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Preliminary Geotechnical Investigation Report – 23 Brock Street West, Uxbridge, Ontario

March 6, 2025

Prepared for:

Township of Uxbridge, 51 Toronto Street South, Uxbridge, ON L9P 1H1

Prepared by:

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Project No. 122140392

PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT – 23 BROCK STREET WEST, UXBRIDGE, ONTARIO

Revision	Date	Description	Prepared By	Reviewed By	Approved By
A	January 9, 2025	Draft	Akshat Shukla	Khash Refahi	Ron Howieson
1	March 6, 2025	Final	Akshat Shukla	Khash Refahi	Ron Howieson

PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT – 23 BROCK STREET WEST, UXBRIDGE, ONTARIO

The conclusions in the Report titled Geotechnical Investigation Report – 23 Brock Street West, Uxbridge, Ontario are Stantec's professional opinion, as of the time of the Report, and concerning the scope described in the Report. The opinions in the document are based on conditions and information existing at the time the scope of work was conducted and do not consider any subsequent changes. The Report relates solely to the specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose, and any unauthorized use or reliance is at the recipient's own risk.

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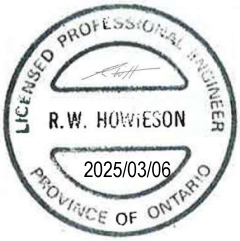

Approved by _____
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Ron Howieson, P.Eng.
Vice President, Geotechnical Engineer

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1.0 INTRODUCTION

Stantec Consulting Ltd. (Stantec) was retained by the Township of Uxbridge (the Client) to complete a preliminary geotechnical investigation to provide an overview of the subsurface conditions which supports structural design of the proposed work and potential geotechnical issues or concerns associated with the proposed work at 23 Brock Street West, Uxbridge, ON (the Site). Stantec's geotechnical investigation was carried out in conjunction with Stantec's Environmental team's investigation program of a Phase II Environmental Site Assessment (ESA).

It has been assumed that the development will include only one level of underground parking; however, it is understood that based on the actual size of the building a second level of underground parking may be required. The development proponent will need to make their own assessment of the number of underground levels to comply with the Township's zoning bylaws with respect to the amount of parking that is required. It is also understood that no design information was available at the time of the investigation and there is an existing buried culvert crossing the Site.

Limitations associated with this report and its contents are provided in the statement of general conditions included in **Appendix A**.

2.0 SITE DESCRIPTION

2.1 SITE DESCRIPTION

The approximate location of the site is shown on the Borehole Location Plan, Figure 1 in **Appendix B**. The approximate location of the existing culvert is shown on the conceptual staging drawing, U18 – 08. For the purposes of this report, the orientation of Brock Street West is taken as east-west, and the orientation of Toronto Street North and Main Street is taken as north-south.

The Site is located on the north side of the Brock Street West between Main Street North and Toronto Street North. The Site has an irregular shape with an approximate area of 5,500 m^2. It includes access from four driveways (two on Toronto Street North, one on Brock Street West, and one on Main Street North). Most of the Site area is currently being utilized as a parking lot with a retail unit on the southeast corner. On the east side of the Site, there is a residential unit with a backyard; on the southeast corner, there are multiple residential and commercial units facing Brock Street West; and on the southwest corner and west side, there are residential units facing Toronto Street North and Brock Street West.

According to AECOM's Hydrogeological Investigation (April 2018) for the culvert, two culverts with a span of approximately 11 m and a length of 190 m are buried underneath the Site in a twinned configuration. The culverts run north-south from the north end of the site to Centennial Avenue on the south side, dividing the site area into approximately two equal parts.

It is understood that during the construction of the culverts, significant settlements occurred at the retail store and other buildings located to the south of the culverts. A shoring system, along with dewatering from outside the shoring system, was utilized during construction.

It is further understood that the Town is considering expanding the Site by purchasing and adding two adjacent properties, namely 24-12 Main Street North and 47 Brock Street West.

3.0 GEOLOGY REFERENCES AND SOURCES OF INFORMATION

3.1 OGS EARTH DATABASE

The Ontario Ministry of Northern Development and Mines (MNDM) has digitized geoscience data created from a variety of sources containing information about the physiography, surficial geology Paleozoic geology and geotechnical boreholes in the province of Ontario.

3.2 MTO GEOCRES FOUNDATION LIBRARY

The Ministry of Transportation of Ontario (MTO) Geocres Foundation Library is an online collection of reports obtained by the Ministry. The reports include information on borehole locations, groundwater conditions, and overburden & rock stratigraphy encountered during drilling for a variety of MTO projects (e.g., highways, interchanges, culverts, bridges, and similar). The reports include data interpretation and recommendations for use in design and construction.

3.3 MECP WELL WATER RECORDS

The Ministry of the Environment, Conservation and Parks (MECP) water well records (WWRs) database includes information on water well locations, groundwater conditions, and overburden & rock stratigraphy encountered during drilling. The MECP WWRs largely include domestic supply wells, municipal supply wells, and ground water monitoring wells. From a geotechnical perspective, the water well records are considered a low-quality dataset. However, the volume of information is extremely useful in understanding “general trends” in the subsurface conditions.

4.0 REGIONAL GEOLOGICAL CONDITIONS

4.1 OVERBURDEN

The Physiography of Southern Ontario by Chapman and Putnam (1984) indicates that the study area is within the Peterborough Drumlin Field. The Surficial Geology of Southern Ontario mapping data (MRD128-Revised, 2003) describes the soils at the Site location as modern alluvial deposits consisting of clay, silt, sand, gravel with a possibility of containing organic remains. There is a zone of ice-contact stratified deposits containing sand and gravel with minor amount of silt, clay and till to the immediate east of the Site and a zone of coarse-textured glaciolacustrine deposits containing sand, gravel, minor silt and clay to the immediate west of the Site.

The Quaternary Geology of Ontario Southern Sheet (Map 2556) indicates that the soils in the Site area consist of Pleistocene glaciolacustrine deposits consisting of sand, gravelly sand and gravel with nearshore and beach deposits.

The OGS Geotechnical Boreholes database did not indicate any boreholes within approximately 500 m of the Site location.

A review of the MTO Geocres Foundation Library did not yield any reports within approximately 500 m of the Site location.

A review of the MECP water well database identified three (3) well records with recorded stratigraphy in proximity of the Site. The depths of the wells were up to 10.7 m below ground surface. The well records generally indicate sand underlain by organic peat soils underlain by clay underlain by sand and gravel until the termination depth. Bedrock was not encountered in any of these wells.

4.2 BEDROCK

The Paleozoic Geology of Southern Ontario mapping data (MRD219, 2007) indicates that the underlying bedrock at the Site consists mainly of the Georgian Bay formation generally consisting of shale, limestone, dolostone and siltstone.

4.3 GROUNDWATER

Groundwater level was measured at 20.7 m below ground surface in one (1) monitoring well.

4.4 PREVIOUS INVESTIGATION

A hydrogeological investigation for reconstruction of the Brock Street Culvert, dated April 16, 2018, was provided for information. The report included records of geotechnical investigation completed by V.A. Wood in February 2018 and Soil Engineers Ltd. in November 2012.

4.4.1 Geotechnical Investigation by Soil Engineers Ltd. (November 2012)

This geotechnical investigation included five (5) boreholes near the proposed culvert. The subsurface stratigraphy in the boreholes was as follows:

- Topsoil; underlain by,
- Peat; underlain by,
- Loose to compact earth fill materials consisting of silty sand and silty clay; underlain by,
- Stiff to very stiff silty clay till and very loose to very dense sandy silt till; underlain by,
- Loose to compact silt to silty sand; underlain by,
- Dense to very dense gravelly sand and silty sand till.

The boreholes were terminated at depths ranging from 12.0 m to 20.0 m below ground surface. Groundwater level varied from 2.4 m to 5.5 m below the ground surface (Elevations 257.6 m to 263.1 m).

4.4.2 Geotechnical Investigation by V.A. Wood (February 2018)

This geotechnical investigation included 11 boreholes with monitoring wells near the culvert. The subsurface stratigraphy in the boreholes was as follows:

- Fill; underlain by,
- Loose to compact silty sand/gravelly sand with organic inclusions; underlain by,
- Loose to dense sandy silt/sandy silt till; underlain by,
- Dense sand and gravel.

The boreholes were terminated at depths ranging from 6.5 m to 9.6 m below ground surface. Groundwater levels varied from the surface to 3.1 m below the ground surface (Elevation of 261.4 m to 264.6 m).

5.0 METHOD OF INVESTIGATION

5.1 FIELD INVESTIGATION

Prior to commencing the field investigation, Stantec contacted Ontario One Call to confirm the location of public services and utilities and retained the services of a private utility locate company, Onsite Locates, to provide additional utility locate clearances at the intended borehole locations.

Strata Drilling Group was retained for the borehole drilling. The borehole drilling was carried out between October 28, 2024, to November 4, 2024. Thirteen (13) boreholes identified as boreholes MW1 to MW10, MW12 and BH11, BH13 were advanced to depths of 6 m to 12 m below the ground surface using a Geoprobe 3230 DT drill rig equipped with 150 mm hollow-stem augers. Boreholes MW1, MW2, MW3, MW5, MW7, MW9 and BH13 were advanced for combined geotechnical and environmental purposes and others only for environmental purposes.

Dynamic Cone Penetration Testing (DCPT) was carried out in borehole BH13 to refusal at a depth of approximately 12.0 m below grade. DCPT was also carried out in borehole MW7 to 12.8 m below grade and was terminated prior to refusal due to time constraints.

The undrained shear strength of cohesive soils encountered in the boreholes was determined using an in-situ shear vane in accordance with ASTM D2573 wherever applicable.

Stantec field personnel recorded the conditions encountered in the boreholes.

Soil samples were recovered using a 50 mm (outside diameter) split-barrel sampler by conducting Standard Penetration Tests (SPTs) in accordance with the procedures outlined in ASTM D1586. Soil samples were collected at regular intervals.

All soil samples recovered from the boreholes were placed in moisture-proof bags. The soil samples were returned to Stantec's geotechnical and construction materials testing laboratory and warehouse facility in Markham, ON.

The groundwater conditions were recorded in the open boreholes on completion of the drilling process. Six (6) groundwater monitoring wells were installed in boreholes MW1, MW2, MW3, MW5, MW7 and MW9.

The boreholes were backfilled with bentonite meeting the requirements of the MECP Regulation 903.

5.2 SURVEYING

A topographic survey was completed by the Stantec Geomatics Team, and the borehole and monitoring well locations and respective ground surface elevations were also surveyed by the Stantec Geomatics Team. The coordinates and respective ground surface elevations of boreholes and monitoring wells are provided in Table 5.1 below. The termination depth and elevation of each of the boreholes are also provided in the table for reference.

Table 5.1: Borehole Locations Summary

Borehole No.	UTM Coordinates (NAD83 - Zone 17)		Ground Surface Elevation (m)	Termination Depth (m)	Termination Elevation (m)
	Northing	Easting			
MW1	4885791	650264	267.0	9.7	257.3
MW2	4885766	650282	265.2	12.2	253.0
MW3	4885753	650265	266.3	10.7	255.6
MW5	4885740	650281	265.9	9.7	256.2
MW7	4885719	650320	265.9	9.0	256.9
MW9	4885761	650309	264.8	11.6	253.2
BH13	4885817	650375	266.4	9.0	257.4

The borehole coordinates are also shown on the borehole records in **Appendix C** for reference.

5.3 LABORATORY TESTING

Soil samples obtained from the boreholes were subjected to visual and tactile examination on return to the Stantec's geotechnical and construction materials testing laboratory.

The laboratory testing program consisted of the following:

- Gradation Analysis 6 samples
- Atterberg Limits 4 samples
- Moisture Content 83 samples

Results of the tests are indicated on the Borehole Records in **Appendix C** and are illustrated on the figures in **Appendix D.**

Samples remaining after testing were placed in storage and will be retained for a period of three months after the date of issue of the final report for this project. After the storage period, the samples will be discarded.

6.0 RESULTS OF INVESTIGATION

6.1 FRAME OF REFERENCE

6.1.1 Overburden

The soils encountered in the boreholes and reported herein have been classified in accordance with the Unified Soil Classification System as defined in ASTM D2487 and D2488 with reference to clay soils and include a “Low to Medium” category with respect to plasticity.

It should be noted that the internal diameter (I.D.) of the SPT sampler 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 (particles from 75 mm to 200 mm) and boulders (particles > 200 mm) where inferred to be present are described separately from the gravel content.

6.2 OVERVIEW

In general, the stratigraphy encountered in the boreholes consisted of:

- Ground surface cover consisting of asphalt/topsoil; underlain by,
- Cohesionless fill consisting of sand and gravel to silty sand with gravel; underlain by,
- Cohesive fill consisting of silty clay with sand in borehole BH13; underlain by,
- Peat in boreholes BH13 and MW1; underlain by,
- Very soft to hard silty clay to clay with sand to clay in all boreholes except borehole BH13; underlain by,
- Very loose to very dense, sandy silt to silty sand.

Groundwater level in the open borehole was measured at a depth of 4.3 m below grade (corresponding elevation of 262.1 m).

The subsurface conditions observed in the boreholes are presented in detail on the Borehole Records provided in **Appendix C**. An explanation of the symbols and terms used to describe the Borehole Records is also provided in **Appendix C**.

6.3 OVERBURDEN

6.3.1 Ground Surface Cover

Asphalt was present at the ground surface at the locations of boreholes MW1, MW2, MW7, MW9 and BH13. The thickness of asphalt varied from 50 mm to 100 mm.

Topsoil was present at the ground surface at the locations of boreholes MW3 and MW5. The thickness of topsoil was 150 mm.

6.3.2 Cohesionless/Less-Cohesive Fill

A layer of brown to black-colored cohesionless/less-cohesive fill consisting of sand and gravel to silty sand with gravel was encountered underlying the ground surface cover. Trace to some gravel, occasional cobbles, trace to some clay was noted in some samples obtained from this layer. Additionally, trace organics, rootlets and wood fragments were observed in some samples from boreholes MW5 and MW9.

This layer extended to depths of 0.7 m to 6.0 m below grade (Elevations 264.8 m to 258.8 m).

The N-value obtained from the SPTs advanced in the cohesionless fill ranged from 0 to 22 blows/0.3 m, indicating a very loose to compact state of compactness with the exclusion of two N-values of 54 and 69 recorded within the sand and gravel underlying the asphalt.

Based on visual and tactile examination of the samples, this layer was characterized as moist. The results of the moisture content tests conducted on the samples of this cohesionless fill layer ranged from approximately 2% to 26%, averaging 14%, with the exclusion of a moisture content of 83% for a sample in borehole MW9 which contained organic matter.

A grain size distribution test was completed on one (1) sample of the soil. The results of the test are shown in Table 6.1 below.

Table 6.1: Grain Size Distribution – Cohesionless/Less-Cohesive Fill

Borehole	Sample	Depth (m)	Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
MW7	SS5	3.4	Silty Sand	2	88	8	2

The grain size distribution test results are shown on the borehole records in **Appendix C** and are illustrated on Figure D2 in **Appendix D**.

In accordance with the Unified Soil Classification System, the sample tested can be classified as Silty Sand (SM).

6.3.3 Cohesive Fill

A layer of brown to black-colored cohesive fill consisting of silty clay with sand was encountered underlying the cohesionless/less-cohesive fill in boreholes MW2 and BH13. Trace gravel was noted in some samples obtained from this layer.

This layer extended to a depth of 3.2 m below grade (elevation of 262.7 m) in borehole BH13 and 6.7 m below grade (elevation of 258.4 m) in borehole MW2.

The N-values obtained from the SPTs advanced in this stratum ranged from 0 to 10, indicating a very soft to stiff consistency.

Based on visual and tactile examination of the samples, the soil was assessed as moist. The results of the moisture content tests conducted on the samples of this layer ranged from approximately 7% to 25%, averaging 17%.

A grain size distribution test was completed on one (1) sample of the soil. The results of the test are shown in Table 6.2 below.

Table 6.2: Grain Size Distribution – Silty Clay Fill

Borehole	Sample	Depth (m)	Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
MW2	SS4	2.6	Silty Clay with Sand (CL-ML)	5	23	61	11

The grain size distribution test results are shown on the borehole records in **Appendix C** and are illustrated on Figure D1 in **Appendix D**.

An Atterberg Limits test was conducted on the sample referenced above. The test results are summarized in Table 6.3 below.

Table 6.3: Atterberg Limits Test – Silty Clay Fill

Borehole	Sample	Depth (m)	Description	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
MW2	SS4	2.6	Silty Clay with Sand (CL-ML)	20	26	20	6

The results of the Atterberg Limits test are shown on the borehole records in **Appendix C** and are illustrated on Figure D3 in **Appendix D.**

In accordance with the Unified Soil Classification System, the samples tested can be classified as Silty Clay with Sand (CL-ML).

6.3.4 Peat

A layer of peat was encountered underlying the cohesionless/less-cohesive fill in borehole MW1 and underlying the cohesive fill in borehole BH13.

The thickness of this layer was 0.9 m in borehole MW1 and 1.1 m in borehole BH13 and it extended to depths of 3.1 m (elevation of 263.9 m) below grade in borehole MW1 and 4.8 m (elevation of 261.6 m) below grade in borehole BH13.

The N-values obtained from the SPTs advanced in this stratum ranged from 2 to 5 indicating a soft to firm consistency.

Based on visual and tactile examination of the samples, the soil was assessed as moist. The results of the moisture content tests conducted on the samples of this layer were approximately 23% and 61%.

6.3.5 Silt to Clay with Sand to Clay

A stratum of native, grey-colored Silt to Clay with Sand to Clay was encountered underlying the fill materials in all boreholes except borehole BH13. Trace to some sand and trace gravel were noted in the samples obtained from this layer. A layer of silt was encountered underlying the fill materials in borehole MW3 overlaying the clay soil. Trace sand was noted in the samples obtained from this layer.

This stratum extended to depths of 8.2 m to 10.2 m (elevations 256.1 m to 257.9 m) in boreholes MW1, MW2, MW3, MW5 and MW9. Borehole MW7 was terminated in this layer at approximately 9.0 m below grade (elevation 256.9 m).

The N-values obtained from the SPTs advanced in this stratum ranged from 0 to 13 blows/0.3 m indicating a very soft to stiff consistency.

Field Vane Shear tests were conducted within this layer in borehole MW1 at a depth of 5.6 m below grade and in borehole MW7 at a depth of 7.2 m below grade. The tests yielded undrained shear strength (Su) values of approximately 60 kPa and 95 kPa, respectively, indicating stiff soil conditions. Sensitivity values of 2.5 and 1.7 were also recorded, reflecting low sensitivity.

Based on visual and tactile examination of the samples, the soil was assessed as moist to wet. The results of the moisture content tests conducted on samples of this layer ranged from approximately 14% to 32%, averaging 22%.

A grain size distribution test was completed on three (3) samples of this stratum. The results of the test are shown in Table 6.4 below.

Table 6.4: Grain Size Distribution – Silty to Clay with Sand to Clay

Borehole	Sample	Depth (m)	Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
MW1	SS5	3.4	Clay (CL)	0	7	45	48
MW3	SS7	4.9	Silt (ML)	0	8	76	16
MW5	SS9	6.4	Clay with Sand (CL)	0	28	40	32

The grain size distribution test results are shown on the borehole records in **Appendix C** and are illustrated on Figures D1 and D2 in **Appendix D**.

Atterberg Limits tests were also conducted on the samples referenced above. The test results are summarized in Table 6.5 below.

Table 6.5: Atterberg Limits Test – Silt to Clay with Sand to Clay

Borehole	Sample	Depth (m)	Description	Moisture Content (%)	Liquid Limit	Plastic Limit	Plasticity Index
MW1	SS5	3.4	Clay (CL)	27	32	16	16
MW3	SS7	4.9	Silt (ML)	21	20	17	3
MW5	SS9	6.4	Clay with Sand (CL)	22	21	11	10

The results of the Atterberg Limits tests are shown on the borehole records in **Appendix C** and are illustrated on Figure D3 in **Appendix D.**

In accordance with the Unified Soil Classification System, the samples tested can be classified as Silty Clay (CL), Silt (ML), and Clay with Sand (CL).

6.3.6 Sandy Silt to Silty Sand with Gravel

A stratum of native, brown to grey-colored Sandy silt to Silty Sand with Gravel was encountered underlying the soils described in the preceding sections in all boreholes except borehole MW7. Trace to some gravel, trace clay and rock fragments were noted in the samples obtained from this layer.

All the boreholes except borehole MW7 were terminated in this soil at approximately 9.7 m to 12.2 m below grade (elevations of 253.0 m to 257.4 m).

The N-values obtained from the SPTs advanced in this stratum ranged from 1 to refusal (more than 50 blows/0.3 m), indicating a very loose to very dense state of compactness.

Based on visual and tactile examination of the samples, the soil was assessed as moist to wet. The results of the moisture content tests conducted on the samples of this layer ranged from approximately 7% to 22%, averaging 15%.

A grain size distribution test was completed on one (1) sample of this stratum. The results of the tests are shown in Table 6.6 below.

Table 6.6: Grain Size Distribution – Sandy Silt to Silty Sand with Gravel

Borehole	Sample	Depth (m)	Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
MW2	SS13	11.0	Silty Sand with Gravel (SM)	30	49	17	4

The grain size distribution test results are shown on the borehole records in **Appendix C** and are illustrated on Figure D1 in **Appendix D**.

In accordance with the Unified Soil Classification System, the sample tested can be classified as Silty Sand with Gravel (SM).

6.4 GROUNDWATER

The groundwater level in the open borehole BH13 was measured at a depth of 4.3 m below grade (Elevation of 262.1 m).

Six (6) monitoring wells were installed in boreholes MW1, MW2, MW3, MW5 and MW7 with the top of the screens at depths varying from 1.6 m to 3.1 m below grade. A summary of the recorded groundwater levels is shown below in Table 6.7.

Table 6.7: Groundwater Level Measurements

Borehole	Date of Monitoring	Groundwater Level below Grade (m)	Groundwater Level Elevation (m)
MW1	November 5, 2024	2.9	264.1
MW2	November 5, 2024	1.4	263.8
MW3	November 5, 2024	2.2	264.1
MW5	November 5, 2024	2.2	263.7
MW7	November 5, 2024	2.1	263.8
MW9	November 5, 2024	2.0	262.8

Groundwater level is subject to fluctuations due to seasonal changes and precipitation events. The water levels should be expected to be higher during the spring season or during and following periods of heavy precipitation or snow melt.

6.5 CHEMICAL TESTING

Two (2) representative samples from the soils at the site were tested for pH, water-soluble sulphate and chloride concentrations, and resistivity. The analysis results are provided in the following table, and can be found in **Appendix D** .

Table 6.8: Results of Chemical Analysis

Borehole No	Sample No.	Depth (m)	pH	Chloride (µg/g)	Sulphate (µg/g)	Resistivity (Ohm-cm)
MW2	SS4	2.6	7.52	197	53	16.5
BH13	SS3	1.5	7.62	297	39	14.8

7.0 DISCUSSION AND RECOMMENDATIONS

7.1 SUBSURFACE AND GROUNDWATER CONDITIONS SUMMARY

The following bullets provide a general description and overview of the conditions encountered in the geotechnical investigation as previously summarized:

- Ground surface cover consisting of asphalt/topsoil; underlain by,
- Cohesionless fill consisting of sand and gravel to silty sand with gravel; underlain by,
- Cohesive fill consisting of silty clay with sand in borehole BH13; underlain by,
- Peat in boreholes BH13 and MW1; underlain by,
- Very soft to hard silty clay to clay with sand to clay in all boreholes except borehole BH13; underlain by,
- Very loose to very dense, sandy silt to silty sand.

Bedrock was not encountered within the depths explored at the referenced borehole locations (maximum drill depth of 12.2 m below existing grade).

The groundwater level was recorded in the monitoring wells installed at the Site at depths ranging from 1.4 m to 2.9 m below grade (Elevations 262.8 to 264.1 m) on November 5, 2024.

7.2 GEOTECHNICAL CONSIDERATIONS AND CONSTRAINTS

The following general considerations and constraints are provided with respect to observations made during the investigation, the subsurface conditions encountered, results of laboratory testing, and the intended scope of construction:

- It is anticipated that the existing structures and associated infrastructure will be demolished and/or decommissioned as a component of the proposed re-development of the Site. Any excavations resulting from the demolition and decommissioning process should be backfilled with approved, compacted engineered fill materials.

- The proposed building must not be placed over the existing concrete culverts to ensure the culverts remains accessible for future maintenance.
- Given the site is already developed, significant regrading is not anticipated. However, any grade raise or additional loading near the existing culverts should not be permitted to prevent settlement of the culverts.
- The groundwater level in the monitoring wells was measured at depths of 1.4 m to 2.9 m below grade. In this respect, groundwater should be anticipated to be encountered during construction of the underground level. Dewatering in advance of excavation may be required to allow excavations within the silty sand fill materials.
- Due to the presence of compressible layers of very soft or loose fill materials, peat, and native soils, as well as the relatively shallow groundwater level, a watertight shoring system (e.g., secant caisson walls) should be implemented for construction of the underground level. Additionally, dewatering should be conducted within the shored excavation to prevent ground subsidence beyond the excavation and settlement of nearby buildings.
- Fill materials were encountered in all boreholes, extending to depths of 2.2 m to 6.7 m below grade. These materials were heterogeneous, ranging from very soft or very loose to very dense, and contained trace organic inclusions. In two boreholes, the fill was underlain by a layer of peat extending to depths of 3.1 m and 4.8 m below grade. Native soils, consisting of very soft to firm silty clay to clay with sand and very loose sandy silt, were found beneath the fill and peat, extending to depths of 7 m to 10.2 m (borehole termination depth). Given these subsurface conditions, the use of shallow foundations and slab-on-grade floor slabs is not suitable for the proposed eight-storey building.
- The proposed building can be supported on deep foundations, such as steel pipe piles, extending into the underlying very dense gravelly sand, silty sand, or sandy silt soils encountered at depths of approximately 10.7 m to 12.0 m, as identified in both the current and historical boreholes referenced in Section 3.4. Additionally, a structural slab is recommended for the underground level floor slab.
- Alternatively, the proposed building can be supported on a raft foundation provided that a ground improvement program utilizing rigid inclusions is implemented.
- A permanent perimeter and floor subdrain system should not be installed. The subdrain systems could cause groundwater drawdown and potential settlement of nearby buildings and infrastructure. Alternatively, the underground level floor slab should be designed and constructed to withstand hydrostatic uplift forces and ensure watertightness.
- A layer of peat was encountered in boreholes MW1 and BH13, extending to depths of 2.2 m to 4.8 m below grade, as well as in the historical boreholes referenced in Section 3.4. The peat should either be removed from the Site, or a passive ventilation system must be installed to mitigate against the potential risk of the accumulation of methane gas.
- Further geotechnical investigation will be required during the detailed design phase of the project to confirm the suitability of the current preliminary recommendations.

Additional geotechnical comments, discussion, and recommendations are provided in the following sections with respect to the design and construction of the planned scope of the project.

7.3 SITE PREPARATION

7.3.1 Demolition and Decommissioning

It is anticipated that the demolition and decommissioning components of the proposed re-development will include removal of the existing building including its foundations and floor slab, asphalt pavement, landscaping, concrete curbs, and sidewalks. All these materials should be removed to an approved off-site location.

It is also anticipated that decommissioning and removal/relocation of some buried services may also be required.

Localized excavations created through the demolition and decommissioning process should be backfilled with approved, compacted engineered fill. Material for this purpose can consist of approved portions of the existing fill materials or imported material meeting the requirements of OPSS Granular B (Type I or II).

Subsequent to inspection and approval by experienced geotechnical personnel of the base of all sub-excavations, approved backfill should be placed in 200 mm thick loose lifts. Each lift should be uniformly compacted to achieve a minimum of 98% of the material's Standard Proctor Maximum Dry Density (SPMDD).

7.4 FOUNDATIONS

7.4.1 Overview

It is understood that an eight-storey building with one level underground is being considered for the Site.

Deep foundations, such as pipe piles driven to refusal or drilled concrete piles (caissons), can be used to support the proposed building structure. These should be founded into the underlying very dense gravelly sand, silty sand, or sandy silt soils encountered at depths of approximately 10.7 m to 12.0 m. Further geotechnical investigation will be required to confirm the conditions and extent of the very dense soils for bearing the deep foundations. A structural slab supported on the deep foundations will be required for the underground level floor slab.

Alternatively, ground improvement using rigid inclusions may be considered to support a raft foundation. The rigid inclusions can consist of Concrete Modulus Columns (CMCs) or similarly Geopier Concrete Columns (GCCs), extending to or near the underlying dense to very dense soils. The ground improvement should be designed and constructed by a specialty contractor.

7.4.2 Driven Piles

Various pile types and sizes may be considered for the Site. Selection of pile type and size should consider design loads, soil resistance, material availability, and local experience. It is noted that pile driving will cause vibration that may impact nearby existing structures.

The piles should be driven to refusal into the very dense soils encountered at depths ranging from 10.7 m to 12.0 m below grade in some of the boreholes. Based on this, the pile founding depths are estimated to be 12 m below the existing grade or deeper. Further investigation will be required to confirm the conditions and extent of the very dense soils.

For preliminary design consideration, Table 6.1 provides values for factored geotechnical resistance at Ultimate Limit States (ULS) and geotechnical reaction at Serviceability Limit States (SLS) for a few pipe pile sizes.

Dynamic pile analysis (PDA) testing should be carried out to confirm the capacities.

Table 7.1: Axial Geotechnical Resistance of Pipe Piles

Pipe Pile Diameter (mm)	Wall Thickness (mm)	Factored Geotechnical Resistance at ULS (kN)	Geotechnical Reaction at SLS (kN)
219.1	8.2	475	400
273.1	12.7	925	775
323.9	12.7	1100	900

The above ULS values include a geotechnical resistance of 0.4. The SLS values have been estimated for a total settlement of up to 25 mm.

A minimum center to center spacing of 3 times pile diameter will be required.

7.4.3 Caissons

Casson foundations can be used to support the proposed structure. For this purpose, the caisson should be founded in the underlying very dense sandy silt to silty sand with gravel soils at a minimum depth of 13.0 m below the existing grade.

For preliminary design purposes a factored geotechnical resistance of 1600 kPa at ULS and a geotechnical reaction of 1200 kPa at SLS can be considered.

The above ULS value includes a geotechnical resistance of 0.4. The SLS value has been estimated for a total settlement of 25 mm (typical differential settlement of 19 mm would apply).

Caissons should have a minimum diameter of 760 mm. The recommended minimum centre-to-centre spacing between the caissons should be at least three times the diameter.

Given the presence of the loose/soft fill/soils and groundwater table, the use of temporary liners will be required to facilitate installation of the caissons, and to prevent caving or infiltration of groundwater into the open holes. Subject to the groundwater conditions encountered, the use of compensating drilling mud may also be required to facilitate the installation of the caissons.

The caisson rig will require stable ground for operation, as the base of the underground level will consist of very loose silty sand fill or soft clay soils. Therefore, a temporary granular working platform will be required.

7.4.4 Structural Slab

The structural slab must be securely tied and sealed to the pile caps and the building's perimeter permanent wall to ensure watertightness. They must be designed to support the floor load and resist uplift forces caused by the hydrostatic pressure of the groundwater.

The use of a permanent perimeter and floor subdrain system may lead to groundwater drawdown and potential ground subsidence impacting nearby structures; therefore, it is not recommended. As noted, the

structural slab and buried portions of the structure should be designed and constructed to be watertight and resistant hydrostatic uplift pressure.

7.5 EXCAVATIONS

The use of a watertight temporary shoring is anticipated to be required to facilitate the construction of the underground floor level and mitigate against groundwater drawdown and subsidence beyond the limits of the excavation. However, for reference the following comments are provided for unsupported excavations.

Temporary excavations must be carried out in accordance with the latest edition of the Occupational Health and Safety Act (OHSA) & Regulations.

The existing fill materials above groundwater level should be classified as Type 3 soils. The maximum excavation side slope for a Type 3 soil is 1:1 (Horizontal: Vertical) from the base of the excavation in accordance with the OHSA regulation.

The very loose fill materials, peat, and native soft to stiff silt, silty clay, clay, and clay with sand soils below the groundwater level should be classified as Type 4 soils. The maximum excavation side slope for a Type 4 soil is 3:1 (Horizontal: Vertical) from the base of the excavation in accordance with the OHSA regulation.

Excavation side slopes 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, the side slopes should be flattened as required to maintain safe working conditions.

If space is restricted such that the side slopes cannot be safely cut back in accordance with the OHSA Regulation, or sloughing and cave-in are encountered in the excavations, the slopes should be flattened to achieve a stable configuration, or temporary shoring must be provided. To prevent overstressing of the shoring structure, the excavated spoil should be placed away from the edge of the excavation at least at a distance equal to the depth of the excavation.

The groundwater level was recorded in the monitoring wells at depths ranging from 1.4 m to 2.9 m below grade on November 5, 2024. The potential presence of perched water within the fill materials should be anticipated. Based on the subsurface conditions at the Site (i.e., silty sand fill overlying peat, followed by silt, clay, and clay with sand), the seepage and infiltration rate into excavations up to approximately 4.0 m below grade (for the construction of one underground level) is expected to range from moderate to high. It is recommended that a hydrogeological assessment be conducted to evaluate the seepage rate and determine whether the use of sumps and floating pumps will be sufficient. The use of a watertight shoring system will reduce the rate.

The above comments are provided for reference. The Contractor is solely responsible for the design and implementation of any required dewatering, including requirements for withdrawal, handling, treatment, and discharge.

Dewatering may be required if deeper and larger excavations are required for the proposed construction. Consistent with the current MECP regulations, an Environmental Activity and Sector Registry (EASR) is required for dewatering over 50,000 L/day and a Permit to Take Water (PTTW) is required for dewatering in excess of 400,000 L/day.

7.6 SHORING

It is anticipated that temporary construction shoring will be required to facilitate construction of the proposed scope of development. Excavation adjacent to and in proximity to the existing culverts, private roads, buildings, and underground services would require particular care and attention.

The temporary shoring system should be designed in accordance with the methods described in the Canadian Foundation Engineering Manual, 2023 Edition (CFEM).

The design of the shoring system should be carried out by a professional engineer specialized in shoring design.

The selection and design of the shoring system must, in part, consider whether deflection of the supported soils is permitted (i.e. whether structures or infrastructure sensitive to deformation are present within the zone of influence of the planned excavation), whether penetration below the prevailing groundwater table or groundwater infiltration is an issue, and related structural and serviceability requirements, in addition to economic considerations.

It is recommended that the shoring system be watertight (e.g. secant caisson walls) to reduce the seepage rate and mitigate the potential for settlement beyond the Site.

The soil unit weight and lateral earth pressure design parameters provided in Table 7.2 can be used for design of temporary shoring. It is recommended that effective parameters be used in the lateral load calculation as a more conservative approach than the use of undrained parameters.

Table 7.2: Lateral Earth Pressure Parameters

Parameters	Existing Fill	Peat	Clay to Clay with Sand	Sandy Silt to Silty Sand with Gravel
Soil Unit Weight (kN/m^3)	20	18	20	21
Effective Angle of Internal Friction (degrees)	28	24	26	32
Undrained Shear Strength, Su, (kPa)	N/A	N/A	25	N/A
Coefficient of Active Earth Pressure, k_a	0.36	0.42	0.39	0.31
Coefficient of Passive Earth Pressure, k_p	2.77	N/A	2.56	3.25
Coefficient of Earth Pressure at Rest, k_o	0.53	0.59	0.56	0.47

The coefficient of at rest earth pressure varies with depth and construction methods and should be evaluated with guidance from experienced geotechnical personnel once the design is finalized.

The groundwater can be taken as 1.4 m below grade consistent with the shallowest level recorded in the monitoring wells installed at the Site.

The design of the shoring system should consider any surcharges or loads from machinery, road embankments or stockpiled materials that may be present within the zone of influence of the shoring/excavations.

7.7 CONSTRAINTS DUE TO NATURAL ENVIRONMENT

7.7.1 Frost Consideration

The Ontario Building Code and the guidelines in the Canadian Foundation Engineering Manual require any exterior foundations and foundations in unheated areas exposed to freezing temperatures be provided with adequate protection against frost. Based on OPSD 3090.101, Foundation Frost Depths for Southern Ontario, the depth of frost penetration for the Site area is approximately 1.5 m. Foundations and pile-caps should therefore be protected from frost action by a minimum soil cover of 1.5 m or be provided with equivalent protection using manufactured insulation.

Where adequate earth cover for frost protection cannot be provided, the use of rigid insulation can be considered. As a general guideline, 25 mm of rigid insulation may be assumed to provide approximately 300 mm of equivalent soil cover.

7.7.2 Seismic Conditions

The seismic site class determination is based on the soil conditions in the upper 30 m of the stratigraphy as encountered in the boreholes for the geotechnical investigation. The investigation depth was up to 12.8 m deep and terminated in the compact to very dense sandy silt to silty sand with gravel soils. For the purposes of this report, the harmonic weighted average N-value method has been used to assess the Seismic Site Classification for this project location, consistent with the second of three methods stated in the National Building Code (2020).

Based on the stratigraphy and observed N-values in the boreholes, as well as the assumption that soil stiffness remains the same with depth, a Seismic Site Class “E” can be used, in accordance with Ontario Building Code (2012).

To confirm or potentially improve the seismic site classification to 'D,' it is recommended to conduct a geophysical survey (e.g., MASW or downhole seismic survey) to measure the average shear wave velocity within 30 m below the founding depth.

8.0 CLOSURE

Use of this report is subject to the Statement of General Conditions provided in **Appendix A**. It is the responsibility of Township of Uxbridge who is identified as “the Client” within the Statement of General Conditions, and its agents to review the conditions and to notify Stantec Consulting Ltd. should any of these not be satisfied. The Statement of General Conditions addresses the following:

- Use of the report;
- Basis of the report;
- Standard of care;
- Interpretation of site conditions;
- Varying or unexpected site conditions; and,
- Planning, design, or construction.

Respectfully Submitted,

STANTEC CONSULTING LTD.

APPENDIX A

A.1 STATEMENT OF GENERAL CONDITIONS

Stantec

STATEMENT OF GENERAL CONDITIONS

USE OF THIS REPORT: This professional work product ("hereinafter referred to as the Report") has been prepared for the sole benefit of the Client in accordance with Stantec's contract with the Client. While the Report may be provided by the Client to applicable authorities having jurisdiction and to other third parties in connection with the project, Stantec disclaims any legal duty based upon warranty, reliance, or any other theory to any third party, and will not be liable to such third party for any damages or losses of any kind that may result.

BASIS OF THIS REPORT: This Report relates solely to the site-specific project for which Stantec was retained and the stated purpose for which the Report was prepared. The information, opinions, conclusions and/or recommendations made in this Report are in accordance with Stantec'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 the scope of work was conducted and do not take into account any subsequent changes. 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 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. This Report is not to be used or relied on for any variation or extension of the project, or for any other project or purpose or site, and any unauthorized use or reliance is at the recipient's own risk.

STANDARD OF CARE: 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.

PROVIDED INFORMATION: Stantec has assumed all information received from the Client and third parties in the preparation of this Report to be correct. While Stantec has exercised a customary level of judgment or due diligence in the use of such information, Stantec assumes no responsibility for the consequences of any error or omission contained therein.

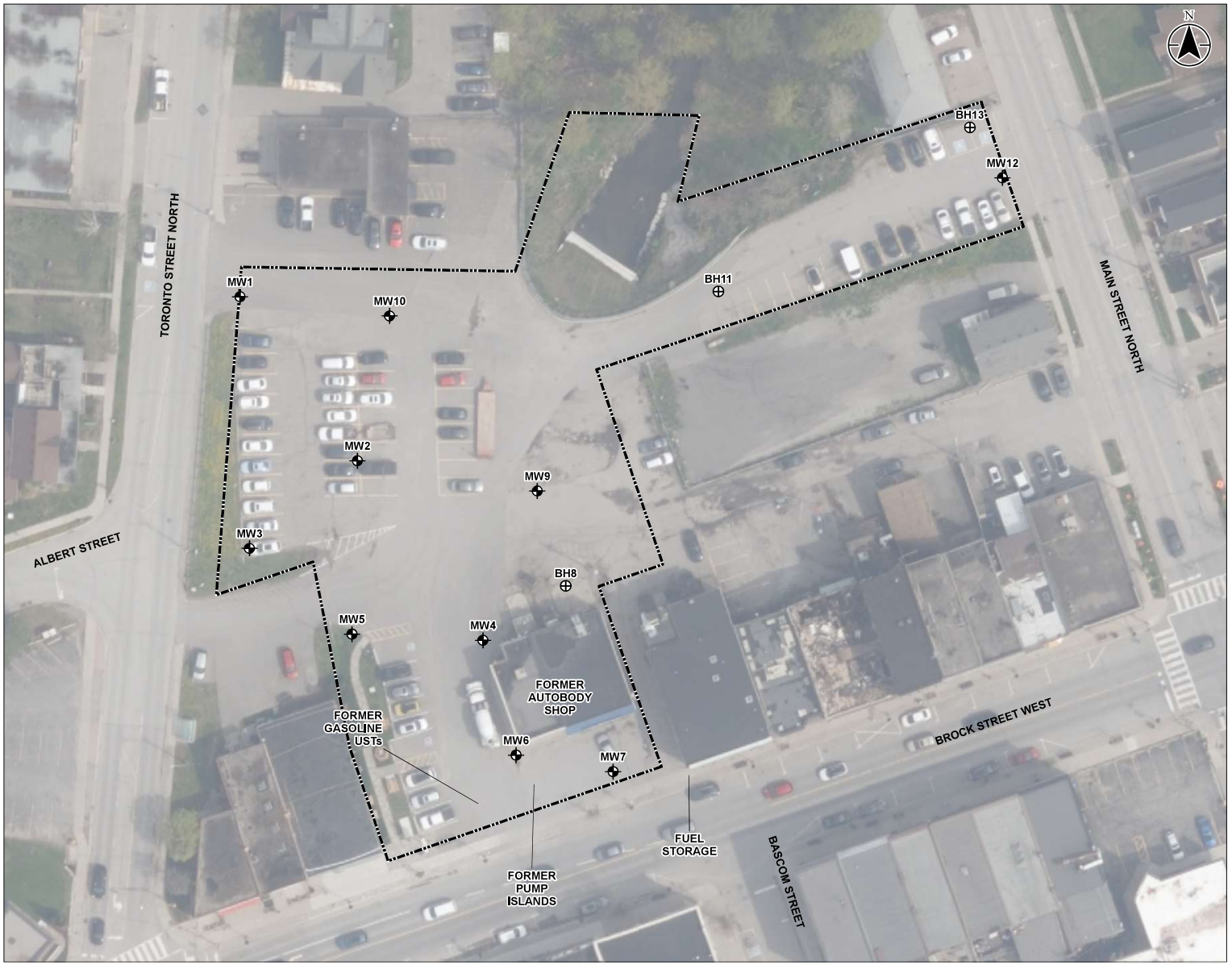
INTERPRETATION OF SITE CONDITIONS: Soil, rock, or other material descriptions, and statements regarding their condition, made in this Report are based on site conditions encountered by Stantec at the time of the scope of work and at the specific testing and/or sampling locations. Classifications and 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 behaviour. 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.

VARYING OR UNEXPECTED CONDITIONS: Should any site or subsurface conditions be encountered that are different from those described in this Report or encountered at the test and/or sample locations, Stantec 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 will not be responsible to any party for damages incurred as a result of failing to notify Stantec that differing site or subsurface conditions are present upon becoming aware of such conditions.

PLANNING, DESIGN, OR CONSTRUCTION: Development or design plans and specifications should be reviewed by Stantec geotechnical engineers, sufficiently ahead of initiating the next project stage (e.g., 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 (e.g., field observations and testing) during construction are a necessary part of the evaluation of subsurface conditions and site work. Site work relating to the recommendations included in this Report should only be carried out in the presence of a qualified geotechnical engineer; Stantec cannot be responsible for site work carried out without being present.

APPENDIX B

B.1 DRAWINGS



Stantec

Legend

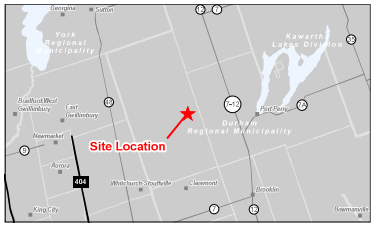
- Approximate Borehole Location (Stantec, 2024)
- Approximate Monitoring Well Location (Stantec, 2024)
- Approximate Site Boundary

0 20 40 metres

1:600 (At original document size of 11x17)

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources © King's Printer for Ontario, 2024.
3. Orthoimagery © First Base Solutions, 2024, Imagery Date, 2023.
4. Site features are based on field observations and should be considered approximate.
5. This figure is to be viewed in the context of the accompanying report and is subject to the limitations specified in that report.



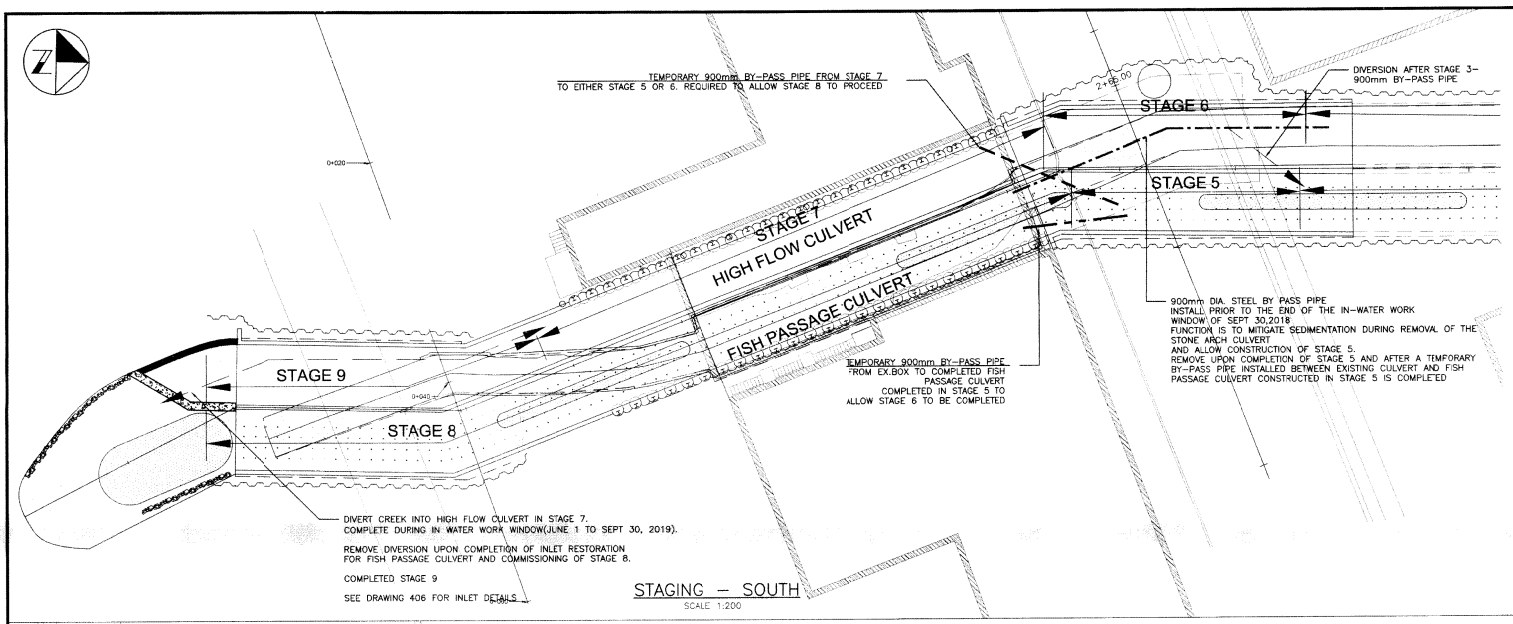
Project Location
23 Brock Street West,
Uxbridge, Ontario

122140392
Prepared by svandamme on 2024-12-20

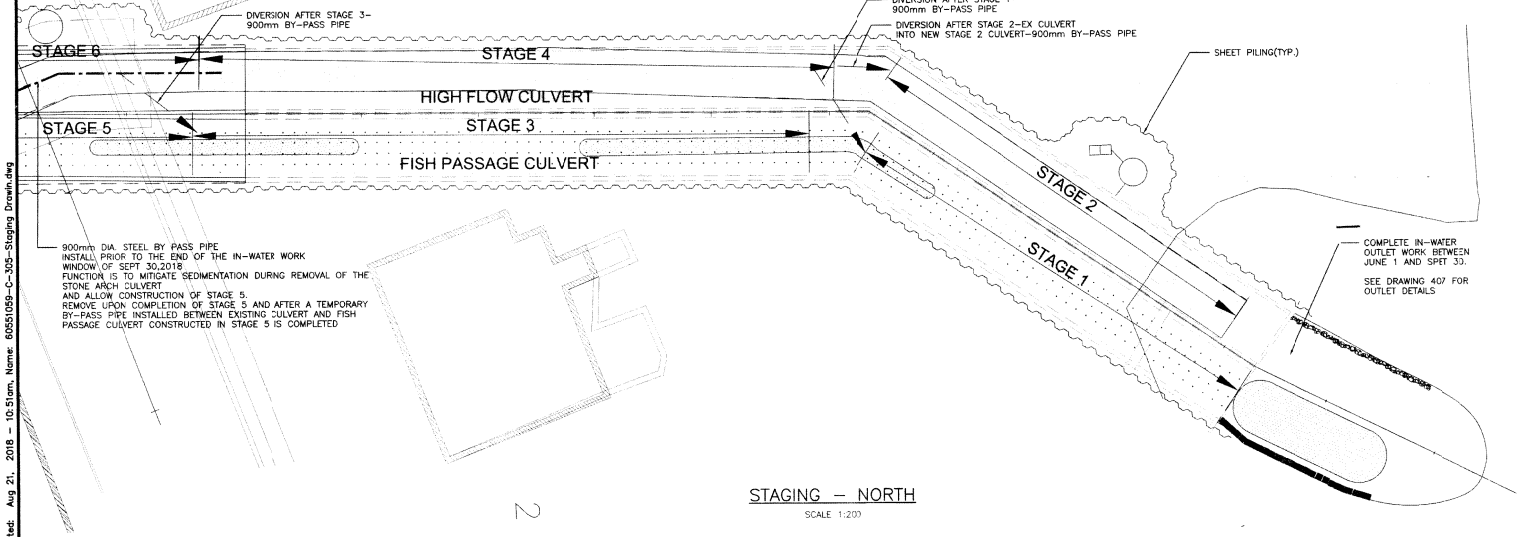
Client/Project
TOWNSHIP OF UXBRIDGE
Preliminary Geotechnical Investigation
23 BROCK STREET WEST, UXBRIDGE, ONTARIO

Figure No.
1

Title
Site Plan



STAGING – SOUTH
SCALE 1:200



STAGING – NORTH
SCALE 1:200

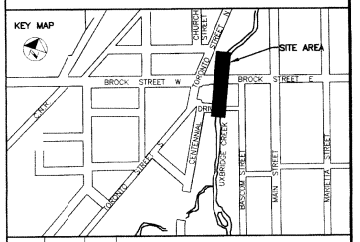
NOTES:

THE STAGING SHOWN ON THE PLAN IS CONCEPTUAL ONLY AND THE CONTRACTOR MAY COMPLETE THE STAGING IN A DIFFEREVT ORDER SUBJECT TO APPROVAL OF THE CONTRACT ADMINISITRATOR. THE CONTRACTOR IS TO PREPARE AND SUBMIT A STAGING PLAN FOR THE APPROVAL OF THE CONTRACT ADMINISITRATOR.

LEGEND:

- DIVERSION OF WATER
- CONSTRUCTION OF CULVERT
- TEMPORARY BY-PASS PIPE
- TEMPORARY BY-PASS PIPE
- TEMPORARY BY-PASS PIPE

KEY MAP



NO.	DATE	NAME	REVISIONS
1	AUG/21/18	P.M.	ISSUED FOR CONSTRUCTION

AECOM

AECOM Canada Ltd.
300 Water Street, Whitby, Ontario, Canada L1N 9J2
T 905.668.3063 F 905.668.8221

UTILITIES VERIFIED REGION OF DURHAM – OCT. 30 2017

BELL – JUNE 28 2017
COGECO – JUNE 07 2017
ENBRIDGE – JUNE 12 2017
GROUP TELECOM – JUNE 08 2017
HYDRO ONE – JUNE 12 2017
ROGERS CABLE – JUNE 22 2017
TELUS – JUNE 09 2017
VERIDIAN – JUNE 07 2017
ZAYO – JUNE 20 2017
TZU – OCT. 2017

CONTRACTOR TO BE RESPONSIBLE FOR LOCATION OF ALL EXISTING U/G & OVERHEAD UTILITIES. VARIOUS UTILITIES REQUIRE ADVANCE NOTICE PRIOR TO DIGGING, FOR STAKE OUT.
THE REGION ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.

SURVEY DATA DATE: SEPT. 2017
SCALE

DRAWN:	A.LAN	DATE: MAY 2018
DESIGN:	J.TEEFY	DATE: MAY 2018
CHECKED:	J.TEEFY	DATE: MAY 2018
APPROVED:	P.MIDDAUGH	DATE: MAY 2018

THE TOWNSHIP OF UXBRIDGE

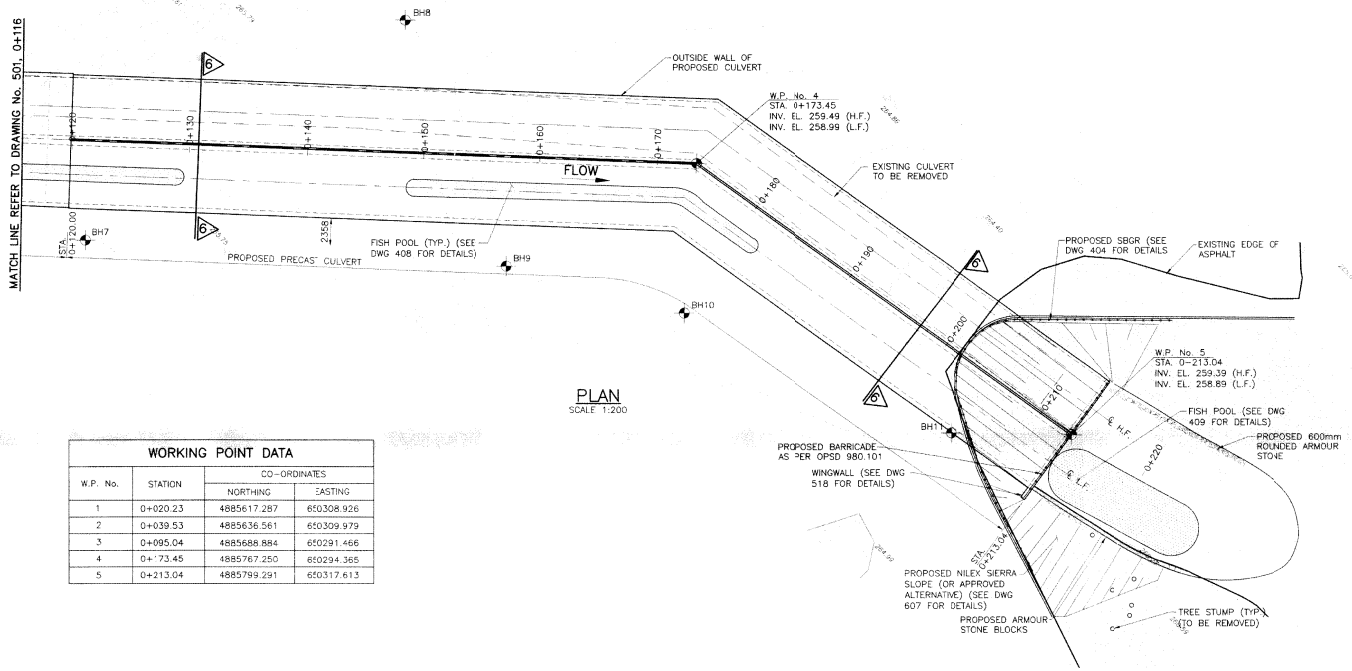
BROCK STREET CULVERT REPLACEMENT

CONCEPTUAL STAGING DRAWING

CONCESSION	REG. RD. NO.	AREA MUNICIPALITY
–	–	UXBRIDGE

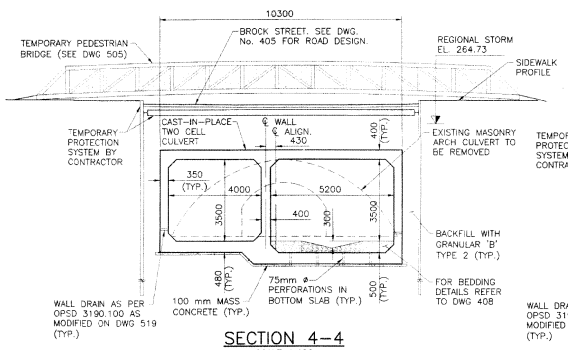
DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
305	U18-08	12

Plotted: Aug 21, 2018 – 10:51am, Name: 60551059-C-305-Staging Drawin.dwg

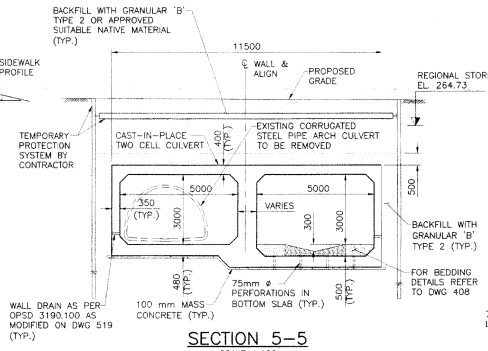


PLAN
SCALE 1:200

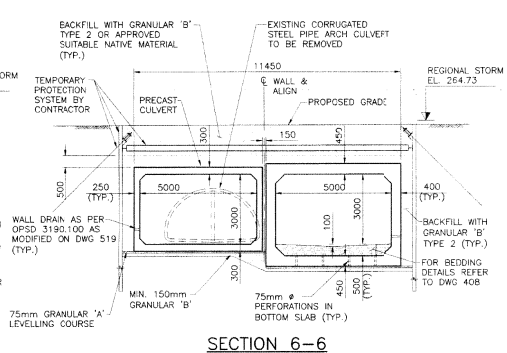
WORKING POINT DATA			
W.P. No.	STATION	CO-ORDINATES	
		NORTHING	EASTING
1	0+020.23	4885617.287	650308.926
2	0+039.53	4885636.561	650309.979
3	0+095.04	4885688.884	650291.466
4	0+173.45	4885767.250	650294.365
5	0+213.04	4885799.291	650317.613



SECTION 4–4
SCALE 1:100
CAST-IN-PLACE CULVERT
(SEE DWGS 506-508 FOR DETAILS)

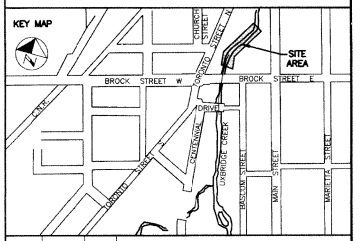


SECTION 5–5
SCALE 1:100
CAST-IN-PLACE CULVERT
(SEE DWGS 506-508 FOR DETAILS)



SECTION 6–6
SCALE 1:100
PRECAST CULVERT
(SEE DWG 504 FOR DETAILS)

NOTES:
1. DRAWING TO BE READ IN CONJUNCTION WITH DWG 501.
2. REFER TO DWG. 101 FOR GENERAL NOTES
3. SEE DRAWINGS 403 AND 404 FOR DRAIN OPENING LOCATIONS AND SIZES



NO.	DATE	NAME	REVISIONS
1	AUG/21/18	P.M.	ISSUED FOR CONSTRUCTION

AECOM
AECOM Canada Ltd.
300 Water Street, Whitby, Ontario, Canada L1N 9J2
T905.668.9383 F905.668.0221

UTILITIES VERIFIED REGION OF DURHAM – OCT. 30 2017

BELL – JUNE 28 2017	ROGERS CABLE – JUNE 22 2017
COGECO – JUNE 07 2017	TELUS – JUNE 09 2017
ENBRIDGE – JUNE 12 2017	VERIDIAN – JUNE 07 2017
GROUP TELECOM – JUNE 08 2017	ZAYO – JUNE 20 2017
HYDRO ONE – JUNE 12 2017	T2U – OCT. 2017

CONTRACTOR TO BE RESPONSIBLE FOR LOCATION OF ALL EXISTING U/G & OVERHEAD UTILITIES. VARIOUS UTILITIES REQUIRE ADVANCE NOTICE PRIOR TO DIGGING, FOR STAKE OUT.
THE REGION ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.

LICENSED PROFESSIONAL ENGINEER J.A. WALLACE 100075989 PROVINCE OF ONTARIO
LICENSED PROFESSIONAL ENGINEER T.N. SUN 100132013 PROVINCE OF ONTARIO

SURVEY DATA DATE: SEPT. 2017
SCALE:

DRAWN:	K. KANAGASABAI	DATE: JULY 2018
DESIGN:	T. SUN	DATE: JULY 2018
CHECKED:	J. WALLACE	DATE: JULY 2018
APPROVED:	J. WALLACE	DATE: JULY 2018

THE TOWNSHIP OF UXBRIDGE

BROCK STREET CULVERT REPLACEMENT

GENERAL ARRANGEMENT – NORTH STA. 0+116 TO 0+213.20

CONCESSION	REG. RD. NO.	AREA MUNICIPALITY
–	–	UXBRIDGE

DRAWING NUMBER	CONTRACT NUMBER	SHEET NUMBER
502	U18-08	26

Plotted: Aug 21, 2018 – 10:04am, Name: 60551059-S-501-502.dwg

APPENDIX C

C.1 SYMBOLS AND TERMS USED ON BOREHOLE RECORDS

C.2 BOREHOLE LOGS

SYMBOLS AND TERMS USED ON BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Terminology describing common soil genesis:

Rootmat	- vegetation, roots and moss with organic matter and topsoil typically forming a mattress at the ground surface
Topsoil	- mixture of soil and humus capable of supporting vegetative growth
Peat	- mixture of visible and invisible fragments of decayed organic matter
Till	- unstratified glacial deposit which may range from clay to boulders
Fill	- material below the surface identified as placed by humans (excluding buried services)

Terminology describing soil structure:

Desiccated	- having visible signs of weathering by oxidization of clay minerals, shrinkage cracks, etc.
Fissured	- having cracks, and hence a blocky structure
Varved	- composed of regular alternating layers of silt and clay
Stratified	- composed of alternating successions of different soil types, e.g. silt and sand
Layer	- > 75 mm in thickness
Seam	- 2 mm to 75 mm in thickness
Parting	- < 2 mm in thickness

Terminology describing soil types:
The classification of soil types are made on the basis of grain size and plasticity in accordance with the Unified Soil Classification System (USCS) (ASTM D 2487 or D 2488) which excludes particles larger than 75 mm. For particles larger than 75 mm, and for defining percent clay fraction in hydrometer results, definitions proposed by Canadian Foundation Engineering Manual, 4th Edition are used. The USCS provides a group symbol (e.g. SM) and group name (e.g. silty sand) for identification.

Terminology describing cobbles, boulders, and non-matrix materials (organic matter or debris):
Terminology describing materials outside the USCS, (e.g. particles larger than 75 mm, visible organic matter, and construction debris) is based upon the proportion of these materials present:

Trace, or occasional	Less than 10%
Some	10-20%
Frequent	> 20%

Terminology describing compactness of cohesionless soils:
The standard terminology to describe cohesionless soils includes compactness (formerly "relative density"), as determined by the Standard Penetration Test (SPT) N-Value - also known as N-Index. The SPT N-Value is described further on page 3. A relationship between compactness condition and N-Value is shown in the following table.

Compactness Condition	SPT N-Value
Very Loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very Dense	>50

Terminology describing consistency of cohesive soils:
The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by *in situ* vane tests, penetrometer tests, or unconfined compression tests. Consistency may be crudely estimated from SPT N-Value based on the correlation shown in the following table (Terzaghi and Peck, 1967). The correlation to SPT N-Value is used with caution as it is only very approximate.

Consistency	Undrained Shear Strength		Approximate SPT N-Value
	kips/sq.ft.	kPa	
Very Soft	<0.25	<12.5	<2
Soft	0.25 - 0.5	12.5 - 25	2-4
Firm	0.5 - 1.0	25 - 50	4-8
Stiff	1.0 - 2.0	50 – 100	8-15
Very Stiff	2.0 - 4.0	100 - 200	15-30
Hard	>4.0	>200	>30

ROCK DESCRIPTION

Except where specified below, terminology for describing rock is as defined by the International Society for Rock Mechanics (ISRM) 2007 publication "The Complete ISRM Suggested Methods for Rock Characterization, Testing and Monitoring: 1974-2006"

Terminology describing rock quality:

RQD	Rock Mass Quality
0-25	*Very Poor Quality*
25-50	*Poor Quality*
50-75	*Fair Quality*
75-90	*Good Quality*
90-100	*Excellent Quality*

Alternate (Colloquial) Rock Mass Quality	
Very Severely Fractured	*Crushed*
Severely Fractured	*Shattered or Very Blocky*
Fractured	*Blocky*
Moderately Jointed	*Sound*
Intact	*Very Sound*

RQD (Rock Quality Designation) denotes the percentage of intact and sound rock retrieved from a borehole of any orientation. All pieces of intact and sound rock core equal to or greater than 100 mm (4 in.) long are summed and divided by the total length of the core run. RQD is determined in accordance with ASTM D6032.

SCR (Solid Core Recovery) denotes the percentage of solid core (cylindrical) retrieved from a borehole of any orientation. All pieces of solid (cylindrical) core are summed and divided by the total length of the core run (It excludes all portions of core pieces that are not fully cylindrical as well as crushed or rubble zones).

Fracture Index (FI) is defined as the number of naturally occurring fractures within a given length of core. The Fracture Index is reported as a simple count of natural occurring fractures.

Terminology describing rock with respect to discontinuity and bedding spacing:

Spacing (mm)	Discontinuities	Bedding
>6000	*Extremely Wide*	-
2000-6000	*Very Wide*	*Very Thick*
600-2000	*Wide*	*Thick*
200-600	*Moderate*	*Medium*
60-200	*Close*	*Thin*
20-60	*Very Close*	*Very Thin*
<20	*Extremely Close*	*Laminated*
<6	-	*Thinly Laminated*

Terminology describing rock strength:

Strength Classification	Grade	Unconfined Compressive Strength (MPa)
Extremely Weak	R0	<1
Very Weak	R1	1 – 5
Weak	R2	5 – 25
Medium Strong	R3	25 – 50
Strong	R4	50 – 100
Very Strong	R5	100 – 250
Extremely Strong	R6	>250

Terminology describing rock weathering:

Term	Symbol	Description
Fresh	W1	No visible signs of rock weathering. Slight discoloration along major discontinuities
Slightly	W2	Discoloration indicates weathering of rock on discontinuity surfaces. All the rock material may be discolored.
Moderately	W3	Less than half the rock is decomposed and/or disintegrated into soil.
Highly	W4	More than half the rock is decomposed and/or disintegrated into soil.
Completely	W5	All the rock material is decomposed and/or disintegrated into soil. The original mass structure is still largely intact.
Residual Soil	W6	All the rock converted to soil. Structure and fabric destroyed.

STRATA PLOT

Strata plots symbolize the soil or bedrock description. They are combinations of the following basic symbols. The dimensions within the strata symbols are not indicative of the particle size, layer thickness, etc.

Boulders Cobbles Gravel | Sand | Silt | Clay | Organics | Asphalt | Concrete | Fill | Igneous Bedrock | Meta-morphic Bedrock | Sedi-mentary Bedrock

SAMPLE TYPE

SS	Split spoon sample (obtained by performing the Standard Penetration Test)
ST	Shelby tube or thin wall tube
DP	Direct-Push sample (small diameter tube sampler hydraulically advanced)
PS	Piston sample
BS	Bulk sample
HQ, NQ, BQ, etc.	Rock core samples obtained with the use of standard size diamond coring bits.

WATER LEVEL MEASUREMENT

measured in standpipe, piezometer, or well

inferred

RECOVERY

For soil samples, the recovery is recorded as the length of the soil sample recovered. For rock core, recovery is defined as the total cumulative length of all core recovered in the core barrel divided by the length drilled and is recorded as a percentage on a per run basis.

N-VALUE

Numbers in this column are the field results of the Standard Penetration Test: the number of blows of a 140 pound (63.5 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (300 mm) into the soil. In accordance with ASTM D1586, the N-Value equals the sum of the number of blows (N) required to drive the sampler over the interval of 6 to 18 in. (150 to 450 mm). However, when a 24 in. (610 mm) sampler is used, the number of blows (N) required to drive the sampler over the interval of 12 to 24 in. (300 to 610 mm) may be reported if this value is lower. For split spoon samples where insufficient penetration was achieved and N-Values cannot be presented, the number of blows are reported over sampler penetration in millimetres (e.g. 50/75). Some design methods make use of N-values corrected for various factors such as overburden pressure, energy ratio, borehole diameter, etc. No corrections have been applied to the N-values presented on the log.

DYNAMIC CONE PENETRATION TEST (DCPT)

Dynamic cone penetration tests are performed using a standard 60 degree apex cone connected to 'A' size drill rods with the same standard fall height and weight as the Standard Penetration Test. The DCPT value is the number of blows of the hammer required to drive the cone one foot (300 mm) into the soil. The DCPT is used as a probe to assess soil variability.

OTHER TESTS

S	Sieve analysis
H	Hydrometer analysis
k	Laboratory permeability
γ	Unit weight
G_s	Specific gravity of soil particles
CD	Consolidated drained triaxial
CU	Consolidated undrained triaxial with pore pressure measurements
UU	Unconsolidated undrained triaxial
DS	Direct Shear
C	Consolidation
Q_u	Unconfined compression
I_p	Point Load Index (I_p on Borehole Record equals $I_p(50)$ in which the index is corrected to a reference diameter of 50 mm)

	Single packer permeability test; test interval from depth shown to bottom of borehole
	Double packer permeability test; test interval as indicated
	Falling head permeability test using casing
	Falling head permeability test using well point or piezometer

Stantec

BOREHOLE RECORD

N: 4 885 766 E: 650 282

MW1

CLIENT Township of Uxbridge PROJECT No. 122140392

LOCATION 23 Brock Street, Uxbridge, ON DATUM Geodatic

DATES: BORING October 29, 2024 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
0	267.0	**Ground Surface**			0				
		75 mm ASPHALT							
		Brown, silty sand (FILL) - trace to some gravel			1	SS	1	150/610	21
					2				
1					3	SS	2	200/610	17
					4				
					5				
2					6	SS	3	180/610	11
	264.8				7				
		Soft, dark brown, Peat - moist			8	SS	4	100/610	5
				▼	9				
3	263.9				10				
		Very soft to soft, grey, CLAY (CL) - moist			11	SS	5	610/610	3
					12				
4					13	SS	6	610/610	1
					14				
					15				
5					16	SS	7	610/610	1
					17				
					18	VANE			
					19				
6					20				
					21	SS	8	610/610	0
					22				
7					23				
					24				
		- wet below 7.6 m			25				
8					26	SS	9	610/610	0
					27				
					28	SS	10	0.0/610	3
9	257.9				29				
		Very loose, grey, Sandy SILT (ML) - wet			30				
					31	SS	11	200/610	1
	257.2				32				
10		End of Borehole at 9.7 m below							

Continued Next Page

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

0 7 45 48

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 885 766 E: 650 282

MW1

CLIENT Township of Uxbridge PROJECT No. 122140392

LOCATION 23 Brock Street, Uxbridge, ON DATUM Geodatic

DATES: BORING October 29, 2024 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES: TYPE	SAMPLES: NUMBER	SAMPLES: RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES: N-VALUE OR RQD(%)
10	257.0	existing grade. Monitoring well installed with a screen installed from 5.3 m to 2.3 m Groundwater level measured at 2.9 m below grade on November 5, 2024.			33				
					34				
					35				
11					36				
					37				
					38				
					39				
12					40				
					41				
					42				
13					43				
					44				
					45				
14					46				
					47				
					48				
15					49				
					50				
					51				
16					52				
					53				
					54				
17					55				
					56				
					57				
18					58				
					59				
					60				
19					61				
					62				
					63				
20					64				
					65				

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 885 753 E: 650 265

MW2

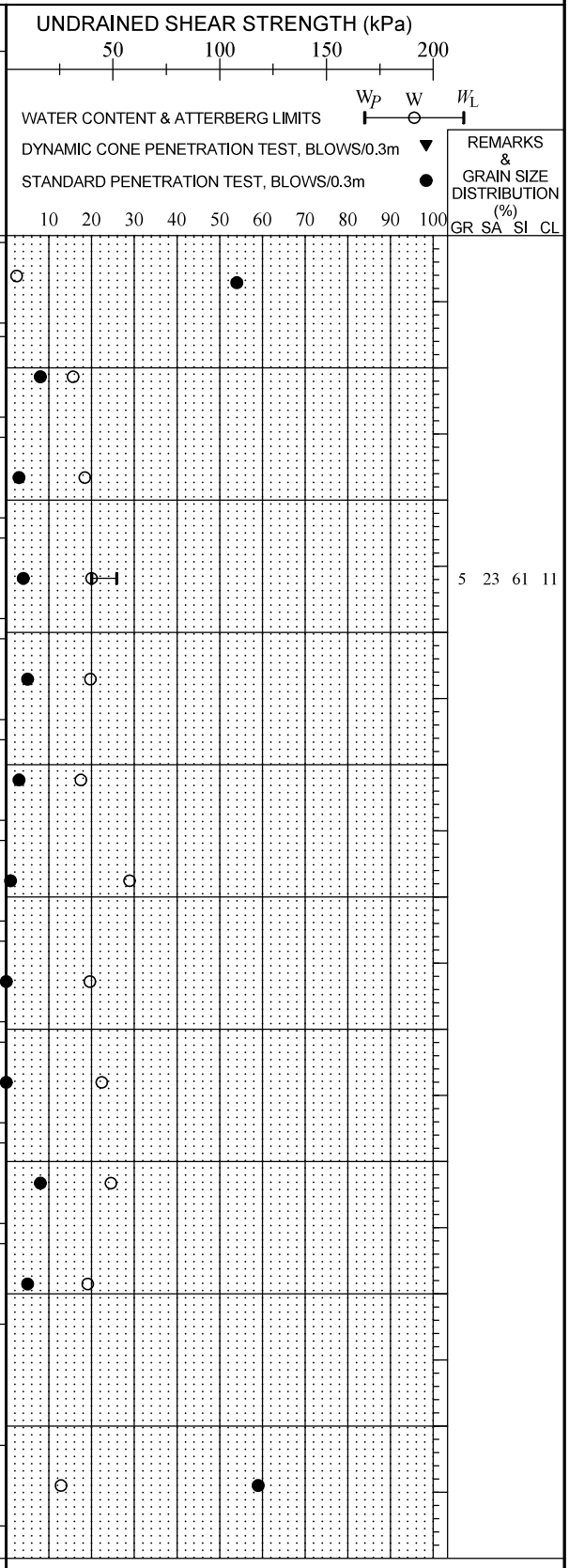
CLIENT Township of Uxbridge PROJECT No. 122140392

LOCATION 23 Brock Street, Uxbridge, ON DATUM Geodatic

DATES: BORING October 28, 2024 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
0	265.2	**Ground Surface**	0				
		50 mm ASPHALT					
		Brown, sand and gravel (FILL) - moist	1	SS	1	480/610	54
	264.5		2				
1		Dark brown to black, silty sand with gravel (FILL) - trace to some clay - moist	3	SS	2	76/610	8
			4				
			5				
2			6	SS	3	280/610	3
	263.0		7				
		Brown to black, silty clay with sand (FILL) - trace gravel - moist	8	SS	4	76/610	4
			9				
3			10				
			11	SS	5	280/610	5
			12				
4		- trace rootlets in SS6 & SS7	13	SS	6	560/610	3
			14				
			15				
5			16	SS	7	610/610	1
			17				
		- wood fragment present in SS8	18	SS	8	430/610	0
			19				
6			20				
		- metal fragment present in SS9	21	SS	9	100/610	0
	258.4		22				
7		Firm to hard, grey, CLAY (CL) - trace to some sand - trace gravel - wet	23	SS	10	250/610	8
			24				
			25				
8			26	SS	11	280/610	5
	256.5		27				
			28				
9		Very dense, dark brown to grey, Silty SAND with Gravel (SM) - trace clay - moist to wet	29				
			30				
			31	SS	12	280/610	59
10			32				

Continued Next Page



□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 885 753 E: 650 265

MW2

CLIENT Township of Uxbridge PROJECT No. 122140392

LOCATION 23 Brock Street, Uxbridge, ON DATUM Geodatic

DATES: BORING October 28, 2024 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)	UNDRAINED SHEAR STRENGTH (kPa) 50 100 150 200 / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m / STANDARD PENETRATION TEST, BLOWS/0.3m	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10	**255.2**				33						
		Very dense, dark brown to grey, Silty SAND with Gravel (SM) *(continued)* - trace clay - moist to wet			34						
					35						
11					36	SS	13	610/610	59		30 49 17 4
					37						
					38						
					39	SS	14	610/610	55		
12	253.0				40						
		End of Borehole at 12.2 m below existing grade. Monitoring well installed with a screen installed from 6.1 m to 3.1 m Groundwater level measured at 1.4 m below grade on November 5, 2024.			41						
					42						
13					43						
					44						
					45						
14					46						
					47						
					48						
15					49						
					50						
					51						
16					52						
					53						
					54						
17					55						
					56						
					57						
18					58						
					59						
					60						
19					61						
					62						
					63						
					64						
20					65						

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 885 740 E: 650 281

MW3

CLIENT Township of Uxbridge — PROJECT No. 122140392

LOCATION 23 Brock Street, Uxbridge, ON — DATUM Geodatic

DATES: BORING October 31, 2024 — WATER LEVEL — TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
0	266.3	**Ground Surface**			0				
		75 mm ASPHALT							
		Brown to dark brown, silty sand (FILL) - trace to some gravel - occssional cobbles - moist to wet			1	SS	1	410/610	15
					2				
1					3	SS	2	280/610	10
					4				
					5				
2					6	SS	3	200/610	16
				▼	7				
					8	SS	4	51/610	22
					9				
3					10				
					11	SS	5	610/610	7
					12				
4					13	SS	6	430/610	1
	261.8				14				
		Firm to stiff, brown with orange staining, SILT (ML) - trace sand - moist			15				
5					16	SS	7	510/610	10
					17				
					18	SS	8	560/610	7
	260.3				19				
6		Very soft to firm, grey, CLAY (CL) - wet			20				
					21	SS	9	610/610	5
					22				
7					23				
					24				
		- trace rootlets in SS10			25				
8					26	SS	10	610/610	2
					27				
					28				
9					29				
					30				
					31	SS	11	610/610	6
10					32				

Continued Next Page

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

0 8 76 16

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 885 740 E: 650 281

MW3

CLIENT Township of Uxbridge PROJECT No. 122140392

LOCATION 23 Brock Street, Uxbridge, ON DATUM Geodatic

DATES: BORING October 31, 2024 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10	256.3				33					
	256.1	Very dense, grey, Sandy SILT (ML) - moist - rock fragments present			34					
	255.6				35	SS	12	51 51	50/51 mm	
11		End of Borehole at 10.7 m below existing grade. Monitoring well installed with a screen installed from 5.5 m to 2.5 m Groundwater level measured at 2.2 m below grade on November 5, 2024.			36 37 38 39					
12					40 41 42					
13					43 44 45					
14					46 47 48					
15					49 50 51					
16					52 53 54					
17					55 56 57					
18					58 59 60					
19					61 62 63					
20					64 65					

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 885 719 E: 650 320

MW5

CLIENT Township of Uxbridge — PROJECT No. 122140392

LOCATION 23 Brock Street, Uxbridge, ON — DATUM Geodatic

DATES: BORING November 4, 2024 — WATER LEVEL — TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
0	265.9	**Ground Surface**	0				
	265.7	150 mm TOPSOIL	1	SS	1	460/610	2
		Brown to dark brown, silty sand (FILL) - trace organics and rootlets - moist to wet - silty clay inclusions in SS2	3	SS	2	430/610	3
2			6	SS	3	430/610	2
			8	SS	4	610/610	2
4			11	SS	5	180/610	2
			13	SS	6	610/610	2
			16	SS	7	510/610	3
5	260.6		17				
		Firm to hard, grey/black, Silty CLAY with Sand (CL) - moist to wet	18	SS	8	560/610	7
6			21	SS	9	610/610	6
8	257.2		26	SS	10	610/610	13
		Dense, grey, Sandy SILT (ML) - trace gravel - moist - rock fragments present in ss11	31	SS	11	580/590	40
9	256.2		32				
10		End of Borehole at 9.7 m below					

Continued Next Page

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

0 28 40 32

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 885 719 E: 650 320

MW5

CLIENT Township of Uxbridge PROJECT No. 122140392

LOCATION 23 Brock Street, Uxbridge, ON DATUM Geodatic

DATES: BORING November 4, 2024 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES: TYPE	SAMPLES: NUMBER	SAMPLES: RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES: N-VALUE OR RQD(%)
10	255.9				33				
		existing grade.			34				
		Monitoring well installed with a screen installed from 4.6 m to 1.6 m			35				
11					36				
		Groundwater level measured at 2.2 m below grade on November 5, 2024.			37				
					38				
12					39				
					40				
					41				
13					42				
					43				
					44				
14					45				
					46				
					47				
15					48				
					49				
					50				
					51				
16					52				
					53				
					54				
					55				
17					56				
					57				
					58				
18					59				
					60				
					61				
19					62				
					63				
					64				
					65				
20									

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 885 761 E: 650 309

MW7

CLIENT Township of Uxbridge — PROJECT No. 122140392

LOCATION 23 Brock Street, Uxbridge, ON — DATUM Geodatic

DATES: BORING November 1, 2024 — WATER LEVEL — TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
0	265.9	**Ground Surface**	0				
	265.7	75 mm ASPHALT					
		Brown, sand and gravel (FILL) - moist	1	SS	1	410/610	15
1		Brown, silty sand (FILL) - trace gravel - occassional cobbles - moist - hydrocarbon odour in ss3 and ss4	3	SS	2	280/610	7
			6	SS	3	51/610	8
2			8	SS	4	200/610	7
3			10	SS	5	410/610	7
4	261.4		13	SS	6	380/610	8
		Soft to firm, grey, CLAY (CL) - trace sand and gravel - wet	15				
5			16	SS	7	510/610	6
			18	SS	8	580/610	4
6		- silty sand seam at 6.6 m	20	SS	9	510/610	5
7			23	VANE			
8			25	SS	10	250/610	2
			28	SS	11	410/610	6
9	256.9						
		End of Borehole at 9.0 m below existing grade. Dynamic Cone Penetration Test (DCPT) from 9.1 m to 12.8 m	30				
10			32				

Continued Next Page

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

2 88 8 2

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 885 761 E: 650 309

MW7

CLIENT Township of Uxbridge PROJECT No. 122140392

LOCATION 23 Brock Street, Uxbridge, ON DATUM Geodatic

DATES: BORING November 1, 2024 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES: TYPE	SAMPLES: NUMBER	SAMPLES: RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES: N-VALUE OR RQD(%)
10	255.9				33				
		below grade			34				
					35				
11					36				
					37				
					38				
					39				
12					40				
					41				
	253.1				42				
13		DCPT completed at 12.8 m below grade.			43				
					44				
		Monitoring well installed with a screen installed from 5.3 m to 2.3 m			45				
14					46				
					47				
		Groundwater level measured at 2.1 m below grade on November 5, 2024.			48				
15					49				
					50				
					51				
16					52				
					53				
					54				
					55				
17					56				
					57				
					58				
18					59				
					60				
					61				
19					62				
					63				
					64				
20					65				

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 885 817 E: 650 375

MW9

CLIENT Township of Uxbridge

PROJECT No. 122140392

LOCATION 23 Brock Street, Uxbridge, ON

DATUM Geodatic

DATES: BORING October 30, 2024

WATER LEVEL

TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
0	264.8	**Ground Surface**	0				
		100 mm ASPHALT					
		Brown, sand and gravel (FILL) - moist	1	SS	1	610/610	69
	264.1		2				
1		Dark brown to black, silty sand (FILL) - trace gravel - trace rootlets and organics - trace wood fragments - moist to wet - silty clay inclusions in ss2 & ss4	3	SS	2	410/610	11
			4				
			5				
2			6	SS	3	200/610	6
			7				
			8	SS	4	51/610	0
			9				
3			10				
			11	SS	5	100/610	0
			12				
4			13	SS	6	51/610	2
			14				
			15				
5		- contains wood fragments/organics in ss7	16	SS	7	51/610	8
			17				
			18	SS	8	560/610	7
	258.8		19				
6		Very soft to firm, grey, Silty CLAY (CL) - trace gravel - trace wood fragments (Possibly driven down by Augers) - wet	20				
			21	SS	9	250/610	1
			22				
7			23	SS	10	410/610	6
			24				
			25				
8			26	SS	11	360/610	7
			27				
	256.1		28				
		Compact to very dense, grey, Sandy SILT (ML) - trace gravel - inferred cobbles - moist	29				
9			30				
			31	SS	12	150/610	11
			32				
10							

Continued Next Page

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 885 817 E: 650 375

MW9

CLIENT Township of Uxbridge PROJECT No. 122140392

LOCATION 23 Brock Street, Uxbridge, ON DATUM Geodatic

DATES: BORING October 30, 2024 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)	UNDRAINED SHEAR STRENGTH (kPa) 50 100 150 200 / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m / STANDARD PENETRATION TEST, BLOWS/0.3m	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10	**254.8**				33						
		Compact to very dense, grey, Sandy SILT (ML) *(continued)* - trace gravel - inferred cobbles - moist			34						
					35						
11					36	SS	13	150/610	50		
	253.2				37						
					38	SS	14	0.0/130	50/127 mm		
		End of Borehole at 11.6 m below existing grade. Monitoring well installed with a screen installed from 5.3 m to 2.3 m Groundwater level measured at 2.0 m below grade on November 5, 2024.			39						
12					40						
					41						
					42						
13					43						
					44						
					45						
14					46						
					47						
					48						
15					49						
					50						
					51						
					52						
16					53						
					54						
					55						
17					56						
					57						
					58						
18					59						
					60						
					61						
19					62						
					63						
					64						
20					65						

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 885 791 E: 650 264

BH13

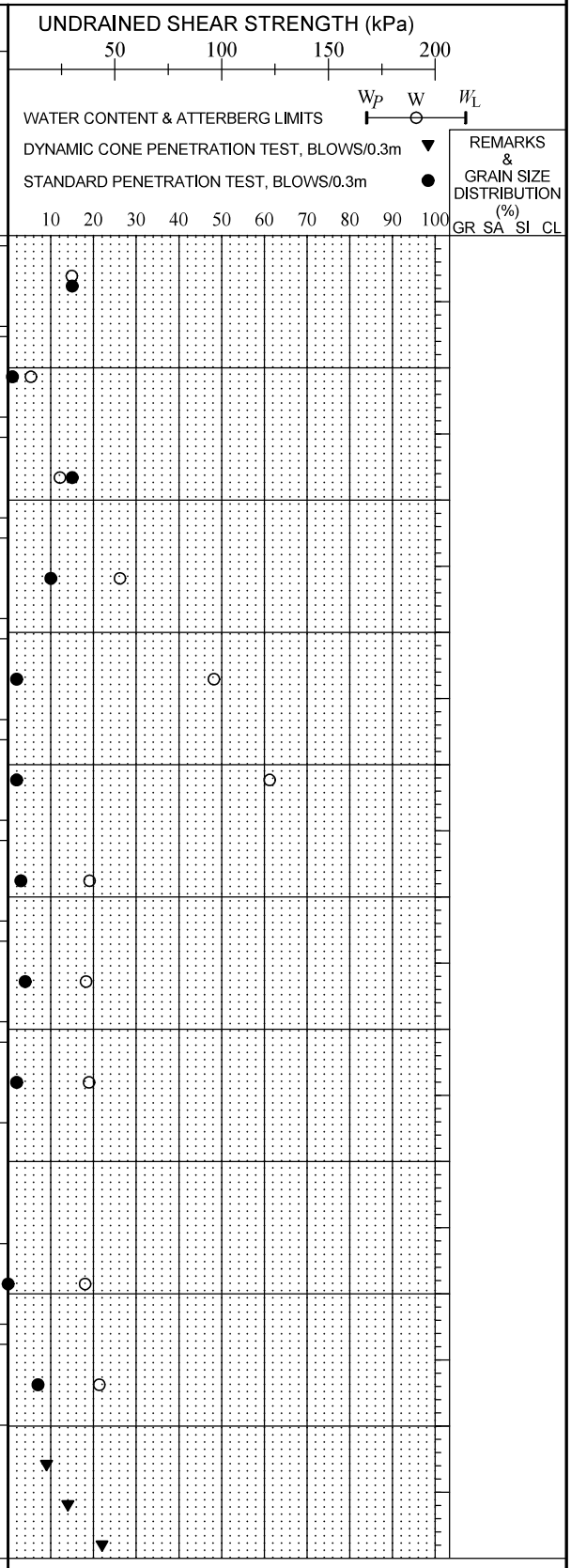
CLIENT Township of Uxbridge — PROJECT No. 122140392

LOCATION 23 Brock Street, Uxbridge, ON — DATUM Geodatic

DATES: BORING October 31, 2024 — WATER LEVEL — TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
0	266.4	**Ground Surface**	0				
		75 mm ASPHALT					
		Brown, sand and gravel (FILL) - moist	1	SS	1	410/610	15
			2				
1		Light brown to dark brown, silty sand (FILL) - trace gravel - moist	3	SS	2	330/610	1
			4				
			5				
2			6	SS	3	300/610	15
	264.2		7				
		Dark brown to black, silty clay with sand (FILL) - trace gravel - moist	8	SS	4	560/610	10
			9				
3			10				
	262.7		11	SS	5	430/610	2
		Very soft, brown, Peat - moist	12				
			13				
4			14	SS	6	460/610	2
	261.6		15				
		Very loose to loose, grey, Sandy SILT (ML) - wet	16	SS	7	610/610	3
			17				
5			18	SS	8	510/610	4
			19				
			20				
6			21	SS	9	580/610	2
			22				
			23				
7			24				
			25				
			26	SS	10	480/610	0
8			27				
			28	SS	11	180/610	7
	257.4		29				
9		End of Borehole at 9.0 m below existing grade. Dynamic Cone Penetration Test (DCPT) from 9.3 m to 12.0 m	30				
			31				
			32				
10							

Continued Next Page



□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 885 791 E: 650 264

BH13

CLIENT Township of Uxbridge PROJECT No. 122140392

LOCATION 23 Brock Street, Uxbridge, ON DATUM Geodatic

DATES: BORING October 31, 2024 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)
10	**256.4**				33				
		below grade			34				
					35				
11					36				
					37				
					38				
12	254.4				39				
		DCPT refusal at 12.0 m below grade			40				
					41				
		Water level and cave-in in open borehole measured at approximately 4.3 m and 5.2 m below existing grade upon completion of drilling.			42				
13					43				
					44				
					45				
14					46				
					47				
					48				
15					49				
					50				
					51				
16					52				
					53				
					54				
17					55				
					56				
					57				
18					58				
					59				
					60				
19					61				
					62				
					63				
20					64				
					65				

UNDRAINED SHEAR STRENGTH (kPa)

50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

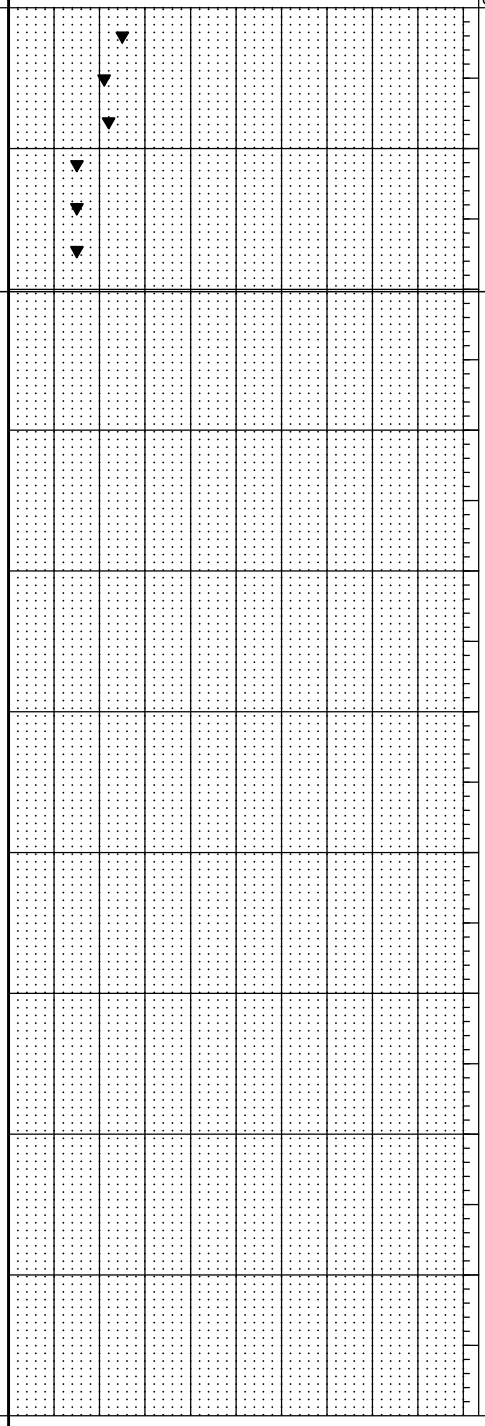
DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%)

10 20 30 40 50 60 70 80 90 100

GR SA SI CL



□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

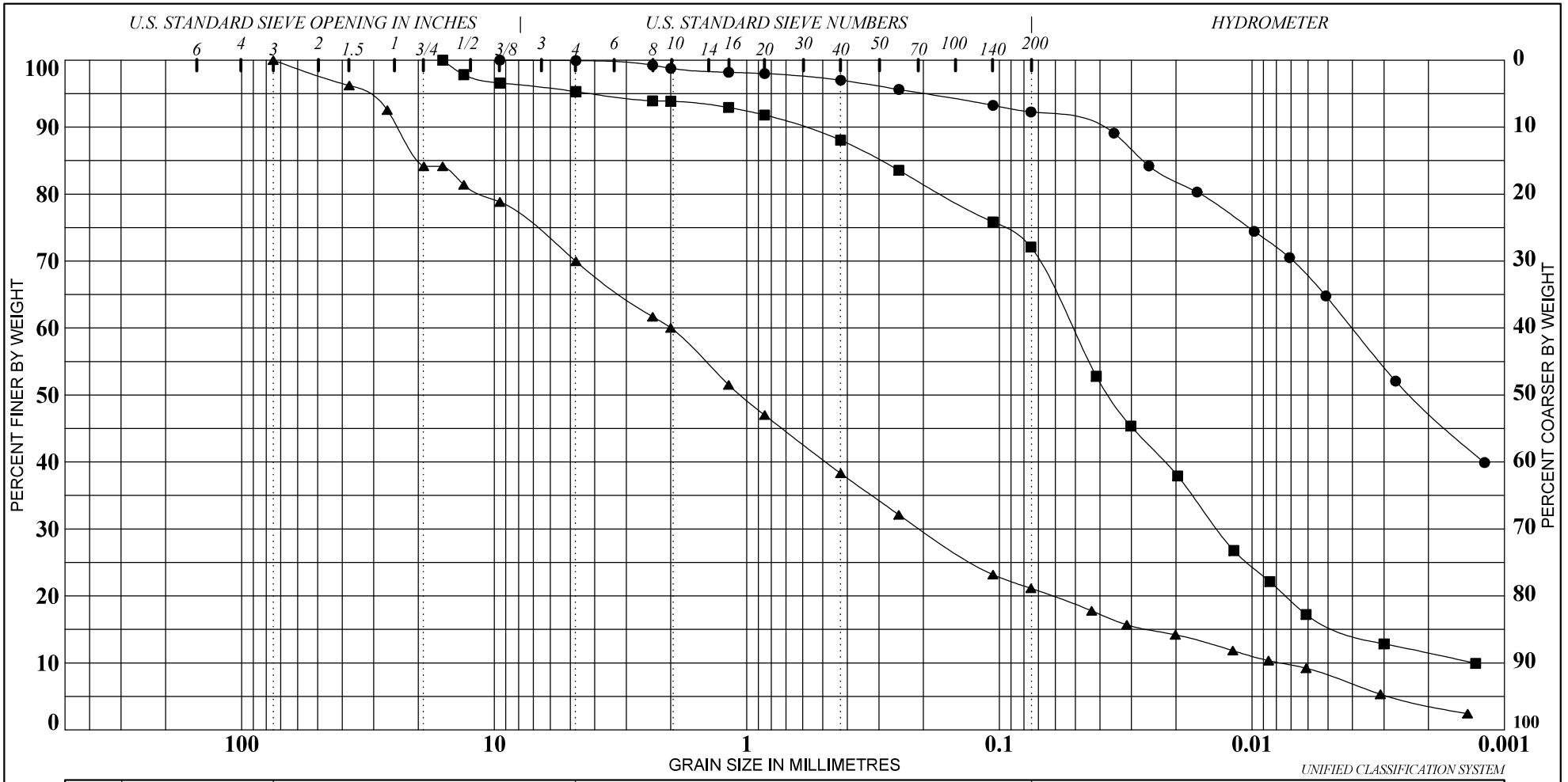
APPENDIX D

D.1 FIGURE D1 – GRADATION TEST RESULTS – BOREHOLES MW1 AND MW2

D.2 FIGURE D2 – GRADATION TEST RESULTS – BOREHOLES MW3, MW5 AND MW7

D.3 FIGURE D3 – ATTERBERG LIMITS TEST RESULTS

D.4 CORROSIVITY TEST RESULTS



BLDs	COBBLES	GRAVEL		SAND			SILT & CLAY	
		coarse	fine	coarse	medium	fine	SILT	CLAY

Sample	Depth (m)	Description	W%	W_L	W_P	I_P	%Gravel	%Sand	%Silt	%Clay
● MW1	3.4	LEAN CLAY(CL)	27	32	16	16	0	7	45	48
■ MW2	2.6	SILTY CLAY with SAND(CL-ML)	20	26	20	6	5	23	61	11
▲ MW2	11.0		8				30	49	17	4

Stantec

Project: Township of Uxbridge - 23 Brock Street

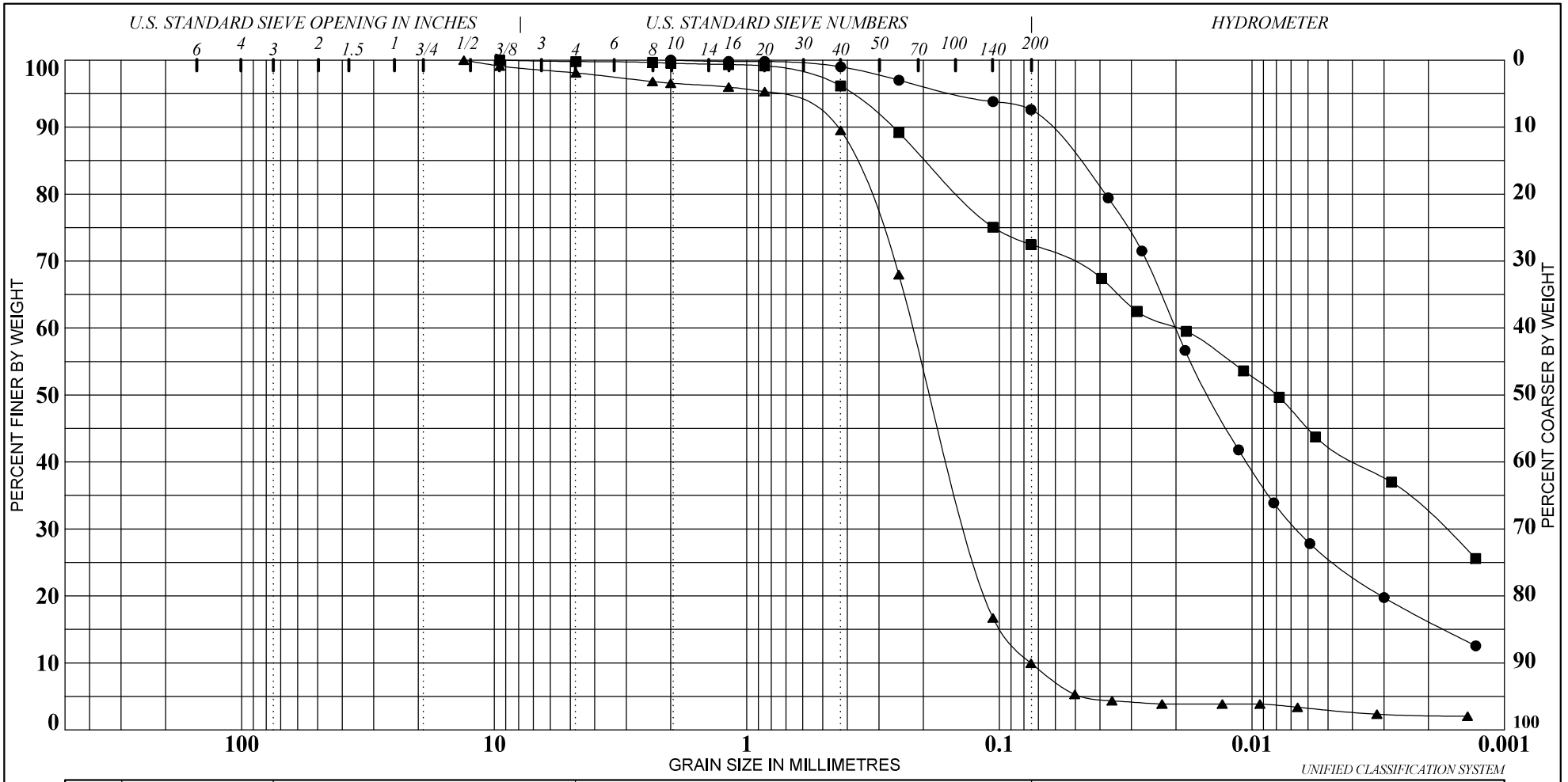
Location: 23 Brock Street, Uxbridge, ON

Project No.: 122140392

GRADATION CURVE (ASTM D422)

Figure: D1

Remarks: More information will be available upon request



BLDs	COBBLES	GRAVEL		SAND			SILT & CLAY	
		coarse	fine	coarse	medium	fine	SILT	CLAY

Sample		Depth (m)	Description	W%	W_L	W_P	I_P	%Gravel	%Sand	%Silt	%Clay
●	MW3	4.9	SILT(ML)	21	20	17	3	0	8	76	16
■	MW5	6.4	LEAN CLAY with SAND(CL)	22	21	11	10	0	28	40	32
▲	MW7	3.4		19				2	88	8	2

Stantec

Project: Township of Uxbridge - 23 Brock Street

Location: 23 Brock Street, Uxbridge, ON

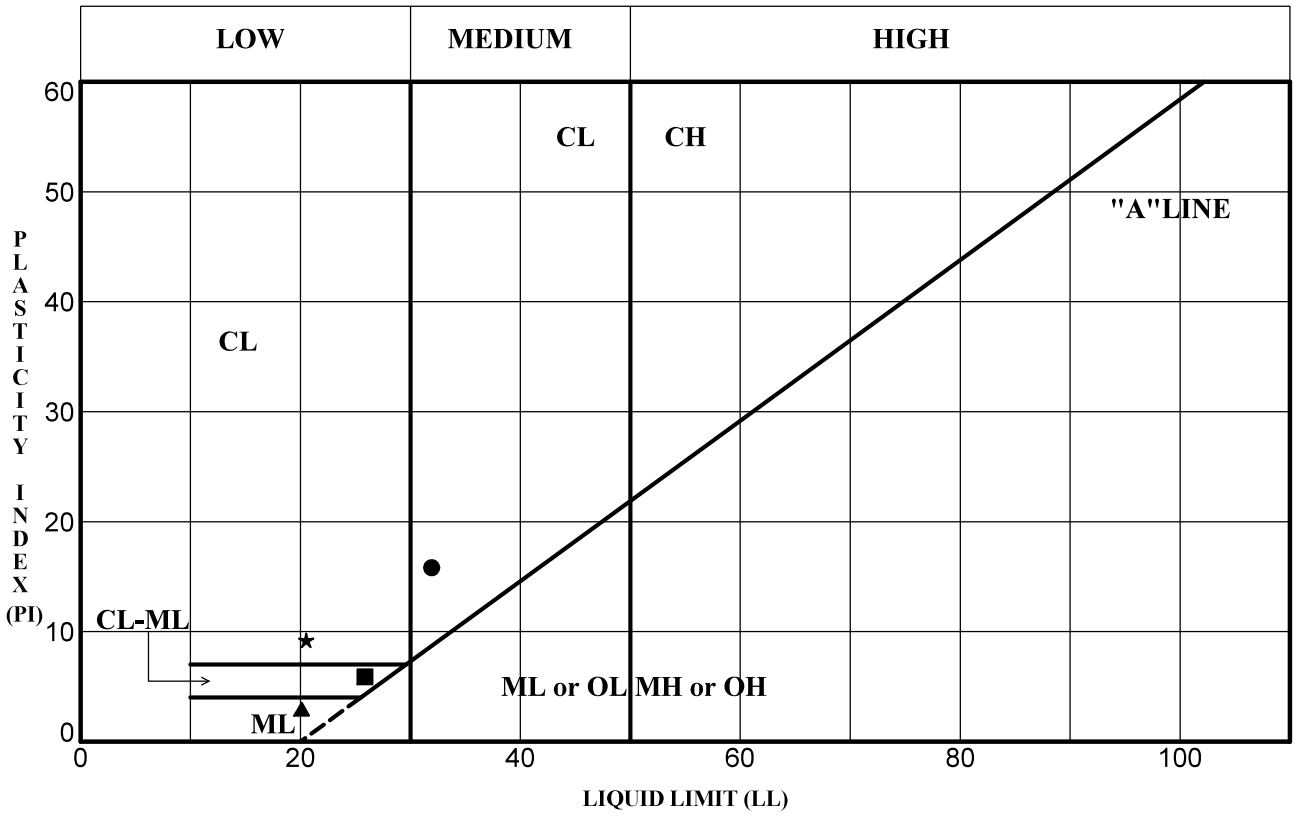
Project No.: 122140392

GRADATION CURVE (ASTM D422)

Figure: D2

Remarks: More information will be available upon request

PLASTICITY CHART



	Specimen	Depth (m)	LL	PL	PI	Fines	W%	Classification
●	MW1	3.4	32	16	16	92	27	LEAN CLAY(CL)
■	MW2	2.6	26	20	6	72	20	SILTY CLAY with SAND(CL-ML)
▲	MW3	4.9	20	17	3	93	21	SILT(ML)
★	MW5	6.4	21	11	10	72	22	LEAN CLAY with SAND(CL)

Stantec

Project: Township of Uxbridge - 23 Brock Street

Location: 23 Brock Street, Uxbridge, ON

Project No.: 122140392

ATTERBERG LIMITS
(ASTM D4318)

Figure: D3

Remarks: More information will be available upon request

STN13-ATTERBERG 122140392-23 BROCK STREET.GPJ STANTEC_MARKHAM_DATA_TEMPLATE_2015-05-20.GDT 11/23/24

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Certificate of Analysis

Stantec Consulting Ltd. (Markham)
300-675 Cochrane Dr West Tower
Markham, ON L3R 0B8
Attn: Gary Zhao

Client PO:
Project: 12214039L
Custody: 75216

Report Date: 30-Dec-2024
Order Date: 18-Dec-2024

Order #: 2451227

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2451227-01	MW2 SS4
2451227-02	BH13 SS3

Approved By:

Dale Robertson, BSc
Laboratory Director

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
Anions	EPA 300.1 - IC, water extraction	23-Dec-24	23-Dec-24
pH, soil	EPA 150.1 - pH probe @ 25 °C, CaCl buffered ext.	20-Dec-24	20-Dec-24
Redox potential, soil	SM 2580 pH/ion meter Extraction	30-Dec-24	30-Dec-24
Resistivity	EPA 120.1 - probe, water extraction	20-Dec-24	20-Dec-24
Solids, %	CWS Tier 1 - Gravimetric	19-Dec-24	23-Dec-24
Sulphide, solid	ASTM E1918-1	30-Dec-24	30-Dec-24

Certificate of Analysis

Report Date: 30-Dec-2024

Client: **Stantec Consulting Ltd. (Markham)**

Order Date: 18-Dec-2024

Client PO:

Project Description: 12214039L

	Client ID:	MW2 SS4	BH13 SS3	-	-	-	-
	Sample Date:	18-Dec-24 09:50	18-Dec-24 09:50	-	-		
	Sample ID:	2451227-01	2451227-02	-	-		
	Matrix:	Soil	Soil	-	-		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	84.1	87.2	-	-	-	-
General Inorganics							
pH	0.05 pH Units	7.52	7.62	-	-	-	-
Resistivity	0.1 Ohm.m	16.5	14.8	-	-	-	-
Anions							
Chloride	10 ug/g	197	297	-	-	-	-
Sulphate	10 ug/g	53	39	-	-	-	-
Subcontract							
Sulphide	0.02 %	<0.02 [2]	<0.02 [2]	-	-	-	-
REDOX Potential	6 mV	312 [1]	318 [1]	-	-	-	-

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions								
Chloride	ND	10	ug/g					
Sulphate	ND	10	ug/g					
General Inorganics								
Resistivity	ND	0.1	Ohm.m					

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	213	10	ug/g	197			7.7	35	
Sulphate	48.2	10	ug/g	53.4			10.2	35	
General Inorganics									
pH	6.58	0.05	pH Units	6.62			0.6	2.3	
Resistivity	25.6	0.1	Ohm.m	24.8			3.3	20	
Physical Characteristics									
% Solids	81.4	0.1	% by Wt.	81.8			0.5	25	

Certificate of Analysis

Report Date: 30-Dec-2024

Client: **Stantec Consulting Ltd. (Markham)**

Order Date: 18-Dec-2024

Client PO:

Project Description: 12214039L

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Anions									
Chloride	294	10	ug/g	197	97.5	82-118			
Sulphate	153	10	ug/g	53.4	99.5	80-120			

Qualifier Notes:

Sample Qualifiers :

1: Subcontracted analysis - Testmark.

Applies to Samples: MW2 SS4, BH13 SS3

2: Subcontracted analysis - SGS

Applies to Samples: MW2 SS4, BH13 SS3

Sample Data Revisions:

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable

ND: Not Detected

MDL: Method Detection Limit

Source Result: Data used as source for matrix and duplicate samples

%REC: Percent recovery.

RPD: Relative percent difference.

NC: Not Calculated

Soil results are reported on a dry weight basis unlesss otherwise noted.

Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

PARACEL LABORATORIES LTD.

Paracel ID: 2451227

Paracel Order Number (Lab Use Only)	Chain Of Custody (Lab Use Only)
2451227	№ 75216

Client Name: Stantec	Project Ref: 122404394	Page 1 of 1
Contact Name: Akshat Shukla / Gary Zhao	Quote #:	Turnaround Time
Address: 3300 - 675 Cochrane drive Markham, ON L3R 0B8	PO #:	☐ 1 day ☐ 3 day ☐ 2 day ☒ Regular
Telephone: 416-415-4196	E-mail: akshat.shukla@stantec.com; gary.zhao@stantec.com	Date Required:

☐ REG 153/04 ☐ REG 406/19

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table ___
For RSC: ☐ Yes ☐ No

Other Regulation: ☐ REG 558 ☐ PWQO ☐ CCME ☐ MISA ☐ SU - Sani ☐ SU - Storm
Mun: ___
☐ Other:

Matrix Type: S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

	Sample ID/Location Name	Matrix	Air Volume	# of Containers	Sample Taken: Date	Sample Taken: Time	Required Analysis: Sulphide	Redox Potential	Conductivity
1	MW2 SS4	Soil		3	Dec 18, 2024	9:50	X	X	X
2	BH13 SS3	"		3	"	"	X	X	X
3									
4									
5									
6									
7									
8									
9									
10									

Comments:

Method of Delivery: Walk in

Relinquished By (Sign): Akshat Shukla	Received at Depot:	Received at Lab: JM	Verified By: SD
Relinquished By (Print):	Date/Time: 18-Dec-24 1020	Date/Time: 12-19-24 1054	Date/Time: Dec 19 2024 11:21am
Date/Time: Dec 18, 2024 / 10:20	Temperature: 20.4 °C	Temperature: 7.1 °C	pH Verified: ☐ By: