
			10	SS	69		151								

Continued Next Page

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

RECORD OF BOREHOLE No C01-A

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 864 798.97 E 337 522.62 ORIGINATED BY LH
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.12.10 - 2008.12.10 CHECKED BY DE

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					
	Continued From Previous Page																
150.0	SAND and GRAVEL, trace silt Dense Brown Wet																
10.7 149.7	Silty CLAY, trace sand, silty sand seams Hard Grey Brown		11	SS	100/	150											
10.9	END OF BOREHOLE AT 10.9m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 06-Jan-09 0.33 160.3 11-Feb-09 1.08 159.5				0.100												

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

RECORD OF BOREHOLE No C01-B

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 864 777.39 E 337 518.89 ORIGINATED BY SL
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.10.17 - 2008.10.17 CHECKED BY DE

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			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100					
165.7	Geodetic															
0.0	ASPHALT															
0.1	SAND, some gravel Brown Moist (FILL)			AS												
164.9																
0.8	Silty CLAY, some sand, trace gravel Hard Brown Moist (FILL)		1	SS	30		165									
			2	SS	13		164									
			3	SS	13		163									5 47 29 19
162.7																
3.0	SAND, trace silt, trace clay Compact to Very Dense Brown Moist (FILL)		4	SS	12		162									
			5	SS	100/ .125											
	Occasional Silty Clay layers		6	SS	8		161									
	Wood fragments from 5.4m to 5.7m						160									
159.8																
5.9	SAND, trace gravel, trace silt Compact Dark Brown Wet		7	SS	13		159									
			8	SS	22		158									11 81 8 (SI+CL)
			9	SS	25		157									
							156									

Continued Next Page

+ 3 X 3

Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C01-B

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 864 777.39 E 337 518.89 ORIGINATED BY SL
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.10.17 - 2008.10.17 CHECKED BY DE

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 (%)		
								20 40 60 80 100	○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE							20 40 60		
	Continued From Previous Page																	
153.8	SAND, trace gravel, trace silt Compact Dark Brown Wet		10	SS	100/ 275		155											
11.9	Silty CLAY, trace sand Hard Grey Moist		11	SS	89		154											
152.0							153								0 5 22 74			
13.7	END OF BOREHOLE AT 13.7m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 17-Oct-08 1.96 163.7 11-Feb-09 0.87 164.8																	

+³ ×³: Numbers refer to
Sensitivity 20
15 10 5 0
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C01-C

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 864 756.68 E 337 549.13 ORIGINATED BY SU
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.11.24 - 2008.11.24 CHECKED BY DE

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			20	40	60	80	100					
159.9	Geodetic																
0.0	TOPSOIL (125mm)																
0.1	SAND, some gravel, occasional cobbles Dense Brown Wet (FILL)		1	SS	35												
158.9							159										
1.0	SAND and GRAVEL, trace silt Compact to Dense Grey Wet		2	SS	28		158										39 49 13 (SI+CL)
			3	SS	38		157										
			4	SS	32		156										
			5	SS	46		155										76 20 3 (SI+CL)
153.8							154										
6.1	SAND, some silt, trace gravel Very Dense Brown Grey Moist (TILL)		6	SS	61		153										3 77 20 (SI+CL)
			7	SS	64		152										
			8	SS	100/ 0.225		151										
							150										

Continued Next Page

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

RECORD OF BOREHOLE No C01-C

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 864 756.68 E 337 549.13 ORIGINATED BY SU
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.11.24 - 2008.11.24 CHECKED BY DE

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	20	40	60	80					
148.7	Continued From Previous Page SAND , some silt, trace gravel Very Dense Brown Grey Moist (TILL)		9	SS	88	149										
11.1	END OF BOREHOLE BOREHOLE CAVED TO 7.0m AND WATER LEVEL AT 2.7m UPON COMPLETION OF DRILLING. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 06-Jan-09 0.62 159.2 11-Feb-09 0.50 159.3															

RECORD OF BOREHOLE No C04-A

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 865 110.63 E 338 447.67 ORIGINATED BY ES
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2008.08.22 - 2008.08.22 CHECKED BY DE

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			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100					
147.6	Geodetic														
0.0	TOPSOIL: (125mm)														
0.1	SAND, some gravel, trace rootlets Compact Brown Moist		1	SS	16		147								
146.3			2	SS	14		146								
1.2	SAND, some silt, trace clay, trace rootlets Loose to Dense Dark brown Moist		3	SS	7		145								
			4	SS	33		144								
			5	SS	22		143								
143.6			6	SS	12		142								
4.0	Sandy SILT, trace gravel Compact Grey Moist		7	SS	8		141								
142.8			8	SS	8		140								
4.8	Clayey SILT, trace sand Stiff Grey Wet		9	SS	8		139								
	Occasional sand layers		10	SS	11		138								
138.4															
9.1	Silty CLAY, trace sand Stiff Grey														

Continued Next Page

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

RECORD OF BOREHOLE No C04-A

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 865 110.63 E 338 447.67 ORIGINATED BY ES
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2008.08.22 - 2008.08.22 CHECKED BY DE

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								
								20 40 60 80 100								
	Continued From Previous Page															
	Silty CLAY, trace sand Stiff Grey						137									
	Firm		11	SS	5											2 6 43 49
			12	SS	13											
							135									
							134								0 6 54 40	
			13	SS	13											
							133									

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

METRIC

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466
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Continued Next Page

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C04-B

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 865 106.20 E 338 462.15 ORIGINATED BY SA
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2008.09.02 - 2008.09.02 CHECKED BY DE

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			
	Continued From Previous Page							SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE		WATER CONTENT (%)				
	Silty CLAY, trace sand, trace gravel Firm to stiff Grey Moist													
			11	SS	8									
			12	SS	5									
			13	SS	7									
			14	SS	16									
			15	SS	16									
131.0														
17.4	END OF BOREHOLE AT 17.4m. BOREHOLE OPEN TO 17.40m AND WATER LEVEL AT 2.44m 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) 11-Feb-09 2.02 146.4													

ONTMT4S 6126 GPJ 20/2/09

+³ x³ Numbers refer to 20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C04-C

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 865 081.70 E 338 468.75 ORIGINATED BY ES
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2008.08.21 - 2008.08.21 CHECKED BY DE

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	
147.2	Geodetic											
0.0	TOPSOIL: (75mm)											
0.1	Clayey SILT, some sand, trace rootlets		1	SS	9		147					
146.6	Stiff											
0.6	Dark brown											
	Moist		2	SS	55		146					29 58 12 (SI+CL)
145.9	SAND, some gravel, trace silt											
	Very dense											
1.4	Brown											
	Moist		3	SS	33		145					
	SAND, some silt											
	Dense to compact		4	SS	19		144					0 72 28 (SI+CL)
	Brown											
	Moist		5	SS	21		143					
			6	SS	34		142					
			7	SS	9		141					1 73 26 (SI+CL)
141.2												
6.1	Clayey SILT, some sand, trace gravel		8	SS	15		140					
	Stiff											
	Grey											
	Moist											
139.6												
7.6	SAND and SILT, some clay		9	SS	9		139					
	Loose to Compact											
	Grey											
	Moist											
	(TILL)											
			10	SS	10		138					2 36 43 19

Continued Next Page

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

RECORD OF BOREHOLE No C04-C

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 865 081.70 E 338 468.75 ORIGINATED BY ES
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
DATUM Geodetic DATE 2008.08.21 - 2008.08.21 CHECKED BY DE

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									
							20	40	60	80	100	WATER CONTENT (%)					
							20	40	60	80	100	20	40	60			
134.1	Continued From Previous Page																
	SAND and SILT, some clay Loose Grey Moist (TILL)		11	SS	5												
			12	SS	8												
132.5	Clayey SILT, some sand, trace gravel Very Stiff Grey Moist		13	SS	24												
131.5	SAND and SILT, some clay Dense Grey Moist (TILL)		14	SS	34												
15.7	END OF BOREHOLE AT 15.70m. BOREHOLE OPEN TO 6.10m UPON COMPLETION. Well installation consists of 50.8mm diameter schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 17-Oct-08 1.96 145.2 21-Nov-08 1.29 145.9 06-Jan-09 0.87 146.3 11-Feb-09 0.79 146.4																

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

RECORD OF BOREHOLE No C05-A

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 125.26 E 339 607.98 ORIGINATED BY ES
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
DATUM Geodetic DATE 2008.08.20 - 2008.08.20 CHECKED BY DE

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				
							WATER CONTENT (%)					
							PLASTIC LIMIT w _p NATURAL MOISTURE CONTENT w LIQUID LIMIT w _L					
166.3	Geodetic											
0.0	TOPSOIL: (125mm)											
0.1	Silty SAND, some clay Loose to compact Brown (FILL) Occasional sand layers		1	SS	8		166					
			2	SS	31		165					
164.8												
1.5	SAND and SILT, some clay Compact to Dense Fissured (TILL) Grey		3	SS	44		164					
			4	SS	46		163					
			5	SS	31		162					
			6	SS	36		161					
			7	SS	21		160					
			8	SS	42		159					
			9	SS	44		158					
			10	SS	31		157					

Continued Next Page

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

RECORD OF BOREHOLE No C05-A

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 125.26 E 339 607.98 ORIGINATED BY ES
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2008.08.20 - 2008.08.20 CHECKED BY DE

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			20	40	60	80	100					
Continued From Previous Page																	
155.2	SAND and SILT, some clay Compact to Dense Grey (TILL)		11	SS	45		156										
11.1	END OF BOREHOLE AT 11.13m. Piezometer installation consists of 19mm diameter schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 17-Oct-08 1.17 165.1 21-Nov-08 1.24 165.0 06-Jan-09 2.01 164.3 11-Feb-09 2.09 164.2																

ONTMT4S 6126.GPJ 20/2/09

+ 3 . X 3 : Numbers refer to
Sensitivity

20
15 5
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C05-B

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 102.19 E 339 606.24 ORIGINATED BY SA
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2008.09.03 - 2008.09.03 CHECKED BY DE

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		
171.2	Geodetic													
0.0	ASPHALT: (150mm)													
0.2	SAND and GRAVEL, trace silt Very dense to dense Light brown Moist (FILL)		1	SS	44		171							
169.9			2	SS	35		170							
1.3	Silty SAND, some gravel, trace clay Compact to loose Light brown to brown Slight petroleum odour Moist (FILL)		3	SS	20		169							10 53 28 9
			4	SS	5		168							
			5	SS	4		167							
	Compact		6	SS	10		166							2 40 38 20
			7	SS	11		165							
166.0							164							
5.2	SAND and SILT, some clay Dense to Compact Grey Moist (TILL)		8	SS	35		163							
			9	SS	24		162							3 39 38 19
			10	SS	21									

Continued Next Page

+ 3 . X 3 : Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

METRIC[illegible]

+ 3, × 3 Numbers refer to Sensitivity

ONTMT4S 6126.GPJ 20/2/09

RECORD OF BOREHOLE No C05-C

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 075.46 E 339 629.33 ORIGINATED BY ES
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2008.08.21 - 2008.08.21 CHECKED BY DE

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									WATER CONTENT (%)		
								○ UNCONFINED		+ FIELD VANE									
								● QUICK TRIAXIAL		× LAB VANE									
167.8	Geodetic						20	40	60	80	100								
0.0	TOPSOIL: (100mm)																		
0.1	Sandy SILT, trace gravel, trace rootlets Loose Dark Brown Wet		1	SS	3								○						
			2	SS	4								○						
	Dense to Compact		3	SS	33								○			0 25 63 12			
			4	SS	24								○						
164.9																			
2.9	SAND and SILT, some clay Compact to Dense Grey Moist (TILL)		5	SS	16								Φ-1			8 41 35 16			
	Occasional silty clay nodules		6	SS	37								○						
	Compact		7	SS	29								○						
			8	SS	34								○			8 39 42 11			
			9	SS	29								○						
			10	SS	26								Φ-1			1 41 43 16			

Continued Next Page

+³ ×³ : Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C05-C

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 075.46 E 339 629.33 ORIGINATED BY ES
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2008.08.21 - 2008.08.21 CHECKED BY DE

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 20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE									
156.7	SAND and SILT, some clay Compact to Dense Grey Moist (TILL)		11	SS	27		157										
11.1	END OF BOREHOLE AT 11.13m. BOREHOLE BACKFILLED WITH BENTONITE GROUT TO SURFACE.																

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

RECORD OF BOREHOLE No C07-A

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 865 973.78 E 341 012.70 ORIGINATED BY ES
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
DATUM Geodetic DATE 2008.08.19 - 2008.08.20 CHECKED BY DE

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		
149.3	Geodetic													
0.1	TOPSOIL: (50mm)													
	Silty CLAY, some sand Stiff Dark brown		1	SS	9		149							
			2	SS	6									
	Brown to grey		3	SS	11		148							
147.1														
2.3	Sand and SILT, some clay Compct to Dense Brown to grey (TILL)		4	SS	24		147							
	Occasional silt layers		5	SS	33		146							
			6	SS	30									
	Compact		7	SS	27		145							
							144							
			8	SS	22		143							
							142							
			9	SS	17		141							
							140							
			10	SS	18									

Continued Next Page

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

RECORD OF BOREHOLE No C07-A

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 865 973.78 E 341 012.70 ORIGINATED BY ES
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
DATUM Geodetic DATE 2008.08.19 - 2008.08.20 CHECKED BY DE

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														
	Sand and SILT, some clay Compact Grey (TILL)		11	SS	14										
			12	SS	12										
	Very stiff		13	SS	20										
			14	SS	30										
133.7															
15.7	END OF BOREHOLE AT 15.70m. Piezometer installation consists of 19mm diameter schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 06-Jan-09 +0.75 150.5 11-Feb-09 3.45 145.9														

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

RECORD OF BOREHOLE No C07-B

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 865 956.24 E 341 018.46 ORIGINATED BY SA
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.09.04 - 2008.09.04 CHECKED BY DE

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			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100					
150.9	Geodetic														
0.0	ASPHALT (0.15m)														
0.2	SAND and GRAVEL, trace silt Very Dense Grey Moist (FILL)		1	SS	60										
150.1															
0.8	SAND with some gravel, trace silt, occasional cobbles Very Dense Grey Moist (FILL) Frequent cobbles, occasional sandy silt seams		2	SS	100/ 275		150								
			3	SS	55		149								16 73 12 (SI+CL)
148.6															
2.3	Clayey SILT, trace gravel Stiff Dark Brown Moist Strong Gas Odour (FILL)		4	SS	16		148								
			5	SS	9										
147.0															
3.8	SAND and SILT, some clay Compact Grey Moist (TILL)		6	SS	13		147								3 20 61 16
			7	SS	19		146								
							145								
			8	SS	17		144								
							143								2 34 44 20
			9	SS	10		142								
			10	SS	13		141								

Continued Next Page

+ 3 × 3 Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

ONTMT4S 6126 GPJ 20/2/09

RECORD OF BOREHOLE No C07-B

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 865 956.24 E 341 018.46 ORIGINATED BY SA
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.09.04 - 2008.09.04 CHECKED BY DE

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													
	SAND and SILT, some clay Compact Grey Moist (TILL)		11	SS	6		140							
							139							
			12	SS	5		138							
							137							
			13	SS	49		136							
			14	SS	40									
135.0														
15.8	END OF BOREHOLE AT 15.8m BOREHOLE CAVED TO 7.6m Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 11-Feb-09 3.80 147.1													

+ 3 x 3 Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C07-C

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 865 938.14 E 341 026.53 ORIGINATED BY ES
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2009.01.05 - 2009.01.06 CHECKED BY DE

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 (%)		
149.1	Geodetic						20 40 60 80 100								
0.8	TOPSOIL (25mm)						20 40 60 80 100								
	Sandy SILT, some clay, occasional rootlets Loose to Compact Dark Brown		1	SS	2										
			2	SS	21							12 33 30 26			
			3	SS	10										
			4	SS	12							1 16 54 30			
			5	SS	22										
			6	SS	25										
144.5															
4.6	SAND and SILT, some clay, trace gravel Dense to Very Dense Grey Moist (TILL)		7	SS	37							7 33 30 30			
			8	SS	60										
			9	SS	62										
			10	SS	15							6 45 35 14			
	Compact														

Continued Next Page

+ ³ . X ³ : Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C07-C

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 865 938.14 E 341 026.53 ORIGINATED BY ES
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2009.01.05 - 2009.01.06 CHECKED BY DE

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			20	40	60	80	100					
	Continued From Previous Page																
	SAND and SILT, some clay, trace gravel Very Dense Grey Moist (TILL)		11	SS	41		139										
							138										
			12	SS	25		137										
							136										
134.9			13	SS	42		135										
14.2	END OF BOREHOLE AT 14.2m. WATER LEVEL AT 0.7m BELOW GROUND SURFACE 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) 11-Feb-09 3.13 146.0																

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

RECORD OF BOREHOLE No C11-A

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 230.46 E 341 799.50 ORIGINATED BY SL
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.12.03 - 2008.12.03 CHECKED BY DE

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			20	40	60	80	100					
152.2	Geodetic																
0.0	TOPSOIL: (900 mm)		1	SS	6		152										GR SA SI CL
151.3			2	SS	10		151										
0.9	Sandy SILT, some clay, trace gravel, trace organics Compact Dark Brown to Brown Moist		3	SS	11		150										
			4	SS	16		149										3 36 40 21
			5	SS	13		148										
			6	SS	10		147										
147.6			7	SS	32		146										
4.6	SAND and SILT, some clay, trace gravel Dense Grey Brown Moist (TILL)		8	SS	100		145										2 41 42 14
	Very Dense		9	SS	100/ 0.125		144										
			10	SS	100/ 0.075		143										

Continued Next Page

+ 3 . × 3 : Numbers refer to
Sensitivity

20
15 10 5
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C11-A

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 230.46 E 341 799.50 ORIGINATED BY SL
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.12.03 - 2008.12.03 CHECKED BY DE

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	20	40	60	80					
	Continued From Previous Page															
141.4	SAND and SILT, some clay, trace gravel Dense Grey Brown Moist (TILL)		11	SS	100/		142									
10.8	END OF BOREHOLE AT 10.8m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. Moist to Damp WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 06-Jan-09 0.26 151.9 11-Feb-09 3.80 148.4				0.125											

ONTMT4S 6126.GPJ 20/2/09

RECORD OF BOREHOLE No C11-B

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 210.02 E 341 790.92 ORIGINATED BY SA
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2008.08.28 - 2008.08.28 CHECKED BY DE

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 (%)	
155.3	Geodetic						20	40	60	80	100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L		
0.0	ASPHALT: (150mm)						20	40	60	80	100					GR SA SI CL
0.2	SAND, trace silt Dense to Very Dense Brown Moist Slight hydrocarbon odour (FILL)		1	SS	31											14 70 16 (SI+CL)
			2	SS	82											
153.8																
1.5	Silty SAND, trace gravel Compact Brown Moist (FILL)		3	SS	17											
152.9																
2.4	SAND and SILT, some clay Compact to Loose Brown Grey Mottled Moist (FILL)		4	SS	13											
	Compact		5	SS	6											1 47 37 16
			6	SS	13											
150.6																
4.7	SAND and SILT, some clay Compact Grey Moist (TILL)		7	SS	17											

Continued Next Page

+ ³ × ³ : Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C11-B

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 210.02 E 341 790.92 ORIGINATED BY SA
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2008.08.28 - 2008.08.28 CHECKED BY DE

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						
141.6	SAND and SILT, some clay Compact Grey Moist (TILL)		11	SS	101/ 225								
			12	SS	100/ 175								
13.7	Silty CLAY, trace sand Hard Grey Moist		13	SS	56								
141.0													
14.3	END OF BOREHOLE AT 14.33m. WATER LEVEL AT 4.27m 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) 11-Feb-09 2.03 153.3												

+³ ×³ Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C11-C

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 193.20 E 341 808.98 ORIGINATED BY SU
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.11.25 - 2008.11.25 CHECKED BY DE

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										WATER CONTENT (%)				
								○ UNCONFINED + FIELD VANE														
								● QUICK TRIAXIAL × LAB VANE														
151.7	Geodetic						20	40	60	80	100						GR	SA	SI	CL		
0.0	TOPSOIL (150mm)						20	40	60	80	100											
0.2	Silty CLAY, trace sand, trace roots and rootlets Soft Dark Brown (FILL)		1	SS	3									○								
150.7																						
1.0	PEAT Dark Brown to Black Soft Moist		2	SS	1									○		○						
150.0																						
1.7	SAND and SILT, some clay, trace gravel Compact to Dense Brown to Grey (TILL)		3	SS	18									○								
			4	SS	27									○								
			5	SS	14									○								
			6	SS	42									○								
			7	SS	56									○								
			8	SS	77									○								

Continued Next Page

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

RECORD OF BOREHOLE No C11-C

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 193.20 E 341 808.98 ORIGINATED BY SU
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.11.25 - 2008.11.25 CHECKED BY DE

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			20	40	60	80	100					
	Continued From Previous Page																
140.6	SAND, trace clay, some silt Very Dense Grey Wet		10	SS	100/ 0.225		141										0 78 13 9
11.0	END OF BOREHOLE AT 11.0m. BOREHOLE OPEN TO 9.9m AND WATER LEVEL AT 0.7m UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.2m, THEN CUTTINGS TO SURFACE.																

ONTMT4S 6126 GPJ 20/2/09

+³ X³ : Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C12-A

1 OF 1

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 347.42 E 342 168.44 ORIGINATED BY ES
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
DATUM Geodetic DATE 2008.08.26 - 2008.08.26 CHECKED BY DE

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			20	40	60	80	100					
153.1	Geodetic																
0.0	TOPSOIL: (50mm)																
	Sandy SILT, some clay Loose Dark brown		1	SS	3		153										
			2	SS	7		152										0 36 53 11
151.6																	
1.5	SAND and SILT, some clay Dense to Very Dense Brown (TILL)		3	SS	38		151										7 43 39 11
			4	SS	62												
			5	SS	102/ 225		150										
			6	SS	100/ 200		149										3 43 33 20
			7	SS	100/ 125		148										
			8	SS	100/ 125		147										
							146										
145.3			9	SS	100/ 150												
7.8	END OF BOREHOLE AT 7.77m. BOREHOLE OPEN TO 1.52m AND WATER LEVEL AT 1.27m UPON COMPLETION. Well installation consists of 50.8mm diameter schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 17-Oct-08 0.79 152.3 21-Nov-08 0.62 152.5 06-Jan-09 0.29 152.8 11-Feb-09 1.67 151.4																

ONTMT4S 6126 GPJ 20/2/09

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

RECORD OF BOREHOLE No C12-B

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 334.97 E 342 182.44 ORIGINATED BY SL
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.10.08 - 2008.10.08 CHECKED BY DE

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		
156.3	Geodetic													
0.0	SAND and GRAVEL, trace silt Compact Brown to Grey Moist (FILL)		1	SS	23		156							
			2	SS	26		155							38 46 16 (SI+CL)
154.5	Gravel in spoon tip		3	SS	50/ .150									
1.8	SAND and SILT, some clay, trace gravel Compact Brown Moist (TILL)		4	SS	17		154							7 43 33 17
			5	SS	5		153							
			6	SS	5		152							
			7	SS	24		151							5 48 36 10
			8	SS	50/ .150		150							
			9	SS	50/ .150		149							
			10	SS	82		147							13 49 27 11
	Some gravel													

Continued Next Page



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

RECORD OF BOREHOLE No C12-B

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 334.97 E 342 182.44 ORIGINATED BY SL
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.10.08 - 2008.10.08 CHECKED BY DE

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									
								20	40	60	80						100
Continued From Previous Page							○ UNCONFINED + FIELD VANE				WATER CONTENT (%)						
							● QUICK TRIAXIAL × LAB VANE										
							20	40	60	80	100	20	40	60			
142.5	SAND and SILT, some clay, trace gravel Compact Brown Moist (TILL)		11	SS	50/ .150		146										
			12	SS	50/ .150		145										
							144										
							143										
13.8	END OF BOREHOLE AT 13.8m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 17-Oct-08 4.96 151.3 11-Feb-09 1.88 154.42		13	SS	50/ .150												

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

RECORD OF BOREHOLE No C12-C

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 303.21 E 342 160.71
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers
 DATUM Geodetic DATE 2008.11.26 - 2008.11.26
 ORIGINATED BY SU
 COMPILED BY AN
 CHECKED BY DE

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								WATER CONTENT (%)		
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL						× LAB VANE		
152.0	Geodetic																	
0.0	TOPSOIL (655 mm)		1	SS	3										GR SA SI CL			
151.3																		
0.7	Sandy SILT, some clay Compact Dark Brown Moist		2	SS	14										0 39 49 12			
			3	SS	20													
149.8																		
2.1	SAND and SILT, some clay, trace gravel Very Dense Brown to Grey Moist (TILL)		4	SS	100/ 0.225													
			5	SS	100/ 0.150													
			6	SS	100/ 0.225										4 46 35 15			
			7	SS	100/ 0.200													
			8	SS	100/ 0.225													
			9	SS	100/ 0.125										1 42 37 20			

Continued Next Page

+ 3 × 3 Numbers refer to
Sensitivity 20
15-65
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C12-C

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 303.21 E 342 160.71 ORIGINATED BY SU
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.11.26 - 2008.11.26 CHECKED BY DE

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	20			40	60	80	100						
141.2	Continued From Previous Page SAND and SILT, some clay, trace gravel Very Dense Grey Moist (TILL)		10	SS	1000	0.050												
10.7	END OF BOREHOLE AT 10.7m. BOREHOLE OPEN AND WATER LEVEL AT 1.6m UPON COMPLETION OF DRILLING. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 06-Jan-09 0.36 151.6																	

ONTMT4S 6126.GPJ 20/2/09

+ 3 . X 3

Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C13-A

1 OF 1

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 553.93 E 342 773.42 ORIGINATED BY ES
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
DATUM Geodetic DATE 2008.08.26 - 2008.08.26 CHECKED BY DE

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	20 40 60					
SHEAR STRENGTH kPa								WATER CONTENT (%)							
○ UNCONFINED + FIELD VANE						○ QUICK TRIAXIAL × LAB VANE									
163.1	Geodetic														
0.9	TOPSOIL (50mm)		1	SS	2		163								
	Clayey SILT, some sand, trace rootlets Soft to stiff Dark brown (FILL)		2	SS	8		162							2 27 57 14	
161.6															
1.5	SAND and SILT, some clay, trace gravel Compact to Very Dense Brown Fissured (TILL) Some sand layers		3	SS	10		161							3 42 39 16	
			4	SS	40										
			5	SS	100/ .225		160								
	Grey		6	SS	111		159							3 43 37 17	
	Occasional sand layers		7	SS	105/ .250		158								
156.8			8	SS	110/ .225		157								
6.3	END OF BOREHOLE AT 6.32m. Piezometer installation consists of 19mm diameter schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 21-Nov-08 0.34 162.7 06-Jan-09 Frozen at Ground Surface 11-Feb-09 2.82 160.28														

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

RECORD OF BOREHOLE No C13-B

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 537.64 E 342 769.81 ORIGINATED BY SL
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.09.05 - 2008.10.16 CHECKED BY DE

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			20 40 60 80 100	20 40 60 80 100	20 40 60					
165.3	Geodetic														
0.0	ASPHALT (150mm)														
0.2	SAND and GRAVEL, trace silt Very Dense Grey Moist (FILL)		1	SS	79		165								
			2	SS	28		164								
163.8															
1.5	Sandy SILT, trace gravel Compact Dark Brown Moist (FILL)		3	SS	11		163								
			4	SS	9										
162.0															
3.4	SAND and SILT, some clay Dense to Very Dense Brown to Grey Moist (TILL)		5	SS	12		162								
			6	SS	32		161								
			7	SS	100/ 0.300										
							160								
			8	SS	70/ 0.075		159								
			9	SS	100/ 0.175		158								
							157								
			10	SS	105/ 0.200		156								
	Occasional silty clay seams														

Continued Next Page

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

RECORD OF BOREHOLE No C13-B

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 537.64 E 342 769.81 ORIGINATED BY SL
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.09.05 - 2008.10.16 CHECKED BY DE

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													
	SAND and SILT, some clay Dense to Very Dense Brown to Grey Moist (TILL)		11	SS	100/ 0.150		155							2 45 34 20
			12	SS	100/ 0.125		154							
			13	SS	100/ 0.125		153							3 43 35 19
149.9			14	SS	100/ 0.150		150							
15.4	END OF BOREHOLE AT 15.4m. BOREHOLE OPEN TO 1.2m, WATER LEVEL AT 10.1m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG, MIXED OF AUGER CUTTINGS TO 0.15m THEN ASPHALT TO SURFACE.													

ONTMT4S 6126 GPJ 20/2/09

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

RECORD OF BOREHOLE No C13-C

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 514.41 E 342 778.32 ORIGINATED BY SU
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.11.27 - 2008.11.27 CHECKED BY DE

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		
162.6	Geodetic													
0.0	TOPSOIL (650 mm)		1	SS	9		162							1 45 40 14
161.9														
0.7	SAND and SILT, some clay, trace gravel Loose to Very Dense Grey Brown Mottled Moist (TILL)		2	SS	9		161							
			3	SS	12		160							5 40 33 22
			4	SS	58		159							
			5	SS	100/ 0.200		158							
			6	SS	100/ 0.150		157							
			7	SS	100/ 0.250		156							4 41 34 21
			8	SS	100/ 0.050		155							
153.4			9	SS	100/ 0.075		154							
9.2	END OF BOREHOLE AT 9.2m. BOREHOLE OPEN AND WATER LEVEL AT 8.0m UPON COMPLETION OF DRILLING. Piezometer installation consists of													

Continued Next Page

+ 3 x 3: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

ONTMT4S 6126 GPJ 20/2/09

METRIC

[illegible]

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C17-A

1 OF 1

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 924.46 E 343 836.69 ORIGINATED BY ES
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
DATUM Geodetic DATE 2008.08.28 - 2008.08.28 CHECKED BY DE

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		
170.5	Geodetic													
0.0 0.1	TOPSOIL (75mm)													
	SAND and SILT, trace clay Loose Dark brown (FILL)		1	SS	6		170							1 47 42 9
168.9			2	SS	4		169							
1.5	SAND and SILT, some clay, trace gravel Compact to Very Dense Brown Moist (TILL) Auger grinding		3	SS	13		168							2 42 37 19
			4	SS	103		167							
			5	SS	100/ .125		166							
			6	SS	100/ .150		165							
			7	SS	100/ .025		164							4 47 32 17
			8	SS	100/ .025		163							
162.8			9	SS	100/ .050									
7.7	END OF BOREHOLE AT 7.67m. BOREHOLE OPEN AND DRY UPON COMPLETION. Well installation consists of 50.8mm diameter schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 17-Oct-08 1.48 169.0 21-Nov-08 2.13 168.4 06-Jan-09 4.17 166.3 11-Feb-09 4.22 166.3													

ONTMT4S 6126.GPJ 20/2/09

+³ ×³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C17-B

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 900.36 E 343 828.59 ORIGINATED BY SA
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
DATUM Geodetic DATE 2008.08.26 - 2008.08.26 CHECKED BY DE

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								WATER CONTENT (%)
								○ UNCONFINED + FIELD VANE								
								● QUICK TRIAXIAL × LAB VANE								
175.1	Geodetic						20	40	60	80	100					
0.0	ASPHALT: (150mm)						20	40	60	80	100				kN/m ³	GR SA SI CL
0.2	SAND and GRAVEL, trace silt Very dense to dense Light brown Moist Slight hydrocarbon odour (FILL)		1	SS	65/ .125											
			2	SS	61											
			3	SS	56											13 51 35 (SI+CL)
			4	SS	61											
			5	SS	35											15 47 39 (SI+CL)
171.3			6	SS	9											
3.8	Silty SAND, trace clay Loose Dark brown Moist (FILL)		7	SS	9											3 54 29 13
			8	SS	8											
168.7			9	SS	26											3 35 41 21
6.4	SAND and SILT, some clay Compact to Very Dense Brown Moist (TILL)		10	SS	100/ .125											

Continued Next Page

+ 3, x 3. Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C17-B

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 900.36 E 343 828.59 ORIGINATED BY SA
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
DATUM Geodetic DATE 2008.08.26 - 2008.08.26 CHECKED BY DE

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		
	Continued From Previous Page													
	SAND and SILT, some clay Compact to Very Dense Brown Moist (TILL) Grinding auger	11	SS	90/	.100		165							
	Grinding auger	12	SS	80/	.100		164							4 45 34 17
	Grinding auger	13	SS	60/	.050		163							
	Grinding auger	14	SS	100/	.050		162							
	Grinding auger	15	SS	80/	.075		161							
158.2	END OF BOREHOLE AT 16.84m. BOREHOLE OPEN TO 11.58m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE TO 0.45m THEN BENTONITE GROUT TO SURFACE.						160							
16.8							159							

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

RECORD OF BOREHOLE No C17-C

1 OF 1

METRIC

G.W.P. 2075-08-00 LOCATION N 4 866 873.79 E 343 836.69 ORIGINATED BY JM
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.12.11 - 2008.12.12 CHECKED BY DE

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				
168.9	Geodetic											
0.0	TOPSOIL (130mm)											
0.1	Silty SAND, trace clay, trace gravel Compact Brown Moist		1	SS	14							
			2	SS	4							
							168					1 54 34 11
	Wet		3	SS	13							
			4	SS	14							
							167					
	Grey		5	SS	40							
							166					
165.3												
3.7	SAND and SILT, some clay, trace gravel Very Dense Grey Moist (TILL)		6	SS	100/ 0.075							
			7	SS	100/ 0.100							7 44 32 17
							165					
							164					
			8	SS	100/ 0.075							
							163					
							162					
161.2			9	SS	100/ 0.075							
7.7	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) 06-Jan-09 1.23 167.7 11-Feb-09 1.69 167.2											

ONTMT4S 6126.GPJ 20/2/09

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

RECORD OF BOREHOLE No C18-A

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 867 238.29 E 344 792.20 ORIGINATED BY ES
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.12.01 - 2008.12.01 CHECKED BY DE

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		
146.2	Geodetic												
0.0	TOPSOIL (50mm)												
	Silty SAND, trace clay, trace rootlets		1	SS	7		146						
	Loose												
145.4	Dark Brown												
0.8	Moist												
	Clayey SILT, some sand, trace		2	SS	14		145						
	gravel												
144.9	Stiff												
1.3	Dark Brown												
	SAND and SILT, some clay, trace												
	gravel		3	SS	17								
	Compact to Very Dense												
	Brown												
	Moist												
	(TILL)		4	SS	87		144						6 38 36 21
			5	SS	84		143						
			6	SS	118		142						
			7	SS	131		141						2 36 41 21
			8	SS	158/ 0.275		140						
							139						
138.6													
7.6	SAND, some silt, trace gravel		9	SS	157		138						11 68 20 (SI+CL)
	Very Dense												
	Grey												
	Moist												
							137						
136.7			10	SS	125/ 0.225								
9.4	SAND and SILT, some clay, trace												
	gravel												
	Very Dense												

Continued Next Page

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

ONTMT4S 6126 GPJ 20/2/09

RECORD OF BOREHOLE No C18-A

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 867 238.29 E 344 792.20 ORIGINATED BY ES
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.12.01 - 2008.12.01 CHECKED BY DE

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					
	Continued From Previous Page																
135.4	SAND and SILT, some clay, trace gravel Very Dense Grey Moist (TILL)		11	SS	100/		136										
10.8	END OF BOREHOLE AT 10.8m. WATER LEVEL AT 2.4m UPON COMPLETION OF DRILLING. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 06-Jan-09 1.31 144.9 11-Feb-09 1.23 145.0				0.100												

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

RECORD OF BOREHOLE No C18-B

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 867 225.64 E 344 803.34 ORIGINATED BY ES
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
DATUM Geodetic DATE 2008.08.11 - 2008.08.11 CHECKED BY DE

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		
147.8	Geodetic													
0.0	ASPHALT (100mm)													
0.1	SAND and GRAVEL, trace silt Dense Brown Moist (FILL)		1	SS	30		147							15 69 16 (SI+CL)
146.7			2	SS	32									
1.1	Silty SAND, trace clay, trace gravel Compact to Loose Dark brown with grey striations Moist (FILL)		3	SS	18		146							9 62 20 9
			4	SS	4		145							
			5	SS	7		144							
143.9	SAND and SILT, some clay, trace gravel Compact to Very Dense Grey (TILL)		6	SS	13		143							
4.0			7	SS	80		142							
			8	SS	93		141							3 41 35 21
			9	SS	82		140							1 36 37 26
			10	SS	178/ 275		139							
							138							

Continued Next Page

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

RECORD OF BOREHOLE No C18-B

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 867 225.64 E 344 803.34 ORIGINATED BY ES
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2008.08.11 - 2008.08.11 CHECKED BY DE

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							
								20 40 60 80 100					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT w _p w w _L		
								20 40 60 80 100					WATER CONTENT (%) 20 40 60		
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+ 3 . X 3 : Numbers refer to
Sensitivity 20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C18-C

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 867 191.33 E 344 806.77 ORIGINATED BY LH
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.12.09 - 2008.12.09 CHECKED BY DE

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							
144.9	Geodetic							20 40 60 80 100							
0.0	TOPSOIL (600mm)		1	SS	6			○ UNCONFINED + FIELD VANE							
144.3								● QUICK TRIAXIAL × LAB VANE							
0.6	SAND, trace silt Loose Dark Brown Moist		2	SS	9		144								
143.4															
1.5	SAND and SILT, some clay, trace gravel Dense to Very Dense Grey Moist (TILL)		3	SS	33		143								
			4	SS	100/ 0.250		142								5 37 41 17
			5	SS	100/ 0.100										
			6	SS	100/ 0.250		141								
			7	SS	100/ 0.250		140								
			8	SS	100/ 0.150		139								1 46 40 12
			9	SS	100/ 0.050		137								
			10	SS	100/ 0.150		136								3 42 38 17
							135								

Continued Next Page

+ 3 × 3 Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

ONTMT4S 6125.GPJ 20/2/09

RECORD OF BOREHOLE No C18-C

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 867 191.33 E 344 806.77 ORIGINATED BY LH
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.12.09 - 2008.12.09 CHECKED BY DE

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															
134.1	SAND and SILT, some clay, trace gravel Dense to Very Dense Grey Moist (TILL)		11	SS	100/											
10.8	END OF BOREHOLE AT 10.8m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 06-Jan-09 4.32 140.5 11-Feb-09 3.76 141.1				0.100											
						134										

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

RECORD OF BOREHOLE No C19-A

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 867 309.29 E 345 026.88 ORIGINATED BY ES
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2008.08.28 - 2008.08.28 CHECKED BY DE

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		
145.2	Geodetic												
0.0	TOPSOIL: (50mm)		1	SS	5		145						2 27 54 18
144.4	Clayey SILT, some sand Firm Dark brown (FILL)		2	SS	11		144						
0.8	SAND and GRAVEL, trace silt Compact Brown Wet		3	SS	102		143						6 45 35 13
143.4	Silty SAND, some clay, trace gravel Very Dense Brown to Grey Moist (TILL)		4	SS	150/ 225		142						
1.8			5	SS	100/ 200		141						
			6	SS	100/ 200		140						
			7	SS	75		139						7 51 36 7
			8	SS	48		138						
			9	SS	55		137						
			10	SS	49		136						

Continued Next Page

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

ONTMT4S 6126.GPJ 20/2/09

RECORD OF BOREHOLE No C19-A

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 867 309.29 E 345 026.88 ORIGINATED BY ES
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2008.08.28 - 2008.08.28 CHECKED BY DE

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					
	Continued From Previous Page																
134.1	Silty SAND, some clay, trace gravel Very Dense Brown to Grey Moist (TILL)		11	SS	119		135										
11.1	END OF BOREHOLE AT 11.13m. BOREHOLE OPEN TO 6.71m AND WATER LEVEL AT 3.05m UPON COMPLETION. Well installation consists of 50.8mm diameter schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 17-Oct-08 0.44 144.7 21-Nov-08 1.43 143.7 06-Jan-09 1.98 143.2 11-Feb-09 1.57 143.6																

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

RECORD OF BOREHOLE No C19-B

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 867 292.19 E 345 008.98 ORIGINATED BY SA
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2008.08.25 - 2008.08.25 CHECKED BY DE

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			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100					
147.8	Geodetic															
0.0	ASPHALT: (150mm)															GR SA SI CL
0.2	SAND and GRAVEL, trace silt Dense to Compact Brown Moist (FILL)		1	SS	41		147									
			2	SS	32											
	Increasing silt		3	SS	23		146									23 64 13 (SI+CL)
145.2			4	SS	23											
2.6	Silty SAND, some clay, trace gravel Very Dense to Compact Brown Moist (FILL)		5	SS	56/ 200		145									16 50 23 11
	Trace topsoil Trace wood fragments Dark brown		6	SS	13		144									4 65 22 9
143.2																
4.6	Silty SAND, trace clay, trace gravel Very Dense Grey Moist (TILL)		7	SS	51		143									
			8	SS	100/ 300		142									6 57 32 5
							141									
			9	SS	100/ 300		140									
							139									
			10	SS	82		138									

Continued Next Page

+ 3 × 3 Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

METRIC

+ 3, X 3: Numbers refer to Sensitivity

RECORD OF BOREHOLE No C19-C

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 867 272.28 E 345 015.99 ORIGINATED BY ES
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.12.10 - 2008.12.11 CHECKED BY DE

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		
145.3	Geodetic													
0.0	TOPSOIL (100mm)													
0.1	Silty SAND, some clay, trace gravel Loose to Very Dense Brown to Grey Moist (TILL)		1	SS	6		145							
			2	SS	44		144							
			3	SS	41		143							
			4	SS	65		142							2 46 37 15
			5	SS	100/ 0.125		141							
			6	SS	140/ 0.225		140							
			7	SS	72		139							13 50 29 8
			8	SS	140/ 0.250		138							
			9	SS	179/ 0.275		137							4 52 34 10
136.0			10	SS	100/ 0.150									
9.3	END OF BOREHOLE AT 9.3m. BOREHOLE OPEN AND WATER LEVEL AT 0.7m UPON COMPLETION OF DRILLING. Piezometer installation consists of													

Continued Next Page

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

ONTMT4S 6126 GPJ 20/2/09

METRIC

+³, ×³: Numbers refer to Sensitivity

METRIC

[illegible]Continued Next Page

(%) STRAIN AT FAILURE

ONTMT4S 6126.GPJ 20/2/09

RECORD OF BOREHOLE No C20-A

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 867 621.61 E 345 970.34 ORIGINATED BY SL
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.12.04 - 2008.12.04 CHECKED BY DE

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	20	40	60	80					
	Continued From Previous Page															
135.7	SAND and SILT, some clay, trace gravel Very Dense Grey Moist (TILL)		11	SS	100/											
10.8	END OF BOREHOLE AT 10.8m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 06-Jan-09 1.13 145.4 11-Feb-09 0.99 145.5				0.150											

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

RECORD OF BOREHOLE No C20-B

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 867 611.40 E 345 984.33 ORIGINATED BY SA
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2008.08.27 - 2008.08.27 CHECKED BY DE

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			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100					
148.8	Geodetic														
0.0	ASPHALT (100mm)														
0.1	SAND and GRAVEL, trace silt Dense to compact Brown Moist (FILL)		1	SS	41		148								
147.7			2	SS	19										20 65 15 (SI+CL)
1.1	Clayey SILT, some sand, trace gravel Stiff Brown (FILL)		3	SS	10		147								
			4	SS	11		146								
			5	SS	42		145								
144.7			6	SS	28		144								0 29 66 6
4.0	Sandy SILT, trace clay Compact to very dense Brown Moist		7	SS	41		143								
							142								
142.5			8	SS	100/ 300		141								
6.2	SAND and SILT, some clay Very Dense Grey Moist (TILL)		9	SS	100/ .125		140								
			10	SS	163/ .275		139								2 43 37 18

Continued Next Page

+ 3 × 3 Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C20-B

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 867 611.40 E 345 984.33 ORIGINATED BY SA
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2008.08.27 - 2008.08.27 CHECKED BY DE

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		20	40	60	80	100					
	Continued From Previous Page															
	SAND and SILT, some clay Very Dense Grey Moist (TILL)		11	SS	173/ .275	138										
136.5						137										
12.3	END OF BOREHOLE AT 12.27m. BOREHOLE OPEN TO 6.17m 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) 17-Oct-08 3.90 144.9 11-Feb-09 2.23 146.6		12	SS	80/ .075											

+³ ×³ Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

METRIC

ORIGINATED BY SU

COMPILED BY AN

CHECKED BY DE

[illegible]

Continued Next Page

 $+^3, \times^3$

Numbers refer to
Sensitivity

(%) STRAIN AT FAILURE

ONTMT4S 6126.GPJ 20/2/09

RECORD OF BOREHOLE No C20-C

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 867 588.79 E 345 993.40 ORIGINATED BY SU
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.11.28 - 2008.11.28 CHECKED BY DE

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	20 40 60 80 100			20 40 60 80 100	W P	W	W L	WATER CONTENT (%)					
	Continued From Previous Page																	
135.1	SAND and SILT, some clay, trace gravel Very Dense Grey Moist (TILL)																	
10.7	END OF BOREHOLE UPON AUGER REFUSAL AT 10.7m. BOREHOLE OPEN TO 3.9m AND WATER LEVEL AT 2.1m UPON COMPLETION OF DRILLING. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 06-Jan-09 2.42 143.4 11-Feb-09 1.97 143.8						135											

ONTMT4S 6126 GPJ 20/2/09

RECORD OF BOREHOLE No C21-A

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 867 876.70 E 346 701.82 ORIGINATED BY SL
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.12.05 - 2008.12.05 CHECKED BY DE

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		
156.0	Geodetic												
0.0	TOPSOIL (1295mm)		1	SS	2		156						
154.7			2	SS	6		155						
1.3	Silty CLAY, trace gravel, trace sand Very Stiff to Stiff Grey Moist		3	SS	28		154						2 15 42 41
			4	SS	28		153						
			5	SS	14		152						0 10 37 53
			6	SS	10		151						
151.0			7	SS	12		150						
5.1	Sandy SILT, trace clay Compact Grey Brown Wet (TILL)		8	SS	10		149						0 30 61 9
			9	SS	100/ 0.225		148						
	Moist Very Dense		10	SS	100/ 0.075		147						

Continued Next Page

+ 3 x 3 Numbers refer to
Sensitivity

20
15 10 5
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C21-A

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 867 876.70 E 346 701.82 ORIGINATED BY SL
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.12.05 - 2008.12.05 CHECKED BY DE

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			20	40	60	80	100					
	Continued From Previous Page																
145.3	Sandy SILT, trace clay Compact Grey Brown Wet (TILL)		11	SS	1007		146										
10.7	END OF BOREHOLE AT 10.7m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 06-Jan-09 1.59 154.4 11-Feb-09 1.40 154.6				0.075												

ONTMT4S 6126.GPJ 20/2/09

+³ ×³

Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C21-B

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 867 864.07 E 346 694.19 ORIGINATED BY ES
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2008.08.12 - 2008.08.12 CHECKED BY DE

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			WATER CONTENT (%)						
								○	●	+			×	W _P	W	W _L			
159.0	Geodetic						20	40	60	80	100								
0.0	ASPHALT: (100mm)																		
0.1	SAND and GRAVEL, some silt Compact Brown Moist (FILL)		1	SS	17														
			2	SS	17														
157.5																			
1.5	SAND and SILT, some clay Loose to Compact Brown Moist (FILL)		3	SS	7														
			4	SS	13														
			5	SS	12														
154.9			6	SS	45														
4.1	SAND and SILT, some clay, trace gravel Very Dense to Compact Brown Moist (TILL)		7	SS	15														
			8	SS	15														
151.4			9	SS	11														
7.6	Silty SAND, trace clay Compact to Very Loose Brown Moist (TILL)																		
			10	SS	1														

Continued Next Page

+³ ×³: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C21-B

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 867 864.07 E 346 694.19 ORIGINATED BY ES
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY ES
 DATUM Geodetic DATE 2008.08.12 - 2008.08.12 CHECKED BY DE

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 x LAB VANE					WATER CONTENT (%)						
						20 40 60 80 100 20 40 60 80 100					20 40 60						
	Continued From Previous Page																
148.3	Silty SAND, trace clay Compact to Very Loose Brown Moist (TILL)																
10.7	SAND and SILT, some clay, trace gravel Very Dense Grey Moist (TILL)		11	SS	117												
			12	SS	100/ .125												
			13	SS	100/ .115												
143.6			14	SS	100/ .125												
15.4	END OF BOREHOLE AT 15.37m. Piezometer installation consists of 19mm diameter schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 17-Oct-08 0.94 158.1 11-Feb-09 2.62 156.4																

ONTMT4S 6126.GPJ 11/3/09

METRIC

Continued Next Page

+³, ×³: Numbers refer to Sensitivity

RECORD OF BOREHOLE No C21-C

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 867 836.51 E 346 683.89 ORIGINATED BY SL
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.12.02 - 2008.12.02 CHECKED BY DE

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			20	40	60	80	100					
	Continued From Previous Page																
145.0	Silty SAND, trace gravel, trace clay Loose to Compact Grey Wet (TILL)		11	SS	100/												
10.7	END OF BOREHOLE AT 10.7m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 06-Jan-09 3.08 152.7 11-Feb-09 1.73 154.1				0.075												

RECORD OF BOREHOLE No C24-A

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 864 365.31 E 336 284.32 ORIGINATED BY ES
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.12.02 - 2008.12.02 CHECKED BY DE

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		
196.8	Geodetic													
0.0	TOPSOIL (50mm)													
196.2	SILT, some sand, trace roots Loose Dark Brown Moist		1	SS	3									
0.6	Silty SAND, some clay, trace gravel Dense Brown Moist		2	SS	42		196							13 49 23 15
			3	SS	66		195							
			4	SS	47		194							2 43 34 20
	Very Dense		5	SS	118									
			6	SS	100/ 0.150		193							
			7	SS	130/ 0.200		192							
190.7							191							
6.1	SILT, some clay, trace sand Very Dense Brown Damp		8	SS	120/ 0.175									0 3 86 11
			9	SS	126/ 0.200		189							
							188							
	Sand layers		10	SS	135/ 0.225									
							187							

Continued Next Page

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

RECORD OF BOREHOLE No C24-A

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 864 365.31 E 336 284.32 ORIGINATED BY ES
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.12.02 - 2008.12.02 CHECKED BY DE

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			20	40	60	80	100					
	Continued From Previous Page																
185.9	SILT, some clay, trace sand Very Dense Brown Damp		11	SS	127/												
10.9	END OF BOREHOLE AT 10.9m. WATER LEVEL AT 3.3m UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH HOLEPLUG TO SURFACE.				0.225		186										

ONTMT4S 6126.GPJ 20/2/09

RECORD OF BOREHOLE No C24-B

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 864 352.15 E 336 283.15 ORIGINATED BY LH
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.10.24 - 2008.10.24 CHECKED BY DE

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					
198.6	Geodetic						20 40 60 80 100						
0.0	ASPHALT (50mm)		1	AS									
	SAND, some gravel, trace silt Dense Brown Moist (FILL)		2	SS	30								
197.2													
1.3	Silty CLAY, some sand, trace gravel Firm Brown (FILL)		3	SS	8								
			4	SS	48								
195.6													
3.0	Silty SAND, some clay, trace gravel Dense to Very Dense Brown Moist		5	SS	47								
			6	SS	100/ 0.175								3 47 34 17
			7	SS	100/ 0.150								
			8	SS	100/ 0.150								
191.1													
7.5	SILT, some clay, some sand Very Dense Grey Moist		9	SS	100/ 0.125								0 13 70 16
			10	SS	100/ 0.175								

Continued Next Page

+ ³ x ³ Numbers refer to Sensitivity 20 15 10 5 0 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C24-B

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 864 352.15 E 336 283.15 ORIGINATED BY LH
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.10.24 - 2008.10.24 CHECKED BY DE

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													
								20 40 60 80 100													
								20 40 60 80 100													
Continued From Previous Page																					
182.7	SILT, some clay, some sand Very Dense Grey Moist		11	SS	100/ 0.150		188											0 6 86 8			
			12	SS	100/ 0.275		186														
			13	SS	37		185														
15.8	END OF BOREHOLE AT 15.8m. BOREHOLE OPEN AND WATER LEVEL AT 8.4m UPON COMPLETION OF DRILLING. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m)		14	SS	31		183										0 37 56 7				

+ 3 . X 3

Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C24-C

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 864 322.65 E 336 282.08 ORIGINATED BY LH
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.12.02 - 2008.12.08 CHECKED BY DE

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		
196.5	Geodetic												
0.0	TOPSOIL (200mm)												
0.2	Sandy SILT, some clay, trace gravel, trace roots Loose Dark Brown Moist		1	SS	3		196						
	Compact to Very Dense		2	SS	15								
			3	SS	53		195						
			4	SS	102/ 0.200		194						
193.5													
3.0	SAND and SILT, some clay, trace gravel, occasional silt layers Very Dense Grey Moist (TILL) Auger grinding from 3.6 to 3.8m Auger grinding from 4.0 to 4.3m		5	SS	100/ 0.150		193						3 39 37 22
			6	SS	100/ 0.050		192						
			7	SS	100/ 0.100		191						
190.4													
6.1	SILT, some sand, trace clay Very Dense Grey Moist		8	SS	149		190						
			9	SS	145		189						0 13 80 7
			10	SS	138/ 0.200		188						
							187						

Continued Next Page

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

RECORD OF BOREHOLE No C24-C

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 864 322.65 E 336 282.08 ORIGINATED BY LH
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.12.02 - 2008.12.08 CHECKED BY DE

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									
185.7	SILT, some sand, trace clay Very Dense Grey Moist		11	SS	123/		186										
10.9	END OF BOREHOLE AT 10.9m. WATER LEVEL AT 2.1m UPON COMPLETION OF DRILLING. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 06-Jan-09 1.77 194.7 11-Feb-09 1.70 194.8				0.200												

ONTMT4S 6126.GPJ 20/2/09

RECORD OF BOREHOLE No C25-A

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 864 492.24 E 336 685.57 ORIGINATED BY LH
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.12.12 - 2008.12.12 CHECKED BY DE

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			
								SHEAR STRENGTH kPa										WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE												
190.7	Geodetic																			
0.0	TOPSOIL (2030mm)		1	SS	6															
			2	SS	7															
			3	SS	6															
188.7																				
2.0	Clayey SILT, some sand, trace rootlets Dark Brown Firm (FILL)		4	SS	7															
187.9																				
2.8	Silty SAND, some clay, trace gravel Compact Light Brown Moist		5	SS	15															
			6	SS	9															
186.2																				
4.6	SAND, some silt Compact to Dense Light Brown Moist		7	SS	15															
			8	SS	82															
							</													

Continued Next Page

+³ ×³ Numbers refer to Sensitivity 20 15 10 5 0 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C25-A

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 864 492.24 E 336 685.57 ORIGINATED BY LH
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.12.12 - 2008.12.12 CHECKED BY DE

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	20			40	60	80	100	20						40
	Continued From Previous Page																		
179.9	Clayey SILT, some sand, trace gravel Light Brown Hard Moist		11	SS	100/														
10.8	END OF BOREHOLE AT 10.8m. WATER LEVEL AT 6.1m UPON COMPLETION OF DRILLING.				0.125														

RECORD OF BOREHOLE No C25-B

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 864 484.67 E 336 689.63 ORIGINATED BY LH
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.10.10 - 2008.10.10 CHECKED BY DE

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			
192.8	Geodetic															
192.8	CONCRETE (150mm)		1	SS	24											
	SAND, some silt, trace clay, trace gravel Compact to Loose Brown Moist (FILL)		2	SS	17											
			3	SS	6											
190.7																
2.1	SAND and SILT, some clay, trace gravel Loose to Compact Grey Moist (TILL)		4	SS	6											
			5	SS	5											
			6	SS	15											
			7	SS	16											
186.7																
6.1	SAND, some silt Very Dense Brown Moist		8	SS	68											
			9	SS	82											
184.3																
8.5	SAND and SILT, some clay, trace gravel Very Dense Grey Moist (TILL)		10	SS	50/ .150											
	</															

Continued Next Page

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

RECORD OF BOREHOLE No C25-B

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 864 484.67 E 336 689.63 ORIGINATED BY LH
HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2008.10.10 - 2008.10.10 CHECKED BY DE

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		20	40	60	80	100					
	Continued From Previous Page															
	SAND and SILT, some clay, trace gravel Very Dense Grey Moist (TILL)		11	SS	50/ .150	182										
						181										
			12	SS	50/ .150	180										
						179										
178.2			13	SS	50/ .150	178										
14.6	SAND, trace silt, trace gravel Very Dense Grey Wet		14	SS	87	177										5 85 9 (SI+CL)
175.8			15	SS	50/ .150	176										
17.0	END OF BOREHOLE AT 16.9m. WATER LEVEL AT 5.4m UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH CUTTINGS AND BENTONITE TO SURFACE.															

+ 3 . X 3

Numbers refer to
Sensitivity

20
15 5
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No C25-C

1 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 864 464.89 E 336 700.74 ORIGINATED BY LH
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.12.01 - 2008.12.02 CHECKED BY DE

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		
193.0	Geodetic													
189.8	TOPSOIL (50mm)		1	SS	18		193							
	SAND, some silt, trace clay, trace gravel Loose Dark Brown Moist (FILL)		2	SS	9		192							
			3	SS	8		191							
			4	SS	5		190							5 71 19 5
189.6			5	SS	8		189							
3.5	Sandy SILT, trace clay, trace gravel Dark Brown Damp (FILL)		6	SS	8		188							
189.2			7	SS	10		187							
3.8	Sandy SILT, some clay, trace gravel Loose to Compact Brown Moist		8	SS	6		186							
			9	SS	16		185							0 18 73 9
185.4			10	SS	83		184							
7.6	SILT, some sand, some clay Brown Compact Moist													
	Very Dense													

Continued Next Page

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

RECORD OF BOREHOLE No C25-C

2 OF 2

METRIC

G.W.P. 2075-08-00 LOCATION N 4 864 464.89 E 336 700.74 ORIGINATED BY LH
 HWY 7 - Brock Rd. to Hwy 12 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2008.12.01 - 2008.12.02 CHECKED BY DE

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
								SHEAR STRENGTH kPa							WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					w _p w w _L				
Continued From Previous Page								20 40 60 80 100					20 40 60			GR SA SI CL	
182.4	SILT, some sand, some clay Brown Compact Moist						183										
10.7	SAND, some silt Very Dense Brown Moist		11	SS	163/ 0.250		182										
							181										
			12	SS	165/ 0.275												
							180										
179.1			13	SS	165/ 0.250												
14.0	END OF BOREHOLE AT 14.0m. WATER LEVEL AT 6.4M UPON COMPLETION OF DRILLING. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 06-Jan-09 0.52 192.5 11-Feb-09 3.11 189.9																

+ ³ × ³ : Numbers refer to
Sensitivity

20
15
10

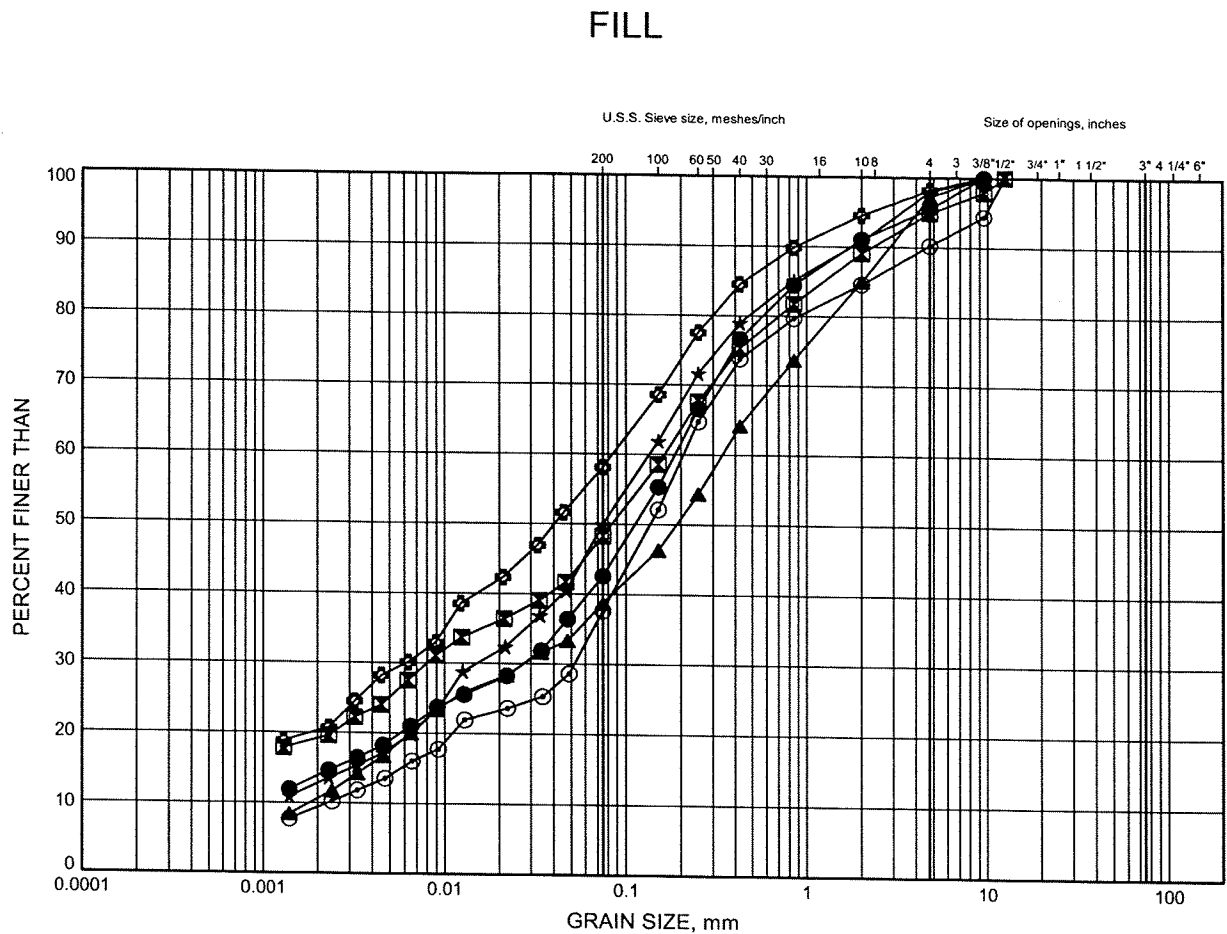
(%) STRAIN AT FAILURE

Appendix B

Laboratory Test Results

Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B1



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

LEGEND

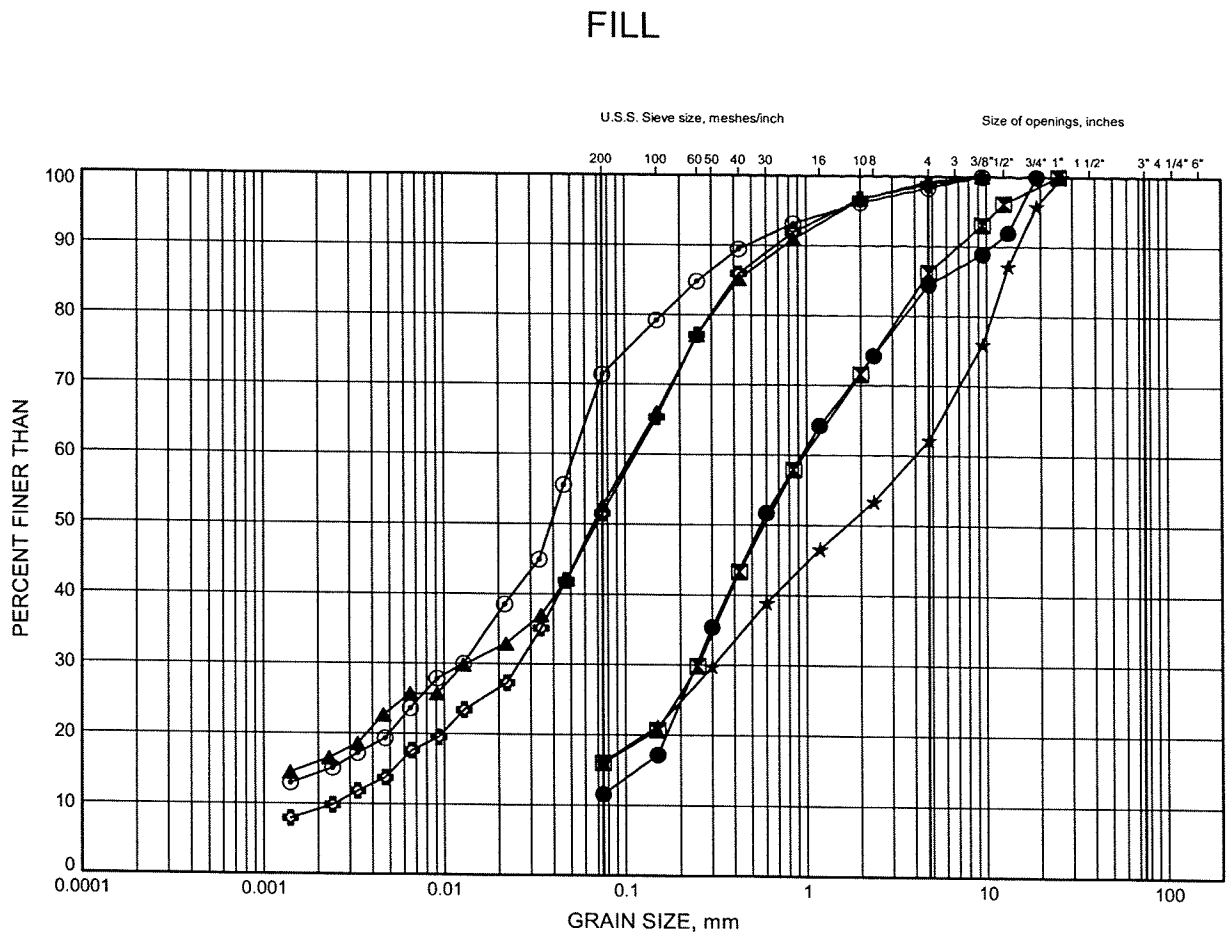
SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C01-A	1.07	159.57
⊠	C01-B	2.59	163.12
▲	C04-B	1.07	147.32
★	C05-A	0.99	165.35
⊙	C05-B	1.83	169.36
⊛	C05-B	4.11	167.07



W.P.# 2075-08-00
Prepared By MFA
Checked By DEE

Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B2



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C07-B	1.83	149.02
⊠	C11-B	0.46	154.87
▲	C11-B	3.35	151.97
★	C12-B	1.07	155.26
⊙	C13-A	1.07	162.04
⊛	C17-A	0.99	169.46

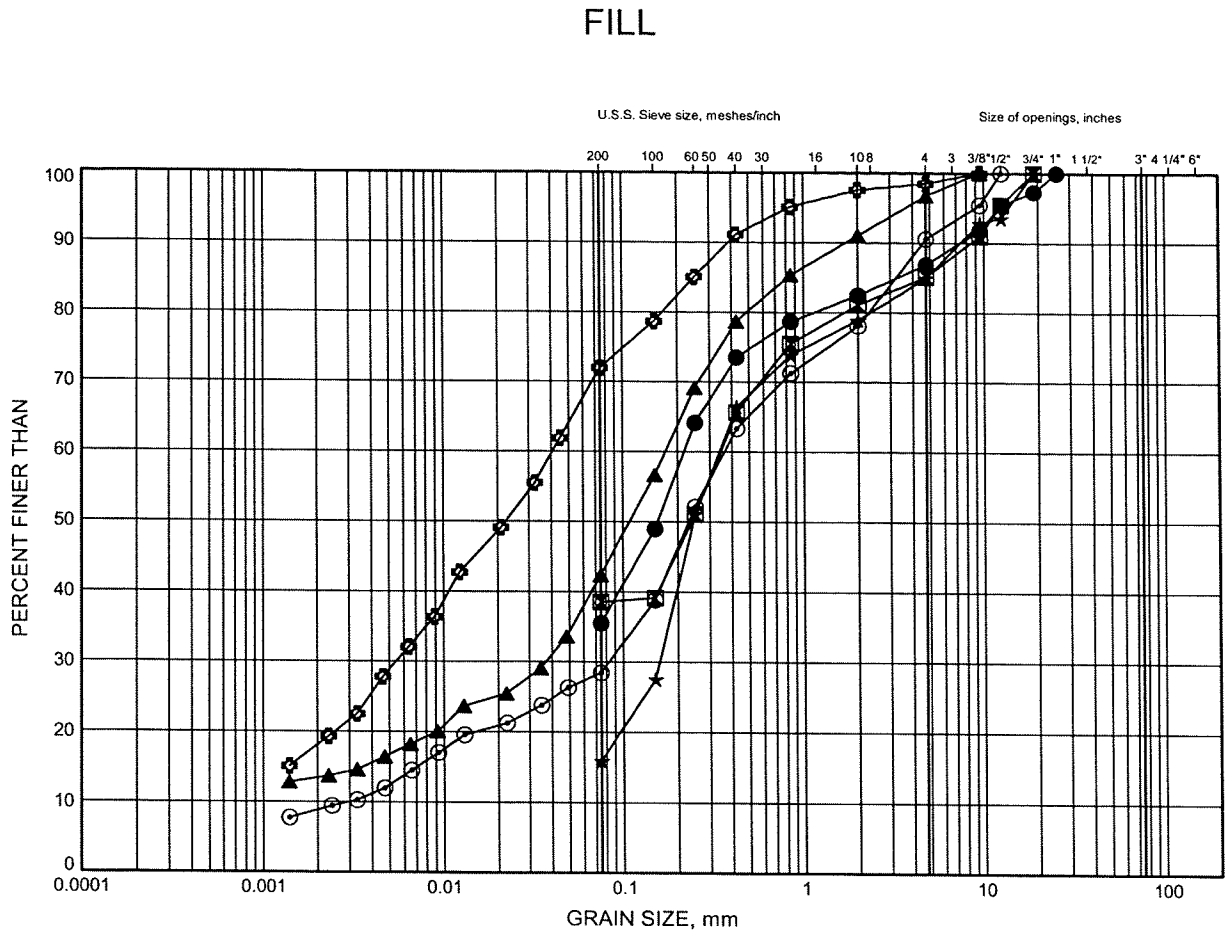
GRAIN SIZE DISTRIBUTION - THURBER 6126.GPJ 2/13/09

W.P.# 2075-08-00.....
Prepared By MFA.....
Checked By DEE.....



Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B3



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C17-B	1.83	173.26
⊠	C17-B	3.35	171.73
▲	C17-B	4.88	170.21
★	C18-B	0.46	147.36
⊙	C18-B	1.83	145.99
⊕	C19-A	0.30	144.89

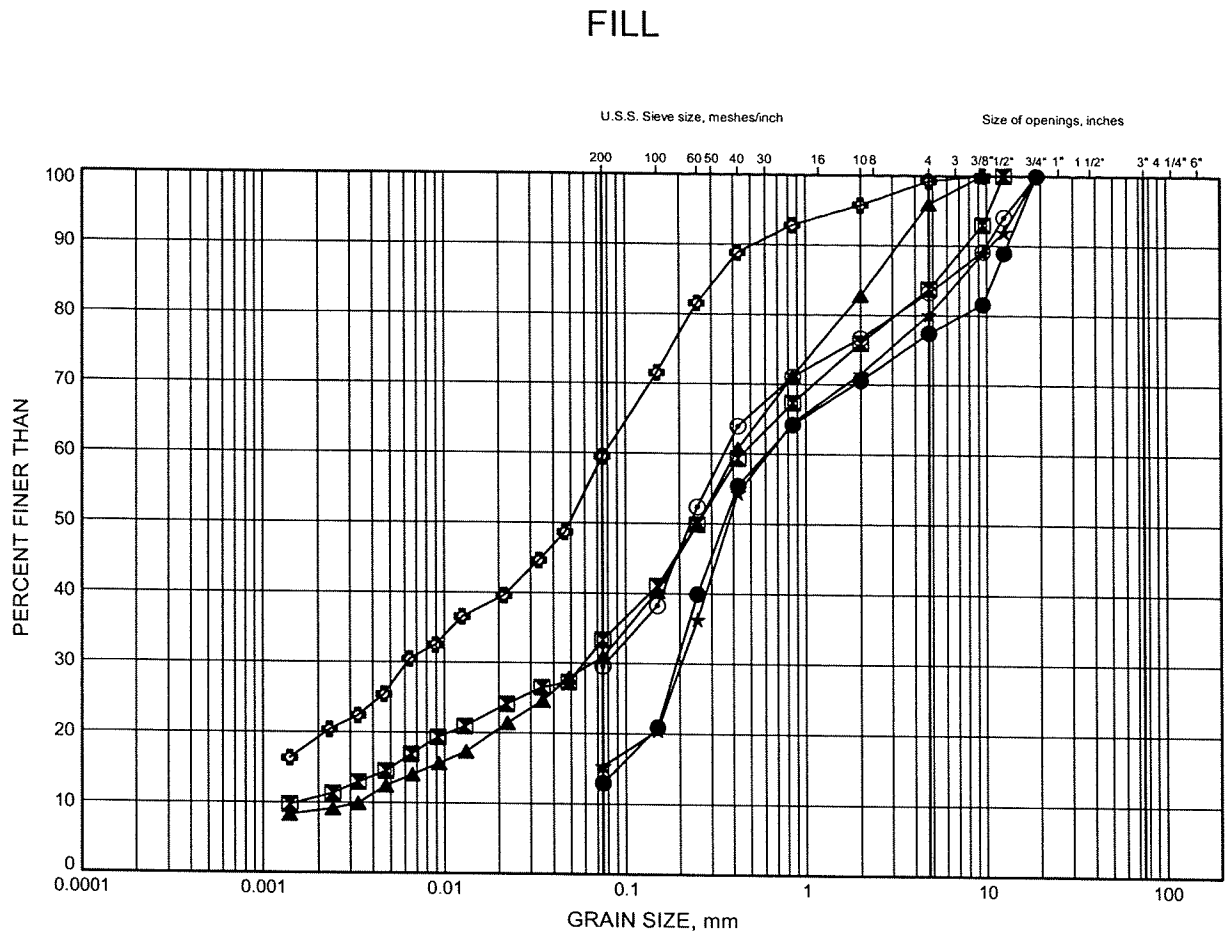
GRAIN SIZE DISTRIBUTION - THURBER 6126.GPJ 2/13/09

W.P.# 2075-08-00.....
Prepared By MFA.....
Checked By DEE.....



Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B4



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C19-B	1.60	146.18
⊠	C19-B	3.35	144.43
▲	C19-B	4.11	143.67
★	C20-B	0.99	147.77
⊙	C21-B	1.07	157.92
⊕	C21-B	3.35	155.63

GRAIN SIZE DISTRIBUTION - THURBER 6126.GPJ 2/13/09

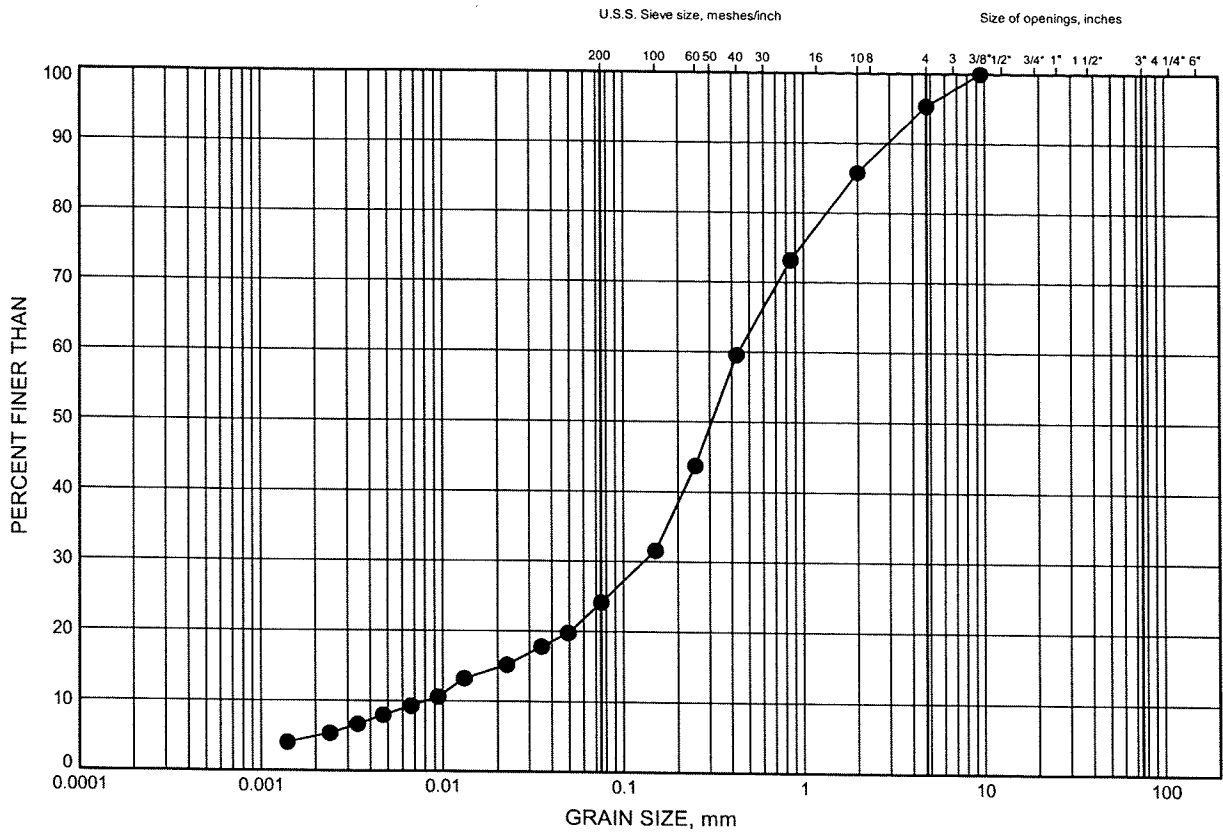
W.P.# 2075-08:00.....
Prepared By MFA.....
Checked By DEE.....



Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B5

FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C25-C	2.59	

GRAIN SIZE DISTRIBUTION - THURBER 6126.GPJ 2/13/09

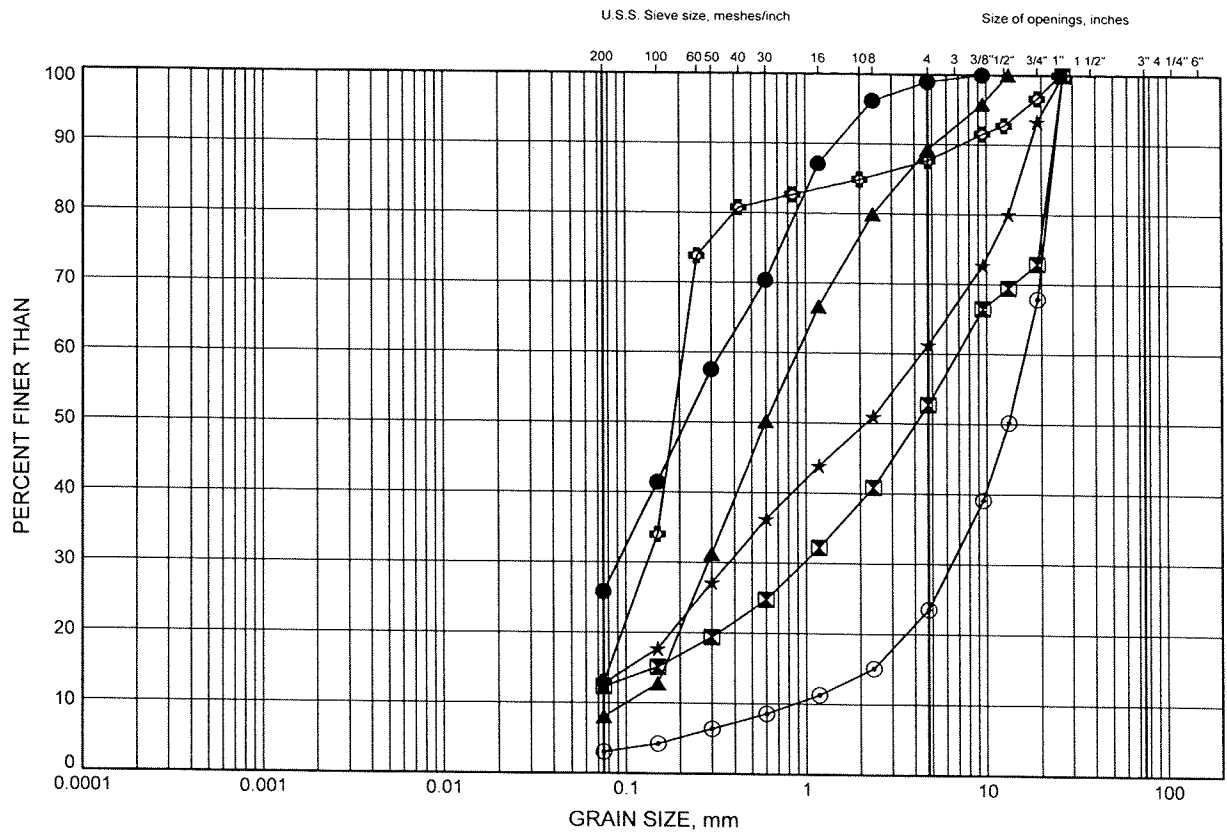
W.P.# 2075-08-00
Prepared By MFA
Checked By DEE



Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B6

SAND, SAND & GRAVEL, SILTY SAND TO SANDY SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C01-A	4.11	156.53
⊠	C01-A	9.45	151.19
▲	C01-B	7.92	157.78
★	C01-C	1.75	158.10
⊙	C01-C	4.80	155.05
⊕	C04-A	3.28	144.28

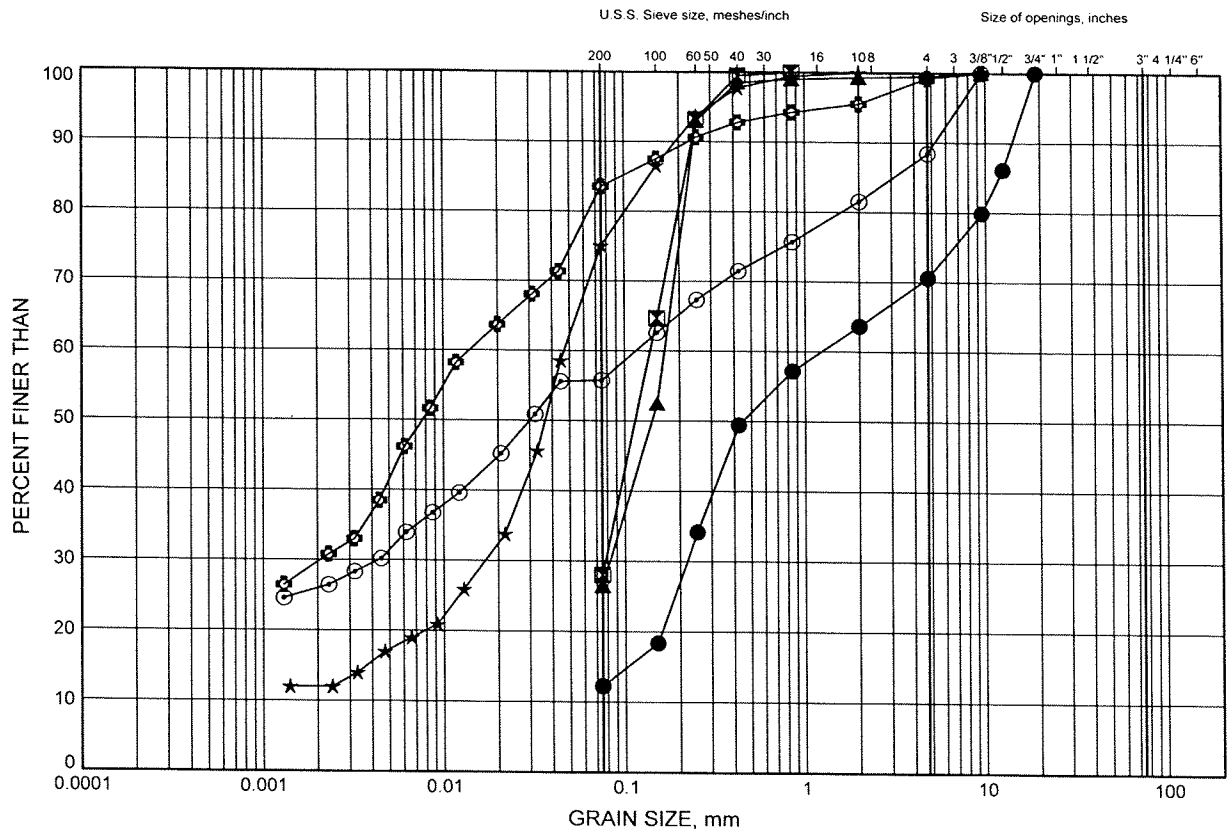


W.P.# 2075-08-00
Prepared By MFA
Checked By DEE

Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B7

SAND, SAND & GRAVEL, SILTY SAND TO SANDY SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C04-C	0.99	146.26
⊠	C04-C	2.59	144.66
▲	C04-C	4.80	142.45
★	C05-C	1.75	166.08
⊙	C07-C	1.07	148.01
⊛	C07-C	2.51	146.56

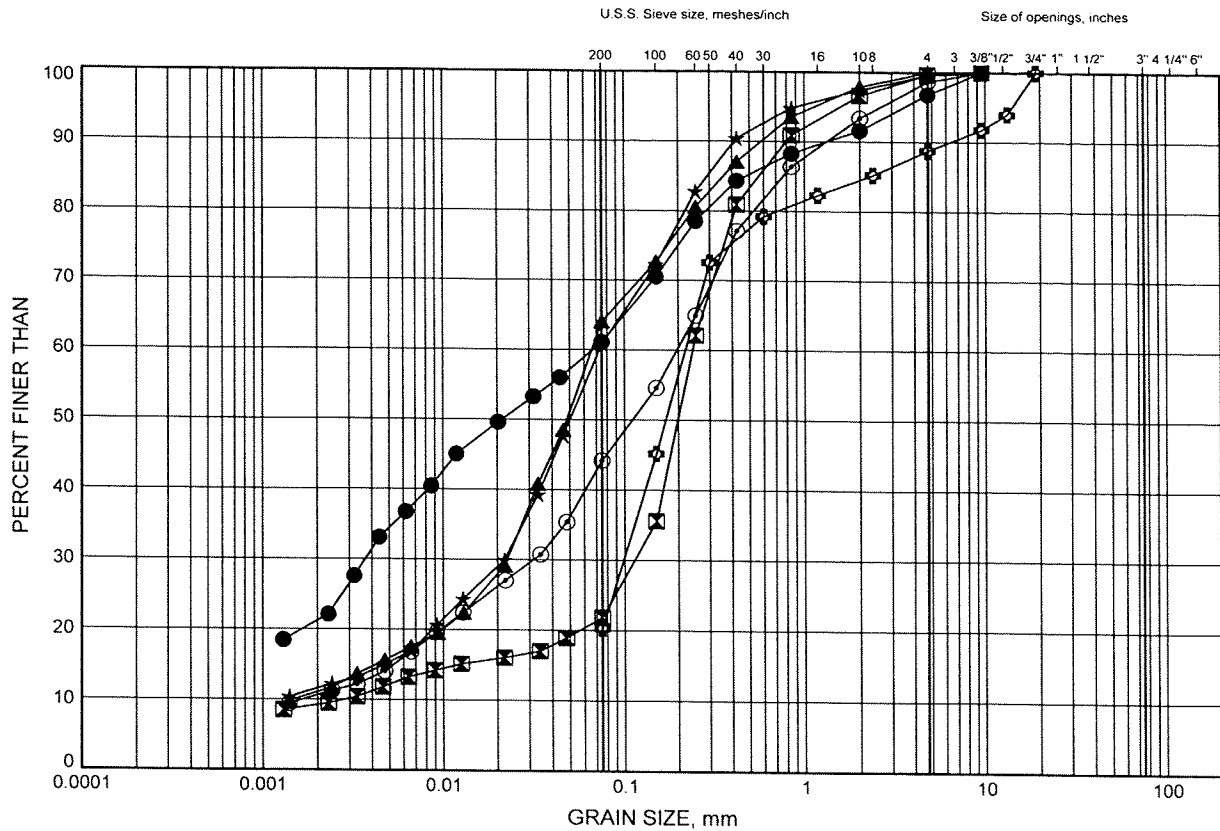


W.P.# 2075-08-00
Prepared By MFA
Checked By DEE

Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B8

SAND, SAND & GRAVEL, SILTY SAND TO SANDY SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C11-A	2.51	149.66
⊠	C11-C	10.82	140.83
▲	C12-A	0.99	152.09
★	C12-C	0.99	150.97
⊙	C17-C	0.99	167.94
⊛	C18-A	7.85	138.32

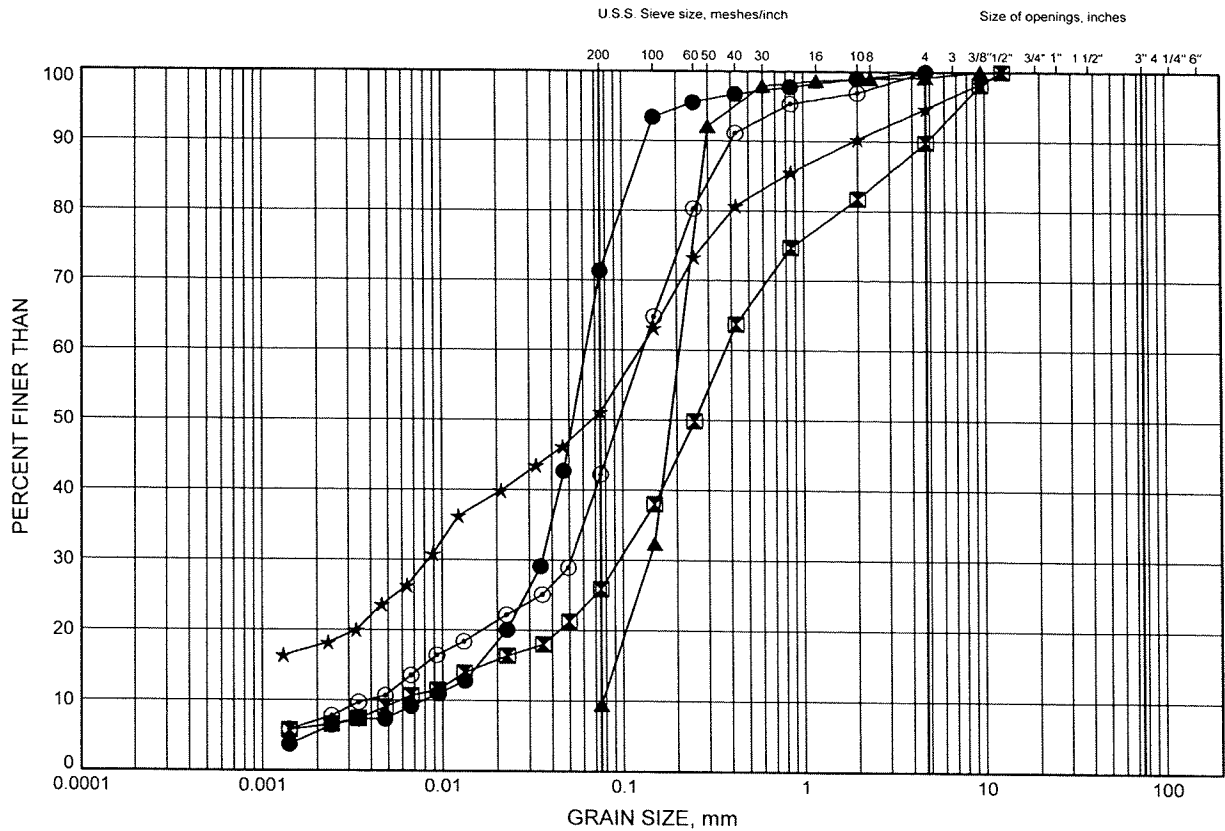


W.P.# 2075-08-00.....
Prepared By MFA.....
Checked By DEE.....

Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B9

SAND, SAND & GRAVEL, SILTY SAND TO SANDY SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C20-B	4.88	143.89
⊠	C20-C	1.75	144.03
▲	C20-C	4.80	140.98
★	C20-C	9.30	136.48
⊙	C21-B	9.45	149.54

GRAIN SIZE DISTRIBUTION - THURBER 6126 GPJ 2/20/09

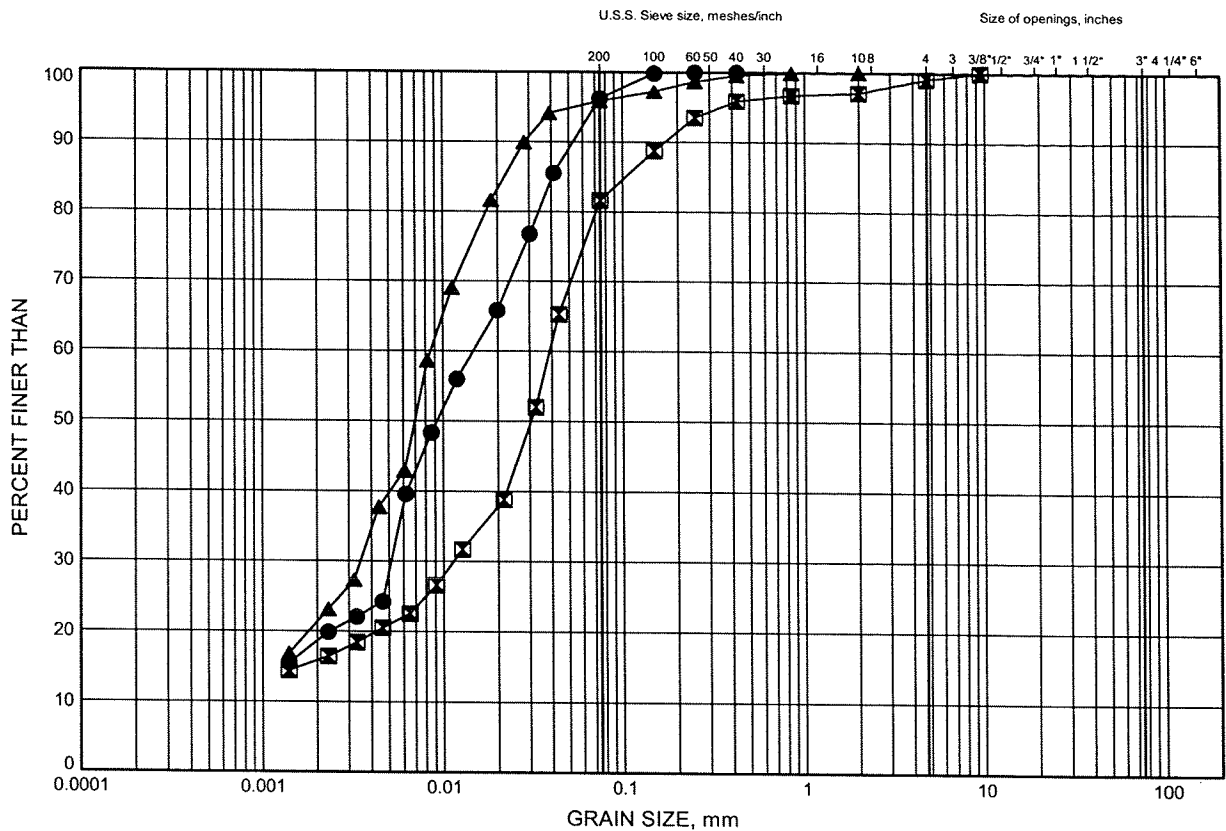
W.P.# 2075-08-00
Prepared By MFA
Checked By DEE



Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B10

SILT TO CLAYEY SILT



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C04-A	6.32	141.24
■	C04-B	6.40	141.98
▲	C04-C	13.94	133.30

GRAIN SIZE DISTRIBUTION - THURBER 6126.GPJ 2/13/09

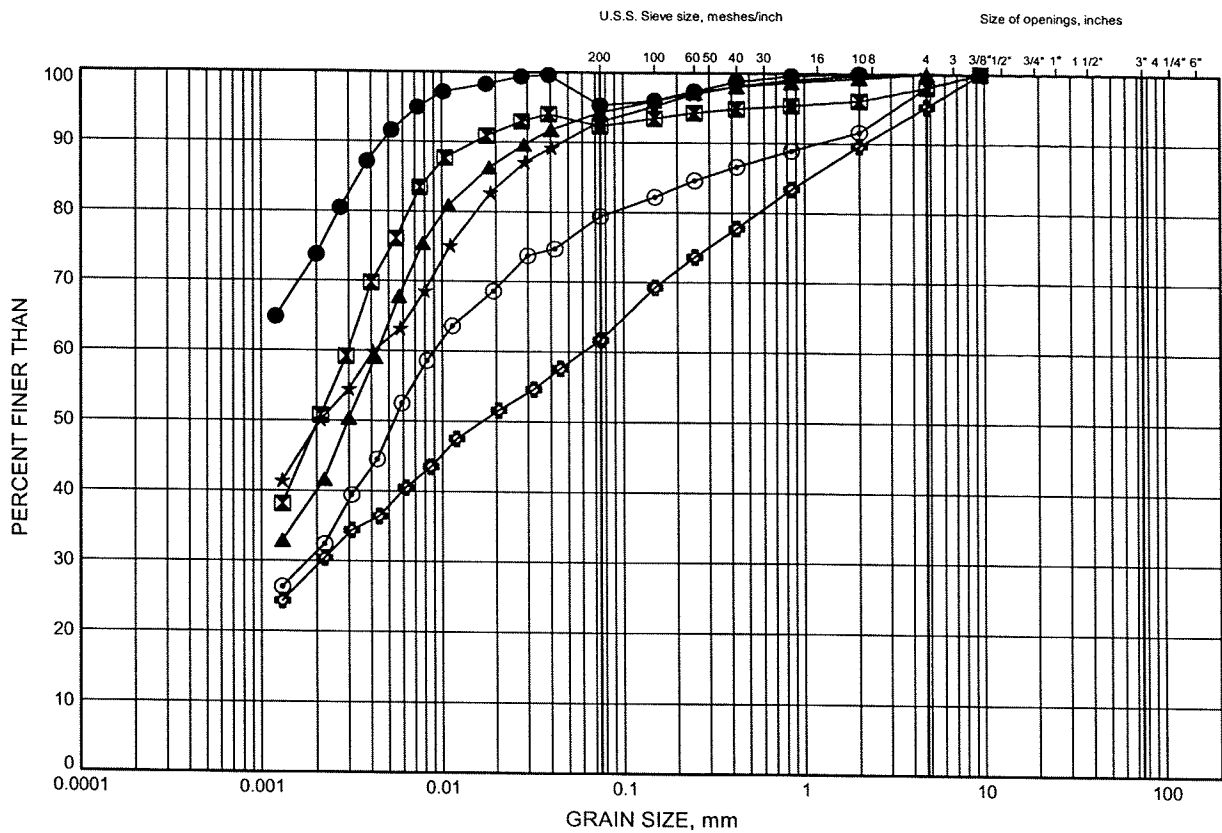
W.P.# 2075-08-00
Prepared By MFA
Checked By DEE



Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B11

SILTY CLAY



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C01-B	12.50	153.21
⊠	C04-A	10.90	136.66
▲	C04-A	13.94	133.62
★	C04-B	9.45	138.94
⊙	C04-B	13.41	134.97
⊗	C05-B	17.07	154.12

GRAIN SIZE DISTRIBUTION - THURBER 6126.GPJ 2/13/09

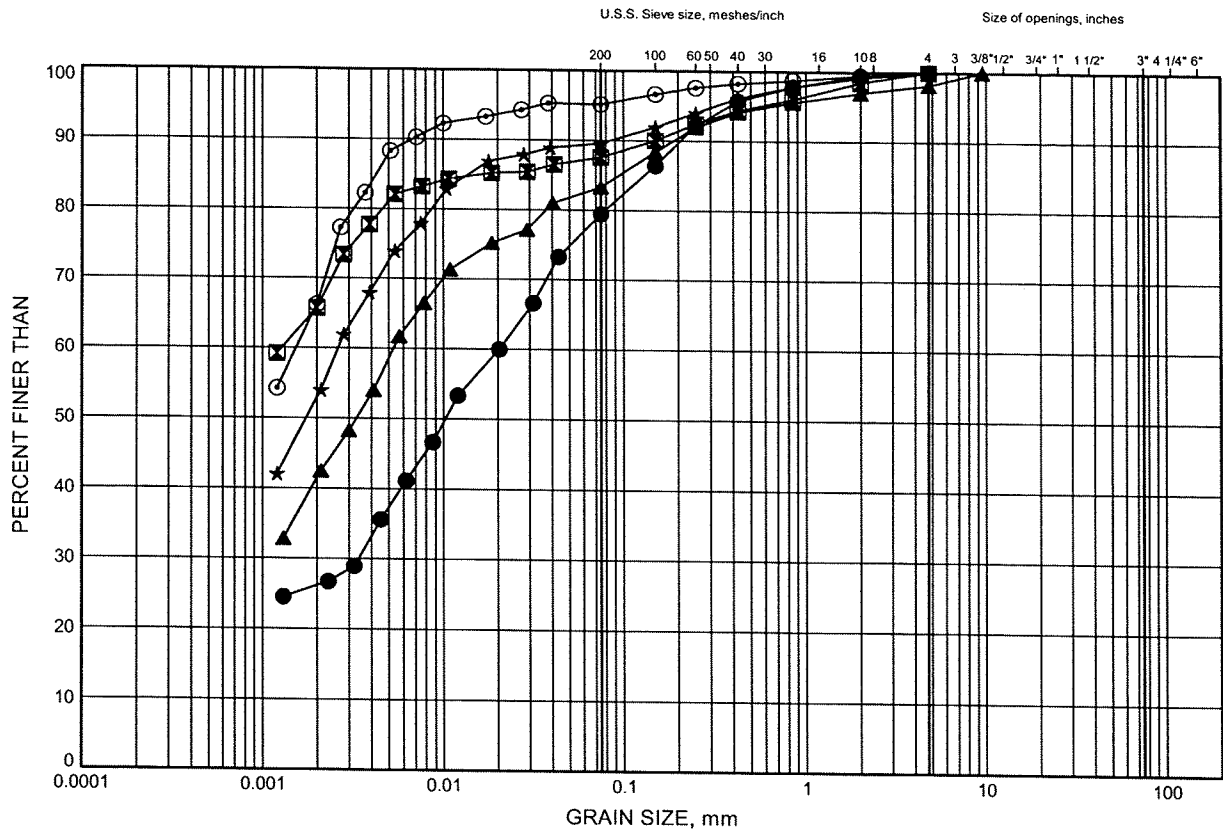
W.P.# 2075-08-00
Prepared By MFA
Checked By DEE



Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B12

SILTY CLAY



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C07-A	1.75	147.60
⊠	C11-B	14.02	141.30
▲	C21-A	1.83	154.21
★	C21-A	3.35	152.68
⊙	C21-C	4.80	150.97

GRAIN SIZE DISTRIBUTION - THURBER 6126.GPJ 2/13/09

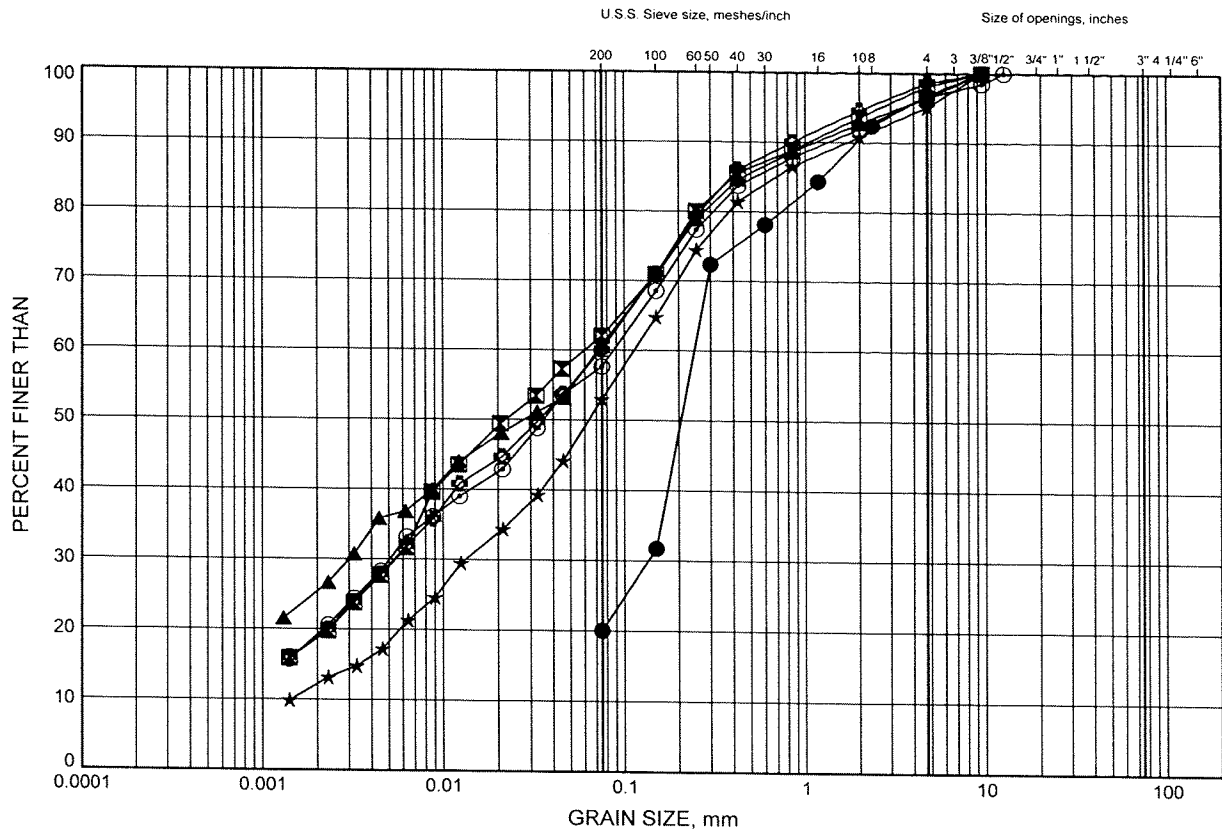
W.P.# 2075-08-00
Prepared By MFA
Checked By DEE



Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B13

SAND & SILT TILL 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)
●	C01-C	6.32	153.53
⊠	C04-C	9.37	137.87
▲	C05-A	2.51	163.83
★	C05-A	6.32	160.02
⊙	C05-B	7.92	163.26
⊕	C05-B	12.50	158.69

GRAIN SIZE DISTRIBUTION - THURBER 6126.GPJ 2/20/09

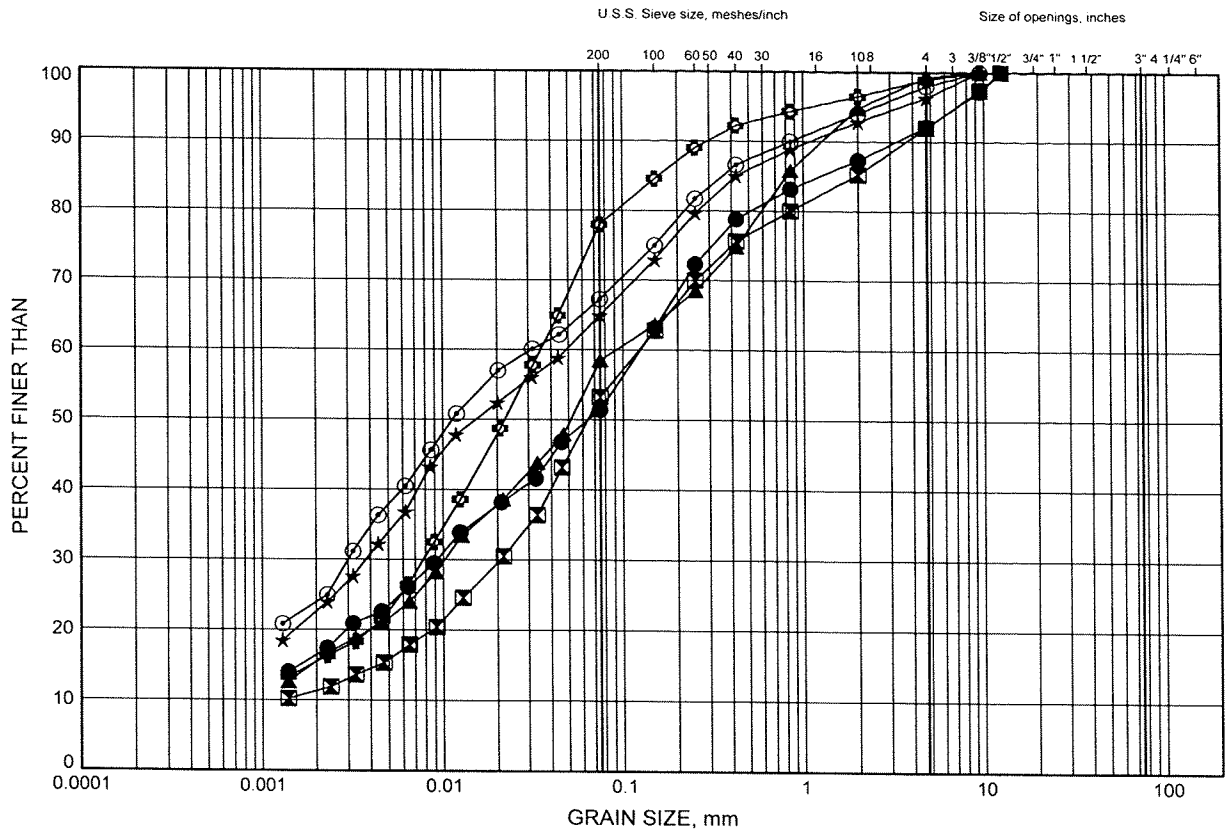
W.P.# 2075-08-00
Prepared By MFA
Checked By DEE



Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B14

SAND & SILT TILL 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)
●	C05-C	3.28	164.56
⊠	C05-C	6.32	161.51
▲	C05-C	9.37	158.46
★	C07-A	3.28	146.07
⊙	C07-A	4.80	144.55
⊗	C07-A	9.37	139.98

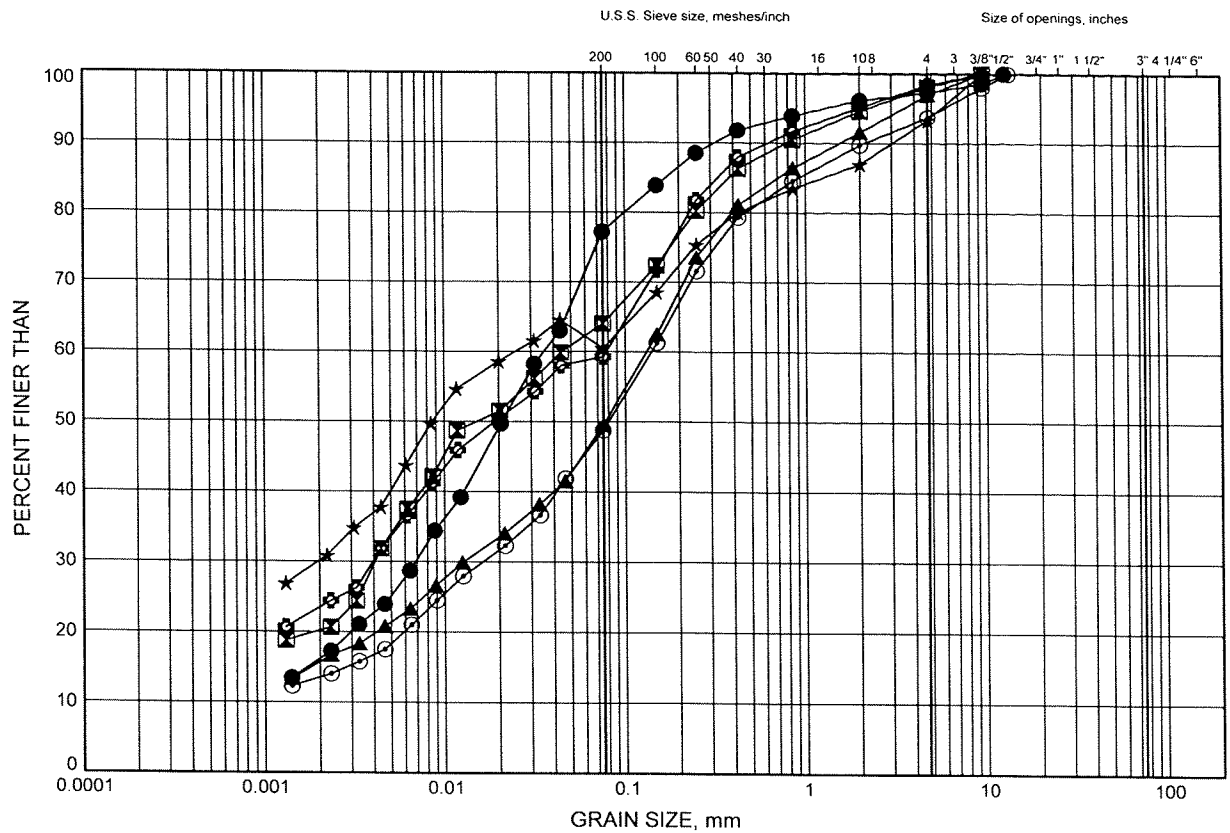


W.P.# 2075-08-00
Prepared By MFA
Checked By DEE

Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B15

SAND & SILT TILL 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)
●	C07-B	4.11	146.74
⊠	C07-B	7.92	142.93
▲	C07-B	12.50	138.36
★	C07-C	6.32	142.75
⊙	C07-C	9.37	139.70
⊗	C07-C	12.42	136.65

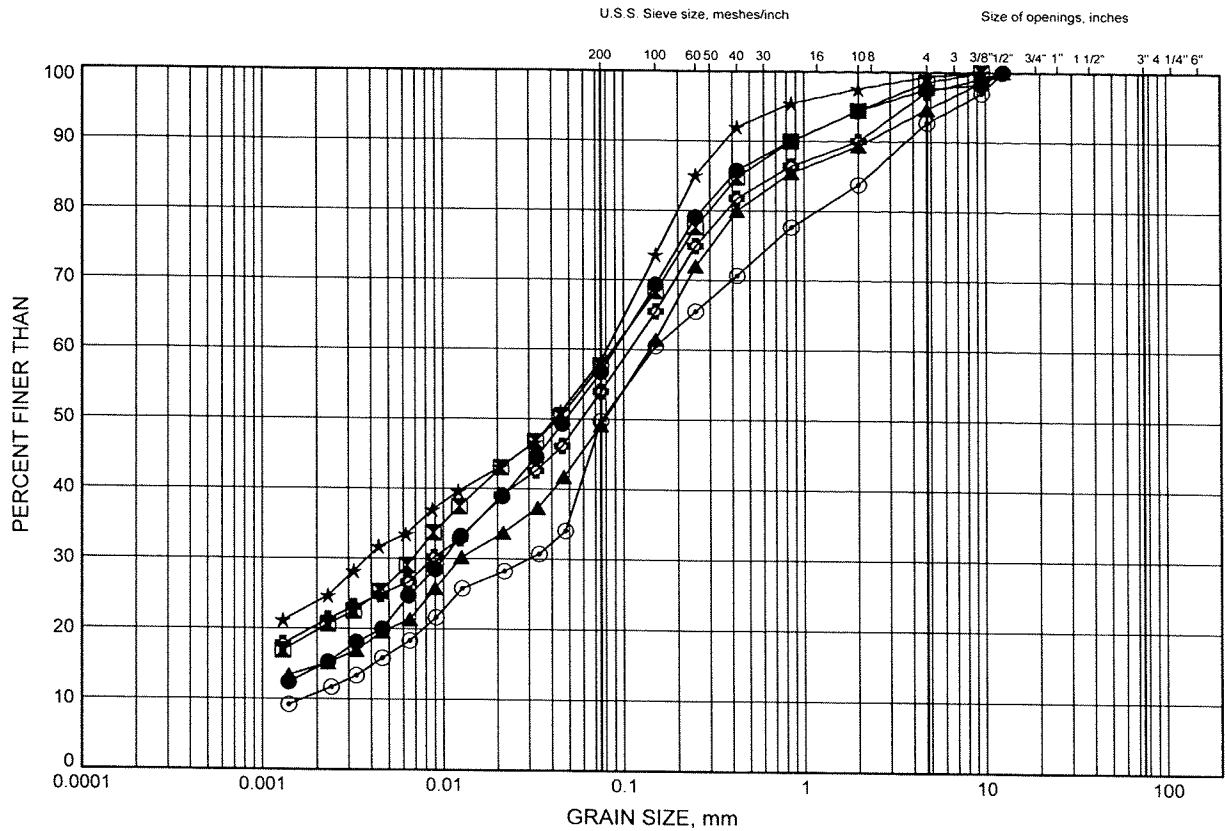


W.P.# 2075-08-00
Prepared By MFA
Checked By DEE

Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B16

SAND & SILT TILL 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)
●	C11-A	6.32	145.85
⊠	C11-B	6.40	148.92
▲	C11-C	3.28	148.38
★	C11-C	7.85	143.81
⊙	C12-A	2.36	150.72
⊛	C12-A	3.91	149.17

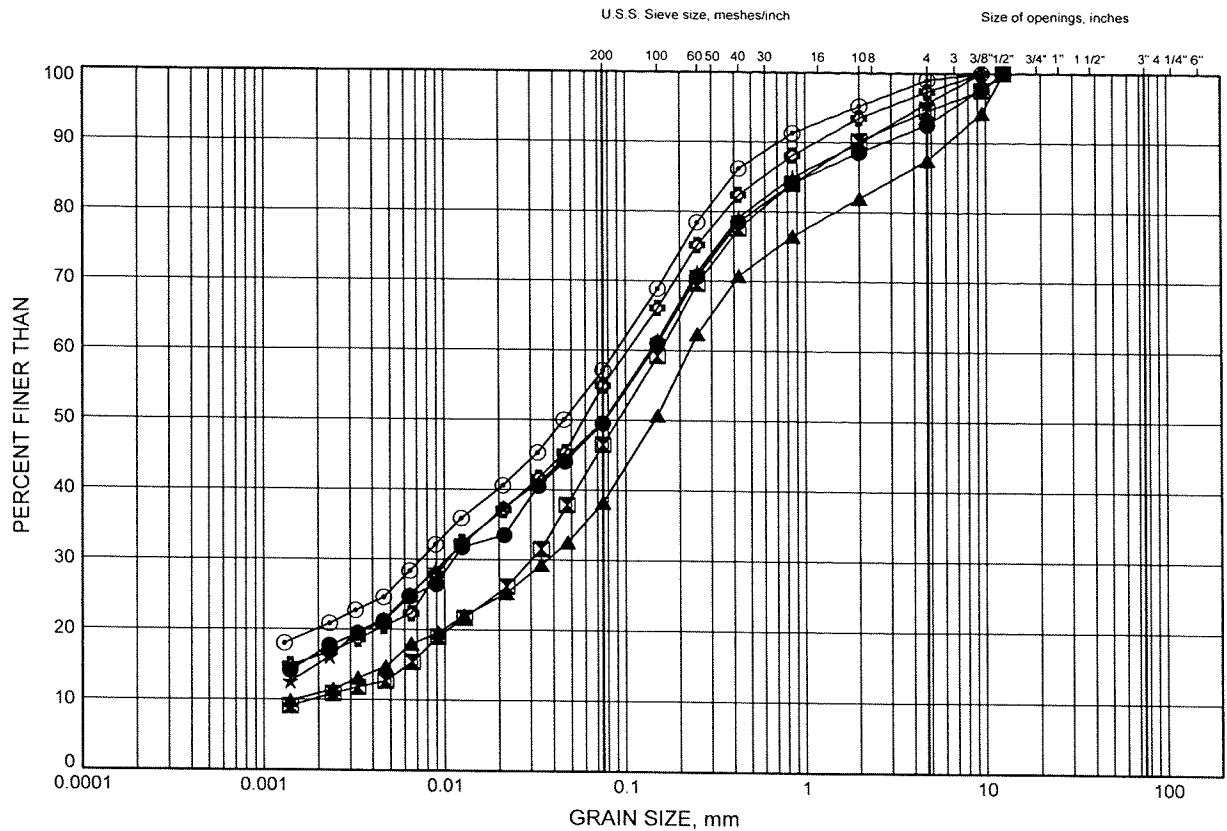


W.P.# 2075-08-00.....
Prepared By MFA.....
Checked By DEE.....

Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B17

SAND & SILT TILL 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)
●	C12-B	2.59	153.73
⊠	C12-B	4.88	151.45
▲	C12-B	9.37	146.95
★	C12-C	4.80	147.16
⊙	C12-C	9.30	142.67
⊛	C13-A	1.83	161.28

GRAIN SIZE DISTRIBUTION - THURBER 6126.GPJ 2/20/09

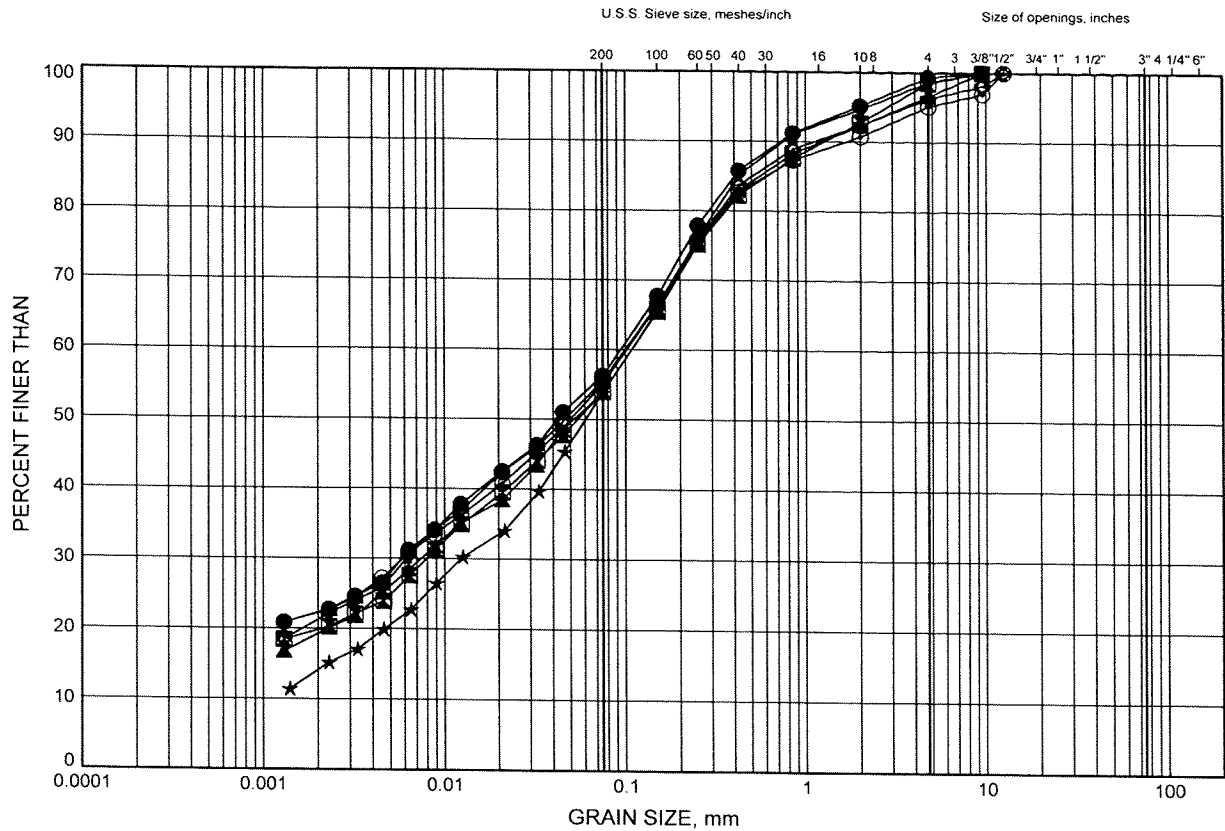
W.P.# 2075-08-00
Prepared By MFA
Checked By DEE



Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B18

SAND & SILT TILL 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)
●	C13-B	4.88	160.44
⊠	C13-B	10.74	154.57
▲	C13-B	13.78	151.53
★	C13-C	0.99	161.59
⊙	C13-C	2.51	160.07
⊕	C13-C	6.30	156.28

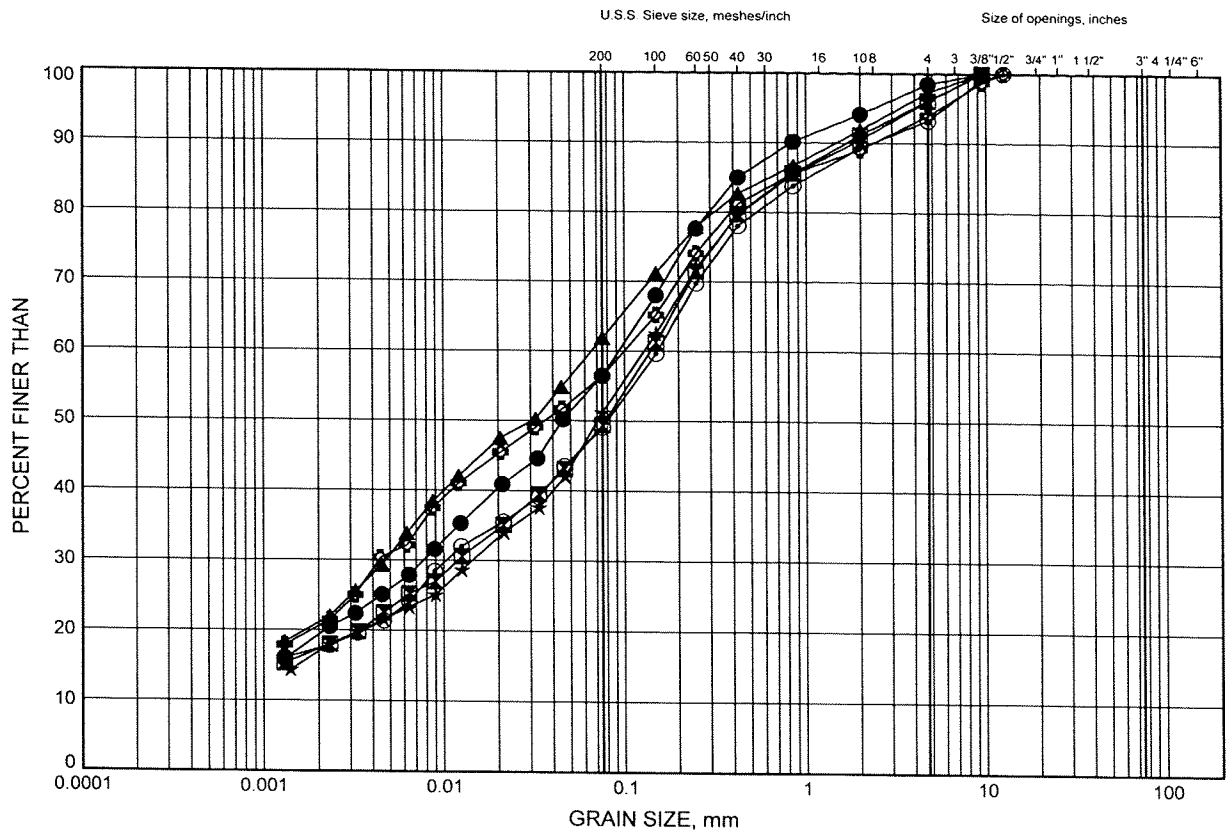


W.P.# 2075-08-00
Prepared By MFA
Checked By DEE

Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B19

SAND & SILT TILL 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)
●	C17-A	2.59	167.86
⊠	C17-A	3.89	166.56
▲	C17-B	7.92	167.16
★	C17-B	10.97	164.11
⊙	C17-C	4.65	164.28
⊛	C18-A	2.51	143.66

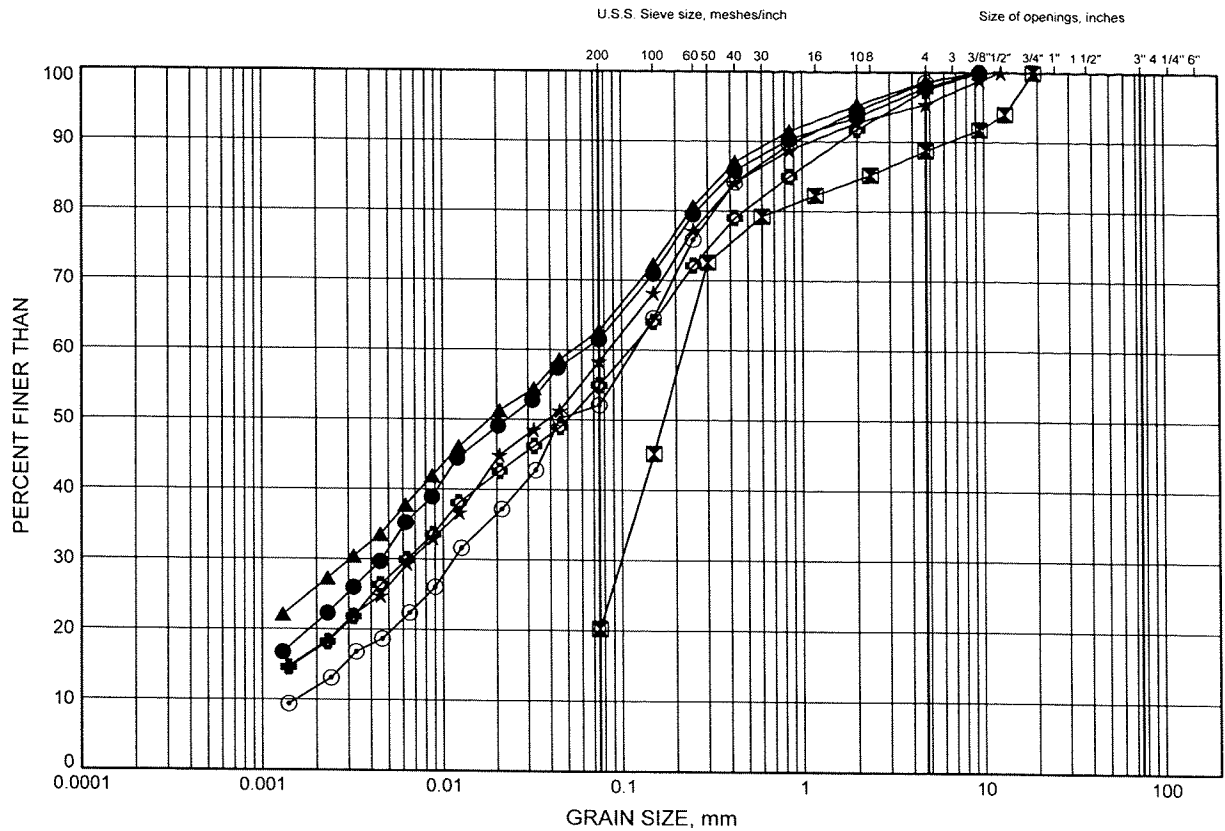


W.P.# 2075-08-00
Prepared By MFA
Checked By DEE

Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B20

SAND & SILT TILL 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)
●	C18-A	4.80	141.37
⊠	C18-A	7.85	138.32
▲	C18-B	7.92	139.89
★	C18-C	2.59	142.31
⊙	C18-C	6.40	138.50
⊛	C18-C	9.45	135.45

GRAIN SIZE DISTRIBUTION - THURBER 6126.GPJ 2/20/09

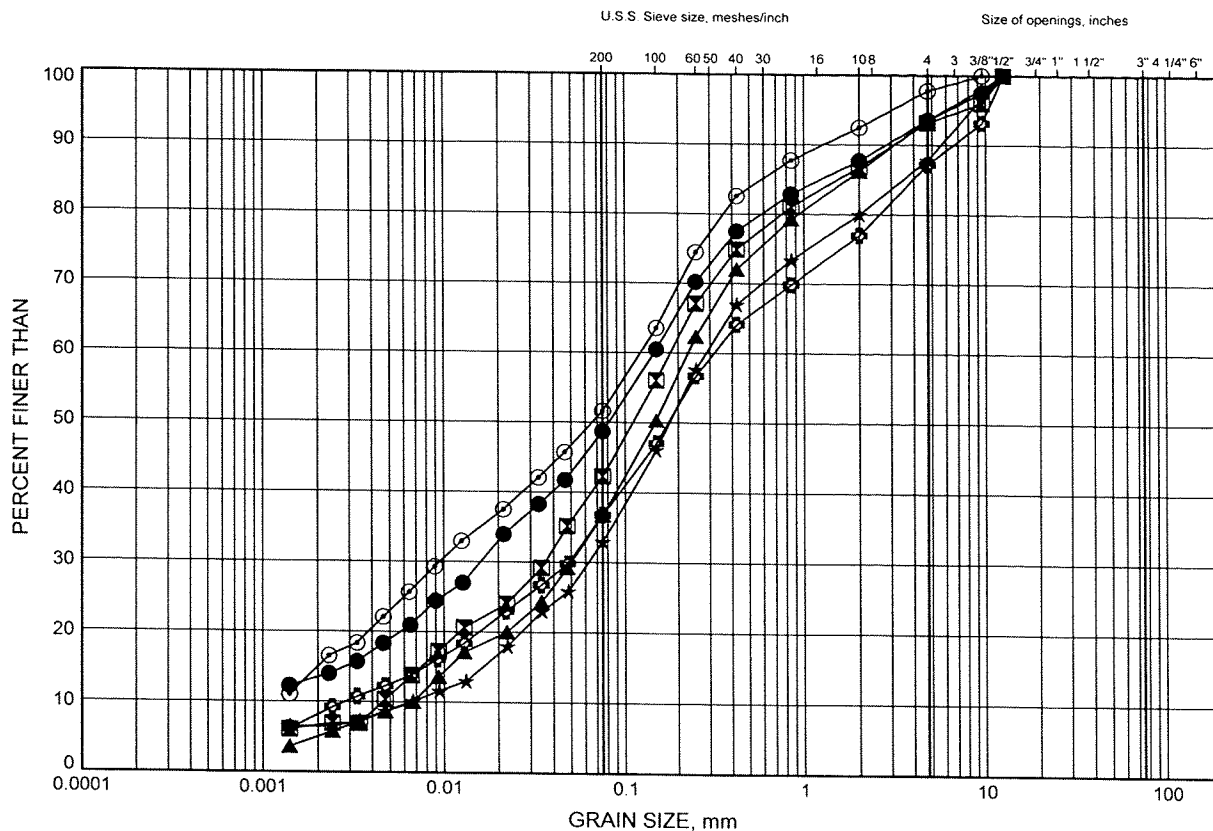
W.P.# 2075-08-00
Prepared By MFA
Checked By DEE



Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B21

SAND & SILT TILL 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)
●	C19-A	2.40	142.79
⊠	C19-A	4.80	140.39
▲	C19-B	6.40	141.38
★	C19-B	10.97	136.81
⊙	C19-C	2.51	142.78
⊛	C19-C	4.80	140.49

GRAIN SIZE DISTRIBUTION - THURBER 6126.GPJ 2/20/09

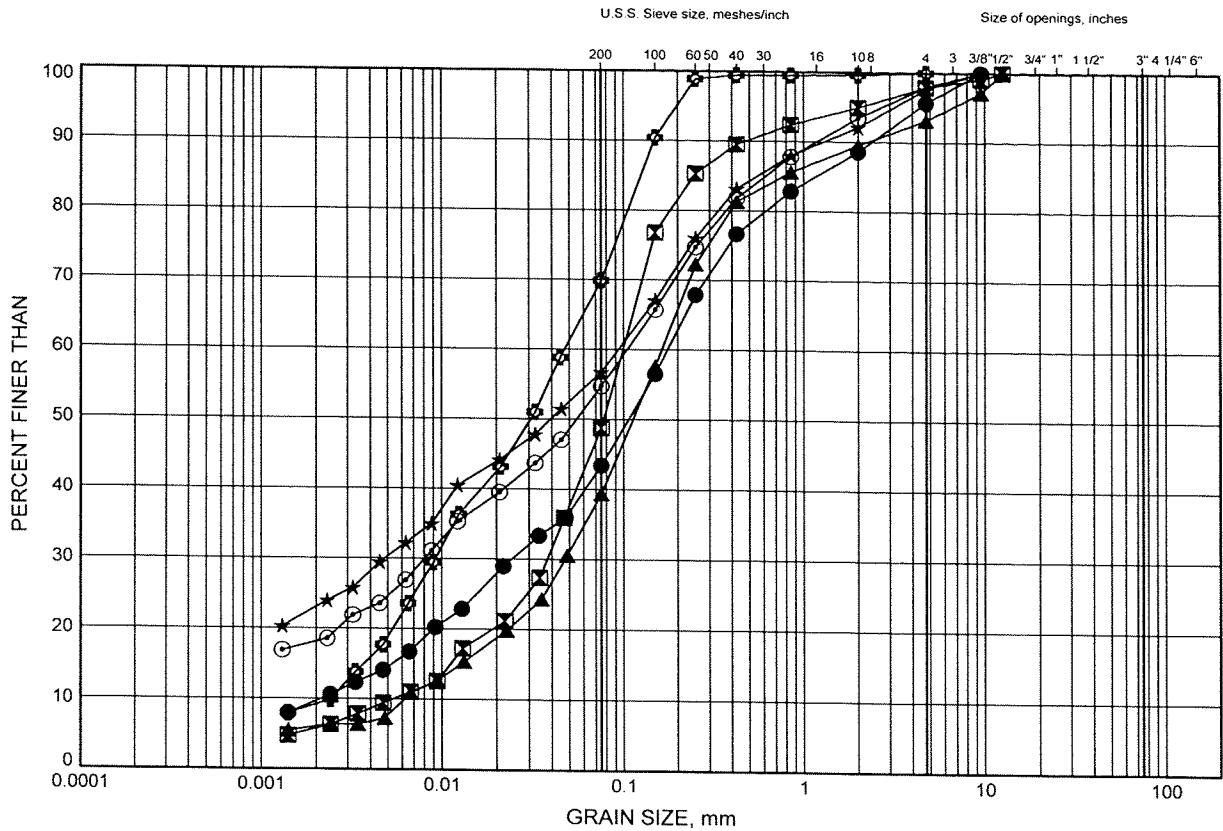
W.P.# 2075-08-00
Prepared By MFA
Checked By DEE



Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B22

SAND & SILT TILL 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)
●	C19-C	7.76	137.53
⊠	C20-A	2.59	143.92
▲	C20-A	4.11	142.39
★	C20-A	7.70	138.81
⊙	C20-B	9.45	139.32
⊛	C21-A	6.40	149.64

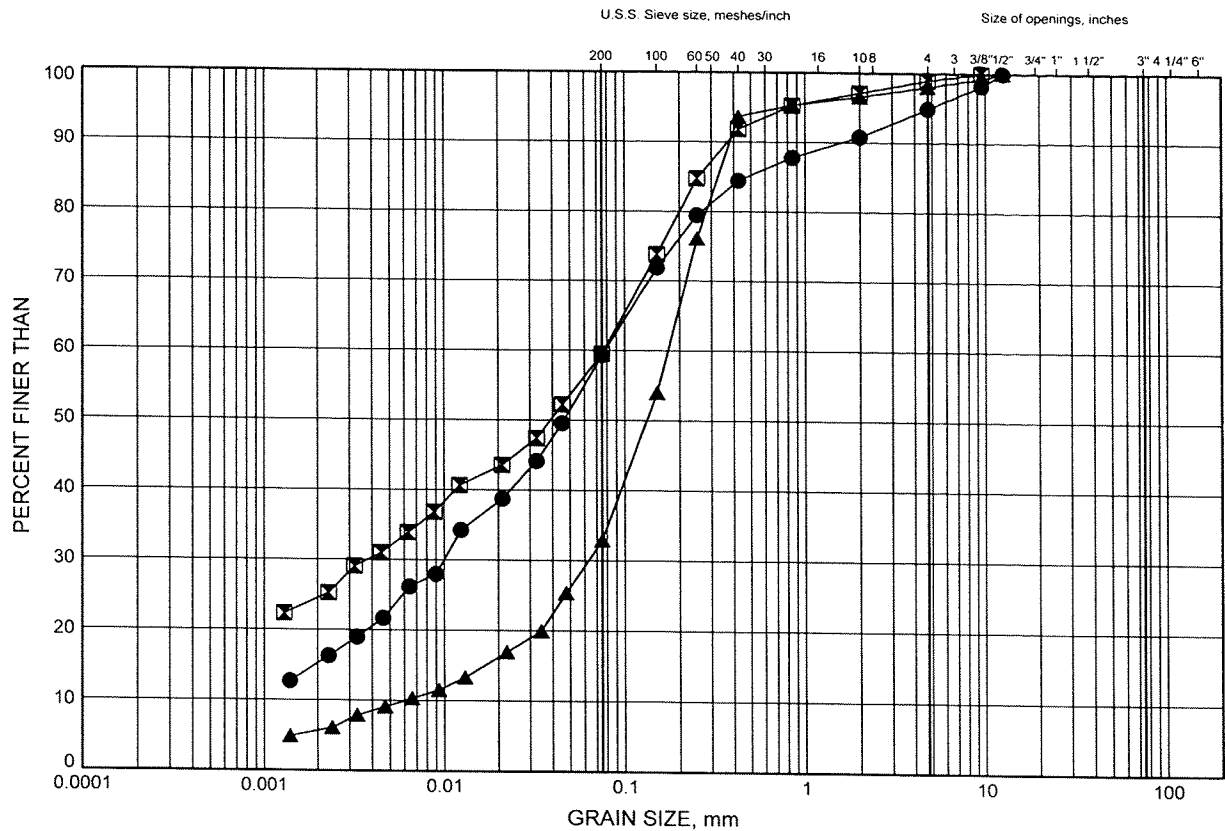


W.P.# 2075-08-00
Prepared By MFA
Checked By DEE

Hwy 7 Brock to Hwy 12 GRAIN SIZE DISTRIBUTION

FIGURE B23

SAND & SILT TILL TO SILTY SAND TILL



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

LEGEND

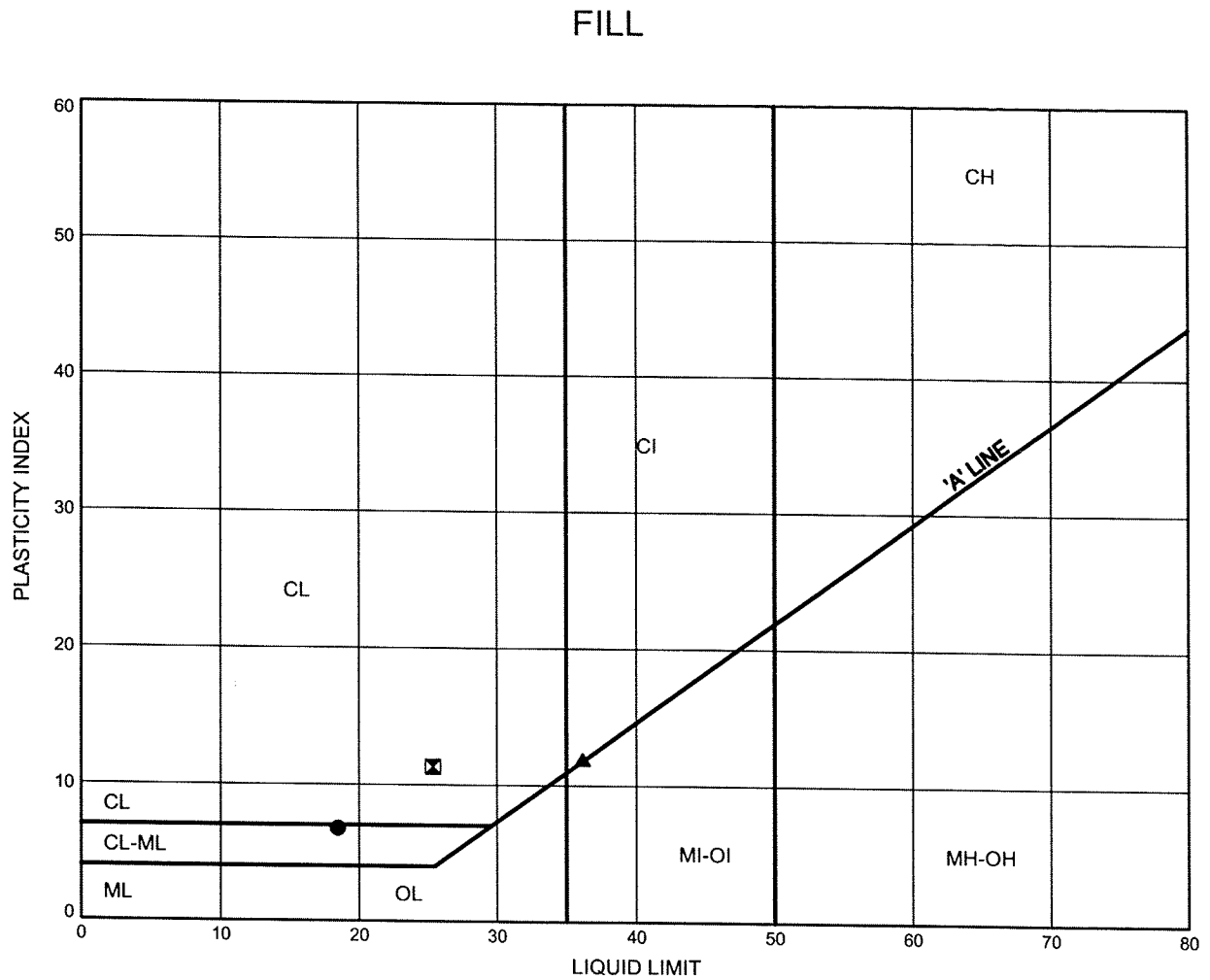
SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	C21-B	6.48	152.51
⊠	C21-C	0.99	154.78
▲	C21-C	6.32	149.44



W.P.# 2075-08-00
Prepared By MFA
Checked By DEE

Hwy 7 Brock to Hwy 12
ATTERBERG LIMITS TEST RESULTS

FIGURE B24



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	C05-A	0.99	165.35
⊠	C11-B	3.35	151.97
▲	C13-A	1.07	162.04

THURBALT 6126.GPJ 2/13/09

Date February 2009
 Project 2075-08-00



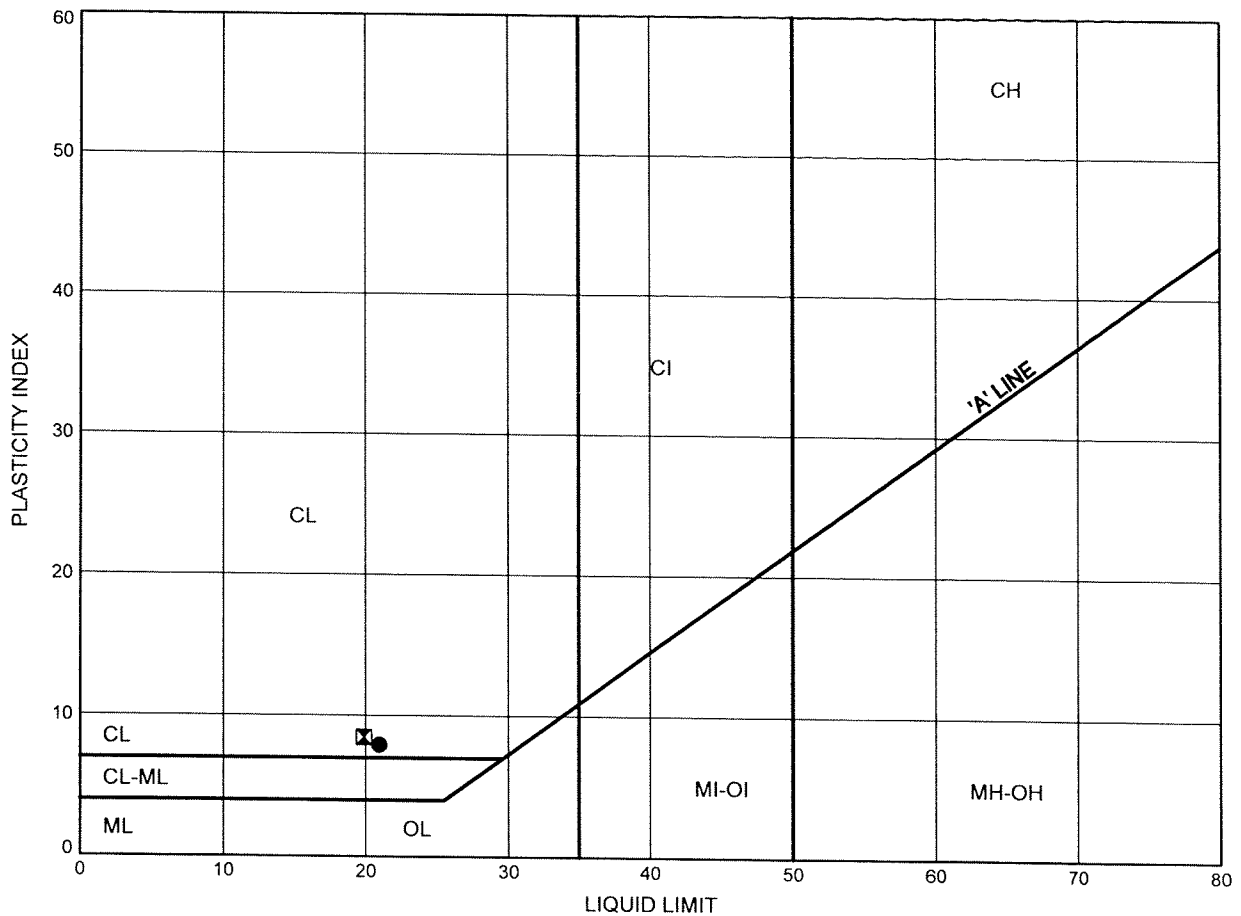
Prep'd MFA
 Chkd. DEE

Hwy 7 Brock to Hwy 12

ATTERBERG LIMITS TEST RESULTS

FIGURE B25

SAND, SAND & GRAVEL, SILTY SAND TO SANDY SILT



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	C07-C	2.51	146.56
⊠	C11-A	2.51	149.66

Date February 2009

Project 2075-08-00



Prep'd MFA

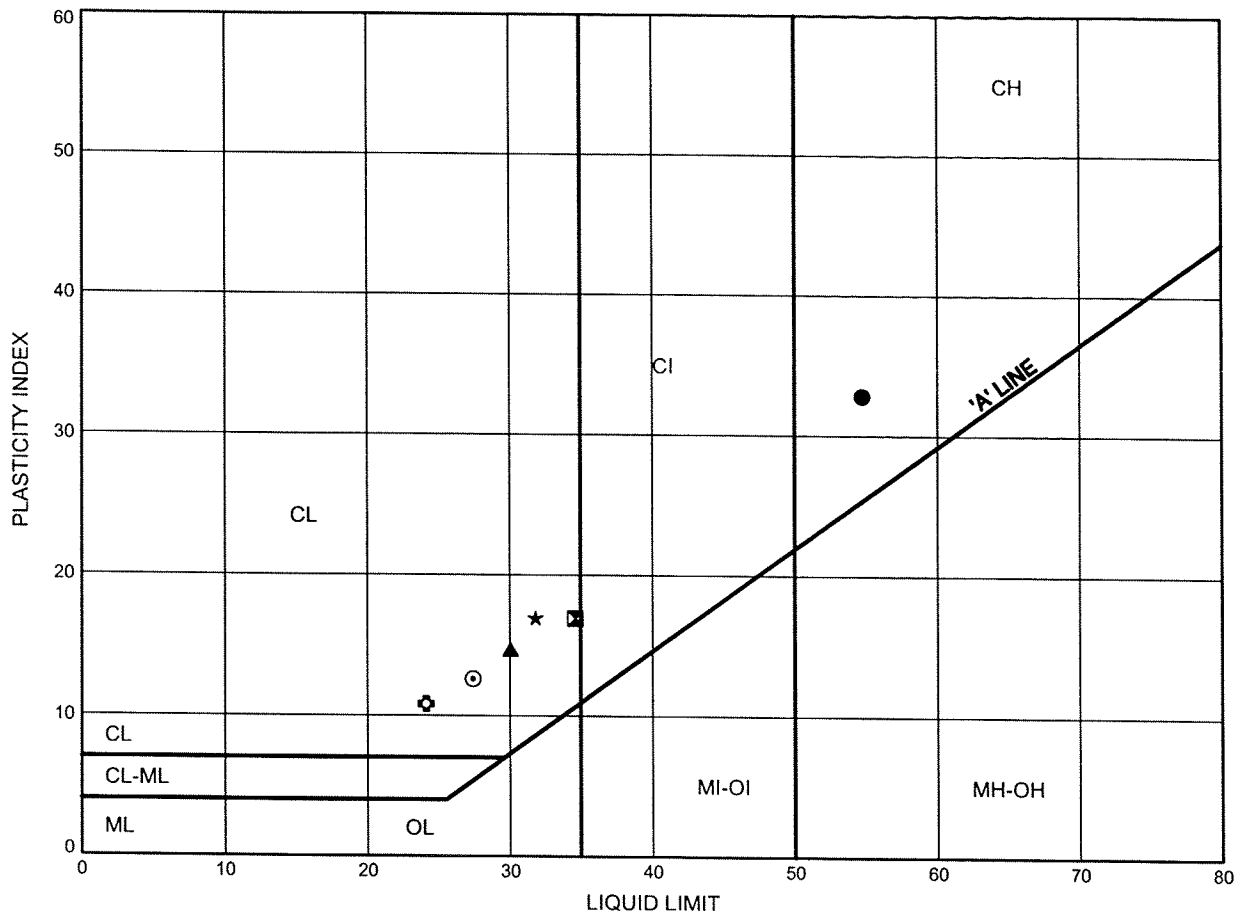
Chkd. DEE

Hwy 7 Brock to Hwy 12

ATTERBERG LIMITS TEST RESULTS

FIGURE B26

SILTY CLAY



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	C01-B	12.50	153.21
⊠	C04-A	10.90	136.66
▲	C04-A	13.94	133.62
★	C04-B	9.45	138.94
⊙	C04-B	14.02	134.36
⊛	C05-B	17.07	154.12

THURBALT 6126.GPJ 2/13/09

Date February 2009
Project 2075-08-00

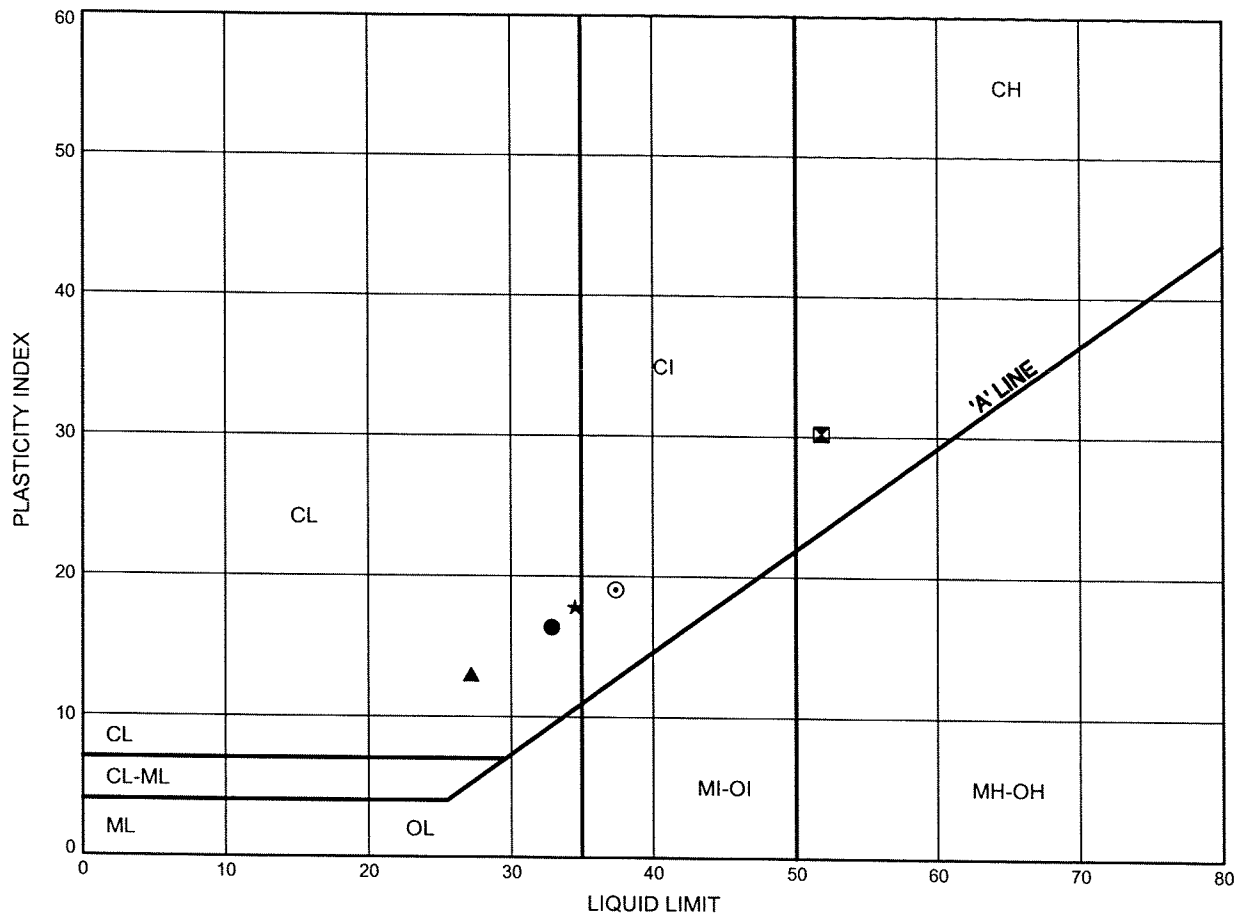


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Chkd. DEE

Hwy 7 Brock to Hwy 12
ATTERBERG LIMITS TEST RESULTS

FIGURE B27

SILTY CLAY



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	C07-A	1.75	147.60
⊠	C11-B	14.02	141.30
▲	C21-A	1.83	154.21
★	C21-A	3.35	152.68
⊙	C21-C	4.80	150.97

Date February 2009

Project 2075-08-00



Prep'd MFA

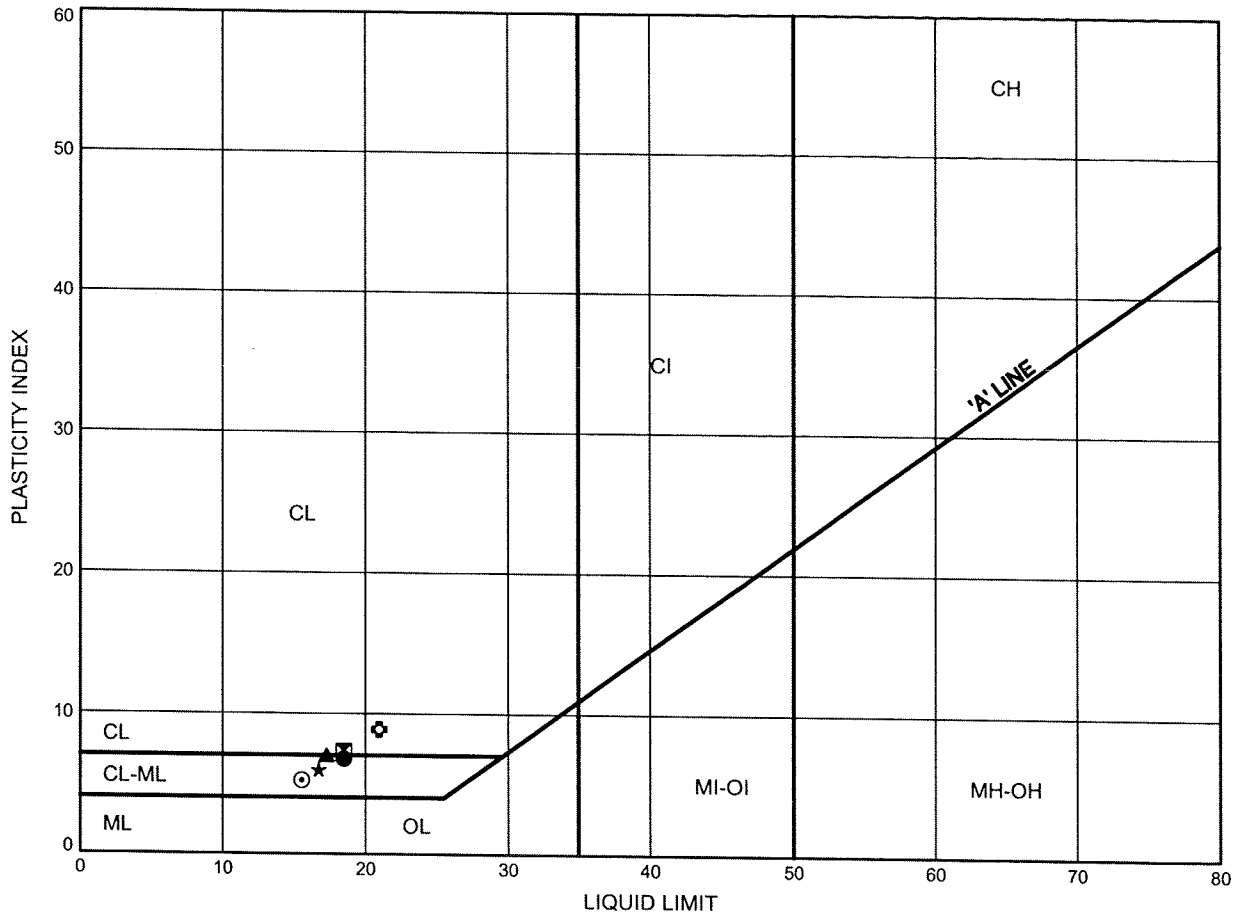
Chkd. DEE

Hwy 7 Brock to Hwy 12

ATTERBERG LIMITS TEST RESULTS

FIGURE B28

SAND & SILT TILL TO SILTY SAND TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	C05-A	0.99	165.35
⊠	C05-B	7.92	163.26
▲	C05-B	12.50	158.69
★	C05-C	3.28	164.56
⊙	C05-C	9.37	158.46
⊛	C07-A	3.28	146.07

Date February 2009

Project 2075-08-00



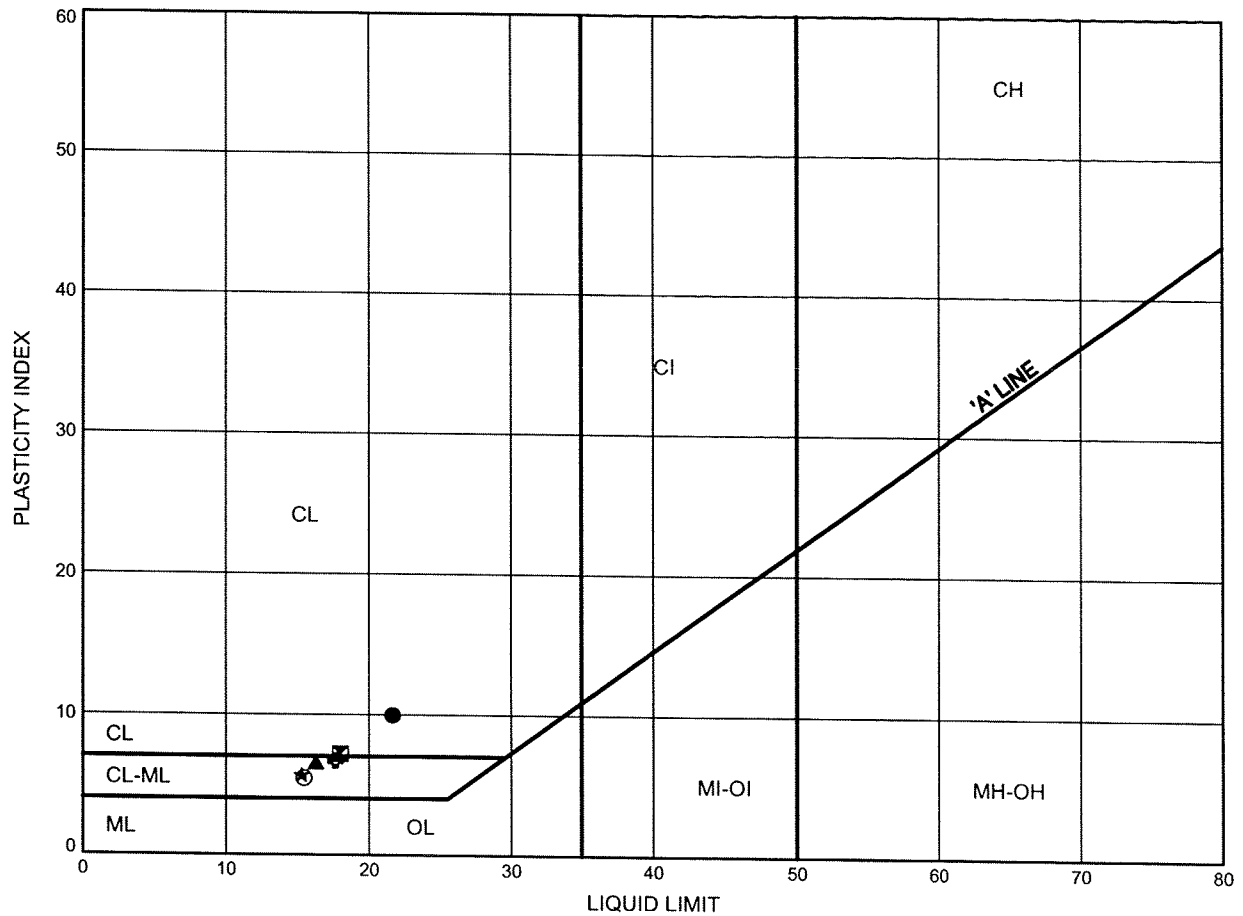
Prep'd MFA

Chkd. DEE

Hwy 7 Brock to Hwy 12
ATTERBERG LIMITS TEST RESULTS

FIGURE B29

SAND & SILT TILL TO SILTY SAND TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	C07-A	4.80	144.55
⊠	C07-B	7.92	142.93
▲	C11-B	6.40	148.92
★	C11-C	3.28	148.38
⊙	C12-C	4.80	147.16
⊕	C13-A	1.83	161.28

Date February 2009
 Project 2075-08-00

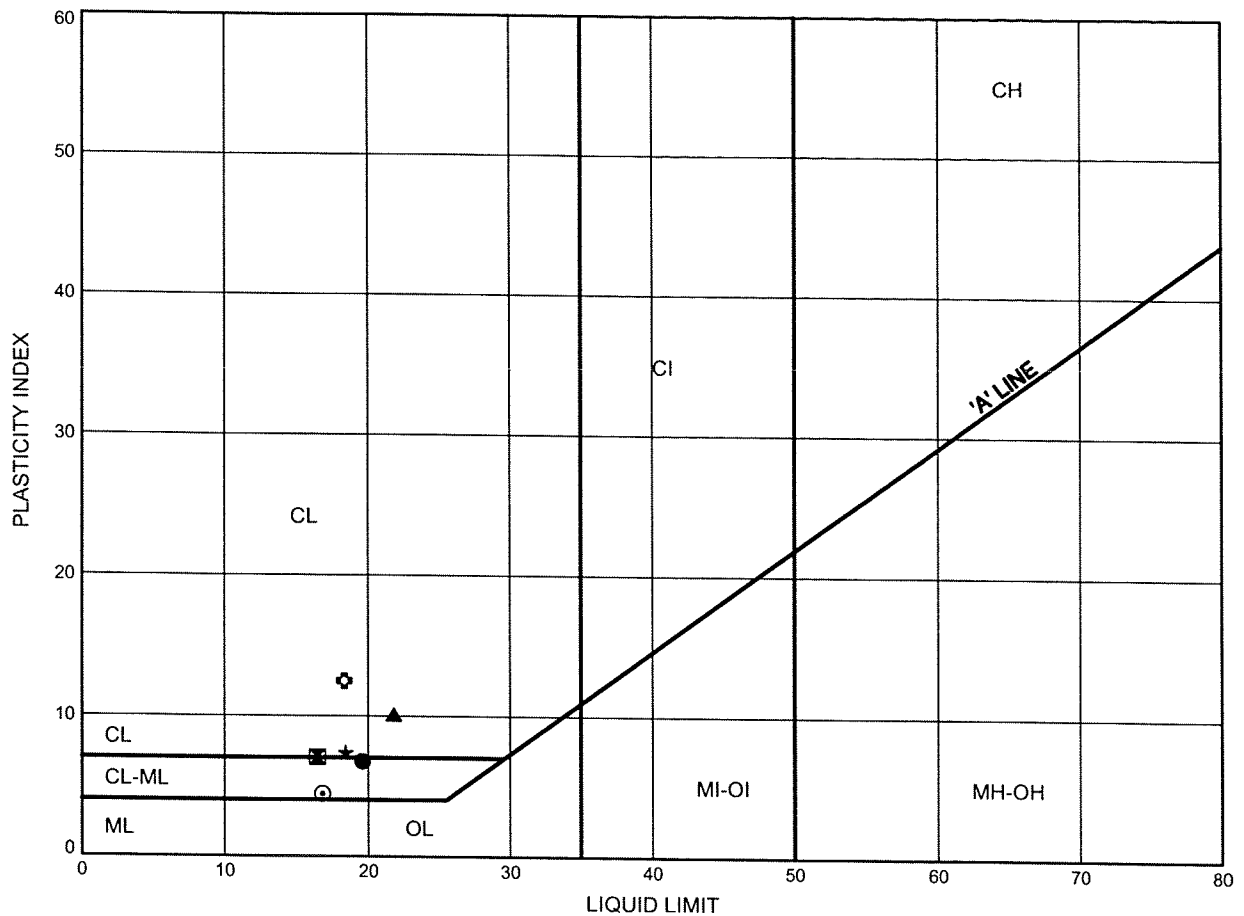


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Hwy 7 Brock to Hwy 12
ATTERBERG LIMITS TEST RESULTS

FIGURE B30

SAND & SILT TILL TO SILTY SAND TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	C13-C	0.99	161.59
⊠	C13-C	6.30	156.28
▲	C17-B	7.92	167.16
★	C18-A	2.51	143.66
⊙	C18-A	4.80	141.37
⊕	C18-B	7.92	139.89

Date February 2009

Project 2075-08-00



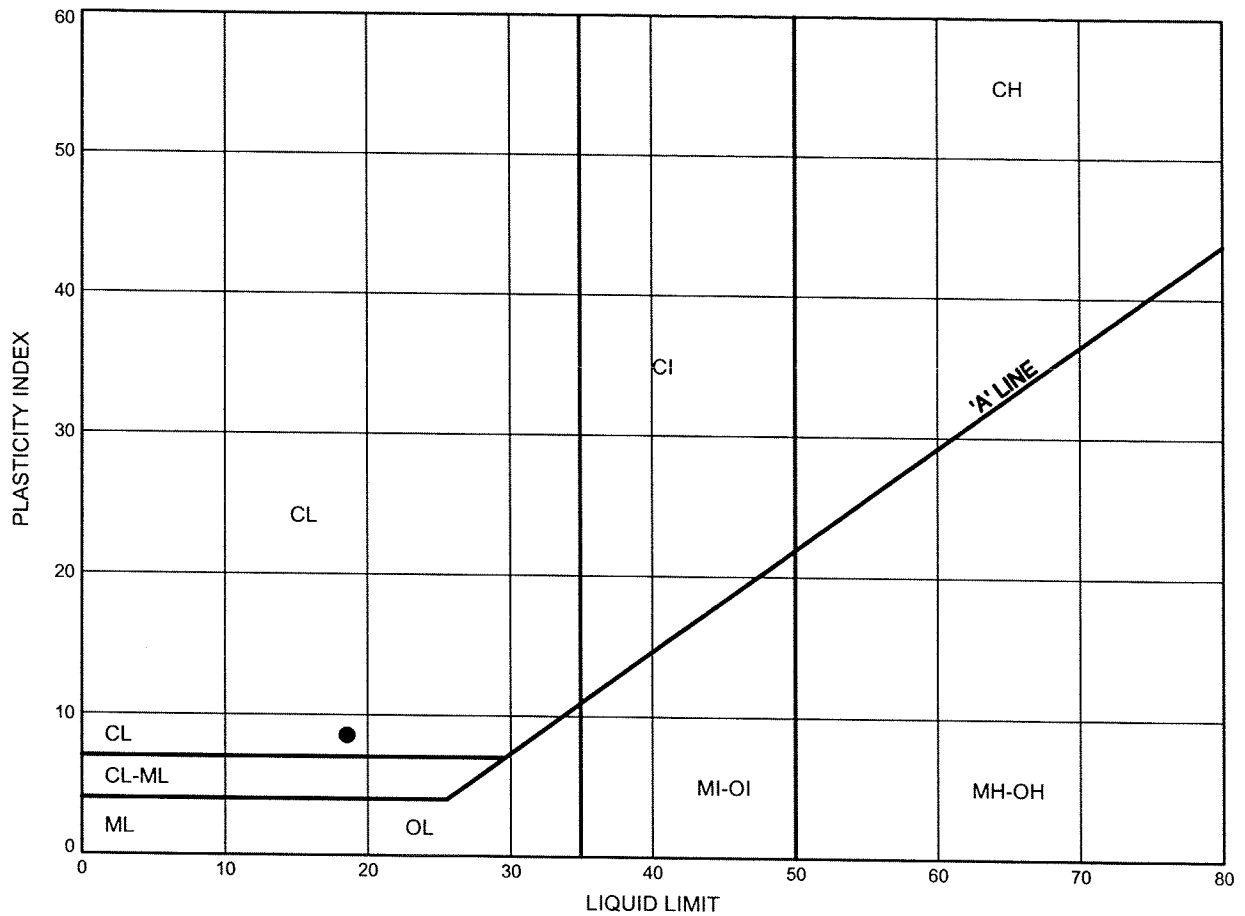
Prep'd MFA

Chkd. DEE

Hwy 7 Brock to Hwy 12
ATTERBERG LIMITS TEST RESULTS

FIGURE B31

SAND & SILT TILL TO SILTY SAND TILL



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	C21-C	0.99	154.78

Date February 2009

Project 2075-08-00



Prep'd MFA

Chkd. DEE

Appendix C

Record of Borehole Sheets (previous investigation)

RECORD OF BOREHOLE No 07-3

1 OF 2

METRIC

G.W.P. W05-20001 LOCATION N 4 867 292.02 E 345 008.37 Stevenson Creek ORIGINATED BY GA
 HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY JL
 DATUM Geodetic DATE 2007.03.27 - 2007.03.27 CHECKED BY RPR

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						
								20 40 60 80 100						
							WATER CONTENT (%)							
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+ 3 . X 3 : Numbers refer to
Sensitivity

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15
10






(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-3

2 OF 2

METRIC

G.W.P. W05-20001 LOCATION N 4 867 292.02 E 345 008.37 Stevenson Creek ORIGINATED BY GA
 HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY JL
 DATUM Geodetic DATE 2007.03.27 - 2007.03.27 CHECKED BY RPR

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 (%)		
								20 40 60 80 100		20 40 60		20 40 60					
							UNCONFINED + FIELD VANE		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT								
							● QUICK TRIAXIAL X LAB VANE										
Continued From Previous Page																	
134.5	Silty SAND to Sandy SILT, trace to some gravel, some clay Very Dense Grey Moist (TILL)		11	SS	84		137										
133.0	Clayey SILT with SAND, trace gravel Hard Grey (TILL)		12	SS	79		136										
132.5			13	SS	107		135								1 28 56 15		
14.8							134										
15.3	END OF BOREHOLE AT 15.32 m. BOREHOLE OPEN AND WATER LEVEL AT 3.96 m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND PATCHED WITH ASPHALT AT SURFACE.		14	SS	100/ .075		133										

+³, X³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-4

1 OF 2

METRIC

G.W.P. W05-20001 LOCATION N 4 867 308.89 E 345 021.91 Stevenson Creek ORIGINATED BY GA
 HWY 7 BOREHOLE TYPE Solid Stem Augers COMPILED BY JL
 DATUM Geodetic DATE 2007.04.11 - 2007.04.12 CHECKED BY RPR

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							
145.3	Sandy SILT, trace clay, trace gravel, occasional rootlets Compact Brown Wet		1	SS	13		20	40	60	80	100	20	40	60	1 39 43 16
144.7			2	SS	23		20	40	60	80	100	20	40	60	
0.6			3	SS	86		20	40	60	80	100	20	40	60	
143.2	Clayey SILT with SAND, trace gravel Very Stiff to Hard Grey (TILL)	4	SS	123	20		40	60	80	100	20	40	60	4 46 43 7	
		5	SS	138	20		40	60	80	100	20	40	60		
		6	SS	101	20		40	60	80	100	20	40	60		
		7	SS	89	20		40	60	80	100	20	40	60		
		8	SS	80	20		40	60	80	100	20	40	60		
		9	SS	70	20		40	60	80	100	20	40	60		
		10	SS	98	20		40	60	80	100	20	40	60		
Resistance to augering from 4.5m to 6.0m															
2.1	Silty SAND to Sandy SILT, trace gravel, trace to some clay Very Dense Grey Damp to Wet (TILL)														
	trace clay														
	some clay														

Continued Next Page

+³ × 3³: Numbers refer to
Sensitivity

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15
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 (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100			
								SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE			
Continued From Previous Page							WATER CONTENT (%) 20 40 60				

[illegible]

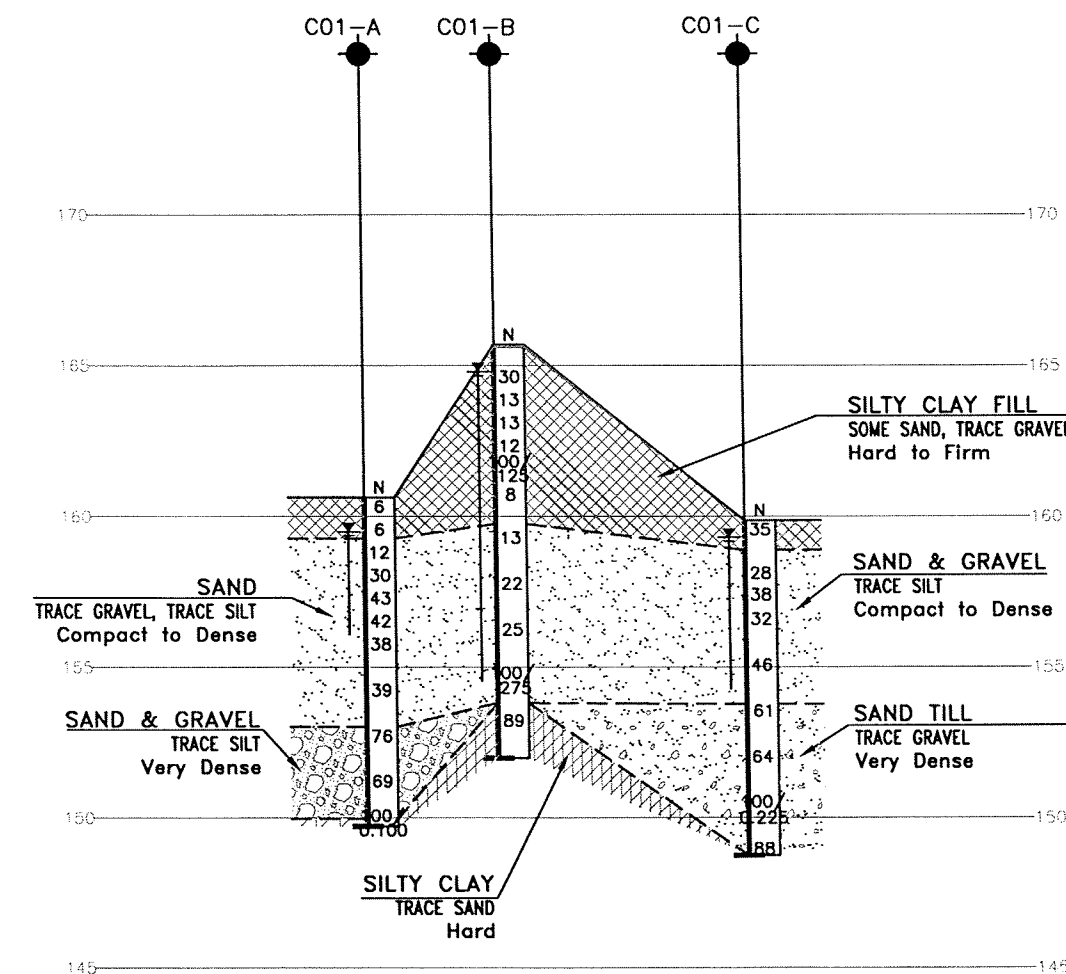
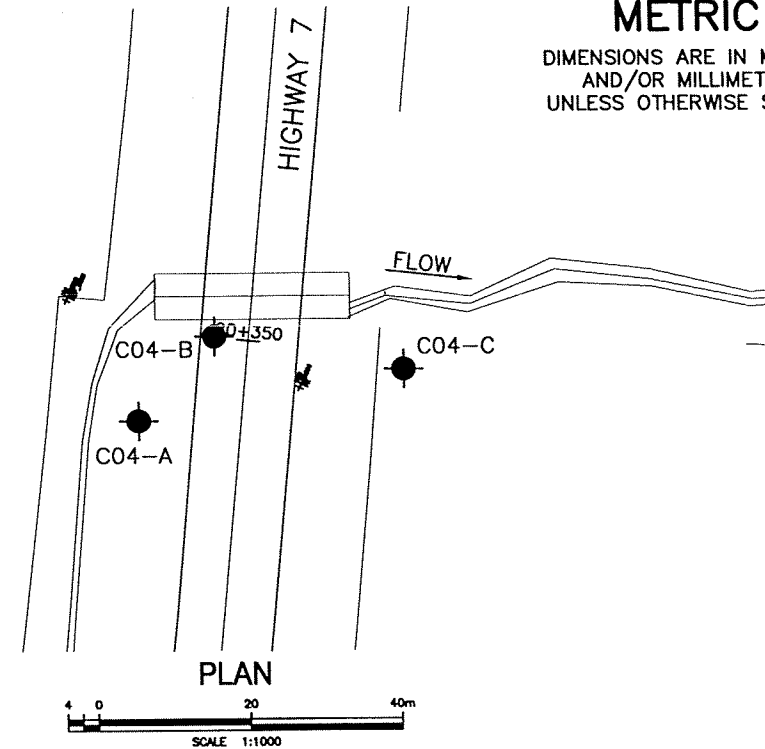
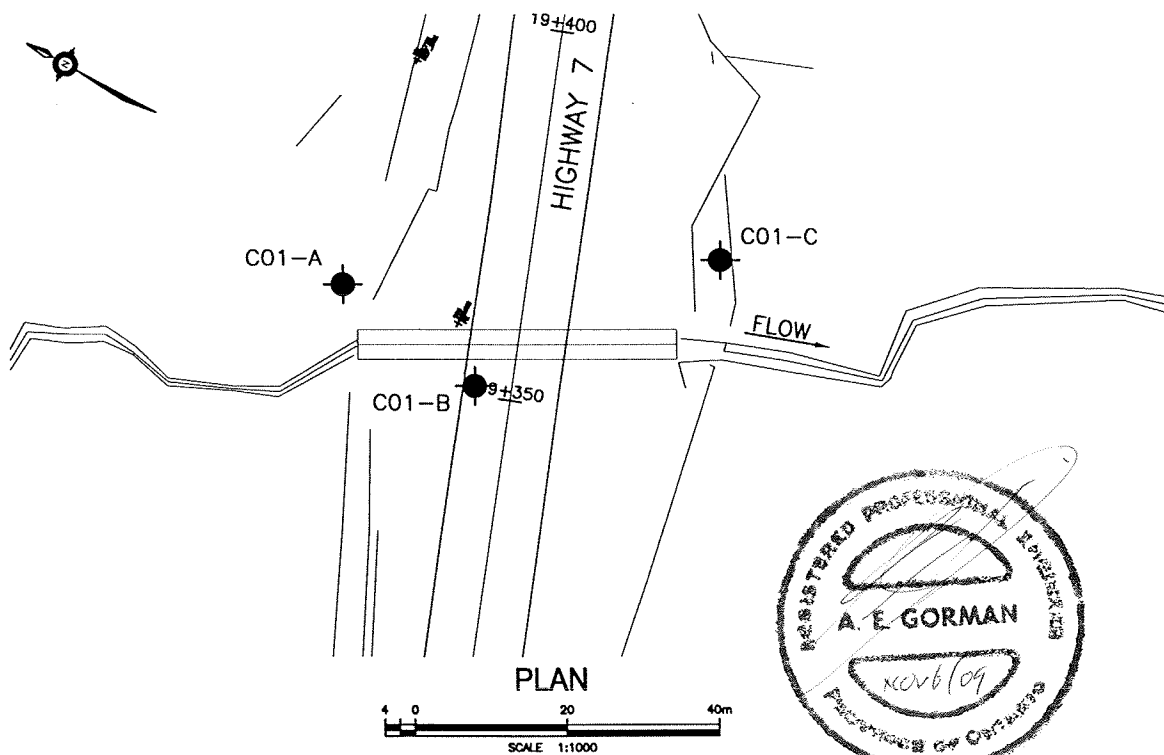
(%) STRAIN AT FAILURE

Appendix D

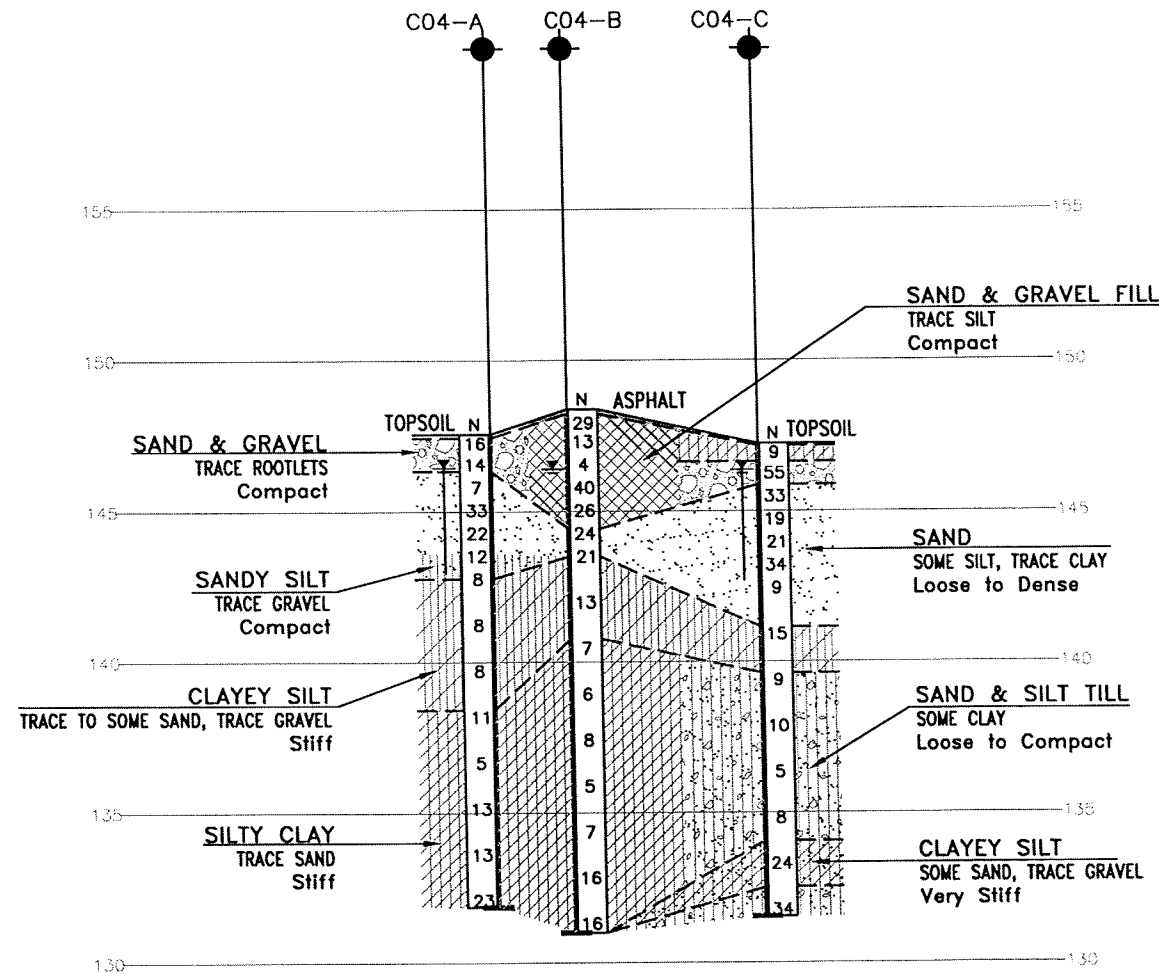
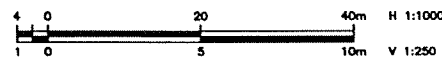
Borehole Locations and Soil Strata Drawings

MINISTRY OF TRANSPORTATION, ONTARIO

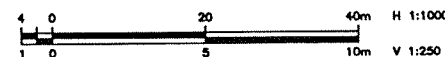
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DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN



PROFILE CULVERT C-01



PROFILE CULVERT C-04

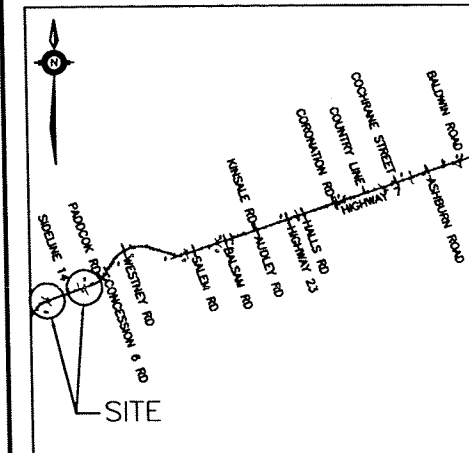


HIGHWAY 7
CONT No
GWP No 2075-08-00



HWY 7
BROCK STREET TO HWY 12
CULVERTS C-01 & C-04
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET



KEYPLAN

LEGEND

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

NO	ELEVATION	NORTHING	EASTING
C01-A	160.6	4 864 798.9	337 522.6
C01-B	165.7	4 864 777.3	337 518.8
C01-C	159.8	4 864 756.7	337 549.1
C04-A	147.5	4 865 110.6	338 447.6
C04-B	148.3	4 865 106.2	338 462.1
C04-C	147.2	4 865 081.7	338 468.7

-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. 30M14-319

REVISIONS	DATE	BY	DESCRIPTION
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			LOAD
			STRUCT
			DWG 1
			DATE NOV. 2009

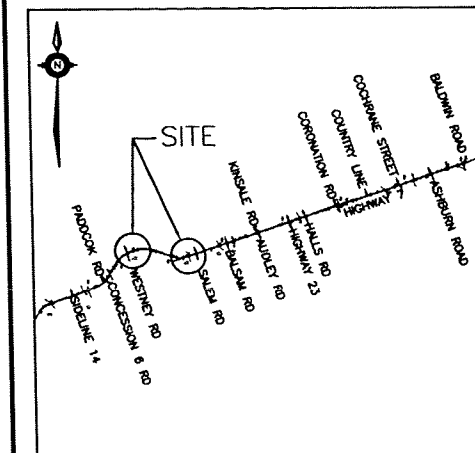
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

HIGHWAY 7
CONT No
GWP No 2075-08-00



HWY 7
BROCK STREET TO HWY12
CULVERTS C-05 & C-07
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET



KEYPLAN

LEGEND

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

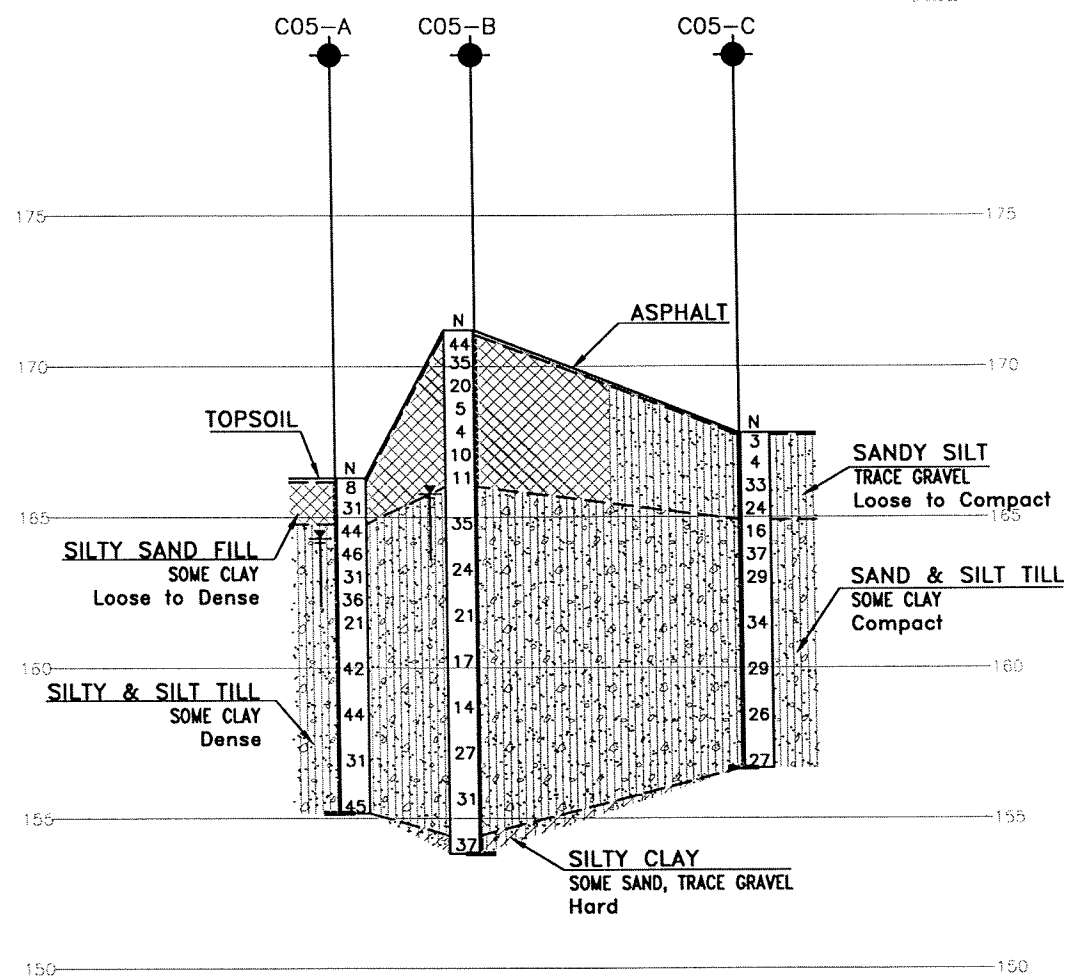
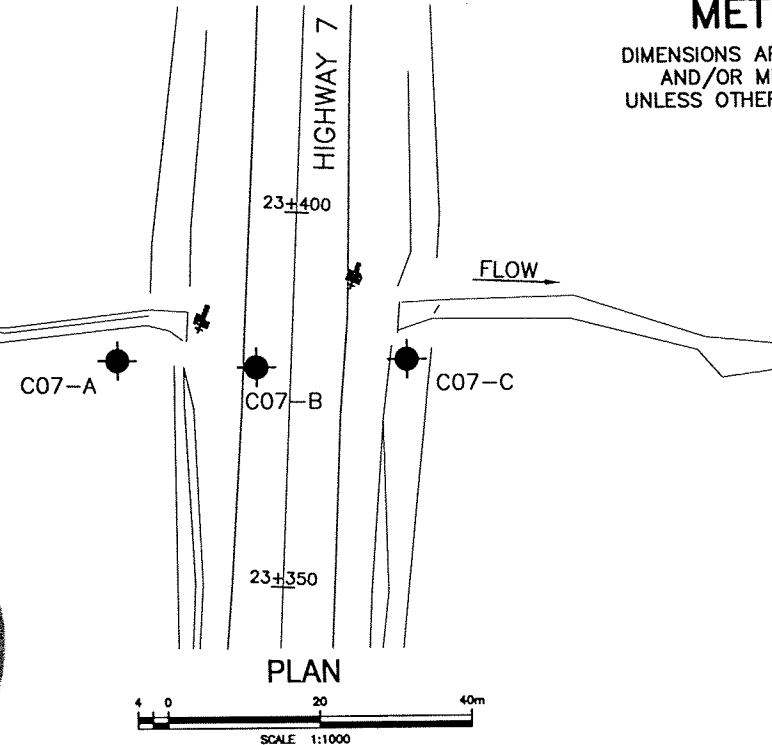
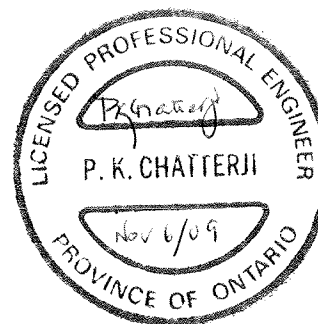
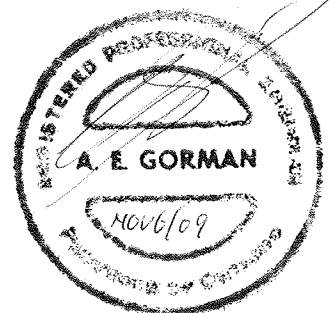
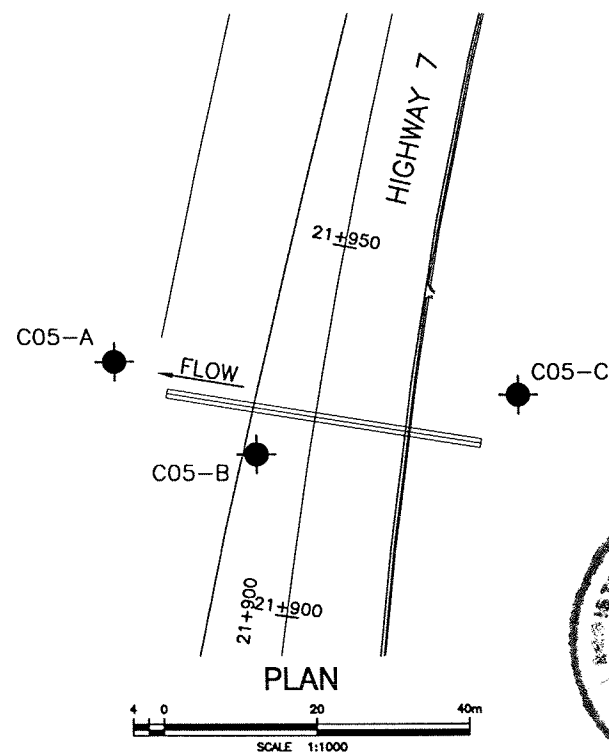
NO	ELEVATION	NORTHING	EASTING
C05-A	166.3	4 866 125.2	339 607.9
C05-B	171.2	4 866 102.9	339 606.2
C05-C	167.8	4 866 075.4	339 629.3
C07-A	149.3	4 865 973.7	341 012.7
C07-B	150.9	4 865 956.2	341 018.4
C07-C	149.1	4 865 938.1	341 026.5

-NOTES-

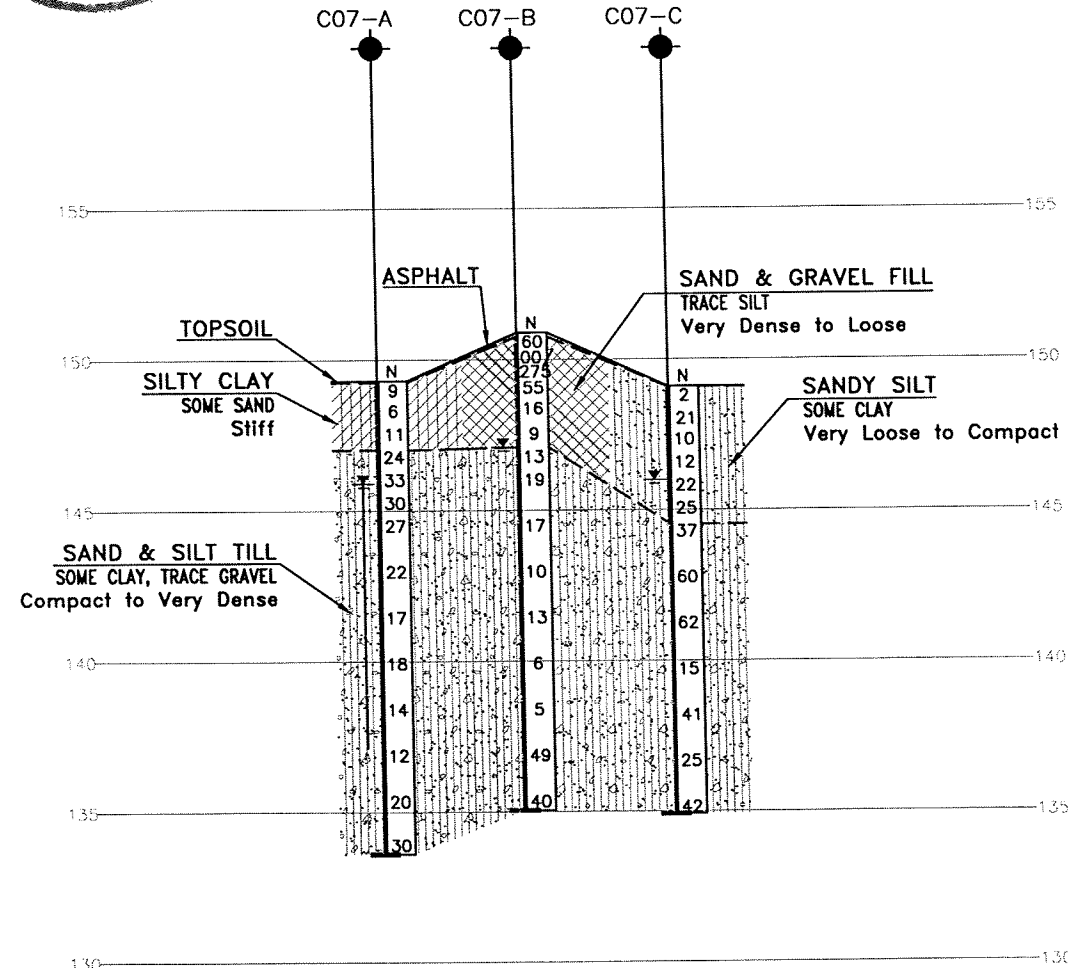
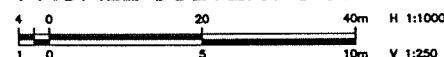
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GEOCRES No. 30M14-319

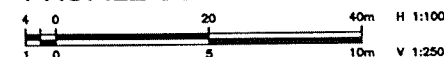
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			LOAD
			STRUCT
			DWG 2
			DATE NOV. 2009

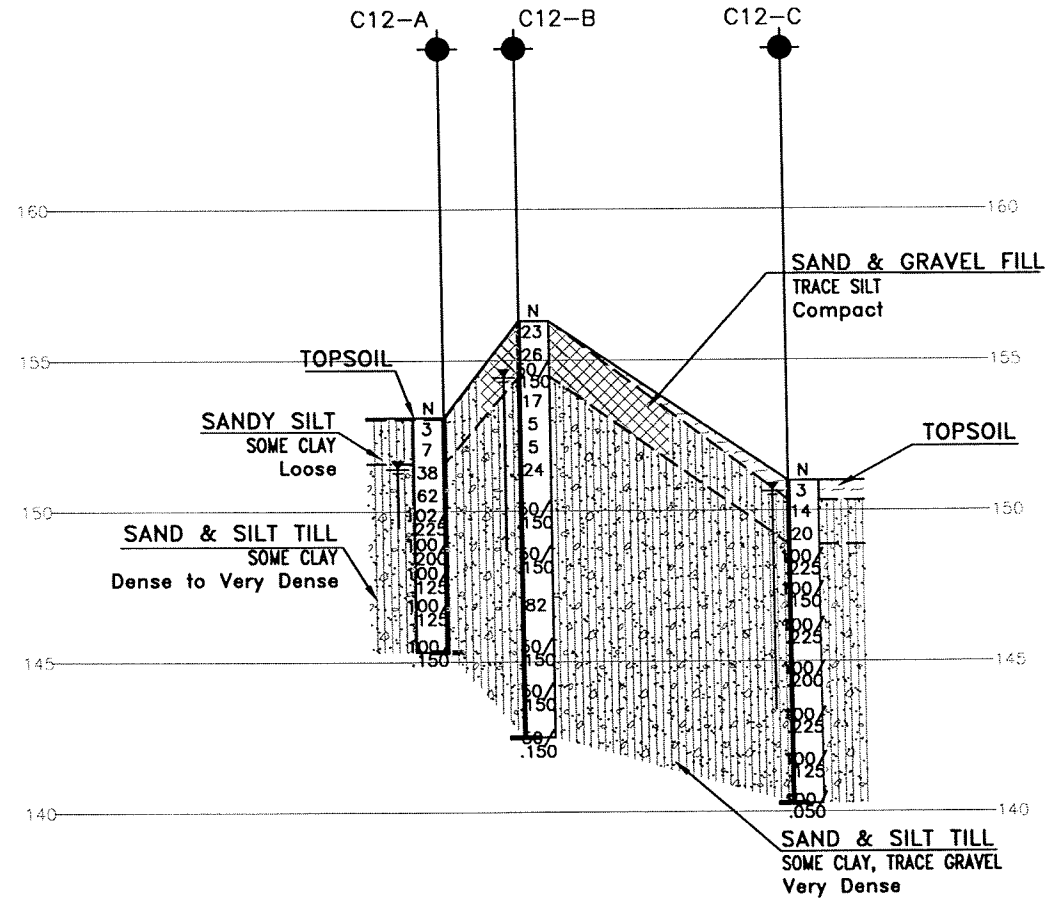
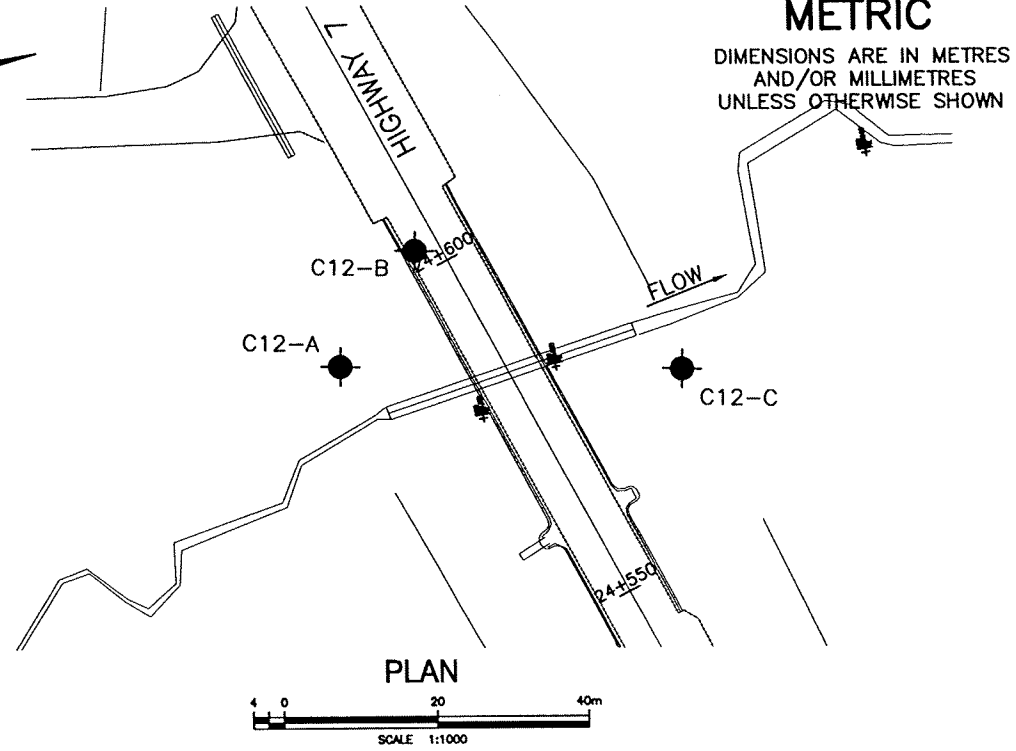
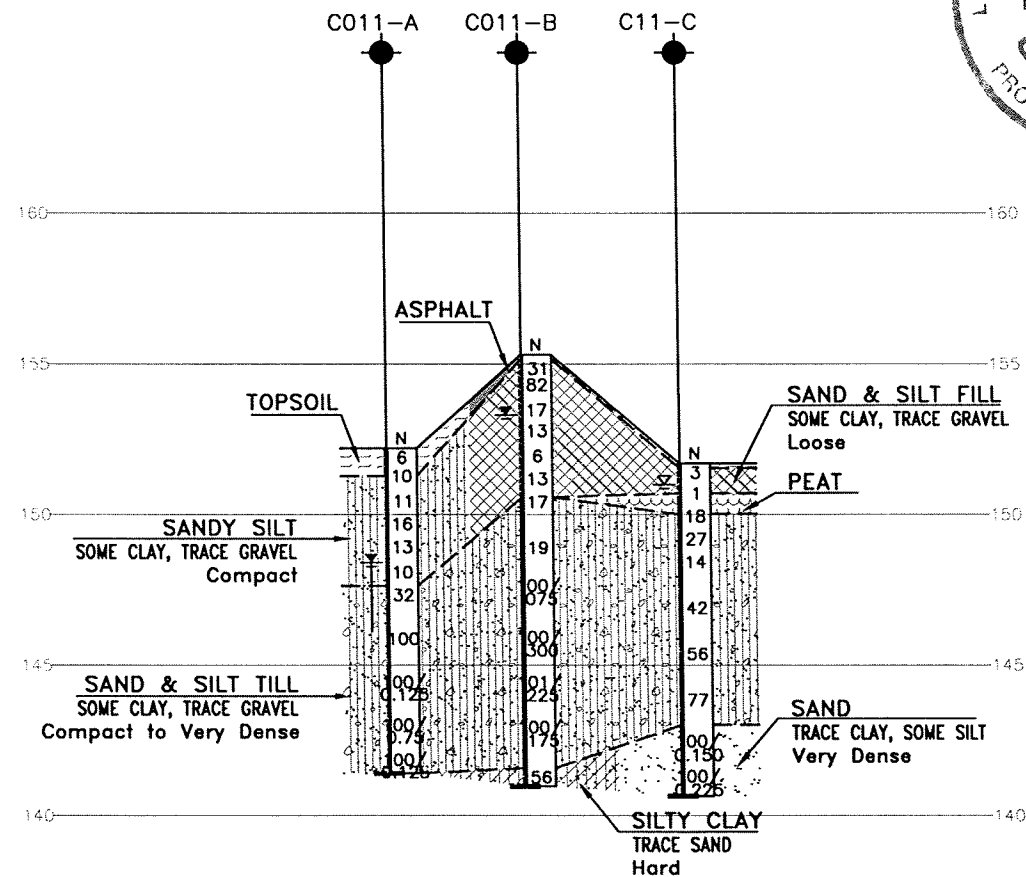
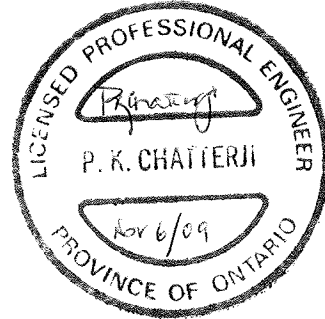
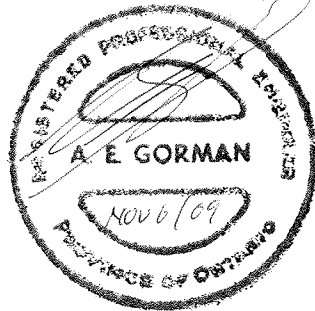
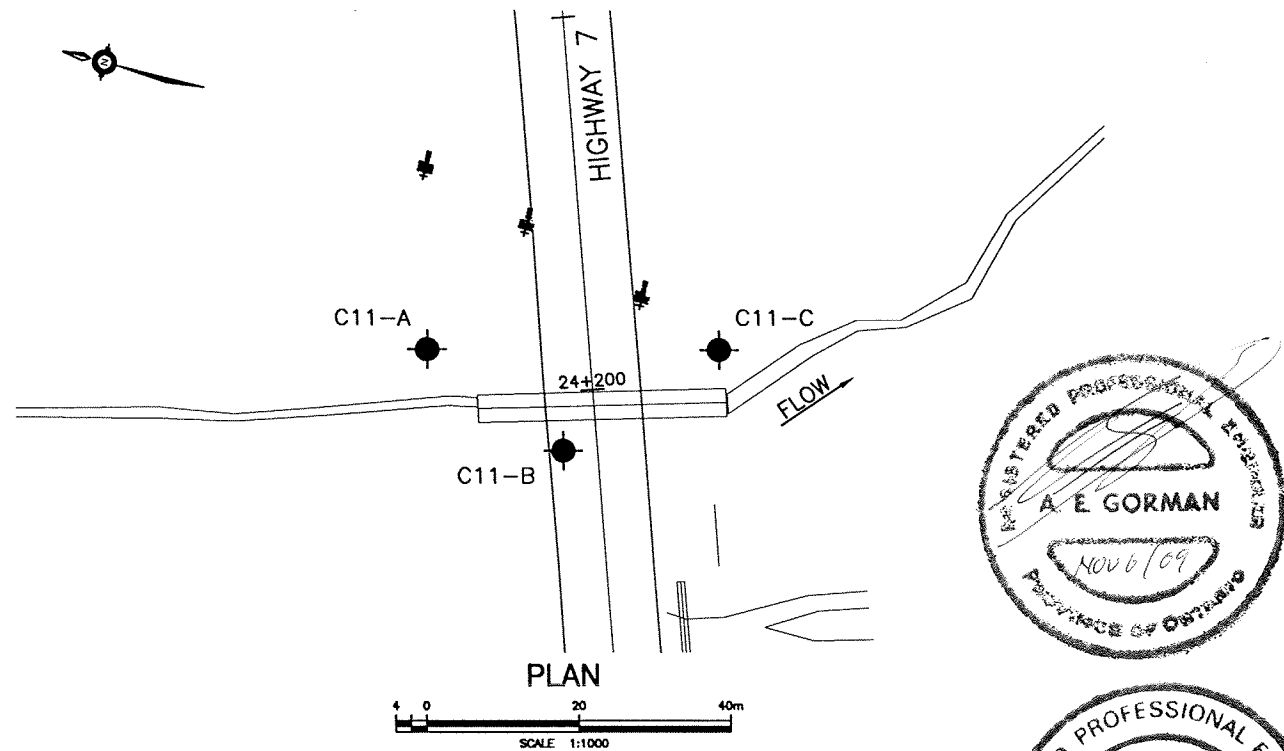


PROFILE CULVERT C-05



PROFILE CULVERT C-07





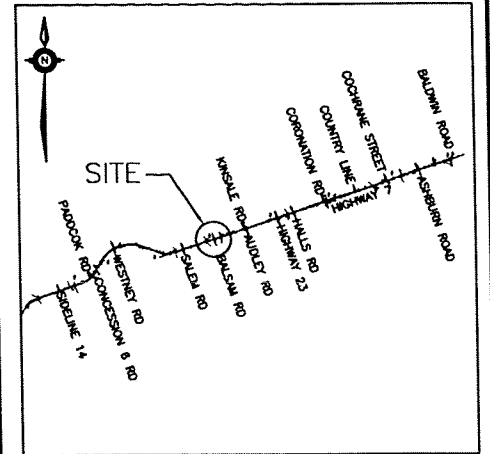
HIGHWAY 7
CONT No
GWP No 2075-08-00

HWY 7
BROCK STREET TO HWY 12
CULVERTS C-11 & C-12
BOREHOLE LOCATIONS AND SOIL STRATA

MMM GROUP

THURBER ENGINEERING LTD.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS

SHEET



LEGEND

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

NO	ELEVATION	NORTHING	EASTING
C11-A	152.2	4 866 230.5	341 799.5
C11-B	155.3	4 866 210.0	341 790.9
C11-C	151.7	4 866 193.2	341 808.9
C12-A	153.1	4 866 347.4	342 168.4
C12-B	156.3	4 866 334.9	342 182.4
C12-C	152.0	4 866 303.2	342 160.7

NOTES-

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GEOCRES No. 30M14-319

REVISIONS

DATE	BY	DESCRIPTION
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DRAWN AN	CHK AEG	SITE

LOAD DATE NOV. 2009
STRUCT DWG 3

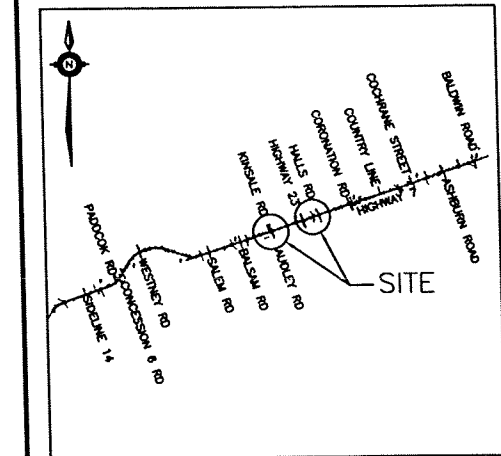
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

HIGHWAY 7
CONT No
GWP No 2075-08-00



SHEET

HWY 7
BROCK STREET TO HWY 12
CULVERTS C-13 & C-17
BOREHOLE LOCATIONS AND SOIL STRATA



KEYPLAN

LEGEND

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

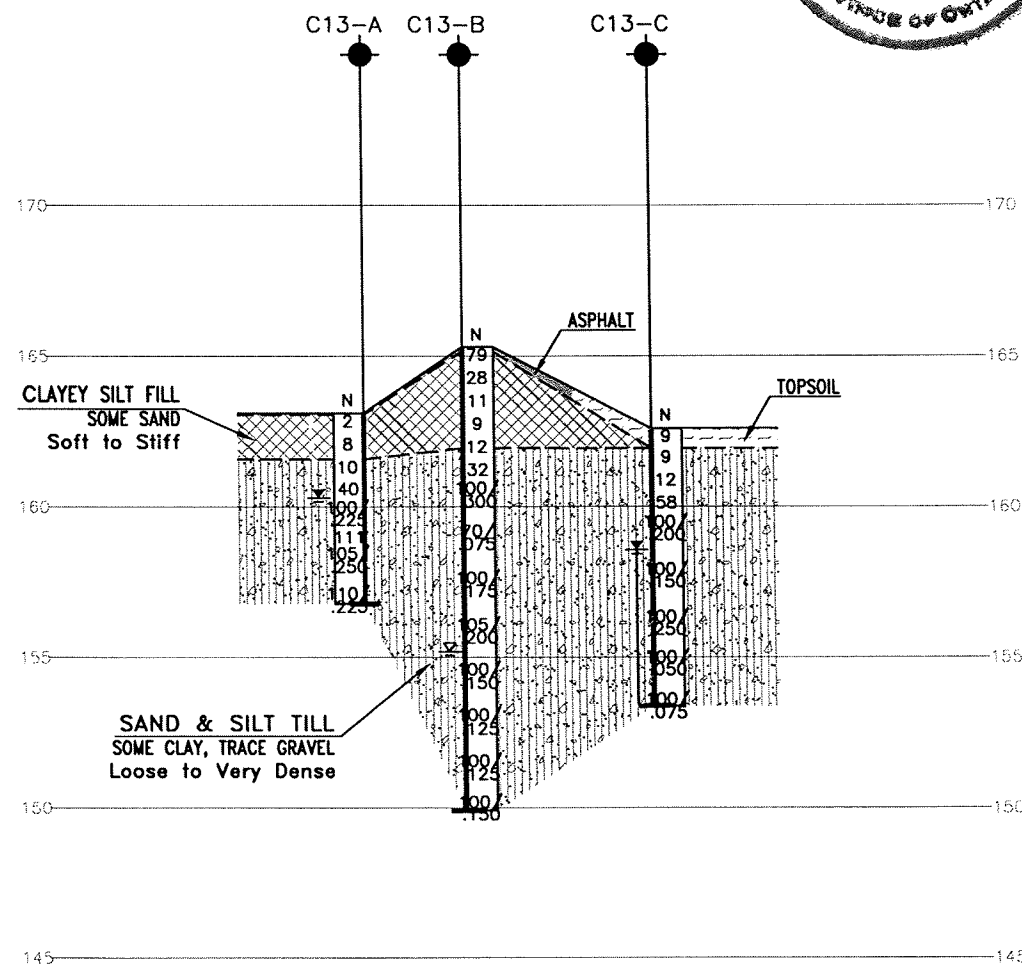
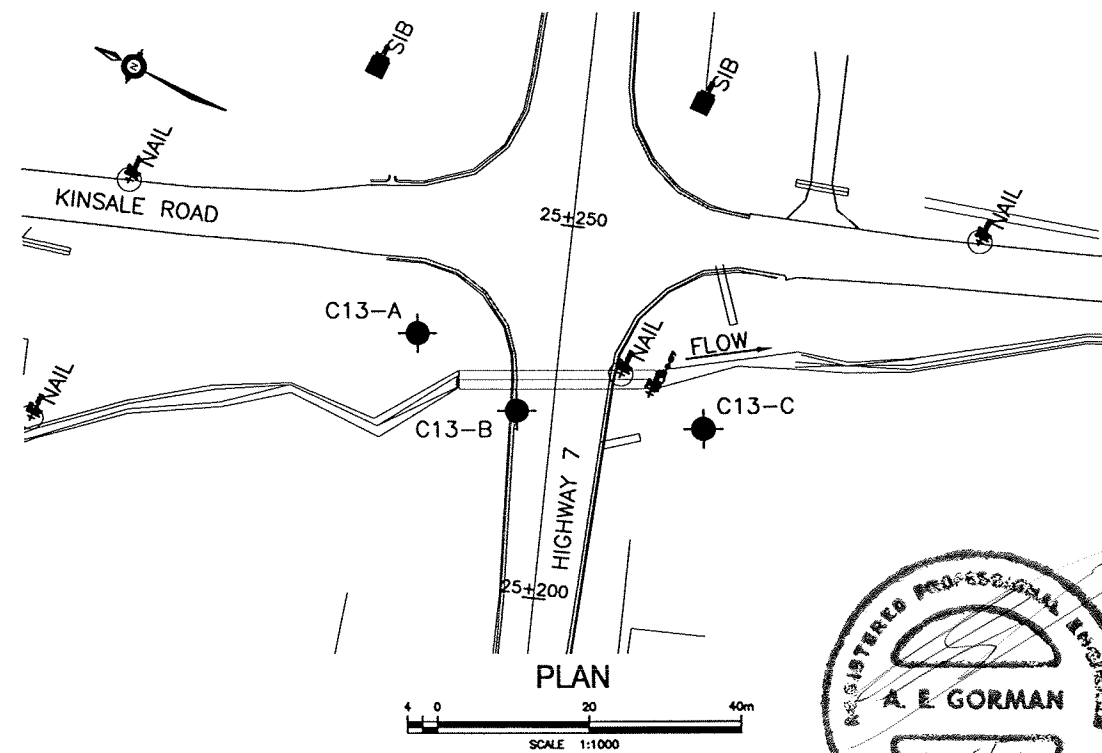
NO	ELEVATION	NORTHING	EASTING
C13-A	163.1	4 866 553.9	342 773.4
C13-B	165.3	4 866 537.6	342 769.8
C13-C	162.6	4 866 514.4	342 778.3
C17-A	170.5	4 866 924.5	343 836.7
C17-B	175.1	4 866 900.4	343 828.6
C17-C	168.9	4 866 873.8	343 836.7

-NOTES-

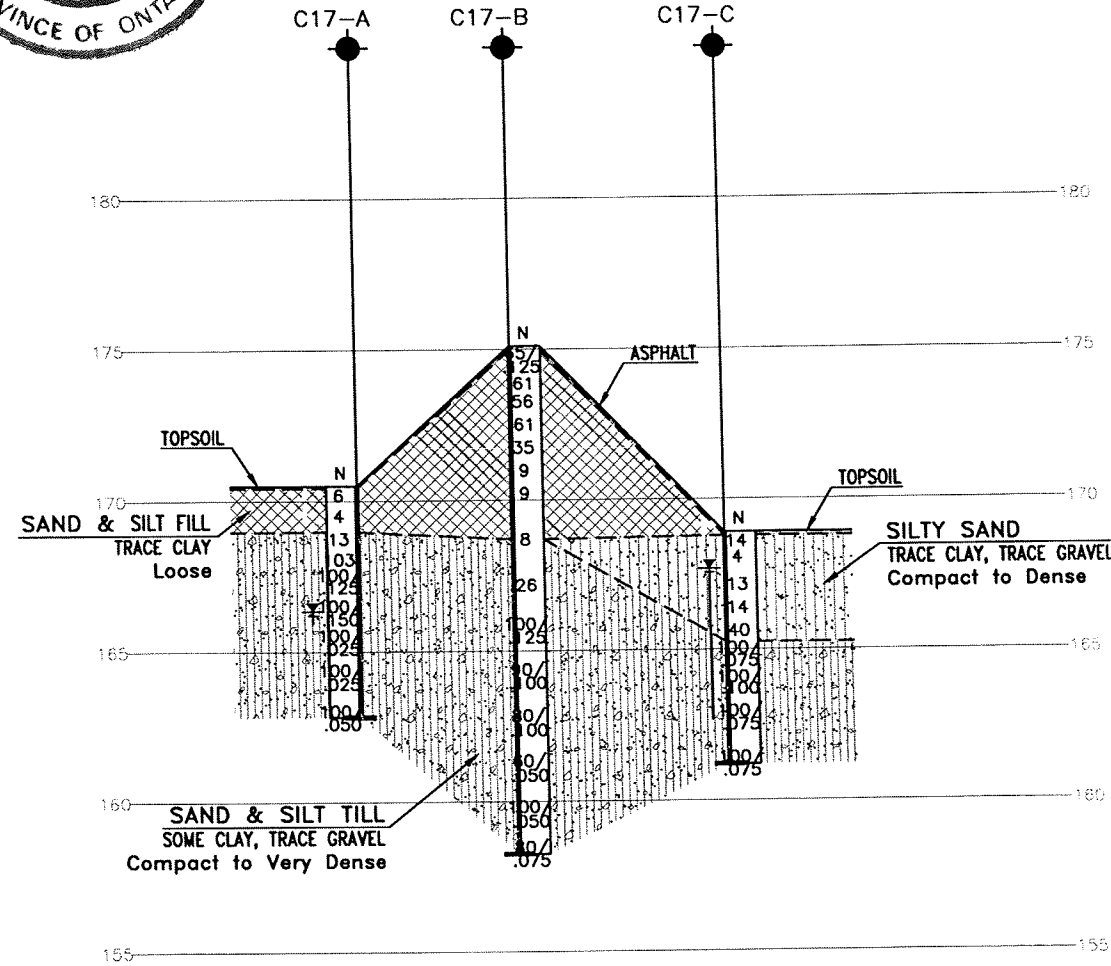
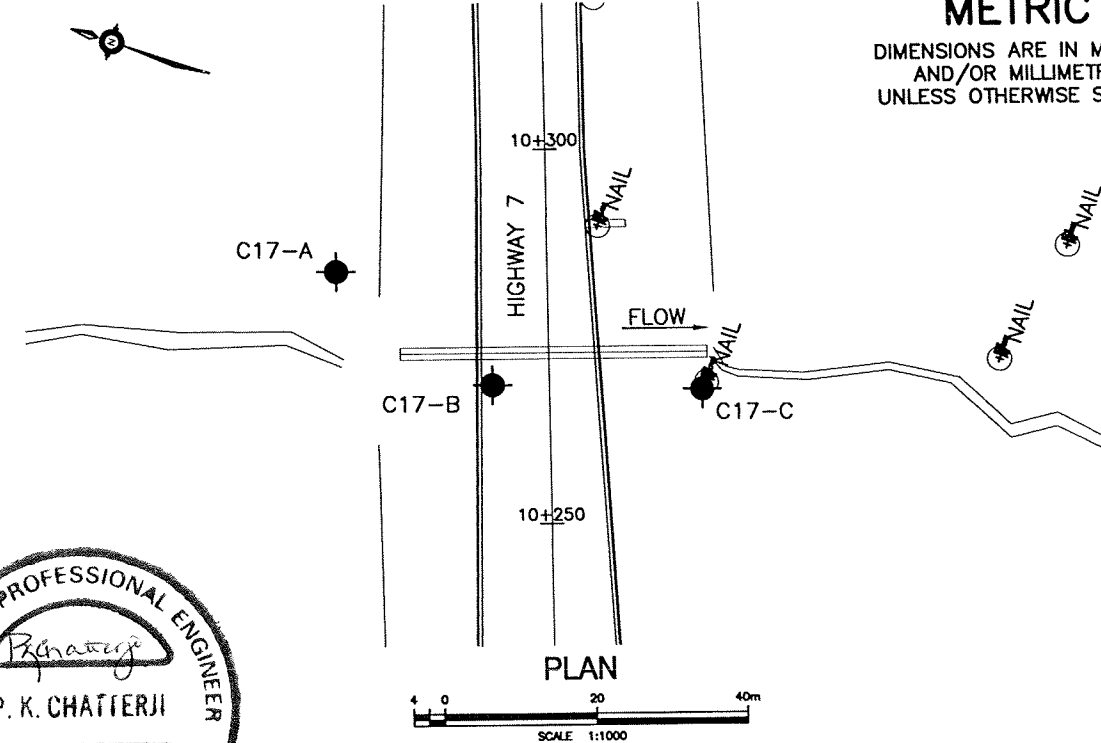
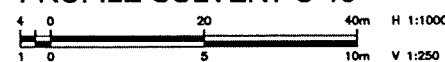
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GEOCREs No. 30M14-319

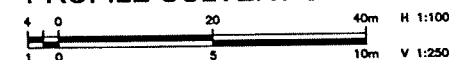
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			DWG 4



PROFILE CULVERT C-13



PROFILE CULVERT C-17



METRIC

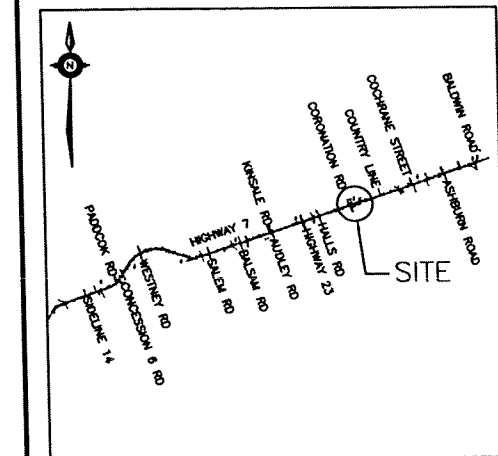
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

HIGHWAY 7
CONT No
GWP No 2075-08-00



SHEET

HWY 7
BROCK STREET TO HWY 12
CULVERTS C-18 & C-19
BOREHOLE LOCATIONS AND SOIL STRATA



KEYPLAN

LEGEND

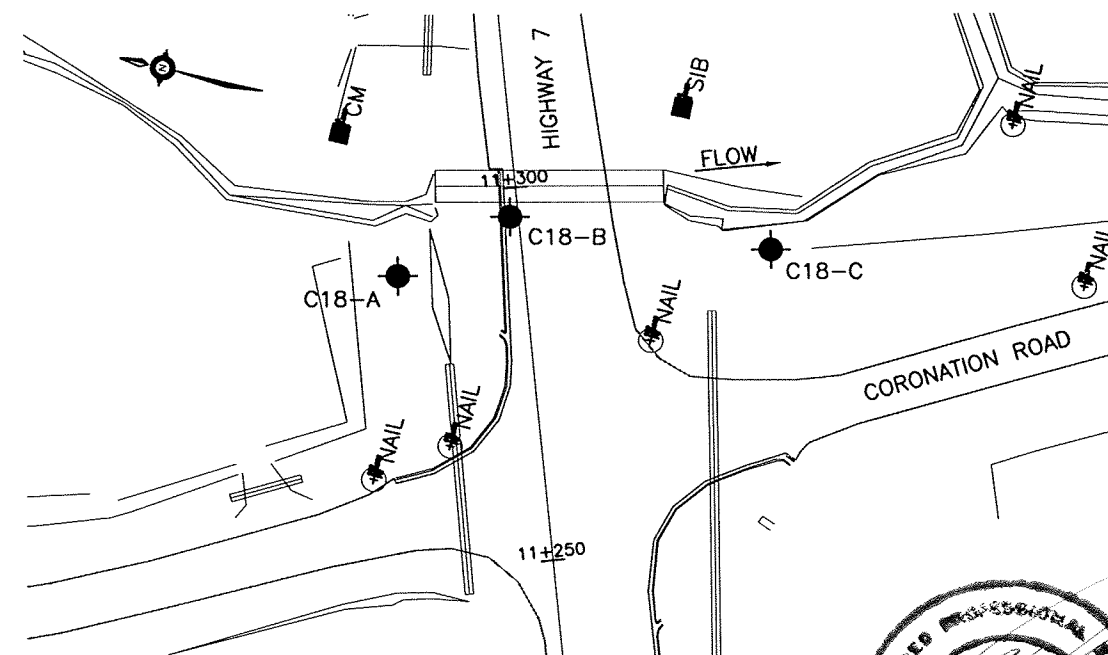
- Borehole
- ⊙ Borehole and Cone
- N Blows /0.3m (Std Pen Test, 475J/blow)
- CONE Blows /0.3m (60° Cone, 475J/blow)
- PH Pressure, Hydraulic
- W Water Level
- HA Head Artesian Water
- PZ Piezometer
- 90% Rock Quality Designation (RQD)
- A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING
C18-A	146.2	4 867 238.3	344 792.2
C18-B	147.8	4 867 225.6	344 803.3
C18-C	144.9	4 867 191.3	344 806.8
C19-A	145.2	4 867 309.3	345 026.9
C19-B	147.8	4 867 292.2	345 009.0
C19-C	145.3	4 867 272.3	345 016.0

-NOTES-

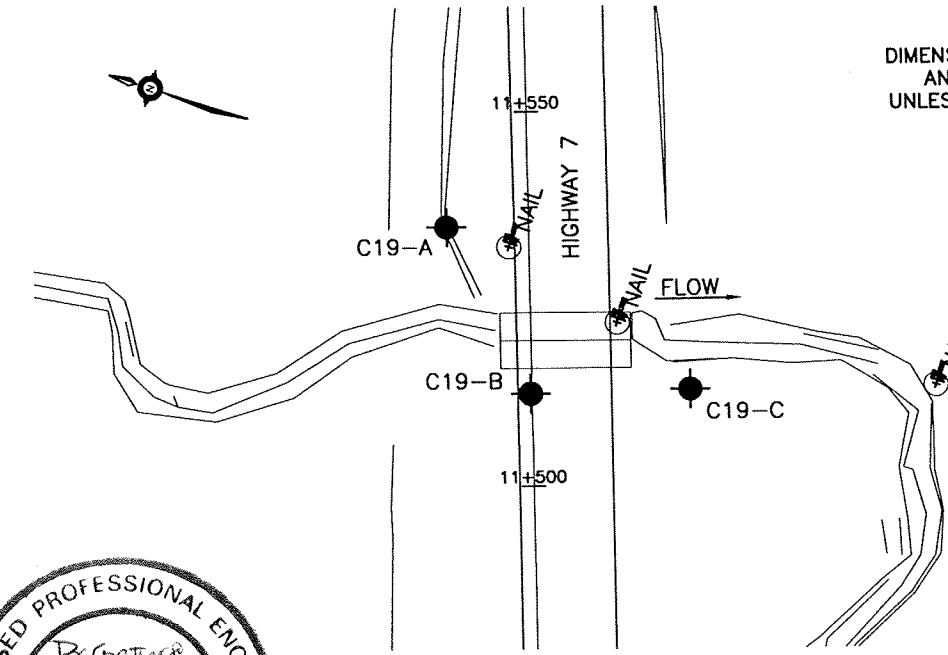
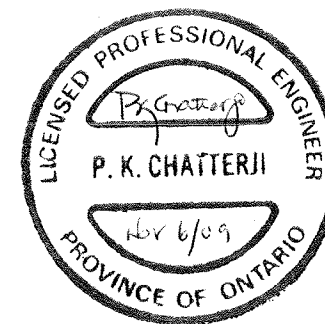
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GEOCREs No. 30M14-319



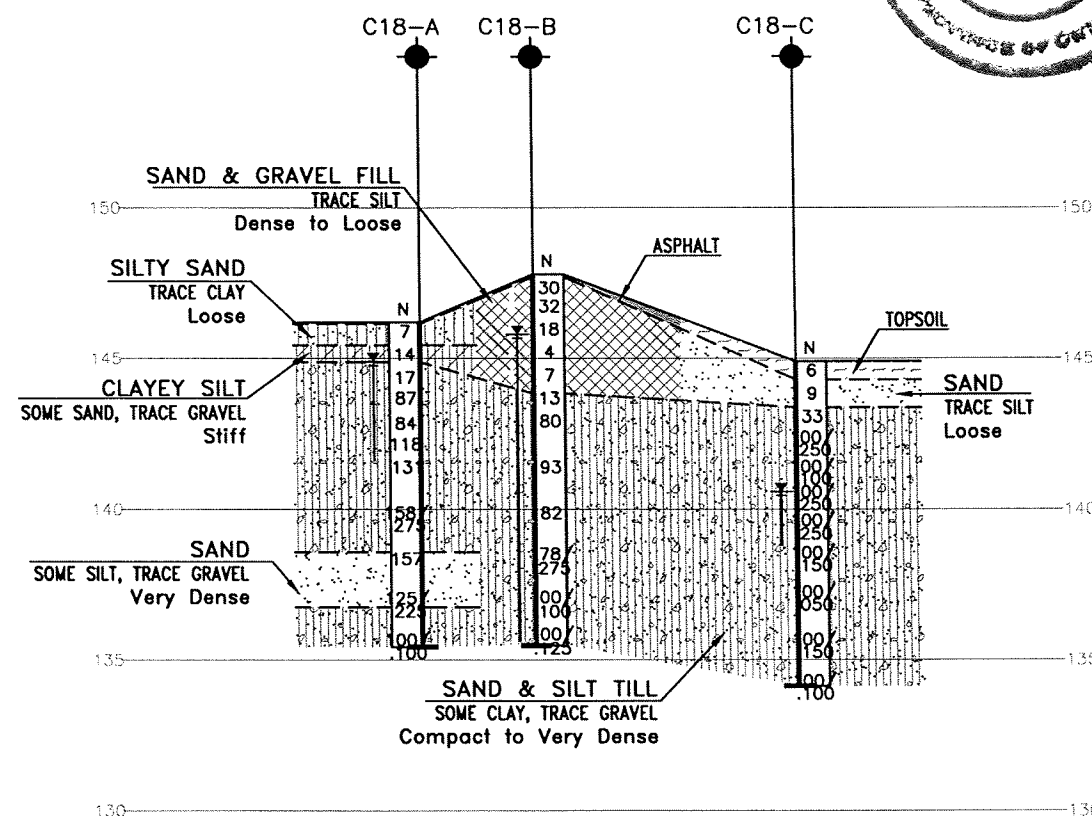
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SCALE 1:1000



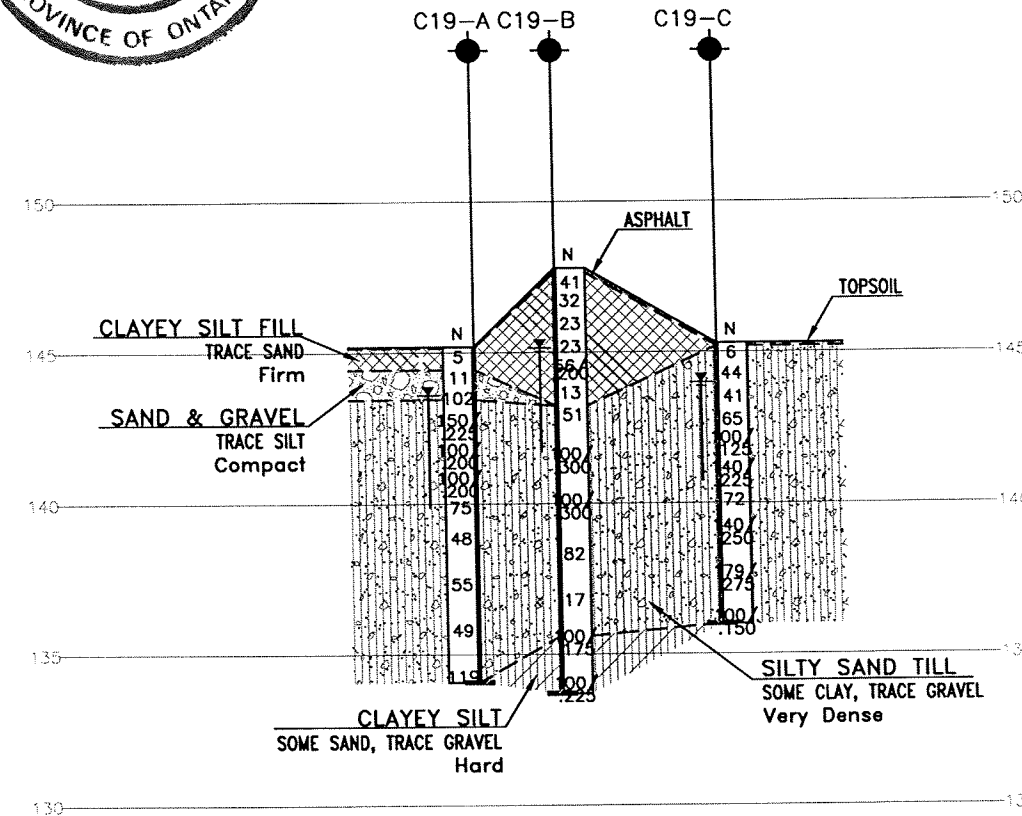
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SCALE 1:1000



PROFILE CULVERT C-18

SCALE 1:1000
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V 1:250



PROFILE CULVERT C-19

SCALE 1:1000
H 1:1000
V 1:250

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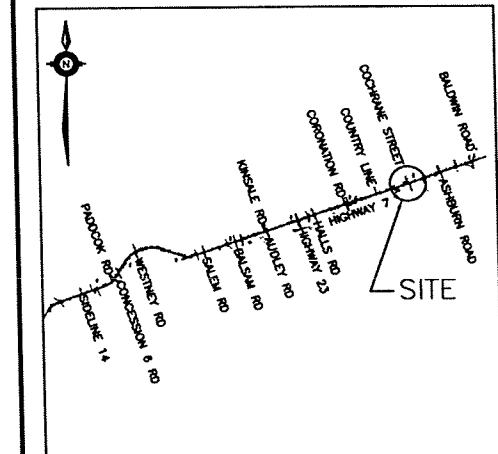
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

HIGHWAY 7
CONT No
GWP No 2075-08-00








SHEET

HWY 7
BROCK STREET TO HWY 12
CULVERTS C-20 & C-21
BOREHOLE LOCATIONS AND SOIL STRATA



KEYPLAN

LEGEND

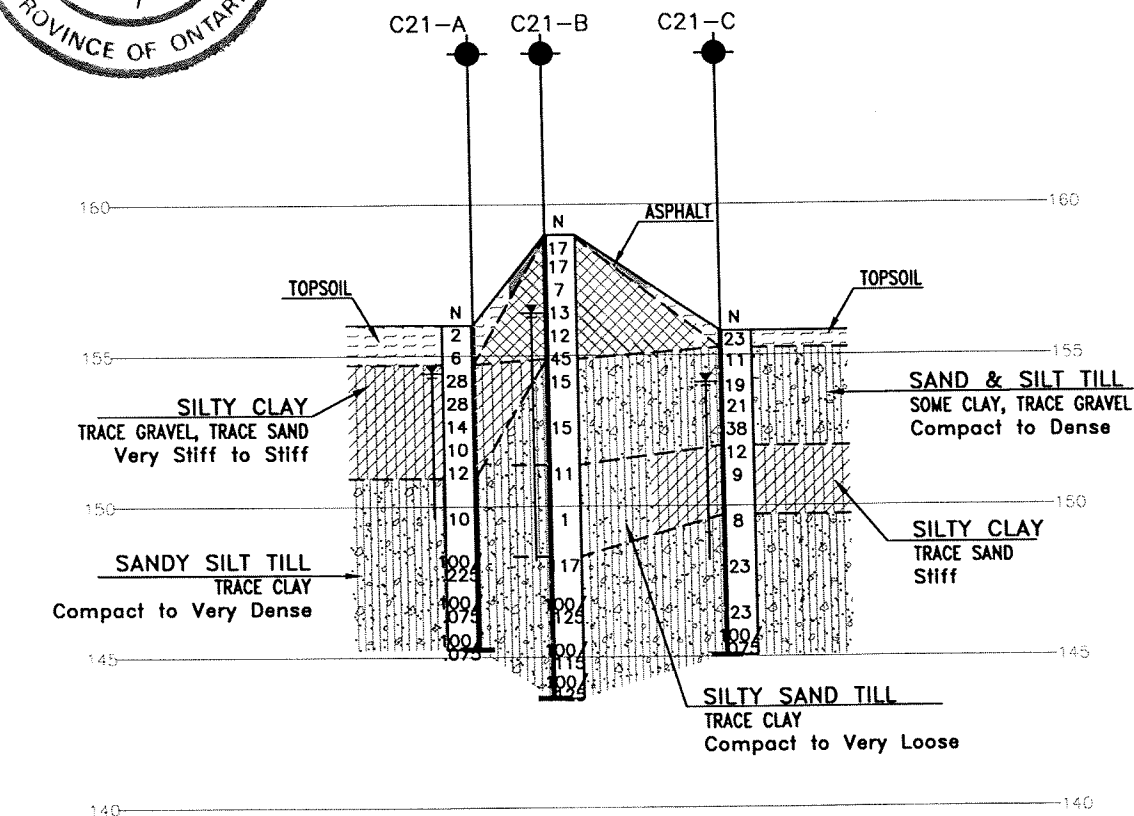
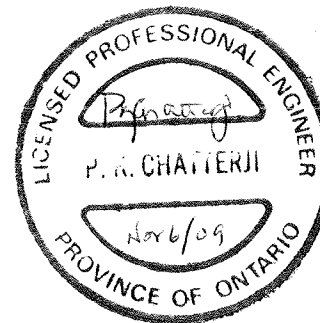
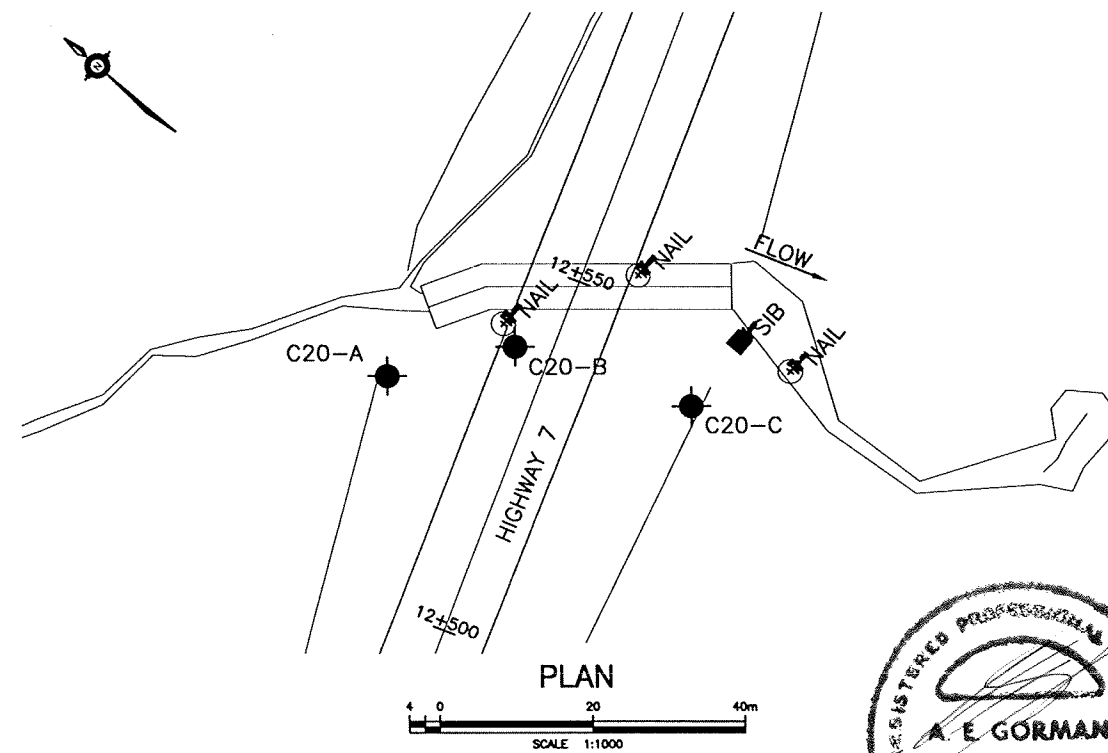
- | | |
|---|---------------------------------------|
|  | Borehole |
|  | Borehole and Cone |
| N | Blows /0.3m (Std Pen Test, 475J/blow) |
| CONE | Blows /0.3m (60° Cone, 475J/blow) |
| PH | Pressure, Hydraulic |
|  | Water Level |
|  | Head Artesian Water |
|  | Piezometer |
| 90% | Rock Quality Designation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

[illegible]

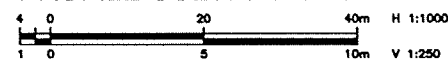
-NOTES-

- 1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
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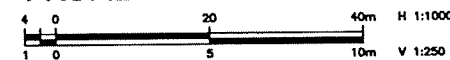
GEOCRES No. 30M14-319



PROFILE CULVERT C-20



PROFILE CULVERT C-21



REVISIONS											
	DATE	BY	DESCRIPTION								
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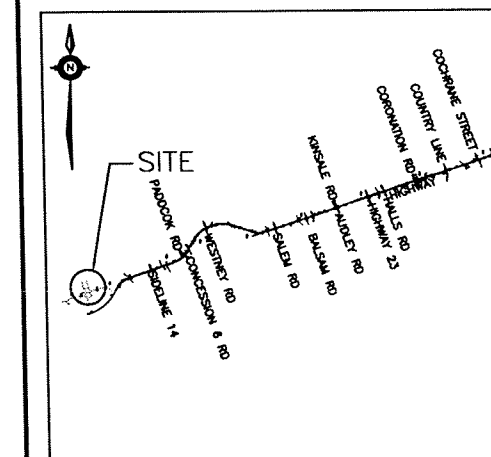
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DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

HIGHWAY 7
CONT No
GWP No 2075-08-00



HWY 7
BROCK STREET TO HWY 12
CULVERTS C-24 & C-25
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET



KEYPLAN

LEGEND

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

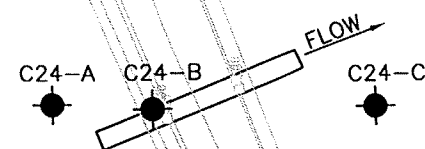
NO	ELEVATION	NORTHING	EASTING
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C24-B	198.6	4 864 352.2	336 283.2
C24-C	196.5	4 864 322.7	336 282.1
C25-A	190.7	4 864 492.2	336 685.6
C25-B	192.8	4 864 484.7	336 689.6
C25-C	193.0	4 864 464.9	336 700.7

-NOTES-

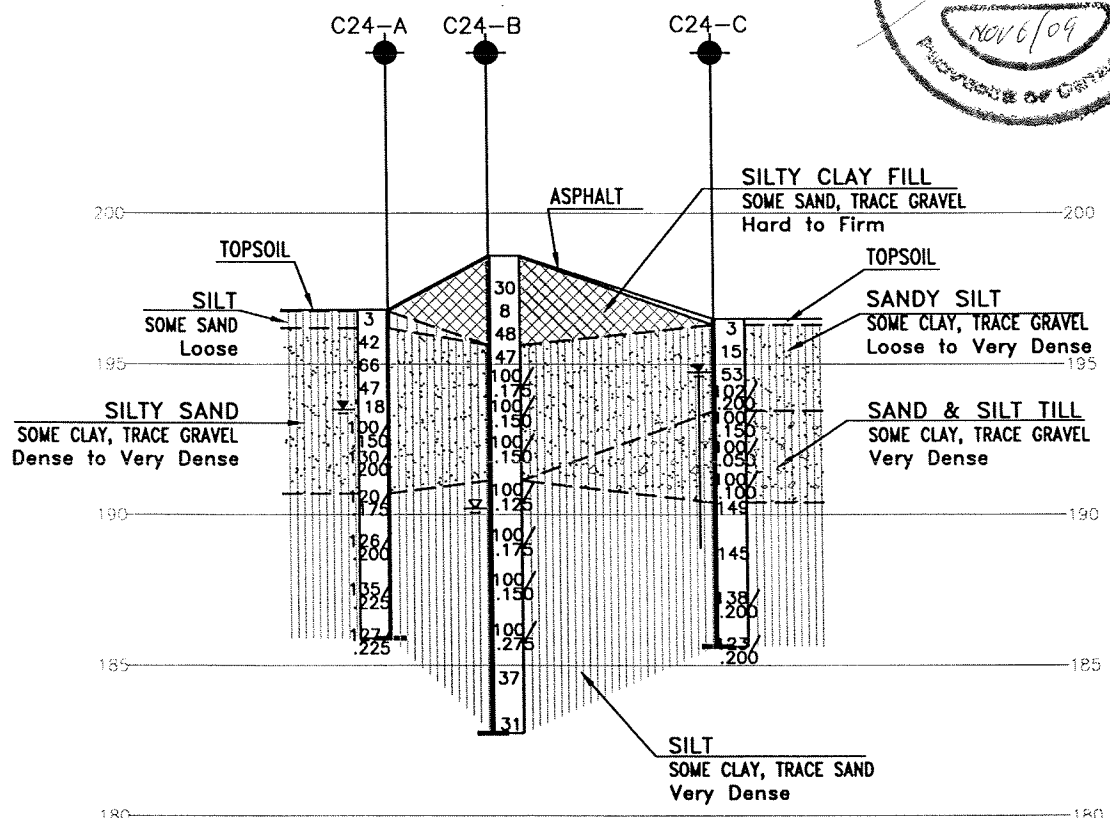
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GEOCRES No. 30M14-319

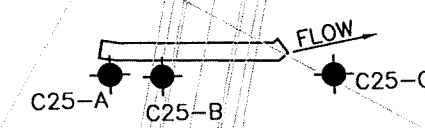
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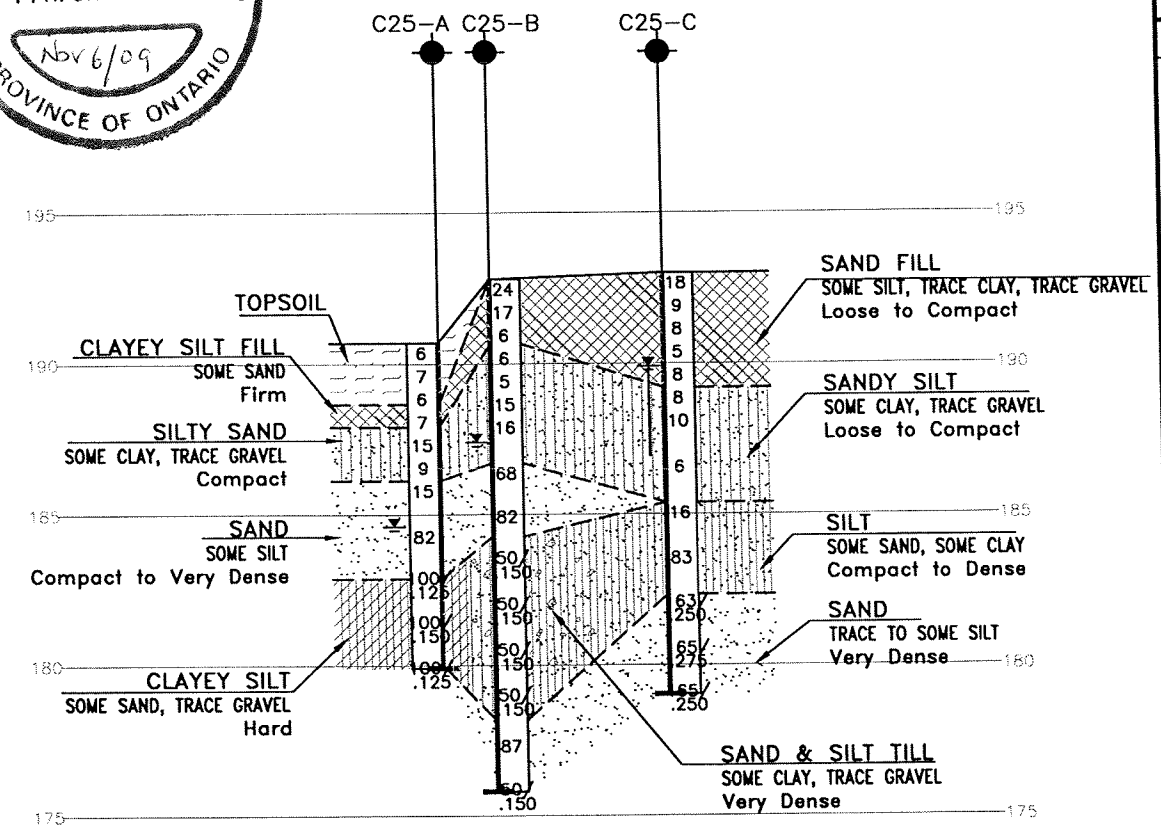
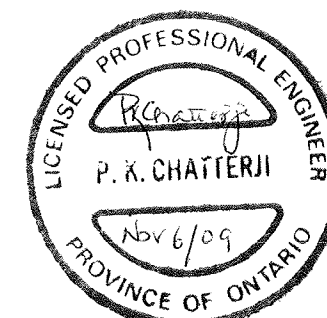
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SCALE 1:1000



PROFILE CULVERT C-24
H 1:1000
V 1:250



PLAN
SCALE 1:1000



PROFILE CULVERT C-25
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V 1:250