GOLDER

REPORT

Hydrogeological Investigation

Lebovic - Seaton Whitevale East Development, Pickering, Ontario

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Distribution List

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Table of Contents

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) has been retained by 1133373 Ontario Inc. (Lebovic Enterprises) to conduct hydrogeological and geotechnical investigations for the proposed Lebovic – Seaton Whitevale East Development in Pickering, Ontario (the Site), at the location shown on the Key Plan (see Figure 1). This report provides the results of the hydrogeological investigation only; the results of the geotechnical investigation are submitted under separate cover.

The purposes of this hydrogeological investigation are to assess the existing hydrogeological conditions, to prepare a preliminary pre- and post-development water budget assessment including the use of proposed low impact development (LID) measures and to assess the potential hydrogeological impacts of development.

The factual data, interpretations and recommendations contained in this report pertain to a specific project as described in the report and are not applicable to any other project or site location. If the project is modified in concept, location, elevation, or if the project is not initiated within eighteen months of the date of the report, Golder should be given an opportunity to confirm that the recommendations are still valid. In addition, this report should be read in conjunction with the attached "*Important Information and Limitations of This Report"* which are included in Appendix A. The reader's attention is specifically drawn to this information, as it is essential for the proper use and interpretation of this report.

2.0 BACKGROUND

2.1 Previous Reports

Stantec Consulting Limited (Stantec) previously completed a water taking report and discharge plan in support of proposed extension and servicing of Peter Mathews Drive. The accompanying road allowance is located just west of the Site, except for a small portion in the southwest corner of the Site. The results of the investigation were provided in the following report:

- Stantec Consulting Limited. (November 1, 2018). "*Water Taking Report and Discharge Plan, Peter Mathews Drive, Seaton Community Assignment 6, Pickering, Ontario*". (Stantec 2018). Reference No. 122450165. Prepared for North Pickering Community Management Inc.

The investigation included three boreholes (BH14, BH15A and BH16) drilled on the Site and others near the Site, at the locations shown on Figure 2, Borehole Location Plan. Golder's 2020 geotechnical investigation, referenced below, was carried out concurrently with the hydrogeological field investigation discussed in this report (Golder 2020).

- Golder Associates Ltd. (August 2020). *"Geotechnical Investigation, Lebovic – Seaton Whitevale East Development, Pickering, Ontario"* (Golder, 2020).

The locations of the boreholes drilled as part of the geotechnical investigation are also shown on Figure 2. The factual subsurface data and information in the previous reports were reviewed and pertinent data were used in preparation of this report.

2.2 Site and Project Description

The Site is comprised of an irregular shaped Draft Plan area, situated east of Sideline 22 and south of Whitevale Road in Pickering, Ontario, as shown on Figure 1. Other draft plan areas owned by Lebovic Enterprises are present to the northwest of Whitevale Road and to the west of Sideline 22 (see Figure 2) but are excluded from this study. The Site consists of undeveloped agricultural lands and cultivated farmlands. Surrounding the Site are agricultural lands to the north, south, east, and west.

Details of the proposed development (including site grading, the development layout and servicing depths) have been provided to Golder and are shown in the drawings referenced as follows:

- Proposed Draft Plan, Drawing No. WEDP-1 entitled "*1133373 Ontario Inc., Whitevale East SP-2015-05*" prepared by GHD, dated February 2019.
- Drawing No. GR-01 entitled "*Functional Grading Plan, 1133373 Ontario Inc., Whitevale East (SP-2015-05, A-10-15)*" prepared by Cole Engineering Ltd., dated May 2019.
- Drawing No. SER-1 entitled "*Functional Servicing Plan, 1133373 Ontario Inc., Whitevale East (SP-2015-05, A-10-15)*" prepared by Cole Engineering Ltd., dated May 2019.
- Figure No. LANDUSE-2 entitled "*Post-Development Land Use Plan, 1133373 Ontario Inc., Seaton Whitevale East*" dated February 2019.
- Topographic Plan Illustrating *"Part of Lots 22 and 23 and Part of the Road Allowance Between Lots 22 and 23, Concession 4, City of Pickering, Regional Municipality of Durham"* prepared by J.D. Barnes Limited, dated January 5, 2017.

Copies of these drawings are provided in Appendix B. Based on the proposed draft plan of subdivision prepared by GHD, it is understood that the proposed development will include detached and semi-detached dwellings and townhouses, open spaces, accompanying roads and a storm water management facility (SWMF) pond to the southeast of the Site. Based on the Grading Plans prepared by Cole Engineering Ltd. (Cole), it is understood that grade changes of up to about 6 m are anticipated as part of Site development.

2.3 Topography, Drainage and Natural Heritage Features

Based on the topographic survey prepared by J.D. Barnes Ltd. dated January 5, 2017 (see Appendix B), the Site is generally of a gentle slope that gradually dips from the north toward the south and east. Ground surface elevations are shown to range from Elevation 183 metres above sea level (masl) in the northwest portion of the Site to Elevation 156 masl in the southeast portion of the Site. Surface water run-off from the Site is expected to ultimately drain toward Ganatsekiagon Creek located off-site to the east and toward two tributaries of Ganatsekiagon Creek located off-site to the south (see Figure 2).

According to the Ministry of Natural Resources and Forestry (MNRF; http://www.gisapplication.lrc.gov.on.ca) and as shown on Figure 2, two unevaluated wetland areas are mapped off-site in the natural heritage system lands near to the southwest and southeastern boundaries of the Site. The wetland to the southwest is located, at its closest approach, approximately 30 m southwest of the Site; in the post-development plan it will be located on the far (west) side of Peter Matthews Drive relative to the Site. The wetlands to the southeast are generally located on the far (east) side of Ganatsekiagon Creek relative to the Site.

Based on the on-line Ontario Flow Assessment Tool from the Ministry of Natural Resources and Forestry (MNRF; http://www.gisapplication.lrc.gov.on.ca), the Site is located in the Ganatsekiagon Creek watershed. Ganatsekiagon Creek drains southward and at its closest approach is located approximately 45 m east of the Site. Two tributaries to Ganatsekiagon Creek are present to the west of the main creek in the area of the Site (see Figure 2). The shortest and closest tributary to the Site drains southeastward (see Figure 2). During all monitoring events (i.e., June 5, July 25 and August 5, 2020), Golder observed part of this tributary to be flowing and part of it was dry.

2.4 Surficial Geology

The Site is within the physiographic region of southern Ontario known as the Iroquois Plain (Chapman and Putnam, 1984). According to published mapping (Quaternary Soils, Geological Survey of Canada/Ontario Geological Survey, 2016) and as presented in Figure 3, the surficial geology at the Site is mainly comprised of stone-poor, sandy silt- to silty sand-textured till, known as the Newmarket Till. Modern alluvial deposits consisting of clay, silt, sand and gravel are reported to be present overlying the till off-Site to the south associated with the tributary of Ganatsekiagon Creek floodplain area.

2.5 Water Well Records

Water well records were obtained from the Ministry of the Environment, Conservation and Parks (MECP). Approximately forty-five water well records were reported within 500 m of the Site, and their locations are shown on Figure 4, Ministry Recorded Wells. A table summarizing the water well record data is provided in Appendix C, MECP Recorded Wells. It is noted that historically there was not a requirement to register dug wells with the MECP, and they can be under-represented in the water well record database.

Fourteen of the records were records of well abandonment/not used and three wells had no information provided which are not considered further. The remaining twenty-eight wells were constructed between 1952 and 2015 and include seventeen observation wells/test holes, including two test holes recorded on the southwest boundary of the Site (nos. 7260789, 7260790), and eleven water supply wells. The depths of the observation wells/test holes ranged from 7.6 m to 18.3 m, with an average of 11.0 m. The observation wells/test holes were generally reported to encounter units of silt and sand that are inferred to be silt and sand till. The water supply wells are comprised of:

- One shallow bored water well with well depth 7.9 m below ground surface (mbgs);
- Four deep bored water wells with well depths ranging from 11.6 mbgs to 20.7 mbgs, including one bored water well record recorded within approximately 25 m of the northwest corner of the Site (no. 4603704).
- Six deep drilled wells, with well depths ranging from 17.1 mbgs to 45.7 mbgs.

The subsurface conditions at the water supply wells were reported to be comprised of thin surficial topsoil overlying clay, silt and sand units that sometimes contained gravel and are interpreted as glacial till, which commonly contained confined sand or gravel layers/units or was underlain by confined sand or gravel units. Bedrock was encountered in one record at a depth of 82.6 mbgs. These various confined layers are inferred to be the primary aquifers utilized by the private wells, although some use of the glacial till unit was inferred. The sand and gravel units were encountered overlying/underlying/within the till at depths ranging from 7.9 mbgs to 45.7 mbgs, and with thicknesses ranging from approximately 1 m to 5 m.

Based on the water wells records and observations during our field program, active private well use may be present off-Site associated with an existing farm and rural residences to the west, northwest and northeast of the Site within 100 to 400 m Golder did not observe any private wells on the Site during site visits. The off-Site rural residences are not inferred to be in a hydraulically downgradient direction from the Site. One shallow bored private well (No. 4603704, reportedly used for stock watering) is indicated to be present approximately 25 m in a hydraulically upgradient location from the Site. This bored well was not observed by Golder, but if present, is located on lands owned by the proponent. Therefore, any active use of this bored well is expected to cease, and the well will be abandoned as development of the Site progresses.

3.0 SITE CHARACTERIZATION

3.1 Drilling and Monitoring Well Installation

As reported in our concurrent geotechnical investigation report, a geotechnical field investigation was carried out between between May 21 to May 25, 2020, during which time nine boreholes (designated as BH20-1 to BH20-9) were advanced to depths ranging from 3.3 m to 8.1 mbgs (Elevations 179.1 m to 157.4 m). The borehole locations are shown on the Borehole Location Plan, Figure 2. The reader is referred to the concurrent geotechnical report (Golder 2020) for additional details.

The as-drilled borehole locations and elevations (referenced to a geodetic datum) were surveyed by the project surveyor, J.D. Barnes Ltd., and provided to Golder.

The shallow groundwater conditions were noted in the open boreholes during drilling. Following the completion of drilling to allow for further groundwater measurements, 50 mm diameter monitoring wells were installed in Boreholes BH20-1, BH20-4, BH20-5, BH20-6, BH20-7 and BH20-8. A sand filter pack was placed to surround the screen in each well. Above the screen, the annulus surrounding the PVC standpipe was backfilled to the ground surface with bentonite pellets. Each monitoring well was completed with a protective monument-style protective casing set in concrete.

The field work was observed by a member of our technical staff, who located the boreholes in the field, arranged for the clearance of underground utility services, observed the drilling, sampling and in situ testing operations, logged the boreholes, and examined and took custody of the recovered soil samples. The samples were identified in the field, placed in appropriate containers, labelled, and transported to our Whitby geotechnical laboratory for further examination and selected laboratory testing. Index and classification tests, consisting of water content determinations as well as selective gradation and Atterberg limit testing were carried out on the recovered soil samples. The results of the geotechnical laboratory tests are presented in Appendix D and on the borehole records.

3.2 Subsurface Soil Conditions

The subsurface soil and shallow groundwater conditions encountered in the boreholes, as well as the results of the field and laboratory testing are shown on the Record of Borehole sheets and on the soil laboratory figures provided in Appendix D, respectively. Golder's "*Method of Soil Classification*", "*Abbreviations and Terms Used on Records of Boreholes and Test Pits*" and "*List of Symbols*" are attached to assist in the interpretation of the borehole logs. It should be noted that the boundaries between the soil strata have been inferred from drilling observations and non-continuous samples. They generally represent a transition from one soil type to another and should not be inferred to represent an exact plane of geological change. Further, conditions will vary between and beyond the boreholes.

The following is a summarized account of the subsurface conditions encountered in the boreholes drilled during this investigation, followed by more detailed descriptions of the major soil strata and shallow groundwater conditions.

The subsurface soils encountered are consistent with geological mapping for the area, and generally consist of topsoil and reworked native materials underlain by the predominant non-cohesive and cohesive glacial till deposit.

Gravelly sand, silty sand, sand, and silt deposits were interlayered within the glacial till deposit. Similar conditions were encountered in the three boreholes drilled at the Site by Stantec (2018) to depths ranging from 12.4 m to 15.4 mbgs.

3.2.1 Topsoil

The topsoil was observed to be approximately 0.3 m to 0.7 m thick and was encountered in all boreholes. It should be noted that due to current Site activities, the thickness may no longer be representative.

3.2.2 Fill / Re-worked Soils

Fill/reworked native soils consisting of cohesive clayey silt to silty clay were encountered in Boreholes BH20-1, BH20-2, BH20-3, BH20-4 and BH20-7. The cohesive fill was encountered underlying the topsoil and extended to depths between 0.7 m and 1.4 mbgs. The fill contained organic inclusions, rootlets, and oxidation staining and are assumed to be reworked native soils.

3.2.3 Glacial Till

A deposit of glacial till was encountered in all boreholes advanced at the site. The till ranges in composition from non-cohesive silty sand to cohesive sandy silty clay to clayey silt and sand. The deposit generally extends to the borehole termination depths and contains non-cohesive interlayers. Although cobbles and boulders were not noted during drilling through the till deposits at this site, cobbles and boulders are commonly encountered in glacially derived materials and should be expected within these deposits. Further, the presence of cobbles and/or boulders in the cohesive and non-cohesive till deposits can be inferred from the multiple instances of auger grinding during drilling as well as the split-spoon sampler not advancing the full sample depth.

(CL-ML) Silty Clay to Clayey Silt (Till)

A cohesive till deposit consisting of silty clay to clayey silt, sand to sandy, containing trace to some gravel and rock fragments was encountered in Boreholes BH20-1 to BH20-6. The cohesive till deposit was generally encountered underlying fill/reworked native soil with the exception of Borehole BH20-5 at which it underlies a silty sand till deposit. Sand seams and pockets were observed in Boreholes BH20-2 and BH20-6.

Atterberg limits testing was performed for a single sample of the silty clay to clayey silt and sand till deposit and is shown on a plasticity chart on Appendix D, Figure D-2. The results of the Atterberg limit test indicate the material is classified as a silty clay to clayey silt of low plasticity. A grain size distribution curve for a single sample of the silty clay to clayey silt and sand till is shown on Figure D-3.

(SM/ML) Silty Sand (Till)

A silty sand till deposit, gravelly to trace gravel, containing rock fragments was encountered in Boreholes BH20-5, BH20-7, BH20-8 and BH20-9. Oxidation staining was observed in some of the boreholes.

A grain size distribution curve for a single sample of the silty sand till deposit is shown on Figure D-4 Appendix D.

3.2.4 (SM) Silty Sand

A silty sand deposit, gravelly to trace gravel, was encountered in Boreholes BH20-5, BH20-6, BH20-7, and BH20-9, typically interlayered within the till deposits. Oxidation staining was observed at some of the borehole locations. The presence of cobbles and/or boulders can be inferred from the multiple instances of auger grinding during drilling.

A grain size distribution curve for a single sample of the silty sand deposit is shown on Figure D-5 in Appendix D.

3.2.5 (SP) Sand

Sand deposits ranging in composition from gravelly sand to sand, containing trace to some fines were encountered in Boreholes BH20-6 and BH20-8 underlying the glacial till deposit. Grain size distribution curve for a single sample of the gravelly sand deposit is shown on Figure D-6 in Appendix D.

3.2.2 (ML) Silt

A 0.7m thick silt deposit, containing some sand and slightly plastic, was encountered in Borehole BH20-8 below the topsoil.

3.3 Water Level Monitoring

Groundwater levels were manually monitored at the monitoring wells on June 5, July 25 and August 5, 2020. Water level depths and elevations are provided in Table E-1, Groundwater Depths and Elevations (Appendix E). It should be noted that these observations reflect the groundwater conditions encountered at the time of the field investigation (selected dates in June, July and August 2020) and some seasonal and annual fluctuations should be anticipated.

The depth to groundwater at the monitoring wells ranged from 1.07 mbgs (BH20-4 on June 5, 2020) to 6.29 mbgs (BH20-6 on August 5, 2020) and from approximate elevations of 153.79 masl (BH20-8 on August 5, 2020) to 177.99 masl (BH20-1 on June 5, 2020) on the dates monitored. The groundwater elevation data on June 5, 2020 are shown on the Record of Borehole Sheets (Appendix D). The groundwater elevation data on July 25, 2020 are shown on Figure 5, Shallow Groundwater Flow, and Figure 6, Cross Section A - A'. As shown on Figure 5, groundwater was inferred to flow toward the southeast to toward the east, depending on location, and generally toward Ganatsekiagon Creek and its nearby tributaries which are off-site to the south and east.

3.4 Hydraulic Testing

Single well response testing (i.e., rising head tests) was carried out at monitoring wells BH20-1, BH20-4, BH20-5 and BH20-7, on July 25, 2020. The rising head tests were carried out by rapidly lowering the water levels by purging with a dedicated Waterra® footvalve and tubing. The resulting water level recoveries were monitored with an electronic water level tape. The recovery data were analyzed using the AQTESOLV for Windows (1996 – 2007) Version 4.5 software. The Bouwer and Rice (1976) method for unconfined conditions was applied to the rising head test data. Estimates of hydraulic conductivity (K) obtained from the rising head tests are summarized below in Table 1. Summary printouts of the rising head test data and results from AQTESOLV are included in Appendix E.

Table 1: Summary of Estimated Hydraulic Conductivity

Location	Unit Screened	Depth of Monitoring Well (mbgs)	Method	K (cm/s)
BH20-1	(CL-ML) SILTY CLAY TILL to CLAYEY SILT and SAND TILL	3.5	Bouwer and Rice (1976), unconfined	$1x10^{-6}$

Location	Unit Screened	Depth of Monitoring Well (mbgs)	Method	K (cm/s)
BH20-4	(CL-ML) sandy SILTY CLAY TILL to CLAYEY SILT and SAND TILL	6.5	Bouwer and Rice (1976), unconfined	$4x10^{-6}$
BH20-7	(SM) SILTY SAND	6.5	Bouwer and Rice (1976), unconfined	$2x10^{-4}$

Note:
mbgs – metres below ground surface. cm/s – centimetres per second

The hydraulic conductivity estimates for (CL-ML) silty clay till to clayey silt till ranged from $1x10^{-6}$ cm/s to $4x10^{-6}$ cm/s. The hydraulic conductivity estimate for (SM) silty sand unit is $2x10^{-4}$ cm/s. The estimated hydraulic conductivities are within the range expected for these soil types.

An attempt was made to perform a rising head test at BH20-5, but the water level recovery was too rapid for accurate manual readings. Thus, the data were not used to estimate a K value for Borehole BH20-5, but the rapid recovery suggests a hydraulic conductivity in the order of 10^{-3} cm/s. This value is higher than expected for glacial till soils and may suggest that the till is lean (i.e., contains few fines) at this location or the presence of sand layer(s).

3.5 Guelph Permeameter Testing

Soil infiltration rate testing was carried out on August 5, 2019 in the unsaturated zone using a Guelph Permeameter (Soilmoisture Equipment Corp., Model 2800K1). The Guelph Permeameter was operated in general accordance with the procedures outlined by the manufacturer (Soilmoisture Equipment Corp., 2012) using a single head method. The apparatus was installed at the base of hand augered test holes.

Once the outflow of water at the depth of installation reached a steady-state flow rate, the field-saturated hydraulic conductivity, K_{fs}, of the soil was estimated using the following equation (Elrick et. al., 1989):

$$K_{fs} = \frac{C_1 Q_1}{2\,\pi\,H_1^2 + \pi\,a^2\,C_1 + 2\,\pi\,\frac{H_1}{\alpha^*}}$$

Where: C_1 = shape factor
Q_1 = flow rate (cm^3/s)
H_1 = water column height (cm)
a = well radius (cm)
α^* = alpha factor (0.04 cm^{-1} for Type 2 soils, 0.12 cm^{-1} for Type 3 soils)

The field data and analysis of the infiltration rate tests are presented as Figure E-1 to Figure E-7, Appendix E. Based on the resulting K_{fs} (cm/s), the corresponding infiltration rates (mm/hr) were estimated using the approximate relationship presented in the *Low Impact Development Stormwater Management Planning and Design Guide* (or "*Design Guide*") (TRCA and CVCA, 2010). A summary of the infiltration rate test results is presented in Table 2, below.

Table 2: Summary of Estimated Infiltration Rates

Test	Soil Description	Depth Relative to Grade (mbgs)	Est. Field-Saturated Hydraulic Conductivity K_{fs} (cm/s)	Estimated Infiltration Rate [1] (mm/hr)	Correction Factor	Corrected Estimated Infiltration Rate [2] (mm/hr)
GP 20-2	(CL-ML) SILTY CLAY to CLAYEY SILT and SAND TILL	0.72	2×10^{-4}	58	2.5	23
GP 20-5	(SM) SILTY SAND	0.92	6×10^{-4}	69	2.5	28
GP 20-8	(ML) SILT	0.80	2×10^{-4}	58	3.5	17

Note:
mbgs – metres below ground surface. cm/s - centimetres per second. mm/hr – millimetres per hour
[1] – based on Table C1 from TRCA and CVCA (2010).
[2] – correction factor in accordance with Table C2 from TRCA and CVCA (2010).

The field-saturated hydraulic conductivity value for the silty clay till to clayey silt and sand till is estimated to be 2×10^{-4} cm/s, corresponding to an infiltration rate of 58 mm/hr. The field-saturated hydraulic conductivity value for the surficial silty sand and silt units ranged from 2×10^{-4} cm/s to 6×10^{-4} cm/s, with corresponding infiltration rates ranging from 58 mm/hr to 69 mm/hr.

The infiltration rate estimates from this investigation are based on the test methods discussed above and are for the corresponding soil types encountered. They represent the soil conditions at the tested locations and depths only; conditions may vary between and beyond the tested locations.

For design discussion purposes, a correction factor was applied to estimate the design infiltration rate in accordance with guidance provided in TRCA and CVCA (2010), to account for potential reductions in soil permeability due to compaction, smearing during the construction of a given infiltration feature and the gradual accumulation of fine sediments over the lifespan of the infiltration feature. Based on the guidance, correction factors of 2.5 and 3.5 was applied to the estimated infiltration rates. The corrected infiltration rate estimates for the surficial silty sand and silt units ranged from 17 mm/hr to 28 mm/hr, with a geometric mean of 22 mm/hr (n=2). The corrected infiltration rate estimate for the silty clay till to clayey silt and sand till was 23 mm/hr.

3.6 Summary

Based on a review of the published information and results of the subsurface investigations, glacial till soils are predominant at the Site. The subsurface investigation indicates that the till ranges from cohesive sandy silty clay till to clayey silt and sand till to non-cohesive or slightly plastic silty sand till to sandy silt till. Non-cohesive layers or lenses of silty sand, and silt, sand and gravel were encountered within the glacial till unit at several locations, and surficial silty sand or silt units were encountered overlying the glacial till at two borehole locations. The lateral extent of the non-cohesive layers/lenses was not investigated and may be continuous between several borehole locations (e.g. Boreholes BH20-6, BH20-7 and BH20-8), but they are not inferred to be laterally continuous across the Site.

The estimated hydraulic conductivity (below the water table) of silty clay till to clayey silt till soils ranged from 1×10^{-6} cm/s to 4×10^{-6} cm/s, and the estimated hydraulic conductivity of the silty sand at BH20-7 was 2×10^{-4} cm/s.

The design infiltration rate (above the water table) for the silty clay till to clayey silt and sand till is estimated to be 23 mm/hr (n = 1). The design infiltration rates for the discontinuous surficial silty sand and silt were estimated to range from 17 mm/hr to 28 mm/hr with a geometic mean of 22 mm/hr (n = 2).

Ganatsekiagon Creek drains southward and at its closest approach is located approximately 45 m east of the Site. Two tributaries to Ganatsekiagon Creek are mapped to the west of the main creek and are located within the natural heritage system lands adjacent to the south of the Site. A portion of the closest and shortest tributary was observed by Golder to be partly flowing during three groundwater level monitoring events in June, July and August 2020.

The depth to groundwater at the monitoring wells ranged from 1.07 mbgs (BH20-4 on June 5, 2020) to 6.29 mbgs (BH20-6 on August 5, 2020) and from approximate elevations of 153.79 masl (BH20-8 on August 5, 2020) to 177.99 masl (BH20-1 on June 5, 2020). These observations reflect the groundwater conditions encountered at the time of the field investigation, and seasonal and annual groundwater fluctuations should be expected. Groundwater at the Site was inferred to flow toward the southeast to toward the east depending on location, and generally toward Ganatsekigaon Creek and its nearby tributaries which are off-site to the south and east. Given the setting of the Site on a glacial till plain, the Site is not expected to represent a significant groundwater recharge or discharge area in the Ganatsekiagon Creek watershed.

Two unevaluated wetland areas are mapped in the natural heritage system lands near to the southwest and southeastern boundaries of the Site. The wetland to the southwest is located, at its closest approach, approximately 30 m southwest and hydraulically cross-gradient to the Site; in the post-development plan it will be located on the far (west) side of Peter Matthews Drive relative to the Site. The wetlands to the southeast are generally located on the far (east) side of Ganatsekiagon Creek relative to the Site, and therefore on the other side of an inferred groundwater flow divide represented by the creek. An evaluation of groundwater conditions in the off-Site wetland areas and tributaries was outside of this scope of services.

Based on the water wells records and observations during our field program, no active private well use is reported or was observed on the Site, although active private well use may be present at off-site agricultural operations/rural residences to the northeast, northwest and west of the Site within 500 m. Confined sand or gravel layers within or underlying the glacial till, or in some cases the glacial till itself, were reported to be utilized for water supply. One deep bored private well (No. 4603704) for stock watering use is recorded to be present approximately 25 m in a hydraulically upgradient direction from the Site, although the current status of this well is not known to Golder. The off-Site private water wells are not inferred to be in a hydraulically downgradient direction from the Site. As the development proceeds on lands owned by the proponent (i.e., the Site plus the adjoining subdivision to the west), it is assumed the use of the upgradient bored well (No. 4603704), if present, and any other private wells on the adjacent property to the west owned by the proponent will cease and the well(s) will be abandoned.

4.0 TEMPORARY CONSTRUCTION DEWATERING PERMITTING

The design of Site servicing for the proposed residential development is shown on the functional servicing plan dated May 2019 (Appendix B). Generally, site servicing will include the construction of local storm and sanitary sewers and a third roof drain collector (RDC) pipe on the local road network, and storm water management facility (SWMF) Block 92, located to the southeast of the Site. Dewatering requirements for construction of the trunk sanitary sewer on Peter Matthews Drive have been considered by others and are not included in this report.

Based on the servicing information provided and the June 2020 groundwater elevation data (see Table E-1, Appendix E), the storm and sanitary sewers and RDC will require excavations ranging up to 3.2 m to 15.0 m below existing grade, or approximately 0.0 m to 7.0 m below groundwater levels measured in June 2020. SWMF Block 92 will be constructed with a forebay cell invert of 155.5 masl and a main cell invert of 154.0 masl, requiring excavations of approximately 4.0 m to 5.0 m below existing grade, or approximately up to 2.5 m below groundwater levels measured in June 2020. Both seasonal and annual groundwater level fluctuations should be expected. As such, it is anticipated that excavations for Site servicing will mostly be at or below the groundwater level with only a few areas being above the groundwater level, and the need for temporary groundwater control during construction is anticipated. Engineering information and recommendations concerning the SWM ponds, excavations and groundwater control are provided in our concurrent geotechnical investigation report, to which the reader is referred.

The method of construction dewatering should be solely determined by the Contractor based on their own assessment of the Site-specific conditions, and likely by their specialist dewatering contractor. In any case, the groundwater level should be lowered to a minimum of 1 m below the inverts in advance of the excavation reaching the invert levels. Surface water runoff must be directed away from any open excavation.

It is recommended that a licensed, specialist dewatering subcontractor supervise the installation, operation and decommissioning of any dewatering systems for this project, in accordance with applicable legislation. It is understood that a dewatering plan from a specialist subcontractor has not yet been prepared.

Water takings in excess of 50 m^3/day are regulated by the MECP. Certain takings of groundwater and storm water for construction site dewatering purposes with a combined total less than 400 m^3/day qualify for self-registration on the MECP's Environmental Activity and Sector Registry (EASR). A Category 3 PTTW is required where the proposed water taking is greater than 400 m^3/day.

The rate of groundwater inflow to excavations will vary during construction. Initially, higher inflow rates will occur as groundwater is removed from storage within the zone of influence. With time, rates will decrease toward a steady-state condition. Incident precipitation into excavations will also need to be managed with the groundwater contributions and factored into the total pumping rate.

Based on the hydrogeological conditions encountered at the borehole locations, the steady state groundwater inflow rate to a typical open length of servicing trench encountering mainly glacial till soils and using a conventional cut and cover method may not individually exceed 50 m^3/day. However, initial dewatering rates may be higher than expected from only glacial till soils depending on the lateral extent of saturated non-cohesive silty sand to sand and gravel layers or lenses encountered within or below the excavation. Including the initial removal of groundwater from storage and the management of incident precipitation the excavation, combined pumping rate is not likely to exceed 400 m^3/day.

Portions of the excavations for the construction of the SWMF may encounter groundwater, depending on seasonal groundwater levels at the time of construction. If construction occurs at a time of seasonal low groundwater levels, excavation of the forebay cell may not encounter groundwater, and excavation of only the deepest portion of the main cell may encounter groundwater. At times of seasonal high groundwater levels, the deepest portions of both cells may encounter groundwater. In either case, if the pumping of incident precipitation into the SWMF excavation is carefully managed (e.g. incident precipitation into the two cells is pumped one at a time, or large storm events are pumped out over multiple days), it is estimated that the combined dewatering rate for SWMF construction will not likely exceed 400 m^3/day..

Therefore, if construction dewatering for linear servicing takes place separately from SWMF construction dewatering, the pumping rate for each task is estimated to be less than 400 m^3/day and the need to prepare a Water Taking Report and Discharge Plan and to register the water taking on the EASR should be anticipated at this time. If construction dewatering for linear servicing and SWMF construction takes place concurrently, the need to prepare a hydrogeological investigation to support at PTTW application should be anticipated. These findings should be re-evaluated as site designs progress and construction plans are developed.

5.0 HYDROLOGIC WATER BALANCE

A water balance assessment was carried out to assess the potential hydrogeological impacts of the proposed Site development with respect to post-development infiltration rates, including potential impacts to groundwater-dependent resources. To estimate current and future water balances on the approximately 5.56 ha Site, Golder prepared a water balance assessment for the existing land uses as shown on the Functional Pre-Development Land Use Plan and proposed land uses as shown on the Draft Plan (provided in Appendix B). The water balance was prepared on a site-wide basis. The site-wide water balance has been completed to include the proposed Low Impact Development (LID) mitigation measure details provided to Golder, comprised of the direction of roof drainage via the RDC to a bio-retention swale located at the southeast flank of the Site just north of the SWMF.

5.1 Methods

The water balance assessment was based on meteorological data obtained from Environment and Climate Change Canada (ECCC) for the Buttonville A Meteorological Station (ID 6158410) from 1986 to 2017, information on current and proposed land uses and existing soil types as identified through the subsurface investigation activities at the Site.

Water balance calculations are based on the following equation, which is described in more detail below:

$$P = S + ET + R + I$$

Where: P = precipitation;

S = change in soil water storage;

ET = evapotranspiration;

R = surface runoff; and

I = infiltration (groundwater recharge).

Precipitation data obtained from ECCC for the Buttonville A station indicate a mean annual precipitation (P) of 863 mm/yr.

Short-term or seasonal changes in soil water storage (S) are anticipated to occur on an annual basis as demonstrated by the typically dry conditions in the summer months and the wet conditions in the winter and spring. Long-term changes (e.g. year to year) in soil water storage are considered to be negligible in this assessment.

Evapotranspiration (ET) refers to water lost to the atmosphere from vegetated surfaces. The term combines evaporation (i.e. water lost from soil or water surfaces) and transpiration (i.e. water lost from plants and trees). Potential ET refers to the loss of water from a vegetated surface to the atmosphere under conditions of an unlimited water supply. The actual rate of ET is typically less than the potential rate under dry conditions (e.g.

during the summer months when there is a moisture deficit). The mean annual potential ET for the areas considered in the water balances is approximately 635 mm/yr based on data provided by ECCC.

The mean annual water surplus is the difference between P and the actual ET. The water surplus represents the total amount of water available for either surface runoff (R) or groundwater infiltration (I) on an annual basis. On a monthly basis, surplus water remains after actual evapotranspiration has been removed from the sum of rainfall and snowmelt, and maximum soil or snow pack storage is exceeded. Maximum soil storage is quantified using a water holding capacity (WHC) specific to the soil type and land use. The WHC data obtained from ECCC are shown in Table F-1, Appendix F.

Infiltration rates were estimated using the method presented in the Ontario Ministry of the Environment (MOE) *Stormwater Management Planning and Design (SWM) Manual* (MOE, 2003). There are three main factors that determine the percent infiltration of the water surplus: topography, soil type and ground cover. The sum of the fractions representing these three factors establishes the approximate annual percentage of surplus which can be infiltrated in an area with a sufficient downward groundwater gradient. The on-Site portion of SWMF Block 92 was assumed to have a negligible downward gradient, resulting in all surpluses being contained in this area, which was assumed to provide increased evaporation and no infiltration.

Land use at the Site under existing (pre-development) conditions was obtained from the Functional Pre-Development Land Use Plan (provided in Appendix B). Land use at the Site under post-development conditions was based on the Draft Plan (provided in Appendix B). The land use data was compiled to estimate the total area of each land use within the Site boundary. Provided information and data and from this investigation were used with Table 3.1: Hydrologic Cycle Component Values, from the MOE *SWM Manual* (MOE, 2003), to identify appropriate WHCs and to sum an infiltration factor for each land use.

5.2 Water Balance Parameters

Based on the results of subsurface investigation activities at the Site (see Section 3), the existing surficial soil type (predominantly cohesive clayey silt to silty clay fill [i.e. re-worked glacial till] and native glacial till) was considered for the purposes of this report to be silt loam based on the U.S. Bureau of Soils classification system and the relative percentages of sand, silt and clay obtained from selected soil samples. Post-development grade changes are assumed to result in the same soil types at grade (i.e. native glacial till or re-worked glacial till). Therefore, the post-development surficial soil type was also considered to be silt loam for the purposes of this report. Water holding capacities were assigned to this soil type using the values listed in Table 3.1: Hydrologic Cycle Component Values, from the MOE *SWM Manual* (MOE, 2003), as summarized in Table F-2, Appendix F.

The surplus data obtained from ECCC for the respective water holding capacities were split into infiltration and runoff components by applying an infiltration factor based on Table 3.1 (MOE, 2003). The infiltration factors were based on a sum of Site-specific topography, surficial soil type and vegetative cover factors as presented in Table F-2 of Appendix F. Based on the Functional Grading Plan (see Appendix B), a topography factor of 0.1, representing hilly land (with an average slope of 28 m/km to 47 m/km), was applied to the pre-development and post-development conditions at the Site. The silt loam soil was considered to be between open sandy loam and medium combinations of clay and loam and was assigned a soils factor of 0.3. Grass-covered areas and agricultural areas were assigned a cover factor of 0.1, representing cultivated land, while woodlots were assigned a cover factor of 0.2, representing woodland. For SWM ponds and impervious surfaces (buildings and paved areas), no infiltration factor was applied.

The water balance analysis was developed under the following assumptions:

- WHCs were chosen based on Table 3.1 in the MOE *SWM Manual* (2003) corresponding to the silt loam soil type, land uses and proposed post-development conditions.
  - Woodlot (Mature Forest): 400 mm WHC and 0.6 infiltration factor (pre-development condition).
  - Agricultural (Moderately Rooted Crops): 200 mm WHC and 0.5 infiltration factor (pre-development condition).
  - Lawn (Urban Lawn): 125 mm WHC and 0.5 infiltration factor (post-development conditions).
  - SWM ponds: Surplus assumed to equal precipitation minus potential evapotranspiration, with a null (i.e. 0%) infiltration factor.
  - Impervious Areas (i.e. buildings, roads, driveways and sidewalks): Surplus assumed as 90% of precipitation and null (i.e. 0%) infiltration factor (Conservation Authorities Geoscience Group, June 2013).
- Net surplus was estimated by multiplying the estimated monthly surplus (mm/month) for the assumed WHC by the associated drainage area. Annual evapotranspiration and surplus values were obtained from the meteorological data from the Buttonville A ECCC Meteorological Station based on the WHC assigned to each land use area.
- Runoff was calculated as the difference between surplus and infiltration.

5.3 Water Balance Results

5.3.1 Pre-Development Condition

Based on the results of this assessment, the average annual pre-development water balance was estimated as summarized in Table 3, and as detailed in Table F-3, Appendix F.

Table 3: Pre-Development Average Annual Water Balance Results

Component	Annual Volume m^3/yr
Precipitation (P)	47,980
Evapotranspiration (ET)	33,640
Surplus (S)	14,340
Infiltration (I)	7,250
Runoff (R)	7,090

For the pre-development condition, the estimated average annual runoff from the Site is approximately 7,090 m^3 and the estimated average annual infiltration on the Site is approximately 7,250 m^3.

5.3.2 Post-Development Condition

The post-development condition water balance was based on the Draft Plan provided in Appendix B without the proposed LID measure. Since the design of the Site is still in early stages, the perviousness of each land type was assumed as the following:

- Residential (including a mixture of low and medium density units): 67% impervious, 73% of the impervious area is roofs;

- Open space and Overland Flow: 100% urban lawn;
- SWM Ponds: 100% open water; and
- Road Right of Way: varies between 61% to 65% impervious based on the Seaton Right of Way Details drawing (refer to Appendix B).

Based on the results of this assessment, the average annual post-development water balance was estimated as summarized in Table 4, and as detailed in Table F-3, Appendix F.

Table 4: Post-Development Average Annual Water Balance Results

Component	Annual Volume m^3/yr
Precipitation (P)	47,980
Evapotranspiration (ET)	15,120
Surplus (S)	32,860
Infiltration (I)	2,740
Runoff (R)	30,120

In the post-development condition, the total estimated average annual runoff from the Site is approximately 30,120 m^3 and the estimated average annual infiltration is approximately 2,740 m^3. As a result of land use changes, runoff is expected to increase by 325% and infiltration is expected to decrease by 62% compared to average annual pre-development conditions.

5.3.3 Post-Development Condition Including Mitigation

As a result of development average annual infiltration volumes at the Site are expected to decrease relative to pre-development conditions and runoff volumes are expected to increase. Although the glacial till plain setting of the Site is not expected to be a significant groundwater recharge/discharge area within the Ganatsekiagon Creek watershed, it is considered prudent to incorporate LID measures into the Site design to mitigate against reductions in post-development infiltration rates to the extent practical. Further, the use of LID measures for stormwater runoff from development sites assists to support the natural hydrologic cycle by helping to maintain groundwater recharge, provide additional water quality treatment and reduce the volume of runoff from a site.

The Functional Grading Plan (see Appendix B) includes a bioretention LID feature located along the southeast flank of the Site. Although Site development plans are in a preliminary stage, the Roof Drainage Area Plan indicates that all roofs will be directed to the LID with a minimum footprint area of 731.4 m^2. For the purpose of this assessment, it was assumed that all roofs will be directed to the bioretention feature for infiltration prior to any overflow reporting to the SWMF in Block 92 and that all other roads and lawn areas will be report to the SWMF directly. Bioretention facilities temporarily store, treat and infiltrate runoff by using a filter bed overlain by a mulch ground cover and plants adapted to the conditions of a stormwater practice.

It is noted that bioretention cells work best for smaller drainage areas as flow is better distributed over the filter bed. The ratio of impervious drainage area to footprint area for the bioretention feature (i.e., 23:1) exceeds the recommended maximum ratio (i.e. 15:1 as per TRCA & CVC, 2010). This could result in an increased rate of accumulation of sediments and premature clogging of the features and can be addressed at the time of detailed design by increasing the footprint area and decreasing the depth of the bioretention feature while maintaining the same overall storage volumes.

Detailed information on seasonal groundwater elevations within the footprint of the bioretention feature is not available. Based on the inferred groundwater elevations in area of the feature (see Figure 4) and post-development ground surface elevations where the feature is shown outside of the grading limits (see Functional Grading Plan, Appendix D), it is estimated that the depth to groundwater along the bioretention alignment would be about 2.2 m or more. As such, a bioretention thickness of 1.2 m would maintain 1 m separation between the invert of the feature and the seasonally high groundwater level.

A frequency analysis of precipitation observed at the Buttonville A station (1986 to 2017) was conducted based on the available storage of the proposed bioretention feature assuming a time to drain of 48 hours. No underdrain would be required because the corrected infiltration rate of the native glacial till soil was observed to be 23 mm/hr. Based on the frequency analysis, a runoff reduction factor of 71% was applied to the roofs of all buildings draining to the bioretention feature.

Based on the results of this assessment using the proposed bioretention LID technique, the average annual mitigated post-development water balance was estimated as summarized in Table 5 and as detailed in Table F-3, Appendix F.

Table 5: Mitigated Post-Development Average Annual Water Balance Results

Component	Annual Volume m^3/yr
Precipitation (P)	47,980
Evapotranspiration (ET)	15,120
Surplus (S)	32,860
Infiltration (I)	12,020
Runoff (R)	20,840

In the mitigated post-development condition, the total estimated average annual runoff from the Site is approximately 20,840 m^3 and the estimated average annual infiltration is approximately 12,020 m^3. As such, runoff is expected to increase by 194% and infiltration is expected to increase by 66% compared to pre-development conditions.

6.0 DISCUSSION

The findings of this investigation indicate that soils at the Site are predominantly comprised of glacial till ranging from cohesive sandy silty clay till to clayey silt and sand till to non-cohesive or slightly plastic silty sand till to sandy silt till. Non-cohesive layers or lenses of silty sand, and silt, sand and gravel were encountered within and/or overlying the till unit at several locations. The lateral extent of the non-cohesive layers/lenses was not investigated and may be continuous between several borehole locations, but they are not inferred to be laterally continuous across the Site.

Ganatsekiagon Creek drains southward and at its closest approach is located approximately 45 m east of the Site. Two tributaries to Ganatsekiagon Creek are mapped to the west of the main creek and are located within the natural heritage system lands adjacent to the south of the Site. Portion of the closest and shortest tributary was observed by Golder to be partly flowing during three groundwater level monitoring events in June, July and August 2020.

The depth to groundwater at five monitoring wells installed as part of the investigation ranged from 1.07 mbgs to 6.29 mbgs, and from approximate elevations of 153.79 masl to 177.99 masl, on the dates monitored in June, July and August 2020 although seasonal and annual fluctuations should be expected. Groundwater at the Site was inferred to flow toward the southeast to toward the east depending on location, and generally toward Ganatsekigaon Creek and its nearby tributaries which are off-site to the south and east. Two unevaluated wetland areas are mapped in the natural heritage system lands adjacent to the southwest and southeastern boundaries of the Site, but are not inferred to be hydraulically downgradient of the Site. Given the setting of the Site on a glacial till plain, the Site is not expected to represent a significant groundwater recharge or discharge area in the Ganatsekiagon Creek watershed.

Excavations for Site servicing are expected to be below the water table, and the need for temporary dewatering during the construction of linear underground Site services and the SWMF is expected. If construction dewatering for linear servicing takes place at a different time than for SWMF construction, the need to prepare a Water Taking Report and Discharge Plan and to register the water taking on the EASR, should be anticipated at this time. If linear servicing and SWMF construction are to occur at the same time, the need to prepare a hydrogeological investigation to support a PTTW application should be anticipated. These findings should be re-evaluated as site designs progress and construction methods are developed. The potential impacts of temporary construction dewatering on existing resources, including private well users and local natural heritage features, should be evaluated at the time of detailed design.

A site-wide water balance assessment was carried out to assess the potential hydrogeological impacts of the proposed development with respect to average annual post-development infiltration rates. The development of the approximately 5.56 ha Site, without the implementation of mitigation measures, is expected to result in an approximate 62% reduction in average annual infiltration rates.

Although the Site is not expected to be a significant groundwater recharge or discharge area within the Ganatsekiagon Creek watershed, it is considered prudent to utilize LID measures to mitigate against reductions in post-development infiltration rates to the extent practical. Further, the use of LID measures for stormwater runoff from development sites assists to support the natural hydrologic cycle by helping to maintain groundwater recharge, provide additional water quality treatment and reduce the volume of runoff from a site. A bioretention feature with a footprint of at least 731.4 m^2 along the southeast flank of the Site is proposed to treat and infiltrate runoff from the residential roofs. Based on implementation of this LID measure, the average annual mitigated post-development runoff volume is expected to increase by approximately 13,750 m^3 (or 194%) and the average annual mitigated post-development infiltration volume is expected to increase by 4,770 m^3 (or 66%), compared to pre-development conditions.

The implementation and location of the bioretention feature should consider grading plans and the separation distance between the invert elevation of the feature and the seasonally high groundwater elevation. Guidance from the conservation authorities generally recommends a separation distance of 1.0 m. While detailed groundwater elevation data within the footprint of the bioretention feature is not available, the existing groundwater elevation data suggests that the separation distance will be maintained for bioretention thickness of 1.2 m. Additional assessment of groundwater elevations could be carried out at the time of detailed design. The ratio of impervious drainage area to footprint area for the bioretention feature (i.e. 23:1) exceeds the recommended maximum ratio (i.e. 15:1 as per TRCA & CVC, 2010). This could result in an increased rate of accumulation of sediments and premature clogging of the features and can be addressed at the time of detailed design by increasing the footprint area and decreasing the depth of the bioretention feature while maintaining the same overall storage volumes.

Given the estimated 66% increase in average annual post-development infiltration rate relative to the pre-development condition, the development of the Site is not expected to have an overall impact on groundwater contributions in the Ganatsekiagon Creek watershed. Consideration can be given at the time of detailed design to sizing the feature to maintain average annual post-development infiltration rates within 10% of pre-development.

Private water well use has been reported at rural residences and agricultural farms along Whitevale Road within 500 m of the Site. A deep bored well (No. 4603704) for stock watering use is recorded to be present approximately 25 m in a hydraulically upgradient direction from the Site. The well was not observed by Golder in the field; current status of this well is not known to Golder. It is recommended that this well, if present, be decommissioned in accordance with applicable legislation in association with Site development. Other recorded water wells within 500 m of the Site are not located in a hydraulically downgradient direction from the Site, and no quantity or quality impacts to private water well uses as a result of Site development are anticipated.

Precipitation falling on residential roofs will be directed to the bioretention feature to be infiltrated. A limited amount of precipitation from paved areas (e.g. driveways) may also infiltrate. This infiltration is not expected to degrade the groundwater quality at the Site, although stormwater from roads and driveways may have increased concentrations of one or more of metals, oil and grease, and road salt. With the exception of road salt, these materials quickly become immobile in the shallow subsurface.

7.0 CLOSURE

We trust that this submission meets your current requirements. Please contact the undersigned with any questions.

Signature Page

Yours truly,

Golder Associates Ltd.

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Associate, Senior Hydrogeologist

SAA/DH/MK/CMK/mlk/sv

https://golderassociates.sharepoint.com/sites/123870/project files/6 deliverables/hydrog/20140088 (2000) rep 2020'09'29 hydrogeological investigation - lebovic whitevale (reva).docx

8.0 REFERENCES

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FIGURES

DRAFT PLAN BOUNDARY

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CLIENT
1133373 ONTARIO INC. (LEBOVIC ENTERPRISES)

PROJECT
HYDROGEOLOGICAL INVESTIGATION
SEATON WHITEVALE EAST DEVELOPMENT, PICKERING, ON.

CONSULTANT
GOLDER

YYYY-MM-DD	2020-09-22
DESIGNED	
PREPARED	JPR
REVIEWED	SA
APPROVED	CMK

TITLE
KEY PLAN

PROJECT NO.	CONTROL	REV.	FIGURE
20140088	0002	----	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
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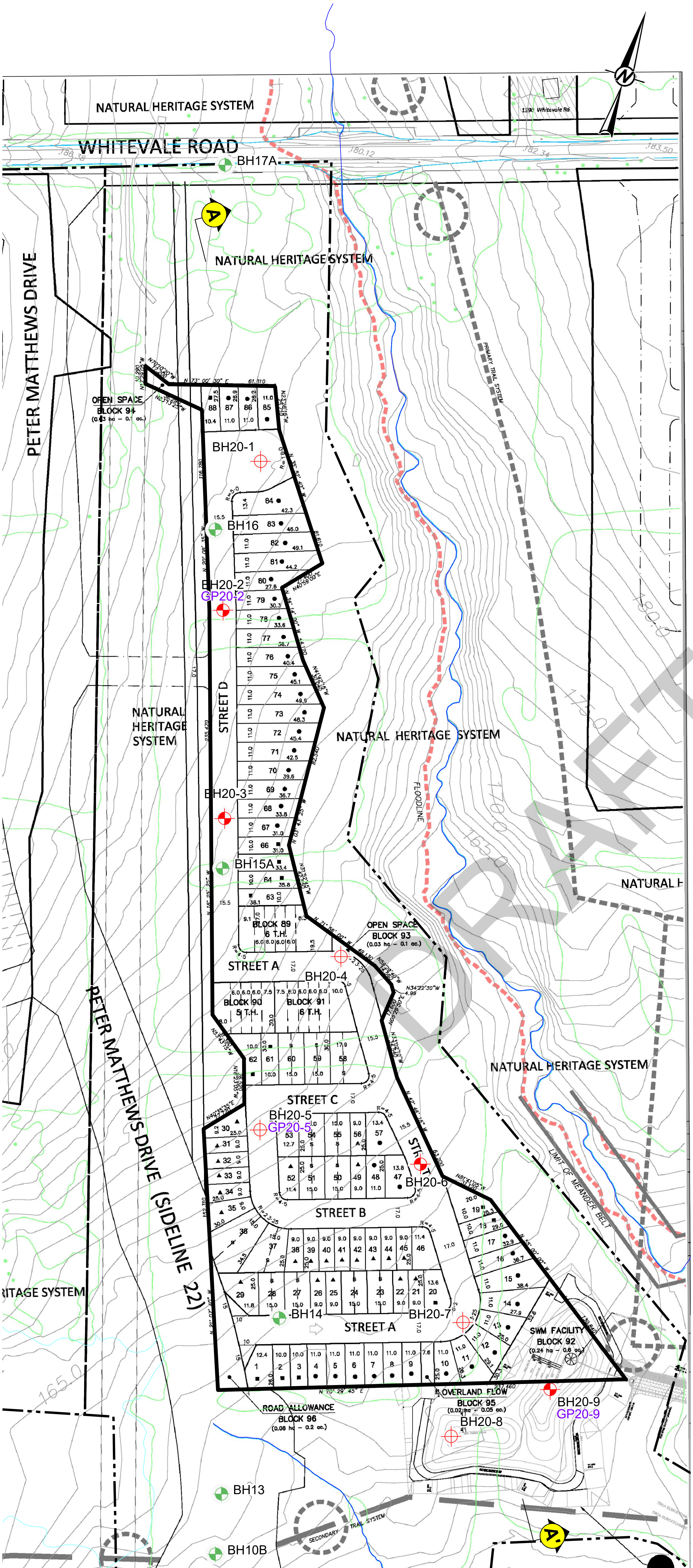

LEGEND

- BOREHOLE LOCATION
- BOREHOLE LOCATION WITH MONITORING WELL
- GP20-5 GUELPH PERMEAMETER TEST ADJACENT BOREHOLE
- PETER MATTHEW DRIVE BOREHOLES (STANTEC)
- DRAFT PLAN BOUNDARY

NOTE(S)

1. ALL BOREHOLE LOCATION ARE APPROXIMATED.
2. 2020 BOREHOLES WERE STAKED OUT AND SURVEYED BY J.D. BARNES LTD.
3. STANTEC SEATON COMMUNITY DEVELOPMENT, ASSIGNMENT 6, PICKERING, SEPT 2018

REFERENCE(S)

BASE MAP TAKEN FROM GHD, DATED FEBRUARY 2019, DELIVERED IN FORMAT PDF.

0 50 100 150 m

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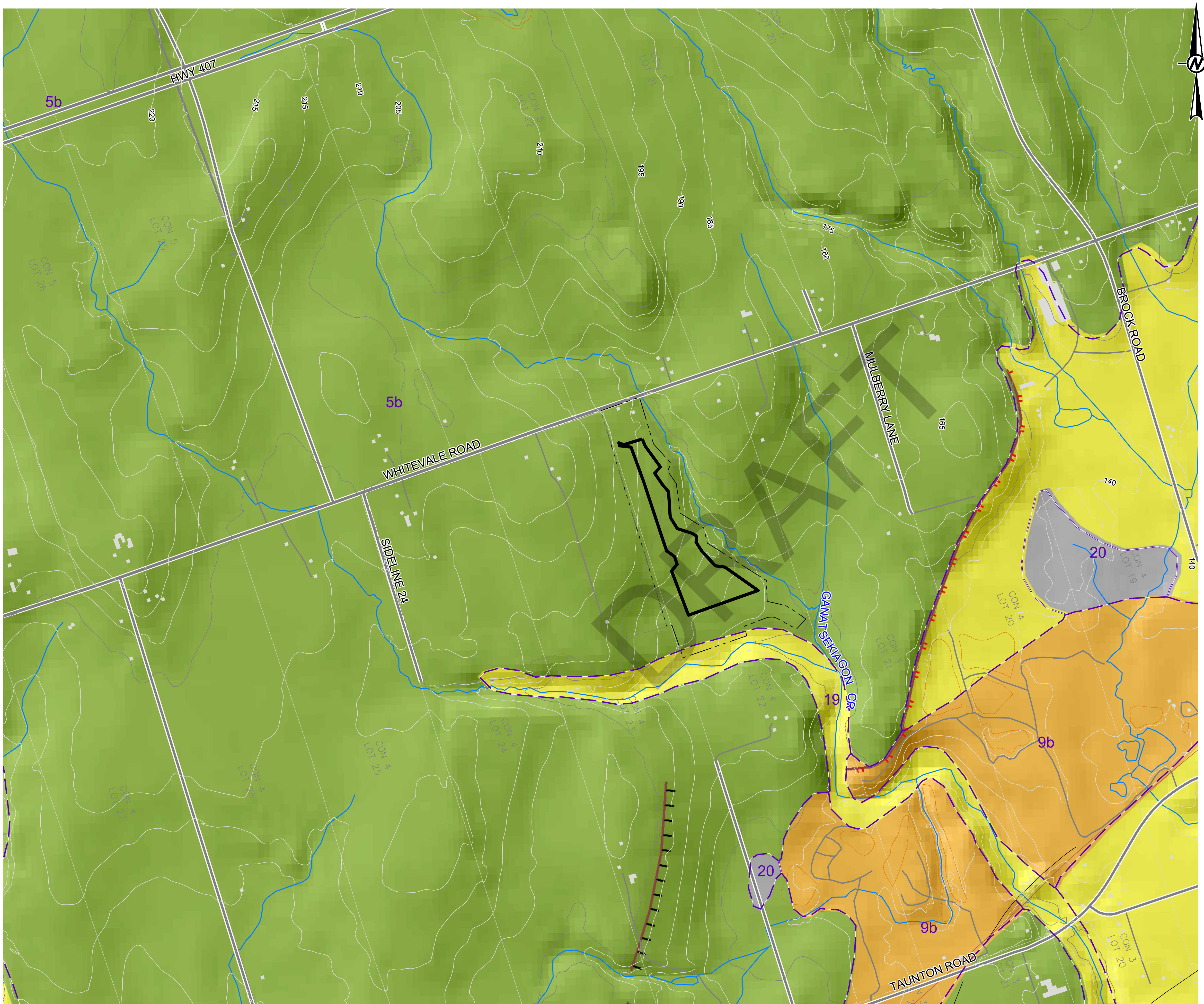
CLIENT 1133373 ONTARIO INC. (LEBOVIC ENTERPRISES)	PROJECT HYDROGEOLOGICAL INVESTIGATION SEATON WHITEVALE EAST DEVELOPMENT, PICKERING, ON.

CONSULTANT			TITLE
GOLDER	YYYY-MM-DD	2020-09-22	**BOREHOLE LOCATION PLAN**
	DESIGNED		
	PREPARED	JPR	
	REVIEWED	SA	
	APPROVED	CMK	

PROJECT NO.	CONTROL	REV.	FIGURE
20140088	0002	----	2



MAP KEY

PLAN LEGEND

DRAFT PLAN BOUNDARY

	20	ORGANIC DEPOSITS
	19	FLUVIAL SILT, SAND, GRAVEL
	9b	GLACIOLACUSTRINE SAND DEPOSITS
	5b	ABLATION TILL

BLUFF FEATURE

TERRACE

REFERENCES & DISCLAIMERS

MINISTRY OF ENVIRONMENT WATER WELL INFORMATION SYSTEM, QUEEN'S PRINTER. LOCATION AND ELEVATIONS OF MAPPED WELLS ARE SUBJECT TO REVISION BASED ON DRILL RECORD OR FIELD VERIFICATION.

ALIGNMENT OF ORTHOGRAPHIC IMAGERY IS APPROXIMATED TO SELECT FEATURES ON DATUM. AWAY FROM POINTS OF ALIGNMENT THE ORTHOGRAPHIC IMAGE MAY BE DIMENSIONALLY SKEWED OR PROJECTED OFF THE MAP DATUM PLANE.

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PROJECTION IS UTM NAD 83 ZONE 17

CLIENT

1133373 ONTARIO INC. (LEBOVIC ENTERPRISES)

PROJECT

HYDROGEOLOGICAL INVESTIGATION
SEATON WHITEVALE EAST DEVELOPMENT, PICKERING, ON.

TITLE

QUATERNARY GEOLOGY MAP

CONSULTANT

GOLDER

YYYY-MM-DD	2020-09-22
DESIGNED	
PREPARED	JPR
REVIEWED	SA
APPROVED	CMK

PROJECT NO.	CONTROL	REV.	FIGURE
20140088	0002	----	3

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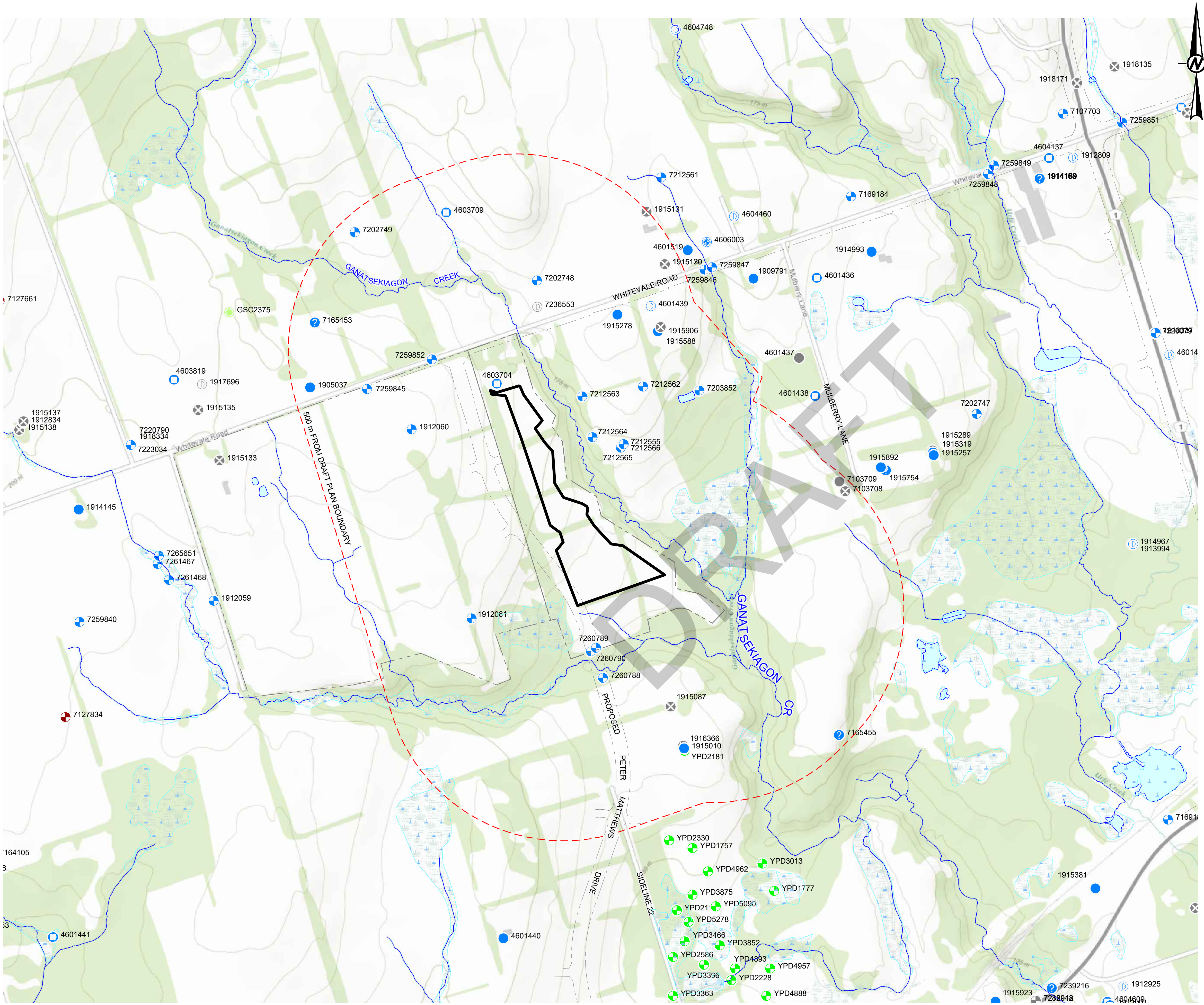

PLAN LEGEND

- DRAFT PLAN BOUNDARY
- SHALLOW DUG OR BORED <10 M
- DEEP BORED WELL >10 M
- DRILLED OVERBURDEN WELL
- TEST OR OBSERVATION WELL
- DRILLED BEDROCK WELL
- SCREENED ABOVE BEDROCK
- MULTIPLE TAGGED NEST
- RECORD OF ABANDONMENT
- INFORMATION UNRECORDED
- ORM REPORTED WELL
- WETLAND

REFERENCES & DISCLAIMERS

MINISTRY OF ENVIRONMENT WATER WELL INFORMATION SYSTEM, QUEEN'S PRINTER. LOCATION AND ELEVATIONS OF MAPPED WELLS ARE SUBJECT TO REVISION BASED ON DRILL RECORD OR FIELD VERIFICATION.

ALIGNMENT OF ORTHOGRAPHIC IMAGERY IS APPROXIMATED TO SELECT FEATURES ON DATUM. AWAY FROM POINTS OF ALIGNMENT THE ORTHOGRAPHIC IMAGE MAY BE DIMENSIONALLY SKEWED OR PROJECTED OFF THE MAP DATUM PLANE.

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PLOTTED 11X17" TABLOID

PROJECTION IS UTM NAD 83 ZONE 17

CLIENT
1133373 ONTARIO INC. (LEBOVIC ENTERPRISES)

PROJECT
HYDROGEOLOGICAL INVESTIGATION
SEATON WHITEVALE EAST DEVELOPMENT, PICKERING, ON.

TITLE
MINISTRY RECORDED WELLS

CONSULTANT
GOLDER

YYYY-MM-DD	2020-09-22
DESIGNED	
PREPARED	JPR
REVIEWED	SA
APPROVED	CMK

PROJECT NO.	CONTROL	REV.	FIGURE
20140088	0002	----	4

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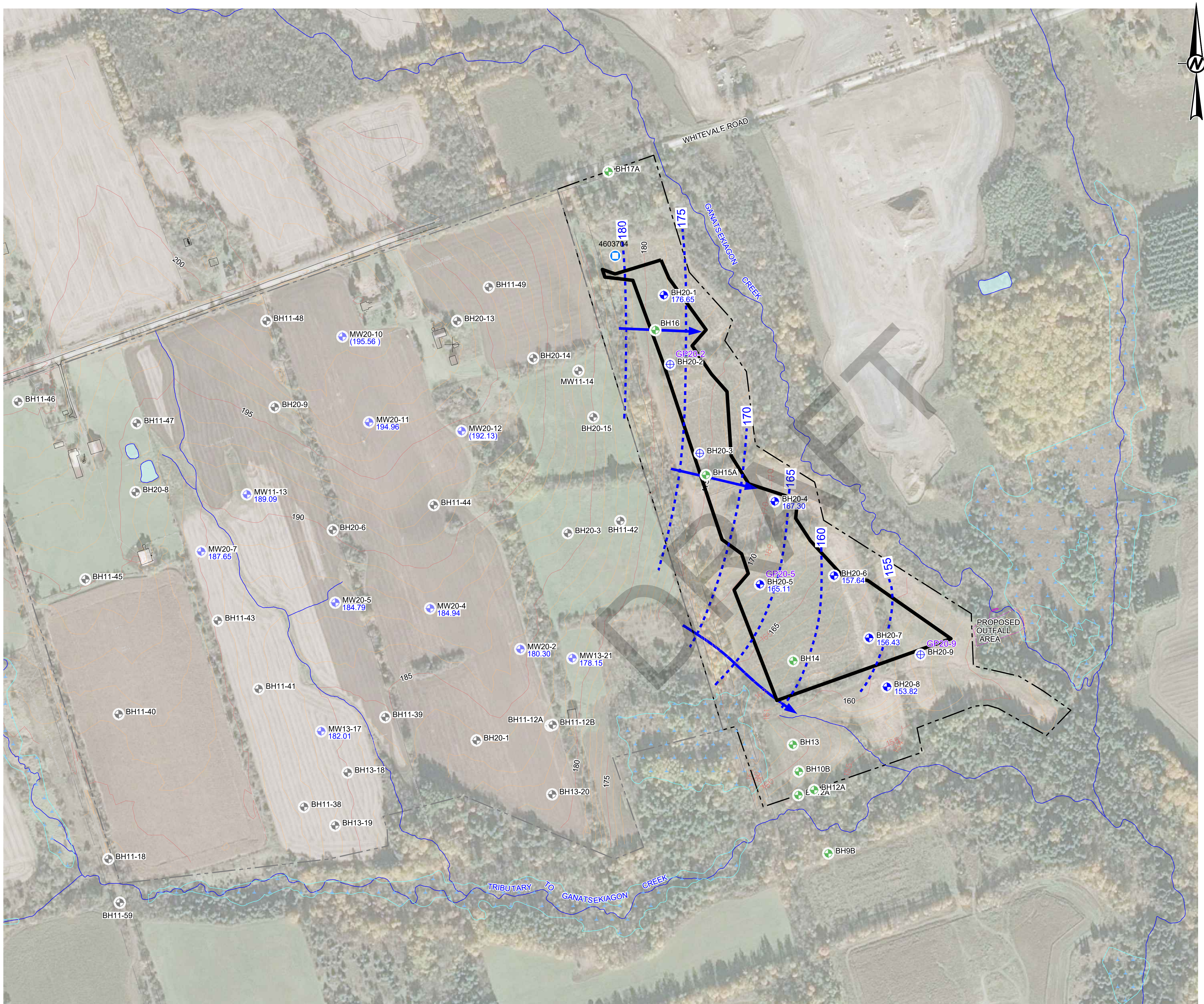

MAP KEY

PLAN LEGEND

- PROPERTY LINES
- DRAFT PLAN BOUNDARY
- WETLAND
- SITE BOREHOLE
- SITE MONITORING WELL
- ADJACENT SITE INVESTIGATIONS MONITORING WELL
- ADJACENT SITE INVESTIGATIONS BOREHOLE
- PETER MATTHEW DRIVE BOREHOLE (STANTEC)
- 189.45 STATIC WATER ELEVATION (25 July 2020)
- GROUNDWATER CONTOUR (masl)
- INFERRED GROUNDWATER FLOW DIRECTION

REFERENCES & DISCLAIMERS

ON-SITE WATER LEVELS JULY 25th 2020, OFF-SITE WATER LEVELS 23rd JULY 2020.

ALIGNMENT OF ORTHOGRAPHIC IMAGERY IS APPROXIMATED TO SELECT FEATURES ON DATUM. AWAY FROM POINTS OF ALIGNMENT THE ORTHOGRAPHIC IMAGE MAY BE DIMENSIONALLY SKEWED OR PROJECTED OFF THE MAP DATUM PLANE.

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PLOTTED 11X17" TABLOID

PROJECTION IS UTM NAD 83 ZONE 17

CLIENT

1133373 ONTARIO INC. (LEBOVIC ENTERPRISES)

PROJECT

HYDROGEOLOGICAL INVESTIGATION
SEATON WHITEVALE EAST DEVELOPMENT, PICKERING, ON.

TITLE

GROUNDWATER FLOW

CONSULTANT

GOLDER

YYYY-MM-DD	2020-09-22
DESIGNED	
PREPARED	JPR
REVIEWED	SA
APPROVED	CMK

PROJECT NO.	CONTROL	REV.	FIGURE
20140088	0002	----	5

25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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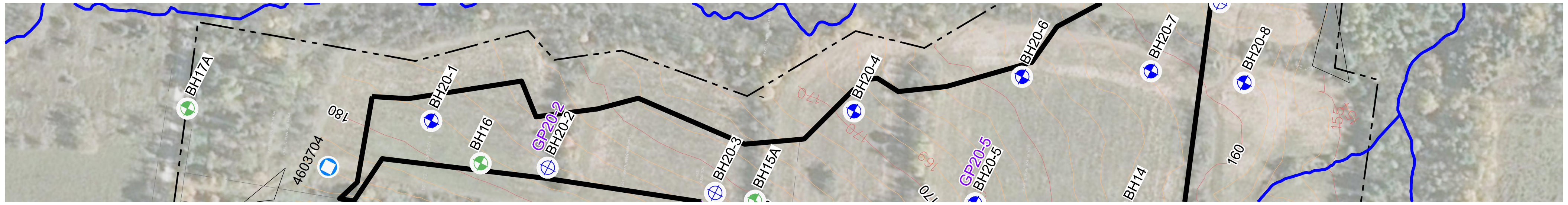
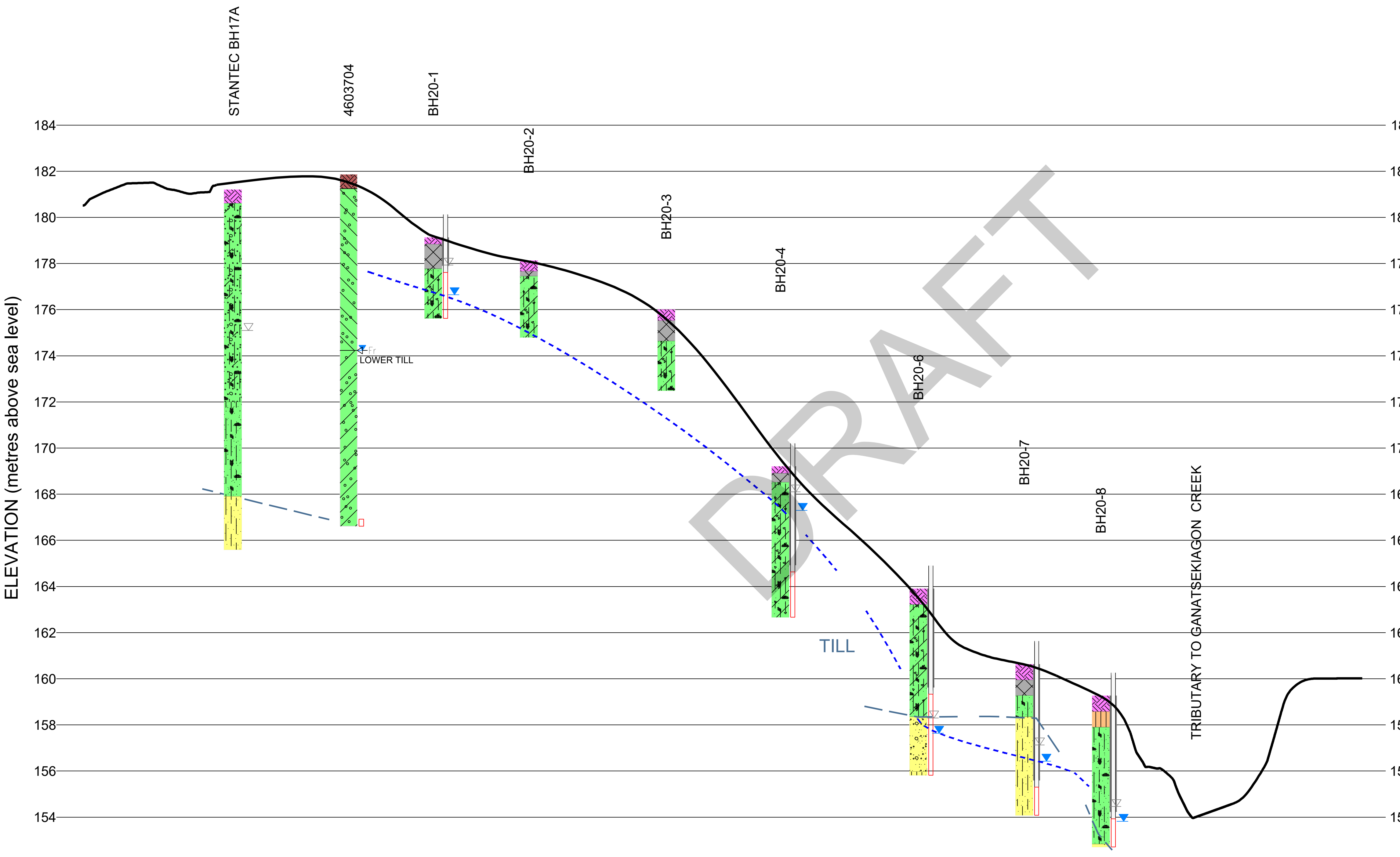
PLAN





SECTION

PLAN LEGEND

- BOREHOLE
- MONITORING WELL
- OFFSITE MONITORING WELL
- OFFSITE BOREHOLE
- RECORDED BORED WELL

SOIL PATTERN LEGEND AND GENERIC SHADING

- ORGANICS / TOPSOIL
- FILL
- SAND
- SILTY SAND
- GRANULAR TILL
- SILT TILL
- SILTY CLAY TILL
- CLAY, STONE (MINISTRY RECORD FORMAT)

SECTION WELL SYMBOLS

- BH1 BOREHOLE ID
- RECORDED STATIC WATER LEVEL 25th JULY 2020
- SCREEN
- GROUNDWATER POTENTIAL
- AS BUILT / PREVIOUS STATIC

NOTES

BASE PLAN JD BARNES, JUNE 2014.
BOREHOLE AND MONITORING WELLS SURVEYED BY SERNAS ASSOCIATES (2011); GHD (2013); AND JD BARNES LTD (2020)
BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN DETERMINED ONLY AT WELL AND TEST WELL LOCATIONS. BETWEEN THE WELLS AND TEST WELLS, BOUNDARIES ARE NOT PROVEN BUT ARE ASSUMED FROM GEOLOGICAL EVIDENCE.

0 80 160 240 m

1:4000

CLIENT
1133373 ONTARIO INC. (LEBOVIC ENTERPRISES)

PROJECT
HYDROGEOLOGICAL INVESTIGATION
SEATON WHITEVALE EAST DEVELOPMENT, PICKERING, ON.

TITLE
SECTION A - A'

CONSULTANT

GOLDER

YYYY-MM-DD	2020-09-22
DESIGNED	
PREPARED	JPR
REVIEWED	SA
APPROVED	CMK

PROJECT NO.	CONTROL	REV.	FIGURE
20140088	0002	----	6

25 mm

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

APPENDIX A

Important Information and Limitations of this Report

IMPORTANT INFORMATION AND LIMITATIONS OF THIS REPORT

Standard of Care: Golder Associates Ltd. (Golder) has prepared this report in a manner consistent with that level of care and skill ordinarily exercised by members of the engineering and science professions currently practising under similar conditions in the jurisdiction in which the services are provided, subject to the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made.

Basis and Use of the Report: This report has been prepared for the specific site, design objective, development and purpose described to Golder by the Client. The factual data, interpretations and recommendations pertain to a specific project as described in this report and are not applicable to any other project or site location. Any change of site conditions, purpose, development plans or if the project is not initiated within eighteen months of the date of the report may alter the validity of the report. Golder cannot be responsible for use of this report, or portions thereof, unless Golder is requested to review and, if necessary, revise the report.

The information, recommendations and opinions expressed in this report are for the sole benefit of the Client. No other party may use or rely on this report or any portion thereof without Golder's express written consent. If the report was prepared to be included for a specific permit application process, then upon the reasonable request of the client, Golder may authorize in writing the use of this report by the regulatory agency as an Approved User for the specific and identified purpose of the applicable permit review process. Any other use of this report by others is prohibited and is without responsibility to Golder. The report, all plans, data, drawings and other documents as well as all electronic media prepared by Golder are considered its professional work product and shall remain the copyright property of Golder, who authorizes only the Client and Approved Users to make copies of the report, but only in such quantities as are reasonably necessary for the use of the report by those parties. The Client and Approved Users may not give, lend, sell, or otherwise make available the report or any portion thereof to any other party without the express written permission of Golder. The Client acknowledges that electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore the Client can not rely upon the electronic media versions of Golder's report or other work products.

The report is of a summary nature and is not intended to stand alone without reference to the instructions given to Golder by the Client, communications between Golder and the Client, and to any other reports prepared by Golder for the Client relative to the specific site described in the report. In order to properly understand the suggestions, recommendations and opinions expressed in this report, reference must be made to the whole of the report. Golder can not be responsible for use of portions of the report without reference to the entire report.

Unless otherwise stated, the suggestions, recommendations and opinions given in this report are intended only for the guidance of the Client in the design of the specific project. The extent and detail of investigations, including the number of test holes, necessary to determine all of the relevant conditions which may affect construction costs would normally be greater than has been carried out for design purposes. Contractors bidding on, or undertaking the work, should rely on their own investigations, as well as their own interpretations of the factual data presented in the report, as to how subsurface conditions may affect their work, including but not limited to proposed construction techniques, schedule, safety and equipment capabilities.

Soil, Rock and Ground Water Conditions: Classification and identification of soils, rocks, and geologic units have been based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Classification and identification of the type and condition of these materials or units involves judgment, and boundaries between different soil, rock or geologic types or units may be transitional rather than abrupt. Accordingly, Golder does not warrant or guarantee the exactness of the descriptions.

Special risks occur whenever engineering or related disciplines are applied to identify subsurface conditions and even a comprehensive investigation, sampling and testing program may fail to detect all or certain subsurface conditions. The environmental, geologic, geotechnical, geochemical and hydrogeologic conditions that Golder interprets to exist between and beyond sampling points may differ from those that actually exist. In addition to soil variability, fill of variable physical and chemical composition can be present over portions of the site or on adjacent properties. The professional services retained for this project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in the report. The presence or implication(s) of possible surface and/or subsurface contamination resulting from previous activities or uses of the site and/or resulting from the introduction onto the site of materials from off-site sources are outside the terms of reference for this project and have not been investigated or addressed.

Soil and groundwater conditions shown in the factual data and described in the report are the observed conditions at the time of their determination or measurement. Unless otherwise noted, those conditions form the basis of the recommendations in the report. Groundwater conditions may vary between and beyond reported locations and can be affected by annual, seasonal and meteorological conditions. The condition of the soil, rock and groundwater may be significantly altered by construction activities (traffic, excavation, groundwater level lowering, pile driving, blasting, etc.) on the site or on adjacent sites. Excavation may expose the soils to changes due to wetting, drying or frost. Unless otherwise indicated the soil must be protected from these changes during construction.

Sample Disposal: Golder will dispose of all uncontaminated soil and/or rock samples 90 days following issue of this report or, upon written request of the Client, will store uncontaminated samples and materials at the Client's expense. In the event that actual contaminated soils, fills or groundwater are encountered or are inferred to be present, all contaminated samples shall remain the property and responsibility of the Client for proper disposal.

Follow-Up and Construction Services: All details of the design were not known at the time of submission of Golder's report. Golder should be retained to review the final design, project plans and documents prior to construction, to confirm that they are consistent with the intent of Golder's report.

During construction, Golder should be retained to perform sufficient and timely observations of encountered conditions to confirm and document that the subsurface conditions do not materially differ from those interpreted conditions considered in the preparation of Golder's report and to confirm and document that construction activities do not adversely affect the suggestions, recommendations and opinions contained in Golder's report. Adequate field review, observation and testing during construction are necessary for Golder to be able to provide letters of assurance, in accordance with the requirements of many regulatory authorities. In cases where this recommendation is not followed, Golder's responsibility is limited to interpreting accurately the information encountered at the borehole locations, at the time of their initial determination or measurement during the preparation of the Report.

Changed Conditions and Drainage: Where conditions encountered at the site differ significantly from those anticipated in this report, either due to natural variability of subsurface conditions or construction activities, it is a condition of this report that Golder be notified of any changes and be provided with an opportunity to review or revise the recommendations within this report. Recognition of changed soil and rock conditions requires experience and it is recommended that Golder be employed to visit the site with sufficient frequency to detect if conditions have changed significantly.

Drainage of subsurface water is commonly required either for temporary or permanent installations for the project. Improper design or construction of drainage or dewatering can have serious consequences. Golder takes no responsibility for the effects of drainage unless specifically involved in the detailed design and construction monitoring of the system.

APPENDIX B

Supporting Documentation

TOPOGRAPHIC PLAN ILLUSTRATING

PART OF LOTS 22 AND 23 AND PART OF THE ROAD ALLOWANCE BETWEEN LOTS 22 AND 23 CONCESSION 4

(GEOGRAPHIC TOWNSHIP OF PICKERING)

NOW IN THE

CITY OF PICKERING

REGIONAL MUNICIPALITY OF DURHAM

SCALE 1 : 1000

10 0 10 20 30 metres

J. D. BARNES LIMITED

METRIC DISTANCES AND/OR COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

BENCHMARK

ELEVATIONS HEREON ARE GEODETIC AND ARE REFERRED TO CITY OF PICKERING BENCHMARK No. 2-045, HAVING A PUBLISHED ELEVATION OF 126.055m (CGVD-1928:1978) AND MINISTRY OF TRANSPORTATION OF ONTARIO BENCHMARK No. 00819668322, HAVING A PUBLISHED ELEVATION OF 227.633m (CGVD-1928:1978).

NOTES AND LEGEND

BEARINGS HEREON ARE GRID AND ARE REFERRED UTM ZONE 17, NAD83 (ORIG.).

DISTANCES ON THIS PLAN ARE GROUND AND CAN BE CONVERTED TO GRID USING A SCALE FACTOR OF 0.99986197.

THE LOCATION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND ANY OTHER UNDERGROUND AND ABOVEGROUND UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THIS PLAN, AND WHERE SHOWN, THE ACCURACY OF THE LOCATION OF SUCH UTILITIES AND STRUCTURES ARE NOT GUARANTEED. THE CONTRACTOR SHALL CONFIRM THE EXACT LOCATION AND INVERT MEASUREMENTS OF ALL SUCH UTILITIES AND STRUCTURES PRIOR TO CONSTRUCTION AND SHALL ASSUME LIABILITY FOR ANY DAMAGE TO THEM.

BOUNDARY INFORMATION IS COMPILED FROM REGISTRY OFFICE DOCUMENTS AND HAS NOT BEEN CONFIRMED BY FIELD MEASUREMENTS.

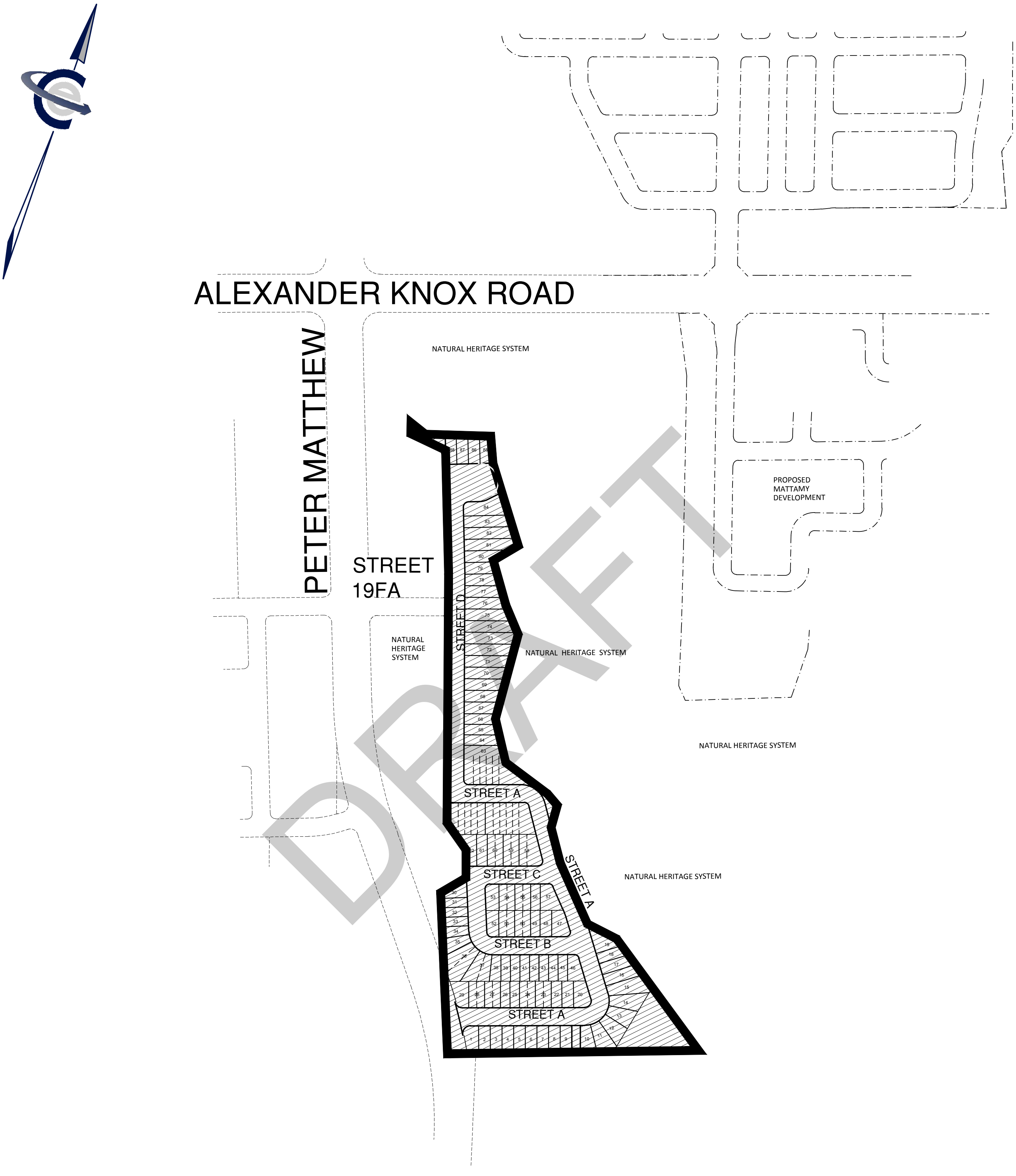
✿	DENOTES DECIDUOUS TREE
MW	DENOTES MONITORING WELL
BH	DENOTES BORE HOLE
■ STK	DENOTES WOODEN STAKE

THE FIELDWORK REPRESENTED BY THIS PLAN WAS COMPLETED ON DECEMBER 22, 2016.

J.D.BARNES LIMITED
SURVEYING MAPPING GIS
LAND INFORMATION SPECIALISTS
110 SCOTIA COURT, #40, WHITBY, ON L1N 8Y7
T: (905) 723-1212 F: (905) 723-4234 www.jdbarnes.com

DRAWN BY:	CHECKED BY:	REFERENCE NO.:
S.J.P.	G.C.L.	16-25-300-00
FILE: G:/16-25-300/00/16-25-300-00.dgn		DATED: JANUARY 5, 2017

PLOTTED: 1/5/2017



COLE ENGINEERING

70 VALLEYWOOD DR., MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

LEGEND

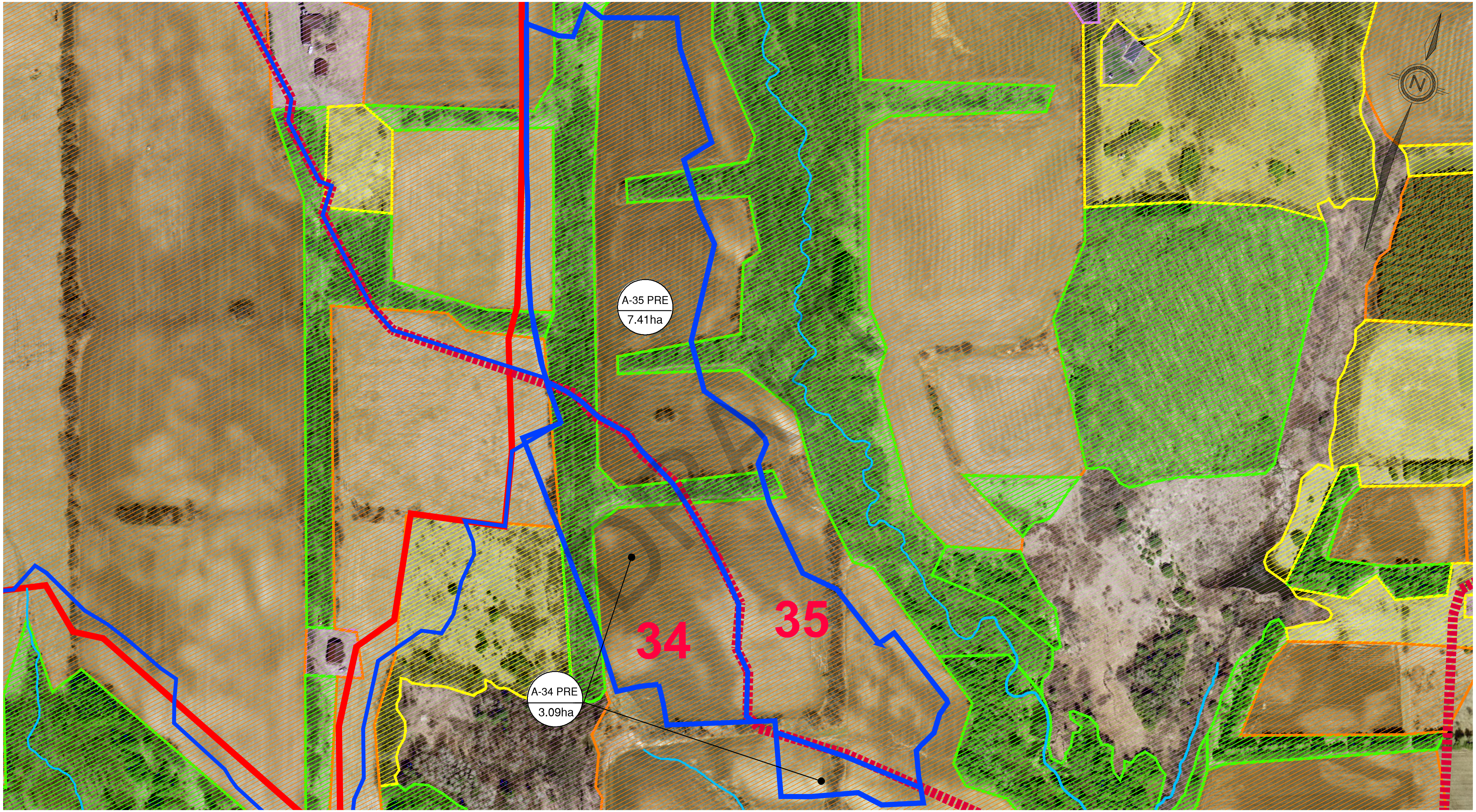
SITE

LOCATION PLAN

1133373 ONTARIO INC. WHITEVALE EAST
(SP -2015-05,A-10-15)
CITY OF PICKERING
REGIONAL MUNICIPALITY OF DURHAM

DATE:	MAY 2019	PROJECT No.:	UD16-0663
SCALE:	N.T.S	FIGURE No.:	LOC

File : S:\2016 Projects\UD\SDM\UD16-0663 Lebovic Enterprises_Res Dev_Pickering\400-CADD\402-Design\Figures\SHEETS\UD16-0663 FIG 1 - Location Plan.dwg, Date :May 14, 2019 - 3:53pm, Edit By : hhuang



COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

LEGEND

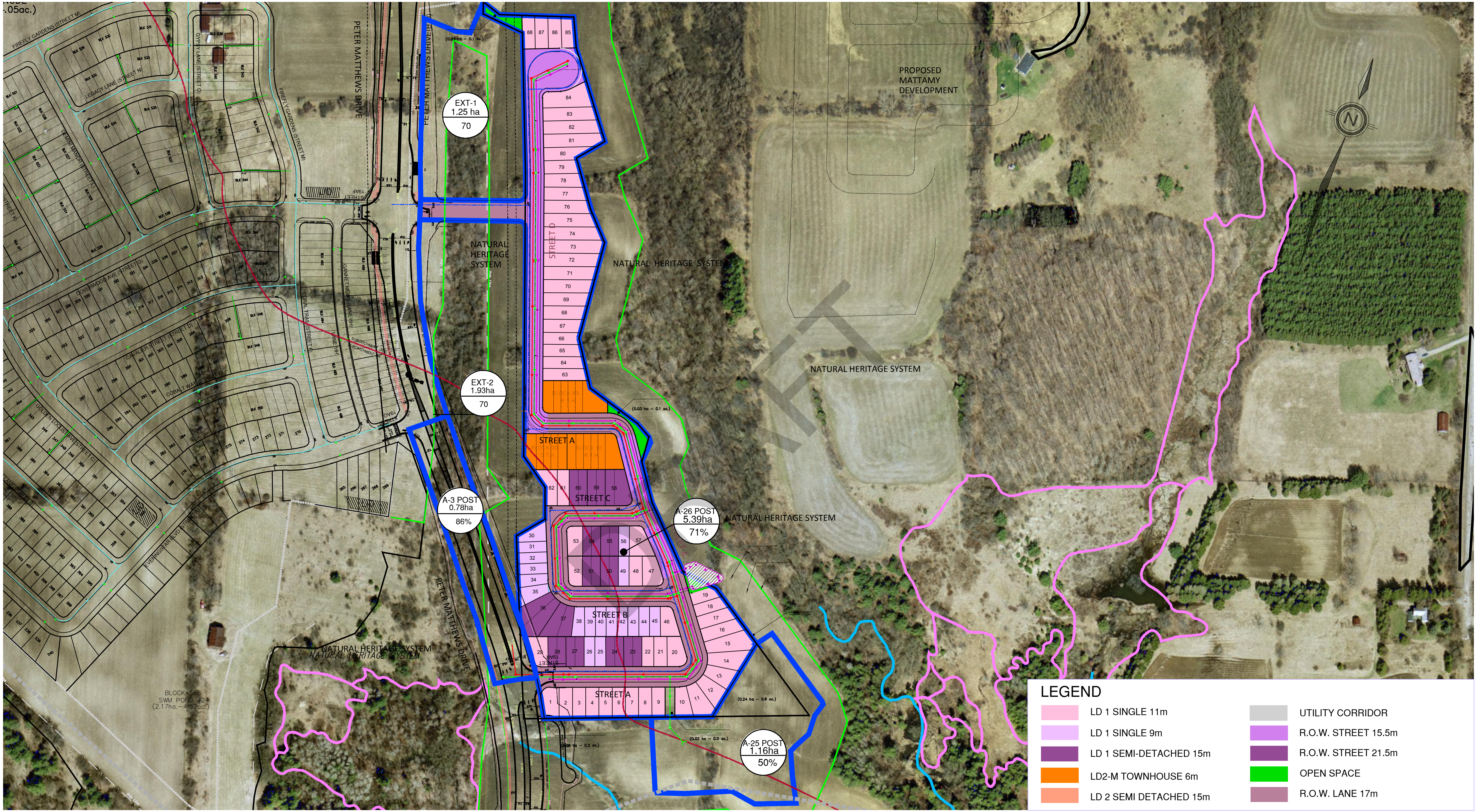
CULTIVATED LAND
MEADOW
WOODLOT (GOOD COVER)
WOODLOT (POOR COVER)
ROAD
WETLAND
LAWN
WATERCOURSE
DRAINAGE AREA BOUNDARY
TRCA CATCHMENT BOUNDARY

A-34 PRE — DRAINAGE AREA ID
56.64ha — AREA (HECTARES)

FUNCTIONAL PRE-DEVELOPMENT LAND USE PLAN

1133373 ONTARIO INC.
SEATON WHITEVALE EAST
CITY OF PICKERING
REGIONAL MUNICIPALITY OF DURHAM

DATE:	FEBRUARY 2019	PROJECT No.:	UD16-0663
SCALE:	1:3000	FIGURE No.:	LAND-USE 1



COLE ENGINEERING

70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

LEGEND

WATERCOURSE	DRAINAGE AREA BOUNDARY
WETLANDS BOUNDARY	
PROPERTY BOUNDARY	

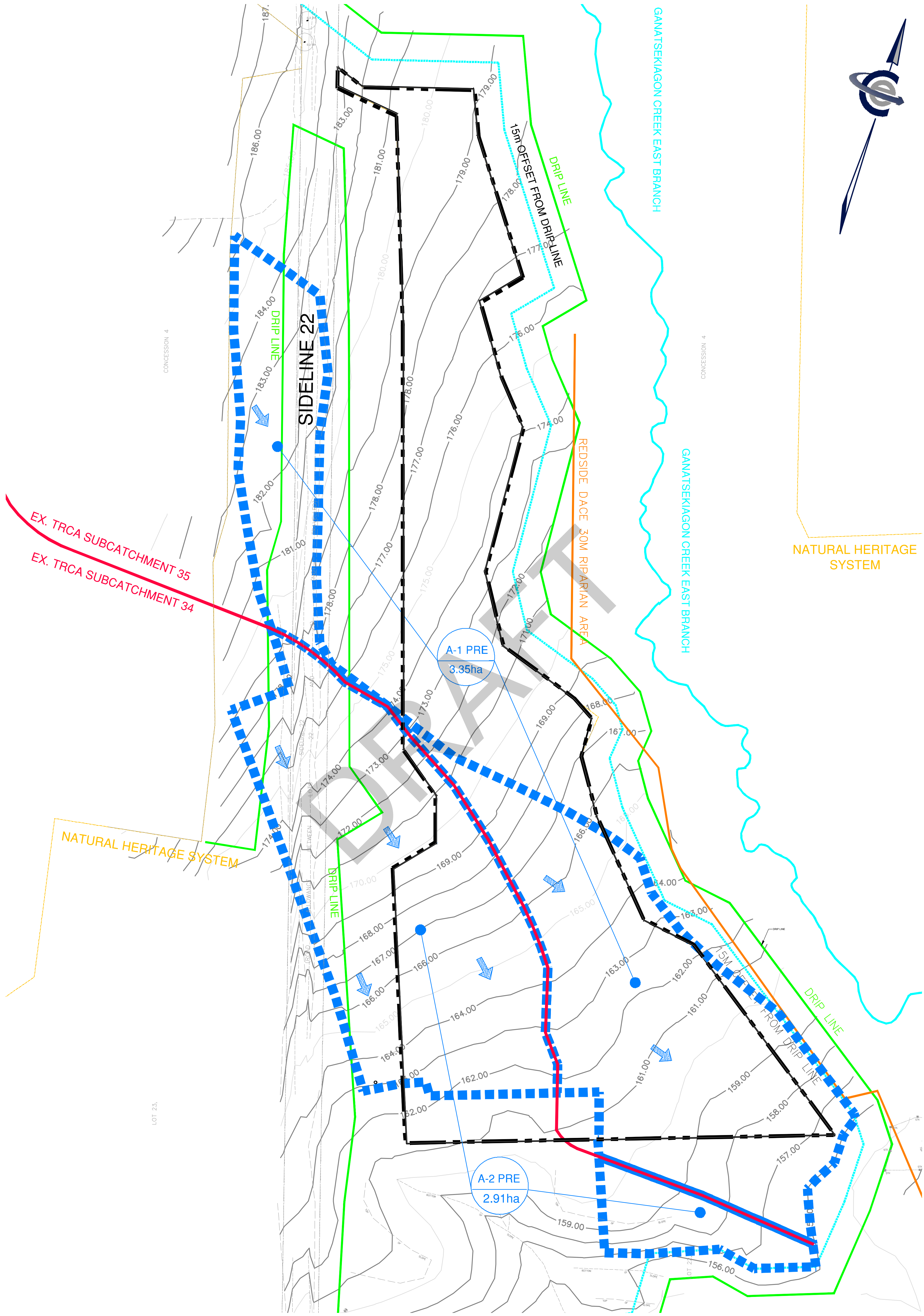
A-3 POST — DRAINAGE AREA ID
35.03ha — DRAINAGE AREA (HECTARES)
50 — CURVE NUMBER (CN) OR PERCENT IMPERVIOUS (%)

POST-DEVELOPMENT LAND USE PLAN

1133373 ONTARIO INC.
SEATON WHITEVALE EAST
CITY OF PICKERING
REGIONAL MUNICIPALITY OF DURHAM

DATE: FEBRUARY 2019	PROJECT No.: UD16-0663
SCALE: 1:3000	FIGURE No.: LANDUSE-2

File: P:\mrk\2012\LD12-0605 1133373ON_TauntonWSubdn_PKR\400-CADD\401-CAD\3-WR\FSR - MID\Figures\East\Post Landuse July 2018.dwg - Revised by <TMARTIN> : Wed, Sep 19 2018 - 9:40am



COLE ENGINEERING

70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

LEGEND

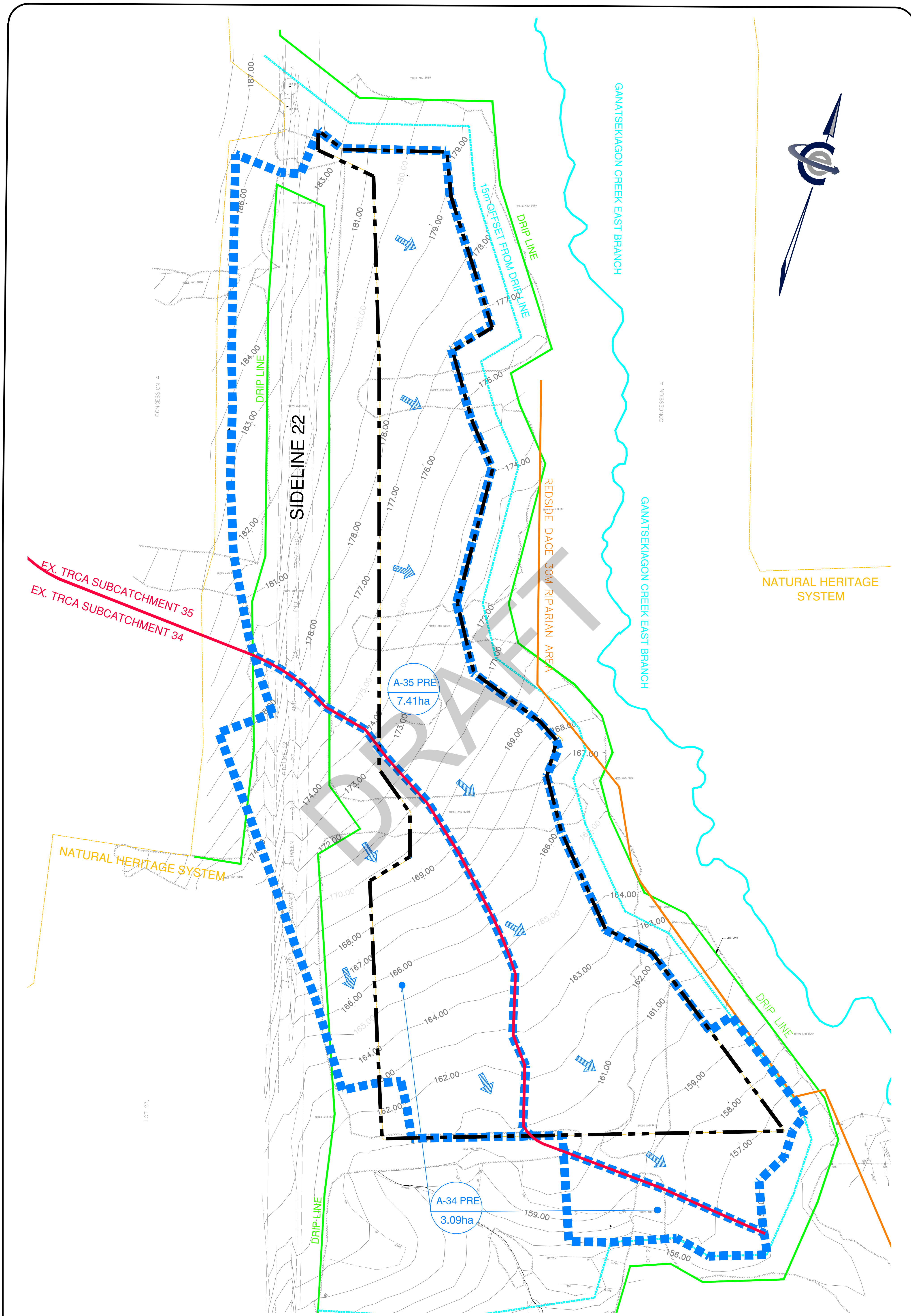
- TRCA SUBWATERSHED BOUNDARY
- DRAINAGE AREA BOUNDARY
- OVERLAND FLOW DIRECTION
- PROPERTY BOUNDARY

A-2 PRE — DRAINAGE AREA ID
2.91ha — DRAINAGE AREA (ha)

PRE-DEVELOPMENT DRAINAGE AREA PLAN (INTERIM)

1133373 ONTARIO INC.
SEATON WHITEVALE EAST
CITY OF PICKERING

DATE:	FEBRUARY 2019	PROJECT No.:	UD16-0663
SCALE:	1:2000	FIGURE No.:	DAP-1



COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

LEGEND

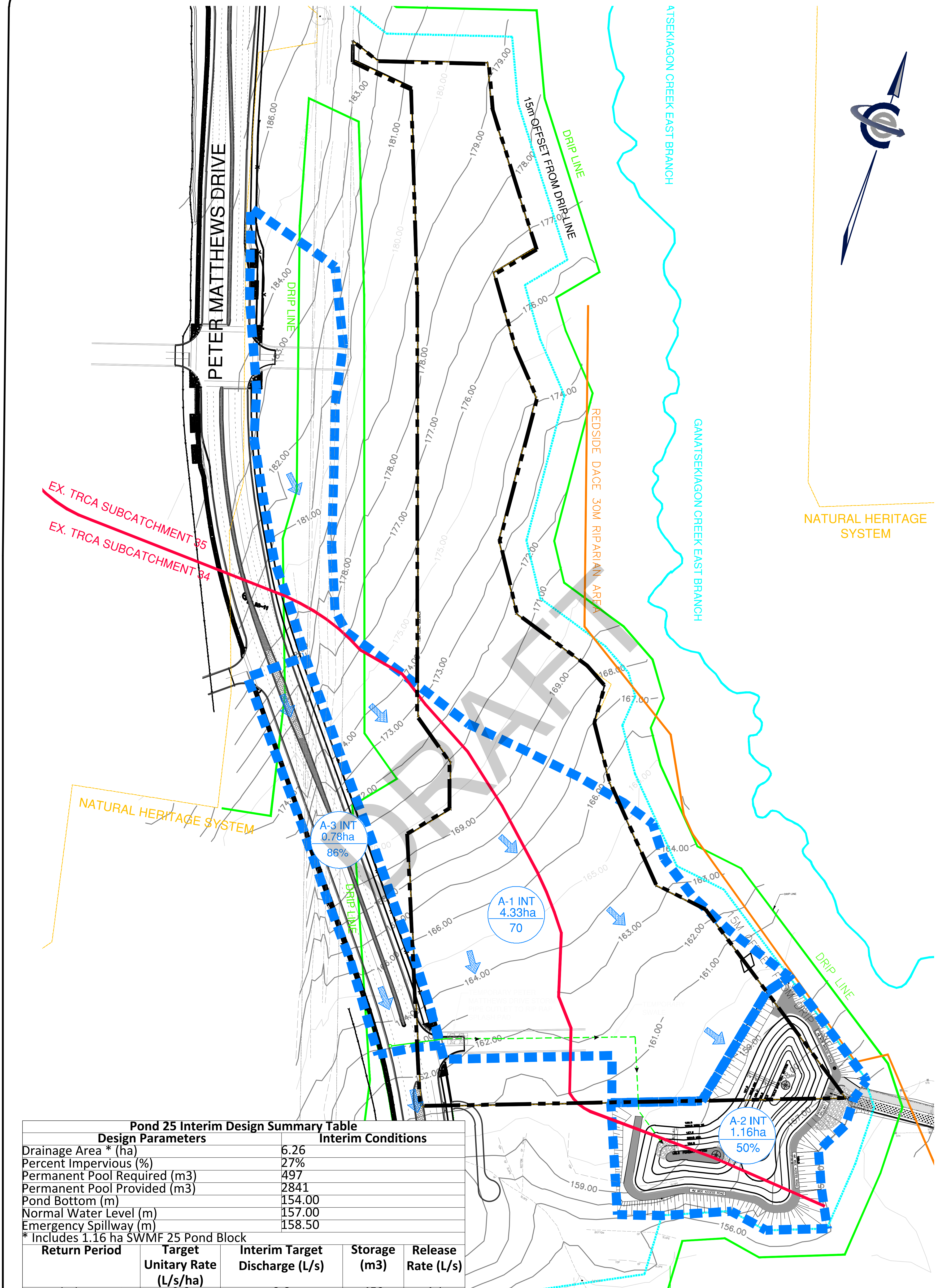
- TRCA SUBCATCHMENT BOUNDARY
- DRAINAGE AREA BOUNDARY
- OVERLAND FLOW DIRECTION
- PROPERTY BOUNDARY

A-34 PRE — DRAINAGE AREA ID
4.21ha — DRAINAGE AREA (HA)

PRE-DEVELOPMENT DRAINAGE AREA PLAN (ULTIMATE)

1133373 ONTARIO INC.
SEATON WHITEVALE EAST
CITY OF PICKERING

DATE:	FEBRUARY 2019	PROJECT No.:	UD16-0663
SCALE:	1:2000	FIGURE No.:	DAP-2



Pond 25 Interim Design Summary Table	
Design Parameters	**Interim Conditions**
Drainage Area * (ha)	6.26
Percent Impervious (%)	27%
Permanent Pool Required (m3)	497
Permanent Pool Provided (m3)	2841
Pond Bottom (m)	154.00
Normal Water Level (m)	157.00
Emergency Spillway (m)	158.50

* Includes 1.16 ha SWMF 25 Pond Block

Return Period	Target Unitary Rate (L/s/ha)	Interim Target Discharge (L/s)	Storage (m3)	Release Rate (L/s)
Extended Detention	0.6	3.8	452	4.1
2 Year	2.81	9.4	782	7.0
5 Year	4.51	15.1	1099	9.0
10 year	5.71	19.1	1300	14.0
25 Year	7.4	24.8	1602	20.0
50 Year	8.72	29.2	1810	25.0
100 Year	10.12	33.9	2029	28.0

COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

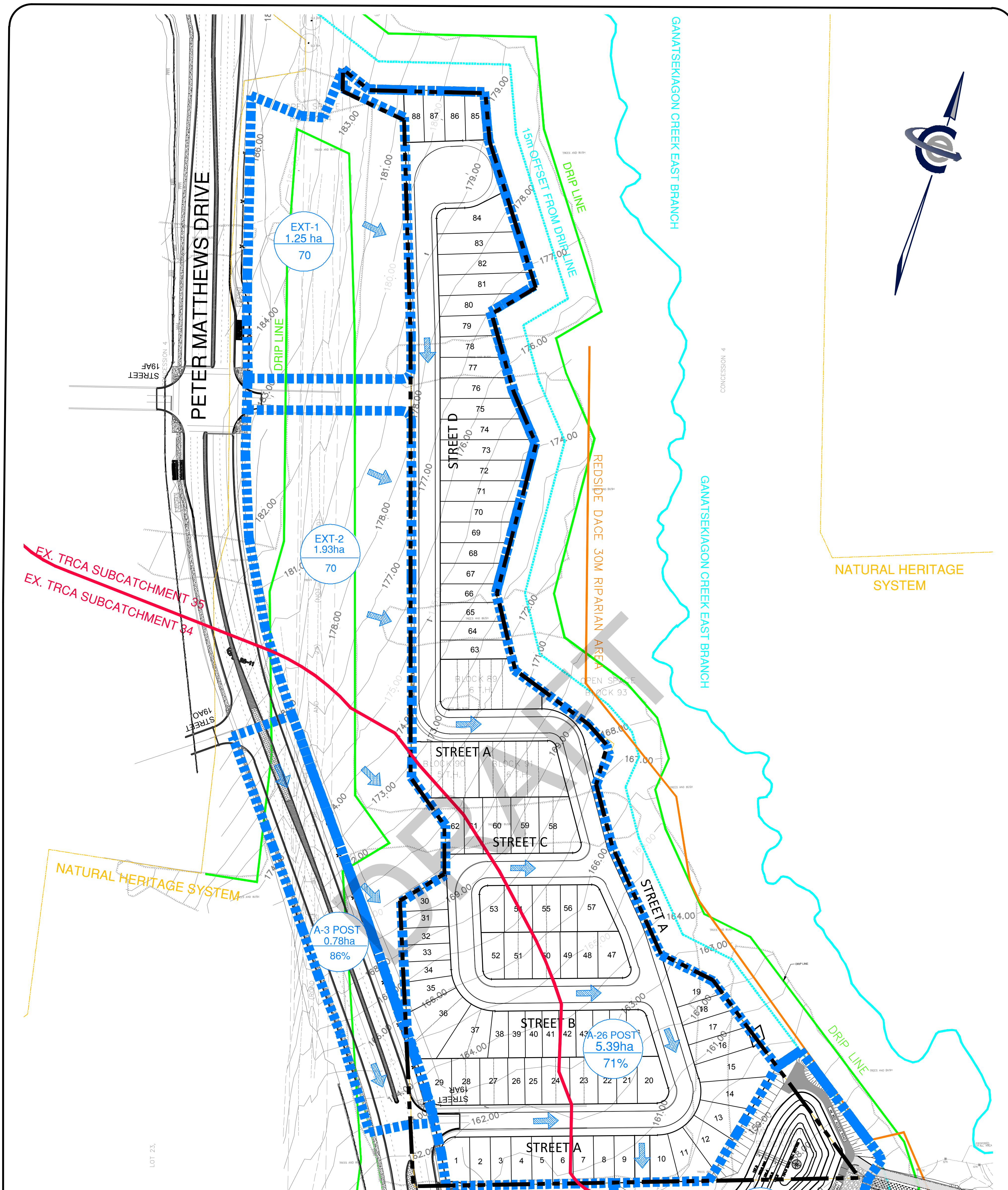
LEGEND

- TRCA SUBWATERSHED BOUNDARY
- DRAINAGE AREA BOUNDARY
- PROPERTY BOUNDARY
- TEMPORARY SWALE
- A-2 INT — DRAINAGE AREA ID
- 1.16ha — DRAINAGE AREA (ha)
- 50% — % IMPERVIOUS OR CN
- OVERLAND FLOW DIRECTION

INTERIM DRAINAGE AREA PLAN

1133373 ONTARIO INC.
SEATON WHITEVALE EAST
CITY OF PICKERING

DATE:	FEBRUARY 2019	PROJECT No.:	UD16-0663
SCALE:	1:2000	FIGURE No.:	DAP-3



Pond 25 Ultimate Design Summary Table	
Design Parameters	**Ultimate Conditions**
Drainage Area * (ha)	10.51
Percent Impervious (%)	71%
Permanent Pool Required (m3)	1482
Permanent Pool Provided (m3)	2841
Pond Bottom (m)	154.00
Normal Water Level (m)	157.00
Emergency Spillway (m)	158.50

* Includes 1.16 ha SWMF 25 Pond Block

Return Period	Target Unitary Rate (L/s/ha)	Ultimate Target Discharge (L/s)	Storage (m3)	Release Rate (L/s)
Extended Detention	0.6	6.3	1507	7.9
2 Year	2.81	20.8	2038	18.0
5 Year	4.51	33.4	2696	29.0
10 year	5.71	42.3	3178	34.0
25 Year	7.4	54.8	3858	40.0
50 Year	8.72	64.6	4307	52.0
100 Year	10.12	75.0	4739	63.0

COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

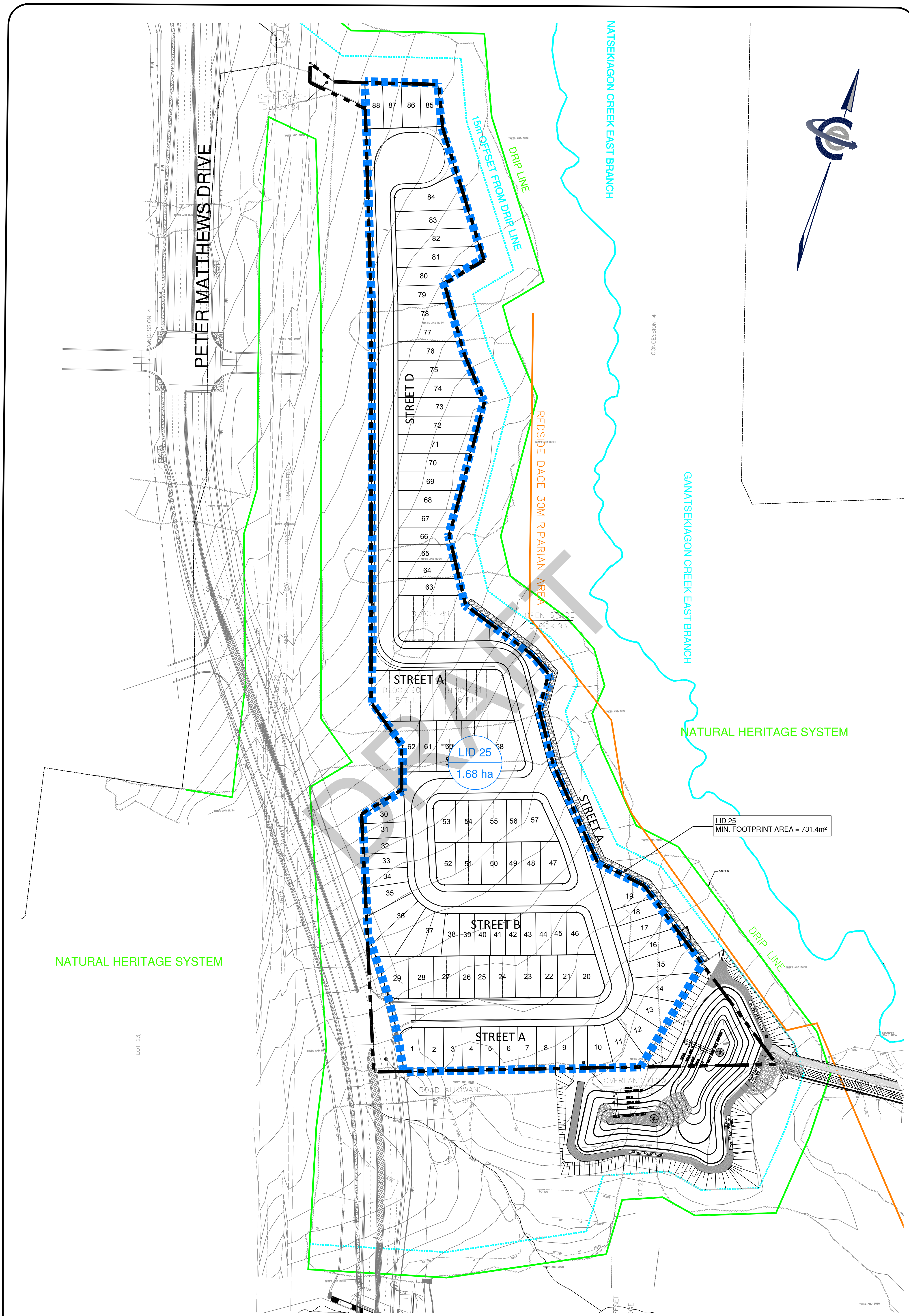
LEGEND

- TRCA SUBCATCHMENT BOUNDARY
- DRAINAGE AREA BOUNDARY
- OVERLAND FLOW DIRECTION
- PROPERTY BOUNDARY

A-26 POST — DRAINAGE AREA ID
1.16ha — DRAINAGE AREA (HA)
50% — % IMPERVIOUS OR CN

POST-DEVELOPMENT DRAINAGE AREA PLAN (ULTIMATE)
1133373 ONTARIO INC.
SEATON WHITEVALE EAST
CITY OF PICKERING

DATE:	FEBRUARY 2019	PROJECT No.:	UD16-0663
SCALE:	1:2000	FIGURE No.:	DAP-4



LEGEND

▪▪▪▪	ROOFTOP DRAINAGE AREA BOUNDARY
▬ · ▬	PROPERTY BOUNDARY
▒▒▒	INFILTRATION GALLERY

LID 25 — LID IDENTIFICATION

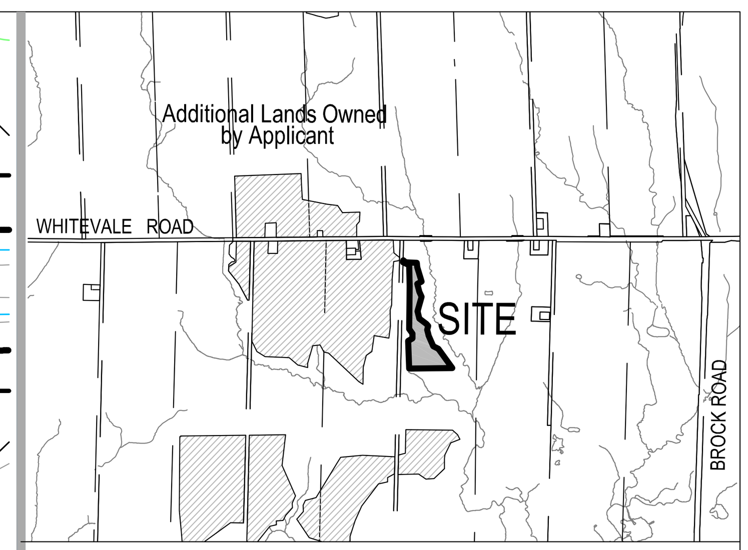
1.68 ha — CONTRIBUTING ROOF AREA (ha)

COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

ROOF DRAINAGE AREA PLAN - LID 25

1133373 ONTARIO INC.
SEATON WHITEVALE EAST
CITY OF PICKERING

DATE:	FEBRUARY 2019	PROJECT No.:	UD16-0663
SCALE:	1:2000	FIGURE No.:	LID-25



KEY PLAN-Not to Scale

PROPOSED

DRAFT PLAN

OF SUBDIVISION OF -
PART OF LOT 22
CONCESSION 4

CITY OF PICKERING

REGIONAL MUNICIPALITY OF DURHAM

SCHEDULE OF LAND USES:

SITE STATISTICS:

LOW DENSITY RESIDENTIAL		LOTS	UNITS
▲ 9.0 +m FRONTAGES - (DETACHED DWELLINGS)		23	23
■ 10.0 +m FRONTAGES - (DETACHED DWELLINGS)		13	13
● 11.0 +m FRONTAGES - (DETACHED DWELLINGS)		38	38
S 15.0 +m FRONTAGES - (SEMI-DETACHED DWELLINGS)		13	26
TOTAL # LOTS/UNITS S.F. RESIDENTIAL		87	100
TOTAL AREA S.F. RESIDENTIAL			3.11 ha
MEDIUM DENSITY RESIDENTIAL	BLOCKS	UNITS	AREA (ha)
6.0m STREET TOWNHOUSES	89-91	17	0.36
TOTAL MEDIUM DENSITY RESIDENTIAL		17	0.36
TOTAL # UNITS / AREA RESIDENTIAL		117	3.47 ha
LAND USE BLOCKS		BLOCKS	AREA (ha)
STORM WATER FACILITY		92	0.24
OPEN SPACE		93-94	0.06
OVERLAND FLOW		95	0.02
ROAD ALLOWANCE (SIDELINE 22)		96	0.08
TOTAL AREA			0.40 ha
ROADS		LENGTH(m)	AREA (ha)
15.5 m R.O.W.		460.7	0.80
17.0 m R.O.W.		498.7	0.89
TOTAL AREA			1.69 ha
TOTAL AREA OF SUBMISSION			5.56 ha

ADDITIONAL INFORMATION UNDER THE PLANNING ACT

Under section 51(17) of The Planning Act information required by clauses A,B,C,D,E F,G, & J shown on Draft and Key plans.

H) Piped municipal water supply
I) Sandy , Clay
K) All municipal services required
L) As shown

OWNER'S CERTIFICATE	SURVEYOR'S CERTIFICATE
WE , THE BENEFICIAL OWNERS OF THE SUBJECT LANDS, HEREBY AUTHORIZE GHD TO PREPARE AND SUBMIT A DRAFT PLAN OF SUBDIVISION FOR APPROVAL.	I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN ON THIS PLAN .
1133373 Ontario Inc.	J.D. BARNES LIMITED ONTARIO LAND SURVEYORS
SIGNED [signature] Lloyd Cherniak	SIGNED [signature]
DATE February 7, 2019	DATE JAN. 21/19

Drawing Revisions

No.	Revision	Drawn	Job Manager	Project Director	Date
A	ORIGINAL SUBMISSION	A.G.	G.E.	A.E.	02/19

GHD Inc.
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N

0 10 20 30 40 50m
SCALE 1:1000 AT ORIGINAL SIZE

GHD

65 Sunray Street, Whitby Ontario L1N 8Y3
T 1 905 686 6402 F 1 905 432 7877
E ytomail@ghd.com W www.ghd.com

Client **1133373 Ontario Inc.**
Project **WHITEVALE EAST**
SP-2015-05

Drawn: A. GRUSZECKA	Date: AS SHOWN
Designer: G. EASTON	Original Size: ARCH D
Project No: 03479	Drawing No: WEDP-1 Rev: A

Plot Date: 7 February 2019 - 2:43 PM Plotted by: Agnes Gruszecka Cad File No: N:\CA\Whitby\Projects\Legacy\GMS\Proj\2003\03479 LEBOVIC - SEATON\Planning\Planning Group\Draft Plans\LEBOVIC-WHITEVALE EAST\Lebovic-WEdp1-Feb7-19.dwg

Drawing: S:\2016 PROJECTS\UD\SDM\UD16-0663 LEBOVIC ENTERPRISES_RES DEV_PICKERING\400-CADD\402-DESIGN\FIGURES\SHEETS\UD16-0663 GRAD.DWG
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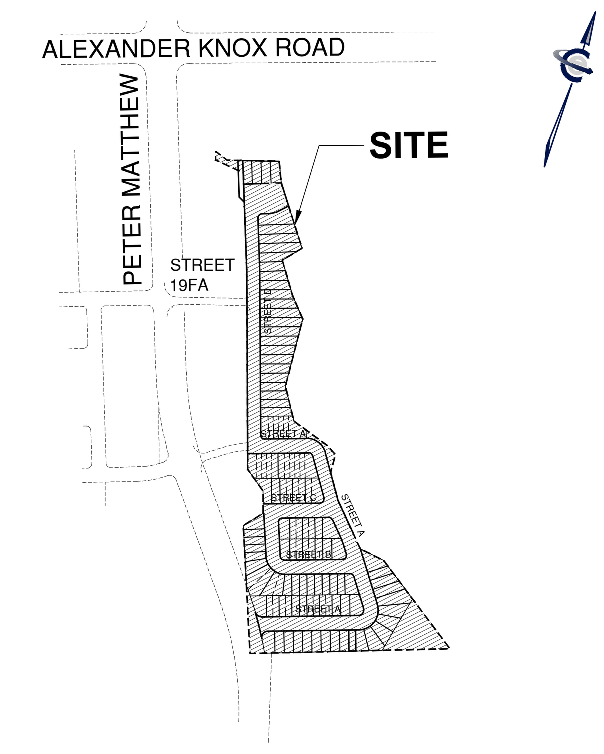


LOCATION PLAN
N.T.S.

LEGEND

	LIMIT OF DEVELOPMENT
× 235.05	EXISTING GRADE
× 238.38	PROP. GRADE
	PROP. OVERLAND FLOW
0.6%	PROP. SLOPE & DIRECTION
	3:1 SLOPE
D	PROPOSED DECK LOT
WO	PROPOSED WALKOUT LOT
WI	PROPOSED WALKIN LOT
F	PROPOSED FRONT DRAINAGE LOT
S/BS	PROPOSED SPLIT DRAINAGE LOT
	PROPOSED HYDRANT
	PROPOSED VALVE & BOX
	PROPOSED STORM MANHOLE
	PROPOSED RDC MANHOLE
	PROPOSED SANITARY MANHOLE
	WETLANDS WITH NHS (TRCA)
	FIODLING LINE
	FIODLING LINE SETBACK 10m
	EROSION HAZARD LIMIT
	TRCA SETBACK
	TRCA WATERSHED BOUNDARY
	REDSIDE DACE BOUNDARY
	DRIP LINE
	15.0m OFFSET FROM DRIP LINE

COLE ENGINEERING
70 VALLEYWOOD DRIVE, MARKHAM, ON L3R 4T5
T:416.987.6161 / 905.940.6161 F:905.940.2064

FUNCTIONAL GRADING PLAN

1133373 ONTARIO INC. WHITEVALE EAST
(SP -2015-05,A-10-15)

CITY OF PICKERING
REGIONAL MUNICIPALITY OF DURHAM

City of PICKERING

DATE:	MAY 2019	PROJECT No.:	UD16-0663
SCALE:	1:1000	FIGURE No.:	GR-1

Drawing: S:\2016 PROJECTS\UD\SDM\UD16-0663 LEBOVIC ENTERPRISES_RES DEV_PICKERING\400-CADD\402-DESIGN\FIGURES\SHEETS\UD16-0663 SERV.DWG
Layout Tab: SS
Date: 06/11/2019 Time: 03:46:30 PM

APPENDIX C

MECP Water Well Records

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
1905037	5 23	Jan-78	650813 4862121	201.2	13.7 Fr	11.3 -1.2	3.0	23	120	9.1	2214 CT	WS DO	**MOE# 1905037** 0.0 BRWN CLAY STNS CMTD 4.6 BLUE CLAY STNS CMTD 13.7 BRWN SAND GRVL LOOS 15.2 BLUE CLAY STNS SAND 17.1
1912060	4 23	Feb-93	651074 4862013	197.8		5.2 -1.5	NR				1508 DM	OW NU	**MOE# 1912060** 0.0 TILL SAND SILT 2.7 SAND SILT 9.4 TILL SAND SILT 37.2 SILT SAND CLAY 41.5 TILL SILT SAND 44.2 SAND SILT 52.7 CLAY SILT 56.4 TILL CLAY SILT 57.9
1912061	4 23	Feb-93	651228 4861527	181.4		3.0 -1.5	NR				1508 DM	OW NU	**MOE# 1912061** 0.0 SAND SILT 3.0 TILL SILT SAND 3.7 TILL SILT SAND 15.5 TILL SAND SILT 18.6 TILL SILT SAND 20.1 CLAY SILT 21.6 TILL SILT SAND 23.2 TILL SILT SAND 25.6 SAND SILT 30.8
1915010	4 22	Feb-01	651775 4861193	162.5	24.7 Fr	23.8 -0.9	17.7	45	60	22.9	1413 RA	WS DO	**MOE# 1915010** 0.0 BRWN CLAY BLDR HARD 17.4 BRWN SAND PCKD 22.6 BLCK CGVL 24.7
1915087	4 22	May-01	651740 4861300	162.5			NR				1413 -	AB DO	**MOE# 1915087** 0.0
1915129	5 26	May-01	651725 4862438	182.6			NR				3136 -	AB -	**MOE# 1915129** 0.0
1915130	5 26	May-01	651725 4862438	182.6			NR				3136 -	AB -	**MOE# 1915130** 0.0
1915131	5 26	May-01	651678 4862573	181.1			NR				3136 -	AB -	**MOE# 1915131** 0.0
1915278	4 22	Feb-01	651603 4862308	185.0	25.0 Fr	22.6 -1.2	9.4	18	140	17.4	2662 RA	WS DO	**MOE# 1915278 TAG#ASSMNT** 0.0 BLCK TPSL 0.9 BRWN CLAY SNDY GRVL 5.8 GREY CLAY SNDY GRVL 18.3 GREY CLAY GRVL 23.5 GREY SAND GRVL WBRG 24.7 GREY SAND SLTY GRVL 25.6
1915305	4 22	May-01	651741 4861299	162.5			NR				2662 OTH	AQ NU	**MOE# 1915305** 0.0
1915588	4 21	Nov-01	651707 4862265	182.9	44.8 -	42.4 -1.2	14.0	23	110	20.7	2662 CT	WS DO	**MOE# 1915588 TAG#ASSMNT** 0.0 BLCK TPSL 0.3 BRWN CLAY GRVL 5.8 GREY CLAY GRVL HARD 18.9 BRWN SILT SAND 20.7 GREY CLAY SILT 23.2 GREY SILT 43.6 GREY SAND 44.8
1915754	4 20	Mar-02	652294 4861908	NR			NR				6974 -	WS DO	**MOE# 1915754 TAG#ASSMNT** 0.0
1915892	4 20	Feb-02	652281 4861916	161.8	45.7 -	43.9 -0.9	FLW	68	80	0.9	2662 CT	WS DO	**MOE# 1915892 TAG#ASSMNT** 0.0 BLCK TPSL 0.3 BRWN CLAY STNS 15.2 GREY CLAY STNS 44.5 BRWN SAND GRVL WBRG 45.7
1915906	4 21	Mar-02	651714 4862276	NR			NR				2662 OTH	AB -	**MOE# 1915906 TAG#ASSMNT** 0.0
1916366	4 22	Feb-03	651772 4861199	NR			NR				6974 -	AQ DO	**MOE# 1916366 TAG#ASSMNT** 0.0
4601437	4 21	Aug-66	652070 4862197	168.2			NR				2610 BR	AS -	**MOE# 4601437** 0.0 GRVL 3.4 CLAY STNS 9.1

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP LEN mbgl m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
4601438	4 21	Sep-66	652112 4862099	166.1	13.7 Fr 9.1 Fr		5.5				5420 BR	WS DO	**MOE# 4601438** 0.0 TPSL 0.3 BRWN CLAY 2.4 GRVL STNS 4.6 BLUE CLAY 8.5 MSND 9.8 CLAY 13.7 MSND 14.0
4601439	4 21	Aug-66	651689 4862330	185.3	4.0 Fr		3.7	9			5412 BR	WS DO	**MOE# 4601439** 0.0 TPSL 0.3 BRWN CLAY 3.0 BLUE CLAY MSND 7.9
4601519	5 21	Nov-52	651784 4862474	179.8	18.3 Fr		5.5	27	60	5.5	3421 RC	WS ST	**MOE# 4601519** 0.0 PRDG 7.0 GREY CLAY HPAN 18.3 GRVL 20.7
4603704	4 22	Oct-68	651293 4862131	182.3	7.6 Fr	14.9 -0.3	7.6	14			3102 BR	WS ST	**MOE# 4603704** 0.0 TPSL 0.6 BRWN CLAY STNS 7.6 GREY CLAY STNS 15.2
4603709	5 22	Mar-68	651163 4862571	189.0	10.7 Fr		4.3				5420 BR	WS DO	**MOE# 4603709** 0.0 TPSL 0.3 BRWN CLAY 3.7 BLUE CLAY 10.7 CLAY GRVL 11.6
4606003	5 23	Sep-74	651833 4862495	182.9	46.3 Fr 30.5 Fr	49.7 -2.7	7.6	59	1440	8.2	1413 RC	OW NU	**MOE# 4606003** 0.0 BRWN SILT SAND FILL 3.7 GREY SILT SAND FILL 16.8 GREY SAND STNS FILL 30.5 GREY FSND 39.0 GREY SILT FILL 46.3 GREY MSND STNS 78.0 GREY CLAY SHLE FILL 81.1 LMSN SHLE 82.6
7103708		Feb-08	652189 4861854	159.4			NR				7219 -	AB NU	**MOE# 7103708 TAG#A071861** 0.0
7103709		Feb-08	652174 4861879	160.3			8.8				7219 -	AB NU	**MOE# 7103709 TAG#A071852** 0.0 CLAY FILL 8.8 8.8 GRVL 9.1
7165453		Apr-11	650825 4862288	195.4			NR				7360 -	- -	**MOE# 7165453 TAG#A061311** 0.0
7165455		Apr-11	652173 4861227	153.3			NR				7360 -	- -	**MOE# 7165455 TAG#A061305** 0.0
7202748		Apr-13	651396 4862396	184.1		12.2 -3.0	NR				7501 RC	OW MO	**MOE# 7202748 TAG#A143185** 0.0
7202749		Apr-13	650928 4862520	191.4		4.6 -3.0	NR				7501 RC	OW MO	**MOE# 7202749 TAG#A143153** 0.0
7203852		Apr-13	651814 4862113	168.9	10.4 Un	9.1 -3.0	NR				7501 RC	TH -	**MOE# 7203852 TAG#A143110** 0.0
7212555		Apr-13	651618 4861975	172.8		18.3 -3.0	NR				7472 BR	- MO	**MOE# 7212555 TAG#A158956** 0.0 BRWN SILT FSND PCKD 3.0 GREY SILT FSND HARD 21.0
7212561	5 21	Apr-13	651716 4862661	178.3		6.1 -3.0	NR				7472 BR	TH MO	**MOE# 7212561 TAG#A158962** 0.0 BRWN SILT FSND PCKD 3.0 GREY SILT FSND HARD 9.1
7212562		Apr-13	651669 4862123	181.1		15.2 -3.0	NR				7472 BR	OW MO	**MOE# 7212562 TAG#A158961** 0.0 BRWN SILT FSND PCKD 3.0 GREY SILT FSND HARD 18.3
7212563		Apr-13	651513 4862098	176.2		9.1 -3.0	NR				7472 BR	OW MO	**MOE# 7212563 TAG#A158960** 0.0 BRWN SILT FSND PCKD 3.0 GREY SILT FSND HARD 12.2
7212564		Apr-13	651539 4861993	170.7		9.1 -3.0	NR				7472 BR	OW MO	**MOE# 7212564 TAG#A158959** 0.0 BRWN SILT FSND PCKD 3.0 GREY SILT FSND HARD 12.2

LABEL	CON LOT	DATE mmm-yr	EASTING NORTHING	ELEV masl	WTR FND mbgl Qu	SCR TOP mbgl	LEN m	SWL mbgl	RATE L/min	TIME min	PL mbgl	DRILLER METHOD	TYPE STAT	WELL NAME DESCRIPTION OF MATERIALS
7212565		Apr-13	651612	172.2		2.4	-0.6	NR				7472	OW	**MOE# 7212565 TAG#A158958**
			4861966									BR	MO	0.0 BRWN SILT FSND PCKD 3.0
7212566		Apr-13	651619	172.8		4.6	-3.0	NR				7472	OW	**MOE# 7212566 TAG#A158957**
			4861975									BR	MO	0.0 BRWN SILT FSND PCKD 3.0 GREY SILT FSND HARD 7.6
7236553	5	Jan-15	651397	181.4				NR				7407	AS	**MOE# 7236553**
	22		4862328									DG	DO	0.0
7259845		Dec-15	650959	198.4		6.1	-3.0	NR				7472	OW	**MOE# 7259845 TAG#A197547**
			4862117									BR	MO	0.0 BRWN SILT SAND PCKD 3.0 BRWN SILT GRVL PCKD 6.1 GREY SILT CGVL PCKD 9.1
7259846		Dec-15	651827	173.7		12.2	-1.5	NR				7472	OW	**MOE# 7259846 TAG#A176115**
			4862424									BR	MO	0.0 WSTE WSTE PCKD 0.3 BRWN SILT FSND PCKD 4.6 GREY FSND SILT PCKD 13.7
7259847		Dec-15	651846	174.3		13.7	-1.5	NR				7472	OW	**MOE# 7259847 TAG#A197551**
			4862430									BR	MO	0.0 WSTE WSTE PCKD 0.3 BRWN SILT FSND PCKD 4.6 GREY FSND SILT PCKD 15.2
7259852		Dec-15	651126	190.2		6.1	-3.0	NR				7472	OW	**MOE# 7259852 TAG#A197540**
			4862193									BR	MO	0.0 WSTE WSTE PCKD 0.3 BRWN CLAY PCKD 3.0 BRWN SAND GRVL LOOS 9.1
7260788		Nov-15	651566	155.1		13.7	-3.0	NR				7383	TH	**MOE# 7260788 TAG#A195018**
			4861374									BR	TH	0.0
7260789		Nov-15	651548	157.0		13.7	-3.0	NR				7383	TH	**MOE# 7260789 TAG#A195042**
			4861451									BR	TH	0.0
7260790		Nov-15	651535	157.0		13.7	-3.0	NR				7383	TH	**MOE# 7260790 TAG#A195041**
			4861442									BR	TH	0.0
YPD2181		Dec-61	651776	163.4				NR					-	**MOE# YPD2181**
			4861186									-	-	0.0 SOIL 0.6 SAND SILT GRVL 1.8

QUALITY:		TYPE:				USE:		METHOD :	
Fr	Fresh	WS	Water Supply	CO	Comercial	NU	Not Used	CT	Cable Tool
Mn	Mineral	AQ	Abandoned Quality	DO	Domestic	IR	Irrigation	JT	Jetting
Sa	Salty	AS	Abandoned Supply	MU	Municipal	AL	Alteration	RC	Rotary Conventional
Su	Sulphur	AB	Abandonment Record	PU	Public	MO	Monitoring	RA	Rotary Air
--	Unrecorded	TH	Test Hole or Observation	ST	Stock	-	Not Recorded	BR	Boring

Easting and Northings UTM NAD 83 Zone 17, Translated from Recorded UTM NAD, subject to Field Verified Location or Improved Location Accuracy.

 Selected information tabulated to metric with changes and corrections subject to Driller's Records.

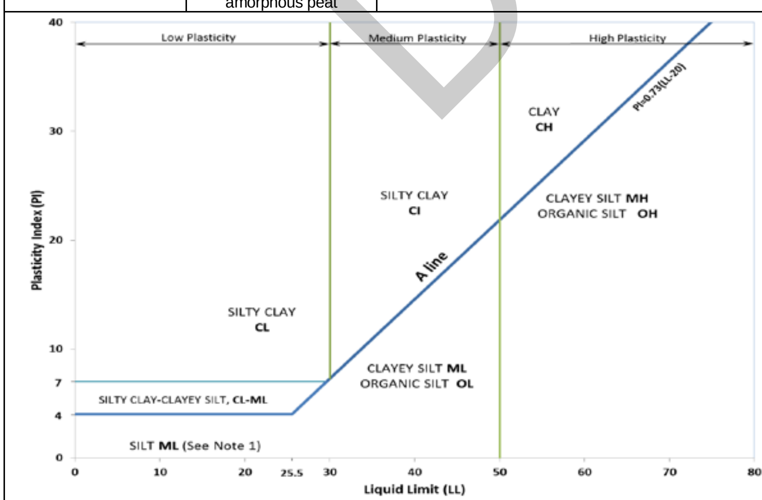
APPENDIX D

Method of Soil Classification
Abbreviations and Terms Used on Records of Boreholes and Test Pits
List of Symbols
Record of Borehole Sheets
Plasticity Chart
Grain Size Analysis

The Golder Associates Ltd. Soil Classification System is based on the Unified Soil Classification System (USCS)

Organic or Inorganic	Soil Group	Type of Soil		Gradation or Plasticity	$Cu = \frac{D_{60}}{D_{10}}$	$Cc = \frac{(D_{30})^2}{D_{10} x D_{60}}$	Organic Content	USCS Group Symbol	Group Name
INORGANIC (Organic Content ≤30% by mass)	COARSE-GRAINED SOILS (>50% by mass is larger than 0.075 mm)	GRAVELS (>50% by mass of coarse fraction is larger than 4.75 mm)	Gravels with ≤12% fines (by mass)	Poorly Graded	<4	≤1 or ≥3	≤30%	GP	GRAVEL
				Well Graded	≥4	1 to 3		GW	GRAVEL
			Gravels with >12% fines (by mass)	Below A Line	n/a			GM	SILTY GRAVEL
				Above A Line	n/a			GC	CLAYEY GRAVEL
		SANDS (≥50% by mass of coarse fraction is smaller than 4.75 mm)	Sands with ≤12% fines (by mass)	Poorly Graded	<6	≤1 or ≥3		SP	SAND
				Well Graded	≥6	1 to 3		SW	SAND
			Sands with >12% fines (by mass)	Below A Line	n/a			SM	SILTY SAND
				Above A Line	n/a			SC	CLAYEY SAND

Organic or Inorganic	Soil Group	Type of Soil		Laboratory Tests	Field Indicators: Dilatancy	Dry Strength	Shine Test	Thread Diameter	Toughness (of 3 mm thread)	Organic Content	USCS Group Symbol	Primary Name
INORGANIC (Organic Content ≤30% by mass)	FINE-GRAINED SOILS (≥50% by mass is smaller than 0.075 mm)	SILTS	(Non-Plastic or PI and LL plot below A-Line on Plasticity Chart below)	Liquid Limit <50	Rapid	None	None	>6 mm	N/A (can't roll 3 mm thread)	<5%	ML	SILT
					Slow	None to Low	Dull	3mm to 6 mm	None to low	<5%	ML	CLAYEY SILT
					Slow to very slow	Low to medium	Dull to slight	3mm to 6 mm	Low	5% to 30%	OL	ORGANIC SILT
				Liquid Limit ≥50	Slow to very slow	Low to medium	Slight	3mm to 6 mm	Low to medium	<5%	MH	CLAYEY SILT
					None	Medium to high	Dull to slight	1 mm to 3 mm	Medium to high	5% to 30%	OH	ORGANIC SILT
		CLAYS	(PI and LL plot above A-Line on Plasticity Chart below)	Liquid Limit <30	None	Low to medium	Slight to shiny	~ 3 mm	Low to medium	0% to 30% (see Note 2)	CL	SILTY CLAY
				Liquid Limit 30 to 50	None	Medium to high	Slight to shiny	1 mm to 3 mm	Medium		CI	SILTY CLAY
				Liquid Limit ≥50	None	High	Shiny	<1 mm	High		CH	CLAY
HIGHLY ORGANIC SOILS (Organic Content >30% by mass)		Peat and mineral soil mixtures								30% to 75%	PT	SILTY PEAT, SANDY PEAT
		Predominantly peat, may contain some mineral soil, fibrous or amorphous peat								75% to 100%		PEAT



Note 1 – Fine grained materials with PI and LL that plot in this area are named (ML) SILT with slight plasticity. Fine-grained materials which are non-plastic (i.e. a PL cannot be measured) are named SILT.
Note 2 – For soils with <5% organic content, include the descriptor "trace organics" for soils with between 5% and 30% organic content include the prefix "organic" before the Primary name.

Dual Symbol — A dual symbol is two symbols separated by a hyphen, for example, GP-GM, SW-SC and CL-ML.
For non-cohesive soils, the dual symbols must be used when the soil has between 5% and 12% fines (i.e. to identify transitional material between "clean" and "dirty" sand or gravel.
For cohesive soils, the dual symbol must be used when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart (see Plasticity Chart at left).

Borderline Symbol — A borderline symbol is two symbols separated by a slash, for example, CL/CI, GM/SM, CL/ML.
A borderline symbol should be used to indicate that the soil has been identified as having properties that are on the transition between similar materials. In addition, a borderline symbol may be used to indicate a range of similar soil types within a stratum.

ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES AND TEST PITS

PARTICLE SIZES OF CONSTITUENTS

Soil Constituent	Particle Size Description	Millimetres	Inches (US Std. Sieve Size)
BOULDERS	Not Applicable	>300	>12
COBBLES	Not Applicable	75 to 300	3 to 12
GRAVEL	Coarse Fine	19 to 75 4.75 to 19	0.75 to 3 (4) to 0.75
SAND	Coarse Medium Fine	2.00 to 4.75 0.425 to 2.00 0.075 to 0.425	(10) to (4) (40) to (10) (200) to (40)
SILT/CLAY	Classified by plasticity	<0.075	< (200)

MODIFIERS FOR SECONDARY AND MINOR CONSTITUENTS

Percentage by Mass	Modifier
>35	Use 'and' to combine major constituents (*i.e.,* SAND and GRAVEL)
> 12 to 35	Primary soil name prefixed with "gravelly, sandy, SILTY, CLAYEY" as applicable
> 5 to 12	some
≤ 5	trace

PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split-spoon sampler for a distance of 300 mm (12 in.). Values reported are as recorded in the field and are uncorrected.

Cone Penetration Test (CPT)
An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm^2 pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (q_t), porewater pressure (u) and sleeve frictions are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); N_d:
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

PH: Sampler advanced by hydraulic pressure
PM: Sampler advanced by manual pressure
WH: Sampler advanced by static weight of hammer
WR: Sampler advanced by weight of sampler and rod

SAMPLES

AS	Auger sample
BS	Block sample
CS	Chunk sample
DD	Diamond Drilling
DO or DP	Seamless open ended, driven or pushed tube sampler – note size
DS	Denison type sample
GS	Grab Sample
MC	Modified California Samples
MS	Modified Shelby (for frozen soil)
RC	Rock core
SC	Soil core
SS	Split spoon sampler – note size
ST	Slotted tube
TO	Thin-walled, open – note size (Shelby tube)
TP	Thin-walled, piston – note size (Shelby tube)
WS	Wash sample

SOIL TESTS

w	water content
PL , w_p	plastic limit
LL , w_L	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test[1]
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement[1]
D_R	relative density (specific gravity, Gs)
DS	direct shear test
GS	specific gravity
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO_4	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V (FV)	field vane (LV-laboratory vane test)
γ	unit weight

1. Tests anisotropically consolidated prior to shear are shown as CAD, CAU.

NON-COHESIVE (COHESIONLESS) SOILS

Compactness[2]

Term	SPT 'N' (blows/0.3m)[1]
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	>50

1. SPT 'N' in accordance with ASTM D1586, uncorrected for the effects of overburden pressure.
2. Definition of compactness terms are based on SPT 'N' ranges as provided in Terzaghi, Peck and Mesri (1996). Many factors affect the recorded SPT 'N' value, including hammer efficiency (which may be greater than 60% in automatic trip hammers), overburden pressure, groundwater conditions, and grainsize. As such, the recorded SPT 'N' value(s) should be considered only an approximate guide to the soil compactness. These factors need to be considered when evaluating the results, and the stated compactness terms should not be relied upon for design or construction.

Field Moisture Condition

Term	Description
Dry	Soil flows freely through fingers.
Moist	Soils are darker than in the dry condition and may feel cool.
Wet	As moist, but with free water forming on hands when handled.

COHESIVE SOILS

Consistency

Term	Undrained Shear Strength (kPa)	SPT 'N'[1,2] (blows/0.3m)
Very Soft	<12	0 to 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	>200	>30

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects; approximate only.
2. SPT 'N' values should be considered ONLY an approximate guide to consistency; for sensitive clays (e.g., Champlain Sea clays), the N-value approximation for consistency terms does NOT apply. Rely on direct measurement of undrained shear strength or other manual observations.

Water Content

Term	Description
w < PL	Material is estimated to be drier than the Plastic Limit.
w ~ PL	Material is estimated to be close to the Plastic Limit.
w > PL	Material is estimated to be wetter than the Plastic Limit.

Unless otherwise stated, the symbols employed in the report are as follows:

I. GENERAL

π	3.1416
ln x	natural logarithm of x
$\log_{10}$	x or log x, logarithm of x to base 10
g	acceleration due to gravity
t	time

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta\,\sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
υ	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma$ - u)
σ'_{vo}	initial effective overburden stress
$\sigma_1, \sigma_2, \sigma_3$	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight)*
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation

* Density symbol is ρ. Unit weight symbol is γ where $\gamma = \rho g$ (i.e. mass density multiplied by acceleration due to gravity)

(a) Index Properties (continued)

w	water content
w_l or LL	liquid limit
w_p or PL	plastic limit
I_p or PI	plasticity index = $(w_l - w_p)$
NP	non-plastic
w_s	shrinkage limit
I_L	liquidity index = $(w - w_p) / I_p$
I_C	consistency index = $(w_l - w) / I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index = $(e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
C_α	secondary compression index
m_v	coefficient of volume change
c_v	coefficient of consolidation (vertical direction)
c_h	coefficient of consolidation (horizontal direction)
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation stress
OCR	over-consolidation ratio = σ'_p / σ'_{vo}

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = tan δ
c′	effective cohesion
c_u, s_u	undrained shear strength (ϕ = 0 analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p′	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

Notes: 1 $\tau = c' + \sigma' \tan \phi'$
2 shear strength = (compressive strength)/2

PROJECT: 20139990

LOCATION: N 4861508.34; E 651114.73

RECORD OF BOREHOLE: BH20-1

BORING DATE: May 20, 2020

SHEET 1 OF 1

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm

HAMMER TYPE: AUTOMATIC

Boring method: CME 55 Track Mounted Rig; 200 mm Hollow Stem Augers

DEPTH SCALE METRES	SOIL PROFILE – DESCRIPTION	ELEV. / DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.3m	ADDITIONAL LAB. TESTING
	GROUND SURFACE	183.79				
0	TOPSOIL	0.00	1	SS	4	
	(CL-ML) SILTY CLAY to CLAYEY and SAND, trace some gravel, brown, oxidation staining (TILL); cohesive, w<PL, very stiff to hard	183.10 / 0.69	2	SS	18	
			3	SS	45	MH
			4	SS	61	
			5	SS	50/0.13	
			6	SS	50/0.13	
	END OF BOREHOLE	178.94 / 4.85				

Dynamic penetration resistance, blows/0.3m: 20, 40, 60, 80. Shear strength Cu, kPa: nat V. + Q - ●; rem V. ⊕ U - ○; 20, 40, 60, 80.

Hydraulic conductivity, k, cm/s: 10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}. Water content percent: Wp —○W— Wl; 10, 20, 30, 40.

PIEZOMETER OR STANDPIPE INSTALLATION

NOTE:

1. Borehole was dry upon completion of drilling.

DEPTH SCALE 1 : 50

GOLDER

LOGGED: JK

CHECKED: SEMP

PROJECT: 20139990
LOCATION: N 4861625.72; E 651171.06

RECORD OF BOREHOLE: BH20-2

BORING DATE: May 20, 2020

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm

HAMMER TYPE: AUTOMATIC

Boring method: CME 55 Track Mounted Rig; 100 mm O.D. HWT Steel Casing

DEPTH SCALE METRES	DESCRIPTION	ELEV. / DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.3m	PIEZOMETER OR STANDPIPE INSTALLATION
	GROUND SURFACE	185.40				
0	TOPSOIL	0.00	1	SS	4	50 mm PVC Monitoring Well
	(SM) SILTY SAND, some gravel to gravelly, brown; non-cohesive, moist, dense to very dense	184.71 / 0.69	2	SS	36	
	- Gravelly between 1.5 m to 2.4 m		3	SS	85/0.28	
			4	SS	50/0.13	
	- No sample recovered at 3.1 m		5	SS	57	
4	(CL-ML) sandy SILTY CLAY to CLAYEY SILT, trace to some gravel; brown to grey, oxidation staining to 6.1 m (TILL), cohesive, w~PL, hard	181.36 / 4.04				June 5/20 (water level)
	- Sand pocket at 4.6 m		6	SS	118	Bentonite
			7	SS	122	
	- Grey at a depth of 7.6 m		8	SS	90/0.25	
10			9	SS		

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DEPTH SCALE
1 : 50

GOLDER

LOGGED: JK
CHECKED: SEMP

PROJECT: 20139990

LOCATION: N 4861625.72; E 651171.06

RECORD OF BOREHOLE: BH20-2

BORING DATE: May 20, 2020

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10	CME 55 Track Mounted Rig; 100 mm O.D. HWT Steel Casing	(CL-ML) sandy SILTY CLAY to CLAYEY SILT, trace to some gravel; brown to grey, oxidation staining to 6.1 m (TILL), cohesive, w~PL, hard			9	SS	84/ 0.25				Bentonite
											Sand
					10	SS	50/ 0.13				
11											Screen and Sand
12				173.11	11	SS	50/ 0.1				
		END OF BOREHOLE		12.29							

NOTES:

1. Water was used to advance borehole.

2. 63.5 mm split spoon was used for SPT sampling below 4.6 m

3. Water was not encountered during drilling.

4. Groundwater level was measured in monitoring well at 3.9 mbgs (El. 181.5 m) on June 5, 2020.

Depth scale: 13, 14, 15, 16, 17, 18, 19, 20

DEPTH SCALE

1 : 50

GOLDER

LOGGED: JK

CHECKED: SEMP

PROJECT: 20139990

LOCATION: N 4861774.72; E 651232.09

RECORD OF BOREHOLE: BH20-3

BORING DATE: May 21, 2020

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE DESCRIPTION	ELEV. DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.3m	ADDITIONAL LAB. TESTING
		GROUND SURFACE	186.19				
0	CME 55 Track Mounted Rig, 200 mm Hollow Stem Augers	TOPSOIL	0.00	1A	SS	2	
		FILL/REWORKED NATIVE - (ML) sandy CLAYEY SILT, trace gravel; brown; trace rootlets; organic inclusion, cohesive, w>PL, soft	185.89 0.30	1B			
1		(CL-ML) SILTY CLAY to CLAYEY SILT and SAND, trace to some gravel; brown to grey; oxidation staining to 3.5 m, containing rock fragments (TILL); cohesive, w<PL, hard	185.50 0.69	2	SS	51	
				3	SS	73	
2				4	SS	65	
3				5	SS	98	
4		- Grey at a depth of 4.6 m		6	SS	50/0.1	MH
6				7	SS	50/0.1	
7				8	SS	50/0.13	
9				9	SS	50/0.13	
10							

Graph columns: DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20, 40, 60, 80); SHEAR STRENGTH Cu, kPa (nat V. + Q - ●; rem V. ⊕ U - ○) (20, 40, 60, 80); HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}); WATER CONTENT PERCENT Wp —○W— Wl (10, 20, 30, 40); PIEZOMETER OR STANDPIPE INSTALLATION

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DEPTH SCALE 1 : 50

GOLDER

LOGGED: JK

CHECKED: SEMP

PROJECT: 20139990

LOCATION: N 4861774.72; E 651232.09

RECORD OF BOREHOLE: BH20-3

BORING DATE: May 21, 2020

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT Wp ⊢—○W—⊣ Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- *CONTINUED FROM PREVIOUS PAGE* ---									
10	CME 55 Track Mounted Rig; 200 mm Hollow Stem Augers	(CL-ML) SILTY CLAY to CLAYEY SILT and SAND, trace to some gravel; brown to grey; oxidation staining to 3.5 m, containing rock fragments (TILL); cohesive, w<PL, hard									
11					10	SS	81/0.28		○		
12		- Auger grinding at a depth of 12.2 m			11	SS	98/0.13		○		
				173.57 / 12.62							
13		END OF BOREHOLE NOTES: 1. Water was used to advance borehole. 2. Groundwater was not encountered during drilling.									
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: JK

CHECKED: SEMP

RECORD OF BOREHOLE: BH20-4

PROJECT: 20139990
LOCATION: N 4861677.98; E 651055.06
BORING DATE: May 20, 2020
SHEET 1 OF 1
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm
HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	ELEV. / DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE	188.22					
0	CME 55 Track Mounted Rig; 200 mm Hollow Stem Augers	TOPSOIL	0.00	1A	SS	3		50 mm Dia. Monitoring Well
		FILL/REWORKED NATIVE - (CL) SILTY CLAY, trace sand; brown; organic inclusion, trace rootlets; cohesive, w>PL, soft to stiff	187.92 / 0.30	1B				
1				2A	SS	12		
		(ML) sandy SILT, slightly plastic; brown; non-cohesive, moist to wet, dense to very dense	187.08 / 1.14	2B				
				3	SS	49		
2				4	SS	37	MH	Bentonite; June 5/20
3		- Wet at a depth of 3.0 m		5	SS	88		
4		(CL-ML) sandy SILTY CLAY to CLAYEY SILT, some gravel; grey (TILL); cohesive, w<PL, hard	184.18 / 4.04					Sand
5				6	SS	50/0.1		Screen and Sand
6				7	SS	78		
		END OF BOREHOLE	181.67 / 6.55					

NOTES:

1. Water encountered at a depth of 3.1 mbgs during drilling.

2. Groundwater was measured in monitoring well at 2.3 m (El. 185.9 m) on June 5, 2020.

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80
SHEAR STRENGTH Cu, kPa: nat V. + Q - ● rem V. ⊕ U - ○ 20 40 60 80
HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}
WATER CONTENT PERCENT: Wp W Wl 10 20 30 40

DRAFT

DEPTH SCALE
1 : 50

GOLDER

LOGGED: JK
CHECKED: SEMP

RECORD OF BOREHOLE: BH20-5

PROJECT: 20139990
LOCATION: N 4861685.33; E 650933.13
BORING DATE: May 19, 2020
SHEET 1 OF 1
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm
HAMMER TYPE: AUTOMATIC

BORING METHOD: CME 55 Track Mounted Rig; 200 mm Hollow Stem Augers

DEPTH (m)	DESCRIPTION	ELEV. / DEPTH (m)
	GROUND SURFACE	187.36
0	TOPSOIL	0.00
0.69	(CL-ML) sandy SILTY CLAY to CLAYEY SILT, some gravel to gravelly; brown to grey; oxidation staining (TILL); cohesive, w<PL, very stiff to hard	186.67 / 0.69
	- Sand pockets from 1.5 m to 1.8 m	
	- Auger grinding at a depth of 3.1	
	- Grey at a depth of 4.6	
4.70	END OF BOREHOLE	182.66 / 4.70

SAMPLE NUMBER	TYPE	BLOWS/0.3m
1	SS	5
2	SS	22
3	SS	57
4	SS	50/0.13
5	SS	50/0.13
6	SS	50/0.13

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80
SHEAR STRENGTH Cu, kPa: nat V. + Q - ● rem V. ⊕ U - ○ ; 20 40 60 80
HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}
WATER CONTENT PERCENT: Wp —○W— Wl ; 10 20 30 40
ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION:
50 mm Dia. Monitoring Well
Bentonite
June 5/20
Sand
Screen and Sand

NOTES:

1. Water was not encountered during drilling.

2. Groundwater was measured in monitoring well at 1.6 mbgs (El. 185.8 m) on June 5, 2020.

DEPTH SCALE 1 : 50
GOLDER
LOGGED: JK
CHECKED: SEMP

PROJECT: 20139990

LOCATION: N 4861778.66; E 650929.90

RECORD OF BOREHOLE: BH20-6

BORING DATE: May 19, 2020

SHEET 1 OF 1

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm

HAMMER TYPE: AUTOMATIC

BORING METHOD: CME 55 Track Mounted Rig; 200 mm Hollow Stem Augers

DESCRIPTION	ELEV. / DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m
GROUND SURFACE	190.16			
TOPSOIL	0.00	1A	SS	8
FILL/REWORKED NATIVE - (CL) sandy SILTY CLAY, trace gravel; brown; oxidation staining; organic inclusions, trace rootlets; cohesive, w>PL, firm	189.86 / 0.30	1B		
(CL-ML) SILTY CLAY to CLAYEY SILT and SAND, trace to some gravel; brown, oxidation staining, containing rock fragments (TILL); cohesive, w<PL to w~PL, hard	189.47 / 0.69	2	SS	53
		3	SS	50/ 0.13
- Auger grinding at a depth of 2.3 m		4	SS	50/ 0.05
- Auger grinding at a depth of 3.1 m		5	SS	50/ 0.13
- Auger grinding at a depth of 4.6 m		6	SS	50/ 0.05
		7	SS	50/ 0.1
END OF BOREHOLE	183.81 / 6.35			

NOTE

1. Water was not encountered during drilling.

Column headings: DEPTH SCALE METRES; BORING METHOD; SOIL PROFILE (DESCRIPTION, STRATA PLOT, ELEV. DEPTH (m)); SAMPLES (NUMBER, TYPE, BLOWS/0.3m); DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80); HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT Wp W Wl (10 20 30 40); ADDITIONAL LAB. TESTING; PIEZOMETER OR STANDPIPE INSTALLATION

DRAFT

DEPTH SCALE

1 : 50

GOLDER

LOGGED: JK

CHECKED: SEMP

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RECORD OF BOREHOLE: BH20-7

PROJECT: 20139990
LOCATION: N 4861751.05; E 650760.78
BORING DATE: May 19, 2020
SHEET 1 OF 1
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm
HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	ELEV. / DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.3m	WATER CONTENT PERCENT (w, approx.)	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE	190.12					
0	CME 55 Track Mounted Rig; 200 mm Hollow Stem Augers	TOPSOIL	0.00	1A			~27	50 mm Dia. Monitoring Well
		FILL/REWORKED NATIVE - (CL) sandy SILTY CLAY, trace gravel; brown, trace rootlets, organic inclusions; cohesive, w>PL, firm	0.15	1B	SS	6	~11	
			189.43 / 0.69					
1		(CL-ML) SILTY CLAY to CLAYEY SILT and SAND, trace to some gravel, brown to grey, oxidation staining to 3.3 m (TILL); cohesive, w<PL, very stiff, hard		2	SS	15	~9	Bentonite
		- Auger grinding at a depth of 1.5 m		3	SS	47	~8	
2		- Auger grinding at a depth of 2.3 m						June 5/20 (water level)
		- Grey at a depth of 2.3 m		4	SS	50/0.13	~6	
3		- Auger grinding at a depth of 3.1 m		5	SS	50/0.13	~5	Sand
4								Screen and Sand
		- Auger grinding at a depth of 4.6 m	185.27 / 4.85	6	SS	50/0.13	~5	
5		END OF BOREHOLE						

NOTES:

1. Water was not encountered during drilling.

2. Groundwater was measured in monitoring well at 1.9 mbgs (El. 188.2 m) on June 5, 2020.

DRAFT

DEPTH SCALE
1 : 50

GOLDER

LOGGED: JK
CHECKED: SEMP

PROJECT: 20139990

LOCATION: N 4861827.37; E 650676.37

RECORD OF BOREHOLE: BH20-8

BORING DATE: May 21, 2020

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	DESCRIPTION	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	ADDITIONAL LAB. TESTING
		GROUND SURFACE	194.44				
0	CME 55 Track Mounted Rig, 200 mm Hollow Stem Augers	TOPSOIL	0.00	1	SS	8	
			193.47	2A			
1		FILL/REWORKED NATIVE - (CL) sandy SILTY CLAY, trace gravel; brown; trace rootlets; cohesive, w>PL, firm	0.97	2B	SS	6	
		(CL-ML) SILTY CLAY to CLAYEY SILT and SAND, trace gravel; brown to grey, oxidation staining to 3.3 m (TILL); cohesive, w<PL, hard	193.07 / 1.37	3	SS	63	MH
2				4	SS	104	
3				5	SS	50/ 0.1	
4		- Grey at a depth of 4.6 m		6	SS	50/ 0.1	
		END OF BOREHOLE	189.61 / 4.83				
5		NOTE: 1. Water was not encountered during drilling.					
6							
7							
8							
9							
10							

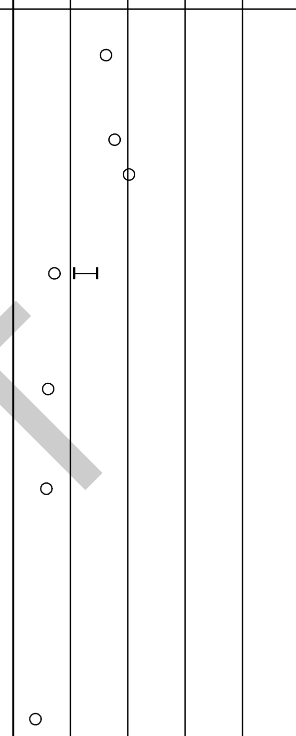
DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat V. + Q - ●; rem V. ⊕ U - ○; 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp ⊢—○W—⊣ Wl; 10 20 30 40

PIEZOMETER OR STANDPIPE INSTALLATION



DRAFT

DEPTH SCALE 1 : 50

GOLDER

LOGGED: JK

CHECKED: SEMP

RECORD OF BOREHOLE: BH20-9

PROJECT: 20139990
LOCATION: N 4861936.66; E 650855.28
BORING DATE: May 15, 2020

DATUM: Geodetic
SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm
HAMMER TYPE: AUTOMATIC

Boring method: CME 55 Track Mounted Rig; 200 mm Hollow Stem Augers

DESCRIPTION	ELEV. / DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.3m
GROUND SURFACE	196.31			
TOPSOIL	0.00	1	SS	6
(SM) SILTY SAND, gravelly to trace gravel; brown; non-cohesive, wet, dense to very dense	195.62 / 0.69	2	SS	42
		3	SS	62/0.23
(CL-ML) SILTY CLAY to CLAYEY SILT and SAND, trace to some gravel; brown to grey (TILL); cohesive, w<PL, hard	194.40 / 1.91	4	SS	50/0.13
		5	SS	50/0.13
		6	SS	50/0.13
- Grey at a depth of 6.1 m		7	SS	50/0.13
- Auger grinding at a depth of 7.6 m		8	SS	50/0.13
	187.06	9	SS	50/0.1
END OF BOREHOLE	9.25			

NOTES:

1. Water encountered in borehole at 0.8 mbgs during drilling.

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 50
GOLDER
LOGGED: JK
CHECKED: SEMP

RECORD OF BOREHOLE: BH20-9

BORING DATE: May 15, 2020

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT Wp —○W— Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- *CONTINUED FROM PREVIOUS PAGE* ---									
10		2. Water was used to advance borehole at 7.6 mbgs.									
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

GOLDER

LOGGED: JK
CHECKED: SEMP

RECORD OF BOREHOLE: BH20-10

PROJECT: 20139990
LOCATION: N 4862027.24; E 650942.33
BORING DATE: May 13, 2020
SHEET 1 OF 2
DATUM: Geodetic
SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm
HAMMER TYPE: AUTOMATIC

Boring method: CME 55 Track Mounted Rig; 200 mm Hollow Stem Augers

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80
SHEAR STRENGTH Cu, kPa: nat V. + Q - ● rem V. ⊕ U - ○ : 20 40 60 80
HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}
WATER CONTENT PERCENT: Wp ⊢—○W—⊣ Wl : 10 20 30 40

DEPTH SCALE METRES	DESCRIPTION	ELEV. / DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.3m	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
	GROUND SURFACE	199.21					
0	TOPSOIL	0.00	1A	SS	7		50 mm Dia. Monitoring Well
	(SM) SILTY SAND, trace gravel to gravelly; brown; trace rootlets from 0.3 m to 0.6 m; non-cohesive, moist, dense - Gravelly at a depth 0.8 m	198.91 / 0.30	1B				
1			2	SS	30		
	(SM) SILTY SAND, trace gravel; brown, oxidation staining (TILL); non-cohesive, moist, dense to very dense	197.76 / 1.45	3	SS	36		
2			4	SS	44	MH	
3	- Sand seam and pockets between 2.3 m and 2.7 m		5	SS	59		Bentonite; June 5/20 (water level)
4	(SM) SILTY SAND, brown; non-cohesive, wet, dense	195.17 / 4.04					
5			6	SS	31		
	(CL-ML) SILTY CLAY to CLAYEY SILT and SAND, trace gravel; grey (TILL); cohesive, w~PL, hard	193.65 / 5.56					
6			7	SS	50/0.13		
7							Sand
8			8	SS	50/0.13		Screen and Sand
9	- Auger grinding between depths of 9.1 m and 9.3 m		9	SS	50/0.13		
	END OF BOREHOLE	189.91 / 9.30					
	NOTES: 1. Water was used to advance borehole						
10							

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 50
GOLDER
LOGGED: JK
CHECKED: SEMP

PROJECT: 20139990

LOCATION: N 4862027.24; E 650942.33

RECORD OF BOREHOLE: BH20-10

BORING DATE: May 13, 2020

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT Wp —O W— Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10		at 7.6 mbgs. 2. Groundwater level was measured in monitoring well at 3.6 mbgs (El. 195.6 m) on June 5, 2020.									
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: JK

CHECKED: SEMP

PROJECT: 20139990

LOCATION: N 4861917.21; E 650976.55

RECORD OF BOREHOLE: BH20-11

BORING DATE: May 15, 2020

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm

HAMMER TYPE: AUTOMATIC

BORING METHOD: CME 55 Track Mounted Rig; 200 mm Hollow Stem Augers

SOIL PROFILE – DESCRIPTION	ELEV. / DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.3m
GROUND SURFACE	197.24			
TOPSOIL	0.00	1A	SS	9
FILL/REWORKED NATIVE - (CL) SILTY CLAY, some sand; brown; trace rootlets; organic inclusions; cohesive, w>PL, firm	196.94 / 0.30	1B		
(SM) SILTY SAND, trace gravel; brown; oxidation staining at 3.1 m; non-cohesive, moist to wet, compact to very dense	196.55 / 0.69	2	SS	17
- Wet at a depth of 1.5 m		3	SS	21
		4	SS	26
		5A	SS	68
(SP-SM) gravelly SAND, some fines; black; non-cohesive, moist, very dense	193.89 / 3.35	5B		
(SM) SILTY SAND, trace gravel; grey (TILL); non-cohesive, moist, very dense	193.20 / 4.04			
- Auger grinding at a depth of 4.6 m		6	SS	50/0.08
- Auger grinding at a depth of 6.1 m		7	SS	50/0.13
		8	SS	50/0.08
		9	SS	50/0.08
END OF BOREHOLE	188.02 / 9.22			

NOTE:

1. Water was encountered at a depth of 1.5 m during drilling.

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80

SHEAR STRENGTH Cu, kPa: nat V. + Q - ● rem V. ⊕ U - ○ : 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}

WATER CONTENT PERCENT: Wp ⊢ ○W ⊣ Wl : 10 20 30 40

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION:

50 mm Dia. Monitoring Well

June 5/20

Bentonite

Sand

Screen and Sand

DEPTH SCALE METRES: 0 1 2 3 4 5 6 7 8 9 10

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 50

GOLDER

LOGGED: JK

CHECKED: SEMP

RECORD OF BOREHOLE: BH20-11

PROJECT: 20139990
LOCATION: N 4861917.21; E 650976.55
BORING DATE: May 15, 2020
SHEET 2 OF 2
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm
HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - O (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT Wp ⊢ O W ⊣ Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10		2. Groundwater level was measured in monitoring well at 1.6 mbgs (El. 195.6 m) on June 5, 2020.									
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE
1 : 50

GOLDER

LOGGED: JK
CHECKED: SEMP

PROJECT: 20139990

LOCATION: N 4861905.89; E 651095.59

RECORD OF BOREHOLE: BH20-12

BORING DATE: May 14, 2020

SHEET 1 OF 1

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm

HAMMER TYPE: AUTOMATIC

Boring method: CME 55 Track Mounted Rig; 200 mm Hollow Stem Augers

DESCRIPTION	ELEV. / DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.3m
GROUND SURFACE	194.09			
TOPSOIL	0.00	1A	SS	3
FILL/REWORKED NATIVE - (CL) SILTY CLAY, some sand; grey; trace rootlets; cohesive, w>PL, very soft	193.63 / 0.46	1B		
(SM) SILTY SAND, trace gravel; brown; non-cohesive, moist, compact	193.40 / 0.69	2A	SS	16
(SP) SAND, trace fines; some gravel; brown; non-cohesive, moist, dense	193.02 / 1.07	2B, 3A	SS	41
(SM) SILTY SAND, some gravel to gravelly; brown (TILL); non-cohesive, moist, dense to very dense - gravelly at a depth of 2.3 m	192.26 / 1.83	3B, 4A, 4B, 5, 6	SS	37; 92/0.25; 50/0.1
(CL-ML) SILTY CLAY to CLAYEY SILT and SAND, trace gravel; grey (TILL); cohesive, w<PL, hard	188.63 / 5.46	7	SS	50/0.13
END OF BOREHOLE	187.87 / 6.22			

Piezometer or standpipe installation: 50 mm Dia. Monitoring Well; Bentonite; Sand; Screen and Sand; water level June 5/20

NOTES:

1. Water was not encountered during drilling.

2. Water was used to advance borehole at a depth of 3.1 m.

3. Groundwater level was measured in monitoring well at 1.4 mbgs (El. 192.7 m) on June 5, 2020.

DRAFT

DEPTH SCALE 1 : 50

GOLDER

LOGGED: JK

CHECKED: SEMP

GTA-BHS 001 S:\CLIENTS\LEBOVIC_ONTARIO\PICKERING_WHITEVALE\02_DATA\GINT\20139990.GPJ GAL-MIS.GDT 6/30/20

RECORD OF BOREHOLE: BH20-13

PROJECT: 20139990
LOCATION: N 4862047.32; E 651089.81
BORING DATE: May 14, 2020

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm
HAMMER TYPE: AUTOMATIC

BORING METHOD: CME 55 Track Mounted Rig; 200 mm Hollow Stem Augers

ELEV. / DEPTH (m)	DESCRIPTION	SAMPLE NUMBER	TYPE	BLOWS/0.3m	ADDITIONAL LAB. TESTING
196.69	GROUND SURFACE				
0.00	TOPSOIL	1	SS	6	
196.00 / 0.69	(SM) SILTY SAND, trace to some gravel; brown, oxidation staining, sand pockets (TILL); non-cohesive, moist, compact to very dense	2	SS	20	
		3	SS	46	MH
		4	SS	88	
	- Auger grinding at a depth 3.1 m	5	SS	80	
192.66 / 4.03	(SM) SILTY SAND, trace gravel; brown; non-cohesive, wet, very dense	6A			
192.02 / 4.67	(SM) SILTY SAND, trace to some gravel; brown, oxidation staining (TILL); non-cohesive, moist, very dense	6B	SS	92/ 0.25	
191.71 / 4.98	(CL-ML) SILTY CLAY to CLAYEY SILT and SAND, some gravel; grey; containing rock fragment (TILL); cohesive, w~PL, hard	7	SS	50/ 0.05	
		8	SS	50/ 0.13	
187.27 / 9.42		9	SS	50/ 0.13	
	END OF BOREHOLE				
	NOTES:				

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80
SHEAR STRENGTH Cu, kPa: nat V. + Q - ● ; rem V. ⊕ U - ○ ; 20 40 60 80
HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}
WATER CONTENT PERCENT: Wp ⊢—○W—⊣ Wl ; 10 20 30 40

PIEZOMETER OR STANDPIPE INSTALLATION

DEPTH SCALE METRES: 0 1 2 3 4 5 6 7 8 9 10

CONTINUED NEXT PAGE

PROJECT: 20139990

LOCATION: N 4862047.32; E 651089.81

RECORD OF BOREHOLE: BH20-13

BORING DATE: May 14, 2020

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6} 10^{-5} 10^{-4} 10^{-3}); WATER CONTENT PERCENT Wp ⊢ ○W ⊣ Wl (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10		1. Water was used to advance borehole at 6.1 mbgs. 2. Water was encountered at 4.6 mbgs during drilling.									
11											
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14											
15											
16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: JK

CHECKED: SEMP

PROJECT: 20139990

LOCATION: N 4861999.61; E 651187.68

RECORD OF BOREHOLE: BH20-14

BORING DATE: May 14, 2020

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm

HAMMER TYPE: AUTOMATIC

BORING METHOD: CME 55 Track Mounted Rig; 200 mm Hollow Stem Augers

DEPTH SCALE METRES	DESCRIPTION	ELEV. / DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.3m	ADDITIONAL LAB. TESTING
	GROUND SURFACE	191.41				
0	TOPSOIL	0.00	1A	SS	4	
	(CL-ML) SILTY CLAY to CLAYEY SILT and SAND, trace gravel; brown, oxidation staining (TILL); cohesive, w>PL, hard	191.11 / 0.30	1B			
1			2	SS	44	
	(SM) SILTY SAND, trace gravel; brown, oxidation staining, containing rock fragment (TILL); non-cohesive, moist, very dense	189.96 / 1.45	3	SS	77	
2	(SM) SILTY SAND, trace gravel; brown; non-cohesive, wet, dense	189.20 / 2.21	4	SS	35	
3	(GP) GRAVEL, trace fines; grey; non-cohesive, moist, very dense - Auger grinding at a depth of 3.1 m	188.46 / 2.95	5	SS	50/ 0.1	
4	(CL-ML) SILTY CLAY to CLAYEY SILT and SAND, trace gravel; grey (TILL); cohesive, w~PL, hard	187.55 / 3.86	6	SS	50/ 0.13	MH
6			7	SS	50/ 0.1	
7	(SM) SILTY SAND, trace gravel; grey (TILL); non-cohesive, moist, very dense	184.50 / 6.91	8	SS	50/ 0.13	
9	- No sample recovered between 9.1 m and 9.2 m		9	SS	50/ 0.08	
	END OF BOREHOLE	182.19 / 9.22				

NOTES:

1. Water was encountered at 2.1 m during drilling.

CONTINUED NEXT PAGE

DEPTH SCALE 1 : 50

GOLDER

LOGGED: JK

CHECKED: SEMP

PROJECT: 20139990

LOCATION: N 4861999.61; E 651187.68

RECORD OF BOREHOLE: BH20-14

BORING DATE: May 14, 2020

DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm

HAMMER TYPE: AUTOMATIC

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20, 40, 60, 80); SHEAR STRENGTH Cu, kPa nat V. + Q - ● rem V. ⊕ U - ○ (20, 40, 60, 80)	HYDRAULIC CONDUCTIVITY, k, cm/s (10^{-6}, 10^{-5}, 10^{-4}, 10^{-3}); WATER CONTENT PERCENT Wp ⊢ ○W ⊣ Wl (10, 20, 30, 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		--- CONTINUED FROM PREVIOUS PAGE ---									
10		2. Water was to advance borehole at 4.6 mbgs.									
11											
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16											
17											
18											
19											
20											

DEPTH SCALE

1 : 50

GOLDER

LOGGED: JK

CHECKED: SEMP

RECORD OF BOREHOLE: BH20-15

PROJECT: 20139990
LOCATION: N 4861923.72; E 651264.91
BORING DATE: May 14, 2020
SHEET 1 OF 1
DATUM: Geodetic

SPT/DCPT HAMMER: MASS, 64kg; DROP, 762mm
HAMMER TYPE: AUTOMATIC

BORING METHOD: CME 55 Track Mounted Rig; 200 mm Hollow Stem Augers

DESCRIPTION	ELEV. / DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.3m	ADDITIONAL LAB. TESTING
GROUND SURFACE	184.69				
FILL/REWORKED NATIVE - (CL) sandy SILTY CLAY, trace gravel; brown; trace rootlets; cohesive, moist, firm	0.00	1	SS	5	
(CL-ML) sandy SILTY CLAY to CLAYEY SILT, trace to some gravel; brown, oxidation staining, containing rock fragments (TILL); cohesive, w<PL to w~PL, very stiff to hard	184.00 / 0.69	2	SS	25	
		3	SS	26	
		4	SS	43	
(SM) SILTY SAND, trace gravel; brown; oxidation staining; non-cohesive, moist, very dense	181.72 / 2.97	5	SS	77	MH
(CL-ML) sandy SILTY CLAY to CLAYEY SILT, trace gravel; grey (TILL); cohesive, w<PL to w~PL, hard - Grey at a depth of 4.6 m	180.58 / 4.11	6	SS	99/ 0.28	
		7	SS	97/ 0.25	
END OF BOREHOLE	178.19 / 6.50				

NOTE:

1. Water was encountered at 3.1 mbgs during drilling.

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m: 20 40 60 80
SHEAR STRENGTH Cu, kPa: nat V. + Q - ● rem V. ⊕ U - ○ 20 40 60 80
HYDRAULIC CONDUCTIVITY, k, cm/s: 10^{-6} 10^{-5} 10^{-4} 10^{-3}
WATER CONTENT PERCENT: Wp W Wl 10 20 30 40

PIEZOMETER OR STANDPIPE INSTALLATION

DEPTH SCALE METRES: 0 1 2 3 4 5 6 7 8 9 10

DRAFT

DEPTH SCALE 1 : 50

GOLDER

LOGGED: JK
CHECKED: SEMP

BOREHOLE RECORD

N: 4 860 214 E: 651 867

Stantec

BH 1

CLIENT North Pickering Community Management Inc.
PROJECT No. 122450165
LOCATION Pickering, Ontario
DATUM Geodetic
DATES: BORING October 19, 2015
WATER LEVEL
TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0	150.5	**Gravel Shoulder**	0					
		FILL: brown, gravel and sand, some silt - moist	1	SS	1	200/610	12	
1		- moist to wet	3	SS	2	250/380	50/76	
			5	SS	3	280/280	50/130	58 31 5 6
2	148.5	hard, brown, sandy silty CLAY (CL-ML), TILL - trace to some gravel - moist	8	SS	4	250/280	50/130	
3		- grey	10	SS	5	280/280	50/130	
4			13	SS	6	330/380	50/76	
5			15	SS	7	360/380	50/76	
6			20	SS	8	280/360	50/51	2 42 24 32
8			25	SS	9	250/280	50/130	
9			30	SS	10	360/610	96	
10	140.8	END OF BOREHOLE at	32					

Continued Next Page

UNDRAINED SHEAR STRENGTH (kPa) 50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L
DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m
STANDARD PENETRATION TEST, BLOWS/0.3m
10 20 30 40 50 60 70 80 90 100

- Field Vane Test, kPa
- Remoulded Vane Test, kPa
- Pocket Penetrometer Test, kPa

BOREHOLE RECORD

Stantec

N: 4 860 214 E: 651 867

BH 1

CLIENT North Pickering Community Management Inc.
PROJECT No. 122450165
LOCATION Pickering, Ontario
DATUM Geodetic
DATES: BORING October 19, 2015
WATER LEVEL
TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	UNDRAINED SHEAR STRENGTH (kPa)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10	140.5	approximately 9.8 m below grade. Groundwater observed at approximately 8.8 m below grade in open borehole upon completion of drilling.			33–65						

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

Depth (m): 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20

Depth (ft): 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65

□ Field Vane Test, kPa

◘ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

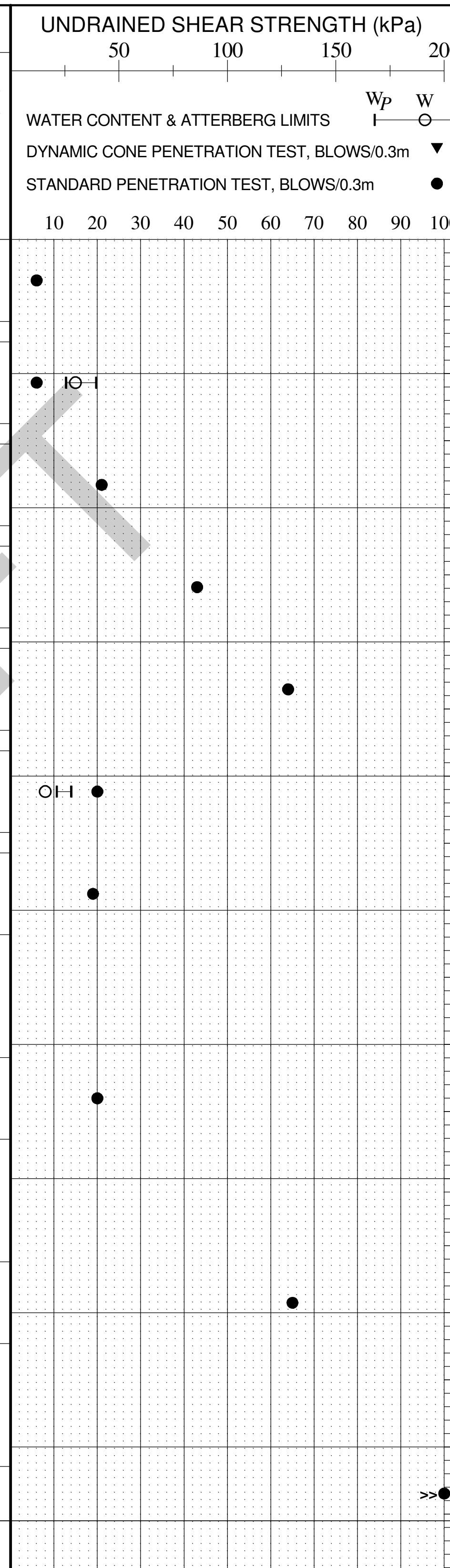
N: 4 860 409 E: 651 800

BH 2

CLIENT: North Pickering Community Management Inc.
PROJECT No.: 122450165
LOCATION: Pickering, Ontario
DATUM: Geodetic
DATES: BORING October 19, 2015
WATER LEVEL:
TPC ELEVATION:

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION
0	**150.0**	**Rough Grass**
0 – 0.9		FILL, brown, silty sand, trace gravel - moist
0.9	149.1	Firm to hard, brown, sandy silty CLAY (CL-ML), TILL - moist
3.6	146.4	Compact to very dense, grey, silty SAND (SM), TILL - some clay, some gravel - moist
9.5	140.5	END OF BOREHOLE at approximately 9.5 m below grade.

DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
1	SS	1	300/610	6	
3.5	SS	2	530/610	6	1 31 37 31
6	SS	3	510/610	21	
8.5	SS	4	460/610	43	
11	SS	5	460/610	64	
13.5	SS	6	560/610	20	14 40 24 22
16	SS	7	360/610	19	
21	SS	8	360/610	20	
26	SS	9	360/610	65	
31	SS	10	360/410	50/100	



Continued Next Page

□ Field Vane Test, kPa
◘ Remoulded Vane Test, kPa
△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

N: 4 860 409 E: 651 800

BH 2

CLIENT North Pickering Community Management Inc.

PROJECT No. 122450165

LOCATION Pickering, Ontario

DATUM Geodetic

DATES: BORING October 19, 2015

WATER LEVEL

TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	UNDRAINED SHEAR STRENGTH (kPa)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10	140.0	Borehole dry and open upon completion of drilling.			33						
20					65						

UNDRAINED SHEAR STRENGTH (kPa): 50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

□ Field Vane Test, kPa

◘ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

DRAFT

Stantec

BOREHOLE RECORD

N: 4 860 172 E: 651 615

BH 3

CLIENT: North Pickering Community Management Inc.

PROJECT No.: 122450165

LOCATION: Pickering, Ontario

DATUM: Geodetic

DATES: BORING October 20, 2015

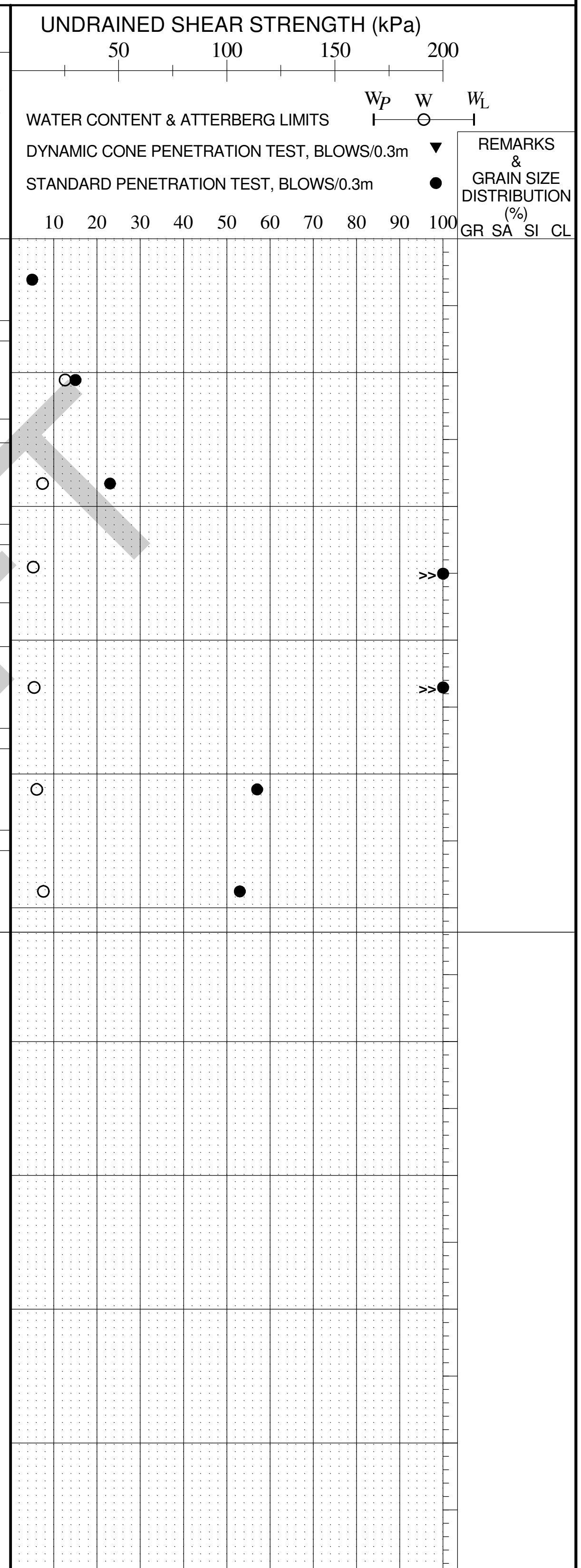
WATER LEVEL:

TPC ELEVATION:

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION
0	159.3	**Rough Grass**
0 – 0.1		100 mm TOPSOIL: sandy silt with organics
0.1 – 1.6		FILL: brown, silty sand with gravel - moist to wet
1.6	157.7	Very stiff to hard, brown, sandy silty CLAY (CL-ML), TILL - trace gravel - moist
3.0		- grey
5.2	154.1	END OF BOREHOLE at approximately 5.2 m below grade. Borehole dry and open upon completion of drilling.

SAMPLES

TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
SS	1	250/610	5
SS	2	430/590	15
SS	3	430/610	23
SS	4	280/430	50/130
SS	5	410/610	104
SS	6	460/610	57
SS	7	460/610	53



□ Field Vane Test, kPa

◘ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 860 308 E: 651 578

BH 4

CLIENT: North Pickering Community Management Inc.

PROJECT No.: 122450165

LOCATION: Pickering, Ontario

DATUM: Geodetic

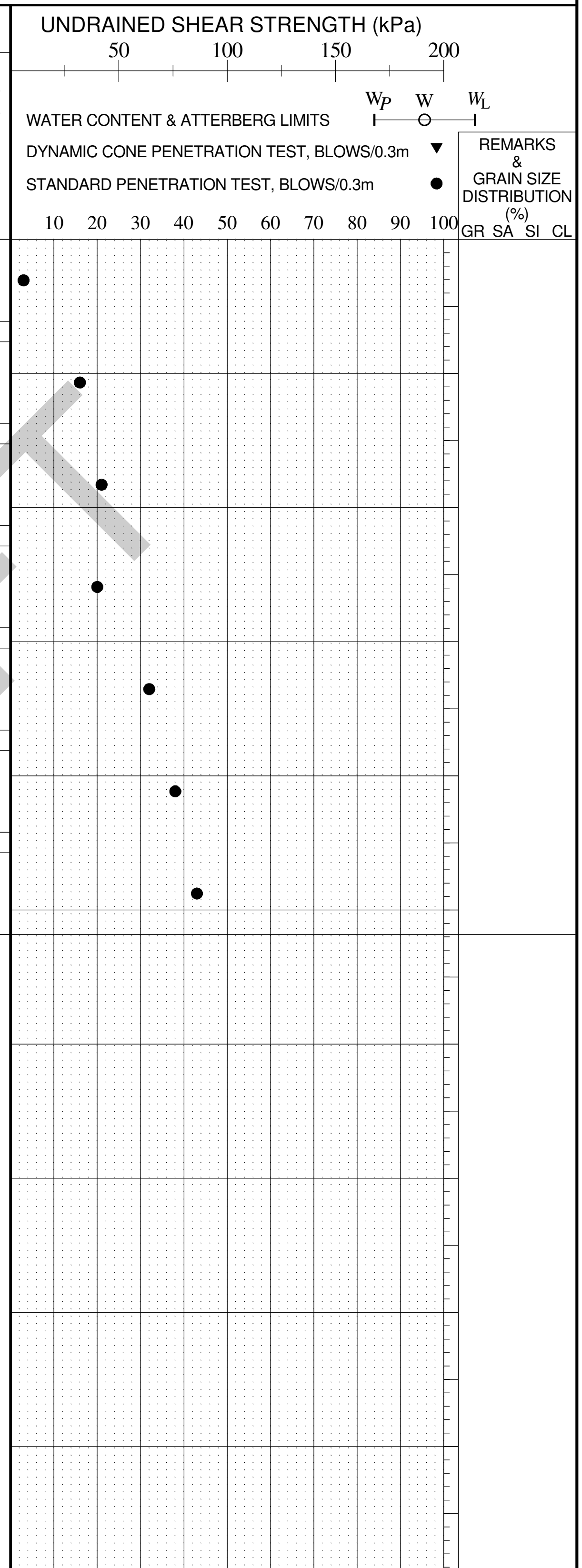
DATES: BORING October 20, 2015

WATER LEVEL:

TPC ELEVATION:

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)
0	**158.5**	**Rough Grass**	0
		TOPSOIL: brown, sandy silt with organics, moist	1
	157.9	Very stiff to hard, sandy silty CLAY (CL-ML), TILL - trace gravel - moist	2–10
3		- grey	10–17
5	153.3	END OF BOREHOLE at approximately 5.2 m below grade. Borehole dry and open upon completion of drilling.	17

SAMPLE TYPE	NUMBER	RECOVERY (mm) / TCR(%) / SCR(%)	N-VALUE OR RQD(%)
SS	1	250/610	3
SS	2	480/610	16
SS	3	460/610	21
SS	4	460/610	20
SS	5	460/610	32
SS	6	530/610	38
SS	7	360/610	43



□ Field Vane Test, kPa

◘ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 860 393 E: 651 552

BH 5

CLIENT: North Pickering Community Management Inc.

PROJECT No.: 122450165

LOCATION: Pickering, Ontario

DATUM: Geodetic

DATES: BORING October 21, 2015

WATER LEVEL:

TPC ELEVATION:

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	SAMPLE TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0	**155.7**	**Rough Grass**	0					
		TOPSOIL: brown, sandy silt with rootlets, moist	1	SS	1	300 / 610	4	
	155.1	Stiff to hard, sandy silty CLAY (CL-ML), TILL - trace gravel - moist - inferred cobbles or boulder based on auger grinding at 1.2 m	3	SS	2	360 / 510	8	
			6	SS	3	380 / 610	25	
			8	SS	4	530 / 610	18	5 40 26 29
			11	SS	5	560 / 610	29	
			13	SS	6	530 / 610	28	
5	150.6		16	SS	7	530 / 610	50	
		END OF BOREHOLE at approximately 5.2 m below grade. Borehole dry and open upon completion of drilling.	17					

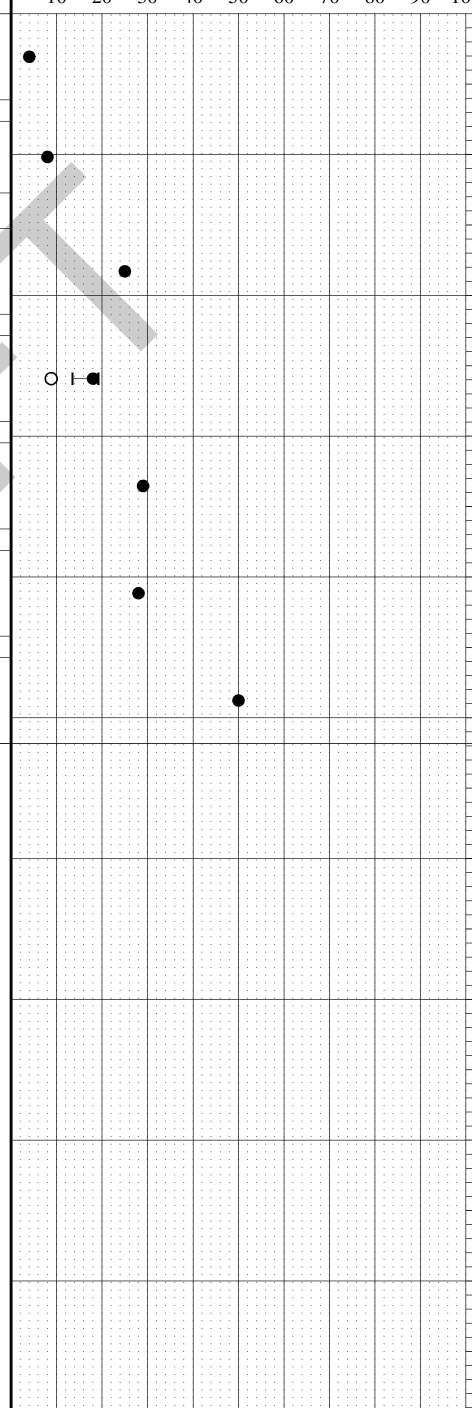
UNDRAINED SHEAR STRENGTH (kPa) 50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100



□ Field Vane Test, kPa

◘ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

N: 4 860 537 E: 651 511

BH 6

Sheet 1 of 1

Stantec

CLIENT North Pickering Community Management Inc. PROJECT No. 122450165

LOCATION Pickering, Ontario DATUM Geodetic

DATES: BORING October 21, 2015 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	SAMPLE TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
0	159.5	**Rough Grass**	0				
	159.3	150 mm TOPSOIL: brown, sandy silt	1	SS	1	410/610	12
1		Stiff to hard, sandy silty CLAY (CL-ML), TILL - trace gravel - moist	3–4	SS	2	580/610	61
2			6	SS	3	510/610	76
			8–9	SS	4	480/610	62
3			11	SS	5	480/610	76
4			13	SS	6	480/280	50/130
	154.5		15–16	SS	7	250/380	50/76
5		END OF BOREHOLE at approximately 5.0 m below grade. Borehole caved at 4.3 m below grade upon completion of drilling. Borehole dry upon completion of drilling.	16				

UNDRAINED SHEAR STRENGTH (kPa) 50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

□ Field Vane Test, kPa

◘ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 861 000 E: 651 530

BH 7A

CLIENT North Pickering Community Management Inc.

PROJECT No. 122450165

LOCATION Pickering, Ontario

DATUM Geodetic

DATES: BORING November 13, 2015

WATER LEVEL

TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	SAMPLE TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
0	159.3	**Rough Grass**	0				
		TOPSOIL: brown, sandy silt with organics, moist	1	SS	1	300/610	4
	158.7	Hard, sandy silty CLAY (CL-ML), TILL - trace gravel - moist	3–4	SS	2	510/610	54
			6	SS	3	460/610	72
			8	SS	4	280/410	50/100
			10–11	SS	5	250/280	50/130
		- grey	13–14	SS	6	380/610	63
			16	SS	7	460/610	54
5.2	154.1	END OF BOREHOLE at approximately 5.2 m below grade. Borehole dry and open upon completion of drilling.	17				

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

DRAFT

Stantec

BOREHOLE RECORD

N: 4 861 319 E: 651 578

BH 8

CLIENT: North Pickering Community Management Inc.

PROJECT No.: 122450165

LOCATION: Pickering, Ontario

DATUM: Geodetic

DATES: BORING: October 19 and 20, 2015

WATER LEVEL:

TPC ELEVATION:

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION
0	159.9	**Rough Grass**
	159.7	200 mm TOPSOIL: brown, sandy silt with organics, moist
		Stiff to hard, sandy silty CLAY (CL-ML), TILL - trace gravel - moist

DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
1	SS	1	330/610	12	
3.5	SS	2	480/610	30	
6	SS	3	530/610	37	
8.5	SS	4	430/610	42	
11	SS	5	530/610	31	
13.5	SS	6	380/610	25	
16	SS	7	560/610	23	
21	SS	8	510/610	67	
25.5	SS	9	280/300	100	
31	SS	10	410/410	50/100	0 46 28 26

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS: W_P, W, W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

Scale: 10 20 30 40 50 60 70 80 90 100

Continued Next Page

□ Field Vane Test, kPa

▣ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

N: 4 861 319 E: 651 578

BH 8

CLIENT North Pickering Community Management Inc.

PROJECT No. 122450165

LOCATION Pickering, Ontario

DATUM Geodetic

DATES: BORING October 19 and 20, 2015

WATER LEVEL

TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10	149.9	Very dense, brown, silty SAND (SM), TILL - some clay - moist to wet			33–36	SS	11	380/410	50/100	
11	148.8	END OF BOREHOLE at approximately 11.1 m below grade. Borehole open upon completion of drilling. Groundwater observed at 10.6 m below grade upon completion of drilling.			37–65					

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS (W_P, W, W_L)

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

>>

□ Field Vane Test, kPa

◘ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

DRAFT

Stantec

BOREHOLE RECORD

N: 4 861 363 E: 651 570

BH 9B

CLIENT North Pickering Community Management Inc. PROJECT No. 122450165

LOCATION Pickering, Ontario DATUM Geodetic

DATES: BORING November 12 and 13, 2015 WATER LEVEL January 7, 2016 TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0	158.3	**Rough Grass**	0					
		TOPSOIL, brown, silty sand with organics and rootlets, moist	1	SS	1	150/610	28	
	157.7	Stiff to hard, brown, sandy silty CLAY (CL-ML), TILL - trace gravel - moist - inferred cobbles and possible boulders based on auger grinding between 0.8 m and 1.5 m	3–4	SS	2	180/610	35	
2			6	SS	3	530/610	12	
			8–9	SS	4	530/610	24	
3			11	SS	5	510/610	11	
4		- brown and grey layers - moist to wet	13–14	SS	6	510/610	13	
5		(water level ▼ at approx. 15.5 ft)	16	SS	7	100/610	22	
	153.0	Very dense, brown, silty SAND (SM) - trace gravel, trace clay - moist to wet	17–20					Non Plastic
6			21	SS	8	460/560	86	1 50 41 8
7–8			25–26	SS	9	200/280	50/130	
9			30–31	SS	10	150/230	50/76	
10			32					

UNDRAINED SHEAR STRENGTH (kPa) 50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

Continued Next Page

□ Field Vane Test, kPa

▣ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 861 363 E: 651 570

BH 9B

CLIENT North Pickering Community Management Inc.
PROJECT No. 122450165
LOCATION Pickering, Ontario
DATUM Geodetic
DATES: BORING November 12 and 13, 2015
WATER LEVEL January 7, 2016
TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	Water content	SPT	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10	**148.3**	Very dense, brown, silty SAND (SM) - trace gravel, trace clay - moist to wet	33–47							
			35	SS	11	130/150	100	~17	100	0 59 38 3 Non Plastic
			41	SS	12	130/610	100	~16	100	
			45	SS	13	180/230	50/76	~21	>>	
14.5	143.8	Very dense, grey, sandy SILT (ML) - trace clay - wet	47–65							
			51	SS	14	100/610	100	~21	100	
			60	SS	15	200/200	50/51	~18	>>	
20										

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

Continued Next Page

□ Field Vane Test, kPa

▪ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 861 363 E: 651 570

BH 9B

CLIENT North Pickering Community Management Inc.

PROJECT No. 122450165

LOCATION Pickering, Ontario

DATUM Geodetic

DATES: BORING November 12 and 13, 2015 WATER LEVEL January 7, 2016

TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) / TCR(%) / SCR(%)	N-VALUE OR RQD(%)
20	138.3	Very dense, grey, sandy SILT (ML) - trace to some clay - wet	66–69				
21			70	SS	16	150/200	50/51
22–23			71–79				
24		- wet	80	SS	17	130/200	50/51
25–27			81–89				
27			90	SS	18	200/230	50/76
28			91–94				
29	129.3	Very dense, grey, sandy SILT (ML) TILL - trace clay, trace gravel - moist	95–98				
30							

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS (W_P, W, W_L)

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

REMARKS & GRAIN SIZE DISTRIBUTION (%): GR SA SI CL

Plotted values: SS 16 — water content ~18%, SPT >>100; SS 17 — water content ~24%, SPT >>100; SS 18 — water content ~21%, SPT >>100.

Continued Next Page

□ Field Vane Test, kPa

◘ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 861 363 E: 651 570

BH 9B

CLIENT North Pickering Community Management Inc.
PROJECT No. 122450165
LOCATION Pickering, Ontario
DATUM Geodetic
DATES: BORING November 12 and 13, 2015
WATER LEVEL January 7, 2016
TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
30	**128.3**	Very dense, grey, sandy SILT (ML) TILL - trace clay, trace gravel - moist			99–101	SS	19	510/610	58	
31	127.2	END OF BOREHOLE at approximately 31.1 m below grade. Groundwater monitoring well installed to a depth of approximately 16.8 m below grade upon completion of drilling. Groundwater level measured at 4.75 m below grade on January 7, 2016. Groundwater level measured at 8.1 m below grade on January 27, 2016.			102–131					

Depth (m) scale: 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40
Depth (ft) scale: 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

□ Field Vane Test, kPa

◘ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 861 467 E: 651 531

BH10B

CLIENT North Pickering Community Management Inc. PROJECT No. 122450165

LOCATION Pickering, Ontario DATUM Geodetic

DATES: BORING October 26, 2015 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0	158.5	**Rough Grass**						
		TOPSOIL: brown, ssandy silt with organics, moist	1	SS	1	360 / 610	5	
	157.9	Firm to very stiff, brown, sandy silty CLAY (CL-ML), TILL - trace gravel - moist	3	SS	2	560 / 610	9	
			6	SS	3	480 / 610	11	
			8	SS	4	410 / 610	17	
3		- wet	11	SS	5	530 / 610	11	
			13	SS	6	530 / 610	18	
	154.2	Compact to very dense, grey, SAND with silt (SP-SM) - wet	16	SS	7	410 / 610	11	
			21	SS	8	460 / 460	102	1 91 7 1
	150.9	Very dense, grey, sandy SILT (SM), TILL - some clay - moist	25	SS	9	200 / 250	50/ 100	
			31	SS	10	250 / 610	100	
10								

Continued Next Page

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS (W_P, W, W_L)

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

Stantec

N: 4 861 467 E: 651 531

BH10B

CLIENT: North Pickering Community Management Inc.

PROJECT No.: 122450165

LOCATION: Pickering, Ontario

DATUM: Geodetic

DATES: BORING October 26, 2015

WATER LEVEL:

TPC ELEVATION:

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	SAMPLE TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
10	148.5	Very dense, grey, sandy SILT (SM), TILL - some clay - moist	33				
			35	SS	11	180/230	50/76
			40	SS	12	200/200	50/51
12.4	146.1	END OF BOREHOLE at approximately 12.4 m below grade. Groundwater level was not measured due to use of drilling mud.	41				

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS (W_P, W, W_L)

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

>>

>>

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

N: 4 861 444 E: 651 551

BH11A

Stantec

CLIENT: North Pickering Community Management Inc. PROJECT No.: 122450165

LOCATION: Pickering, Ontario DATUM: Geodetic

DATES: BORING: November 10 and 11, 2015 WATER LEVEL: January 7, 2016 TPC ELEVATION:

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0	156.6	**Rough Grass**	0					
		TOPSOIL, brown, sandy silt with organics, moist	1	SS	1	280/610	7	
	156.0	Compact to dense, brown, silty clayey SAND (SC-SM) with gravel, TILL - moist - cobbles inferred based on rock pieces in sampler	3	SS	2	280/610	34	
	154.8	Stiff to very stiff, grey, sandy silty CLAY (CL-ML), TILL - trace gravel - moist to wet	6	SS	3	360/610	18	9 27 39 25
			8	SS	4	460/610	13	
3	153.6	Dense to very dense, grey, silty SAND (SM) - trace clay, trace gravel - moist to wet	11	SS	5	480/610	46	
			13	SS	6	360/430	50/130	
			15	SS	7	300/410	50/100	Non Plastic 1 71 24 4
	151.0	Very dense, grey, sandy SILT (ML) TILL - trace to some clay, trace gravel - moist	21	SS	8	530/610	72	
			26	SS	9	510/610	88	
			30	SS	10	200/200	105	
10								

UNDRAINED SHEAR STRENGTH (kPa): 50 100 150 200

WATER CONTENT & ATTERBERG LIMITS: W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

Continued Next Page

□ Field Vane Test, kPa

◘ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 861 444 E: 651 551

BH11A

CLIENT: North Pickering Community Management Inc.
PROJECT No.: 122450165
LOCATION: Pickering, Ontario
DATUM: Geodetic
DATES: BORING: November 10 and 11, 2015
WATER LEVEL: January 7, 2016
TPC ELEVATION:

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION
10	146.6	Very dense, grey, sandy SILT (ML) TILL - trace to some clay, trace gravel - moist
13	143.5	Very dense, grey, sandy SILT (ML) - trace clay - moist
14.6	142.0	Very dense, grey, SAND with silt (SP-SM) - wet
16.7	139.9	Very dense, grey, sandy SILT (ML) - trace clay - moist
18.5	138.1	END OF BOREHOLE at approximately 18.5 m below grade. Groundwater monitoring well installed to a depth of approximately 16.8 m below grade.

SAMPLES

DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	STANDARD PENETRATION TEST, BLOWS/0.3m
35	SS	11	100/150	50/51	>>
40	SS	12	150/230	50/76	>>
45	SS	13	250/300	100	
50	SS	14	200/250	50/100	>>
60	SS	15	150/230	50/76	>>

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS: W_P, W, W_L
DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼
STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

REMARKS & GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

DRAFT

Continued Next Page

□ Field Vane Test, kPa
◘ Remoulded Vane Test, kPa
△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

N: 4 861 444 E: 651 551

BH11A

CLIENT North Pickering Community Management Inc.

PROJECT No. 122450165

LOCATION Pickering, Ontario

DATUM Geodetic

DATES: BORING November 10 and 11, 2015 WATER LEVEL January 7, 2016

TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) TCR(%) / SCR(%)	SAMPLES N-VALUE OR RQD(%)	UNDRAINED SHEAR STRENGTH (kPa)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
20	136.6	Groundwater level measured at 3.3 m below grade on January 7, 2016.			66, 67, 68						
21		Groundwater level measured at 4.3 m below grade on January 27, 2016.			69, 70, 71						
22					72, 73, 74, 75						
23					76, 77, 78						
24					79, 80, 81						
25					82, 83, 84, 85						
26					86, 87, 88						
27					89, 90, 91						
28					92, 93, 94						
29					95, 96, 97, 98						
30											

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

□ Field Vane Test, kPa

◘ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

N: 4 861 439 E: 651 531

BH12A

CLIENT North Pickering Community Management Inc.
LOCATION Pickering, Ontario
DATES: BORING Novrmber 9 and 10, 2015 WATER LEVEL January 7, 2016
PROJECT No. 122450165
DATUM Geodetic
TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	WATER LEVEL	SAMPLE TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
0	157.1	**Rough Grass**					
0.0–0.6	156.5	TOPSOIL, brown, sandy silt with organics, moist		SS	1	280/610	6
0.6–3.8	153.3	Stiff to very stiff, brown, sandy silty CLAY (CL-ML), TILL - trace gravel - moist - grey (at ~2.9 m)	▼ (~2.9 m)	SS	2	510/610	11
				SS	3	150/610	13
				SS	4	510/610	21
				SS	5	480/610	13
3.8–7.1	150.0	Compact to very dense, grey, sandy SILT (ML), - moist to wet		SS	6	300/610	23
				SS	7	300/460	102
				SS	8	330/410	50/100
7.1–8.4	148.7	Very dense, grey to light grey SAND with silt (SP-SM) - moist		SS	9	180/200	50/51
8.4–10		Very dense, grey, sandy SILT (ML) TILL - trace to some clay - moist		SS	10	200/230	50/76

UNDRAINED SHEAR STRENGTH (kPa) 50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

Continued Next Page

□ Field Vane Test, kPa
◘ Remoulded Vane Test, kPa
△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 861 439 E: 651 531

BH12A

CLIENT North Pickering Community Management Inc.
PROJECT No. 122450165
LOCATION Pickering, Ontario
DATUM Geodetic
DATES: BORING Novrmber 9 and 10, 2015
WATER LEVEL January 7, 2016
TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	SAMPLE TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	WATER CONTENT (%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10	**147.1**	Very dense, grey, sandy SILT (ML) TILL - trace to some clay - moist	33–42						
			35	SS	11	230 / 280	50/ 130	10	Non Plastic 0 41 40 19
			40	SS	12	230 / 250	50/ 100		
13	144.0	Very dense, grey, sandy SILT (SM) - trace gravel - moist to wet	43–47						
			45	SS	13	150 / 150	100		
	142.5	Very dense, grey, silty SAND (SM) - trace gravel - moist to wet	48–60						
			50	SS	14	180 / 200	50/ 51		
			60	SS	15	250 / 280	50/ 130		
	138.6	END OF BOREHOLE at approximately 18.6 m below grade. Groundwater monitoring well installed to a depth of approximately 16.8 m below grade.	61–65						
20									

UNDRAINED SHEAR STRENGTH (kPa): 50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

Continued Next Page

□ Field Vane Test, kPa

◘ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

N: 4 861 439 E: 651 531

BH12A

CLIENT: North Pickering Community Management Inc.

PROJECT No.: 122450165

LOCATION: Pickering, Ontario

DATUM: Geodetic

DATES: BORING: Novrmber 9 and 10, 2015

WATER LEVEL: January 7, 2016

TPC ELEVATION:

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	STRATA PLOT	WATER LEVEL	DEPTH (ft)	SAMPLES TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	UNDRAINED SHEAR STRENGTH (kPa) 50 100 150 200 / WATER CONTENT & ATTERBERG LIMITS W_P W W_L / DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼ / STANDARD PENETRATION TEST, BLOWS/0.3m ● / 10 20 30 40 50 60 70 80 90 100	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
20	137.1	Groundwater level measured at 2.89 m below grade on January 7, 2016.			66, 67, 68						
21		Groundwater level measured at 3.4 m below grade on January 27, 2016.			69, 70, 71, 72						
22					73, 74, 75						
23					76, 77, 78						
24					79, 80, 81, 82						
25					83, 84, 85						
26					86, 87, 88						
27					89, 90, 91						
28					92, 93, 94, 95						
29					96, 97, 98						
30											

□ Field Vane Test, kPa

◘ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 861 499 E: 651 524

BH13

CLIENT North Pickering Community Management Inc.

PROJECT No. 122450165

LOCATION Pickering, Ontario

DATUM Geodetic

DATES: BORING October 23 and 26, 2015

WATER LEVEL

TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	SAMPLE TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0	160.7	**Rough Grass**	0					
0–0.6	160.1	TOPSOIL: brown, sandy silt, moist with organics, moist	1	SS	1	250/610	4	
0.6–4.2		Firm to Hard, brown, sandy silty CLAY (CL-ML), TILL - trace gravel - moist	3	SS	2	530/610	6	
			6	SS	3	510/610	11	
			8.5	SS	4	560/610	31	
			11	SS	5	560/610	33	
4.2–6.4		- grey - moist to wet	13.5	SS	6	580/610	39	
			16	SS	7	560/610	21	
6.4	154.3	Very dense to loose, grey, SAND (SP) - trace silt, trace gravel - wet - 1.2 m blowback in hollow stem augers at 7.6 m loosening the soil and affecting N-values	21	SS	8	560/610	95	
			26	SS	9	560/610	9	
			31	SS	10	580/610	21	4 92 3 1
10			32					

Continued Next Page

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 861 499 E: 651 524

BH13

CLIENT: North Pickering Community Management Inc.

PROJECT No.: 122450165

LOCATION: Pickering, Ontario

DATUM: Geodetic

DATES: BORING: October 23 and 26, 2015

WATER LEVEL:

TPC ELEVATION:

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	SAMPLES TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	SPT (BLOWS/0.3m)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10	**150.7**		33						
	150.5	Very dense, grey, sandy SILT (ML), TILL - trace to sme clay, trace gravel - moist	34–35						
11			36	SS	11	430/610	103	>>	
12			37–40						
	148.1		41	SS	12	360/410	50/100	>>	
13		END OF BOREHOLE at approximately 12.6 m below grade. Sand blowback observed at 7.6 m during drilling. Groundwater level was not measured due to use of drilling mud to control sand blowback.	42–65						
20									

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS (W_P, W, W_L)

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

N: 4 861 612 E: 651 523

BH14

Stantec

CLIENT: North Pickering Community Management Inc.

PROJECT No.: 122450165

LOCATION: Pickering, Ontario

DATUM: Geodetic

DATES: BORING: October 22 and 23, 2015

WATER LEVEL:

TPC ELEVATION:

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	SAMPLE TYPE	NUMBER	RECOVERY (mm) / TCR(%) / SCR(%)	N-VALUE OR RQD(%)
0	162.2	**Rough Grass**				
	162.0	150 mm TOPSOIL: brown, sandy silt with organics, moist	SS	1	330/610	8
	161.4	Loose, brown, silty sand, moist				
1		Hard, brown, sandy silty CLAY (CL-ML), TILL - trace gravel - moist - inferred cobbles and possible boulders based on auger griding between 1.5 m and 2.3 m	SS	2	510/610	30
			SS	3	330/380	50/76
2			SS	4	250/610	101
3			SS	5	76/76	50/76
4			SS	6	250/380	50/76
		- grey	SS	7	250/280	50/130
6		- moist to wet	SS	8	250/250	50/100
7			SS	9	250/250	50/100
	153.5	Very dense, grey, sandy SILT (SM) - trace clay - wet				
9			SS	10	430/430	50/130
10						

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS: W_P, W, W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

REMARKS & GRAIN SIZE DISTRIBUTION (%): GR SA SI CL

Continued Next Page

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

DRAFT

Stantec

BOREHOLE RECORD

N: 4 861 612 E: 651 523

BH14

CLIENT North Pickering Community Management Inc.

PROJECT No. 122450165

LOCATION Pickering, Ontario

DATUM Geodetic

DATES: BORING October 22 and 23, 2015

WATER LEVEL

TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	Water content	SPT, blows/0.3m	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10	**152.2**	Very dense, grey, sandy SILT (SM) - trace clay - wet	33–35							
11			36	SS	11	460/610	105	○	>>●	
12			41	SS	12	530/530	103	○	>>●	0 50 41 9
14			46	SS	13	51/410	50/100	○	>>●	
15	146.7		50	SS	14	130/200	50/51	○	>>●	
		END OF BOREHOLE at approximately 15.4 m below grade. Borehole caved at 9.1 m below grade upon completion of drilling. Borehole dry upon completion of drilling.	51–65							

UNDRAINED SHEAR STRENGTH (kPa) 50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

□ Field Vane Test, kPa

◘ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

N: 4 861 849 E: 651 412

Stantec

BH15A

CLIENT: North Pickering Community Management Inc.

PROJECT No.: 122450165

LOCATION: Pickering, Ontario

DATUM: Geodetic

DATES: BORING October 22, 2015

WATER LEVEL:

TPC ELEVATION:

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION
0	175.2	**Rough Grass**
0		TOPSOIL: brown, sandy silt with organics, moist - trace rootlets
0.6	174.6	Hard, brown, sandy silty CLAY (CL-ML), TILL - trace gravel - moist
~3.1		- occasional wet silty sand seams and layers
7.6	167.6	Very dense, grey, sandy SILT (ML), TILL - some clay, trace gravel - moist to wet

SAMPLES

TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
SS	1	280/610	9	
SS	2	460/590	74	
SS	3	530/610	44	
SS	4	530/610	63	
SS	5	380/430	50/130	
SS	6	280/410	50/100	
SS	7	510/590	82	7 39 27 27
SS	8	510/530	85	
SS	9	510/530	83	
SS	10	150/150	50/25	

UNDRAINED SHEAR STRENGTH (kPa): 50 100 150 200

WATER CONTENT & ATTERBERG LIMITS (W_P W W_L)

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

DRAFT

Continued Next Page

□ Field Vane Test, kPa

◘ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

N: 4 861 849 E: 651 412

BH15A

CLIENT North Pickering Community Management Inc.

PROJECT No. 122450165

LOCATION Pickering, Ontario

DATUM Geodetic

DATES: BORING October 22, 2015

WATER LEVEL

TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
10	165.2	Very dense, grey, sandy SILT (ML), TILL - some clay, trace gravel - moist to wet	33				
			35	SS	11	100/130	50/130
11–12			36–40				
	162.5		41	SS	12	150/480	82
13–20		END OF BOREHOLE at approximately 12.7 m below grade. Groundwater seepage observed from wet silty sand seams at 3.0 m below grade during drilling.	42–65				

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS: W_P, W, W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

REMARKS & GRAIN SIZE DISTRIBUTION (%): GR SA SI CL

>>

- □ Field Vane Test, kPa
- ◘ Remoulded Vane Test, kPa
- △ Pocket Penetrometer Test, kPa

DRAFT

Stantec

BOREHOLE RECORD

N: 4 862 034 E: 651 349

BH16

CLIENT: North Pickering Community Management Inc.

PROJECT No.: 122450165

LOCATION: Pickering, Ontario

DATUM: Geodetic

DATES: BORING: October 21, 2015

WATER LEVEL:

TPC ELEVATION:

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) / TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0	**179.0**	**Rough Grass**	0					
		TOPSOIL: brown, sandy silt with organics, moist - trace rootlets	1	SS	1	300/610	7	
	178.4	Hard, brown, sandy silty CLAY (CL-ML), TILL - trace gravel - moist	3–4	SS	2	410/610	35	
			5	SS	3	180/180	50/25	
		- moist to damp	8	SS	4	280/380	50/76	9 38 27 26
3			10	SS	5	150/200	50/51	
		- grey - occasional silty sand seams and layers - moist	13	SS	6	200/230	50/76	
5			16	SS	7	360/610	69	
			21	SS	8	250/610	86	
8			25	SS	9	150/230	50/76	
9			30	SS	10	150/130	50/130	
10		Continued Next Page						

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

□ Field Vane Test, kPa

◘ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

DRAFT

BOREHOLE RECORD

N: 4 862 034 E: 651 349

BH16

CLIENT: North Pickering Community Management Inc.
LOCATION: Pickering, Ontario
DATES: BORING October 21, 2015
WATER LEVEL:
PROJECT No.: 122450165
DATUM: Geodetic
TPC ELEVATION:

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	SAMPLE TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
10	169.0	Hard, grey, sandy silty CLAY (CL-ML), TILL - trace gravel - moist	33–40	SS	11	150/350	50/51
12	166.7		40	SS	12	150/180	50/25
		END OF BOREHOLE at approximately 12.4 m below grade. Borehole open to 11.3 m below grade and dry upon completion of drilling.	41–65				

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

□ Field Vane Test, kPa
◘ Remoulded Vane Test, kPa
△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 862 237 E: 651 288

BH17A

CLIENT: North Pickering Community Management Inc.

LOCATION: Pickering, Ontario

DATES: BORING October 27, 2015

WATER LEVEL:

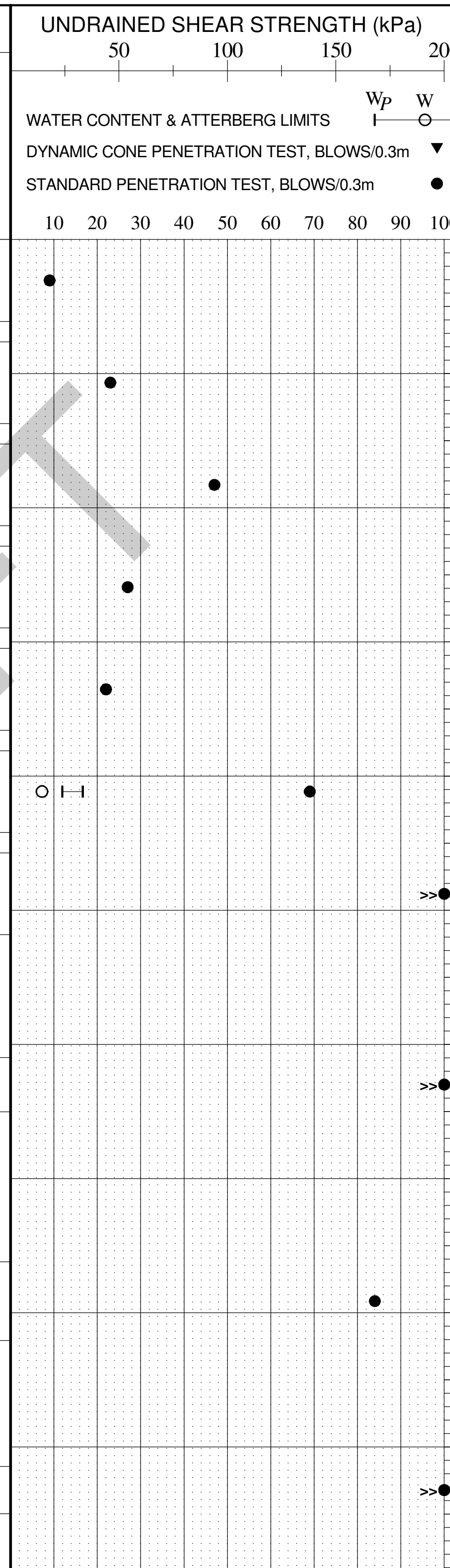
PROJECT No. 122450165

DATUM: Geodetic

TPC ELEVATION:

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION
0	181.2	**Rough Grass**
0 – 0.6	180.6	TOPSOIL: brown, sandy silt with organics, moist - trace rootlets
0.6 – 4.6		Compact to very dense, brown, silty clayey SAND (SC-SM), TILL - trace to some gravel - moist
4.6 – 9.2	172.0	- grey - occasional wet silty sand seams and layers - inferred cobbles and possible boulder based on auger grinding at 6.4 m
9.2 – 10		Very dense, brown, silty SAND (SM), TILL - trace to some clay, trace to some gravel

SAMPLE TYPE	NUMBER	RECOVERY (mm)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
SS	1	300/610	9	
SS	2	380/610	23	
SS	3	410/610	47	
SS	4	480/610	27	
SS	5	430/610	22	
SS	6	530/610	69	12 39 24 25
SS	7	430/610	102	
SS	8	410/410	50/100	
SS	9	480/590	84	
SS	10	250/350	50/51	



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□ Field Vane Test, kPa

◘ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 862 237 E: 651 288

BH17A

CLIENT North Pickering Community Management Inc.
PROJECT No. 122450165
LOCATION Pickering, Ontario
DATUM Geodetic
DATES: BORING October 27, 2015
WATER LEVEL
TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
10	171.2	- moist Very dense, brown, silty SAND (SM), TILL - trace to some clay, trace to some gravel - moist	33–36	SS	11	510/590	65
12			40–41	SS	12	360/430	50/130
13	167.9	Very dense, grey, SAND with silt (SP-SM) - moist to wet	45–46	SS	13	380/380	50/76
15	165.6		50–51	SS	14	280/300	100
15.5		END OF BOREHOLE at approximately 15.5 m below grade. Borehole caved at 11.0 m below grade upon completion of drilling. Groundwater level measured at 6.1 m below grade upon completion of drilling.					

UNDRAINED SHEAR STRENGTH (kPa): 50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

SPT plot: SS 11 at ~65; SS 12 >>100; SS 13 >>100; SS 14 at 100.

REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

□ Field Vane Test, kPa
▣ Remoulded Vane Test, kPa
△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

N: 4 860 313 E: 651 832

BH101

CLIENT: North Pickering Community Management Inc.

PROJECT No.: 122450165

LOCATION: Pickering, Ontario

DATUM: Geodetic

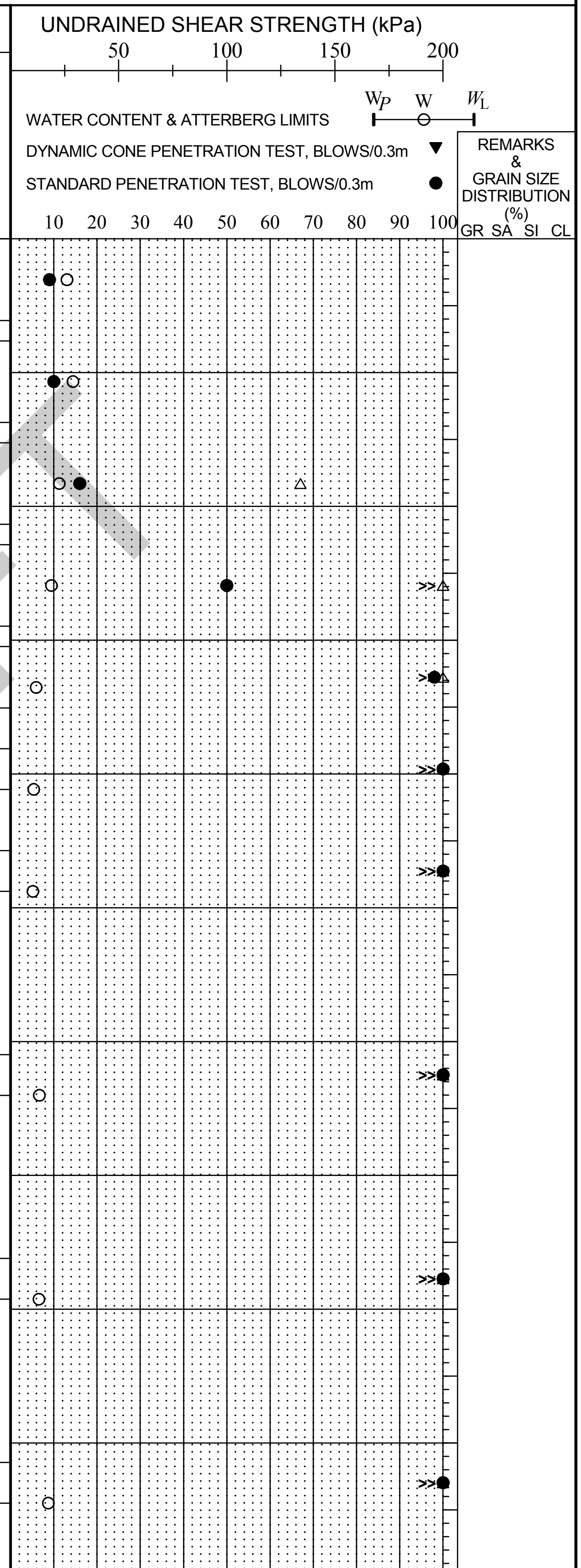
DATES: BORING: June 6, 2018

WATER LEVEL: June 20, 2018

TPC ELEVATION:

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION
0	**153.0**	**Grass covered road shoulder**
		Loose, brown SILTY SAND - trace organics and rootlets - moist
	152.4	Stiff to hard, brown SANDY CLAY (CL), TILL - moist to wet
		- inferred cobbles and boulders due to auger grinding from 3.0 m to 17.2 m
	148.4	- grey
10		

SAMPLE TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
SS	1	560/610	9
SS	2	510/610	10
SS	3	580/610	16
SS	4	460/610	50
SS	5	460/460	98
SS	6	300/300	50/150
SS	7	300/300	50/150
SS	8	300/300	50/150
SS	9		50/150
SS	10	300/300	50/150



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□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 860 313 E: 651 832

BH101

CLIENT North Pickering Community Management Inc.

PROJECT No. 122450165

LOCATION Pickering, Ontario

DATUM Geodetic

DATES: BORING June 6, 2018

WATER LEVEL June 20, 2018

TPC ELEVATION

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

REMARKS & GRAIN SIZE DISTRIBUTION (%): GR SA SI CL

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10	143.0	Hard, grey SANDY CLAY (CL), TILL - moist	33					
11			35–36	SS	11		94	
12			40–41	SS	12		57	9 24 39 28
14			45–46	SS	13	380/380	50/76	
15			50–51	SS	14	530/530	76	
17	135.8		55–56	SS	15	460/460	75	
		End of Borehole at 17.2 m below grade. Groundwater monitoring well installed with a screen from 9.1 m to 12.2 m below grade. Static groundwater level measured in monitoring well at 3.03 m below grade on June 20, 2018.	57–65					

□ Field Vane Test, kPa

◘ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

N: 4 860 452 E: 651 788

BH102

CLIENT: North Pickering Community Management Inc.

PROJECT No.: 122450165

LOCATION: Pickering, Ontario

DATUM: Geodetic

DATES: BORING June 7, 2018

WATER LEVEL:

TPC ELEVATION:

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION
0	148.3	**Grass**
0–0.6		Loose, brown sandy TOPSOIL - trace gravel - moist
0.6	147.7	Loose to dense, brown SILTY CLAYEY SAND with GRAVEL (SC-SM), TILL - moist
		- inferred cobbles and boulders due to auger grinding from 2.4 m to 12.2 m
3.0	145.3	- grey - compact to very dense - moist to wet

Water level symbol (▽) at approx. 2.1 m.

TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	DEPTH (ft)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
SS	1	580/610	6	1	
SS	2	560/610	5	3.5	
SS	3	510/610	12	6	
SS	4	510/610	40	8.5	
SS	5	480/610	39	11	
SS	6	460/610	22	13.5	
SS	7	360/610	19	16	
SS	8	360/610	69	21	16 42 25 17
SS	9	480/610	10	26	
SS	10	360/460	82	31	

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS: W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

Continued Next Page

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 860 452 E: 651 788

BH102

CLIENT North Pickering Community Management Inc.
PROJECT No. 122450165
LOCATION Pickering, Ontario
DATUM Geodetic
DATES: BORING June 7, 2018
WATER LEVEL
TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	SAMPLE TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
10	138.3	Very dense, grey SILTY CLAYEY SAND with GRAVEL (SC-SM), TILL - moist	33–35				
11			36	SS	11	510/610	68
12	136.1	Dense, brown to grey SAND - moist to wet	40				
			41	SS	12	430/610	34
	135.5	End of Borehole at 12.8 m below grade. Borehole open to 5.8 m below grade. Groundwater level measured in open borehole at approximately 2.1 m below grade upon completion of borehole.	42				

Depth scale: 10–20 m; 33–65 ft.

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

>>

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 860 869 E: 651 657

BH103

CLIENT North Pickering Community Management Inc. PROJECT No. 122450165

LOCATION Pickering, Ontario DATUM Geodetic

DATES: BORING June 7, 2018 WATER LEVEL TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	WATER LEVEL	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	Water content (%)	SPT blows/0.3m	Pocket Penetrometer	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0	151.2	**Grass**		0								
		Compact, brown SAND and GRAVEL - trace organics and rootlets - moist		1	SS	1	460/610	12				
	150.6	Loose to very dense, brown SILTY CLAYEY SAND (SC-SM), TILL - moist		3–4	SS	2	530/610	7				
2				6	SS	3	560/610	24			>>	
			∇	8–9	SS	4	560/610	40			>>	
3		- inferred cobbles and boulders due to auger grinding from 3.0 m to 11.0 m		11	SS	5	510/610	50			>>	
4				13–14	SS	6	530/610	39			>>	
5				16	SS	7	510/610	38			>>	
6		- wet to moist		21	SS	8	510/610	80				3 67 17 13
8				25–26	SS	9	280/300	50/150		>>		
9				30	SS	10	150/150	50/150		>>		

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

Continued Next Page

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 860 869 E: 651 657

BH103

CLIENT North Pickering Community Management Inc.

PROJECT No. 122450165

LOCATION Pickering, Ontario

DATUM Geodetic

DATES: BORING June 7, 2018

WATER LEVEL

TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	SAMPLE TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10	141.2	Very dense, brown SILTY CLAYEY SAND (SC-SM), TILL - wet	33–35					
	140.6	- 150 mm silt layer	35	SS	11	150/150	50/150	
11	140.4	Compact, grey SILTY CLAYEY SAND (SC-SM), TILL - wet	36–42					
12			41	SS	12	430/610	13	
	138.4	End of Borehole at 12.8 m below grade. Borehole open to 3.6 m below grade. Groundwater level measured in open borehole at approximately 2.4 m below grade upon completion of borehole.	42					

UNDRAINED SHEAR STRENGTH (kPa) 50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

□ Field Vane Test, kPa

◘ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

N: 4 861 101 E: 651 612

BH104

Stantec

CLIENT	North Pickering Community Management Inc.
PROJECT No.	122450165
LOCATION	Pickering, Ontario
DATUM	Geodetic
DATES: BORING	June 8, 2018
WATER LEVEL	June 20, 2018
TPC ELEVATION	

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION
0	160.5	**Old Hay Field**
		Loose, brown SAND - organics - trace rootlets - moist
0.6	159.9	Very dense, brown CLAYEY SAND with GRAVEL (SC), TILL - moist - inferred cobbles and boulders due to auger grinding from 2.2 m to 16.0 m
4.5	156.0	- grey

Water level symbol shown at approximately 5.4 m depth.

SAMPLES

DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) / TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
1	SS	1	530/610	10	
3.5	SS	2	510/530	58	
6	SS	3	560/610	50	
8.5	SS	4	510/610	47	
11	SS	5	530/610	51	
13.5	SS	6	580/610	55	20 33 25 22
16	SS	7	530/610	50	
21	SS	8	410/460	80	
26	SS	9	560/610	38	
31	SS	10	510/530	65	

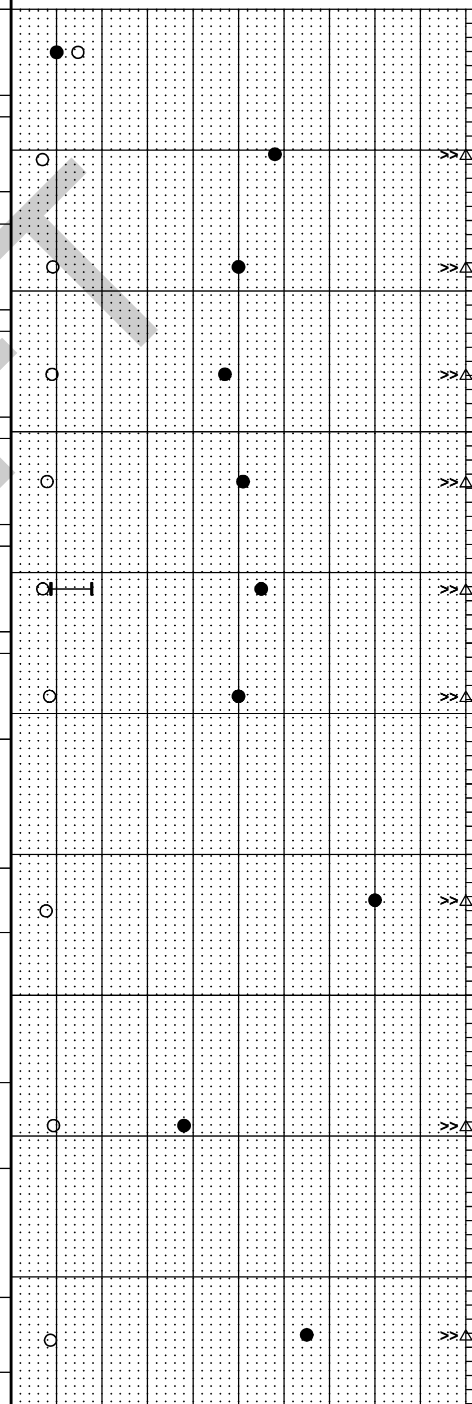
UNDRAINED SHEAR STRENGTH (kPa) 50 100 150 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100



Continued Next Page

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

N: 4 861 101 E: 651 612

BH104

Stantec

CLIENT: North Pickering Community Management Inc.
PROJECT No.: 122450165
LOCATION: Pickering, Ontario
DATUM: Geodetic
DATES: BORING June 8, 2018
WATER LEVEL June 20, 2018
TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	SAMPLE TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10	150.5	Very dense, grey CLAYEY SAND with GRAVEL (SC), TILL - moist	33–35					
11			36	SS	11	510/610	61	
12			40	SS	12	150/150	50/1300	
13.7	146.8	Hard, grey SANDY SILTY CLAY (CL-ML), TILL - moist	45	SS	13	51/61	50/1300	
14			46					4 36 41 19
15			50	SS	14	76/76	50/1300	
16.9	143.6		55	SS	15	150/150	50/1300	
17–20		End of Borehole at 16.9 m below grade. Groundwater monitoring well installed with a screen from 6.1 m to 9.1 m below grade. Static groundwater level measured in monitoring well at 5.41 m below grade on June 20, 2018.	56–65					

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS (W_P, W, W_L)

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

>>

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 861 186 E: 651 603

BH105

CLIENT North Pickering Community Management Inc.
PROJECT No. 122450165
LOCATION Pickering, Ontario
DATUM Geodetic
DATES: BORING June 7 and 8, 2018
WATER LEVEL
TPC ELEVATION

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)
0	161.3	**Hay Field**	0				
		Loose, brown SILTY SAND - organics - moist -inferred cobbles and boulders due to auger grinding from 1.0 m to 9.0 m	1	SS	1	580/610	10
1			3	SS	2	25/100	50/100
	159.8	Loose to dense, brown to grey SILTY CLAYEY SAND (SC-SM), TILL - moist	6	SS	3	580/610	10
2–3			8–9	SS	4	610/610	34
3			11	SS	5	560/610	38
4			13–14	SS	6	560/610	32
5			16	SS	7	560/610	33
6			21	SS	8	580/610	42
8			26	SS	9	580/610	41
9	152.1	Dense to very dense, brown SILTY SAND (SM) - moist to wet	30	SS	10	0.0/150	50/150
10			32				

10 20 30 40 50 60 70 80 90 100

DRAFT

Continued Next Page

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

Stantec

BOREHOLE RECORD

N: 4 861 186 E: 651 603

BH105

CLIENT: North Pickering Community Management Inc.

PROJECT No.: 122450165

LOCATION: Pickering, Ontario

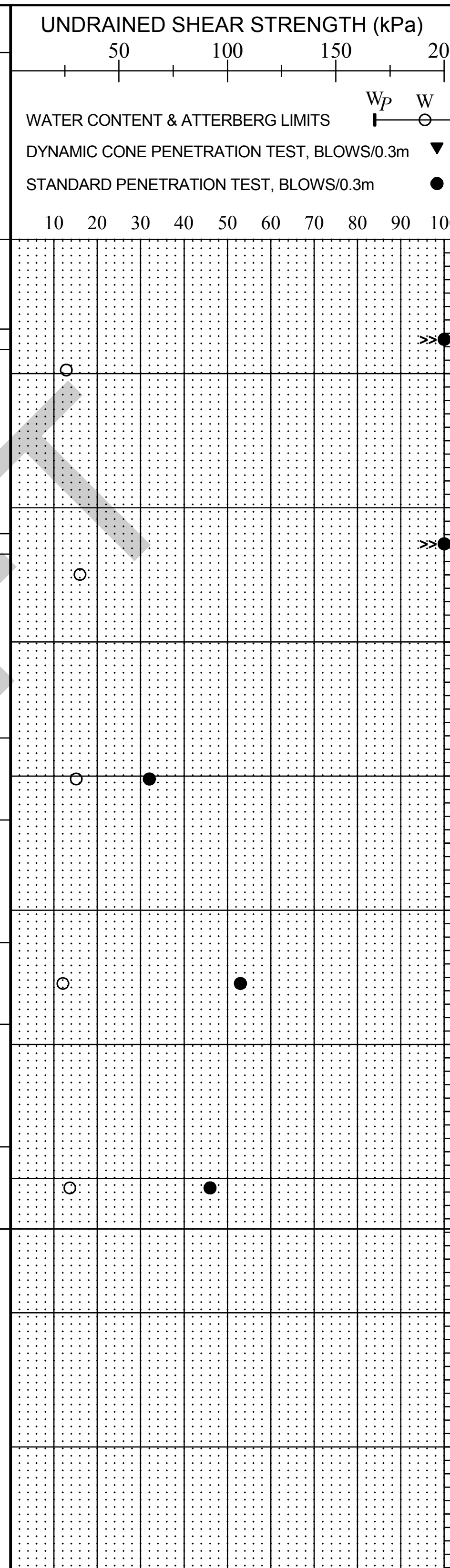
DATUM: Geodetic

DATES: BORING June 7 and 8, 2018

WATER LEVEL:

TPC ELEVATION:

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10	151.3	Very dense, brown SILTY SAND (SM) - wet	33–35					
			35	SS	11	150/150	50/150	
11–12			36–40					
			40	SS	12	150/150	50/150	
13			41–45					
14		- dense	46	SS	13	460/610	32	
15			47–50					
		- very dense	51	SS	14	410/610	53	0 80 15 5
16			52–55					
17	143.9	- dense	56	SS	15	360/610	46	
18–20		End of Borehole at 17.4 m below grade. Borehole open to 9.1 m below grade upon completion.	57–65					



□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

N: 4 861 318 E: 651 580

BH106

CLIENT: North Pickering Community Management Inc.
PROJECT No.: 122450165
LOCATION: Pickering, Ontario
DATUM: Geodetic
DATES: BORING June 11, 2018
WATER LEVEL June 20, 2018
TPC ELEVATION

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0	159.9		0					
	159.6	Loose, dark brown TOPSOIL - moist	1	SS	1	380/610	7	
		Very stiff to hard, brown SANDY CLAY (CL), TILL - moist	3	SS	2	580/610	20	
2		- inferred cobbles and boulders due to auger grinding from 1.8 m to 10.5 m	6	SS	3	580/610	38	
			8	SS	4	530/610	36	
3			11	SS	5	530/610	30	
4			13	SS	6	530/610	16	
5			16	SS	7	560/610	22	6 31 40 23
6			21	SS	8	560/610	72	
7			25	SS	9	150/150	50/150	
9			30	SS	10	200/300	50/150	
10		Continued Next Page						

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS: W_P, W, W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

10 20 30 40 50 60 70 80 90 100

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

BOREHOLE RECORD

N: 4 861 318 E: 651 580

BH106

CLIENT: North Pickering Community Management Inc.
PROJECT No.: 122450165
LOCATION: Pickering, Ontario
DATUM: Geodetic
DATES: BORING June 11, 2018
WATER LEVEL: June 20, 2018
TPC ELEVATION:

DEPTH (m)	ELEVATION (m)	STRATA DESCRIPTION	DEPTH (ft)	TYPE	NUMBER	RECOVERY (mm) TCR(%) / SCR(%)	N-VALUE OR RQD(%)	Water content / SPT / DCPT	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
10	**149.8**	Hard, brown SANDY CLAY (CL), TILL	33–34						
	149.2	Very dense to loose, brown to grey SILTY SAND (SM) - moist to wet	35–36	SS	11	280/300	50/150	>>	0 73 21 6
11–12			40–42	SS	12	560/610	8		
13–14			45–47	AS	13				
	145.5	End of Borehole at 13.7 m below grade. Groundwater monitoring well installed with a screen from 7.3 m to 10.4 m below grade. Static groundwater level measured in monitoring well at 9.65 m below grade on June 20, 2018.	47–65						
15–20									

UNDRAINED SHEAR STRENGTH (kPa): 50, 100, 150, 200

WATER CONTENT & ATTERBERG LIMITS: W_P W W_L

DYNAMIC CONE PENETRATION TEST, BLOWS/0.3m ▼

STANDARD PENETRATION TEST, BLOWS/0.3m ●

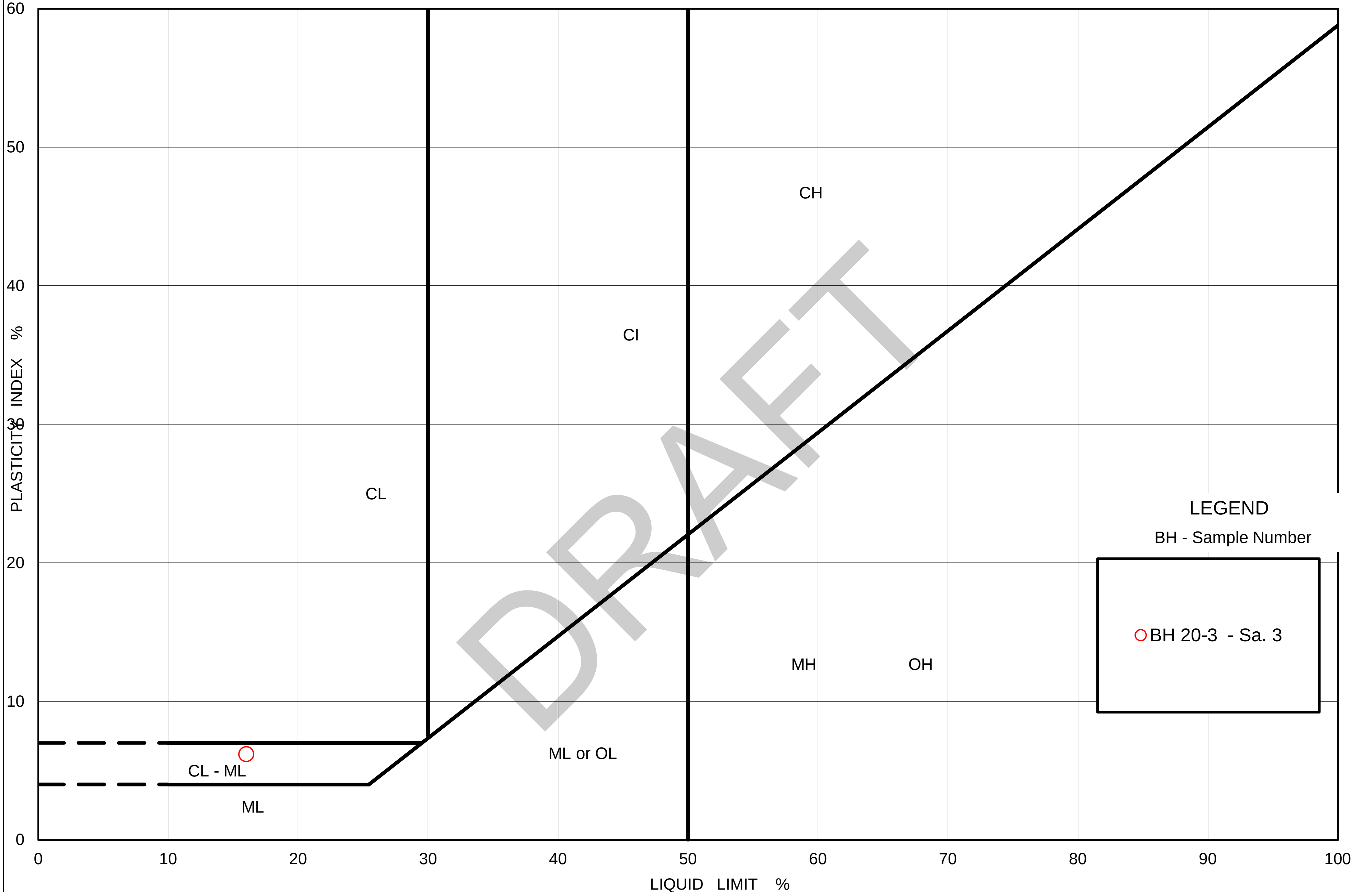
10 20 30 40 50 60 70 80 90 100

□ Field Vane Test, kPa

■ Remoulded Vane Test, kPa

△ Pocket Penetrometer Test, kPa

LIQUID LIMIT, PLASTIC LIMIT, AND PLASTICITY INDEX OF SOILS (ASTM D4318)



GOLDER

PLASTICITY CHART

(CL-ML) SILTY CLAY to CLAYEY SILT and SAND (TILL)

Figure No.: 2

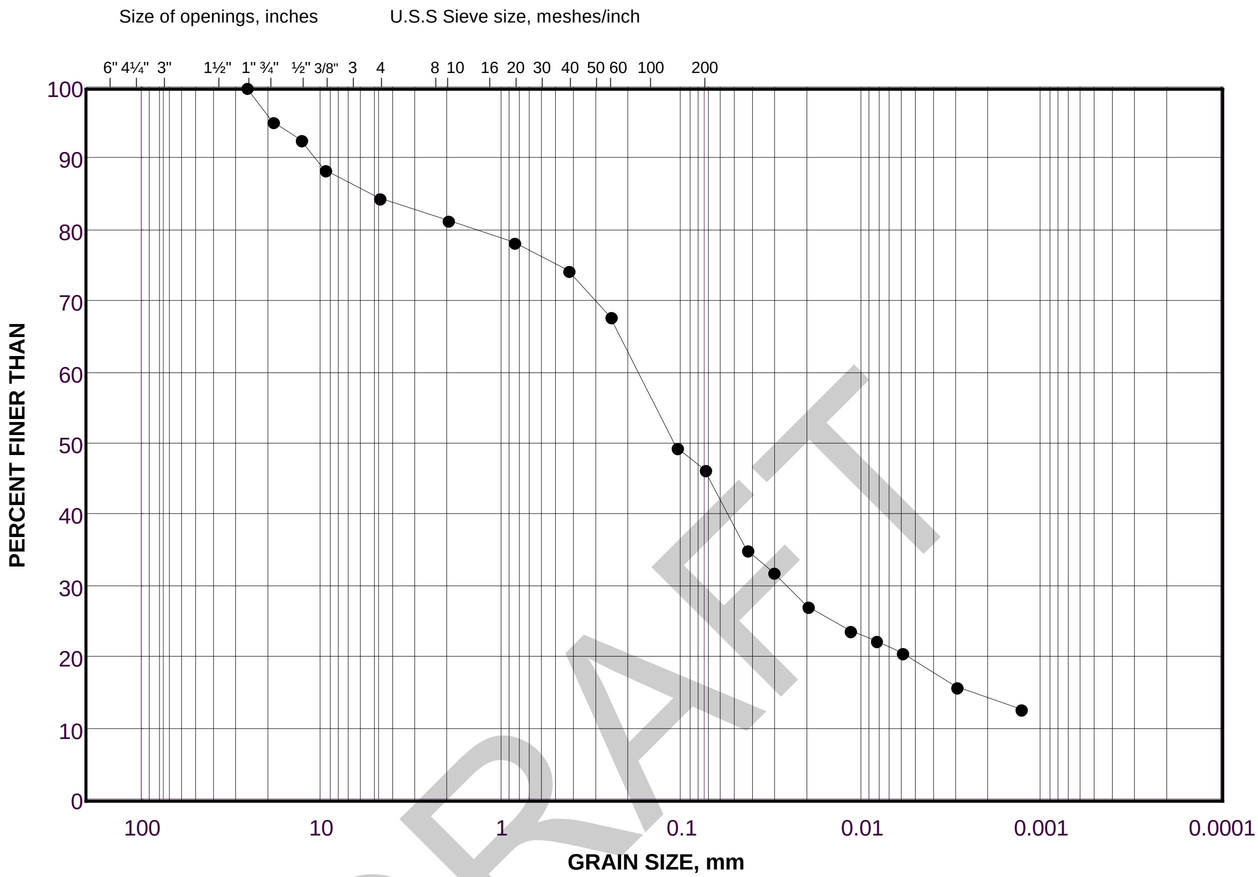
Project No.: 20140088

Checked By: TO

GRAIN SIZE DISTRIBUTION

(CL-ML) SILTY CLAY to CLAYEY SILT and SAND (TILL)

FIGURE 3



COBBLE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY SIZES
SIZE	GRAVEL SIZE		SAND SIZE			FINE GRAINED

LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●	20-3	3	1.50 - 1.95

Project Number: 20140088

Checked By: TO

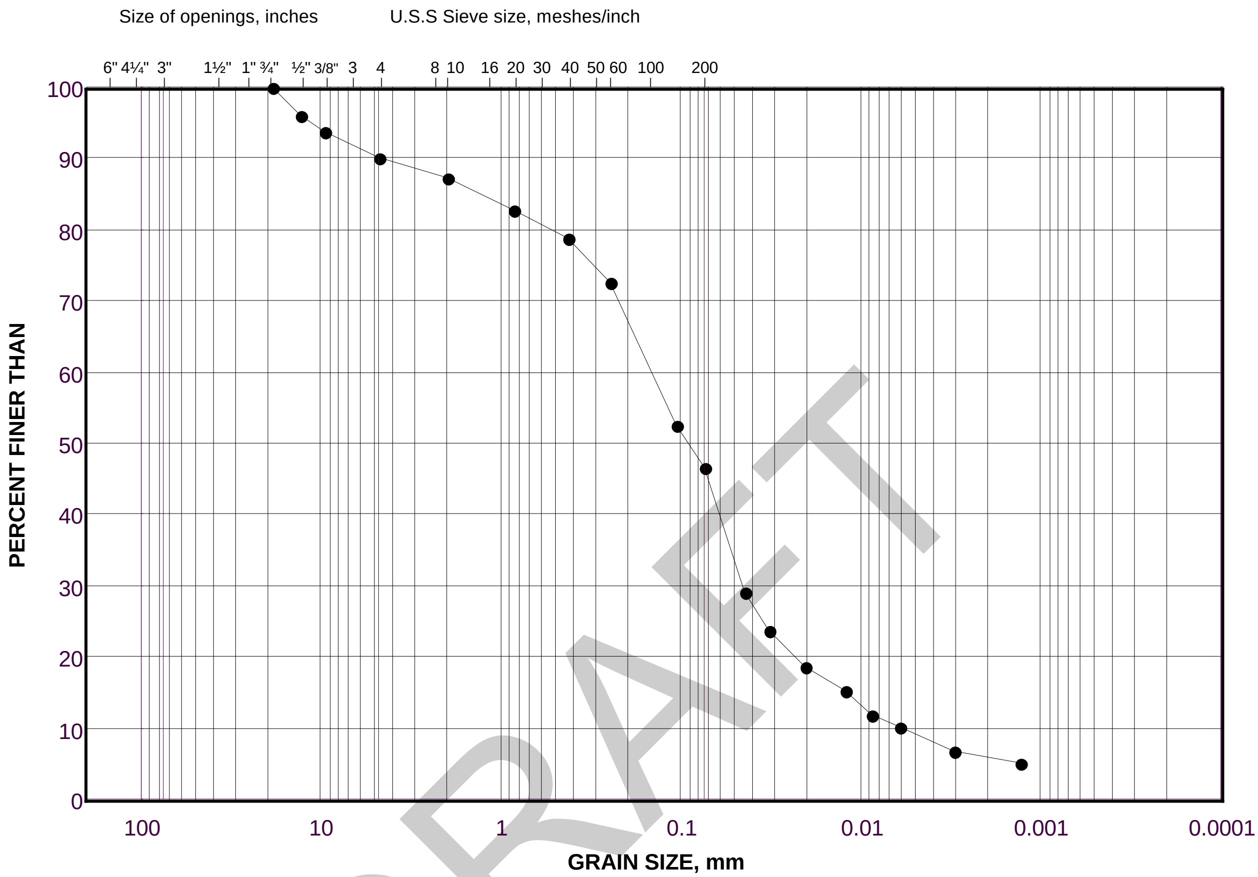
Golder Associates

Date: 30-Jun-20

GRAIN SIZE DISTRIBUTION

(SM) SILTY SAND (TILL)

FIGURE 4



COBBLE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY SIZES
SIZE	GRAVEL SIZE		SAND SIZE			FINE GRAINED

LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●	20-9	4	2.25 - 2.70

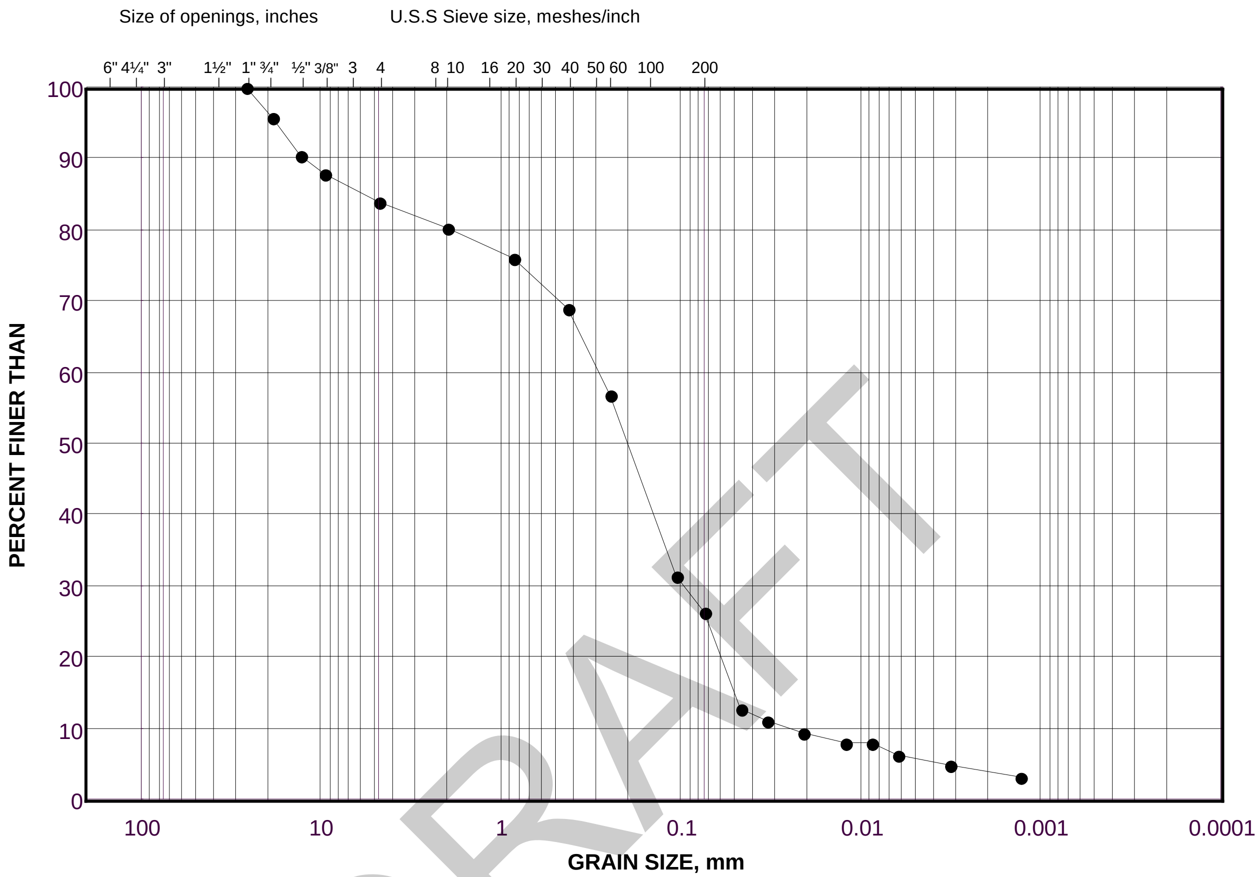
Project Number: 20140088

Checked By: TO

Golder Associates

Date: 30-Jun-20

GRAIN SIZE DISTRIBUTION (SM) SILTY SAND	FIGURE 5



COBBLE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY SIZES
SIZE	GRAVEL SIZE		SAND SIZE			FINE GRAINED

LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●	20-7	6	4.50 - 4.95

Project Number: 20140088

Checked By: TO

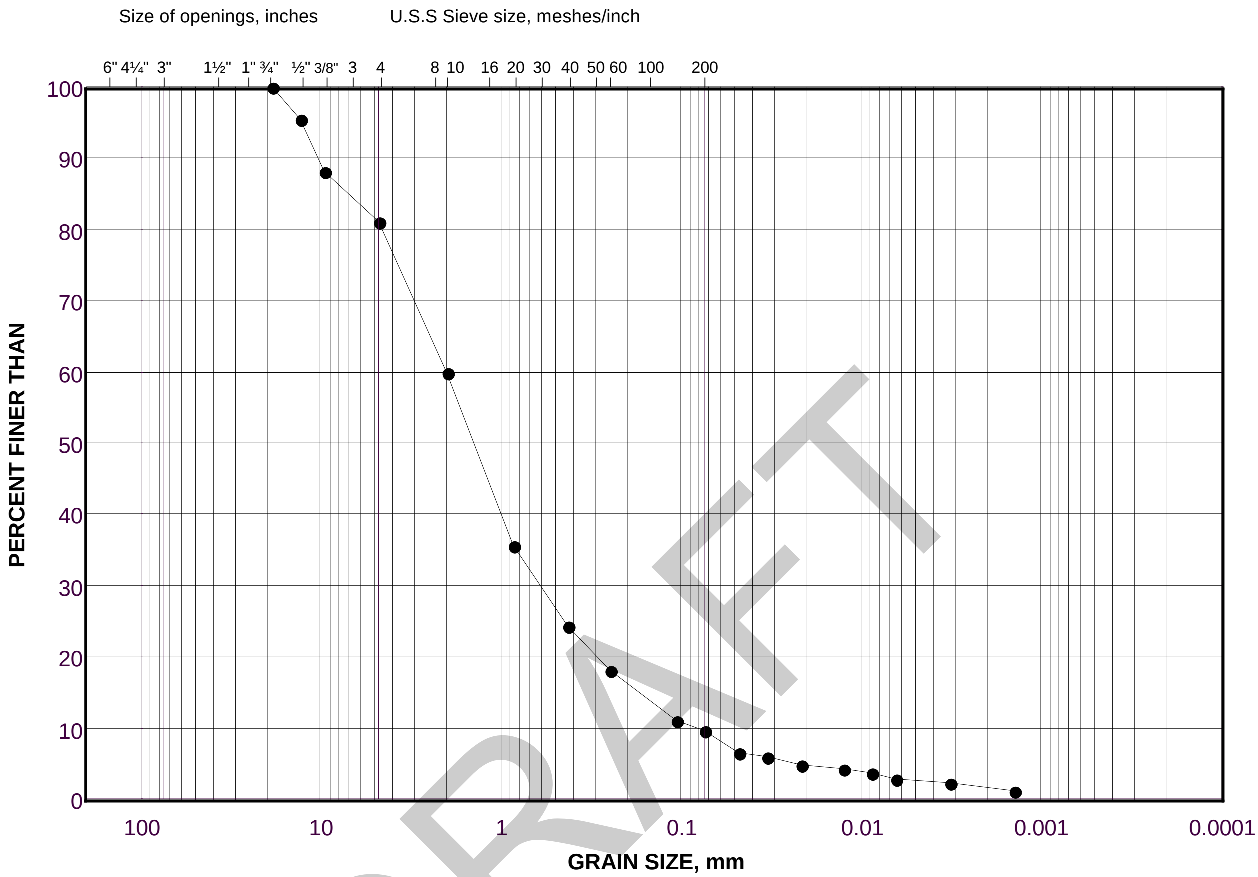
Golder Associates

Date: 30-Jun-20

GRAIN SIZE DISTRIBUTION

(SP-SM) gravelly SAND

FIGURE 6



COBBLE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT AND CLAY SIZES
SIZE	GRAVEL SIZE		SAND SIZE			FINE GRAINED

LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●	20-6	7	6.0 - 6.28

Project Number: 20140088

Checked By: TO

Golder Associates

Date: 30-Jun-20

APPENDIX E

Water Level Measurements and Hydraulic Conductivity Testing

Table E-1 - Groundwater Depths and Elevations
Lebovic - Seaton Whitevale East Development, Pickering, Ontario

Borehole	Unit Screened	Elevation (masl)	Stick-up (m)	05-Jun-20		25-Jul-20		05-Aug-20	
				(mbgs)	(masl)	(mbgs)	(masl)	(mbgs)	(masl)
BH 20-1	(CL-ML) SILTY CLAY to CLAYEY SILT and SAND (TILL)	179.13	0.86	1.14	177.99	2.48	176.65	2.76	176.37
BH 20-4	(CL-ML) sandy SILTY CLAY to CLAYEY SILT (TILL)	169.20	0.83	1.07	168.13	1.90	167.30	2.11	167.10
BH 20-5	(SM) SILTY SAND (TILL) and (CL-ML) sandy SILTY CLAY to CLAYEY SILT (TILL)	168.42	0.67	1.93	166.49	3.31	165.11	3.52	164.90
BH 20-6	(CL-ML) SILTY CLAY to CLAYEY SILT and SAND (TILL) and (SP-SM) gravelly SAND	163.90	0.60	5.50	158.40	6.26	157.64	6.29	157.61
BH 20-7	(SM) SILTY SAND	160.63	0.70	3.40	157.23	4.20	156.43	4.30	156.34
BH 20-8	(SM) SILTY SAND (TILL) and (SP) SAND	159.26	0.70	4.80	154.46	5.44	153.82	5.47	153.79

Notes

mbgs - metres below ground surface

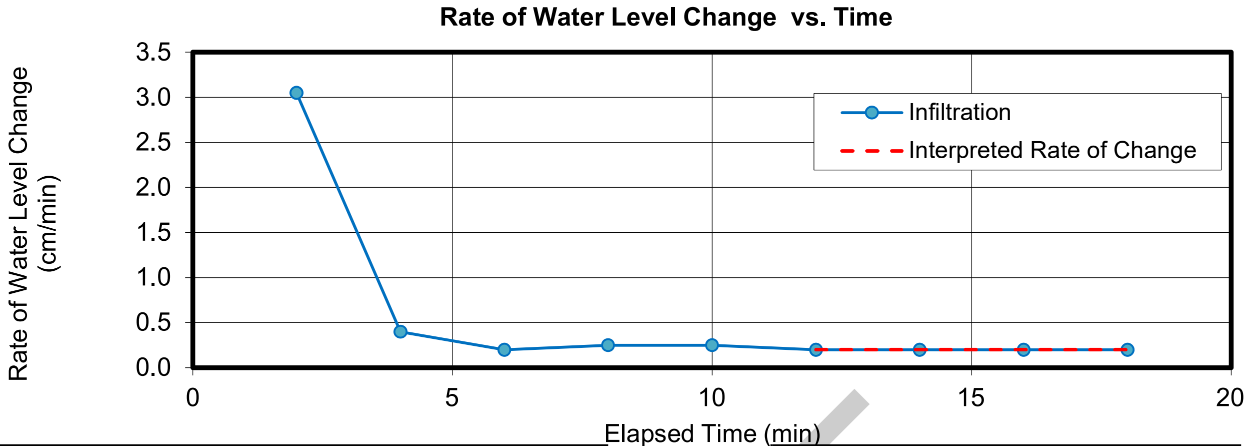
masl - metres above sea level

17
28
21.817

Constant Head Permeameter Test Report - Test GP 20-2

Figure E-1

Approximate Location: 1 m west of borehole stake 20-2
Test Depth: 0.72 m below grade



Elapsed Time (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0.0	1.0	-	-
2.0	7.1	6.1	3.05
4.0	7.9	0.8	0.40
6.0	8.3	0.4	0.20
8.0	8.8	0.5	0.25
10.0	9.3	0.5	0.25
12.0	9.7	0.4	0.20
14.0	10.1	0.4	0.20
16.0	10.5	0.4	0.20
18.0	10.9	0.4	0.20

=input data

Soil Type 3 - (CL-ML) SILTY CLAY to CLAYEY SILT and SAND

Interpreted Rate of:

Water Level Change (R_1) = 3E-03 cm/s

Steady Intake Water Rate (Q_1) = 1E-01 cm^3/s

hole radius (a) = 3 cm

Water column height in hole (H_1) = 7.5 cm

Shape factor for H_1/a = (C_1) = 1.06 -

Soil Type Coefficient α^* = 0.12 cm^{-1}

Single Head Analysis

$$K_{fs} = \frac{C_1 Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi \frac{H_1}{\alpha^*}}$$

Field Saturated Hydraulic Conductivity (K_{fs})

K_{fs} = **2E-04** cm/s

DATE: 2020-09-17

PROJECT: 20140088

GOLDER

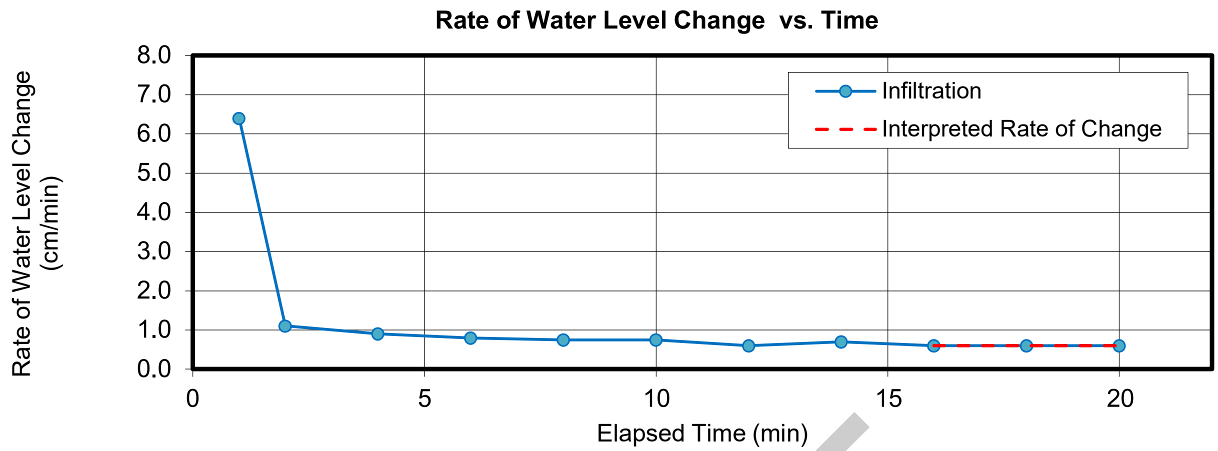
PREPARED BY: AGB

REVIEW: CMK

Constant Head Permeameter Test Report - Test GP 20-5

Figure E-2

Approximate Location: 2 m west of 20-5
Test Depth: 0.92 m below grade



Elapsed Time (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0.0	0.5	-	-
1.0	6.9	6.4	6.4
2.0	8.0	1.1	1.1
4.0	9.8	1.8	0.9
6.0	11.4	1.6	0.8
8.0	12.9	1.5	0.8
10.0	14.4	1.5	0.8
12.0	15.6	1.2	0.6
14.0	17.0	1.4	0.7
16.0	18.2	1.2	0.6
18.0	19.4	1.2	0.6
20.0	20.6	1.2	0.6

=input data

Soil Type 3 - (SM) SILTY SAND

Interpreted Rate of:

Water Level Change (R_1) =	1E-02	cm/s
Steady Intake Water Rate (Q_1) =	4E-01	cm^3/s
hole radius (a) =	3	cm
Water column height in hole (H_1) =	5	cm
Shape factor for H_1/a = (C_1) =	0.80	-
Soil Type Coefficient α^* =	0.12	cm^{-1}

Single Head Analysis

$$K_{fs} = \frac{C_1 Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi \frac{H_1}{\alpha^*}}$$

Field Saturated Hydraulic Conductivity (K_{fs})

K_{fs} = **6E-04** cm/s

DRAFT

DATE: 2020-09-17
PROJECT: 20140088

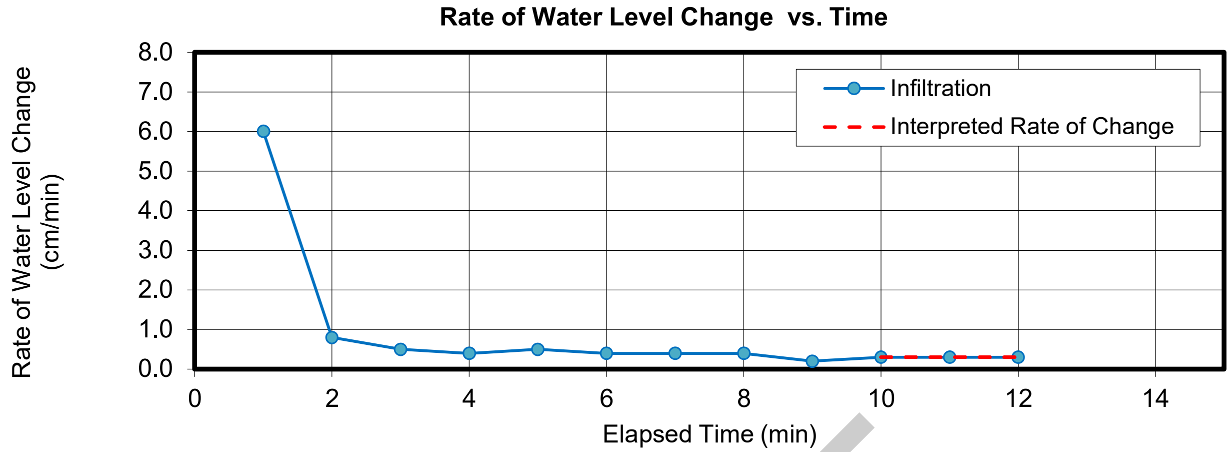
GOLDER

PREPARED BY: AGB
REVIEW: CMK

Constant Head Permeameter Test Report - Test GP 20-8

Figure E-3

Approximate Location: 1.0 m west of 20-8
Test Depth: 0.80 m below grade



Elapsed Time (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0	0.5	-	-
1.0	6.5	6.0	6.00
2.0	7.3	0.8	0.80
3.0	7.8	0.5	0.50
4.0	8.2	0.4	0.40
5.0	8.7	0.5	0.50
6.0	9.1	0.4	0.40
7.0	9.5	0.4	0.40
8.0	9.9	0.4	0.40
9.0	10.1	0.2	0.20
10.0	10.4	0.3	0.30
11.0	10.7	0.3	0.30
12.0	11.0	0.3	0.30

=input data

Soil Type 3 - (ML) SILT

Interpreted Rate of:

Water Level Change (R_1) =	5.0E-03	cm/s
Steady Intake Water Rate (Q_1) =	2E-01	cm^3/s
hole radius (a) =	3	cm
Water column height in hole (H_1) =	7.5	cm
Shape factor for H_1/a = (C_1) =	1.06	-
Soil Type Coefficient α^* =	0.12	cm^{-1}

Single Head Analysis

$$K_{fs} = \frac{C_1 Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi \frac{H_1}{\alpha^*}}$$

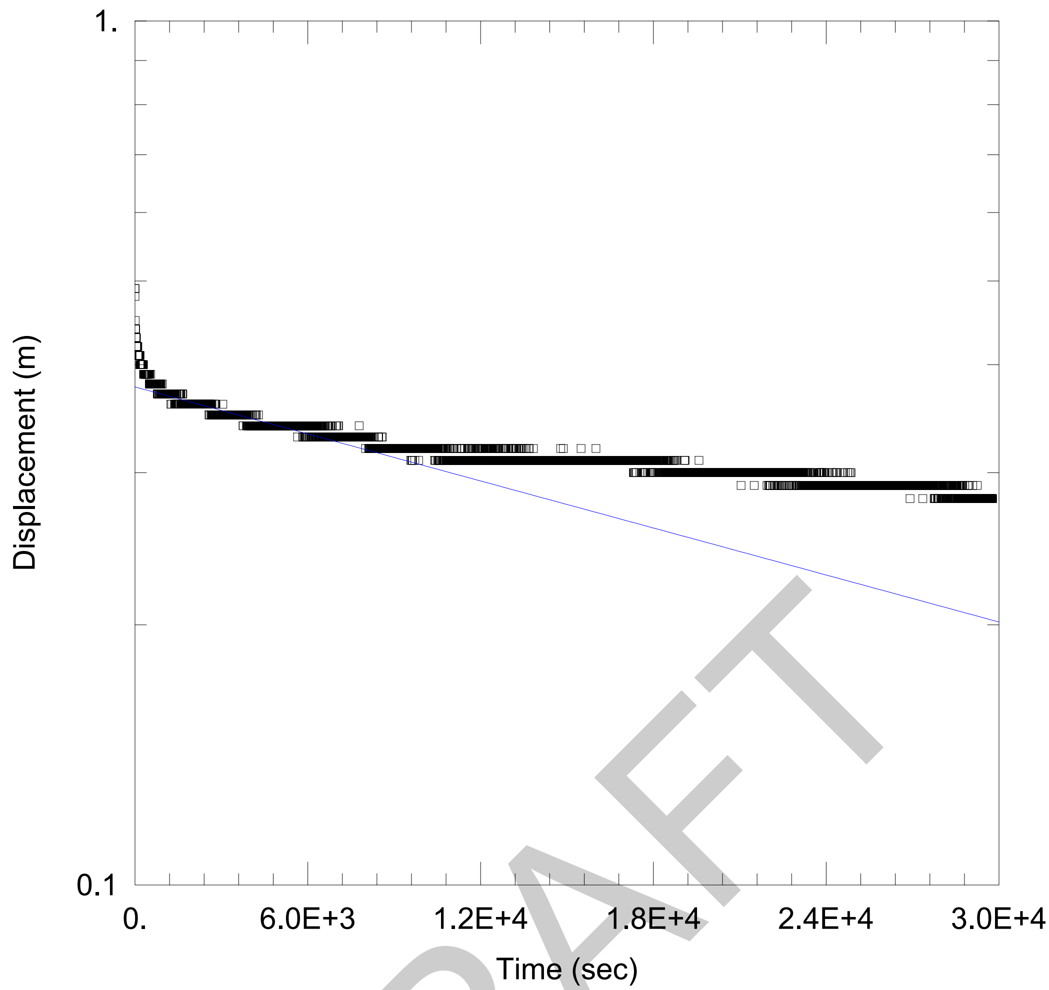
Field Saturated Hydraulic Conductivity (K_{fs})

K_{fs} = **2E-04** cm/s

DATE: 2020-09-17
PROJECT: 20140088

GOLDER

PREPARED BY: AGB
REVIEW: CMK



WELL TEST ANALYSIS

Data Set: C:\...\BH20-01.aqt
Date: 09/22/20 Time: 20:50:16

PROJECT INFORMATION

Company: Golder
Client: Lebovic East
Project: 20140088
Location: North Pickering
Test Well: BH20-1
Test Date: July, 2020

AQUIFER DATA

Saturated Thickness: 1.03 m
Anisotropy Ratio (Kz/Kr): 1.

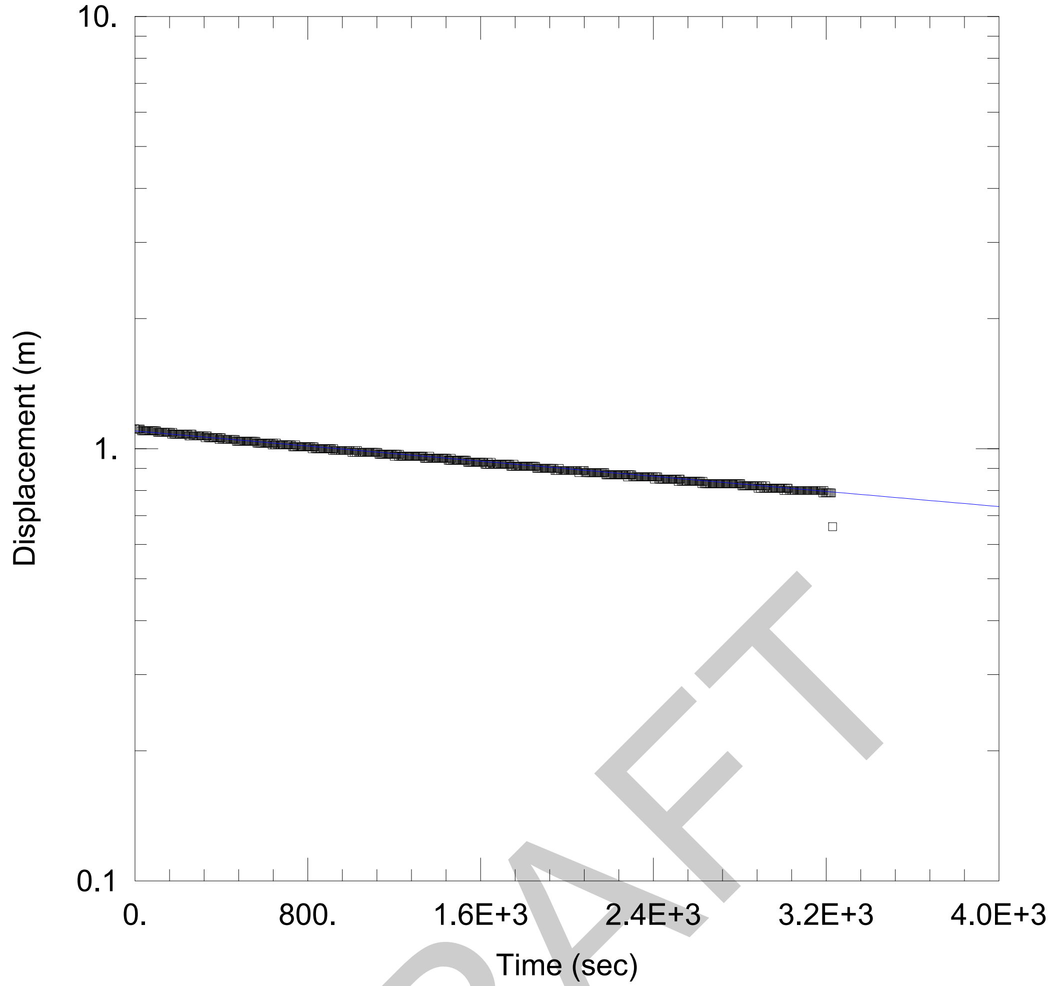
WELL DATA (BH20-1)

Initial Displacement: 0.49 m
Total Well Penetration Depth: 1.03 m
Casing Radius: 0.025 m
Static Water Column Height: 1.03 m
Screen Length: 1.03 m
Well Radius: 0.06 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 1.324E-6 cm/sec
y0 = 0.377 m



WELL TEST ANALYSIS

Data Set: C:\...\BH20-4.aqt
Date: 08/06/20 Time: 14:43:41

PROJECT INFORMATION

Company: Golder
Client: Lebovic East
Project: 20140088
Location: North Pickering
Test Well: BH20-4
Test Date: July, 2020

AQUIFER DATA

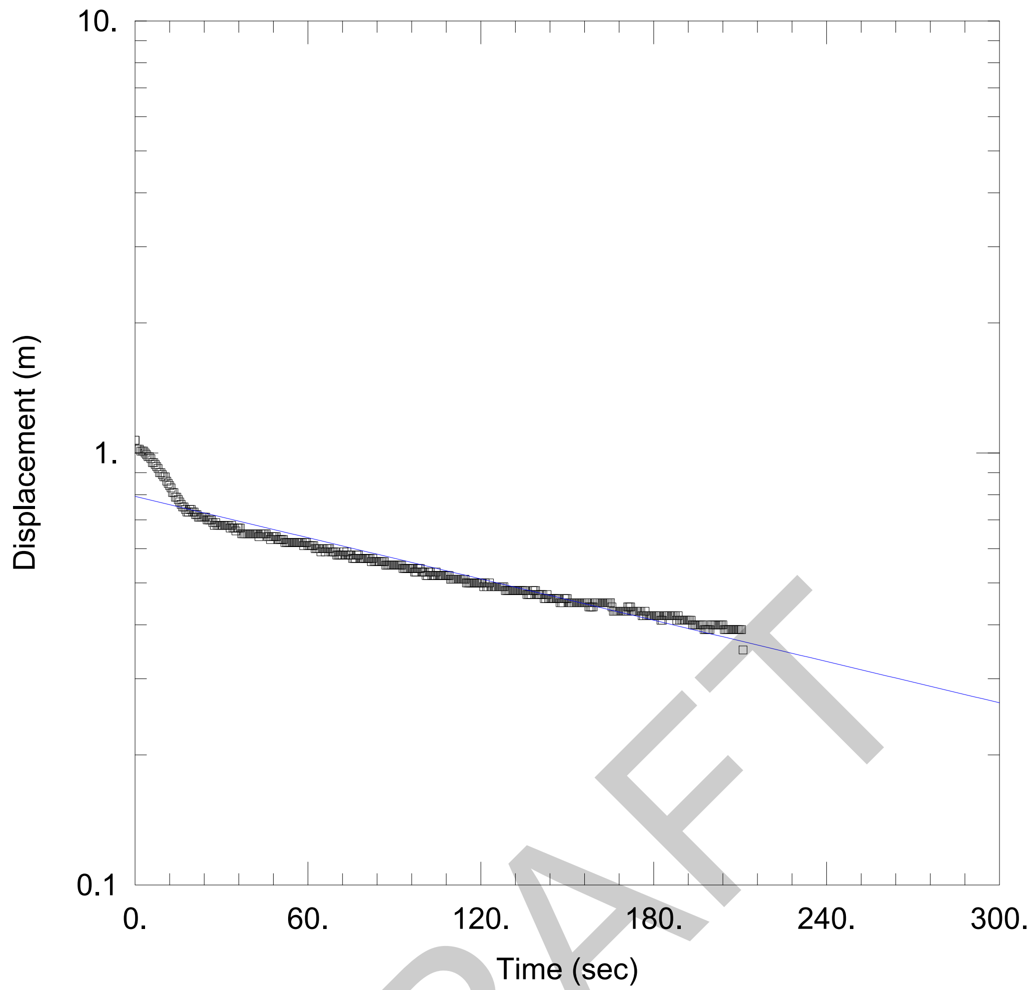
Saturated Thickness: 4.63 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH20-4)

Initial Displacement: 1.112 m Static Water Column Height: 4.63 m
Total Well Penetration Depth: 4.63 m Screen Length: 2.23 m
Casing Radius: 0.025 m Well Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 3.872E-6 cm/sec y0 = 1.099 m



WELL TEST ANALYSIS

Data Set: C:\...\BH20-7.aqt
Date: 08/06/20 Time: 14:45:28

PROJECT INFORMATION

Company: Golder
Client: Lebovic East
Project: 20140088
Location: North Pickering
Test Well: BH20-7
Test Date: July, 2020

AQUIFER DATA

Saturated Thickness: 2.35 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH20-7)

Initial Displacement: 1.07 m Static Water Column Height: 2.35 m
Total Well Penetration Depth: 2.35 m Screen Length: 1.55 m
Casing Radius: 0.025 m Well Radius: 0.11 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
K = 0.0001596 cm/sec y0 = 0.7931 m

APPENDIX F

Water Balance Results

BUTTONVILLE A WATER BUDGET MEANS FOR THE PERIOD 1986-2017 DC20492

Water Holding Capacity	125	mm
Heat Index	39.55	
Lower Zone	75	mm
A	1.122	
Date Range	1986	2017
Climate ID (Station #):	DC20492	

Date	**Temperature**	**Precipitation**	**Rain**	**Melt**	**Potential Evaporation**	**Actual Evapotranspiration**	**Deficit**	**Surplus**	**Snow**	**Soil**	**Accumulated Precipiation**
	(oC)	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
January	-5.8	60	26	19	2	2	0	38	27	124	272
February	-5.6	51	20	24	1	1	0	42	33	125	323
March	-0.4	55	36	49	10	10	0	75	4	125	378
April	6.7	75	71	7	34	34	0	45	0	124	453
May	13.4	80	80	0	80	80	0	15	0	110	534
June	18.7	90	90	0	116	116	0	8	0	76	622
July	21.3	82	82	0	136	118	-18	0	0	40	705
August	20.3	77	77	0	120	87	-33	4	0	27	777
September	16	83	83	0	80	68	-12	7	0	35	855
October	9.2	73	73	0	40	38	-2	7	0	63	73
November	3.2	74	68	5	13	13	0	20	0	103	148
December	-2.6	64	37	15	3	3	0	32	12	119	211
AVE	7.8										
TTL		863	743	119	635	570	-65	293			

Water Holding Capacity	200	mm
Heat Index	39.55	
Lower Zone	120	mm
A	1.122	
Date Range	1986	2017
Climate ID (Station #):	DC20492	

Date	**Temperature**	**Precipitation**	**Rain**	**Melt**	**Potential Evaporation**	**Actual Evapotranspiration**	**Deficit**	**Surplus**	**Snow**	**Soil**	**Accumulated Precipiation**
	(oC)	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
January	-5.8	60	26	19	2	2	0	26	27	192	272
February	-5.6	51	20	24	1	1	0	38	33	197	323
March	-0.4	55	36	49	10	10	0	72	4	200	378
April	6.7	75	71	7	34	34	0	45	0	199	453
May	13.4	80	80	0	80	80	0	15	0	185	534
June	18.7	90	90	0	116	116	0	8	0	151	622
July	21.3	82	82	0	136	132	-5	0	0	101	705
August	20.3	77	77	0	120	102	-18	4	0	73	777
September	16	83	83	0	80	71	-9	7	0	78	855
October	9.2	73	73	0	40	38	-2	6	0	106	73
November	3.2	74	68	5	13	13	0	12	0	154	148
December	-2.6	64	37	15	3	3	0	27	12	176	211
AVE	7.8										
TTL		863	743	119	635	602	-34	260			

	Water Holding Capacity	400	mm	
	Heat Index	39.55		
	Lower Zone	240	mm	
	A	1.122		
	Date Range	1986	2017	
	Climate ID (Station #):	DC20492		

Date	**Temperature**	**Precipitation**	**Rain**	**Melt**	**Potential Evaporation**	**Actual Evapotranspiration**	**Deficit**	**Surplus**	**Snow**	**Soil**	**Accumulated Precipiation**
	(oC)	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
January	-5.8	60	26	19	2	2	0	21	27	371	272
February	-5.6	51	20	24	1	1	0	28	33	385	323
March	-0.4	55	36	49	10	10	0	62	4	398	378
April	6.7	75	71	7	34	34	0	44	0	399	453
May	13.4	80	80	0	80	80	0	15	0	384	534
June	18.7	90	90	0	116	116	0	8	0	350	622
July	21.3	82	82	0	136	136	0	0	0	296	705
August	20.3	77	77	0	120	118	-2	3	0	252	777
September	16	83	83	0	80	77	-3	7	0	251	855
October	9.2	73	73	0	40	39	-1	6	0	279	73
November	3.2	74	68	5	13	13	0	10	0	328	148
December	-2.6	64	37	15	3	3	0	24	12	353	211
AVE	7.8										
TTL		863	743	119	635	629	-6	228			

Entered by: DPH
Checked by: MK

Land Use			Infiltration Factor				WHC (mm)	Precip (mm)	Evap (mm)	Surplus (mm)	Runoff (mm)	Infiltration (mm)
Land Use Type	**Soil Type**	**Description**	**Topo**	**Soils**	**Cover**	**Total**						
Agricultural	Silt Loam	Moderately Rooted Crops	0.1	0.3	0.1	0.5	200	863	602	260	130	130
Woodlot	Silt Loam	Mature Forest	0.1	0.3	0.2	0.6	400	863	629	228	91	137
Storm Water Facility	Water	Water	-	-	-	0	P-PET	863	635	228	228	0
Lawn, Park	Silt Loam	Urban Lawn	0.1	0.3	0.1	0.5	125	863	570	293	147	147
Buildings, Roads, Sidewalks, Driveways	Impervious	Impermeable Surfaces	0	0	0	0	0	863	86	777	777	0
Buildings to Bioretention Cell	Mitigation	Impermeable Surfaces	-	-	-	0.71	0	863	86	777	225	551

Entered by: DPH
Checked by: MK

Table 1: Pre-Development Water Balance Results

Catchment	Area	Precipitation		Potential ET		Actual ET		Surplus		Infiltration		Runoff	
	(m^2)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)
Cultivated Land	51,870	863	44,760	635	32,940	602	31,270	260	13,490	130	6,740	130	6,750
Woodlot	3,730	863	3,220	635	2,370	635	2,370	228	850	137	510	91	340
Total	**55,600**	**863**	**47,980**	**635**	**35,310**	**605**	**33,640**	**258**	**14,340**	**130**	**7,250**	**128**	**7,090**

Table 2: Unmitigated Post-Development Water Balance Results

Catchment	Area	Precipitation		Potential ET		Actual ET		Surplus		Infiltration		Runoff	
	(m^2)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)
Buildings	16,800	863	14,500	635	10,670	86	1,430	778	13,070	0	0	778	13,070
Pavement	17,696	863	15,270	635	11,240	86	1,510	778	13,760	0	0	778	13,760
Lawns	18,704	863	16,140	635	11,880	570	10,660	293	5,480	147	2,740	147	2,740
Storm Water Facility	2,400	863	2,070	635	1,520	635	1,520	229	550	0	0	229	550
Total	**55,600**	**863**	**47,980**	**635**	**35,310**	**272**	**15,120**	**591**	**32,860**	**49**	**2,740**	**542**	**30,120**

Entered by: DPH
Checked by: MK

Table 3: Mitigated Post-Development Water Balance Results

Catchment	Area	Precipitation		Potential ET		Actual ET		Surplus		Infiltration		Runoff	
	(m^2)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)
Buildings to Bioretention	16,800	863	14,500	635	10,670	86	1,430	778	13,070	552	9,280	226	3,790
Pavement	17,696	863	15,270	635	11,240	86	1,510	778	13,760	0	0	778	13,760
Lawns	18,704	863	16,140	635	11,880	570	10,660	293	5,480	147	2,740	147	2,740
Storm Water Facility	2,400	863	2,070	635	1,520	635	1,520	229	550	0	0	229	550
Total	**55,600**	**863**	**47,980**	**635**	**35,310**	**272**	**15,120**	**591**	**32,860**	**216**	**12,020**	**375**	**20,840**

Entered by: DPH
Checked by: MK

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