Geotechnical investigation

THE BROCK ZENTS PARTNERSHIP

PROPOSED RESIDENTIAL DEVELOPMENT

2660, 2670, and 2680 Brock Road and
Part of Lot 19, Concession 3, Parts 3 and 4 of Plan 40R-27228
Pickering, Ontario

December 15, 2023

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1 INTRODUCTION

Terrapex Environmental Ltd. **(Terrapex)** has been retained by The Brock Zents Partnership to carry out a geotechnical investigation for a proposed residential development located at 2660, 2670, and 2680 Brock Road and the property with the legal description of Part of Lot 19, Concession 3, Parts 3 and 4 of Plan 40R-27228 in Pickering, Ontario. Authorization to proceed with this study was given by Mr. Jack Greenberg of The Brock Zents Partnership.

At the time of preparation of the original report in 2018, we were advised that the eastern section of the property was to be developed with two high-rise apartment buildings and the central and western sections with several blocks of back to back townhouses. Two underground parking garage levels were proposed under the entire property.

We now understand that the site will be developed with five (5) blocks of 4-storeys Stacked and eight (8) Blocks of 3-storeys Townhomes without basement. A municipal road will be constructed at the west side of the Site.

The site is located on the southwest corner of the intersection of Brock Road and Zents Drive, in Pickering. The investigation was undertaken in three phases. The first phase of the investigation was completed on May 2018 for the three lots addressed as 2660, 2670, and 2680 Brock Road. The second phase of the investigation was completed in June 2019 when a portion of the property with the legal description of Part of Lot 19, Concession 3, Part 3 on Plan 40R27228; immediately south of Zents Drive was appended to the combined properties of 2660, 2670, and 2680 Brock Road. Parts 3 and 4 of Plan 40R-27228 are currently owned by the City of Pickering, and are being considered for purchase by The Brock Zents Partnership. The whole of Part 4, and the northeast corner of Part 3 would then be subsequently conveyed to the municipality for a road right-of-way and daylight triangle, respectively. The locations of the conveyances are presented on Drawing 1. The third phase of the investigation consisted of an additional six boreholes which were advanced at the site in October 2021 for a Phase Two ESA.

The fieldwork for the geotechnical study was conducted in conjunction with the hydrogeological and environmental investigations. The hydrogeological and environmental conditions at the site are reported under separate covers.

A grading plan was not available at the time of the investigation, and accordingly the recommendations provided in this report are considered to be preliminary in nature, subject for review and revision upon completion of proposed grading plans.

The purpose of this investigation was to characterize the subsurface soil and groundwater conditions, to determine the engineering properties of the various soil deposits underlying the site, and to provide geotechnical engineering recommendations pertaining to the proposed development.

This report presents the results of the investigation performed in accordance with the general terms of reference outlined above and is intended for the guidance of the client and the design architects or engineers only. It is assumed that the design will be in accordance with the applicable building codes and standards.

2 FIELDWORK

The fieldwork for this investigation consisted of ten (10) boreholes advanced between April 30 and May 7, 2018, two (2) boreholes advanced on June 12, 2019 and six (6) boreholes advanced on October 4 and 5,

2021. The locations of the boreholes were chosen by **Terrapex** to provide general coverage of the site and are shown on the Borehole Location Plan enclosed in Appendix B as Drawing 1.

The boreholes were advanced to depths ranging from 6.1 to 15.4 m below ground surface (mbgs).

Monitoring wells were installed in 12 of the boreholes to determine the long-term groundwater table at the site and for use for the hydrogeological assessment by **Terrapex**. Three (3) of the monitoring wells; MW1, MW3, and MW8 were installed as clustered pairs (a shallow and deep monitoring well in adjacent separate boreholes).

The ground surface elevations at the locations of the boreholes were established by **Terrapex** using a Topcon Hiper V GNSS Receiver.

Standard penetration tests were carried out in the course of advancing the boreholes to take representative soil samples and to measure penetration index values (N-values) to characterize the condition of the various soil materials. The number of blows of the striking hammer required to drive the split spoon sampler to 300 mm depth was recorded and these are presented on the logs as penetration index values. Results of SPT are shown on the borehole log sheets in Appendix C of this report.

Groundwater level observations were made in the boreholes (excluding the boreholes which were advanced using hollow stem augers) upon completion of each of their advancement, and in the monitoring wells during the period between May 2018 and October 2021. The results of the groundwater measurements are discussed in Section 4.5 of this report.

The fieldwork for this project was carried out under the supervision of an experienced geotechnical technician from this office who laid out the positions of the boreholes in the field; arranged locates of buried services; effected the drilling, sampling and in situ testing; observed groundwater conditions; and prepared field borehole log sheets.

3 LABORATORY TESTS

The soil samples retained from the split spoon sampler were properly sealed, labelled and brought to our laboratory. They were visually classified and water content tests were conducted on all soil samples retained from Boreholes BH7, MW8, and MW10. The results of the classification, water contents, and Standard Penetration Tests are presented on the borehole logs sheets attached in Appendix C of this report.

Grain-size analyses were carried out on seven (7) native soil samples; Atterberg Limits test on one (1) soil sample. Test results are presented as Figures D-1 through D-8 in Appendix D.

In addition, two (2) soil samples were submitted to an analytical laboratory for chemical analyses for pH and soluble sulphate tests. The results of these tests are enclosed in Appendix E; discussed in Section 5.9 of this report.

4 SITE AND SUBSURFACE CONDITIONS

Full details of the subsurface soil and groundwater conditions at the site are given on the borehole Log sheets attached in Appendix C of this report.

The following paragraphs present a description of the site and a commentary on the engineering properties of the various soil materials contacted in the boreholes.

It should be noted that the boundaries of soil types indicated on the borehole logs are inferred from non-continuous soil sampling and observations made during drilling. These boundaries are intended to reflect transition zones for the purpose of geotechnical design, and therefore, should not be construed as exact planes of geological change.

4.1 Site Description

The site is located on the southwest corner of the intersection of Brock Road and Zents Drive in Pickering, Ontario. It is bounded by vacant lands on the west, and south sides.

The site occupies a rectangular block of approximate dimensions of 210 and 125 m; consisting of four lots including municipal addresses 2660, 2670, and 2680 Brock Road and the property with the legal description of Part of Lot 19, Concession 3, Parts 3 and 4 of Plan 40R-27228.

The eastern section of the property is developed with two residential houses at 2660 and 2680 Brock Road; two paved driveways provide access to the houses. The remaining area of the site is vacant and covered with vegetation and some trees; located predominantly at the western section of the property.

The ground surface topography of the site is not level. It has an overall gradient that slopes down from the west to the east. The ground surface elevations at the borehole locations ranged between 129.3 m at Borehole MW10 and 132.0 m at Borehole MW1.

4.2 Topsoil

Topsoil was encountered in all boreholes except Boreholes MW5, BH201 and BH202. The thickness of the topsoil varies between approximately 70 and 600 mm at the borehole locations.

It should be noted that the topsoil thickness will vary between boreholes. Thicker topsoil than that found in the boreholes may be present.

4.3 Fill Material

Fill material is present below the topsoil in Boreholes MW3, BH7, BH9, MW203, BH204, BH205 and MW206, and underneath the surficial vegetation in Borehole MW5, BH201 and BH202. The fill material generally consists of clayey silt with trace of gravel and organics, silty sand or sand with trace of gravel and clay, and sand and gravel. It extends to a maximum depth of 2.1 mbgs.

Standard Penetration Test (SPT) carried out in the fill material measured N-values ranging from 3 to 43, indicating soft to firm consistency and loose to dense compactness condition.

The fill material is generally brown to dark brown in color and moist in appearance. The water content of the fill samples from Borehole BH7 was about 10 and 23% by weight.

4.4 Native Soils

4.4.1 Sandy Clayey Silt (Till)

A sandy clayey silt (till) stratum is present below the topsoil and fill materials in Boreholes MW1, MW8, BH9, MW10, MW101, and BH201 through BH205, underneath the sandy silt in Boreholes BH2 and MW206, and below gravelly sand in Borehole MW102; extending to approximate depths ranging from 2.1 to 9.8 mbgs.

The sandy clayey silt (till) is a glacial deposit, consisting of a random mixture of soil particles ranging from clay to gravel with the sand, clay, and silt being the predominant fractions. The sandy clayey silt (till) soil is interspersed with occasional sand layers and sand seams at various depths. Cobbles and boulders are probably present within this soil stratum but would not be representatively sampled with the equipment used in this investigation.

SPT carried out in the sandy clayey silt (till) provided N-values ranging from 13 to 50/125 mm penetration, indicating stiff to hard consistency; generally being hard.

The sandy clayey silt (till) is brown in color with oxidized lenses and damp to moist in appearance at shallow depths; becoming grey and moist to wet below approximate depths ranging from 3.0 to 3.7 mbgs. The water content of the tested samples of the sandy clayey silt (till) from Boreholes MW8 and MW10 ranged from approximately 7 to 11% by weight.

Sieve and hydrometer grain size analyses and Atterberg Limits test were carried out on one representative sample obtained from Borehole MW1 at 2.3 mbgs (Sample 4). The tests revealed that the soil consists of 39% sand, 34% silt, 23% clay, and 4% gravel; its Liquid Limit is 17.8 and Plasticity Index is 6.9. According to Figure 3.1 of the CFEM (4th Edition), the soil is classified as "*Inorganic clays of low plasticity*". The test results are enclosed in Appendix D as Figures D-1 and D-8.

Based on the results of the grain size analysis, the k value of the sandy clayey silt (till) is estimated to be less than 10^{-7} cm/sec, corresponding to a very low relative permeability.

4.4.2 Sand and Silt (Till)

A deposit of sand and silt (till) is present at various depths in all boreholes except Boreholes MW3, MW4; BH201, BH202 and MW206.

The sand and silt (till) is a glacial deposit; consisting of a random mixture of soil particles ranging from clay to gravel with the sand and silt being the predominant fractions. The sand and silt (till) soil is interspersed with occasional sand layers and seams at various depths. Cobbles and boulders are probably present within this soil stratum but would not be representatively sampled with the equipment used in this investigation.

SPT carried out in the sand and silt (till) provided N-values ranging from 17 to 92/150 mm penetration, indicating compact to very dense compactness condition; generally being very dense.

The sand and silt (till) is brown in color and moist in appearance at shallow depths; becoming grey and wet below an approximate depth of 3.5 mbgs. The water content of the tested samples of the sand and silt (till) from Boreholes BH7, MW8, and MW10 ranged from approximately 6 to 15% by weight.

Sieve and hydrometer grain size analyses were carried out on three soil samples. The test results are enclosed in Appendix D as Figures D-2 through D-4, and summarized Table 1 below.

Table 1: Summary of Grain Size Analysis Results (Silty Sand to Silt and Sand Till)

Borehole Number	Sample Depth (mbgs) and No.	Sample Description	Gravel %	Sand %	Silt %	Clay %
MW5	4.5 (Sample 6)	grey, Silty Sand, some clay, trace gravel	6	50	28	16
BH6	4.5 (Sample 7)	grey, Silty Sand, some clay, trace gravel	9	52	25	14
BH9	6.1 (Sample 8)	grey, Silt and Sand, some clay, trace gravel	4	43	37	16

Based on the results of the grain size analysis, the k value of the sand and silt (till) is estimated to be approximately 10^{-6} cm/sec, corresponding to a low relative permeability.

4.4.3 Sandy Silt to Silty Sand

A deposit of sandy silt to silty sand is present in all boreholes at various depths with the exception of Boreholes MW1, MW5, BH6, BH204 and BH205; positioned below the topsoil in Boreholes BH2, MW4, and MW102, underneath the fill material in Borehole MW3 and MW206, below the sand and silt (till) in Boreholes BH7, MW8, and MW10, and underlying the sandy clayey silt (till) in Boreholes BH9, MW101, BH201, BH202, MW203. The soil unit contains variable proportions of fine sand classifying the soil as sandy silt, sand and silt, and silty sand.

The sandy silt to silty sand unit is brown in color and moist in appearance at shallow depths; becoming grey and wet below approximate depths ranging from 3.7 to 7 mbgs. The water content of the tested samples of the sandy silt to silty sand from Boreholes BH7, MW8, and MW10 ranged from approximately 8 to 19% by weight.

SPT carried out in the sandy silt to silty sand unit had N-values ranging from 22 to 50/75 mm penetration, indicating compact to very dense compactness condition; generally being very dense.

Grain size analyses were carried out on three soil samples. The test results are enclosed in Appendix D as Figures D-5 through D-7, and summarized Table 2 below.

Table 2: Summary of Grain Size Analysis Results (Silty Sand to Sandy Silt)

Borehole Number	Sample Depth (mbgs) and No.	Sample Description	Gravel %	Sand %	Silt %	Clay %
MW4	3 (Sample 5)	brown, Silt and Sand, trace clay	0	42	50	8
BH7	6.1 (Sample 7)	brown, Silty Sand	0	80	20	
MW8	9.2 (Sample 9)	grey, Silty Sand, some gravel	11	69	20	

Based on the grain size analysis results, the Coefficient of Permeability (k) of the sandy silt to silty sand soil is

estimated to be in the range of $3x10^{-5}$ to $3x10^{-3}$ cm/sec; medium to high relative permeability.

4.4.4 Gravelly Sand to Sandy Gravel

A deposit of gravelly sand to sandy gravel is present below the silt and sand (till) in Borehole MW1, intercepting the sand and silt (till) unit in Borehole BH6 and MW8, intercepting the sandy silt deposit in Borehole MW10, intercepting the clayey sandy silt in Borehole MW102, and below the clayey sandy silt till in BH205.

The gravelly sand to sandy gravel unit is grey in colour and has a wet appearance; water bearing in this regard.

The measured N-values of this unit ranged from 74 to 50/100 mm penetration, indicating very dense compactness condition.

4.4.5 Clayey Silt

A clayey silt stratum is present below the sandy gravel in Borehole MW1 and underneath the sand unit in Borehole MW4 at an approximate depth of 13 mbgs.

SPT carried out in the clayey silt soil provided N-values of 50/150 and 50/100 mm penetration, indicating hard consistency. This unit is grey in color and moist in appearance.

4.5 Groundwater

Groundwater level and cave-in of the unlined side walls of the boreholes (excluding the boreholes which were advanced using hollow stem augers) were measured upon completion of the boreholes. The groundwater measurements are shown on the individual borehole logs and summarized in table 3.

Table 3: Summary of Borehole Cave-in and groundwater Conditions

Borehole No.	Cave-in Level (mbgs)	Groundwater Depth (mbgs)
MW1	12.1	7.3
BH2	7.6	6.7
MW3	4.3	2.4
BH6	11.3	0.6
BH7	4.5	1.8
MW8	12.2	2.7
BH9	3.3	1.5
MW10	5.8	2.7
MW101	open	5.7
MW102	open	1.8

Groundwater levels in the monitoring wells were measured on several occasions during the period between May 17, 2018 and October 27, 2021. The groundwater levels were measured as shallow as 0.2 m in shallow wells and as deep as 8 m in the deep wells.

The hydrogeological report should be referred to for the groundwater measurements.

Based on our field observations, the water content of the various soil units, and the groundwater measurements made in the monitoring wells, the long term groundwater table is situated predominantly between approximate elevations ranging from 125 to 128 m.

It should be noted that groundwater levels are subject to seasonal fluctuations. A higher groundwater level condition will likely develop in the spring and following significant rainfall events. The hydrogeological report should be referred to for interpretation of the groundwater levels and conditions at the site.

5 DISCUSSION AND RECOMMENDATIONS

The following discussions and recommendations are based on the factual data obtained from the boreholes advanced at the site by **Terrapex** and are intended for use by the client and design architects and engineers only.

The investigation has revealed that the site is underlain by surface cover of topsoil and fill material, followed by variable hard sandy clayey silt (till), very dense sand and silt (till), sandy silt (till), dense to very dense sandy silt to silty sand, and very dense gravelly sand to sandy gravel soils at various depths. On the basis of our fieldwork and laboratory tests, the following comments and recommendations are made.

It is anticipated that there will be some modifications to site grading, but this has not been established at the time of reporting. The provided recommendations are considered to be preliminary in nature, subject for review and revision upon completion of proposed grading plans.

Contractors bidding on this project or conducting work associated with this project should make their own interpretation of the factual data and/or carry out their own investigations.

5.1 Excavation

Based on the field results, excavations for foundations and basements are not expected to pose any difficulty. Excavation of the soils at this site can be carried out with hydraulic excavators.

All excavations must be carried out in accordance with Occupational Health and Safety Act (OHSA). With respect to OHSA, the near surface fill and silty and sandy soils above the groundwater table can be classified as Type 3 soils. Sandy and silty soils that are situated below the groundwater table are classified as Type 4 soils. The hard sandy clayey silt (till) and very dense sand and silt (till) soils are classified as Type 2 soils.

Temporary excavations for slopes in Type 3 soil should not exceed 1.0 horizontal to 1.0 vertical. In the event very loose and/or soft soils are encountered at shallow depths or within zones of persistent seepage, it will be necessary to flatten the side slopes as necessary to achieve stable conditions. In wet sandy/silty soils it may be necessary to slope the excavation at an inclination of 1.0 vertical to 2.0 horizontal or 1.0 vertical to 3.0 horizontal. Excavations in Type 2 soil may be cut with vertical side-walls within the lower 1.2 m height of excavation and 1.0 horizontal to 1.0 vertical above this height.

For excavations through multiple soil types, the side slope geometry is governed by the soil with the highest number designation. Excavation side-slopes should not be unduly left exposed to inclement weather.

Excavation slopes consisting of sandy soils will be prone to gullying in periods of wet weather, unless the slopes are properly sheeted with tarpaulins.

Where workers must enter excavations extending deeper than 1.2 m below grade, the excavation side-walls must be suitably sloped and/or braced in accordance with the Occupational Health and Safety Act and Regulations for Construction Projects.

It should be noted that glacial deposit is non-sorted sediment and therefore may contain boulders. Provisions must be made in the excavation and foundation installation contracts for the removal of possible boulders.

5.2 Reuse of On-site Excavated Soil as a Compacted Backfill

On-site excavated native soils above the groundwater table are considered suitable for reuse as backfill material or engineered fill, provided their water content is within 2% of their optimum water contents (OWC) as determined by Standard Proctor test, and the materials are effectively compacted with heavy smooth drum compaction rollers.

While the quality of the native soils are considered suitable for backfilling; the moisture content of the soils and the lift thickness for compaction must be properly controlled during the backfilling. Alternatively, imported suitable material should be used.

The on-site native soils below the groundwater table are excessively wetter than their optimum moisture contents. These materials may prove difficult to compact and should be dried sufficiently prior to use as backfill in order to achieve the specified degree of compaction. Spreading the material in a wide area and air drying will be required to achieve the specified compaction of the native material. Thorough vertical mixing of the excavated soils will be required to provide a material that can be adequately compacted.

In areas of narrow trenches or confined spaces such as around manholes, foundations, foundation walls, etc., the use of aggregate fill such as Granular 'B' (OPSS 1010) is required if there is to be post-construction grade integrity.

5.3 Groundwater Control

Based on observations made during drilling of the boreholes, close examination of the soil samples extracted from the boreholes, and groundwater measurements made in the monitoring wells, groundwater will be encountered within the presumed service trench and foundation excavation depths.

Water bearing silty and sandy soils are present at various depths across the site. Based on the results of grain size analyses and the estimated k values, the sandy and silty soils are expected to have medium to high permeability coefficients; the groundwater yield from these soils is expected to be moderate. The sandy clayey silt (till) and sand and silt (till) soils have very low to low permeability coefficients. The groundwater yield from these soils is expected to be very small.

The hydrogeological report must be referred to regarding the dewatering quantities and requirement for PTTW.

The contractor should make their own assessment for temporary control of groundwater seepage into the excavation, as well as to maintain basal stability of the subgrade during the foundation construction stage.

5.4 Foundation Design

We understand that the proposed development will consist of five (5) blocks of 4-storeys Stacked and eight (8) Blocks of 3-storeys Town homes without basement. It is anticipated that there will be some modifications to site grading, but this has not been established at the time of reporting. It is not recommended to install the foundations of the proposed buildings on the existing fill material.

The borehole findings reveal that the near surface native clayey sandy silt till, sand and silt and sandy silt till soils throughout the site are considered suitable for the support of building foundations. Conventional shallow strip and spread footings may be used to support the proposed buildings. The footings must be founded at a minimum depth of 300 mm into the undisturbed native soil. Locally, it will be necessary to deepen the foundations where the native soil is less competent in strength.

Footings founded at shallow depths into the native soil may be designed based on bearing resistance of 200 KPa at Serviceability Limit States (SLS)and factored geotechnical bearing resistances at Ultimate Limit States (ULS) of 300 kPa.

Due to variations in the consistency of the founding soils and/or loosening caused by to excavating disturbance and/or seasonal frost effects, all footing subgrade must be evaluated by the Geotechnical Engineer prior to placing formwork and foundation concrete to ensure that the soil exposed at the excavation base is consistent with the design geotechnical bearing resistance.

In the event necessary, the stepping of the footings at different elevations should be carried out at an angle no steeper than 2 horizontal (clear horizontal distance between footings) to 1 vertical (difference in elevation) and no individual footing step should be greater than 0.60 m.

All footings exposed to seasonal freezing conditions should be provided with at least 1.2 m of earth cover or equivalent thermal insulation against frost.

Rainwater or groundwater seepage entering the foundation excavations must be pumped away (not allowed to pond). The foundation subgrade soils should be protected from freezing, inundation and equipment traffic at all times. If unstable subgrade conditions develop, **Terrapex** should be contacted in order to assess the conditions and make appropriate recommendations.

The soils tend to weather and deteriorate rapidly on exposure to atmosphere or surface water, so construction scheduling should consider the amount of excavation left exposed to the elements, during foundation preparation. **Terrapex** recommends that footings placed on the exposed soil should be poured on the same day as they are excavated, after removal of all unsuitable founding materials and approval of the bearing surface. Alternatively, a concrete mud slab could be used to protect a bearing surface where footing construction is to be delayed.

5.5 Concrete Slab-on-Grade

The subgrade supporting the ground floor slab will in general consist of fill material. Subgrade preparation should include the removal of topsoil, surface vegetation, organic materials, weak and softened soils. After removal of all unsuitable materials, the subgrade should be proof-rolled with heavy rubber tired equipment and adjudged as satisfactory before preparing the granular base course. The proof-rolling operation should be witnessed by the Geotechnical Engineer. Any soft or unsuitable subgrade areas which deflect significantly should be sub-excavated and replaced with suitable engineered fill material compacted to at least 98% of Standard Proctor Maximum Dry Density (SPMDD).

Where new fill is required to raise the grade, excavated earth fill and native soils from the site or similar clean imported fill material may be used, free from topsoil, organic or deleterious matter, provided the material is placed in large areas where it can be compacted with a heavy vibratory roller. The fill material should not be frozen and should not be too dry or too wet for efficient compaction (moisture content at optimum or 2% greater than optimum). Fill placement should not be performed during winter months when freezing temperatures occur persistently or intermittently. All fill placed below the slab on grade areas of the buildings must be placed in thin lifts of 200 mm thickness or less, and compacted to a minimum of 98% of SPMDD.

Conventional lightly loaded concrete floor slabs should be placed on a 150 mm thick drainage layer consisting of 19 mm clear stone (OPSS 1004) compacted by vibration to a dense state, or Granular 'A' material compacted to 100% of its SPMDD.

Provided that the slab-on-grade will be a minimum of 150 mm above exterior grade, perimeter drainage system will not be required for the proposed buildings.

Provided the subgrade, under-floor fill and granular base are prepared in accordance with the above recommendations, the Modulus of Subgrade Reaction (Ks) for floor slab design will be 30,000 kPa/m.

The soils at this site are susceptible to frost effects which would have the potential to deform hard landscaping adjacent to the building. At locations where proposed building is expected to have flush entrances, care must be taken in detailing the exterior slabs / sidewalks, providing insulation / drainage / non-frost susceptible backfill to maintain the flush threshold during freezing weather conditions.

5.6 Lateral Earth Pressure

Parameters used in the determination of earth pressure acting on temporary shoring walls are defined in Table 4 below.

Table 4: Soil Parameters

Parameter	Definition	Units
Φ'	angle of internal friction	degrees
γ	bulk unit weight of soil	kN/m^3
K_a	active earth pressure coefficient (Rankine)	dimensionless
K_o	at-rest earth pressure coefficient (Rankine)	dimensionless
K_p	passive earth pressure coefficient (Rankine)	dimensionless

The appropriate un-factored values for use in the design of structures subject to unbalanced earth pressures at this site are tabulated as in Table 5 follows:

Table 5: Soil Parameter Values

Soil	Parameter				
	Φ'	γ	K_a	K_p	K_o
Fill material	28°	20.0	0.36	2.77	0.53
Hard Sandy Clayey Silt (till)	32°	21.0	0.31	3.25	0.47
very dense Sand and Silt (till)	36°	20.0	0.26	3.88	0.40
Sandy silt to Silty sand	compact - 32° dense to very dense - 36°	19.0 19.0	0.31 0.26	3.25 3.88	0.47 0.40

Subsurface walls above water table subject to unbalanced earth pressures must be designed to resist a pressure that can be calculated based on the following formula:

$P = K (\gamma h + q)$

Where P = lateral pressure in kPa acting at a depth h (m) below ground surface

K = applicable lateral earth pressure coefficient

γ = bulk unit weight of backfill (kN/m^3)

q = the complete surcharge loading (kPa)

This equation assumes that free-draining backfill and positive drainage is provided to ensure that there is no hydrostatic pressure acting in conjunction with the earth pressure.

Subsurface walls below water table that are subject to unbalanced earth and hydrostatic pressures must be designed to resist a pressure that can be calculated based on the following formula:

$P = K [\gamma (h – hw) + \gamma' hw + q] + \gamma w hw$

Where P = lateral pressure in kPa acting at a depth h (m) below ground surface

K = applicable lateral earth pressure coefficient (Use Ko for basement wall design)

H = height at any point along the interface (m)

hw = depth below the groundwater level at point of interest (m)

γ = bulk unit weight of backfill (kN/m3)

γ' = the submerged unit weight (kN/m3) of exterior soil ($\gamma' = \gamma - \gamma w$)

γw = unit weight of water, assume a value of 9.8 kN/m3

q = the complete surcharge loading (kPa)

This equation does not assume that free-draining backfill and positive drainage is provided and can be used if conditions indicate the wall will be partially or fully submerged in conjunction with the earth pressure.

Resistance to sliding of earth retaining structures is developed by friction between the base of the footing and the soil. This friction (R) depends on the normal load on the soil contact (N) and the frictional resistance of the soil (tan Φ') expressed as: R = N tan Φ'. This is an ultimate resistance value and does not contain a factor of safety.

5.7 Earthquake Design Parameters

The 2012 Ontario Building Code (OBC) stipulates the methodology for earthquake design analysis, as set out in Subsection 4.1.8.7. The determination of the type of analysis is predicated on the importance of the structure, the spectral response acceleration and the site classification.

The parameters for determination of the Site Classification for Seismic Site Response are set out in Table 4.1.8.4.A of the 2012 OBC. The classification is based on the determination of the average shear wave velocity in the top 30 metres of the site stratigraphy, where shear wave velocity (vs) measurements have been taken. In the absence of such measurements, the classification is estimated on the basis of empirical analysis of undrained shear strength or penetration resistance. The applicable penetration resistance is that which has been corrected to a rod energy efficiency of 60% of the theoretical maximum or the (N_{60}) value.

Based on the borehole information, the subsurface stratigraphy generally comprises surficial topsoil and fill material underlain by native soils consisting of variable hard sandy clayey silt (till), very dense sand and silt (till), very dense sandy silt to silty sand, and layers of very dense gravelly sand to sandy gravel soils. Based on the above, the site designation for seismic analysis is Class C according to Table 4.1.8.4.A from the quoted code.

The site specific 5% damped spectral acceleration coefficients, and the peak ground acceleration factors are provided in the 2012 Ontario Building Code - Supplementary Standards SB-1 (September 14, 2012), Table 1.2, location Pickering, Ontario.

5.8 Chemical Characterization

Two (2) soil samples obtained from Boreholes MW4 (Sample 7; 6.1 mbgs) and BH9 (Sample 8; 6.1 mbgs) were submitted to AGAT Laboratories (AGAT) for pH index test and water-soluble sulphate content to determine the potential of attacking the subsurface concrete. The test results are summarized Table 6 below.

Table 6: Chemical Test Results of Soil Sample

Soil Parameter	MW4 : 6.1 mbgs (Sample7)	MW8: 6.1 mbgs (Sample 8)
pH	7.79	7.80
Water-soluble Sulphate (%)	0.0038	0.0034

The pH of the three tested samples indicates slight alkalinity. The concentration of water-soluble sulphate content of the tested samples is below the CSA Standard of 0.1% water-soluble sulphate (Table 12 of CSA A23.1, Requirements for Concrete Subjected to Sulphate Attack). Special concrete mixes against sulphate attack is therefore not required for the sub-surface concrete of the proposed building.

Certificates of Analysis provided by the analytical chemical testing laboratory is contained in Appendix E of this report.

6 PAVEMENT DESIGN AND SITE SERVICE

It is understood that the site will be served by driveway and parking lots. A municipal road will also be constructed at the west side of the site.

6.1 Road and Pavement

The investigation has shown that the predominant subgrade soil after stripping off the topsoil and existing fill will generally consist of very stiff to hard sandy clayey silt and compact to very dense sandy silt, sand and silt as well as silty sand deposit. Boreholes MW1 and MW5 were drilled in the close vicinity of the proposed municipal road.

Based on the above and assuming that traffic usage will be residential local or residential collector for the municipal road, the following minimum pavement thickness is recommended:

For driveways and parking lots:

40 mm HL3 Asphaltic Concrete
50 mm HL8 Asphaltic Concrete
150 mm Granular 'A'
200 mm Granular 'B' for light duty parking and 300 mm Granular "B" for heavy duty parking

For residential local roads

40 mm HL3 Asphaltic Concrete
50 mm HL8 Asphaltic Concrete
150 mm Granular 'A'
300 mm Granular 'B' or 50 mm crusher run limestone as per City Specifications

For residential collector roads, the following minimum pavement thickness is recommended:

40 mm HL3 Asphaltic Concrete
70 mm HL Asphaltic Concrete
150 mm Granular 'A'
450 mm Granular 'B' or 50 mm crusher run limestone as per City Specifications

The site subgrade and weather conditions (i.e. if wet) at the time of construction may necessitate the placement of geogrid/filter fabric and/or thicker granular sub-base layer in order to facilitate the construction. Furthermore, heavy construction equipment may have to be kept off the newly constructed roads before the placement of asphalt and/or immediately thereafter, to avoid damaging the weak subgrade by heavy truck traffic.

6.2 Stripping, Sub-excavation and Grading

The site should be stripped off all topsoil (if any); loose fill and any organic or otherwise unsuitable soils to the full depth of the roads, both in cut and fill areas under roads.

Following stripping, the site should be graded to the subgrade level and approved. The subgrade should then be proof-rolled, in the presence of the Geotechnical Engineer, by at least several passes of a heavy compactor having a rated capacity of at least 8 tonnes. Any soft spots thus exposed should be removed and replaced by select fill material, similar to the existing subgrade soil and approved by the Geotechnical Engineer. The subgrade should then be re-compacted from the surface to at least 98% of its Standard Proctor Maximum Dry Density (SPMDD). The final subgrade should be cambered or otherwise shaped properly to facilitate rapid drainage and to prevent the formation of local depressions in which water could accumulate.

Due to the clayey (i.e. impervious) nature of the subsoil in the upper portions (in MW1), proper cambering and allowing the water to escape towards the sides (where it can be removed by means of sub-drains) is considered to be beneficial for this project. Otherwise, any water collected in the granular sub-base materials could be trapped thus causing problems due to softened subgrade, differential frost heave, etc. For the same reason damaging the subgrade during and after placement of the granular materials by heavy construction traffic should be avoided. If the moisture content of the local material cannot be maintained at ±2% of the optimum moisture content, imported granular material may be required.

Any fill required for regrading the site or backfill should be select, clean material, free of topsoil, organic or other foreign and unsuitable matter. The fill should be placed in layers and compacted to at least 95% of its SPMDD. The degree of compaction should be increased to 98% within the top 1.0 m of the subgrade. The compaction of the new fill should be checked by sufficient number of field compaction tests.

6.3 Construction

Once the subgrade has been inspected and approved, the granular base and sub-base course materials should be placed in layers not exceeding 200mm (uncompacted thickness) and should be compacted to at least 100% of their respective SPMDD. The grading of the material should conform to current OPS Specifications.

The placing, spreading and rolling of the asphalt should be in accordance with OPS Specifications or, as required by the local authorities.

Frequent field compaction tests should be carried out on both the asphalt and granular base and sub-base materials to ensure that the required degree of compaction is achieved.

6.4 Drainage

Installation of full-length sub-drains is required on all roads. The sub-drains should be properly filtered to prevent the loss of (and clogging by) soil fines.

All paved surfaces should be sloped to provide satisfactory drainage towards Catch Basins. As discussed in Section 6.2, by means of good planning any water trapped in the granular sub-base materials should be drained rapidly towards sub-drains or other interceptors.

6.5 Sewers

As a part of the site development, a network of new storm and sanitary sewers is to be constructed.

6.5.1 Trenching

As no detail drawing is available for us at the time of writing this report, we estimated that trenches will probably be 3 m to 4 m below the existing ground levels,

As indicated in the boreholes, the trenches will be dug through the fill and sandy clayey silt, sandy silt, sand and silt and silty sand. Based on the borehole information, groundwater seepage is anticipated during construction in trench to a maximum depth of 4 m. Groundwater control may be established by the use of conventional pumping from collection sumps and ditches for most excavation. However, the effectiveness of this method can only be proven by field pump testing. Or otherwise, a positive dewatering system should be adopted. Please refer to Hydrogeology Study report for detail of the groundwater control.

It should be noted that the till is a non-sorted sediment and therefore may contain boulders. Possible large obstructions such as buried concrete pieces are also anticipated in the fill material. Provisions must be made in the excavation contract for the removal of possible boulders in the till or obstructions in the fill material.

Any loose fill or other unsuitable material below the pipe invert level must be removed and replaced with inorganic material compacted to at least 95% of its Standard Proctor Maximum Dry Density (SPMDD) and to 98% of SPMDD within 0.5 m below the pipe invert level.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the fill and compact to dense sandy soil above the water table can be classified as Type 3 soils. The very stiff to hard clayey silt and very dense sandy silt till/silty sand till deposits above the water table are classified as Type 2 soils.

6.5.2 Bedding

The undisturbed very stiff to hard clayey silt, very dense sandy silt, sand and silt as well as the silty sand as described in Section 4 of this report will provide adequate support for the sewer pipes and allow the use of normal Class B type bedding. The recommended minimum thickness of granular bedding below the invert of the pipes is 150mm. The thickness of the bedding may, however, have to be increased depending on the pipe diameter or if wet or weak subgrade conditions are encountered. The bedding material should consist of well graded granular material such as Granular ‘A’ or equivalent. After installing the pipe on the bedding, a granular surround of approved bedding material, which extends at least 300mm above the obvert of the pipe, or as set out by the local Authority, should be placed.

To avoid the loss of soil fines from the subgrade, uniformly graded clear stone should not be used unless, below the granular bedding material, a suitable, approved filter fabric (geotextile) is placed. The geotextile should extend along the sides of the trench and should be wrapped all around the poorly (i.e. uniformly) graded bedding material.

6.5.3 Backfilling of Trenches

Based on visual and tactile examination, the on-site excavated organic free sandy clayey silt, sandy silt, sand and silt as well as the silty sand deposits can generally be re-used as backfill in the service trenches provided their moisture contents at the time of construction are at or near optimum.

The clayey silt is likely to be excavated in cohesive chunks or blocks and will be difficult to compact in confined areas. For use as backfill, the clayey material will have to pulverized and placed in thin layers. The clayey soils will have to be compacted using heavy equipment suitable for these soils which may be difficult to operate in the narrow confines of the trenches. Unless the clayey materials are properly pulverized and compacted in sufficiently thin lifts post-construction settlements could occur.

The backfill should be placed in maximum 200mm thick layers at or near (±2%) their optimum moisture content, and each layer should be compacted to at least 95% SPMDD. Unsuitable materials such as organic soils, boulders, cobbles, frozen soils, etc. should not be used for backfilling.

The on-site excavated soils, especially the clayey soils should not be used in confined areas (e.g. around catch basins and laterals under roadways) where heavy compaction equipment cannot be operated. The use of imported granular fill together with an appropriate frost taper would be preferable in confined areas and around structures, such as catch basins.

7 LIMITATIONS OF REPORT

The Limitations of Report, as quoted in Appendix 'A', are an integral part of this report.

Yours respectfully

TERRAPEX ENVIRONMENTAL LTD.

LICENSED PROFESSIONAL ENGINEER
T. YAN
100208861
4/15/2023
PROVINCE OF ONTARIO

Thomas Yan., P.Eng.
Senior Geotechnical Engineer

Meysam Najari, PhD
Vice President, Geotechnical Services

APPENDIX A

LIMITATIONS OF REPORT

limitations of report

The conclusions and recommendations in this report are based on information determined at the inspection locations. Soil and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction which could not be detected or anticipated at the time of the soil investigation.

The design recommendations given in this report are applicable only to the project described in the text, and then only if constructed substantially in accordance with details of alignment and elevations stated in the report. Since all details of the design may not be known to us, in our analysis certain assumptions had to be made as set out in this report. The actual conditions may, however, vary from those assumed, in which case changes and modifications may be required to our recommendations.

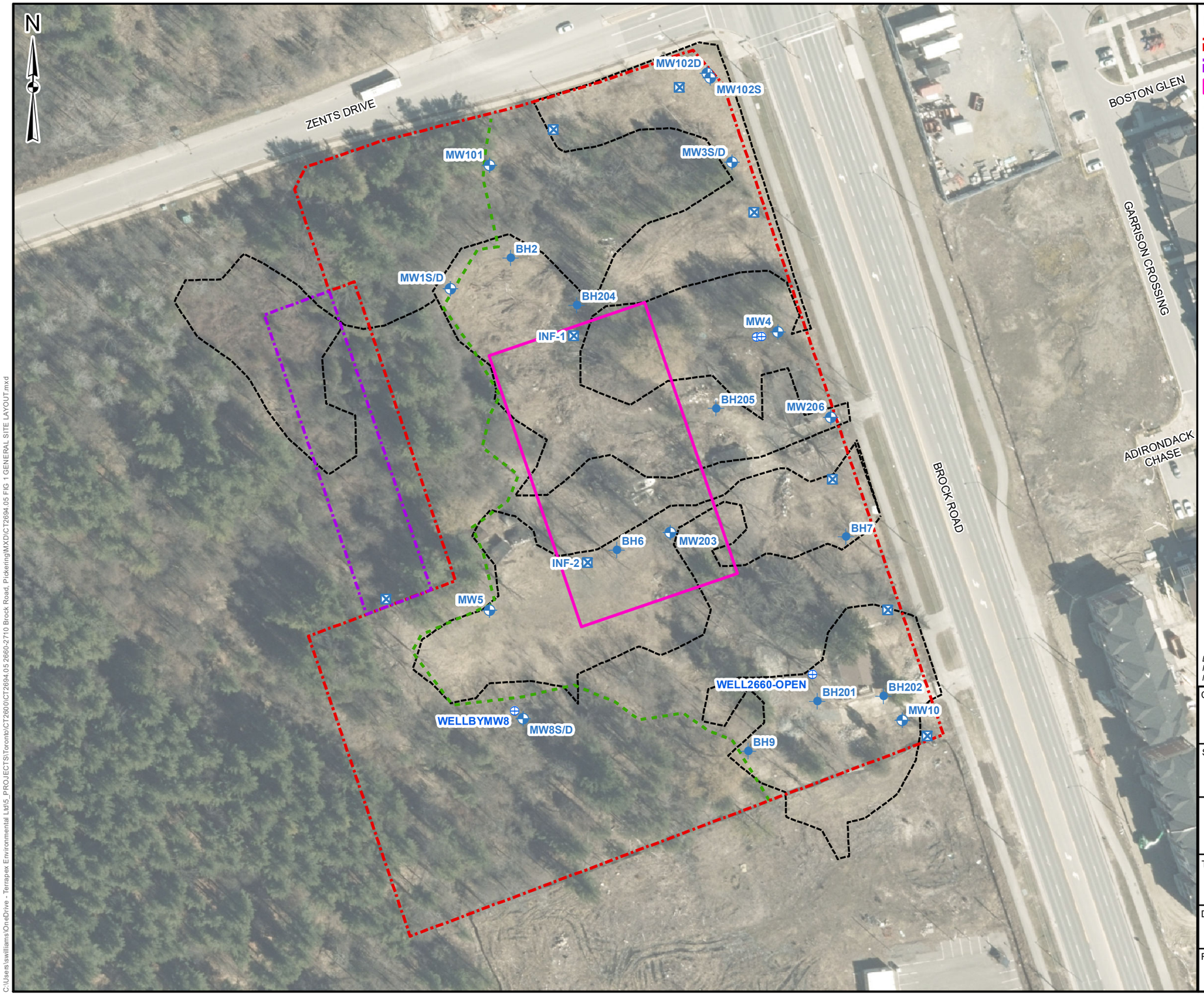
This report was prepared for The Brock Zents Partnership by Terrapex Environmental Ltd. The material in it reflects Alston Associates judgement in light of the information available to it at the time of preparation. Any use which a Third Party makes of this report, or any reliance on decisions which the Third Party may make based on it, are the sole responsibility of such Third Parties.

We recommend, therefore, that we be retained during the final design stage to review the design drawings and to verify that they are consistent with our recommendations or the assumptions made in our analysis. We recommend also that we be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered in the test holes. In cases where these recommendations are not followed, the company's responsibility is limited to accurately interpreting the conditions encountered at the test holes, only.

The comments given in this report on potential construction problems and possible methods are intended for the guidance of the design engineer, only. The number of inspection locations may not be sufficient to determine all the factors that may affect construction methods and costs. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work.

APPENDIX B

DRAWING 1: BOREHOLE LOCATION PLAN



LEGEND

- SITE BOUNDARY
- PLAN 2 BOUNDARY
- INFILTRARTION AREA
- TRCA STAKED TREE LINE
- OPEN AREA
- BOREHOLE
- MONITORING WELL
- PLANNED TEST PIT LOCATION
- WATER WELL LOCATION

0 25 50
Metres

DATA SOURCE: CITY OF PICKERING
IMAGERY SOURCE: MAPCAST MAPPING SERVICES
MAP PROJECTION: NAD 1983 UTM ZONE 17N

CLIENT:
ICON HOMES

SITE LOCATION:
2660 TO 2710 BROCK ROAD AT ZENTS DRIVE
PICKERING, ONTARIO

TERRAPEX

TITLE:
GENERAL SITE LAYOUT

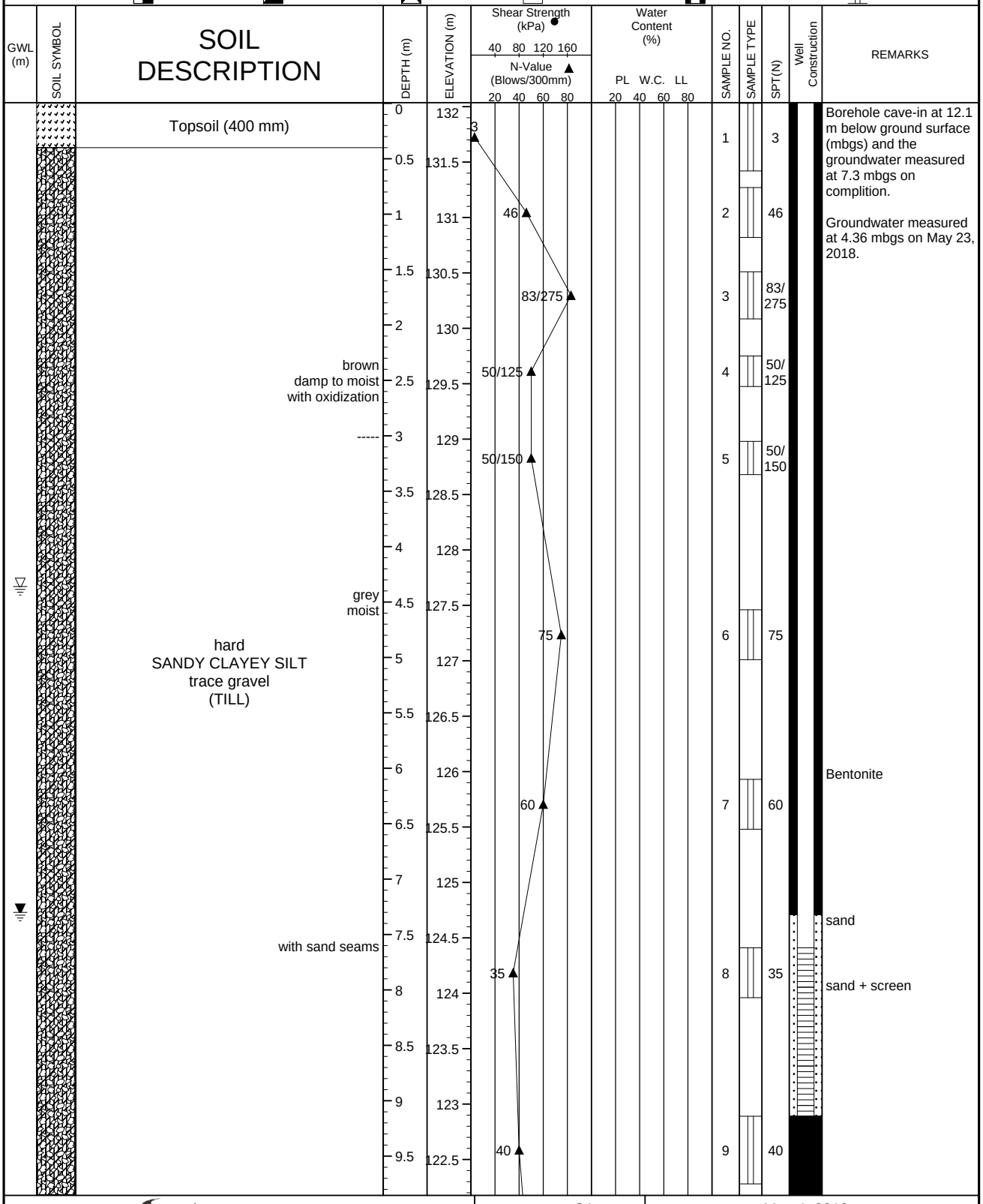
DRAWN BY:	PROJECT NO.:	CHECKED BY:
SW/JS	CT2694.05	XX
REVISION:	DATE:	FIGURE:
00	OCTOBER 2023	**1**

C:\Users\swilliams\OneDrive - Terrapex Environmental Ltd\5_PROJECTS\Toronto\CT2600\CT2694.05 2660-2710 Brock Road, Pickering\MXD\CT2694.05 FIG 1 GENERAL SITE LAYOUT.mxd

APPENDIX C
BOREHOLE LOG SHEETS

CLIENT: The Brock Zents Partnership	METHOD: Solid Stem Auger and Split Spoon		**BH No.: MW1D**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN	ELEV. (m) 132.03	
LOCATION: 2660 - 2680 Brock Road, Pickering	NORTHING:	EASTING:	PROJECT NO.: 18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON



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CLIENT: The Brock Zents Partnership	METHOD: Solid Stem Auger and Split Spoon	**BH No.: MW1D**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN / ELEV. (m) 132.03	
LOCATION: 2660 - 2680 Brock Road, Pickering	NORTHING: / EASTING:	PROJECT NO.: 18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) 40 80 120 160 / N-Value (Blows/300mm) 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		very dense, wet, grey SAND AND SILT trace gravel, trace clay (TILL) with sand seams and layers	10	122							Augering through rock/ boulder
			10.5	121.5							
			11	121	50/150		10		50/ 150		
			11.5	120.5							
		very dense, wet, grey SANDY GRAVEL	12	120	50/150		11		50/ 150		
			12.5	119.5							
		hard, damp, grey CLAYEY SILT	13	119							Augering through rock/ boulder
			13.5	118.5							
					50/100		12		50/ 100		
		END OF BOREHOLE									

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CLIENT: The Brock Zents Partnership	METHOD: Solid Stem Auger and Split Spoon		**BH No.: MW1S**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN	ELEV. (m) 132.03	
LOCATION: 2660 - 2680 Brock Road, Pickering	NORTHING:	EASTING:	PROJECT NO.: 18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) 40 80 120 160 / N-Value (Blows/300mm) 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
▽		Straight auger to install the monitoring well	0 0.5 1 1.5 2 2.5 3 3.5 4 4.5	132 131.5 131 130.5 130 129.5 129 128.5 128 127.5						Bentonite Sand Sand + Screen	Groundwater measured at 0.81 mbgs on May 23, 2018.
		END OF BOREHOLE									

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CLIENT: The Brock Zents Partnership	METHOD: Solid Stem Auger and Split Spoon		**BH No.: BH2**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN	ELEV. (m) 131.44	
LOCATION: 2660 - 2680 Brock Road, Pickering	NORTHING:	EASTING:	PROJECT NO.: 18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
	Topsoil (300 mm)	0		24		1A				Borehole cave-in at 7.6 mbgs and the groundwater measured at 6.7 mbgs on complition.
	compact, moist, brown SANDY SILT	0.5	131			1B		24		
	hard, damp, brown SANDY CLAYEY SILT trace gravel (TILL)	1	130.5	60		2		60		
		1.5	130	50/150		3		50/150		
		2	129.5							
	brown damp to moist with oxidization	2.5	129	50/125		4		50/125		
		3	128.5	50/100		5		50/100		
	-----	3.5	128							
		4	127.5							
	grey moist to wet	4.5	127							
	very dense SANDY SILT trace gravel trace to some clay (TILL) with sand seams and layers	5	126.5	52		6		52		
		5.5	126							Augering through rock/ boulder
		6	125.5							
		6.5	125	50/100		7		50/100		
		7	124.5							
		7.5	124							
		8	123.5	50/150		8		50/150		Augering refusal due to a boulder
	END OF BOREHOLE									

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CLIENT: The Brock Zents Partnership	METHOD: Solid Stem Auger and Split Spoon		**BH No.: MW3D**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN	ELEV. (m) 130.37	
LOCATION: 2660 - 2680 Brock Road, Pickering	NORTHING:	EASTING:	PROJECT NO.: 18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		Topsoil (600 mm)	0	130	3		1		3		Borehole cave-in at 4.3 mbgs and the groundwater measured at 2.4 mbgs on complition.
		compact to dense, moist, brown silty sand, trace gravel, trace clay (Probable FILL)	0.5	129.5	25		2		25		Groundwater measured at 2.67 mbgs on May 23, 2018.
▼			1	129							
			1.5	128.5	42		3		42		
			2	128							
			2.5		52		4		52		
		very dense, brown, moist SANDY SILT with slight cohesion intermixed with TILL layers	3	127.5							
			3.5	127	57		5		57		
			4	126.5							
			4.5	126							Bentonite
			5	125.5	50/125		6		50/125		
			5.5	125							sand
		brown wet	6	124.5							sand + screen
			6.5	124	71/275		7		71/275		
		very dense SANDY SILT to SILTY SAND trace gravel	7	123.5							
			7.5	123							Straight auger to install the monitoring well.
		grey wet	8	122.5	50/125		8		50/125		
			8.5	122							
			9	121.5							
			9.5	121	50/150		9		50/150		

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CLIENT: The Brock Zents Partnership	METHOD: Solid Stem Auger and Split Spoon	**BH No.: MW3D**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN / ELEV. (m) 130.37	
LOCATION: 2660 - 2680 Brock Road, Pickering	NORTHING: / EASTING:	PROJECT NO.: 18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) 40 80 120 160 / N-Value (Blows/300mm) 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		very dense, wet, grey SILTY SAND	10	120.5							
			10.5	120							
			11	119.5	96/250		10		96/250		
			11.5	119							
			12	118.5							
			12.5	118	50/125		11		50/125		
			13	117.5							
			13.5	117							
				116.5	50/125		12		50/125		
		END OF BOREHOLE									

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CLIENT: The Brock Zents Partnership	METHOD: Solid Stem Auger and Split Spoon	**BH No.: MW3S**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN / ELEV. (m) 130.34	
LOCATION: 2660 - 2680 Brock Road, Pickering	NORTHING: / EASTING:	PROJECT NO.: 18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) 40 80 120 160 / N-Value (Blows/300mm) 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
▽		Straight auger to install the monitoring well	0 0.5 1 1.5 2 2.5 3	130 129.5 129 128.5 128 127.5						Sand Sand + Screen Bentonite	Groundwater measured at 1.62 mbgs on May 23, 2018.
		END OF BOREHOLE									

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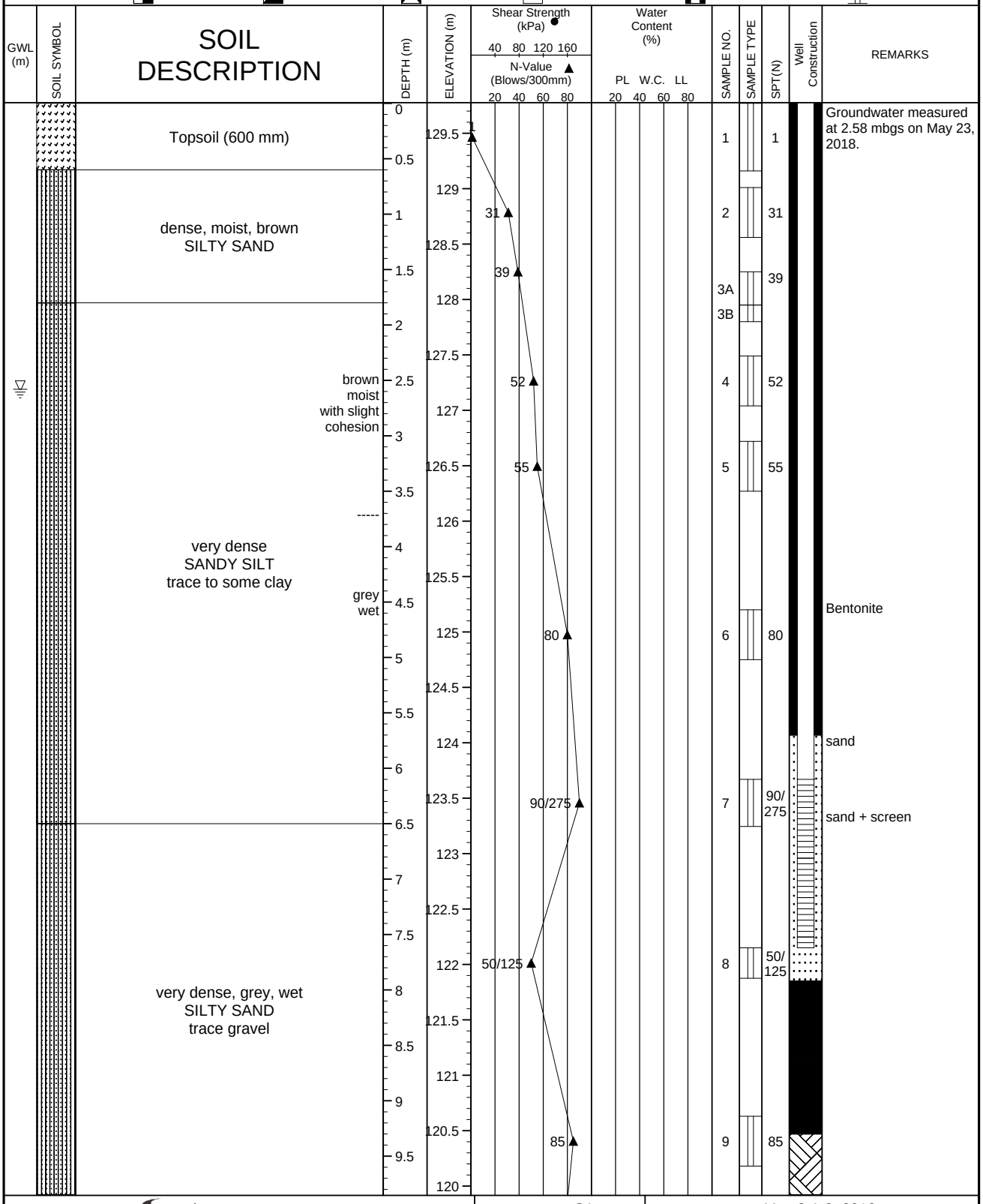
CLIENT: The Brock Zents Partnership	METHOD: Hollow Stem Auger and Split Spoon		**BH No.: MW4**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN	ELEV. (m) 129.77	
LOCATION: 2660 - 2680 Brock Road, Pickering	NORTHING:	EASTING:	PROJECT NO.: 18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON



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CLIENT: The Brock Zents Partnership	METHOD: Hollow Stem Auger and Split Spoon	**BH No.: MW4**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN	ELEV. (m) 129.77
LOCATION: 2660 - 2680 Brock Road, Pickering	NORTHING:	EASTING: PROJECT NO.: 18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) 40 80 120 160 / N-Value (Blows/300mm) 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		very dense, wet, grey SAND trace to some gravel trace silt	10	119.5							
			10.5	119	71		10		71		
			11	118.5							
			11.5	118							
			12	117.5	50/125		11		50/125		Augering through rock/ boulder
			12.5	117							
		hard, grey, moist CLAYEY SILT	13	116.5							
			13.5	116			12		50/150		
			14		50/150						
		END OF BOREHOLE									

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CLIENT: The Brock Zents Partnership	METHOD: Hollow Stem Auger and Split Spoon		**BH No.: MW5**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN	ELEV. (m) 131.59	
LOCATION: 2660 - 2680 Brock Road, Pickering	NORTHING:	EASTING:	PROJECT NO.: 18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
	black, moist, sand and gravel (FILL)	0	131.5	8		1		8		Groundwater measured at 5.56 mbgs on May 23, 2018.
		0.5	131							
		1	130.5	30		2		30		
		1.5	130							
				66		3		66		
		2	129.5							
	brown damp	2.5	129	50/150		4		50/150		
		3	128.5							
	-----			72		5		72		
		3.5	128							
	grey moist	4	127.5							
		4.5	127							
	very dense SAND and SILT trace gravel, trace clay (TILL)			52		6		52		
		5	126.5							
		5.5	126							
		6	125.5							Bentonite
				46		7		46		
		6.5	125							Augering through rock/ boulder
		7	124.5							
		7.5	124	50/150		8		50/150		sand
										sand + screen
		8	123.5							
		8.5	123							Augering through rock/ boulde
		9	122.5	50/125		9		50/125		
	END OF BOREHOLE									

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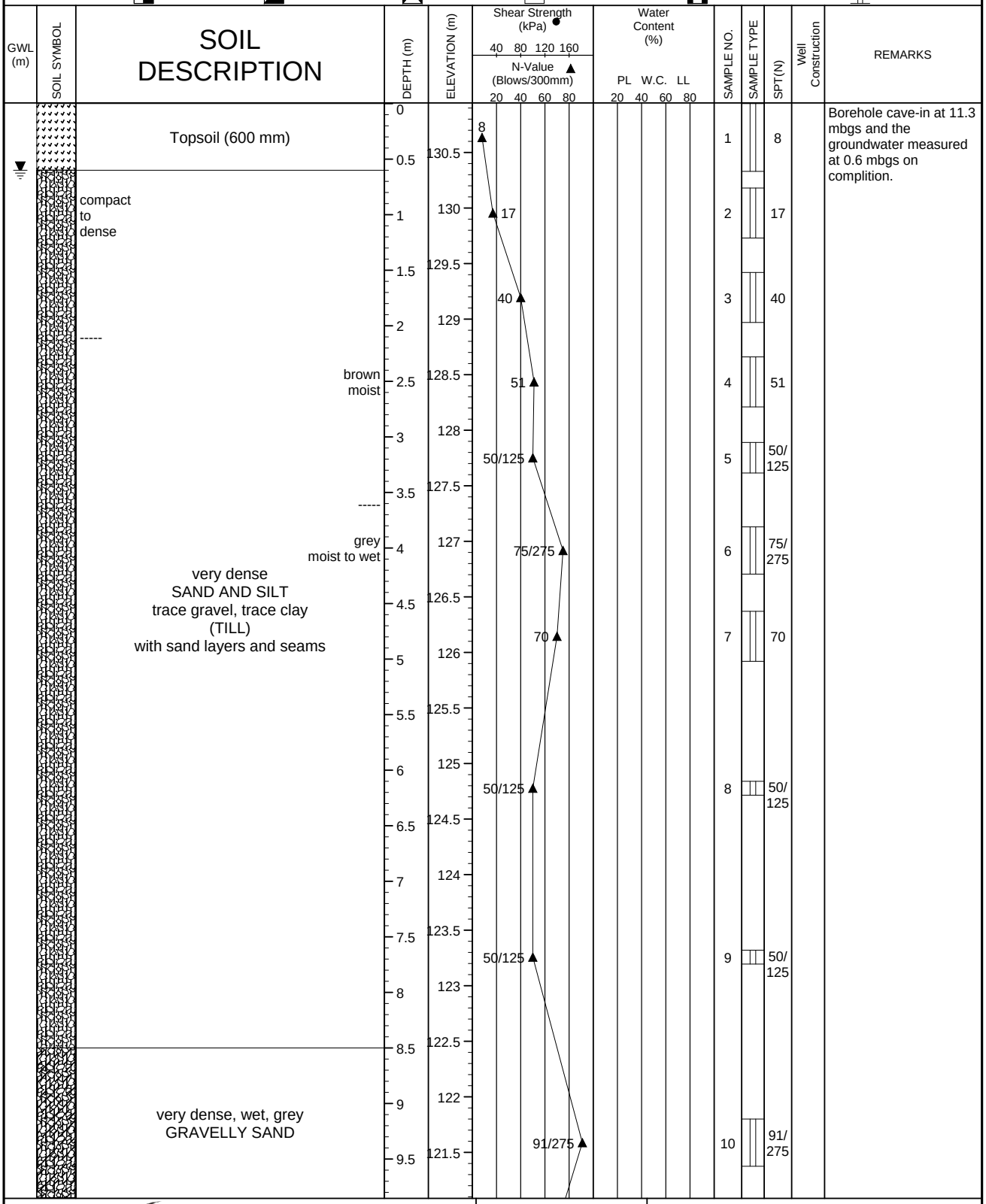
REVIEWED BY: VN	Page 1 of 1

CLIENT: The Brock Zents Partnership	METHOD: Solid Stem Auger and Split Spoon		**BH No.: BH6**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN	ELEV. (m) 130.94	
LOCATION: 2660 - 2680 Brock Road, Pickering	NORTHING:	EASTING:	PROJECT NO.: 18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON



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CLIENT: The Brock Zents Partnership	METHOD: Solid Stem Auger and Split Spoon		**BH No.: BH6**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN	ELEV. (m) 130.94	
LOCATION: 2660 - 2680 Brock Road, Pickering	NORTHING:	EASTING:	PROJECT NO.: 18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) 40 80 120 160 / N-Value (Blows/300mm) 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		very dense, wet, grey SAND AND SILT trace gravel, trace clay (TILL) with sand seams and layers	10	121							
			10.5	120.5							
			11	120	50/150		11		50/150		
			11.5	119.5							
			12	119							
		very dense, wet, grey SANDY GRAVEL	12.5	118.5	50/275		12		50/275		
			13	118							
		hard, damp, grey SAND AND SILT trace gravel, trace clay (TILL) with shale pieces	13.5	117.5	50/20		13		50/20		(Possible BEDROCK)
		END OF BOREHOLE									

TERRAPEX

LOGGED BY: SA	DRILLING DATE: April 30, 2018
REVIEWED BY: VN	Page 2 of 2

CLIENT: The Brock Zents Partnership	METHOD: Hollow Stem Auger and Split Spoon		**BH No.: BH7**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN	ELEV. (m) 129.91	
LOCATION: 2660 - 2680 Brock Road, Pickering	NORTHING:	EASTING:	PROJECT NO.: 18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
	Topsoil (150 mm)	0	129.5	7	23	1		7		Borehole cave-in at 4.5 mbgs and the groundwater measured at 1.8 mbgs on complition.
	firm, dark brown , moist clayey silt (FILL) with sandy gravell layer	0.5								
		1	129	6	18	2		6		
		1.5	128.5							
▼				20	15	3		20		The borehole moved 3 m south due to an existing concrete foundation
	compact	2	128							
	moist, brown SANDY SILT trace gravel, trace clay (TILL) with oxidization	2.5	127.5	26	10	4		26		
	----- very dense	3	127							
				55	8	5		55		
		3.5	126.5							
		4	126							
	brown moist with clayey silt seams	4.5	125.5							
				50/250	12	6		50/250		
		5	125							
		5.5	124.5							
		6	124							
				34	19	7		34		
	very dense, wet SILTY SAND	6.5	123.5							
	-----	7	123							
	grey moist to wet	7.5	122.5							
				50/125	18	8		50/125		
		8	122							
		8.5	121.5							
		9	121							
				50/125	16	9		50/125		
		9.5	120.5							

TERRAPEX

LOGGED BY: SA | DRILLING DATE: April 30, 2018

REVIEWED BY: VN |

CLIENT: The Brock Zents Partnership	METHOD: Hollow Stem Auger and Split Spoon	**BH No.: BH7**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN / ELEV. (m) 129.91	
LOCATION: 2660 - 2680 Brock Road, Pickering	NORTHING: / EASTING:	PROJECT NO.: 18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) 40 80 120 160 / N-Value (Blows/300mm) 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		very dense, wet, grey SILTY SAND	10	120	50/125	13	10		50/125		
			10.5	119.5							
			11	119							
			11.5	118.5							
			12	118							
			12.5	117.5	78	16	11		78		
			13	117							
			13.5	116.5							
			14	116	68	17	12		68		
		END OF BOREHOLE									

TERRAPEX

LOGGED BY: SA | DRILLING DATE: April 30, 2018

REVIEWED BY: VN |

CLIENT: The Brock Zents Partnership	METHOD: Solid Stem Auger and Split Spoon		**BH No.: MW8D**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN	ELEV. (m) 131.64	
LOCATION: 2660 - 2680 Brock Road, Pickering	NORTHING:	EASTING:	PROJECT NO.: 18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
	Topsoil (600 mm)	0	131.5	3	30	1		3		Borehole cave-in at 12.2 mbgs and the groundwater measured at 2.7 mbgs on complition.
		0.5	131	13	11	2		13		Groundwater measured at 5.11 mbgs on May 23, 2018.
		1	130.5	39	9	3		39		
		1.5	130							
	hard, damp to moist, brown SANDY CLAYEY SILT trace gravel (TILL)	2	129.5	67	10	4		67		
▼		2.5	129							
		3	128.5	84	9	5		84		
		3.5	128							
		4	127.5							
	very dense, moist to wet, grey SAND AND SILT trace gravel, trace clay (TILL)	4.5	127	50/150	8	6		50/150		
▽		5	126.5							
		5.5	126							
		6	125.5	73	10	7		73		
		6.5	125							
		7	124.5							
		7.5	124	50/125	8	8		50/125		Bentonite
	very dense, wet, grey SILTY SAND trace gravel	8	123.5							
		8.5	123							sand
		9	122.5	50/75	12	9		50/75		
		9.5	122							sand + screen

TERRAPEX

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REVIEWED BY: VN | Page 1 of 2

CLIENT: The Brock Zents Partnership	METHOD: Solid Stem Auger and Split Spoon	**BH No.: MW8D**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN	ELEV. (m) 131.64
LOCATION: 2660 - 2680 Brock Road, Pickering	NORTHING:	EASTING: PROJECT NO.: 18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) 40 80 120 160 / N-Value (Blows/300mm) 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		very dense, wet, grey GRAVELLY SAND	10	121.5	50/100	6	10		50/100		Sand + Screen
			10.5	121							
			11	120.5							
			11.5	120							
			12	119.5	50/150	11	11		50/150		Augering through rock/ boulder
		very dense, wet, grey SAND AND SILT trace gravel, trace clay (TILL) with occasional sand semas and layers	12.5	119							
			13	118.5							
			13.5	118							
			14	117.5	50/275	13	12		50/275		
			14.5	117							
			15	116.5	50/125	6	13		50/125		POSSIBLE BEDROCK
		END OF BOREHOLE									

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REVIEWED BY: VN |

CLIENT: The Brock Zents Partnership	METHOD: Solid Stem Auger and Split Spoon		**BH No.: BH9**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN	ELEV. (m) 130.22	
LOCATION: 2660 - 2680 Brock Road, Pickering	NORTHING:	EASTING:	PROJECT NO.: 18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
	Topsoil (300 mm)	0	130	3		1		3		Borehole cave-in at 3.35 mbgs and the groundwater measured at 1.5 mbgs on complition.
	soft, dark brown, moist clayey silt, trace gravel trace organics (FILL)	0.5	129.5	19		2A 2B		19		
▼	hard, damp, brown SANDY CLAYEY SILT trace gravel (TILL) with sand seams and layers	1	129							
		1.5	128.5	32		3		32		
		2	128							
	very dense, wet, brown SILTY SAND with occasional clay layers	2.5	127.5	46		4		46		
		3	127	52		5		52		
		3.5	126.5							
	hard, moist, grey SANDY CLAYEY SILT trace gravel (TILL) with wet sand seams and layers	4	126	64		6		64		
		4.5	125.5	47		7		47		
		5	125							
		5.5	124.5							
	very dense, moist to wet, grey SAND AND SILT trace gravel, trace clay (TILL)	6	124	52		8		52		
		6.5	123.5							
		7	123							
		7.5	122.5	69		9		69		
		8	122							
		8.5	121.5							
		9	121	78		10		78		
	END OF BOREHOLE	9.5								

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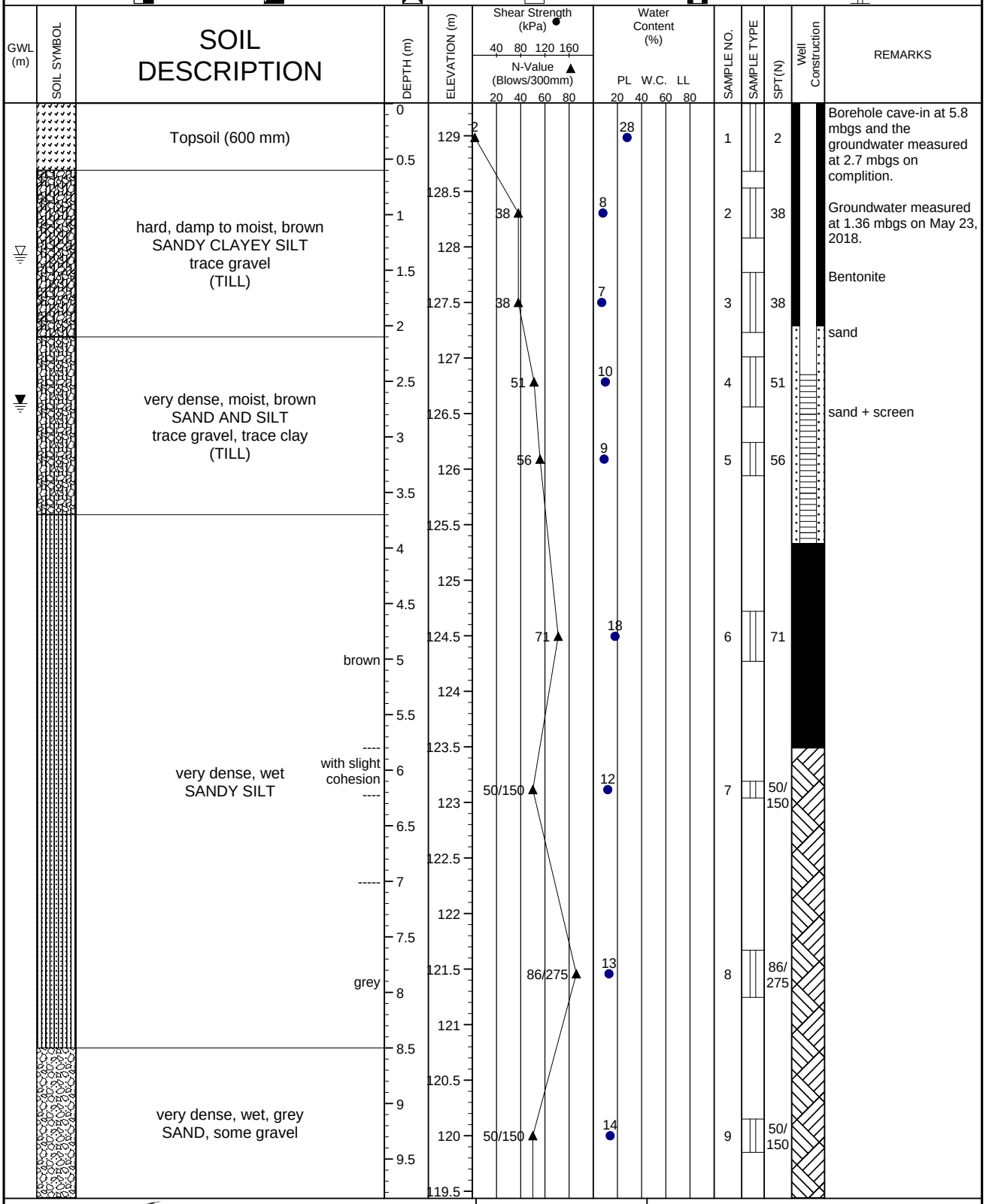
CLIENT: The Brock Zents Partnership	METHOD: Solid Stem Auger and Split Spoon		**BH No.: MW10**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN	ELEV. (m) 129.29	
LOCATION: 2660 - 2680 Brock Road, Pickering	NORTHING:	EASTING:	PROJECT NO.: 18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON



TERRAPEX	LOGGED BY: SA	DRILLING DATE: May 7, 2018
	REVIEWED BY: VN	Page 1 of 2

CLIENT: The Brock Zents Partnership	METHOD: Solid Stem Auger and Split Spoon	**BH No.: MW10**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN	ELEV. (m) 129.29
LOCATION: 2660 - 2680 Brock Road, Pickering	NORTHING:	EASTING: PROJECT NO.: 18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) 40 80 120 160 / N-Value (Blows/300mm) 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		very dense, wet, grey SANDY SILT	10	119							
			10.5	118.5	50/150	16	10		50/150		
			11	118							
			11.5	117.5							
		very dense, wet, grey SAND AND SILT trace gravel, trace clay (TILL) with sand layers	12	117	50/100	9	11		50/100		
			12.5	116.5							
			13	116							
			13.5	115.5	50/150	11	12		50/150		
		END OF BOREHOLE									

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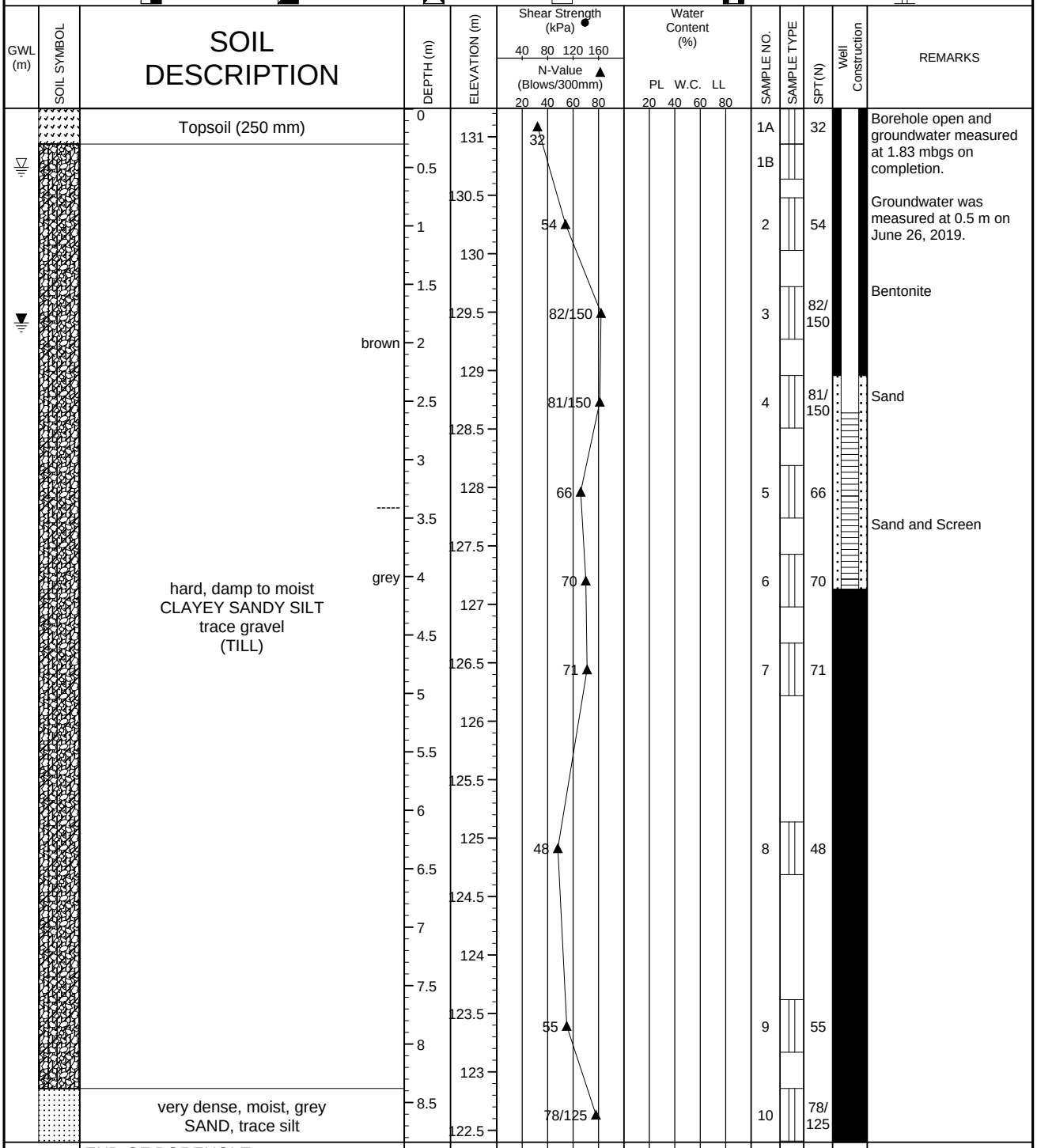
LOGGED BY: SA | DRILLING DATE: May 7, 2018

REVIEWED BY: VN |

CLIENT: The Brock Zents Partnership	METHOD: Solid Stem Augering and Split Spoon	**BH No.: MW101**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN / ELEV. (m) 131.238	
LOCATION: 2660-2680 Brock Road, Pickering, ON	NORTHING: / EASTING:	PROJECT NO.: CA18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON



TERRAPEX	LOGGED BY: LG	DRILLING DATE: June 12, 2019
	REVIEWED BY: VN	Page 1 of 1

CLIENT: The Brock Zents Partnership	METHOD: Solid Stem Augering and Split Spoon		**BH No.: MW102D**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN	ELEV. (m) 130.695	
LOCATION: 2660-2680 Brock Road, Pickering, ON	NORTHING:	EASTING:	PROJECT NO.: CA18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		Topsoil (230 mm)	0	130.5	18		1A		18		Borehole open and groundwater measured at 5.7 mbgs oncompletion.
			0.5				1B				
		compact	1	130	22		2		22		Groundwater was measured at 2.94 m on June 26, 2019.
		-----	1.5	129.5							
		moist to wet, brown SANDY SILT	2	129	41		3		41		
		dense	2.5	128.5							
▽			3	128	47		4		47		
			3.5	127.5	41		5		41		Bentonite
		brown	4	127							
		----	4.5	126.5	69		6		69		
		hard, moist CLAYEY SANDY SILT	5	126	50/150		7		50/150		
		grey	5.5	125.5							
▼			6	125							Sand
			6.5	124.5	85		8		85		
		very dense, wet, grey GRAVELLY SAND	7	124							Sand and Screen
			7.5	123.5							
			8	123	74		9		74		
			8.5	122.5	50/150		10A		50/150		
		hard, moist, grey CLAYEY SANDY SILT, trace gravel (TILL)					10B				
		END OF BOREHOLE									

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CLIENT: The Brock Zents Partnership	METHOD: Solid Stem Augering and Split Spoon	**BH No.: MW102S**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN / ELEV. (m) 130.683	
LOCATION: 2660-2680 Brock Road, Pickering, ON	NORTHING: / EASTING:	PROJECT NO.: CA18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) 40 80 120 160 / N-Value (Blows/300mm) 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
▽		Straight auger to 3.66 m to install the monitoring well	0 0.5 1 1.5 2 2.5 3 3.5	130.5 130 129.5 129 128.5 128 127.5						Bentonite Sand Sand and Screen	Borehole open and groundwater measured at 2.53 mbgs on completion. Groundwater was measured at 2.53 m on June 26, 2019.
		END OF BOREHOLE									

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REVIEWED BY: VN |

CLIENT: The Brock Zents Partnership	METHOD: Solid Stem Augering and Split Spoon	**BH No.: MW8S**
PROJECT: Proposed Residential Development	PROJECT ENGINEER: VN / ELEV. (m) 131.033	
LOCATION: 2660-2680 Brock Road, Pickering, ON	NORTHING: / EASTING:	PROJECT NO.: CA18-041

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		Straight auger to 2.28 m	0	131	40 80 120 160 / 20 40 60 80	20 40 60 80					Borehole open and dry on completion. Groundwater was measured at 2.72 m on June 26, 2019.
			0.5	130.5							
			1	130							
			1.5	129.5							
			2	129							Bentonite
			2.5	128.5	50/125		1		50/125		Sand
		hard, damp CLAYEY SANDY SILT trace gravel (TILL) brown	3	128	72		2		72		
			3.5	127.5							Sand and Screen
		----- grey	4	127	71		3		71		
		END OF BOREHOLE									

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CLIENT: Patheon Developers(Ontario) Inc.	PROJECT NO.: CT2694.03	**RECORD OF:**	
ADDRESS: 2660-2680 Brock Rd, Pickering ON		**BH201**	
CITY/PROVINCE: 2660-2680 Brock Rd, Pickering ON	NORTHING (m): 4860080.93	EASTING (m): 653626.84	ELEV. (m) 129.65
CONTRACTOR: Pontil	METHOD: Solid Stem Auger and Spilt Spoon		
BOREHOLE DIAMETER (cm): 16.51	WELL DIAMETER (cm):	SCREEN SLOT #:	SAND TYPE:	SEALANT TYPE:

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	SV/TOV (ppm or %LEL) (new title)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
		FILL moist, brown clayey silt, trace sand trace rootlets	0	129.5	1		37	<5p/0p	PAHs, M&I, PHCs, VOCs		
		stiff to hard moist, brown CLAYEY SANDY SILT trace gravel (TILL)	1	129	2A		100	<5p/0p			
			1.5	128.5	2B		100	<5p/0p	Boron		
			2	128	3		100	<5p/0p			
			2.5	127.5	4		100	<5p/0p			
		very dense, wet, grey SILTY SAND	3	127	5		100	<5p/1p			
			3.5	126.5	6		100	<5p/0p			
▼		very dense, wet, grey SANDY SILT	4	126	7		100	<5p/0p			
			4.5	125.5	8		100	<5p/0p			
			5	125	9		100	<5p/0p			
			5.5	124.5							
			6	124							
			6.5	123.5							
		END OF BOREHOLE		123							

SHEAR STRENGTH (kPa) ● 40 80 120 160
N-VALUE (Blows/300mm) ▲ 20 40 60 80
WATER CONTENT (%) PL W.C. LL 20 40 60 80

N-VALUE: 5, 19, 13, 35, 44, 67, 75, 75, 85

TERRAPEX

LOGGED BY: SJ	DRILLING DATE: 04-Oct-2021
INPUT BY: MW	MONITORING DATE:
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CLIENT: Patheon Developers(Ontario) Inc.	PROJECT NO.: CT2694.03	**RECORD OF: BH202**
ADDRESS: 2660-2680 Brock Rd, Pickering ON		
CITY/PROVINCE: 2660-2680 Brock Rd, Pickering ON	NORTHING (m):	EASTING (m): ELEV. (m)
CONTRACTOR: Pontil	METHOD:	
BOREHOLE DIAMETER (cm):	WELL DIAMETER (cm):	SCREEN SLOT #: SAND TYPE: SEALANT TYPE:

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa) 40 80 120 160 / N-VALUE (Blows/300mm) 20 40 60 80	WATER CONTENT (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	SV/TOV (ppm or %LEL) (new title)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
		FILL moist, brown clayey silt, trace sand, trace rootlets layer of crushed limestone	0		12		1		70	<5p/0p	M&I, PAHs		
		FILL moist, light brown silty sand, trace gravel layer of crushed limestone	0.5 1		43		2		66	<5p/0p			
		hard, moist, brown CLAYEY SANDY SILT trace gravel (TILL)	1.5		42		3A		100	<5p/0p	BTEX F1-F4		
			2				3B		100	<5p/1p			
			2.5		34		4		100	<5p/0p			
			3										
			3.5		64		5		100	<5p/0p			
			4								pH, VOCs, PHCs, PAHs		
					44		6		100	<5p/0p			
▼		dense to very dense wet, brown SAND	4.5										
			5		42		7		100	<5p/0p			
			5.5		94/6"		8		100	<5p/0p			
		very dense, wet, grey SANDY SILT	6										
			6.5		90/6"		9		100	<5p/0p			
		END OF BOREHOLE											

TERRAPEX

LOGGED BY: SJ	DRILLING DATE: 04-Oct-2021
INPUT BY: MW	MONITORING DATE:
REVIEWED BY: VN	PAGE 1 OF 1

CLIENT: Patheon Developers(Ontario) Inc.	PROJECT NO.: CT2694.03	**RECORD OF: MW203**
ADDRESS: 2660-2680 Brock Rd, Pickering ON		
CITY/PROVINCE: 2660-2680 Brock Rd, Pickering ON	NORTHING (m): 4860130.02	EASTING (m): 653584.45 / ELEV. (m) 131.61
CONTRACTOR: Pontil	METHOD: Solid Stem Auger and Spilt Spoon	
BOREHOLE DIAMETER (cm): 12.7 / WELL DIAMETER (cm): 5.08	SCREEN SLOT #: 10 / SAND TYPE: Silica #2	SEALANT TYPE: bentonite

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	SV/TOV (ppm or %LEL) (new title)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
TOPSOIL 70mm	0	131.5							
SAND AND GRAVEL 100mm									
FILL moist, brown clayey sandy silt, trace gravel	0.5	131	1A		65	<5p/1p			
			1B		100	<5p/1p	PAHs		
very stiff to hard moist, brown CLAYEY SANDY SILT trace gravel (TILL)	1	130.5	2		100	<5p/1p	M&I		
	1.5	130							
	2	129.5	3		100	<5p/0p			
	2.5	129	4		100	<5p/1p	BTEX, PHCs		
dense to very dense moist, brown SILTY SAND	3	128.5	5		100	<5p/0p			
	3.5	128							
	4		6A		100	<5p/1p			
very dense to dense moist, grey SANDY SILT trace clay, trace gravel (TILL)		127.5	6B		100	<5p/1p			
	4.5	127					PAHs, PHCs, VOCs, pH		
	5	126.5	7		100	<5p/0p			
	5.5	126	8		100	<5p/1p			
	6	125.5							
	6.5	125	9		100	<5p/1p			
END OF BOREHOLE									

SHEAR STRENGTH (kPa) 40 80 120 160 / N-VALUE (Blows/300mm) 20 40 60 80: 13, 13, 16, 35, 36, 39, 87/6", 50, 46, 48

WATER CONTENT (%) PL W.C. LL 20 40 60 80

Borehole dry at completion

TERRAPEX

LOGGED BY: SJ	DRILLING DATE: 05-Oct-2021
INPUT BY: MW	MONITORING DATE: 27-Oct-21
REVIEWED BY: VN	PAGE 1 OF 1

CLIENT: Patheon Developers(Ontario) Inc.	PROJECT NO.: CT2694.03	**RECORD OF: BH204**
ADDRESS: 2660-2680 Brock Rd, Pickering ON		
CITY/PROVINCE: 2660-2680 Brock Rd, Pickering ON	NORTHING (m): 4860198.21	EASTING (m): 653566.49 / ELEV. (m) 131.08
CONTRACTOR: Pontil	METHOD: Solid Stem Auger and Spite Spoon	
BOREHOLE DIAMETER (cm): -	WELL DIAMETER (cm):	SCREEN SLOT #: / SAND TYPE: / SEALANT TYPE:

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa) / N-VALUE (Blows/300mm)	WATER CONTENT (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	SV/TOV (ppm or %LEL) (new title)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
		TOPSOIL 100mm FILL loose, moist, brown sandy silt	0	131	4		1		98	<5p/0p	PAHs, M&I, PHCs, VOCs		Borehole dry at completion
		very stiff to hard moist, brown CLAYEY SANDY SILT trace gravel (TILL)	0.5 1 1.5 2 2.5	130.5 130 129.5 129 128.5	27 33 57		2 3 4		98 98 98	<5p/1p <5p/1p <5p/1p			
		very dense, moist, grey SANDY SILT trace clay, trace gravel (TILL)	3 3.5 4 4.5 5 5.5 6 6.5	128 127.5 127 126.5 126 125.5 125 124.5	43 77 88/6" 85/6" 88/6"		5 6 7 8 9		98 100 100 100 100	<5p/1p <5p/1p <5p/1p <5p/1p <5p/1p			
		END OF BOREHOLE											

TERRAPEX

LOGGED BY: SJ	DRILLING DATE: 05-OCt-2021
INPUT BY: MW	MONITORING DATE:
REVIEWED BY: VN	PAGE 1 OF 1

CLIENT: Patheon Developers(Ontario) Inc.		PROJECT NO.: CT2694.03	**RECORD OF: BH205**
ADDRESS: 2660-2680 Brock Rd, Pickering ON			
CITY/PROVINCE: 2660-2680 Brock Rd, Pickering ON	NORTHING (m): 4860175.78	EASTING (m): 653592.76	ELEV. (m) 130.07
CONTRACTOR: Pontil	METHOD: Solid Stem Auger and Spilt Spoon		
BOREHOLE DIAMETER (cm): 16.51	WELL DIAMETER (cm):	SCREEN SLOT #:	SAND TYPE:	SEALANT TYPE:

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa) / N-VALUE (Blows/300mm)	WATER CONTENT (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	SV/TOV (ppm or %LEL) (new title)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
		TOPSOIL 100mm	0	130	7		1		49	5p/0p	PHCs, VOCs		Borehole dry at completion
		FILL firm, moist, dark brown sandy clayey silt	0.5	129.5									
		FILL compact, moist, brown sand, trace gravel	1	129	16		2		65	<5p/0p	PAHs, M&I		
		hard, moist, brown CLAYEY SANDY SILT, tr. gravel (TILL)	1.5	128.5			3A		98	<5p/1p			
		dense to very dense moist, brown GRAVELLY SAND	2	128	35		3B			<5p/1p			
		very dense, moist, brown SANDY SILT trace clay, trace gravel (TILL)	2.5	127.5	76		4		92	5p/1p			
			3	127									
			3.5	126.5	52		5		50	5p/1p			
		hard, moist, grey CLAYEY SANDY SILT trace gravel (TILL)	4	126	84/6"		6		100	<5p/1p			
		dense to very dense wet, grey SANDY SILT trace clay, trace gravel (TILL)	4.5	125.5									
			5	125	92/6"		7		100	<5p/0p			
			5.5	124.5	43		8		100	<5p/0p			
			6	124									
			6.5	123.5	71		9		100	5p/1p			
		END OF BOREHOLE											

TERRAPEX

LOGGED BY: SJ	DRILLING DATE: 04/5-Oct-2021
INPUT BY: MW	MONITORING DATE:
REVIEWED BY: VN	PAGE 1 OF 1

CLIENT: Patheon Developers(Ontario) Inc.	PROJECT NO.: CT2694.03	**RECORD OF:**	
ADDRESS: 2660-2680 Brock Rd, Pickering ON		**MW206**	
CITY/PROVINCE: 2660-2680 Brock Rd, Pickering ON	NORTHING (m): 4860163.27	EASTING (m): 653631.28	ELEV. (m) 130.56
CONTRACTOR: Pontil	METHOD: Solid Stem Auger and Spilt Spoon		
BOREHOLE DIAMETER (cm): 12.7	WELL DIAMETER (cm): 5.08	SCREEN SLOT #: 10	SAND TYPE: Silica #2	SEALANT TYPE: Bentonite

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	SHEAR STRENGTH (kPa) / N-VALUE (Blows/300mm)	WATER CONTENT (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	RECOVERY (%)	SV/TOV (ppm or %LEL) (new title)	LABORATORY TESTING	WELL INSTALLATION	REMARKS
		TOPSOIL 70mm	0	130.5	12		1A		98	<5p/1p	PHCs, VOCs		
		FILL, moist, brown, sand and gravel											
		FILL, moist, brown, clayey silty sand trace rootlets	0.5	130			1B			<5p/1p	M&I, PAHs		
		compact, moist, brown SANDY SILT	1	129.5	21		2		100	<5p/1p			
			1.5	129									
					28		3		100	<5p/1p			
			2	128.5									
		very stiff, moist, brown CLAYEY SANDY SILT trace gravel (TILL)	2.5	128	21		4		66	<5p/1p			
		very dense, moist, grey SANDY SILT occasional layers of clayey silt	3	127.5									
					70/6"		5		83	<5p/1p			
			3.5	127									
			4	126.5	72		6		100	<5p/1p			
			4.5	126									
					72		7		100	<5p/1p			
			5	125.5									
			5.5	125	58		8		100	<5p/1p			
			6	124.5									
		END OF BOREHOLE											

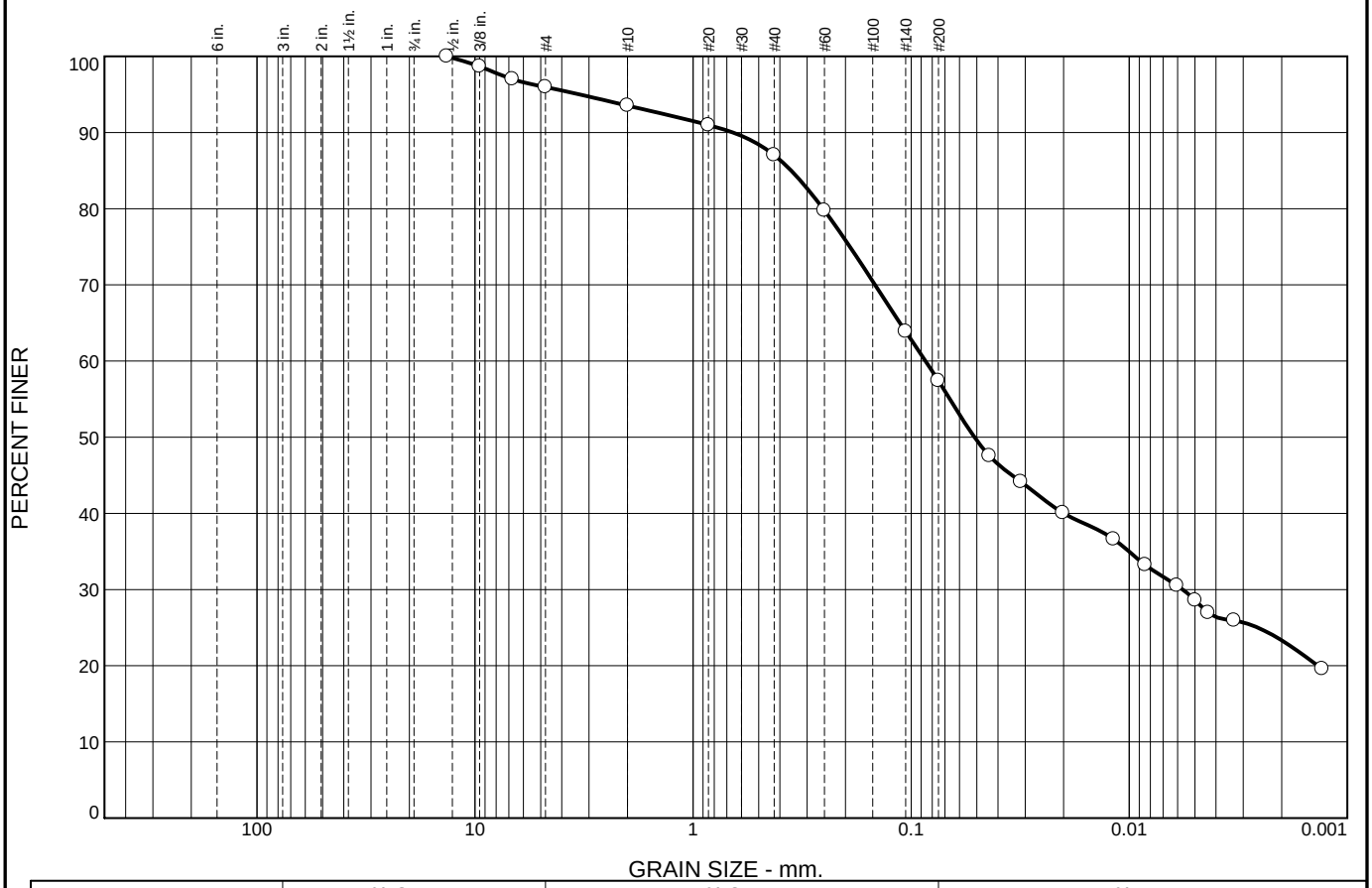
TERRAPEX

LOGGED BY: SJ	DRILLING DATE: 05-Oct-2021
INPUT BY: MW	MONITORING DATE: 27-Oct-21
REVIEWED BY: VN	PAGE 1 OF 1

APPENDIX D

LABORATORY TEST RESULTS

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	4.0	2.5	6.5	29.6	34.1	23.3

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.3551	0.0859	0.0512	0.0057				

Material Description	USCS	AASHTO
○ CLAYEY SILT and SAND, trace Gravel		

Project No. 18-041 **Client:** The Brock Zents Partnership

Project: 2660 - 2680 Brock road, Pickering

○ **Sample Number:** MW1, Sample 4

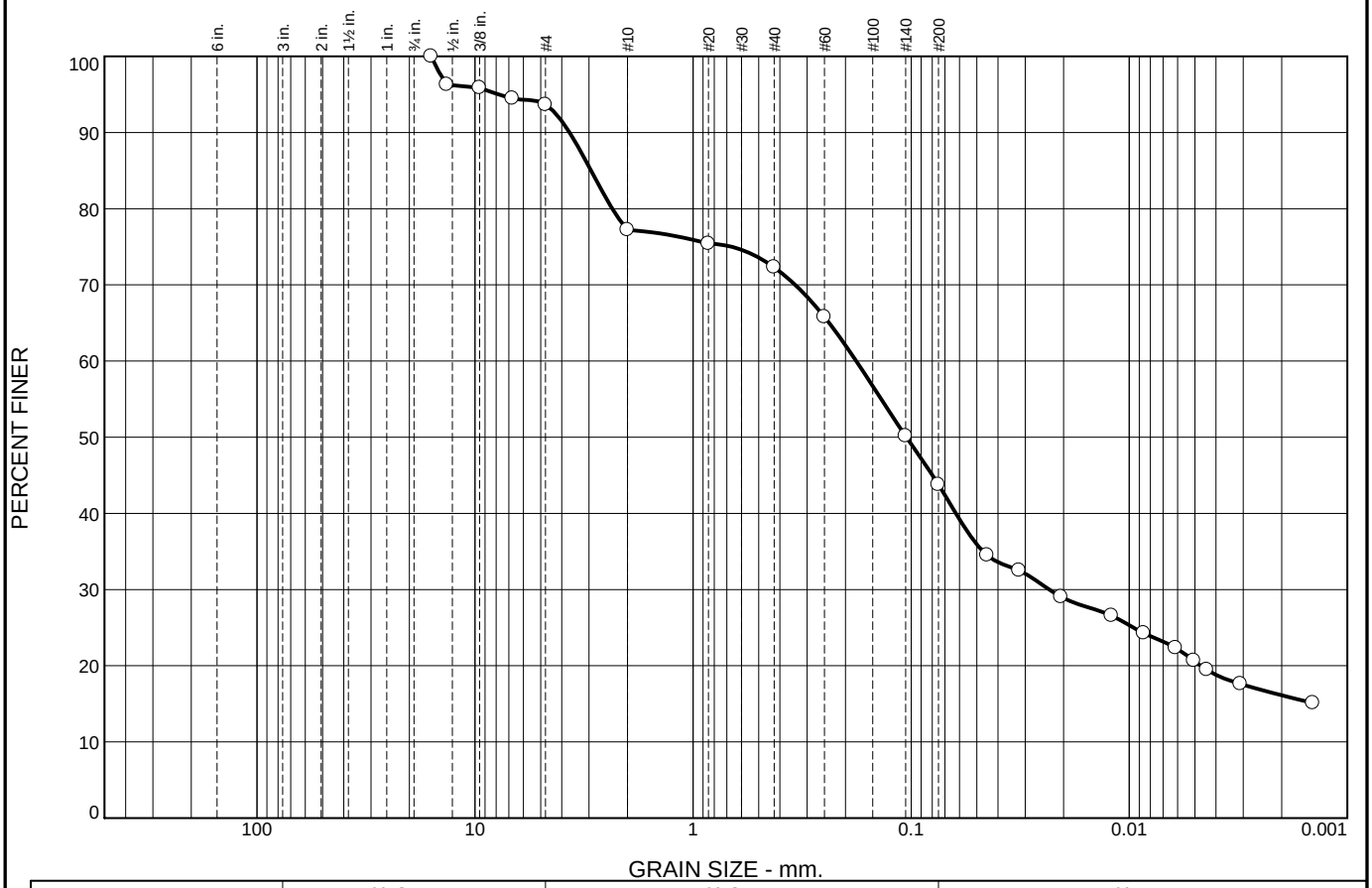
Remarks:

Terrapex

Figure D-1

Tested By: VP **Checked By:** DM

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	6.3	16.5	4.9	28.5	27.7	16.1

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			2.9366	0.1786	0.1052	0.0233				

Material Description	USCS	AASHTO
○ SILTY SAND, some Clay, trace Gravel		

Project No. 18-041 **Client:** The Brock Zents Partnership

Project: 2660 - 2680 Brock road, Pickering

○ **Sample Number:** MW5, Sample 6

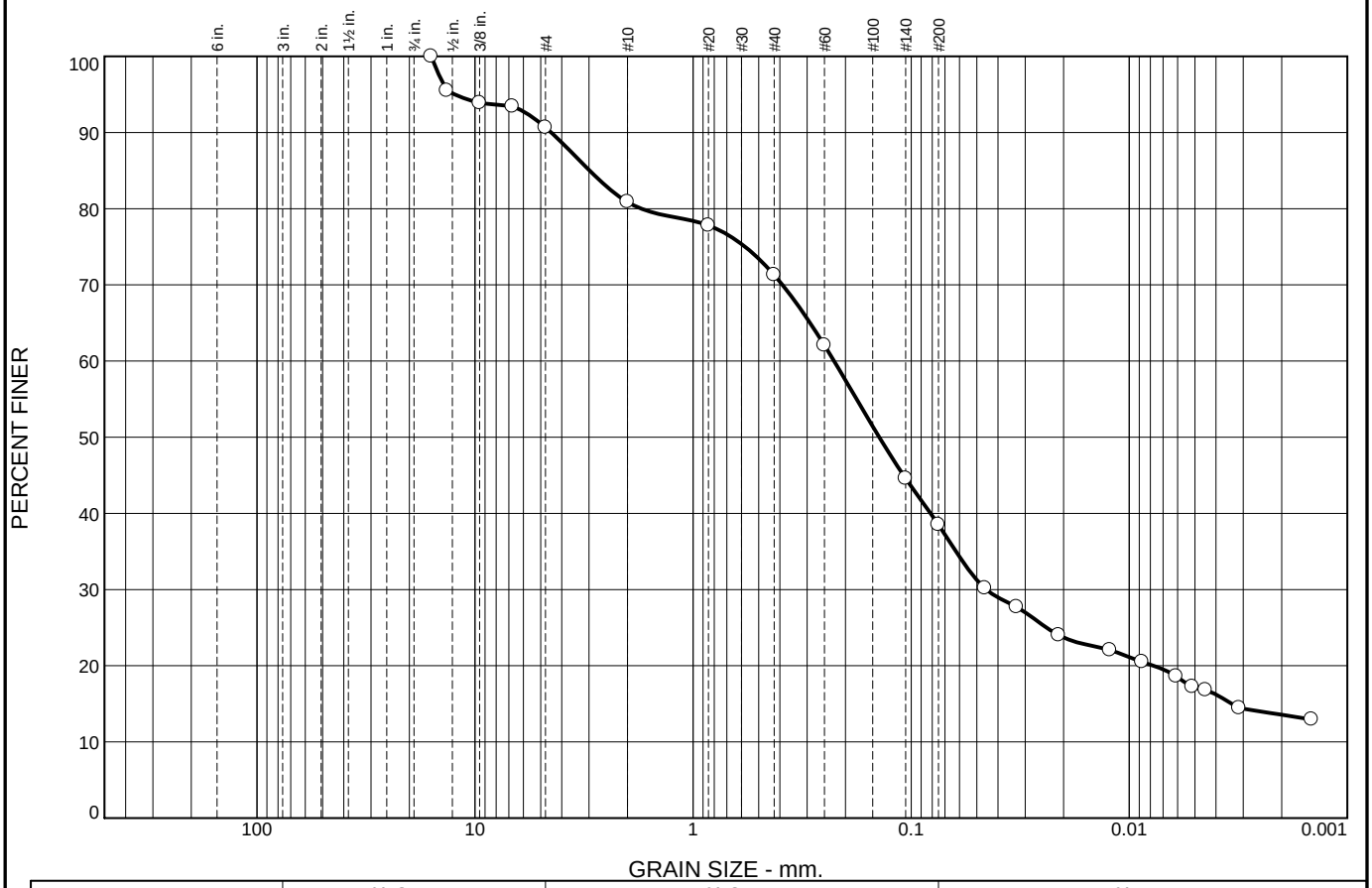
Remarks:

Terrapex

Figure D-2

Tested By: VP **Checked By:** DM

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	9.3	9.8	9.6	32.8	24.9	13.6

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			2.9816	0.2258	0.1401	0.0452	0.0034			

Material Description	USCS	AASHTO
○ SILTY SAND, some Clay, trace Gravel		

Project No. 18-041 **Client:** The Brock Zents Partnership

Project: 2660 - 2680 Brock road, Pickering

○ **Sample Number:** BH6, Sample 7

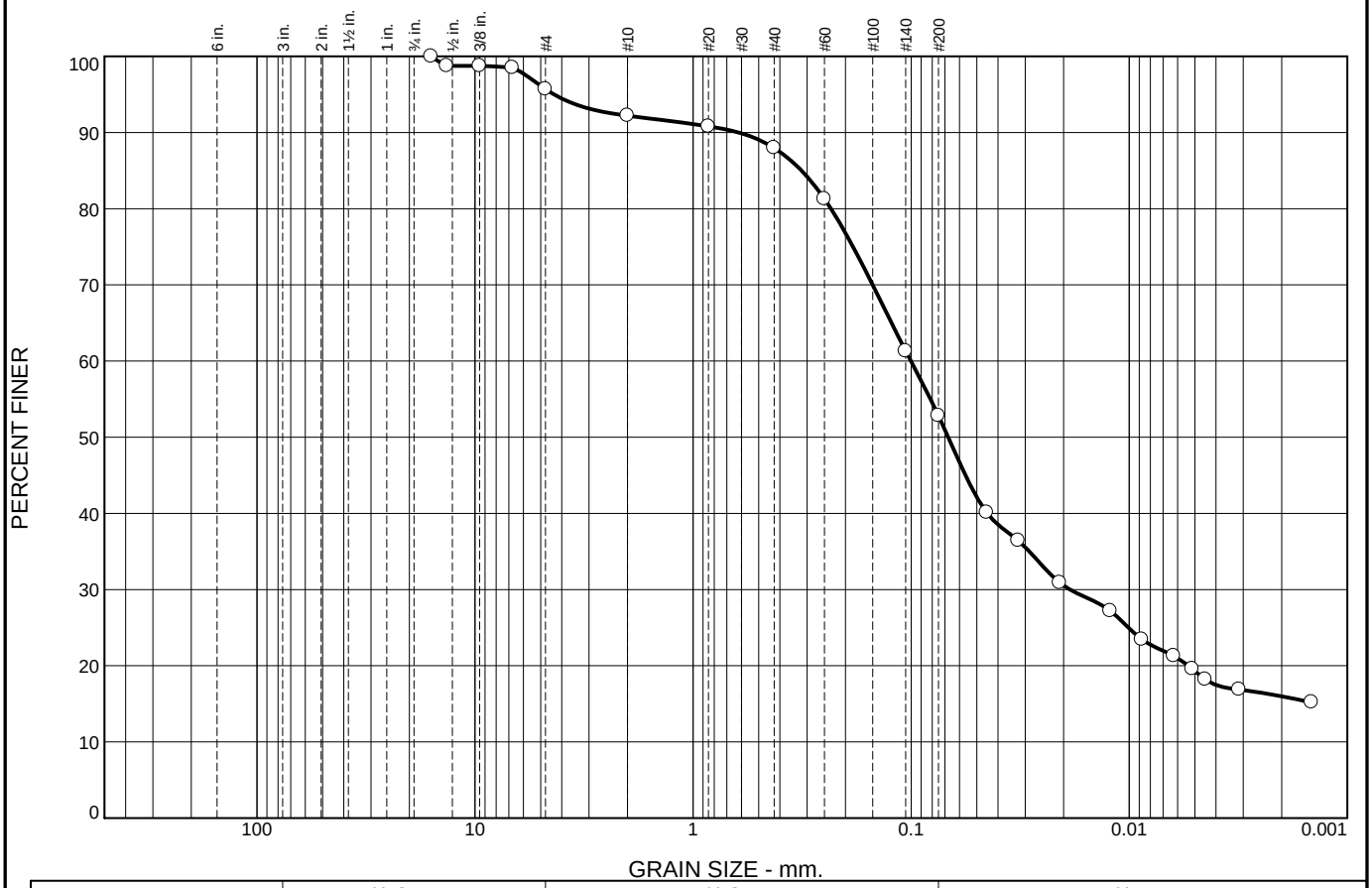
Remarks:

Terrapex

Figure D-3

Tested By: VP **Checked By:** DM

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	4.3	3.5	4.2	35.2	36.8	16.0

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.3183	0.1003	0.0676	0.0187				

Material Description	USCS	AASHTO
○ SAND and SILT, some Clay, trace Gravel		

Project No. 18-041 **Client:** The Brock Zents Partnership

Project: 2660 - 2680 Brock road, Pickering

○ **Sample Number:** BH9, Sample 8

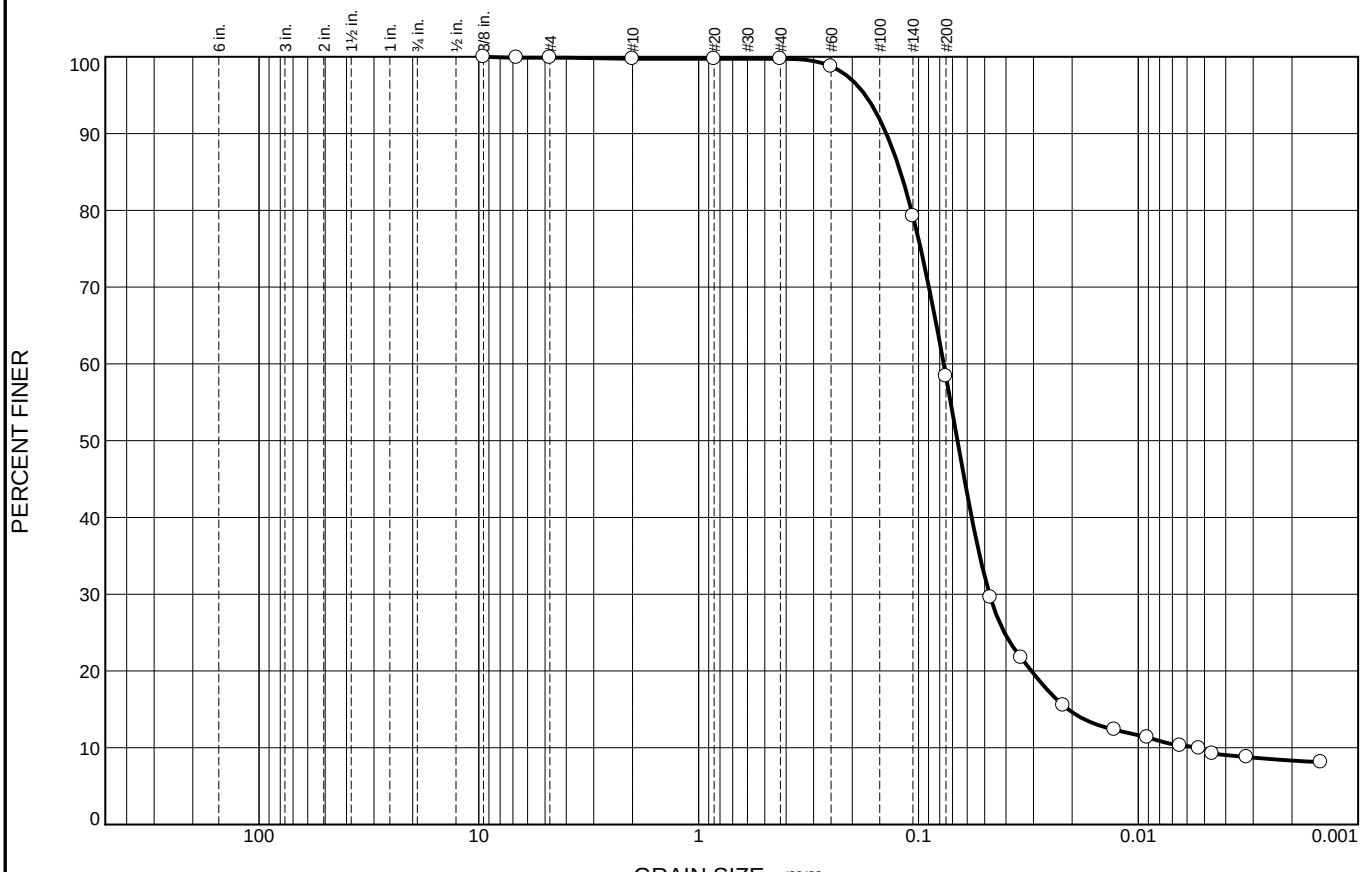
Remarks:

Terrapex

Figure D-4

Tested By: VP **Checked By:** DM

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.1	0.2	0.0	41.3	50.1	8.3

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.1208	0.0768	0.0665	0.0476	0.0209	0.0054	5.46	14.22

Material Description	USCS	AASHTO
○ SILT and SAND, trace Clay		

Project No. 18-041 **Client:** The Brock Zents Partnership

Project: 2660 - 2680 Brock road, Pickering

○ **Sample Number:** MW4, Sample 5

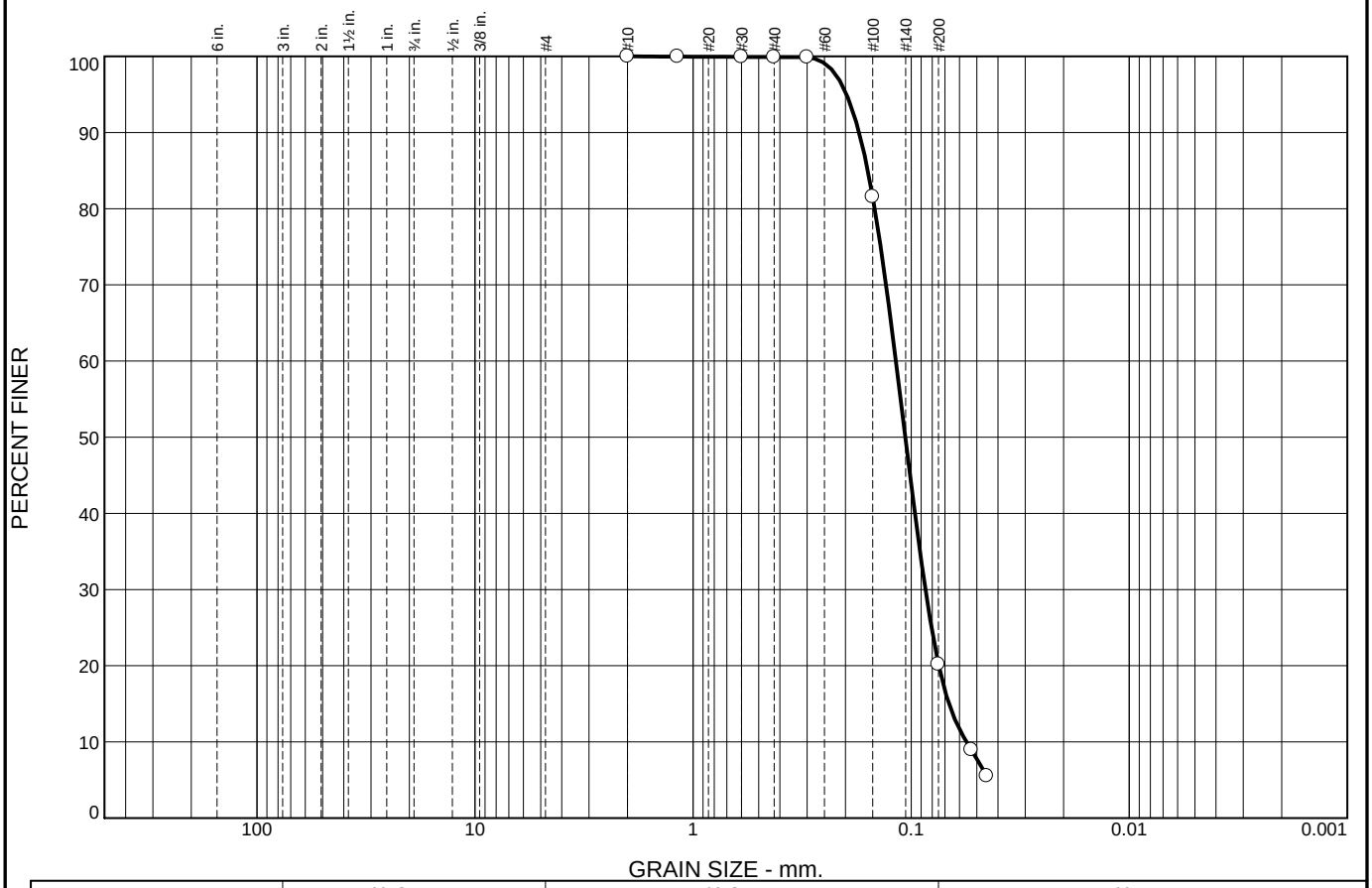
Remarks:

Terrapex

Figure D-5

Tested By: VP **Checked By:** DM

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.1	79.7	20.2	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.1580	0.1175	0.1064	0.0860	0.0671	0.0557	1.13	2.11

	Material Description	USCS	AASHTO
○	SILTY SAND		

Project No. 18-041 **Client:** The Brock Zents Partnership

Project: 2660 - 2680 Brock road, Pickering

○ **Sample Number:** BH7, Sample 7

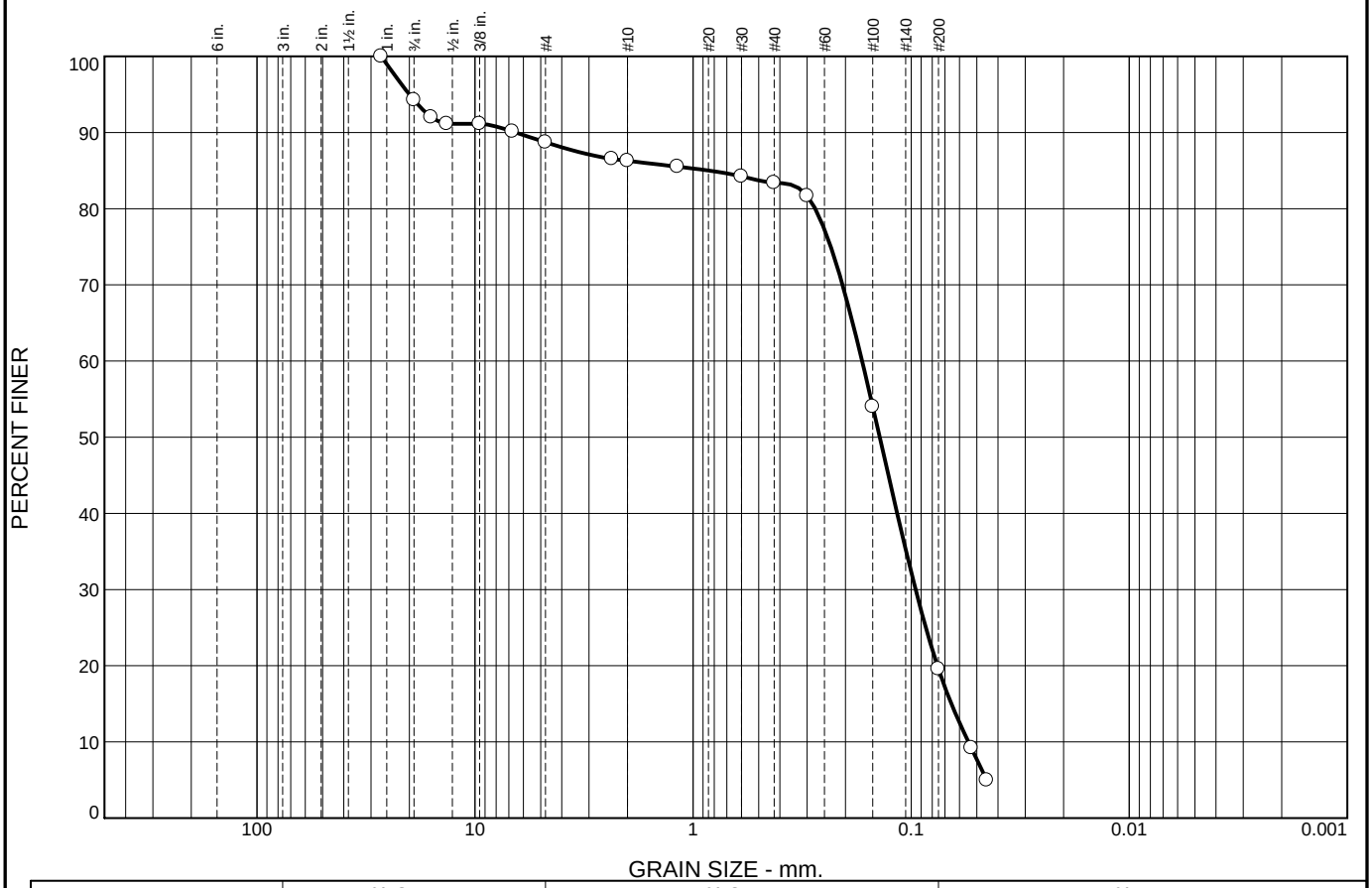
Remarks:

Terrapex

Figure D-6

Tested By: VP **Checked By:** DM

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	5.7	5.6	2.4	2.9	63.8	19.6	

	LL	PL	D_{85}	D_{60}	D_{50}	D_{30}	D_{15}	D_{10}	C_c	C_u
○			0.8440	0.1679	0.1393	0.0954	0.0654	0.0547	0.99	3.07

	Material Description	USCS	AASHTO
○	SILTY SAND, some Gravel		

Project No. 18-041 **Client:** The Brock Zents Partnership

Project: 2660 - 2680 Brock road, Pickering

○ **Sample Number:** MW8, Sample 9

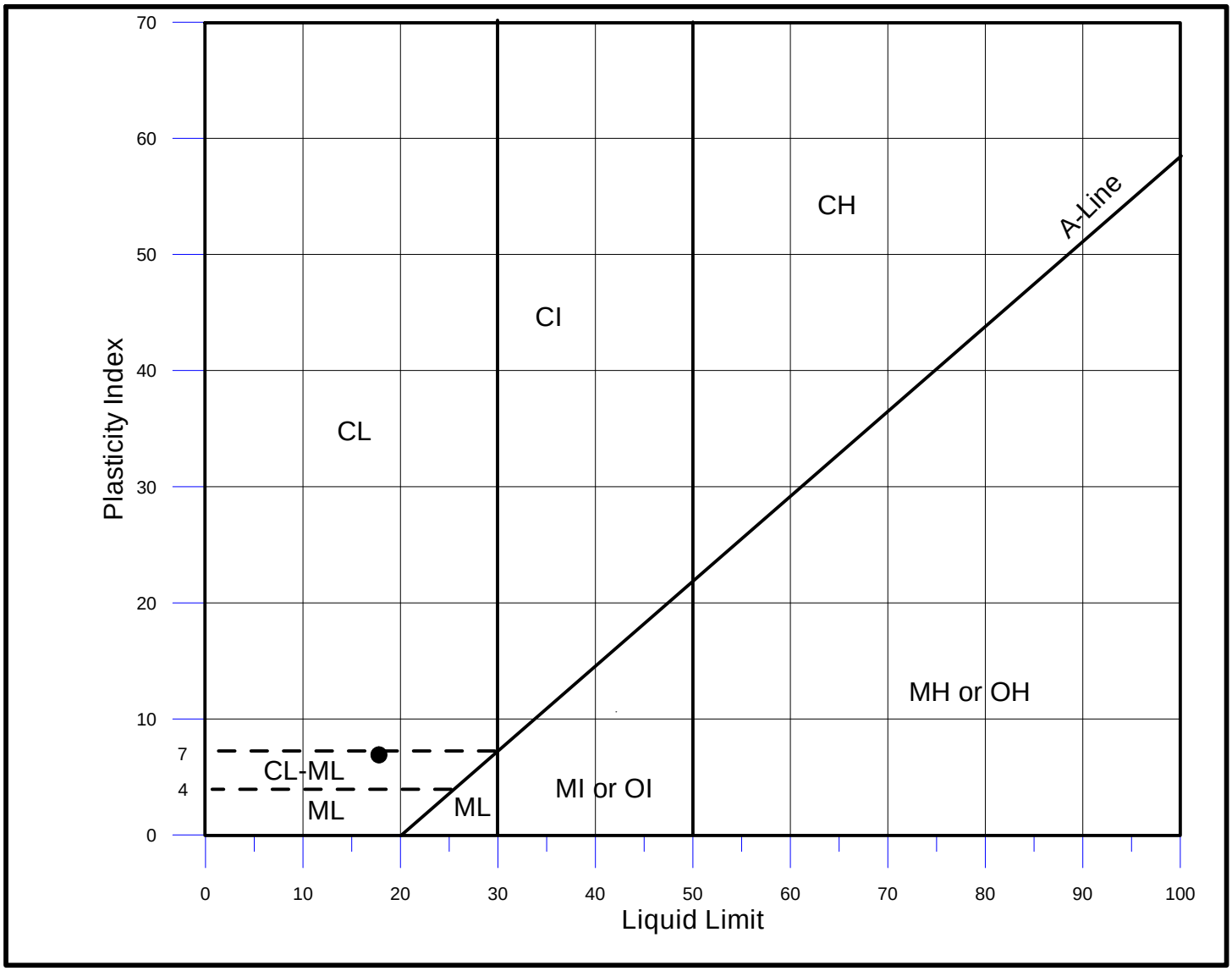
Remarks:

Terrapex

Figure D-7

Tested By: VP **Checked By:** DM

PLASTICITY CHART



Client: The Brock Zents Partnership
Project: 2660 - 2680 Brock road, Pickering
Ref. No.: 18-041

Sample	Symbol
MW 1, Sample 4	●

Remarks:

TERRAPEX

Figure No. D-8

APPENDIX E

CERTIFICATE OF CHEMICAL ANALYSES

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: TERRAPEX ENVIRONMENTAL LIMITED
90 SCARSDALE RD
TORONTO, ON M3B2R7
(905) 474-5265

ATTENTION TO: VIC NERSESIAN

PROJECT: 18-041

AGAT WORK ORDER: 18T336858

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

DATE REPORTED: May 14, 2018

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 18T336858

PROJECT: 18-041

CLIENT NAME: TERRAPEX ENVIRONMENTAL LIMITED

ATTENTION TO: VIC NERSESIAN

SAMPLING SITE:

SAMPLED BY:

pH & Sulphate (Soil)

DATE RECEIVED: 2018-05-08

DATE REPORTED: 2018-05-14

SAMPLE DESCRIPTION:				BH4/S7	BH9/S8
SAMPLE TYPE:				Soil	Soil
DATE SAMPLED:				2018-05-04	2018-05-04
Parameter	Unit	G / S	RDL	9230016	9230017
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.79	7.80
Sulphate (2:1)	µg/g		2	38	34

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

9230016-9230017 pH was determined on the 0.01M CaCl2 extract obtained from 2:1 leaching procedure (2 parts extraction fluid:1 part wet soil).Sulphate was determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil).

Certified By: Amanjot Bhela

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: TERRAPEX ENVIRONMENTAL LIMITED

AGAT WORK ORDER: 18T336858

PROJECT: 18-041

ATTENTION TO: VIC NERSESIAN

SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date: May 14, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
pH & Sulphate (Soil)															
pH, 2:1 CaCl2 Extraction	9207796		7.55	7.50	0.7%	NA	100%	90%	110%	NA			NA		
Sulphate (2:1)	9230023		74	69	7.0%	< 2	99%	70%	130%	107%	70%	130%	108%	70%	130%

Comments: NA signifies Not Applicable.

Certified By: Amanjot Bhela

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: TERRAPEX ENVIRONMENTAL LIMITED

AGAT WORK ORDER: 18T336858

PROJECT: 18-041

ATTENTION TO: VIC NERSESIAN

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	pH METER
Sulphate (2:1)	INOR-93-6004	McKeague 4.12 & SM 4110 B	ION CHROMATOGRAPH

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 18T336858

Cooler Quantity: Smeep

Arrival Temperatures: 4.3 4.1 3.9 3.5 3.2 2.6

Custody Seal Intact: ☐ Yes ☐ No ☐ N/A

Notes:

Report Information:

Company: Alston Associates (Geotechnical division of Terrapex Environmental Ltd.)
Contact: Shabnam Azizinejad
Address:
Phone: 647-447-0027 Fax:
Reports to be sent to:
1. Email: s.azizinejad@alston.ca
2. Email: v.nersesian@alston.ca

Regulatory Requirements:

(Please check all applicable boxes)

☒ No Regulatory Requirement

☐ Regulation 153/04
Table (Indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☐ Fine

☐ Sewer Use
☐ Sanitary ☐ Storm
Region (Indicate One) ☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
(Indicate One)

Turnaround Time (TAT) Required:

Regular TAT ☒ 5 to 7 Business Days SA

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
*TAT is exclusive of weekends and statutory holidays

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: 18-041
Site Location:
Sampled By:
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Is this submission for a **Record of Site Condition?** ☐ Yes ☐ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Invoice Information:

Bill To Same: Yes ☒ No ☐

Company: * Terrapex Environmental Ltd.
Contact:
Address:
Email:

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Y/N)	O. Reg 153: Metals and Inorganics; ☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides); ORPs: ☐ B-HWS ☐ Cl ☐ CN ☐ Cr^{6+} ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use	PH	Soluble Sulphate
BH4/S7	May 4, 18		1	S															V	V
BH9/S8	April 30, 18		1	S															V	V

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Shabnam Azizinejad	May 8, 18			2018/5/8	11:30
	2018/5/8	2:31			

Page _____ of _____

N°: T 066996

Document ID: DIV 78-1511.014

Pink Copy - Client | Yellow Copy - AGAT | White Copy- AGAT

Date Issued: February 22, 2017

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: TERRAPEX ENVIRONMENTAL LIMITED
90 SCARSDALE RD
TORONTO, ON M3B2R7
(905) 474-5265

ATTENTION TO: Roy Yu

PROJECT: CT2694.02

AGAT WORK ORDER: 19T487627

SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist

DATE REPORTED: Jul 09, 2019

PAGES (INCLUDING COVER): 7

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

5835 COOPERS AVENUE
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FAX (905)712-5122
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Certificate of Analysis

AGAT WORK ORDER: 19T487627

PROJECT: CT2694.02

CLIENT NAME: TERRAPEX ENVIRONMENTAL LIMITED

ATTENTION TO: Roy Yu

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - Metals (Including Hydrides) (Soil)

DATE RECEIVED: 2019-07-03

DATE REPORTED: 2019-07-09

		SAMPLE DESCRIPTION:		MW101-1A	MW102-1A
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2019-06-12	2019-06-12
Parameter	Unit	G / S	RDL	320200	320208
Antimony	µg/g	1.3	0.8	<0.8	<0.8
Arsenic	µg/g	18	1	3	2
Barium	µg/g	220	2	74	36
Beryllium	µg/g	2.5	0.5	<0.5	<0.5
Boron	µg/g	36	5	6	<5
Cadmium	µg/g	1.2	0.5	<0.5	<0.5
Chromium	µg/g	70	2	19	10
Cobalt	µg/g	21	0.5	6.1	3.5
Copper	µg/g	92	1	12	7
Lead	µg/g	120	1	9	6
Molybdenum	µg/g	2	0.5	<0.5	<0.5
Nickel	µg/g	82	1	11	7
Selenium	µg/g	1.5	0.4	0.4	<0.4
Silver	µg/g	0.5	0.2	<0.2	<0.2
Thallium	µg/g	1	0.4	<0.4	<0.4
Uranium	µg/g	2.5	0.5	0.5	<0.5
Vanadium	µg/g	86	1	32	20
Zinc	µg/g	290	5	39	27

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Vivine Basily

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 19T487627

PROJECT: CT2694.02

CLIENT NAME: TERRAPEX ENVIRONMENTAL LIMITED

ATTENTION TO: Roy Yu

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2019-07-03

DATE REPORTED: 2019-07-09

		SAMPLE DESCRIPTION:		MW101-1A	MW102-1A
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2019-06-12	2019-06-12
Parameter	Unit	G / S	RDL	320200	320208
Hexachloroethane	µg/g	0.01	0.01	<0.01	<0.01
Gamma-Hexachlorocyclohexane	µg/g	0.01	0.005	<0.005	<0.005
Heptachlor	µg/g	0.05	0.005	<0.005	<0.005
Aldrin	µg/g	0.05	0.005	<0.005	<0.005
Heptachlor Epoxide	µg/g	0.05	0.005	<0.005	<0.005
Endosulfan	µg/g	0.04	0.005	<0.005	<0.005
Chlordane	µg/g	0.05	0.007	<0.007	<0.007
DDE	µg/g	0.05	0.007	<0.007	<0.007
DDD	µg/g	0.05	0.007	<0.007	<0.007
DDT	µg/g	1.4	0.007	<0.007	<0.007
Dieldrin	µg/g	0.05	0.005	<0.005	<0.005
Endrin	µg/g	0.04	0.005	<0.005	<0.005
Methoxychlor	µg/g	0.05	0.005	<0.005	<0.005
Hexachlorobenzene	µg/g	0.01	0.005	<0.005	<0.005
Hexachlorobutadiene	µg/g	0.01	0.01	<0.01	<0.01
Moisture Content	%		0.1	24.7	10.1
Surrogate	Unit	Acceptable Limits			
TCMX	%	50-140		68	69
Decachlorobiphenyl	%	60-130		75	81

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

320200-320208 Results are based on the dry weight of the soil.
DDT total is a calculated parameter. The calculated value is the sum of op'DDT and pp'DDT.
DDD total is a calculated parameter. The calculated value is the sum of op'DDD and pp'DDD.
DDE total is a calculated parameter. The calculated value is the sum of op'DDE and pp'DDE.
Endosulfan total is a calculated parameter. The calculated value is the sum of Endosulfan I and Endosulfan II.
Chlordane total is a calculated parameter. The calculated value is the sum of Alpha-Chlordane and Gamma-Chlordane.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: NPopowkolof

AGAT Laboratories

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Quality Assurance

CLIENT NAME: TERRAPEX ENVIRONMENTAL LIMITED

AGAT WORK ORDER: 19T487627

PROJECT: CT2694.02

ATTENTION TO: Roy Yu

SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date: Jul 09, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals (Including Hydrides) (Soil)															
Antimony	319654		<0.8	<0.8	NA	< 0.8	130%	70%	130%	105%	80%	120%	94%	70%	130%
Arsenic	319654		4	3	NA	< 1	108%	70%	130%	104%	80%	120%	103%	70%	130%
Barium	319654		55	54	1.8%	< 2	94%	70%	130%	102%	80%	120%	97%	70%	130%
Beryllium	319654		<0.5	<0.5	NA	< 0.5	83%	70%	130%	102%	80%	120%	82%	70%	130%
Boron	319654		<5	<5	NA	< 5	99%	70%	130%	99%	80%	120%	75%	70%	130%
Cadmium	319654		<0.5	<0.5	NA	< 0.5	102%	70%	130%	103%	80%	120%	102%	70%	130%
Chromium	319654		10	10	0.0%	< 2	96%	70%	130%	117%	80%	120%	109%	70%	130%
Cobalt	319654		6.1	6.1	0.0%	< 0.5	109%	70%	130%	120%	80%	120%	112%	70%	130%
Copper	319654		29	29	0.0%	< 1	86%	70%	130%	112%	80%	120%	99%	70%	130%
Lead	319654		10	9	10.5%	< 1	100%	70%	130%	112%	80%	120%	104%	70%	130%
Molybdenum	319654		<0.5	<0.5	NA	< 0.5	110%	70%	130%	111%	80%	120%	110%	70%	130%
Nickel	319654		11	10	9.5%	< 1	91%	70%	130%	99%	80%	120%	90%	70%	130%
Selenium	319654		<0.4	<0.4	NA	< 0.4	123%	70%	130%	100%	80%	120%	99%	70%	130%
Silver	319654		<0.2	<0.2	NA	< 0.2	85%	70%	130%	99%	80%	120%	92%	70%	130%
Thallium	319654		<0.4	<0.4	NA	< 0.4	106%	70%	130%	100%	80%	120%	93%	70%	130%
Uranium	319654		<0.5	<0.5	NA	< 0.5	111%	70%	130%	101%	80%	120%	97%	70%	130%
Vanadium	319654		18	17	5.7%	< 1	110%	70%	130%	119%	80%	120%	110%	70%	130%
Zinc	319654		47	46	2.2%	< 5	97%	70%	130%	115%	80%	120%	106%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Nivine Basily

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Quality Assurance

CLIENT NAME: TERRAPEX ENVIRONMENTAL LIMITED

AGAT WORK ORDER: 19T487627

PROJECT: CT2694.02

ATTENTION TO: Roy Yu

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Jul 09, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - OC Pesticides (Soil)															
Hexachloroethane	320208	320208	< 0.01	< 0.01	NA	< 0.01	87%	50%	140%	91%	50%	140%	98%	50%	140%
Gamma-Hexachlorocyclohexane	320208	320208	< 0.005	< 0.005	NA	< 0.005	98%	50%	140%	93%	50%	140%	90%	50%	140%
Heptachlor	320208	320208	< 0.005	< 0.005	NA	< 0.005	87%	50%	140%	91%	50%	140%	98%	50%	140%
Aldrin	320208	320208	< 0.005	< 0.005	NA	< 0.005	92%	50%	140%	100%	50%	140%	108%	50%	140%
Heptachlor Epoxide	320208	320208	< 0.005	< 0.005	NA	< 0.005	94%	50%	140%	99%	50%	140%	102%	50%	140%
Endosulfan	320208	320208	< 0.005	< 0.005	NA	< 0.005	97%	50%	140%	100%	50%	140%	95%	50%	140%
Chlordane	320208	320208	< 0.007	< 0.007	NA	< 0.007	92%	50%	140%	97%	50%	140%	98%	50%	140%
DDE	320208	320208	< 0.007	< 0.007	NA	< 0.007	96%	50%	140%	97%	50%	140%	109%	50%	140%
DDD	320208	320208	< 0.007	< 0.007	NA	< 0.007	95%	50%	140%	90%	50%	140%	102%	50%	140%
DDT	320208	320208	< 0.007	< 0.007	NA	< 0.007	88%	50%	140%	84%	50%	140%	102%	50%	140%
Dieldrin	320208	320208	< 0.005	< 0.005	NA	< 0.005	98%	50%	140%	94%	50%	140%	100%	50%	140%
Endrin	320208	320208	< 0.005	< 0.005	NA	< 0.005	95%	50%	140%	91%	50%	140%	104%	50%	140%
Methoxychlor	320208	320208	< 0.005	< 0.005	NA	< 0.005	86%	50%	140%	87%	50%	140%	108%	50%	140%
Hexachlorobenzene	320208	320208	< 0.005	< 0.005	NA	< 0.005	102%	50%	140%	91%	50%	140%	106%	50%	140%
Hexachlorobutadiene	320208	320208	< 0.01	< 0.01	NA	< 0.01	101%	50%	140%	93%	50%	140%	102%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: N Popnikolof

AGAT Laboratories

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Method Summary

CLIENT NAME: TERRAPEX ENVIRONMENTAL LIMITED

AGAT WORK ORDER: 19T487627

PROJECT: CT2694.02

ATTENTION TO: Roy Yu

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Trace Organics Analysis			
Hexachloroethane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Gamma-Hexachlorocyclohexane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Aldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endosulfan	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Chlordane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDE	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDD	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDT	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Dieldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Methoxychlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobenzene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobutadiene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
TCMX	ORG-91-5112	EPA SW-846 3541,3620 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Moisture Content		MOE E3139	BALANCE

AGAT Laboratories

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Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 19T487627

Cooler Quantity: Small

Arrival Temperatures: 3.6 | 3.8 | 3.5
3.1 | 3.2 | 2.8

Custody Seal Intact: ☐ Yes ☐ No ☐ N/A

Notes:

Report Information:

Company: Terrapex Environmental Ltd.
Contact: Ray Yu
Address: 90 Scarsdale Rd
Toronto, ON M3B 2R7
Phone: 416-245-0011 Fax:
Reports to be sent to:
1. Email: r.yu@terrapex.com
2. Email:

Regulatory Requirements: ☐ No Regulatory Requirement

(Please check all applicable boxes)

☒ Regulation 153/04
Table 3 (Indicate One)
☐ Ind/Com
☒ Res/Park
☐ Agriculture
Soil Texture (Check One)
☒ Coarse
☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region (Indicate One)
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
(Indicate One)

Turnaround Time (TAT) Required:

Regular TAT ☒ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: ~~EA18-001~~ CT2694-C2
Site Location:
Sampled By:
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Is this submission for a **Record of Site Condition?** ☐ Yes ☒ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☒ No

Invoice Information:

Bill To Same: Yes ☒ No ☐

Company:
Contact:
Address:
Email:

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Y/N)	O. Reg 153: Metals and Inorganics	O. Reg 153: All Metals ☐ 153 Metals (excl. Hydrides)	O. Reg 153: Field Filtered Metals ☒ 153 Metals (Incl. Hydrides)	O. Reg 153: ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN ☐ Cr^{6+} ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	O. Reg 153: Full Metals Scan	O. Reg 153: Regulation/Custom Metals	O. Reg 153: Nutrients: ☐ TP ☐ NH_3 ☐ TKN ☐ NO_3 ☐ NO_2 ☐ NO_3+NO_2	O. Reg 153: Volatiles: ☐ VOC ☐ BTEX ☐ THM	O. Reg 153: PHCs F1 - F4	O. Reg 153: ABNs	O. Reg 153: PAHs	O. Reg 153: PCBs: ☐ Total ☐ Aroclors	O. Reg 153: Organochlorine Pesticides	O. Reg 153: TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	O. Reg 153: Sewer Use	O. Reg 153: [illegible]	Potentially Hazardous or High Concentration (Y/N)
MW101-1A	June 12 2019	11:00	1	S		N		X											X				
MW102-1A	June 12 2019	12:30	1	S		N		X											X				

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
Sam Beatty Sam Beatty	July 3/2019	10:00 AM		July 4/19	12
	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page 1 of 1

Nº: T 090069