GEO-ENVIRONMENTAL CONSULTANTS

REPORT ON
GEOTECHNICAL INVESTIGATION
WEST OF CAMBRIAN ROAD AND GREENBANK ROAD
(3845 CAMBRIAN ROAD - SOUTH PARCEL)
BARRHAVEN, ONTARIO

REPORT NO.: 4817-18-G-LPL-A
REPORT DATE: AUGUST 5, 2025
REVISION NO.: 02

PREPARED FOR
LOBLAW REAL ESTATE
1 PRESIDENT'S CHOICE CIRCLE
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1.0 INTRODUCTION

Toronto Inspection Ltd. (TIL) was retained by Loblaw Real Estate to conduct a Geotechnical Investigation at two parcels of land, located at the northwest and southwest corners of Cambrian Road and Greenbank Road in Barrhaven, Ontario (hereinafter described as “the Site”) for a proposed commercial development.

The field work for the investigation was carried out, at different stages, on April 27, 30, May 1, 2, August 16, 17, September 20, 24 and 25, 2018. A total of twelve sampled boreholes, BH-1 to BH-12, were carried out at the Site. Boreholes BH-1 to BH-6 were drilled within the north parcel and Boreholes BH-7 to BH-12 drilled within the south parcel.

The report of findings, Geotechnical Investigation Report, No.: 4817-18-G-LPL-A, was issued on November 13, 2018, based on the Preliminary Concept Site Plans, Drawing #: 1314C for the north parcel and Drawing #: 1313D for the south parcel, prepared by Turner Fleischer Architects Inc., dated April 19, 2018, which indicated that the development at both parcels will consist of Retails A & B with the associated driveway and parking lots.

TIL was requested to revise the geotechnical investigation report, to clarify some of the items included in comments from the City of Ottawa, based on an update of the Site Servicing Plan and the Grading Plan at the south parcel (3845 Cambrian Road), and the additional site visit to document the groundwater table and obtain soil samples for chemical analysis. A revised Geotechnical Investigation Report, No.: 4817-18-G-LPL-A, Revision No.: 01, was prepared and issued to the client, dated December 21, 2023.

TIL was requested to update the geotechnical investigation report, based on additional revision of the Site Servicing Plan (Drawing No. C102) and the Ultimate Grading Plan (Drawing No. C103A), at the south parcel (3845 Cambrian Road), prepared by Parsons, dated January 14, 2025 (Revision #3), and the additional site visits to document any changes in the groundwater table and carry out CPTu testing,, to fulfil requirements included in comments from the City of Ottawa.

The purpose of the initial geotechnical investigation was to determine the subsoil and groundwater conditions within the two parcels and, based on the information obtained at the current boreholes, provide our recommendations of the design and construction of the structures. In particular, geotechnical data was to be provided for:

- General founding conditions
- Foundation design bearing pressures
- Construction recommendations
- Excavation recommendations

The original report and the revisions were provided on the basis of the above terms of reference and on an assumption that the design of structures will be in accordance with the applicable building codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, our office should be consulted to review the design and to confirm the recommendations and comments provided in the report.

This report supersedes the previous report and / or any written or verbal recommendations provided for the client.

2.0 SITE CONDITIONS

The two open parcels of land of the subject Site are located on the north side and south side of Cambrian Road, along the west side of the proposed Greenbank Road in Barrhaven, Onatrio. The north parcel is approximately 1.36 ha in area and approximately square in shape, and the south parcel is approximately 1.51 ha in area and rectangle in shape.

At the time of the investigation, both parcels of land of the Site were vacant with vegetation and bushes at the ground surface at the east portion, and gravel covered surface along the east boundary and at the west portion, indicating some earth work might have been carried out within the Site. Some water ponding at the low lying area was observed at the time of the investigation.

Within the north parcel, a drainage ditch ran across the land in a north-south direction, along the mid-east portion. Piles of mixed soil, rocks, debris and concrete rubble were observed along the south part of the east boundary, with some debris piled at the mid-west portion. With the south parcel, a drainage ditch ran across the land in a north-south direction, along the middle portion. Remnants of construction debris consisting of asphalt, insulation and concrete were observed along the north part of the east boundary.

The site gradient were slightly undulating, generally slightly dropping towards the south and west at the north parcel, and towards the north and west at the south parcel.

3.0 INVESTIGATION PROCEDURE

The field work for the investigation was carried out, at different stages, on April 27, 30, May 1, 2, August 16, 17, September 20, 24 and 25, 2018. A total of twelve sampled boreholes, BH-1 to BH-12, were carried out at the Site. Boreholes BH-1 to BH-6 were drilled within the north parcel and Boreholes BH-7 to BH-12 drilled within the south parcel, as shown on the Borehole Location Plan, Drawing No. 1.

Due to the very wet and unfavourable ground conditions at the proposed borehole locations, only Boreholes BH-2 to BH-8 could be drilled during the period of April to May 2, 2018 and the remaining Boreholes BH-1 and BH-9 to BH-12 were drilled in August and September, 2018. The sampled boreholes generally extended to depths of 7.6m to 10.7m below the existing ground level at Boreholes BH-2 to BH-10 and BH-12. In addition to obtaining samples within the very soft clayey silt / silty clay deposits at the shallow boreholes, dynamic cone penetration tests were carried out below the sampling depths at these boreholes to estimate the extent of the very soft deposits. The dynamic cone penetration testing extended to depths of 19.0m to 24.7m from grade The sampled boreholes BH-1 and BH-11 extended to depths of 24.5m to 24.8m from grade. Field shear vane tests were carried out in the cohesive soil strata to estimate the undrained shear strength of the soil. Relatively undisturbed soil samples were also collected from the very soft silty clay / clayey silt deposits using thin walled Shelby tubes for later laboratory testing. Bedrock samples were cored at BH-1 location for a depth of approximately 3.1m (10ft) to confirm the rock quality. The core sampling at BH-1 was terminated at a depth of 27.6m from grade.

The boreholes were advanced using a track mounted grill rig, equipped with continuous flight hollow stem augers, sampling rods and a drop hammer, supplied by a specialist drilling contractor; Boreholes BH-1 and BH-11 were advanced using mud drilling. Soil samples were taken generally at 0.76m intervals to depths of 3.0m below the existing ground level. Below the depths, the sampling frequency was increased to 1.5m. The samples were obtained using a split spoon sampler in conjunction with Standard Penetration Tests using a driving energy of 475 joules (350 ft-lbs). The soil samples were identified and logged in the field and were carefully bagged for later visual identification and the determination of moisture content.

Groundwater observations were made in the boreholes during and upon the completion of drilling. Boreholes BH-1, BH-7, BH-8 and BH-11 were completed as monitoring wells for determination of groundwater conditions.

The borehole locations, established in the field by our field personnel, are shown on the appended Borehole Location Plan (Drawing No.1). The ground elevations at the borehole locations were obtained from Plan of Survey with Topography of Part of Lots 10 and 11, Concession 3 (Rideau Front), City of Ottawa, prepared by Speight, Van Nostrand & Gibson Limited, dated October 4, 2018, provided to ***TIL*** office by the client.

Furthermore, CPTu testing was carried out at the south parcel on March 31 and April 1, 2925, at ten locations, CPTu-1 to CPTu-10, to depths of 18.0m to 20.6m from grade, including dissipation tests at each location. The CPTu testing locations, established in the field by our field personnel, are shown on the appended CPTu Test Location Plan (Drawing No. 1 within Appendix C).

4.0 SUMMARISED SUBSURFACE CONDITIONS

Reference is made to the appended Borehole Location Plan (Drawing No. 1) and Logs of Borehole sheets (Drawing Nos. 2 to 13) for details of field work, including soil classification, inferred stratigraphy, groundwater observations during and on completion of borehole drilling.

The boreholes revealed that the subsoil, below the surficial topsoil or gravel, the overburden over the bedrock consisted of fill material, overlying silty clay / clayey silt, and sand and gravel deposits.

Brief descriptions of the subsoil, at the borehole locations, were as follows:

4.1 Surface Course

Topsoil, approximately 25mm to 150mm in thickness, was contacted at the ground surface, at BH-1, BH-3, and BH-8 to BH-11 locations. Gravel, approximately 25mm to 75mm in thickness, was contacted at the remaining locations.

4.2 Fill

Underlying the topsoil and gravel at the borehole locations, a layer of fill was contacted at depths of 0.025m to 0.15m from grade. The fill consisted of a mixture of silty sand, sandy silt, clayey silt, trace to some gravel, occasional shale pieces, with minor or occasional minor rootlets, topsoil, organics or wood pieces. The fill extended to depths of 1.5m to 3.7m from grade.

Based on the soil quality and the Standard Penetration N-values, in the range of 2 to 36 blows per 0.3m penetration, it appears that the fill might have been placed and compacted under some supervision at BH-2, BH-4 BH-7 and BH-8 locations, where are along the east boundary and could be part of site preparation of the proposed Greenbank Road. The fill at the remaining borehole locations was generally in very loose to loose or very soft to soft states.

The in-situ moisture content of the soil samples retrieved from the fill ranged from 8% to 33%, indicating moist to wet conditions, normally wet at the lower portion of the fill.

4.3 Silty Clay / Clayey Silt

Underlying the fill at all borehole locations, at depths of 1.5m to 3.7m from grade, silty clay / clayey silt deposits were contacted. The silty clay / clayey silt deposits, of low to medium plasticity, consisted of a mixture of silt and clay, trace to some sand, with seams of thin layers of sand or silty sand, and contained occasional gravel, cobble or boulder at the deeper portion of the deposits at BH-1 and BH-11 locations. Dark grey organic spots were evident within the deposits.

Boreholes sampling at BH-2 to BH-10 and BH-12 were terminated in the silty clay / clayey silt deposits at depths of 7.6m to 10.7m from grade. The silty clay / clayey silt deposits at Boreholes BH-1 and BH-11 extended to depths of 21.0m from grade.

Based on the Standard Penetration N-values, in the range of 1 to 8 blows per 0.3m penetration, the consistency of the silty clay / clayey silt deposit was very soft to stiff, generally very soft.

The in-situ moisture content of the soil samples retrieved from the deposits ranged from 8% to 54%, indicating moist to wet conditions, generally wet conditions. The in-situ moisture content less than 10% at the lower portion of the deposits at BH-1 location was due to the presence of silty sand and gravel layers.

Dynamic cone penetration tests were carried out at Boreholes BH-2 to BH-10 and BH-12 locations, below depths of 7.6m to 10.7m from grade and extended to depths of 19.0m to 24.7m from grade. Based on the dynamic cone test results, the very soft to soft silty clay deposit extended to depths of 15.0m to 19.5m from grade, where there was a gradual increase n the blow counts.

The in-situ undrained shear strength of the silty clay / clayey silt deposits, at depths of approximately 3.0m to 10.1m from grade, was estimated using a field shear vane. The shear vane rest results were in the range of 13 kPa to 25 kPa with sensitivity in the range of 1.5 to 14.0. The shear vane test results are plotted on the appended borehole logs.

Grain size analyses were carried out on selected soil samples, obtained from Borehole BH-2 (SS6, at a depth of 4.6m), and BH-7 (SS6, at a depth of 4.6m), using both mechanical sieves and hydrometer. The grain size distributions are shown on the appended Figure No. 1.

Atterberg Limits test results, carried out on the representative samples, obtained from BH-2 (SS6, at a depth of 4.6m), and BH-7 (SS6, at a depth of 4.6m), indicated that the deposits can be classified as lean clay of low to medium plasticity. The rest results are shown on the appended Figure No. 2. The Atterberg Limits Tests indicated that for the samples tested, the in-situ moisture contents are higher than the liquid limits.

Relatively undisturbed soil samples were obtained from Boreholes BH-2 & BH-11, at depths of 6.1m to 6.7m & 3.8m to 4.4m from grade, respectively, using thin walled shelby tubes for the determination of bulk unit weight and consolidation test in our laboratory. The unit weight of the clay deposit was estimated to be 17.5 kN/m3. The consolidation test results are shown on Figure Nos. 3 & 4. The results indicated that the soil samples are normally consolidated comparing to the existing effective overburden stresses at the test levels.

Occasional boulders were encountered at BH-1 location between depths of 17.4m and 20.4m from grade. Obtaining core samples between these depths indicated boulders ranged in thicknesses from 400mm and 300mm.

4.4 Sand and Gravel

Underlying the silty clay / clayey silt deposits at BH-1 and BH-11 locations, at depths of 21.0m from grade, a sand and gravel deposit was contacted. The sand and gravel deposit contained occasional cobbles or boulders, thin layers of silt or fine to medium sand, and rock pieces at the bottom of the deposit.

Borehole BH-11 was terminated in the sand and gravel deposit at a depth of 24.8m from grade. The sand and gravel deposit at Borehole BH-1 extended to a depth of 24.5m from grade.

Based on the Standard Penetration N-values, in the range of 40 to more than 100 blows per 0.3m penetration, the relative density of the sand and gravel deposit was dense to very dense.

The in-situ moisture content of the soil samples retrieved from this deposit ranged from 8% to 20%, indicating wet conditions.

A boulder was encountered at BH-1 location at a depth of 21.6m from grade and was proved by coring, approximately 200mm in thickness.

4.5 Bedrock

A bedrock was encountered underlying the sand and gravel deposit at BH-1 location, at a depth of 24.5m from grade.

Approximately 3.1m (10ft) long NQ rock cores were obtained at BH-1 location, below the depth of 24.5m from grade to determine the quality of the bedrock. An inspection of the rock cores indicated that the rock quality, within the cored depths, was very poor, based on RQD values of 0% and Recovery of 98%. The rock cores at BH-1 location was terminated at a depth of 27.6m from grade.

4.6 Groundwater

Free water and/or wet cave-in was recorded in all the open boreholes, at depths of 1.8m to 5.5m from grade, during and upon completion of drilling and sampling, except at BH-1 and BH-11 locations where mud drilling was used and the free water could not be properly measured.

On November 5, 2018, the groundwater levels, measured in the monitoring wells, installed at BH-1, BH-7, BH-8 and BH-11 locations, were at depths of 0.51m, 1.10m, 1.28m and 1.18m from grade, respectively.

On December 7, 2023, the groundwater levels, measured in the monitoring wells, installed at BH-7, BH-8 and BH-11 locations at the south parcel, were at depths of 2.40m, 1.63m and 1.83m from grade, respectively. The field work of this site visit did not include the north parcel. Additional groundwater measurements will be conducted for both parcels in April or May 2014. The groundwater levels are listed below:

Well Location	Ground Elevation	Well Depth	Strata Screened	Groundwater Depths / Elevations	
				Nov 5, 2018	Dec 7, 2023
BH-1	93.00m	6.1m	Silty Clay/Clayey Silt	0.51m / 92.49m	----
BH-7	93.63m	6.1m	Silty Clay/Clayey Silt	1.10m / 92.53m	2.40m / 91.23m
BH-8	94.08m	6.1m	Silty Clay/Clayey Silt	1.28m / 92.80m	1.63m / 92.45m
BH-11	94.12m	6.1m	Silty Clay/Clayey Silt	1.18m / 92.94m	1.18m / 92.94m

Additional seasonal groundwater measurements were conducted for the south parcel during the period of March to June 2025. The groundwater levels, measured in the monitoring wells, installed at BH-7, BH-8 and BH-11 locations at the south parcel, are listed below:

Well Location	Groundwater Depths / Elevations					
	Mar 30, 25	Apr 4, 25	May 3, 2025	May 23, 2025	Jun 13, 2025	Jun 25, 2025
BH-7	1.60m/ 92.03m	1.27m/ 92.36m	1.95m/ 91.68m	2.07m/ 91.56m	2.56m/ 91.07m	2.39m/ 91.24m
BH-8	1.73m/ 92.35m	1.43m/ 92.65m	2.03m/ 92.05m	2.22m/ 91.86m	2.86m/ 91.22m	2.73m/ 91.35m
BH-11	0.97m/ 93.15m	0.70m/ 93.42m	1.15m/ 92.97m	1.50m/ 92.62m	1.87m/ 92.25m	1.91m/ 92.21m

Based on the field observation and the moisture content profile of the subsoil samples, it is our opinion that there is a continuous groundwater table across the Site, below depths of 0.5m (at the north parcel) and 0.7m to 2.4m (at the south parcel) from grade, in the wet and saturated silty clay / clayey silt deposits, including perched water at the lower portion of the fill. The static groundwater table conditions at the Site will be subject to seasonal fluctuations.

5.0 RECOMMENDATIONS

Based on the Preliminary Concept Site Plans, Drawing #: 1314C for the north parcel and Drawing #: 1313D for the south parcel, prepared by Turner Fleischer Architects Inc., dated April 19, 2018, the development at both parcels will consist of Retails A & B with the associated driveway and parking lots.

In addition, based on the Site Servicing Plan (Drawing No. C102) and Ultimate Grading Plan (Drawing No. C103A) at the south parcel (3845 Cambrian Road), prepared by Parsons, dated January 14, 2025 (Revision #3), the development at the south parcel will consist of Retail A at the south portion and Retail B at the north portion, with the associated driveway and parking lots, and underground stormwater storage chambers to the west of Retail B.

We understand that each of the proposed retail buildings will consist of single storey structure without basements. The building pregrade at the north parcel may be at elevation 93.5m, with the Finished Floor Elevation (FFE) at 93.8m. At the south parcel, the Finished Floor (FF) of Retail A and Retail B will be at elevations 94.10m and 94.12m, respectively. The top and bottom of the underground stormwater storage chambers will be at elevations of approximately 93.65m and 92.20m, respectively.

Our recommendations on the design and construction for the proposed development, based on the subsoil and groundwater data, encountered at the borehole locations, are as follows:

5.1 Site Preparation

The soil description and depth of fill shown on the Borehole Logs are specific depths at the borehole locations only. The thickness of topsoil and the depth of the fill at locations beyond the boreholes may be thicker or deeper. We recommend that the contractor bidding for the job should determine the depths of deleterious material by test pits and allow for removal of any deleterious fill and material, with high moisture and/or organic content, during the site preparation for site grading.

To achieve uniform subgrade conditions, we recommend that after removal of the topsoil, unsuitable surficial soil and the deleterious fill material, the exposed subgrade should be proof-rolled, after it has been reviewed by a soils engineer from our office. Any soft areas, identified during proof-rolling, should be sub-excavated and replaced with organic free soil, compacted to a minimum of 98% of its SPMDD.

Depending on the final grades, the Site may have to be regraded for the proposed development. If cut and fill operation is proposed, the on-site excavated fill, to be used for site grading, should be organic free and maintained at or close to its optimum moisture content during placement and compaction. The new fill should be compacted in lifts of 200mm to at least 98% of its Standard Proctor maximum dry density (SPMDD).

To support the building footings, the new fill within the buildings should be placed and compacted in lifts of 200mm to 100% of SPMDD in accordance with the engineered fill guidelines, after the existing topsoil and fill is completely removed within the proposed building envelopes. The guideline for placement and compaction of engineered fill is provided in Appendix A.

Compressible topsoil and the fill material, containing relatively high organic content, will not be suitable for reuse in areas where future settlement cannot be tolerated. This material will have to be disposed off-site or reused in landscaped areas, subject to approval by the landscape architect.

5.2 Foundation Design

With the placement of engineered fill, replacing the topsoil and the existing fill material, and the presence of the underlying very soft silty clay / clayey silt deposits, the total and differential settlement of the buildings, founded on spread / strip foundations, could be considerably more than normally anticipated limits of 25mm and 20mm, respectively. Since the extent of the very soft to soft deposits, at the borehole locations, extending to depths of 15.0m to 19.5m from grade, and the actual loads imposed by the proposed buildings are not known, the magnitude of the total settlement cannot be accurately determined. In this respect, it is our opinion that the most cost effective option for the subject Site is to preload the proposed building areas to a minimum of 150% of the anticipated loads.

The surcharge, after preparing the building pads to the finish floor elevations, can consist of loose fill and allowed to stay on Site, until the primary consolidation of the native soils has been completed. Prior to placement of surcharge fill, settlement plates should be installed on the prepared building pads and the settlement of the building pad, over a period of time, documented by ***Toronto Inspection Ltd.*** to determine when the primary consolidation settlement has been completed.

The native subsoils at the Site consist of silty clay to clayey silt deposits. In order to speed up the consolidation of these deposits, we recommend that sand wicks should be installed, at approximately 3m centres. It is our opinion, that with the installation of the sand wicks, the primary consolidation could take up to 2 years.

After it has been determined that the primary consolidation is completed, the fill surcharge can be removed and the proposed buildings can be supported on conventional spread / strip footings, founded on the engineered fill or in the native very soft silty clay / clayey silt deposits.

Conventional spread/strip footings of the proposed retail buildings A & B, at north and south parcels, founded on the engineered fill, at or above depths of 1.5m below the proposed finished floor elevations, can be designed using the following bearing pressures:

- 75 kPa at the Serviceability Limit State (SLS)
- 120 kPa at the factored Ultimate Limit State (ULS)

Conventional spread/strip footings of the proposed retail buildings A & B, at north and south parcels, founded on the engineered fill and native very soft silty clay / clayey silt deposits, at or below depths of 1.5m below the proposed finished floor elevations, can be designed using the following bearing pressures:

- 50 kPa at the Serviceability Limit State (SLS)
- 75 kPa at the factored Ultimate Limit State (ULS)

For strip footings placed in the engineered fill, we recommend that all perimeter footings should be reinforced continuously with at least 2-15M steel bars. This reinforcement will bridge any loose pockets of fill, if any, under the footings.

Provided that the Site has been preloaded, as recommended above, and primary settlement completed under the surcharge loads, the total and differential settlement of footings, founded on the engineered fill / native soil strata and designed for the above recommended bearing pressures at the serviceability limit state, will not exceed 25mm and 20mm, respectively.

The native silty clay / clayey silt deposits at the Site is very sensitive to moisture changes and disturbance by the construction traffic.

Concrete for the footings should be poured immediately after the bearing areas have been excavated, cleaned, inspected and approved by a qualified geotechnical engineer from our office. If the base of the footings will be left open for some time, a 100mm mud slab of lean mix concrete should be poured on the footing bases immediately after inspection.

Alternatively, if surcharging is not feasible for the proposed buildings at the Site, **deep foundations**, can be used to support the structures. The deep foundation can consist of cast in place drilled concrete piles, minimum of 0.6m diameter, CFA piles, founded at least 1m into the bedrock, at or below depths of 25.5m from grade at BH-1 and BH-11 locations designed for an axial load of 1000 kN. The minimum spacing of the CFA piles should be 3 times the diameter of piles, centre to centre.

Ground improvement systems, aggregate piers or rigid inclusions, taken through the very soft silty clay / clayey silt and placed on the bedrock, can also be considered to support the proposed buildings. They should be designed and installed by a specialist in the trade. Typically, the use of aggregate piers / rigid inclusions can improve the bearing pressures to 150 kPa at SLS and 220 kPa at ULS.

All perimeter footings or any footings, which may be exposed to freezing conditions, should be placed below the frost penetration depth of 1.5m below the outside grade or provided with an equivalent thermal protection.

We recommend that the site grading and the foundation plans of the proposed development should be reviewed by this office to confirm the bearing strata and the recommended design bearing pressures for the new structures.

It should be noted that the above recommendations for foundations have been analysed by ***Toronto Inspection Ltd.*** from the subsoil information obtained at the borehole locations. The bearing material, the interpretation between the boreholes and the recommendations of this report must be checked through field inspection provided by ***Toronto Inspection Ltd.*** to validate the information for use during the construction stage.

5.3 Floor Slab Construction

The floor slab can be designed and constructed as a conventional slab-on-grade method.

Following site preparation in the building areas, the exposed building subgrade should be proof rolled under the supervision of a geotechnical technician. All compressible, loose, or weak spots observed during proof-rolling should be removed from the subgrade and replaced with an approved granular material, compacted in 200mm lifts to 98% Standard Proctor Maximum Dry Density (SPMDD).

However, some long term settlement will be anticipated if the building areas are not preloaded. The magnitude of settlement will depend on the loads imposed by the amount of filling for site grading and the floor loads. An alternative, to minimise the settlement, is to use a combination of light weight fill (Geofoam, cellular concrete or equivalent) and traditional soil to fill the building areas.

A bedding consisting of at least 150 mm of Granular A (OPSS Form 1010) or 20mm crusher run limestone, is recommended as a moisture barrier. The bedding should be compacted to at least 100% SPMDD.

5.4 Earthquake Consideration

The Ontario Building Code requires that all buildings be designed to resist earthquake forces. In accordance with Table 4.1.8.4.A of the Ontario Building Code. The site classification for the Seismic Site Response is Class E (Soft soil).

The acceleration and velocity based site coefficients, Fa and Fv, should conform to Tables 4.1.8.4.B and 4.1.8.4.C. These values should be reviewed by the Structural Engineer.

5.5 Excavation and Backfilling

All excavations should comply with the Ontario Occupational Health and Safety Act. Any excavation should be sloped back to a safe angle of less than 45°. a flatter slope will be required for excavation in saturated soils.

The in-situ moisture contents of the native silty clay / clayey silt deposits were much higher than their optimum moisture contents. The use of the on-site excavated materials, for backfilling the foundations at exterior and service trenches, should be controlled properly on site by the soils technicians. If the seasonal condition is not favourable for drying the silty clay / clayey silt, the reuse of the on-site material will be limited to areas where future settlement will be of little consequence.

Groundwater seepage can be anticipated in excavations of 1.8m and deeper from grade. Due to the very fine grained subsoils of low permeability, the rate of water seepage is expected to be relatively low and, in our opinion, can be handled by conventional pumping from sumps.

Bedding for the underground services, within the clayey silt deposit, should consist of OPSS Granular A or its equivalent. If the subsoil at bottom of trench consists of saturated silty clay, the bedding in the service trenches should consist of 20mm clear limestone and a geotextile filter fabric should be used to separate the clear stone bedding from the base and the sides of the excavation. The geotextile filter fabric must surround the clear stone bedding completely, to prevent internal erosion (loss of fines) from the surrounding soils.

Backfill around catch basins, manholes, and narrow trenches, should consist of imported granular material. The backfill should be compacted using a smaller vibratory equipment.

5.6 Pavement Construction

Since the silty clay / clayey silt material is considered to be highly frost susceptible, the following pavement design is based on an assumption that the subgrade soils for the parking lot and driveways will consist of organic free silty clay / clayey silt material.

		Heavy Duty Driveway	Light Duty Parking
Asphaltic Concrete:	**OPSS HL3**	**40 mm**	**65 mm**
	OPSS HL8	**60 mm**	**-**
Base - OPSS Granular ‘A’ or 20mm crusher-run		**150 mm**	**150 mm**
Sub-base - OPSS Granular ‘B’ or 50mm crusher-run		**450 mm**	**300 mm**

The pavement design is based on pavement construction being carried out during the drier time of the year and that the subgrade is stable, not heaving under construction traffic. If the subgrade is wet and unstable, additional thickness of sub-base material may be required.

Following site grading, the subgrade of the entire pavement should be proof-rolled using a heavy vibratory roller. Any soft spots revealed by the proof rolling should be subexcavated and replaced with an approved dry material and compacted to at least 98% of its SPMDD.

The granular base and sub-base materials should be placed in thin lifts and compacted to a minimum 100% of its SPMDD. Asphaltic concrete should be placed and compacted to at least 96% Marshall density.

Provision should be made for the water to drain out of and not collect in the granular base courses for the pavement to function properly. Perforated subdrains should be provided, extending to a distance of 3m in all directions of catch basins, (see Figure No. 5) and continuously in locations where a drop in the subgrade elevation is relevant, such as beside the ramp or concrete sidewalk (see Figure No. 6). The subdrains should be at least 800mm below the road pavement level, and installed on a positive gradient to allow for a free flow of water. The backfill above the drains should comprise of free draining Granular B or its equivalent and should be continuous with the granular subbase of the pavement.

Catch basins and manholes should be backfilled with OPSS Granular B material. The catch basins should be perforated just above the drain level and the weep holes should be screened with a filtered fabric. This will help the pavement structure as well as alleviate the differential movement of the catch basins or the manholes due to the frost action.

5.7 Rate of Percolation

Grain size analyses were carried out on selected soil samples, obtained from Borehole BH-2 (SS6, at a depth of 4.6m, at the north parcel), and BH-7 (SS6, at a depth of 4.6m, at the south parcel), within the native silty clay to clayey silt deposits, to estimate the coefficient of percolation. Based on the grain size distributions of the samples, plotted in Figure No. 1, the Percolation time is estimated at 50 minutes / cm. This can apply to Borehole BH-9 location. If actual percolation time is required, a field percolation test will have to be carried out at the designated location and depth.

The bottom of the underground storm-water storage chambers, in the vicinity of Borehole BH-9 location, will be at or below elevation 92.20m, which could be on the engineered fill or native clayey silt deposit. A field percolation test will be required at the designated location and depth.

5.8 Subsurface Concrete and Metal Requirements

Chemical tests for pH, Sulphate, Sulphide, Chloride, Conductivity, Resistivity and Redox Potential were undertaken on two selected soil samples of the soils, collected from two shallow Test Pits 23TP-1 and 23TP-2 on December 5, 2023. The test results, as attached in Appendix B, are summarized below:

BH ID	Depth	Corrosivity Index	pH	Sulphate (µg/g)	Sulphide (%)	Chloride (ug/g)	Conductivity (mS/cm)	Resistivity (Ohm-cm)	Redox Potential (mV)
23TP-1	0.3m	14	7.82	930	0.01	9.5	836	1200	235
23TP-2	0.3m	5.0	8.77	15	<0.01	0.8	106	9430	286

*: 23TP-1: to the South of BH-7; 23TP-2: to the South of BH-10.

The test results indicated that the soil samples contained pH values slightly higher than 7, indicating slightly alkaline. The sulphate contents of the samples were generally less than 930 µg/g (0.093 %). In accordance with National Standards of Canada, CAN/CSA – A23.1-04, normal Type 10 Portland Cement can be used in the construction of substructures with direct contact with the soils. With reference to Canadian Standards Association (CSA) A23.1-04, Table 3, this concentration of sulphate in the soils would have a negligible potential of sulphate attack.

The sulphide contents of the samples were at or below the Reporting Limit of 0.01%. The concentration of sulphide in the soil would, therefore, have a negligible potential of sulphide attach for steel reinforcement.

The chloride contents of the samples were less than 0.00095%. The concentration of chloride in the soil would, therefore, have a negligible potential of chloride attack.

The electrical resistivity values indicate that the corrosion potential of the soil was “moderate”, based on the comparison of the test results with the literature reference, J.D. Palmer, Soil Resistivity Measurement and Analysis, Materials Performance, Volume 13, 1974.

With reference to the American Water Work Association (AWWA) C105-10 Standard for Polyethylene Encasement for Ductile-Iron Pipe, the soil was evaluated against a point scale that considers Resistivity, pH, Redox Potential, Sulphides and Moisture Content to determine its Corrosivity Index. Both soil samples scored less than 10, indicating the soil has a low risk for corrosion potential.

5.9 Other Engineering Concerns

The Atterberg Limits Test results indicated that for the samples tested, the in-situ moisture content is higher than the liquid limits and loss of moisture from the silty clay deposit could result in shrinkage of the soil and subsequent settlements. It is, therefore, recommended that all sub-surface storm and sewer pipes should have an impervious collars, extending from the base of the service trenches to above the groundwater table, to prevent movement of water through the granular base and the backfill around the service pipes.

Trees

The minimum distance of any trees, planted on or close to the Site, must be at least two times the anticipated maximum estimated hight of the trees. Trees to be planted within 5m of the building foundations should be low water demanding trees with shallow loots less than the foundation depths. This will prevent / minimise the loss of groundwater from under the structures by the root system of the trees.

Soil Liquefaction

Soil liquefaction is a phenomenon in which the strength of the soil is reduced during earthquake or other rapid loading. Liquefaction is most likely to occur in cohesion-less saturated silt and very loose to loose sand (with high void content) deposits. During an earthquake or rapid loading, the groundwater will rise to the surface, through the high voids in the soil, thereby resulting in quick sand conditions. Liquefaction may also occur in Leda clay, resulting in quick clay conditions.

The Site is within the Leda clay area and the Leda clay, with high sensitivity values, can be subject to liquefaction. However, the in-situ sensitivity of the silty clay / clayey silt, tested in the boreholes determined during the investigation stage, ranges from 1.5 to 14.0, generally less than 10.0. And based on the laboratory work consisting of grain size distribution analyses and Atterberg Limit tests on the two soil samples, obtained from Borehole BH-2 (SS6, at a depth of 4.6m), and BH-7 (SS6, at a depth of 4.6m), the most predominate deposit at the Site, to depths of 18m – 20m below existing grade, consists of low cohesive clayey silt / silty clay material, CL range, with 63%-65% silt and 25% -26% clay content. The probability of soil qualification of this deposit is very low.

In Section 5.1 (Site Preparation), we had recommended that the existing fill should be removed and replaced by engineered fill and the Site surcharged for a period of approximately two years.

With these two recommendations and the fact that the soil has significant clay content, the probability of liquefaction will be very low. The only way to eliminate the damage to the building due to liquefaction is to found the structure on deep foundations or on ground improvement systems.

5.10 CPTu Test Results

CPTu testing was carried out at the south parcel on March 31 and April 1, 2025, at ten locations, CPTu-1 to CPTu-10, to depths of 18.0m to 20.6m from grade, including dissipation tests at each location. The test reports were generated by Mr. Geotechnix

Inc., dated April 4, 2025, as attached in Appendix C. The CPTu testing locations are shown on the appended CPTu Test Location Plan (Drawing No. 1 within Appendix C). The testing completed in each location is summarized below:

CPTu ID	Date Tested	Ground Elevation	CPTu Depth	Dissipation Test Depth
CPTu-1	Apr 1, 25	92.77m	18.43m	18.37m
CPTu-2	Mar 31, 25	93.42m	20.16m	20.16m
CPTu-3	Mar 31, 25	92.70m	19019m	7.01m, 14.25m, 19.19m
CPTu-4	Apr 1, 25	93.49m	19.60m	18.89m
CPTu-5	Mar 31, 25	94.22m	20.57m	20.57m
CPTu-6	Apr 1, 25	92.88m	18.93m	18.93m
CPTu-7	Apr 1, 25	93.59m	18.96m	18.90m
CPTu-8	Mar 31, 25	94.16m	18.64m	6.95m, 14.26m, 18.64m
CPTu-9	Apr 1, 25	93.83m	18.19m	18.19m
CPTu-10	Apr 1, 25	94.50m	18.00m	18.00m

The CPTu testing provides the data of cone resistance, sleeve friction and pore pressure to assist the design and construction of ground improvement systems, carried out by the specialists in the trade.

6.0 GENERAL STATEMENT OF LIMITATION

The comments and recommendations presented in this report are based on the subsoil and ground water conditions encountered at the borehole locations, indicated in the borehole location plan, and are intended for the guidance of the design engineer. Although we consider this report to be representative of the existing subsurface conditions at the subject property, the soil and the ground water conditions between and beyond the borehole locations may differ from those encountered at the time of our investigation and may become apparent during construction. Any contractor bidding on, or undertaking the works, should decide on their own investigation and interpretations of the groundwater and the soil conditions between the borehole locations.

Any use and / or the interpretation of the data presented in this report, and any decisions made on it by the third party are responsibility of the third parties. The responsibility of ***Toronto Inspection Ltd.*** is limited to the accurate interpretation of the soil and ground water conditions prevailing in the locations investigated and accepts no responsibility for the loss of time and damages, if any, suffered by the third party as a result of decisions or actions based on this report.

Any legal actions arising directly or indirectly from this work and/or ***Toronto Inspection Ltd.'s*** performance of the services shall be filed no longer than two years from the date of ***Toronto Inspection Ltd.'s*** substantial completion of the services. ***Toronto Inspection Ltd.*** shall not be responsible to the client for lost revenues, loss of profits, cost of content, claims of customers, or other special indirect, consequential, or punitive damages.

To the fullest extent permitted by law, the client's maximum aggregate recovery against ***Toronto Inspection Ltd.***, its directors, employees, sub-contractors, and representatives, for any and all claims by clients for all causes including, but not limited to, claims of breach of contract, breach of warranty and/or negligence, shall be the amount of the fee paid to ***Toronto Inspection Ltd.*** for its professional services rendered under the agreement with respect to the particular site which is the subject of the claim by the client.

Yours very truly,
TORONTO INSPECTION LTD.

LICENSED PROFESSIONAL ENGINEER
S. WANG
100131918
August 5, 2025
PROVINCE OF ONTARIO

David S. Wang

David S. Wang, P. Eng.
Senior Engineer

REGISTERED PROFESSIONAL ENGINEER
U.S. SAPPAL
Aug. 5, 2025
PROVINCE OF ONTARIO

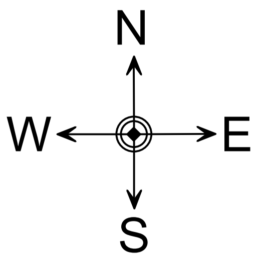
USSappal

Upkar S. Sappal, P. Eng.
Principal Engineer

DRAWINGS

Borehole Location Plan

Logs of Boreholes



LEGEND :

— — — Approximate Site Boundary

⊕/⊕ Borehole / Monitoring Well Location

NOT TO SCALE

TorontoInspection LTD.
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Tel: 905-940 8509 Fax: 905-940 8192
Email : TIL@torontoinspection.com

TITLE: Borehole / Monitoring Well Location Plan

LOCATION: West of Cambria Road and Greenbank Road, Barrhaven, Ontario

PROJECT NO. 4817-18-G-LPL-A

DATE : September 2018

DRAWING NO. 1

Project No. 4817-18-G-LPL-A

Log of Borehole BH-1

Dwg No. 2

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: West of Cambrian Road and Greenbank Road, Barrhaven, Ontario

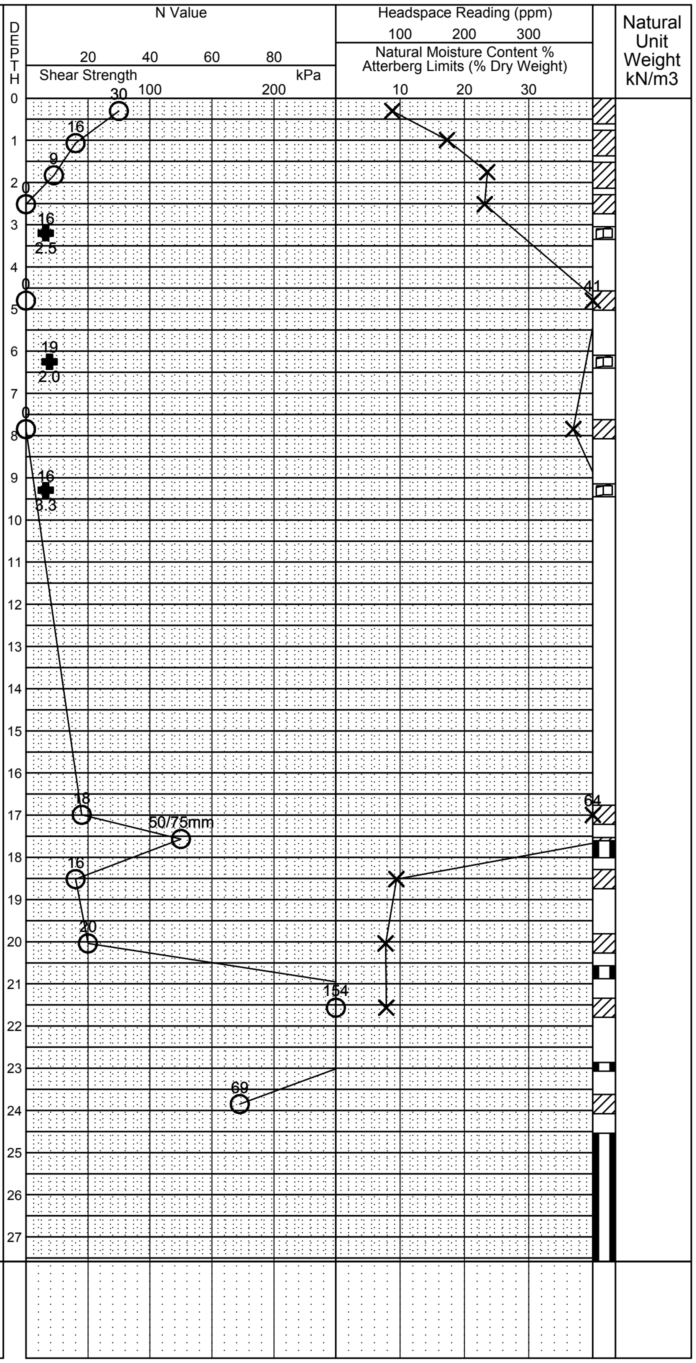
Date Drilled: 9/20/18

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	●
Natural Moisture	×
Plastic and Liquid Limit	⊢⊣
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲

Soil Description	ELEV. m
Ground Surface	93.00
TOPSOIL	92.8792.49
FILL - brown to brownish grey sandy silt to silty sand - trace to some gravel - very minor rootlets - moist to wet	90.56
SILTY CLAY / CLAYEY SILT - very soft, very stiff to hard below 16.8m - grey - low plasticity - with dark grey organics - gravel at 16.9m - a boulder at 17.4m (400mm thick, proved by rock coring) - with silty sand and gravel at 18m & 19.5m - a boulder at 20.4m (300mm thick, proved by rock coring) - wet	71.97
SAND AND GRAVEL - very dense, grey - occasional cobbles and boulders - a boulder at 21.6m (200mm thick, proved by rock coring) - some silt - wet	68.46
BEDROCK - Recovery 98% - RQD 0%	65.42
END OF BOREHOLE **NOTE:** Upon completion of drilling: - (mud Drilling)	



LGBE3 4817-18-G-LPL-A.GPJ 11/13/18

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
Nov 5, 2018	0.51m	

Project No. 4817-18-G-LPL-A

Log of Borehole BH-2

Dwg No. 3

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: West of Cambrian Road and Greenbank Road, Barrhaven, Ontario

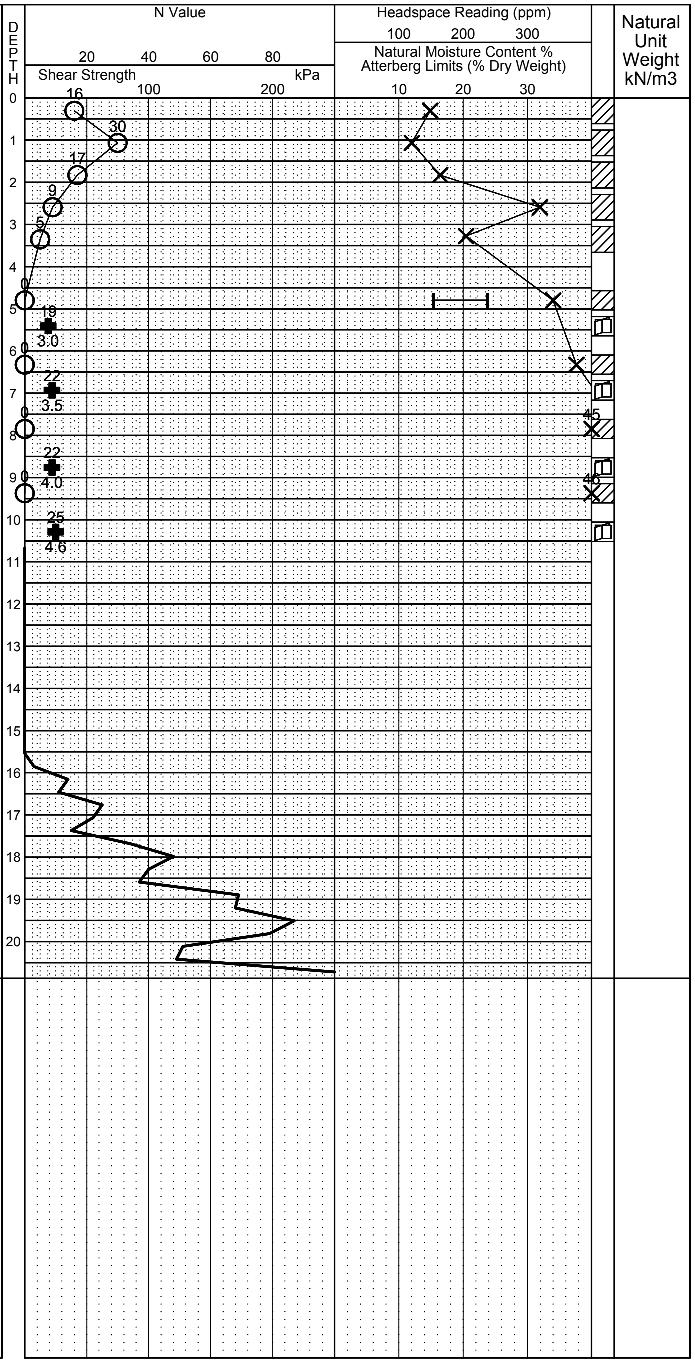
Date Drilled: 4/30/18

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	●
Natural Moisture	×
Plastic and Liquid Limit	⊢—⊣
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲

GWL	SYMBOL	Soil Description	ELEV. m
		Ground Surface	94.39
	▨	**GRAVEL**- with sand	94.37
	▨	**FILL** - brown silty sand to sandy silt - trace to some gravel - pockets of topsoil / organics at 1.5m & 2.3m - pockets of clayey silt at 2.3m - moist to very moist	91.34
	▨	**SILTY CLAY / CLAYEY SILT** - firm at 3.0m, very soft below 3.6m - brown, grey below 3.6m - seams of fine sand at 3.0m to 3.6m - low plasticity - with dark grey organics below 3.6m - wet	83.72
		(DYNAMIC CONE TEST)	73.51
		END OF BOREHOLE **NOTE:** Upon completion of drilling: - cave-in at 4.6m	



LGBE3 4817-18-G-LPL-A.GPJ 11/13/18

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 4817-18-G-LPL-A

Log of Borehole BH-3

Dwg No. 4

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: West of Cambrian Road and Greenbank Road, Barrhaven, Ontario

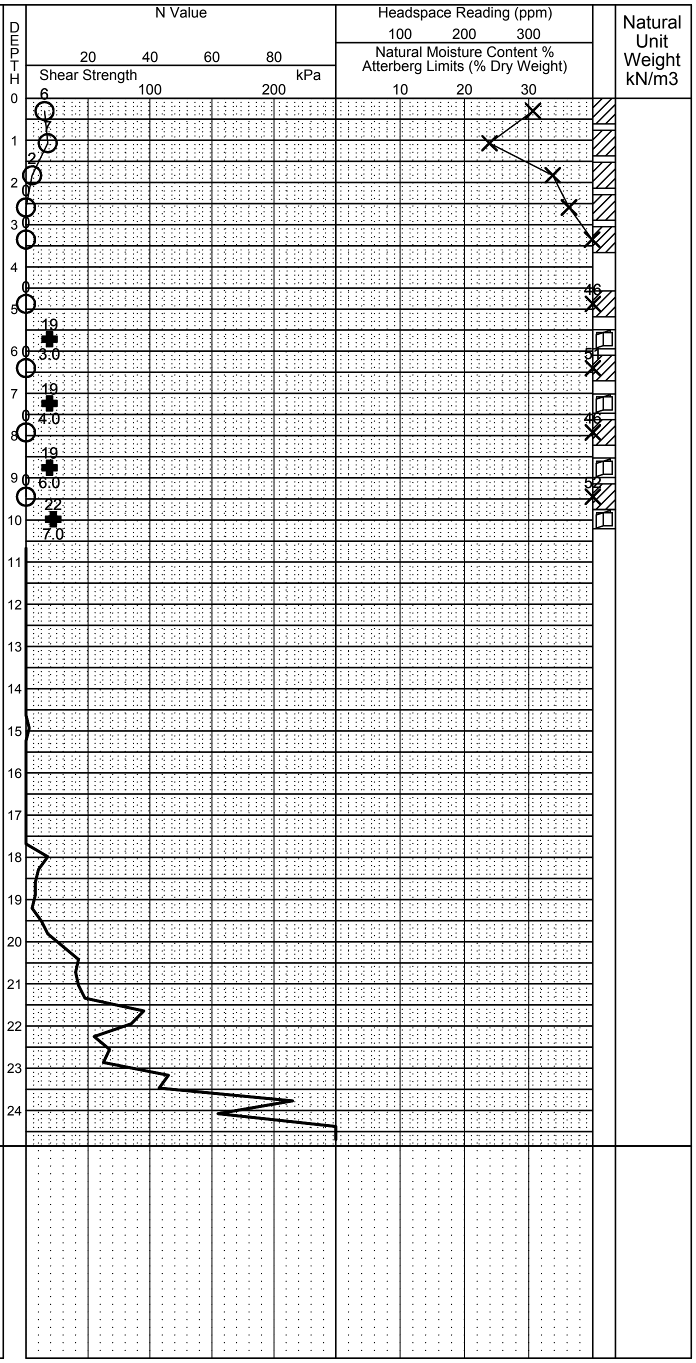
Date Drilled: 4/30/18

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒	Headspace Reading (ppm)	●
SPT (N) Value	○ ▨	Natural Moisture	×
Dynamic Cone Test	—	Plastic and Liquid Limit	├──┤
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲

GWL	SYMBOL	Soil Description	ELEV. m
		Ground Surface	92.78
	▩	**TOPSOIL**	92.76
	▩	**FILL** - brown clayey silt - some sandy silt - minor rootlets at 0.8m - pockets of topsoil / organics - very moist to wet	91.26
	▨	**SILTY CLAY / CLAYEY SILT** - very soft - brown, grey below 2.3m - a thin layer of silty sand at 1.5m - low plasticity - with dark grey organics below 2.3m - wet	82.11
		(DYNAMIC CONE TEST)	67.94
		END OF BOREHOLE **NOTE:** Upon completion of drilling: - cave-in at 5.5m	



LGBE3 4817-18-G-LPL-A.GPJ 11/13/18

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 4817-18-G-LPL-A

Log of Borehole BH-4

Dwg No. 5

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: West of Cambrian Road and Greenbank Road, Barrhaven, Ontario

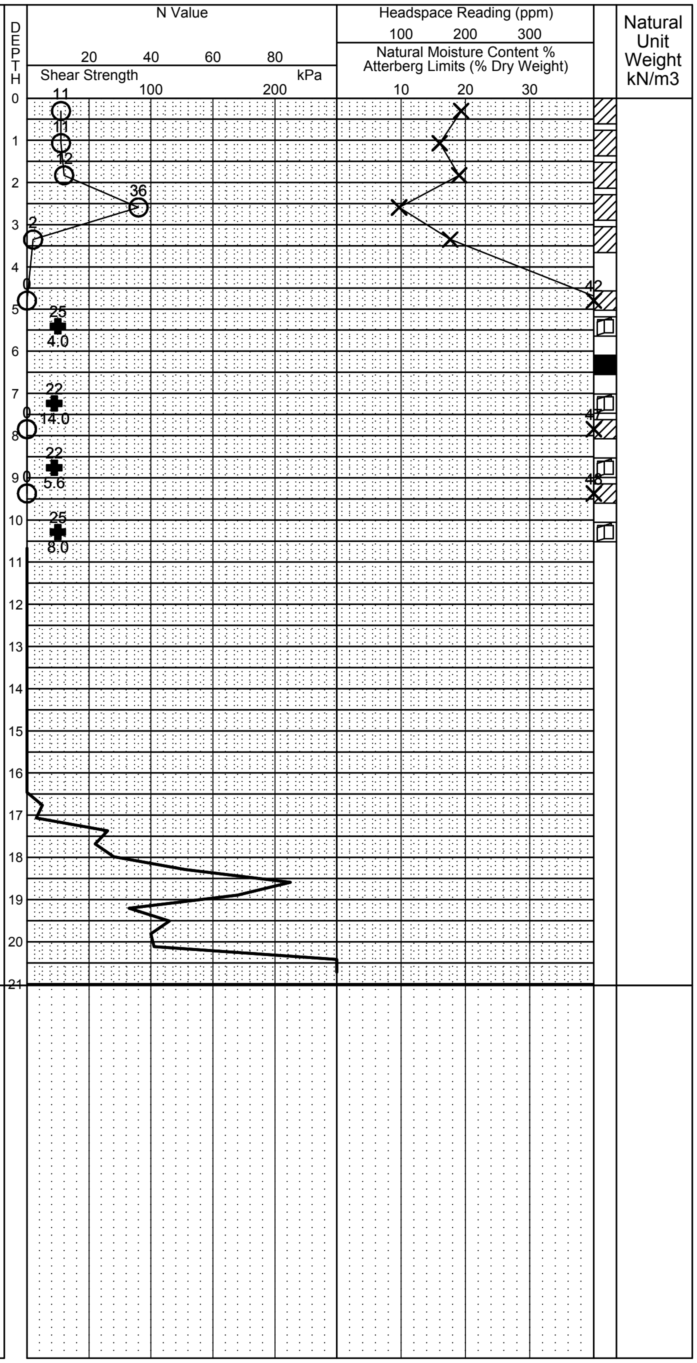
Date Drilled: 5/1/18

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒	Headspace Reading (ppm)	●
SPT (N) Value	○ ▨	Natural Moisture	×
Dynamic Cone Test	—	Plastic and Liquid Limit	├─┤
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲

GWL	SYMBOL	Soil Description	ELEV. m
		Ground Surface	94.12
		GRAVEL- with sand	94.09
		FILL - brown sandy silt to clayey silt - some silty sand at 0.1m - some gravel - a layer of gravel at 2.7m to 2.8m - moist to very moist	91.07
		SILTY CLAY / CLAYEY SILT - very soft - brown, grey below 4.5m - some silty sand and seams of fine sand at 3.0m - low plasticity - with dark grey organics below 4.5m - wet	83.45
		(DYNAMIC CONE TEST)	73.09
		END OF BOREHOLE **NOTE:** Upon completion of drilling: - cave-in at 5.2m	



NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

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Time	Water Level (m)	Depth to Cave (m)

Project No. 4817-18-G-LPL-A

Log of Borehole BH-5

Dwg No. 6

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: West of Cambrian Road and Greenbank Road, Barrhaven, Ontario

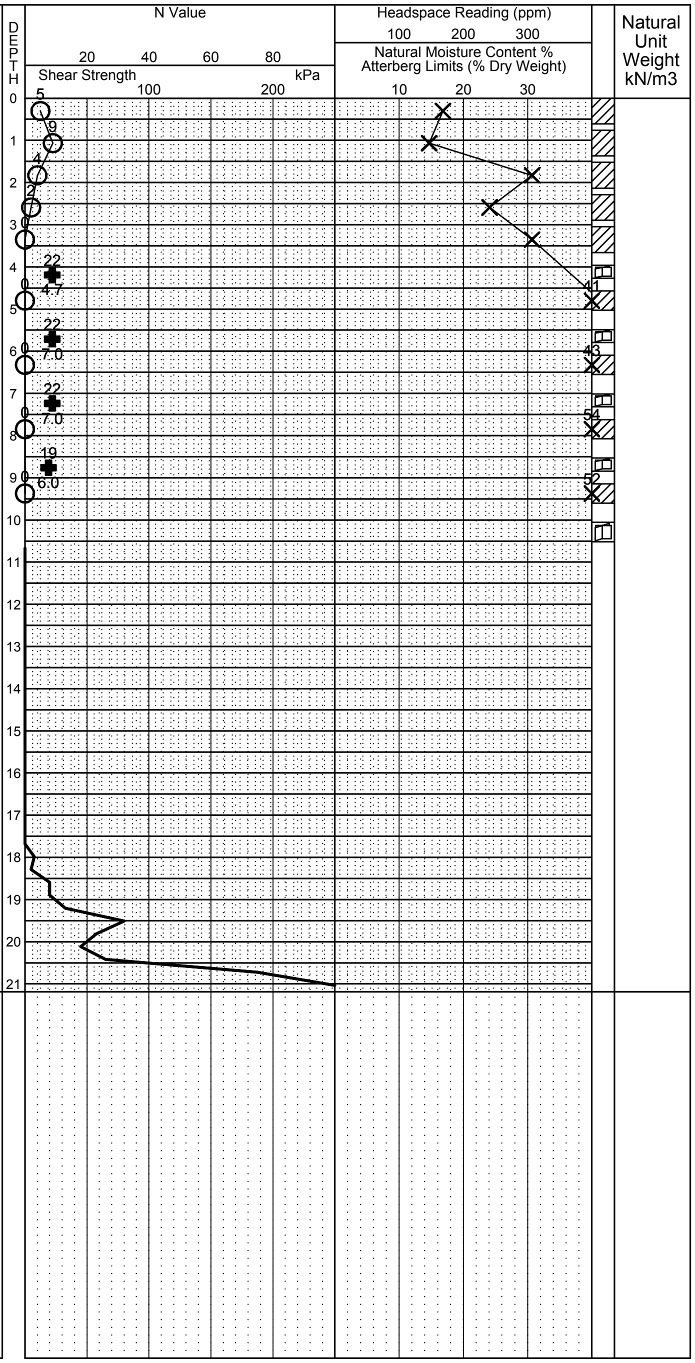
Date Drilled: 5/2/18

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	•
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲

GWL	Soil Description	ELEV. m
	Ground Surface	93.57
	GRAVEL- with sand	93.52
	FILL - grey to brown clayey silt - some sandy silt - some gravel - wood pieces at 0.8m	90.52
▼	- some organics, rootlets at 2.3m - very moist to wet	89.27
	SILTY CLAY / CLAYEY SILT - very soft, grey - low plasticity - with dark grey organics - wet	82.90
	(DYNAMIC CONE TEST)	72.39
	END OF BOREHOLE **NOTE:** Upon completion of drilling: - water level at 4.3m - cave-in at 4.9m	



NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 4817-18-G-LPL-A

Log of Borehole BH-6

Dwg No. 7

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: West of Cambrian Road and Greenbank Road, Barrhaven, Ontario

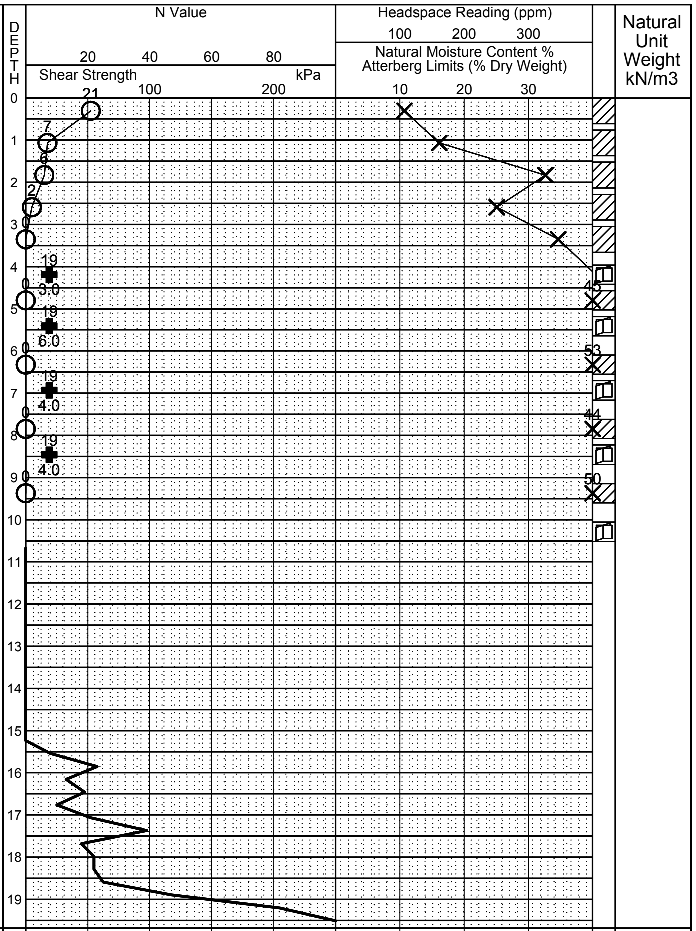
Date Drilled: 4/30/18

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	●
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲

GWL	Soil Description	ELEV. m
	Ground Surface	93.26
	GRAVEL	93.24
	FILL - brown sandy silt to clayey silt - some silty sand at 0.1m & 1.5m - some to trace gravel - some organics and rootlets at 0.8m - very minor rootlets at 2.3m - very moist to wet	
▼		90.21 90.26
	SILTY CLAY / CLAYEY SILT - very soft, grey - low plasticity - with dark grey organics - wet	
		82.59
	(DYNAMIC CONE TEST)	
		73.58
	END OF BOREHOLE **NOTE:** Upon completion of drilling: - water level at 3.0m - cave-in at 3.7m	



NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

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Time	Water Level (m)	Depth to Cave (m)

LGBE3 4817-18-G-LPL-A.GPJ 11/13/18

Project No. 4817-18-G-LPL-A

Log of Borehole BH-7

Dwg No. 8

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: West of Cambrian Road and Greenbank Road, Barrhaven, Ontario

Date Drilled: 5/1/18

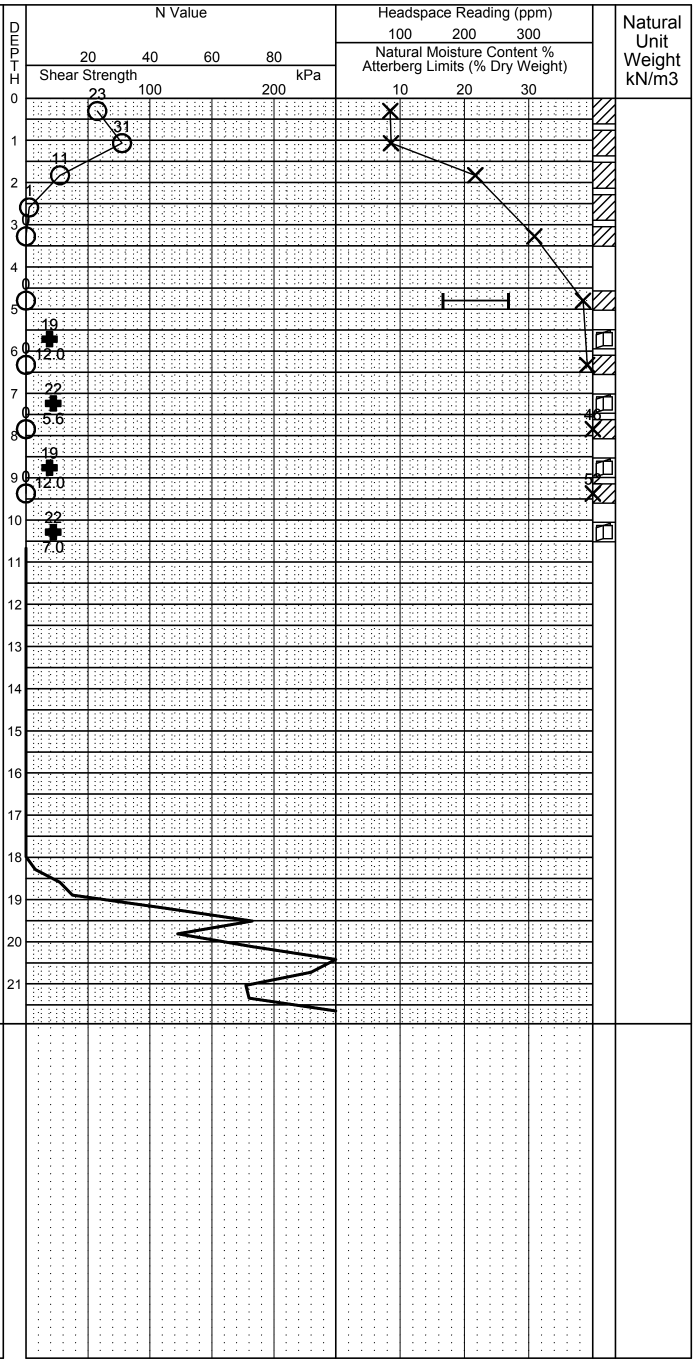
Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S

Headspace Reading (ppm)	●
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲

Soil Description	ELEV. m
Ground Surface	93.63
GRAVEL- with sand	93.61
FILL - brown silty sand to sandy silt - some gravel to 1.4m - some clayey silt at 1.5m - some organics at 1.8m - moist to wet	92.53 91.50
SILTY CLAY / CLAYEY SILT - very soft, grey - low plasticity - with dark grey organics - wet	82.96
(DYNAMIC CONE TEST)	71.69
END OF BOREHOLE **NOTE:** Upon completion of drilling: - water level at 5.5m - cave-in at 6.7m	



NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
Nov 5, 2018	1.10m	

Project No. 4817-18-G-LPL-A

Log of Borehole BH-8

Dwg No. 9

Project: Geotechnical Investigation

Sheet No. 1 of 1

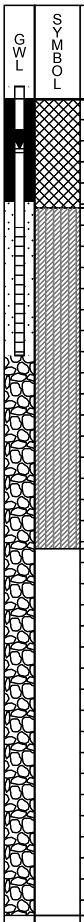
Location: West of Cambrian Road and Greenbank Road, Barrhaven, Ontario

Date Drilled: 5/2/18

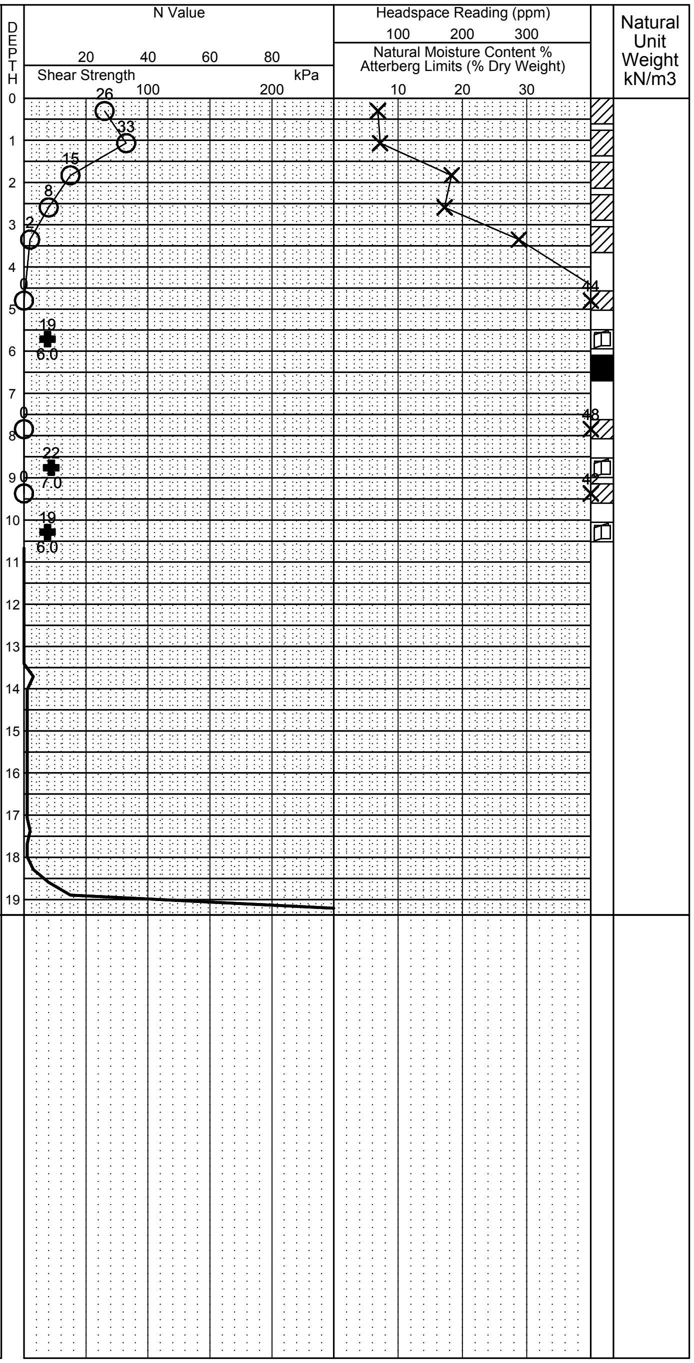
Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒	Headspace Reading (ppm)	●
SPT (N) Value	○ ▨	Natural Moisture	✕
Dynamic Cone Test	—	Plastic and Liquid Limit	├─┤
Shelby Tube	■	Unconfined Compression % Strain at Failure	⊗
Field Vane Test	✚ S	Penetrometer	▲



ELEV. m	Soil Description
94.08	Ground Surface
94.06	**TOPSOIL**
92.80	**FILL** - brown silty sand to sandy silt - trace to some clayey silt - some gravel to 1.4m
91.49	- very minor rootlets at 2.3m - a layer of sand at 2.4m to 2.5m - moist to very moist **SILTY CLAY / CLAYEY SILT** - firm at 2.5m, very soft below 3.0m - grey - low plasticity - with dark organics - wet
83.41	**(DYNAMIC CONE TEST)**
74.71	**END OF BOREHOLE** **NOTE:** Upon completion of drilling: - water level at 3.0m - cave-in at 5.5m



LGBE3 4817-18-G-LPL-A.GPJ 11/13/18

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
Nov 5, 2018	1.28m	

Project No. 4817-18-G-LPL-A

Log of Borehole BH-9

Dwg No. 10

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: West of Cambrian Road and Greenbank Road, Barrhaven, Ontario

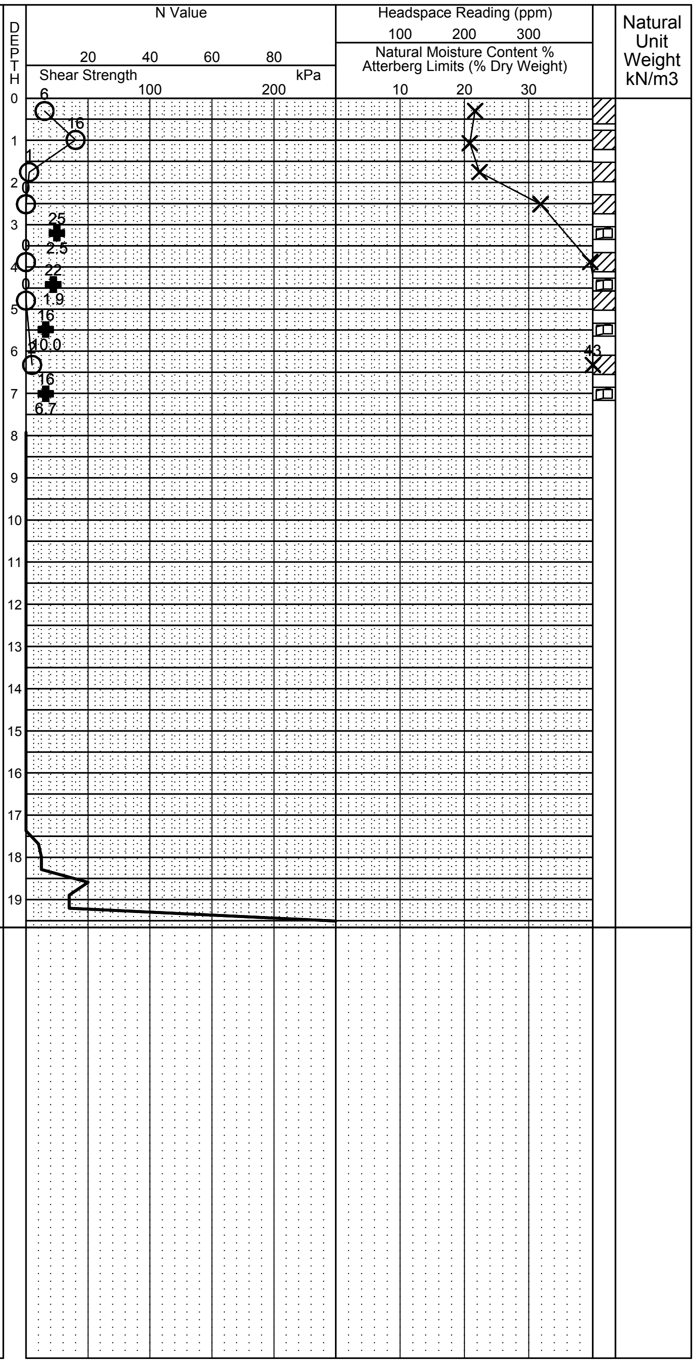
Date Drilled: 8/16/18

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	•
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲

Soil Description	ELEV. m
Ground Surface	92.79
TOPSOIL	92.74
FILL - grey sandy silt - minor topsoil, minor rootlets to 1.0m - trace gravel - a thin sand layer at 1.2m - few shell pieces at 1.5m - some clayey silt - very moist to wet	90.68 90.79
SILTY CLAY / CLAYEY SILT - very soft - grey - low plasticity - with dark grey organics - wet	85.17
(DYNAMIC CONE TEST)	73.13
END OF BOREHOLE **NOTE:** Upon completion of drilling: - water level at 2.0m - cave-in at 2.0m	



LGBE3 4817-18-G-LPL-A.GPJ 11/13/18

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 4817-18-G-LPL-A

Log of Borehole BH-10

Dwg No. 11

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: West of Cambrian Road and Greenbank Road, Barrhaven, Ontario

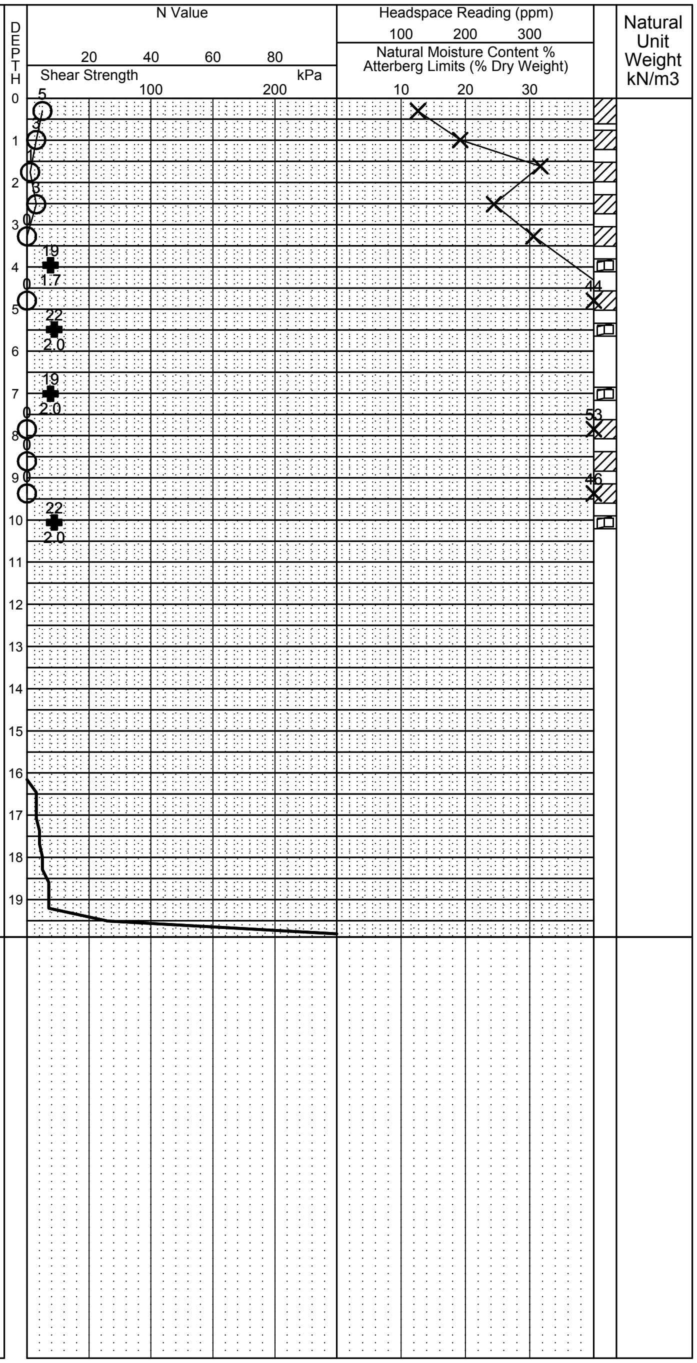
Date Drilled: 8/17/18

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	•
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲

Soil Description	ELEV. m
Ground Surface	94.01
TOPSOIL	93.96
FILL - brownish grey sandy silt to clayey silt - minor topsoil or rootlets to 1.2m - trace gravel - minor organics at 2.3m - some silty sand at 2.3m to 2.7m - very moist to wet	92.21 91.27
SILTY CLAY / CLAYEY SILT - very soft - grey - low plasticity - with dark grey organics - wet	83.65
(DYNAMIC CONE TEST)	74.12



END OF BOREHOLE
NOTE:
Upon completion of drilling:
- water level at 1.8m
- cave-in at 1.8m

LGBE3 4817-18-G-LPL-A.GPJ 11/13/18

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

Project No. 4817-18-G-LPL-A

Log of Borehole BH-11

Dwg No. 12

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: West of Cambrian Road and Greenbank Road, Barrhaven, Ontario

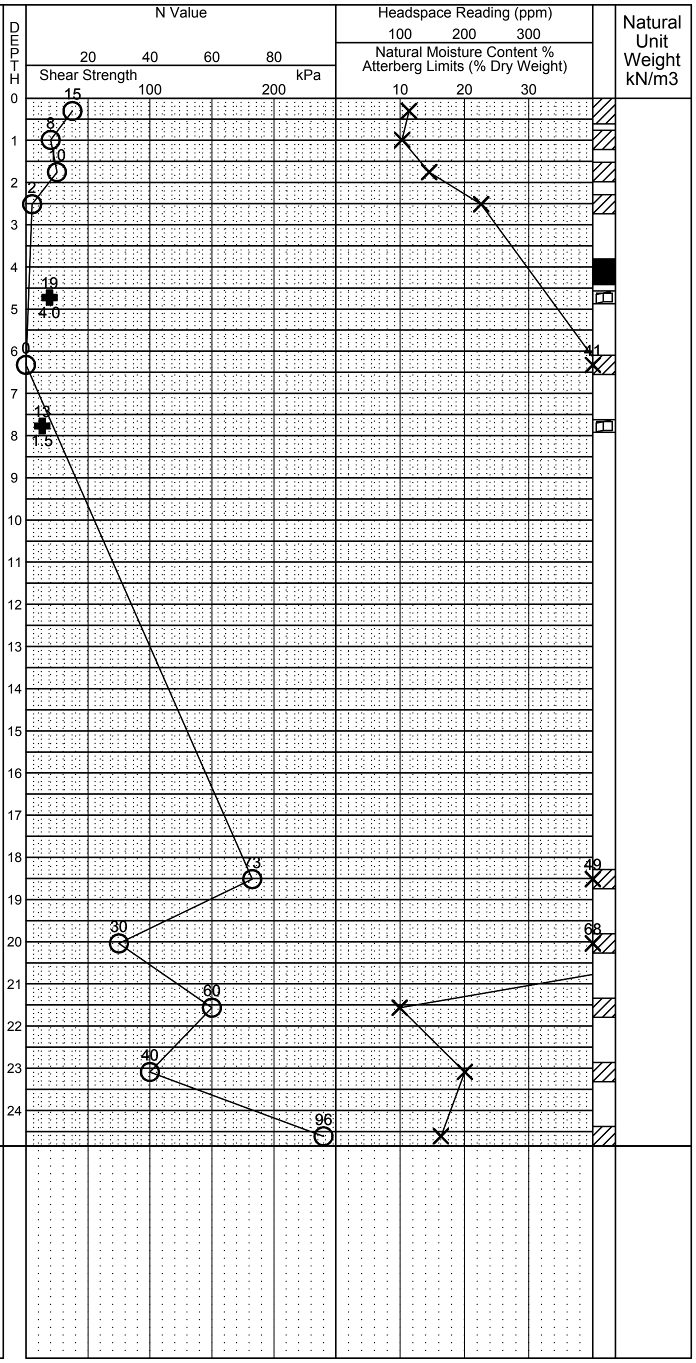
Date Drilled: 9/25/18

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	●
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲

Soil Description	ELEV. m
Ground Surface	94.12
TOPSOIL	93.97
FILL	92.94
- brown sandy silt - some gravel - minor rootlets to 1.2m - grey sand to silty sand below 1.8m - moist to wet	91.38
SILTY CLAY / CLAYEY SILT - very soft, hard at 18m & 19.5m - grey - low plasticity - with dark grey organics - grey silty clay/ clayey silt with gravel below 18m - gravel & cobble at 18.3m - wet	73.09
SAND WITH GRAVEL - dense to very dense, grey - river sand and gravel at 21m to 21.4m - a thin layer of silt at 21.5m - fine to medium sand with trace gravel at 22.5m to 24.0m - sand and gravel below 24.2m - occasional cobbles - rock pieces at 24.4m - wet	69.28
END OF BOREHOLE **NOTE:** Upon completion of drilling: - (mud drilling)	



NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)
Nov 5, 2018	1.18m	

Project No. 4817-18-G-LPL-A

Log of Borehole BH-12

Dwg No. 13

Project: Geotechnical Investigation

Sheet No. 1 of 1

Location: West of Cambrian Road and Greenbank Road, Barrhaven, Ontario

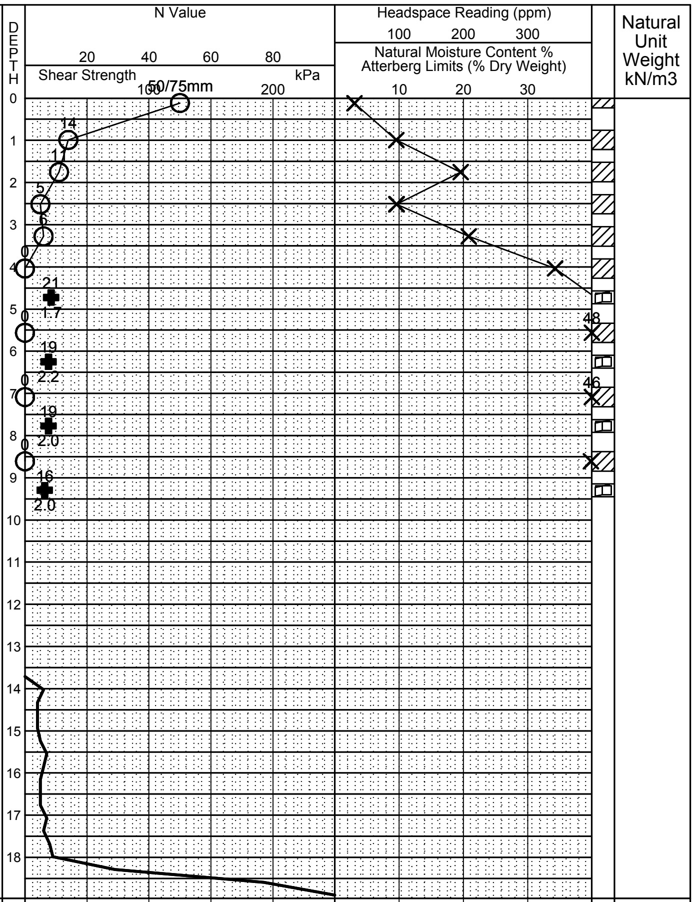
Date Drilled: 8/16/18

Drill Type: Track Mounted Drill Rig

Datum: Geodetic

Auger Sample	☒
SPT (N) Value	○ ▨
Dynamic Cone Test	—
Shelby Tube	■
Field Vane Test	✚ S
Headspace Reading (ppm)	●
Natural Moisture	×
Plastic and Liquid Limit	├─┤
Unconfined Compression % Strain at Failure	⊗
Penetrometer	▲

GWL	SYMBOL	Soil Description	ELEV. m
		Ground Surface	94.70
		GRAVEL- with sand	94.63
▼		**FILL** - brown to dark brown sandy silt - trace to some gravel - minor topsoil at 1.5m to 2.0m - some clayey silt - grey silty sand below 3.0m - some shell pieces below 3.0m - moist to wet	92.00 91.04
		SILTY CLAY / CLAYEY SILT - very soft - grey - low plasticity - with dark grey organics - wet	84.03
		(DYNAMIC CONE TEST)	75.73
		END OF BOREHOLE **NOTE:** Upon completion of drilling: - water level at 2.7m - cave-in at 2.7m	



LGBE3 4817-18-G-LPL-A.GPJ 11/13/18

NOTE: THE BOREHOLE DATA NEEDS INTERPRETATION ASSISTANCE BY TORONTO INSPECTION LTD. BEFORE USE BY OTHERS

Toronto Inspection Ltd.

Time	Water Level (m)	Depth to Cave (m)

FIGURES

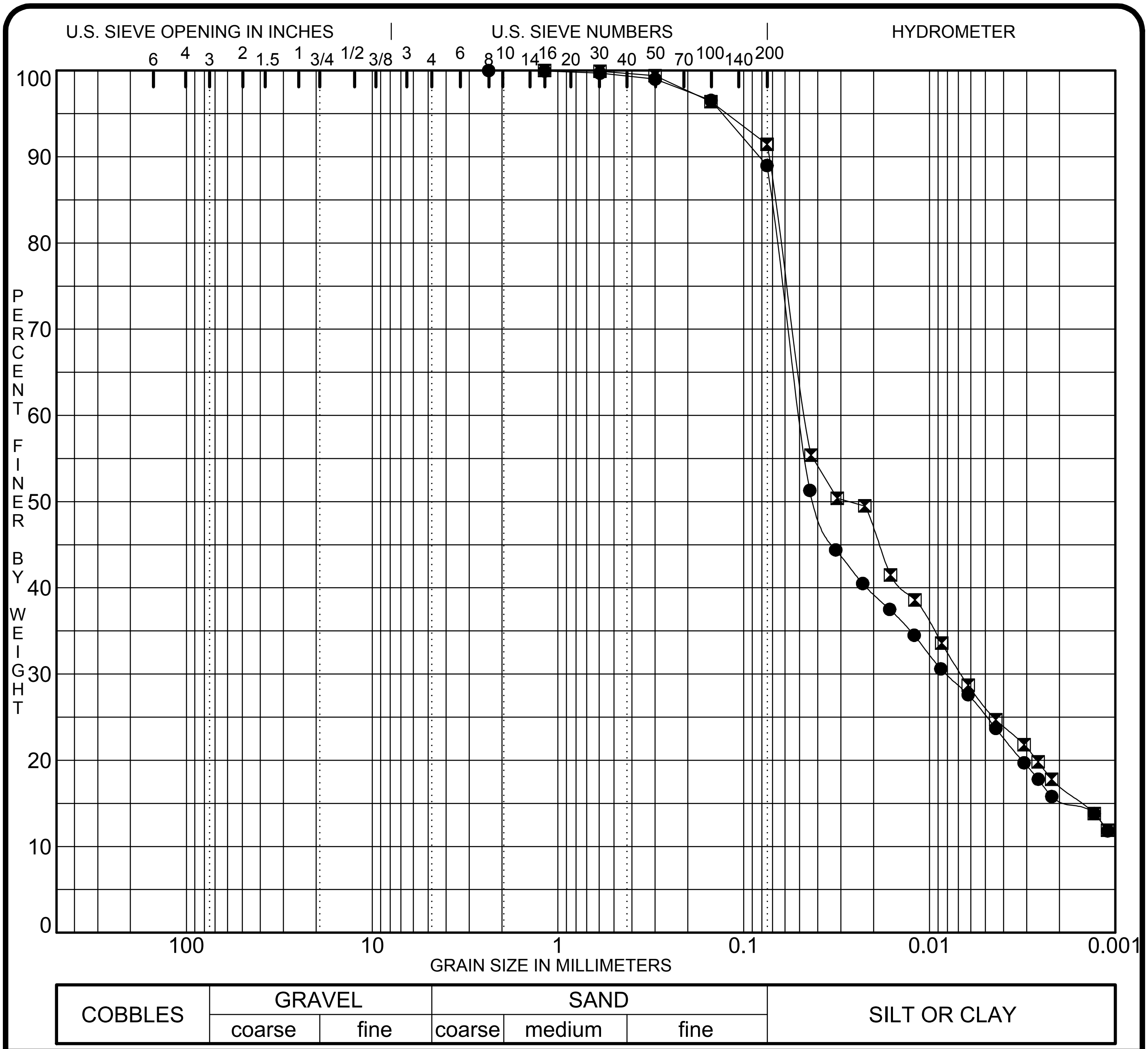
Gradation Curves

Atterberg Limits

Consolidation Tests

Detail For Subdrain At CB's & DBMH's

Concrete Ramp/Sidewalk Sections



	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**BH-2**	**4.6**	**LEAN CLAY CL**		**24**	**15**	**8**		
⧗	**BH-7**	**4.6**	**LEAN CLAY CL**		**27**	**17**	**10**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BH-2**	**4.6**	**2.36**	**0.05**	**0.008**		**0.0**	**11.0**	**63.8**	**25.2**
⧗	**BH-7**	**4.6**	**1.18**	**0.05**	**0.007**		**0.0**	**8.5**	**65.3**	**26.2**

PROJECT **Geotechnical Investigation - NW Quadrant Road of Cambrian Road and Greenbank Road, Barrhaven, Ontario**

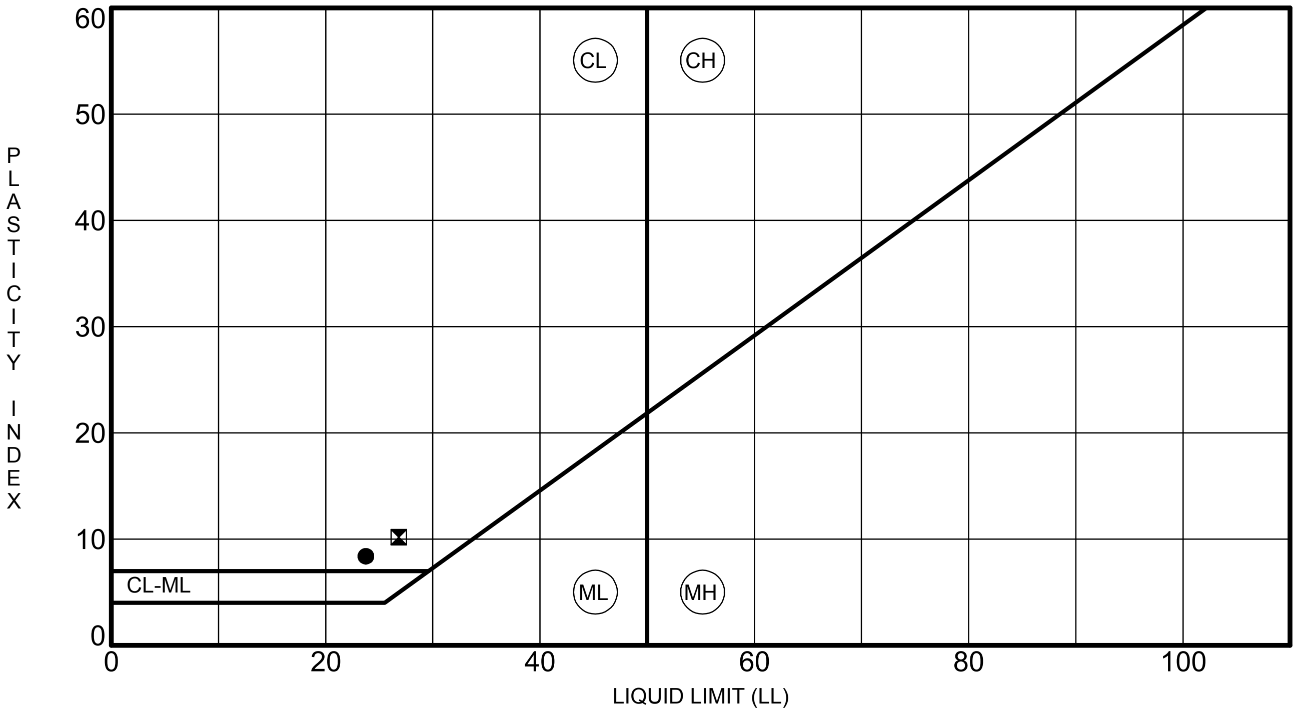
JOB NO. **4817-18-G-LPL-A**

DATE **5/10/18**

GRADATION CURVES

FIGURE NO. 1

Toronto Inspection Ltd.



Specimen Identification			LL	PL	PI	Fines	Classification
●	**BH-2**	**15.0**	**24**	**15**	**9**	**89.0**	**LEAN CLAY CL**
⧗	**BH-7**	**15.0**	**27**	**17**	**10**	**91.5**	**LEAN CLAY CL**

PROJECT **Geotechnical Investigation - NW Quadrant Road of Cambrian Road and Greenbank Road, Barrhaven, Ontario**

JOB NO. **4817-18-G-LPL-A**
DATE **5/10/18**

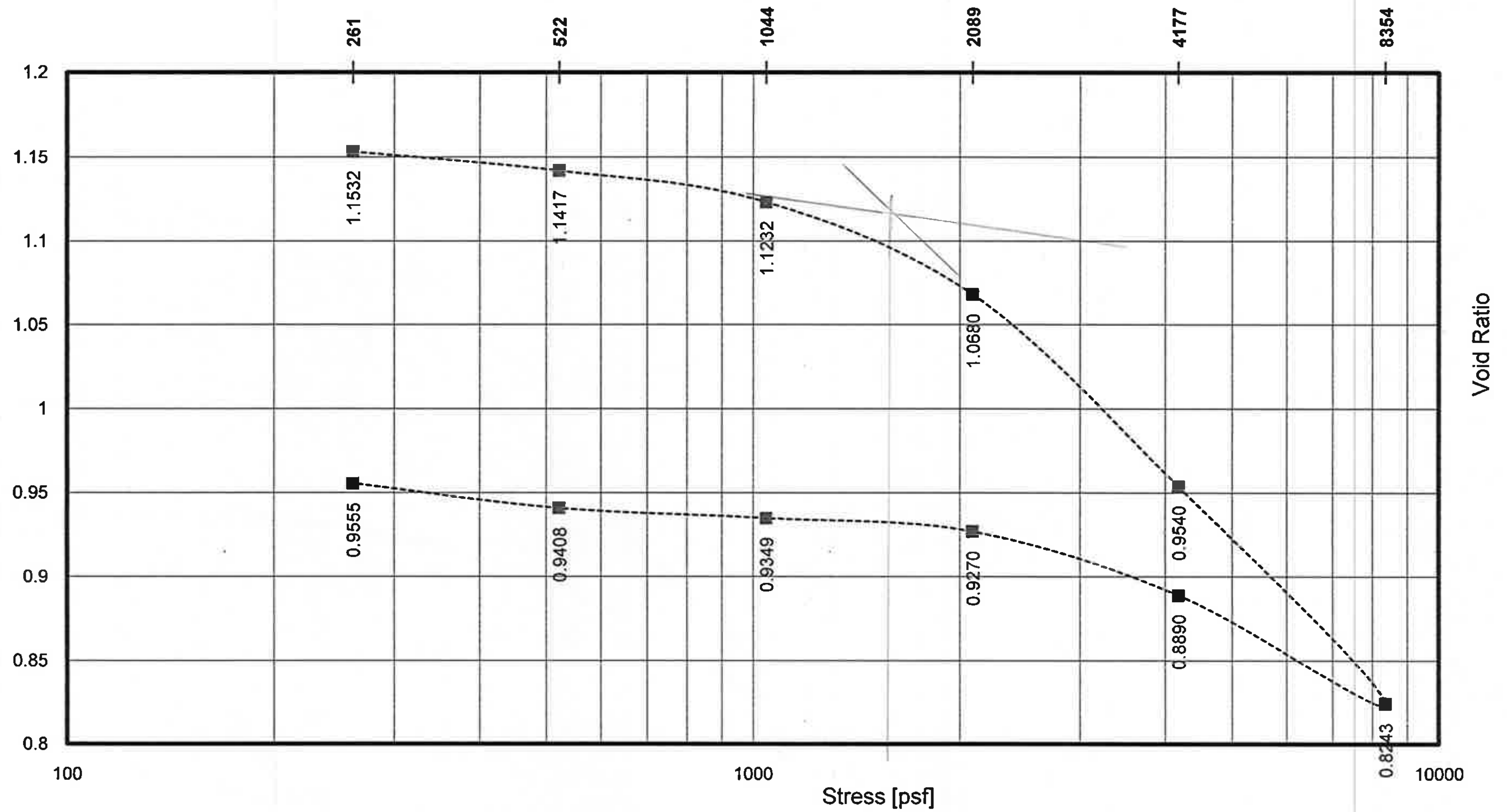
ATTERBERG LIMITS' RESULTS

FIGURE NO. 2

Toronto Inspection Ltd.

Figure No. 3 - Void Ratio vs Log Pressure

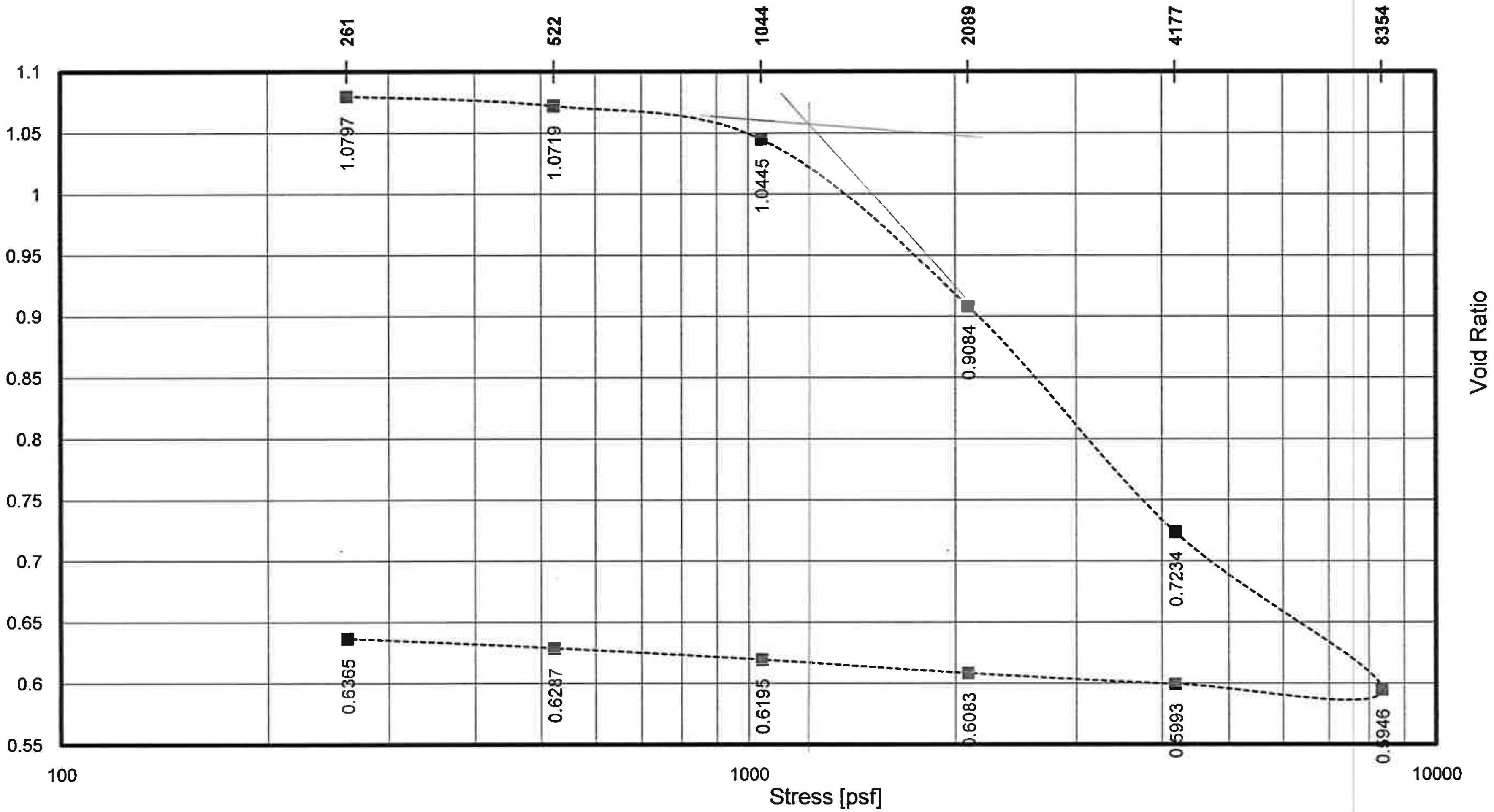
Project : Proposed Retail Buildings
Location : NW-Cambrian Road and Greenbank Road, Barrhaven,Ontario
Sample Description : Silty Clay / Clayey Silt, BH-4, at a depth of 6.6m (20.5')



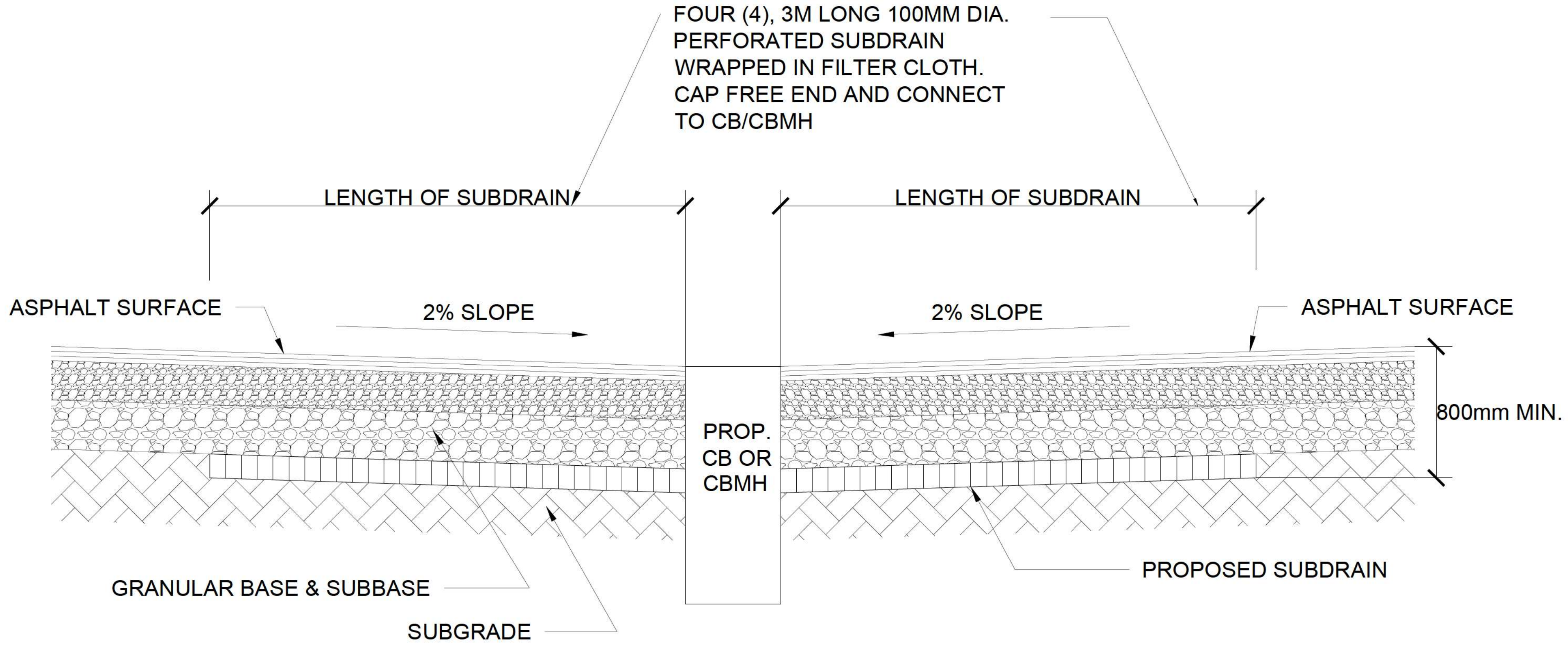
Preconsolidation Pressure P'c = 1700 psf (i.e. 85 kPa)

Figure No. 4 - Void Ratio vs Log Pressure

Project : Proposed Retail Buildings
Location : SW-Cambrian Road and Greenbank Road, Barrhaven,Ontario
Sample Description : Silty Clay / Clayey Silt, BH-11, at a depth of 4.3m (14')



Preconsolidation Pressure P'c = 1275 psf (i.e. 64 kPa)



NOT TO SCALE

TorontoInspection LTD.
GEO-ENVIRONMENTAL CONSULTANTS

110 Konrad Cresent, Unit 16, Markham, On L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192

TITLE:	Detail For Subdrain At CB's
PROJECT NO:	4817-18-G-LPL-A
LOCATION:	West of Cambrian Road & Greenbank Road, Barrhaven, Ontario
DATE:	November, 2018
FIGURE NO:	5

GENERAL NOTES:

G1. SIDEWALK SLOPES TO BE 1/8"/ FT. (1%)MAX. IN ALL DIRECTIONS ALONG STOREFRONT, 1/4"/ FT. (2%)MAX. IN OTHER AREAS.

G2. EXPANSION JOINTS ARE TO BE AS SPECIFIED & AS LOCATED ON ARCHITECTURAL DOCUMENTS.

G3. REINFORCING TO BE AS PER STRUCTURAL DOCUMENTS.

G4. CONCRETE TO BE BROOM FINISHED AS PER ARCHITECTURAL SPECIFICATIONS.

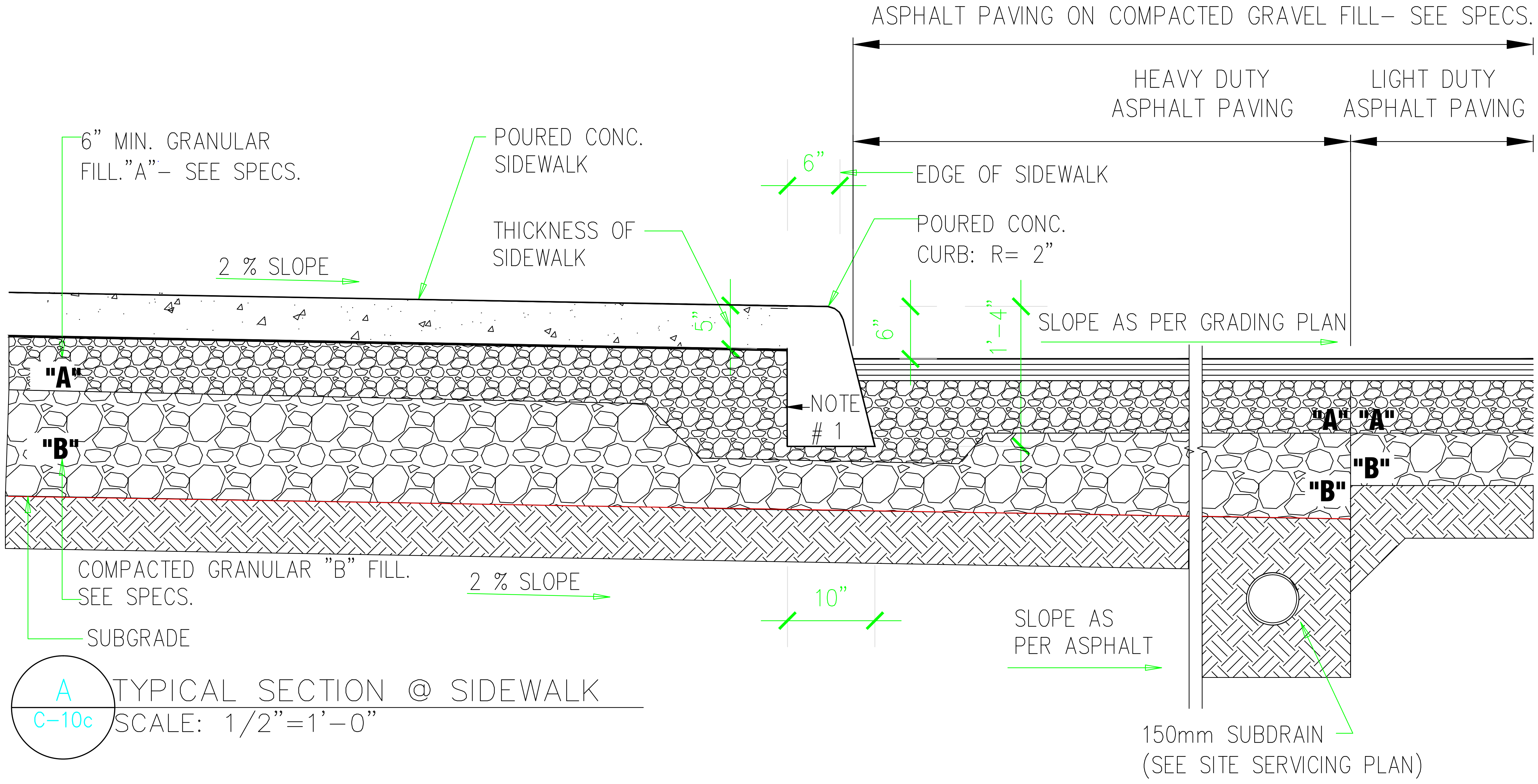
NOTES:

1 FOR SLIPFORMING PROCEDURE A 5% BATTER IS ACCEPTABLE

A TREATMENT AT ENTRANCES SHALL CONFORM WITH OPSD-351.01

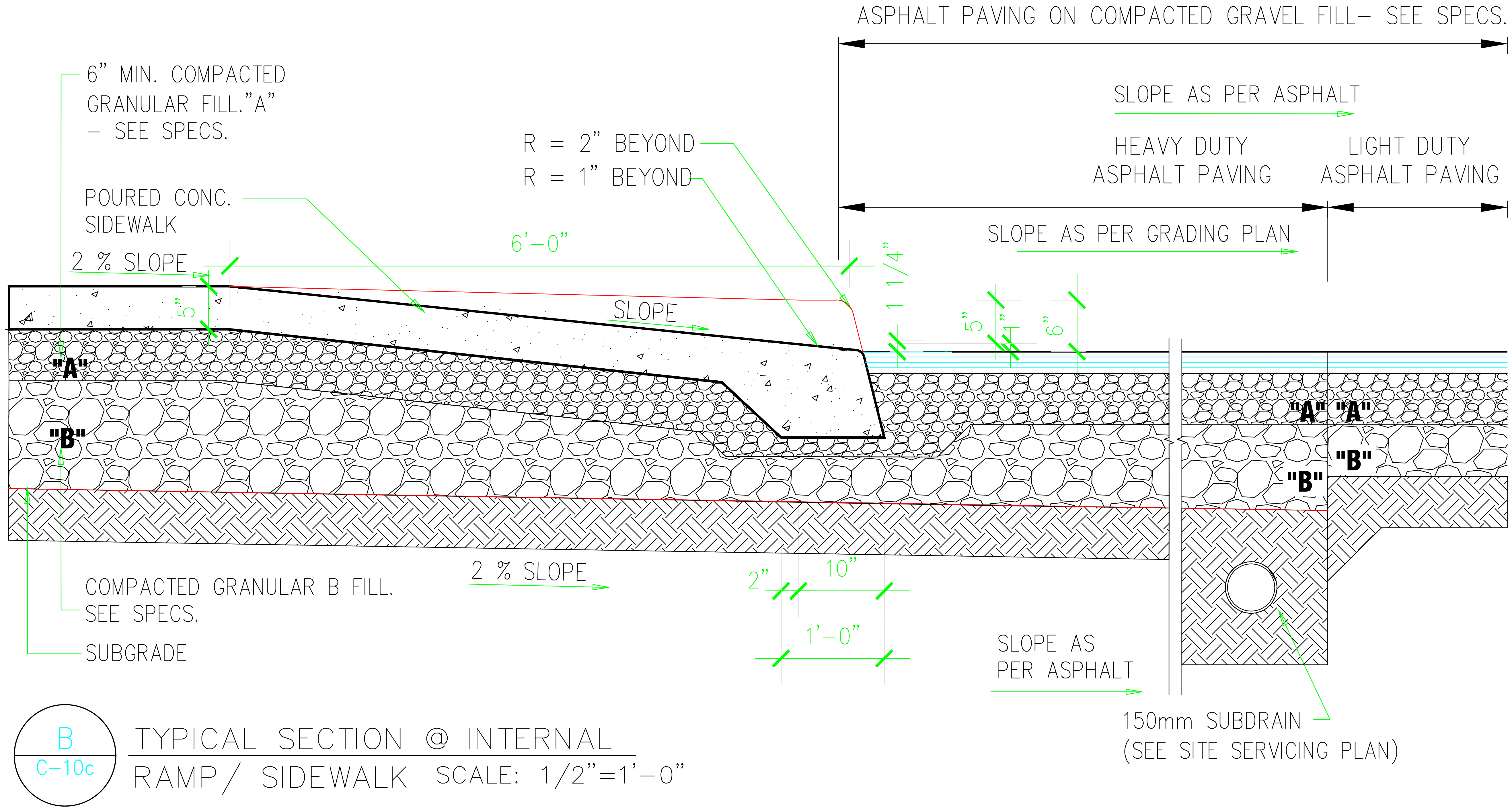
B OUTLET TREATMENT SHALL CONFORM WITH OPSD-610 SERIES

C THE LENGTH OF TRANSITION FROM ONE CURB TYPE TO ANOTHER SHALL BE 3.0M, EXCEPT IN CONJUNCTION WITH GUIDE RAIL, IT SHALL CONFORM TO OPSD-900 SERIES



TYPICAL SECTION @ SIDEWALK
SCALE: 1/2"=1'-0"

REFER TO SITE GRADING PLAN



TYPICAL SECTION @ INTERNAL RAMP/ SIDEWALK SCALE: 1/2"=1'-0"

NOT TO SCALE

TorontoInspection LTD.
GEO-ENVIRONMENTAL CONSULTANTS

110 Konrad Cresent, Unit 16, Markham, On L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192

TITLE: **Typical Details for Concrete Ramp / Sidewalk Sections**

LOCATION:
West of Cambrian Road Greenbank Road, Barrhaven, Ontario

PROJECT NO: 4817-18-G-LPL-A
DATE: November, 2018

FIGURE NO.: **6**

APPENDIX A

Guidelines of Engineered Fill

GUIDELINES FOR ENGINEERED FILL

The information presented in this guideline is intended for general guidance only. Site specific and prevailing weather conditions may require modification of the material(s) to be used and the compaction standards or procedures changed. The site preparation and the material(s) to be used must be discussed and procedures agreed with ***Toronto Inspection Ltd.*** prior to the start of the earthworks and must be subjected to on going review during construction.

For fill to be classified as engineered fill, suitable for supporting structural loads, a number of conditions must be satisfied, including but not necessarily limited to the following:

1. Areal Extent

The engineered fill must extend beyond the envelope of the structure to be supported. The minimum extent should be 2.0m beyond the envelope in all directions at the foundation level, including the loading dock pad and the front sidewalk, and sloping downwards to the sub-grade at 45°. Once the envelope is set, the structure cannot be moved out of the envelope without consultation with ***Toronto Inspection Ltd.*** Similarly, no excavation should encroach on the engineered fill envelope without consultation with ***Toronto Inspection Ltd.***

2. Survey Control

Accurate survey control is essential to the success of an engineered fill project. The boundaries of the engineered fill must be laid out by a surveyor. During construction. it is necessary to have qualified surveyors providing control stations on the three-dimensional extent of the engineered fill.

3. Subsurface Preparation

Prior to placement of the engineered fill, the sub-grade must be prepared to the satisfaction of ***Toronto Inspection Ltd.*** All deleterious material must be removed and in some cases excavation of native mineral soils may also be required. Particular attention must be paid to wet sub-grade and possible additional measures required to achieve sufficient compaction. Where fill is placed against a slope, benching will be necessary and natural drainage paths must not be blocked.

4. Suitable Fill Material

All material to be used as fill must be approved by ***Toronto Inspection Ltd.*** Such approval will be influenced by weather factors. External sources of fill material must be sampled, tested and approved prior to material being hauled to the job site.

5. Trial Test Section

In advance of the construction of the engineered fill pad, the contractor should conduct a trial test section. The compaction criterion will be assessed for the backfill material to be used, using specified lift thicknesses and number of passes for the compaction equipment proposed by the contractor. To achieve a uniform degree of compaction of each layer, the lift thickness of loose material, prior to start of compaction, must not exceed 200mm (8 inches). Additional trial test section(s) may be required throughout the course of the project to reflect changes in material sources, the moisture content of the material and the weather conditions.

6. Degree of Compaction

The minimum degree of compaction for the engineered fill should not be less than 100% of the Standard Proctor maximum dry density, or 95% of the Modified Proctor maximum dry density, to the level at or above 0.3m from proposed footing founding level. Each layer must be tested and approved by this office before the next layer is placed.

7. Inspection and Testing

Uniform and thorough compaction is crucial to the performance of the fill and the supported structure. Hence, all subgrade preparation, filling and compacting must be done with full time inspection and to the satisfaction of ***Toronto Inspection Ltd.*** All founding surfaces must be inspected and approved by ***Toronto Inspection Ltd.*** prior to placement of concrete.

8. Protection of Fill

Fills are generally more susceptible to the effects of weather than are natural soils. Fill placed and approved to the level at which structural support is required must be protected from excessive wetting, drying, erosion or freezing. Where inadequate protection had been provided, it may be necessary to provide deeper founding level for footings or to strip and re-compact some of the filled layers.

9. Limitations

The engineered fill is subjected to the following limitations:

i. Proper drainage must be maintained at all times within the engineered fill pad.

ii. If the engineered fill is left in place during the winter months, adequate protection must be provided against frost penetration to the proposed footing depths.

iii. If the engineered fill depth exceeds 5m below the foundation depth, the construction of the foundations might have to be delayed for a period of 1 year after placement, depending on the type of fill material used.

iv. Strip footings and foundation walls founded on engineered fill must be reinforced continuously with a minimum of two 15mm steel bars with at least 1m of overlap.

APPENDIX B

Chemical Test Results

FINAL REPORT

CA40037-DEC23 R1

4817

Prepared for

Toronto Inspection Ltd.

FINAL REPORT

First Page

CLIENT DETAILS

Client	Toronto Inspection Ltd.
Address	110 Konrad Crescent, Unit 16 Markham, ON L3R 9X2. Canada
Contact	Natalle Chan
Telephone	905-940-8509
Facsimile	905 940 8192
Email	lab@torontoinspection.com
Project	4817
Order Number	
Samples	Soil (2)

LABORATORY DETAILS

Project Specialist	Jill Campbell, B.Sc.,GISAS
Laboratory	SGS Canada Inc.
Address	185 Concession St., Lakefield ON, K0L 2H0
Telephone	2165
Facsimile	705-652-6365
Email	jill.campbell@sgs.com
SGS Reference	CA40037-DEC23
Received	12/06/2023
Approved	12/12/2023
Report Number	CA40037-DEC23 R1
Date Reported	12/12/2023

COMMENTS

Temperature of Sample upon Receipt: 4 degrees C
Cooling Agent Present: Yes
Custody Seal Present: Yes

Chain of Custody Number: 036702

Corrosivity Index is based on the American Water Works Corrosivity Scale according to AWWA C-105. An index greater than 10 indicates the soil matrix may be corrosive to cast iron alloys.

SIGNATORIES

Jill Campbell, B.Sc.,GISAS

Jill Campbell

TABLE OF CONTENTS

MATRIX: SOIL

			Sample Number	5	6
			Sample Name	23TP-1	23TP-2
			Sample Matrix	Soil	Soil
			Sample Date	05/12/2023	05/12/2023
Parameter	**Units**	**RL**		**Result**	**Result**
Corrosivity Index					
Corrosivity Index	none	1		14	5
Soil Redox Potential	mV	no		235	286
Sulphide (Na2CO3)	%	0.01		0.01	< 0.01
pH	pH Units	0.05		7.82	8.77
Resistivity (calculated)	ohms.cm	-9999		1200	9430
General Chemistry					
Conductivity	uS/cm	2		836	106
Metals and Inorganics					
Moisture Content	%	0.1		11.1	6.0
Sulphate	µg/g	0.4		930	15
Other (ORP)					
Chloride	µg/g	0.4		9.5	0.8

QC SUMMARY

Anions by IC

Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-[ENV]IC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High
Chloride	DIO0245-DEC23	µg/g	0.4	<0.4	1	35	92	80	120	98	75	125
Sulphate	DIO0245-DEC23	µg/g	0.4	<0.4	1	35	101	80	120	113	75	125

Carbon/Sulphur

Method: ASTM E1915-07A | Internal ref.: ME-CA-[ENV]ARD-LAK-AN-020

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High
Sulphide (Na2CO3)	ECS0021-DEC23	%	0.01	< 0.01								

Conductivity

Method: SM 2510 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High
Conductivity	EWL0134-DEC23	uS/cm	2	< 2	1	20	100	90	110	NA		

QC SUMMARY

pH

Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0134-DEC23	pH Units	0.05	NA	1		100			NA		

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate laboratory accuracy with sample matrix effects.

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS	Insufficient sample for analysis.
RL	Reporting Limit.
↑	Reporting limit raised.
↓	Reporting limit lowered.
NA	The sample was not analysed for this analyte
ND	Non Detect

Results relate only to the sample tested.
Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.
"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

This report supersedes all previous versions.

-- End of Analytical Report --

SGS

Request for Laboratory Services and CHAIN OF CUSTODY

No: 036702

Industries & Environment - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

Page 1 of 1

Laboratory Information Section - Lab use only

Received By: Bo Camer
Received Date: 12/06/23 (mm/dd/yy)
Received Time: 12:35 (hr : min)
Received By (signature):
Custody Seal Present: Yes ☐ No ☐
Custody Seal Intact: Yes ☐ No ☐
Cooling Agent Present: Yes ☒ No ☐ Type: ICE.
Temperature Upon Receipt (°C) 4.
LAB LIMS #: CA-40037-Dec23 SR.

REPORT INFORMATION

Company: Toronto Inspection Ltd.
Contact: Natalie Chan
Address: 110 Konrad Crescent
Markham ON L3R 9X2
Phone: 905 940 8509
Fax:
Email: lab@torontoinspection.com

INVOICE INFORMATION

☑ (same as Report Information)
Company:
Contact: Shannon
Address:
Phone:
Email: shannon@torontoinspection.com

Quotation #:
P.O. #:
Project #: 4817
Site Location/ID:

TURNAROUND TIME (TAT) REQUIRED

☑ Regular TAT (5-7days)

TAT's are quoted in business days (exclude statutory holidays & weekends).
Samples received after 6pm or on weekends: TAT begins next business day

RUSH TAT (Additional Charges May Apply): ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days

PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date:

*NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY

REGULATIONS

☐ O.Reg 153/04 ☐ O.Reg 406/19
☐ Table 1 ☐ Res/Park Soil Texture:
☐ Table 2 ☐ Ind/Com ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ Medium/Fine
☐ Table ____ Appx. ____
Soil Volume ☐ <350m3 ☐ >350m3

Other Regulations:
☐ Reg 347/558 (3 Day min TAT)
☐ PWQO ☐ MMER
☐ CCME ☐ Other:
☐ MISA
☐ ODWS Not Reportable *See note

Sewer By-Law:
☐ Sanitary
☐ Storm
Municipality:

RECORD OF SITE CONDITION (RSC) ☐ YES ☐ NO

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	Field Filtered (Y/N)	M & I: Metals & Inorganics incl CrVI, CN,Hg pH,(B(HWS),EC,SAR-soil) (Cl, Na-water)	M & I: Full Metals Suite ICP metals plus B(HWS-soil only) Hg, CrVI	M & I: ICP Metals only Sb,As,Ba,Be,B,Cd, Cr,Co,Cu,Pb,Mo,Ni,Se,Ag,Tl,U,V,Zn	SVOC: PAHs only	SVOC: SVOCs all incl PAHs, ABNs, CPs	PCB: PCBs Total ☐ Aroclor ☐	PHC: F1-F4 + BTEX	PHC: F1-F4 only no BTEX	VOC: VOCs all incl BTEX	VOC: BTEX only	Pest: Pesticides Organochlorine or specify other	Other (please specify): Corrosivity	Other	Other	Other	Sewer Use: Specify pkg:	Water Characterization Pkg General ☐ Extended ☐	SPLP Specify tests ☐Metals ☐VOC ☐1,4-Dioxane ☐OCP ☐ABN	TCLP Specify tests ☐M&I ☐VOC ☐PCB ☐B(a)P ☐ABN ☐Ignit.	COMMENTS:
1	23TP-1	Dec 5/23	9:00	1	S													✓								
2	23TP-2	Dec 5/23	9:15	1	S													✓								
3																										
4																										
5																										
6																										
7																										
8																										
9																										
10																										
11																										
12																										

Observations/Comments/Special Instructions

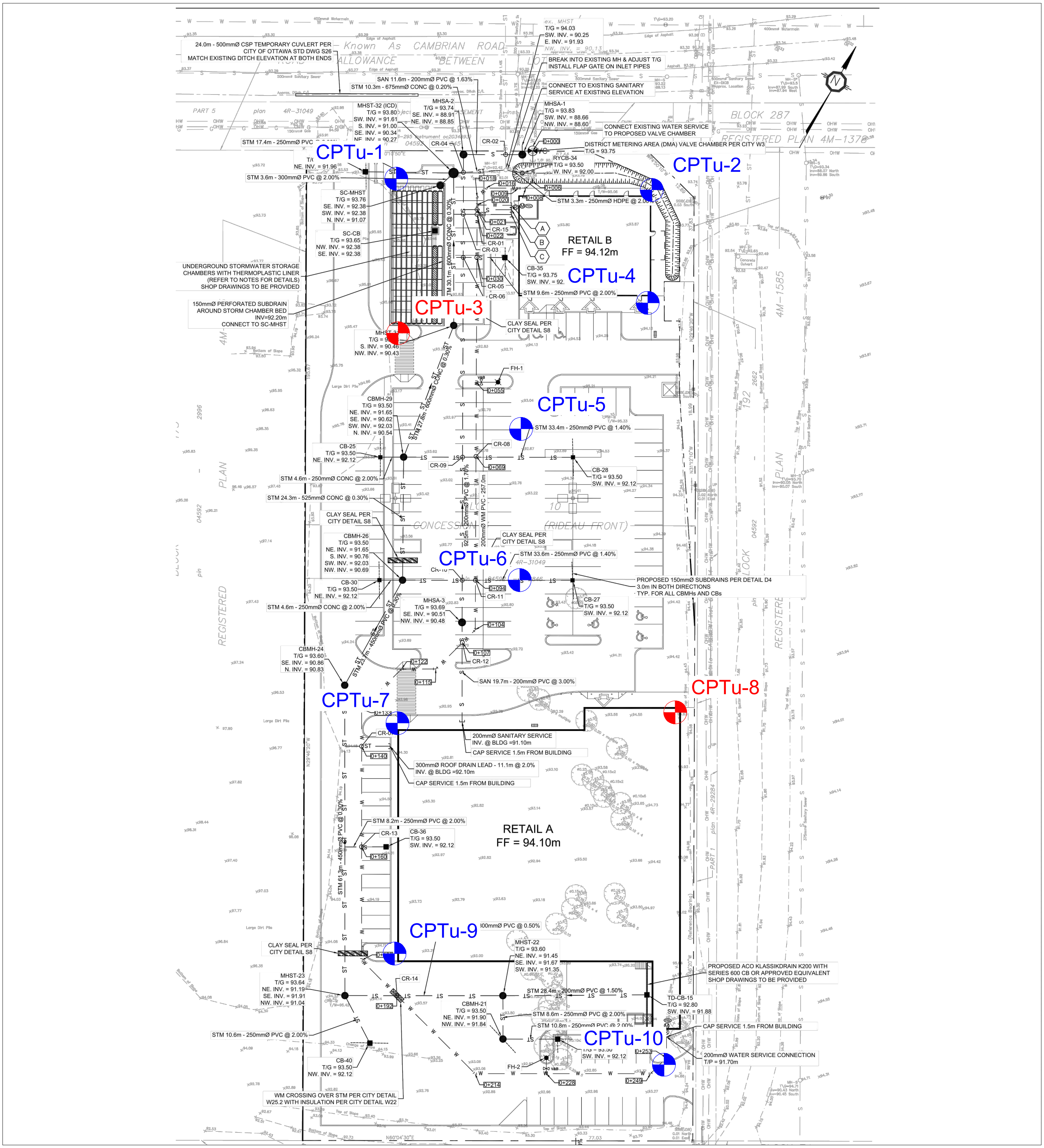
Sampled By (NAME): Mamoon Signature: o/B Natalie Date: 12/06/23 (mm/dd/yy) Pink Copy - Client
Relinquished by (NAME): Natalie Chan Signature: Natalie Date: 12/06/23 (mm/dd/yy) Yellow & White Copy - SGS

Revision #: 1.7
Date of Issue: 07 JUNE 2023

Note: Submission of samples to SGS is acknowledgement that you have been provided direction on sample collection/handling and transportation of samples. (2) Submission of samples to SGS is considered authorization for completion of work. Signatures may appear on this form or be retained on file in the contract, or in an alternative format (e.g. shipping documents). (3) Results may be sent by email to an unlimited number of addresses for no additional cost. Fax is available upon request. This document is issued by the Company under its General Conditions of Service accessible at http://www.sgs.com/terms_and_conditions.htm. (Printed copies are available upon request.) Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

APPENDIX C

CPTu Test Results



LEGEND:

- ◕ CPTu Tests, with pore pressure dissipation at sand and gravel layer below clayey silt (approximately 20m)
- ◕ CPTu Tests, with pore pressure dissipation at bottom of clay layer (approximately 20m) and 2 pore pressure dissipation tests in clay layer (approximately 7m and 14m)

NOT TO SCALE

TorontoInspection LTD.
GEO-ENVIRONMENTAL CONSULTANTS
110 Konrad Crescent, Unit 16, Markham, Ontario L3R 9X2
Tel: 905-940 8509 Fax: 905-940 8192
Email : TIL@torontoinspection.com

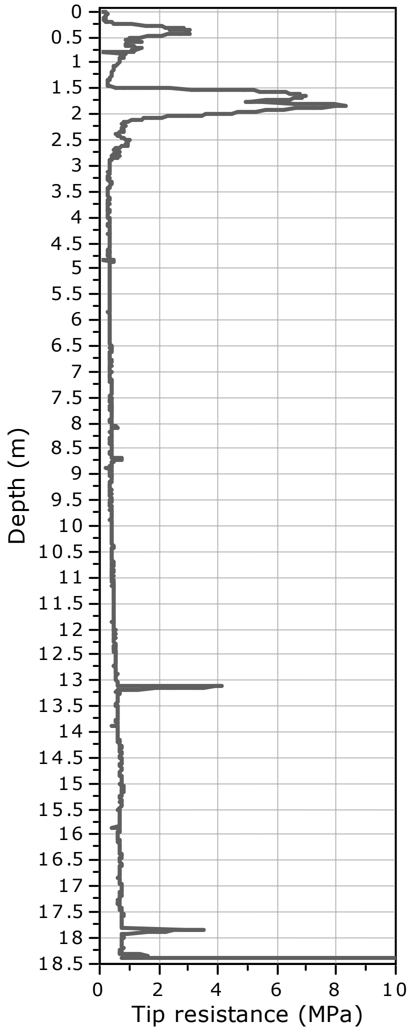
TITLE:	CPTu Test Location Plan
LOCATION:	3845 Cambrian Road, Barrhaven, Ontario

PROJECT NO.:	DATE :	DRAWING NO.
4817-25-GB	March 2025	1

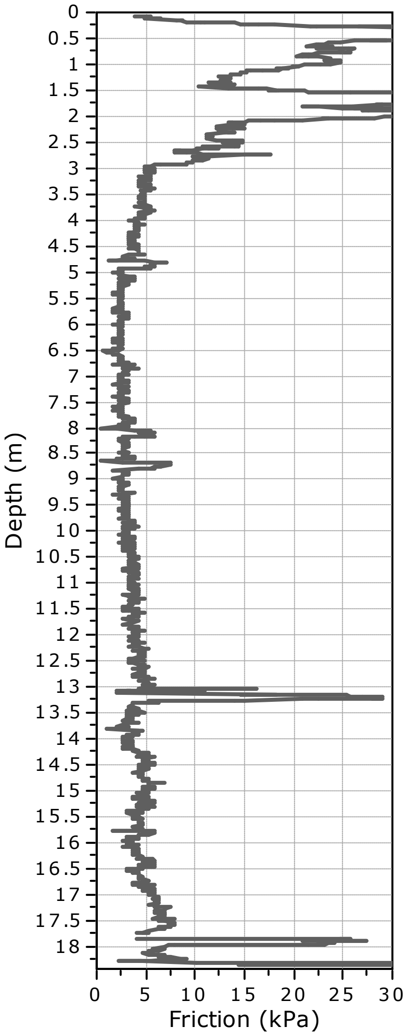
CPT: 25021_CPTu-01
Total depth: 18.43 m, Date: 2025-04-01
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

Project:
Location:

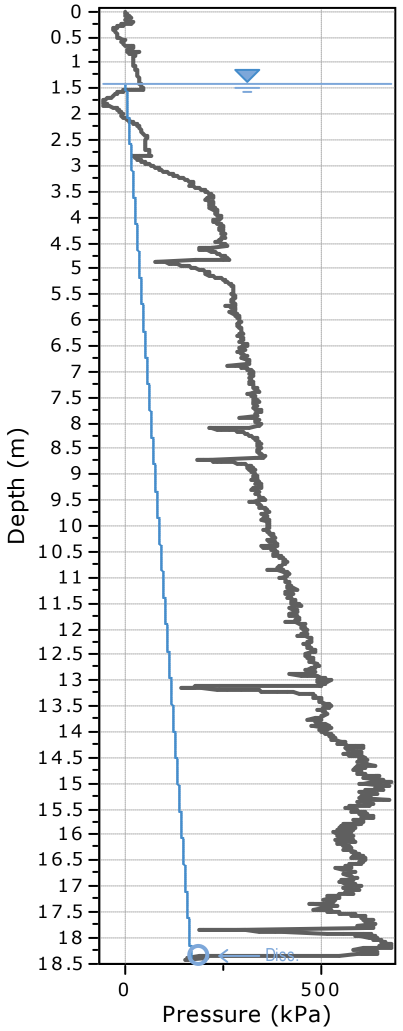
Cone resistance



Sleeve friction

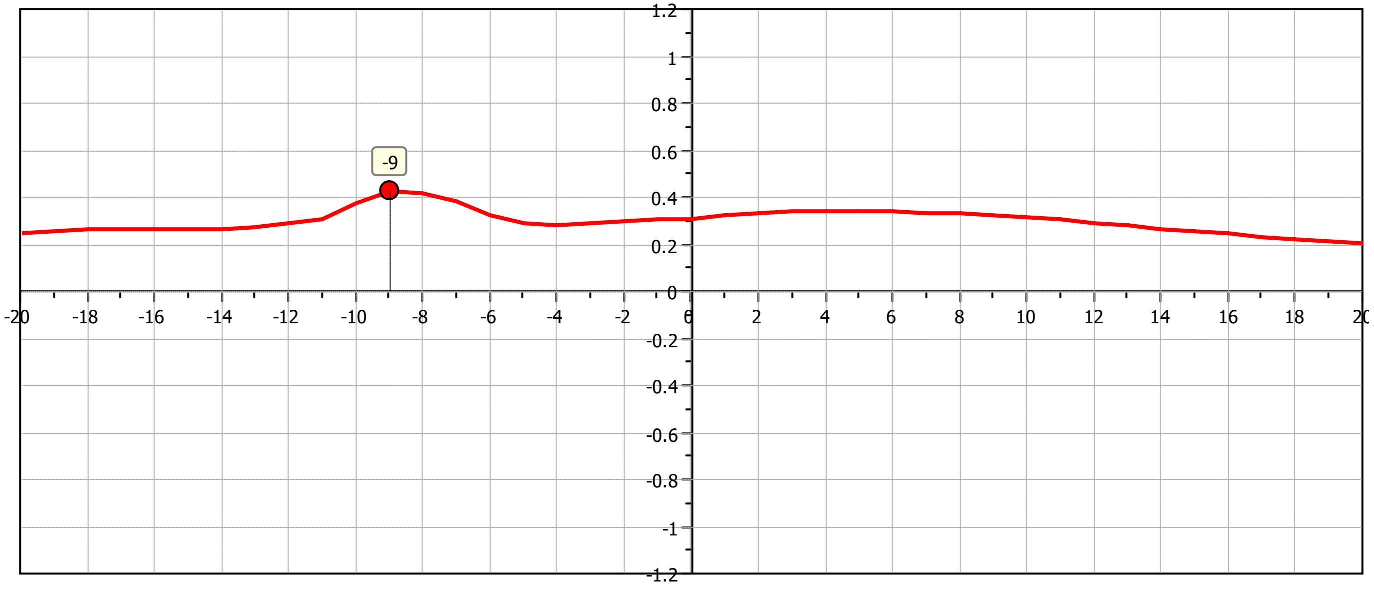


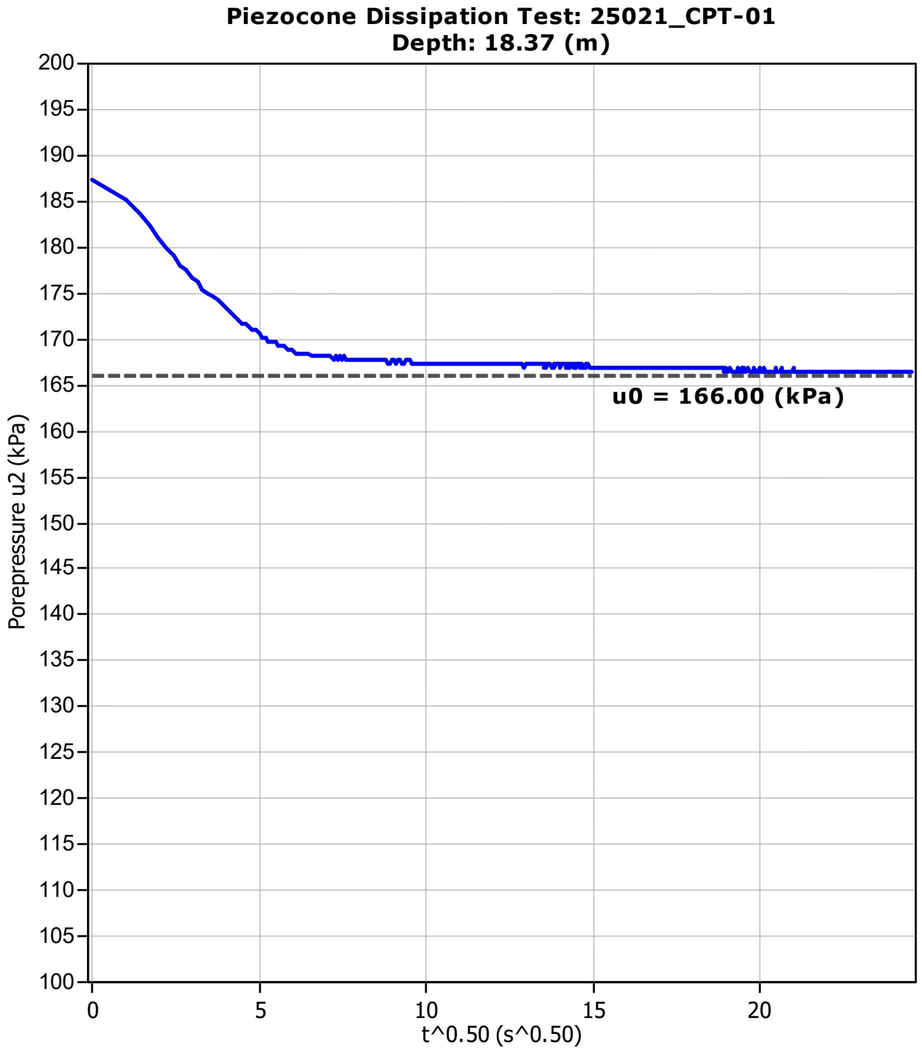
Pore pressure



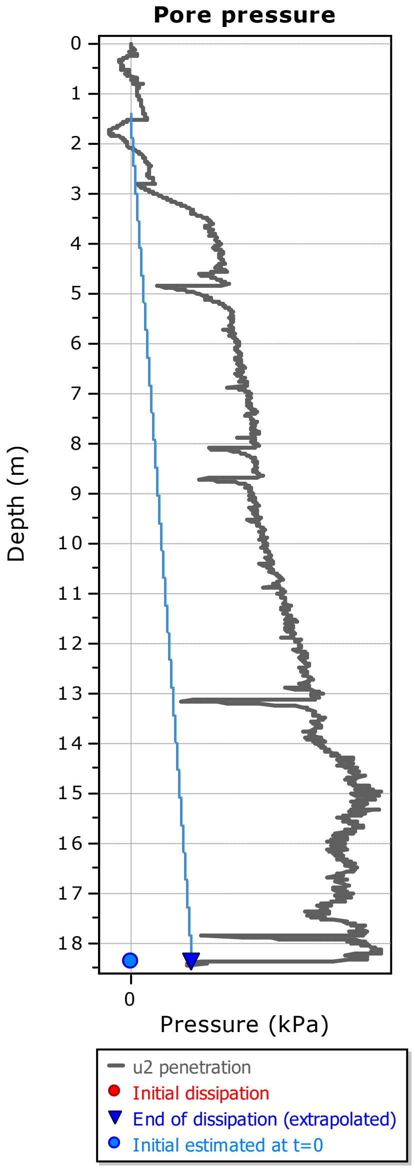
The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

Cross correlation between qc & fs

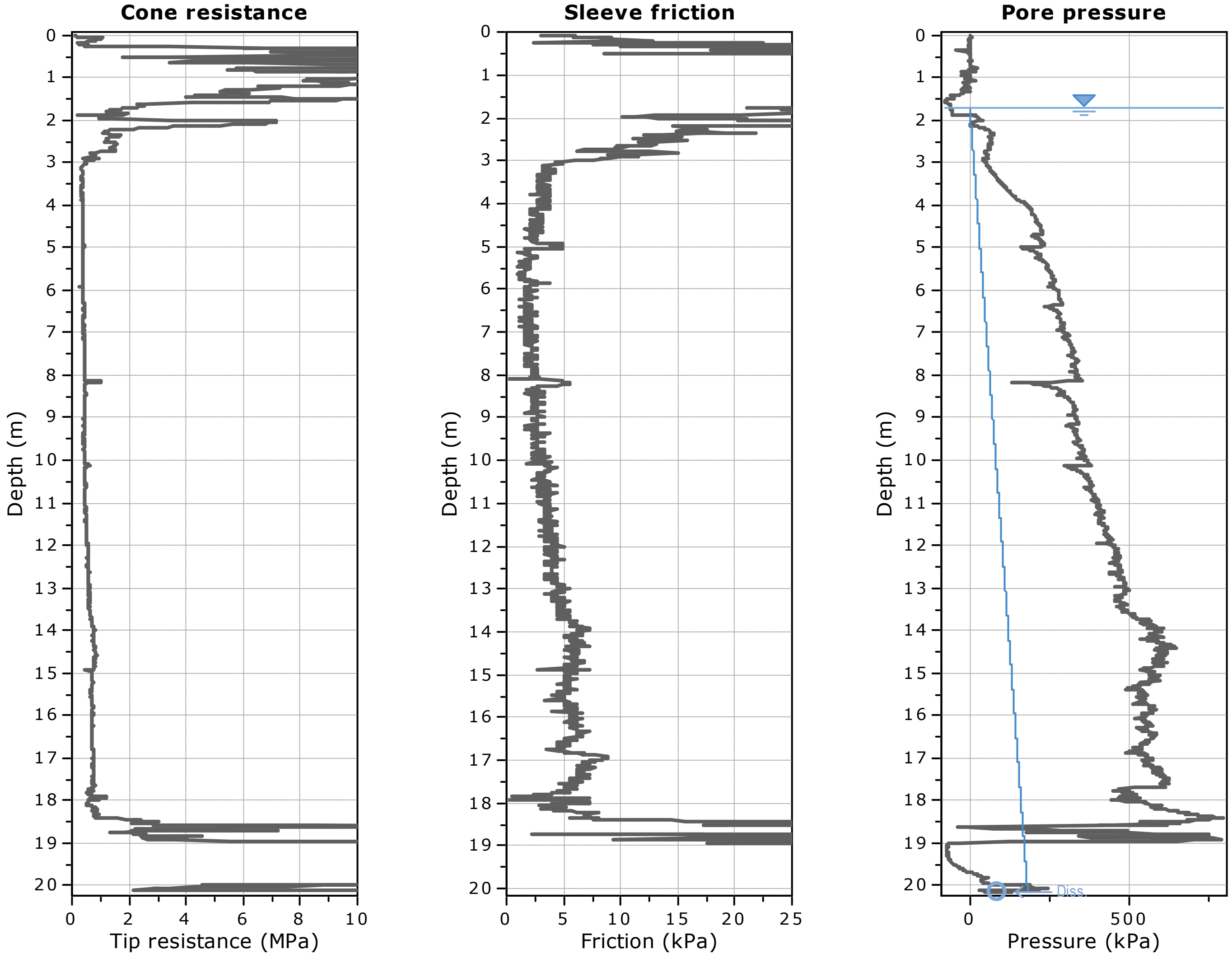




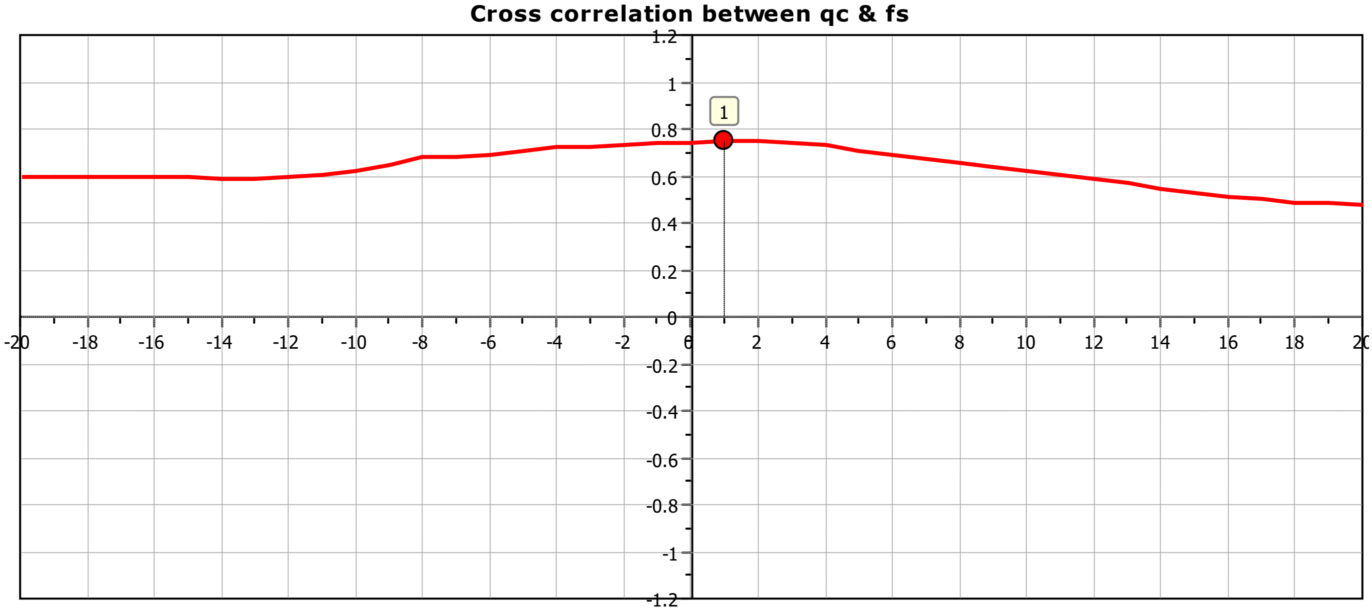
Piezocone Dissipation Test: 25021_CPT-01
Depth: 18.37 (m)

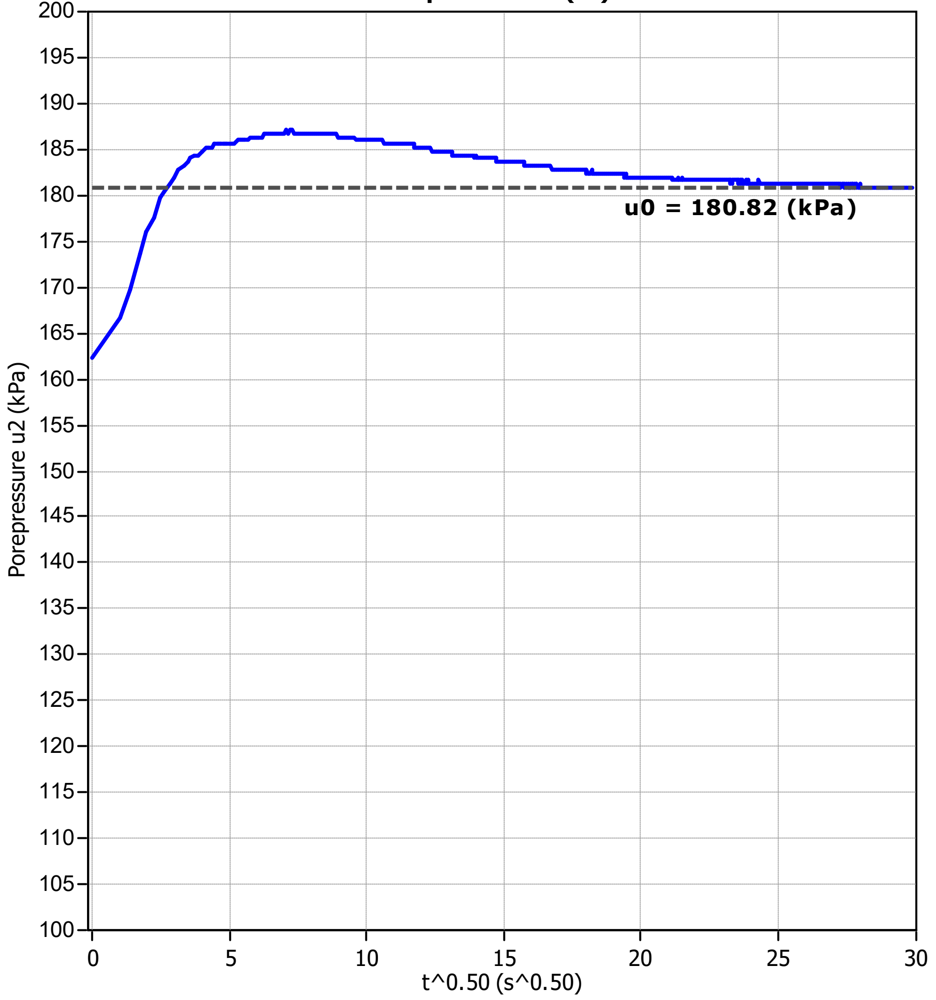


Pore pressure

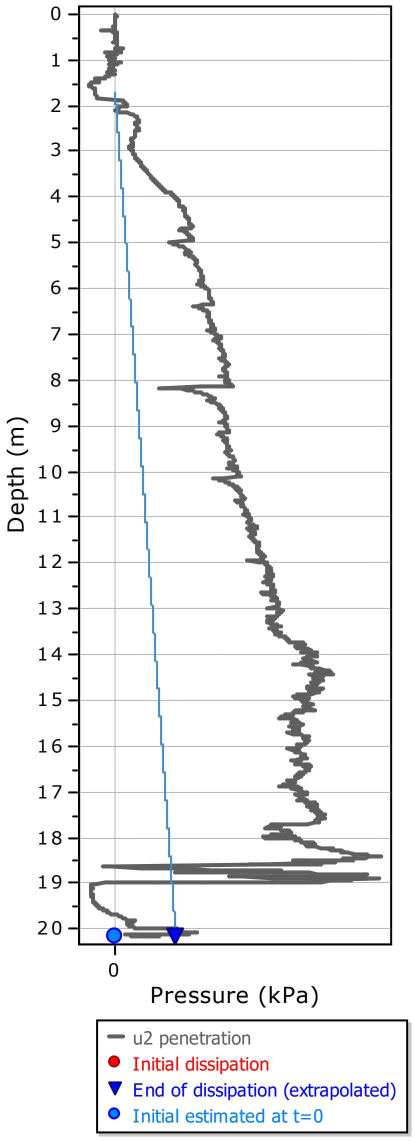


The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).





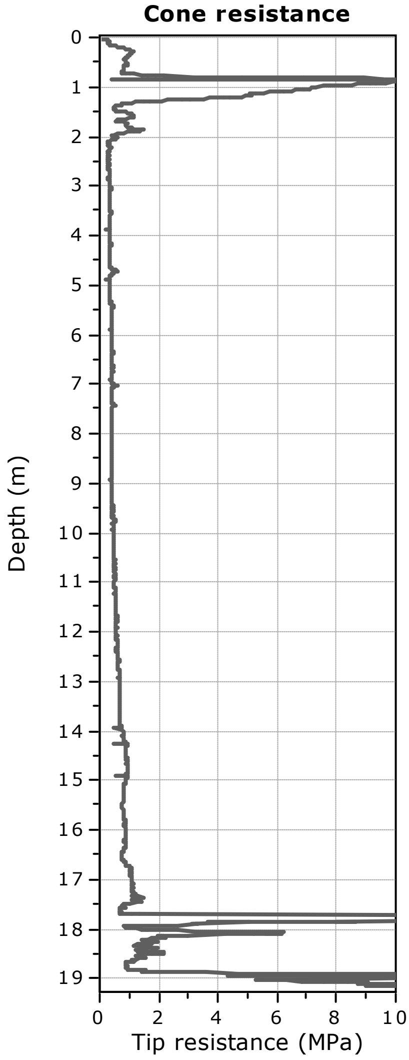
Piezocone Dissipation Test: 25021_CPT-2_
Depth: 20.16 (m)

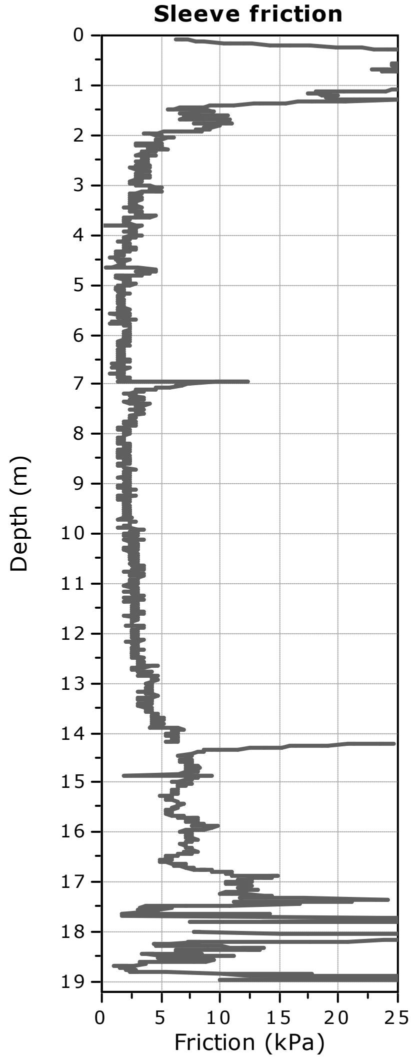


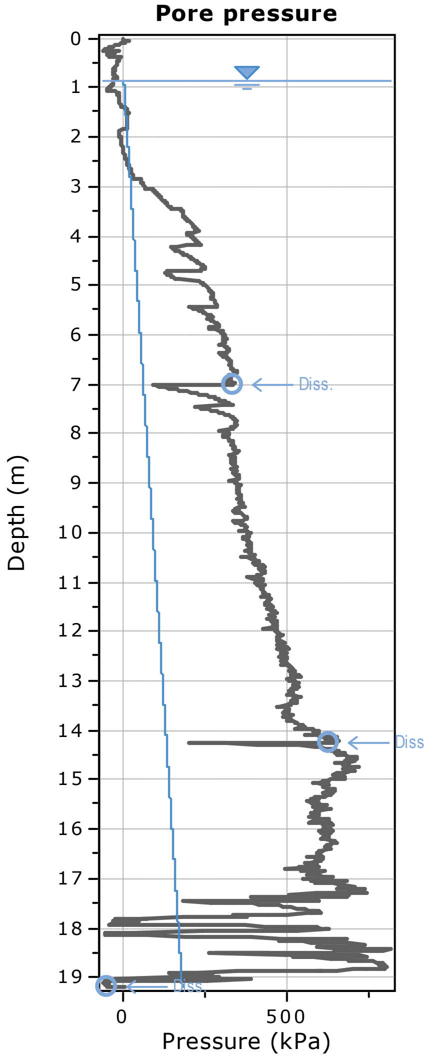
Pore pressure

CPT: 25021_CPTu-03
Total depth: 19.19 m, Date: 2025-03-31
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

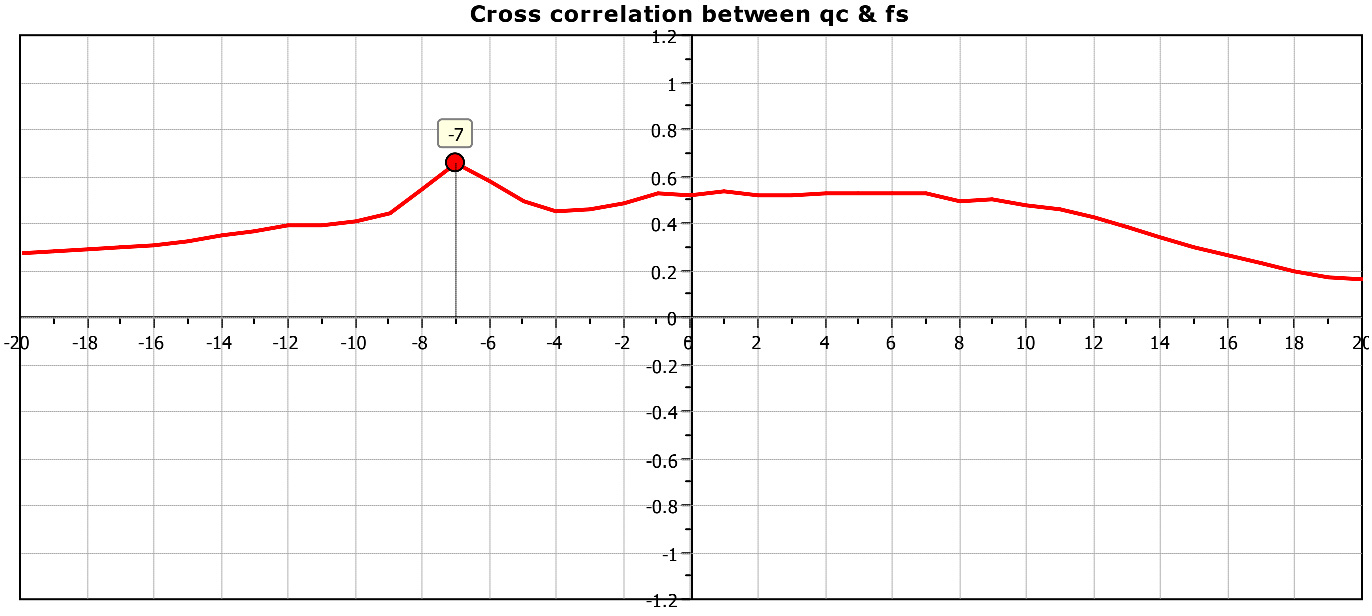
Project:
Location:

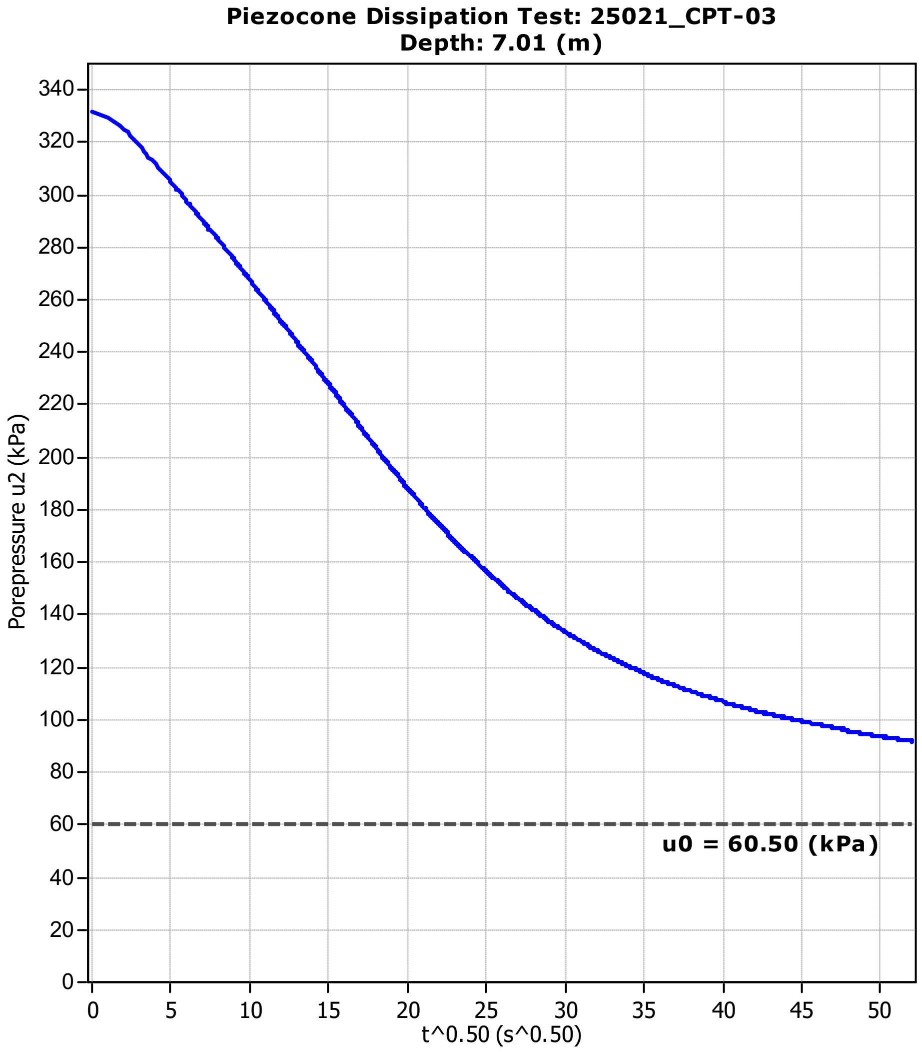


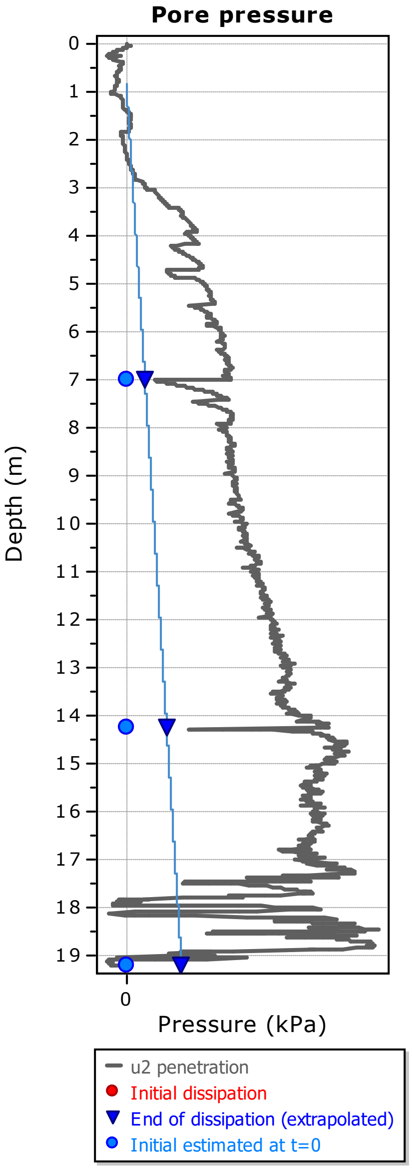


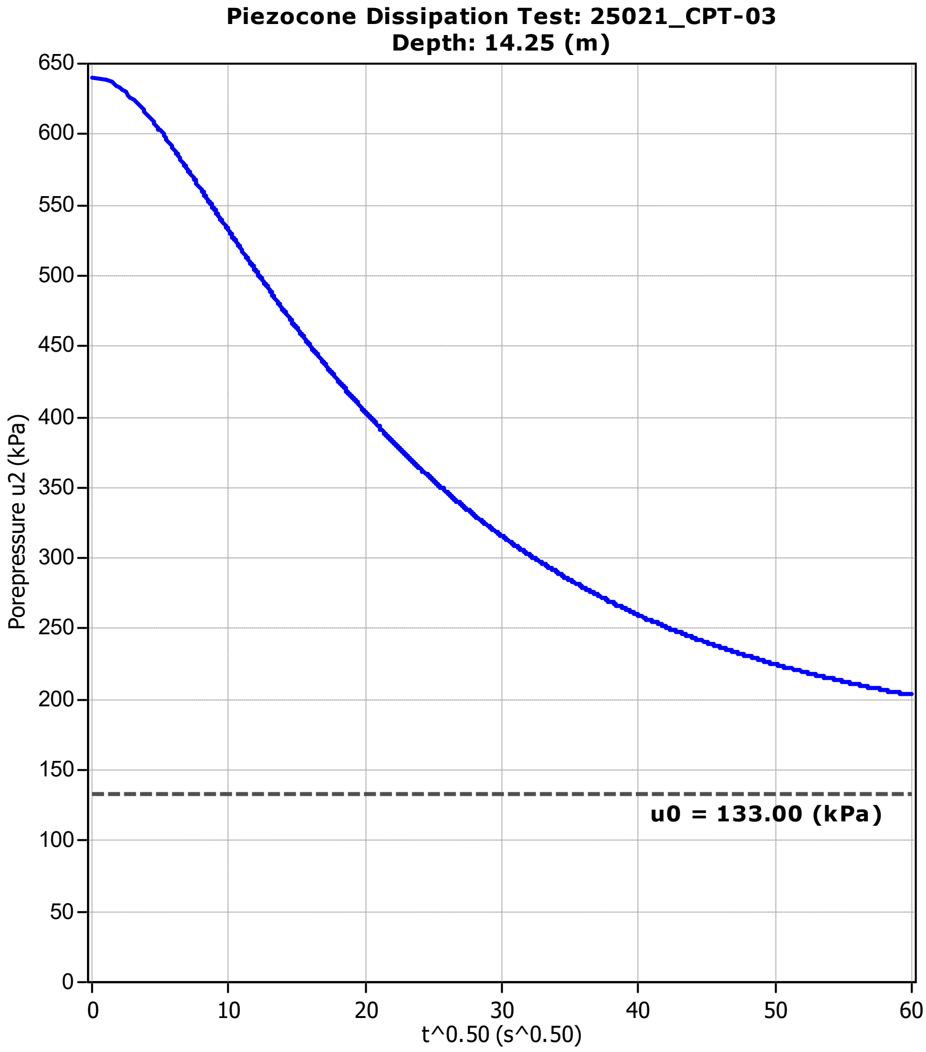


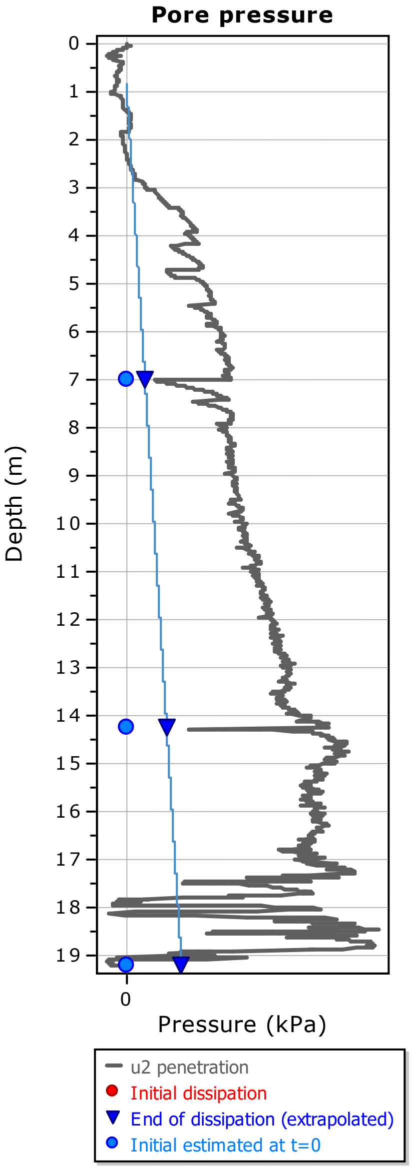
The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

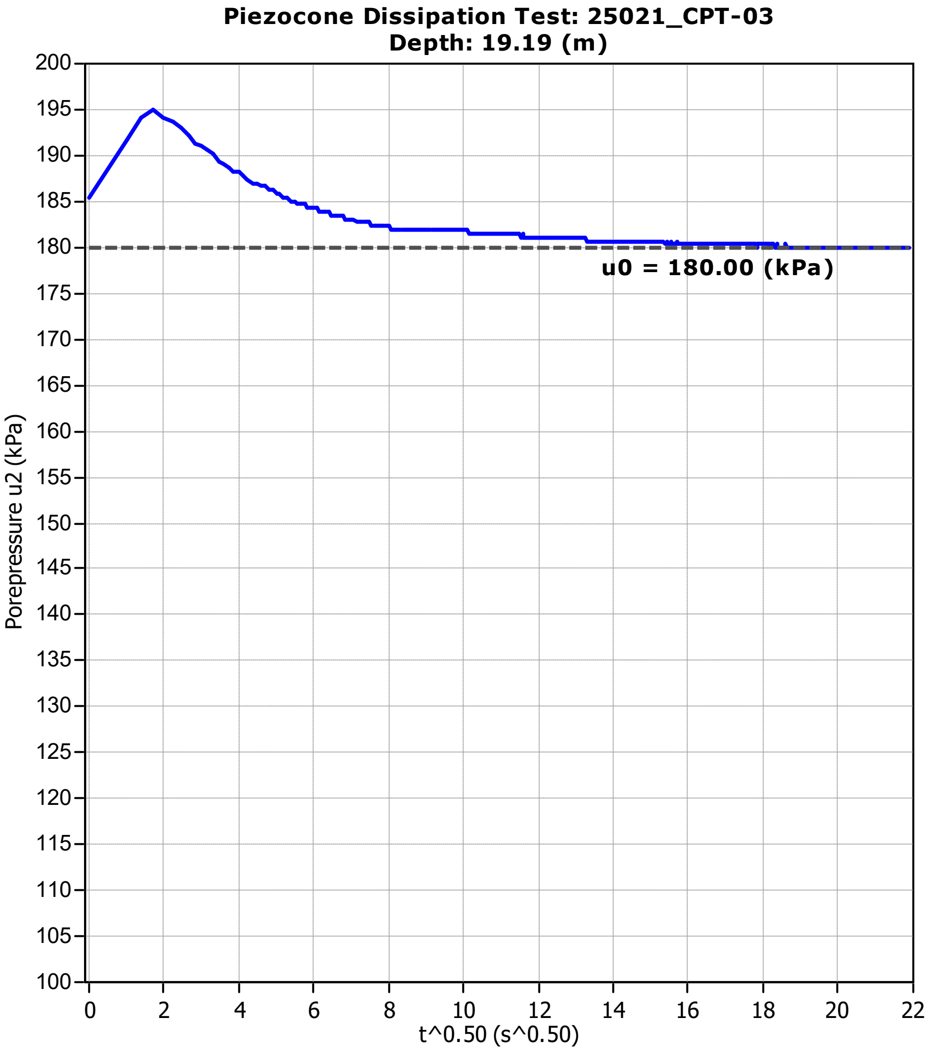


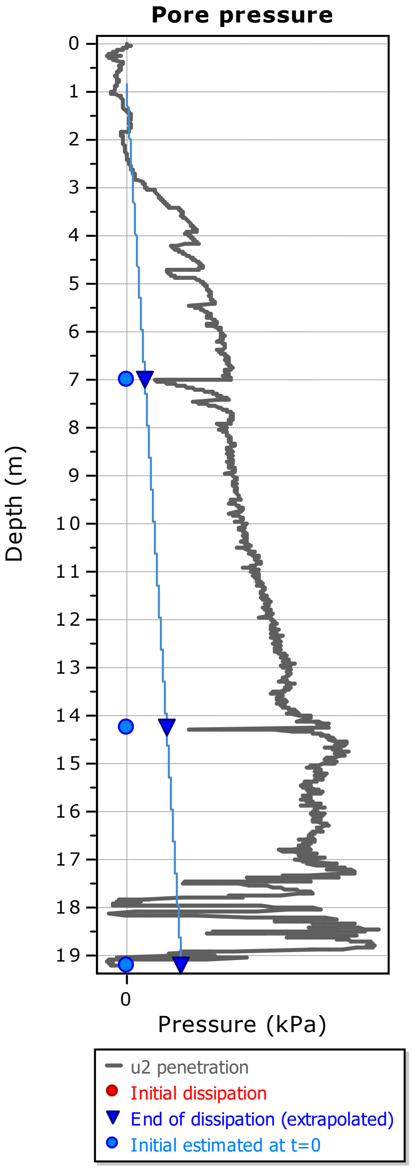

Piezocone Dissipation Test: 25021_CPT-03
Depth: 7.01 (m)
Porepressure u2 (kPa)
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
t^0.50 (s^0.50)
0
5
10
15
20
25
30
35
40
45
50
u0 = 60.50 (kPa)


Pore pressure
Depth (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
Pressure (kPa)
0
u2 penetration
● Initial dissipation
▼ End of dissipation (extrapolated)
● Initial estimated at t=0


Piezocone Dissipation Test: 25021_CPT-03
Depth: 14.25 (m)
Porepressure u2 (kPa)
650
600
550
500
450
400
350
300
250
200
150
100
50
0
u0 = 133.00 (kPa)
0
10
20
30
40
50
60
t^0.50 (s^0.50)


Pore pressure
Depth (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
0
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

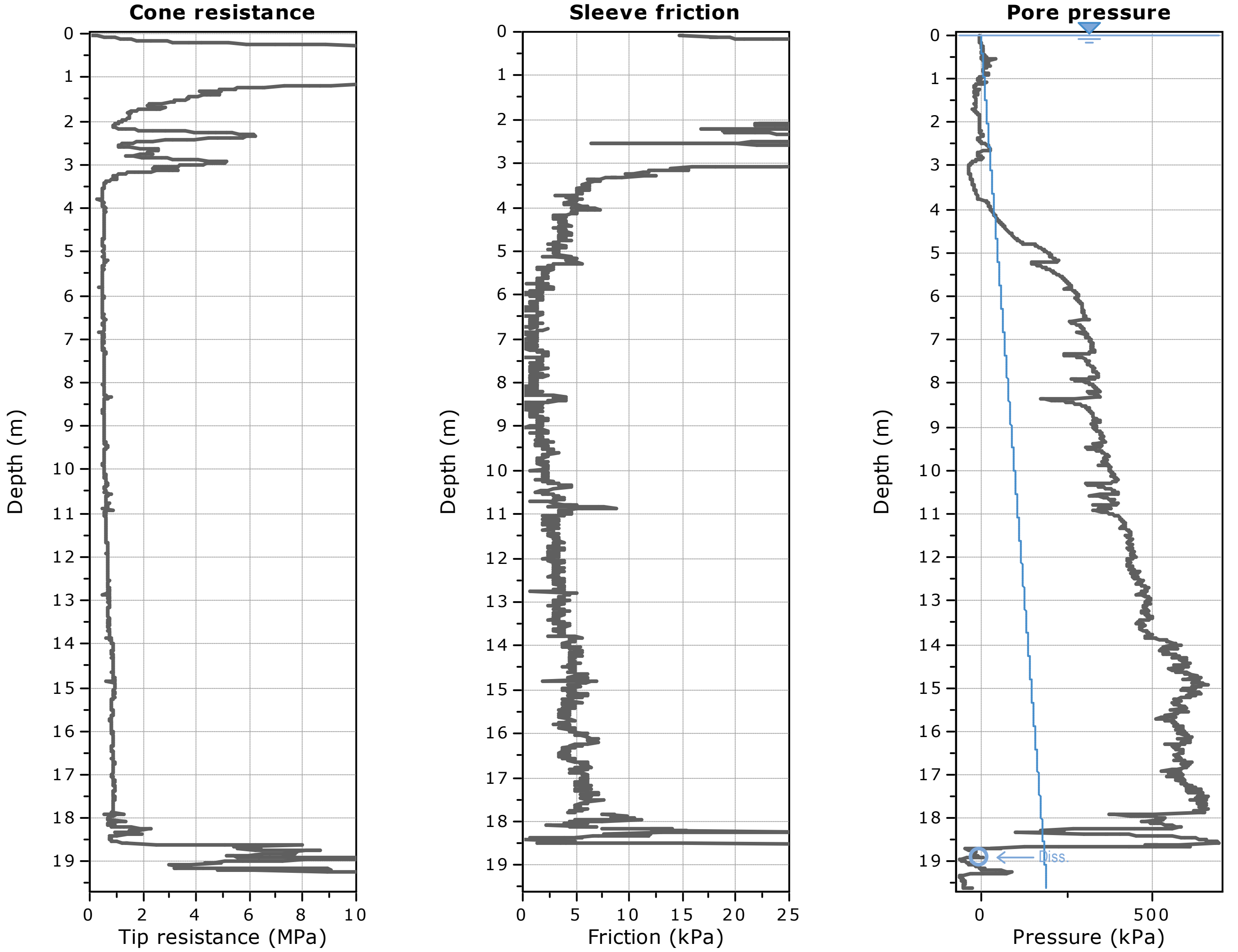

Piezocone Dissipation Test: 25021_CPT-03
Depth: 19.19 (m)
200
195
190
185
180
175
170
165
160
155
150
145
140
135
130
125
120
115
110
105
100
Porepressure u2 (kPa)
0
2
4
6
8
10
12
14
16
18
20
22
t^0.50 (s^0.50)
u0 = 180.00 (kPa)


Pore pressure
Depth (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
0
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

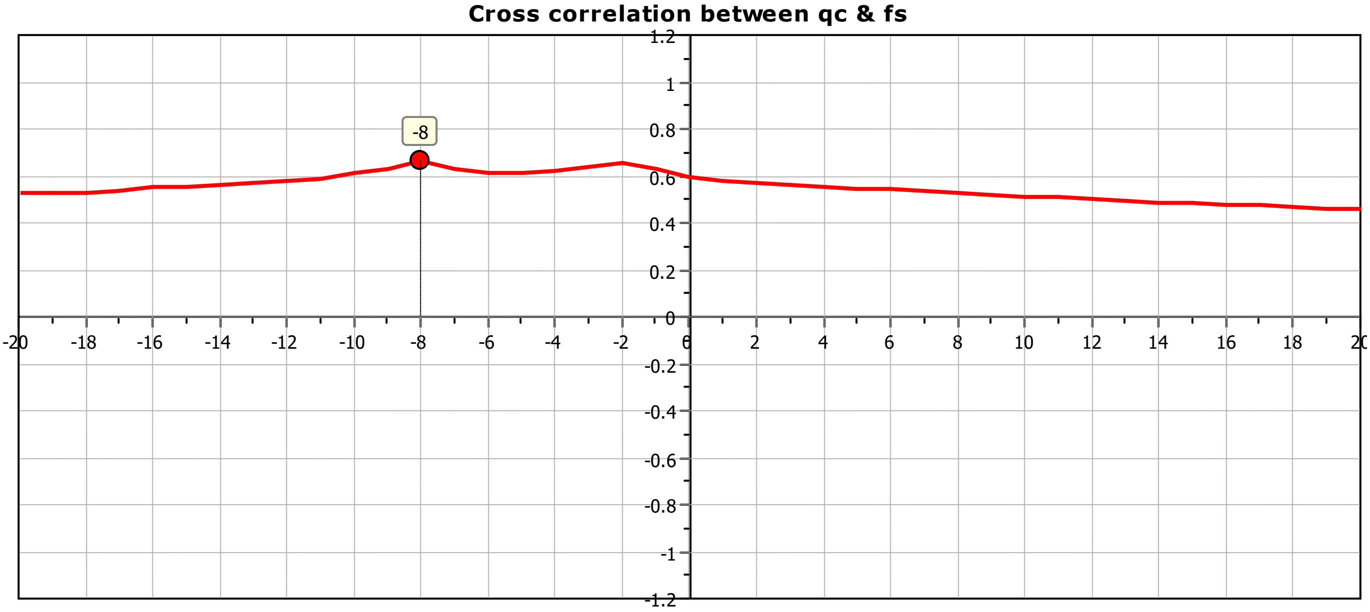
CPT: 25021_CPTu-04

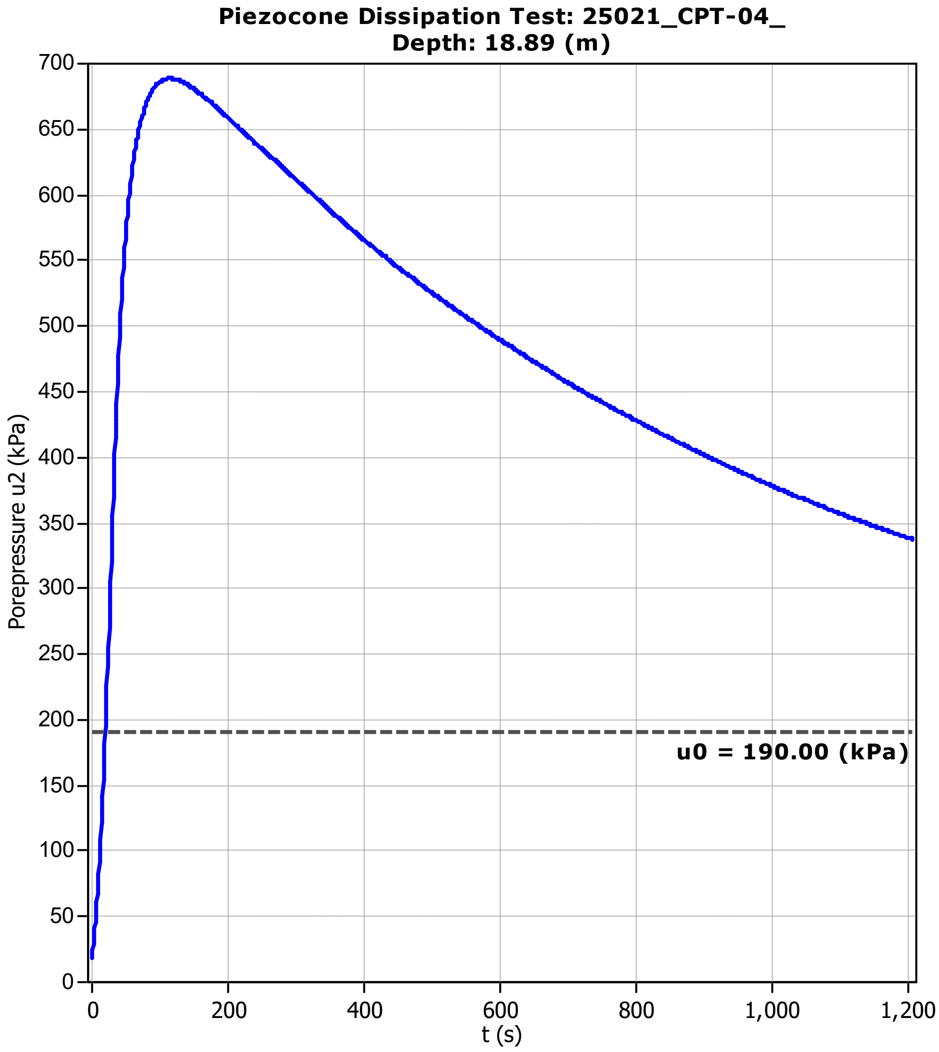
Total depth: 19.60 m, Date: 2025-04-01
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

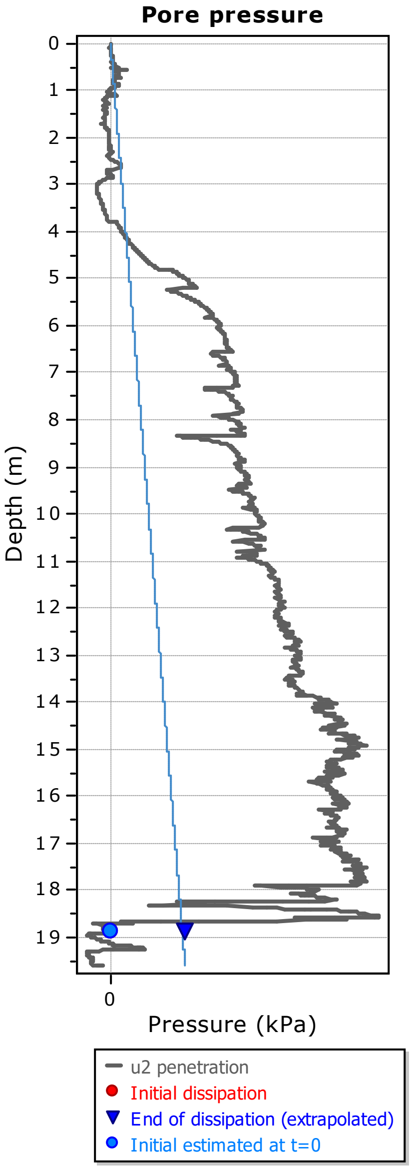
Project:
Location:



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

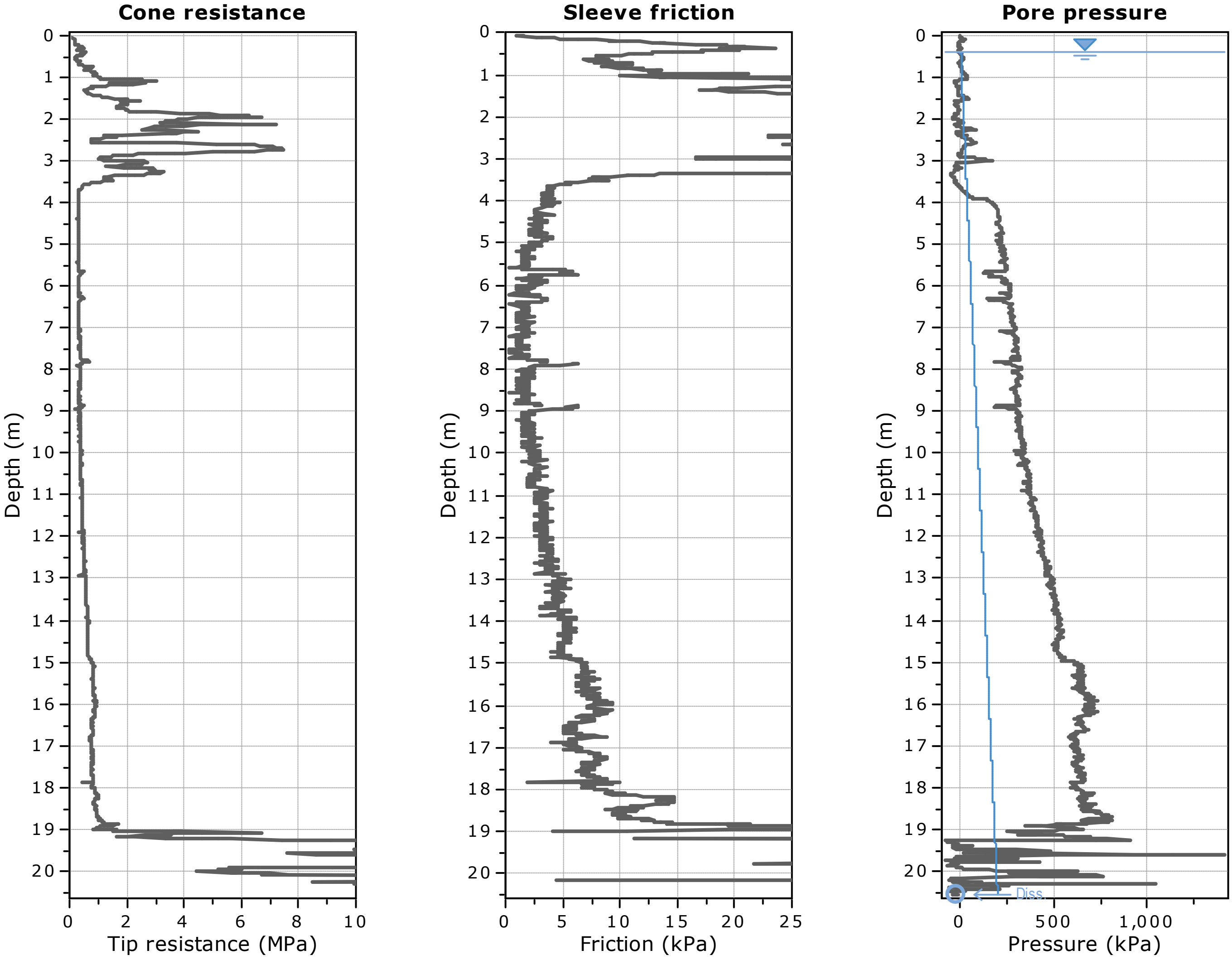



Piezocone Dissipation Test: 25021_CPT-04_
Depth: 18.89 (m)
Porepressure u2 (kPa)
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
u0 = 190.00 (kPa)
0
200
400
600
800
1,000
1,200
t (s)

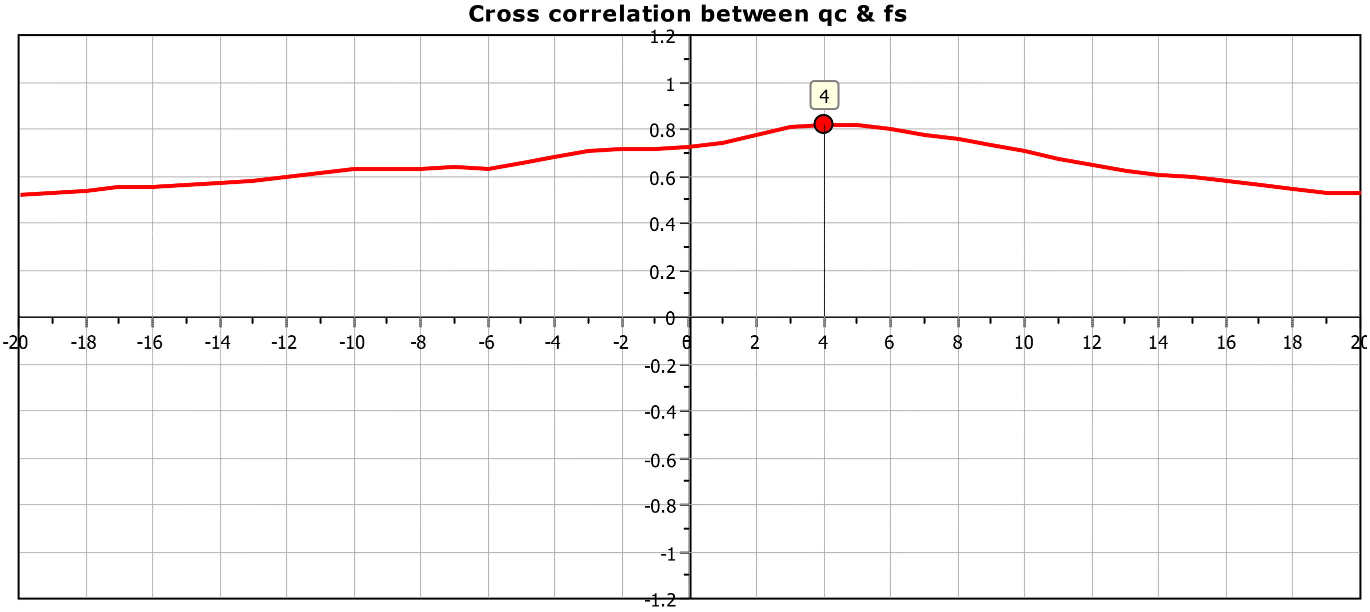

Pore pressure
Depth (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
0
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

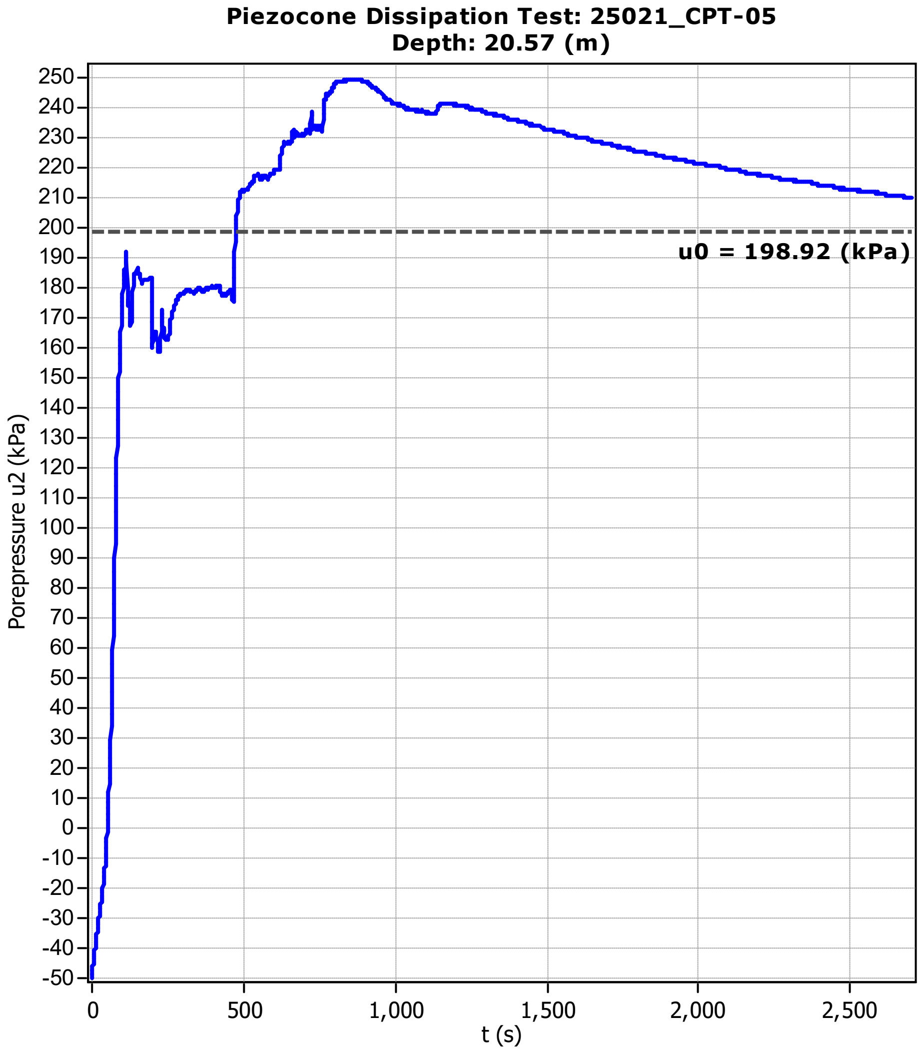
CPT: 25021_CPTu-05
Total depth: 20.57 m, Date: 2025-03-31
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

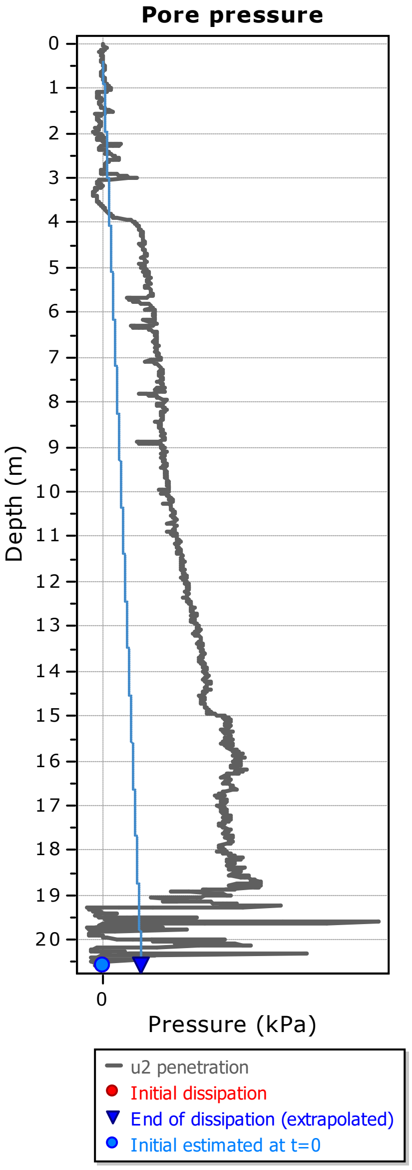
Project:
Location:



The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

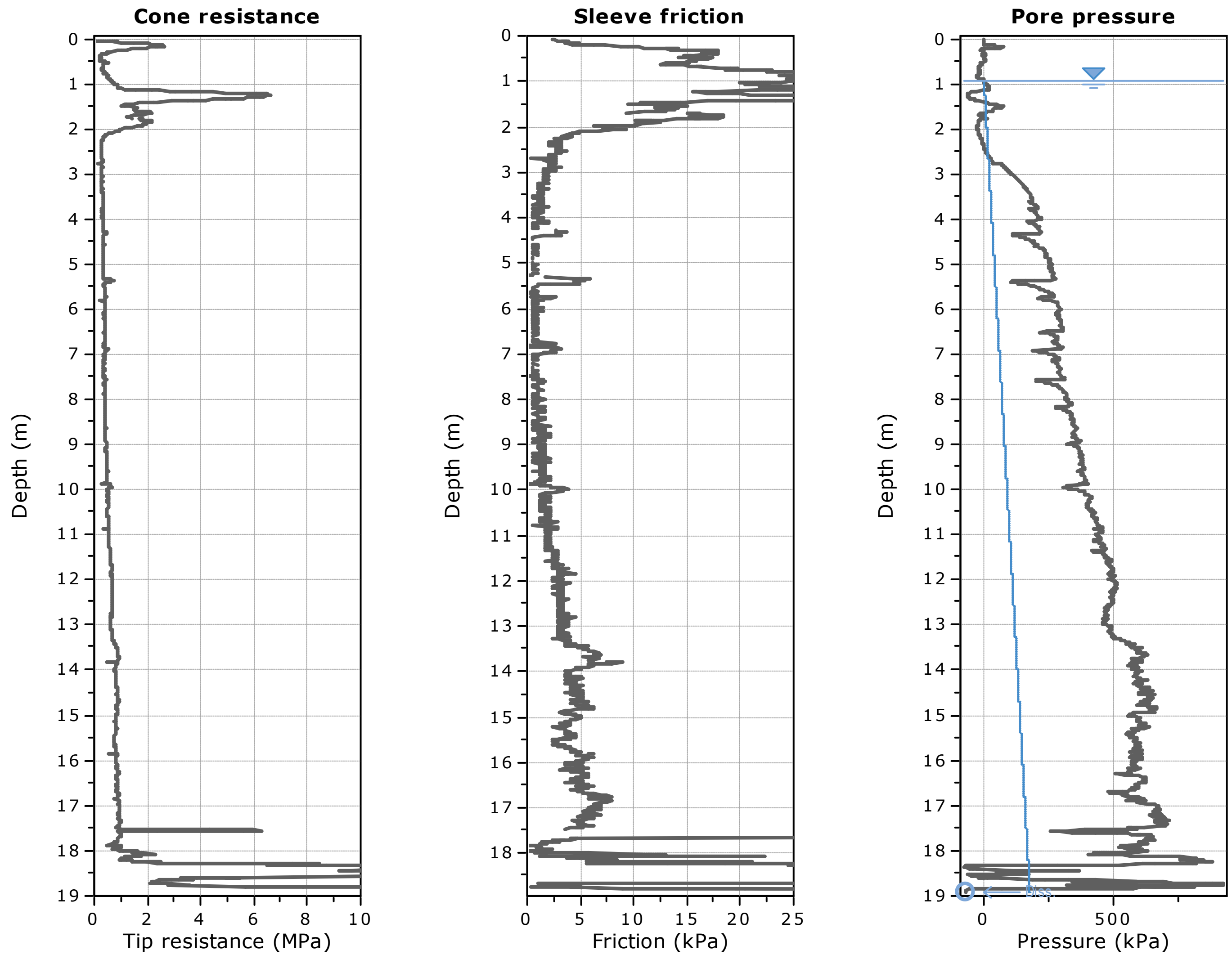



Piezocone Dissipation Test: 25021_CPT-05
Depth: 20.57 (m)
Porepressure u2 (kPa)
250
240
230
220
210
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
-20
-30
-40
-50
u0 = 198.92 (kPa)
0
500
1,000
1,500
2,000
2,500
t (s)


Pore pressure
Depth (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
0
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

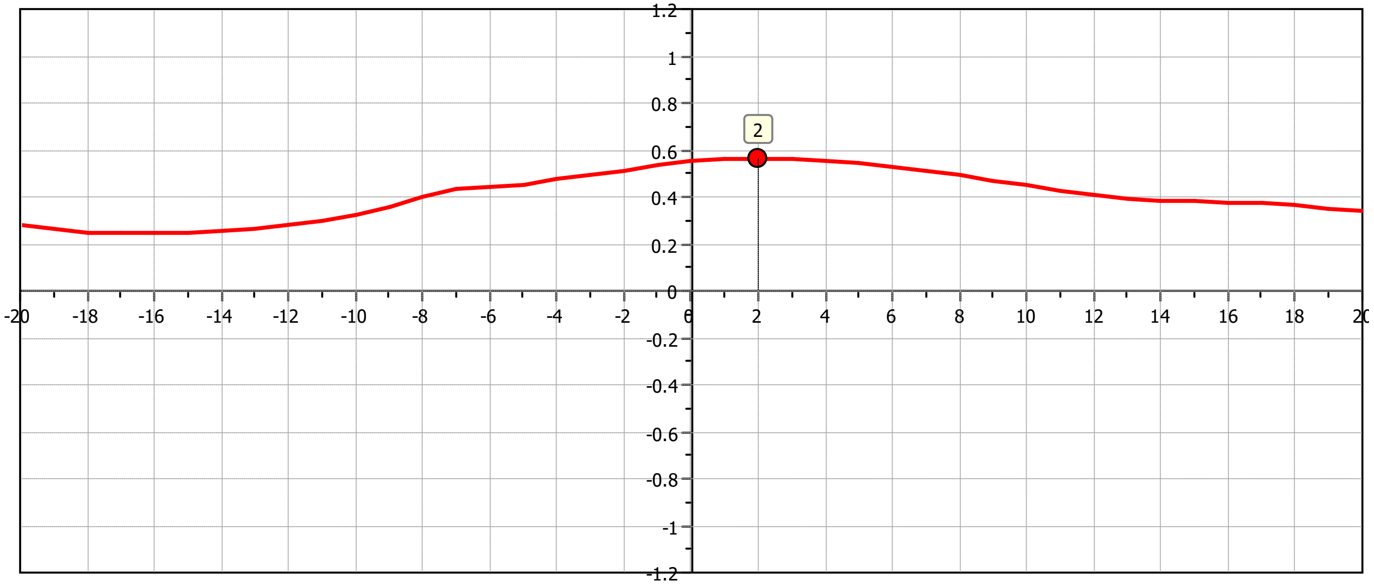
CPT: 25021_CPTu-06
Total depth: 18.93 m, Date: 2025-04-01
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

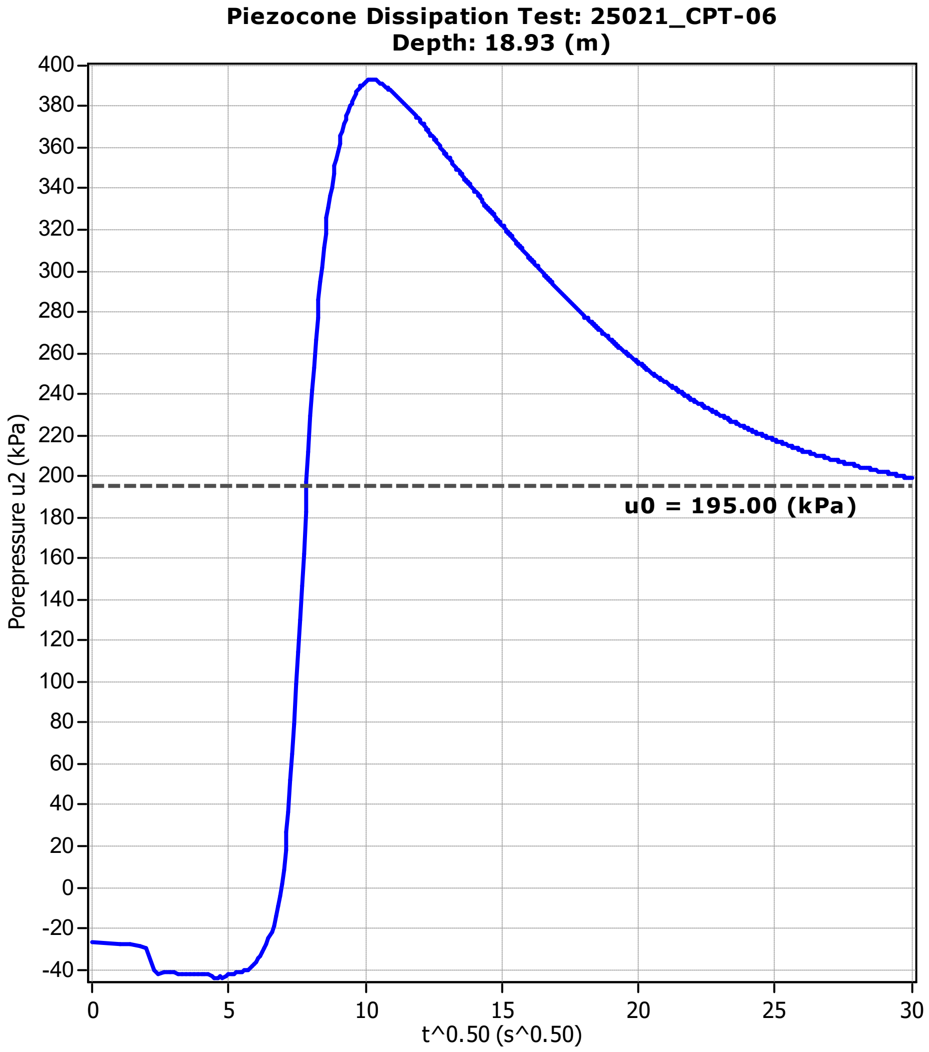
Project:
Location:

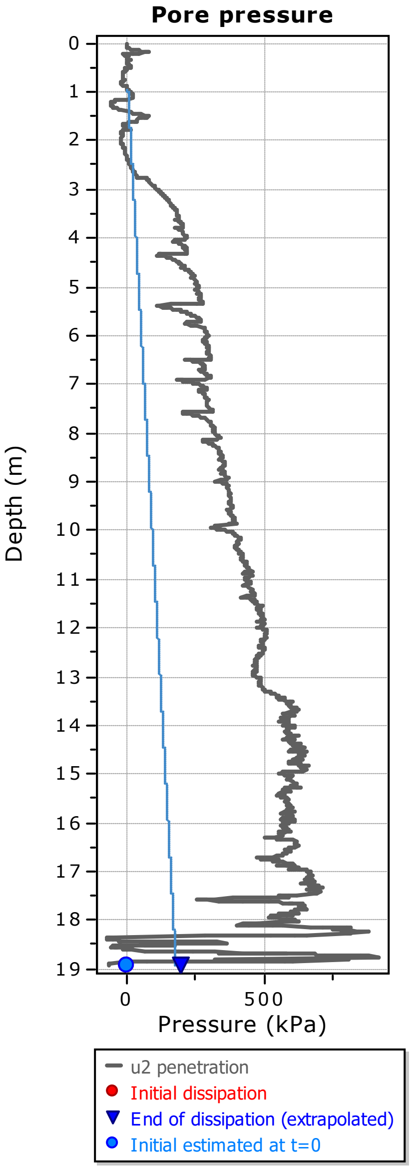


The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

Cross correlation between qc & fs

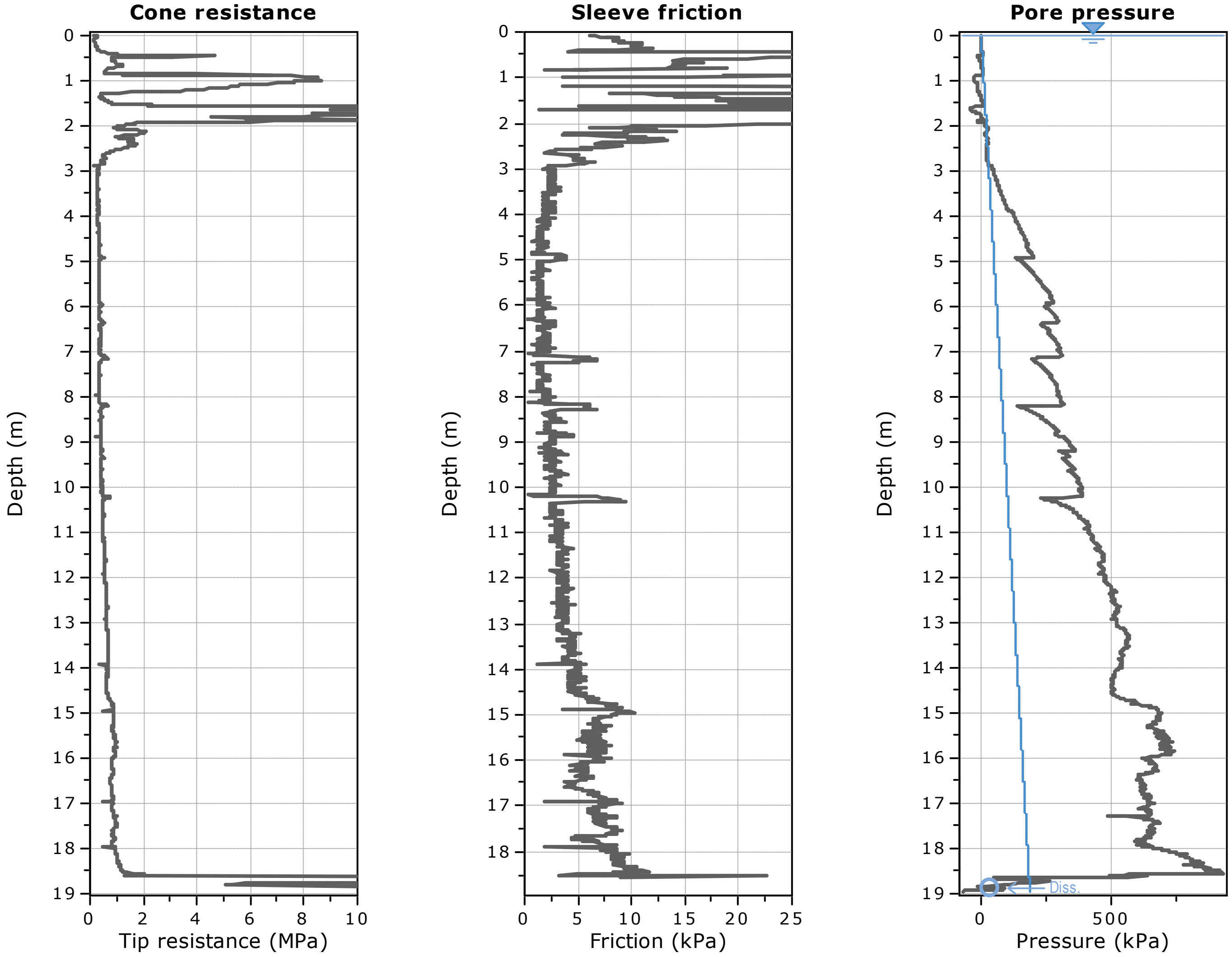



Piezocone Dissipation Test: 25021_CPT-06
Depth: 18.93 (m)
Porepressure u2 (kPa)
400
380
360
340
320
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
-20
-40
u0 = 195.00 (kPa)
0
5
10
15
20
25
30
t^0.50 (s^0.50)

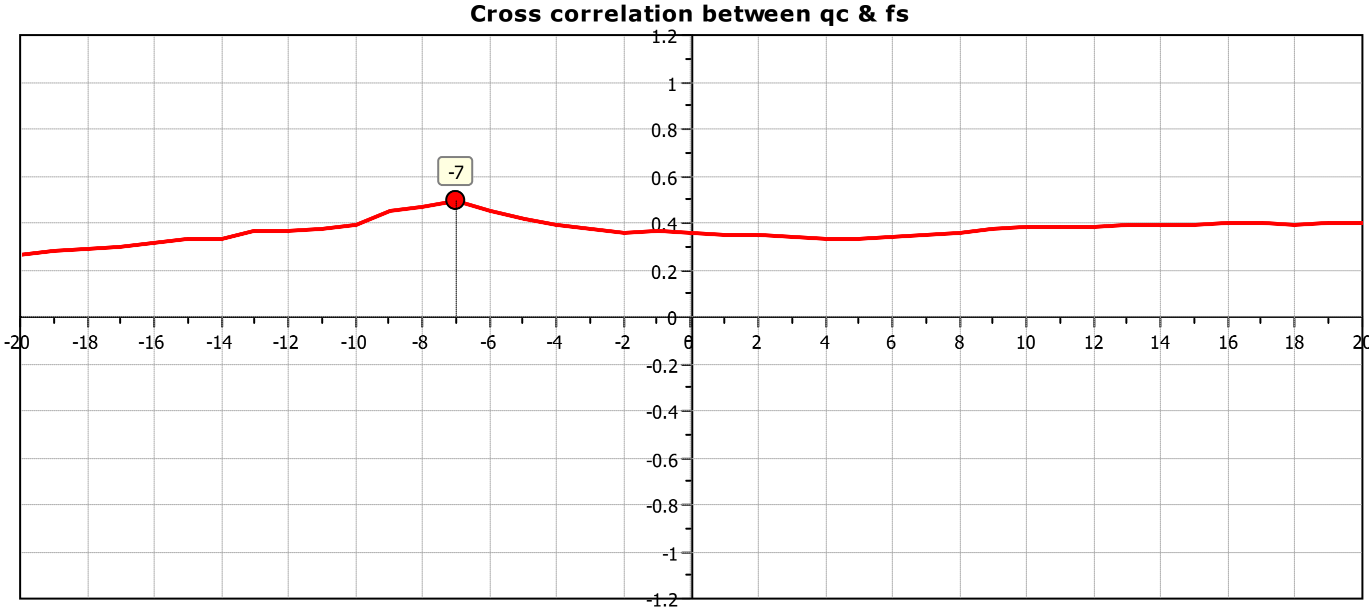

Pore pressure
Depth (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
0
500
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

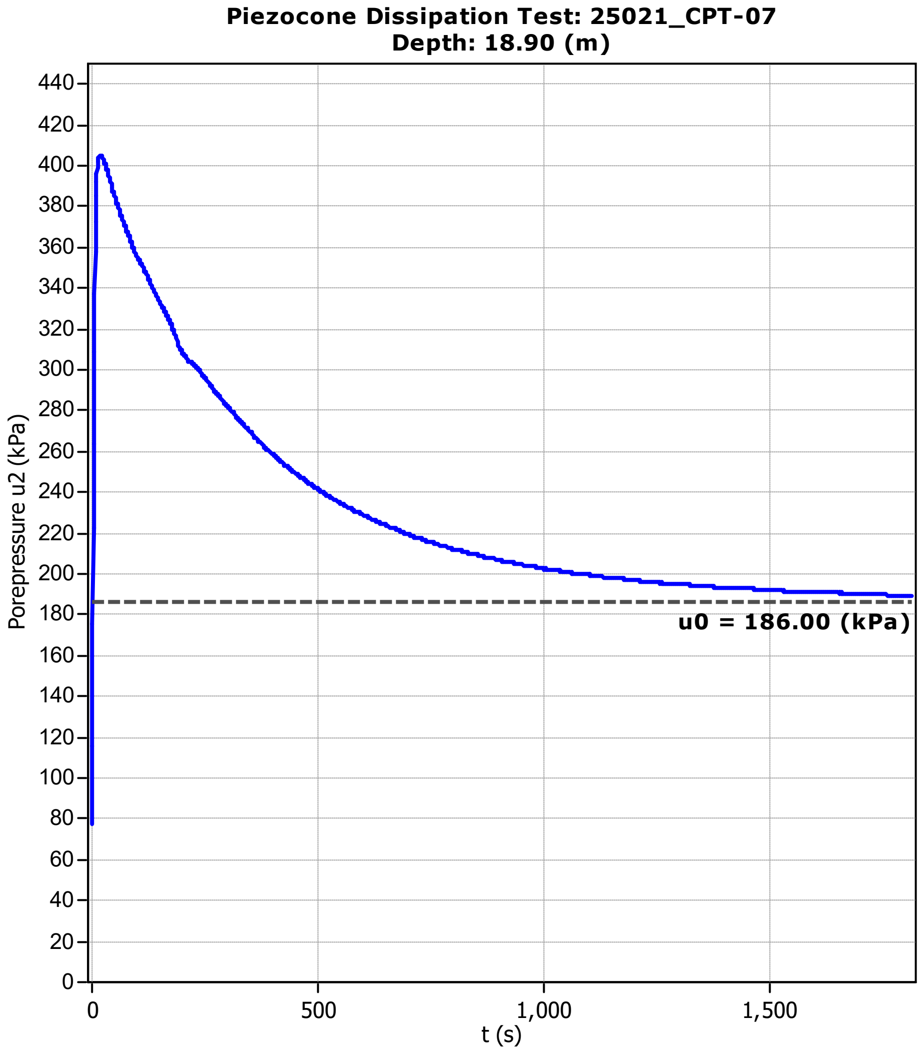
CPT: 25021_CPTu-07
Total depth: 18.96 m, Date: 2025-04-01
Surface Elevation: 0.00 m
Coords: X:0.00, Y:0.00
Cone Type:
Cone Operator:

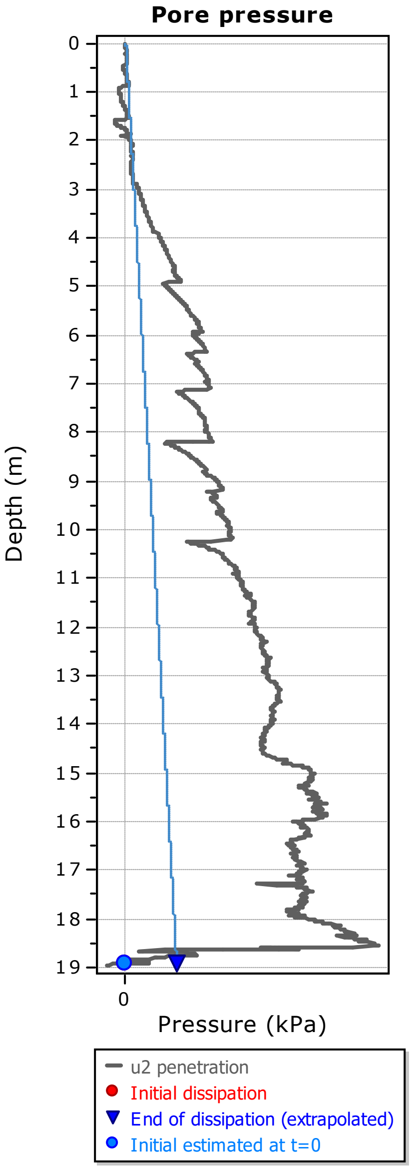
Project:
Location:

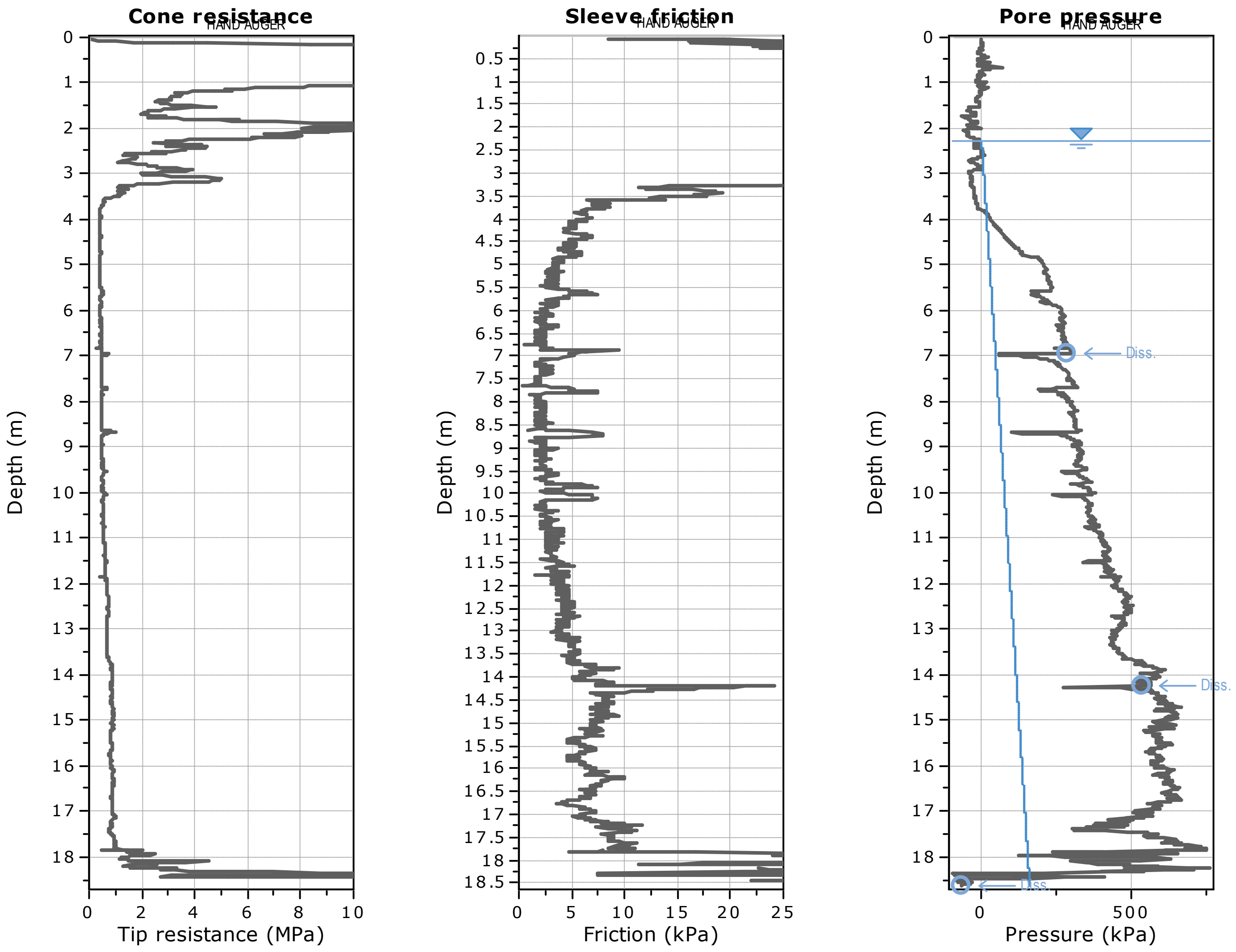


The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

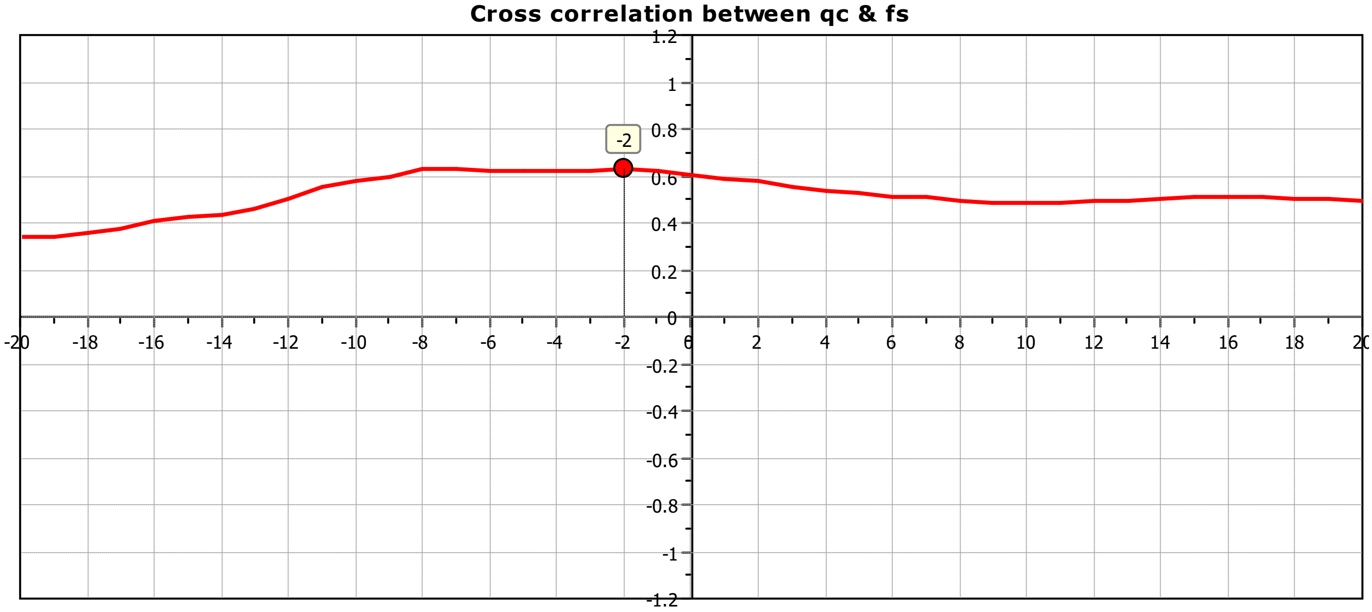


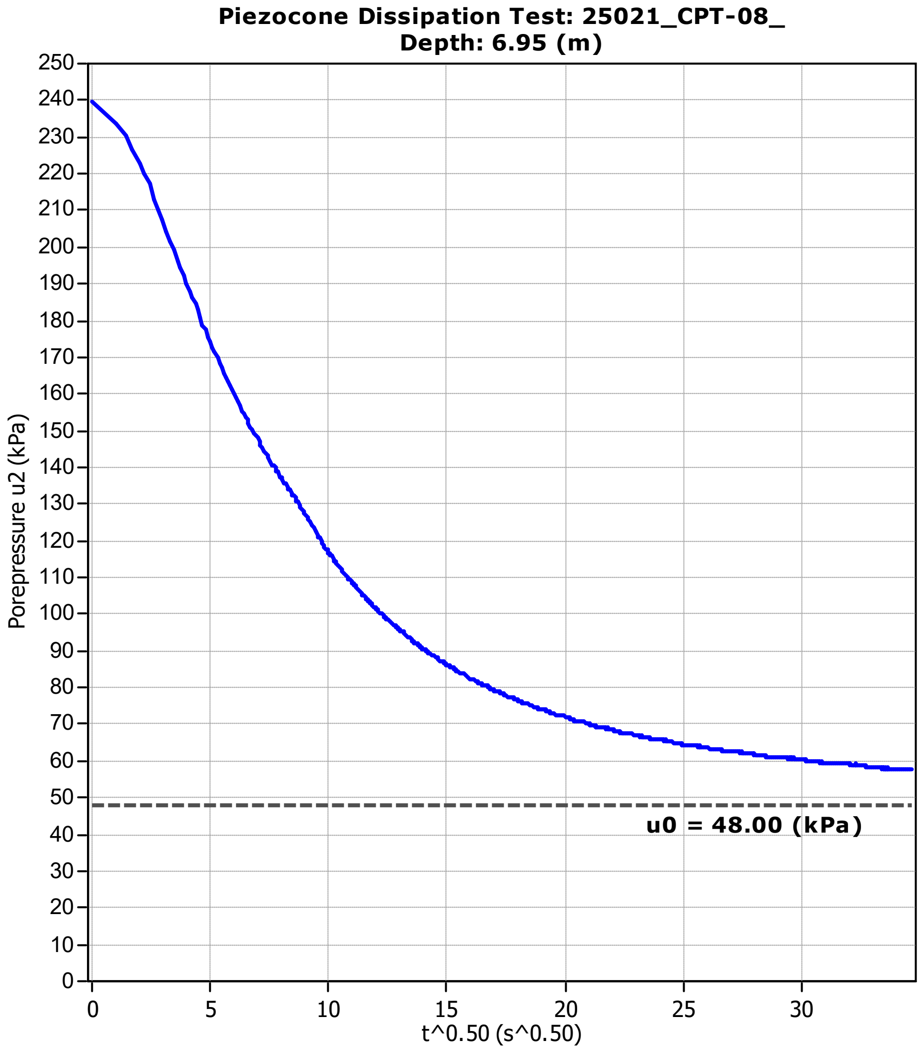

Piezocone Dissipation Test: 25021_CPT-07
Depth: 18.90 (m)
Porepressure u2 (kPa)
440
420
400
380
360
340
320
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
t (s)
0
500
1,000
1,500
u0 = 186.00 (kPa)


Pore pressure
Depth (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
0
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0

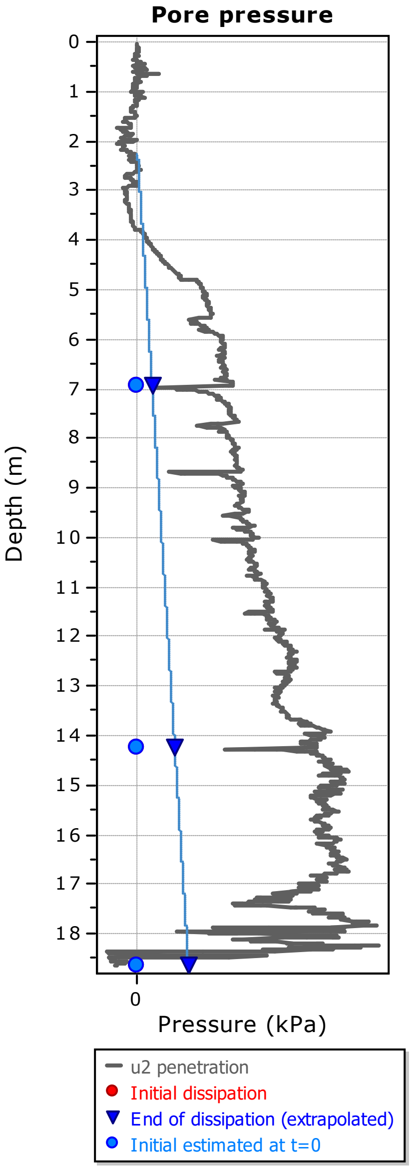


The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

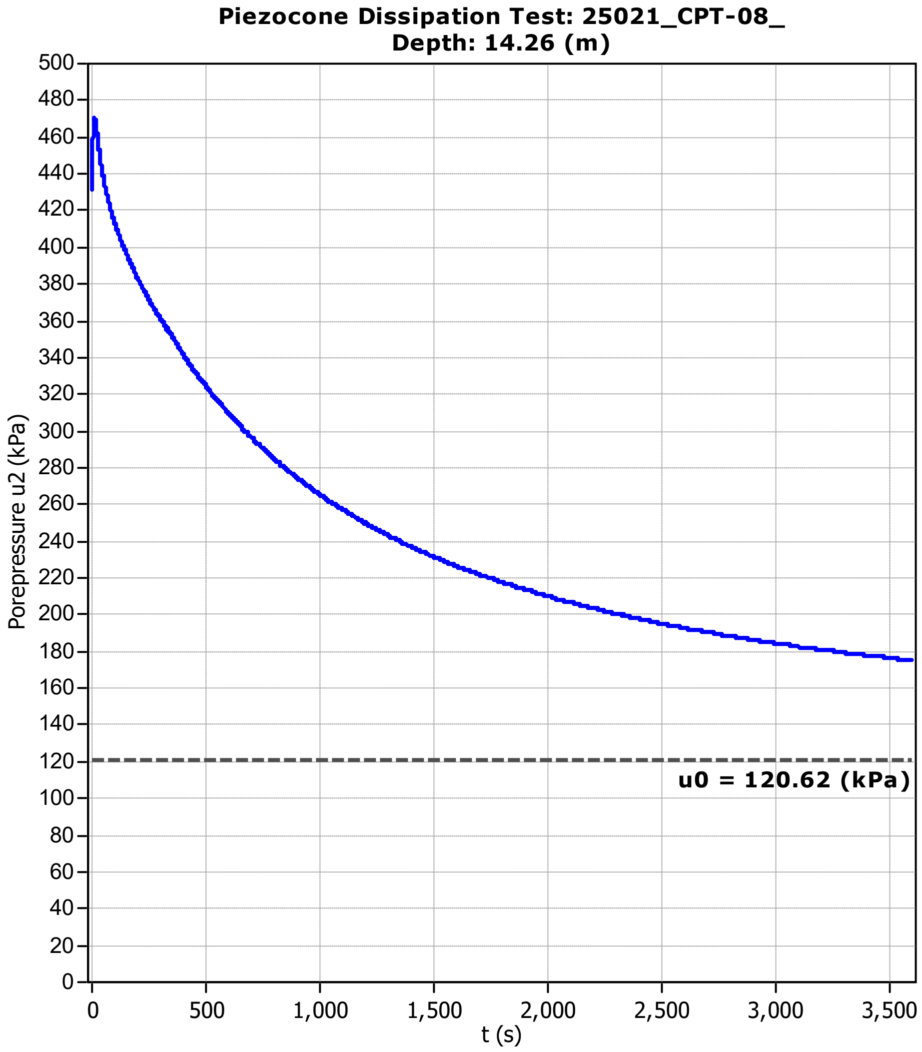


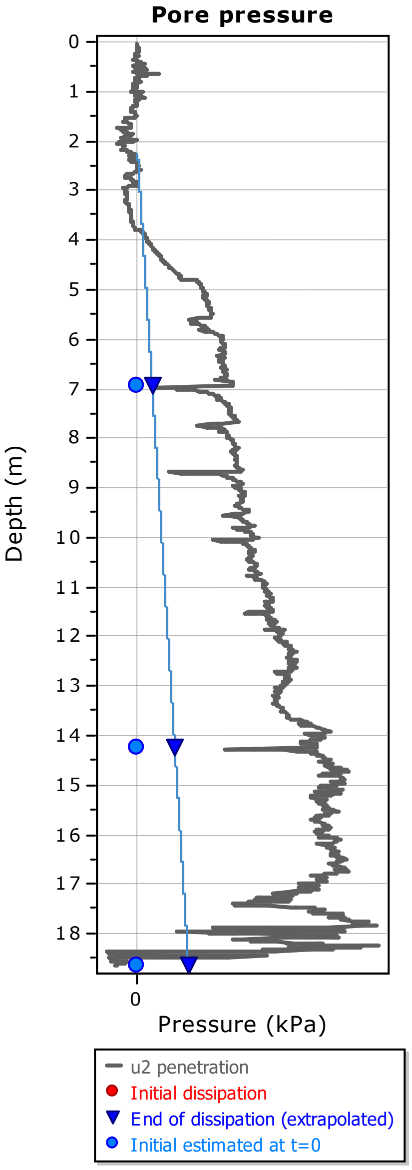


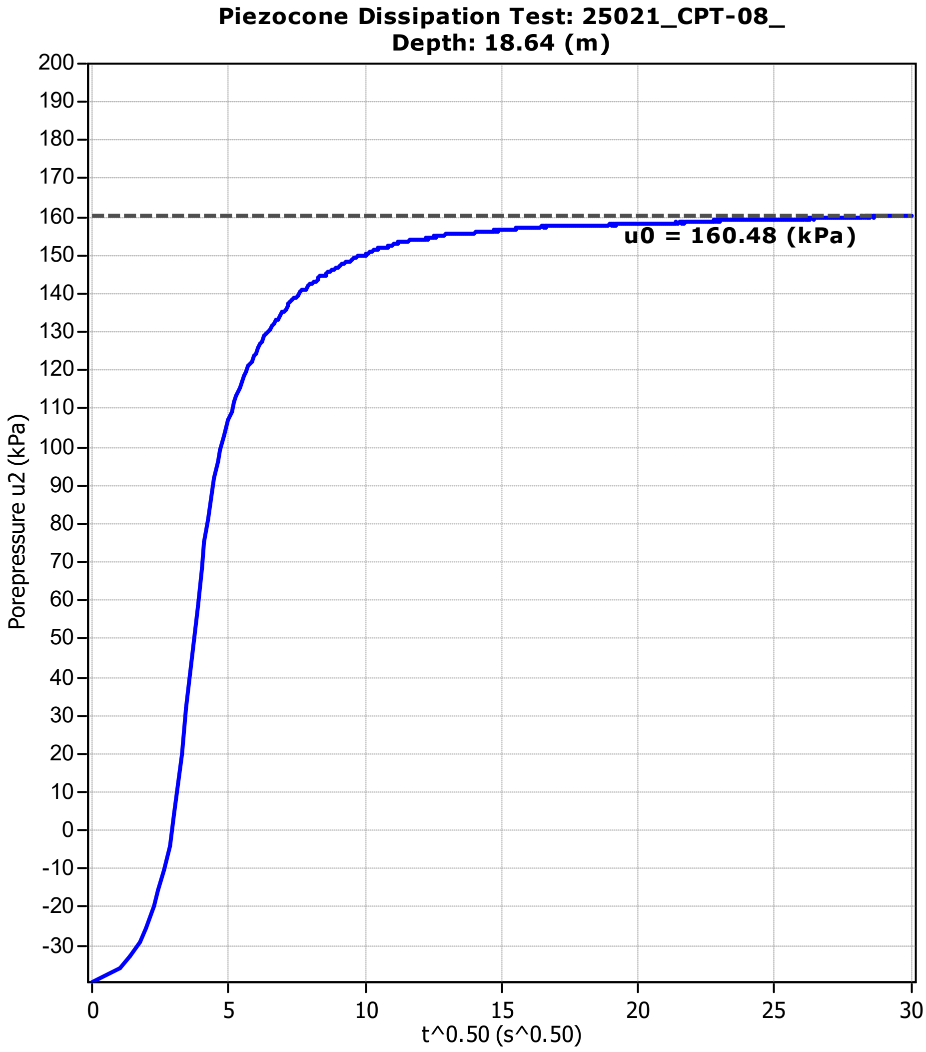
Piezocone Dissipation Test: 25021_CPT-08_
Depth: 6.95 (m)

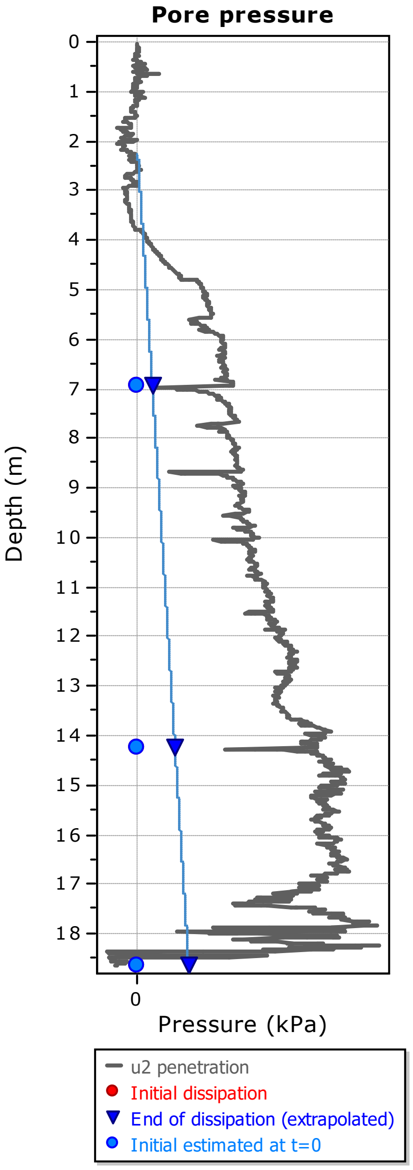


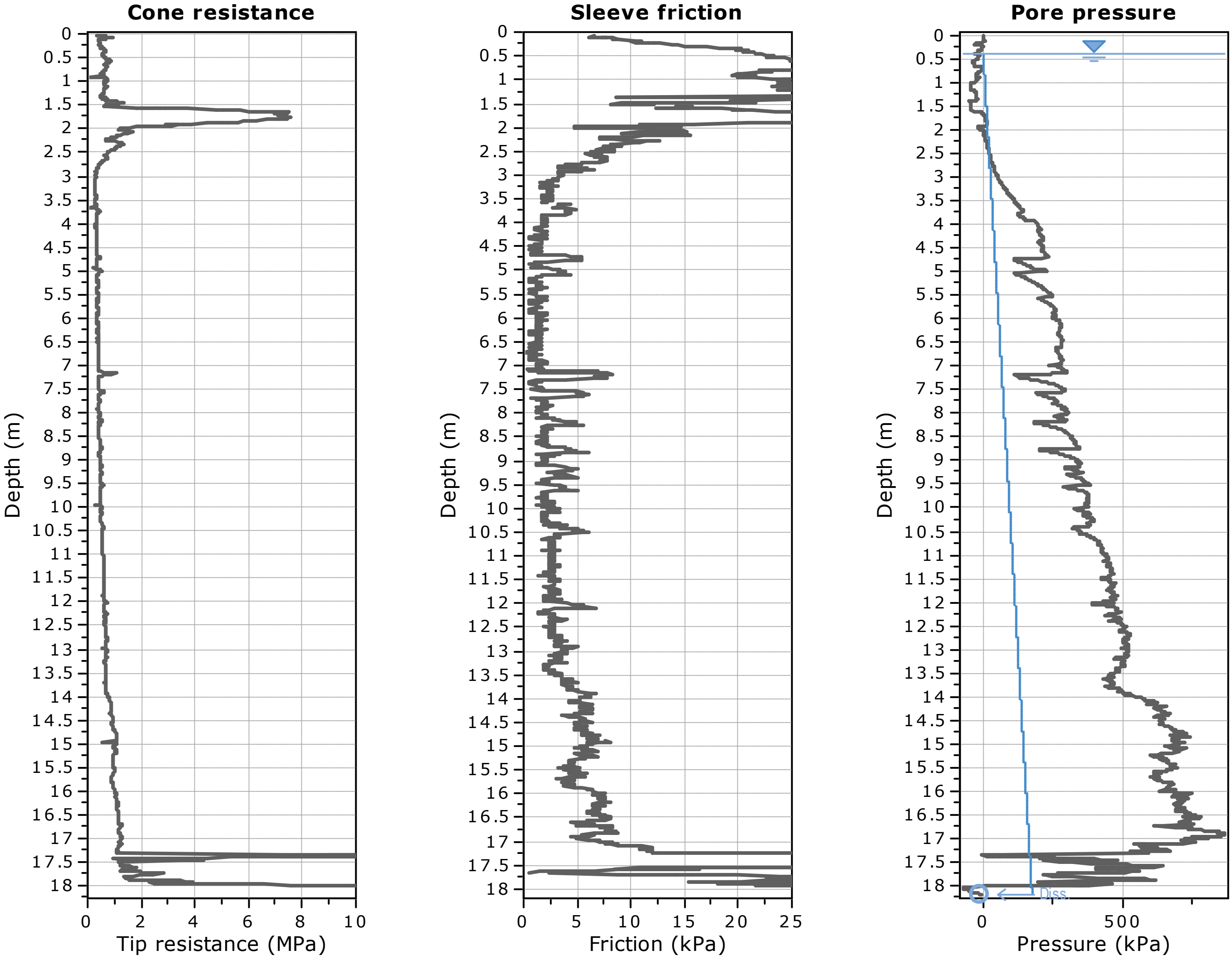
Pore pressure


Piezocone Dissipation Test: 25021_CPT-08_
Depth: 14.26 (m)
Porepressure u2 (kPa)
500
480
460
440
420
400
380
360
340
320
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
u0 = 120.62 (kPa)
0
500
1,000
1,500
2,000
2,500
3,000
3,500
t (s)

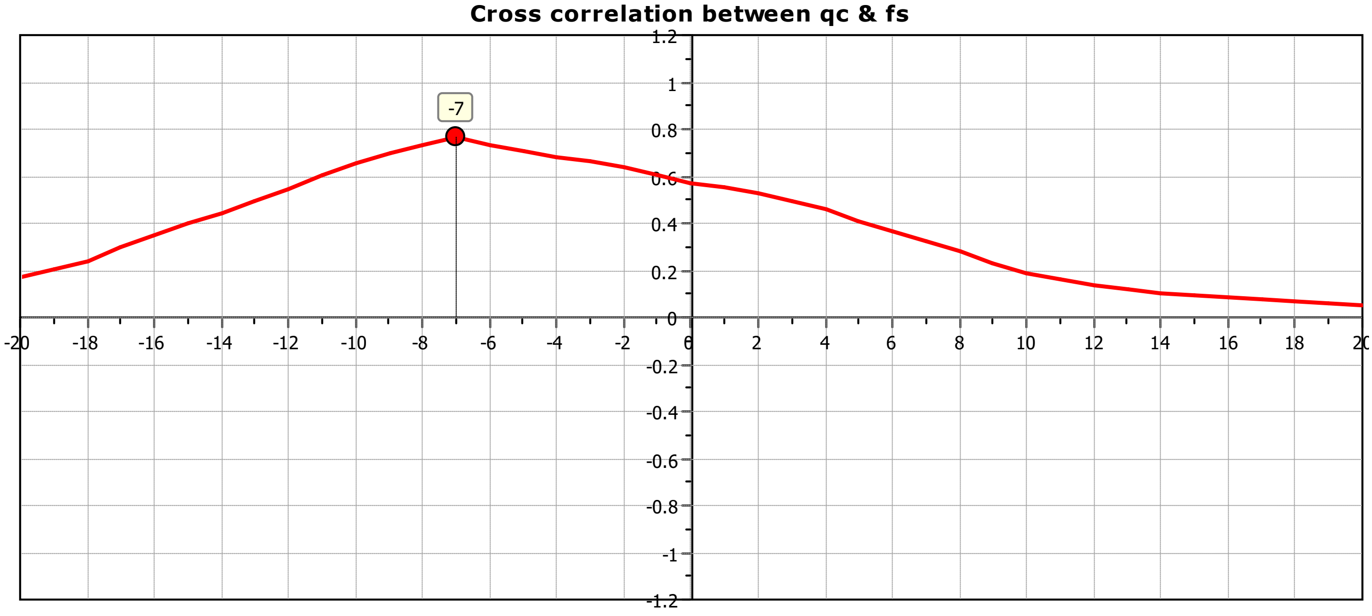

Pore pressure
Depth (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
0
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0


Piezocone Dissipation Test: 25021_CPT-08_
Depth: 18.64 (m)

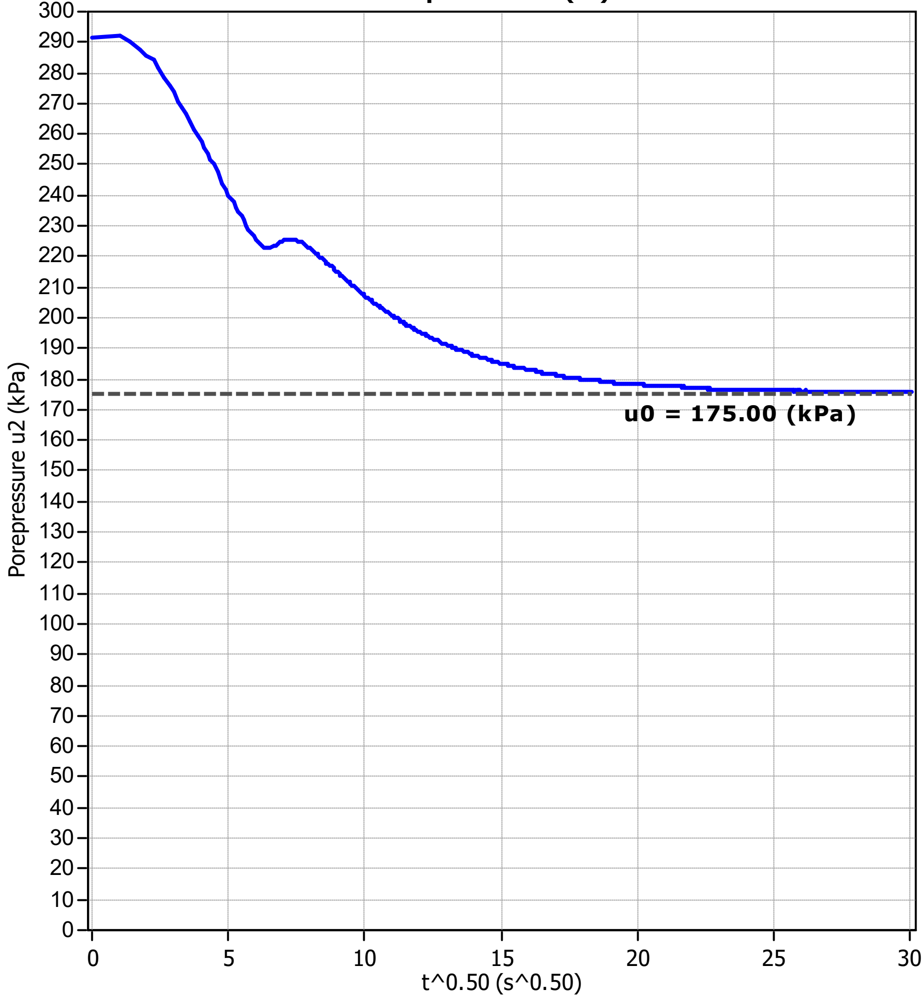

Pore pressure



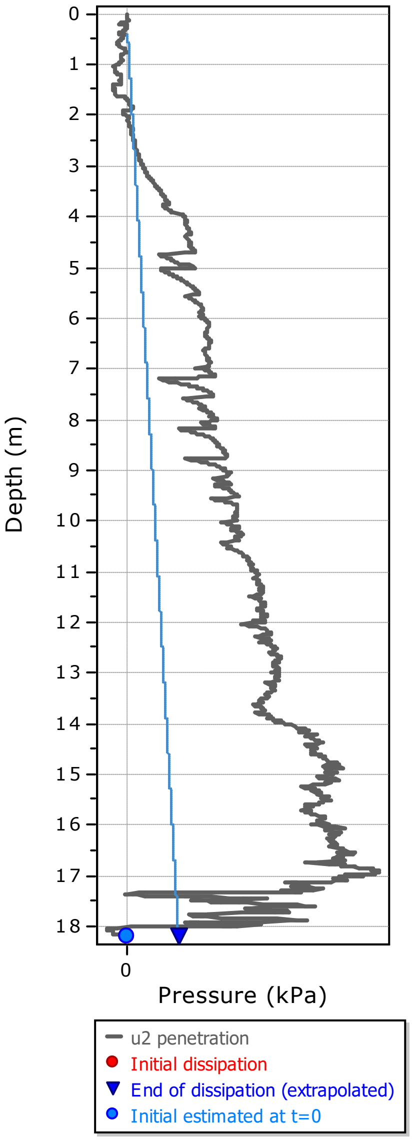
The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).

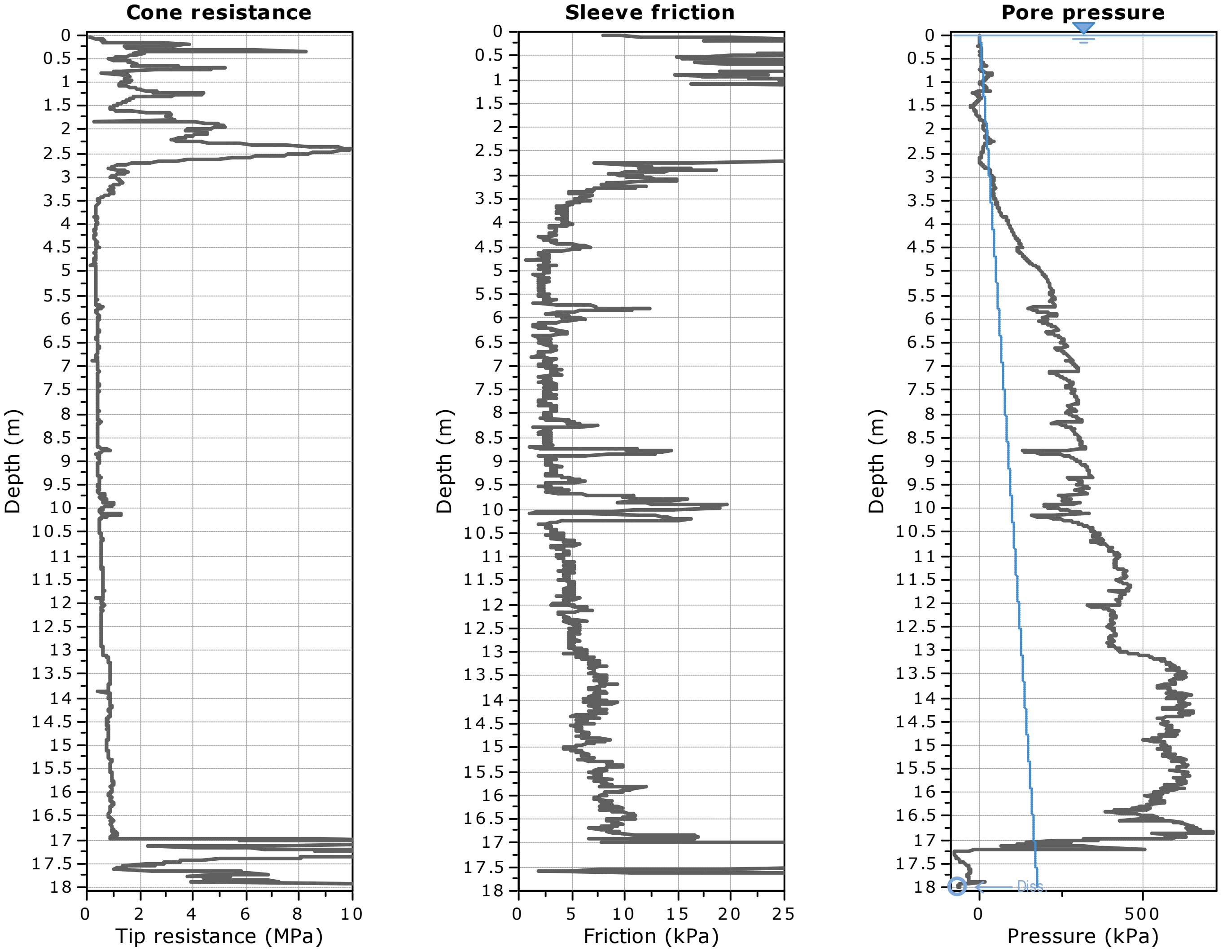


Piezocone Dissipation Test: 25021_CPT-09
Depth: 18.19 (m)

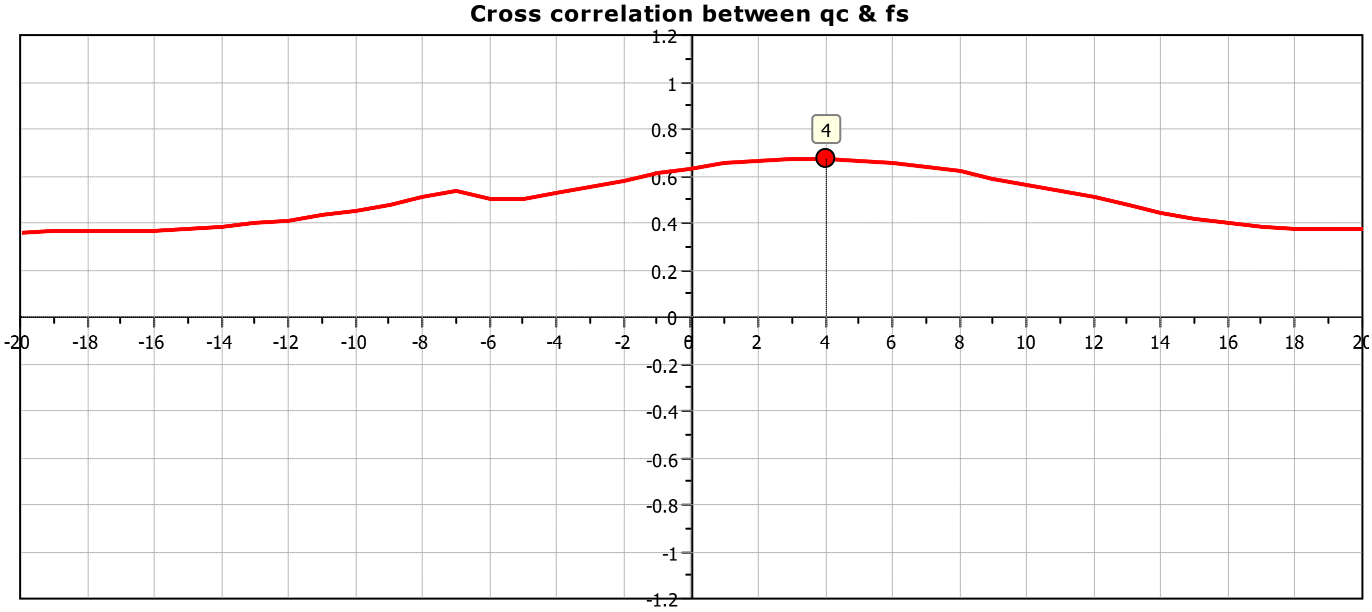


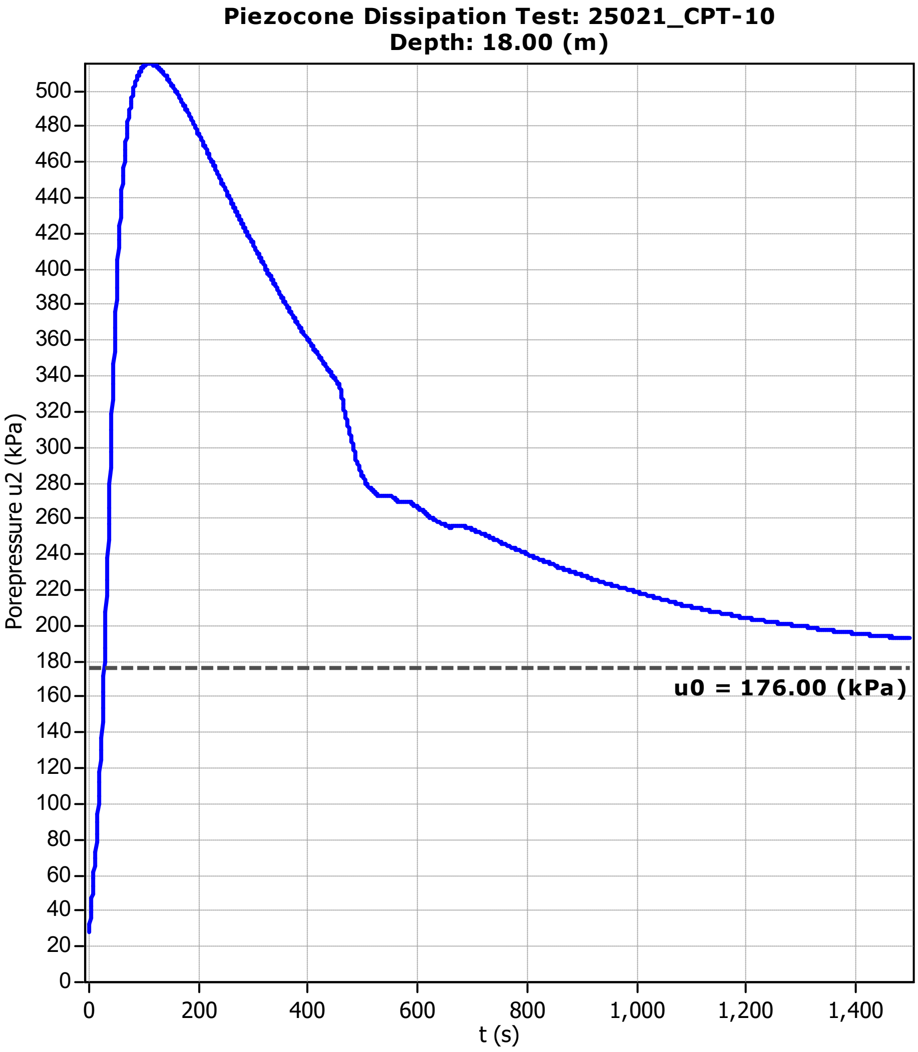
Pore pressure

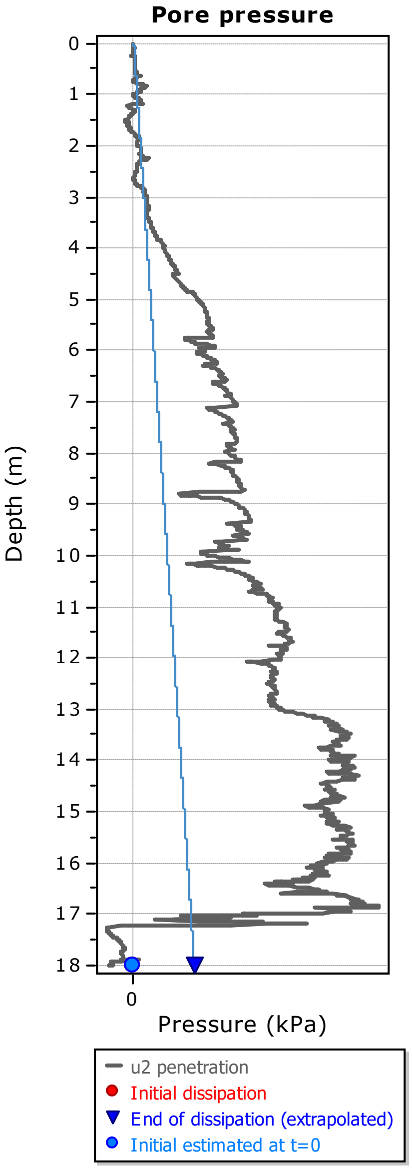




The plot below presents the cross correlation coeficient between the raw qc and fs values (as measured on the field). X axes presents the lag distance (one lag is the distance between two sucessive CPT measurements).




Piezocone Dissipation Test: 25021_CPT-10
Depth: 18.00 (m)
Porepressure u2 (kPa)
500
480
460
440
420
400
380
360
340
320
300
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
u0 = 176.00 (kPa)
0
200
400
600
800
1,000
1,200
1,400
t (s)


Pore pressure
Depth (m)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
0
Pressure (kPa)
u2 penetration
Initial dissipation
End of dissipation (extrapolated)
Initial estimated at t=0