45 AND 47 ANDERSON BOULEVARD, UXBRIDGE, ONTARIO

GEOTECHNICAL AND HYDROGEOLOGICAL INVESTIGATION

ECMI PROPERTIES (125 VILLARBOIT) INC.

PROJECT NO.: 201-03673-00
DATE: March 25, 2021

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March 25, 2021

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Subject: Geotechnical and Hydrogeological Investigation - FINAL
45 and 47 Anderson Boulevard
Uxbridge, Ontario
Project No. 201-03673-00

Dear Mr. Kirchmair:

We are pleased to submit our updated Geotechnical and Hydrogeological Investigation Report for 45 and 47 Anderson Boulevard, located in Uxbridge, Ontario.

The report is based on information obtained from a borehole investigation and a laboratory testing program conducted in May and June 2020 and additional information pertaining to soil management provided in December 2020. Geotechnical and Hydrogeological conclusions and recommendations relevant to the Site's proposed development as a Waste Transfer Processing and Bioremediation Facility for Soil are included.

We trust that this report meets your present requirements. Please contact us if you have any questions.

Yours truly,

Lisa Gardiner, B.Sc., A.Sc.T.
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WSP ref.: 201-03673-00

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TABLES IN TEXT

FIGURES

APPENDICES

1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by ECMI Properties (125 Villarboit) Inc. (the Client) to complete a geotechnical and hydrogeological investigation at 45 and 47 Anderson Boulevard, in Uxbridge, Ontario (the Site) to accompany a rezoning application. The investigation was requested to obtain subsurface geotechnical and hydrogeological information for the proposed development of the Site, which will include a proposed Waste Transfer Processing and Bioremediation Facility for soil, including one building (Butler Building) slab on grade (approximately 3,200 m^2), an asphalt parking lot and access ways, and an outdoor storage area that is also concrete slab on grade. A retaining wall is proposed to be constructed along the base of the existing on-site berm. It is understood that the Site is currently vacant of any structures and is not serviced by sewage works, with some areas showing surficial grading. Final proposed grades including building finished floor elevation (FFE) and parking lot grades were not available as of writing this report; for the purpose of this investigation and report it is assumed the final grades will be effectively similar to the existing grades.

The act of 'processing' and improving soil for beneficial reuse is an environmentally sustainable operation which prevents reusable and valuable soil from ending up in landfills. This process is vital to the success of many private and public projects (including those initiated by the Province and many municipalities in Ontario). The soil is then transferred to a final destination (for example: non-structural fill for a construction project, soil amendment recycled in top soil mixtures, fill material for mine reclamation, capping fill material for closed landfills, and interim cover material for operating landfills).

It is our understanding that the site will receive non-hazardous soil/material (classified as per the requirements of Regulation 558) from construction and demolition projects which would be brought to the facility and processed for beneficial re-use where possible. Processing would include soil handling, soil inspection, sampling, classification, sorting, homogenization, bulking, soil treatment (bioremediation and manual manipulation) and temporary soil storage.

Soil quality will be understood prior to receipt on site or within the first few days on site, so that soil processing and treatment can be managed appropriately on site. Where necessary soil treatment via bioremediation and mechanical processing will be implemented on site.

Wet soils from hydrovac trucks will be received in the Butler Building and dry soils will be moved to outdoor storage areas using dump trucks. Soil will be stored only on concrete slabs both inside the Butler Building and at the outside storage area.

Soils received in the Butler Building are materials from hydrovac trucks that will be decanted and that decant water will be reused in a closed loop system.

The outside soil storage area will have a concrete slab base and the uncovered soils stored outside will be clean soils and will therefore have no impacts on runoff water quality with the exception of possibly sediment loading. Stockpiles that do require some bio remedial treatment will be covered with a low permeable membrane, therefore the runoff from those stockpiles should have no water quality concerns. All water from the outside soil storage area runoff will be directed to catchbasins with sediment control measures to ensure that this discharge water meets the Storm Sewer Use by law prior to discharge to the stormwater system off site. Therefore, the outside soil storage runoff water during operations are not anticipated to influence shallow groundwater quality or receiving surface water.

This geotechnical and hydrogeological investigation has been performed in accordance with WSP's proposal to the Client dated February 19, 2020, under WSP Reference No. 1970743, which was crafted based on a request for a proposal sent by emails dated between Nov 21 and 27, 2019, by Armstrong Planning/Project Management (Armstrong) to WSP.

This report summarizes the investigation procedures and findings, and provides information on the existing subsurface soil and groundwater conditions within the investigated limits, and provides geotechnical recommendations relevant to the proposed Site developments.

2 PHYSICAL SETTING

2.1 DESCRIPTION OF THE STUDY AREA

The location of the Site is on the northeast side of Anderson Boulevard, approximately 1.8 km west of the Village of Goodwood, Ontario (**Figure 1**) in an industrial area. The Site is currently 3.58 hectares (ha) of vacant undeveloped land.

2.2 TOPOGRAPHY AND DRAINAGE

Based on survey data provided by Armstrong to WSP, the topography in the study area is slightly undulating with elevations ranging from 350.5 to 353.0 metres above sea level (mASL) and slopes to the south-west. There is a berm along the north and east side of the Site with a maximum elevation of approximately 361 mASL.

There is little to no surface water drainage shown in the Site area. There is a relatively small wetland area approximately 225 m north of the Site, however, it does not appear to be connected to any larger water bodies and does not appear to be part of a wetland complex (although a wetland study confirming this was not completed as part of this investigation).

2.3 PHYSIOGRAPHY

The subject property is located within the Oak Ridges Moraine physiographic region (**Figure 2**), as described by Chapman and Putnam (1984), which is characterized as a complex package of granular sediments deposited in meltwater at the later stages of the last glacial period.

2.4 SURFICIAL GEOLOGY

The surficial geology at the project Site consists of stone-poor, sandy silt to silty sand-textured till on Paleozoic terrain that is represented on **Figure 3** as Diamicton on the northern two thirds of the property and sand deposit on the southern one-third. The diamicton is likely Newmarket Till.

2.4.1 HYDROGEOLOGY

The movement of groundwater through the subsurface is controlled by the hydraulic gradients and the relative distribution of coarse and fine-grained sediments. As such, the geologic units are typically grouped into hydrostratigraphic units that reflect the capacity of the geologic units to transmit water. Hydrostratigraphic units are considered to be either aquifers (with good capacity to transmit water) or aquitards (which typically impede transmission of water). Ultimately the distribution and interconnection of aquifers and aquitards are responsible for observed groundwater movement.

The Oak Ridges Aquifer Complex (ORAC) is a regional aquifer system in Ontario that corresponds to the area where the Oak Ridges Sediments are deposited. The aquifer is a significant source of groundwater for domestic, commercial, industrial, institutional, agricultural, and municipal water supplies.

The MECP Source Protection Information Atlas contains information regarding vulnerable aquifer locations. There is information regarding the Wellhead Protection Area (WHPA), which includes the surface and underground area surrounding a water well or well field that supplies a municipal residential system or other designated system where contaminants are reasonably likely to reach the water well(s). The atlas also contains information broken down in to the following categories:

WHPA-A – 100 m circle centered on the wellhead;

WHPA-B – two year time of travel;

WHPA-C – five year time of travel;

WHPA- D – 25 year time of travel;

WHPA-E – 2 hour time of travel (GUDI Well); and

WHPA-Q – Area where there is a water quality threat; WHPA-Q1 is mapped as the combined area of the cone of influence of the well and the whole of the cones of influence of all other wells that intersect that area and WHPA-Q2 is an area that includes WHPA-Q1 and any area where a future reduction in recharge would significantly impact that area.

According to the MECP Source Protection Information Atlas the site is not located in a wellhead protection area or a Groundwater Under Direct Influence (GUDI) wellhead protection area, nor is it considered a highly vulnerable aquifer. This site is located in a Significant Groundwater Recharge Area with a score of 2 and this designation has no policies associated with it relative to the site. This site is also located within the wellhead protection area Q1 and Q2 with a stress rating of moderate which means if additional water taking is required then recharge will be needed to off set any recharge loss. Therefore, a recharge infiltration trench was investigated as a part of this project. This infiltration trench is detailed in the Stormwater Management report for this Site (WSP, 2020).

2.5 BEDROCK GEOLOGY

The Site is underlain by Upper Ordovician age Blue Mountain Formation (**Figure 4**) consisting of uniform soft and laminated dark blue-grey to brown to black shale with thin interbeds of limestone or calcareous siltstone (*Hewitt, 1966; Hamblin 1999)*. The formation has an open marine provenance (*Churcher et al., 1991*). No boreholes advanced for the current investigations encountered bedrock. However, based on available geological mapping, it is inferred that the depth to bedrock is approximately 180 to 190 m below ground surface (bgs) in the Site area. The bedrock surface slopes in a southwesterly direction, as shown on **Figure 4**.

2.6 MECP WATER WELLS

Water well records from the Ministry of Environment, Conservation and Parks (MECP) Water Well Information System (WWIS) database were obtained and plotted to assess distribution of private water supply wells within approximately 500 m of the Site (**Figure 5**).

The database indicates that there are twenty-one (21) well records within 500 m, however, it is noted that no wells were identified on the Site. It is noted that some of the reported UTM coordinates for the wells may be based on centre of lot locations rather than actual well locations, so it is expected that some coordinates are not accurate. Of the wells identified in the database:

- Thirteen (13) were listed as water supply wells for domestic use.
- Three (3) were listed as water supply for livestock use.
- Two (2) were listed as abandoned, of which neither had a use listed.
- Three (3) did not have a water use listed.

Seventeen (17) of the well records contained subsurface stratigraphic information, which can be summarized as follows:

- Clay was identified at ground surface in nine (9) well records at a thickness ranging between 0.6 m and 48.8 m.
- A layer of 0.6 m of topsoil was located in three (3) well records, one location with clay underlying the topsoil to a depth of 31.4 m. Layers of sand and gravel to gravel were identified below the clay. Two locations with fine to medium sand underlying the topsoil to depths of 3.7 to 5.5. m. Layers of clay and fine to coarse sand were identified below the sand in one of the wells to a depth of 49.7 m.
- Fine to coarse sand to gravel was identified at the surface in two (2) well records at a thickness ranging between 6.7 m and 39.9 m.
- Two (2) locations were previously dug to depths of 1.5 m with medium sand to fine sand identified at lower depths.
- One (1) location identified Silt at the surface to a depth of 12.8 m underlain by sand.
- Sand was the main water-bearing feature in the well records.

Bedrock was not encountered in any of the wells.

All the

well records with stratigraphic information were terminated in overburden (fine to coarse sand, gravel) and well depths ranged between 3.7 m and 92.4 m bgs. Static groundwater levels ranged between 2.13 m bgs to 44.8 m bgs with an average measured level of 21.3 m bgs. No water information or soil formation was listed in four (4) of the records. Water well records are provided in **Appendix A**.

3 FIELD INVESTIGATION PROCEDURES

3.1 BOREHOLE LAYOUT AND UTILITY LOCATES

Boreholes were established in the field by WSP personnel, and borehole locations were selected to avoid conflicts with existing above ground and underground utilities, including water, sewer, gas, hydro, telephone and cable locations that were verified in the field using Ontario One-call and Private Locate Services.

3.2 GPS TOPOGRAPHIC SURVEY

Borehole locations and elevations were surveyed by a surveyor retained by the Client and data were provided to WSP. Ground surface elevations are summarized in **Table 3-1** and are also presented on the Logs in **Appendix A**. Elevations contained herein are for engineering analytical purposes only, and must be verified prior to finalizing any design or construction parameters upon which they are based.

3.3 FIELD INVESTIGATION

The purpose of the field investigation was to confirm shallow sub-surface soil conditions and investigate groundwater conditions across the Site. The borehole locations were located to obtain an overview of the sub-surface conditions at the Site, with five locations focused in the proposed building envelope completed to 6 mBGL and three (3) locations at the base of the existing berm to a depth of 3 mBGL. Monitoring wells were installed in three (3) locations across the Site to obtain a data for modeling of the groundwater surface and flow direction, if groundwater was encountered.

3.3.1 BOREHOLE PROGRAM

The field drilling investigation was conducted in May 2020. In total, eight (8) boreholes were advanced, to depths ranging between 3.7 to 6.7 mBGL. The boreholes, designated as BH20-01 to BH20-08, were advanced at the locations as shown on **Figure 1** provided in the Figure section of this report.

Boreholes were advanced using a track-mounted drill rig equipped with 110 mm Outside Diameter (O.D.) solid stem augers and 51 mm O.D. split-spoon samplers. A qualified WSP geotechnical engineering inspector supervised the drilling, logged and sampled the boreholes. Soil samples were recovered and retained in labeled air-tight containers for subsequent review by the project engineer and laboratory testing as required.

The depth to any groundwater and/or any borehole “cave-in” was measured upon completion of drilling. The boreholes were backfilled immediately upon completion.

Table 3-1: Borehole Surface Elevation and Termination Depth/Elevation Summary

BOREHOLE ID	SURFACE ELEVATION (mASL) (1)	TERMINATION DEPTH (mBGL)	TERMINATION ELEVATION (mASL)
BH20-01	351.6	6.7	344.9
BH20-02	352.8	6.7	346.1
BH20-03	352.0	6.0	346.0
BH20-04	351.4	6.7	344.7
BH20-05	352.2	6.7	345.5
BH20-06	354.1	3.7	350.4
BH20-07	353.7	3.7	350.0
BH20-08	353.3	3.7	349.5

(1) Ground surface elevations based on survey information provided to WSP by Armstrong.

Three (3) borehole locations were completed as piezometers to facilitate measurements of groundwater levels. Piezometers were constructed with 50 mm OD Schedule 40 PVC machine-slotted screen and riser pipe, monitor tip, couplings, and a protective plastic cap or lockable J-Plug. Screened intervals 1.5 m long were backfilled with manufactured filter sand. Installations were completed in general accordance with Ontario Provincial Regulation (O. Reg.) 903, as amended.

Borehole logs detailing the soil profiles are provided in **Appendix A**.

3.4 LABORATORY TESTING PROGRAM

3.4.1 SOIL ANALYSIS

Selected soil samples were submitted to WSP's certified soils laboratory for geotechnical soil testing in accordance with **Table 3-2**. Geotechnical laboratory test results are provided on the borehole logs in **Appendix A**. Copies of the geotechnical laboratory test results are provided in **Appendix B**.

Table 3-2: Geotechnical Laboratory Soil Testing Summary

Geotechnical Test	Procedure/Methodology	Number of Tests
Moisture Content	ASTM D2974	Fifty (50)
Sieve & Hydrometer Analysis	ASTM D6913	Three (3)

Note that to assess the hydraulic conductivity of the shallow sub-surface soils the percolation rates and hydraulic conductivity of selected soils were determined from the laboratory grain size analyses. The hydraulic conductivity calculations were completed using the Hazen Method. See **Section 4.3** for results of the hydraulic conductivity calculations.

3.4.2 GROUNDWATER ANALYSIS

The wells were dry upon completion and no groundwater had infiltrated into the wells by the date of our last groundwater monitoring event (June 11, 2020). Based on the dry conditions, no groundwater samples were obtained and no chemical laboratory analysis was completed.

4 FINDINGS

4.1 SOIL PROFILE

4.1.1 OVERBURDEN (DISTURBED EARTH)

A layer of soil identified as "overburden" on the logs was encountered at surface in all boreholes, ranging in thickness ranged from 50 mm to 100 mm. This soil was a disturbed surficial earth with some organics and vegetative growth but not necessarily a topsoil. It was in a loose and disturbed state.

4.1.2 SILTY SAND

Layers of silty sand, with some to trace amounts of clay and gravel, were encountered in all boreholes, with the exception of BH20-01, BH20-02 and BH20-04. The silty sand was first encountered at depths ranging from approximately 0.1 to 3.5 mBGL. The natural moisture contents as determined by laboratory tests ranged between approximately 7% and 22%. The silty sand was considered loose to compact on the basis of SPT values of 3 to 18 blows per 0.3 m of penetration.

4.1.3 SILT

Layers of silt were encountered in boreholes BH20-04 and BH20-5, at depths of 2.3 and 6.2 mBGL, respectively. The silt contained some to trace amounts of sand and clay. Based on SPT values ranging between 12 to 20 blows per 0.3 m of penetration, the silt was considered compact. In-situ moisture contents ranged between 20% and 21%. Borehole BH20-05 was terminated in the silt, at a depth of 6.7 mBGL.

4.1.4 SAND

Sand layers were encountered in boreholes BH20-02, BH20-03 and BH20-05 at depths of 1.8 mBGL, 4.6 mBGL, and 1.1 mBGL, respectively. Borehole BH20-03 was terminated in the sand layer at a depth of 6.0 mBGL. The sand contained some silt and was considered to be loose to very dense on the basis of SPT values ranging between 5 and greater than 50 blows per 0.3 m of penetration.

4.1.5 SANDY SILT

Layers of sandy silt were encountered in all boreholes, with the exception of BH20-05, at depths ranging between 0.1 and 0.6 mBGL. The sandy silt contained some to trace amounts of clay and gravel. The natural moisture contents as determined by laboratory tests ranged between approximately 7% and 22%. The sandy silt was considered loose to compact on the basis of SPT values of 12 to 20 blows per 0.3 m of penetration.

Laboratory particle size distribution analyses were completed on selected samples of the sandy silt. Results are presented on borehole logs in **Appendix A** and particle size distribution plots are included in **Appendix B**. A summary of the analyses completed to date is provided in **Table 4-1** below (as per the USCS Classification System).

Table 4-1: Summary of Sandy Silt Particle Size Analysis

Borehole No.	Sample I.D.	% Gradation			Primary Soil Classification
		Gravel	Sand	Silt & Clay	
BH20-06	SS3	8	23	69	Sandy Silt, some clay, trace gravel

4.1.6 SAND AND GRAVEL

Layers of sand and gravel were encountered in boreholes BH20-04 and BH20-08, at depths of 0.1 mBGL and 0.8 mBGL, respectively. The sand and gravel contained trace amounts of silt and clay, and occasional cobbles were observed. The sand and gravel was encountered below the overburden and sandy silt layers described above. The in-situ moisture contents as determined by laboratory tests was approximately 9% to 14 %. The sand and gravel is considered to be loose to compact on the basis of SPT values of 9 to 32 blows per 0.3 m of penetration.

4.1.7 SANDY SILT TILL

Layers of sandy silt till were encountered in all boreholes, with the exception of BH20-03, at depths ranging between 2.1 and 4.6 mBGL. The sandy silt till contained some to trace amounts of clay and gravel. The natural moisture contents as determined by laboratory tests ranged between approximately 2% and 21%. The sandy silt till was considered loose to very dense on the basis of SPT values of 3 to greater than 50 blows per 0.3 m of penetration.

Laboratory particle size distribution analyses were completed on selected samples of the sandy silt till. Results are presented on borehole logs in **Appendix A** and particle size distribution plots are included in **Appendix B**. A summary of the analyses completed to date is provided in **Table 4-2** below (as per the USCS Classification System).

Table 4-2: Summary of Sandy Silt Till Particle Size Analysis

Borehole No.	Sample I.D.	% Gradation			Primary Soil Classification
		Gravel	Sand	Silt & Clay	
BH20-04	SS6	1	23	76	Sandy Silt, trace clay, trace gravel
BH20-08	SS4	7	23	70	Sandy silt, some clay, trace gravel

4.2 GROUNDWATER CONDITIONS

Wet soil conditions were observed in some of the soil samples during the drilling and sampling operations, however upon completion of drilling all the boreholes remained open to their full depth and free of any water accumulation. Groundwater monitoring wells were installed at three (3) borehole locations. The wells were visited twice (April and June 2020) and measured for the presence of any groundwater; each time the wells were free of groundwater ("dry"). The groundwater monitoring well installation details are summarized in Table 4-3, below, and are indicated on the corresponding borehole logs in Appendix A.

Based upon the MECP water well records outlined in Section 2.6 above the groundwater within 500 m of the site ranges from 2.13 to 44.8 mbgs, with nearest wells obtaining water from 17 mBGS and deeper.

Based upon local topography, the inferred shallow groundwater flow direction is southward towards the wetlands and streams (tributaries of Duffins Creek) located approximately 1.5 km south of the study area.

Table 4-3: Summary of Groundwater Monitoring Well Locations and Data

BOREHOLE IDENTIFICATION AND GROUNDWATER MONITORING WELL IDENTIFICATION	GROUND SURFACE ELEVATION (MASL)	DEPTH OF SCREEN (M)	MEASURED GROUNDWATER DEPTH (APRIL 22, 2020) MBGL	MEASURED GROUNDWATER DEPTH (JUNE 11, 2020) MBGL
BH20-04/MW20-04	351.43	3.0 – 6.0	DRY	DRY
BH20-06/ MW20-06	354.05	0.6 – 2.1	DRY	DRY
BH20-08/ MW20-08	353.32	1.5 – 2.0	DRY	DRY

4.3 SUBSURFACE HYDRAULIC CONDUCTIVITY

Percolation rates and hydraulic conductivities were estimated based on the particle size distribution data, as shown in **Table 4-4** below.

Table 4-4: Percolation Rates and Hydraulic Conductivity of Soils

Sample I.D.	Depth (m BGL)	Soil Description	Percolation Rate (min/cm)	Hydraulic Conductivity (cm/sec)
BH20-04 SS6	4.6 – 5.2	Sandy Silt Till	30	*6.25 x 10^{-4}
BH20-06 SS3	1.5 – 2.1	Sandy Silt	35	** 10^{-4} to 10^{-5}
BH20-08 SS4	2.3 – 2.9	Sandy Silt Till	35	** 10^{-4} to 10^{-5}

Notes: * based on Hazen Method ** based on particle size curves and established values for soil types

4.4 EXISTING SITE WATER QUALITY

Groundwater quality samples could not be obtained from the onsite wells as they were dry. However, a Phase One ESA report was completed and based on the information obtained as part of the Phase One ESA, it is concluded that no Potentially Contaminating Activities (PCAs)were identified on the Phase One Property or within the Phase One Study Area and no Areas of Potential Environmental Concerns (APECs) were identified on the property which would warrant further environmental assessment of the Phase One Property (WSP, 2019). It should be noted that general environmental management and housekeeping practices were reviewed as part of this assessment with respect to their impact on the environmental condition of the property; however; a detailed review of regulatory compliance issues was beyond the scope of the investigation. The Phase One ESA does not constitute an audit of environmental management practices, indicate geotechnical conditions, or identify geologic hazards. Based on the findings of the Phase One ESA, no PCA causing APEC were identified and as such, no Phase Two ESA was deemed required. For additional details see the Phase One report completed September 2019 by WSP.

4.5 SITE WATER QUALITY MANAGEMENT DURING OPERATIONS

The Site water management during operations that may influence surface water and /or groundwater quality will include both the management of decant water from within the Butler Building and water collected from the outdoor soil storage area.

Soils received in the Butler Building are materials from hydrovac trucks that will be decanted and that decant water will be reused in a closed loop system. Given this is a closed loop system with no discharge, this water quality will not influence either surface water nor groundwater quality.

The outside soil storage area will have a concrete slab base and the uncovered soils stored outside will be clean soils and will therefore have no impacts on runoff water quality with the exception of possibly sediment loading. Stockpiles that do require some bio remedial treatment will be covered with a low permeable membrane, therefore the runoff from those stockpiles should have no water quality concerns. All water from the outside soil storage area runoff will be directed to catchbasins with sediment control measures to ensure that this discharge water meets the Storm Sewer Use by law prior to discharge to the stormwater system off site. Therefore, the outside soil storage runoff water during operations are not anticipated to influence shallow groundwater quality or receiving surface water.

5 GEOTECHNICAL RECOMMENDATIONS

The following recommendations are intended to support design of the proposed Waste Transfer Processing and Bioremediation Facility for Soil located at 45 & 47 Anderson Boulevard, in Uxbridge, ON, and are based on the borehole information provided in **Section 4** as well as the project parameters made available to WSP as of writing this report. While we believe our findings are reasonably representative of the Site, conditions may vary between and beyond the investigated borehole locations. If significant differences in the subsurface conditions described above are found at a later time, WSP must be contacted immediately to review and update our findings and recommendations, as necessary.

Recommendations are intended for Designers and are not intended as instructions to Contractors, who should perform their own investigations to confirm any conditions that may affect them. Recommendations in this report must not be used by third parties without the express written consent of WSP.

Final Site development layout and proposed grades including building FFE and parking lot grades were not available as of writing this report; for the purpose of this investigation and report it is assumed the final grades will be effectively similar to the existing grades. If final grades are significantly different that existing grades, then WSP's geotechnical engineers must be notified and allowed the opportunity to review and provide any supplementary recommendations as appropriate.

5.1 SITE PREPARATION

The existing overburden (disturbed surficial earth), topsoil and any other organic-bearing soils, fill, and any otherwise deleterious materials should be stripped from below the footprint of proposed structures (including foundations and floor slabs), concrete slabs for soil management area(s) and pavement areas. Prepared structural concrete and pavement subgrade areas should be proof-rolled using a self-propelled vibratory compactor or smooth drum roller with a minimum static weight of 8 tonnes, or approved equivalent. Proof-rolling should be completed in the presence of a qualified Geotechnical Engineer or qualified personnel working under the direct supervision of a Geotechnical Engineer. Loose or soft subsoils, if any, should be subexcavated and replaced with approved fill that is texturally consistent with the native material.

Silty material may become loose/weak or otherwise unstable when construction loads are applied in wet weather conditions. This material may require stabilization or full removal, subject to the moisture conditions at the time of construction. This material may also be frost susceptible and should be removed from below footings, concrete slab and pavement areas that are potentially exposed to freezing.

See **Section 5.4** for details regarding backfill and compaction.

5.2 EXCAVATIONS AND DEWATERING

Excavations must be constructed in accordance with the most recent version (O. Reg. 123/08) of the Occupational Health and Safety Act (OHSA). In general, the Site soils consist predominantly of silts and sands. Based on OHSA criteria, the Site soils may be classified and otherwise unsupported excavation sidewall should be sloped, as follows:

- The existing fill and native soils, above the groundwater table, may be considered a Type 3 soil, and excavation sidewalls should be sloped at a maximum of 1H:1V to the base of the excavation; and
- Any soils below the groundwater table should be considered a Type 4 soil, and excavation sidewalls should be sloped at a maximum of 3H:1V to the base of the excavation.

Seams and/or pockets of sand or silt will behave as Type 4 soils below the groundwater table, and may behave similarly above the groundwater table where any trapped or perched groundwater exists within such soils. For excavations through multiple soil types, the side slope geometry is governed by the soil with the highest number Type designation. In general, the boreholes for this investigation did not encounter a groundwater table, and therefore Type 3 soils predominate (knowing that some localized areas of trapped groundwater or otherwise loose/wet soil zones may act as Type 4 soils and require appropriate management during construction). Locally, where loose or soft soil is encountered at shallow depths or within zones of persistent seepage, it may be necessary to flatten the side slopes as necessary to achieve stable conditions.

Excavations should be protected from exposure to precipitation and associated ground surface runoff, and should be inspected regularly for signs of instability. If localized instability is noted during excavation, or if wet conditions are encountered, side slopes should be flattened as required to maintain safe working conditions. If excavation side slopes cannot be achieved due to Site confinements, appropriate shoring should be designed and installed.

Stockpiles of excavated materials should be kept at least 3 m from the edge of the excavation to avoid slope instability, subject to on-site confirmation. Care should also be taken to avoid overloading of any underground services/structures by stockpiles.

Based on the anticipated depth of excavations remaining above 1.5 to 3.0 m depth maximum, and considering no groundwater was encountered during the investigation, it is expected that excavations will not extend below the groundwater table for this project. Relatively minor seepage into excavations above the groundwater table may be controlled using filtered sumps and pumps. Surface water inflow can also be controlled in this manner, but preferably it should be directed away from the excavations. From a preliminary perspective, dewatering requirements during construction may not exceed 50,000 L/day, however this is dependent on a number of factors including the weather conditions at the time of construction, the depth of excavations, as well as the contractor's dewatering plan and execution. Should dewatering exceed 50,000 L/day, this would trigger the requirement for either an EASR or PTTW. For tendering purposes the Contractor will be responsible for obtaining any EASR or PTTW based on their dewatering plan and execution, as this will influence their peak dewatering rates during construction.

5.3 SERVICE TRENCHES

Buried infrastructure pipes and conduit may be installed using a Class B bedding design, in accordance with the OPSD 802.010. Water and sewer lines installed outside of heated areas should be provided with a minimum of 1.5 m soil cover or equivalent for frost protection. Pipe bedding and cover should be compacted to at least 98 % of SPMDD as per ASTM D698.

5.4 MATERIAL REUSE, BACKFILL AND COMPACTION

Existing soils on Site, generally contain significant fines content (i.e., material passing No. 200 sieve); as such, they have limited value as structural or foundation backfill materials. The existing Site soils may be suitable for general fill usage provided the material is properly segregated, inspected and approved by the Geotechnical Engineer. Organic and otherwise deleterious material containing debris should be discarded. Overly silty or clayey soils will not be suitable for reuse, and any soils that are overly wet will be unsuitable for reuse or may require aeration to lower its moisture content to acceptable levels. Contact WSP if fill with recycled concrete or asphalt materials is to be considered.

Foundation backfill and areas beneath concrete slabs should consist of a free-draining material such as OPSS 1010 Granular B Type I, or an approved equivalent. Imported material should be screened and approved by the Geotechnical Engineer before being delivered to the Site. Screening should also confirm that any imported fill meets the Environmental Standards for the Site.

Care should be taken immediately adjacent to foundation walls to avoid over compaction of the soil and resulting wedging pressures, which may result in damage to the walls. Foundation walls must be designed according to the Ontario Building Code to resist lateral earth pressures from the fill. Assume an unfactored active earth pressure coefficient (K_a) of 0.3 for compacted granular backfill materials.

Any new fill from onsite cuts or offsite borrow sources, should be approved by the Geotechnical Engineer. Engineered fill beneath any foundations (including retaining walls) and concrete slabs (including floor slab areas) must be constructed as detailed in the attached General Recommendations for Engineered Fill (**Appendix C**). In other areas (such as pavement areas and general landscaped fill areas) the fill material must be approved by the Geotechnical Engineer before being used, placed in

200 mm maximum loose lifts, and subsequently compacted to the following minimum Standard Proctor Maximum Dry Density (SPMDD) standards (ASTM D698) based on the presumptive loading conditions:

— Material placed below parking areas/roadways: 98 % SPMDD

— Materials placed below general fill areas: 95 % SPMDD

5.5 BUILDING FOUNDATION

Foundations for the building can consist of suitably-dimensioned strip and spread, reinforced concrete footings placed directly on the compact native soils (typically sandy silt or silty sand). In the area of boreholes BH20-01 to 05, the compact native soils suitable for placement of footings were encountered at the following depths:

Table 5-1: Depth / Elevation to Suitable Bearing Soils for Footings

BOREHOLE ID	SURFACE ELEVATION (mASL) (1)	DEPTH TO SUITABLE SOIL (mBGL)	ELEVATION OF SUITABLE SOIL (mASL)
BH20-01	351.6	1.7	349.9
BH20-02	352.8	2.3	350.5
BH20-03	352.0	2.3	349.7
BH20-04	351.4	2.3	349.1
BH20-05	352.2	2.3	349.9

(1) Ground surface elevations based on survey information provided to WSP by Armstrong.

For design purposes, it is recommended that the footings be designed using a factored geotechnical resistance at Ultimate Limit States (ULS) of 150 kPa, and a geotechnical reaction at Serviceability Limit States (SLS) of 100 kPa. It is recommended that the in-situ density of the otherwise undisturbed native soils exposed at the founding subgrade be optimized by performing localized compaction using a diesel plate tamper or small vibratory roller compactor prior to being approved by the Geotechnical Engineer.

For foundations placed on approved soil, the geotechnical reaction at SLS is based on a total allowable settlement of 25 mm, and maximum differential settlement of 15 mm.

Confirmation and approval of soil conditions at the founding elevations must be undertaken at the time of construction, by the Geotechnical Engineer. Any loose, soft, wet or deleterious soils or fill at the exposed bearing surfaces must be sub-excavated and replaced with: approved engineered fill compacted to 100% of the SPMDD, unshrinkable fill, geotextile wrapped clear stone, or another pre-approved alternative.

Insulation should be used where earth cover for frost protection is less than 1.4 m.

A filtered, perforated perimeter drain should be installed around the exterior perimeter of the footings. The perimeter drain should outlet to an acceptable frost-free outlet.

5.6 BUILDING FLOOR AND SOIL MANAGEMENT SLABS

It is expected that the proposed Butler Building will be constructed on concrete slab-on-grade. The soil management area will also be underlain by a concrete slab. Recommendations assume that the maximum concentrated floor slab loads will not exceed 15 kPa. Unsuitable deleterious materials (e.g. organic soils, existing fill) shall be removed from beneath the concrete slab areas, and replaced with a minimum 150 mm of either Granular "A" as per OPSS compacted to 100% SPMDD, or (if there are any slab areas greater than 0.3 m below the adjacent exterior grade) 150 mm of 19 mm diameter crushed clearstone compacted to 100% SPMDD, and underlain by a layer of filter fabric (to provide separation from the underlying soils and prevent migration of fines into the clearstone). Any grade raises required beneath the Granular A or clearstone should be placed as engineered fill as described in **Appendix C**. Prior to the placement of any fill, the exposed subgrade should be proof rolled a minimum 6 times using a minimum 8 tonne smooth drum roller. Engineered fill required to reinstate subgrade level (in the case of buried organic soils) may consist of imported inorganic soils or inorganic Site soils from other excavations (as approved by the Engineer). All material should be approved by the Engineer prior to being delivered to the Site.

A moisture barrier is recommended below all concrete slabs in general accordance with the OBC requirements for wet/damp subsurface conditions, to minimize any upwards migration of moisture resulting from surficial-sourced drainage water such as stormwater.

5.7 SEISMIC SITE CLASS

Section 4.1.8.4 of the 2012 Ontario Building Code (OBC 2012) summarizes site classifications with respect to seismic site response. Based on the encountered ground conditions and average standard penetration resistances, seismic Site Class D (stiff soils) is recommended.

5.8 PAVEMENT AND CIVIL STRUCTURE

Provided that exposed subgrade surfaces are prepared in accordance with previous recommendations, the following asphalt pavement structures may be considered for this Site.

Table 5-2: Preliminary Asphalt Pavement Structure Design

PAVEMENT LAYER	STANDARD PAVEMENT STRUCTURE (CARS)	ENHANCED PAVEMENT STRUCTURE (DELIVERY TRUCKS)	COMPACTION REQUIREMENTS
Asphaltic Concrete OPSS HL-4 (SP 12.5)	50 mm	40 mm	92% to 97% MRD*
Asphaltic Concrete OPSS HL-8 (SP 19.0)	-	50 mm	--
Base Course OPSS 1010 Granular 'A'	150 mm	150 mm	98% SPMDD
Subbase Course OPSS 1010 Granular 'B'	300 mm	450 mm	98% SPMDD

*MRD = Maximum Relative Density

For all applications, the subgrade should be sloped towards catch basin structures at a minimum cross-fall of 2 to 3%. Perforated, sub-drain stubs with a minimum length of 3 m should be installed at all catch basin locations to improve drainage. The use of perforated sub-drains at the curb lines or any low points in the subgrade also is suggested to provide positive drainage from the granular base and subbase layers.

It should be noted that the above mentioned pavement structures are for end-use loadings, and that partially completed pavement structures may not provide suitable resistance to all construction vehicle loadings.

5.9 TESTING AND INSPECTIONS

It is recommended that geotechnical testing and inspections be carried out during construction operations to confirm construction is in accordance with the project specifications. Quality testing of all new aggregate imported to Site during construction should be completed to ensure that all material adheres to OPSS or the Municipality's specification (whichever is greater). Testing and inspections should include foundation and slab subgrades, pavement subgrades proof-rolling inspections, compaction testing, monitoring of asphalt placement, etc.

5.10 OPERATION OF WASTE TRANSFER PROCESSING AND BIOREMEDIATION FACILITY

The site will receive non-hazardous soil/material from construction projects which would be brought to the facility and processed for beneficial re-use where possible. Processing would include soil handling, soil inspection, sampling, classification, sorting, homogenization, bulking, soil treatment and temporary soil storage. All activities would be performed in accordance with the conditions outlined in a Waste Transfer Site Environmental Compliance Approval ('ECA') pursued by the owner and issued by the MECP.

6 CONCLUSIONS AND RECOMMENDATIONS

The hydrogeological and geotechnical findings support the re-zoning application for the development of the proposed Waste Transfer Processing and Bioremediation Facility for soil. This support is based upon the assumption that the following recommendations are to be followed:

— The outside soil storage area will have a concrete slab base and the uncovered soils stored outside will be clean soils and will therefore have no impacts on runoff water quality with the exception of possibly sediment loading. Stockpiles that do require some bio remedial treatment will be covered with a low permeable membrane, therefore the runoff from those stockpiles should have no water quality concerns. All water from the outside soil storage area runoff will be directed to catchbasins with sediment control measures to ensure that this discharge water meets the Storm Sewer Use by law prior to discharge to the stormwater system off site. Therefore, the outside soil storage runoff water during operations are not anticipated to influence shallow groundwater quality or receiving surface water.

— Geotechnical testing and inspections be carried out during construction operations to confirm construction is in accordance with the project specifications as detailed in Section 5 of this report.

— All activities would be performed in accordance with the conditions outlined in the Waste Transfer Site Environmental Compliance Approval ('ECA') pursued by the owner and issued by the MECP.

7 LIMITATIONS

WSP should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, WSP will assume no responsibility for interpretation of the recommendations in the report.

The comments given in this report are intended only for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc., would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole and/or test pit results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

This report is intended solely for the Client named. The material in it reflects our best judgment considering the information available to WSP at the time of preparation. Unless otherwise agreed in writing by WSP, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on information determined at the borehole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the

Site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

We accept no responsibility for any decisions made or actions taken as a result of this report unless we are specifically advised of and participate in such action, in which case our responsibility will be as agreed to at that time.

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

8 REFERENCES

- Chapman, L.J., and Putnam, D.F., 1984. The Physiography of Southern Ontario; 3rd Edition, Ontario Geological Survey, 1984.
- Ministry of the Environment Water Well Record Database.
- Ministry of Natural Resources, Ontario Base Mapping, July 2011.
- Ministry of Northern Development and Mines, Bedrock Topography and Overburden Thickness Mapping, Southern Ontario, MRD 207.
- Ministry of Northern Development and Mines. Paleozoic Geology of Southern Ontario, MRD 219.
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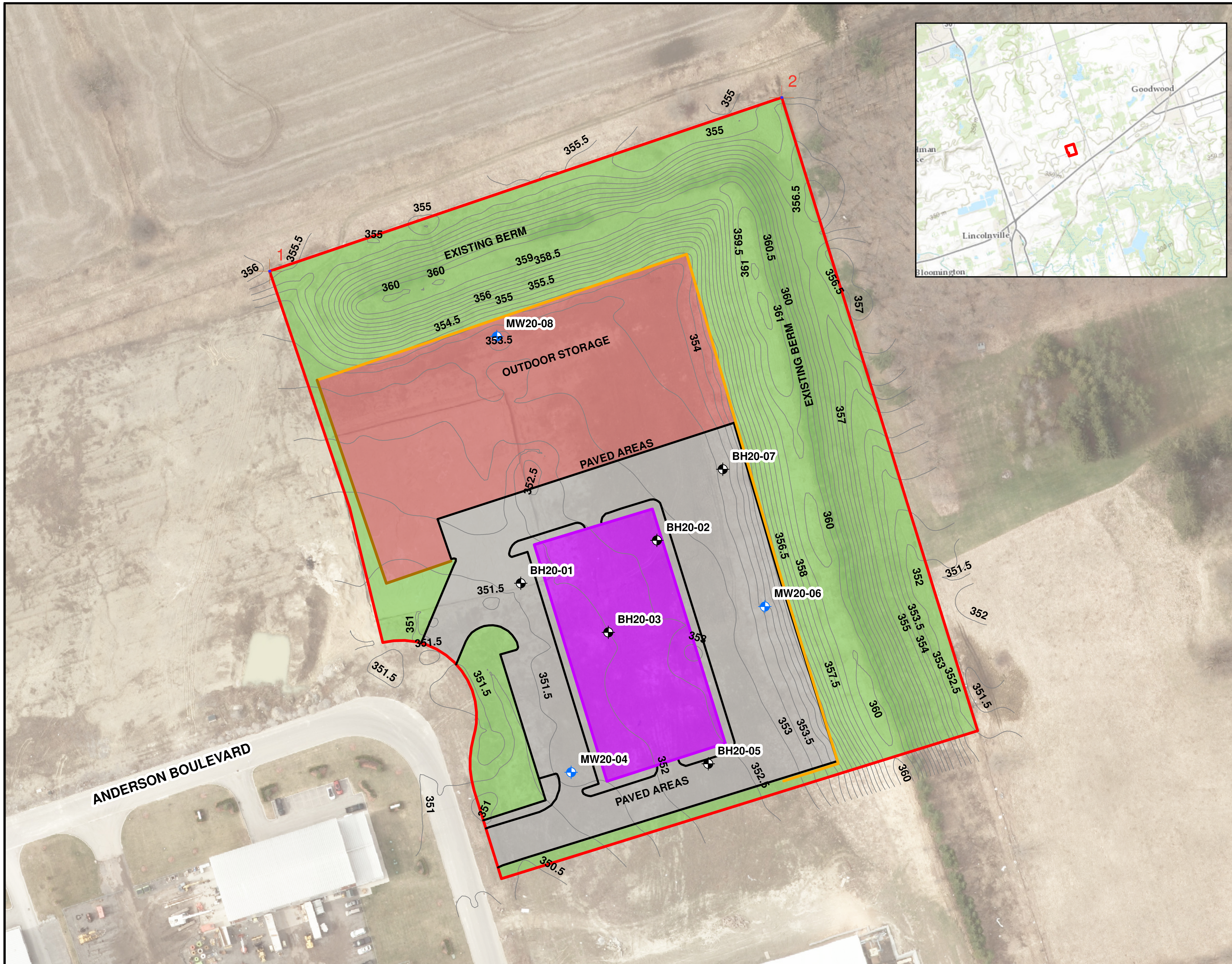
- Ministry of the Environment and Energy. Water Management: Policies, Guidelines, Provincial Water Quality Objectives, July 1999.
- Ontario Geological Survey. Aggregate Resources Inventory of the Regional Municipality of Durham Paper 185, 2010.
- Source protection information Atlas
- WSP September 20, 2019, Phase One Environmental Site Assessment 45 & 47 Anderson Boulevard, Uxbridge Ontario.
- WSP August 2020, 45 & 47 Anderson Boulevard Stormwater Management Report.

FIGURES



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LEGEND

- APPROXIMATE SITE BOUNDARY
- TOPOGRAPHIC CONTOURS
- BOREHOLE LOCATION
- MONITORING WELL LOCATION
- LANDSCAPE AREA
- OUTDOOR STORAGE
- PARKING
- BUILDING
- RETAINING WALL
- PRIVACY WALL

12 6 0 12 Metres

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CLIENT:

ECMI PROPERTIES (125 VILLARBOIT) INC.

PROJECT:

GEOTECHNICAL &
HYDROGEOLOGICAL INVESTIGATION
ANDERSON BOULEVARD
UXBRIDGE, ONTARIO

PROJECT NO:	DATE:
201-03673-00	MARCH 2021

DESIGNED BY:
-

DRAWN BY:
TP

CHECKED BY:
-

FIGURE NO:	SCALE:
1	1:1,250

TITLE:

SITE PLAN

DISCIPLINE:
ENVIRONMENT

ISSUE:	REV.:
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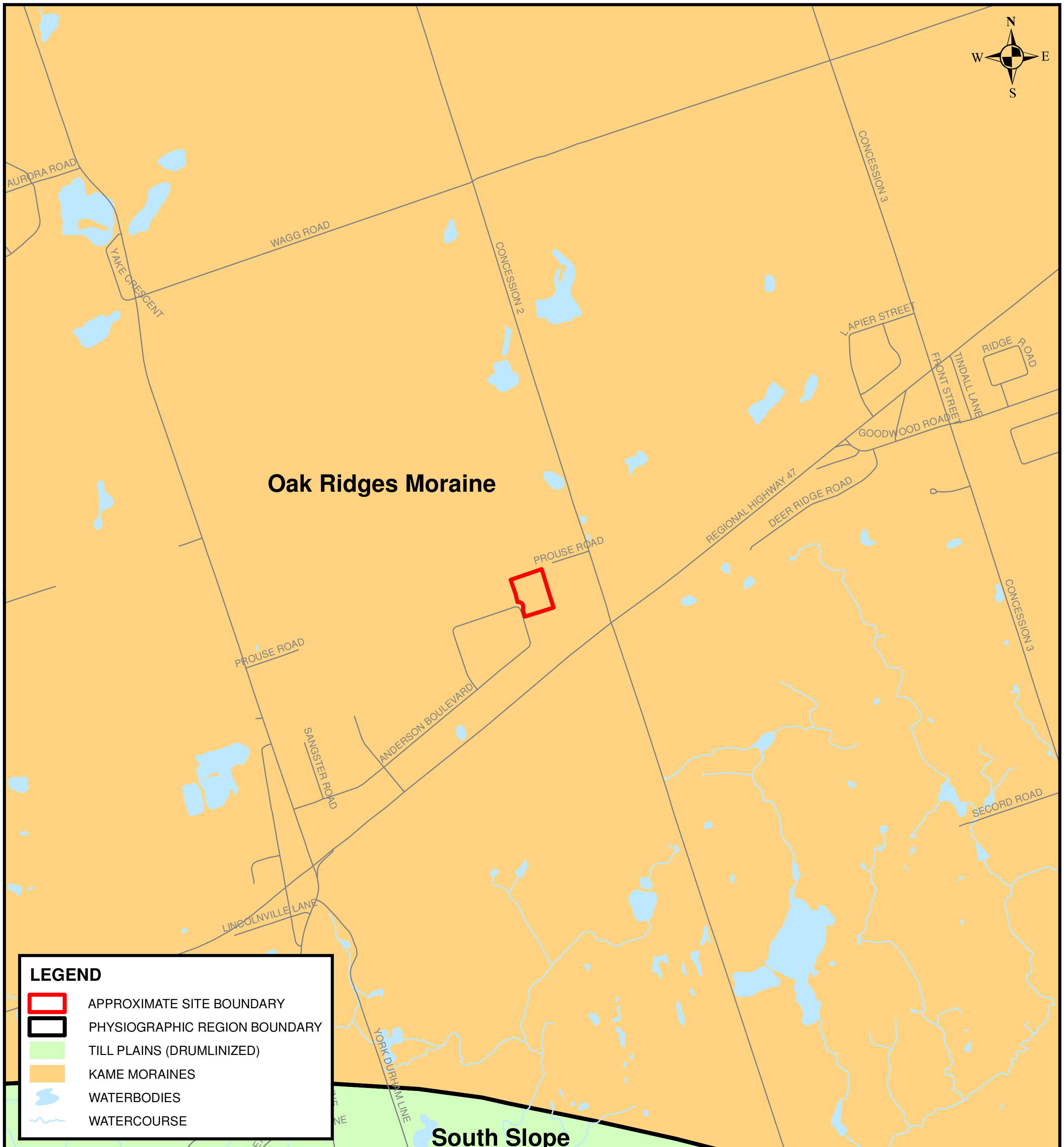

Data Source: Ministry of Natural Resources, Ontario Base Mapping, March 2014.
Chapman, L.J. and Putnam, D.F. 2007. Physiography of southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 228.

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PROJECT:
GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATION
45 & 47 ARMSTRONG BOULEVARD
UXBRIDGE, ONTARIO

TITLE:
REGIONAL PHYSIOGRAPHY

CLIENT:
ECMI PROPERTIES (125 VILLARBOIT) INC.

SCALE: 1:30,000

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CHECKED BY: -

PROJECT NO: 201-03673-00

DATE: JULY 2020

FIGURE NO: 2

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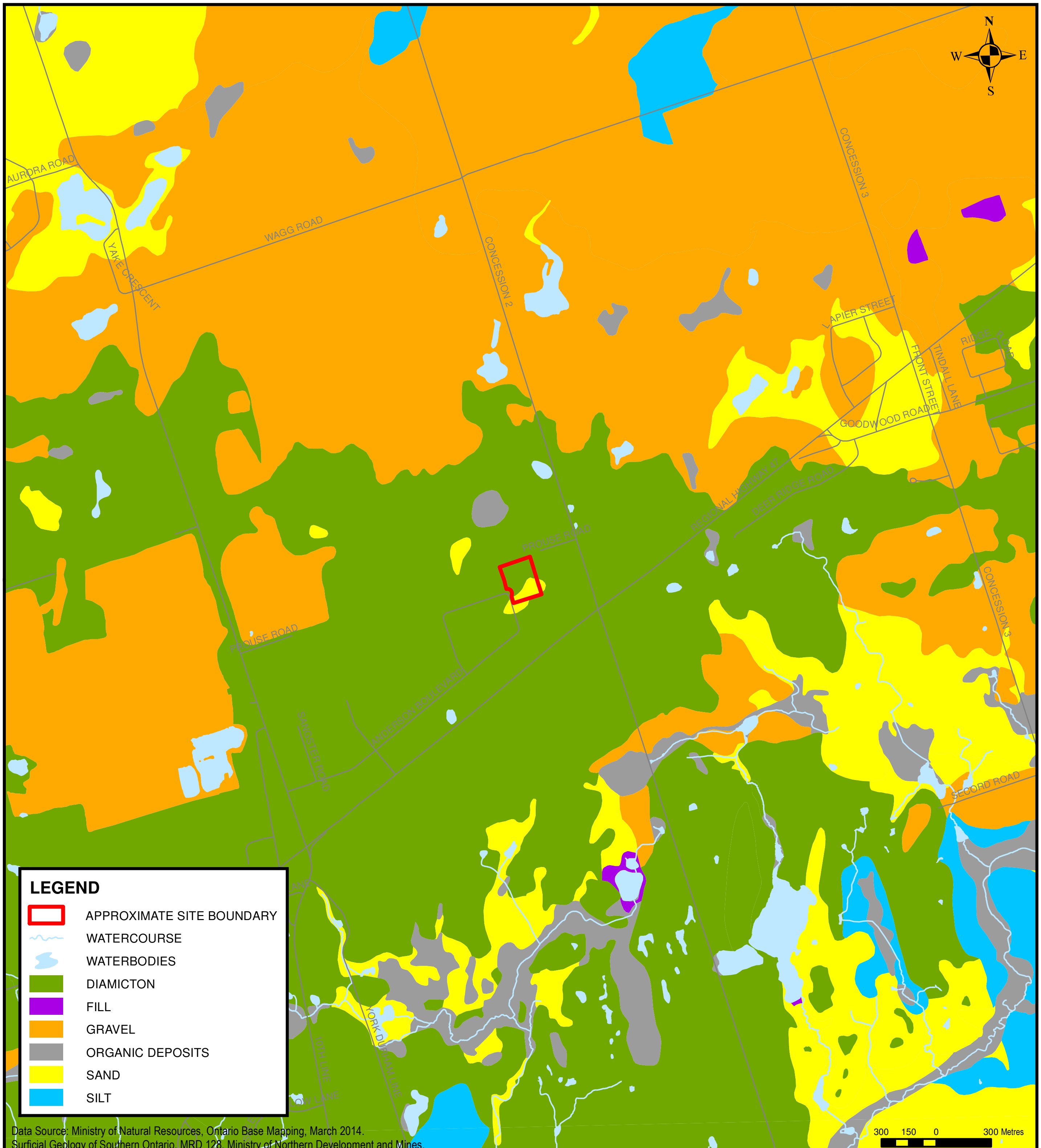

Data Source: Ministry of Natural Resources, Ontario Base Mapping, March 2014.
Surficial Geology of Southern Ontario, MRD 128, Ministry of Northern Development and Mines.

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PROJECT:
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45 & 47 ARMSTRONG BOULEVARD
UXBRIDGE, ONTARIO

TITLE:
SURFICIAL GEOLOGY

CLIENT:
ECMI PROPERTIES (125 VILLARBOIT) INC.

SCALE: 1:30,000
DRAWN BY: TP
CHECKED BY: -
PROJECT NO: 201-03673-00
DATE: JULY 2020
FIGURE NO: 3
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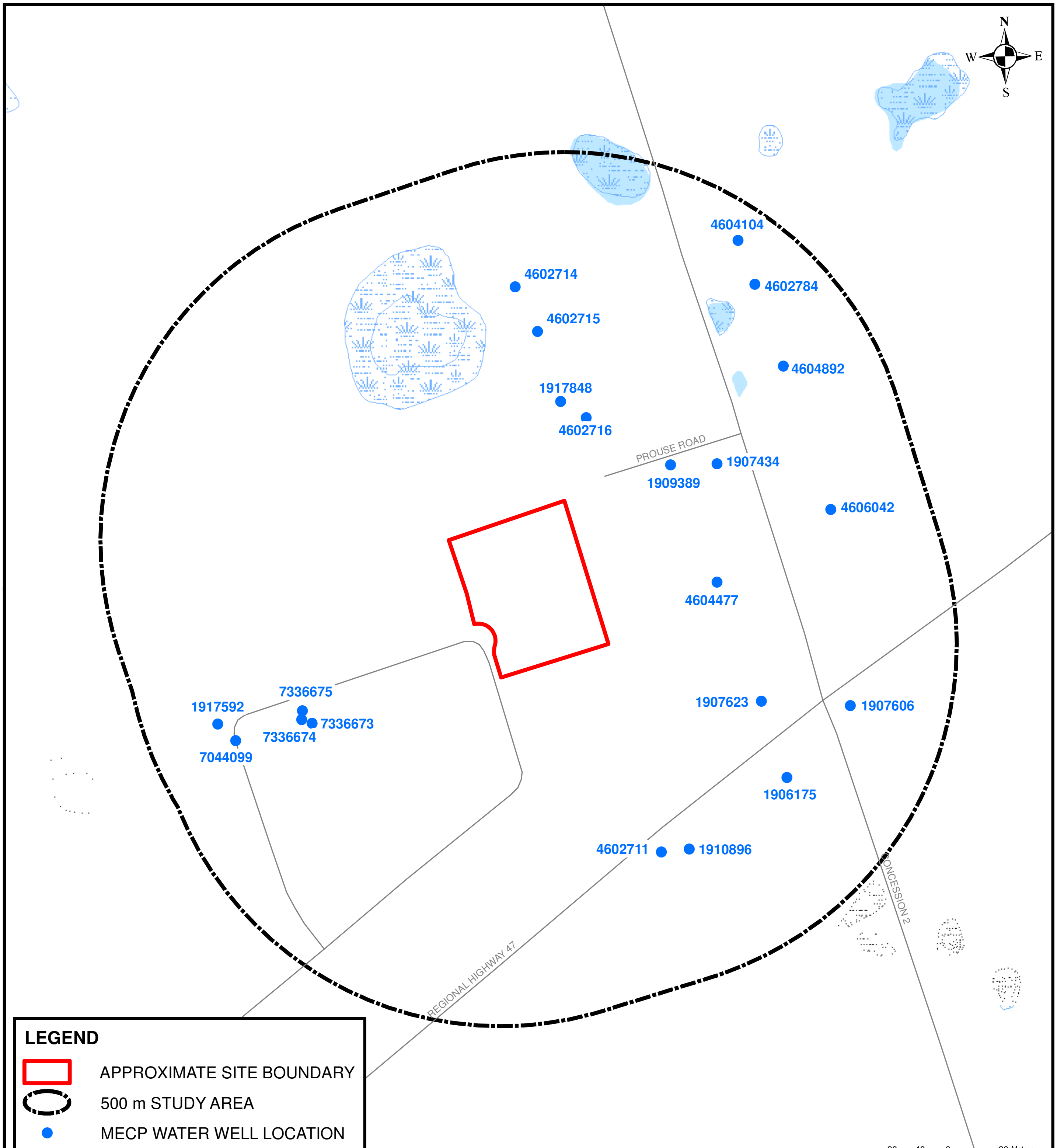

Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016.

wsp 126 DON HILLOCK DRIVE, UNIT 2 AURORA, ONTARIO CANADA L4G 0G9 TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM	PROJECT: GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATION 45 & 47 ARMSTRONG BOULEVARD UXBRIDGE, ONTARIO	SCALE: 1:8,000 DRAWN BY: TP CHECKED BY: -
	TITLE: MECP WATER WELLS	PROJECT NO: 201-03673-00 DATE: JULY 2020
	CLIENT: ECMI PROPERTIES (125 VILLARBOIT) INC.	FIGURE NO: 5 REV.: -

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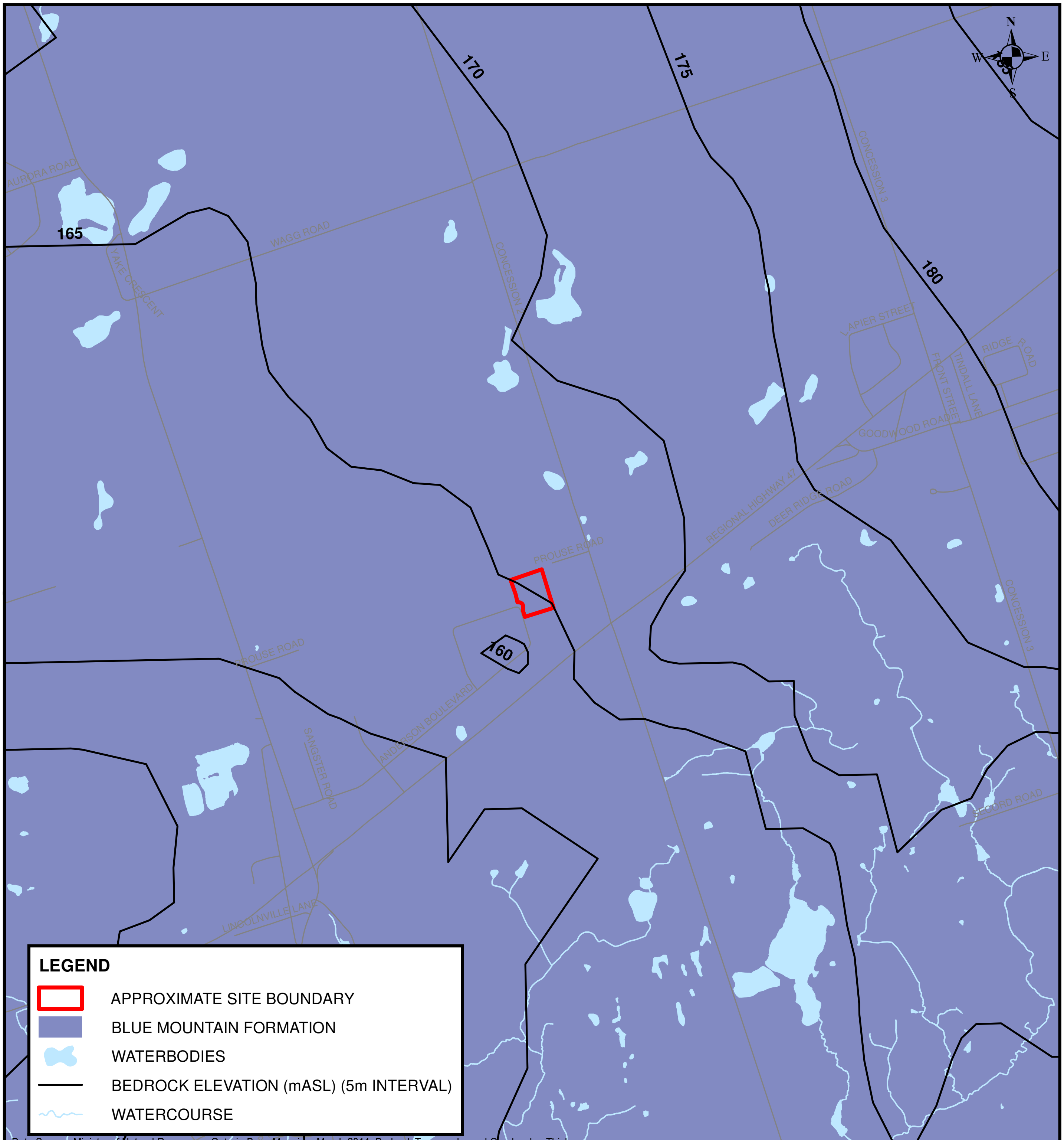

Data Source: Ministry of Natural Resources, Ontario Base Mapping, March 2014. Bedrock Topography and Overburden Thickness Mapping, Southern Ontario, MRD 207, Ministry of Northern Development and Mines. Ontario Geological Survey 2011. Paleozoic Geology of Southern Ontario, MRD 219, Ministry of Northern Development and Mines.

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PROJECT:
GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATION
45 & 47 ARMSTRONG BOULEVARD
UXBRIDGE, ONTARIO

TITLE:
BEDROCK GEOLOGY & BEDROCK TOPOGRPAHY

CLIENT:
ECMI PROPERTIES (125 VILLARBOIT) INC.

SCALE: 1:30,000

DRAWN BY: TP

CHECKED BY: -

PROJECT NO: 201-03673-00

DATE: JULY 2020

FIGURE NO: 4

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APPENDIX

A

MECP WATER WELL RECORDS AND WSP EXPLANATION FORMS, BOREHOLE LOGS

Table A1: MECP Well Data
Geotechnical and Hydrogeological Investigation - 45 & 47 Anderson Boulevard
Project No. 201-03673-00

WELL ID	x	y	ELEVATION (mASL)	Well Depth (m)	METHOD	Static Water Level (m)	Pumping Rate (L/min)	Use	Final Status	Depth (m)	MaterialColor	Material 1	Material 2	Material 3
1906175	642764.6	4876123	345.62	50.60	Cable Tool	17.37	45.42	Domestic	Water Supply	0.91	BROWN	CLAY	TOPSOIL	MEDIUM-GRAINED
										48.77	GREY	CLAY	STONES	HARD
										48.77	GREY	CLAY	STONES	HARD
										50.60	GREY	SAND	GRAVEL	HARD
										50.60	GREY	SAND	GRAVEL	HARD
1907434	642664.6	4876573	349.09	7.62	Boring	3.05	22.71	Domestic	Water Supply	3.05	BROWN	CLAY	PACKED	
										7.01	GREY	SAND		
										7.62		UNKNOWN TYPE		
1907606	642856	4876226	339.30	25.91	Cable Tool	14.33	15.14	Domestic	Water Supply	5.18	BROWN	CLAY	SAND	
										10.97	BROWN	SAND	LOOSE	
										21.95	GREY	CLAY	SAND	SOFT
										23.77	BROWN	CLAY	SAND	SOFT
										25.91	BROWN	FINE SAND	LOOSE	
1907623	642728	4876232	345.16	39.93	Cable Tool	27.43	56.78	Domestic	Water Supply	7.62	BROWN	FINE SAND		
										11.28	BROWN	MEDIUM SAND		
										30.48	BROWN	FINE SAND		
										39.93	BROWN	MEDIUM SAND		
1909389	642597.6	4876571	356.04	92.35	Rotary	41.15	75.71	Domestic	Water Supply	6.10	BROWN	CLAY	SOFT	
										39.62	BLUE	SAND	CLAY	PACKED
										85.34	GREY	CLAY	BOULDERS	HARD
										88.39	GREY	GRAVEL	CLAY	LAYERED
										92.35	GREY	GRAVEL	COARSE GRAVEL	
1910896	642624.6	4876020	341.95	32.61	Cable Tool	19.81	26.50	Domestic	Water Supply	12.80	BROWN	CLAY		
										18.29	BROWN	SAND	CLAY	SOFT
										26.52	BROWN	CLAY	SOFT	
										28.65	GREY	CLAY	SOFT	
										31.09	BROWN	SAND	CLAY	
										32.61	BROWN	SAND	FINE SAND	
4602711	642584.6	4876016	340.77	32.00	Jetting	27.43	11.36	Domestic	Water Supply	12.19	BROWN	CLAY		
										32.00		FINE SAND		
										27.43	GREY	MEDIUM SAND		
4602714	642374.6	4876826	347.75	4.57	Boring	2.13	15.14	Livestock	Water Supply	0.61	YELLOW	CLAY		
										4.57		FINE SAND		
4602715	642406.6	4876762	353.68	3.66	Boring	2.44	3.79	Livestock	Water Supply	0.30		TOPSOIL	MEDIUM SAND	
										1.83		FINE SAND		
										3.66		FINE SAND	CLAY	
4602716	642476.6	4876639	360.97	49.68	Cable Tool	32.00	22.71	Livestock	Water Supply	0.61		TOPSOIL		
										5.49	BROWN	MEDIUM SAND		
										33.53	BLUE	CLAY		
										43.59		FINE SAND		
										46.02	BLUE	CLAY		
										49.68	BLUE	COARSE SAND		
4602784	642718.6	4876830	349.52	29.26	Jetting	22.86	15.14	Domestic	Water Supply	15.24		CLAY	MEDIUM SAND	
										22.86	BLUE	CLAY		
										29.26		FINE SAND		

Table A1: MECP Well Data
Geotechnical and Hydrogeological Investigation - 45 & 47 Anderson Boulevard
Project No. 201-03673-00

WELL ID	x	y	ELEVATION (mASL)	Well Depth (m)	METHOD	Static Water Level (m)	Pumping Rate (L/min)	Use	Final Status	Depth (m)	MaterialColor	Material 1	Material 2	Material 3
4604104	642694.6	4876893	346.56	38.10	Cable Tool	21.34	15.14	Domestic	Water Supply	1.52		PREVIOUSLY DUG		
										32.00	BROWN	MEDIUM SAND		
										32.92	BLUE	CLAY	MEDIUM SAND	
										35.97	GREY	MEDIUM SAND		
										38.10		MEDIUM SAND		
4604477	642664.6	4876403	349.43	50.29	Cable Tool	19.51	18.93	Domestic	Water Supply	1.52		PREVIOUSLY DUG		
										18.90	BROWN	MEDIUM SAND		
										48.77	BLUE	CLAY		
										50.29	BLUE	HARDPAN		
4604892	642759.6	4876713	353.73	47.85	Rotary	32.92	22.71	Domestic	Water Supply	34.14	BROWN	MEDIUM SAND	CLAY	
										43.28	RED	FINE SAND		
										47.85	BLUE	MEDIUM SAND	SILT	
4606042	642827.6	4876507	345.30	33.22	Cable Tool	12.80	22.71	Domestic	Water Supply	0.61	BROWN	TOPSOIL		
										18.90	BROWN	CLAY	SAND	
										24.99	BLUE	CLAY		
										31.39	BLUE	CLAY	SAND	
										33.22	BLUE	MEDIUM SAND		
1917592	641947	4876200	345.76	25.91	Boring				Abandoned-Other	12.80	BROWN	SILT	TILL	
										25.91	BROWN	SAND		
1917848	642440	4876662	360.92	89.61	Rotary	44.78		Domestic	Water Supply	6.71	BROWN	CLAY	SANDY	
										48.16	BROWN	SAND	SILTY	
										65.23	GREY	CLAY	STONES	
										81.08	GREY	SAND	STONES	SILT
										85.95	GREY	SAND	SILT	
										86.87	GREY	CLAY	SILTY	
										89.61	GREY	SAND	STONES	
7044099	641973	4876176	346.38		Other Method				Abandoned-Other					
7336673	642083	4876201												
7336674	642068	4876206												
7336675	642069	4876219												

BOREHOLE LOG EXPLANATION FORM

This explanatory section provides the background to assist in the use of the borehole logs. Each of the headings used on the borehole log, is briefly explained.

DEPTH

This column gives the depth of interpreted geologic contacts in metres below ground surface.

STRATIGRAPHIC DESCRIPTION

This column gives a description of the soil based on a tactile examination of the samples and/or laboratory test results. Each stratum is described according to the following classification and terminology.

Soil Classification*		Terminology	Proportion
Silt & Clay	< 0.075 mm	"trace" (e.g. trace sand)	<10%
Sand	0.075 to 4.75 mm	"some" (e.g. some sand)	10% - 20%
Gravel	4.75 to 75 mm	adjective (e.g. sandy)	20% - 35%
Cobbles	75 to 300 mm	"and" (e.g. and sand)	35% - 50%
Boulders	>300 mm	noun (e.g. sand)	>50%

* Extension of USCS Classification system unless otherwise noted.

The use of the geologic term "till" implies that both disseminated coarser grained (sand, gravel, cobbles or boulders) particles and finer grained (silt and clay) particles may occur within the described matrix.

The compactness of cohesionless soils and the consistency of cohesive soils are defined by the following:

COHESIONLESS SOIL		COHESIVE SOIL	
Compactness	Standard Penetration Resistance "N", Blows / 0.3 m	Consistency	Standard Penetration Resistance "N", Blows / 0.3 m
Very Loose	0 to 4	Very Soft	0 to 2
Loose	4 to 10	Soft	2 to 4
Compact	10 to 30	Firm	4 to 8
Dense	30 to 50	Stiff	8 to 15
Very Dense	Over 50	Very Stiff	15 to 30
		Hard	Over 30

The moisture conditions of cohesionless and cohesive soils are defined as follows.

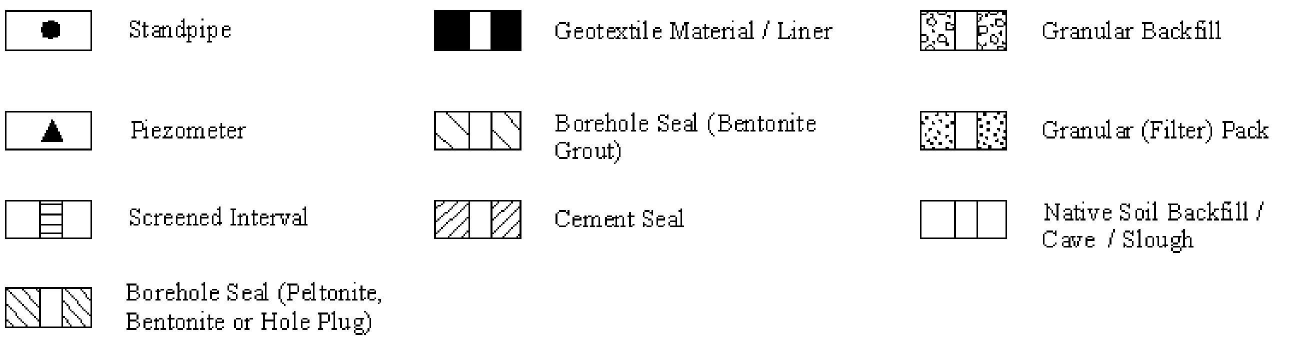
COHESIONLESS SOILS	COHESIVE SOILS		
Dry	DTPL	-	Drier Than Plastic Limit
Moist	APL	-	About Plastic Limit
Wet	WTPL	-	Wetter Than Plastic Limit
Saturated	MWTPL	-	Much Wetter Than Plastic Limit

STRATIGRAPHY

Symbols may be used to pictorially identify the interpreted stratigraphy of the soil and rock strata.

MONITOR DETAILS

This column shows the position and designation of standpipe and/or piezometer ground water monitors installed in the borehole. Also the water level may be shown for the date indicated.



Where monitors are placed in separate boreholes, these are shown individually in the "Monitor Details" column. Otherwise, monitors are in the same borehole. For further data regarding seals, screens, etc., the reader is referred to the summary of monitor details table.

SAMPLE

These columns describe the sample type and number, the "N" value, the water content, the percentage recovery, and Rock Quality Designation (RQD), of each sample obtained from the borehole where applicable. The information is recorded at the approximate depth at which the sample was obtained. The legend for sample type is explained below.

SS	=	Split Spoon	GS	=	Grab Sample
ST	=	Thin Walled Shelby Tube	CS	=	Channel Sample
AS	=	Auger Flight Sample	WS	=	Wash Sample
CC	=	Continuous Core	RC	=	Rock Core

$$\% \text{ Recovery} = \frac{\text{Length of Core Recovered Per Run}}{\text{Total Length of Run}} \times 100$$

Where rock drilling was carried out, the term RQD (Rock Quality Designation) is used. The RQD is an indirect measure of the number of fractures and soundness of the rock mass. It is obtained from the rock cores by summing the length of core recovered, counting only those pieces of sound core that are 100 mm or more in length. The RQD value is expressed as a percentage and is the ratio of the summed core lengths to the total length of core run. The classification based on the RQD value is given below.

RQD Classification	RQD (%)
Very poor quality	< 25
Poor quality	25 - 50
Fair quality	50 - 75
Good quality	75 - 90
Excellent quality	90 - 100

TEST DATA

The central section of the log provides graphs which are used to plot selected field and laboratory test results at the depth at which they were carried out. The plotting scales are shown at the head of the column.

Dynamic Penetration Resistance - The number of blows required to advance a 51 mm diameter, 60º steel cone fitted to the end of 45 mm OD drill rods, 0.3 m into the subsoil. The cone is driven with a 63.5 kg hammer over a fall of 750 mm.

Standard Penetration Resistance - Standard Penetration Test (SPT) "N" Value - The number of blows required to advance a 51 mm diameter standard split-spoon sampler 300 mm into the subsoil, driven by means of a 63.5 kg hammer falling freely a distance of 750 mm. In cases where the split spoon does not penetrate 300 mm, the number of blows over the distance of actual penetration in millimetres is shown as $\frac{xBlows}{mm}$

Water Content - The ratio of the mass of water to the mass of oven-dry solids in the soil expressed as a percentage.

W_P - Plastic Limit of a fine-grained soil expressed as a percentage as determined from the Atterberg Limit Test.

W_L - Liquid Limit of a fine-grained soil expressed as a percentage as determined from the Atterberg Limit Test.

REMARKS

The last column describes pertinent drilling details, field observations and/or provides an indication of other field or laboratory tests that were performed.

BOREHOLE NO. BH20-01

PROJECT NAME: 45 & 47 ANDERSON BLVD. UXBRIDGE
PROJECT NO.: 201-03673-00
CLIENT: ECMI PROPERTIES INC.
DATE COMPLETED: May 29, 2020
BOREHOLE TYPE: DIRECT PUSH
SUPERVISOR: GS
GROUND ELEVATION: 351.6 m
REVIEWER: VHG

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	MONITOR DETAILS	SAMPLE TYPE	N VALUE	% WATER	% RECOVERY	RQD (%)	REMARKS
0.0	351.6								
0.1	351.6	**OVERBURDEN** (50mm)							
		SANDY SILT: Brown SANDY SILT, trace gravel, trace clay, trace roots, moist, loose		SS1	7	20	100		
0.6	351.0	**SANDY SILT:** Light brown mottled orangey brown SANDY SILT, some clay, moist to wet, loose							
1.0				SS2	9	23	100		
		- Trace gravel, moist, compact							
		- Wet sand seam		SS3	10	21	83		
2.0									
2.2	349.4	**SANDY SILT TILL:** Light brown to brown SANDY SILT TILL, trace gravel, trace clay, moist, dense to very dense							
				SS4	48	21	100		
		- Greyish brown							
3.0		- Grey							Change to Tricone method at 3.0 m below ground surface.
				SS5	43	2	83		
4.0									
									Direct push to 4.6 m
5.0				SS6	94	8	100		
6.0									
				SS7	86	8	100		
6.7	344.9	Borehole terminated at 6.7 m below ground surface in SANDY SILT TILL.							Borehole open and dry upon completion of drilling.
7.0									
8.0									

CONE PENETRATION; "N" VALUE 10 20 30; SHEAR STRENGTH 20 40 60 80; Intact (MaX) Cu; Remoulded Cu
WATER CONTENT % 10 20 30; W_P W_L

N value plot annotations: 48, 43, 94, 88

BOREHOLE NO. BH20-02

PROJECT NAME: 45 & 47 ANDERSON BLVD. UXBRIDGE
PROJECT NO.: 201-03673-00
CLIENT: ECMI PROPERTIES INC.
DATE COMPLETED: May 28, 2020
BOREHOLE TYPE: DIRECT PUSH
SUPERVISOR: MN
GROUND ELEVATION: 352.8 m
REVIEWER: VHG

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	SAMPLE TYPE	N VALUE	% WATER	% RECOVERY	RQD (%)	REMARKS
0.0	352.8							
0.1	352.8	**OVERBURDEN** (50mm)						
		SANDY SILT: Brown SANDY SILT, trace gravel, trace clay, moist, compact	SS1	18	12	83		
1.0			SS2	13	22	100		
1.8	351.0	**SAND:** Light brown SAND, some silt, moist, loose to compact	SS3	5	16	100		
2.0		- Trace gravel, moist to wet	SS4	12	16	100		
3.0		- Wet	SS5	10	18	100		
4.0								
4.6	348.2	**SANDY SILT TILL:** Light brown SANDY SILT TILL, trace gravel, trace clay, moist to wet, compact	SS6	15	14	100		
5.0								
6.0		- Wet	SS7	26	21	100		
6.7	346.1	Borehole terminated at 6.7 m below ground surface in SANDY SILT TILL.						Borehole open and dry upon completion of drilling.
7.0								
8.0								

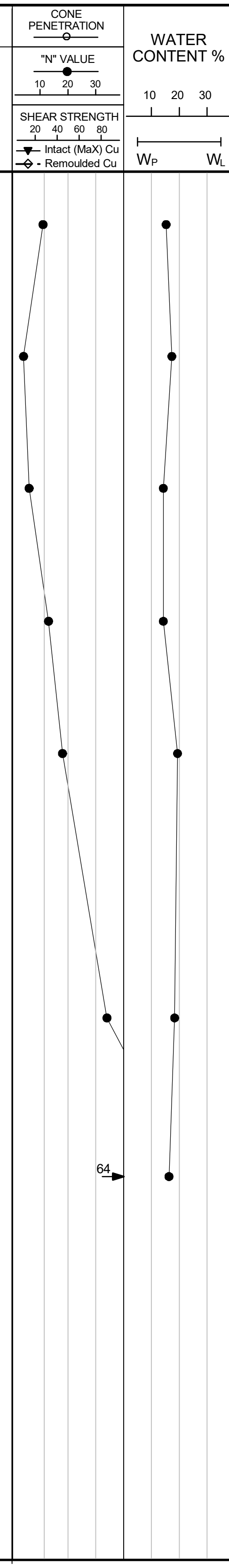
CONE PENETRATION: "N" VALUE 10 20 30; SHEAR STRENGTH 20 40 60 80 — Intact (MaX) Cu, Remoulded Cu

WATER CONTENT %: 10 20 30; W_P W_L

BOREHOLE NO. BH20-03

PROJECT NAME: 45 & 47 ANDERSON BLVD. UXBRIDGE
PROJECT NO.: 201-03673-00
CLIENT: ECMI PROPERTIES INC.
DATE COMPLETED: May 28, 2020
BOREHOLE TYPE: DIRECT PUSH
SUPERVISOR: MN
GROUND ELEVATION: 352.0 m
REVIEWER: VHG

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	TYPE	N VALUE	% WATER	% RECOVERY	RQD (%)	REMARKS
0.0	352.0							
0.1	352.0	**OVERBURDEN** (50mm)						
		SANDY SILT: Brown SANDY SILT, trace gravel, trace clay, moist, compact	SS1	11	15	67		
0.6	351.4	**SILTY SAND:** Light brown SILTY SAND, trace gravel, moist to wet, loose to compact						
1.0			SS2	4	17	83		
2.0			SS3	6	14	100		
			SS4	13	14	100		
3.0		- Moist	SS5	18	19	67		
4.0								
4.6	347.4	**SAND:** Light brown SAND, some silt, moist, dense to very dense						
5.0			SS6	34	18	100		
		- Refusal at 5.5 m with casing	SS7	64	16	100		
6.0	346.0	Borehole terminated at 6.0 m below ground surface in SAND.						Borehole open and dry upon completion of drilling.
7.0								
8.0								



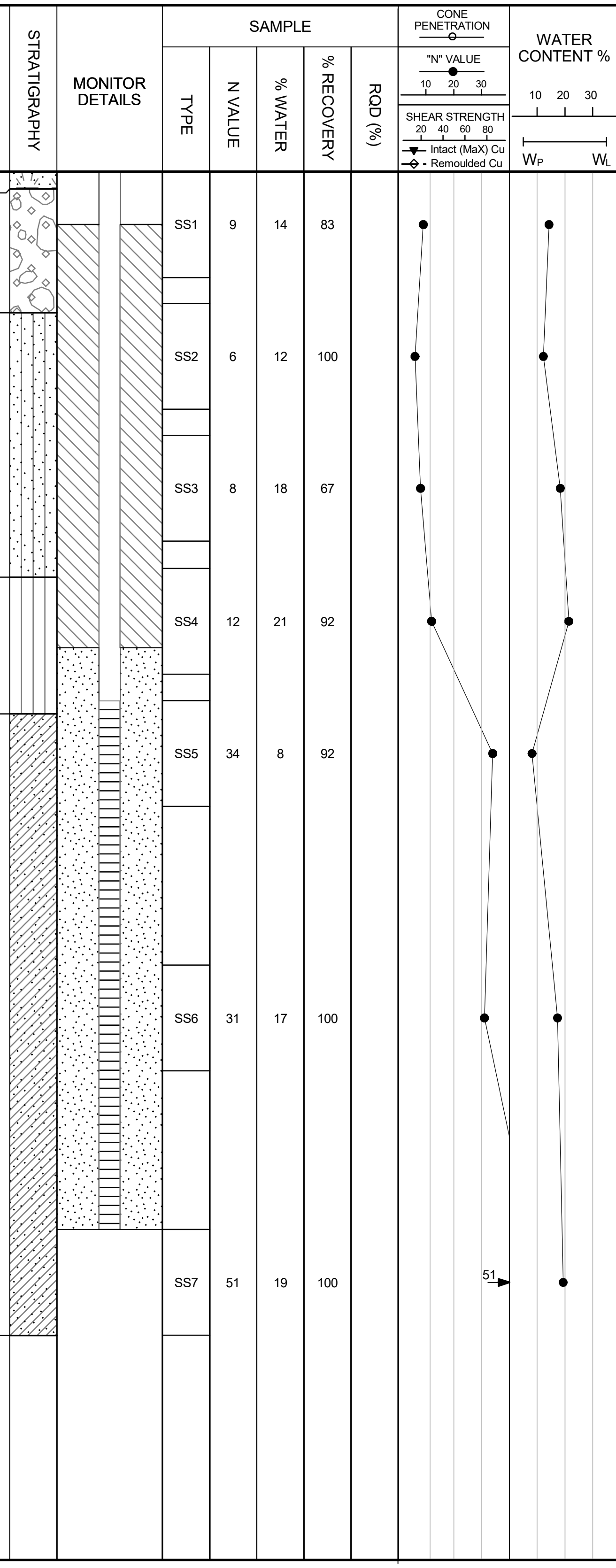
WSP GEOLOGIC (METRIC) WITH MASL ANDERSON BLVD_FINALLOGS.GPJ WSP_ENV_V1.GDT 7/6/20

BOREHOLE NO. BH20-04

PROJECT NAME: 45 & 47 ANDERSON BLVD. UXBRIDGE
PROJECT NO.: 201-03673-00
CLIENT: ECMI PROPERTIES INC.
DATE COMPLETED: May 28, 2020
BOREHOLE TYPE: DIRECT PUSH
SUPERVISOR: MN
GROUND ELEVATION: 351.4 m
REVIEWER: VHG

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	TYPE	N VALUE	% WATER	% RECOVERY	RQD (%)	REMARKS
0.0	351.4	**OVERBURDEN** (100mm)						
0.1	351.3	**SAND AND GRAVEL:** Brown SAND AND GRAVEL, moist, loose	SS1	9	14	83		
0.8	350.6	**SANDY SILT:** Light brown SANDY SILT, trace gravel, trace clay, moist, loose	SS2	6	12	100		
		- Moist to wet	SS3	8	18	67		
2.3	349.1	**SILT:** Light brown SILT, some clay, trace sand, wet, compact	SS4	12	21	92		
3.1	348.3	**SANDY SILT TILL:** Light brown SANDY SILT TILL, trace gravel, trace clay, moist to wet, dense	SS5	34	8	92		
		- Wet	SS6	31	17	100		GSA SS6: Gravel: 1% Sand: 23% Silt & Clay: 76%
			SS7	51	19	100		
6.7	344.7	Borehole terminated at 6.7 m below ground surface in SANDY SILT TILL.						Borehole open and dry upon completion of drilling.

Depth scale: 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0



BOREHOLE NO. BH20-05

PROJECT NAME: 45 & 47 ANDERSON BLVD. UXBRIDGE
PROJECT NO.: 201-03673-00
CLIENT: ECMI PROPERTIES INC.
DATE COMPLETED: May 28, 2020
BOREHOLE TYPE: DIRECT PUSH
SUPERVISOR: MN
GROUND ELEVATION: 352.2 m
REVIEWER: VHG

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	SAMPLE TYPE	N VALUE	% WATER	% RECOVERY	RQD (%)	REMARKS
0.0–0.1	**OVERBURDEN** (50mm)						
0.1–1.1	**SILTY SAND:** Light brown SILTY SAND, trace gravel, moist, compact	SS1	16	9	83		
		SS2	19	12	100		
1.1–3.1	**SAND:** Brown SAND, some silt, moist, compact to loose	SS3	7	12	100		
	- Moist to wet	SS4	9	15	100		
3.1–6.2	**SANDY SILT TILL:** Light brown SANDY SILT TILL, trace gravel, moist to wet, compact to dense	SS5	10	15	83		
		SS6	33	19	100		
6.2–6.7	**SILT:** Light brown SILT, some sand, wet, dense	SS7	37	20	100		
6.7	Borehole terminated at 6.7 m below ground surface in SILT.						Borehole open and dry upon completion of drilling.

Column headings also include: ELEV (mASL); STRATIGRAPHY; MONITOR DETAILS; CONE PENETRATION; "N" VALUE 10 20 30; SHEAR STRENGTH 20 40 60 80 (Intact (MaX) Cu, Remoulded Cu); WATER CONTENT % 10 20 30 (W_P, W_L).

BOREHOLE NO. BH20-06

PROJECT NAME: 45 & 47 ANDERSON BLVD. UXBRIDGE
PROJECT NO.: 201-03673-00

CLIENT: ECMI PROPERTIES INC.
DATE COMPLETED: May 29, 2020

BOREHOLE TYPE: DIRECT PUSH
SUPERVISOR: GS

GROUND ELEVATION: 354.1 m
REVIEWER: VHG

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	REMARKS
0.0	354.1		
0.1	354.1	**OVERBURDEN** (50mm) **SILTY SAND:** Light brown with orangey brown mottling SILTY SAND, trace gravel, trace clay, trace rootlets / grass, moist, very loose	
0.6	353.5	**SANDY SILT:** Dark brown to light brown SANDY SILT, trace to some clay, trace gravel, occasional cobbles, moist, compact - Light brown	GSA SS3: Gravel: 8% Sand: 23% Silt & Clay: 69%
2.1	352.0	**SANDY SILT TILL:** Light brown SANDY SILT TILL, trace gravel, trace clay, occasional cobbles, moist, sandy wet seam, compact - Dark brown to light brown, moist	
3.7	350.4	Borehole terminated at 3.7 m below ground surface in SANDY SILT TILL.	Borehole open and dry upon completion of drilling.

Depth scale (m): 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0

SAMPLE TYPE	N VALUE	% WATER	% RECOVERY	RQD (%)
SS1	3	14	58	
SS2	13	15	92	
SS3	18		100	
SS4	20	13	100	
SS5	12	12	92	

CONE PENETRATION — "N" VALUE: 10 20 30
SHEAR STRENGTH: 20 40 60 80 — Intact (MaX) Cu; Remoulded Cu
WATER CONTENT %: 10 20 30 — W_P W_L

STRATIGRAPHY | MONITOR DETAILS

BOREHOLE NO. BH20-07

PROJECT NAME: 45 & 47 ANDERSON BLVD. UXBRIDGE
PROJECT NO.: 201-03673-00
CLIENT: ECMI PROPERTIES INC.
DATE COMPLETED: May 28, 2020
BOREHOLE TYPE: DIRECT PUSH
SUPERVISOR: MN
GROUND ELEVATION: 353.7 m
REVIEWER: VHG

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	N VALUE	% WATER	% RECOVERY	RQD (%)	REMARKS
0.0	353.7									
0.1	353.7	**OVERBURDEN** (50mm)								
		SILTY SAND: Light brown SILTY SAND, trace gravel, moist, loose to compact			SS1	8	10	83		
1.0					SS2	18	12	100		
		- Dark brown			SS3	8	22	100		
2.1	351.6	**SANDY SILT TILL:** Light brown SANDY SILT TILL, trace gravel, trace clay, wet, very loose to loose			SS4	3	19	58		
3.0					SS5	5	21	100		
3.7	350.0	Borehole terminated at 3.7 m below ground surface in SANDY SILT TILL.								Borehole open and dry upon completion of drilling.

Depth scale: 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0

CONE PENETRATION — "N" VALUE (10, 20, 30); SHEAR STRENGTH (20, 40, 60, 80) — Intact (MaX) Cu; Remoulded Cu

WATER CONTENT % (10, 20, 30) — W_P, W_L

BOREHOLE NO. BH20-08

PROJECT NAME: 45 & 47 ANDERSON BLVD. UXBRIDGE
PROJECT NO.: 201-03673-00
CLIENT: ECMI PROPERTIES INC.
DATE COMPLETED: May 29, 2020
BOREHOLE TYPE: DIRECT PUSH
SUPERVISOR: GS
GROUND ELEVATION: 353.3 m
REVIEWER: VHG

DEPTH (m)	ELEV (mASL)	STRATIGRAPHIC DESCRIPTION
0.0	353.3	**SANDY SILT:** Light brown orangey brown mottling SANDY SILT, trace gravel, occasional cobbles, moist, loose (trace black staining)
0.6	352.7	**SAND AND GRAVEL:** Brown SAND AND GRAVEL, trace clay, occasional cobbles, moist, compact
1.5	351.8	**SANDY SILT TILL:** Light brown SANDY SILT TILL, some clay, trace gravel, wet, loose
2.8	350.5	**SAND AND GRAVEL:** Brown SAND AND GRAVEL, trace silt, occasional cobbles, moist, compact
3.0	350.3	**SANDY SILT TILL:** Light brown SANDY SILT TILL, some clay, trace gravel, occasional cobbles, wet sand seam, moist, dense
3.5	349.8	**SILTY SAND:** Light brown SILTY SAND, trace gravel, occasional cobbles, moist, compact
3.7	349.6	Borehole terminated at 3.7 m below ground surface in SILTY SAND.

SAMPLE TYPE	N VALUE	% WATER	% RECOVERY	RQD (%)	REMARKS
SS1	10	12	100		
SS2	32	9	21		
SS3	27	12	83		
SS4	18	5	100		GSA SS4: Gravel: 7% Sand: 23% Silt & Clay: 70%
SS5	32	13 / 7	100		

Depth scale (m): 0.0, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0

CONE PENETRATION; "N" VALUE 10 20 30; SHEAR STRENGTH 20 40 60 80; Intact (MaX) Cu; Remoulded Cu
WATER CONTENT % 10 20 30; WP WL

REMARKS: Borehole open and dry upon completion of drilling.

APPENDIX

B GEOTECHNICAL LABORATORY RESULTS

MOISTURE CONTENTS

Project Location: 45 & 47 Anderson Boulevard, Uxbridge — **Tech:** BS/MSN
File No.: 201-03673-00 — **Date:** 28-May-20

TIN NO.	KR47	BV11	D12	7M	HC3
BOREHOLE NO.	BH20-1	BH20-1	BH20-1	BH20-1	BH20-1
SAMPLE & DEPTH	SS1	SS2	SS3	SS4	SS5
WT of TIN & WET SOIL (g)	99.9	83.2	81.7	68.9	67.7
WT of TIN & DRY SOIL (g)	85.8	70.3	70.1	60.0	66.5
WT of WATER (g)	14.2	12.9	11.6	8.9	1.2
TARE WT (g)	15.2	15.0	15.0	16.8	15.5
WT of DRY SOIL (g)	70.6	55.3	55.0	43.3	51.1
MOISTURE CONTENT	20.1%	23.3%	21.1%	20.5%	2.3%

TIN NO.	L24	S68	W9	Z7	AT28
BOREHOLE NO.	BH20-1	BH20-1	BH20-2	BH20-2	BH20-2
SAMPLE & DEPTH	SS6	SS7	SS1	SS2	SS3
WT of TIN & WET SOIL (g)	68.8	68.9	115.5	76.9	106.7
WT of TIN & DRY SOIL (g)	64.8	65.0	105.0	65.8	94.1
WT of WATER (g)	4.1	3.9	10.5	11.2	12.6
TARE WT (g)	16.1	15.4	15.4	15.5	14.6
WT of DRY SOIL (g)	48.7	49.6	89.6	50.3	79.6
MOISTURE CONTENT	8.3%	7.9%	11.7%	22.2%	15.8%

TIN NO.	LW6	DAB	HHH	95	X1
BOREHOLE NO.	BH20-2	BH20-2	BH20-2	BH20-2	BH20-3
SAMPLE & DEPTH	SS4	SS5	SS6	SS7	SS1
WT of TIN & WET SOIL (g)	113.6	131.4	97.3	111.0	89.9
WT of TIN & DRY SOIL (g)	99.9	113.9	87.4	94.9	80.2
WT of WATER (g)	13.6	17.5	9.9	16.1	9.7
TARE WT (g)	15.2	15.4	15.5	16.9	15.4
WT of DRY SOIL (g)	84.8	98.5	71.9	78.1	64.8
MOISTURE CONTENT	16.1%	17.7%	13.8%	20.6%	15.0%

TIN NO.	N3	Z2	LBA	X4	AY8
BOREHOLE NO.	BH20-3	BH20-3	BH20-3	BH20-3	BH20-3
SAMPLE & DEPTH	SS2	SS3	SS4	SS5	SS6
WT of TIN & WET SOIL (g)	78.7	102.0	110.8	89.4	95.4
WT of TIN & DRY SOIL (g)	69.4	91.6	99.2	77.4	83.0
WT of WATER (g)	9.3	10.4	11.6	12.0	12.4
TARE WT (g)	15.4	15.4	15.4	15.4	15.4
WT of DRY SOIL (g)	54.1	76.2	83.8	61.9	67.7
MOISTURE CONTENT	17.2%	13.7%	13.9%	19.4%	18.3%

TIN NO.	N2	N8	N1	TU32	Z3
BOREHOLE NO.	BH20-3	BH20-4	BH20-4	BH20-4	BH20-4
SAMPLE & DEPTH	SS7	SS1	SS2	SS3	SS4
WT of TIN & WET SOIL (g)	122.9	87.7	76.2	87.8	107.5
WT of TIN & DRY SOIL (g)	108.2	78.7	69.5	76.9	91.5
WT of WATER (g)	14.7	9.0	6.7	10.9	16.0
TARE WT (g)	15.4	15.4	15.5	15.4	15.5
WT of DRY SOIL (g)	92.8	63.3	54.0	61.5	76.1
MOISTURE CONTENT	15.8%	14.2%	12.4%	17.8%	21.0%

MOISTURE CONTENTS

Project Location: 45 & 47 Anderson Boulevard, Uxbridge
Tech: BS/MSN
File No.: 201-03673-00
Date: 28-May-20

TIN NO.	A2	X3	W6	A49	2V
BOREHOLE NO.	BH20-4	BH20-4	BH20-4	BH20-5	BH20-5
SAMPLE & DEPTH	SS5	SS6	SS7	SS1	SS2
WT of TIN & WET SOIL (g)	86.4	89.6	116.1	89.9	83.1
WT of TIN & DRY SOIL (g)	80.9	79.0	100.0	83.5	75.8
WT of WATER (g)	5.5	10.7	16.1	6.4	7.3
TARE WT (g)	15.4	15.5	15.5	15.5	16.7
WT of DRY SOIL (g)	65.6	63.5	84.6	68.0	59.1
MOISTURE CONTENT	8.4%	16.8%	19.0%	9.4%	12.4%

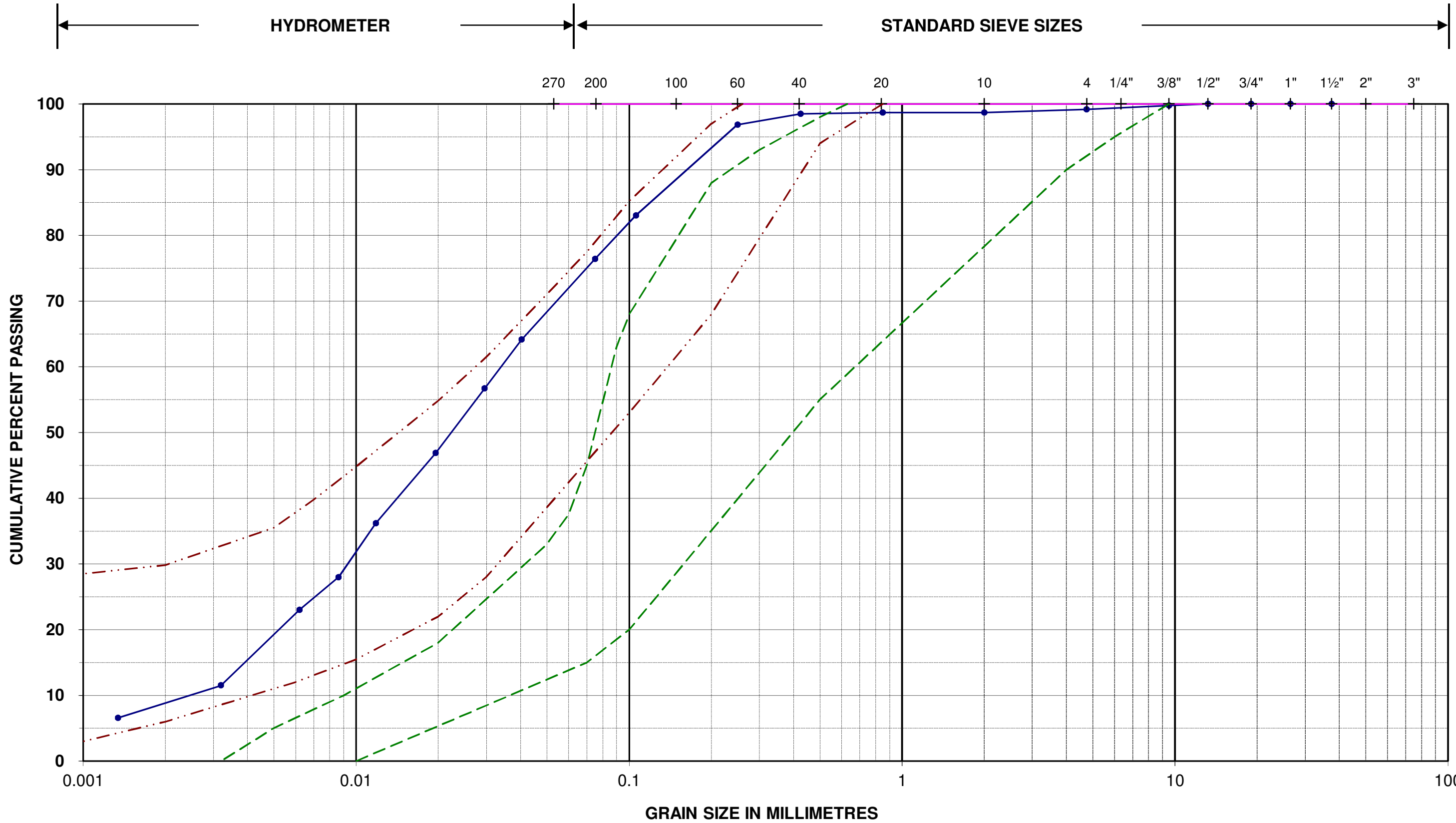
TIN NO.	Z6	N7	FR1	Z4	BR2
BOREHOLE NO.	BH20-5	BH20-5	BH20-5	BH20-5	BH20-5
SAMPLE & DEPTH	SS3S	SS4	SS5	SS6	SS7
WT of TIN & WET SOIL (g)	79.6	118.7	96.0	81.2	91.6
WT of TIN & DRY SOIL (g)	72.7	105.1	85.4	70.7	78.9
WT of WATER (g)	6.9	13.6	10.6	10.4	12.7
TARE WT (g)	15.4	15.4	15.0	15.5	15.2
WT of DRY SOIL (g)	57.3	89.7	70.4	55.2	63.7
MOISTURE CONTENT	12.1%	15.1%	15.0%	18.9%	19.9%

TIN NO.	BA2	K98	J01	OS16	JR1
BOREHOLE NO.	BH20-6	BH20-6	BH20-6	BH20-6	BH20-7
SAMPLE & DEPTH	SS1	SS2	SS4	SS5	SS1
WT of TIN & WET SOIL (g)	84.3	73.2	79.4	68.9	68.8
WT of TIN & DRY SOIL (g)	75.8	65.7	71.9	63.4	63.9
WT of WATER (g)	8.5	7.5	7.5	5.5	4.8
TARE WT (g)	15.5	15.3	15.4	15.3	15.4
WT of DRY SOIL (g)	60.3	50.4	56.6	48.0	48.6
MOISTURE CONTENT	14.2%	14.9%	13.2%	11.5%	10.0%

TIN NO.	3G	A24	082	PE	FR9
BOREHOLE NO.	BH20-7	BH20-7	BH20-7	BH20-7	BH20-8
SAMPLE & DEPTH	SS2	SS3	SS4	SS5	SS1
WT of TIN & WET SOIL (g)	93.8	96.9	89.3	86.5	72.4
WT of TIN & DRY SOIL (g)	85.8	82.3	77.3	74.1	66.1
WT of WATER (g)	8.1	14.7	12.1	12.4	6.3
TARE WT (g)	16.8	16.1	15.2	15.4	14.6
WT of DRY SOIL (g)	69.0	66.2	62.1	58.7	51.4
MOISTURE CONTENT	11.7%	22.2%	19.4%	21.1%	12.3%

TIN NO.	P8	X7	KR33	27E	P5
BOREHOLE NO.	BH20-8	BH20-8	BH20-8	BH20-8	BH20-8
SAMPLE & DEPTH	SS2	SS3	SS4	SS5A	SS5B
WT of TIN & WET SOIL (g)	61.2	72.6	45.6	66.9	58.2
WT of TIN & DRY SOIL (g)	57.5	66.6	44.3	61.0	55.4
WT of WATER (g)	3.7	6.1	1.3	5.9	2.8
TARE WT (g)	15.6	16.7	15.8	15.5	15.3
WT of DRY SOIL (g)	41.9	49.9	28.5	45.5	40.1
MOISTURE CONTENT	8.9%	12.2%	4.5%	12.8%	7.1%

PARTICLE SIZE DISTRIBUTION ASTM D422



GRAVEL	1	%
SAND	22	%
SILT	69	%
CLAY	8	%

Unified Classification System

SILT AND CLAY	SAND	GRAVEL

sm envelope T = 8 - 20 min/cm

ml envelope T = 20 - 50 min/cm

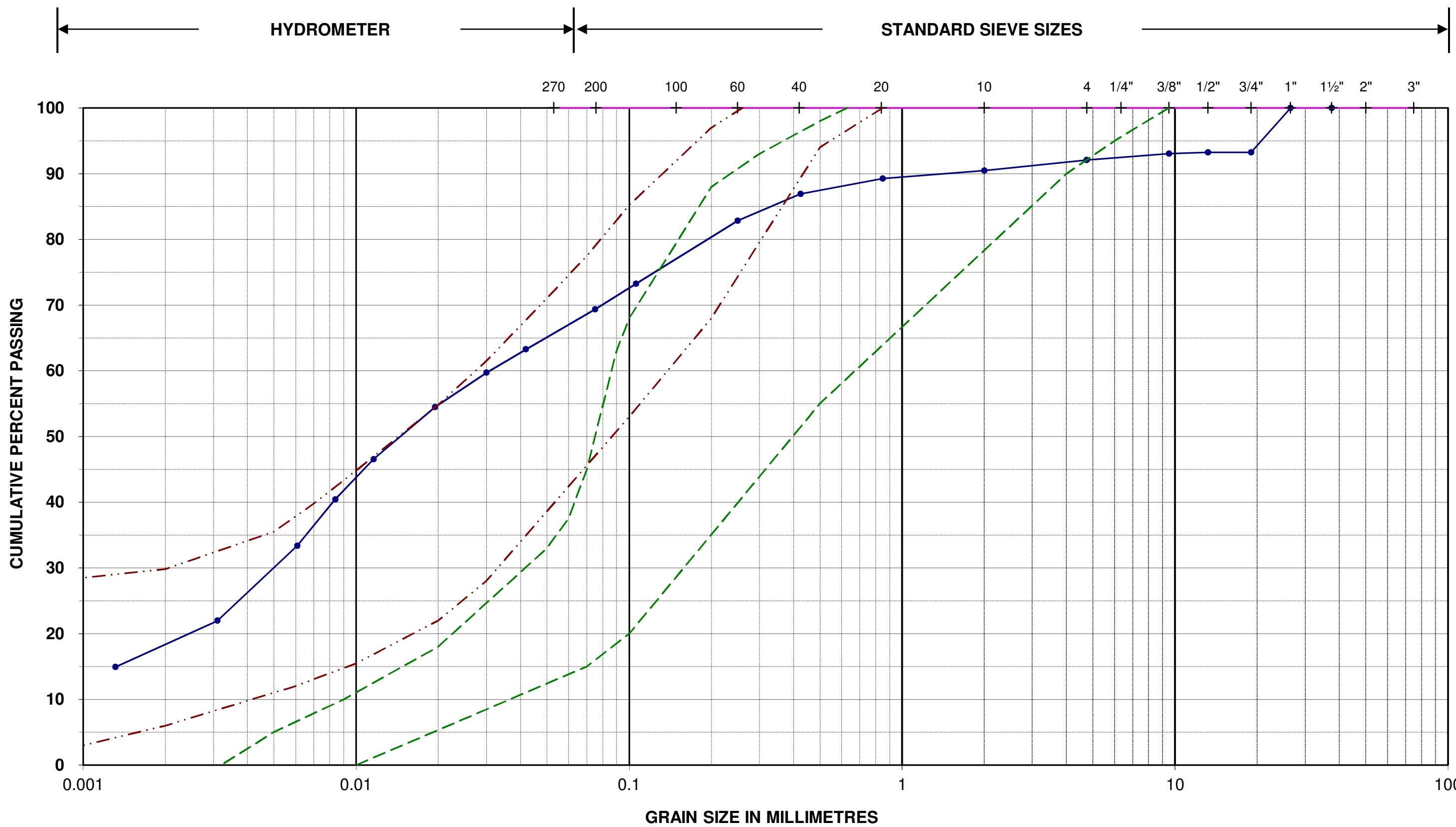
Estimated T = 30 min/cm

Project Name: 45-47 Anderson Boulevard **Project No.:** 201-03673-00

Location ID.: BH20-04 **Sample No./Depth:** SS6 / 4.6-5.2m

Sieve Size	% Passing Coarse	Sieve Size	% Passing Fine	Hydrometer (mm)	% Passing
37.5 mm	100.0	**2.00 mm**	98.67	**0.040**	64.1
26.5 mm	100.0	**0.850 mm**	98.7	**0.020**	46.9
19.0 mm	100.0	**0.425 mm**	98.5	**0.009**	28.0
13.2 mm	100.0	**0.250 mm**	96.8	**0.003**	11.5
9.50 mm	99.8	**0.106 mm**	83.0	**0.001**	6.6
4.75 mm	99.2	**0.075 mm**	76.4		

PARTICLE SIZE DISTRIBUTION ASTM D422



Unified Classification System

SILT AND CLAY	SAND	GRAVEL

GRAVEL	8	%
SAND	23	%
SILT	51	%
CLAY	18	%

------------------------ sm envelope T = 8 - 20 min/cm

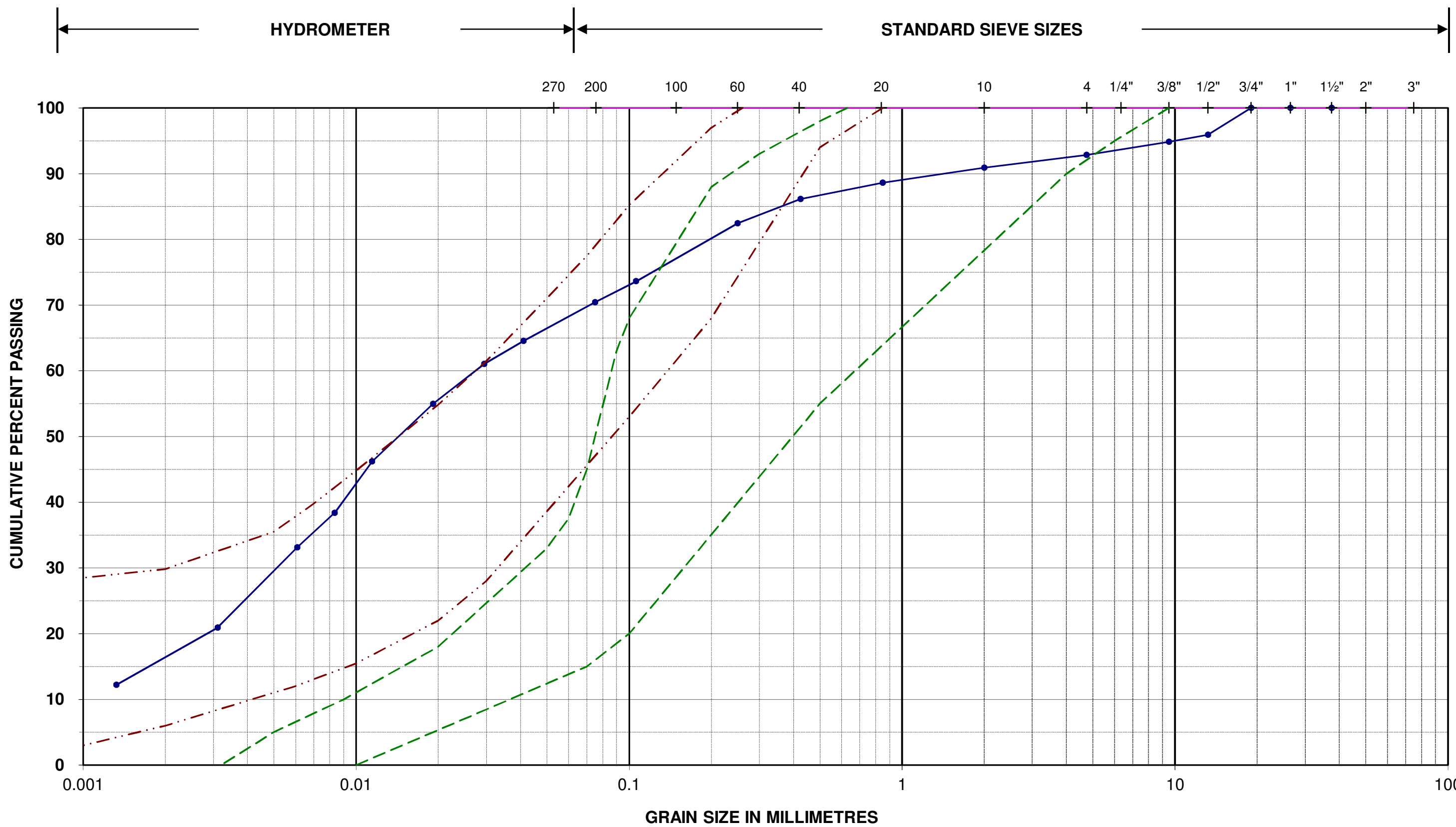
-·-·—·-·—·-·- ml envelope T = 20 - 50 min/cm

Estimated T = 35 min/cm

Project Name:	45-47 Anderson Boulevard	**Project No.:**	201-03673-00
Location ID.:	BH20-06	**Sample No./Depth:**	SS3 / 1.5-2.1m

Sieve Size	% Passing Coarse	Sieve Size	% Passing Fine	Hydrometer (mm)	% Passing
37.5 mm	100.0	**2.00 mm**	90.48	**0.042**	63.3
26.5 mm	100.0	**0.850 mm**	89.2	**0.019**	54.5
19.0 mm	93.2	**0.425 mm**	86.9	**0.008**	40.4
13.2 mm	93.2	**0.250 mm**	82.8	**0.003**	22.0
9.50 mm	93.0	**0.106 mm**	73.2	**0.001**	14.9
4.75 mm	92.1	**0.075 mm**	69.3		

PARTICLE SIZE DISTRIBUTION ASTM D422



Unified Classification System

SILT AND CLAY	SAND	GRAVEL

GRAVEL	7	%
SAND	23	%
SILT	53	%
CLAY	17	%

------------------------ sm envelope T = 8 - 20 min/cm

-·-·-—·-—·-·- ml envelope T = 20 - 50 min/cm

Estimated T = 35 min/cm

Project Name: 45-47 Anderson Boulevard
Project No.: 201-03673-00
Location ID.: BH20-08
Sample No./Depth: SS4 / 2.3-2.9m

Sieve Size	% Passing Coarse	Sieve Size	% Passing Fine	Hydrometer (mm)	% Passing
37.5 mm	100.0	2.00 mm	90.90	0.041	64.5
26.5 mm	100.0	0.850 mm	88.6	0.019	54.9
19.0 mm	100.0	0.425 mm	86.1	0.008	38.4
13.2 mm	95.9	0.250 mm	82.4	0.003	20.9
9.50 mm	94.8	0.106 mm	73.6	0.001	12.2
4.75 mm	92.8	0.075 mm	70.4		

APPENDIX

C GENERAL RECOMMENDATIONS FOR ENGINEERED FILL

GENERAL RECOMMENDATIONS FOR ENGINEERED FILL

Compacted imported soil that meets specific engineering requirements and is free of organics and debris and that has been continually monitored on a full-time basis by a qualified geotechnical representative is classified as engineered fill. Engineered fill that meets these requirements and is bearing on suitable native subsoil can be used for the support of foundations.

Imported soil used as engineered fill can be removed from other portions of a site or can be brought in from other sites. In general, most Ontario soils are too wet to achieve the 100% Standard Proctor Maximum Dry Density (SPMDD) and will require drying and careful site management if they are to be considered for engineered fill. Imported non-cohesive granular soil is preferred for all engineered fill. For engineered fill, we recommend use of OPSS Granular 'B' sand and gravel fill material. Materials for the use of engineered fill must be approved by WSP prior to placement.

Adverse weather conditions such as rain make the placement of engineered fill to the required degree of density difficult or impossible; engineered fill cannot be placed during freezing conditions, i.e. normally not between December 15 and April 1 of each year.

The location of the foundations on the engineered fill pad is critical and certification by a qualified surveyor that the foundations are within the stipulated boundaries is mandatory. Since layout stakes are often damaged or removed during fill placement, offset stakes must be installed and maintained by the surveyors during the course of fill placement so that the contractor and engineering staff are continually aware of where the engineered fill limits lie. Excavations within the engineered fill pad must be backfilled with the same conditions and quality control as the original pad.

To perform satisfactorily, engineered fill requires the cooperation of the designers, engineers, contractors and all parties must be aware of the requirements. The minimum requirements are as follows; however, the geotechnical report must be reviewed for specific information and requirements.

1. Prior to site work involving engineered fill, a site meeting to discuss all aspects must be convened. The surveyor, contractor, design engineer and geotechnical engineer must attend the meeting. At this meeting, the limits of the engineered fill will be defined. The contractor must make known where all fill material will be obtained from and samples must be provided to the geotechnical engineer for review, and approval before filling begins.

2. Detailed drawings indicating the lower boundaries as well as the upper boundaries of the engineered fill must be available at the site meeting and be approved by the geotechnical engineer.

3. The building footprint and base of the pad, including basements, garages, etc. must be defined by offset stakes that remain in place until the footings and service connections are all constructed. Confirmation that the footings are within the pad, service lines are in place, and that the grade conforms to drawings, must be obtained by the owner in writing from the surveyor and WSP. Without this confirmation no responsibility for the performance of the structure can be accepted by WSP. Survey drawing of the "pre- and post" fill location and elevations will also be required.

4. The area must be stripped of all topsoil and fill materials. Subgrade must be proof-rolled. Soft spots must be dug out. The stripped native subgrade must be examined and approved by a WSP Canada Inc. engineer prior to placement of fill.

5. The approved engineered fill material must be compacted to 100% Standard Proctor Maximum Dry Density throughout. Engineered fill should not be placed during the winter months. Engineered fill compacted to 100% SPMDD will settle under its own weight approximately 0.5% of the fill height and the structural engineer must be aware of this settlement. In addition to the settlement of the fill, additional settlement due to consolidation of the underlying soils from the structural and fill loads will occur and should be evaluated prior to placing the fill.

6. Full-time geotechnical inspection by WSP Canada Inc. during placement of engineered fill is required. Work cannot commence or continue without the presence of the WSP Canada Inc. representative.

7. The fill must be placed such that the specified geometry is achieved. Refer to the attached sketches for minimum requirements. Take careful note that the projection of the compacted pad beyond the footing at footing level is a minimum of 2 m. The base of the compacted pad extends 2 m plus the depth of excavation beyond the edge of the footing.

8. A bearing capacity of 150 kPa at SLS (225 kPa at ULS) can be used provided that all conditions outlined above are adhered to. A minimum footing width of 500 mm (20 inches) is suggested and footings must be provided with nominal steel reinforcement.

9. All excavations must be done in accordance with the Occupational Health and Safety Regulations of Ontario.

10. After completion of the engineered fill pad a second contractor may be selected to install footings. The prepared footing bases must be evaluated by engineering staff from WSP Canada Inc. prior to footing concrete placements. All excavations must be backfilled and compacted under full time supervision by WSP Canada Inc. to the same degree as the engineered fill pad. Surface water cannot be allowed to pond in excavations or to be trapped in pre-approved backfill material. Clear stone backfill can only be used with the approval of WSP.

11. After completion of compaction, the surface of the engineered fill pad must be protected from disturbance from traffic, rain and frost. During the course of fill placement, the engineered fill must be smooth-graded, proof-rolled and sloped/crowned at the end of each day, prior to weekends and any stoppage in work in order to promote rapid runoff of rainwater and to avoid any ponding surface water. Any stockpiles of fill intended for use as engineered fill must also be smooth-bladed to promote runoff and/or protected from excessive moisture take up.

12. If there is a delay in construction, the engineered fill pad must be inspected and accepted by the geotechnical engineer. The location of the structure must be reconfirmed that it remains within the pad.

13. The geometry of the engineered fill as illustrated in these General Requirements is general in nature. Each project will have its own unique requirements. For example, if perimeter sidewalks are to be constructed around the building, then the projection of the engineered fill beyond the foundation wall may need to be greater.

14. These guidelines are to be read in conjunction with WSP Canada Inc. report attached.