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 Highway 427 Expansion – Package 9 (100% Submission)
 High Mast Lighting

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1. INTRODUCTION

This report provides foundation recommendations for the design and construction of the proposed High Mast Lighting (HML) to be installed at selected locations along the new extension of Highway 427. This report discusses HML located within the Package 9 limits. The installation of the HML constitutes part of the Highway 427 Expansion project in the City of Vaughan, Ontario.

Recommendations on the foundation aspects of the HML design presented in this report were based on the interpretation of the subsurface information obtained during recently completed geotechnical investigation by Thurber Engineering Ltd. (Thurber) as well as previous investigations the results of which were presented in the reports listed below:

1. GEOCREC 30M12-164: Geotechnical Investigation Proposed Albion Road Underpass Structure at Highway 427, W.P. 153-80-03, District 6 (Toronto), Central Region for Ministry of Transportation and Communications, dated March 1982, prepared by Peto MacCallum Ltd.
2. GEOCREC 30M12-288: Foundation Investigation and Design Report Highway 427 Widening From Fasken Drive to Steeles Avenue, CN Halton Subdivision Overhead, Toronto, ON, G.W.P. 202-95-00, dated November 26, 2009, prepared by Thurber Engineering Ltd.
3. GEOCREC 30M12-292: Foundation Investigation and Design Report Proposed Sewer Pipe Crossings Hwy 427 Inside Widening From Fasken Drive to Steeles Avenue, Toronto, Ontario, G.W.P. 202-95-00, dated March 10, 2010, prepared by Thurber Engineering Ltd.

The discussion and recommendations for design presented in this report were based on preliminary drawings provided by WSP showing the proposed highway alignment and HML. The approximate locations of the high mast lights have been listed in the table attached to this report and are shown on the Borehole Location Plans in Appendix D.

Geotechnical design parameters for the supports of the proposed HML have been provided in a tabularized format following the text of the report.

It is a condition of this report that Thurber's performance of its professional services is subject to the attached Statement of Limitations and Conditions.

2. SITE DESCRIPTION AND GEOLOGY BACKGROUND

The project site of the Highway 427 Expansion project includes a widening section between Finch Avenue and Highway 7 and the 6.6 km long expansion from Highway 7 to Major Mackenzie Drive in the City of Vaughan, Ontario. Package 9, the subject of this report, is located within the widening section between Finch Avenue and Highway 7. The proposed HML is distributed throughout the widening area, as shown on the Borehole Location Drawing in Appendix D. A total of twenty-six (26) high mast lights are included in Package 9 and are addressed in this report. Lands surrounding the Package 9 area are mostly developed and are used for a mix of commercial and industrial purposes.

The site is situated within the physiographic region known as the Peel Plain (*The Physiography of Southern Ontario* by L.J. Chapman and D.F. Putnam, 1984). The subsurface conditions in the region generally comprise clayey silt to silty clay till (Halton Till) with interlayers of sand and silt till. Localized recent deposits of sands, silts and soft clays formed in small glacial meltwater ponds throughout the region and may be encountered near the river and creek valleys. The site is underlain by shale bedrock of the Georgian Bay Formation with siltstone and limestone interlayers.

3. GEOTECHNICAL INVESTIGATION

The field investigation program for this part of the project was carried out between July 4, 2017 and July 28, 2017. The field program involved drilling and sampling of twenty-two (22) boreholes. In addition, borehole information collected for other structures in the recent and previous investigations and located near the high mast lights was utilized in preparation of this report.

The ground surface elevations and coordinates at the borehole locations were provided to Thurber by WSP. The coordinate system MTM NAD 83, Zone 16 was used to establish locations of the boreholes.

The drilling and sampling operations were supervised on a full-time basis by members of Thurber's technical staff. The supervisors logged the boreholes and processed the recovered soil samples for transport to Thurber's laboratory for further examination and testing.

Groundwater conditions were observed in the open boreholes throughout the drilling operations. Standpipe piezometers were installed in selected boreholes, as detailed on the Record of Borehole sheets. Boreholes without piezometers have been decommissioned in general accordance with Ontario Reg. 903. After the final water level readings, the piezometers will be decommissioned in general accordance with Ontario Reg. 903.

The Record of Borehole sheets from the current investigation are enclosed in Appendix A following the text of this report. The locations of boreholes, as well as the proposed high mast lights are shown on the Borehole Location Plans enclosed in Appendix D. Boreholes from previous investigation utilized in this report are enclosed in Appendix C.

4. SUBSURFACE CONDITIONS

Details of the encountered soil stratigraphy are presented on the Record of Borehole sheets included in Appendix A. In addition, subsurface information obtained from boreholes drilled for other structures along the alignment and placed near the locations of high mast lights has been utilized for the design. Also, selected boreholes from Geocres Reports Nos. 30M12-164, 30M12-288 and 30M12-292 were used in preparation of this report. The Record of Borehole sheets from previous investigations are included in Appendix C.

In general, the soil stratigraphy encountered at this site consisted of either asphalt, topsoil or surficial silty clay to clayey silt overlying a cohesive till deposit. In some boreholes a cohesionless till deposit was encountered below the cohesive till. Occasional cobbles were reported in the till deposit. Cobbles and boulders are inherently present in the till deposits and should be expected during excavations/construction.

The simplified soil stratigraphy, borehole coordinates and design ground water levels at each high mast light location are provided in the attached table.

5. FOUNDATION DESIGN FOR OVERHEAD SIGN AND HIGH MAST SUPPORTS

5.1 Foundation Parameters

Design of the HML foundations should be carried out in accordance with the following document.

- Ministry of Transportation, Ontario (2004) "Guidelines for the Design of High Mast Pole Foundations", Fourth Edition, BRO-009, Engineering Standards Branch, Bridge Office, (Reference 1).

Reference should also be made to the following document.

- Canadian Highway Bridge Design Code and Commentary, 2014 or the most recent edition (Reference 2)

It is understood that a typical high mast lighting support consists of a single augered caisson (drilled shaft). The recommended parameters for foundation design of caissons are provided in the table following the text of this report.

To account for frost action and surficial disturbance, the ultimate lateral passive resistance in front of a caisson within the upper 1.2 m below final grade should be neglected in the foundation design. It is recommended that all topsoil and organic deposits also be neglected in determination of lateral resistance.

Where downward sloping fill or native soil exists in front of a caisson, reduction of lateral passive resistance should be taken into consideration during design. For foundation design at the caissons, it should be assumed that full lateral resistance can only be mobilized where the width of the soil in front of or behind the caisson is equal to or greater than approximately four (4) times the diameter of the caissons. For sloping ground in front of a caisson, the magnitude of the mobilized passive resistance can be estimated by interpolating between zero passive resistance at the level where the slope face intersects the pile, and full passive resistance at the level where the slope face is at a horizontal distance equal to or greater than four (4) times the diameter of the caisson.

Where an unconfined compressive strength, q_u , ($q_u = 2 \times c_u$, where c_u is undrained shear strength) is provided for cohesive soils (clayey silt to silty clay fill, native clayey silt or silty clay or clayey silt to silty clay till), the ultimate lateral passive resistance should be calculated in conjunction with the total soil unit weight.

When designing for portions of the caissons below the groundwater level in cohesionless sands and silts, the submerged soil unit weight, γ' , should be used.

The design parameters were provided for the soils encountered beneath the existing ground surface at the borehole locations. The high mast lighting may be installed through the embankment fill to be placed for the proposed highway. The embankment fill may consist of either granular fill or cohesive fill (reused soils excavated on site). Providing the fills are properly placed and compacted as per specifications, the design parameters presented in the table below may be used for design of the HML in fills.

Fill Material	q_u (kPa)	ϕ' (deg.)	γ (kN/m ³)	n_h (MN/m ³)	K_p
Granular Fill - compact	-	32	22	5000	3.3
Cohesive Fill – firm to stiff	80	-	20	-	-

The stabilized groundwater level may be at higher elevation than indicated on the Record of Borehole sheets. The required depth of the drilled shaft will be governed by lateral loads, including wind loads. The length of the caisson should also be sufficient to counteract frost action (upward forces).

An equivalent caisson width equal to two (2) times the caisson diameter may be assumed for lateral resistance calculations. Appropriate load and resistance factors should be applied for caisson design.

5.2 Caisson Installation

Caisson installation should be carried out in accordance with OPSS 903.

Caisson installation equipment must be able to dislodge, handle, remove cobbles and boulders, to penetrate obstructions within the fill and to drill through hard or very dense layers, where encountered.

The short term groundwater levels were measured to be at various depths below existing ground surface. The stabilized groundwater levels may be higher than indicated on the record of Borehole sheets. Soil sloughing and water seepage may occur in unsupported holes especially in sands and silts below the groundwater level. The cohesionless soils would also be susceptible to disturbance (basal and sidewall instability) under conditions of unbalanced hydrostatic head. Temporary liners must be available to support the caisson sidewalls and to provide seepage cut-off where required. Any accumulated water may have to be pumped out from the hole prior to placing concrete. A balancing water head should be used inside the caisson hole in cases where the caisson base is within sands and silts. Should it be considered impractical to remove the accumulated water inside the hole, it is recommended that the concrete be placed by the tremie method.

5.3 Construction Concerns

Concerns during caisson installation mainly involve the handling and removal of cobbles or boulders, or other obstructions in the fill and till, drilling through hard/very dense soils, soil sloughing and water seepage from caisson sidewalls, and basal instability primarily due to unbalanced hydrostatic head. Recommendations on how to address these issues have been outlined in the previous section.

5.4 Construction Inspection and Testing

Caisson construction should be monitored by qualified geotechnical personnel (as per OPSS 903) to verify the soil conditions and to confirm that those conditions are consistent with the design assumptions provided in this report.



STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

5. INTERPRETATION OF THE REPORT

- a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

7. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.

TABLE 1
HIGHWAY 427 EXTENSION - DESIGN PACKAGE 9
HIGH MAST LIGHTING SUPPORTS
FOUNDATION DESIGN PARAMETERS

HML Location/ Station (approx.)/ Number	Relevant Borehole	Simplified Stratigraphy	Ground Surface Elev. (m)	Depth Below Existing Grade (m)	Foundation Design Parameters						
					q _u (kPa)	ϕ' (deg.)	γ (kN/m³)	γ' (kN/m³)	n _h (MN/m³)	K _p	Ground water depth (m)
Median 10+100 P1 (Finch Ave at 10+000)	HM17-38	Asphalt Gravelly Sand Fill – compact / v. dense Clayey Silt Till – v. stiff Clayey Silt Till - hard	166.2	0.0 – 0.2 0.2 – 1.4 1.4 – 3.0 3.0 – 7.9	- - 190 300	- 33 - -	- 20 19 20	- - - -	- 6500 - -	- 3.4 - -	2 (below existing grade)
Median 10+360 P2	PC-21 (Geocres 30M12- 292)	Asphalt Sand Fill – compact Silty Clay Fill – firm to v. stiff Silty Clay Fill – firm Sand and Gravel – Dense Silty Sand Till – v dense	168.2	0 – 0.2 0.2 – 0.8 0.8 – 3.7 3.7 – 7.3 7.3 – 8.8 8.8 – 9.8	- - 100 80 - -	- 30 - - 34 38	- 20 19 19 - -	- - - - 10 10	- 2500 - - 6000 11000	- 3.0 - - 3.5 4.2	4 (below existing grade)
Median 10+500 P3	HM17-01	Asphalt Gravelly Sand Fill – compact/dense Silty Clay – firm Silty Clay Till – stiff to v. stiff Silty Sand Till – dense to v. dense	170.3	0.0 – 0.1 0.1 – 1.5 1.5 – 2.2 2.2 – 5.9 5.9 – 8.2	- - 50 150 -	- 32 - - 37	- 20 19 19 -	- - - - 10	- 3500 - - - 9000	- 3.3 - - - 4.0	6 (below existing grade)
Median 10+650 P4	HM17-02	Asphalt Gravelly Sand Fill – compact to dense Silty Clay/Silty Clay Till – stiff to v.stiff	172.3	0.0 – 0.1 0.1 – 1.5 1.5 – 8.2	- - 140	- 32 -	- 19 19	- - -	- 5100 -	- 3.3 -	2 (below existing grade)
Median 10+780 P5	HM17-03	Asphalt Sand and Gravel Fill –dense Silty Clay/ Clayey Silt Till – stiff Silty Clay Till –v.stiff/ hard	174.3	0.0 – 0.1 0.1 – 0.7 0.7 – 5.6 5.6 - 8.2	- - 120 190	- 32 - -	- 19 19 19	- - - -	5100 - - -	3.3 - - --	2 (below existing grade)

HML Location/ Station (approx.)/ Number	Relevant Borehole	Simplified Stratigraphy	Ground Surface Elev. (m)	Depth Below Existing Grade (m)	Foundation Design Parameters						
					q_u (kPa)	ϕ' (deg.)	γ (kN/m ³)	γ' (kN/m ³)	n_h (MN/m ³)	K_p	Ground water depth (m)
Median 10+920 P6	HM17-04	Asphalt Sand and Gravel Fill – compact to dense, awl Sand and Gravel Fill – compact to dense, bwl Clayey Silt /Silty Clay Till -stiff Clayey Silt/Silty Clay Till-v.stiff	176.5	0.0 – 0.1 0.1 – 2.0 2.0 – 2.2 2.2 – 4.0 4.0 – 8.2	- - - 140 170	- 32 32 - -	- 19 - 19 19	- - 9 - -	- 5100 3500 - -	- 3.3 3.3 - -	2 (below existing grade)
Median 11+070 P7	HM17-05	Asphalt Sand and Gravel Fill – compact to dense, awl Sand and Gravel Fill – compact to dense, bwl Clayey Silt/Silty Clay Till -stiff	178.4	0.0 – 0.1 0.1 – 2.0 2.0 – 2.2 2.2 – 8.2	- - - 110	- 32 32 -	- 19 - 19	- - 9 -	- 5100 3500 -	- 3.3 3.3 -	2 (below existing grade)
Median 11+220 P8 (south of CNR)	CNR17-01	Topsoil Sand Fill – compact Clayey Silt/Silty Clay Fill – firm to stiff Silty Clay Till – v.stiff	181.2	0.0 – 0.2 0.2 – 0.8 0.8 – 9.1 9.1 – 9.8	- - 60 180	- 30 - -	- 19 18 19	- - - -	- 2500 - -	- 3.0 - -	2 (below existing grade)
Median 11+380 P9	CNH-10 (Geocres 30M12-288)	Asphalt Silt and Sand Fill – compact/dense, awl Silt and Sand Fill – compact/dense, bwl Silty Clay with Sand Till – v. stiff	181.3	0.0 – 0.1 0.1 – 2.0 2.0 – 4.3 4.3 – 6.7	- - - 150	32 32 -	19 - 19	- 9 -	5100 3500 -	3.3 3.3 -	2 (below existing grade)
Median 11+550 P10 (near Albion Rd)	164-1 (Geocres 30M12-164)	Topsoil Silty Clay – firm/stiff Silty Clay with Sand Till – v.stiff/hard Silty Sand/SandTill – v.dense	172.3	0.0 – 0.3 0.3 – 2.1 2.1 – 7.0 7.0 – 18.6	100 200 -	- - 38	19 20 -	- - 11	- - 11000	- - 4.2	4 (below existing grade)
Median 11+700 P11	PC-29 (Geocres 30M12-292)	Asphalt Sand Fill -compact Silty Clay Fill – firm/stiff Sandy Silt Fill – compact Silty Clay Till – stiff/hard	179.9	0.0 – 0.1 0.1 – 1.0 1.0 – 4.6 4.6 – 6.1 6.1 – 9.8	- 60 - 150	30 - 33 -	19 19 - 20	- - 10 -	2500 - 4000 -	3.0 - 3.4 -	4 (below existing grade)

HML Location/ Station (approx.)/ Number	Relevant Borehole	Simplified Stratigraphy	Ground Surface Elev. (m)	Depth Below Existing Grade (m)	Foundation Design Parameters						
					q_u (kPa)	ϕ' (deg.)	γ (kN/m ³)	γ' (kN/m ³)	n_h (MN/m ³)	K_p	Ground water depth (m)
Median 12+590 P12	HM17-06	Clayey Silt -stiff Silty Clay/Clayey Silt Till -stiff/very stiff Silty Clay/Clayey Silt Till -hard Silty Sand Till -v. dense	179.1	0.0 – 0.8 0.8 – 2.5 2.5 – 7.6 7.6 – 9.1	120 150 300 -	- - - 38	19 19 20 -	- - - 11	-- - - 11000	- - - 4.2	7 (below existing grade)
Median 12+780 P13	HM17-07	Clayey Silt -stiff Silty Clay/Clayey Silt Till -v. stiff/hard Silty Sand Till -v.dense	178.0	0.0 – 0.8 0.8 – 5.6 7.0 - 9.1	100 300 -	- - 38	19 20 -	- - 11	- - 11000	- - 4.2	5 (below existing grade)
Median 12+970 P14	HM17-08	Topsoil Clayey Silt - stiff Silty Clay/Clayey Silt Till -hard Silty Sand Till - dense	177.7	0.0 – 0.2 0.2 – 0.8 0.8 – 7.6 7.6 – 9.1	- 120 300 -	- - - 36	- 19 20 -	- - - 11	- - - 8000	- - - 3.9	2 (below existing grade)
Median 13+160 P15	HM17-09	Topsoil Clayey Silt – stiff Silty Clay/Clayey Silt Till -hard	177.3	0.0 – 0.1 0.1 – 0.8 0.8 – 9.1	100 300	- -	19 20	- -	- -	- -	1 (below existing grade)
Median 13+310 P16	HM17-10	Clayey Silt -v.stiff Silty Clay/Clayey Silt Till -hard	177.5	0.0 - 0.8 0.8 – 9.1	160 300	- -	19 20	- -	- -	- -	1 (below existing grade)
Median 13+430 P17	HM17-11	Clayey Silt Fill - Stiff Clayey Silty/Silty Clay Till –hard	177.6	0.0 – 0.8 0.8 – 9.1	120 300	- -	19 20	- -	- -	- -	1 (below existing grade)
Median 13+590 P18	HM17-12	Sand and Gravel Fill - loose Clayey Silt to Silty Clay Till -hard	177.7	0.2 – 0.8 0.8 – 5.8	- 300	30 -	16 20	- -	2800 -	3.0 -	1 (below existing grade)
Median 13+740 P19	HM17-13	Asphalt Clayey Silt Fill - stiff Clayey Silt/Silty Clay Till -hard Sandy Silt Till – dense	177.8	0.0 – 0.1 0.1 – 0.9 0.9 – 7.6 7.6 – 8.2	- 140 300 -	- - - 34	- 19 20 -	- - - 11	- - - 5500	- - - 3.5	1 (below ground surface)

HML Location/ Station (approx.)/ Number	Relevant Borehole	Simplified Stratigraphy	Ground Surface Elev. (m)	Depth Below Existing Grade (m)	Foundation Design Parameters						
					q_u (kPa)	ϕ' (deg.)	γ (kN/m ³)	γ' (kN/m ³)	n_h (MN/m ³)	K_p	Ground water depth (m)
Median 13+860 P20	HM17-14	Asphalt Sand and Silt Fill - compact Clayey Silt/Silty Clay Till -hard	178.0	0.0 – 0.1 0.1 – 0.8 0.8 – 7.3	- - 300	- 30 -	- 16 20	- - -	- 2800 -	- 3.0 -	1 (below ground surface)
Ramp W-S at Hwy 7 9+750 P21	HM17-15	Silty Clay – stiff Clayey Silt /Silty Clay Till - hard	180.2	0.0 – 0.7 0.7 – 8.2	100 300	- -	19 20	- -	- -	- -	0 (below ground surface)
Ramp E-S 9+900 P25	HM17-16	Topsoil Silty Clay – firm Silty Clay/Clayey Silt -very stiff Silty Clay/Clayey Silt Till -hard	180.5	0.0 – 0.1 0.1 – 0.7 0.7 – 2.0 2.0 – 7.7	- 80 180 300	- - - -	- 19 19 20	- - - -	- - - -	- - - -	1 (below ground surface)
Ramp W-N 9+850 P28	STM17-10	Asphalt Gravelly Sand Fill – compact Silty Clay – firm/stiff Silty Clay Till – firm/stiff Silt - dense/v.dense	179.2	0.0 – 0.1 0.1 – 0.8 0.8 - 2.3 2.3 – 4.4 4.4 – 6.7	- - 100 100 -	- 31 - - 36	- 18 19 19 -	- - - - 11	- 3800 - - 8000	- 3.1 - - 3.9	2 (below ground surface)
Ramp E-N 9+630 P24	HM17-18	Clayey Silt Fill - firm Clayey Silt/ Silty Clay Till – v.stiff Clayey Silt /Silty Clay - hard Sandy Silt Till -v.dense	181.6	0.0 – 0.8 0.8 – 2.0 2.0 – 4.6 4.6 – 8.2	60 180 300 -	- - - 38	18 19 20 -	- - - 10	- - - 11000	- - - 4.2	1 (below ground surface)
Median 10+210 P30	HM17-17	Clayey Silt Fill - stiff Clayey Silt /Silty Clay Till – stiff Clayey Silt /Silty Clay Till -hard Silt – very dense	182.0	0.0 – 0.6 0.6 – 3.0 3.0 – 6.4 6.4 – 8.0	125 125 200 -	- - - 38	18 19 20 -	- - - 10	- - - 11000	- - - 4.2	1 (below existing grade)

HML Location/ Station (approx.)/ Number	Relevant Borehole	Simplified Stratigraphy	Ground Surface Elev. (m)	Depth Below Existing Grade (m)	Foundation Design Parameters						
					q_u (kPa)	ϕ' (deg.)	γ (kN/m ³)	γ' (kN/m ³)	n_h (MN/m ³)	K_p	Ground water depth (m)
Median 10+390 P31	HM17-39	Topsoil	184.1	0.0 – 0.2	-	-	-	-	-	-	1 (below existing grade)
		Silty Clay -stiff		0.2 – 0.7	100	-	18	-	-	-	
		Clayey Silt / Silty Clay – stiff to hard		0.7 – 8.1	175	-	20	-	-	-	

Legend:

q_u	=	unconfined compressive strength, ($q_u = 2 \times c_u$, where c_u is undrained shear strength) (kPa)
ϕ'	=	angle of internal friction (degrees)
γ	=	soil unit weight (kN/m ³)
γ'	=	submerged soil unit weight (kN/m ³) – to be used only for cohesionless soils below the groundwater table
n_h	=	coefficient of horizontal subgrade reaction (MN/m ³)
K_p	=	coefficient of passive earth pressure

Notes:

1. High mast lighting stations are approximate.
2. For approximate borehole locations reference should be made to the Borehole Location Plan (attached). Borehole coordinates (northings and eastings) are provided on the Record of Borehole sheets.
3. This table must be read in conjunction with the text of this report.
4. To account for frost action and surficial soil disturbance, the ultimate lateral passive resistance in front of the caisson within the upper 1.2 m below final grade should be neglected in the foundation design.
5. If new fill is placed, some caissons may be partially embedded within the new fill.

Appendix A

Record of Borehole Sheets – Recent Investigation

SYMBOLS, ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES

1. TEXTURAL CLASSIFICATION OF SOILS

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

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

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

3. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

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

NOTE: Hierarchy of Soil Strength Prediction

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


4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

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

5. LEGEND FOR RECORDS OF BOREHOLES

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

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

 Water Level
 Shear Strength Determination by Pocket Penetrometer

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

EXPLANATION OF ROCK LOGGING TERMS


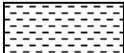



ROCK WEATHERING CLASSIFICATION

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

DISCONTINUITY SPACING

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

SYMBOLS

	CLAYSTONE
	SILTSTONE
	SANDSTONE
	COAL
	BEDROCK

STRENGTH CLASSIFICATION

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

TERMS

Total Core Recovery: (TCR)	Core recovered as a percentage of total core run length
Solid Core Recovery:(SCR)	Percent Ratio of solid core of full cylindrical shape recovered. Expressed with respect to the total length of core run
Rock Quality Designation:(RQD)	Total length of sound core recovered in pieces 0.1m in length or larger as a % of total core run length.
Uniaxial Compressive Strength (UCS)	Axial stress required to break the specimen
Fracture Index:(FI)	Frequency of natural fractures per 0.3m of core run.

UNIFIED SOILS CLASSIFICATION

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

RECORD OF BOREHOLE No CNR 17-01

1 OF 2

METRIC

W.P. _____ LOCATION N 4 845 013.7 E 294 340.4 ORIGINATED BY ES
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.25 - 2017.07.25 CHECKED BY AMP

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											
181.2	GROUND SURFACE							20	40	60	80	100							
0.0	ASPHALT: (150mm)						181												
0.2	SAND, trace gravel Compact Brown		1	GS															
180.4	Moist (FILL)																		
0.8	Clayey SILT to Silty CLAY, some sand, trace gravel Firm to Stiff Brown Moist (FILL)		1	SS	7		180												
			2	SS	4														
							179												
			3	SS	5														
			4	SS	5		178												
							177												
			5	SS	10														
							176												
			6	SS	7		175												
	Occasional wood fibres below 7.2m depth						174												
			7	SS	8														
							173												
172.1							172												
9.1	Silty CLAY, some sand, trace gravel Very Stiff Brown		8	SS	25														
171.4	Moist (TILL)																		
9.8																			

Continued Next Page

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

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RECORD OF BOREHOLE No CNR 17-01

2 OF 2

METRIC

W.P. _____ LOCATION N 4 845 013.7 E 294 340.4 ORIGINATED BY ES
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.25 - 2017.07.25 CHECKED BY AMP

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					WATER CONTENT (%)						
						20	40	60	80	100	20	40	60				
	Continued From Previous Page																
	END OF BOREHOLE AT 9.8m. BOREHOLE OPEN AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO 0.3m, CEMENT TO 0.1m, THEN ASPHALT TO SURFACE.																

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RECORD OF BOREHOLE No HM 17-01

1 OF 1

METRIC

W.P. _____ LOCATION N 4 844 299.0 E 294 469.7 ORIGINATED BY OA
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.21 - 2017.07.21 CHECKED BY ME

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									
170.3	GROUND SURFACE							20	40	60	80	100					
0.0 0.1	ASPHALT: (75mm)							20	40	60	80	100					
	Gravelly SAND Dense to Compact Grey Moist (FILL)		1	SS	36		170										
			2	SS	11		169										
168.8																	
1.5	Silty CLAY , trace sand, trace gravel Firm Brown Moist		3	SS	4		168										
168.1																	
2.2	Silty CLAY , trace to some sand, trace gravel Stiff to Very Stiff Brown Moist (TILL)		4	SS	14		167										
			5	SS	21		166										
			6	SS	21		165										
164.4																	
5.9	Silty SAND , some gravel, some clay Very Dense Brown Moist (TILL)		7	SS	46		164										
			8	SS	72		163										
162.1																	
8.2	END OF BOREHOLE AT 8.2m. WATER LEVEL AT 7.6m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO SURFACE.																

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RECORD OF BOREHOLE No HM 17-02

1 OF 1

METRIC

W.P. _____ LOCATION N 4 844 441.2 E 294 448.2 ORIGINATED BY OA
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.21 - 2017.07.21 CHECKED BY ME

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					
172.3	GROUND SURFACE												
0.0 0.1	ASPHALT: (75mm)												
	Gravelly SAND , some silt Dense to Compact Grey Moist (FILL)		1	SS	36		172						36 47 17 (SI+CL)
			2	SS	22		171						
170.8													
1.5	Silty CLAY , trace sand, trace gravel, trace organics (rootlets) Stiff Grey Moist		3	SS	10		170						
170.0													
2.3	Silty CLAY , trace to some sand, trace gravel, occasional cobbles Stiff to Very Stiff Brown Moist (TILL)		4	SS	9		169						
			5	SS	10		168						
			6	SS	18		167						
			7	SS	8		166						
			8	SS	19		165						
164.1	END OF BOREHOLE AT 8.2m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS, THEN ASPHALT TO SURFACE.												
8.2													

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

RECORD OF BOREHOLE No HM 17-03

1 OF 1

METRIC

W.P. _____ LOCATION N 4 844 583.7 E 294 427.1 ORIGINATED BY KK
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.24 - 2017.07.24 CHECKED BY ME

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						
174.3	GROUND SURFACE													
0.0	ASPHALT: (100mm)													
0.1	SAND and GRAVEL Dense Brown Moist (FILL)		1	SS	38		174							
173.6														
0.7	Clayey SILT to Silty CLAY, trace to some sand, trace gravel Stiff to Hard Brown to Grey Moist (TILL)		2	SS	12		173							
			3	SS	11		172							
			4	SS	10		171							
			5	SS	13		170							
			6	SS	13		169							
			7	SS	31		168							
			8	SS	20		167							
166.1														
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS, THEN ASPHALT TO SURFACE.													

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RECORD OF BOREHOLE No HM 17-04

1 OF 1

METRIC

W.P. _____ LOCATION N 4 844 725.9 E 294 405.9 ORIGINATED BY KK
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.24 - 2017.07.24 CHECKED BY ME

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE							PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT W _P W W _L WATER CONTENT (%)		
176.5	GROUND SURFACE							20	40	60	80	100					
0.0	ASPHALT: (100mm)							20	40	60	80	100					
0.1	SAND and GRAVEL, trace silt Compact to Dense Brown Moist (FILL)		1	SS	46		176							○			
			2	SS	37									○			
			3	SS	10		175							○			
174.3			4	SS	10		174							○			
2.2	Clayey SILT to Silty CLAY, some sand, trace gravel Stiff to Very Stiff Brown Moist (TILL)		5	SS	14		173							○			
			6	SS	18		172							○			
			7	SS	23		170							○			
			8	SS	20		169							○			
168.2	END OF BOREHOLE AT 8.2m. BOREHOLE DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH CUTTINGS THEN ASPHALT TO SURFACE.																
8.2																	

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

RECORD OF BOREHOLE No HM 17-05

1 OF 1

METRIC

W.P. _____ LOCATION N 4 844 868.3 E 294 385.0 ORIGINATED BY KK
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.24 - 2017.07.24 CHECKED BY ME

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						
178.4	GROUND SURFACE													
0.0	ASPHALT: (100mm)													
0.1	SAND and GRAVEL, trace silt Dense to Compact Brown Moist (FILL)		1	SS	45		178							
			2	SS	27		177							
			3	SS	17									
176.2							176							
2.2	Clayey SILT to Silty CLAY, some sand, trace gravel Stiff Brown Moist (TILL)		4	SS	11		175							
			5	SS	11		174							
			6	SS	8		173							
			7	SS	12		172							
			8	SS	14		171							
170.1														
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS, THEN ASPHALT TO SURFACE.													

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

RECORD OF BOREHOLE No HM 17-06

1 OF 2

METRIC

W.P. _____ LOCATION N 4 846 369.0 E 294 159.2 ORIGINATED BY TF
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.18 - 2017.07.18 CHECKED BY ME

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						
179.1	GROUND SURFACE													
0.0	Clayey SILT , trace gravel, trace sand, trace organics (rootlets) Stiff Brown Moist		1	SS	12		179							
178.4														
0.8	Clayey SILT to Silty CLAY , trace to some sand, trace gravel, occasional cobbles Firm to Hard Brown to Grey Moist (TILL)		2	SS	19		178							
			3	SS	8		177							
			4	SS	22		176							
			5	SS	33		175							
			6	SS	41		174							
			7	SS	50/ 0.075		173							
							172							
171.5														
7.6	Silty SAND , some clay, some gravel Very Dense Grey Wet (TILL)		8	SS	50/ 0.075		171							17 41 31 11
170.0							170							
9.1	END OF BOREHOLE AT 9.1m. BOREHOLE CAVED TO 6.7m AND WATER LEVEL AT 8.0m BELOW GROUND SURFACE. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND													

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

METRIC

[illegible]

RECORD OF BOREHOLE No HM 17-07

1 OF 2

METRIC

W.P. _____ LOCATION N 4 846 561.8 E 294 130.7 ORIGINATED BY TF
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.18 - 2017.07.18 CHECKED BY ME

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						
178.0	GROUND SURFACE													
0.0	Clayey SILT , trace sand, trace gravel, trace organics (rootlets) Stiff Brown Moist		1	SS	10									
177.2														
0.8	Clayey SILT to Silty CLAY , trace to some sand, trace gravel, occasional cobbles Very Stiff to Hard Brown to Grey Moist (TILL)		2	SS	24		177							
			3	SS	44		176							
			4	SS	39		175							
			5	SS	40		174							
			6	SS	117		173							
172.3														
5.6	SAND , some silt to silty, trace to some clay, some gravel Very Dense Brown to Grey Moist (TILL)		7	SS	50/ 0.075		172							
							171							
			8	SS	50/ 0.075		170							
168.8							169							
9.1	END OF BOREHOLE AT 9.1m. BOREHOLE CAVED TO 6.7m AND WATER LEVEL AT 7.0m BELOW GROUND SURFACE. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND													

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

METRIC

[illegible]

RECORD OF BOREHOLE No HM 17-08

1 OF 2

METRIC

W.P. _____ LOCATION N 4 846 739.3 E 294 104.7 ORIGINATED BY TF
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2107.07.15 - 2017.07.15 CHECKED BY ME

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE							PLASTIC LIMIT w _P NATURAL MOISTURE CONTENT w LIQUID LIMIT w _L WATER CONTENT (%)		
177.7	GROUND SURFACE							20	40	60	80	100					
0.0	TOPSOIL: (150mm)							20	40	60	80	100					
0.2	Clayey SILT , trace sand, trace gravel, trace organics (rootlets) Stiff Brown		1	SS	12		177							○			
176.9	Moist																
0.8	Clayey SILT to Silty CLAY , trace sand, trace gravel, occasional cobbles Hard Brown to Grey Moist (TILL)		2	SS	33									○			
			3	SS	37		176							○			
			4	SS	40		175							○			
			5	SS	60									○	├──┐		
							174										
			6	SS	61		173							○			
							172										
			7	SS	41		171							○			
170.1																	
7.6	Silty SAND , some clay, trace to some gravel Dense Grey Moist to Wet (TILL)		8	SS	48		170							○			
							169										
168.5																	
9.1	END OF BOREHOLE AT 9.1m. BOREHOLE CAVED TO 6.4m AND WATER LEVEL AT 4.3m BELOW GROUND SURFACE. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND																

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

METRIC

[illegible]

RECORD OF BOREHOLE No HM 17-09

1 OF 1

METRIC

W.P. _____ LOCATION N 4 846 881.4 E 294 089.2 ORIGINATED BY TF
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.15 - 2017.07.15 CHECKED BY ME

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						
177.3	GROUND SURFACE							20 40 60 80 100						
0.0	TOPSOIL: (100mm)							○ UNCONFINED + FIELD VANE						
0.1	ClayeySILT, trace sand, trace gravel Stiff Brown Moist		1	SS	9		177	● QUICK TRIAXIAL × LAB VANE						
176.5								20 40 60 80 100						
0.8	ClayeySILT to Silty CLAY, some sand, trace gravel, occasional cobbles Hard Brown to Grey Moist (TILL)		2	SS	66		176	W P W W L						
								WATER CONTENT (%)						
			3	SS	58			20 40 60						
			4	SS	90/ 0.125		175	○						
			7	SS	50/ 0.075		174	○						
							173							
			8	SS	80		172	○						
			9	SS	50		171	○						0 0 44 56
							170							
			10	SS	34		169	○						
168.1														
9.1	END OF BOREHOLE AT 9.1m. BOREHOLE CAVED TO 7.0m AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO SURFACE.													

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RECORD OF BOREHOLE No HM 17-10

1 OF 1

METRIC

W.P. _____ LOCATION N 4 847 046.1 E 294 057.0 ORIGINATED BY TF
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.14 - 2017.07.14 CHECKED BY ME

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL	× LAB VANE	WATER CONTENT (%)					
177.5	GROUND SURFACE						20	40	60	80	100						
0.0	Clayey SILT , trace sand, trace gravel Very Stiff Brown Moist		1	SS	19		177							○			
176.7														○			
0.8	Clayey SILT to Silty CLAY , trace to some sand, trace gravel, occasional cobbles Hard Brown Moist (TILL)		2	SS	50/ 0.075		176							○			
			3	SS	56		175							○			
			4	SS	41		174							○			
			5	SS	100/ 0.150		173							○			
			6	SS	66		172							○			
			7	SS	59		171							○			
			8	SS	50/ 0.075		170							○			
							169										
168.3																	
9.1	END OF BOREHOLE AT 9.1m. BOREHOLE CAVED TO 3.6m AND DRY. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO SURFACE																

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+³, ×³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No HM 17-11

1 OF 1

METRIC

W.P. _____ LOCATION N 4 847 199.6 E 294 049.8 ORIGINATED BY TF
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.13 - 2017.07.13 CHECKED BY ME

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									
177.6	GROUND SURFACE							20	40	60	80	100					
0.0	Clayey SILT , trace sand, trace gravel, trace organics (rootlets) Stiff Brown Moist (FILL)		1	SS	12		177										
176.9																	
0.8	Clayey SILT to Silty CLAY , trace to some sand, trace gravel Hard Brown Moist (TILL)		2	SS	65		176										
			3	SS	98		175										
			4	SS	64		174										
			5	SS	41		173										
			6	SS	79		172										
			7	SS	52		171										
			8	SS	45		170										
							169										
168.5																	
9.1	END OF BOREHOLE AT 9.1m. BOREHOLE CAVED TO 6.2m AND DRY. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO SURFACE																

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+³, ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No HM 17-12

1 OF 1

METRIC

W.P. _____ LOCATION N 4 847 352.9 E 294 059.2 ORIGINATED BY TF
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.13 - 2017.07.13 CHECKED BY ME

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									
177.7	GROUND SURFACE							20	40	60	80	100					
0.0	SAND and GRAVEL , some silt, trace clay, trace organics (rootlets) Loose Brown Moist (FILL)		1	SS	8										○		
176.9							177										
0.8	Clayey SILT to Silty CLAY , some sand, trace gravel, occasional cobbles Hard Brown Moist (TILL)		2	SS	62										○		
			3	SS	125		176								○		
			4	SS	50/ 0.075		175								○		
	Cobbles		5	SS	146										○		
							174										
			6	SS	80		173								○		
							172										
			7	SS	58		171								○		
			8	SS	104/ 0.225		170								○		
169.1																	
8.5	END OF BOREHOLE AT 8.5m. BOREHOLE CAVED TO 5.8m AND DRY UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO SURFACE.																

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+³, ×³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No HM 17-13

1 OF 1

METRIC

W.P. _____ LOCATION N 4 847 504.2 E 294 029.6 ORIGINATED BY CAR
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.04 - 2017.07.04 CHECKED BY ME

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE							PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT w _P w w _L WATER CONTENT (%)		
177.8	GROUND SURFACE							20	40	60	80	100					
0.0	ASPHALT: (100mm)																
0.1	Clayey SILT , some sand, trace gravel Stiff Brown Moist (FILL)		1	SS	14		177							○			
176.9														○			
0.9	Clayey SILT to Silty CLAY , some sand, trace gravel Hard Brown to Grey Moist (TILL)		2	SS	36									○			
			3	SS	87		176							○			
			4	SS	70		175							○	┌───┐		
			5	SS	79									○			
							174										
			6	SS	100		173							○			
							172										
			7	SS	62		171							○			
							170							○			
169.6			8	SS	38												0 25 46 29
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE CAVED TO 6.1m, BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO SURFACE.																

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RECORD OF BOREHOLE No HM 17-14

1 OF 1

METRIC

W.P. _____ LOCATION N 4 847 636.8 E 294 013.5 ORIGINATED BY CAR
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.11 - 2017.07.11 CHECKED BY ME

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					
178.0	GROUND SURFACE												
0.0	ASPHALT: (100mm)												
0.1	SAND and SILT , some clay, some gravel, asphalt fragments Compact Brown Dry (FILL)		1	SS	11								
177.2													
0.8	Clayey SILT to Silty CLAY , trace to some sand, trace gravel, occasional cobbles Very Stiff to Hard Grey Dry (TILL)		2	SS	21								
			3	SS	85								
			4	SS	80								
			5	SS	54/ 0.100								
			6	SS	55								
			7	SS	53								
			8	SS	50								
169.8													
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE OPEN TO 7.3m AND DRY. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO SURFACE.												

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RECORD OF BOREHOLE No HM 17-15

1 OF 1

METRIC

W.P. _____ LOCATION N 4 847 763.3 E 293 964.4 ORIGINATED BY KK
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.28 - 0217.07.28 CHECKED BY ME

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			
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						W P W W L			
180.2	GROUND SURFACE																
0.0	Silty CLAY , trace sand, trace gravel, trace organics Firm Brown Moist		1	SS	9		180							0 30 57 13			
179.5																	
0.7	Clayey SILT to Silty CLAY , some sand to sandy, trace gravel, occasional cobbles Hard Brown to Grey Moist (TILL)		2	SS	30		179										
			3	SS	46		178										
			4	SS	100/ 0.225		177										
			5	SS	100/ 0.100		176										
			6	SS	58		175										
			7	SS	60		174										

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RECORD OF BOREHOLE No HM 17-16

1 OF 1

METRIC

W.P. _____ LOCATION N 4 847 948.9 E 293 908.4 ORIGINATED BY KK
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.25 - 2017.07.25 CHECKED BY ME

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL LIMIT MOISTURE CONTENT		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 (%)			
180.5	GROUND SURFACE							20 40 60 80 100		W _P W W _L			
0.0	TOPSOIL: (100mm)							○ UNCONFINED + FIELD VANE					
0.1	Silty CLAY , trace sand, trace gravel, trace organics (rootlets)		1	SS	7		180	● QUICK TRIAXIAL × LAB VANE					
179.8	Firm												
0.7	Brown Moist												
	Clayey SILT to Silty CLAY , some sand, trace gravel, occasional cobbles below 3.0m depth Very Stiff to Hard Brown to Grey Moist (TILL)		2	SS	20		179						
			3	SS	27								
			4	SS	46		178						
			5	SS	100/ 0.200		177						
			6	SS	100/ 0.125		176						
			7	SS	100/ 0.125		174						
172.8			8	SS	100/ 0.050		173						
7.7	END OF BOREHOLE AT 7.7m. BOREHOLE DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH CUTTINGS TO SURFACE.												

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RECORD OF BOREHOLE No HM 17-17

1 OF 1

METRIC

W.P. _____ LOCATION N 4 848 035.7 E 293 978.9 ORIGINATED BY TF
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.20 - 2017.07.20 CHECKED BY ME

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							
182.0	GROUND SURFACE							20 40 60 80 100							
0.0	Clayey SILT , some sand, trace gravel, trace organics (rootlets)		1	SS	12										
181.3	Brown Moist (FILL)														
0.6	Clayey SILT to Silty CLAY , some sand, trace gravel		2	SS	12										
	Stiff to Hard														
	Brown to Grey		3	SS	14										
	Moist (TILL)														
			4	SS	13										
			5	SS	34										
			6	SS	80										
			7	SS	100/ 0.150										
175.5	SILT , some clay														
6.4	Very Dense														
	Grey														
	Moist														
			8	SS	50/ 0.075										
173.9	END OF BOREHOLE AT 8.0m. BOREHOLE DRY UPON COMPLETION. BOREHOLE CAVED TO 7.0M, THEN BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO SURFACE.													0 0 87 13	
8.0															

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RECORD OF BOREHOLE No HM 17-18

1 OF 1

METRIC

W.P. _____ LOCATION N 4 847 895.1 E 294 058.6 ORIGINATED BY TF
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.21 - 2017.07.21 CHECKED BY ME

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								
181.6	GROUND SURFACE							20	40	60	80	100	PLASTIC LIMIT w _P	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
0.0	Clayey SILT , some sand, trace gravel, trace organics Firm Dark Brown Moist (FILL)		1	SS	6		181									
180.8																
0.8	Clayey SILT to Silty CLAY , some sand to sandy, trace gravel, occasional oxide stains Very Stiff to Hard Brown Moist (TILL)		2	SS	18		180									
			3	SS	29											
			4	SS	48		179									
			5	SS	114		178									
177.0							177									
4.6	Sandy SILT , trace to some clay, trace gravel Very Dense Grey Moist (TILL)		6	SS	99		176									
			7	SS	66		175									
							174									
			8	SS	53											
173.3																
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO SURFACE.															

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RECORD OF BOREHOLE No HM 17-38

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METRIC

W.P. _____ LOCATION N 4 843 901.3 E 294 528.9 ORIGINATED BY OA
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.21 - 2017.07.21 CHECKED BY ME

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
166.2	GROUND SURFACE																	
0.0	ASPHALT: (200mm)																	
0.1	Gravelly SAND Dense to Compact Grey Moist (FILL)		1	SS	60													
			2	SS	25													
164.8	Clayey SILT, sandy, some gravel Compact to Very Dense Grey Moist (TILL)		3	SS	25													
1.4			4	SS	21													
			5	SS	35													
			6	SS	50/ 0.150													
			7	SS	50/ 0.125													
			8	SS	50/ 0.150													
158.3	END OF BOREHOLE AT 7.9m. BOREHOLE DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CUTTINGS TO SURFACE.																	
7.9																		

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RECORD OF BOREHOLE No HM 17-39

1 OF 1

METRIC

W.P. _____ LOCATION N 4 848 216.2 E 293 960.7 ORIGINATED BY KK
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.26 - 2017.07.26 CHECKED BY ME

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					
184.1	GROUND SURFACE												
0.0	TOPSOIL: (150mm)												
0.2	Silty CLAY , trace sand, trace gravel, trace organics (rootlets)		1	SS	10								
183.4	Stiff												
0.7	Brown												
	Moist												
	Clayey SILT to Silty CLAY , trace to some sand, trace gravel		2	SS	33								
	Stiff to Hard												
	Brown to Grey												
	Moist												
	(TILL)		3	SS	32								
			4	SS	46								
			5	SS	33								
			6	SS	14								
			7	SS	40								
										</			

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RECORD OF BOREHOLE No STM 17-10

1 OF 1

METRIC

W.P. _____ LOCATION N 4 847 737.1 E 294 151.9 ORIGINATED BY OA
 HWY 427 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2017.07.19 - 2017.07.19 CHECKED BY ME

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								
								<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div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+³, ×³: Numbers refer to Sensitivity 20 15 10 5 0 (%) STRAIN AT FAILURE

Appendix B

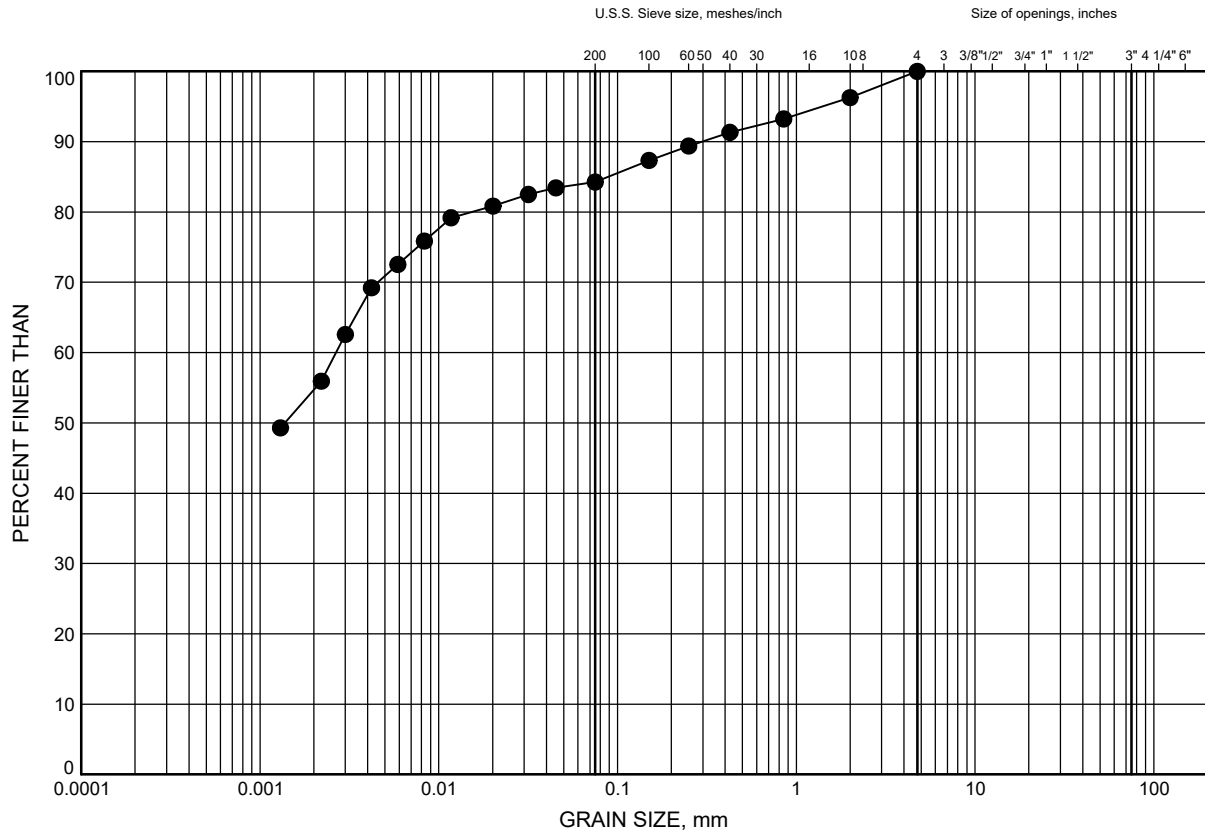
Geotechnical Laboratory Testing Results – Current Investigation

High Mast Lighting - Package 9

GRAIN SIZE DISTRIBUTION

FIGURE B1

Silty CLAY FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	CNR 17-01	4.9	176.3

Date March 2018
W.P. _____



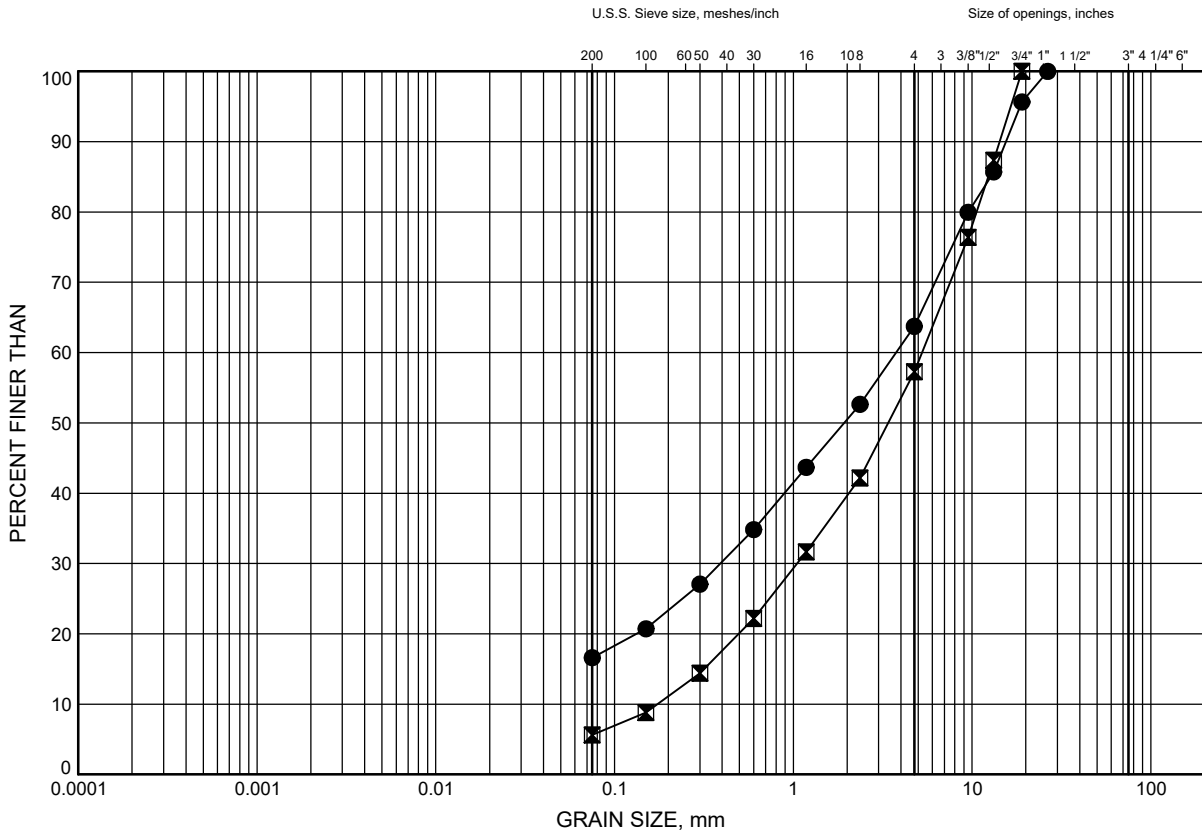
Prep'd AN
Chkd. MTB

High Mast Lighting - Package 9

GRAIN SIZE DISTRIBUTION

FIGURE B2

Gravelly SAND to SAND and GRAVEL FILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	HM 17-02	1.1	171.2
◻	HM 17-05	1.1	177.3

Date March 2018
W.P. _____



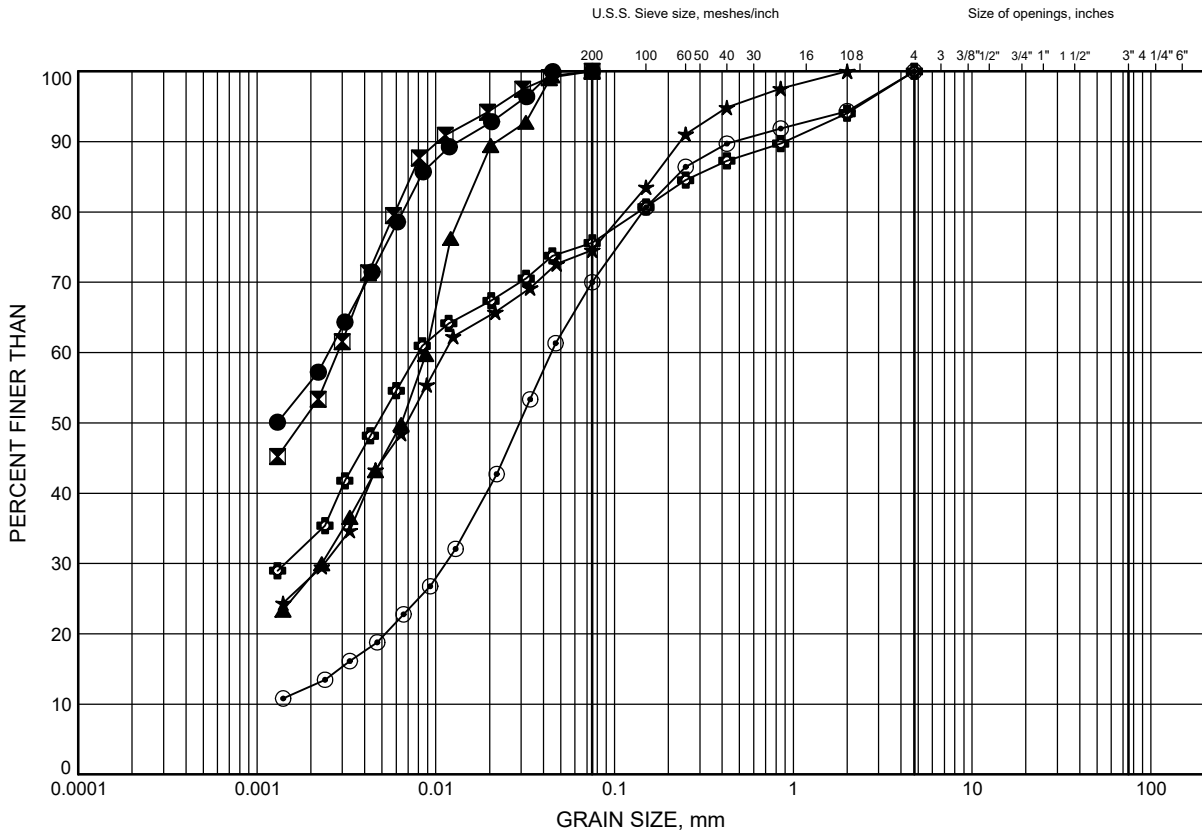
Prep'd AN
Chkd. MTB

High Mast Lighting - Package 9

GRAIN SIZE DISTRIBUTION

FIGURE B3

Clayey SILT to Silty CLAY TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	HM 17-09	6.4	170.9
⊠	HM 17-10	4.9	172.6
▲	HM 17-11	3.4	174.3
★	HM 17-13	7.9	169.9
⊙	HM 17-15	2.5	177.7
⊕	HM 17-18	1.8	179.7

Date March 2018
W.P. _____



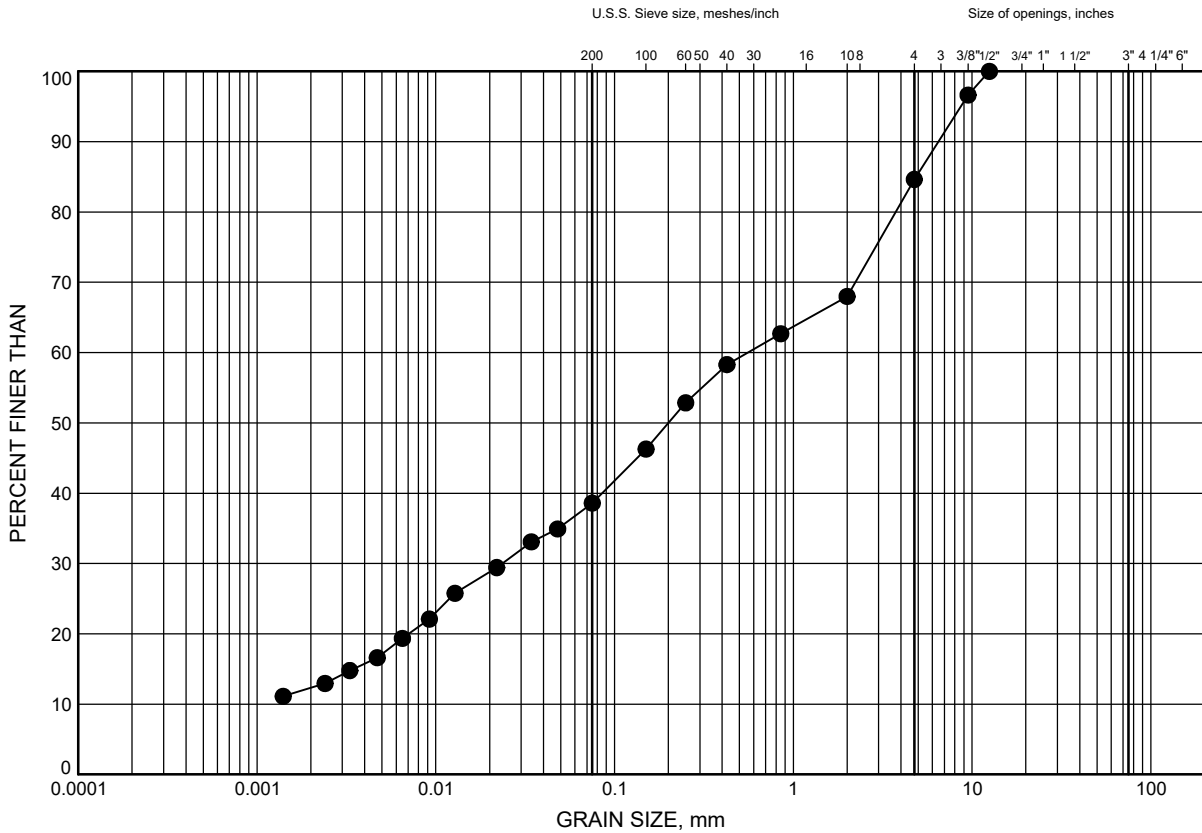
Prep'd AN
Chkd. MTB

High Mast Lighting - Package 9

GRAIN SIZE DISTRIBUTION

FIGURE B4

Clayey SILT to Silty CLAY TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	HM 17-38	3.4	162.8

Date March 2018
W.P. _____



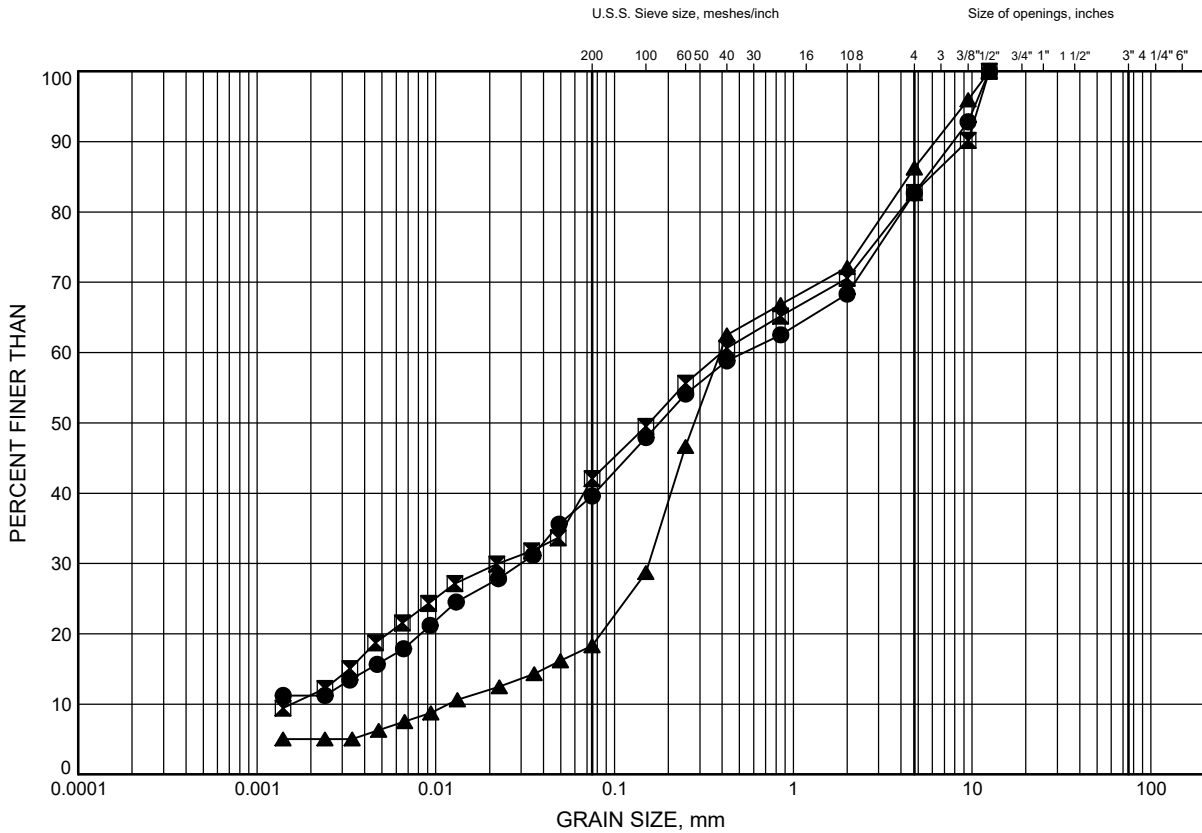
Prep'd AN
Chkd. MTB

High Mast Lighting - Package 9

GRAIN SIZE DISTRIBUTION

FIGURE B5

SAND to Sandy SILT TILL



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

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	HM 17-01	6.4	163.9
⊠	HM 17-06	7.9	171.2
▲	HM 17-07	6.4	171.6

Date March 2018
W.P. _____



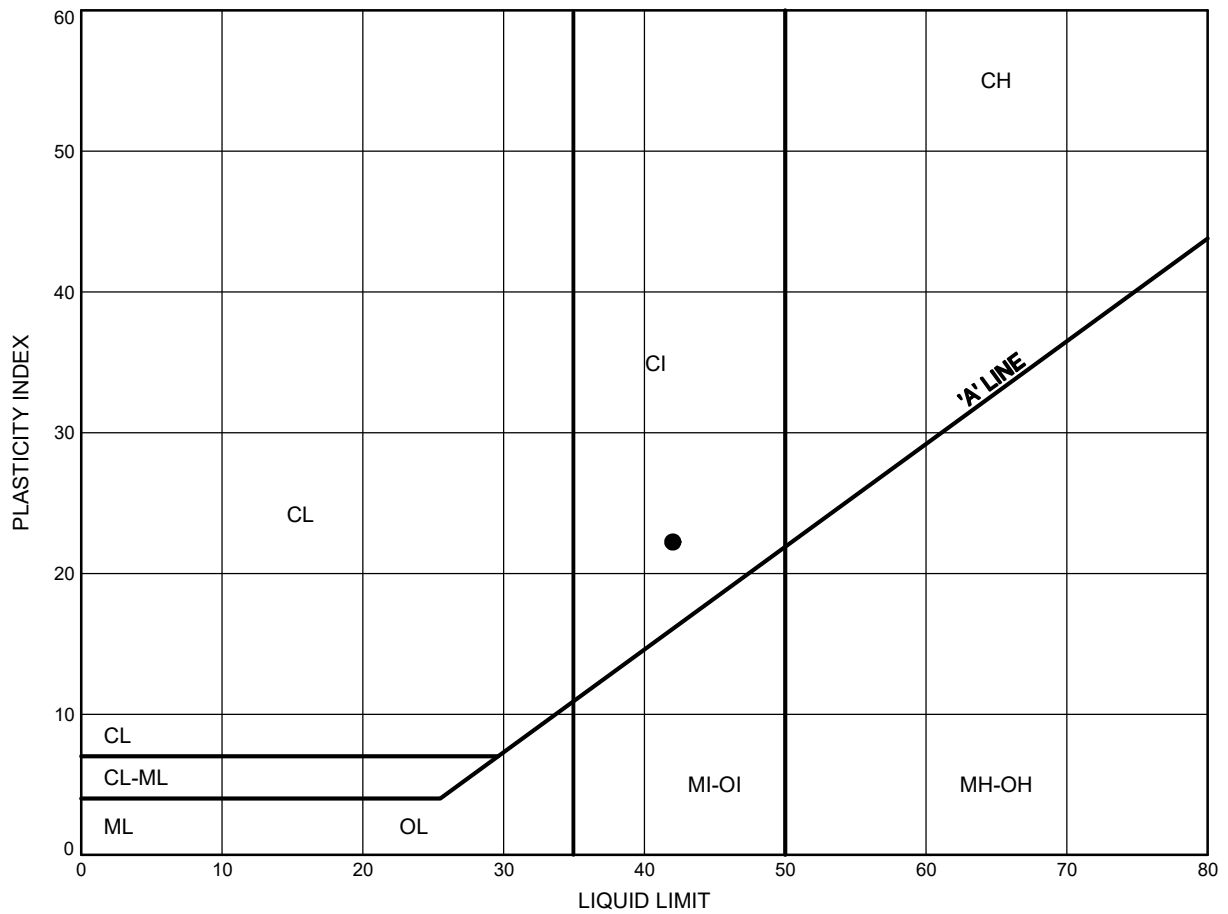
Prep'd AN
Chkd. MTB

High Mast Lighting - Package 9

ATTERBERG LIMITS TEST RESULTS

FIGURE B6

Silty CLAY FILL



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	CNR 17-01	4.9	176.3

Date March 2018
W.P. _____

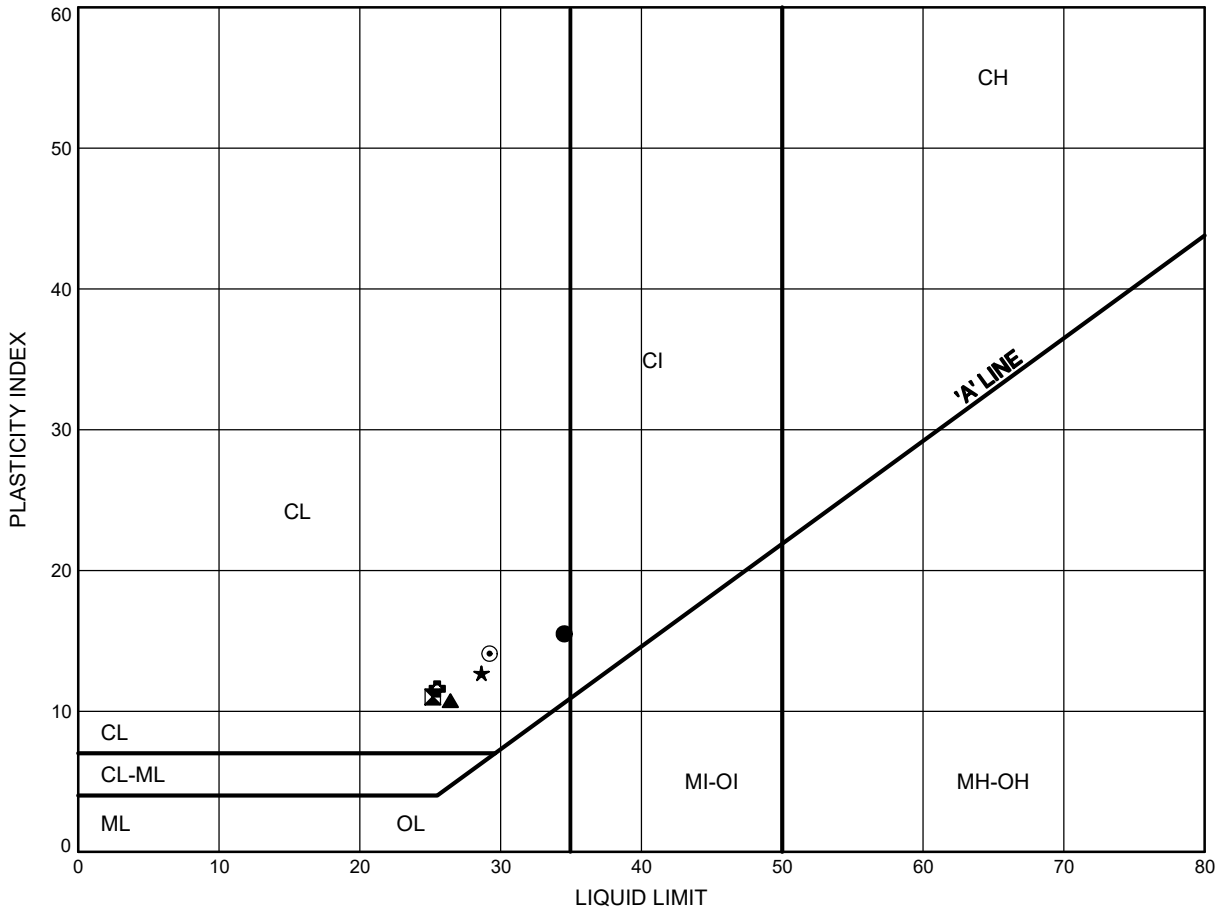


Prep'd AN
Chkd. MTB

High Mast Lighting - Package 9 ATTERBERG LIMITS TEST RESULTS

FIGURE B7

Clayey SILT to Silty CLAY TILL



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	CNR 17-01	9.4	171.8
⊠	HM 17-01	4.9	165.4
▲	HM 17-02	6.4	165.9
★	HM 17-03	1.8	172.5
⊙	HM 17-03	4.9	169.4
⊕	HM 17-04	3.4	173.1

Date March 2018
W.P. _____



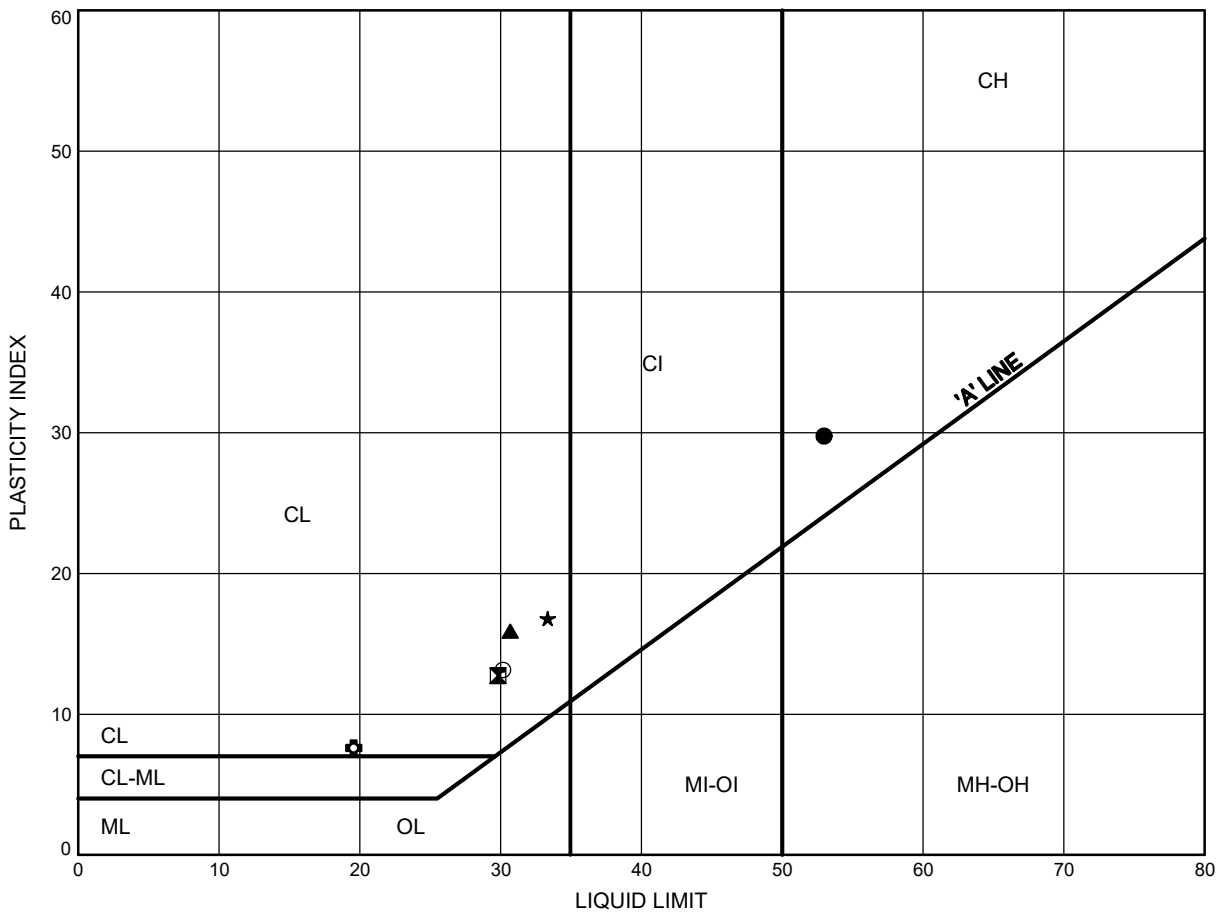
Prep'd AN
Chkd. MTB

High Mast Lighting - Package 9

ATTERBERG LIMITS TEST RESULTS

FIGURE B8

Clayey SILT to Silty CLAY TILL



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	HM 17-05	6.4	172.0
⊠	HM 17-07	2.6	175.4
▲	HM 17-08	3.4	174.3
★	HM 17-09	6.4	170.9
⊙	HM 17-10	4.9	172.6
⊕	HM 17-12	4.9	172.8

Date March 2018
W.P. _____



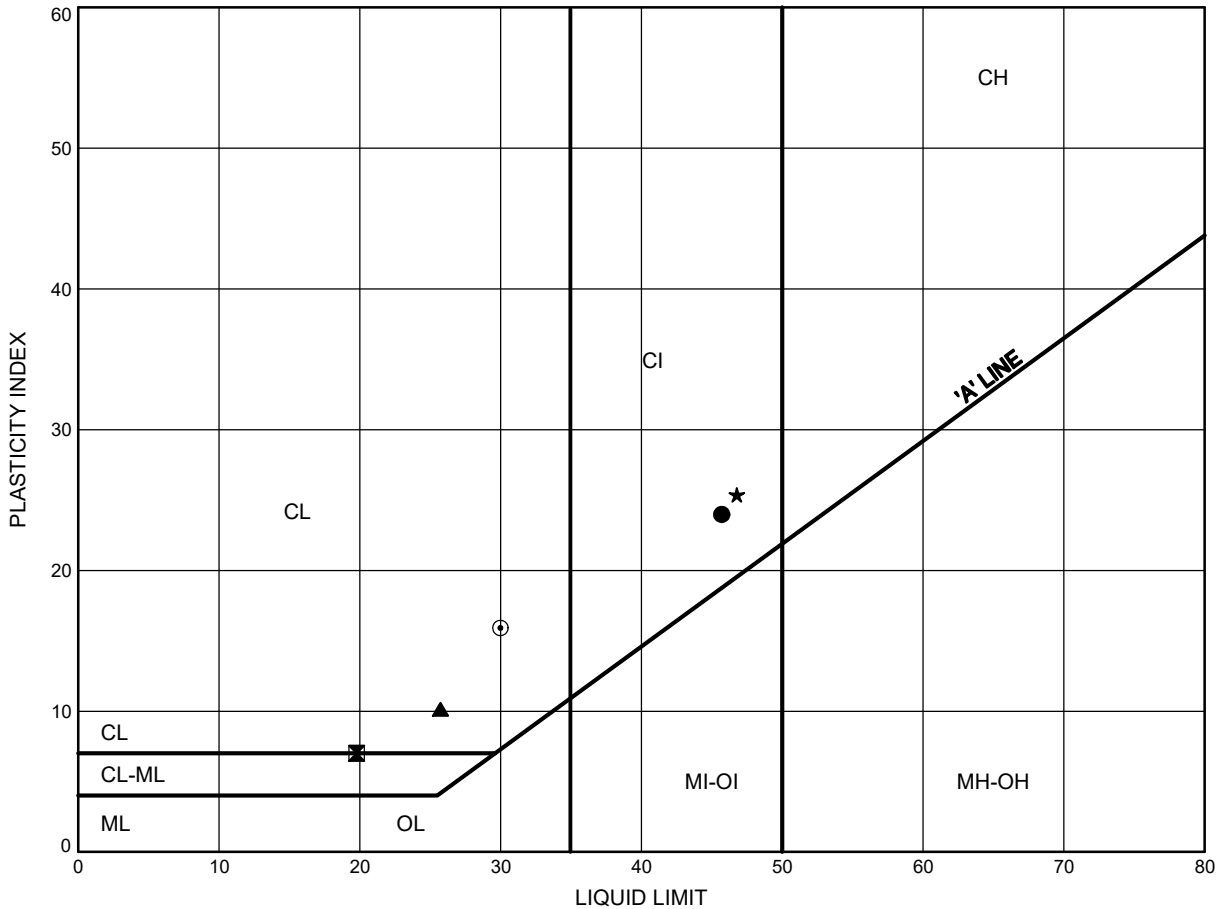
Prep'd AN
Chkd. MTB

High Mast Lighting - Package 9

ATTERBERG LIMITS TEST RESULTS

FIGURE B9

Clayey SILT to Silty CLAY TILL



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	HM 17-13	2.6	175.2
⊠	HM 17-14	1.1	176.9
▲	HM 17-14	3.4	174.6
★	HM 17-16	1.8	178.7
⊙	STM 17-10	3.4	175.8

Date March 2018
W.P. _____



Prep'd AN
Chkd. MTB

Appendix C

Record of Borehole Sheets – Previous Investigations

BH 164-1

RECORD OF BOREHOLE No 1

Metric

W P 153-80-02 LOCATION Co-ords, 4,845, 115N; 294, 281E ORIGINATED BY M.R.
DIST 6 HWY 427 BOREHOLE TYPE Hollow Stem Auger COMPILED BY S.P.
DATUM Geodetic DATE February 17, 1982 CHECKED BY SP

SOIL PROFILE			SAMPLES		GR. UND 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	W _p	W			W _L	WATER CONTENT (%)	GR SA SI CL					
172.32	Ground Level										10 20 30									
172.01	Topsoil, silty clay, low organic, dark brown																			
0.31	Silty clay with sand, trace gravel, fissured, thin fine sand layers, (Glacial Till)		1	SS	10						44	0 17 38 45								
170.19	Intermediate plasticity		2	SS	7						19.1									
2.13	Stiff to Firm, Brown			SS	37															
	Silty clay with sand, trace gravel, fissured, thin sand layers (Glacial Till) Low plasticity		4	SS	53						22.2	1 19 52 28								
162.75	Hard Brown		5	S	30															
4.57	becoming very stiff, Grey		6	SS	26															
			7	SS	27															
165.31																				
7.01	Silty sand fine to coarse with gravel, (Glacial Till)		8	SS	93						22.4	28 40 29 3								
	Very Dense Grey		9	SS	100/280 mm															
			10	SS	100/200 mm							14 44 37 5								
			11	SS	100/280 mm															
			12	SS	100															
			13	SS	100/200 mm															
156.17																				
16.15	Sand, fine with silt, occasional thin layers of silty clay		14	SS	80/180 mm							0 65 22 13								
153.75	Very Dense Grey		15	SS	100/280 mm															
18.57	End of Borehole																			
<p>Note: 1/2 hr. after sample 11, water at elevation 160.42 inside augers</p> <p>Upon completion of augering, water at elevation 161.42 inside augers</p> <p>Piezometer installed at elevation 154.03 seal at elevation 163.48</p> <table><tr><th>Date</th><th>Water Elevation</th></tr><tr><td>Feb. 13/82</td><td>165.02</td></tr><tr><td>Feb. 19/82</td><td>165.42</td></tr><tr><td>Feb. 26/82</td><td>167.02</td></tr></table>													Date	Water Elevation	Feb. 13/82	165.02	Feb. 19/82	165.42	Feb. 26/82	167.02
Date	Water Elevation																			
Feb. 13/82	165.02																			
Feb. 19/82	165.42																			
Feb. 26/82	167.02																			

+3, x5; Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No CNH-10

1 OF 1

METRIC

G.W.P. 202-95-00

LOCATION N 4 845 130.8 E 294 336.8

ORIGINATED BY WB

HWY 427

BOREHOLE TYPE Solid Stem Auger

COMPILED BY MFA

DATUM Geodetic

DATE 2008.12.17 - 2008.12.17

CHECKED BY SKP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
181.3	ASPHALT: (75mm)													
0.0														
0.1	SILT and SAND, trace clay Dense to Compact Brown Moist (FILL)		1	SS	47		181							
			2	SS	47		180							
			3	SS	25		179							
			4	SS	24		178							
			5	SS	14		177							
177.0							176							
4.3	Silty CLAY, with sand, trace gravel Very Stiff Brown (TILL)		6	SS	16		175							
			7	SS	15									
174.6														
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.075m. THEN ASPHALT TO SURFACE.													

+³ . x³ : Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No PC-21

1 OF 2

METRIC

G.W.P. 202-95-00 LOCATION N 4 844 149.4 E 294 503.4 ORIGINATED BY SLL
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2010.01.21 - 2010.01.21 CHECKED BY MEF

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					
168.2													
0.0	ASPHALT: (180mm)												
0.2	SAND, some gravel Brown Moist (FILL)		1	GS									
167.5													
0.8	Silty CLAY, sandy, trace gravel Firm to Very Stiff Brown (FILL)(CL)		1	SS	7								
			2	SS	19								
	wood fragments at 2.4m		3	SS	20								
			4	SS	8								
164.5													
3.7	Silty CLAY, trace sand, trace topsoil Firm Brown (FILL)		5	SS	7								
			6	SS	8								
			7	SS	6								
160.9													
7.3	SAND and GRAVEL, some silt Dense Brown Wet		8	SS	34								
159.4													
8.8	Silty SAND, trace clay, trace gravel Very Dense Grey Moist (TILL)		9	SS	84								
158.5													
9.8	END OF BOREHOLE AT 9.8m.												

Continued Next Page

+³, X³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

ONTMT4S 9270.GPJ 1/22/10

RECORD OF BOREHOLE No PC-21

2 OF 2

METRIC

G.W.P. 202-95-00 LOCATION N 4 844 149.4 E 294 503.4 ORIGINATED BY SLL
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2010.01.21 - 2010.01.21 CHECKED BY MEF

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa									WATER CONTENT (%)
							20	40	60	80	100						
	Continued From Previous Page																
	Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) 2010.01.06 7.5 160.7 2010.01.18 5.1 163.1																

ONTMT4S 9270.GPJ 1/22/10

RECORD OF BOREHOLE No PC-29

1 OF 2

METRIC

G.W.P. 202-95-00 LOCATION N 4 845 453.6 E 294 280.2 ORIGINATED BY LRB
 HWY 427 BOREHOLE TYPE Solid Stem Auger COMPILED BY AN
 DATUM Geodetic DATE 2010.01.12 - 2010.01.12 CHECKED BY MEF

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							
179.9								20 40 60 80 100							
0.0	ASPHALT: (125mm)														
0.1	SAND, some silt, trace gravel Brown Damp (FILL)														
178.8			1	SS	23		179								
1.0	Silty CLAY, some sand, trace gravel Very Stiff to Stiff Grey/Brown (FILL)(CL)		2	SS	12		178								
			3	SS	5		177								0 20 40 40
			4	SS	4		176								
			5	SS	7		175								
175.3			6	SS	27		174								1 18 66 15
4.6	SILT, some sand to sandy, some clay, trace gravel Compact Brown Moist (FILL)						173								
173.8			7	SS	12		172								
6.1	Silty CLAY, sandy, trace gravel Stiff to Hard Brown (TILL)(CL)		8	SS	19		171								
			9	SS	31										1 23 42 34
170.1															
9.8	END OF BOREHOLE AT 9.8m.														

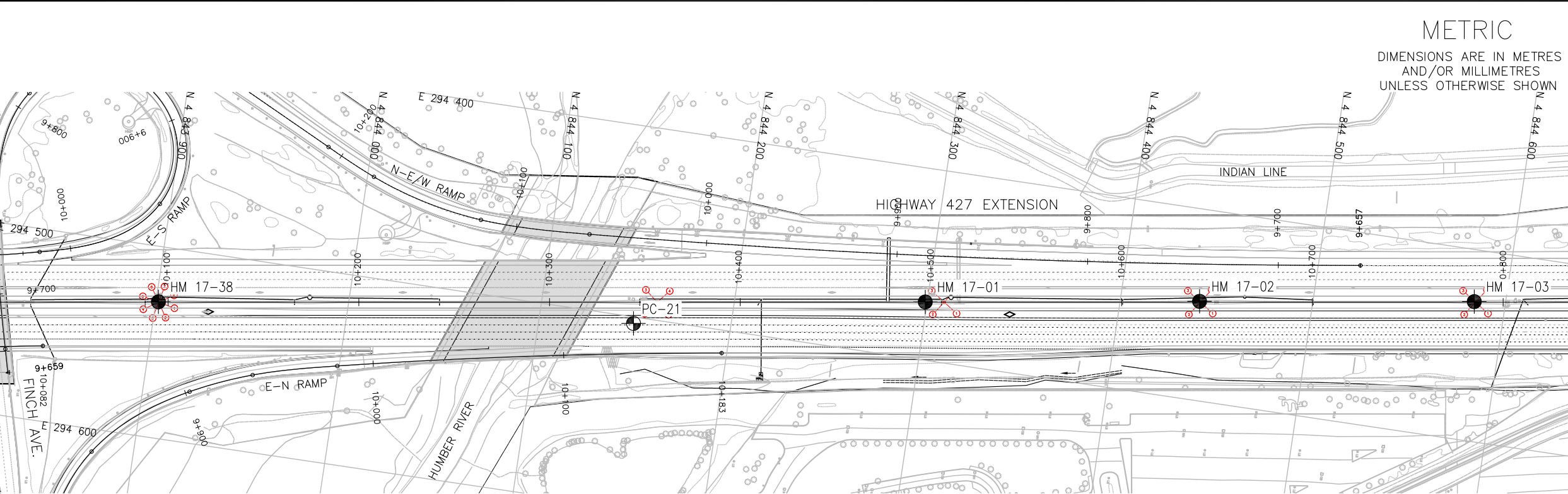
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+ 3 . X 3 : Numbers refer to
Sensitivity

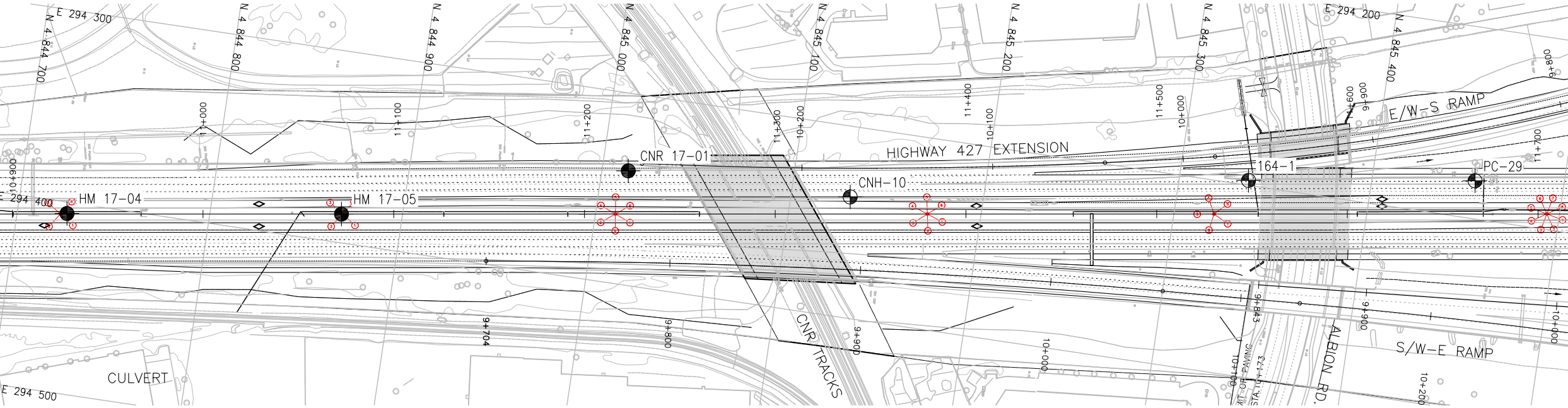
20
15
10

(%) STRAIN AT FAILURE

Appendix D
Borehole Location Plans



PLAN



PLAN

METRIC

DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN



KEYPLAN

LEGEND

- Borehole (By Thurber)
- Borehole (By Others)

NO	ELEVATION	NORTHING	EASTING
164-1	172.4	4 845 336.1	294 297.4
CNH-10	181.3	4 845 130.8	294 336.8
CNR 17-01	181.2	4 845 013.7	294 340.4
HM 17-01	170.3	4 844 299.0	294 469.7
HM 17-02	172.3	4 844 441.2	294 448.2
HM 17-03	174.3	4 844 583.7	294 427.1
HM 17-04	176.5	4 844 725.9	294 405.9
HM 17-05	178.4	4 844 868.3	294 385.0
HM 17-38	166.2	4 843 901.3	294 528.9
PC-21	168.2	4 844 149.4	294 503.4
PC-29	179.9	4 845 453.6	294 280.2

-NOTES-

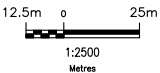
- The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

GEOCRES No.

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PLOTDATE: 2/11/2019 9:55 AM

NO.	DATE	REVISIONS	BY	CHK	LEO. DES.	PROJ. MGR.
A	19/02/13	100% SUBMISSION TO CA	AN	MB	JL	JL

SCALE :

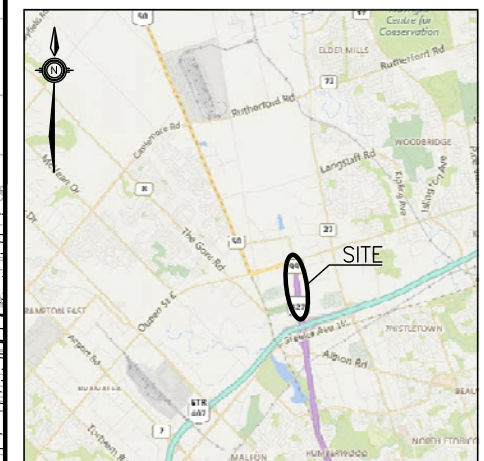


DESIGNED	M. BOUCHER	MB	19/02/13
DRAWN	A. NOOR	AN	19/02/13
CHECKED	M. BOUCHER	MB	19/02/13
APPROVED LEAD ENGINEER	J. LEE	JL	19/02/13
APPROVED PROJ. MANAGER	J. LEE	JL	19/02/13
NAME (PRINT)		INIT.	DATE



TITLE							
HWY 427 EXPANSION HIGH MAST LIGHTING FINCH AVENUE TO ALBION ROAD PACKAGE 9 BOREHOLE LOCATIONS PLAN							
PROJECT ID.	STAGE IDENTIFIER	DESIGN PACKAGE NUMBER	DISCIPLINE	STRUCTURE NUMBER	DOCUMENT TYPE	DRAWING NUMBER	REVISION NUMBER
H427-D	H	9	FND		DWG		A

DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN



LEGEND



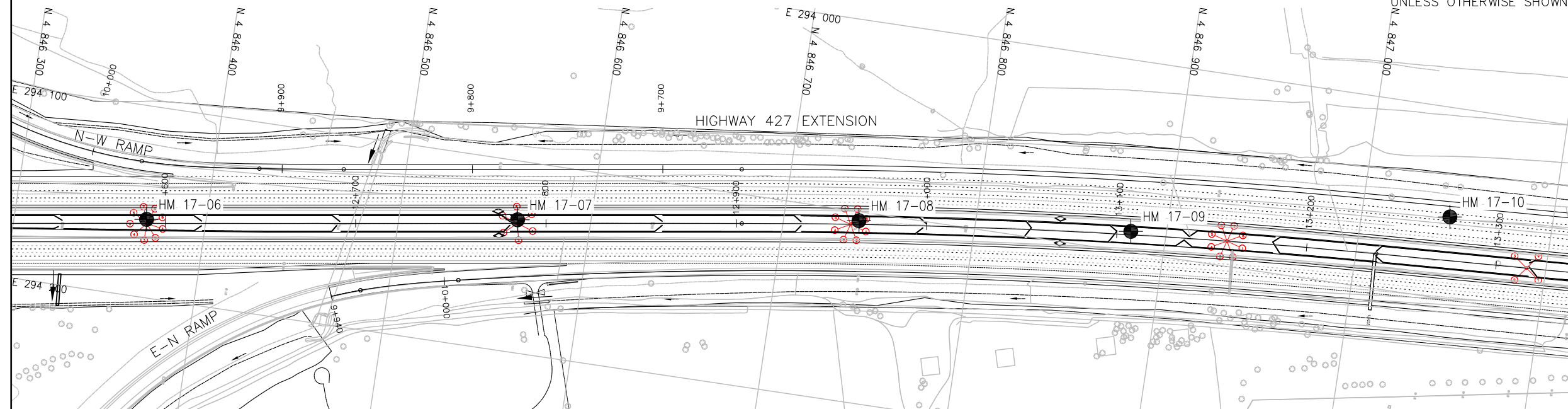
Borehole (By Thurber)	
Borehole (By Others)	

NO	ELEVATION	NORTHING	EASTING
HM 17-06	179.1	4 846 369.0	294 159.2
HM 17-07	178.0	4 846 561.8	294 130.7
HM 17-08	177.7	4 846 739.3	294 104.7
HM 17-09	177.3	4 846 881.4	294 089.2
HM 17-10	177.5	4 847 046.1	294 057.0
HM 17-11	177.6	4 847 199.6	294 049.8
HM 17-12	177.7	4 847 352.9	294 059.2
HM 17-13	177.8	4 847 504.2	294 029.6
HM 17-14	178.0	4 847 636.8	294 013.5
HM 17-15	180.2	4 847 763.3	293 964.4
HM 17-16	180.5	4 847 948.9	293 908.4
HM 17-18	181.6	4 847 895.1	294 058.6
STM 17-10	179.2	4 847 737.1	294 151.9

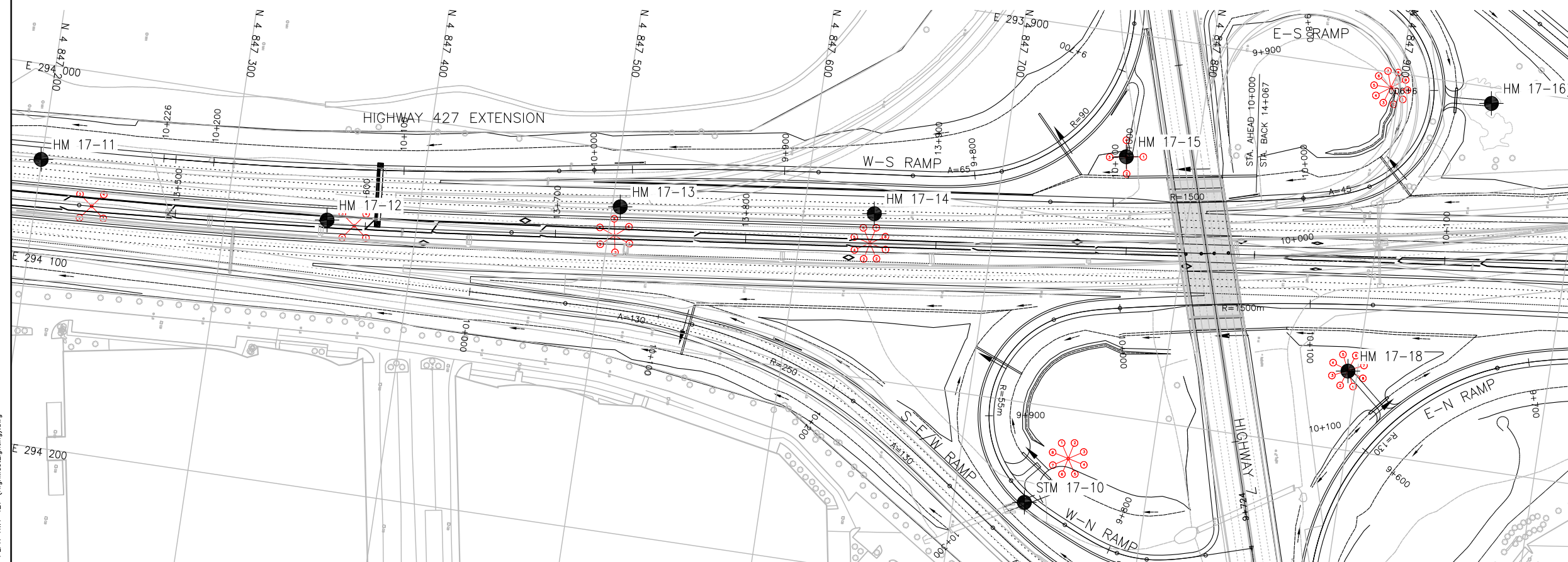
- 1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- 2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.

HWY 427 EXPANSION
HIGH MAST LIGHTING
HIGHWAY 407 TO HIGHWAY 7
PACKAGE 9
BOREHOLE LOCATIONS PLAN

PROJECT ID.	STAGE IDENTIFIER	DESIGN PACKAGE NUMBER	DISCIPLINE	STRUCTURE NUMBER	DOCUMENT TYPE	DRAWING NUMBER	REVISION NUMBER
H427-D	H	9	FND		DWG		A



PLAN



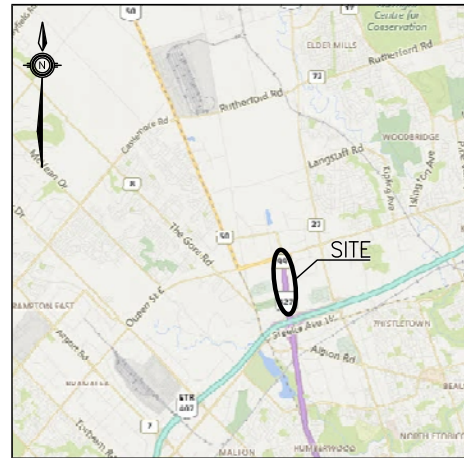
PLAN

LOT/DATE: 2/11/2019 10:04 AM						
A	19/02/13	100% SUBMISSION TO CA	AN	MB	JL	JL
NO.	DATE	REVISIONS	BY	CHK	LEAD. DISC.	PROG. MAN

CONSULTANT	DESIGNED	M. BOUCHER	MB	19/02/11
	DRAWN	A. NOOR	AN	19/02/11
	CHECKED	M. BOUCHER	MB	19/02/11
	APPROVED LEAD ENGINEER	J. LEE	JL	19/02/11
	APPROVED PROJ. MANAGER	J. LEE	JL	19/02/11
		NAME (PRINT)	INIT.	DATE



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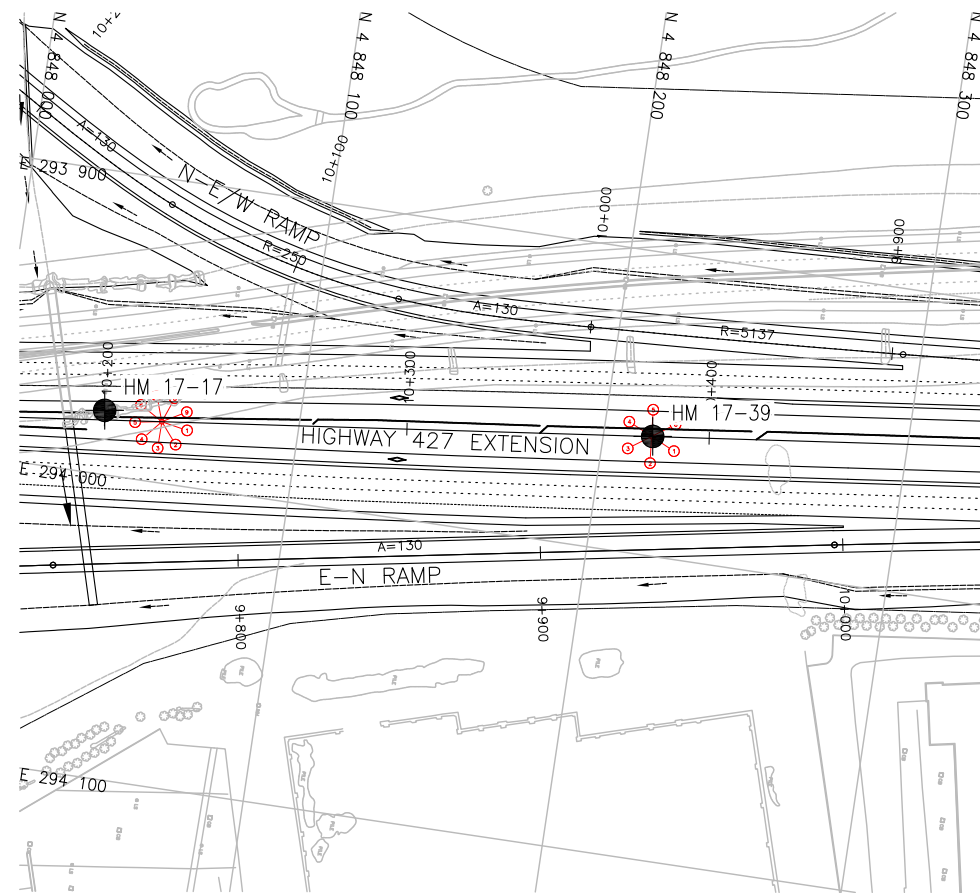
LEGEND

- | NO | ELEVATION | NORTHING | EASTING |
|----------|-----------|-------------|-----------|
| HM 17-17 | 182.0 | 4 848 035.7 | 293 978.9 |
| HM 17-39 | 184.1 | 4 848 216.2 | 293 960.7 |

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HWY 427 EXPANSION
HIGH MAST LIGHTING
HIGHWAY 407 TO HIGHWAY 7
PACKAGE 9
BOREHOLE LOCATIONS PLAN

PROJECT ID.	STAGE IDENTIFIER	DESIGN PACKAGE NUMBER	DISCIPLINE	STRUCTURE NUMBER	DOCUMENT TYPE	DRAWING NUMBER	REVISION NUMBER
H427-D	H	9	FND		DWG		A



PLAN

[illegible]

CONSULTANT	DESIGNED	M. BOUCHER	MB	19/02/13
	DRAWN	A. NOOR	AN	19/02/13
	CHECKED	M. BOUCHER	MB	19/02/13
	APPROVED LEAD ENGINEER	J. LEE	JL	19/02/13
	APPROVED PROJ. MANAGER	J. LEE	JL	19/02/13
	NAME (PRINT)	INT.	DATE	



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