



Geotechnical
Engineering

Environmental
Engineering

Hydrogeology

Geological
Engineering

Materials Testing

Building Science

Archaeological Services

Hydrogeological Assessment
Proposed Mixed-Use Development
936 March Road
Ottawa, Ontario

Prepared For

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Report PG4554-2R

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1.0 INTRODUCTION

Paterson Group (Paterson) was commissioned by Minto Communities and 2559688 Ontario Inc. to prepare a hydrogeological assessment for the proposed mixed-used development to be located at 936 March Road in Ottawa, Ontario (refer to Figure 1 - Key Plan within Appendix 1).

Subsurface information was obtained from the geotechnical investigation carried out to determine the subsoil and groundwater conditions at the site by means of test holes.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. It contains the investigation findings and includes hydrogeological assessments pertaining to the proposed program as understood at the time of writing this report.

1.1 Proposed Project

It is our understanding that the proposed mixed-use development, to be located on the east side of March Road and north of Maxwell Bridge Road, consists of the municipal address 936 March Road.

The subject site consists of an approximate 60 hectare mostly undeveloped property consisting of agricultural fields with some brush covered areas and mature treed areas. A farmstead with associated outbuildings is present within the southwest corner of the property. The site is trisected in an approximate northwest-southeast orientation by an existing railway track through the eastern portion of the site and an unnamed tributary of Shirley's Brook through the western portion of the site. The property generally slopes downward from southwest to northeast and is bordered to the north, east and west by a mixture of treed areas and agricultural fields and to the south by residential developments and March Road.

2.0 SITE CONDITIONS

Physical Setting

As previously noted, the subject site is located on the east side of March Road and contains a mixture of agricultural lands and densely treed areas. Site topography is relatively flat to gently rolling, with average elevations of 80 m above sea level (asl) along the southwest portion of the property and average elevations of 65 m asl along the northeast portion. Elevations provided for the unnamed tributary of Shirley's Brook that crosses the property indicates a northwest to southeast drainage direction, with elevations of approximately 78 m asl at the western side of the property and 76 m asl at the eastern side. There were no named water bodies known to exist on the subject site.

According to available mapping, the subject site is located in the Ottawa Valley Clay Plains physiographic region. The region is characterized by relatively flat clay plains interrupted by rock ridges, which is generally consistent with field observations at the subject site.

2.1 Geology

Surficial Geology

The field program for the geotechnical investigation was carried out between June and July 2018. A total of 41 boreholes were advanced to a maximum depth of 7.5 m below ground surface (bgs). The borehole locations were distributed in a manner to provide general coverage of the subject site. The approximate locations of the boreholes are shown on Drawing PG4554-1 - Test Hole Location Plan included in Appendix 2

Overburden soils identified during the geotechnical field investigation were generally consistent with available mapping for the area. Soils typically consisted of topsoil underlain by hard to firm brown silty clay that became grey with depth, which was further underlain by a glacial till deposit comprised of a silty sand/silty clay matrix with gravel, cobbles and boulders. A deposit of silty sand was noted above the silty clay layer at borehole locations within the central portion of the site. Where encountered, the silty sand deposit was typically 0.5 to 1.5 m in thickness.

Practical refusal to augering was encountered on the inferred bedrock surface at depths ranging from approximately 1.3 m bgs on the western portion of the site to approximately 7.8 m bgs on the eastern boundary of the site.

Specific details of the soil profile at each test hole location are presented on the Soil Profile and Test Data sheets included in Appendix 2.

Bedrock

Based on available geological mapping, the subject site is located in an area where the bedrock in the western portion of the site consists of interbedded sandstone and dolomite of the March formation, while the bedrock in the eastern portion of the site consists of dolomite of the Oxford formation. Overburden thickness in the area is estimated to range from 3 to 10 m.

Karst Features

The term “karst” refers to a geologic formation characterized by the dissolution of carbonate bedrock, such as limestone or dolostone. In order for karstification to occur, precipitation must be allowed to infiltrate the top of the bedrock to dissolutionally enlarge previously existing joints and bedding planes. Based on visual inspection of rock core samples taken from the subject site, and given the composition of surficial soils typically overlying the dolomite/limestone bedrock that are non-conductive to groundwater infiltration, it is unlikely that karstification is occurring.

2.2 Hydrogeology

Existing Aquifer Systems

Aquifer systems may be defined as geological media, either overburden soils or fractured bedrock, which permit the movement of groundwater under hydraulic gradients. In general, aquifer systems may be present in overburden soils or bedrock. Although groundwater has been observed within the overburden soils at the subject site, the composition of materials does not allow for the development of significant water supply wells. Water supply wells in the vicinity are instead likely found in bedrock aquifers.

Bedrock aquifer mapping, provided by Natural Resources Canada Urban Geology of the National Capital Region mapping, as well as the MECP water well record database, were reviewed as part of this assessment. Using these tools, two water supply aquifer systems were found to exist in the vicinity of the study area.

The March/Nepean formation aquifer system is located within the western portion of the study area. Because water well records do not differentiate between March and Nepean formation sandstone, the two units are considered as one for the purposes of

this assessment. Wells utilizing this aquifer system generally encountered water at depths ranging between 12 and 20 m bgs.

The Oxford formation aquifer system is typically encountered within the eastern portion of the study area. Water wells completed in this formation encountered water at depths of over 30 m bgs. Based on the limited stratigraphic information provided in the water well records, wells advanced through the Oxford formation to depths exceeding 30 m could have penetrated the formation and are potentially accessing water from the underlying March/Nepean formations.

Groundwater Levels

Groundwater was observed in the piezometers installed in the overburden at the borehole locations. Groundwater was also observed in the monitoring well installed in the bedrock where overburden thickness was minimal.

Groundwater levels at the subject site were observed to vary from 0.8 to 4.4 m bgs at the time of the geotechnical field investigation. It should be noted that groundwater levels may have been influenced by surface water infiltrating the backfilled boreholes. Subsequent groundwater level readings within the piezometers can be influenced by perched water in the backfill material within the borehole. Groundwater levels are also influenced by seasonal variations in temperature and precipitation. As such, long-term groundwater levels are also estimated based on other factors such as colour and consistency of the recovered soil samples. Based on these observations, the long-term groundwater level at the subject site is expected to range from 2.5 to 4.5 m bgs. The measured groundwater levels are summarized in Table 1 below and presented on the Soil Profile and Test Data sheets included in Appendix 1.

| Table 1 - Summary of Groundwater Level Readings | | | | |
|--|-------------------------------------|------------------------------|----------------------------------|---------------|
| Test Hole Number | Ground Surface Elevation (m) | Groundwater Depth (m) | Groundwater Elevation (m) | Date |
| BH 1 | 79.44 | 1.36 | 78.08 | July 12, 2018 |
| BH 2 | 78.59 | 0.93 | 77.66 | July 12, 2018 |
| BH 3 | 78.88 | 2.31 | 76.57 | July 12, 2018 |
| BH 4 | 75.89 | 1.85 | 74.04 | July 12, 2018 |
| BH 5 | 79.16 | 1.65 | 77.51 | July 12, 2018 |
| BH 6 | 77.99 | 1.04 | 76.95 | July 12, 2018 |
| BH 7 | 79.20 | 3.09 | 76.11 | July 12, 2018 |

| Table 1 - Summary of Groundwater Level Readings (Continued) | | | | |
|--|-------------------------------------|------------------------------|----------------------------------|---------------|
| Test Hole Number | Ground Surface Elevation (m) | Groundwater Depth (m) | Groundwater Elevation (m) | Date |
| BH 8 | 72.56 | 0.79 | 71.77 | July 12, 2018 |
| BH 11 | 69.43 | 1.51 | 67.92 | July 12, 2018 |
| BH 12 | 67.58 | 1.20 | 66.38 | July 12, 2018 |
| BH 13 | 65.95 | 1.09 | 64.86 | July 12, 2018 |
| BH 14 | 78.85 | 1.27 | 77.58 | July 12, 2018 |
| BH 15 | 77.56 | 1.43 | 76.13 | July 12, 2018 |
| BH 16 | 74.85 | 2.80 | 72.05 | July 12, 2018 |
| BH 18 | 69.78 | 1.11 | 68.67 | July 12, 2018 |
| BH 20 | 69.37 | 1.51 | 67.86 | July 12, 2018 |
| BH 21 | 66.25 | 0.85 | 65.40 | July 12, 2018 |
| BH 22 | 65.61 | 1.10 | 64.51 | July 12, 2018 |
| BH 23 | 78.70 | 1.35 | 77.35 | July 12, 2018 |
| BH 24 | 77.03 | 1.06 | 75.97 | July 12, 2018 |
| BH 25 | 74.86 | 2.49 | 72.37 | July 12, 2018 |
| BH 29 | 68.94 | 1.47 | 67.47 | July 12, 2018 |
| BH 30 | 66.95 | 1.07 | 65.88 | July 12, 2018 |
| BH 31 | 66.06 | 0.92 | 65.14 | July 12, 2018 |
| BH 32 | 76.95 | Dry | - | July 12, 2018 |
| BH 33 | 71.39 | Dry | - | July 12, 2018 |
| BH 37 | 68.89 | 1.26 | 67.63 | July 12, 2018 |
| BH 38 | 67.01 | 1.15 | 65.95 | July 12, 2018 |
| BH 40* | 79.19 | 4.44 | 74.75 | July 12, 2018 |
| BH 41* | 78.67 | 4.28 | 74.39 | July 12, 2018 |
| BH 42* | 73.50 | 4.04 | 69.46 | July 12, 2018 |

**Note: - * Denotes borehole instrumented with a 51 mm diameter monitoring well.
 - The ground surface at the test hole locations is referenced to an assumed geodetic datum.**

Hydraulic Gradients

Vertical hydraulic gradients were not measured at the subject site as the previous studies completed did not warrant the installation of monitoring well nests.

With respect to horizontal hydraulic gradients, due to the nature of the water levels obtained from field work conducted at the site (piezometers), the absolute direction of horizontal hydraulic gradients was not determined. However, using the available data, it was possible to approximate the horizontal hydraulic gradients in the overburden material given that the horizontal hydraulic gradient between any 2 points is the slope of the hydraulic head between those points:

$$i = \frac{h_2 - h_1}{L}$$

Where: i = horizontal hydraulic gradient
 h = water level (m bgs)
 L = horizontal distance between test hole locations

Using the above noted formula, the horizontal hydraulic gradient was observed to have an approximate northeast orientation and a magnitude ranging from approximately 0.01 to 0.002. Shallow groundwater flow in the vicinity of the subject site is expected to reflect local topography. Regional groundwater flow is considered to be in an easterly direction, towards the Ottawa River.

Hydraulic Conductivity

The hydraulic conductivity values were conservatively estimated based upon previous experience at similar sites in the area, information obtained from the results of the geotechnical field program and typical published values for similar stratigraphy. The values are interpreted to be approximately 1×10^{-7} to 1×10^{-10} m/sec for silty clay and 1×10^{-6} to 1×10^{-12} m/sec for limestone/dolomite bedrock.

Groundwater Recharge and Discharge

In general, groundwater will follow the path of least resistance from areas of higher hydraulic head to areas of lower hydraulic head. While upward and downward hydraulic gradients may be indicative of discharge and recharge, respectively, other factors must be considered.

Based on the hydraulic conductivity estimates obtained from previous studies and published literature, the silty clay overburden is generally considered to act as a confining layer. It is our interpretation that groundwater will generally flow laterally through the upper layer of silty sand/weathered brown silty clay, as opposed to vertically upwards or downwards through overburden soils with lower hydraulic conductivity such as the grey silty clay. While small amounts of groundwater recharge and discharge could potentially take place on a localized scale where overburden thickness is minimal, neither the topographical or geological conditions are suitable for recharge or discharge to be occurring on a large scale at the subject site.

3.0 POTENTIAL IMPACTS

3.1 Adverse Effects on Adjacent Structures

The overburden in the area generally consists of topsoil overlying a silty clay layer which is further underlain by a glacial till deposit comprised of a silty sand/silty clay matrix with gravel, cobbles and boulders. A deposit of silty sand was noted above the silty clay layer at boreholes located within the central portion of the site. The potential dewatering volumes required to accommodate the proposed development are anticipated to be low to moderate depending on the volume of perched water encountered within the silty sand overlying the silty clay. Additionally, given the nature of the development (low lying residential housing, commercial and institutional buildings, associated servicing, and a stormwater management facility), the duration of excavations at the site are expected to be short term in duration. As such, any effects related to ground surface settlement due to the water taking activities during construction are expected to be negligible.

3.2 Adverse Effects on Neighbouring Water Wells

A review of the MECP Water Well Records online mapping database indicates there are greater than 20 wells within 500 m of the subject site as depicted on Drawing PG4554-3 - MECP Water Well Location Plan included in Appendix 1. However, upon investigation it was determined that a number of the wells in the area are monitoring wells and not for water supply. It is also expected that several wells in the area are no longer in use, based on their installation dates and the availability of municipal water at certain locations.

Given the number of wells remaining in use in the surrounding area, and in the interest of public perception, a baseline subdivision sampling program was undertaken for the residences surrounding the development that were expected to remain on private water supply. The premise of the program was to obtain groundwater quality information from the water supply wells in the vicinity of the proposed development prior to the project commencing. This ensures that all parties involved (developer, homeowner and City of Ottawa) are protected should a concern arise during or after construction. The results of this study are available under separate cover.

3.3 Soil and Groundwater

A review of the MECP Brownfields Environmental Site Registry was conducted as part of the assessment of the site, neighbouring properties and the general area surrounding the site. A total of one recorded Brownfield site was located within 1 km of the subject

site and has been identified as Record of Site Condition (RSC) registration number 63910. The Brownfield site and its respective registration number indicates there are no groundwater controls under the RSC, nor were there any groundwater remediations performed as part of a cleanup process. No concerns were identified in the review of the MECP Brownfields database.

It is anticipated that the material on site will be disposed of or re-used as per the MECP policy, *Management of Excess Soil - A Guide for Best Management Practices* dated January, 2014.

The groundwater that is pumped from site excavations must be managed in an appropriate manner. The contractor will be required to implement a water management program to dispose of the pumped water.

4.0 STATEMENT OF LIMITATIONS

The recommendations provided in this report are in accordance with our present understanding of the project.

A hydrogeological review of this nature is a limited sampling of a site. The recommendations are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around the test locations. Should any conditions at the site be encountered which differ from those at the test locations, we request notification immediately in order to permit reassessment of our recommendations.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Minto Communities, 2559688 Ontario Inc. or their agent(s) is not authorized without review by Paterson Group for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

Michael Laflamme, P.Geol.



Michael S. Killam, P.Eng.

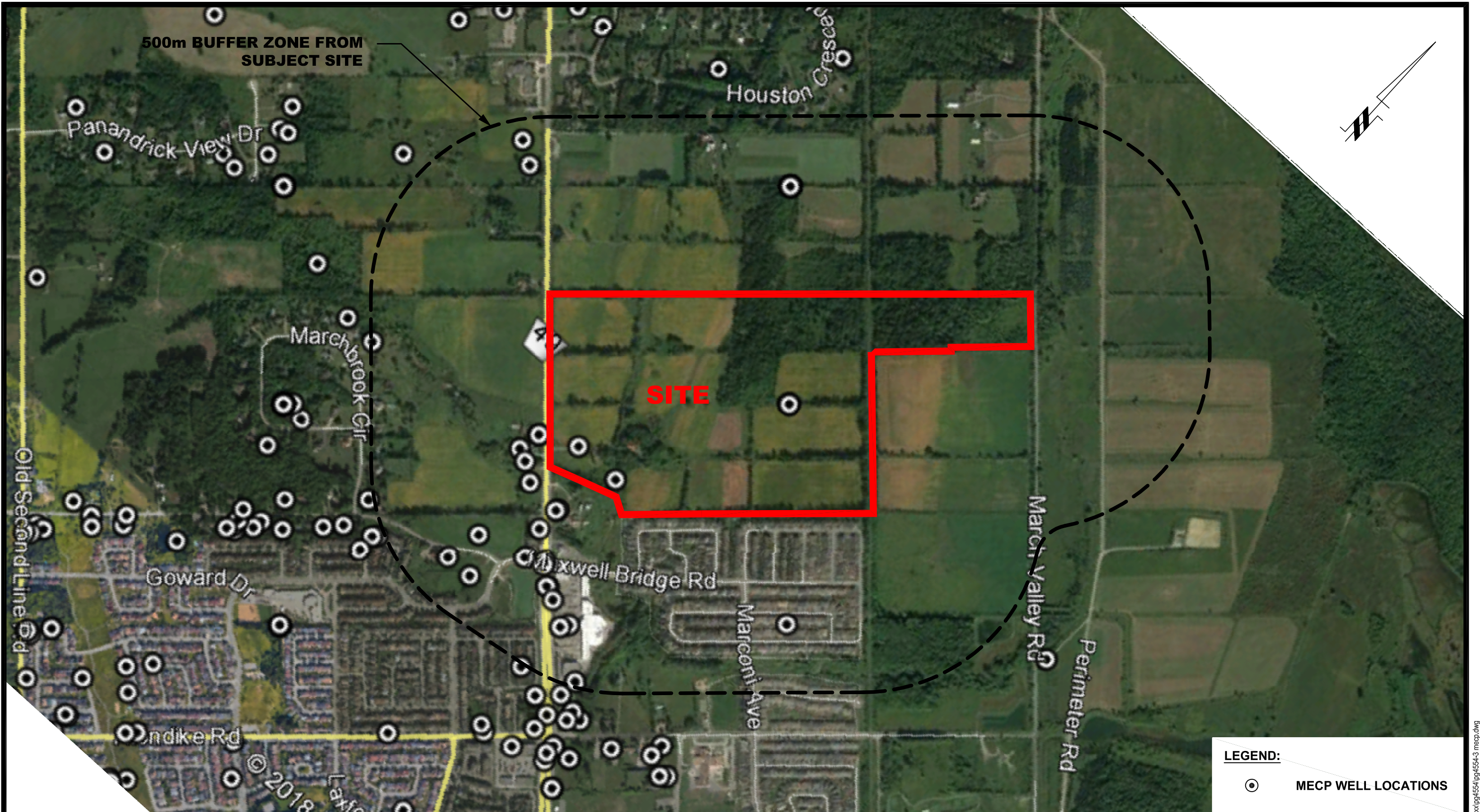
APPENDIX 1

Figure 1 - Key Plan

Drawing PG4554-3 - MECP Water Well Location Plan



FIGURE 1
KEY PLAN



LEGEND:

⊙ MECP WELL LOCATIONS

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| NO. | REVISIONS | DATE | INITIAL |
|-----|-----------|------|---------|
| 0 | | | |

MINTO COMMUNITIES / 2559688 ONTARIO INC.
HYDROGEOLOGICAL ASSESSMENT
PROPOSED MIXED-USE DEVELOPMENT - 936 MARCH ROAD

OTTAWA, ONTARIO

Title: **MECP WATER WELL LOCATION PLAN**

| | | | |
|--------------|---------|---------------|-----------------|
| Scale: | 1:10000 | Date: | 12/2018 |
| Drawn by: | MPG | Report No.: | PG4554-2 |
| Checked by: | ML | Dwg. No.: | PG4554-3 |
| Approved by: | CDS | Revision No.: | 0 |

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APPENDIX 2

Soil Profile and Test Data

Drawing PG4554-1 - Test Hole Location Plan

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

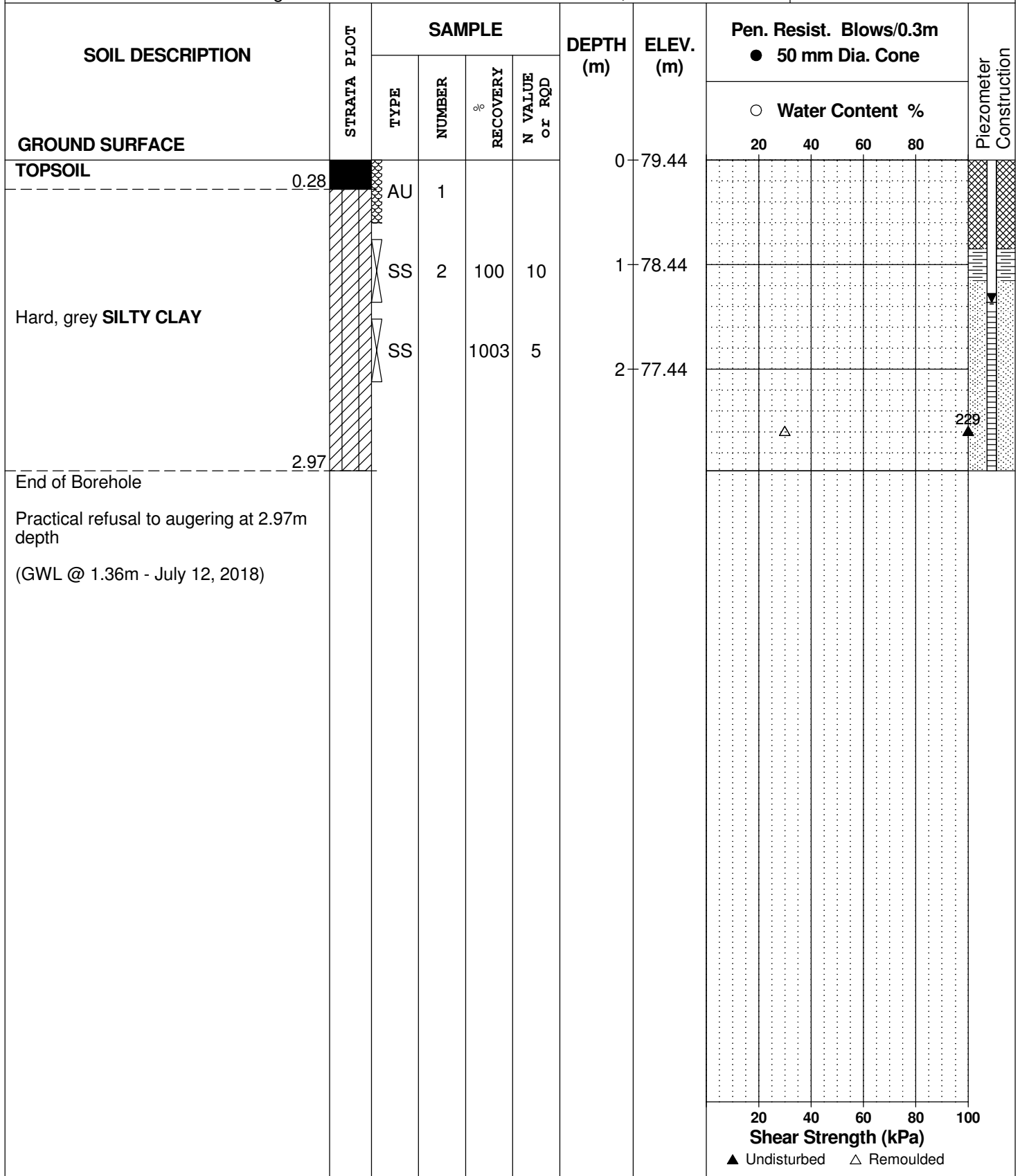
REMARKS

BORINGS BY CME 55 Power Auger

DATE June 26, 2018

FILE NO. **PG4554**

HOLE NO. **BH 1**



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

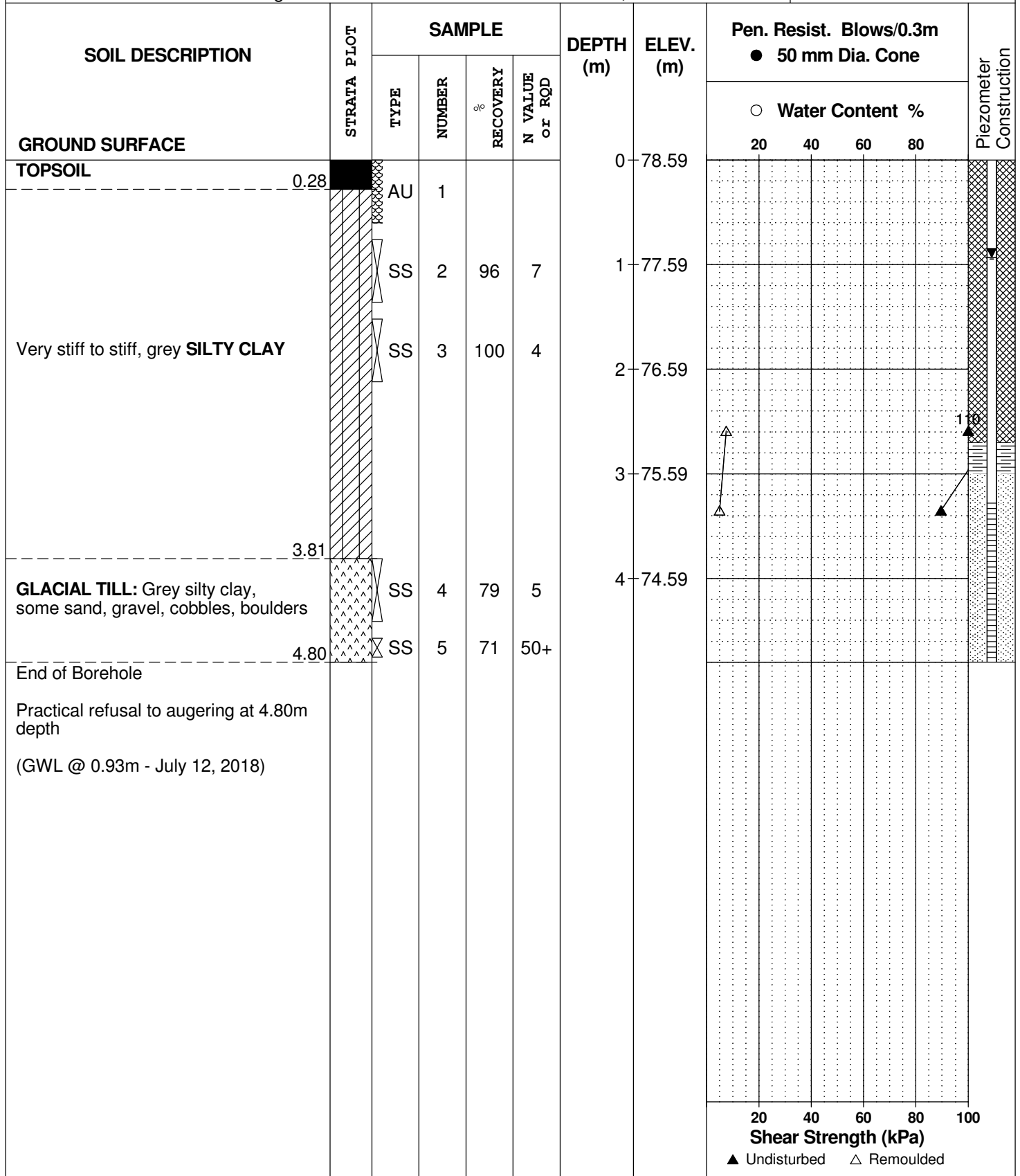
FILE NO. **PG4554**

REMARKS

HOLE NO. **BH 2**

BORINGS BY CME 55 Power Auger

DATE June 26, 2018



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

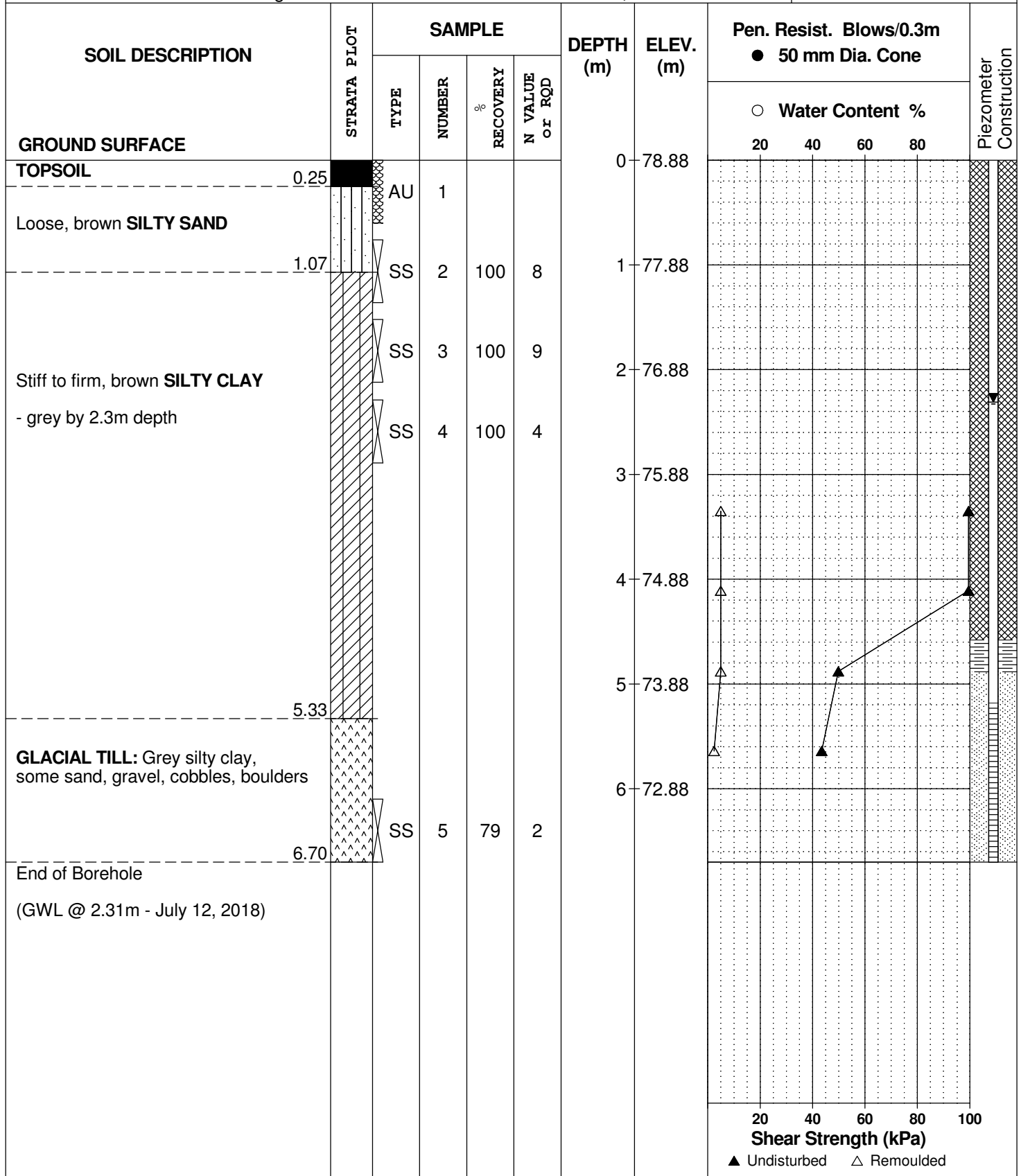
REMARKS

BORINGS BY CME 55 Power Auger

DATE June 27, 2018

FILE NO. **PG4554**

HOLE NO. **BH 3**



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

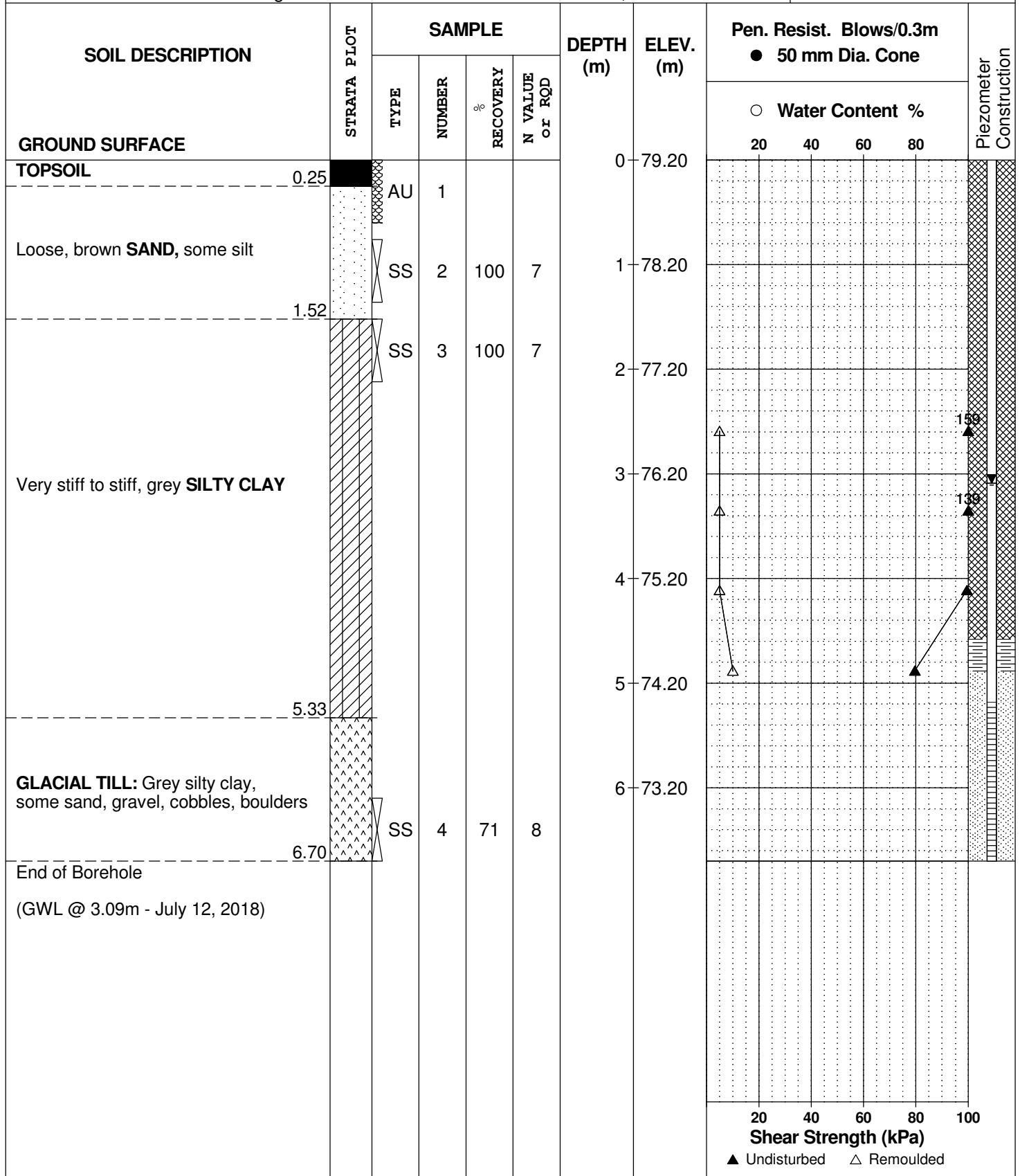
FILE NO. **PG4554**

REMARKS

HOLE NO. **BH 7**

BORINGS BY CME 55 Power Auger

DATE June 26, 2018



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG4554**

REMARKS

HOLE NO. **BH 9**

BORINGS BY CME 55 Power Auger

DATE June 28, 2018

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE | | | | DEPTH (m) | ELEV. (m) | Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone | | | | Piezometer Construction |
|--|-------------|--------|--------|------------|----------------|-----------|-----------|--|----|----|----|-------------------------|
| | | TYPE | NUMBER | RECOVERY % | N VALUE or RQD | | | 20 | 40 | 60 | 80 | |
| GROUND SURFACE | | | | | | | | | | | | |
| TOPSOIL | 0.15 | AU | 1 | | | 0 | 69.71 | | | | | |
| Loose, brown SILTY SAND , trace clay | 0.76 | AU | 2 | | | | | | | | | |
| Firm, grey SILTY CLAY | 1.68 | SS | 3 | 100 | 3 | 1 | 68.71 | | | | | |
| GLACIAL TILL: Grey silty clay, some sand, gravel, cobbles, boulders | 1.68 | SS | 4 | 58 | 3 | 2 | 67.71 | | | | | |
| | | SS | 5 | 62 | 14 | | | | | | | |
| End of Borehole | 3.10 | SS | 6 | 100 | 50+ | 3 | 66.71 | | | | | |
| Practical refusal to augering at 3.10m depth (GWL @ 2.4m depth based on field observations) | | | | | | | | | | | | |

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

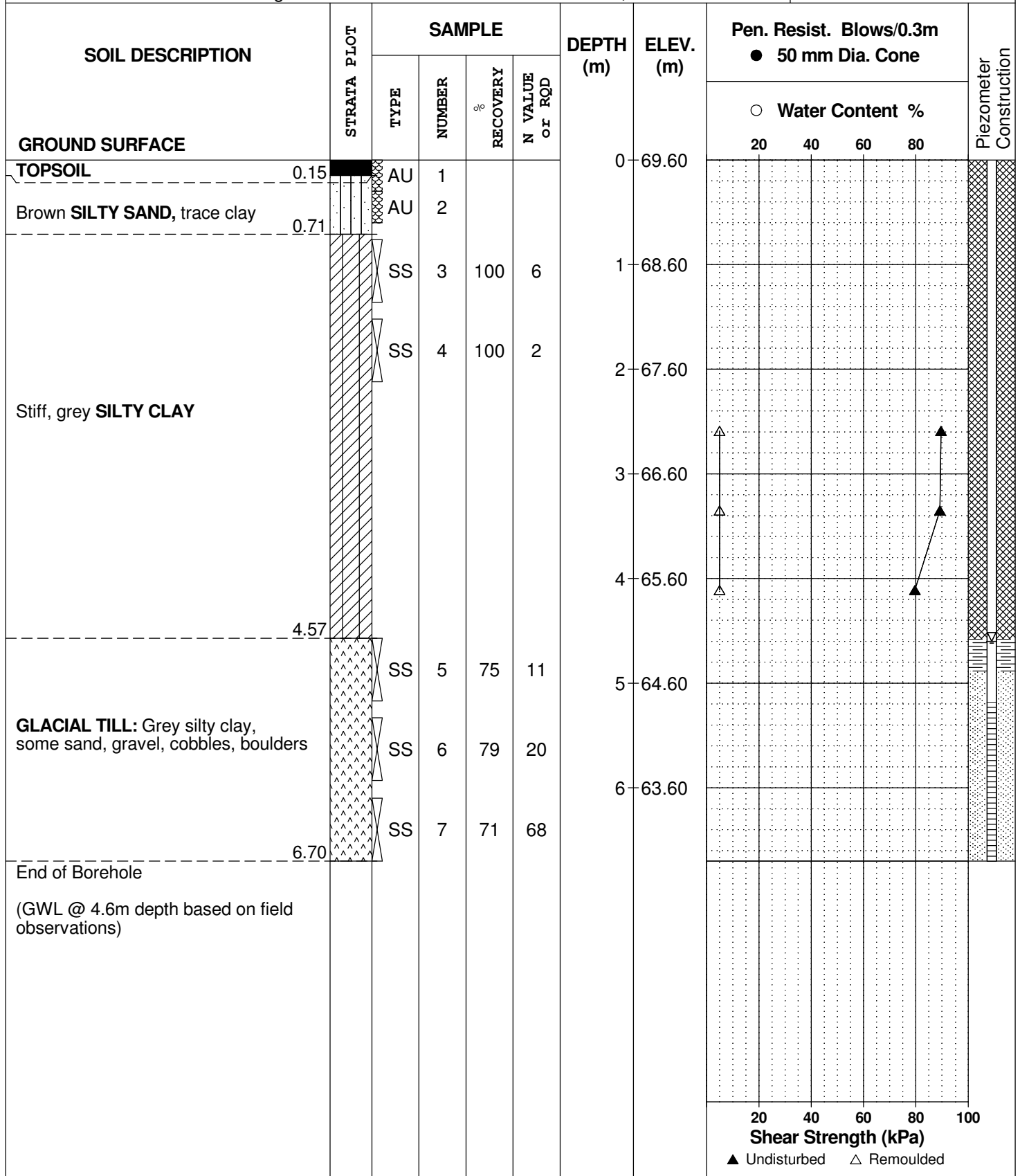
FILE NO. **PG4554**

REMARKS

HOLE NO. **BH10**

BORINGS BY CME 55 Power Auger

DATE June 28, 2018



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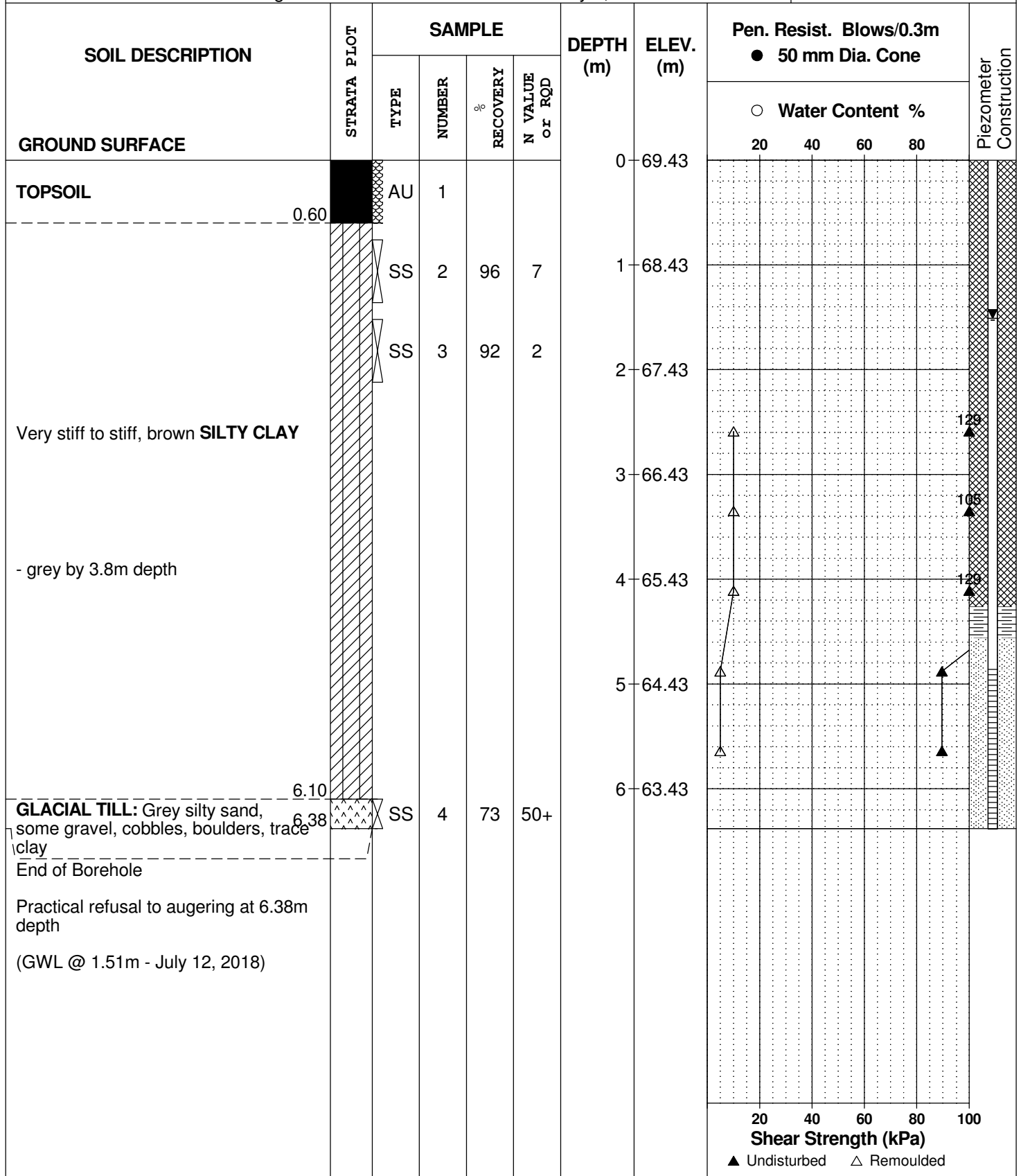
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REMARKS

HOLE NO. **BH11**

BORINGS BY CME 55 Power Auger

DATE July 3, 2018



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

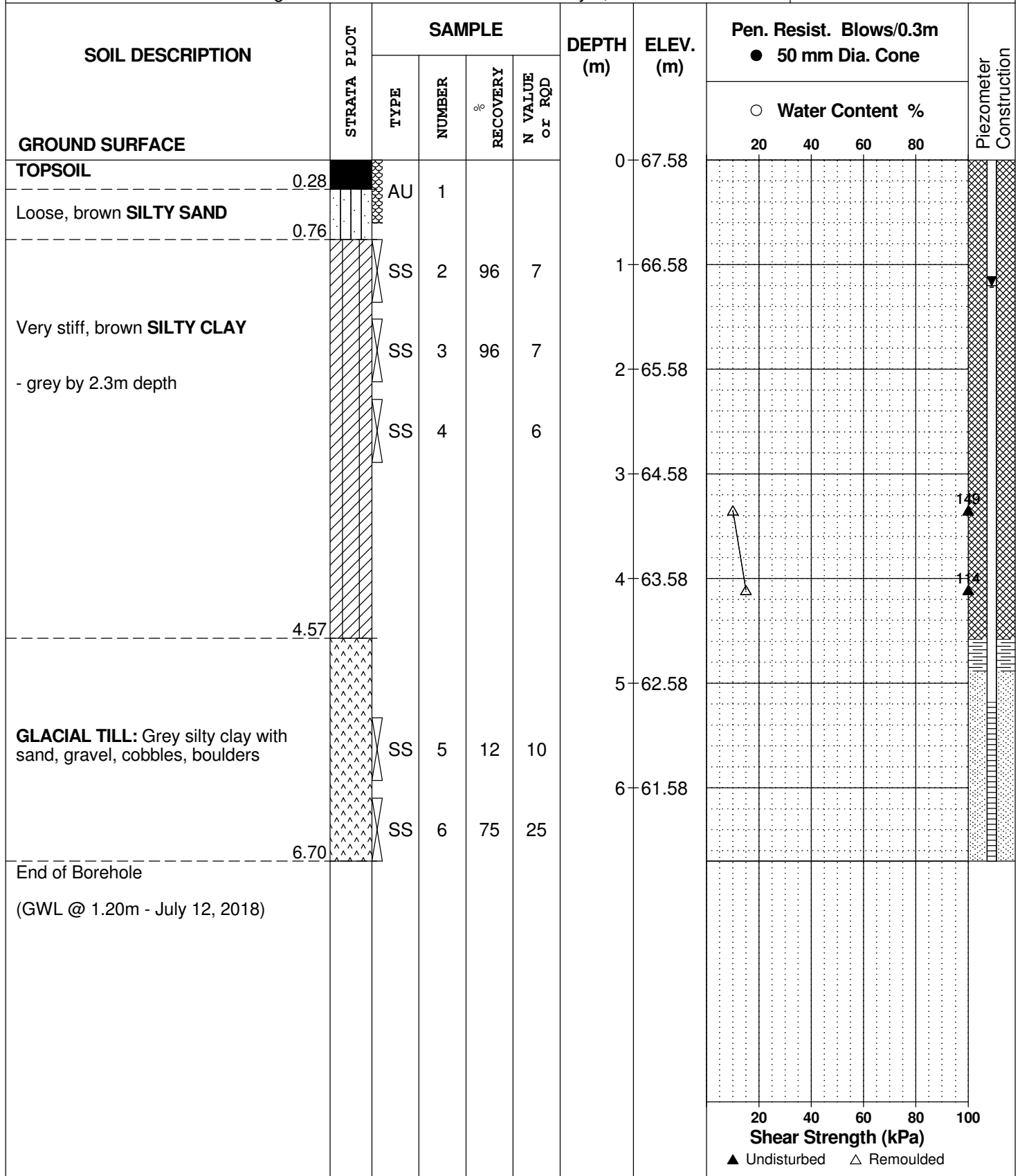
REMARKS

BORINGS BY CME 55 Power Auger

DATE July 3, 2018

FILE NO. **PG4554**

HOLE NO. **BH12**



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

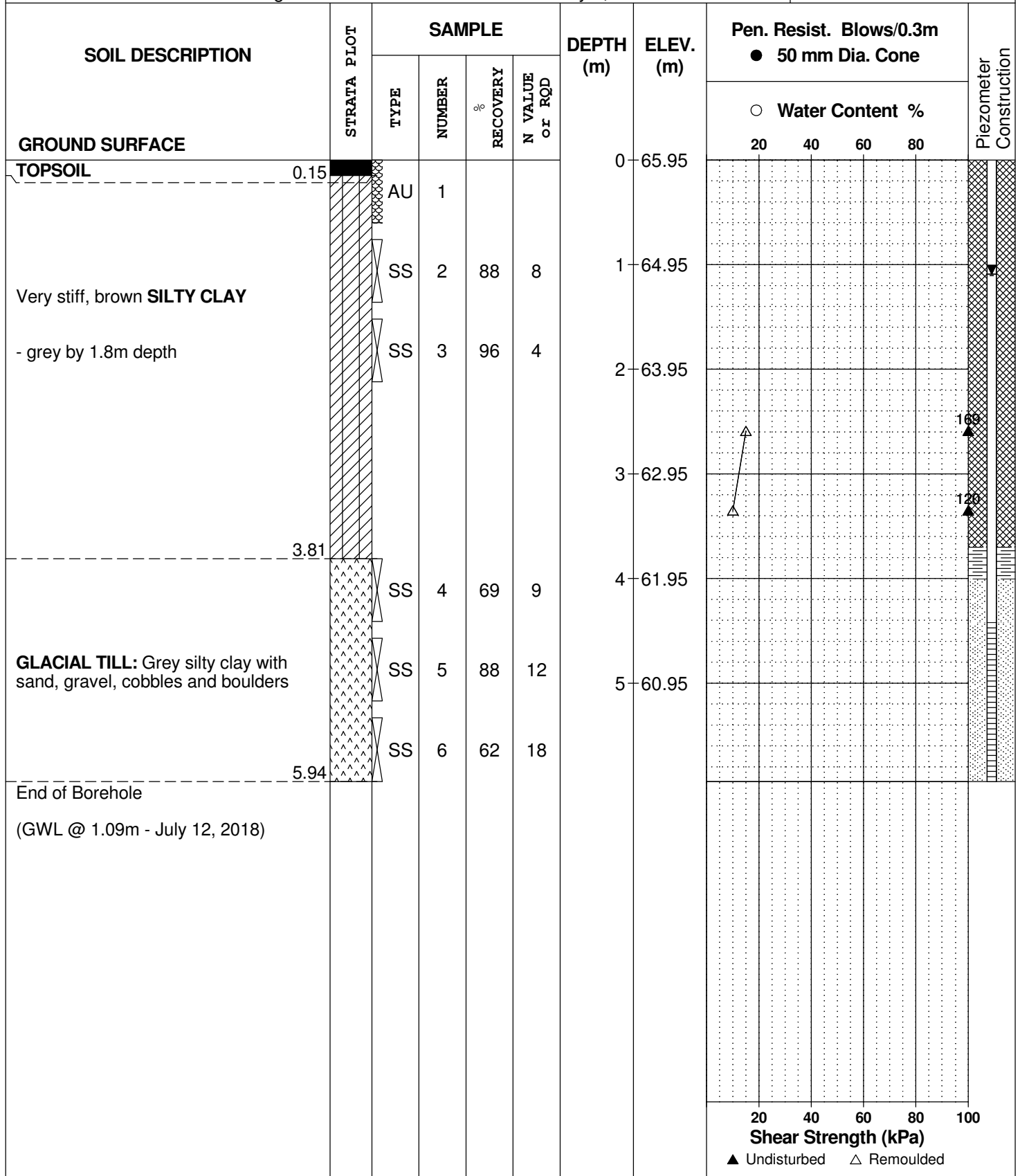
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REMARKS

HOLE NO. **BH13**

BORINGS BY CME 55 Power Auger

DATE July 2, 2018



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG4554**

REMARKS

HOLE NO. **BH14**

BORINGS BY CME 55 Power Auger

DATE June 26, 2018

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE | | | | DEPTH (m) | ELEV. (m) | Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone | | | | Piezometer Construction | |
|---|-------------|--------|--------|------------|----------------|-----------|-----------|--|----|----|----|-------------------------|--|
| | | TYPE | NUMBER | RECOVERY % | N VALUE or RQD | | | 20 | 40 | 60 | 80 | | |
| GROUND SURFACE | | | | | | 0 | 78.85 | | | | | | |
| TOPSOIL | 0.28 | AU | 1 | | | | | | | | | | |
| Very stiff, grey SILTY CLAY | | SS | 2 | 100 | 10 | 1 | 77.85 | | | | | | |
| | | SS | 3 | 100 | 50+ | | | | | | | | |
| End of Borehole | 1.85 | | | | | | | | | | | | |
| Practical refusal to augering at 1.85m depth (GWL @ 1.27m - July 12, 2018) | | | | | | | | | | | | | |
| | | | | | | | | 20 | 40 | 60 | 80 | 100 | |
| | | | | | | | | Shear Strength (kPa) | | | | | |
| | | | | | | | | ▲ Undisturbed △ Remoulded | | | | | |

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

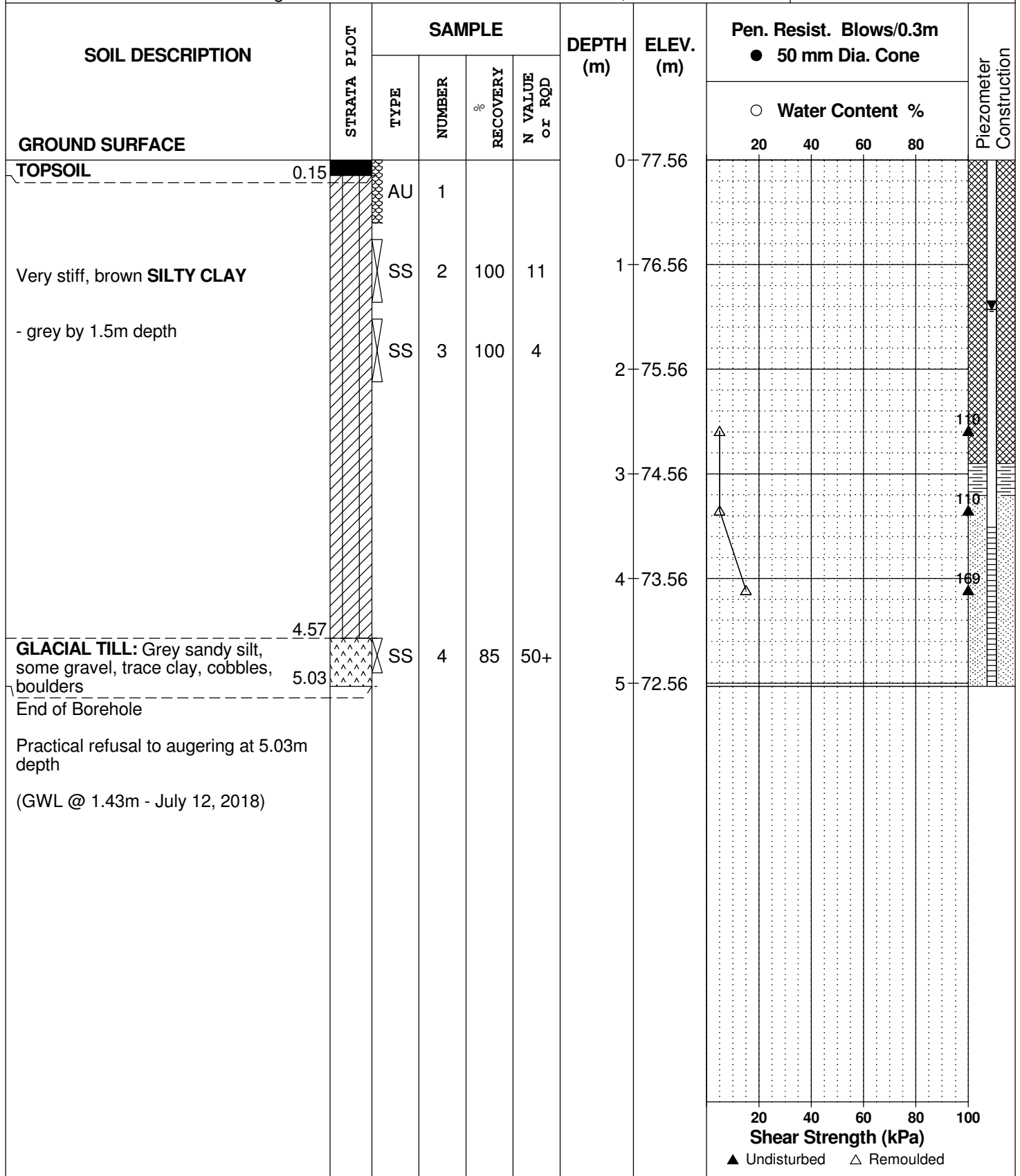
FILE NO. **PG4554**

REMARKS

HOLE NO. **BH15**

BORINGS BY CME 55 Power Auger

DATE June 26, 2018



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG4554**

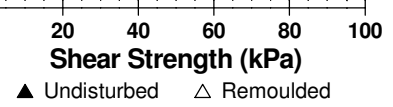
REMARKS

HOLE NO. **BH17**

BORINGS BY CME 55 Power Auger

DATE June 27, 2018

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE | | | | DEPTH (m) | ELEV. (m) | Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone | | | | Piezometer Construction | |
|---|-------------|--------|--------|------------|----------------|-----------|-----------|--|----|----|----|-------------------------|--|
| | | TYPE | NUMBER | RECOVERY % | N VALUE or RQD | | | 20 | 40 | 60 | 80 | | |
| GROUND SURFACE | | | | | | 0 | 69.99 | | | | | | |
| TOPSOIL | 0.30 | AU | 1 | | | | | | | | | | |
| GLACIAL TILL: Grey silty clay, some sand, gravel, cobbles, boulders | 1.37 | SS | 2 | 100 | 5 | 1 | 68.99 | | | | | | |
| End of Borehole Practical refusal to augering at 1.37m depth (BH dry upon completion) | | | | | | | | | | | | | |



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG4554**

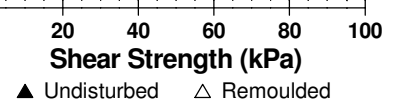
REMARKS

HOLE NO. **BH18**

BORINGS BY CME 55 Power Auger

DATE June 27, 2018

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE | | | | DEPTH (m) | ELEV. (m) | Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone | | | | Piezometer Construction | |
|---|-------------|--------|--------|------------|----------------|-----------|-----------|--|----|----|----|-------------------------|--|
| | | TYPE | NUMBER | RECOVERY % | N VALUE or RQD | | | 20 | 40 | 60 | 80 | | |
| GROUND SURFACE | | | | | | 0 | 69.78 | | | | | | |
| TOPSOIL | 0.28 | AU | 1 | | | | | | | | | | |
| Very stiff, grey SILTY CLAY | | SS | 2 | 100 | 2 | 1 | 68.78 | | | | | | |
| | 1.52 | | | | | | | | | | | | |
| GLACIAL TILL: Grey clayey silt, some sand, trace gravel, cobbles, boulders | | SS | 3 | 100 | 50+ | 2 | 67.78 | | | | | | |
| | 2.74 | | | | | | | | | | | | |
| End of Borehole | | | | | | | | | | | | | |
| Practical refusal to augering at 2.74m depth | | | | | | | | | | | | | |
| (GWL @ 1.11m - July 12, 2018) | | | | | | | | | | | | | |



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

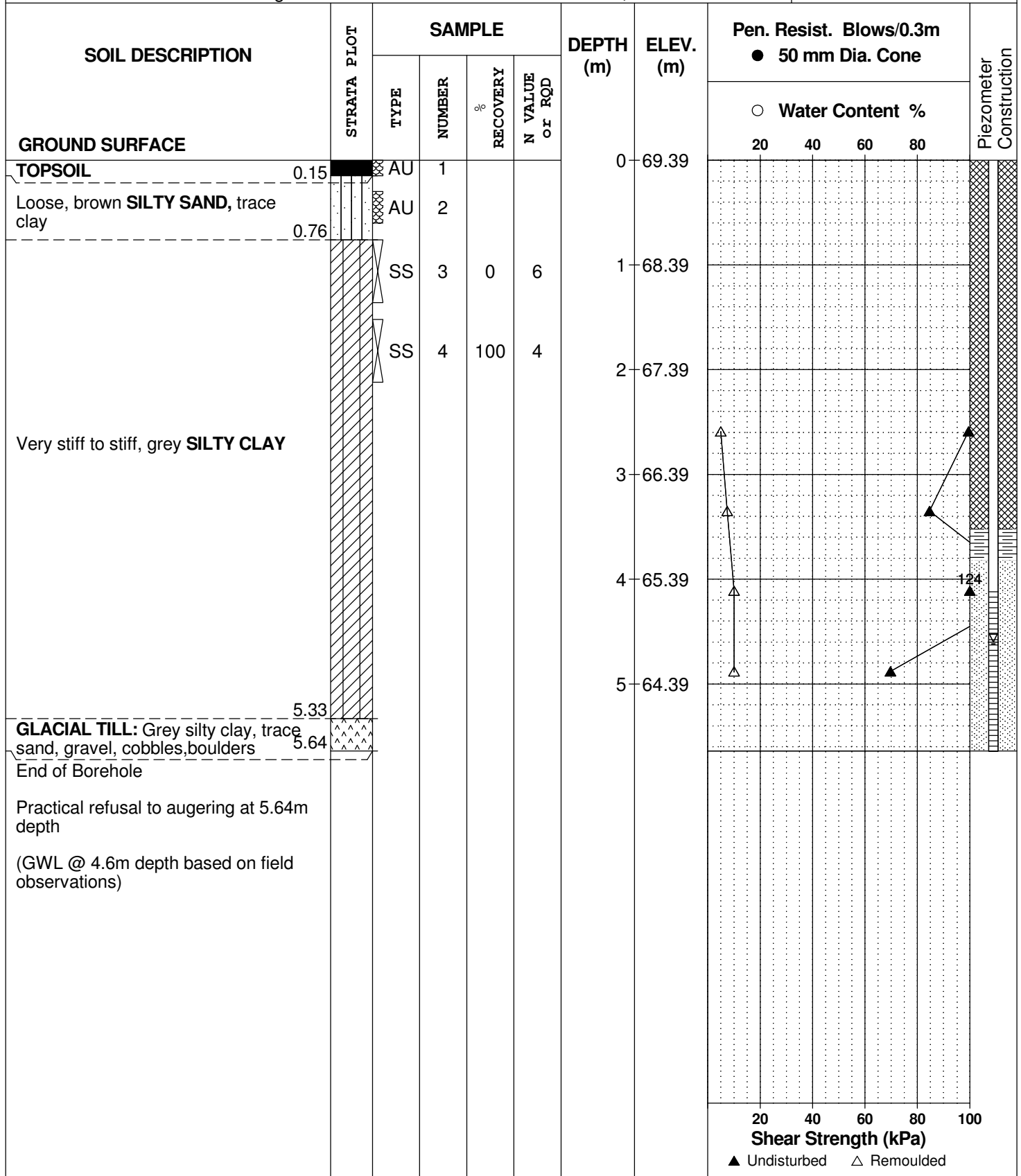
REMARKS

BORINGS BY CME 55 Power Auger

DATE June 28, 2018

FILE NO. **PG4554**

HOLE NO. **BH19**



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

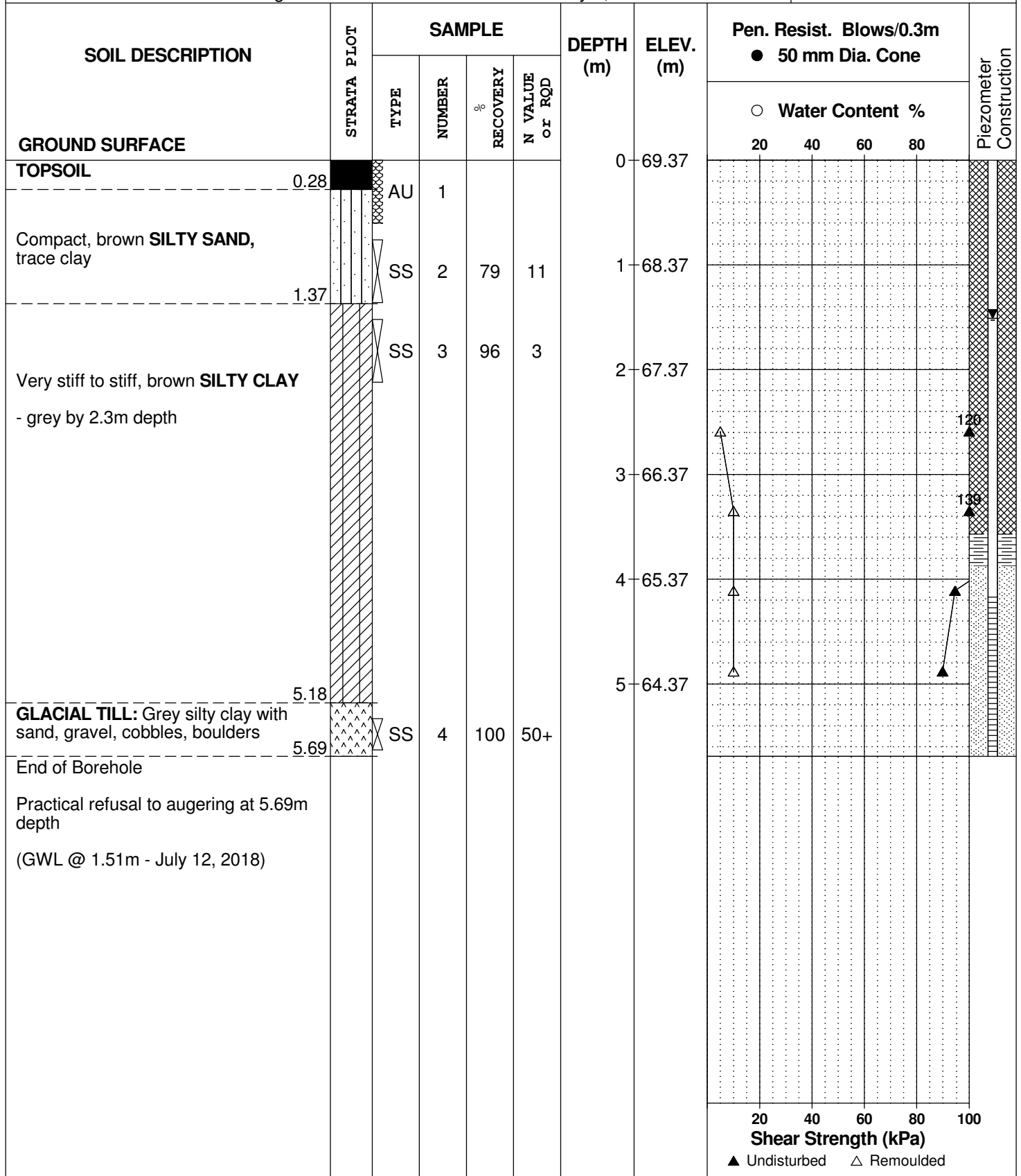
FILE NO.
PG4554

REMARKS

HOLE NO.
BH20

BORINGS BY CME 55 Power Auger

DATE July 3, 2018



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

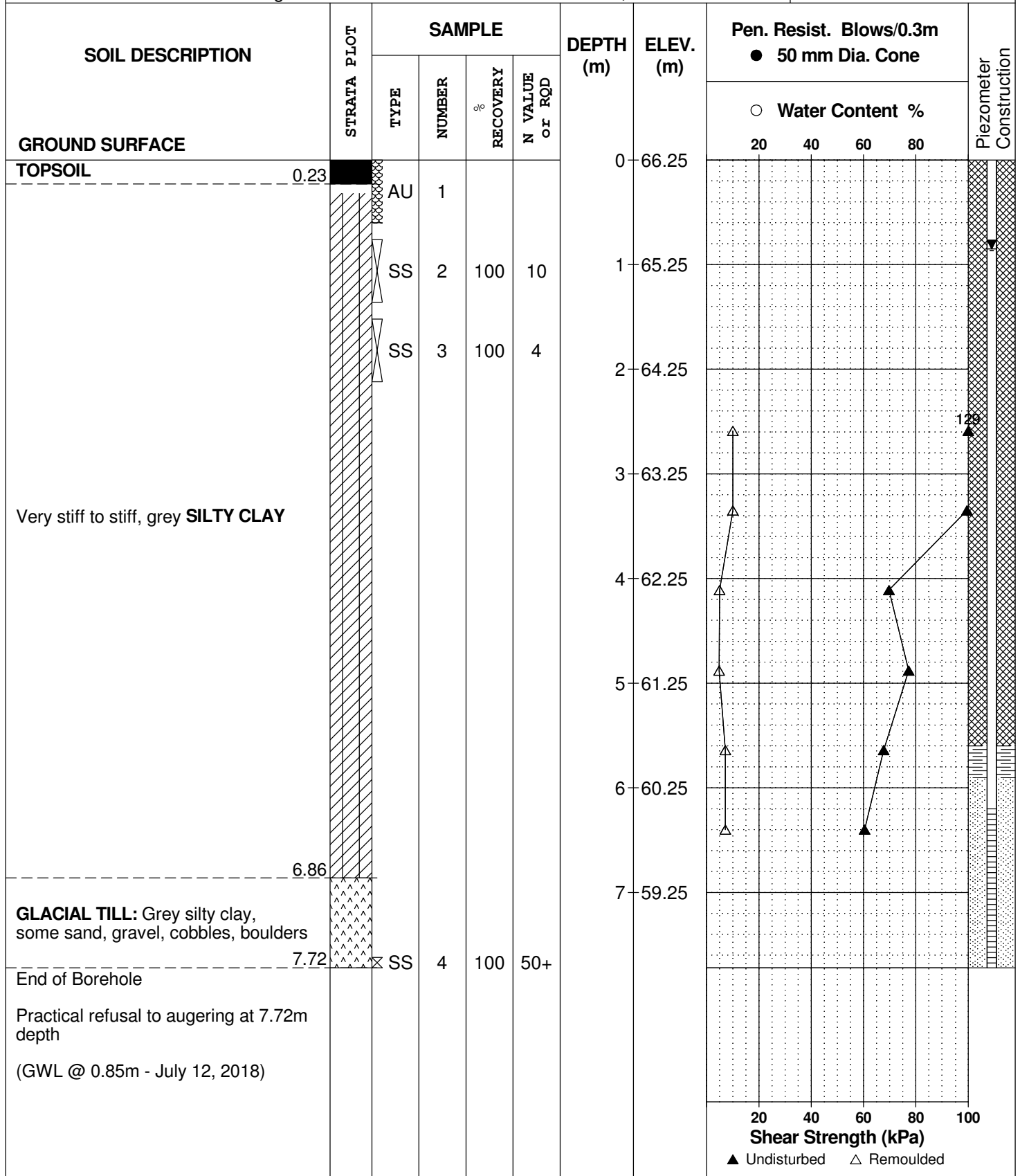
REMARKS

BORINGS BY CME 55 Power Auger

DATE June 29, 2018

FILE NO. **PG4554**

HOLE NO. **BH21**



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

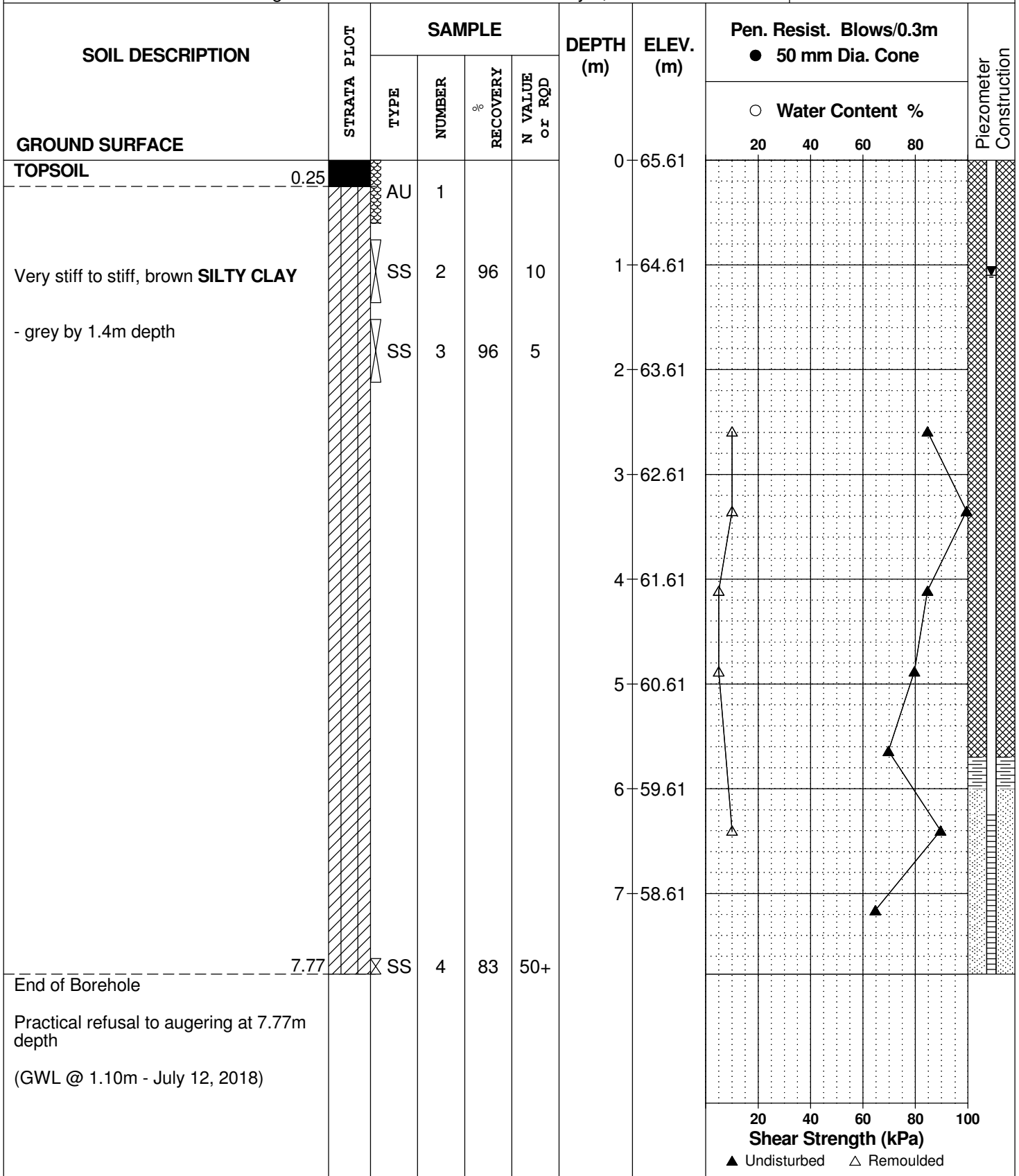
REMARKS

BORINGS BY CME 55 Power Auger

DATE July 3, 2018

FILE NO. **PG4554**

HOLE NO. **BH22**



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

REMARKS

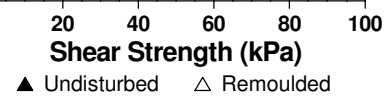
BORINGS BY CME 55 Power Auger

DATE July 3, 2018

FILE NO. **PG4554**

HOLE NO. **BH23**

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE | | | | DEPTH (m) | ELEV. (m) | Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone | | | | Piezometer Construction | |
|---|-------------|--------|--------|------------|----------------|-----------|-----------|--|----|----|----|-------------------------|--|
| | | TYPE | NUMBER | RECOVERY % | N VALUE or RQD | | | 20 | 40 | 60 | 80 | | |
| GROUND SURFACE | | | | | | 0 | 78.70 | | | | | | |
| TOPSOIL | 0.20 | AU | 1 | | | | | | | | | | |
| Very stiff, brown SILTY CLAY | | SS | 2 | 69 | 11 | 1 | 77.70 | | | | | | |
| | 1.52 | SS | 3 | 50 | 11 | 2 | 76.70 | | | | | | |
| GLACIAL TILL: Brown silty clay with gravel, sand, cobbles, boulders | | | | | | | | | | | | | |
| End of Borehole | 2.23 | | | | | | | | | | | | |
| Practical refusal to augering at 2.23m depth (GWL @ 1.35m - July 12, 2018) | | | | | | | | | | | | | |



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG4554**

REMARKS

HOLE NO. **BH25**

BORINGS BY CME 55 Power Auger

DATE June 27, 2018

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE | | | | DEPTH (m) | ELEV. (m) | Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone | | | | Piezometer Construction | |
|---|-------------|--------|--------|------------|----------------|-----------|-----------|--|----|----|----|-------------------------|--|
| | | TYPE | NUMBER | RECOVERY % | N VALUE or RQD | | | 20 | 40 | 60 | 80 | | |
| GROUND SURFACE | | | | | | 0 | 74.86 | | | | | | |
| TOPSOIL | 0.53 | AU | 1 | | | | | | | | | | |
| Very stiff to stiff, grey SILTY CLAY | | SS | 2 | 100 | 12 | 1 | 73.86 | | | | | | |
| | | SS | 3 | 100 | 10 | 2 | 72.86 | | | | | | |
| | | SS | 4 | 100 | 8 | | | | | | | | |
| End of Borehole | 3.00 | | | | | 3 | 71.86 | | | | | | |
| Practical refusal to augering at 3.00m depth (GWL @ 2.49m - July 12, 2018) | | | | | | | | | | | | | |
| | | | | | | | | 20 | 40 | 60 | 80 | 100 | |
| | | | | | | | | Shear Strength (kPa) | | | | | |
| | | | | | | | | ▲ Undisturbed △ Remoulded | | | | | |

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG4554**

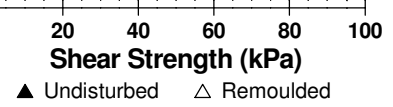
REMARKS

HOLE NO. **BH26**

BORINGS BY CME 55 Power Auger

DATE June 27, 2018

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE | | | | DEPTH (m) | ELEV. (m) | Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone | | | | Piezometer Construction | |
|--|-------------|--------|--------|------------|----------------|-----------|-----------|--|----|----|----|-------------------------|--|
| | | TYPE | NUMBER | RECOVERY % | N VALUE or RQD | | | 20 | 40 | 60 | 80 | | |
| GROUND SURFACE | | | | | | 0 | 70.45 | | | | | | |
| TOPSOIL | 0.28 | AU | 1 | | | | | | | | | | |
| GLACIAL TILL: Grey silty clay with sand, gravel, cobbles, boulders | | SS | 2 | 100 | 50+ | 1 | 69.45 | | | | | | |
| End of Borehole | 1.45 | | | | | | | | | | | | |
| Practical refusal to augering at 1.45m depth (BH dry upon completion) | | | | | | | | | | | | | |



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

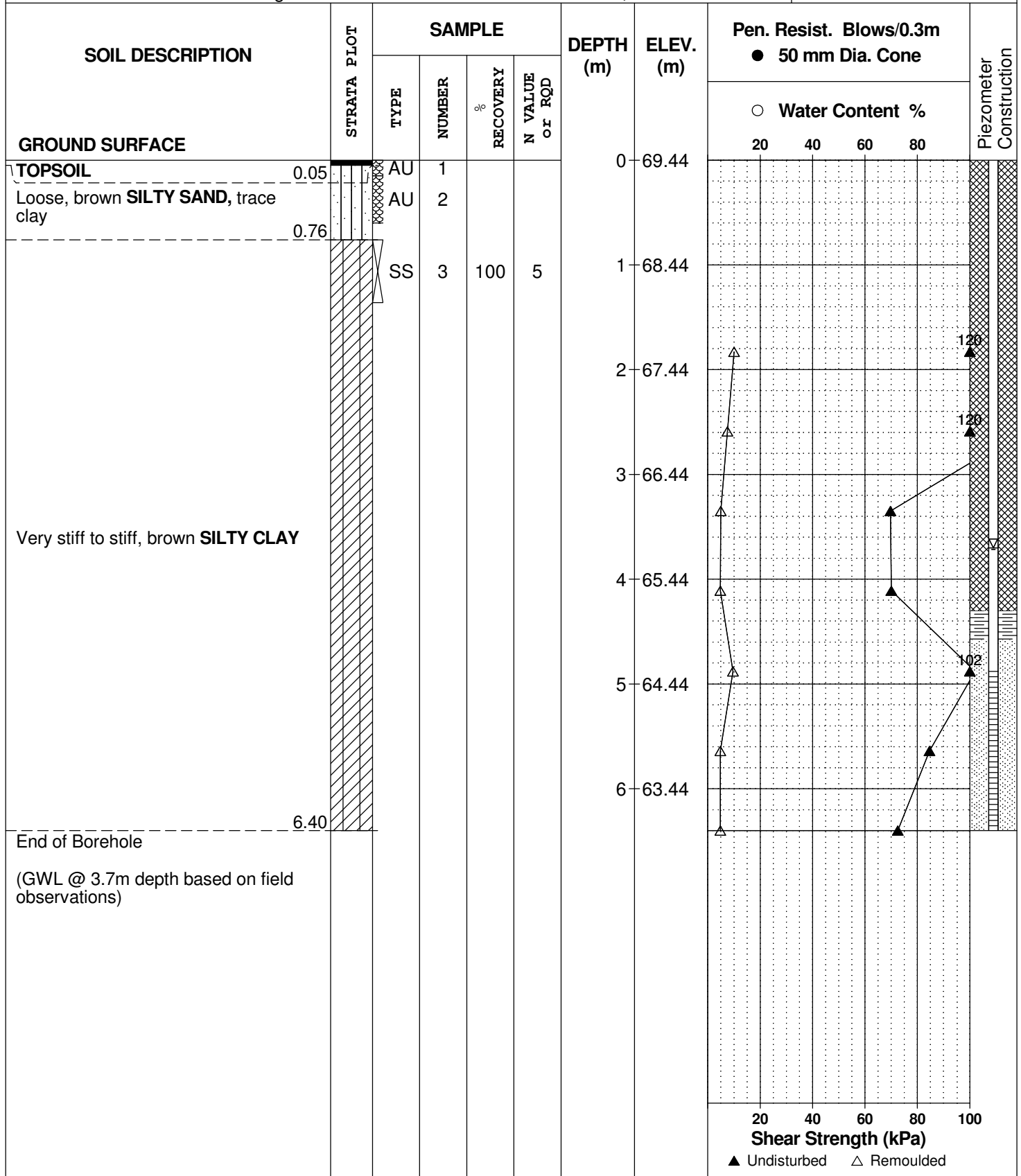
FILE NO. **PG4554**

REMARKS

HOLE NO. **BH28**

BORINGS BY CME 55 Power Auger

DATE June 28, 2018



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

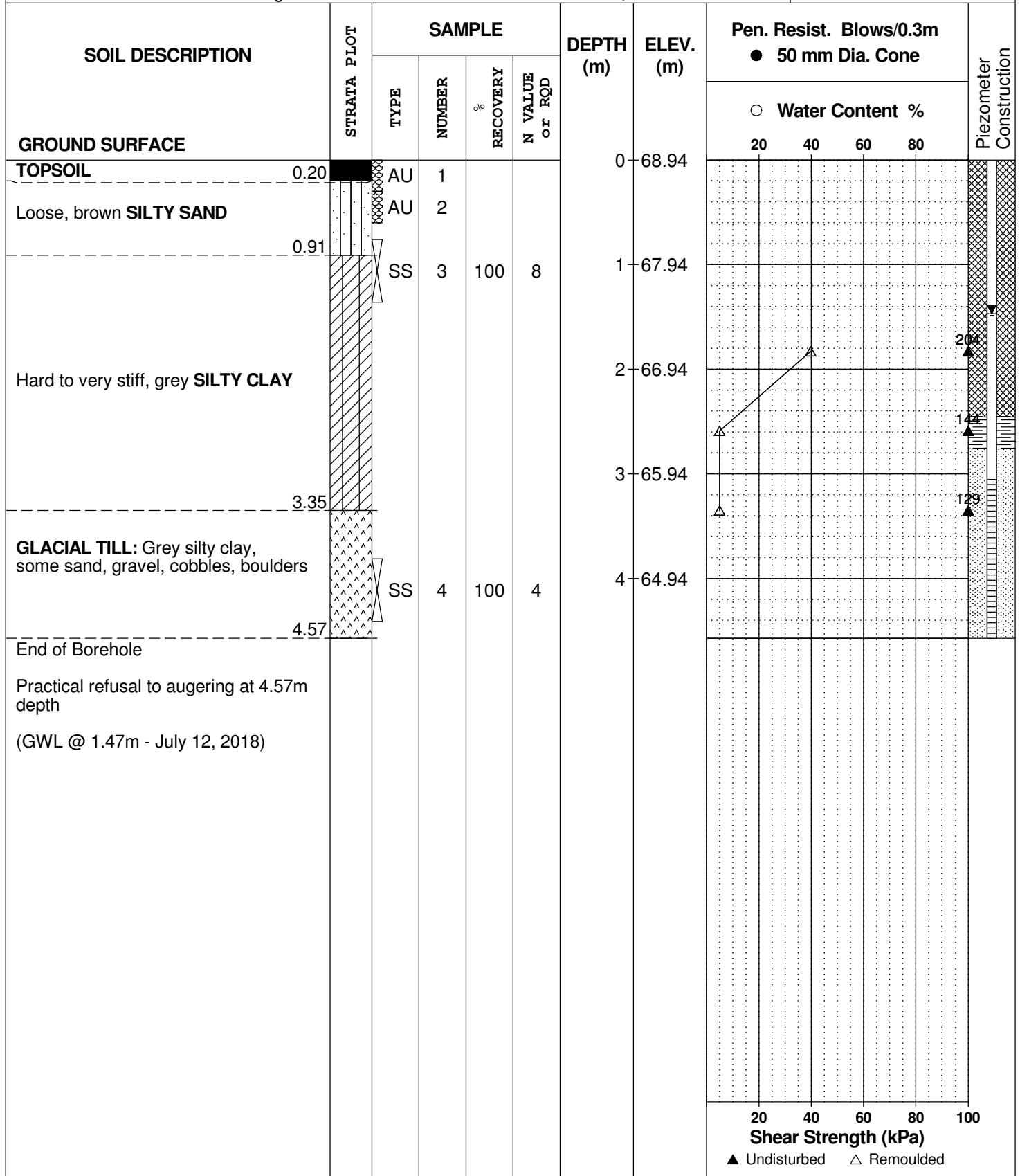
FILE NO.
PG4554

REMARKS

HOLE NO.
BH29

BORINGS BY CME 55 Power Auger

DATE June 29, 2018



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

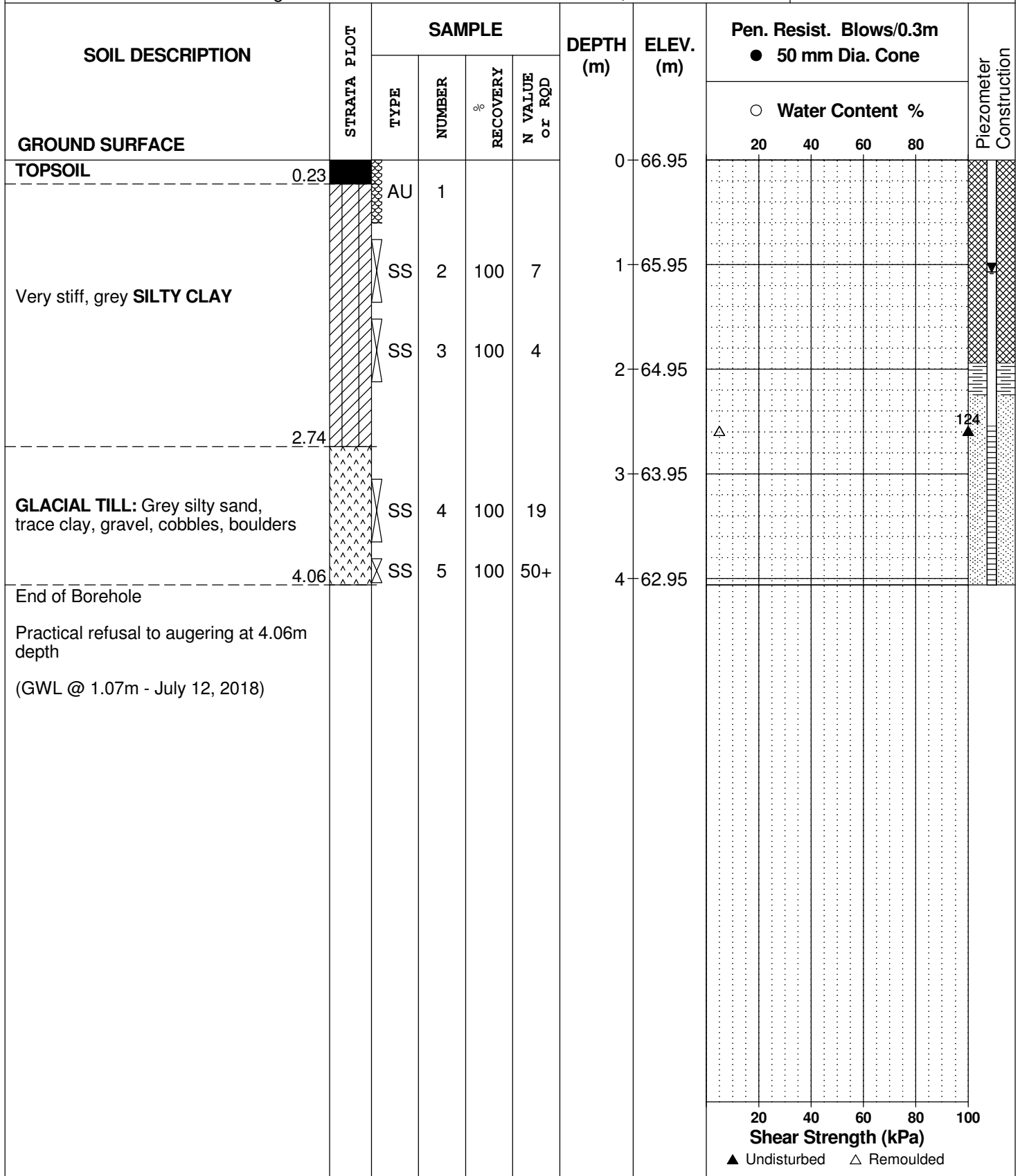
REMARKS

BORINGS BY CME 55 Power Auger

DATE June 29, 2018

FILE NO. **PG4554**

HOLE NO. **BH30**



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

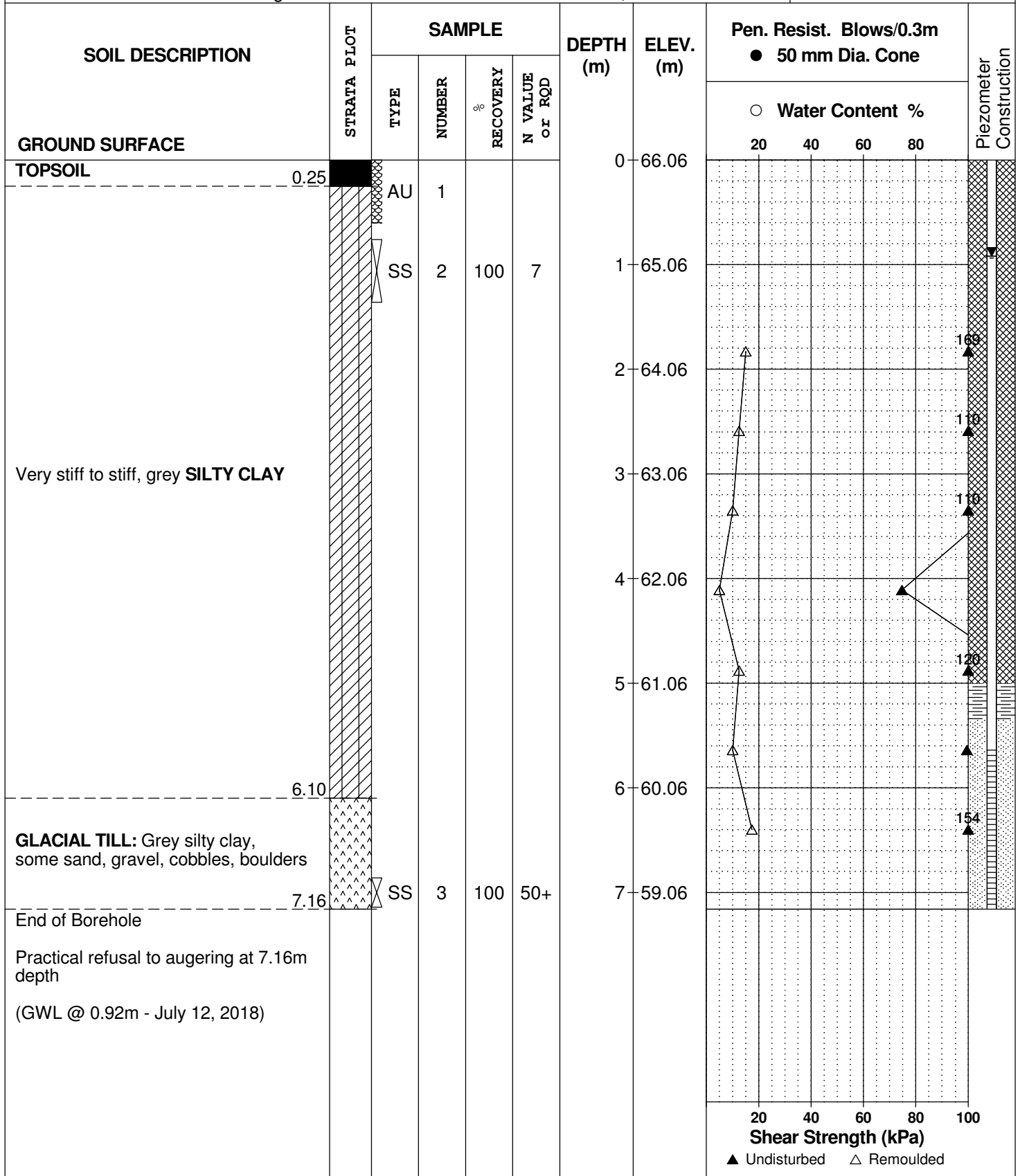
FILE NO. **PG4554**

REMARKS

HOLE NO. **BH31**

BORINGS BY CME 55 Power Auger

DATE June 29, 2018



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG4554**

REMARKS

HOLE NO. **BH32**

BORINGS BY CME 55 Power Auger

DATE June 27, 2018

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE | | | | DEPTH (m) | ELEV. (m) | Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone | | | | Piezometer Construction | |
|---|-------------|--------|--------|------------|----------------|-----------|-----------|--|----|----|----|-------------------------|--|
| | | TYPE | NUMBER | RECOVERY % | N VALUE or RQD | | | 20 | 40 | 60 | 80 | | |
| GROUND SURFACE | | | | | | 0 | 76.95 | | | | | | |
| TOPSOILB | 0.30 | AU | 1 | | | | | | | | | | |
| Very stiff, grey SILTY CLAY | | SS | 2 | 100 | 10 | 1 | 75.95 | | | | | | |
| | | SS | 3 | 100 | 8 | 2 | 74.95 | | | | | | |
| | | SS | 4 | 100 | 8 | | | | | | | | |
| GLACIAL TILL: Grey silty clay, trace sand, gravel, cobbles, boulders | 2.74 | SS | 5 | 71 | 50+ | 3 | 73.95 | | | | | | |
| | | | | | | | | | | | | | |
| End of Borehole | 4.14 | | | | | 4 | 72.95 | | | | | | |
| Practical refusal to augering at 4.14m depth (BH dry - July 12, 2018) | | | | | | | | | | | | | |
| | | | | | | | | 20 | 40 | 60 | 80 | 100 | |
| | | | | | | | | Shear Strength (kPa) | | | | | |
| | | | | | | | | ▲ Undisturbed △ Remoulded | | | | | |

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG4554**

REMARKS

HOLE NO. **BH33**

BORINGS BY CME 55 Power Auger

DATE June 27, 2018

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE | | | | DEPTH (m) | ELEV. (m) | Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone | | | | Piezometer Construction | |
|--|-------------|--------|--------|------------|----------------|-----------|-----------|--|----|----|----|-------------------------|--|
| | | TYPE | NUMBER | RECOVERY % | N VALUE or RQD | | | 20 | 40 | 60 | 80 | | |
| GROUND SURFACE | | | | | | 0 | 71.39 | | | | | | |
| TOPSOIL | 0.28 | AU | 1 | | | | | | | | | | |
| Very stiff, grey SILTY CLAY | | | | | | | | | | | | | |
| GLACIAL TILL: Grey silty clay, trace sand, gravel, cobbles, boulders | 0.91 | SS | 2 | 100 | 23 | 1 | 70.39 | | | | | | |
| End of Borehole | 1.40 | | | | | | | | | | | | |
| Practical refusal to augering at 1.40m depth (BH dry - July 12, 2018) | | | | | | | | | | | | | |

20 40 60 80 100
Shear Strength (kPa)
 ▲ Undisturbed △ Remoulded

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG4554**

REMARKS

HOLE NO. **BH34**

BORINGS BY CME 55 Power Auger

DATE June 27, 2018

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE | | | | DEPTH (m) | ELEV. (m) | Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone | | | | Piezometer Construction | |
|---|-------------|--------|--------|----------|----------------|-----------|-----------|--|----|----|----|-------------------------|--|
| | | TYPE | NUMBER | RECOVERY | N VALUE or RQD | | | 20 | 40 | 60 | 80 | | |
| GROUND SURFACE | | | | | | 0 | 69.83 | | | | | | |
| TOPSOIL | | | | | | | | | | | | | |
| Very stiff, grey SILTY CLAY | 0.28 | AU | 1 | | | | | | | | | | |
| | 0.76 | | | | | | | | | | | | |
| GLACIAL TILL: Grey silty clay, trace sand, gravel, cobbles, boulders | | SS | 2 | | 10 | 1 | 68.83 | | | | | | |
| | 1.40 | | | | | | | | | | | | |
| End of Borehole | | | | | | | | | | | | | |
| Practical refusal to augering at 1.40m depth (BH dry upon completion) | | | | | | | | | | | | | |

20 40 60 80 100
Shear Strength (kPa)
 ▲ Undisturbed △ Remoulded

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG4554**

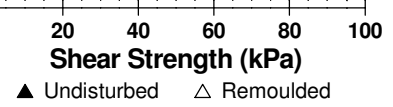
REMARKS

HOLE NO. **BH36**

BORINGS BY CME 55 Power Auger

DATE June 28, 2018

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE | | | | DEPTH (m) | ELEV. (m) | Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone | | | | Piezometer Construction | |
|---|-------------|--------|--------|------------|----------------|-----------|-----------|--|----|----|----|-------------------------|--|
| | | TYPE | NUMBER | RECOVERY % | N VALUE or RQD | | | ○ Water Content % | | | | | |
| GROUND SURFACE | | | | | | | | 20 | 40 | 60 | 80 | | |
| TOPSOIL | 0.23 | AU | 1 | | | 0 | 69.60 | | | | | | |
| Loose, brown SILTY SAND, trace clay | | AU | 2 | | | | | | | | | | |
| | 0.84 | | | | | | | | | | | | |
| Stiff, grey SILTY CLAY | | SS | 3 | 100 | 5 | 1 | 68.60 | | | | | | |
| | 1.83 | | | | | | | | | | | | |
| | | SS | 4 | 100 | 7 | 2 | 67.60 | | | | | | |
| | | SS | 5 | 29 | 4 | 3 | 66.60 | | | | | | |
| GLACIAL TILL: Grey silty clay, some sand, gravel, cobbles, boulders | | SS | 6 | 83 | 15 | 4 | 65.60 | | | | | | |
| | | SS | 7 | 33 | 22 | 5 | 64.60 | | | | | | |
| | 5.13 | SS | 8 | 100 | 11 | 5 | 64.60 | | | | | | |
| End of Borehole | | | | | | | | | | | | | |
| Practical refusal to augering at 5.13m depth | | | | | | | | | | | | | |



DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG4554**

REMARKS

HOLE NO. **BH40**

BORINGS BY CME 55 Power Auger

DATE July 4, 2018

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE | | | | DEPTH (m) | ELEV. (m) | Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone | | | | Monitoring Well Construction | |
|---|-------------|--------|--------|------------|----------------|-----------|-----------|--|----|----|----|------------------------------|--|
| | | TYPE | NUMBER | RECOVERY % | N VALUE or RQD | | | 20 | 40 | 60 | 80 | | |
| GROUND SURFACE | | | | | | 0 | 79.19 | | | | | | |
| TOPSOIL | 0.25 | AU | 1 | | | | | | | | | | |
| Compact, brown SILTY SAND , trace clay | | SS | 2 | 71 | 11 | 1 | 78.19 | | | | | | |
| | 1.52 | SS | 3 | 96 | 8 | 2 | 77.19 | | | | | | |
| Stiff, brown SILTY CLAY , trace sand | | SS | 4 | 96 | 7 | | | | | | | | |
| | | SS | 5 | 96 | 7 | 3 | 76.19 | | | | | | |
| - grey by 3.8m depth | | SS | 6 | 94 | 6 | 4 | 75.19 | | | | | | |
| | | SS | 7 | 96 | 5 | 5 | 74.19 | | | | | | |
| | | SS | 8 | 96 | 4 | 6 | 73.19 | | | | | | |
| | | SS | 9 | 96 | W | | | | | | | | |
| | 6.86 | SS | 10 | 96 | 2 | 7 | 72.19 | | | | | | |
| GLACIAL TILL: Grey silty clay with sand, gravel, cobbles, boulders | | | | | | | | | | | | | |
| | 7.62 | | | | | | | | | | | | |
| End of Borehole (GWL @ 4.44m - July 13, 2018) | | | | | | | | | | | | | |

20 40 60 80 100
Shear Strength (kPa)
 ▲ Undisturbed △ Remoulded

DATUM Ground surface elevations provided by Stantec Geomatics Ltd.

FILE NO. **PG4554**

REMARKS

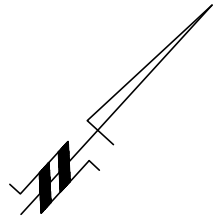
HOLE NO. **BH42**

BORINGS BY CME 55 Power Auger

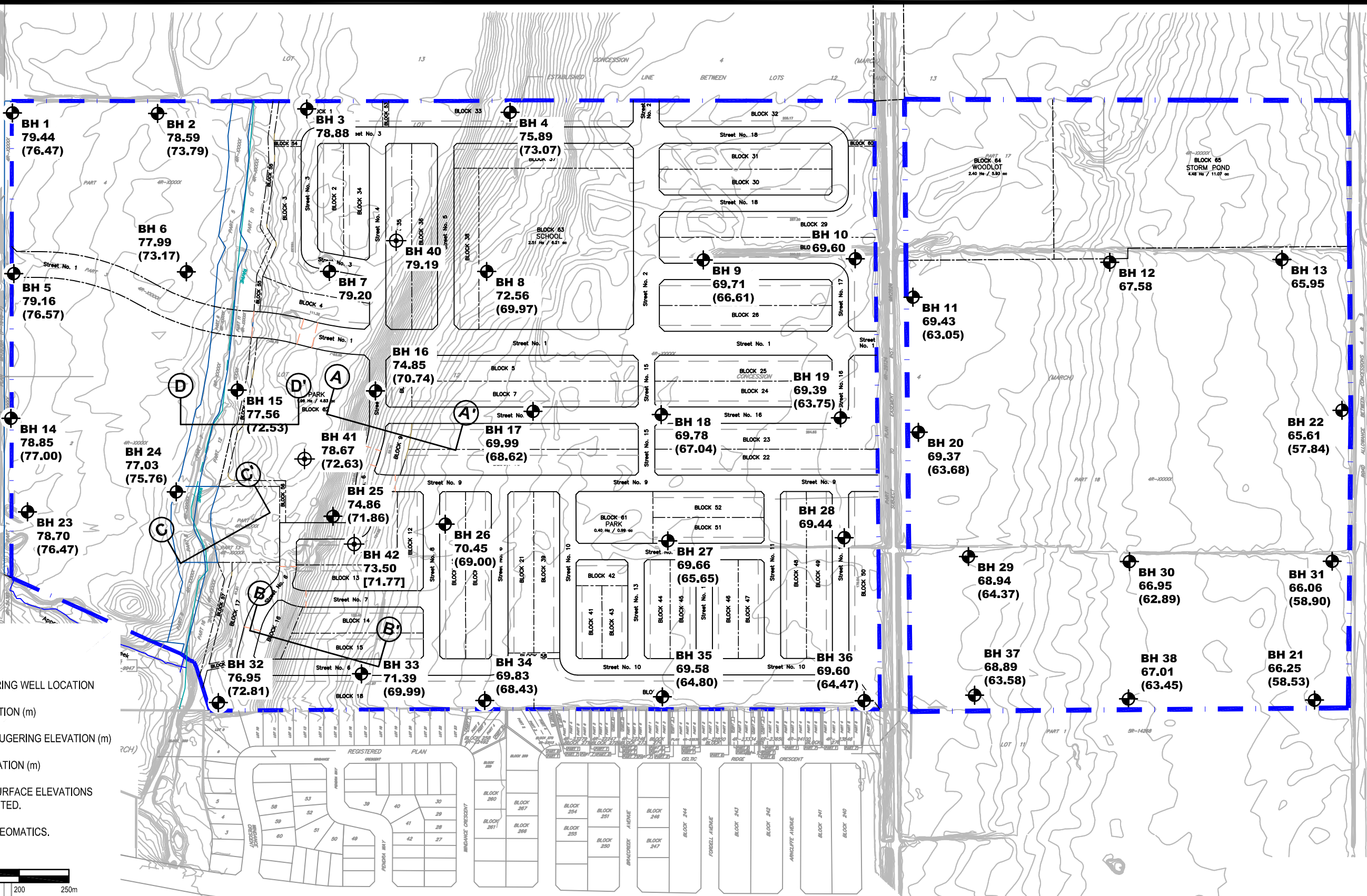
DATE July 4, 2018

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE | | | | DEPTH (m) | ELEV. (m) | Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone | | | | Monitoring Well Construction | |
|--|-------------|--------|--------|------------|----------------|-----------|-----------|--|----|----|----|------------------------------|--|
| | | TYPE | NUMBER | RECOVERY % | N VALUE or RQD | | | 20 | 40 | 60 | 80 | | |
| GROUND SURFACE | | | | | | 0 | 73.50 | | | | | | |
| TOPSOIL | 0.18 | AU | 1 | | | | | | | | | | |
| Compact, brown SILTY SAND , trace clay | | SS | 2 | 21 | 10 | 1 | 72.50 | | | | | | |
| | 1.52 | | | | | | | | | | | | |
| GLACIAL TILL: Brown silty sand with gravel, cobbles, boulders | 1.73 | SS | 3 | 20 | 50+ | | | | | | | | |
| | | RC | 1 | 98 | 98 | 2 | 71.50 | | | | | | |
| | | RC | 2 | 98 | 79 | 3 | 70.50 | | | | | | |
| BEDROCK: Grey limestone with shale seams | | RC | 3 | 100 | 93 | 5 | 68.50 | | | | | | |
| | | RC | 4 | 100 | 81 | 6 | 67.50 | | | | | | |
| | 7.21 | | | | | 7 | 66.50 | | | | | | |
| End of Borehole (GWL @ 4.04m - July 13, 2018) | | | | | | | | | | | | | |

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded



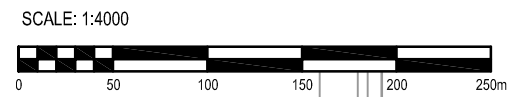
MARCH ROAD



- LEGEND:**
- BOREHOLE LOCATION
 - BOREHOLE WITH MONITORING WELL LOCATION
 - 68.69 GROUND SURFACE ELEVATION (m)
 - (63.58) PRACTICAL REFUSAL TO AUGERING ELEVATION (m)
 - [71.77] BEDROCK SURFACE ELEVATION (m)

TEST HOLE LOCATIONS AND GROUND SURFACE ELEVATIONS PROVIDED BY STANTEC GEOMATICS LIMITED.

SURVEY PLAN PROVIDED BY STANTEC GEOMATICS.



patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

| NO. | REVISIONS | DATE | INITIAL |
|-----|-------------------|------------|---------|
| 2 | BASE PLAN UPDATED | 23/11/2018 | SD |
| 1 | BASE PLAN UPDATED | 30/08/2018 | SD |

MINTO COMMUNITIES / 2559688 ONTARIO INC.

**GEOTECHNICAL INVESTIGATION
PROPOSED DEVELOPMENT - 936 MARCH ROAD**

ONTARIO

OTTAWA,
Title: **TEST HOLE LOCATION PLAN**

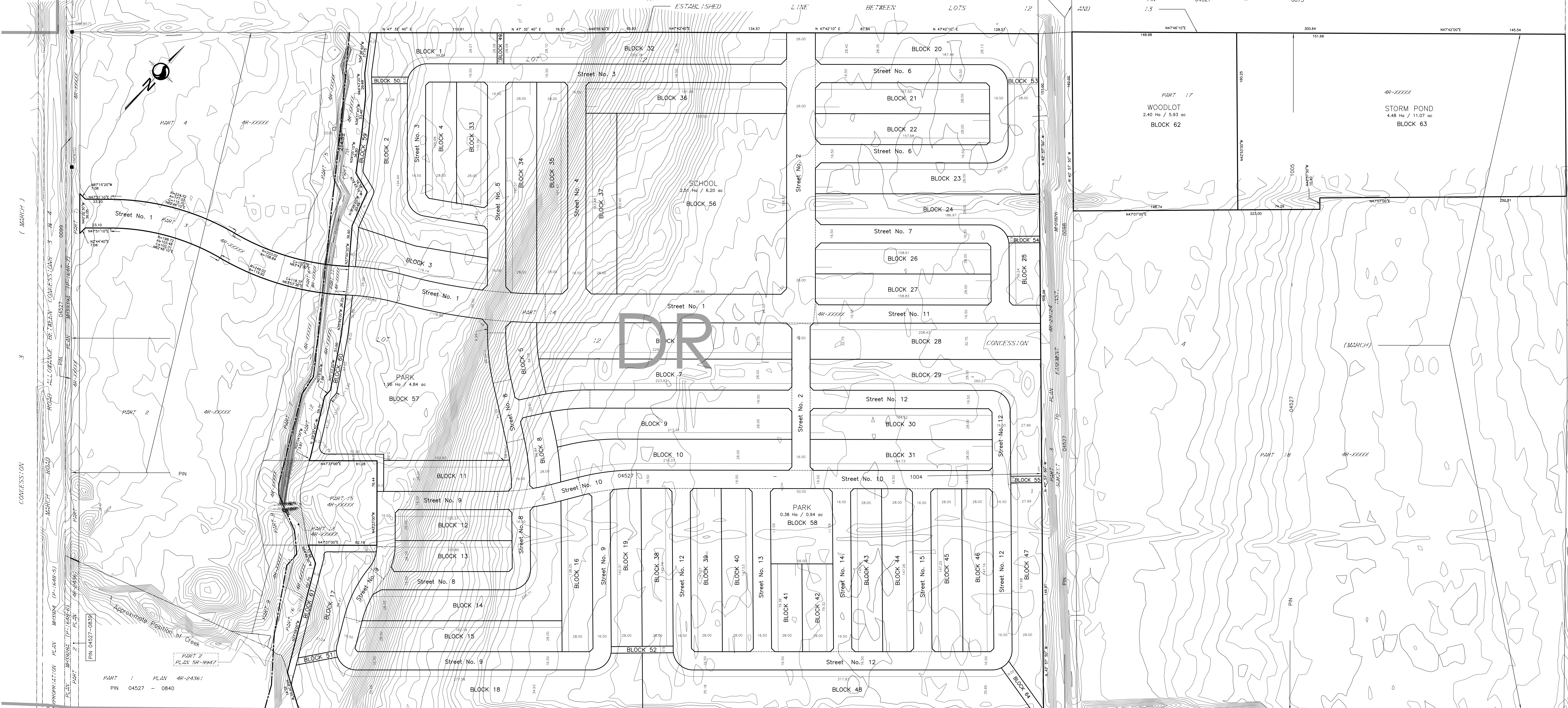
| | |
|-----------------|---------------------------|
| 1:4000 | 07/2018 |
| Drawn by: RCG | Report No.: PG4554-1 |
| Checked by: SD | Dwg. No.: PG4554-1 |
| Approved by: SD | Revision No.: 2 |

APPENDIX 3

Stantec Geomatics Limited - Draft Plan of Subdivision With Contours

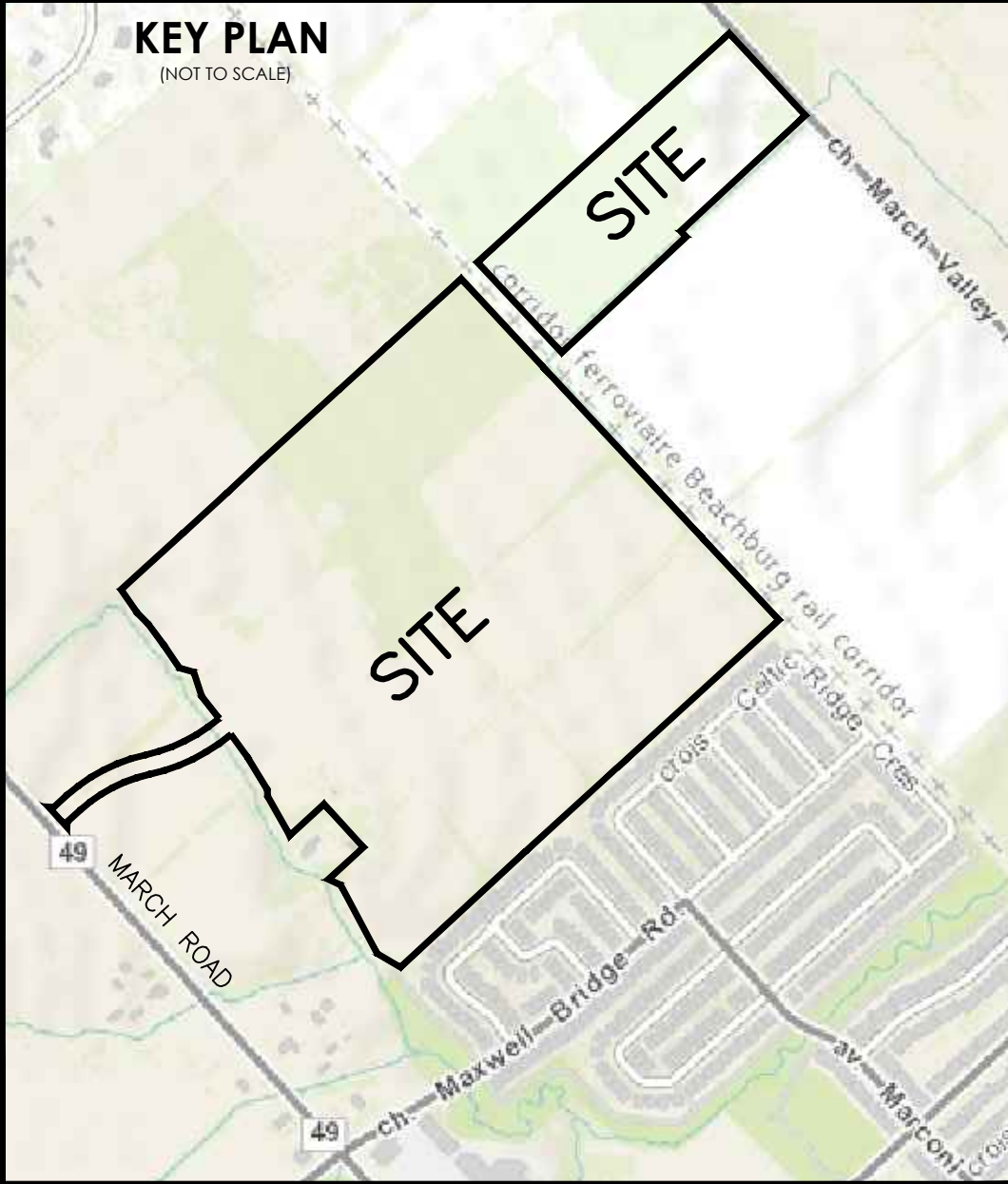
RC[338r]

LOT PIN 04527 13 0074 CONCESSION 4 (MARCH) AND PIN 04527 0075



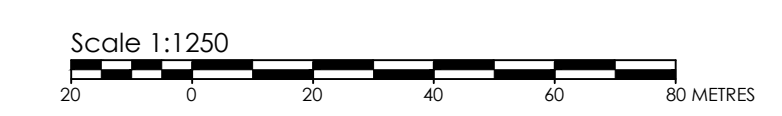
SUBJECT TO THE CONDITIONS, IF ANY, SET FORTH IN OUR LETTER DATED... THIS DRAFT PLAN IS APPROVED BY THE CITY OF OTTAWA UNDER SECTION 51 OF THE PLANNING ACT. THIS DAY OF ... 20...

ADAM BROWN, MANAGER DEVELOPMENT REVIEW: RURAL PLANNING, INFRASTRUCTURE AND ECONOMIC DEVELOPMENT DEPARTMENT, CITY OF OTTAWA



DRAFT PLAN OF SUBDIVISION

PART OF LOT 12 CONCESSION 4 (GEOGRAPHIC TOWNSHIP OF MARCH) CITY OF OTTAWA



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

GRID SCALE CONVERSION DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.99992

BEARING NOTE BEARINGS ARE DERIVED FROM PLAN 48-XXXXX PREPARED BY OTHERS.

INFORMATION REQUIRED UNDER SECTION 51 OF THE PLANNING ACT R.S.O. 1990

- a. SEE PLAN b. SEE PLAN c. SEE PLAN d. SEE PROPOSED LAND USE SCHEDULE (ABOVE) e. SEE PLAN f. SEE PLAN g. SEE PLAN h. CITY WATER AVAILABLE i. SEE SOIL REPORT j. SEE TOPOGRAPHICAL INFORMATION k. ALL CITY SERVICES AVAILABLE l. NO EASEMENTS REGISTERED ON TITLE

SURVEYOR'S CERTIFICATE I HEREBY CERTIFY THAT THE BOUNDARIES OF THE SUBJECT LANDS AND THEIR RELATIONSHIP TO ADJOINING LANDS HAVE BEEN ACCURATELY AND CORRECTLY SHOWN.

DATE: ... BRIAN J. WEBSTER ONTARIO LAND SURVEYOR

Stantec Geomatics Ltd. CANADA LAND SURVEYORS ONTARIO LAND SURVEYORS 1231 CLIVE AVENUE, SUITE 400 OTTAWA, ONTARIO K2C 3C9 TEL: 416.724.4200 FAX: 416.722.3799 stantec.com

NOTE: THE PLAN DATA IS COMPILED FROM OFFICE RECORDS OF STANTEC GEOMATICS LTD. AND HAS NOT BEEN VERIFIED BY FIELD MEASUREMENTS. ALL DISTANCES ARE APPROXIMATE. TO BE VERIFIED BY FINAL REGISTERED PLANS.

LOT DR 11 CONCESSION 4 (MARCH)

R37 [1306]

LOT 11 CONCESSION 4 (MARCH)