### Municipal Roads, Geotechnical Borehole Investigation Amherst Island Wind Energy Project, Amherst Island, Ontario

Project Number: 133560104



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### Sign-off Sheet

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Introduction July 20, 2017

### 1.0 INTRODUCTION

Pennecon Heavy Civil Limited (PHCL) commissioned Stantec Consulting Ltd. (Stantec) to carry out a geotechnical investigation of the municipal roads on Amherst Island.

The purpose of the investigation was to confirm the existing conditions (presence, thickness and condition of asphalt and/or granular materials and soil type/condition of the underlying subgrade) and subsequently assess the use of the existing municipal roads as 'heavy haul routes' during construction of the planned project.

This report provides a summary and overview of the conditions encountered in the boreholes advanced for the investigation and the results of the laboratory testing completed on samples of the granular materials and sub-grade soils collected. This report also includes an assessment of the anticipated construction traffic on the island and an assessment of the heavy haul traffic that the municipal roads can support in the present condition.

Use of this report is subject to the Statement of General Conditions provided in **Appendix A**.

### 2.0 AREA OF INVESTIGATION

Given the current proposed layout of the project and the intended locations of the wind turbines, the following municipal roads were investigated:

- Front Road
- Stella 40 Foot Road
- 2nd Concession Road
- 3rd Concession Road
- South Shore Road
- Lower 40 Foot Road
- Dump Road

For reference, the portion of Front Road in the immediate area of the town core and the initial portion of Stella 40 Foot Road from Front Road to 2nd Concession were not included in the scope of the investigation.



Field Investigation Program July 20, 2017

### 3.0 FIELD INVESTIGATION PROGRAM

#### 3.1 PRE-INVESTIGATION MEASURES

The locations of the boreholes were established with a general view to obtaining information along the portion of the municipal roads of interest. The specific locations of the boreholes were constrained by the locations of residences and development and availability of access for the drilling equipment.

Prior to commencing the drilling investigation, Stantec contacted Ontario One-Call to identify and confirm the potential presence of buried utilities and services in proximity to the borehole locations. Staff from Stantec accompanied the utility locate contractor during the execution of the utility locates program.

Prior to commencing the drilling investigation, Algonquin Power (developers) forwarded letters of notification to local residents requesting that any knowledge of existing infrastructure (buried water mains or electrical cables) near the proposed borehole locations be provided. In consideration of the responses to this inquiry, the locations of several boreholes were adjusted to reflect the potential presence of private buried utilities or services that were not identified through the public utility locates program.

Algonquin Power coordinated obtaining the necessary Excavation Permits and a Temporary Road Closure Permit (specific to Dump Road) with Loyalist Township.

Use of this report is subject to the Statement of General Conditions provided in **Appendix A**.

### 3.2 BOREHOLE LOCATIONS AND NUMBERS

The number of boreholes was established to provide general coverage of the municipal roads of interest (reference the list provided in a previous section of this report) with consideration for the general characterization of the roads based on previous visual observations.

The following table provides a summary of the type of roads (or general purpose) and number of investigation holes included in the program.



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Table 1 Summary of Investigation Holes

Road Type	Number of Boreholes
Paved Roads	4
Gravel Roads	2
Poor Quality Roads	19
Proposed Road Widening	6
Existing Culverts	2 (hand dug test pits)
Proposed O/M Building	1

The road boreholes were advanced on the travelled surface of the road with due consideration for avoiding traffic disruption and consideration for appropriate traffic control and safety.

The boreholes at the locations of the two culverts were deleted from the program in lieu of hand-dug test pits to confirm the thickness of cover over the existing culverts.

The borehole for the O/M Building was included in the current municipal road investigation program for efficiency in execution. The borehole was advanced on the edge of the travelled surface of the road.

The boreholes were advanced to relatively shallow depth, consistent with penetrating the full depth of the asphalt and/or granular road structure and terminating in the underlying native soils/sub-grade. Sampling was conducted in accordance with the Standard Penetration Test as described in ASTM D1586. Samples were obtained on a continuous basis in all of the boreholes.

The locations of the boreholes are illustrated on the drawing in **Appendix B.** 

#### 3.3 DRILL EQUIPMENT

The boreholes were advanced with a truck mounted drill rig supplied and operated by Terex Drilling Solutions based in Concord, Ontario.

#### 3.4 TRAFFIC CONTROL

Traffic control services were provided by On Track Safety Limited, based in Thornhill, Ontario, specialists in traffic management and control.

Traffic control was provided in accordance with the latest version of "Ontario Traffic Manual Book 7 Temporary Conditions" (OTM Book 7).

Based on the rural nature of the municipal roads on the island and the prevailing light traffic volume, Typical Layout Figure TL-19 was adopted for the traffic control program. This Layout Type applies to low volume roads, very short duration work.



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The exception to the traffic control plan described in the preceding paragraph was Dump Road. Given the extremely narrow width of this road, the Township required a temporary closure from 2nd Concession Road to the north while maintaining access from Front Road to the south.

#### 3.5 DRILLING PROGRAM

The field drilling program was completed in accordance with the following:

- The boreholes were advanced using solid stem augers.
- Standard Penetration Testing (SPTs) was conducted on a continuous basis in each borehole.
- Soil samples were collected from the split tubes advanced for the SPTs.
- The soil samples were placed in moisture-proof containers for storage and transport.
- The presence of groundwater seepage and/or free groundwater in the open borehole was recorded (where applicable).

Coring of the underlying bedrock (known to exist at shallow depth based on the results of previous investigation drilling and test pitting on the island) was not intended or required as a component of the investigation proposed herein. In several boreholes, augering and/or sampling was terminated on presumed bedrock.

The installation of groundwater monitoring stand-pipes or monitoring wells was not included as a component of the investigation.

The boreholes were backfilled with a low-permeability mixture of the auger spoils and granular bentonite, meeting the intent of MOE Regulation 903.

A "cold-asphalt" plug was placed at the ground surface of the boreholes advanced through existing asphaltic pavements.

Consistent with the Township's request, the drilling program included consideration for barreling, testing and disposing of excess soils generated while drilling at an approved (off-island) location. However, given the limited depth of the boreholes and the volume of the samples retained for geotechnical characterization and testing, excess soils were not generated.

Stantec's Standard Operating Procedures included consideration for identification of potential environmental contamination (e.g. via olfactory or visual observation) during the investigation. If such conditions were observed, Stantec would report the conditions to Algonquin Power for discussion and further action as may be warranted.



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#### 3.6 SURVEYING

As outlined in a previous section, the locations of the boreholes were established to provide general coverage of the municipal roads of interest (reference the list provided in a previous section of this report) with consideration for the general characterization of the roads based on previous visual observations. The specific locations of the boreholes were constrained by the locations of residences and development and availability of access for the drilling equipment.

The coordinates for the "as-drilled" locations of the boreholes were recorded in the field using hand-held GPS. The locations were referenced to the Universal Transverse Mercator (UTM) NAD 83 CSRS Zone 18N.

The ground surface elevations at the borehole locations were inferred from the available topographic information. The ground surface elevations were referenced to Canadian Geodetic Vertical Datum (CGVD) 1929/1978 adjustment.

The coordinates are shown in the table on Drawing No. 1 in **Appendix B**. The ground surface elevations are shown on the borehole (and test pit) records in **Appendix C**.

### 3.7 GEOTECHNICAL LABORATORY TESTING PROGRAM

The geotechnical laboratory testing program was to include the following:

- Grain size distribution tests Representative samples of the granular surfacing.
- Grain size distribution tests Representative samples of the underlying native sub-grade soils.
- Atterberg Limits tests Representative samples of the underlying native sub-grade soils.
- Moisture Content Tests Representative samples of granular surfacing and the underlying native sub-grade soils.
- Unit Weight tests Limited number of representative samples of the underlying native sub-grade soils.
- Moisture-Density Relations Two (2) representative samples of the underlying native subgrade soils.



Health and Safety July 20, 2017

### 4.0 HEALTH AND SAFETY

Stantec's Safe Work Practices (SWPs) are documents designed around specific tasks and are intended to help identify hazards and applicable controls necessary to reduce our employees' exposure to health and safety risks. The following SWPs apply to all drilling field investigation activities undertaken by Stantec.

Risk Management Strategy (RMS) 1 – Prepared in advance of commencement of work.

Risk Management Strategy (RMS) 2 – Prepared in the field at the time of the work.

Safe Work Practice (SWP (416) – Supervision of Contracted Drilling Activities.

The RM\$1 document was prepared at commencement of the project. The document included a description of the work, recognition of applicable hazards, an assessment of the hazards, applicable and appropriate Personal Protective Equipment (PPE), and H&S contacts, documentation, and controls.

The RMS2 (Fit for Duty) is an extension of the RMS1 and was completed by the field staff on mobilization to the Island to conduct the geotechnical investigation. The RMS2 includes a field evaluation of conditions with a view to identifying potential hazards (or changed conditions) that were not identified at the time of the RMS1. It also provides for an opportunity to discuss all potential hazards and concerns with the sub-contractors present and engaged in the work, and finally includes a requirement that the field staff acknowledge they are physically capable of carrying out the required tasks.

Stantec's SWP 416 includes a comprehensive description of the responsibilities, potential hazards, and controls associated with executing field drilling activities.

Field staff (both Stantec and the drilling sub-contractor) were required to have the following personal protective equipment (PPE):

- Hearing protection;
- Eye protection;
- Head protection;
- High-visibility vests; and,
- CSA approved work boots (with a 6" steel shank and a defined heel).



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### 5.0 FACTUAL RESULTS OF THE INVESTIGATION

#### 5.1 REFERENCE STANDARDS

The soils encountered in the boreholes were classified in accordance with the Unified Soil Classification System (USCS). Stantec adopts minor modifications to the USCS Standard consistent with the methods of the Ontario Ministry of Transportation (MTO) including the removal of the descriptions "lean" and "fat" with reference to clay soils, and including a "Medium" category with respect to plasticity.

It should be noted that the internal diameter (I.D.) of the split tube used in the Standard Penetration Test is 38 mm and hence the grain size test results and soil classifications may not reflect the entire gravel size fraction which extends to 75 mm diameter.

The presence of cobbles and/or boulders is similarly not reflected in the grain size distribution tests and typically described separately, when and where these materials are inferred to have been encountered in the boreholes.

#### 5.2 SUBSURFACE CONDITIONS

#### 5.2.1 Overview

The subsurface conditions encountered in the boreholes are provided in the table in **Appendix C**. The results of the geotechnical laboratory testing program are included in **Appendix D**.

In general, the subsurface stratigraphy encountered in the boreholes consisted of asphalt (on select roads), granular fill materials (travel surface or as base/sub-base under the asphalt pavement), and native sub-grade soils. Inferred bedrock was encountered in several boreholes based on the content of the split tube samples and/or on the progress or resistance/refusal to augering and/or sampling.

#### 5.2.2 Asphalt Pavement

Front Road East was asphalt paved. The thickness of the asphalt in the two boreholes advanced on this road was approximately 1" (25 mm).

A portion of Front Road West (extending west from the intersection with Stella 40 Foot Road) was also asphalt paved. The two boreholes advanced along this portion of the road encountered two layers of asphalt; a surface layer that was approximately 1" (25 mm thick) and a second underlying layer (below a granular layer) that was also approximately 1" (25 mm) thick.



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A portion of Stella 40 Foot Road (from the intersection with 2nd Concession Road and extending south) was also asphalt paved. The two boreholes advanced along this portion of the road encountered asphalt that was 1.5" (37.5 mm) and 2" (50 mm) thick.

#### 5.2.3 Granular Materials

The granular material underlying the asphalt on Front Road East was 6" (150 mm) and 9" (225 mm) thick.

The granular material underlying the surface course of asphalt on Front Road West was 3" (75 mm) and 4" (100 mm). The granular material underlying the buried asphalt layer was 4" (100 mm) and 5" (125 mm) thick.

The granular material underlying the asphalt on Stella 40 Foot Road was 13" (330 mm) and 5 %" (140 mm).

The thickness of the existing granular surfacing encountered in the boreholes varied considerably. The following table provides a summary of the range in thicknesses recorded for the boreholes advanced on the respective roads (locations where asphalt was present are discussed in the preceding paragraphs and not included in the table).

Table 2 Summary of the Granular Surface Thickness

Road	Number of Boreholes	Granular Surface Thickness (Inches/mm)
Front Road East	3	7.5/190 – 10/250
Lower 40 Foot Road	3	7.5/190 – 8/200
South Shore Road	4	4/100 – 10/250
Stella 40 Foot Road	1	7/190
2 <sup>nd</sup> Concession Road	7	6/150 – 8/200
3 <sup>rd</sup> Concession Road	6	7/180 – 12/300
Dump Road	2	No Granular Surface

For additional reference, the hand-dug test pit at the location of the existing culvert on Stella 40 Foot Road encountered 10" (250 mm) of granular cover and the hand-dug test pit at the location of the existing culvert on Marshall 40 Foot Road encountered 7" (180 mm) of granular cover.

The existing granular surfacing consists of well-graded sand and gravel with a varying fines content.



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Moisture content tests were conducted on 17 samples of the granular surfacing material. The tests yielded results in a narrow range, from 2.1% to 3.9%.

A total of 17 grain size analysis tests were conducted on samples of the granular surfacing. The tests yielded a fines content (combined percentage of silt and clay size particles) ranging from 9% to 24% and the average of the samples tested was 18.5%. For reference, this percentage of fines exceeds the maximum fines percentage for OPSS Granular A base material (e.g. 8%).

The results of the grain size analysis tests are shown on the grain size analysis tests curves in Figures 1 to 4 in **Appendix E**.

### 5.2.4 Subgrade

The subgrade encountered underlying the asphalt and granular materials consisted of sandy clay, clay with sand, and silty clayey sand.

For reference, the hand-dug test pit at the location of the existing culvert on Stella 40 Foot Road encountered 5" (130 mm) of topsoil and fill material underlying the granular material noted in the preceding section; combined the granular material and fill material provided 15" (380 mm) of cover over the top of the culvert. The hand-dug test pit at the location of the existing culvert on Marshall 40 Foot Road encountered 2" (50 mm) of topsoil and fill material underlying the granular material noted in the preceding section; combined the granular material and fill material provided 9" (230 mm) of cover over the top of the culvert.

Moisture content tests were conducted on seven samples of the native subgrade soils. The results were typically in two ranges; a lower range with two results of 6.5% and 7.5% and a higher range of 16.6% to 30%. The lower range is representative of the samples described as silty clayey sand soil and the higher range is representative of the samples described as sandy clay and clay with sand.

The results of grain size analysis tests completed on seven samples of the native subgrade soils are shown on Figures 5 and 6 in **Appendix D**.

The results of Atterberg Limits tests completed on the seven samples are illustrated on the Plasticity Chart included as Figure 7 in **Appendix D**.

The test results indicate that these soils contain varying proportions of sand, silt, and clay, with very limited gravel (e.g. typically 5% or less). The varying percentage of sand, silt and clay size particles also reflect the varying plasticity index test results; the soils range from low to high plasticity.

As indicated above and in accordance with the Unified Soil Classification System, the soil samples tested can be characterized as sandy clay (CL), clay with sand (CH) and silty clayey sand (SC-SM).



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Four samples of the native subgrade were submitted for unit weight tests. The tests yielded unit weights of 18.8 kN/m<sup>3</sup>, 17.6 kN/m<sup>3</sup>, 21.0 kN/m<sup>3</sup> and 19.2 kN/m<sup>3</sup>.

Moisture-density relations tests were completed on 2 samples of the native sub-grade soil. The tests yielded results of 1995 kg/m³ and 1900 kg/m³ at optimum moisture contents of 10.7% and 13.0% respectively.

A single sample of the silty clayey sand (SC-SM) was selected for California Bearing Ratio (CBR) testing. The result yielded a CBR of 4.99 (un-soaked) for a penetration of 2.5 mm and a CBR of 5.39 (soaked) for a penetration of 2.5 mm. A single sample of the clay with sand (CH) was selected for CBR testing. The result yielded a CBR of 1.30 (un-soaked) for a penetration of 2.5 mm and a CBR of 1.67 (soaked) for a penetration of 2.5 mm.

#### 5.2.5 Bedrock

The inferred depth to bedrock is indicated on the borehole summary table in **Appendix C**. The depth is indicated as "inferred" given that coring of the rock was not included as a component of the investigation. The contact surface with the bedrock was inferred based on refusal of the augers and/or sampler.

As indicated, the majority of the boreholes encountered the inferred surface of the bedrock at depths ranging from 0.33 m to 3.51 m. Several boreholes were terminated at depths of 3.66 m below grade without encountering the inferred contact with the underlying bedrock.

#### 5.2.6 Groundwater

Free groundwater was not observed in any of the open boreholes at the time of drilling.

### 6.0 MUNICIPAL ROAD ASSESSMENT

#### 6.1 ASSESSMENT METHODOLOGY

Two methods were used to assess the suitability of the existing and proposed roads to handle the anticipated heavy haul traffic.

For the majority of the roads, the 1993 AASHTO Guide of Design of Pavement Structure methodology for aggregate-surface roads was used. This approach considers two serviceability limits mechanisms as follows:

 Loss of Pavement Serviceability Index (PSI) which indicates a general decline in the road surface. For the assessment completed, an allowable decrease in serviceability of 2.0 was set as the maximum allowable.



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• Surface wheel path rutting which allows for a specific depth of ruts. For the assessment completed, a rut depth of 50 mm was permitted.

For the new road required from the new island dock to 2nd Concession Road and for Dump Road, the assessment was undertaken using a geotextile methodology by DuPont Typar titled Designing Aggregate Bases.

#### 6.2 EXISTING CONDITIONS

#### 6.2.1 Road Granular

As discussed above in Section 5.0, the existing roadway granular surfacing consists of a well-graded sand and gravel with a percentage of silt/clay (e.g. fines) that exceeds the OPSS specification for typical granular base materials.

As a result of the high silt/clay content, the existing granular surfacing is prone to softening and rutting in wet conditions and the surface can become muddy. Under the heavy haul traffic anticipated, this condition will be compounded.

#### 6.2.2 Subgrade

As discussed above in Section 5.0, the predominant subgrade type underlying the existing roadways (and encountered in the majority of the boreholes advanced on the island to date) consists of sandy clay, clay with sand, and silty clayey sand. For convenience, these soil strata are referred to in subsequent sections as sandy clay.

The soil types described above are generally characterized as providing poor to very poor support, impervious drainage, and a high frost potential in the context of subgrade for roads.

In consideration of the soil types described, the results of the drilling investigation, and the results of the geotechnical laboratory testing program, a subgrade modulus of 28 MPa was selected for the native sub-grade and subsequently used in this assessment.

#### 6.2.3 Drainage

Most of the municipal roads on the island do not have adequate drainage.

The lack of drainage will result in deterioration of the existing roads under the heavy haul traffic.

#### 6.3 FORECASTED CONSTRUCTION TRAFFIC

The loading and truck configuration for each turbine component including the transformers was reviewed, and the Equivalent Single Axle Loadings (ESALs) for construction deliveries, including concrete and aggregates, were estimated.



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The total traffic loadings were estimated and the traffic was subsequently proportioned based on the number of turbine sites accessed via the specific municipal road being assessed.

#### 6.4 ROAD DESCRIPTION & TRAFFIC ASSESSMENT

#### 6.4.1 Front Road

It is understood that the portion of Front Road from the new island dock to the access road for Turbine S30 will be used for the transport of turbine components for four Turbines (\$13, \$18, \$26 and \$30). It is not intended for use by other heavy vehicle loads which will use an alternative route.

The road has an asphalt surface on approximately 25% of the length, a chip seal surface on approximately 50% of the length and a gravel surface on approximately 25% of the length (this last may in fact have been a former chip seal surface that has deteriorated to the current state).

Comments regarding this road are as follows:

- Construction traffic was estimated to be 1,000 ESALs.
- The existing structure is either chip seal asphalt with 140 mm to 225 mm of granular or 180 mm to 250 mm of granular, over sandy clay subgrade.
- The assessment indicated that the existing road structure is suitable for 1,000 ESALs; and,
- Based on the results of the assessment no improvements are anticipated to be required for this road.

#### 6.4.2 Stella 40 Foot Road

Stella 40 Foot Road was reviewed with consideration for the initial portion of the road from 2<sup>nd</sup> Concession Road to 3<sup>rd</sup> Concession Road and from just beyond 3<sup>rd</sup> Concession Road to the access entrance road to Turbine S37. Comments are as follows:

- The construction traffic on the north end of the road between 2<sup>nd</sup> Concession Road and 3<sup>rd</sup> Concession Road was estimated to be 15,000 ESALs. The construction traffic on the south end of the road from beyond 3<sup>rd</sup> Concession Road was estimated to be 13,000 ESALs.
- The existing structure has:
  - 40 mm to 50 mm of asphalt for approximately 60% of the road length (The asphalt is severely distressed, likely due to the lack of roadside drainage); and,
  - 200 mm granular over sandy clay subgrade for approximately 40% of the road length.
- The assessment indicated that the existing road structure is suitable for 2,000 ESALs based on the rutting criteria.
- Based on the results of the assessment, the improvements specified in Section 6.5.1 and Section 6.5.2 below are recommended for the respective gravel surface and asphalt surface segments of this road.



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#### 6.4.3 2nd Concession Road

The portion of 2nd Concession Road from the intended access to the layover area extending east to the access entrance road to Turbine S01 was reviewed. Comments are as follows:

- The construction traffic at the east end of the road was estimated to be 9,000 ESALs. The
  construction traffic beyond the access road to Turbine S22 to the west was estimated to
  be 4,000 ESALs.
- The existing structure consists of 150 mm granular material over the sandy clay subgrade.
- The assessment indicated that the existing road structure is suitable for less than 1,000 ESALs based on the rutting criteria.
- Based on the results of the assessment, the improvements specified in Section 6.5.1 below are recommended for this road.

#### 6.4.4 3rd Concession Road

The section of 3rd Concession Road from Stella 40 Foot Road to the construction access to Turbine S11 was reviewed. Comments are as follows:

- Construction traffic was estimated to be 3,500 ESALs.
- The existing structure consists of 180 mm granular material over sandy clay subgrade.
- The assessment indicated that the existing road structure is suitable for 1,000 ESALs based on the rutting criteria.
- Based on the results of the assessment, the improvements specified in Section 6.5.1 below are recommended for this road.

#### 6.4.5 South Shore Road

This section of South Shore Road extends from the access road to Turbine S02 to the access road to Turbine S33. Comments regarding this section are as follows:

- The construction traffic at the west end of this road segment was estimated to be 8,000 ESALs. The construction traffic towards the east beyond the access road to Turbine \$14 was estimated to be 6,000 ESALs.
- The existing structure consists of 150 mm granular material over sandy clay subgrade.
- The assessment indicated that the existing road structure is suitable for less than 2,500 ESALs based on the PSI and rutting criteria.
- Based on the results of the assessment, the improvements specified in Section 6.5.1 below are recommended for this road.

#### 6.4.6 Lower 40 Foot Road

This section of road includes the portion of South Shore Road from the access to Turbine S33 to the corner with Lower 40 Foot Road, the entire length of Lower 40 Foot Road, and the portion of Front Road from the corner with Lower 40 Foot Road to the access to Turbine S30 on Front Road. It is noted that construction traffic along this road will consist of aggregate trucks, miscellaneous



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materials/service trucks and concrete trucks but that the turbine delivery trucks will not use this route. Comments regarding this section are as follows:

- Construction traffic was estimated to be 3,500 ESALs.
- The existing pavement is 200mm granular over sandy clay subgrade.
- The assessment indicated that the existing road structure is suitable for less than 1,300 ESALs based on the rutting criteria.
- Based on the results of the assessment, the improvements specified in Section 6.5.1 below are recommended for this road.

#### 6.5 UPGRADES TO EXISTING ROADS

#### 6.5.1 Gravel Surface Roads

As a component of the pre-construction activity the roads with gravel surfaces will be upgraded through the following:

- Sub-excavate the upper 200 mm of existing road base materials;
- Place a Terrafix Combigrid 30/30 or equivalent; and,
- Place and compact 200 mm of OPSS Granular A.

The Combigrid will extend from one road edge to within 0.5 m of the opposite road edge. The 0.5 m gap will provide open access for the placement of the collection circuit within the road platform without the need to cut the geogrid. The side of the road accommodating the gap will vary in accordance with the collection system installation drawings, as trenching location will vary across the project.

To reiterate from a preceding section, it is understood that the portion of Front Road from the project docks to the access road for Turbine S30 will be used for the transport of turbine components for four Turbines (S13, S18, S26 and S30). It is not intended for use by other heavy vehicle loads. The assessment indicates that due to the limited traffic loading, no improvements are anticipated to be required to the gravel surface segment of this road.

As a component of the pre-construction activity, the gravel roads will be provided with a proper center crown meeting the municipal standards and a minimum functional road width of 6.0 m. Where the current granular surface is less than 6.0 m in width the existing "shoulder" material will be sub-excavated to a depth of 100 mm and replaced with compacted Granular A. The sub-excavation and replacement with 100 mm of Granular A where applied will strengthen the existing shoulder and provide for temporary passing of vehicles if and as required.

Two exceptions to the 6.0 m functional road width will occur on South Shore Road where restoration will occur within the existing widths except where temporary widening takes place in specific areas and Dump Road where the planned width is 5.0 m.

The gravel roads will be monitored and maintained/restored as necessary throughout the construction period to support the construction traffic. This approach is consistent with the current general practice for maintenance of aggregate-surface municipal roads during construction traffic loading.



Municipal Road Assessment July 20, 2017

#### 6.5.2 Asphalt Surface Roads

As stated in a preceding section, approximately 60% of the length of Stella 40 Foot Road has a severely distressed asphalt travel-surface. The recommended treatment specific to this road segment would be either of the following:

- Undertake continual monitoring, maintenance, repairs, and upgrades, as necessary throughout the construction period to maintain the road in a suitable condition for the support of the heavy construction traffic; or,
- Upgrade by:
  - o Removing the upper 200 mm of asphalt and granular materials;
  - o Placing a Terrafix Combigrid 30/30 or equivalent; and,
  - o Placing and compacting 200 mm of OPSS Granular A.

To reiterate from a preceding section, it is understood that the portion of Front Road from the project docks to the access road for Turbine S30 will be used for the transport of turbine components for four Turbines (S13, S18, S26 and S30). It is not intended for use by other heavy vehicle loads. The assessment indicates that due to the limited traffic loading, no improvements are anticipated to be required to the asphalt segment of this road.

#### 6.5.3 Seasonal Effects of Construction Traffic

It is noted that: heavy loads hauled when the roads are frozen will have little impact on the road condition; heavy loads hauled in the spring thaw period will have a significant impact on the road condition; and, heavy loads hauled in the summer and fall period (when dryer conditions are presumed to prevail) will have less impact on the road condition but will deteriorate the road surface with cumulative passes.

#### 6.6 CONSTRUCTION OF NEW ROADS

#### 6.6.1 Dump Road

Based on visual observations and the conditions encountered in the boreholes, Dump Road does not have an existing granular structure or travel surface, although minor gravel was present at the intersection with 2nd Concession Road. There may also have been placement of granular material at low spots in the roadway or where standing water accumulated, though these areas were most certainly localized.

The assessment of Dump Road considered construction extending from 2nd Concession to the location of Turbine S31. Comments regarding this road are as follows:

- Construction traffic was estimated to be 1,000 ESALs.
- The existing roadway has no granular surface of any significance.
- The subgrade consists of sandy clay.

In the absence of an existing road structure, this road is not considered suitable to support heavy construction traffic. It is therefore recommended that Dump Road be upgraded as follows:



Closure July 20, 2017

- Compact and proof-roll the exposed subgrade/road surface.
- Place Terrafix Combigrid 30/30 or approved equivalent.
- Place and compact 300 mm of OPSS Granular A.

#### 6.6.2 Temporary Turning Alignments at Existing Intersections

It is understood that there are two locations on the municipal roads where temporary turning alignments will be required to permit turning for 'longer' delivery vehicles.

Construction of these turning alignments should be as follows. Any existing vegetation and organics (including topsoil) should be stripped and stockpiled for reinstatement on completion of the construction of the overall project. The turning alignments can be constructed by placing a Terrafix Combigrid 30/30 or equivalent and placing OPSS Granular A material to the design grades. The thickness of the required granular material will be dependent on the specific topography and grades at the turning location and the thickness of any existing vegetation and organics (including topsoil). It is recommended that the thickness of the granular be not less than 300 mm in any case. The granular material should be placed in loose lifts having a maximum thickness of 200 mm and each lift uniformly compacted to achieve 100% of the material's Standard Proctor Maximum Dry Density.

### 7.0 CLOSURE

We trust that this is satisfactory for your present purposes. If you have any questions, please contact the undersigned at your convenience.

STANTEC CONSULTING

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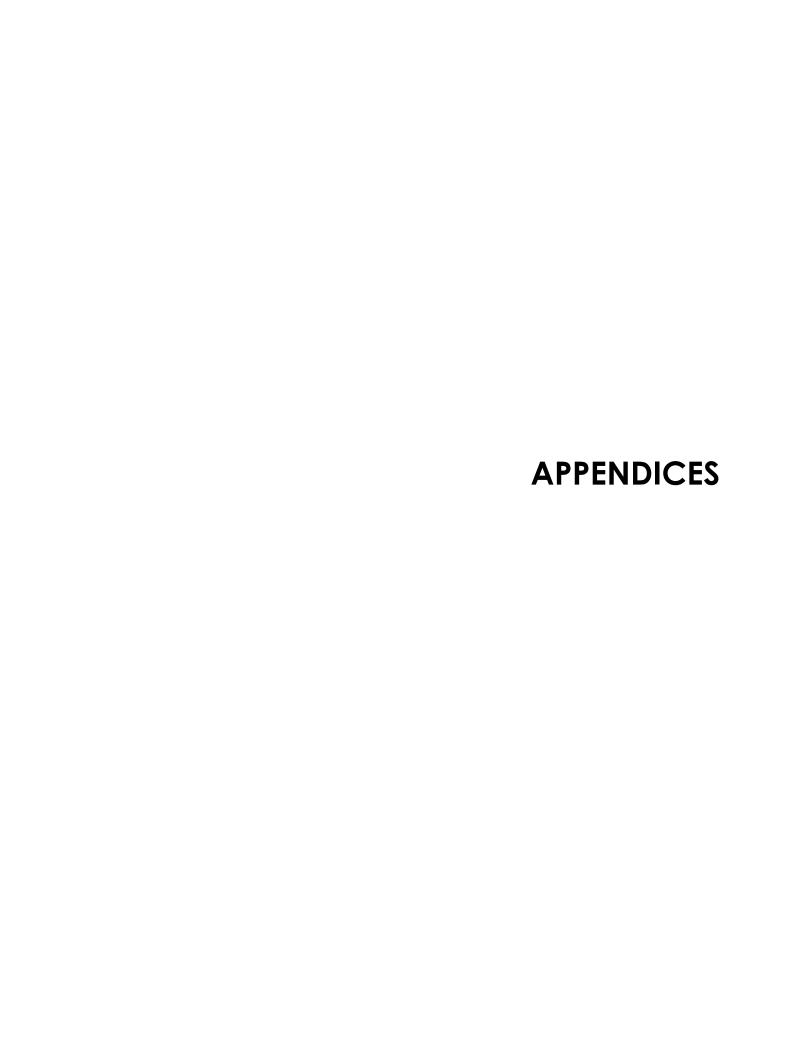
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Appendix A July 20, 2017

### Appendix A

### A.1 STATEMENT OF GENERAL CONDITIONS



#### STATEMENT OF GENERAL CONDITIONS

<u>USE OF THIS REPORT</u>: This report has been prepared for the sole benefit of the Client or its agent and may not be used by any third party without the express written consent of Stantec Consulting Ltd. and the Client. Any use which a third party makes of this report is the responsibility of such third party.

<u>BASIS OF THE REPORT</u>: The information, opinions, and/or recommendations made in this report are in accordance with Stantec Consulting Ltd.'s present understanding of the site specific project as described by the Client. The applicability of these is restricted to the site conditions encountered at the time of the investigation or study. If the proposed site specific project differs or is modified from what is described in this report or if the site conditions are altered, this report is no longer valid unless Stantec Consulting Ltd. is requested by the Client to review and revise the report to reflect the differing or modified project specifics and/or the altered site conditions.

<u>STANDARD OF CARE</u>: Preparation of this report, and all associated work, was carried out in accordance with the normally accepted standard of care in the state or province of execution for the specific professional service provided to the Client. No other warranty is made.

<u>INTERPRETATION OF SITE CONDITIONS</u>: Soil, rock, or other material descriptions, and statements regarding their condition, made in this report are based on site conditions encountered by Stantec Consulting Ltd. at the time of the work and at the specific testing and/or sampling locations. Classifications and statements of condition have been made in accordance with normally accepted practices which are judgmental in nature; no specific description should be considered exact, but rather reflective of the anticipated material behavior. Extrapolation of in situ conditions can only be made to some limited extent beyond the sampling or test points. The extent depends on variability of the soil, rock and groundwater conditions as influenced by geological processes, construction activity, and site use.

<u>VARYING OR UNEXPECTED CONDITIONS</u>: Should any site or subsurface conditions be encountered that are different from those described in this report or encountered at the test locations, Stantec Consulting Ltd. must be notified immediately to assess if the varying or unexpected conditions are substantial and if reassessments of the report conclusions or recommendations are required. Stantec Consulting Ltd. will not be responsible to any party for damages incurred as a result of failing to notify Stantec Consulting Ltd. that differing site or subsurface conditions are present upon becoming aware of such conditions.

<u>PLANNING, DESIGN, OR CONSTRUCTION</u>: Development or design plans and specifications should be reviewed by Stantec Consulting Ltd., sufficiently ahead of initiating the next project stage (property acquisition, tender, construction, etc), to confirm that this report completely addresses the elaborated project specifics and that the contents of this report have been properly interpreted. Specialty quality assurance services (field observations and testing) during construction are a necessary part of the evaluation of sub-subsurface conditions and site preparation works. Site work relating to the recommendations included in this report should only be carried out in the presence of a qualified geotechnical engineer; Stantec Consulting Ltd. cannot be responsible for site work carried out without being present.



Appendix B July 20, 2017

### **Appendix B**

### **B.1** BOREHOLE LOCATION PLAN





Appendix C July 20, 2017

### **Appendix C**

### C.1 BOREHOLE SUMMARY



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C	s	tantec	B	OR	REF N: 4	IOI 893 3	JE 77 J	<b>RE</b> (E: 366	<b>COR</b>	RD						16	-0	8		S	Shee	et 1 of 1
	LIENT -															PROJ		Γ Νο		1	335	<u>560104</u>
	OCATIO ATES: E	N Front Road East, Amherst Isl BORING November 17, 2016	land,	ON		WAT	ER I	LEVEL								DATI FPC I		- Vat	ION			
			TC	긥			SA	MPLES	;		UN	IDRA		D SH	ΙΕΑ	R ST		NGT	H (kl	Pa)	00	
DEРТН (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEРТН (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	D	YNA	ER COM	ONE F	PENE	TRATI	BERG ON TE	ST, I	BLOW	W <sub>P</sub> <b>⊢</b> S/0.3r	W	, [	W <sub>L</sub> REMARKS & GRAIN SIZE DISTRIBUTION
0 -		Gravel Road	44.	,	0			보고		ļ	10	20	30	40	5(	) 60	) <u>;</u>	70 8	30	90 1	00 <sub>G</sub>	(%) R SA SI CL
- - - -		Dense to very dense, brown silty, clayey SAND (SC-SM) - trace gravel - dry to moist			1 -	SS	1	<u>530</u> 610	20	Ö.											3	7 44 19
1 - -		- light brown			3 -	SS	2	610 610	66		Ø <b>1</b>						•					5 49 32 14
_					5 -	X SS	3	100 91	50/ 100	-										>>(	H	
2 - -		BOREHOLE TERMINATED on inferred bedrock approximately 1.6 m below existing grade.  Borehole open and dry on completion of drilling.			6 - 7 - 8 -		9	91	100													
3 -					9 -	-																
- - - - 4 -					12-																	
- - - -					14 - 15 - 16 -																L.,	
5 -			<u>[</u>	<u> </u>	I	1	<u>I</u>	l	<u> </u>		3	:::1: Field Remo	ulde	d Va	ne Te	est, k		1::::	1::::	:1::::	1	

	s	tantec	B	BOREHOLE RECORD N: 4 894 009 E: 368 273										16-10					Sheet 1 of 1			
Cl	LIENT _	ed										PROJECT No.				1	133560104					
	OCATIO												DATUM									
DATES: BORING November 17, 2016								WATER LEVEL									TPC ELEVATION					
(	7		7	岀										IEAR STRENGTH (kPa)								
4 (m	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	<b>DEPTH (ft)</b>			(%);			50 100 150 200											
DEPTH (m)					EPTI	Ш	NUMBER	SCR	UE D(%	$\begin{array}{cccccccccccccccccccccccccccccccccccc$						<i>W</i> <sub>L</sub> <b>⊣</b>						
					۵	TYPE		VEF (%) / (%	.VALUE RQD(%)	DY	DTIVAIVIIC COINE PEINETRATION TEST, BLOWS/0.3III						REMARKS &					
							ž	RECOVERY (mm) TCR(%) / SCR(%)	,5 R	STANDARD PENETRATION TEST, BLOWS/0.3m							GRAIN SIZE DISTRIBUTION					
0 -		Gravel Road 200 mm Silty SAND with gravel	dh.	<u> </u>	0	Н		<u> </u>		   	10 	20	30	40 :	50 (	60     : : :	70 : :::	80 : :::	90 1		(%) GR SA SI CL 29 48 23	
-						M															29 40 23	
-		Dense to very dense, light brown silty, clayey SAND (SC-SM)		1	1 -	SS	1	<u>200</u> 610	24			•										
		- trace gravel		1		$\mathbb{N}$		010														
-		- dry			2 -					<b>∤</b> ∷∷:										$\left\  \cdot \right\ $		
-		- increasing silt with depth		1		$\parallel$				1::::												
1 -					3 -	╢														: -		
1 -				}		SS	2	610 610	42	0	Н			•							5 55 26 14	
-					4 -	$\mathbb{N}$																
_						H				<b> </b>										:		
-				}	5 -	ss	3	200	50/ 51	   												
-		BOREHOLE TERMINATED on	: -	<u> </u>		N 33	3	<u>200</u> 200	51	: : : : : : : : : : : : : : : : : : :	<u>                                     </u>											
-		inferred bedrock approximately 1.7			6 -																	
2 -		m below existing grade.																				
_		Borehole open and dry on			7 -																	
-		completion of drilling.																				
-					8 -	<b> </b>														$\mathbb{H}$		
-																						
-					9 -	<b>i</b>																
3 -					10					:::::												
-					10-																	
_					   11 -																	
-					11																	
-					12-															$\left\  \cdot \right\ $		
-																						
_					13-																	
4 -																				-		
-					   14-																	
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_					15-															H		
-																						
-					16-																	
5 -					<u> </u>	Ш				::::		: :::: ald 37	iliii oro T	oct 1-	] De	1:::	:1:::	:1:::	:l::i	:11		
										<ul><li>□ Field Vane Test, kPa</li><li>■ Remoulded Vane Test, kPa</li></ul>												
											△ Pocket Penetrometer Test, kPa											

C	s	tantec	B	OR	REF N: 4	IOI 891 1	<b>E</b> 51 1	<b>RE</b> (E: 364	<b>PRD</b> 16-11	Sheet 1 of 1								
Cl	LIENT _	ed							<u>60104</u>									
LOCATION 2nd Concession Road, Amherst Island, ON  DATES: BORING November 16, 2016 WATER LEVEL										DATUM TPC ELEVATION								
							SAI	MPLES		UNDRAINED SHEAR STRENGTH (kPa)								
DЕРТН (m)	ELEVATION (m)	STRATA DESCRIPTION	A PLC	WATER LEVEL	<b>DEPTH (ft)</b>			(mm) R(%)	(%		200 W W <sub>L</sub>							
DEPT			STRATA PLOT		DEP	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	WATER CONTENT & ATTERBERG LIMITS  DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m  STANDARD PENETRATION TEST, BLOWS/0.3m	REMARKS & GRAIN SIZE STRIBUTION							
0 -		Gravel Road 150 mm SAND and GRAVEL	<b></b>		0			AEC.		10 20 30 40 50 60 70 80 90 100 GF	(%) R SA SI CL							
-		Stiff, brown sandy CLAY (CL) - trace gravel - dry to moist			1 -	SS	1	480 610	15	5								
1 - -		Compact to dense, brown clayey SAND (SC)			3 -		_	530										
		- trace gravel - moist to wet (increasing moisture with depth)			4 -	SS	2	530 610	15	5								
-		- gravel seam (3")			6 -	SS	3	300 610	39									
2 -													7 -			610		
- - - -					8 -	ss	4	250 610	21	1								
3 -					10-													
-						SS	5	410 610	27	7								
- - 4 -		BOREHOLE TERMINATED at approximately 3.7 m below grade.  Borehole open and dry on completion.			13 -													
- - -					14-													
- - -					15-													
5 -				<u> </u>		<u> </u>				☐ Field Vane Test, kPa ☐ Remoulded Vane Test, kPa ☐ Pocket Penetrometer Test, kPa								

	s	tantec	В	OR	REH N: 48	[O] 890 7	LE 14 I	<b>RE</b> (E: 363	<b>COR</b>	RE	)						16	5-1	2			5	She	et 1 of 1
	LIENT _			slanc	1, ON													JEC ΓUΜ		No.		1	33:	560104
		ORING November 16, 2016				WAT	ER I	LEVEL												TIC	)N			
DEРТН (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEРТН (ft)			CR(%)				+	50		+	10	00	+	15	50	(kP —+ W <sub>P</sub>		00	$W_{ m L}$
DEF	ELE		STRA	WATE	DE	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)		DYN	AMIC	COI	TENT NE PE ENET	ENET	TRAT	ION T	TEST,	, BLO	0.3m		•	[	REMARKS & GRAIN SIZE DISTRIBUTION
0 -		Gravel Road 150 mm Silty SAND with gravel	QY)	1	0	<u> </u>		쀭			10	2	20 	30	40	50	0 (	60 	70	80	9	0 1		(%) <u>BR SA SI CI</u> 29 49 22
- - -	-	Firm to very stiff, brown sandy CLAY (CL) - trace gravel - moist			1 -	SS	1	410 610	10	,	•													.9 49 22
-					2 -																		-	
1 -					3 -	SS	2	<u>560</u> 610	20				•											
-					4 -			010																
-	-				5 -					- ::														
2 -		Compact to very dense, brown to grey clayey SAND (SC) - trace gravel			6 -	SS	3	<u>560</u> 610	23				•											
-		- moist to wet - auger grinding			8 -	\ \																		
-		- auger grinding (corresponds to			9 -	SS	4	360 610	64									•						
3 -		rock in spoon)  BOREHOLE TERMINATED on	<i>'</i> .,'		10																		F	
-	-	inferred bedrock approximately 3.1 m below grade.			11 -																			
-		Borehole caved to approximately 2.9 m below grade. Borehole dry on completion of drilling.			12 -																			
4 -					13-																		1	
- -					14-																			
-					15-																			
5 -					10-					::		Fie	ld V	ane	Test	t, kP	'a							
														lded				kPa						

△ Pocket Penetrometer Test, kPa

	s	tantec	B	OR	EF N: 4	IOI 890 1	LE 57 I	<b>RE</b> (E: 364	COR	RD	)								1	6-	13	3			;	She	et 1	of 1
	LIENT .																	]	PRO	ЭЛ	ЕСТ	N	0.		1	133	560	<u>104</u>
		N 3rd Concession Road, Amheronius November 16, 2016	rst Is	land	, ON		ΓER I	LEVEL											DA'					NI				
		OKING INOVERIBEL 10, 2010	ı.	بر				MPLES	<del></del>	1	U	NE	DR	ΑII	٧E	D S	SHI						TH					
DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	ОЕРТН (#)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	0	YN	IAM	IC (	CON	EN'	PEN	ETF	RATI	BER ON	TES			V WS/0		W	<b>-</b> [	W <sub>L</sub> −I REI GRA	MARKS & AIN SIZE RIBUTIO
0 -		Gravel Road 250 mm Silty SAND with gravel	ary 1		0			A C		  ::	10	0	20	) :::	30 : ] :		10	5(	)	60	7	0	80	9	0 1	100	GR S	(%) A SI (
- - - -		Dense, grey to brown silty, clayey SAND (SC-SM) - trace gravel			1 -	SS	1	480 610	31	α 					•												39 3	9 22
- - 1 -		- dry to moist  Stiff to very stiff, brown CLAY (CH) with sand - trace gravel			3 -	GG	2	460	12																			
- - -		- moist			4 -	SS	2	<u>460</u> 610	13																			
-					6 -	SS	3	<u>530</u> 610	18				•															
2 -		Dense, grey to brown silty, clayey SAND (SC-SM) - trace gravel			7 -			010																		+		
- - -		- moist - auger grinding (minimal recovery in spoon)			8 - 9 -	SS	4	<u>51</u> 610	50/ 51																>>	•		
3 -		Dense, grey clayey SAND (SC) - trace gravel - wet			10-					-																		
- - -		Dense, grey to brown silty, clayey SAND (SC-SM) - trace gravel			11 -	SS	5	<u>560</u> 610	47									•								-		
4 -		- possible bedrock fragment  BOREHOLE TERMINATED at approximately 3.7 m below existing grade.			13 -																					-		
-		Borehole open and dry on completion of drilling.			14-																							
5 -					16-																					-		
																	est, 'ane		a est,	kP	a							

△ Pocket Penetrometer Test, kPa

	s	tantec	В	OF	REH N: 48	IOI 889 3	LE 48 1	<b>RE</b> (E: 364	C <b>O</b> R	RD	)					]	6-	14			Sh	eet 1 of 1
CI	LIENT _	Pennecon Heavy Civil Limite	ed													PF	ROJE	ЕСТ	No.	_	13:	<u>3560104</u>
		N 3rd Concession Road, Amhe	rst Is	slanc	l, ON		EED I								_		ATU					
D	ATES: B	ORING November 16, 2016		1		WA]		LEVEL		1	_	NDE		IED (					ATIC			
m)	NC		LOT	VEL	(#)		SAI	MPLES ⊺ ∂⊚	; 		U	NDF	50 50	IED :		100	SIF		GTH 150	(кРа	1) 200	
DЕРТН (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (		<u>~</u>	(mn CR(%	ы (%)			1								N <sub>P</sub>	W	$W_{\rm L}$
DEP	ELE\		TRA	'ATE	H	TYPE	NUMBER	ERY )/S(	-VALUE RQD(%)					ENT & E PEN					_OWS/(	).3m	▼	REMARKS
	1		S	3		-	Ž	RECOVERY (mm) TCR(%) / SCR(%)	7-7-0 7-8-0	s	STAI	NDAR	RD PE	NETR	ATIO	N TE	ST, BI	LOW	S/0.3m		•	& GRAIN SIZE DISTRIBUTION
0 -		Gravel Road	947	M	0	<u> </u>		쀭인		<u> </u>	10	) 2	0 :	30 4	40 	50	60	70	80	90	100	(%) GR SA SI CL
-		280 mm Silty SAND with gravel				M																
-		Stiff to hard, brown CLAY (CH)	-9A		1 -	ss	1	$\frac{430}{610}$	46							•						
_		with sand				$\backslash$																
_		<ul><li>trace gravel</li><li>moist to wet (increasing moisture</li></ul>	/ /		2 -																	
-		with depth)			,																	
1 -			· ,/		3 -	SS	2	410	14													
_					4 -	∭33	4	<u>410</u> 610	14													
_					-																	
_			j/.		5 -	<u> </u>				-												
-			//			$\mathbb{N}$																
_			/ ;		6 -	ss	3	<u>510</u> 610	10		•	):										
2 -			/:/			$\setminus$																
-		- grey	<u>/.</u>		7 -																	
_		Very dense, brown to grey clayey	·/.	1																		
_		SAND (SC) - trace to some gravel			8 -	SS	4	560	89													
-		- dry to slightly moist	//		9 -	∭33 ∭	4	610	09													
_																						
3 -			./		10-	<u> </u>				<u> </u>												
_			/:/			$\int S$	5	<u>230</u> 300	50/ 130												>>•	
-		BOREHOLE TERMINATED on	/•••		11			200														
-		inferred bedrock at approximately																				
_		3.4 m below existing grade.			12-	1																
-		Borehole open and dry on			1,																	
4 -		completion of drilling.			13-																	
_					   14-																	
-																						
_					15-																	
-																						
-					16-																	
5 -			1	1	<u> </u>		<u> </u>	1	<u> </u>		::i	Fiel	liiiii ld Va	ane T	est,	∷i∷ kPa	::1:	:::1	::::1:	:::1:	:::1	
											0	Ren	noul	ded V	ane	Tes						
										4	Δ	Poc	ket I	Peneti	ome	eter '	Γest,	kPa				

	s	tantec	В	OR	REH N: 48	[O] 888 5	LE 35 1	<b>RE</b> (E: 363	<b>COR</b>	RD	)				1	6-1	5		Sł	neet 1 of 1
L	LIENT .	N 3rd Concession Road, Amhe	rst Is		-	-										OJEC TUM	T No	١.	13	3560104
D	ATES: I	BORING November 16, 2016				WAT	ΓER I	LEVEL		_										
DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TO TCR(%) / SCR(%)	N-VALUE OR RQD(%)	D	VATE OYNAI	R CON	(0) 	+ & ATTE	100 	G LIM	BLOW	W <sub>P</sub>	200 W	W <sub>L</sub> REMARKS
		Gravel Road					_	ECC ICR(	∠ <u>P</u>								WS/0.3		0 10	GRAIN SIZE DISTRIBUTION (%) GR SA SI C
0 -		250 mm SAND and GRAVEL  Stiff to hard, brown to grey CLAY (CH) with sand - trace gravel - moist to wet			1 -	SS	1	250 610	20			•								TGR SA SI C
1 -					3 -	SS	2	<u>510</u> 610	13											
- - - -		- 300 m wet layer - 25 mm gravel seam			5 -	SS	3	<u>460</u> 610	26	-			•							
2 -		Very dense, grey silty, clayey SAND (SC-SM) - trace to some gravel			8 -	ss	4	<u>560</u> 610	73	-										
3 -		- dry to slightly moist			9 -					-									-	_
-				,	11 -	ss	5	430 460	50/ 150										<b>&gt;&gt;•</b>	
4     		BOREHOLE TERMINATED on inferred bedrock at approximately 3.5 m below existing grade.  Borehole open and dry on completion of drilling.	<u>  .</u>		12 - 13 - 14 - 15 -															
- - -					16-														-	
5 -			ı	1	•								Vane ulded			kPa		<del>1</del>		1

△ Pocket Penetrometer Test, kPa

	S	tantec	B	OF	REF N: 4	IOI 888 2	<b>E</b>	<b>RE</b> (E: 363	C <b>OR</b>	RD	16-16	Sheet 1 of 1
C	LIENT .	Pennecon Heavy Civil Limite	ed								PROJECT No	133560104
		N 3rd Concession Road, Amher		lanc							DATUM	
		BORING November 16, 2016					ER I	LEVEL			TPC ELEVATION .	
			<b>—</b>	بے			SA	MPLES	;	UNDRAINED SHE	AR STRENGTH (kP	a)
(m)	ELEVATION (m)		STRATA PLOT	WATER LEVEL	Œ		T			50	100 150	200
DEРТН (m)	(m)	STRATA DESCRIPTION	Ι¥	R	DEРТН (ft)	l	<u> </u>	CR(	щ%	WATER CONTENT & ATTE	Wp	$W W_{\rm L}$
DEF			TR <sub>A</sub>	ATE	DE	TYPE	NUMBER	ER)	ALL		ATION TEST, BLOWS/0.3m	▼ REMARKS
			S	>			₽	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	STANDARD PENETRATIO	N TEST, BLOWS/0.3m	● GRAIN SIZE DISTRIBUTION
0 -		Gravel Road	/A 1			<u> </u>		RE C		10 20 30 40	50 60 70 80 9	0 100 <sub>GR SA SI CL</sub>
-		300 mm Silty SAND with gravel		4						0		28 48 24
-			\$8		1 -	SS	1	360	25			
-		Compact, bown silty, clayey SAND (SC)		1	1		1	610	23			
-		- trace gravel		1	2 -							
-		- dry			-	<u> </u>				_		:::: <del> -</del>
-		Stiff to very stiff, brown CLAY	/	1	3 -							
1 -		(CH) with sand - trace gravel	//	1		ss	2	<u>510</u> 610	20	• 0		2 26 38 34
-		- moist to wet		1	4 -		-	610				
-						Ц_						
_			. , ,	1	5 -							
-				}		$\mathbf{M}$						
-					6 -	SS	3	<u>480</u> 610	13	•		
2 -		- 50 mm - 75 mm sand seam	<i></i>	}				610	13			
					7 -							
-			/	1	′							
-			//	]	8 -	Į/						
-			/	1		ss	4	610 610	14	•		
-				1	9 -		•	610				
-		- grey	.,/	1								
3 -			<u>/::</u>	1	10-					_		<u>:::: </u>
-		Compact, brown to grey clayey SAND (SC)	/	1		$\mathbf{M}$						
-		- trace gravel	//	1	   11 -	SS	5	<u>610</u> 610	12	•		
_		- moist to wet	/	1				610	12			
-			.:/	_	12							
-		BOREHOLE TERMINATED at approximately 3.7 m below existing										
- ا		grade.			13-							
4 -												
-		Borehole open and dry on completion of drilling.			14-							
-		completion of utiling.			•							::::[
-					15-							
-					-							::::[
-					16-							
5 -											<u> </u>	<u>:::::[ </u>
										☐ Field Vane Test, ☐ Remoulded Vane		
										△ Pocket Penetrome		

	s	tantec	B	OR	REF N: 4	[O] 893 8	<b>E</b> 32 1	<b>RE</b> (E: 369	C <b>OR</b> 249	RD	)						16	5-1	17			Sł	eet 1 of 1
	LIENT _		ed													_ :	PRO	)JE(	CT :	No.		13	<u>3560104</u>
		N Lower 40 Foot Road, Amher	st Is	land.	ON												DAT	UN	1				
D.	ATES: E	BORING November 17, 2016				WA	TER I	LEVEL								- '	TPC	EL	EV	ATI(	ON .		
_	_		F				SA	MPLES	;		U	NDF			SH			TRI			l (kP		
(m)	<u> </u>		PLO	EX.	£			E%		L		-	50	)	+	10	)()	-	1	50	-	200	)
TH	(m)	STRATA DESCRIPTION	Ϋ́	띪	<b>DEPTH (ft)</b>	l	l E	CR(	三%	١.,	V A T	TD C	TIAC	TNIT	0 AT	TED!	BERG	2116	ште		$W_P$	W	$W_{\rm L}$
DEРТН (m)	ELEVATION (m)		STRATA PLOT	WATER LEVEL	DEI	TYPE	NUMBER	ER/	.VALUE RQD(%)	1										ows	/0.3m	▼	REMARKS
	Ш		S	>		<del>-</del>	Ę		N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-N-								TEST,					•	& GRAIN SIZE DISTRIBUTION
		Gravel Road						RECOVERY (mm) TCR(%) / SCR(%)			10	2	0	30	40	50	0 6	50	70	80	) 9	0 100	(%) GR SA SI CL
0 -		200 mm Silty SAND with gravel	<b>%</b>		0					1::													GIT OA GI GE
-		Compact, brown clayey SAND (SC)	ΣМ			M		250		 													
-		- trace gravel	/:		1 -	SS	1	$\frac{250}{610}$	12		::  <b>'</b>	<b>)</b>											
_		- moist to dry	,,,	}		$\mathbb{N}$																	_
-			//	1	2 -	H				::													
-		BOREHOLE TERMINATED on	<u> </u>	-						::							::::	 					
-		inferred bedrock approximately 0.8			3 -																		
1 -		m below existing grade.								::													
-		D 11 1.07 1.1			4 -																		
=		Borehole caved to 0.7 m below grade on completion of drilling.																					
_		Borehole dry on completion of			5 -					 													_
-		drilling																					
-					6 -																		
-					"																	-	
2 -					_					::													=
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-					11-																		
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-					12 -																		
-																							
4 -					13-					<u>::</u>													
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-					14-																		
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-					15-																		1
-					10																		
-					16-																		
5 -					10												::::						
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	s	tantec	B	OR	REH N: 4	IOI 893 2	<b>E</b> 50	RE( E: 369	C <b>OR</b> 591	<b>D</b>	16-18	Sheet 1 of 1
	LIENT .		ed								PROJECT No.	133560104
		N Lower 40 Foot Road, Amher	st Is	and.	ON						DATUM	
D.	ATES: E	BORING November 17, 2016				WA	ER	LEVEL			TPC ELEVATION	_
(m	N O		LOT	:VEL	  £		SA	MPLES		UNDRAINED SHE	EAR STRENGTH (kPa	a) 200
DEРТН (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	.VALUE RQD(%)	WATER CONTENT & ATTE	Wp ERBERG LIMITS H	W W <sub>L</sub> ▼ REMARKS
			S	>		-	≥	00 X 00 X	N-\ 0R.I	STANDARD PENETRATIO		GRAIN SIZE     DISTRIBUTION
0 -		Gravel Road 190 mm Silty SAND with gravel			0			RE		10 20 30 40	50 60 70 80 90	) 100 <sub>GR SA</sub> SI CL
- - -		Compact to very dense, brown to grey clayey SAND (SC) - trace gravel			1 -	SS	1	380 610	10	•		
-		- moist			2 -							: : : : -   : : : : : -   : : : : : -
_		DODELIOI E TEDMBIATED	<u>'</u>		3	<u>SS</u>	2	<u>130</u> 200	50/ -51			::>>> <b>•</b>
1 -		BOREHOLE TERMINATED on inferred bedrock approximately 0.9 m below existing grade.			4 -							-
_		Borehole caved to 0.7 m below grade on completion of drilling. Borehole dry on completion of			5 -							
2 -		drilling			6 -							
<b>4</b> -					7 -							
- -					8 -							- - - - -
3 -					9 -							
- -					10-							
-					12 -							
4 -					13-							
-					14-							
- - -					15-							
5 -					16-							
ı										☐ Field Vane Test, ☐ Remoulded Vane		
										△ Pocket Penetrome		

(	S	tantec	B	<b>O</b> R	REF N: 4	IOI 892 7	<b>∠E</b> 30 ]	<b>RE</b> ( E: 369	<b>COR</b> 925	<b>AD</b>	16-19	Sheet 1 of 1
C	LIENT _	Pennecon Heavy Civil Limite	ed								PROJECT No.	133560104
	CATIO	-		land							DATUM	
D.	ATES: E	BORING November 17, 2016				WAT	ER I	LEVEL			TPC ELEVATION	
			<b>—</b>	L			SA	MPLES		UNDRAINED SHE	AR STRENGTH (kP	a)
DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	WATER CONTENT & ATTE	ATION TEST, BLOWS/0.3m	200  W WL  → REMARKS  & GRAIN SIZE DISTRIBUTION
0		Gravel Road						REC		10 20 30 40	50 60 70 80 90	) 100 <sub>GR SA SI CL</sub>
0 -		190 mm Silty SAND with gravel	NA.	M	0			_		Ö		25 55 20
- - -		Compact, brown clayey SAND (SC) - trace gravel (decreasing content with depth) - moist			1 -	SS	1	250 610	11	•		
-					3 -							
1 -			<i>/</i>		4 -	SS	2	<u>510</u> 610	23	•		
_			<u> </u>	1	5							
- - -		BOREHOLE TERMINATED on inferred bedrock approximately 1.5 m below existing grade.			6 -	_						- - - - - - -
2 -		Borehole open and dry on completion of drilling.			7 -							
- - -					8 -							<u>-</u>
3 -					10-	<u>.</u>						- - - - - -
-					11 -	<del>.</del>						-
- -					12-	<u>.</u>						- -
4 -					13-	<u>.</u>						
- - - -					14-							
5 -					16-							- - - -
3										☐ Field Vane Test,		
										Remoulded Vane		
										△ Pocket Penetrome	nei Test, kpa	

	s	tantec	B	OR	REH N: 48	IOI 892 0	<b>E</b>	<b>RE</b> (E: 369	C <b>OR</b>	RD 16-20 Sheet 1 of 1	
Cl	LIENT _	Pennecon Heavy Civil Limite								PROJECT No133560104	
	OCATIO		Islan	d, O	N					DATUM	
D.	ATES: E	SORING November 17, 2016				WA	ER	LEVEL		TPC ELEVATION	
			Ë				SA	MPLES		UNDRAINED SHEAR STRENGTH (kPa)	
(m)	NO NO		7	E	£			E%		50 100 150 200	
тΉ	(m)	STRATA DESCRIPTION	Ι¥	R	DEPTH (ft)		22	CR.	ЛЕ (%)	$W_P$ $W$ $W_L$	
DEРТН (m)	ELEVATION (m)		STRATA PLOT	WATER LEVEL		TYPE	NUMBER	ER/	-VALUE RQD(%)	WATER CONTENT & ATTERBERG LIMITS  DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m  ▼ REMARK:	 S
	ш		S	$\geq$		<del>-</del>	Ę	08%	N-V OR R	STANDARD PENETRATION TEST, BLOWS/0.3m   GRAIN SIZ DISTRIBUTION	Œ.
•		Gravel Road				]		RECOVERY (mm) TCR(%) / SCR(%)	0	10 20 30 40 50 60 70 80 90 100 GR SA SI	CI
0 -		150 mm Silty SAND with gravel	34	4	0						<u> </u>
-		Hard, brown CLAY (CH) with sand	//			$\mathbb{N}$		120			
-		- trace gravel		1	1 -	SS	1	$\frac{430}{610}$	49		
-		- slightly moist to moist		1							
-		BOREHOLE TERMINATED on			2						
-		inferred bedrock approximately 0.6									
1 -		m below existing grade.			3 -						
1 -		Borehole caved to 0.5 m below									
-		grade on completion of drilling.			4 -						
_		Borehole dry upon completion of									
-		drilling			5 -						
_											
-					6 -						
2 -											
-					7 -						
-											
-					8 -						
-					9 -						
-											
3 -					10-						
-					10						
_					   11 -						
-					11						
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-					12-						
_					12						
4 -					13-	<b>†</b>					
-											
-					14-						
-					15-						
-											
					16-						
5 -		1	1				-			☐ Field Vane Test, kPa	_
										■ Remoulded Vane Test, kPa	
										△ Pocket Penetrometer Test, kPa	

	s	tantec	B	OR	REF N: 4	IOI 891 5	<b>E</b> 74	<b>RE</b> (E: 368	C <b>OR</b>	RD 16-21 Sheet 1 of 1
Cl	LIENT .	Pennecon Heavy Civil Limite	ed							PROJECT No133560104
	OCATIO		Islan	d, O	N					DATUM
D.	ATES: E	BORING November 17, 2016				WA	TER I	LEVEL		TPC ELEVATION
			ΤC	닖			SA	MPLES	;	UNDRAINED SHEAR STRENGTH (kPa)
DEРТН (m)	<u>N</u>		PLC	E.E.	DEРТН (ft)			E%		- 50 100 150 200
TH	(m)	STRATA DESCRIPTION	Ι¥	띪	ΙĦ	l	<u>بد</u>	CR.	三%	WP W $W_{\rm L}$ WATER CONTENT & ATTERBERG LIMITS
DE	ELEVATION (m)		STRATA PLOT	WATER LEVEL	DE	TYPE	NUMBER	ER/	.VALUE RQD(%)	DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼ REMARKS
			S	>			$\exists$	RECOVERY (mm) TCR(%) / SCR(%)	7-7-0 7-7-0	STANDARD PENETRATION TEST, BLOWS/0.3m GRAIN SIZI DISTRIBUTION
0 -		Gravel Road						REC TCI		10 20 30 40 50 60 70 80 90 100 (%) GR SA SI
		250 mm Silty SAND with gravel		M i	"	l l				Ö:
-		X .: (C. 1 11 1		ļ H	,		,	360	19	
_		Very stiff to hard, brown clayey SAND (SC)			1 -	SS	1	360 610	19	
-		- trace gravel		1	_					
_		- moist to wet (increasing moisture		1	2 -					
-		content with depth)				M				7
1 -					3 -	SS	2	180 460	50/ 150	2 53 21
-				1		$\mathbb{N}$		400	130	
-		BOREHOLE TERMINATED on			4					
-		inferred bedrock approximately 1.2								
-		m below existing grade.			5 -	<b>i</b>				
-		Borehole caved to 0.8 m below								
-		grade on completion of drilling.			6 -					
2 -		Borehole dry on completion of drilling								
-		diffing			7 -					
-										
-					8 -	$\  \cdot \ $				
-										
-					9 -					
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-					13-					
4 -										
-					14-	]				
-					1-7					
-					15-					
-					13-					
-					1.6					
5 -					16-					<u>                                     </u>
										☐ Field Vane Test, kPa
										Remoulded Vane Test, kPa
	I									△ Pocket Penetrometer Test, kPa

	S	tantec	B	OF	REF N: 4	<b>[O]</b> 890 7	<b>E</b> 26 1	<b>RE</b> (E: 367	C <b>OR</b> 572	2 <b>D</b>	6-22	Sheet 1 of 1
C	LIENT .	Pennecon Heavy Civil Limite	ed							PR	OJECT No	133560104
	OCATIO	•		d, C							ATUM	
		BORING November 16, 2016				WA	ER I	LEVEL			C ELEVATION _	
			<b>—</b>	بــا			SA	MPLES	<u> </u>	UNDRAINED SHEAR	STRENGTH (kPa)	
(m)	ELEVATION (m)		STRATA PLOT	WATER LEVEL	Œ					50 100	150	200
DEРТН (m)	(m)	STRATA DESCRIPTION	Ι¥	R.	DEPTH (ft)	l	监	CR(	щ <sup>®</sup>	WATER CONTENT & ATTERBEI		$W = W_{\rm L}$
DEF	E,		TR <sub>A</sub>	ATE	DE	TYPE	NUMBER	ER)	ALL	DYNAMIC CONE PENETRATION		▼ REMARKS
			S	>			Ž	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	STANDARD PENETRATION TES	ST, BLOWS/0.3m	GRAIN SIZE DISTRIBUTION
0 -		Gravel Road				<u> </u>		A S		10 20 30 40 50	60 70 80 90	100 GR SA SI CL
-		100 mm SAND and GRAVEL				M				0		32 45 23
-		Very stiff, brown CLAY (CH) with			1 -	SS	1	380	16	_		
-		sand - trace gravel			1 -	W 22	1	380 610	10			
-		- dry to moist		1	,							
_		- rock fragments at 0.5 m			2							
-		BOREHOLE TERMINATED on										
1 -		inferred bedrock approximately 0.6 m below existing grade.			3 -	<b>†</b>						
-		in below existing grade.										
-		Borehole caved to 0.5 m below			4 -	1						
-		grade on completion of drilling.										
-		Borehole dry upon completion of drilling			5 -							
-												
-					6 -							
2 -												
-					7 -							
-												
-					8 -							
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4 -												
-					14-							
-					14-							
_					1.5							H
-					15-							
-					1.							
5 -					16-	<b>i</b>						
5										☐ Field Vane Test, kPa		
										Remoulded Vane Test		
										△ Pocket Penetrometer 7	est, kPa	

	s	tantec	B	OR	REF N: 4	HOI 890 2	<b>LE</b> 79	<b>RE</b> (E: 362	C <b>OR</b>	<b>RD</b> 16-23 Sheet 1 of 1
CI	LIENT _	Pennecon Heavy Civil Limite	ed							PROJECT No133560104
	OCATIO		rst I	sland	<u>d, ON</u>					DATUM
D	ATES: E	BORING November 16, 2016				WAT	ER	LEVEL		TPC ELEVATION
m)	NO		LOT	VEL	(£)		SA	MPLES	; 	UNDRAINED SHEAR STRENGTH (kPa)  50 100 150 200
DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	ш	Ä	Y (mn SCR(%	.VALUE RQD(%)	
DE	ELE		STR	WAT	ä	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VAL OR RQI	STANDARD PENETRATION TEST, BLOWS/0.3m  GRAIN SIZE DISTRIBUTIO
0 -		Gravel Road 190 mm SAND and GRAVEL			0			- AR		10 20 30 40 50 60 70 80 90 100 <sub>GR SA SI</sub> (%)
-		Firm to very stiff, brown sandy CLAY (CL) - trace gravel		•	1 -	SS	1	380 610	8	•
-		- dry to moist	./		2 -					
- 1 -			,/		3 -	$\sqrt{ss}$	2	130 240	50/ 100	<b>≫</b> •
- - -		BOREHOLE TERMINATED on inferred bedrock approximately 1.0 m below grade.			4 -	-				
-		Borehole open and dry on completion of drilling.			5 -					
2 -					6 -					
-					7 -	<u>.</u>				
-					8 -					
3 -					10-					
-					11-	<u>.</u>				
-					12-	<u> </u>  -				
4 -					13-	<u> </u>  -				
-					14-	-				
- -					15-					
5 -					16-					
										☐ Field Vane Test, kPa
										<ul><li>■ Remoulded Vane Test, kPa</li><li>△ Pocket Penetrometer Test, kPa</li></ul>
										— 1 000011 0100110101 1 001, RI 4

	S	tantec	B	OR	EF N: 4	HOI 889 7	<b>E</b> 72	<b>RE</b> ( E: 361	COR 528	<b>D</b>	16-24	Sheet 1 of 1
C	LIENT _	Pennecon Heavy Civil Limite	ed								PROJECT No.	133560104
	OCATIO		rst Is	slano	<u>l, O</u>						DATUM	
D	ATES: E	BORING November 16, 2016				WAT	ER I	LEVEL	-		TPC ELEVATION .	
(	7		TO	Ē			SA	MPLES	;		EAR STRENGTH (kP 100 150	a) 200
DEРТН (m)	ELEVATION (m)		STRATA PLOT	LEV	<b>DEPTH (ft)</b>			(%)	_	50	100 150	
:PT	YE W	STRATA DESCRIPTION	ATA	띪	FPT	<u>ш</u>	Ä	SCF	.UE D(%	WATER CONTENT & ATTE	ERBERG LIMITS $\stackrel{ ext{W}_{P}}{dash}$	$W \longrightarrow W_{L}$
DE			STR	WATER LEVEL	🖺	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	-VALUE RQD(%)		ATION TEST, BLOWS/0.3m	I &
							Ž	SR(°	Ş R	STANDARD PENETRATIO		GRAIN SIZE DISTRIBUTION
0 -		Gravel Road 180 mm Silty SAND with gravel	Q(Y)		0	$\mathbf{h}$		<u> </u>		10 20 30 40	50 60 70 80 90	0 100 GR SÀ SI CL
-		Stiff, brown to black sandy CLAY				V						:::: <del> -</del>
-		(CL)	//		1 -	SS	1	$\frac{410}{610}$	10	•		
_		- trace gravel	//			$\setminus$						
-		- moist			2 -							
-						H				-		
1 -		- light brown to grey	•//		3 -	ss	2	<u>280</u> 460	10			
1.		- moist to wet	/				_	460	10			
-		BOREHOLE TERMINATED on	//		4							::::
-		inferred bedrock approximately 1.2										
-		m below grade.			5 -	1						
-		Borehole open and dry on										
-		completion of drilling.			6 -	1						
2 -												:::::
-					7 -	1						
-												
_					8 -	1						
-												
-					9 -	1						
3 -					10							
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_					1.5							
-					15-							:::: -
-					1.6							
5 -					16-							
										☐ Field Vane Test,		
										<ul><li>■ Remoulded Vane</li><li>△ Pocket Penetrome</li></ul>		

	S	tantec	B	OF	REF N: 4	<b>IOI</b> 889 1	<b>E</b> 51 1	<b>RE</b> (E: 360	C <b>OR</b>	RD	16-25	Sheet 1 of 1
C	LIENT .	Pennecon Heavy Civil Limite	ed								PROJECT No.	133560104
	OCATIO	<u>-</u>		slan							DATUM	
		BORING November 16, 2016				WA	ER I	LEVEL			TPC ELEVATION	
			<b>—</b>	بــا			SA	MPLES	<u> </u>	UNDRAINED SHI	EAR STRENGTH (kP	'a)
(m)	ELEVATION (m)		STRATA PLOT	WATER LEVEL	Œ		<u> </u>			50	100 150	200
DEРТН (m)	E (E)	STRATA DESCRIPTION	Ι¥Ι	R	<b>DEPTH (ft)</b>		<u> </u>	ER.	ш%	·	Wp	$W W_{\rm L}$
DEP	LE)		IRA	ATE	DEF	TYPE	NUMBER	ERY /S(	ALU	WATER CONTENT & ATT	ERBERG LIMITS ——RATION TEST, BLOWS/0.3m	▼ REMARKS
	ш		S	Š		] ←	Ž	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	STANDARD PENETRATIO		GRAIN SIZE DISTRIBUTION
•		Gravel Road						FR F		10 20 30 40	50 60 70 80 9	0 100 GR SA SI CL
0 -		200 mm Silty SAND with gravel	174	M	0							-
-		Compact, brown silty, clayey SAND	7.5					380	1.5			
-		(SC-SM)			1 -	SS	1	$\frac{380}{610}$	15	9		
_		- trace gravel										
-		- moist	///		2 -					7		
-		Stiff, brown sandy CLAY (CL) - trace gravel	/,	1		$\mathbb{I}$		400				
1 -		- moist	1/-	•	3 -	SS	2	$\frac{480}{610}$	13	•		
-						$\mathbb{N}$						
-			<b>,</b> /,		4 -	Ħ				-		
-		BOREHOLE TERMINATED on	1/9	1								
-		inferred bedrock approximately 1.4			5 -	1						
-		m below grade.										:::::
-		Borehole caved to approximately			6 -	1						
2 -		1.2 m below grade on completion.										
-		Borehole dry on completion.			7 -	1						
-												
-					8 -	$\ \cdot\ $						
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-					17							
5 -					16-	1						
										☐ Field Vane Test,		
										<ul><li>■ Remoulded Vane</li><li>△ Pocket Penetrom</li></ul>		
	I									- 1 OCKET LEHERIOHI	icui icoi, Kra	

	s	tantec	B	OR	REF N: 4	IOI 890 6	LE 75	<b>RE</b> (E: 362	C <b>OR</b>	RD					1	6-2	26		S	Sheet 1 of 1
C	LIENT _	Pennecon Heavy Civil Limite													PRO	OJEC	CT N	0.	1	33560104
		N <u>Dump Road, Amherst Island</u>	ON												DA	TUM	1			
D.	ATES: E	BORING November 15, 2016				WA	ΓER I	LEVEL							TPO	CEL	EVA	TION		
	_		Ţ	닒			SA	MPLES	;	ı	UNI	DRAI				STRE				
DEРТН (m)	ELEVATION (m)		STRATA PLOT	WATER LEVEL	DEPTH (ft)			E%		_	-	50	0	-	100		15	0	20	00 
Ť	MAT (m)	STRATA DESCRIPTION	Ϋ́	띪	Ҥ	l	<u>بي</u>	E.S.	щ%	\	л те г	R CON	TENIT (	) ATTE	DDED	CLIM	ште	W	y W	$W_{ m L}$
DEF			TRA	ATE	DE	TYPE	NUMBER	ER)	-VALUE RQD(%)	DY		AIC CO						NS/0.3	m V	REMARKS
			S)	≥		<del>-</del>	Į₹	RECOVERY (mm) TCR(%) / SCR(%)	V-N R R	ST		ARD P							•	& GRAIN SIZE DISTRIBUTION
0 -		Gravel Road			_						10	20	30	40	50	60	70	80	90 1	00 GR SA SI CL
0 -		Compact to very dense, brown	/	1	0															-
-		sandy CLAY (CL) - trace gravel	,			$\mathbb{N}_{aa}$		410	1.2											-
-		- gravel content increases below 0.8	, , , , , , ,	1	1 -	SS	1	$\frac{410}{610}$	13		•									
-		m	<b>!</b>																	
-		- dry to moist			2 -					<b> </b>										<del> -</del>
-			//.			X SS	2	100 91	50/ 130	]::::									>>	
1 -		BOREHOLE TERMINATED on	<b> </b> • • /		3			/ /												
-		inferred bedrock approximately 0.9																		-
-		m below existing grade.			4 -															<del> -</del>
-		Borehole open and dry on								::::										-
-		completion of drilling.			5 -															
-																				  -  -
-					6 -															<del> </del> -
2 -																				
-					7 -															
-																				
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3												ield V								
												Remou					D.			
	ĺ									Δ	P	ocket	Pene	trome	ter T	est, k	ra			

	s	tantec	B	OR	REH N: 4	<b>IOI</b> 891 0	L <b>E</b> 30	RE E: 362	COR 502	RD					16	5-2	7		S	neet 1 of 1
CI	LIENT _	Pennecon Heavy Civil Limit	ed											_	PRO	JEC.	Γ Νο	١.	13	33560104
		NDump Road, Amherst Island	l, ON	1										_	DAT	UM	_			
D	ATES: E	BORING November 15, 2016				WA	ΓER	LEVEL							TPC	ELE	VAT	ION		
	_		Ţ	급			SA	MPLES	}	U	NDF		ED S			TRE				
l (m)	ION		PLO	<u>F</u>	(#) 			(%)		-	+	50		10	)0 <del> </del>	+	150		20	0
DЕРТН (m)	ELEVATION (m)	STRATA DESCRIPTION	٩T٨	ERI	<b>DEPTH (ft)</b>	l	씸	> C CR	UE (%)	WAT	TER C	ONTE	NT & A	TTER	BERG	LIMIT	rs	$W_P$	W	$W_{\rm L}$
DE	ELE		STRATA PLOT	WATER LEVEL	🛚	TYPE	NUMBER	VER 6) / 8	-VALUE RQD(%)	DYN	AMIC	CONE	E PENE	ETRAT	TON T	EST, I	BLOW	S/0.3r	n <b>v</b>	REMARKS &
			- 0,	>			∣ź	RECOVERY (mm) TCR(%) / SCR(%)	, 고 R	STAI	NDAF	RD PEI	NETRA						•	GRAIN SIZE DISTRIBUTION
0 -		Gravel Road	-		0	<u> </u>		\( \text{\text{\$\}\$}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}}		10	) 2	0 3	0 4	0 5	0 6	0 7	70 8	30 9	90 10	OIT OF OF
_		150 mm Silty SAND with gravel				M				Ω:::										42 41 17
_		Compact to very dense, brown sandy CLAY (CL)			1 -	$\ _{\mathrm{SS}}$	1	330 610	13		 • :									
_		- trace gravel				$\mathbb{N}$		010												
-		- moist			2 -					<b>.</b>										
-		DODELIOLE TERMINATED		-		  ×SS	2	<u>25</u> 30	50/ 25		:::: ::::								>>>	
-		BOREHOLE TERMINATED on inferred bedrock at approximately			3 -			30	23											
1 -		0.8 m below existing grade.																		_
-		Donah ala aman and duri an			4 -															
		Borehole open and dry on completion of drilling.																		
-					5 -															
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5 -				1	<u> </u>	I I	<u> </u>				Fiel	liiii ld Va	ne Te	st kī	Liiii Pa	Liiii	1::::	1::::	1::::1	
													led Va			Pa				
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C	s	tantec	B	OR	REF N: 4	IOI 888 8	<b>E</b> 73	<b>RE</b> (E: 359	COR 675	D						16	5-2	28			Sh	eet 1 of	f 1
CI	LIENT _														_	PRO	JEC	CT N	No.	_	133	35601	<u>04</u>
	OCATIO	N <u>2nd Concession Road, Amhe</u> BORING November 16, 2016	rst Is	slano	<u>l, ON</u>		ER I	LEVEL								DAT			TIOI	NI .			
D		NOVEMBER 10, 2010				,,,,,,		MPLES			1U	NDR/	AINI	ED S									
(m)	NOI		PLO	EVE	£)					L			50			00	+		50 		200		
DЕРТН (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEРТН (ft)	Ш	R	SCR(	.UE D(%)	w	/ATI	ER CC	NTE	NT & A	TTER	BERG	S LIM	IITS	V	P	₩ Э—	$W_{\rm L}$	
ao	ELE		STR	WAT	ä	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)					PENE						.3m	•	REMA & GRAIN DISTRIB	SIZE UTION
0 -		Gravel Road	العاد	y .	0	<u> </u>		AR F		<u> </u>	10	20	3	0 40	5	0 6	50 1:::	70	80	90	100	(% GR SA	) SI CL
-		200 mm Silty SAND with gravel				M				Ö:												35 43	22
-		Firm to stiff, brown sandy CLAY (CL)			1 -	ss	1	380 610	17			•											
_		- trace gravel	1.			$\backslash$																	
_		- moist to wet			2 -																		
-					3 -	M																	
1 -		- 300 m wet layer				ss	2	<u>460</u> 610	8		•	1-0										2 35	33 30
-		300 m wet layer			4 -	$\mathbb{N}$		010															
_					_					1													
-		- 100 mm gravel seam	//		5 -	M																	
-					6 -	$\ _{\mathrm{SS}}$	3	<u>510</u> 610	17			•											
2 -			//,			$\setminus$		610													::: -		
-			//		7 -					   													
_		Very dense, brown silty, clayey		•	_	H				 													
-		SAND (SC-SM) n- trace gravel			8 -	SS	4	380 380	50/ 76	:::											>> <b>•</b>		
_		- dry to moist			9 -	$\vdash$				<b> </b>													
-		BOREHOLE TERMINATED on inferred bedrock approximately 2.6																					
3 -		m below existing grade.			10-	$\ \cdot\ $															-		
-		Borehole open and dry on																					
_		completion of drilling.			11 -																		
-					12 -																		
_																							
4 -					13-	$\ \cdot\ $																	
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-																							
-					16-																		
5 -		I .	1	I	I	1	1	I	I	::::   				ne Tes			1:::	:	::1::	::1::	::1		
														ed Va				Pa					

	S	tantec	B	OR	REH N: 4	<b>IOI</b> 886 7	LE 54 I	<b>RE</b> (E: 361	C <b>OR</b> 975	RE	)						16	5-2	29			Sh	eet 1 of 1
	LIENT _		ed													_	PRC	)JEC	CT 1	No.	_	13	3560104
		N 3rd Concession Road, Amher	rst Is	slanc	l, ON		ED.										DA						<del></del>
DA	ATES: B	ORING November 15, 2016				WAI	ERI	LEVEL		_										ATIO			
(E)	NO		2LOT	EVEL	(#)		SAI	MPLES	; 	L	U	ND +	RAI 5( —		) SI		∖R S )0 	TRI		50 50	(kPa —⊢	1) 	)
DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)		DYN	IAMIC	ссо	TENT NE PE	ENE	TRAT	ION	TEST	, BLC	\ DWS/0 /0.3m	N <sub>P</sub> <b>⊢</b> ∴3m	W ▼	W <sub>L</sub> REMARKS & GRAIN SIZE DISTRIBUTION
0 -		Gravel Road						M D D		<u> </u>	10	0 :	20	30	40	5	0	60	70	80	90	100	(%) GR SA SI CL
V		180 mm Silty SAND with gravel		M I	"																	-	
- - - -		Stiff to hard, brown to grey CLAY (CH) with sand - trace gravel - moist - possible fill to 0.8 m			1 -	ss	1	410 610	14	-		•											
1 -		- possible in to 0.8 in - decreasing clay content with depth below 2.7 m			3 -	SS	2	<u>510</u> 610	24	-			•									-	
- - - -		- auger grinding			4 -			610	2.														
- - - -					6 -	SS	3	610 610	22	-			•										
2 -					7 -					-													
- - - -					9 -	SS	4	610 610	45							•							
3 -		Very dense, grey silty, clayey SAND (SC-SM) - trace gravel - dry to slightly moist			10-	ss	5	280 300	50/ 130	-												>>•	
- - - -		BOREHOLE TERMINATED on inferred bedrock at approximately 3.4 m below existing grade.			12-																		
4 - -		Borehole open and dry on completion of drilling.			13-																		
- - - - -					15-																		
5 -					16-							Fie	eld V	/ane	Tes	t, kI	Pa						
										1				ılded		-		kPa					
										1	Δ	Po	cket	Pene	etro	mete	r Te	st, k	Pa				

C	s	tantec	В	OR	EH N: 48	IOI 891 9	E 08 I	<b>RE</b> (E: 363	C <b>OR</b>	<b>Sheet 1 of 1</b> 16-30
LO		Pennecon Heavy Civil Limite  N Front Road West, Amherst Is  BORING November 15, 2016		<u>l, O</u>	J	WAT	ER I	LEVEL		PROJECT No
DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TOTE (%) / SCR(%)	N-VALUE OR RQD(%)	UNDRAINED SHEAR STRENGTH (kPa)  50 100 150 200  WP W WL  WATER CONTENT & ATTERBERG LIMITS  DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m  STANDARD PENETRATION TEST, BLOWS/0.3m  GRAIN SIZE  GRAIN SIZE
0 -		Paved Road 25 mm ASPHALT 75 mm SAND and GRAVEL 25 mm ASPHALT 100 mm SAND and GRAVEL Stiff, brown sandy CLAY (CL) - trace gravel - moist			1 - 2 - 3 -	SS		360 610	8	DISTRIBUTION  10 20 30 40 50 60 70 80 90 100 GR SA SI CL   •  •  -  -  -  -  -  -  -  -  -  -  -
1 - - - - -					<b>4</b> - <b>5</b> -	SS		300 610	9	
3		BOREHOLE TERMINATED on inferred bedrock approximately 1.7 m below existing grade.  Borehole open and dry on completion of drilling.			6 - 7 - 8 - 9 - 10 - 11 - 12 - 13 - 16 - 16 - 16 - 16 - 16 - 16 - 16	X ss	3	130 150	50/1300	
										<ul> <li>□ Field Vane Test, kPa</li> <li>■ Remoulded Vane Test, kPa</li> <li>△ Pocket Penetrometer Test, kPa</li> </ul>

	s	tantec	B	OR	REF N: 4	IOI 891 0	E 40 1	<b>RE</b> (E: 364	C <b>OR</b>	D					16	-3]	1		Sh	eet 1 of 1
CI	LIENT _	Pennecon Heavy Civil Limite													PRO.	JECT	No.		13	<u>3560104</u>
	OCATIO		rst Is	sland	<u>d, ON</u>	1								_	DAT	UM	_			
D	ATES: E	BORING November 16, 2016				WAT	TER I	LEVEL						_	TPC	ELE	VATI	ON .		
)	_		T	님			SA	MPLES	;	Ī	JND		NED S			REN		l (kP		`
DЕРТН (m)	ELEVATION (m)		STRATA PLOT	WATER LEVEL	DEPTH (ft)			E(%)		-	-	50		10	00	+	150	+	200	)
PTH	(m)	STRATA DESCRIPTION	٩T٨	ER I	l id.	l	띪	> SCR	UE (%)	W	ATER	CONT	ENT & A	ATTER	BERG	LIMITS	S	$W_P$	W	$W_{\rm L}$
DE			TR/	MAT	=	TYPE	NUMBER	ER (c	AAL	1			IE PENI					s/0.3m	▼	REMARKS &
			0)	>		-	=	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	ST	ANDA	RD PE	NETRA						•	GRAIN SIZE DISTRIBUTION
0 -		Gravel Road	العام		0	ļ,		쀭		<u> </u>	10	20	30 4	0 5	0 60	0 7	0 8	0 9	0 100	GR SA SI CL
_		180 mm Silty SAND with gravel				M				Ö:										28 51 21
-		Stiff to very stiff, brown sandy	1.		1 -	$\ _{\mathrm{SS}}$	1	<u>280</u> 610	13		•									
-		CLAY (CL) - trace gravel				$\Lambda$		610												
_		- moist	·/		2 -					<b>.</b>										
-										<b>.</b>										
_			,/,	1	3 -	M														
1 -			1/9/			ss	2	<u>360</u> 610	13											-
-				•	4 -		_	610	13											
-					١.															
				1	5 -															
-																				
						SS	3	510	26											
_					6 -	1 33	3	<u>510</u> 610	26			•								
2 -			//		_															-
-			<b>/</b> •/		7 -															
-			1/2			ss	4	230 230	50/ 76										>>•	
-		Very dense, brown clayey SAND	1.7		8 -		<u> </u>	230	/6	<b>.</b>										-
-		(SC) - trace gravel	,																	
-		- moist to wet			9 -															
3 -		BOREHOLE TERMINATED on			10															-
-		inferred bedrock approximately 2.6			10-															
-		m below grade.																		
-		Borehole open and dry upon			11 -	1														
-		completion.																		
-					12 -	1														
-																				
4 -					13-	1														-
-					14-															
-					15-															
-																				
-					16-															
5 -		I	1	1	1	1	1	1	I		Fie	eld V	ane Te	st, kF	a::::1	:::::	1::::1		::::1	l
													ded V			Pa				
											Po	cket l	Penetro	omete	r Tes	t, kPa	a			

	s	tantec	B	OR	REF N: 4	IOI 890 4	LE 15	<b>RE</b> (E: 364	C <b>OR</b>	RD	)						1	6-	-32	2			Sh	eet 1 of 1
Cl	LIENT .	Pennecon Heavy Civil Limite	ed													_	PR	ЮЛ	ЕСТ	. No	).	_	13.	<u>3560104</u>
		N 3rd Concession Road, Amher	rst Is	slanc	l, ON													ATU		-				
D.	ATES: E	BORING November 15, 2016	<u> </u>		_	WA'I		LEVEL		<del>-</del>														
E (	   <u>Z</u>		5	VEL	₽		SA	MPLES		4	U	ND	RAI إ5		บร		AR 100	SII	KEN	ا بي. 150		kPa)	) 200	)
DEPTH (m)	m) m)	STRATA DESCRIPTION	ΑP	RE	DEРТН (ft)		<u>م</u>	(mr SR(%	ш%								1		-	+	W	+ P	W	$W_{ m L}$
DEP	ELEVATION (m)		STRATA PLOT	WATER LEVEL	DEP	TYPE	NUMBER	ERY 7/SC	ALU (QD)	۱ ا						ATTEI ETRA					<b>⊢</b> 2.0/S/	 3m	<b>→</b>	REMARKS
			S.	>		←	Ž	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	,						NOITA							•	& GRAIN SIZE DISTRIBUTION
0 -		Gravel Road			0			A S C		ļ.,	10	0	20	30	4	0	50	60	7	0	80	90	100	(%) GR SA SI C
-		270 mm SAND and GRAVEL				M																	-	
-		Stiff to very stiff, brown CLAY	<b>.</b> ./		1 -	$\ _{\mathrm{SS}}$	1	<u>460</u> 610	31					•									-	
-		(CH) with sand	.,			$\setminus$		010																
-		- trace gravel			2 -					<b>∃</b> ∷													-	
_										-  ::													-	
1 -					3 -	╢		250																
-						SS	2	<u>250</u> 610	10		Í	): : : :											-	
_					4 -	1																	-	
-			<i>i.</i> ,		5 -																		-	
-			//,			M																	-	
-			/:,		6 -	$\ _{\mathrm{SS}}$	3	610 610	20				•										-	
2 -			,,,,			$\mathbb{N}$		610		::														
-			/:/		7 -					- ::													-	
-		Compact to your dance gilty, alayay		<u> </u>		$\parallel$				- ::														
-		Compact to very dense silty, clayey SAND (SC-SM)			8 -	╢																	-	
-		- trace gravel				SS	4	$\frac{330}{610}$	20				•										-	
-					9 -	1																	-	
3 -					10																		-	
-					10-	M																	-	
_				]	   11 -	SS	5	<u>580</u> 610	67														-	
-					11			610	07														-	
-		DODELIOLE TERM (DIATED)	:/	_	12					::													-	
_		BOREHOLE TERMINATED at approximately 3.7 m below existing																					-	
4 -		grade.			13-					::														
-		Borehole open and dry on																					-	
_		completion of drilling.			14-																		-	
-																							-  -	
-					15-	<u> </u>																		
-					1.																			
5 -					16-					1::														
																st, k ane		- <b>Ն</b> ը	)a					
											Δ					ane ome				a				

	s	tantec	B	OR	REH N: 48	<b>IOI</b> 892 4	E 44 I	<b>RE</b> (E: 370	COR 025	RD	16-34	Sheet 1 of 1
Cl	LIENT .	Pennecon Heavy Civil Limite									PROJECT No.	133560104
	OCATIO		slan	d, O	N						DATUM	
D.	ATES: E	BORING November 17, 2016				WAT	ER I	LEVEL			TPC ELEVATION	
			Ĕ	Ш			SAI	MPLES	;		EAR STRENGTH (kP	
DEРТН (m)	ELEVATION (m)		STRATA PLOT	WATER LEVEL	£			Ê%		50	100 150	200
ΤΤ	TA(m)	STRATA DESCRIPTION	Ι¥	R	Ĭ		<u>م</u>	SR(	ш%	·	W <sub>P</sub>	$W = W_{\rm L}$
ЭEР	LE)		RA	\TE	<b>DEPTH (ft)</b>	TYPE	/BE	SK	-VALUE RQD(%)	WATER CONTENT & AT	TERBERG LIMITS FOR	▼ REMARKS
	Ш		S	>		←	NUMBER		N-V OR R	STANDARD PENETRATI		GRAIN SIZE     DISTRIBUTION
		Gravel Road			_			RECOVERY (mm) TCR(%) / SCR(%)	_0	10 20 30 40	50 60 70 80 90	DISTRIBUTION (%)
0 -		240 mm SAND and GRAVEL			0	М				†:::::::::::::::::::::::::::::::::::::		GR SA SI CL
-						SS	1	<u>200</u> 340	50/ 51			<b>≫</b> •
-		Very dense, grey weathered bedrock		_	1 -					<u> </u>		
-		fragments   BOREHOLE TERMINATED on										
-		inferred bedrock approximately 0.3			2 -							
-		m below existing grade.										
-					3 -							
1 -		Borehole open and dry on										<del>:::: </del>
-		completion of drilling.			4 -							
-												
-					5 -							
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_					16-							:::: <u>[</u>
5 -					<u> </u>	Ш	<u> </u>			☐ Field Vane Test	∷∷ ::::  bPa	::::H
										Remoulded Van		
										△ Pocket Penetron		

	s	tantec	B	OR	REF N: 4	IOI 891 1	E 18 1	<b>RE</b> (E: 364	C <b>OR</b> 597	RD 16-38 Sheet 1 of 1	
Cl	LIENT _	Pennecon Heavy Civil Limite								PROJECT No133560104	
LO	OCATIO:	N Stella 40 Foot Road, Amhers	t Isl	and,	ON					DATUM	
D.	ATES: E	BORING November 15, 2016				WAT	ER I	LEVEL	-	TPC ELEVATION	
			T	긢			SA	MPLES	;	UNDRAINED SHEAR STRENGTH (kPa)	
DEРТН (m)	NO.		PLC	EVE	DEPTH (ft)			E%		50 100 150 200	
νТΗ	(m)	STRATA DESCRIPTION	Ϋ́	띪	PTH	l	<u> </u>	CR(	三 (%)	WP W WL WATER CONTENT & ATTERBERG LIMITS	
DEF	ELEVATION (m)		STRATA PLOT	WATER LEVEL	DE	TYPE	NUMBER	ER)	ALL ROD	DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼ REMARKS	3
	1		S	>			3	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	STANDARD PENETRATION TEST, BLOWS/0.3m GRAIN SIZ DISTRIBUTION	E NC
0 -		Paved Road			0			RE( TCI		10 20 30 40 50 60 70 80 90 100 (%) GR SA SI	CL
		\38 mm ASPHALT			"	l/					
-		330 mm SAND and GRAVEL					١.	460	20	Ö 43 41 10	í
-		Firm to very stiff, grey to brown			1 -	SS	1	<u>460</u> 610	28		
-		CLAY (CH) with sand			١.						
-		- trace gravel		}	2 -						
-		- moist		}							
1 -				1	3 -	M		200			
-						SS	2	$\frac{300}{610}$	7		
-					4 -	1					
-		BOREHOLE TERMINATED on	//								
-		inferred bedrock approximately 1.4			5 -						
-		m below existing grade.									
-		Borehole open and dry on			6 -						
2 -		completion of drilling.									
-					7 -						
-											
-					8 -						
-											
-					9 -	$\ \cdot\ $					
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3 -					10-						
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-					16-	$\  \ $					
5 -					L						
										☐ Field Vane Test, kPa ☐ Remoulded Vane Test, kPa	
										△ Pocket Penetrometer Test, kPa	

	S	tantec	,	ΓE	<b>ST</b> N: 4	PI' 889 7	Γ F 58 I	<b>REC</b> (E: 365	ORD 446	)			16-	-35	SI	neet 1 of 1
CL	ENT .	Pennecon Heavy Civil Limite	ed										PR⊖∏	ECT No.	13	3560104
	CATION			and,									DATU			
		ON DATE: November 17, 2016				WA	ΓER I	LEVEL							ON	
			<b>—</b>	بـــا			SAI	MPLES			UNDRAINE	D SHE	AR ST	RENGTH	l (kPa)	
(m)	ELEVATION (m)		STRATA PLOT	WATER LEVEL	Œ		T			L	50		100	150	20	0
DEРТН (m)	M)	STRATA DESCRIPTION	ΙĀ	R	DEPTH (ft)		œ	E,S,S	ш%		' '	'	ı	' '	W <sub>P</sub> W	$W_{ m L}$
ŒP	LEV (		Ř.	1	] 	TYPE	1BE	SC/	ALU QD(		VATER CONTEN YNAMIC CONE				(0.2m) <b>V</b>	REMARKS
	Ш		S	*	_	_	NUMBER	88	N-VALUE OR RQD(%)		TANDARD PEN					& GRAIN SIZE DISTRIBUTION
		Gravel Road					_	RECOVERY (mm) TCR(%) / SCR(%)	20							DISTRIBUTION (%) GR SA SI CL
0 -		250 mm SAND and GRAVEL			0			<u> </u>		::						GR SA SI CL
		- some organic inclusions (at road														
		edge)														
_																
		Durani CI AV (CI )idid		1												
-		Brown CLAY (CL) with sand - topsoil inclusions		1	1 -										:::: :::: <del> </del>	
		- moist		1						::						
-		TEST HOLE TERMINATED on														
		existing CSP culvert at														
		approximately 0.4 m below existing														
_		grade.			١,											
		Note: Test hole was excavated by			2 -	]										
-		hand.														
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C	s	tantec	r	TEST PIT RECORD N: 4 893 279 E: 367 131										16-36			;	Sheet 1	of 1			
	ENT _	Pennecon Heavy Civil Limite  Marshall 40 Foot Road, Amh		Isla												PRO:		T No	Э.	1	33560	0104
		ON DATE: November 17, 2016		WATER LEVEL TPC ELEVA										TION	I							
			TO.	VEL	æ		SAN	MPLES			UI	NDR/	AINE 50	ED SI		R S	TRE	NGT 150			200	
DEРТН (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEРТН (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	1	WATER CONTENT & ATT			ITER TRAT	RATION TEST, BLOWS/0.3			<del></del>	RE GR. DIST	MARKS & AIN SIZE RIBUTION		
0 -		Gravel Road 180 mm Silty SAND with gravel			0			보고			10	20	3(	) 40	5	0 6	0	70	80	90 1	.00 GR S	(%) SA SI CL
-		- some organic inclusions (at road edge)  Brown CLAY (CL) with sand - topsoil inclusions - moist			1 _																	
-		TEST HOLE TERMINATED on existing CSP culvert at approximately 0.2 m below existing grade.			1 -																	
-		Note: Test hole was excavated by hand.			2 -																	
1 -					3 -																-	
-					4 -																	
-					5 -																	
2 -					6 -							Field										
												Remo		ed Va				Pa				

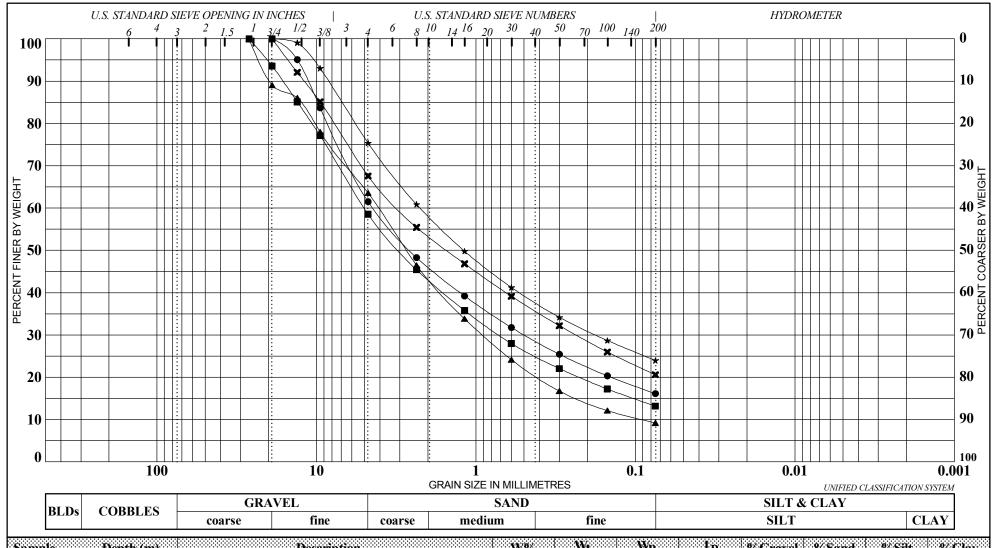
# MUNICIPAL ROADS, GEOTECHNICAL BOREHOLE INVESTIGATION AMHERST ISLAND WIND ENERGY PROJECT, AMHERST ISLAND, ONTARIO

Appendix D July 20, 2017

## **Appendix D**

#### D.1 GEOTECHNICAL LABORATORY TESTING RESULTS





Sa	mple	Depth (m)	Description	W%	W <sub>L</sub>	Wp	1 <sub>P</sub>	%Gravel	%Sand	%Silt %Clay
•	16-01	0.2	SAND and GRAVEL	4				39	45	16
	16-03	0.1	SAND and GRAVEL	4				41	46	13
<b>A</b>	16-04	0.1	SAND and GRAVEL	3				36	55	9
*	16-06	0.1	SILTY SAND with GRAVEL	3				25	51	24
×	16-07	0.1	SILTY SAND with GRAVEL	3				32	47	21

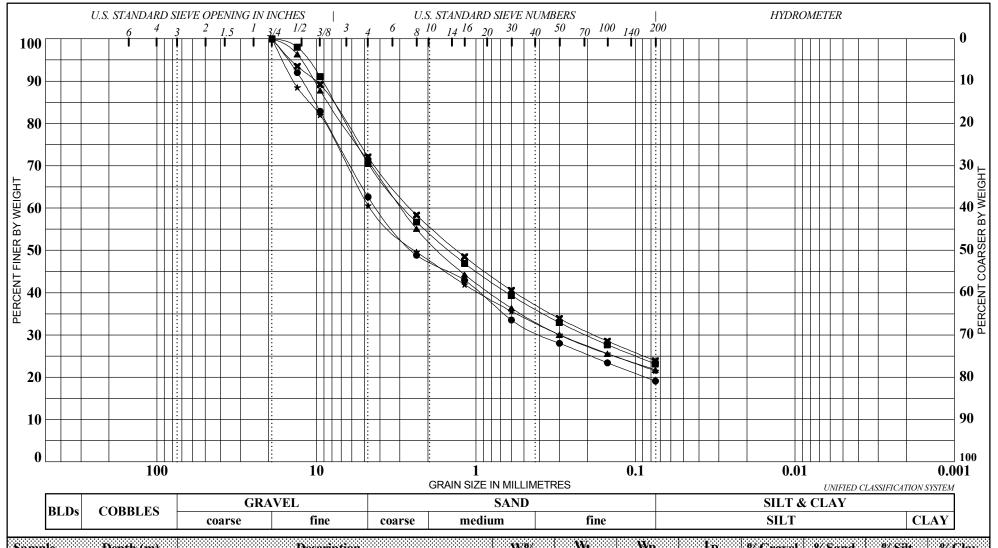


**Location:** Amherst Island, ON

**Project No.:** 133560104

GRADATION CURVE (ASTM D422)

Figure: 1 Remarks:



Sai	nple	Depth (m)	Description	W%	W <sub>L</sub> W <sub>P</sub>	Ip.	%Gravel	%Sand	%Silt %Clay
•	16-08	0.1	SILTY SAND with GRAVEL	3			37	44	19
	16-10	0.1	SILTY SAND with GRAVEL	3			29	48	23
<b>A</b>	16-12	0.1	SILTY SAND with GRAVEL	3			29	49	22
*	16-13	0.1	SILTY SAND with GRAVEL	3			39	39	22
×	16-16	0.2	SILTY SAND with GRAVEL	3			28	48	24

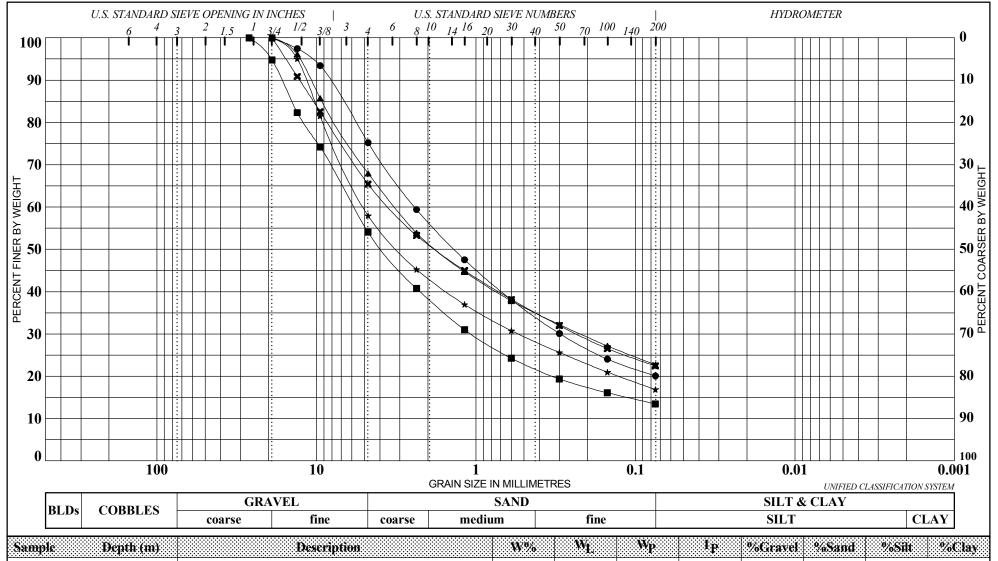


**Location:** Amherst Island, ON

**Project No.:** 133560104

### GRADATION CURVE (ASTM D422)

Figure: 2 Remarks:



Sa	mple	Depth (m)	Description	₩%	W <sub>L</sub> W <sub>P</sub>	Ip.	%Gravel	%Sand	%Silt %Clay
	16-19	0.1	SILTY SAND with GRAVEL	3			25	55	20
	16-21	0.1	SILTY SAND with GRAVEL	2			46	41	13
<b>A</b>	16-22	0.0	SAND and GRAVEL	3			32	45	23
*	16-27	0.1	SILTY SAND with GRAVEL	3			42	41	17
×	16-28	0.1	SILTY SAND with GRAVEL	3			35	43	22

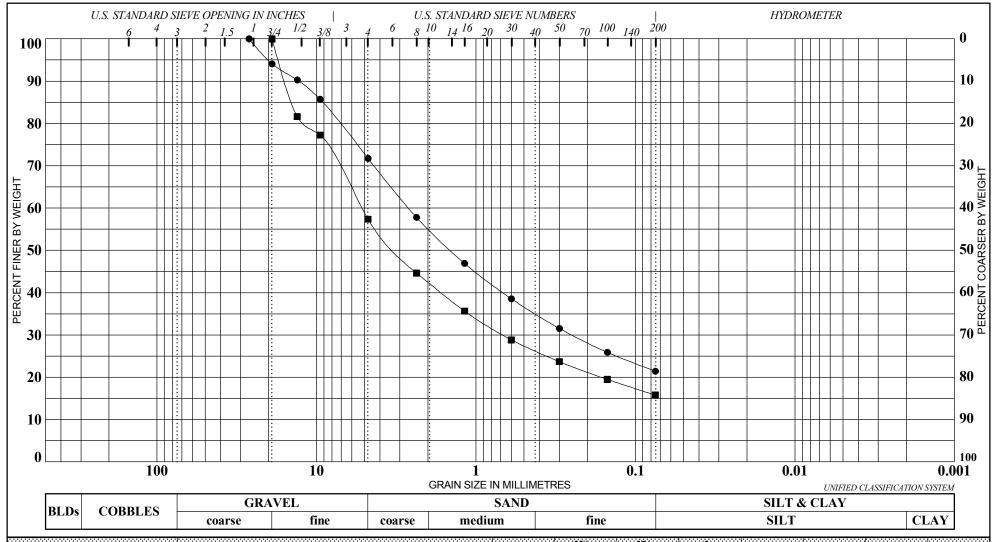


**Location:** Amherst Island, ON

**Project No.:** 133560104

### GRADATION CURVE (ASTM D422)

Figure: 3 Remarks:



Sai	mple	Depth (m)	Description	W%	W <sub>L</sub> W <sub>P</sub>	Ip	%Gravel	%Sand	%Silt %Clay
•	16-31	0.1	SILTY SAND with GRAVEL	3			28	51	21
	16-38	0.2	SAND with GRAVEL	4			43	41	16

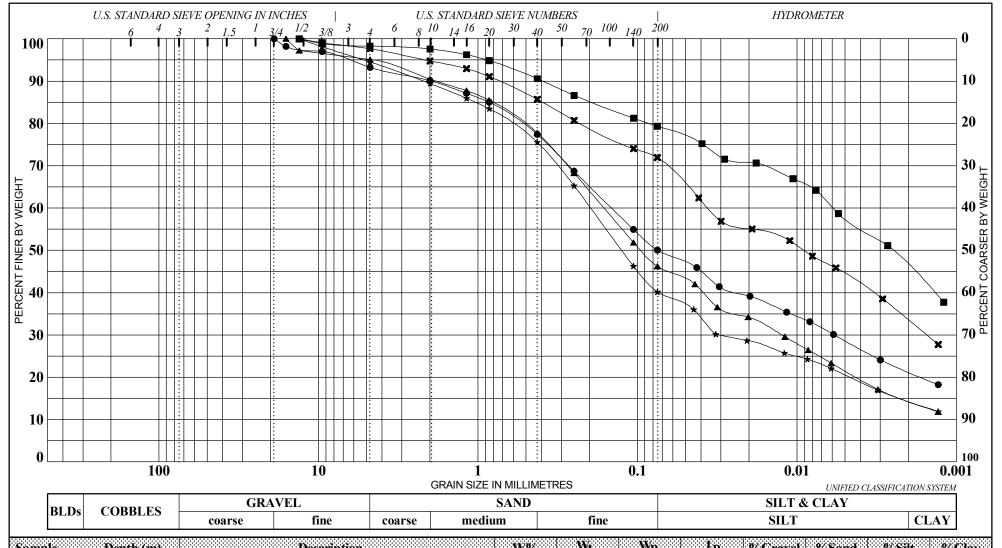


**Location:** Amherst Island, ON

**Project No.:** 133560104

GRADATION CURVE (ASTM D422)

Figure: 4 Remarks:



Sa	nple	Depth (m)	Description	₩%	w <sub>L</sub>	Wp	Ip	%Gravel	%Sand	%Silt	%Clay
•	16-01	0.5	SANDY CLAY (CL)	17	28	17	11	7	43	29	21
	16-07	1.1	CLAY with SAND (CH)	30	53	27	26	2	19	33	46
<b>A</b>	16-08	1.1	SILTY, CLAYEY SAND (SC-SM)	8	18	13	5	5	49	32	14
*	16-10	1.1	SILTY, CLAYEY SAND (SC-SM)	7	15	11	4	5	55	26	14
×	16-16	1.1	CLAY with SAND (CH)	29	55	29	26	2	26	38	34

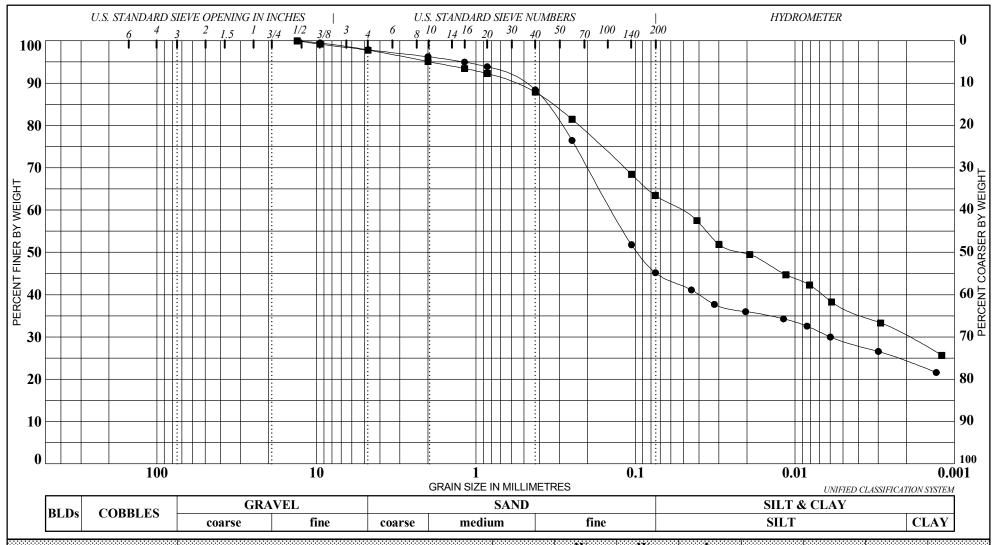


**Location:** Amherst Island, ON

**Project No.:** 133560104

### GRADATION CURVE (ASTM D422)

Figure: 5 Remarks:



Sa	mple	Depth (m)	Description	W%	w <sub>L</sub>	Wp	1 <sub>P</sub>	%Gravel	%Sand	%Silt	%Clay
•	16-21	1.0	CLAYEY SAND (SC)	22	24	15	9	2	53	21	24
	16-28	1.1	SANDY CLAY (CL)	21	37	16	21	2	35	33	30



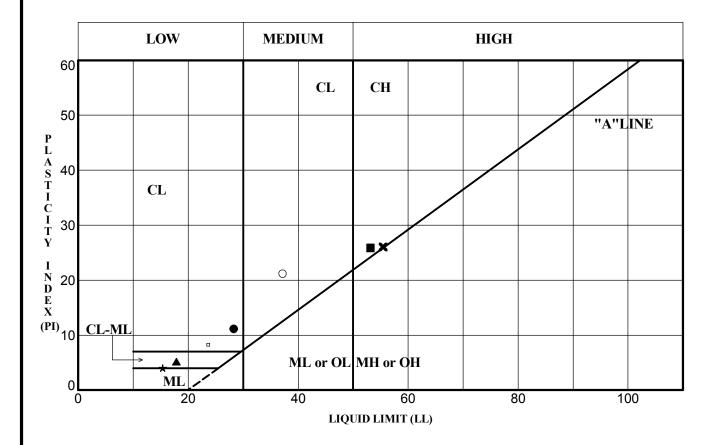
**Location:** Amherst Island, ON

**Project No.:** 133560104

GRADATION CURVE (ASTM D422)

Figure: 6
Remarks:

## **PLASTICITY CHART**



	Specimen	Depth (m)	LL	PL	PI	Fines	W%	Classification
•	16-01	0.5	28	17	11	50	17	SANDY CLAY (CL)
	16-07	1.1	53	27	26	79	30	CLAY with SAND (CH)
	16-08	1.1	18	13	5	46	8	SILTY, CLAYEY SAND (SC-SM)
*	16-10	1.1	15	11	4	40	7	SILTY, CLAYEY SAND (SC-SM)
×	16-16	1.1	55	29	26	72	29	CLAY with SAND (CH)
-	16-21	1.0	24	15	9	45	22	CLAYEY SAND (SC)
0	16-28	1.1	37	16	21	63	21	SANDY CLAY (CL)



Project: Amherst Island Wind Farm - Municipal

Roads Investigation

**Location:** Amherst Island, ON

**Project No.:** 133560104

ATTERBERG LIMITS

(ASTM D4318)

Figure: 7
Remarks: