PATERSON GROUP

Geotechnical Investigation

Proposed Residential Development

Wateridge Block 105 – Mikinak Road & Vedette Way
Ottawa, Ontario

Prepared for Mattamy Homes

Report PG7353-1 Revision 1 dated April 30, 2025

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Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by Mattamy Homes to conduct a geotechnical investigation for the proposed residential development to be located at Mikinak Road & Vedette Way in the City of Ottawa, Ontario (refer to Figure 1 - Key Plan in Appendix 2 for the general site location).

The objectives of the geotechnical investigation were to:

- ☐ Determine the subsoil and groundwater conditions at this site by means of test holes.

- ☐ Provide geotechnical recommendations pertaining to the design of the proposed development including construction considerations which may affect the design.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. It contains our findings and includes geotechnical recommendations pertaining to the design and construction of the subject development as they are understood at the time of writing this report.

Investigating for the presence or potential presence of contamination on the subject property was not part of the scope of the present investigation. Therefore, the present report does not address environmental issues.

2.0 Proposed Development

Based on the available drawings, it is understood that the proposed development will consist of back-to-back and stacked townhouses with basements or of slab-on-grade construction. A below-grade stormwater storage system is proposed within the southwest corner of the subject site.

At finished grades, the proposed buildings will generally be surrounded by asphalt-paved access lanes, parking areas, and walkways with landscaped margins. It is also understood that the proposed development is to be municipally serviced.

3.0 Method of Investigation

3.1 Field Investigation

Field Program

The field program for the current geotechnical investigation was carried out on March 10, 2025 and consisted of advancing a total of 5 boreholes to a maximum depth of 6.7 m below the existing ground surface. A previous geotechnical investigation was carried out by Paterson in the vicinity of the subject site on March 26, 2021, and consisted of advancing 6 boreholes (BH 1-21 through BH 6-21) to a maximum depth of 6 m below the existing ground surface.

Previous geotechnical investigations were also carried out by others in the vicinity of the subject site in August 2015, February 2014, August through September 2013 and November 2004. The location of the test holes and ground surface elevation at each test hole location are presented on Drawing PG7353-1 – Test Hole Location Plan included in Appendix 2.

The boreholes were advanced using a low clearance drill rig operated by a two-person crew. The test hole procedure consisted of augering to the required depths at the selected locations, and sampling and testing the overburden. All fieldwork by Paterson was conducted under the full-time supervision of our personnel under the direction of a senior engineer from the geotechnical division.

Sampling and In-Situ Testing

Soil samples were recovered from the boreholes using a 50 mm diameter split-spoon (SS) sampler or the auger flights. All soil samples were visually inspected and classified on site, placed in sealed plastic bags, and transported to the laboratory for further review. The depths at which the auger and split-spoon samples were recovered from the boreholes are shown as AU and SS, respectively, on the Soil Profile and Test Data sheets in Appendix 1.

A Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split-spoon samples and are recorded as “N” values on the Soil Profile and Test Data sheets. The “N” value is the number of blows required to drive the split-spoon sampler 300 mm into the soil after a 150 mm initial penetration using a 63.5 kg hammer falling from a height of 760 mm.

Undrained shear strength testing, using a vane apparatus, was carried out at regular intervals of depth in cohesive soils.

The thickness of the overburden was evaluated during the course of the investigation by completing a dynamic cone penetration test (DCPT) at borehole BH 1-25. A DCPT was also completed at borehole BH 4-21 during the historic investigation. The DCPT consists of driving a steel drill rod, equipped with a 50 mm diameter cone at its tip, using a 63.5 kg hammer falling from a height of 760 mm. The number of blows required to drive the cone into the soil is recorded for each 300 mm increment.

The subsurface conditions observed in the boreholes were recorded in detail in the field. The soil profiles are presented on the Soil Profile and Test Data sheets in Appendix 1 of this report.

Groundwater

A monitoring well was installed at borehole BH 2-25 within the footprint of the underground stormwater storage system. Flexible piezometers were installed in all other boreholes to permit monitoring of the groundwater levels subsequent to the completion of the sampling program. The groundwater level readings were obtained after a suitable stabilization period subsequent to the completion of the field investigation. Groundwater monitoring wells were also installed in boreholes BH 14-30 and BH 13-02 by others.

3.2 Field Survey

The test hole locations and ground surface elevation at each test hole location were surveyed by Paterson using a handheld GPS and referenced to a geodetic datum. The location of the test holes and ground surface elevation at each test hole location are presented on Drawing PG7353-1 – Test Hole Location Plan in Appendix 2.

3.3 Laboratory Review

The soil samples recovered from the test holes were examined in our laboratory to review the results of the field logging. Additionally, 3 silty clay samples were submitted for Atterberg Limits testing, 3 soil samples were submitted for grain size distribution analysis, and 1 soil sample was submitted for shrinkage limit testing. During the previous investigations, 3 samples were submitted for Atterberg Limits testing, 2 samples were submitted for grain size distribution testing and 1 shrinkage limit test was completed.

Moisture content testing was also completed on all soil samples recovered by Paterson and are summarized on the Soil Profile and Test Data sheets included in

Appendix 1. All test results are included in Appendix 1 and further discussed in Subsection 4.2 of the current report.

3.4 Analytical Testing

One (1) soil sample was submitted for analytical testing to assess the corrosion potential for exposed ferrous metals and the potential of sulphate attacks against subsurface concrete structures. An additional soil sample was submitted during the historic investigation. The samples were submitted to determine the concentration of sulphate and chloride, the resistivity, and the pH of the samples. The results are presented in Appendix 1 and are discussed further in Section 6.7.

4.0 Observations

4.1 Surface Conditions

The subject site is currently vacant and grass covered. The ground surface across the subject site slopes gently downward from east to west at approximate elevations of 88.5 to 86.55

The site is bordered by a park block to the east, Hemlock Road to the north, Vedette Way to the west and Mikinak Road to the south.

However, the subject site was part of the lots acquired by the Department of National Defense in the 1890's and used as a military base known as CFB Rockcliffe until the early 2010's. The majority of the subject site was previously occupied by single family dwellings, local roadways and car parking areas in addition to some landscaped areas. By 2013, all structures within the subject section of the site were demolished. Historical aerial photographs of the subject site and its surroundings are provided in Figures 2, 3, and 4 - Aerial Photographs, in Appendix 2.

4.2 Subsurface Profile

Overburden

Generally, the subsurface profile encountered at the subject site consists of topsoil and/or fill underlain by silty clay and glacial till. Fill material was encountered at all test holes with the exception of BH 1-21, BH 6-21, BH 14-30, BH 13-01, BH 13-02, and extended to depths ranging from 0.2 to 2.7 m below existing grade. The fill was noted to consist of brown silty clay and/or silty sand with gravel, crushed stone, organics, bricks.

A layer of compact brown sand with silt, clay and trace gravel was encountered at boreholes BH 14-30, BH 13-01 and BH 13-02 and was noted to extend to approximate depths ranging from 0.2 to 0.6 m.

A hard to stiff brown silty clay crust was encountered below the fill and/or topsoil at all test holes with the exception of BH 4-25, BH 15-13 and TP 13-19, where fill material was noted to extend to the underlying glacial till layer, or the refusal depth of the test holes. The silty clay was noted to transition from brown to grey in colour varying depths below ground surface.

Where encountered, the glacial till layer was noted to consist of a compact brown to grey, silty sand to silty clay with gravel cobbles and boulders.

Practical refusal to the DCPT was encountered in boreholes BH 2-25 and BH 4-21 at approximate depths of 6.3 and 6.4 m, respectively.

Bedrock

The bedrock was cored at boreholes BH 15-12, BH 15-13, BH 15-15 and BH 15-18 by others, and was noted to consist of poor to excellent quality grey to dark grey limestone bedrock. At borehole BH 15-18, shale bedrock was encountered underlying the limestone bedrock at an approximate depth of 8.6 m below the existing ground surface. The bedrock was cored to a maximum depth of 10 m below the existing ground surface.

Based on available geological mapping, the bedrock in the area of the subject site generally consists of interbedded limestone and dolomite of the Gull River Formation. The overburden drift thickness is estimated to be between 2 to 5 m depth.

Reference should be made to the Soil Profile and Test Data sheets in Appendix 1 for the details of the soil and bedrock profile encountered at each test hole location.

Grain Size Distribution and Hydrometer Testing

Two (2) sieve analyses were completed during a previous investigation by Paterson to further classify selected soil samples. The results are summarized in Table 1 below and are presented in Appendix 1.

Table 1 – Summary of Grain Size Distribution Analysis

Test Hole	Sample	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
BH 1-25	SS5	0.0	1.7	32.8	65.5
BH 2-25	SS5	0.0	1.0	36.5	62.5
BH 3-25	SS3	0.0	2.5	38.0	59.5
BH 2-21	SS5	0	1.1	98.9	
BH 5-21	SS4	0	0.8	99.2	

Atterberg Limit Tests

A total of 7 samples were submitted for Atterberg Limits testing during the current and historic investigations. The results are summarized in Table 2 on the following page.

Table 2 – Summary of Atterberg Limits Results

Test hole	Sample	Depth (m)	LL (%)	PL (%)	PI (%)	Classification
BH 1-25	SS4	2.3 – 2.9	56	27	29	CH
BH 2-25	SS6	3.8 – 4.4	52	26	26	CH
BH 3-25	SS4	2.3 – 2.9	62	29	33	CH
BH 3-21	SS3	1.5 – 2.1	57	24	32	CH
BH 4-21	SS5	3.0 – 3.7	54	24	30	CH
BH 6-21	SS4	2.2 – 2.9	57	22	35	CH
BH 14-30	-	0.6	38	12	26	CI

Notes: LL: Liquid Limit; PL: Plastic Limit; PI: Plasticity Index; CH: Inorganic Clays of High Plasticity; CI: Clays of Medium Plasticity

Shrinkage Test

The shrinkage limit of the tested silty clay samples were found to 18.97% and 17.65% at boreholes BH 1-25 and BH 4-21, respectively. Further, the shrinkage ratios were found to be 1.77 and 1.83.

4.3 Groundwater

Groundwater levels were measured within the installed monitoring well and piezometers on March 21, 2025. Groundwater levels measurements taken during the previous investigations are also presented in Table 3 on the following page.

Table 3 – Summary of Groundwater Levels

Test Hole Number	Ground Surface Elevation (m)	Measured Groundwater Level		Dated Recorded
		Depth (m)	Elevation (m)	
BH 1-25	86.69	Dry	-	March 21, 2025
		Dry	-	April 24, 2025
BH 2-25*	86.42	3.94	82.48	March 21, 2025
		4.11	82.31	April 24, 2025
BH 3-25	87.36	Dry	-	March 21, 2025
		4.90	82.46	April 24, 2025
BH 4-25	88.46	Dry	-	March 21, 2025
		3.26	85.2	April 24, 2025
BH 5-25	87.58	4.54	-	March 21, 2025
		4.14	83.44	April 24, 2025
BH 1-21	83.87	1.62	82.25	April 5, 2021
BH 2-21	83.33	0.53	82.80	April 5, 2021
BH 3-21	83.52	1.17	82.35	April 5, 2021
BH 4-21	85.28	Dry	-	April 5, 2021
BH 5-21	85.75	1.75	84.00	April 5, 2021
BH 6-21	84.93	0.51	84.42	April 5, 2021
BH 15-15	87.76	3.27	84.50	October 1, 2015
BH 15-16	85.24	3.34	81.90	October 1, 2015
BH 15-31	85.51	3.04	82.50	October 1, 2015
BH 14-30*	85.85	3.13	82.72	-
BH 13-02*	87.08	2.97	84.11	August 7, 2013

Notes:
- Ground surface elevations at test hole locations are referenced to a geodetic datum.
- ‘*’ Denotes monitoring well

Long-term groundwater levels can also be estimated based on the observed colour and consistency of the recovered soil samples. Based on these observations, the groundwater table can be expected at an approximate geodetic elevation of **82.0 to 84.5 m**.

It should be noted that surface water can be perched within the open holes which may be interpreted as shallow groundwater in some of the borehole locations. The recorded groundwater levels are also provided on the applicable Soil Profile and Test Data sheets presented in Appendix 1.

It should be noted that groundwater levels are subject to seasonal fluctuations, therefore, the groundwater levels could vary at the time of construction.

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is suitable for the proposed residential development. It is recommended that the proposed residential buildings be founded on conventional spread footings placed on an undisturbed, hard to stiff brown silty clay, compact silty sandy, compact glacial till or engineered fill placed over the hard to stiff silty clay, compact silty sand and/or compact glacial till.

It is further expected that the proposed stormwater storage system will be founded on a raft foundation bearing on the undisturbed hard to stiff silty clay.

It is anticipated that some bedrock removal may be required for building construction and servicing installation. Therefore, the contractor should be prepared for bedrock removal.

Due to the presence of a silty clay deposit, the subject site will be subjected to permissible grade raise restrictions.

The above and other considerations are further discussed in the following sections.

5.2 Site Grading and Preparation

Stripping Depth

Topsoil and deleterious fill, such as those containing organic or deleterious materials, should be stripped from under the proposed buildings and other settlement sensitive structures.

If encountered, existing foundation walls and other construction debris should be entirely removed from within the building perimeters. Under paved areas, existing construction remnants, such as foundation walls should be excavated to a minimum of 1 m below final grade.

Bedrock Removal

Bedrock removal may be required at the subject site and can be accomplished by hoe ramming where the bedrock is weathered, and/or where only small quantities need to be removed. Sound bedrock may be removed by line drilling in conjunction with controlled blasting and/or hoe ramming.

Prior to considering blasting operations, the blasting effects on the existing services, buildings, and other structures should be addressed. A pre-blast or pre-construction survey of the existing structures located in the proximity of the blasting operations should be carried out prior to commencing site activities.

The extent of the survey should be determined by the blasting consultant and should be sufficient to respond to any inquiries or claims related to the blasting operations. The blasting operations must be planned and conducted under the supervision of a licensed professional engineer who is also an experienced blasting consultant.

Vibration Considerations

Construction operations are also the cause of vibrations, and possibly, sources of nuisance to the community. Therefore, means to reduce the vibration levels should be incorporated in the construction operations to maintain, as much as possible, a cooperative environment with the residents.

The following construction equipment could be a source of vibrations: piling rig, hoe ram, compactor, dozer, crane, truck traffic, etc. Vibrations, whether caused by blasting operations or by construction operations, could be the cause of the source of detrimental vibrations on the nearby buildings and structures. Therefore, it is recommended that all vibrations be limited.

Two parameters are used to determine the permissible vibrations, namely, the maximum peak particle velocity and the frequency. For low frequency vibrations, the maximum allowable peak particle velocity is less than that for high frequency vibrations. As a guideline, the peak particle velocity should be less than 15 mm/s between frequencies of 4 to 12 Hz, and 50 mm/s above a frequency of 40 Hz (interpolate between 12 and 40 Hz).

It should be noted that these guidelines are for today’s construction standards. Considering that these guidelines are above perceptible human level and, in some cases, could be very disturbing to some people, it is recommended that a pre-construction survey be completed to minimize the risks of claims during or following the construction of the proposed buildings.

Fill Placement

Fill placed for grading beneath the building areas should consist, unless otherwise specified, of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. The imported fill material should be tested and approved prior to delivery. This material should be tested and approved prior to delivery.

The fill should be placed in maximum 300 mm thick loose lifts and compacted by suitable compaction equipment. Fill placed beneath the propose buildings should be compacted to a minimum 98% of the Standard Proctor Maximum Dry Density (SPMDD).

Non-specified existing fill, along with site-excavated soil, can be used as general landscaping fill where settlement of the ground surface is of minor concern. These materials should be spread in thin lifts and at least compacted by the tracks of the spreading equipment to minimize voids. If this material is to be used to build up the subgrade level for areas to be paved, it should be compacted in thin lifts to at least 95% of the material's SPMDD.

Non-specified existing fill and site-excavated soils are not suitable for use as backfill against foundation walls unless a composite drainage blanket connected to a perimeter drainage system is provided.

Protection of Subgrade (Raft Foundation) – Stormwater Storage System

Since the subgrade material will consist of a silty clay deposit, it is recommended that a minimum 75 mm thick lean concrete mud slab be placed on the undisturbed silty clay subgrade shortly after the completion of the excavation. The main purpose of the mudslab is to reduce the risk of disturbance of the subgrade under the traffic of workers and equipment.

The final excavation to the raft bearing surface level and the placing of the mud slab should be done in smaller sections to avoid exposing large areas of the silty clay to potential disturbance due to drying.

5.3 Foundation Design

Bearing Resistance Values

Strip footings, up to 3 m wide, and pad footings, up to 5 m wide, placed on an undisturbed, hard to stiff silty clay, or on engineered fill placed directly over the undisturbed hard to stiff silty clay bearing surface, can be designed using a bearing resistance value at serviceability limit states (SLS) of **150 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **225 kPa**. A geotechnical resistance factor of 0.5 was incorporated in calculating the bearing resistance values at ULS.

Footings placed on an undisturbed, compact silty sand, glacial till, or on engineered fill placed directly over the undisturbed silty sand or glacial bearing surface, can be designed using a bearing resistance value at serviceability limit states (SLS) of **150 kPa** and a factored bearing resistance value at ultimate limit states (ULS) of **225 kPa**. A geotechnical resistance factor of 0.5 was incorporated in calculating the bearing resistance values at ULS.

An undisturbed soil bearing surface consists of a surface from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, whether in situ or not, have been removed, in the dry, prior to the placement of concrete for footings.

Footings placed on a soil bearing surface and designed using the above-noted bearing resistance value at SLS will be subjected to potential post-construction total and differential settlements of 25 and 20 mm, respectively.

Footings supported directly on clean, surface-sounded bedrock, or on lean concrete which is placed directly over clean, surface sounded bedrock, can be designed using a factored bearing resistance value at ultimate limit states (ULS) of **500 kPa**. A geotechnical resistance factor of 0.5 was applied to the bearing resistance value at ULS.

A clean, surface-sounded bedrock bearing surface should be free of loose materials, and have no near surface seams, voids, fissures or open joints which can be detected from surface sounding with a rock hammer.

Footings supported directly on clean, surface sounded bedrock and design for the bearing resistance values provided above will be subject to negligible post-construction total and differential settlements.

Raft Foundation – Stormwater Storage System

It is understood that the proposed below-grade stormwater storage system will be founded on a raft foundation located approximately 4 m below the existing ground surface.

The amount of settlement of the raft slab will be dependent on the sustained raft contact pressure. The loading conditions for the contact pressure are based on sustained loads, that are generally taken to be 100% Dead Load and 50% Live Load. The contact pressure provided considers the stress relief associated with the soil removal required for construction of the system.

A bearing resistance value at SLS (contact pressure) of **150 kPa** will be considered acceptable for a raft supported on the undisturbed, hard to stiff silty clay. The factored bearing resistance (contact pressure) at ULS can be taken as **225 kPa**. For this case, the modulus of subgrade reaction was calculated to be **6 MPa/m** for a contact pressure of **150 kPa**.

The raft foundation design is required to consider the relative stiffness of the reinforced concrete slab and the supporting bearing medium.

Permissible Grade Raise Recommendations

Due to the presence of the silty clay deposit at the site, a permissible grade raise restriction of **3.0 m** is recommended.

If a higher permissible grade raise is required, preloading with or without surcharge, lightweight fill and/or other measures should be investigated to reduce the risks of unacceptable long-term post construction and differential settlements.

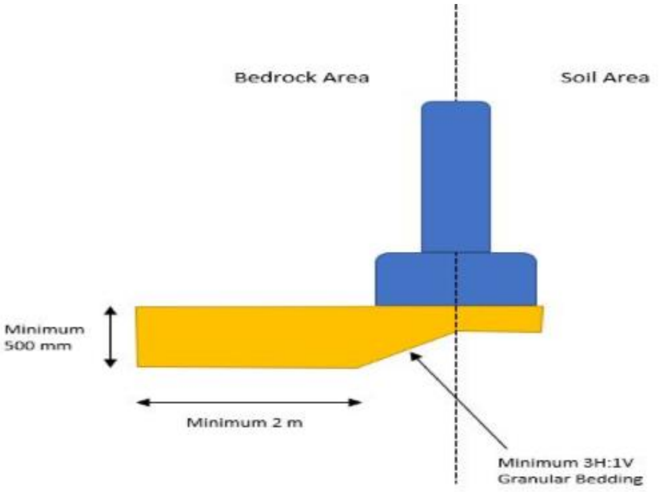
Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to the in-situ bearing medium soils above the groundwater table when a plane extending down and out from the bottom edge of the footing at a minimum of 1.5H:1V passes only through in situ soil of the same or higher capacity as the bearing medium soil.

Adequate lateral support is provided to a sound bedrock bearing medium when a plane extending down and out from the bottom edge of the footing at 1H:6V (or flatter) passes only through sound bedrock or a material of the same or higher capacity as the bedrock, such as concrete. A soil bearing medium or a heavily fractured, weathered bedrock will require a lateral support zone of 1H:1V (or flatter).

Bedrock/Soil Transition

Where a building is founded partly on bedrock and partly on soil, it is recommended at the soil/bedrock and bedrock/soil transitions that the upper 0.5 m of the bedrock be removed for a minimum length of 2 m (on the bedrock side) and replaced with nominally compacted OPSS Granular A or Granular B Type II material, see below. The width of the sub-excavation should be at least the proposed footing width plus 0.5 m. Steel reinforcement, extending at least 3 m on both sides of the 2 m long transition, should be placed in the top part of the footings and foundation walls.



Bedrock/Soil Transition Treatment

5.4 Design for Earthquakes

The site class for seismic site response can be taken as **Class X_c** for the foundations at the subject site. The soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest revision of the Ontario Building Code (OBC) 2024 for a full discussion of the earthquake design requirements.

5.5 Basement Slab / Slab-on-Grade Construction

With the removal of all topsoil and fill, containing significant amounts of deleterious or organic materials, the native soil and/or approved fill is considered to be an acceptable subgrade surface on which to commence backfilling for floor slab construction.

For structures with slab-on-grade construction, it is recommended that the upper 200 mm of sub-slab fill consist of OPSS Granular A crushed stone. For structures with basement slabs, it is recommended that the upper 300 mm of sub-floor fill consists of 19 mm clear crush stone.

All backfill material within the footprint of the proposed buildings should be placed in a maximum 300 mm thick loose layers and compacted to a minimum of 98% of the material's SPMDD.

Any soft areas should be removed and backfilled with appropriate backfill material prior to placing any fill. OPSS Granular B Type II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab.

5.6 Pavement Design

For preliminary design purposes, the following pavement structures, presented in Tables 4 and 5, are recommended for car parking areas and access lanes.

Table 4 – Recommended Asphalt Pavement Structure – Car Only Parking Areas

Thickness (mm)	Material Description
50	**Wear Course** – Superpave 12.5 Asphaltic Concrete
150	**BASE** – OPSS Granular A Crushed Stone
300	**SUBBASE** – OPSS Granular B Type II
SUBGRADE – Either fill, in situ soils or OPSS Granular B Type I or II material placed over in situ soil or bedrock.	

Table 5 – Recommended Asphalt Pavement Structure – Local roadways

Thickness (mm)	Material Description
40	**Wear Course** – Superpave 12.5 Asphaltic Concrete
50	**Binder Course** – Superpave 19.0 Asphaltic Concrete
150	**BASE** – OPSS Granular A Crushed Stone
400	**SUBBASE** – OPSS Granular B Type II
SUBGRADE – Either fill, in situ soils or OPSS Granular B Type I or II material placed over in situ soil or bedrock.	

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project.

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type II material.

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 100% of the material's SPMDD using suitable compaction equipment.

Pavement Structure Drainage

Satisfactory performance of the pavement structure is largely dependent on the contact zone between the subgrade material and the base stone in a dry condition. Failure to provide adequate drainage under conditions of heavy wheel loading can result in the fine subgrade soil being pumped into the voids in the stone subbase, thereby reducing load carrying capacity.

Where silty clay is anticipated at subgrade level, consideration should be given to installing subdrains during the pavement construction as per City of Ottawa standards. The subdrain inverts should be approximately 300 mm below subgrade level. The subgrade surface should be crowned to promote water flow to drainage lines.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

Foundation Drainage

It is recommended that a perimeter foundation drainage system be provided for each proposed structure which has below-grade space. The system should consist of a 150 mm diameter perforated and corrugated plastic pipe, surrounded on all sides by 150 mm of 19 mm clear crushed stone, which is placed at the footing level around the exterior perimeter of the structure. The pipe should have positive outlet, such as a gravity connection to the storm sewer, or to the sump pit where sump pumps are proposed at the residential dwellings.

Foundation Backfill

Backfill against the exterior sides of the foundation walls should consist of free draining non frost susceptible granular materials. The greater part of the site excavated materials will be frost susceptible and, as such, are not recommended for re-use as backfill against the foundation walls, unless used in conjunction with a drainage geocomposite, such as Delta Drain 6000, connected to the perimeter foundation drainage system.

6.2 Protection of Footings Against Frost Action

Perimeter foundations of heated structures are required to be insulated against the deleterious effects of frost action. A minimum 1.5 m thick soil cover, or an equivalent thickness of soil cover and foundation insulation, should be provided in this regard.

Exterior unheated foundations, such as isolated piers, are more prone to deleterious movement associated with frost action than the exterior walls of the structure, and require additional protection, such as soil cover of 2.1 m, or an equivalent combination of soil cover and foundation insulation.

6.3 Excavation Side Slopes

The side slopes of excavations in the overburden materials should either be cut back at acceptable slopes or should be retained by shoring systems from the start of the excavation until the structure is backfilled. For the proposed development, it is anticipated that sufficient room will be available for the greater part of the excavation to be undertaken by open-cut methods (i.e. unsupported excavations).

The excavation side slopes in the overburden soils, above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or flatter. A flatter slope is required for excavation below groundwater level, such as 3H:1V. The subsurface soil at this site is considered to be mainly Type 2 and 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides.

Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

It is recommended that a trench box is used to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by “cut and cover” methods and excavations will not be left open for extended periods of time.

6.4 Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with the most recent material specifications and standard detail drawings from the department of public works and services, infrastructure services branch of the City of Ottawa.

The pipe bedding for sewer and water pipes should consist of at least 150 mm of OPSS Granular A material. Where the bedding is located on the grey silty clay, the thickness of the bedding material should be increased to 300 mm. The bedding should extend to the spring line of the pipe. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 99% of the material’s standard Proctor maximum dry density.

Cover material, from the spring line to a minimum of 300 mm above the obvert of the pipe, should consist of OPSS Granular A (concrete or PSM PVC pipes) or sand (concrete pipe). The bedding and cover materials should be placed in maximum 225 mm thick lifts and compacted to a minimum of 99% of its SPMDD.

It should generally be possible to re-use the site generated fill materials (moist, not wet) above the cover material if excavation and filling operations are carried out in dry and non-freezing weather conditions. The wet silty clay should be given a sufficient drying period to decrease its moisture content to an acceptable level to make compaction possible prior to being re-used.

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.8 m below finished grade) and above the cover material should match the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the material's SPMDD. All cobbles larger than 200 mm in their longest direction should be segregated from re-use as trench backfill.

Clay Seals

To reduce long-term lowering of the groundwater at this site, clay seals should be provided within the service trenches excavated through the silty clay deposit. The seals should be at least 1.5 m long (in the trench direction) and should extend from trench wall to trench wall. The seals should extend from the frost line and fully penetrate the bedding, subbedding and cover material. The barriers should consist of relatively dry and compactable brown silty clay placed in maximum 225 mm thick loose layers and compacted to a minimum of 95% of the SPMDD. The clay seals should be placed at the site boundaries and at strategic locations at no more than 60 m intervals in the service trenches excavated through the silty clay deposit.

6.5 Groundwater Control

It is anticipated that groundwater infiltration into the excavation should be low to moderate and controllable using open sumps. Pumping from open sumps should be sufficient to control the groundwater influx through the sides of shallow excavations. The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

Permit to Take Water

A temporary Ministry of Environment, Conservation and Parks (MECP) permit to take water (PTTW) may be required if more than 400,000 L/day of ground and/or surface water are to be pumped during the construction phase. At least 4 to 5 months should be allowed for completion of the application and issuance of the permit by the MECP.

For typical ground or surface water volumes being pumped during the construction phase, typically between 50,000 to 400,000 L/day, it is required to register on the Environmental Activity and Sector Registry (EASR). A minimum of two to four weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan to be prepared by a Qualified Persons as stipulated under O.Reg. 63/16.

6.6 Winter Construction

Precautions must be taken if winter construction is considered for this project. The subsoil conditions at this site consist of frost susceptible materials. In the presence of water and freezing conditions, ice could form within the soil mass. Heaving and settlement upon thawing could occur.

In the event of construction during below zero temperatures, the founding stratum should be protected from freezing temperatures using straw, propane heaters and tarpaulins or other suitable means. In this regard, the base of the excavations should be insulated from sub-zero temperatures immediately upon exposure and until such time as heat is adequately supplied to the building and the footings are protected with sufficient soil cover to prevent freezing at founding level.

Trench excavations and pavement construction are also difficult activities to complete during freezing conditions without introducing frost into the subgrade or in the excavation walls and bottoms. Precautions should be taken if such activities are to be carried out during freezing conditions. Additional information could be provided, if required.

6.7 Corrosion Potential and Sulphate

The results of analytical testing show that the sulphate content is less than 0.1%. This result is indicative that Type 10 Portland cement (GU – General Use cement) would be appropriate for this site. The chloride content and pH of the sample indicate that they are not a significant factor in creating a corrosive environment for exposed ferrous metals at this site, whereas the resistivity is indicative of a non-aggressive to slightly aggressive corrosive environment.

6.8 Landscaping Considerations

Tree Planting Restrictions

Based on the subsurface profile at the test hole locations, a low to medium sensitivity clay soil was encountered throughout the site. Based on our Atterberg limits test results, the modified plasticity index does not exceed 40% in these areas. The following tree planting setbacks are recommended for the low to medium sensitivity area.

Large trees (mature height over 14 m) can be planted within these areas where a tree to foundation setback equal to the full mature height of the tree can be provided (e.g. in a park or other green space). Tree planting setback limits may be reduced to 4.5 m for small (mature height up to 7.5 m) and medium size trees (mature tree height 7.5 to 14 m), provided that the conditions noted below are met:

☐ The underside of footing (USF) is 2.1 m or greater below the lowest finished grade must be satisfied for footings within 10 m from the tree, as measured from the center of the tree trunk and verified by means of the Grading Plan.

☐ A small tree must be provided with a minimum of 25 m^3 of available soil volume while a medium tree must be provided with a minimum of 30 m^3 of available soil volume, as determined by the Landscape Architect. The developer is to ensure that the soil is generally un-compacted when backfilling in street tree planting locations.

☐ The tree species must be small (mature tree height up to 7.5 m) to medium size (mature tree height 7.5 m to 14 m) as confirmed by the Landscape Architect.

☐ The foundation walls are to be reinforced at least nominally (minimum of two upper and two lower 15M bars in the foundation wall).

☐ Grading surrounding the tree must promote drainage to the tree root zone (in such a manner as not to be detrimental to the tree).

Swimming Pools, Hot Tubs, Decks and Additions

The in-situ soils are considered to be acceptable for in-ground swimming pools. Above ground swimming pools must be placed at least 5 m away from the residence foundation and neighboring foundations. Otherwise, pool construction is considered routine, and can be constructed in accordance with the manufacturer`s requirements.

Additional grading around the hot tub should not exceed permissible grade raises. Otherwise, hot tub construction is considered routine, and can be constructed in accordance with the manufacturer’s specifications.

Additional grading around proposed deck or addition should not exceed permissible grade raises. Otherwise, standard construction practices are considered acceptable.

6.9 Stormwater Management System Recommendations

It is understood that a below-grade open-bottom stormwater storage chamber is proposed to be located within the southwest limits of the subject site. Based on the subsurface profile at the borehole completed at the location of the proposed stormwater storage chamber, it is expected that the system will be placed over a raft slab bearing on a stiff silty clay subgrade.

It is anticipated that the proposed stormwater management system will be founded in proximity to the groundwater table. However, a minimum of 1.5 m of soil cover will be provided over the system. Based on our calculations, the system will resist buoyancy under fully saturated conditions. The proposed system is considered to be suitable from a geotechnical perspective.

Further, where any portion of the proposed system has less than 2.1 m of soil cover, a 50 mm thickness of SM rigid insulation should be provided overtop of the chambers.

7.0 Recommendations

It is a requirement for the foundation design data provided herein to be applicable that the following material testing and observation program be performed by the geotechnical consultant.

- ☐ Observation of all bearing surfaces prior to the placement of concrete.
- ☐ Sampling and testing of the concrete and fill materials.
- ☐ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ☐ Observation of all subgrades prior to backfilling.
- ☐ Field density tests to determine the level of compaction achieved.
- ☐ Sampling and testing of the bituminous concrete including mix design reviews.

A report confirming that these works have been conducted in general accordance with our recommendations could be issued upon the completion of a satisfactory inspection program by the geotechnical consultant.

All excess soil must be handled as per ***Ontario Regulation 406/19: On-Site and Excess Soil Management.***

8.0 Statement of Limitations

The recommendations provided are in accordance with the present understanding of the project. Paterson requests permission to review the recommendations when the drawings and specifications are completed.

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, Paterson requests immediate notification to permit reassessment of our recommendations.

The recommendations provided herein should only be used by the design professionals associated with this project. They are not intended for contractors bidding on or undertaking the work. The latter should evaluate the factual information provided in this report and determine the suitability and completeness for their intended construction schedule and methods. Additional testing may be required for their purposes.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Mattamy Homes, or their agents, is not authorized without review by Paterson for the applicability of our recommendations to the alternative use of the report.

Paterson Group Inc.

LICENSED PROFESSIONAL ENGINEER
April 30, 2025
K. A. PICKARD
100531344
PROVINCE OF ONTARIO

Mrunmayi Anvekar, M.Eng.

Kevin Pickard, P.Eng.

Report Distribution:

- ☐ Mattamy Homes (email copy)
- ☐ Paterson Group (1 copy)

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

SOIL PROFILE AND TEST DATA SHEETS BY OTHERS

ATTERBERG LIMITS TESTING RESULTS

ATTERBERG LIMITS TESTING RESULTS BY OTHERS

GRAIN SIZE DISTRIBUTION ANALYSIS

SHRINKAGE TESTING RESULTS

ANALYTICAL TESTING RESULTS

PATERSON GROUP

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

Wateridge Block 15 - Mikinak Road & Vedette Way, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 372289.43 **NORTHING:** 5035042.12 **ELEVATION:** 86.69

PROJECT: Proposed Residential Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS:

DATE: March 10, 2025

FILE NO. : PG7353

HOLE NO. : BH 1-25

SAMPLE DESCRIPTION

GROUND SURFACE

TOPSOIL 0.25m [86.44m]

FILL: Brown silty clay, with topsoil, crushed stone and gravel 1.98m [84.71m]

Very stiff, brown **SILTY CLAY** 4.72m [81.97m]

GLACIAL TILL: Very stiff, brown silty clay, with gravel and sand, occasional cobbles and boulders

- Grey by 5.18 m depth

6.22m [80.47m]

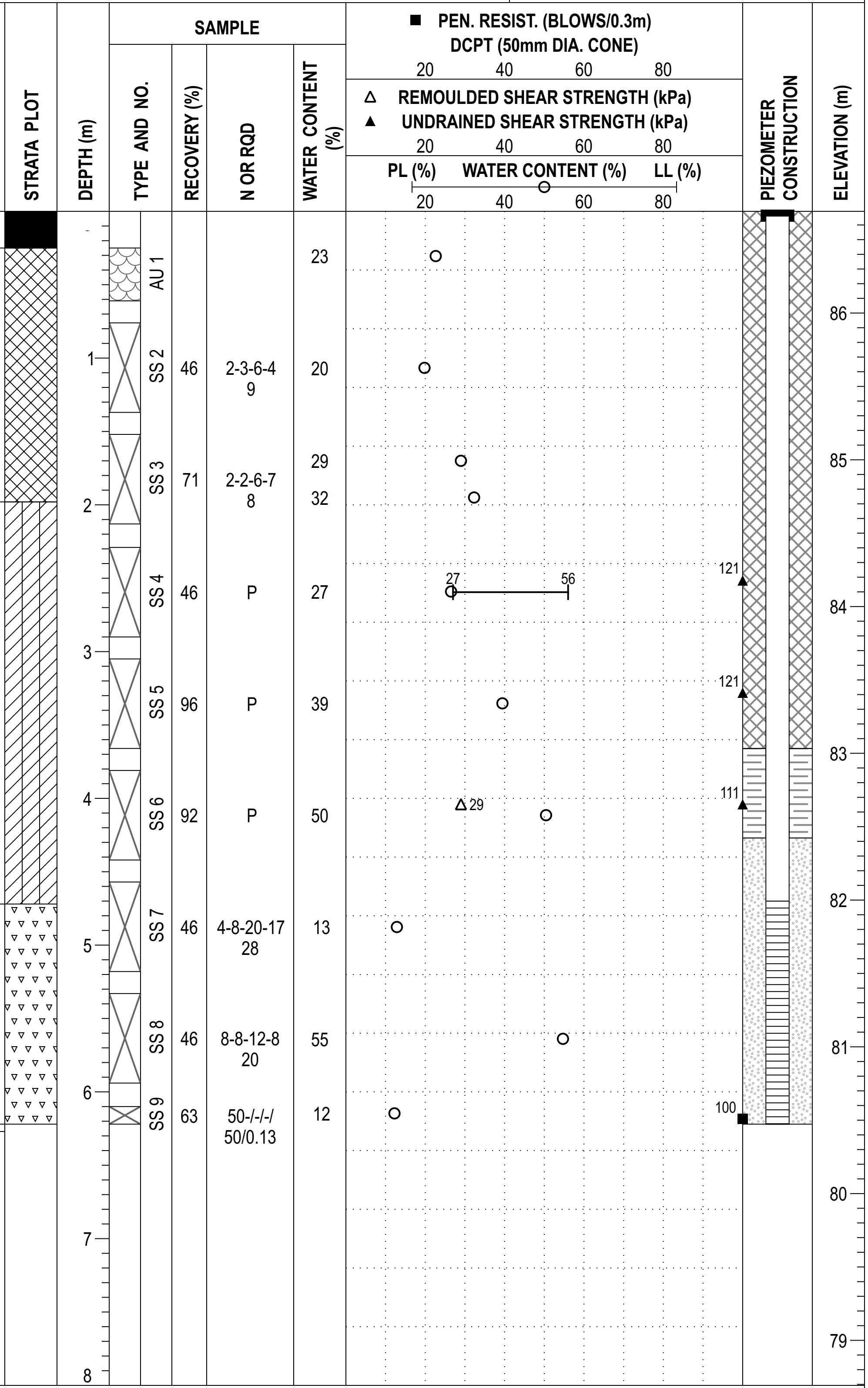
Dynamic cone penetration test commenced at 6.22 m depth 6.27m [80.42m]

End of Borehole

Practical refusal to DCPT at 6.27 m depth

(Dry - March 21, 2025)

TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)
AU 1			23
SS 2	46	2-3-6-4 9	20
SS 3	71	2-2-6-7 8	29 32
SS 4	46	P	27
SS 5	96	P	39
SS 6	92	P	50
SS 7	46	4-8-20-17 28	13
SS 8	46	8-8-12-8 20	55
SS 9	63	50-/-/-/ 50/0.13	12



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

Wateridge Block 15 - Mikinak Road & Vedette Way, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 372313.90 **NORTHING:** 5034952.10 **ELEVATION:** 86.42

PROJECT: Proposed Residential Development

ADVANCED BY: CME-55 Low Clearance Drill

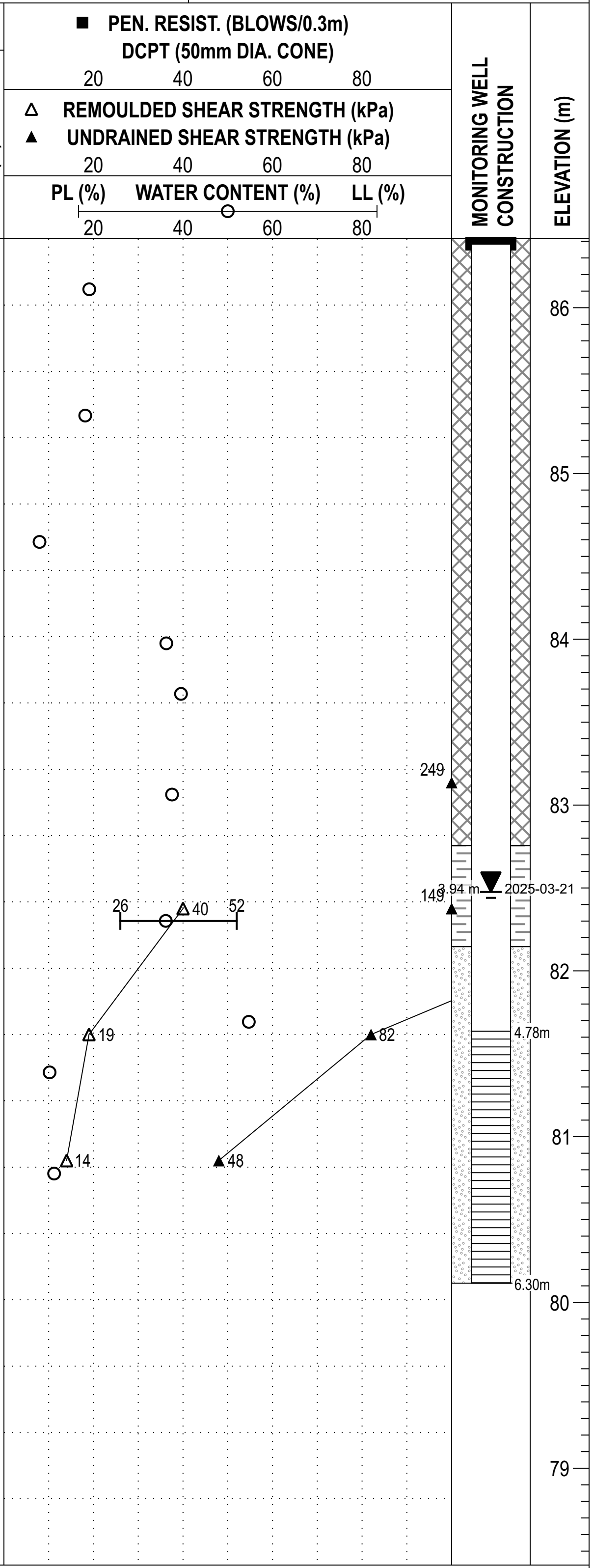
REMARKS:

DATE: March 10, 2025

FILE NO. : **PG7353**

HOLE NO. : **BH 2-25**

SAMPLE DESCRIPTION GROUND SURFACE	SAMPLE: TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)
TOPSOIL 0.18m [86.24m]				
FILL: Brown silty clay, trace gravel, topsoil and sand	AU 1			19
	SS 2	29	2-3-2-3 5	18
1.45m [84.97m]				
FILL: Brown silty sand, some organics, trace gravel, some bricks	SS 3	83	7-12-11-12 23	8
2.29m [84.13m]				
FILL: Brown silty clay, some sand and topsoil	SS 4	58	1-2-3-3 5	36 40
2.74m [83.68m]				
Hard to very stiff, brown **SILTY CLAY**	SS 5	96	P	38
	SS 6	96	P	36
				55
4.88m [81.54m]	SS 7	83	P	
Firm, grey **SILTY CLAY**				10
				11
5.94m [80.48m]				
GLACIAL TILL: Compact, grey silty sand, some gravel, trace clay, occasional cobbles and boulders	SS 8	25	7-14-12-10 26	
6.71m [79.71m]				
End of Borehole (GWL at 3.94 m depth - March 21, 2025)				



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

Wateridge Block 15 - Mikinak Road & Vedette Way, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 372399.54 **NORTHING:** 5035001.50 **ELEVATION:** 87.36

PROJECT: Proposed Residential Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS:

DATE: March 10, 2025

FILE NO. : PG7353

HOLE NO. : BH 3-25

SAMPLE DESCRIPTION

GROUND SURFACE

TOPSOIL

0.20m [87.16m]

FILL: Brown silty clay, with sand, some topsoil, trace gravel

1.45m [85.91m]

Hard to very stiff, brown **SILTY CLAY**

2.97m [84.39m]

GLACIAL TILL: Compact to dense, brown silty sand, some gravel, occasional cobbles and boulders

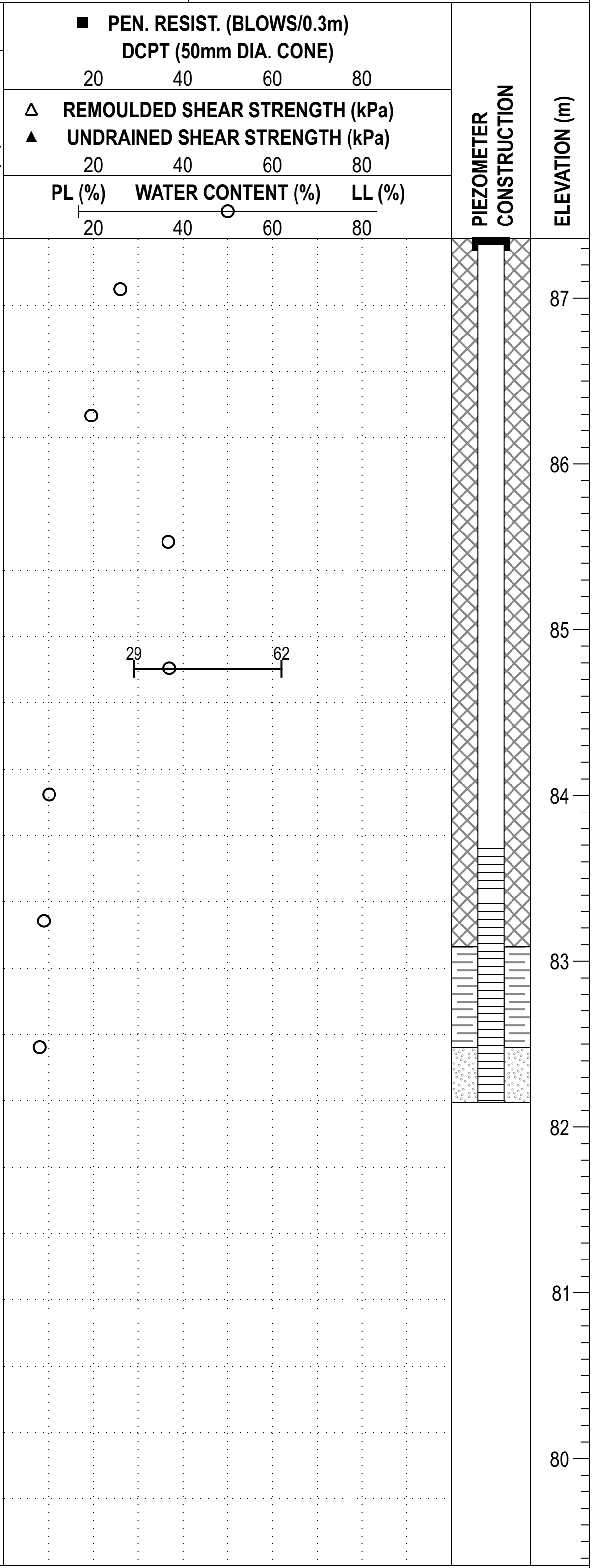
5.21m [82.15m]

End of Borehole

Practical refusal to augering at 5.21 m depth

(Dry - March 21, 2025)

TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)
AU 1			26
SS 2	29	2-3-3-2 6	20
SS 3	71	2-6-8-9 14	37
SS 4	100	3-7-8-8 15	37
SS 5	83	6-8-3-11 11	10
SS 6	87	8-22-20-23 42	9
SS 7		10-17-37-50 54	8



STRATA PLOT

DEPTH (m): 1, 2, 3, 4, 5, 6, 7, 8

SOIL PROFILE AND TEST DATA

Geotechnical Investigation

Wateridge Block 15 - Mikinak Road & Vedette Way, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 372379.42 **NORTHING:** 5035089.00 **ELEVATION:** 88.46

PROJECT: Proposed Residential Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS:

DATE: March 10, 2025

FILE NO. : PG7353

HOLE NO. : BH 4-25

SAMPLE DESCRIPTION

GROUND SURFACE

TOPSOIL 0.20m [88.26m]

FILL: Brown silty clay, some sand, trace gravel

1.98m [86.48m]

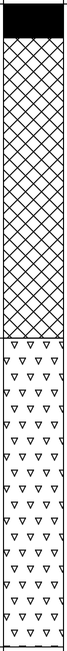
GLACIAL TILL: Dense to compact, brown silty sand, trace clay, occasional cobbles and boulders

3.81m [84.65m]

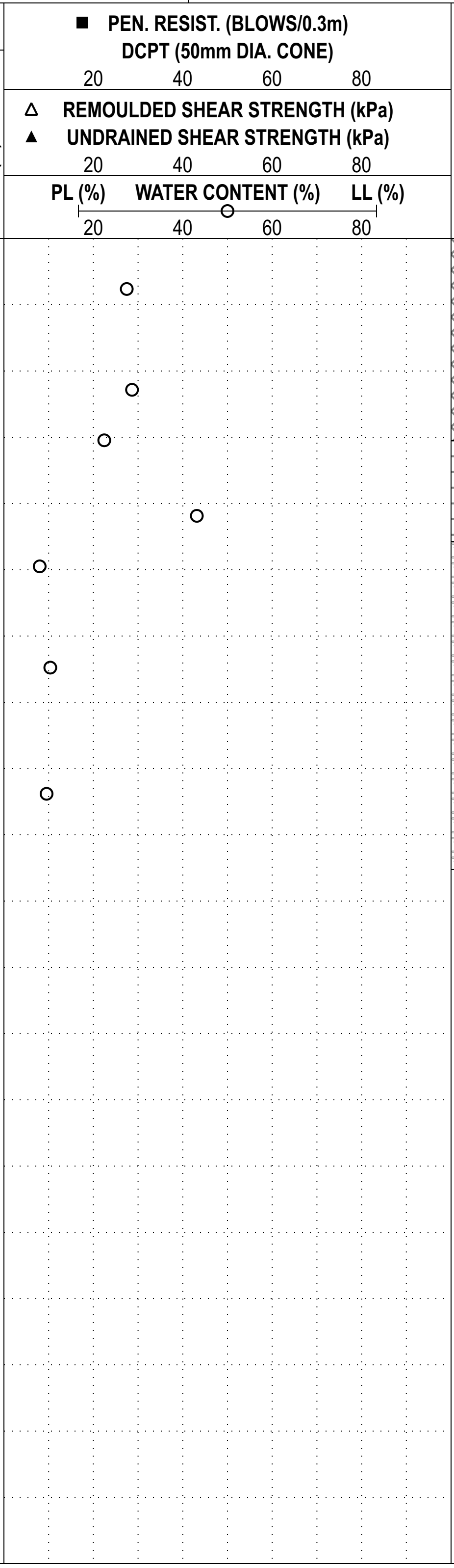
End of Borehole

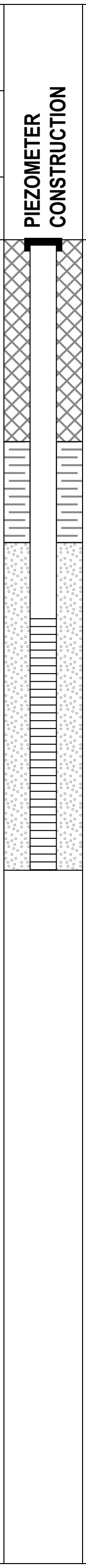
Practical refusal to augering at 3.81 m depth

(Dry - March 21, 2025)



TYPE AND NO.	RECOVERY (%)	N OR RQD	WATER CONTENT (%)
AU 1			27
SS 2	71	2-3-4-2 7	29 22
SS 3	71	1-2-6-27 8	43 8
SS 4	83	13-19-13-12 32	10
SS 5	67	11-11-14-17 25	10





DEPTH (m): 1, 2, 3, 4, 5, 6, 7, 8

ELEVATION (m): 88, 87, 86, 85, 84, 83, 82, 81

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation

Wateridge Block 15 - Mikinak Road & Vedette Way, Ottawa, Ontario

COORD. SYS.: MTM ZONE 9 **EASTING:** 372335.12 **NORTHING:** 5035084.75 **ELEVATION:** 87.58

PROJECT: Proposed Residential Development

ADVANCED BY: CME-55 Low Clearance Drill

REMARKS:

DATE: March 10, 2025

FILE NO. : PG7353

HOLE NO. : BH 5-25

SAMPLE DESCRIPTION	STRATA PLOT	DEPTH (m)	SAMPLE: TYPE AND NO.	SAMPLE: RECOVERY (%)	SAMPLE: N OR RQD	SAMPLE: WATER CONTENT (%)	■ PEN. RESIST. (BLOWS/0.3m) DCPT (50mm DIA. CONE) 20 40 60 80 △ REMOULDED SHEAR STRENGTH (kPa) ▲ UNDRAINED SHEAR STRENGTH (kPa) 20 40 60 80 PL (%) WATER CONTENT (%) LL (%) 20 40 60 80	PIEZOMETER CONSTRUCTION	ELEVATION (m)

GROUND SURFACE

Overburden

5.05m [82.53m]

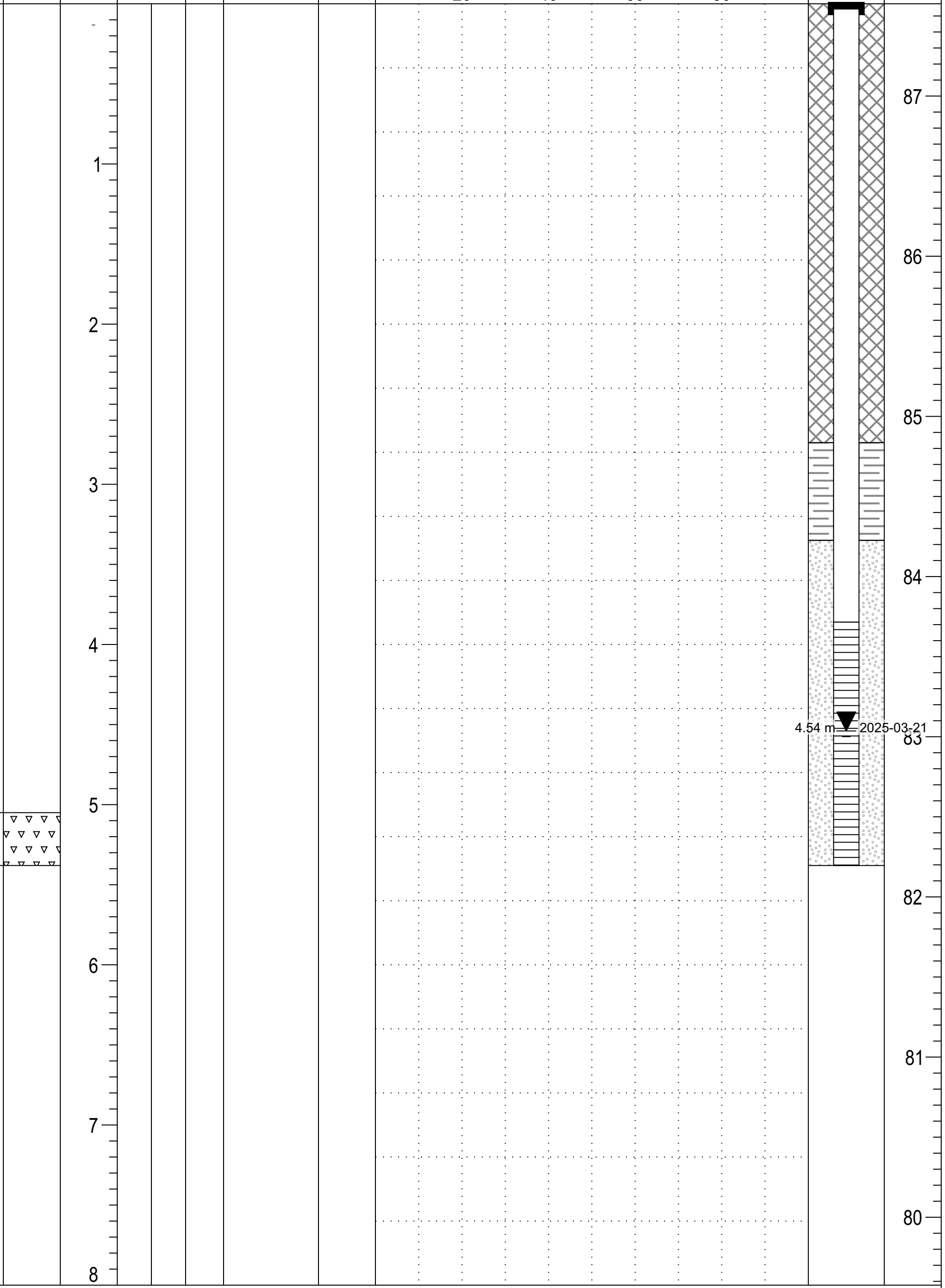
Inferred Glacial Till

5.38m [82.20m]

End of Borehole

Practical refusal to augerings at 5.38 m depth

(GWL at 4.54 m depth - March 21, 2025)



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patersongroup Consulting Engineers

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Subdivision - Phase 3A
101 Vedette Way, Ottawa, Ontario

DATUM Ground surface elevations were determined using a high precision GPS. The ground surface elevations are referenced to a geodetic datum.

REMARKS

BORINGS BY CME-55 Low Clearance Drill

DATE March 26, 2021

FILE NO. PG5756

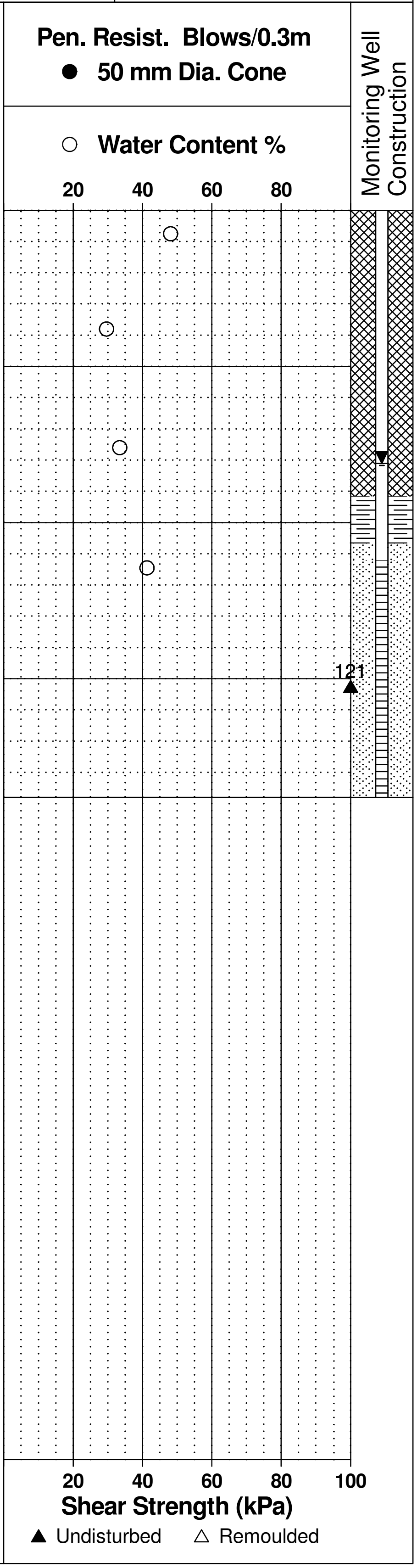
HOLE NO. BH 1-21

SOIL DESCRIPTION	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE					0	83.87
TOPSOIL (0.36)	AU	1				
Very stiff to stiff, brown **SILTY CLAY**	SS	2	100	12	1	82.87
	SS	3	100	9	2	81.87
	SS	4	100	3	3	80.87
3.76						

End of Borehole

Practical refusal to augering at 3.76m depth

(GWL @ 1.62m - April 5, 2021)



SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Subdivision - Phase 3A
101 Vedette Way, Ottawa, Ontario

DATUM Ground surface elevations were determined using a high precision GPS. The ground surface elevations are referenced to a geodetic datum.

REMARKS

BORINGS BY CME-55 Low Clearance Drill

DATE March 26, 2021

FILE NO. PG5756

HOLE NO. BH 2-21

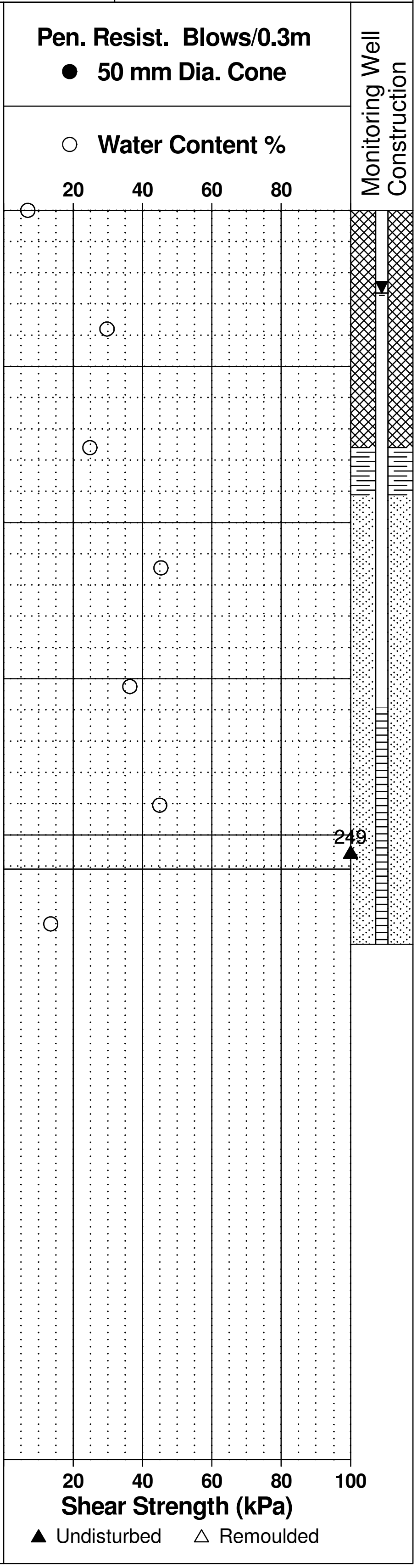
SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	% RECOVERY	N VALUE or RQD
GROUND SURFACE				
FILL: Crushed stone with brown silty sand 0.20	AU	1		
Very stiff to stiff, brown **SILTY CLAY**	SS	2	100	11
	SS	3	100	9
	SS	4	100	3
	SS	5	100	3
4.22	SS	6	100	11
GLACIAL TILL: Brown silty clay with sand, gravel, cobbles and boulders 4.70	SS	7	0	+50

DEPTH (m)	ELEV. (m)
0	83.33
1	82.33
2	81.33
3	80.33
4	79.33

End of Borehole

Practical refusal to augering at 4.70m depth

(GWL @ 0.53m - April 5, 2021)



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Subdivision - Phase 3A
101 Vedette Way, Ottawa, Ontario

DATUM Ground surface elevations were determined using a high precision GPS. The ground surface elevations are referenced to a geodetic datum.

REMARKS

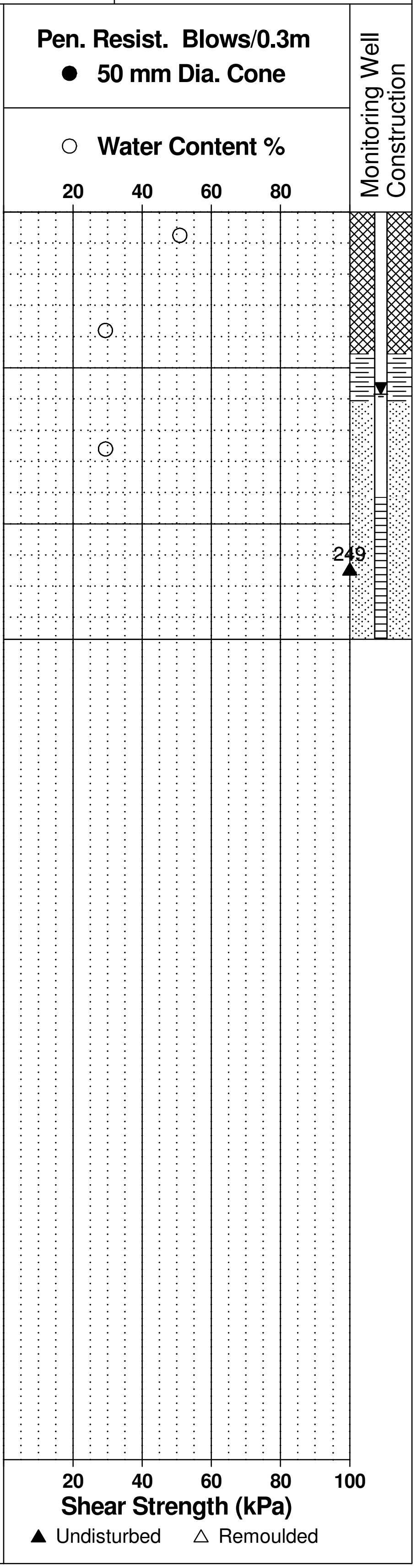
BORINGS BY CME-55 Low Clearance Drill **DATE** March 26, 2021

FILE NO. PG5756

HOLE NO. BH 3-21

SOIL DESCRIPTION	Depth to base (m)	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
GROUND SURFACE					
TOPSOIL	0.10				
FILL: Brown silty clay with sand	0.61	AU	1		
Very stiff to stiff, brown **SILTY CLAY**	2.74	SS	2	100	9
		SS	3	100	10

DEPTH (m)	ELEV. (m)
0	83.52
1	82.52
2	81.52



End of Borehole

Practical refusal to augering at 2.74m depth

(GWL @ 1.17m - April 5, 2021)

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Subdivision - Phase 3A
101 Vedette Way, Ottawa, Ontario

DATUM Ground surface elevations were determined using a high precision GPS. The ground surface elevations are referenced to a geodetic datum.

REMARKS

BORINGS BY CME-55 Low Clearance Drill **DATE** March 26, 2021

FILE NO. PG5756

HOLE NO. BH 4-21

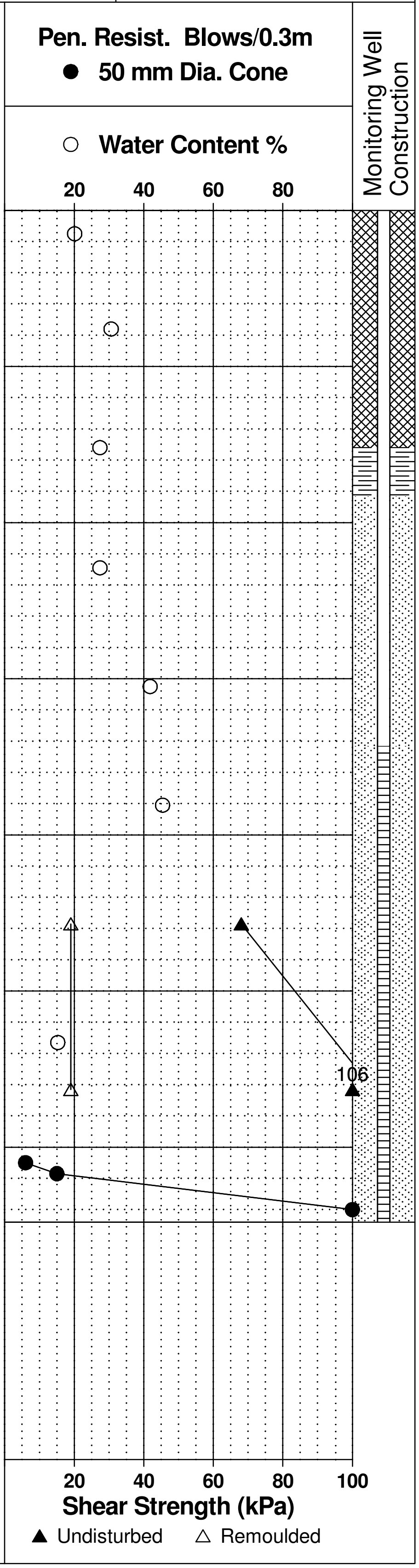
SOIL DESCRIPTION	Depth to base (m)	SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
GROUND SURFACE					
TOPSOIL	0.05				
FILL: Brown silty clay, some sand, trace organics	0.61	AU	1		
Very stiff to stiff brown **SILTY CLAY**	5.33	SS	2	100	10
		SS	3	100	12
		SS	4	100	8
		SS	5	100	3
		SS	6	100	W
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles and boulders	5.94	SS	7	100	W
Dynamic Cone Penetration Test commenced at 5.94m depth.	6.48				

End of Borehole

Practical refusal to DCPT at 6.48m depth

(Monitoring Well dry - April 5, 2021)

DEPTH (m)	ELEV. (m)
0	85.28
1	84.28
2	83.28
3	82.28
4	81.28
5	80.28
6	79.28



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Subdivision - Phase 3A
101 Vedette Way, Ottawa, Ontario

DATUM Ground surface elevations were determined using a high precision GPS. The ground surface elevations are referenced to a geodetic datum.

REMARKS

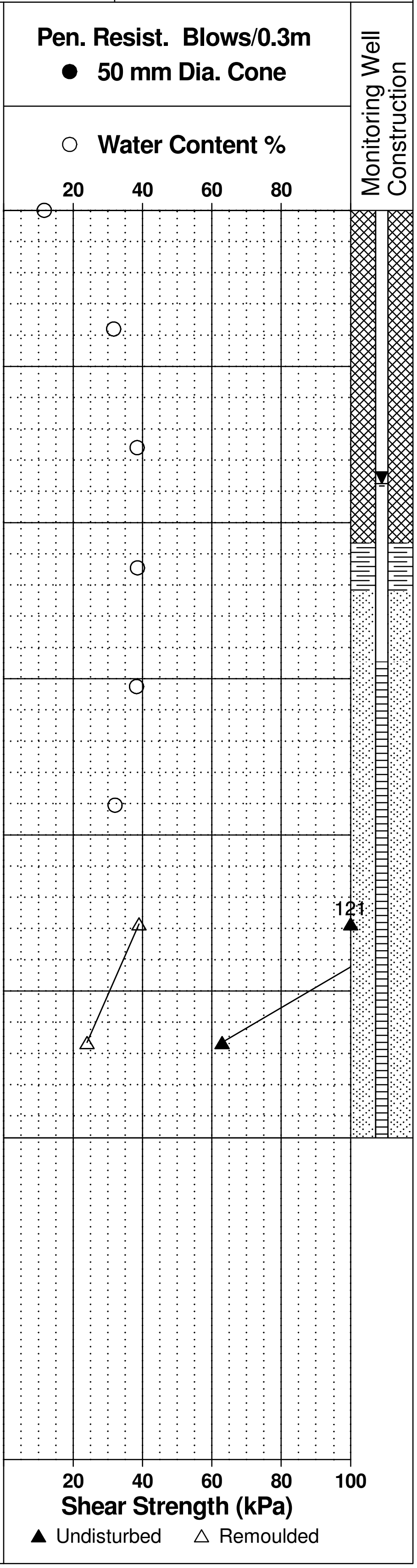
BORINGS BY CME-55 Low Clearance Drill

DATE March 26, 2021

FILE NO. PG5756

HOLE NO. BH 5-21

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	85.75
FILL: Crushed stone with brown silty sand, some clay 0.30		AU	1				
FILL: Brown silty clay some sand, trace organics 0.91							
		SS	2	58	9	1	84.75
		SS	3	100	9		
						2	83.75
		SS	4	100	9		
Very stiff to stiff, brown **SILTY CLAY**						3	82.75
		SS	5	100	9		
		SS	6	100	3	4	81.75
						5	80.75
5.94							
End of Borehole							
(GWL @ 1.75m - April 5, 2021)							



SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Residential Subdivision - Phase 3A
101 Vedette Way, Ottawa, Ontario

DATUM Ground surface elevations were determined using a high precision GPS. The ground surface elevations are referenced to a geodetic datum.

REMARKS

BORINGS BY CME-55 Low Clearance Drill

DATE March 26, 2021

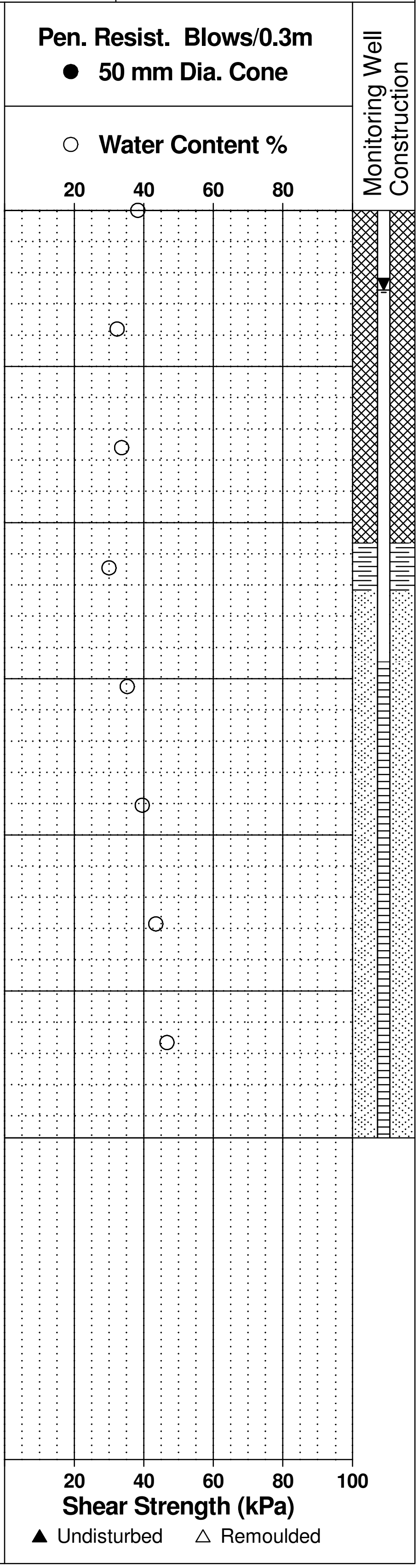
FILE NO. PG5756

HOLE NO. BH 6-21

SOIL DESCRIPTION	Depth to base (m)
GROUND SURFACE	
TOPSOIL	0.23
Very stiff to stiff, brown **SILTY CLAY** - grey by 5.3m depth	5.94
End of Borehole (GWL @ 0.51m - April 5, 2021)	

SAMPLE TYPE	NUMBER	% RECOVERY	N VALUE or RQD
AU	1		
SS	2	100	11
SS	3	100	10
SS	4	100	6
SS	5	100	4
SS	6	100	2
SS	7	100	2
SS	8	100	2

DEPTH (m)	ELEV. (m)
0	84.93
1	83.93
2	82.93
3	81.93
4	80.93
5	79.93



SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) ‘N’ value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

Relative Density	‘N’ Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

Consistency	Undrained Shear Strength (kPa)	‘N’ Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NXL size core. However, it can be used on smaller core sizes, such as BX, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

RQD %	**ROCK QUALITY**
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC% - Natural moisture content or water content of sample, %
LL - Liquid Limit, % (water content above which soil behaves as a liquid)
PL - Plastic limit, % (water content above which soil behaves plastically)
PI - Plasticity index, % (difference between LL and PL)

Dxx - Grain size which xx% of the soil, by weight, is of finer grain sizes
These grain size descriptions are not used below 0.075 mm grain size
D10 - Grain size at which 10% of the soil is finer (effective grain size)
D60 - Grain size at which 60% of the soil is finer

Cc - Concavity coefficient = $(D30)^2$ / (D10 x D60)
Cu - Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay
(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

p'_o - Present effective overburden pressure at sample depth
p'_c - Preconsolidation pressure of (maximum past pressure on) sample
Ccr - Recompression index (in effect at pressures below p'_c)
Cc - Compression index (in effect at pressures above p'_c)

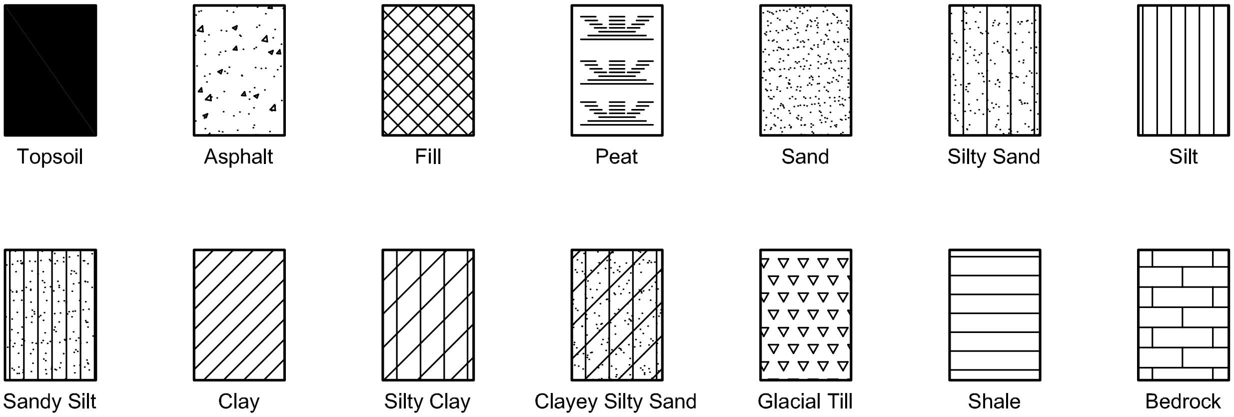
OC Ratio Overconsolidaton ratio = p'_c / p'_o
Void Ratio Initial sample void ratio = volume of voids / volume of solids
Wo - Initial water content (at start of consolidation test)

PERMEABILITY TEST

k - Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

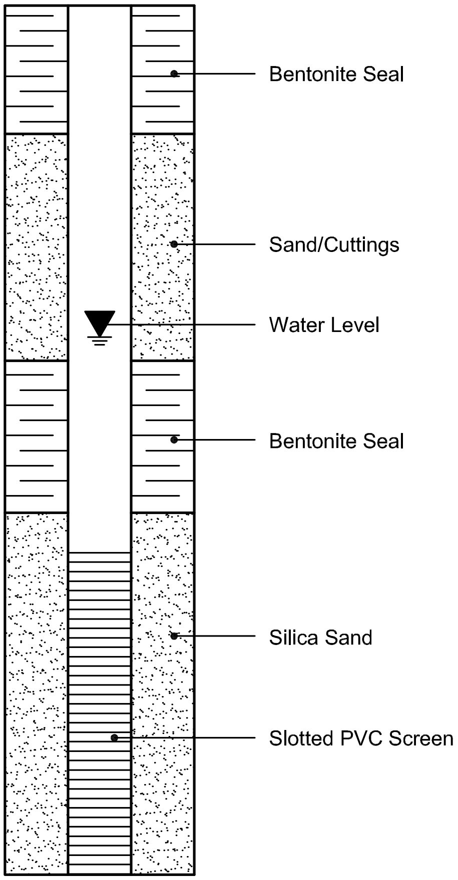
SYMBOLS AND TERMS (continued)

STRATA PLOT

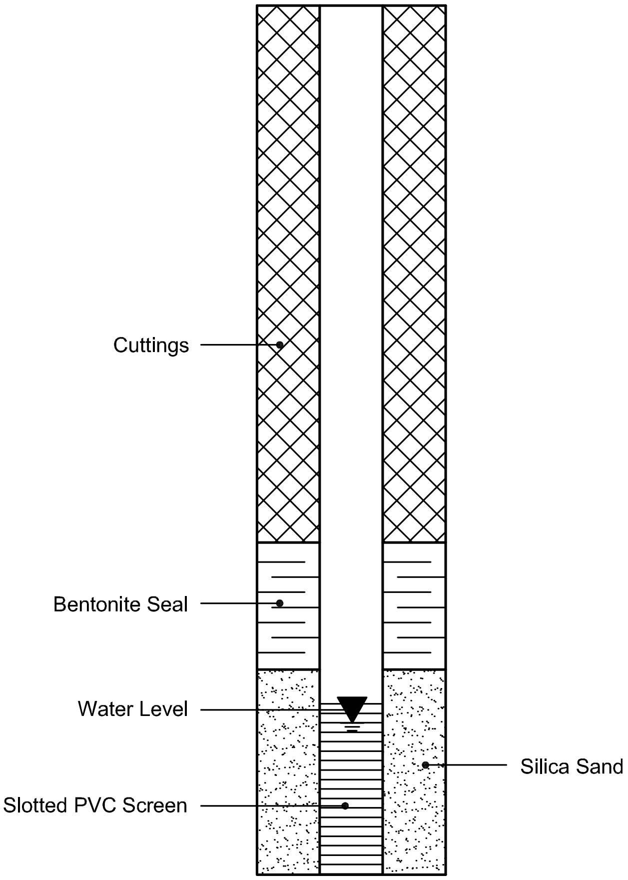


MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



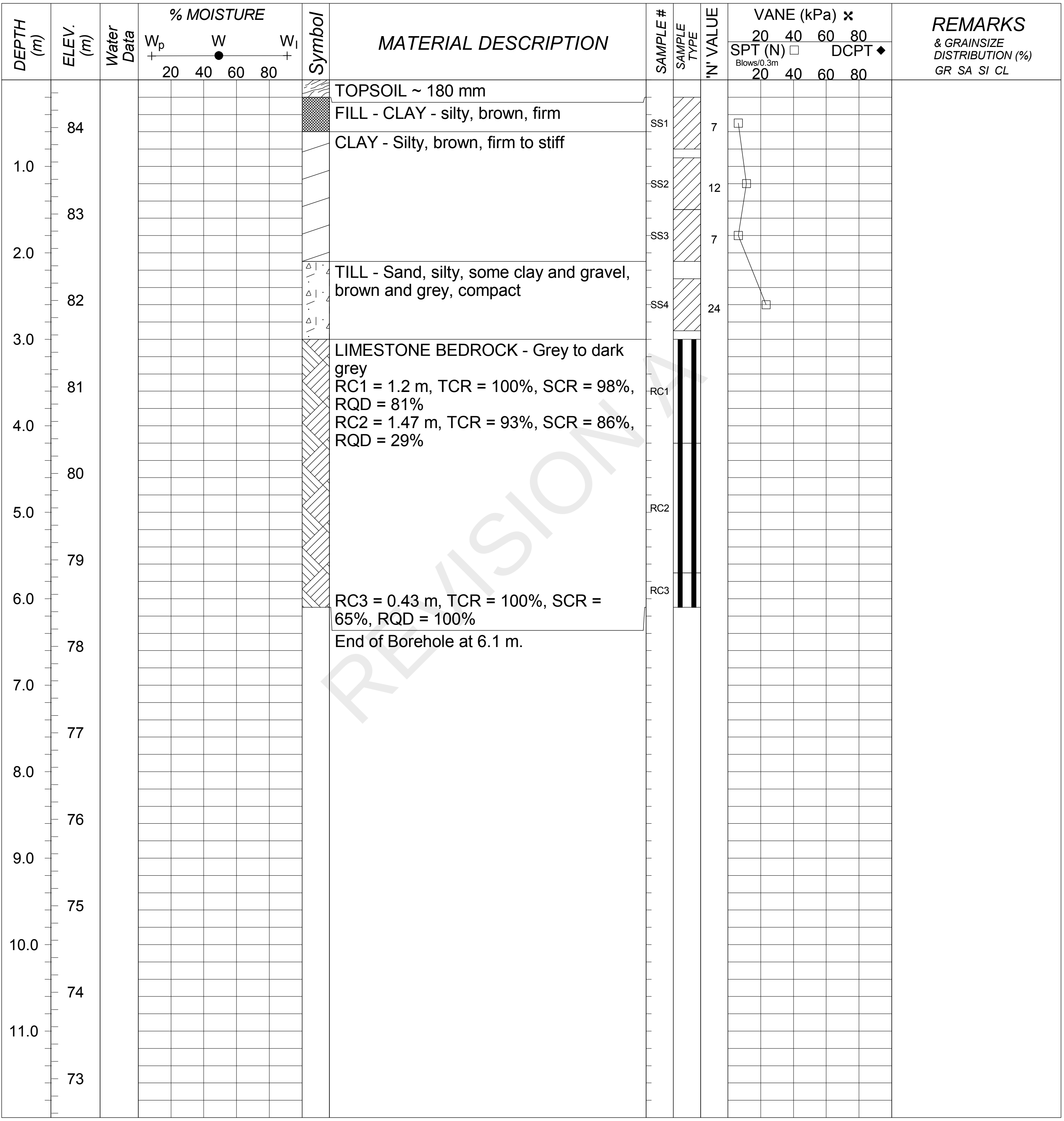
PIEZOMETER CONSTRUCTION



LOG OF BOREHOLE BH15-12

DST REF. No.:**OE-OT-015358**
CLIENT: **Canada Lands Company (CLC)**
PROJECT: **Phase 1A Development - Site Servicing**
LOCATION:**Former CFB Rockliffe, Ottawa Ontario**
SURFACE ELEVATION: 84.55 N/A

Drilling Data
METHOD: **Hollow Stem Auger/ NQ Size Core Barrel**
DIAMETER: **200 mm**
DATE: **August 21, 2015**
COORDINATES: **5033393.443** m N, **450130.224** m E



MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE
TOPSOIL ~ 180 mm			
FILL - CLAY - silty, brown, firm	SS1	▨	7
CLAY - Silty, brown, firm to stiff	SS2 SS3	▨ ▨	12 7
TILL - Sand, silty, some clay and gravel, brown and grey, compact	SS4	▨	24
LIMESTONE BEDROCK - Grey to dark grey RC1 = 1.2 m, TCR = 100%, SCR = 98%, RQD = 81% RC2 = 1.47 m, TCR = 93%, SCR = 86%, RQD = 29% RC3 = 0.43 m, TCR = 100%, SCR = 65%, RQD = 100%	RC1 RC2 RC3	▮ ▮ ▮	
End of Borehole at 6.1 m.			

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SAMPLE TYPE LEGEND

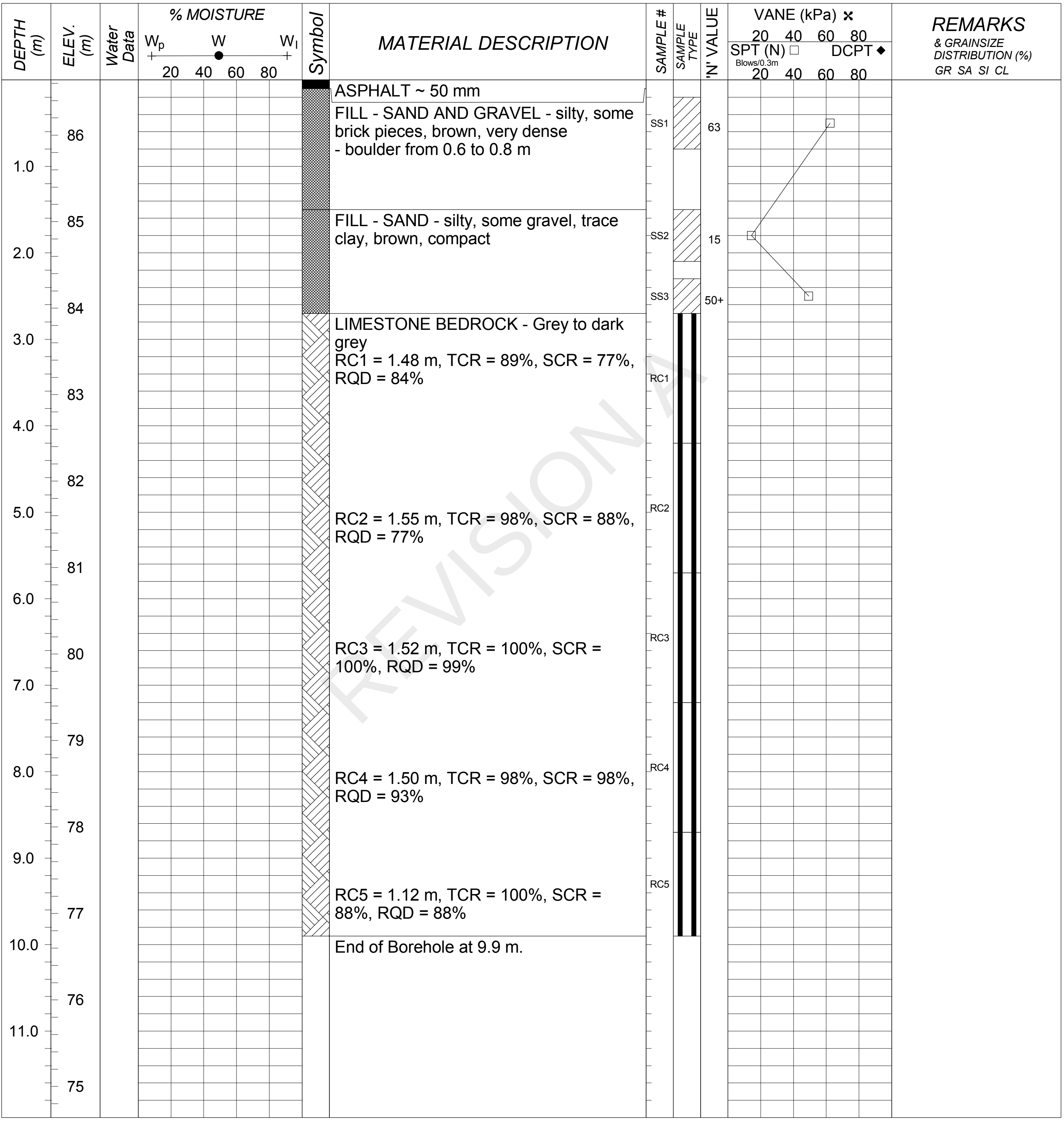
☰	Auger Sample	▮	Rock Core	■	Bentonite
▨	Split Spoon Sample	▧	Hiller Peat Sampler	░	Sand
▥	Bulk Sample	▯	70mm Thin Wall Tube	▩	Slough

ENCLOSURE 13

LOG OF BOREHOLE BH15-13

DST REF. No.:**OE-OT-015358**
CLIENT: **Canada Lands Company (CLC)**
PROJECT: **Phase 1A Development - Site Servicing**
LOCATION:**Former CFB Rockliffe, Ottawa Ontario**
SURFACE ELEVATION: 86.64 N/A

Drilling Data
METHOD: **Hollow Stem Auger/ NQ Size Core Barrel**
DIAMETER: **200 mm**
DATE: **August 21, 2015**
COORDINATES: **5033444.108** m N, **450254.911** m E



MATERIAL DESCRIPTION	SAMPLE #	'N' VALUE
ASPHALT ~ 50 mm		
FILL - SAND AND GRAVEL - silty, some brick pieces, brown, very dense - boulder from 0.6 to 0.8 m	SS1	63
FILL - SAND - silty, some gravel, trace clay, brown, compact	SS2	15
	SS3	50+
LIMESTONE BEDROCK - Grey to dark grey RC1 = 1.48 m, TCR = 89%, SCR = 77%, RQD = 84%	RC1	
RC2 = 1.55 m, TCR = 98%, SCR = 88%, RQD = 77%	RC2	
RC3 = 1.52 m, TCR = 100%, SCR = 100%, RQD = 99%	RC3	
RC4 = 1.50 m, TCR = 98%, SCR = 98%, RQD = 93%	RC4	
RC5 = 1.12 m, TCR = 100%, SCR = 88%, RQD = 88%	RC5	
End of Borehole at 9.9 m.		

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SAMPLE TYPE LEGEND

☰	Auger Sample	▮	Rock Core	■	Bentonite
▨	Split Spoon Sample	▨	Hiller Peat Sampler	░	Sand
▥	Bulk Sample	▯	70mm Thin Wall Tube	▩	Slough

ENCLOSURE 14

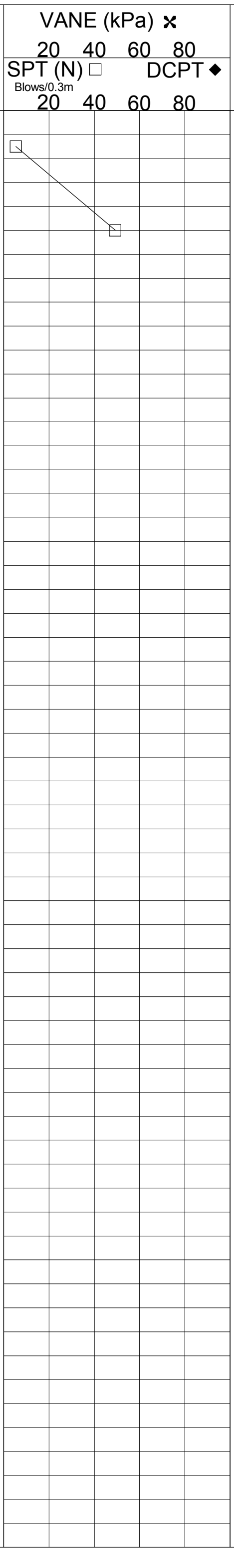
LOG OF BOREHOLE BH15-14

DST REF. No.:**OE-OT-015358**
CLIENT: **Canada Lands Company (CLC)**
PROJECT: **Phase 1A Development - Site Servicing**
LOCATION:**Former CFB Rockliffe, Ottawa Ontario**
SURFACE ELEVATION: 87.77 N/A

Drilling Data
METHOD: **Hollow Stem Auger**
DIAMETER: **200 mm**
DATE: **August 21, 2015**
COORDINATES: **5033470.374** m N, **450323.531** m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE W	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
					TOPSOIL ~ 75 mm				
					FILL - SAND AND GRAVEL - silty, brown ~ 100 mm	SS1	Split Spoon	6	
	87				ORGANIC SAND - Silty, some roots and rootlets, black				
1.0						SS2	Split Spoon	50+	
					CLAY - Silty, some sand and gravel, brown				
	86				End of Borehole at 1.1 m. Auger Refusal				
2.0									
	85								
3.0									
	84								
4.0									
	83								
5.0									
	82								
6.0									
	81								
7.0									
	80								
8.0									
	79								
9.0									
	78								
10.0									
	77								
11.0									
	76								

% MOISTURE: W_p W W_l; 20 40 60 80



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SAMPLE TYPE LEGEND

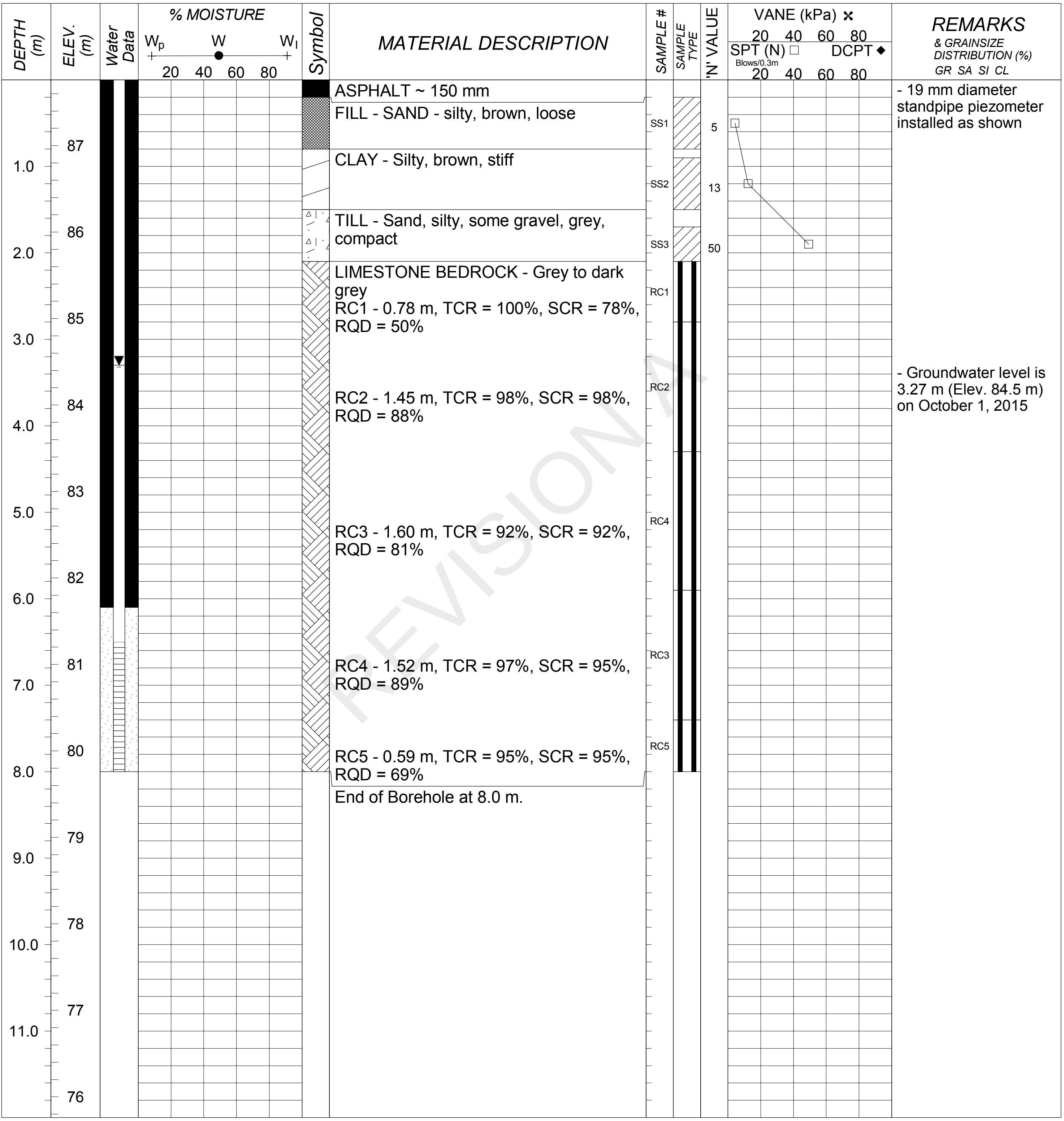
▤ Auger Sample	▥ Rock Core	■ Bentonite
▨ Split Spoon Sample	▧ Hiller Peat Sampler	░ Sand
▥ Bulk Sample	▯ 70mm Thin Wall Tube	▩ Slough

ENCLOSURE 15

LOG OF BOREHOLE BH15-15

DST REF. No.:**OE-OT-015358**
CLIENT: **Canada Lands Company (CLC)**
PROJECT: **Phase 1A Development - Site Servicing**
LOCATION:**Former CFB Rockliffe, Ottawa Ontario**
SURFACE ELEVATION: 87.76 N/A

Drilling Data
METHOD: **Hollow Stem Auger/ NQ Size Core Barrel**
DIAMETER: **200 mm**
DATE: **August 26, 2015**
COORDINATES: **5033477.421** m N, **450420.068** m E



MATERIAL DESCRIPTION	SAMPLE #	'N' VALUE
ASPHALT ~ 150 mm		
FILL - SAND - silty, brown, loose	SS1	5
CLAY - Silty, brown, stiff	SS2	13
TILL - Sand, silty, some gravel, grey, compact	SS3	50
LIMESTONE BEDROCK - Grey to dark grey RC1 - 0.78 m, TCR = 100%, SCR = 78%, RQD = 50%	RC1	
RC2 - 1.45 m, TCR = 98%, SCR = 98%, RQD = 88%	RC2	
RC3 - 1.60 m, TCR = 92%, SCR = 92%, RQD = 81%	RC4	
RC4 - 1.52 m, TCR = 97%, SCR = 95%, RQD = 89%	RC3	
RC5 - 0.59 m, TCR = 95%, SCR = 95%, RQD = 69%	RC5	
End of Borehole at 8.0 m.		

REMARKS
& GRAINSIZE DISTRIBUTION (%)
GR SA SI CL

- 19 mm diameter standpipe piezometer installed as shown
- Groundwater level is 3.27 m (Elev. 84.5 m) on October 1, 2015

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SAMPLE TYPE LEGEND

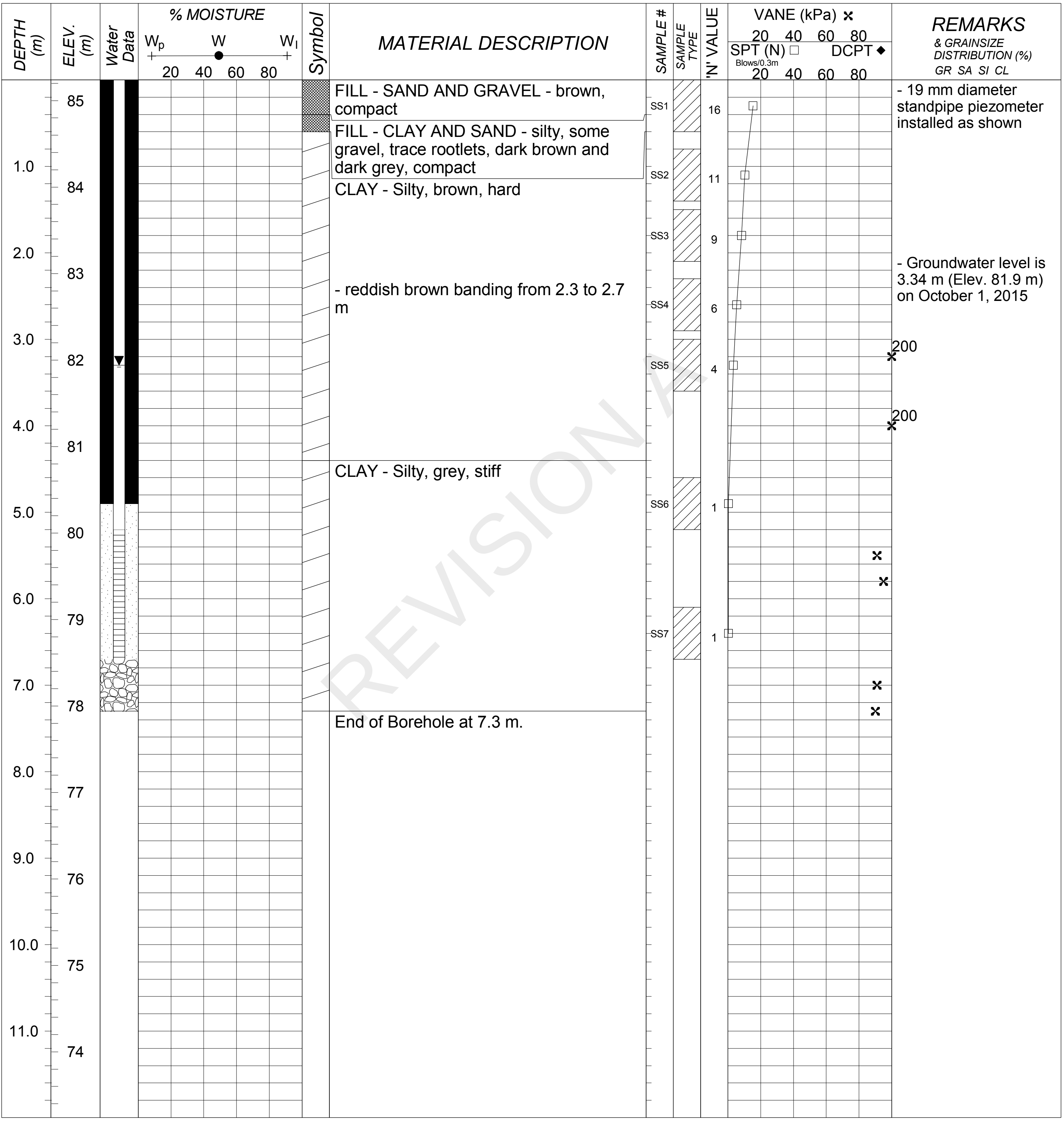
☰ Auger Sample	▮ Rock Core	■ Bentonite
▨ Split Spoon Sample	▧ Hiller Peat Sampler	░ Sand
▥ Bulk Sample	▯ 70mm Thin Wall Tube	▩ Slough

ENCLOSURE 16

LOG OF BOREHOLE BH15-16

DST REF. No.:**OE-OT-015358**
CLIENT: **Canada Lands Company (CLC)**
PROJECT: **Phase 1A Development - Site Servicing**
LOCATION:**Former CFB Rockliffe, Ottawa Ontario**
SURFACE ELEVATION: 85.24 N/A

Drilling Data
METHOD: **Hollow Stem Auger**
DIAMETER: **200 mm**
DATE: **August 21, 2015**
COORDINATES: **5033243.095** m N, **450192.969** m E



FILL - SAND AND GRAVEL - brown, compact

FILL - CLAY AND SAND - silty, some gravel, trace rootlets, dark brown and dark grey, compact

CLAY - Silty, brown, hard

- reddish brown banding from 2.3 to 2.7 m

CLAY - Silty, grey, stiff

End of Borehole at 7.3 m.

SAMPLE #	'N' VALUE
SS1	16
SS2	11
SS3	9
SS4	6
SS5	4
SS6	1
SS7	1

- 19 mm diameter standpipe piezometer installed as shown

- Groundwater level is 3.34 m (Elev. 81.9 m) on October 1, 2015

BOREHOLE (STANDARD) - OTTAWA PROJECT.GPJ DST_MIN.GDT 11/6/15

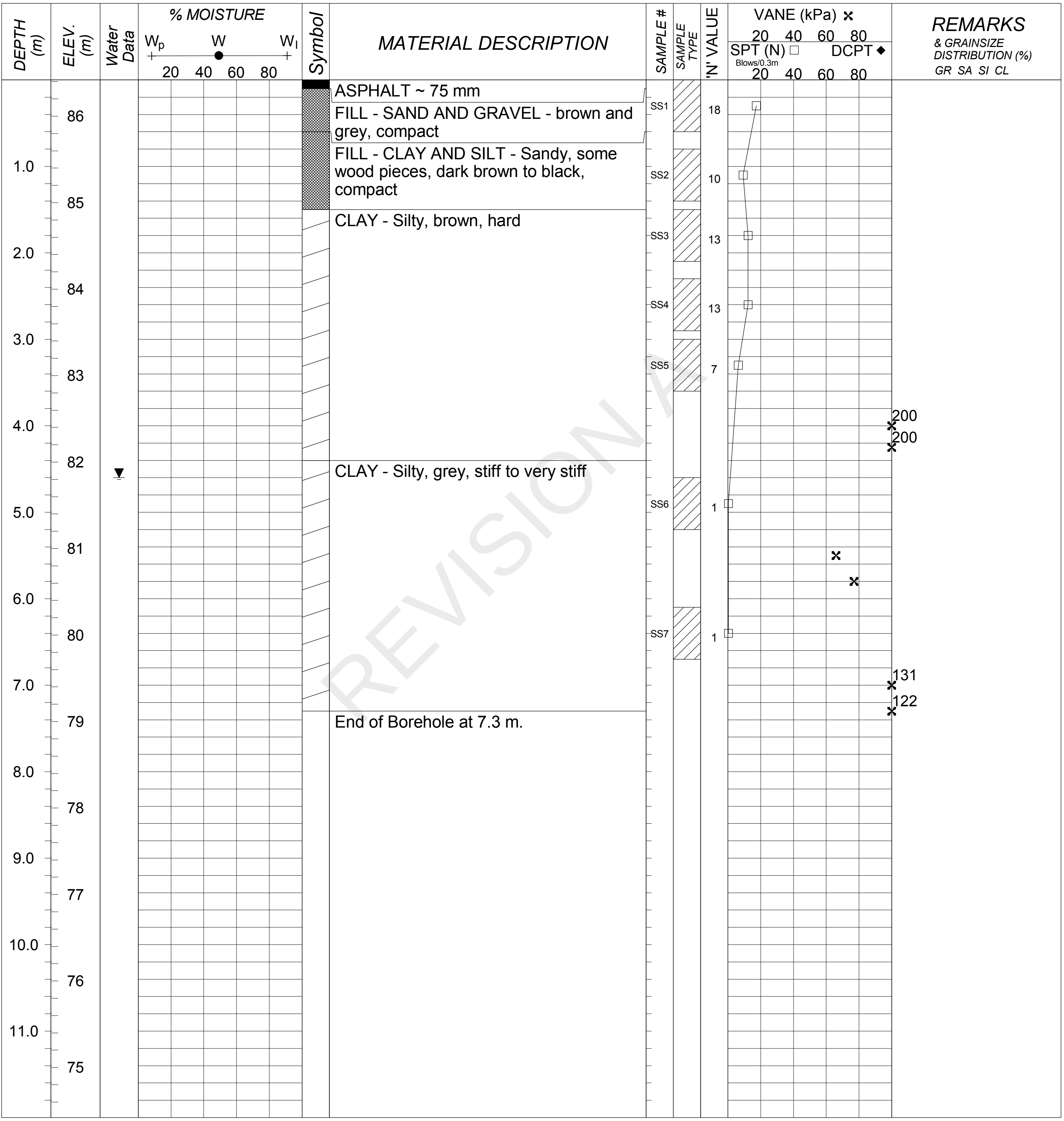
SAMPLE TYPE LEGEND

☰	Auger Sample	▥	Rock Core	■	Bentonite
▨	Split Spoon Sample	▧	Hiller Peat Sampler	░	Sand
▥	Bulk Sample	▯	70mm Thin Wall Tube	▩	Slough

LOG OF BOREHOLE BH15-17

DST REF. No.:**OE-OT-015358**
CLIENT: **Canada Lands Company (CLC)**
PROJECT: **Phase 1A Development - Site Servicing**
LOCATION:**Former CFB Rockliffe, Ottawa Ontario**
SURFACE ELEVATION: 86.42 N/A

Drilling Data
METHOD: **Hollow Stem Auger**
DIAMETER: **200 mm**
DATE: **August 21, 2015**
COORDINATES: **5033291.753** m N, **450306.8** m E



MATERIAL DESCRIPTION

ASPHALT ~ 75 mm

FILL - SAND AND GRAVEL - brown and grey, compact

FILL - CLAY AND SILT - Sandy, some wood pieces, dark brown to black, compact

CLAY - Silty, brown, hard

CLAY - Silty, grey, stiff to very stiff

End of Borehole at 7.3 m.

SAMPLE #	'N' VALUE
SS1	18
SS2	10
SS3	13
SS4	13
SS5	7
SS6	1
SS7	1

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SAMPLE TYPE LEGEND

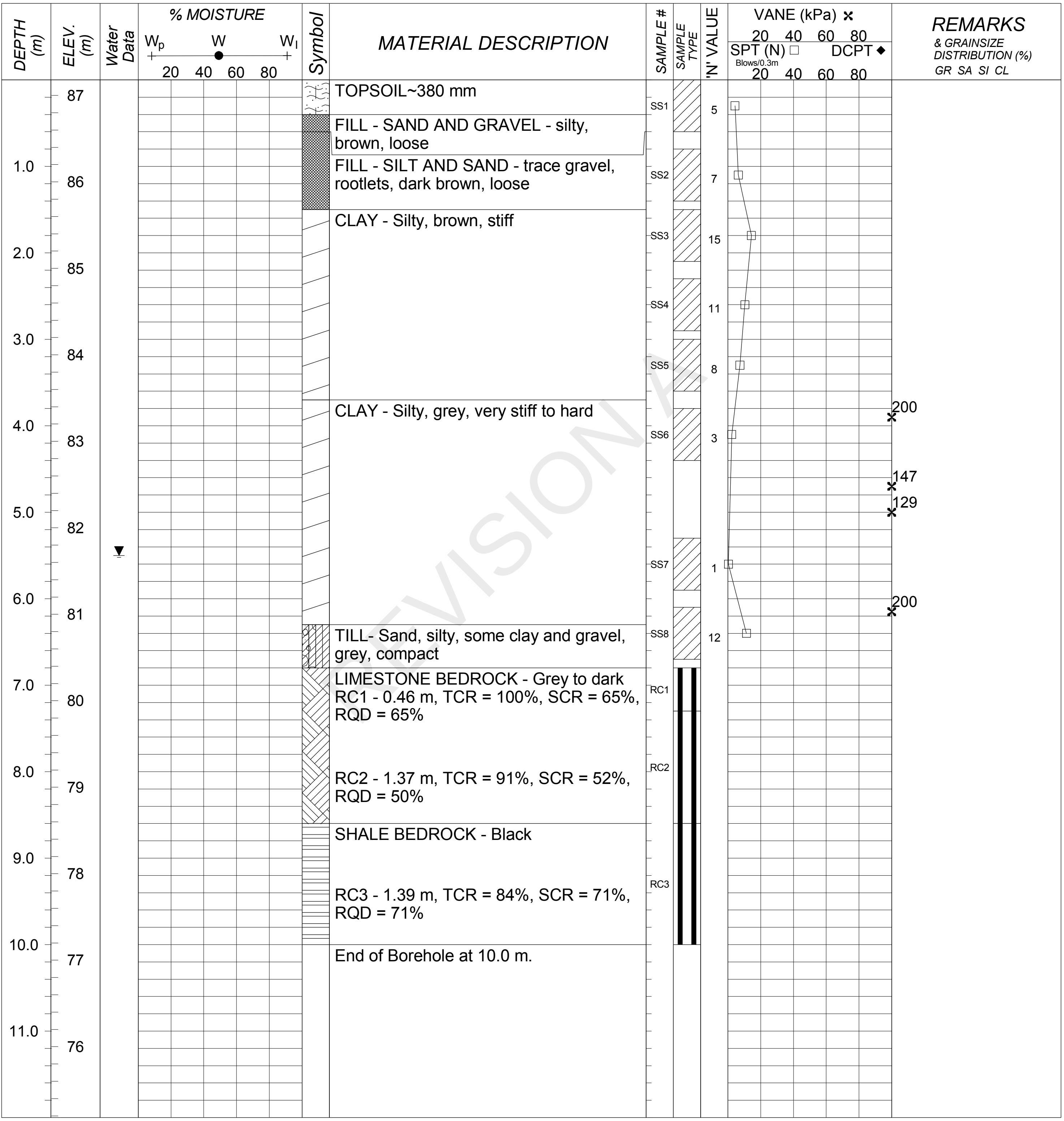
▤ Auger Sample	▥ Rock Core	■ Bentonite
▨ Split Spoon Sample	▧ Hiller Peat Sampler	░ Sand
▥ Bulk Sample	▯ 70mm Thin Wall Tube	▩ Slough

ENCLOSURE 18

LOG OF BOREHOLE BH15-18

DST REF. No.:**OE-OT-015358**
CLIENT: **Canada Lands Company (CLC)**
PROJECT: **Phase 1A Development - Site Servicing**
LOCATION:**Former CFB Rockliffe, Ottawa Ontario**
SURFACE ELEVATION: 87.18 N/A

Drilling Data
METHOD: **Hollow Stem Auger/ NQ Size Core Barrel**
DIAMETER: **200 mm**
DATE: **August 24, 2015**
COORDINATES: **5033318.423** m N, **450416.451** m E



TOPSOIL~380 mm

FILL - SAND AND GRAVEL - silty, brown, loose

FILL - SILT AND SAND - trace gravel, rootlets, dark brown, loose

CLAY - Silty, brown, stiff

CLAY - Silty, grey, very stiff to hard

TILL- Sand, silty, some clay and gravel, grey, compact

LIMESTONE BEDROCK - Grey to dark
RC1 - 0.46 m, TCR = 100%, SCR = 65%, RQD = 65%

RC2 - 1.37 m, TCR = 91%, SCR = 52%, RQD = 50%

SHALE BEDROCK - Black

RC3 - 1.39 m, TCR = 84%, SCR = 71%, RQD = 71%

End of Borehole at 10.0 m.

SAMPLE #	'N' VALUE
SS1	5
SS2	7
SS3	15
SS4	11
SS5	8
SS6	3
SS7	1
SS8	12
RC1	
RC2	
RC3	

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SAMPLE TYPE LEGEND

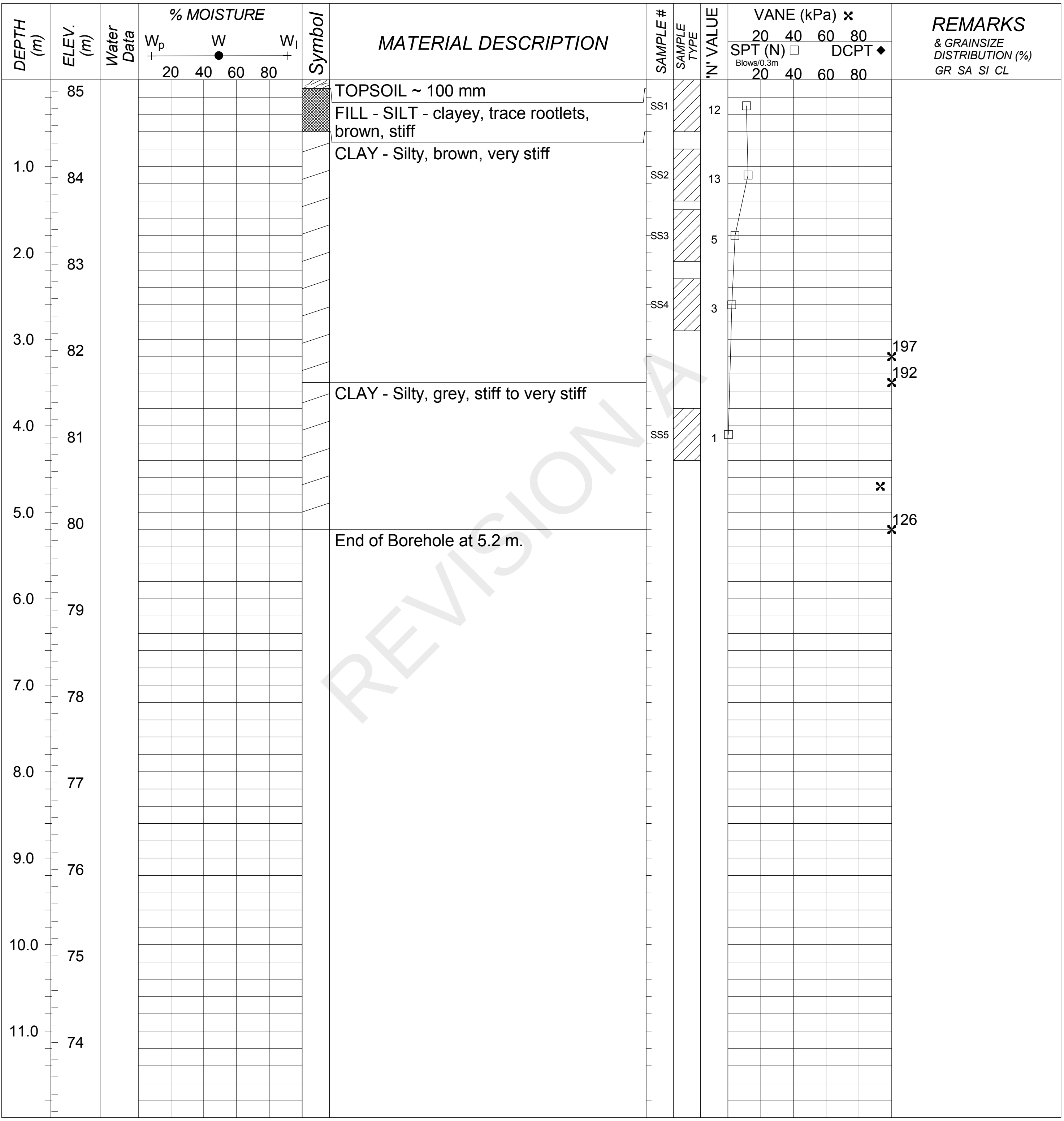
☰	Auger Sample	‖	Rock Core	■	Bentonite
▨	Split Spoon Sample	▧	Hiller Peat Sampler	░	Sand
⦀	Bulk Sample	▯	70mm Thin Wall Tube	▩	Slough

ENCLOSURE 19

LOG OF BOREHOLE BH15-30

DST REF. No.:**OE-OT-015358**
CLIENT: **Canada Lands Company (CLC)**
PROJECT: **Phase 1A Development - Site Servicing**
LOCATION:**Former CFB Rockliffe, Ottawa Ontario**
SURFACE ELEVATION: 85.13 N/A

Drilling Data
METHOD: **Hollow Stem Auger**
DIAMETER: **200 mm**
DATE: **August 25, 2015**
COORDINATES: **5033117.379** m N, **450143.42** m E



MATERIAL DESCRIPTION
TOPSOIL ~ 100 mm
FILL - SILT - clayey, trace rootlets, brown, stiff
CLAY - Silty, brown, very stiff
CLAY - Silty, grey, stiff to very stiff
End of Borehole at 5.2 m.

SAMPLE #	'N' VALUE
SS1	12
SS2	13
SS3	5
SS4	3
SS5	1

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SAMPLE TYPE LEGEND

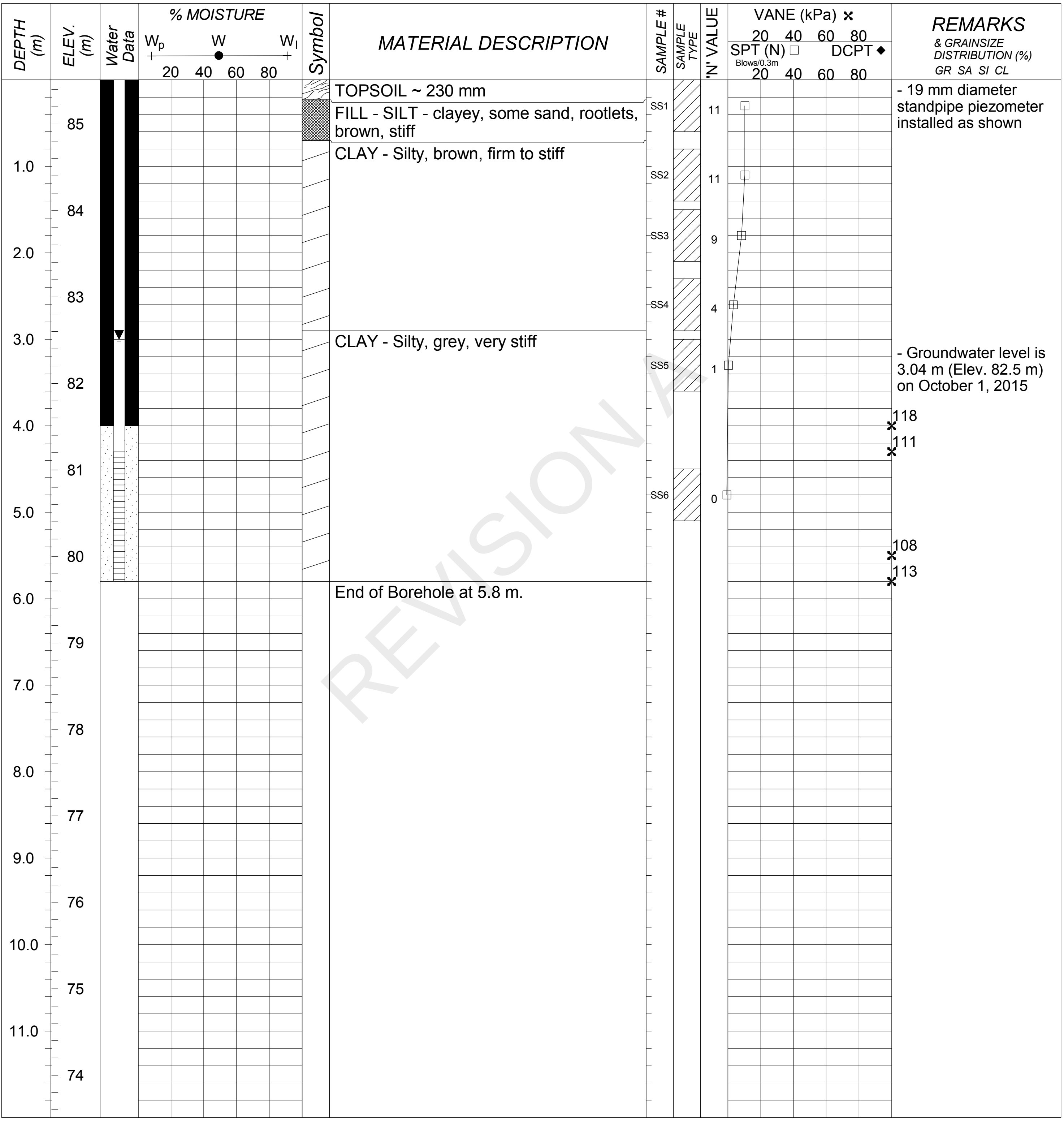
▤	Auger Sample	▮	Rock Core	■	Bentonite
▨	Split Spoon Sample	▧	Hiller Peat Sampler	░	Sand
▥	Bulk Sample	▯	70mm Thin Wall Tube	▩	Slough

ENCLOSURE 32

LOG OF BOREHOLE BH15-31

DST REF. No.:**OE-OT-015358**
CLIENT: **Canada Lands Company (CLC)**
PROJECT: **Phase 1A Development - Site Servicing**
LOCATION:**Former CFB Rockliffe, Ottawa Ontario**
SURFACE ELEVATION: 85.51 N/A

Drilling Data
METHOD: **Hollow Stem Auger**
DIAMETER: **200 mm**
DATE: **August 26, 2015**
COORDINATES: **5033162.451** m N, **450228.648** m E



MATERIAL DESCRIPTION
TOPSOIL ~ 230 mm
FILL - SILT - clayey, some sand, rootlets, brown, stiff
CLAY - Silty, brown, firm to stiff
CLAY - Silty, grey, very stiff
End of Borehole at 5.8 m.

SAMPLE #	'N' VALUE
SS1	11
SS2	11
SS3	9
SS4	4
SS5	1
SS6	0

VANE (kPa): 118, 111, 108, 113

REMARKS & GRAINSIZE DISTRIBUTION (%)
GR SA SI CL

- 19 mm diameter standpipe piezometer installed as shown
- Groundwater level is 3.04 m (Elev. 82.5 m) on October 1, 2015

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SAMPLE TYPE LEGEND

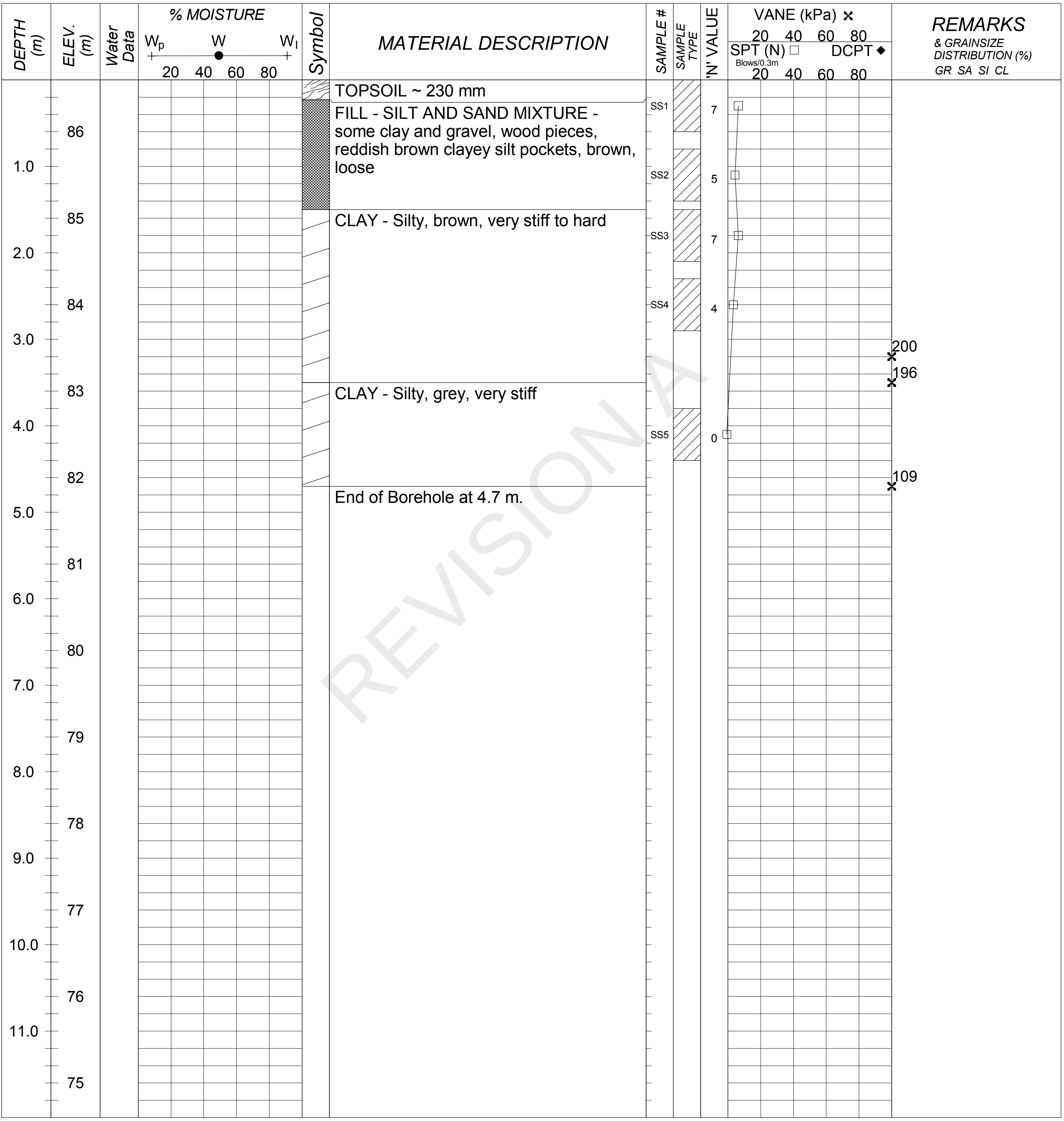
▤	Auger Sample	▮	Rock Core	■	Bentonite
▨	Split Spoon Sample	▩	Hiller Peat Sampler	░	Sand
▥	Bulk Sample	▯	70mm Thin Wall Tube	▦	Slough

ENCLOSURE 33

LOG OF BOREHOLE BH15-32

DST REF. No.:**OE-OT-015358**
CLIENT: **Canada Lands Company (CLC)**
PROJECT: **Phase 1A Development - Site Servicing**
LOCATION:**Former CFB Rockliffe, Ottawa Ontario**
SURFACE ELEVATION: 86.60 N/A

Drilling Data
METHOD: **Hollow Stem Auger**
DIAMETER: **200 mm**
DATE: **August 26, 2015**
COORDINATES: **5033207.38** m N, **450340.36** m E



TOPSOIL ~ 230 mm

FILL - SILT AND SAND MIXTURE - some clay and gravel, wood pieces, reddish brown clayey silt pockets, brown, loose

CLAY - Silty, brown, very stiff to hard

CLAY - Silty, grey, very stiff

End of Borehole at 4.7 m.

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SAMPLE TYPE LEGEND

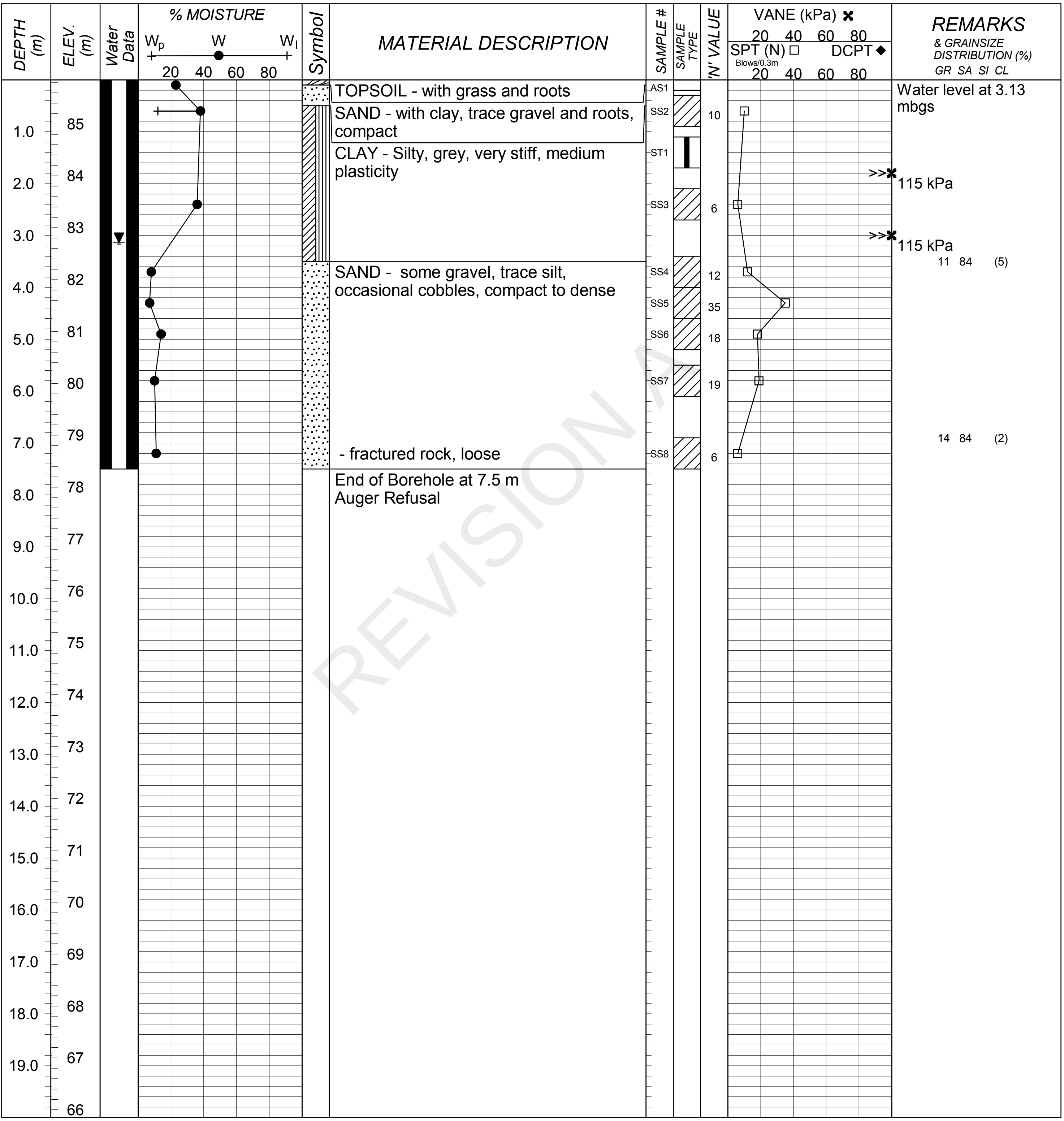
- ☰ Auger Sample
- ▨ Split Spoon Sample
- ▥ Bulk Sample
- ▮ Rock Core
- ▧ Hiller Peat Sampler
- ▯ 70mm Thin Wall Tube
- ■ Bentonite
- ░ Sand
- ▩ Slough

ENCLOSURE 34

LOG OF BOREHOLE BH14-30

DST REF. No.: **OE-OT-015358**
CLIENT: **Canada Lands Company**
PROJECT: **Former CFB Rockcliffe**
LOCATION: **Ottawa, Ontario**
SURFACE ELEV.: **85.85 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
DIAMETER: **80 mm ID**
DATE: **February 24, 2014**
COORDINATES: **5033327.89** m N, **450239.28** m E



MATERIAL DESCRIPTION
TOPSOIL - with grass and roots
SAND - with clay, trace gravel and roots, compact
CLAY - Silty, grey, very stiff, medium plasticity
SAND - some gravel, trace silt, occasional cobbles, compact to dense
- fractured rock, loose
End of Borehole at 7.5 m Auger Refusal

SAMPLE #	'N' VALUE
AS1	
SS2	10
ST1	
SS3	6
SS4	12
SS5	35
SS6	18
SS7	19
SS8	6

REMARKS & GRAINSIZE DISTRIBUTION (%)
GR SA SI CL

Water level at 3.13 mbgs

115 kPa

115 kPa

11 84 (5)

14 84 (2)

DST Consulting Engineers Inc.
203 - 2150 THURSTON DRIVE
OTTAWA, ONTARIO, K1G 5T9
PH: (613)748-1415
FX: (613)748-1356
Email: ottawa@dstgroup.com
Web: www.dstgroup.com

SAMPLE TYPE LEGEND

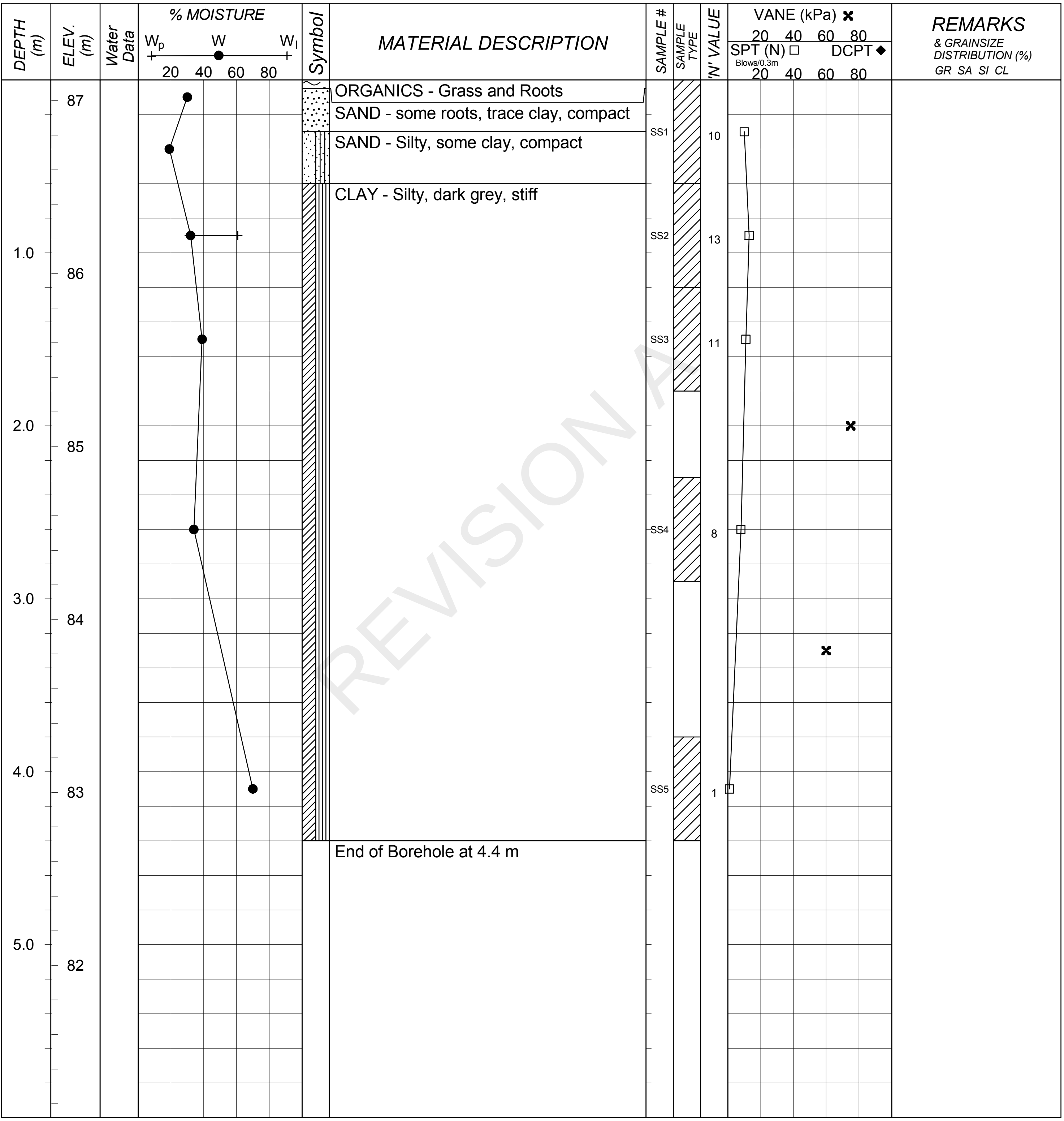
- ☰ Auger Sample
- ▨ Split Spoon Sample
- ▥ Bulk Sample
- ▩ Rock Core
- ▧ Hiller Peat Sampler
- ▯ 70mm Thin Wall Tube
- ■ Bentonite
- ░ Sand

ENCLOSURE 5

LOG OF BOREHOLE BH13-01

DST REF. No.: **OE-OT-017184**
CLIENT: **Canada Lands Company (CLC)**
PROJECT: **Storm Water Infiltration Ponds**
LOCATION: **Former CFB Rockcliffe, Ottawa, Ontario**
SURFACE ELEV.: **87.12 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
DIAMETER: **80 mm ID**
DATE: **August 7, 2013**
COORDINATES: **5033357.4** m N, **450411** m E



ORGANICS - Grass and Roots

SAND - some roots, trace clay, compact

SAND - Silty, some clay, compact

CLAY - Silty, dark grey, stiff

End of Borehole at 4.4 m

SS1	10
SS2	13
SS3	11
SS4	8
SS5	1

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Web: www.dstgroup.com

SAMPLE TYPE LEGEND

- ☰ Auger Sample
- ▨ Split Spoon Sample
- ▥ Bulk Sample
- ▩ Rock Core
- ▧ Hiller Peat Sampler
- ◫ 70mm Thin Wall Tube
- ■ Bentonite
- ░ Sand

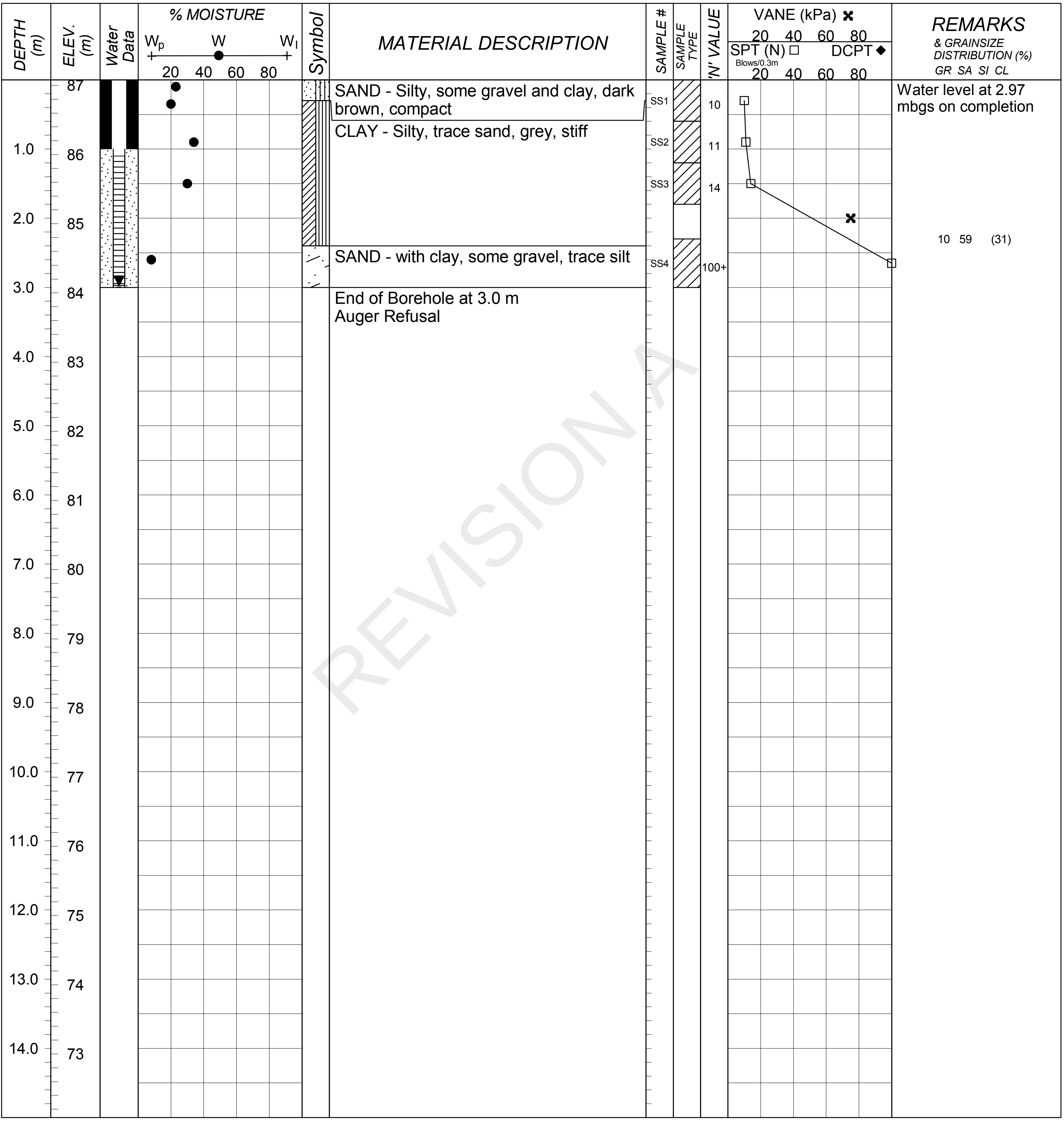
ENCLOSURE 1

BOREHOLE (STANDARD) - OTTAWA OE-OT-017184 CFB ROCKCLIFFE.GPJ DST_MIN.GDT 5/6/14

LOG OF BOREHOLE BH13-02

DST REF. No.: **OE-OT-017184**
CLIENT: **Canada Lands Company (CLC)**
PROJECT: **Stormwater Management Plan**
LOCATION: **Former CFB Rockcliffe, Ottawa, Ontario**
SURFACE ELEV.: **87.08 metres**

Drilling Data
METHOD: **Hollow Stem Auger**
DIAMETER: **80 mm ID**
DATE: **August 7, 2013**
COORDINATES: **5033403.6** m N, **450399.3** m E



MATERIAL DESCRIPTION

SAND - Silty, some gravel and clay, dark brown, compact

CLAY - Silty, trace sand, grey, stiff

SAND - with clay, some gravel, trace silt

End of Borehole at 3.0 m
Auger Refusal

SAMPLE #	'N' VALUE
SS1	10
SS2	11
SS3	14
SS4	100+

REMARKS

& GRAINSIZE DISTRIBUTION (%)

Water level at 2.97 mbgs on completion

GR	SA	SI	CL
10	59	(31)	

DST consulting engineers

DST Consulting Engineers Inc.
Email: thunderbay@dstgroup.com
Web: www.dstgroup.com

SAMPLE TYPE LEGEND

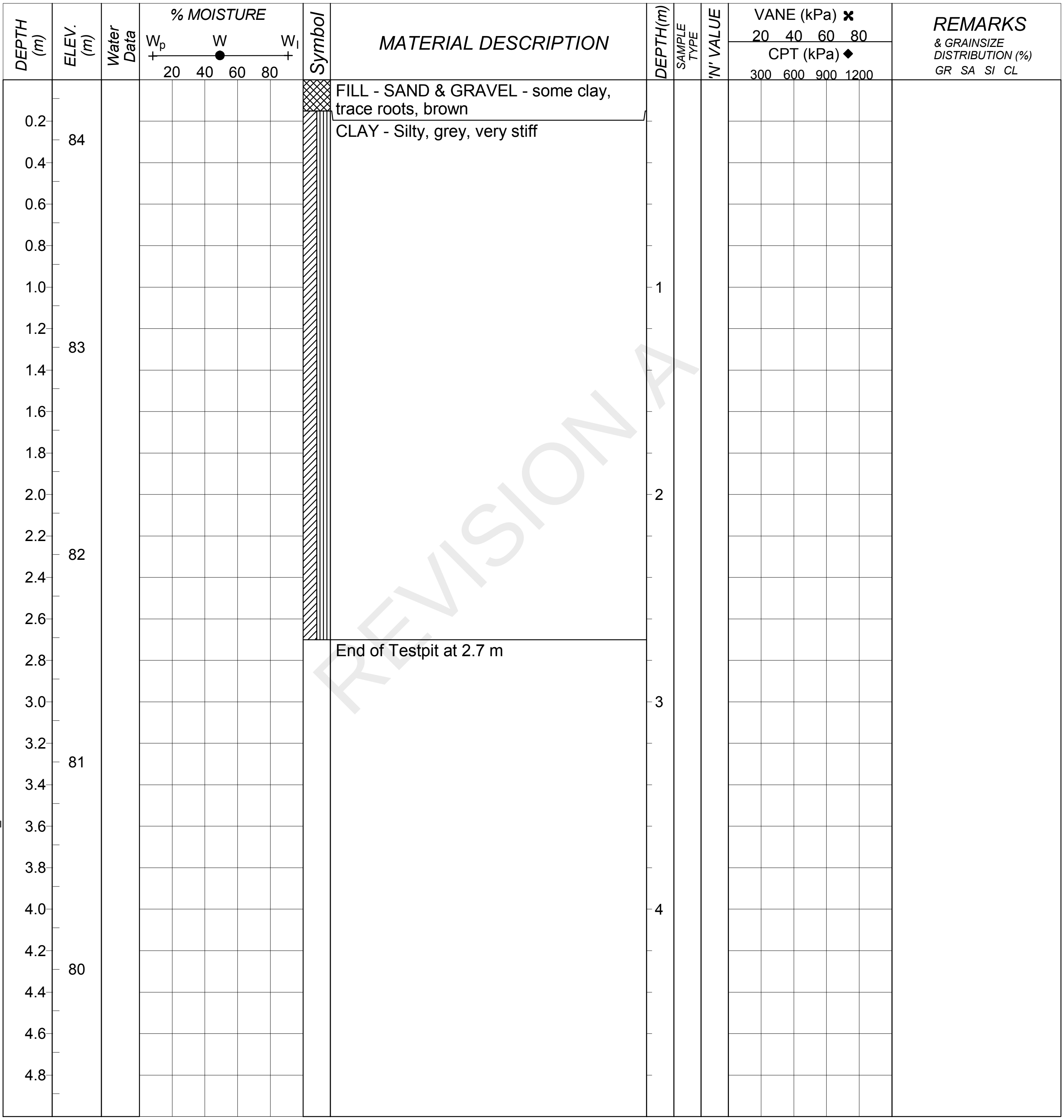
- ▤ Auger Sample
- ▨ Split Spoon Sample
- ▥ Bulk Sample
- ▩ Rock Core
- ▧ Hiller Peat Sampler
- ◫ 70mm Thick Wall Tube
- ■ Bentonite
- ░ Sand

ENCLOSURE 2

LOG OF TESTPIT TP13-08

DST REF. No.: **OE-OT-017184**
CLIENT: **Canada Lands Company (CLC)**
PROJECT: **Stormwater Management Plan**
LOCATION: **Former CFB Rockcliffe, Ottawa, Ontario**
SURFACE ELEV.: **84.29 metres**

Testpit Data
METHOD: **Excavator**
DATE: **9/4/2013**
COORDINATES: **5033198.1** m N, **450085.4** m E



FILL - SAND & GRAVEL - some clay, trace roots, brown

CLAY - Silty, grey, very stiff

End of Testpit at 2.7 m

DST consulting engineers

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Web: www.dstgroup.com

SAMPLE TYPE LEGEND

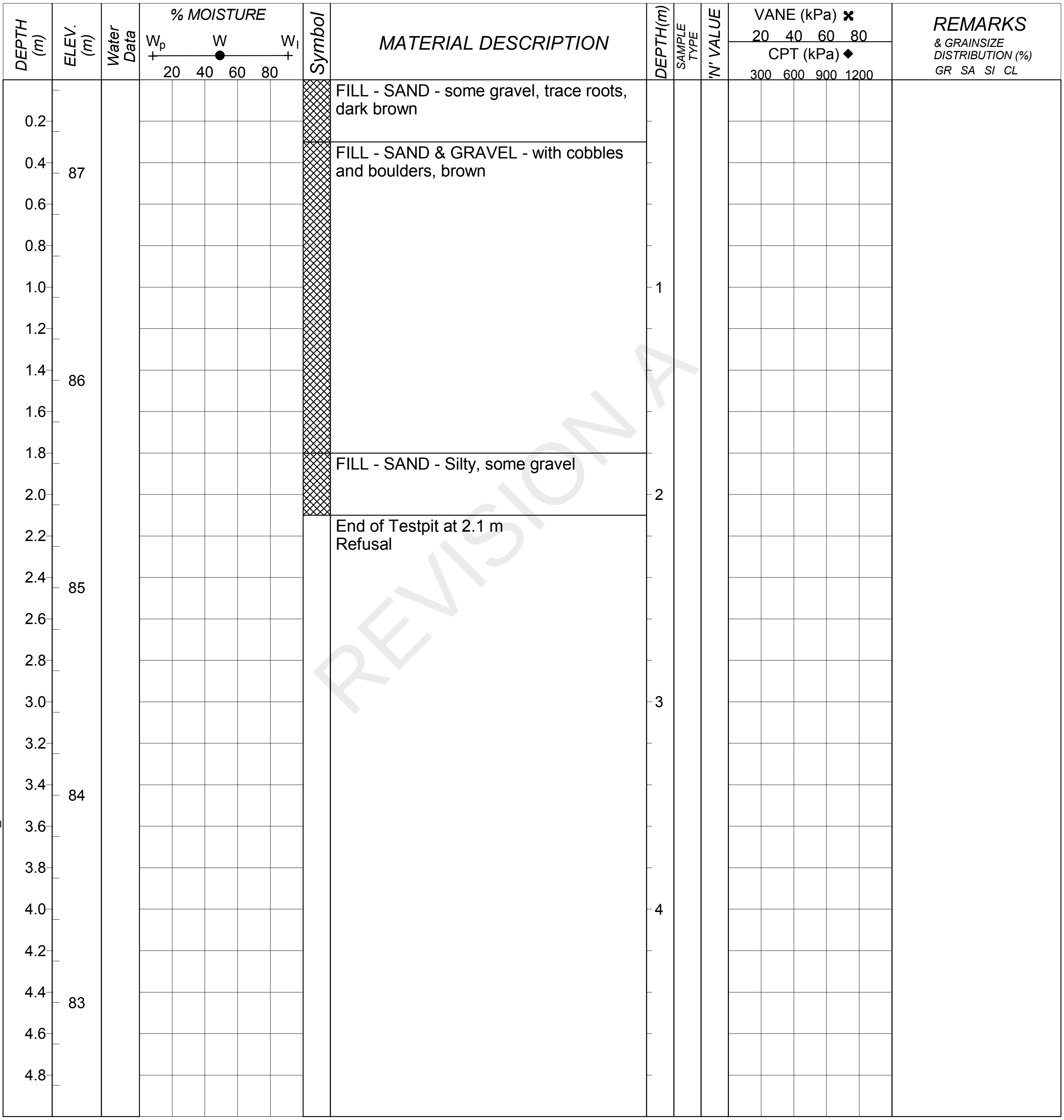
▥ Bulk Sample

ENCLOSURE 8

LOG OF TESTPIT TP13-09

DST REF. No.: **OE-OT-017184**
CLIENT: **Canada Lands Company (CLC)**
PROJECT: **Stormwater Management Plan**
LOCATION: **Former CFB Rockcliffe, Ottawa, Ontario**
SURFACE ELEV.: **87.45 metres**

Testpit Data
METHOD: **Excavator**
DATE: **9/9/2013**
COORDINATES: **5033428.8** m N, **450315.2** m E



FILL - SAND - some gravel, trace roots, dark brown

FILL - SAND & GRAVEL - with cobbles and boulders, brown

FILL - SAND - Silty, some gravel

End of Testpit at 2.1 m
Refusal

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FX: (613)748-1356
Email: ottawa@dstgroup.com
Web: www.dstgroup.com

SAMPLE TYPE LEGEND

▥ Bulk Sample

ENCLOSURE 9

LOG OF BOREHOLE / MONITORING WELL BHMW9

DST REF. No.: **OE04940**
CLIENT: **Canada Lands Company**
PROJECT: **Steam Line Decommissioning**
LOCATION: **Canadian Forces Base, Rockcliffe, Ottawa, Ontario**
SURFACE ELEV.: **--/--**

Drilling Data
METHOD: **CME 55 Track Mounted Drill Rig**
DIAMETER: **200 mm**

DATE: **November 12 2004**

CCGD *
○ RKI EAGLE (PPM) 20 40 60 80
□ MINIRAE (PPM) 5 10 15 20

SURFACE

PPM	No.	Type	SPT N-Value	MATERIAL DESCRIPTION	REMARKS
				ASPHALT - ~100 mm thick	
0	SS1	▨	23	FILL - sand and gravel, some silt, compact to loose	Groundwater level observed 1.5 m below grade on November 25, 2004.
10	SS2	▨	8	- sand, silty, some clay	Black staining noted. Light odour.
5	SS3	▨	10	CLAY - silty, olive grey, stiff to soft, with depth	
0	SS4	▨	17		
5	SS5	▨	7		
0	SS6	▨	5		
5	SS7	▨	4		
0	SS8	▨	2		
0	SS9	▨	3		
0	SS10	▨	1		

DPTH m: 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0

ELEV m

WATER DATA

End of borehole at 6.1 m depth.

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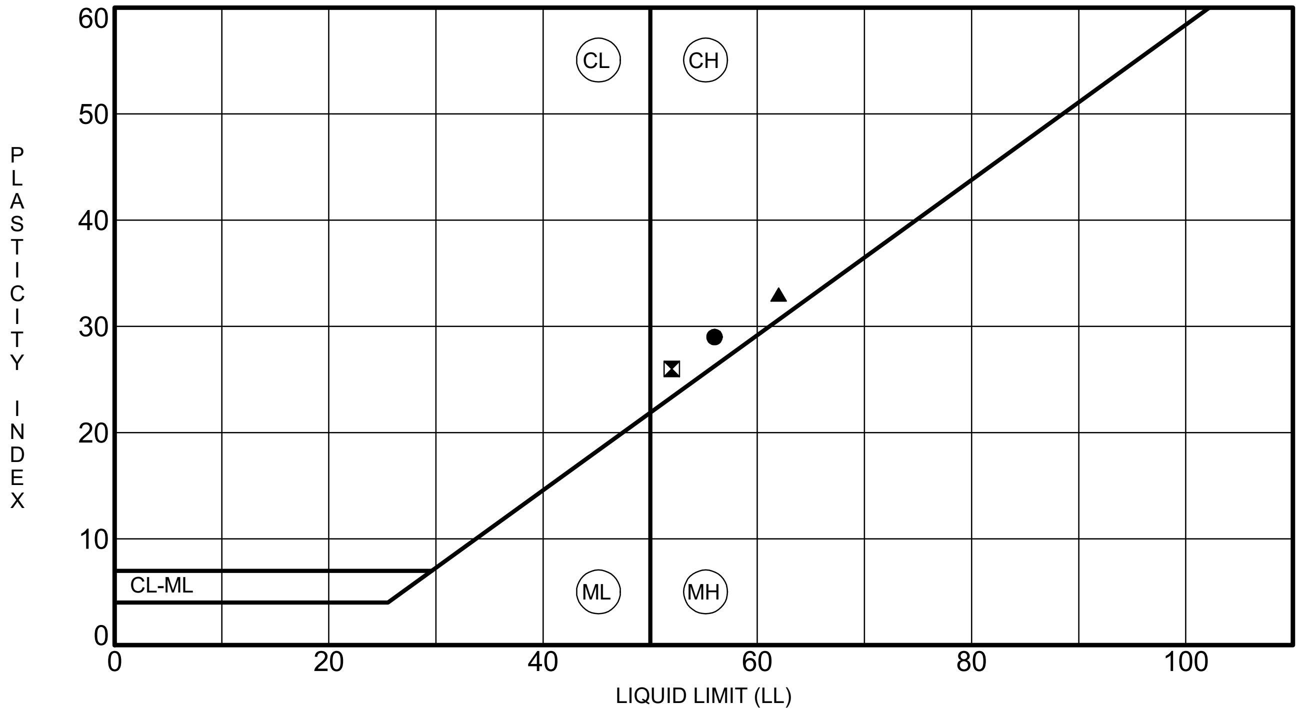
* - Catalytic Combustible Gas Detector

SAMPLE TYPE LEGEND

☐	Auger Sample	■	Rock Core	▥	Ponar Sample
▨	Split Spoon Sample	▩	Side Sampler		
☐	Thin Wall Tube	☐	Grab Sample		

APPENDIX H



Specimen Identification			LL	PL	PI	Fines	Classification
●	**BH 1-25**	**SS4**	**56**	**27**	**29**		**CH - Inorganic clays of high plasticity**
⧗	**BH 2-25**	**SS6**	**52**	**26**	**26**		**CH - Inorganic clays of high plasticity**
▲	**BH 3-25**	**SS4**	**62**	**29**	**33**		**CH - Inorganic clays of high plasticity**

CLIENT **Mattamy Homes**

PROJECT **Geotechnical Investigation - Wateridge Block 15 - Mikinak Road & Vedette Way, Ottawa, Ontario**

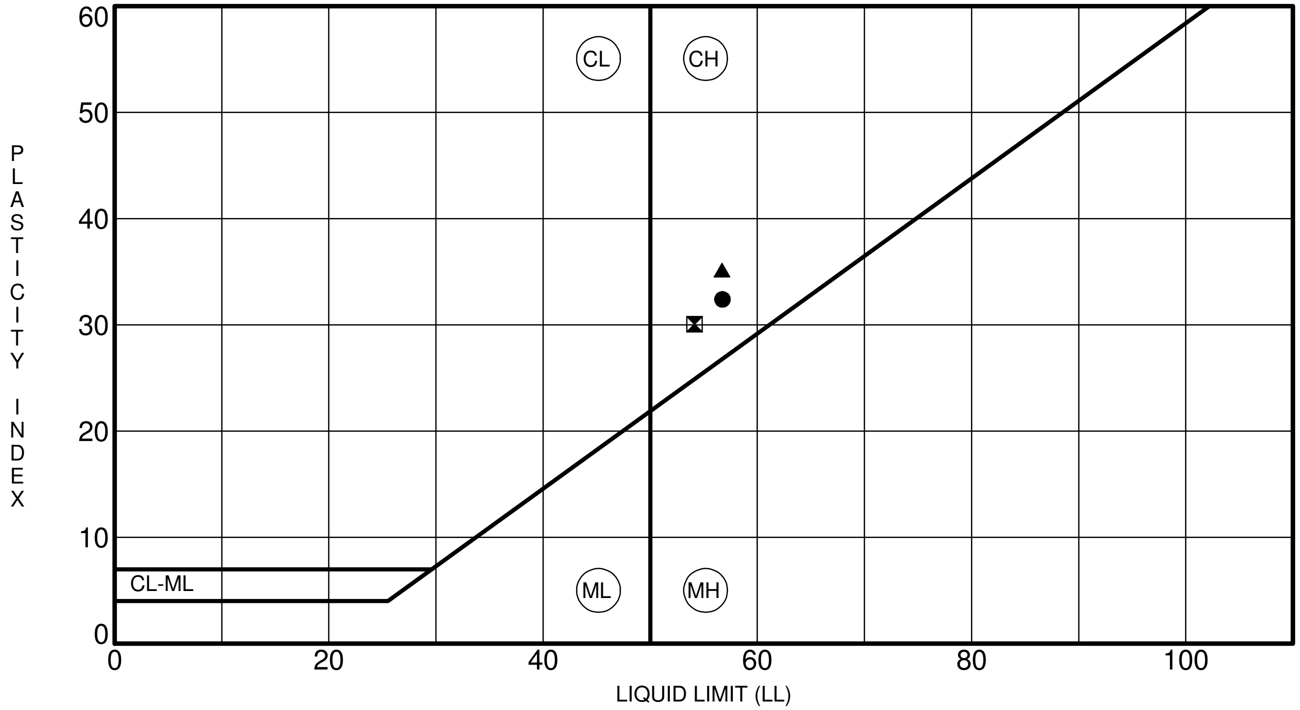
FILE NO. **PG7353**

DATE **31 Mar 25**

PATERSON GROUP

9 Auriga Drive
Ottawa, Ontario
K2E 7T9
TEL: (613) 226-7381

ATTERBERG LIMITS' RESULTS



Specimen Identification			LL	PL	PI	Fines	Classification
●	**BH 3-21**	**SS 3**	**57**	**24**	**32**		**CH - Inorganic clays of high plasticity**
⧗	**BH 4-21**	**SS 5**	**54**	**24**	**30**		**CH - Inorganic clays of high plasticity**
▲	**BH 6-21**	**SS 4**	**57**	**22**	**35**		**CH - Inorganic clays of high plasticity**

CLIENT **Mattamy Homes**

FILE NO. **PG5756**

PROJECT **Geotechnical Investigation - Proposed Residential Subdivision - Phase 3A, 101 Vedette Way**

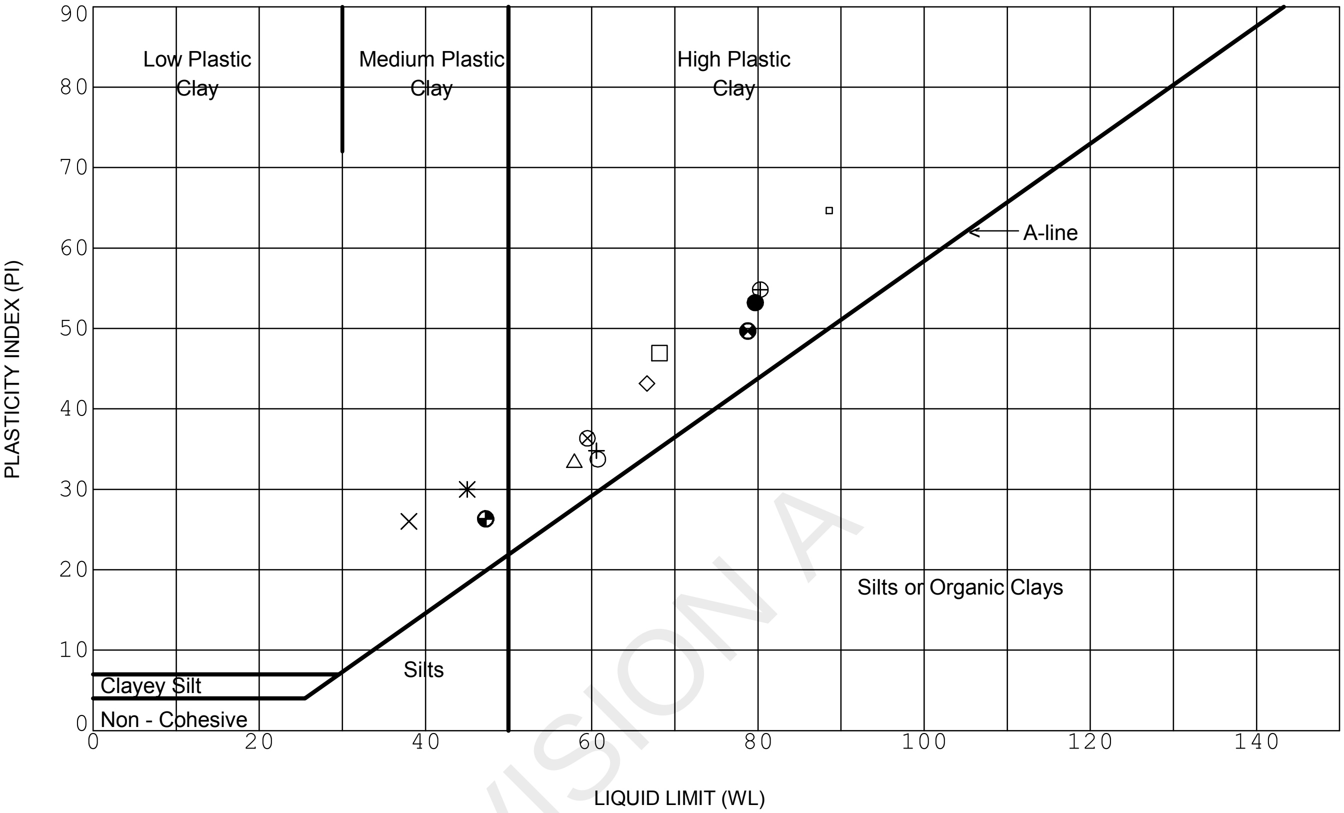
DATE **26 Mar 21**

patersongroup **Consulting Engineers**

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

ATTERBERG LIMITS' RESULTS

ATTERBERG LIMIT TEST RESULTS



LEGEND:

	W_L	W_P	PI	W
□ BOREHOLE BH14-28 DEPTH 3.60	68	21	47	59
✳ BOREHOLE BH14-29 DEPTH 0.50	45	15	30	
× BOREHOLE BH14-30 DEPTH 0.60	38	12	26	44
+ BOREHOLE BH14-31 DEPTH 0.60	61	26	35	38
◇ BOREHOLE BH14-33 DEPTH 1.40	67	23	43	32
△ BOREHOLE BH14-33 DEPTH 10.00	58	24	34	70
○ BOREHOLE BH14-34 DEPTH 0.80	61	27	34	39
▫ BOREHOLE BH14-34 DEPTH 7.80	89	24	65	80
⊗ BOREHOLE BH14-35 DEPTH 0.80	59	23	36	21
⊕ BOREHOLE BH14-37 DEPTH 4.40	80	25	55	89
● BOREHOLE BH14-38 DEPTH 2.40	80	26	53	51
⨂ BOREHOLE BH14-38 DEPTH 7.40	79	29	50	78
◑ BOREHOLE BH14-39 DEPTH 4.90	47	21	26	47

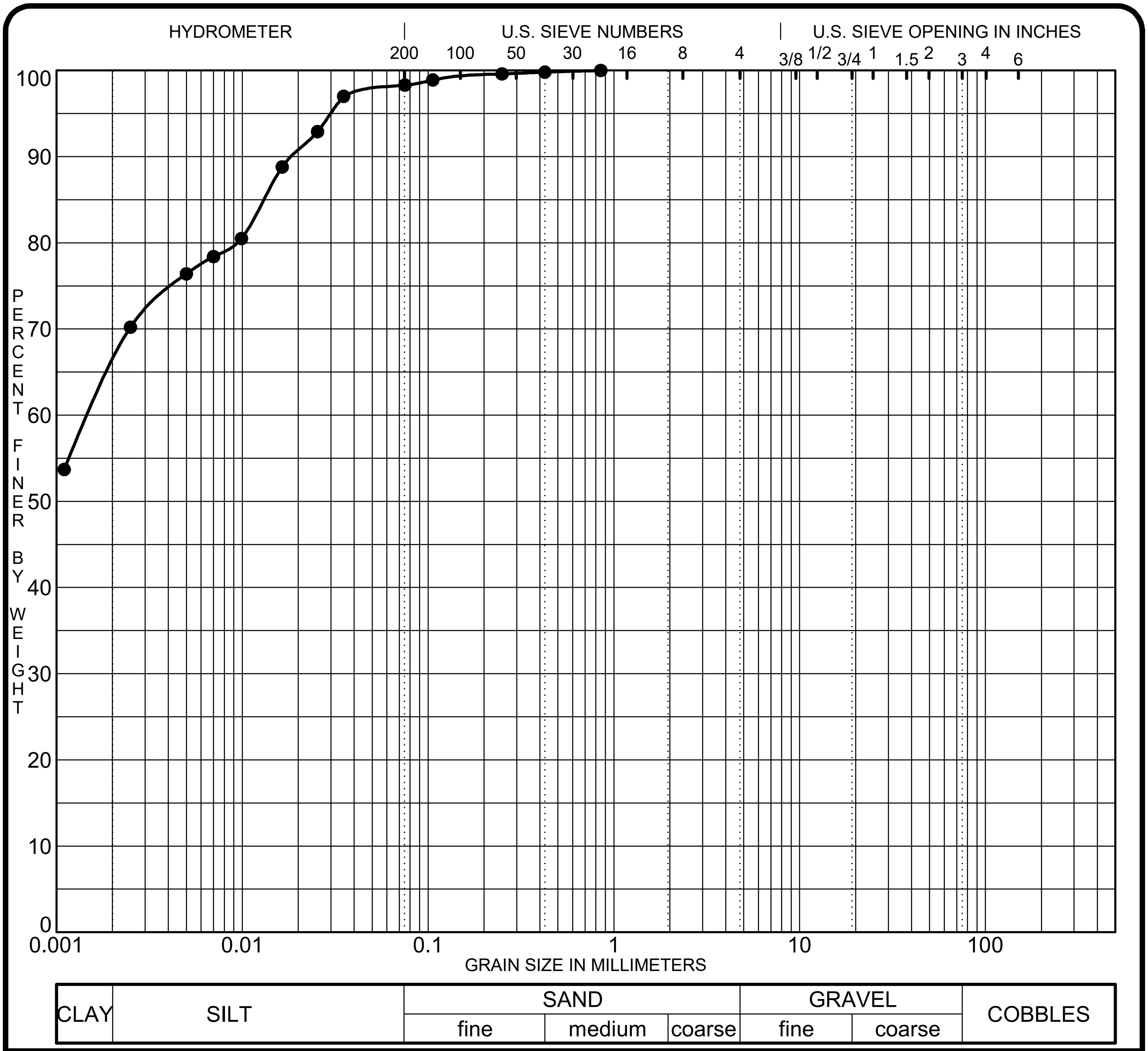
April 2014

Reference No.: OE-OT-015358

Former CFB Rockcliffe -

DST CONSULTING ENGINEERS INC.

Enclosure 20



	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**BH 1-25**	**SS5**		**39.0**					
☒									
▲									
★									

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BH 1-25**	**SS5**	**0.85**	**0.00**			**0.0**	**1.7**	**34.0**	**65.5**
☒										
▲										
★										

CLIENT **Mattamy Homes**

PROJECT **Geotechnical Investigation - Wateridge Block 15 -**
Mikinak Road & Vedette Way, Ottawa, Ontario

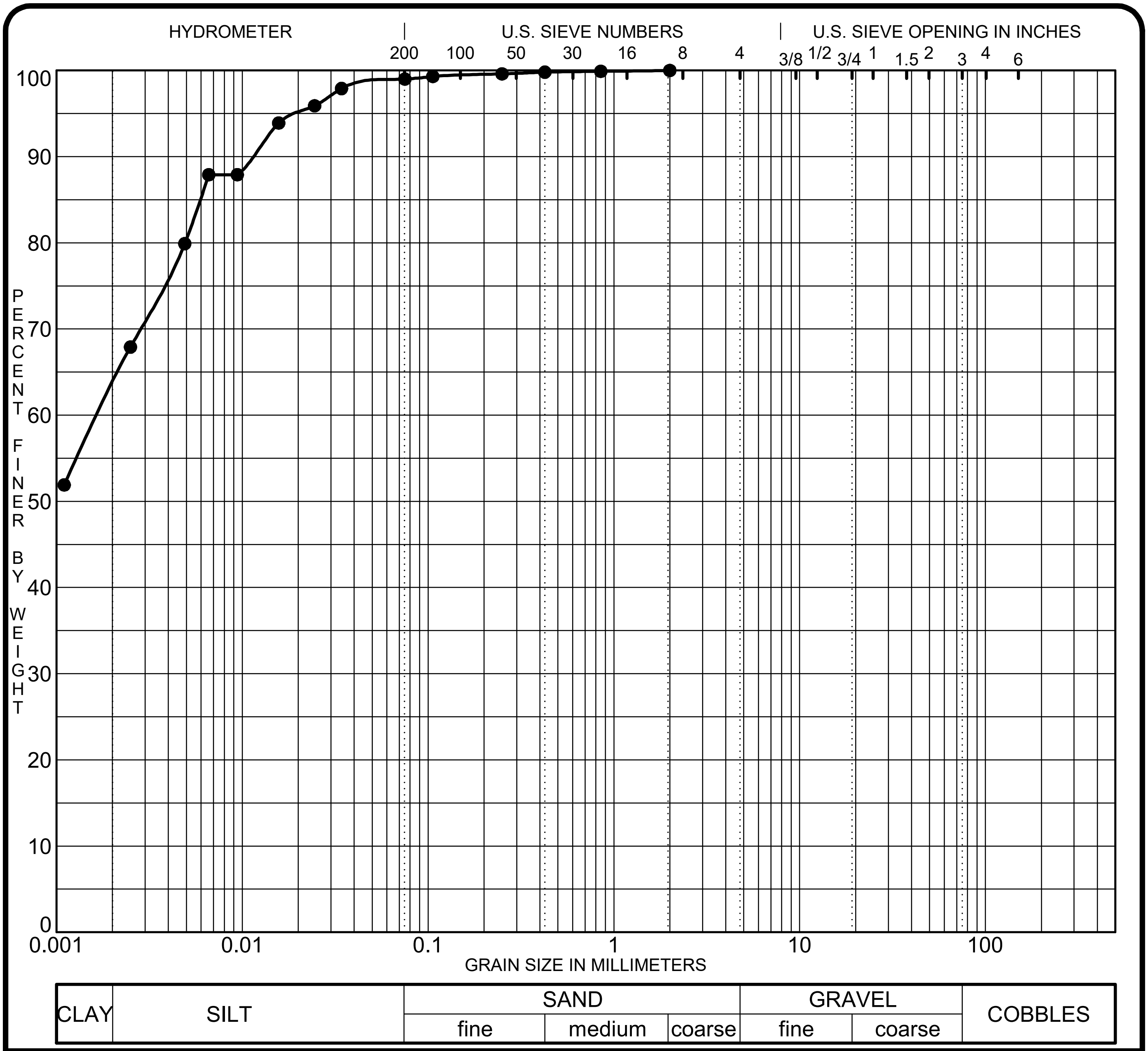
FILE NO. **PG7353**

DATE **31 Mar 25**

PATERSON GROUP

9 Auriga Drive
Ottawa, Ontario
K2E 7T9
TEL: (613) 226-7381

GRAIN SIZE DISTRIBUTION



	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**BH 2-25**	**SS5**							
☒									
▲									
★									

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BH 2-25**	**SS5**	**2.00**	**0.00**			**0.0**	**1.0**	**36.5**	**62.5**
☒										
▲										
★										

CLIENT **Mattamy Homes**

FILE NO. **PG7353**

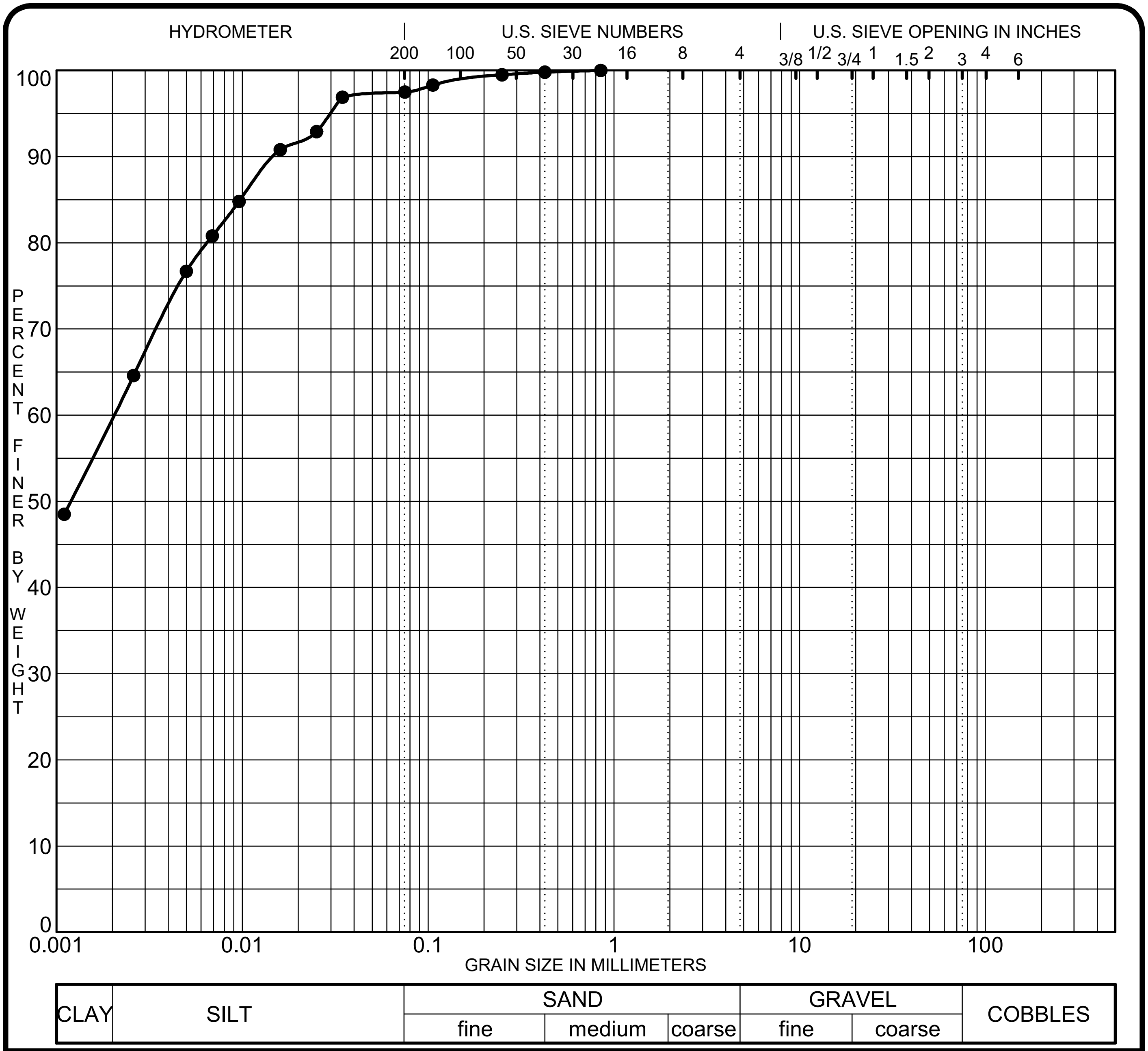
PROJECT **Geotechnical Investigation - Wateridge Block 15 - Mikinak Road & Vedette Way, Ottawa, Ontario**

DATE **31 Mar 25**

PATERSON GROUP

9 Auriga Drive
Ottawa, Ontario
K2E 7T9
TEL: (613) 226-7381

GRAIN SIZE DISTRIBUTION



Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
● **BH 3-25**	**SS3**		**37.5**					
☒								
▲								
★								

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **BH 3-25**	**SS3**	**0.85**	**0.00**			**0.0**	**2.5**	**38.0**	**59.5**
☒									
▲									
★									

CLIENT **Mattamy Homes**

PROJECT **Geotechnical Investigation - Wateridge Block 15 -**
Mikinak Road & Vedette Way, Ottawa, Ontario

FILE NO. **PG7353**

DATE **31 Mar 25**

PATERSON GROUP

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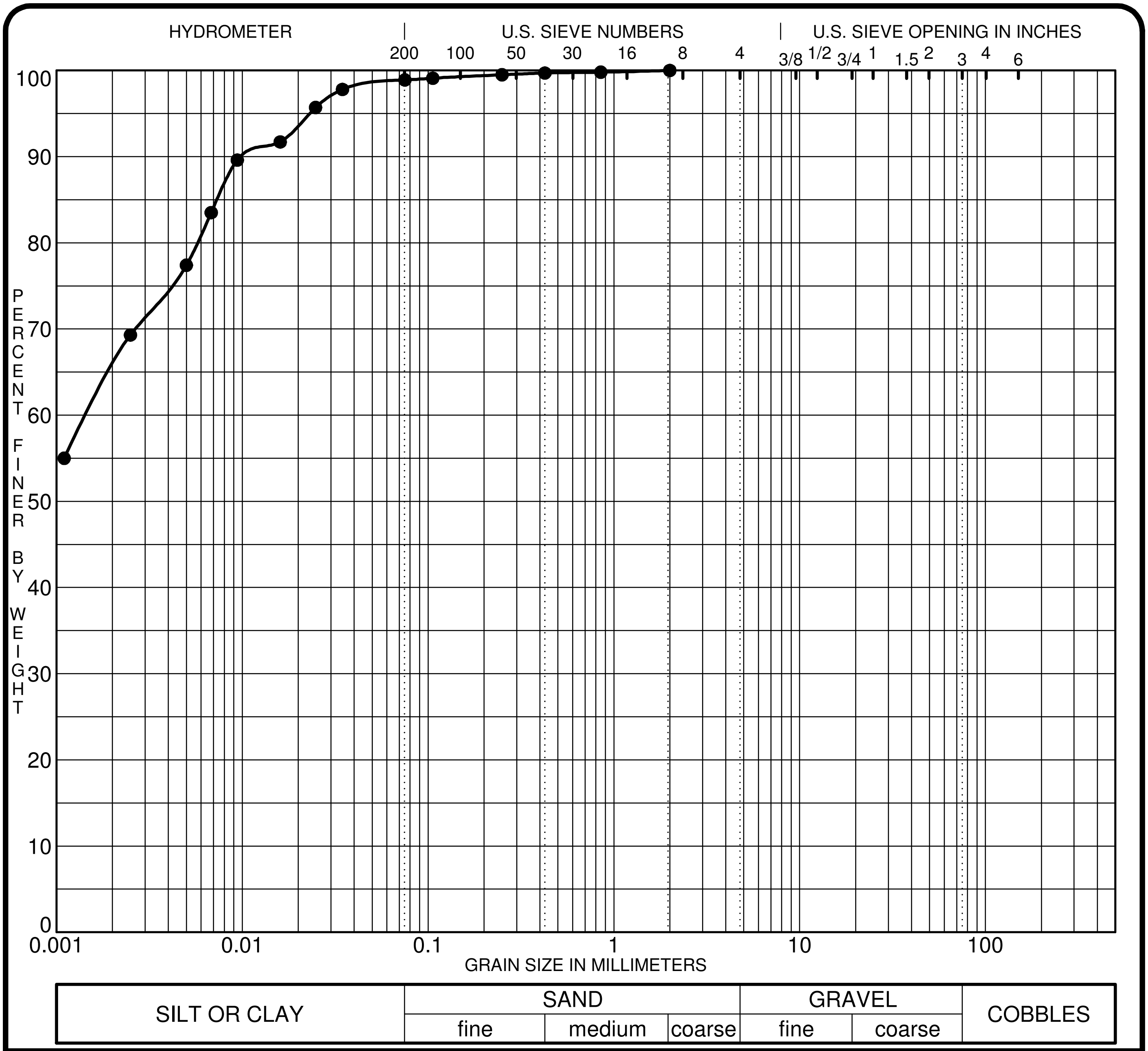
TEL: (613) 226-7381

GRAIN SIZE DISTRIBUTION



	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**BH 2-21**	**SS 5**	**CH - Inorganic clays of high plasticity**						
☒									
▲									
★									

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BH 2-21**	**SS 5**	**2.00**	**0.00**			**0.0**	**1.1**	**98.9**	
☒										
▲										
★										

CLIENT **Mattamy Homes**

FILE NO. **PG5756**

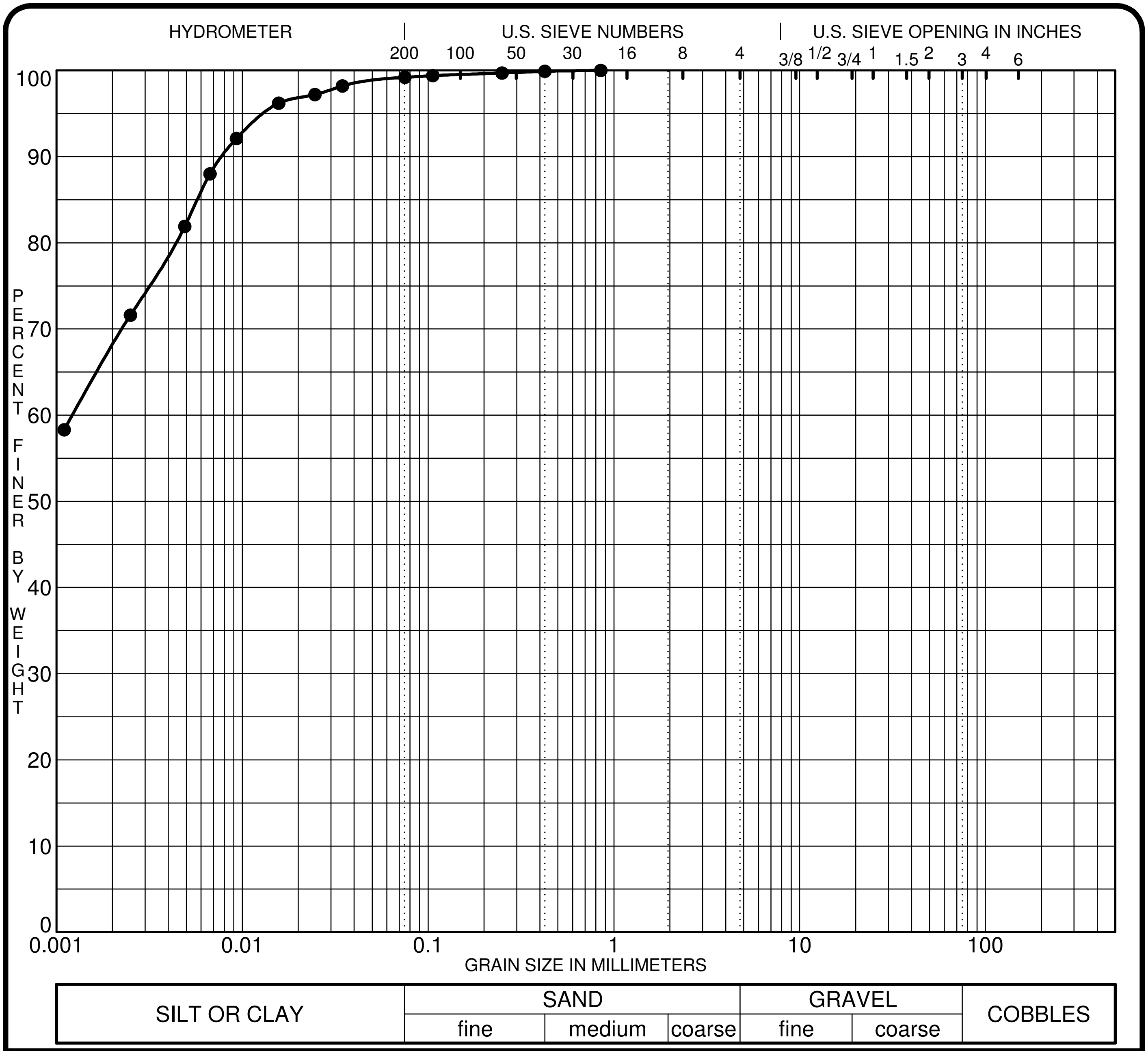
PROJECT **Geotechnical Investigation - Proposed Residential Subdivision - Phase 3A, 101 Vedette Way**

DATE **26 Mar 21**

patersongroup **Consulting Engineers**

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

GRAIN SIZE DISTRIBUTION



	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	**BH 5-21**	**SS 4**	**CH - Inorganic clays of high plasticity**						
☒									
▲									
★									

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BH 5-21**	**SS 4**	**0.85**	**0.00**			**0.0**	**0.8**	**99.2**	
☒										
▲										
★										

CLIENT **Mattamy Homes**

FILE NO. **PG5756**

PROJECT **Geotechnical Investigation - Proposed Residential Subdivision - Phase 3A, 101 Vedette Way**

DATE **26 Mar 21**

patersongroup **Consulting Engineers**

154 Colonnade Road South, Ottawa, Ontario K2E 7J5

GRAIN SIZE DISTRIBUTION

PATERSON GROUP

Linear Shrinkage
ASTM D4943-02

CLIENT:	Richcraft	DEPTH	3.81 - 4.42	FILE NO.:	PG7353
PROJECT:	Maple Grove	BH OR TP No:	BH1-25 SS5	DATE SAMPLED	20-Mar-25
LAB No:	59104	TESTED BY:	C.P	DATE RECEIVED	21-Mar-25
SAMPLED BY:	K.S.	DATE REPORTED:	31-Mar-25	DATE TESTED	24-Mar-25

LABORATORY INFORMATION & TEST RESULTS

Moisture	No. of Blows(7)	Calibration (Two Trials)	Tin NO.(A1)	
Tare	4.96	Tin	4.77	4.77
Soil Pat Wet + Tare	62.1	Tin + Grease	4.97	4.97
Soil Pat Wet	57.14	Glass	43.25	43.24
Soil Pat Dry + Tare	36.26	Tin + Glass + Water	85.82	85.81
Soil Pat Dry	31.3	Volume	37.60	37.6
Moisture	**82.56**	**Average Volume**	**37.60**	

Soil Pat + String	31.45
Soil Pat + Wax + String in Air	35.91
Soil Pat + Wax + String in Water	13.2
Volume Of Pat (Vdx)	22.71

RESULTS:

Shrinkage Limit	**18.97**
Shrinkage Ratio	**1.768**
Volumetric Shrinkage	**112.444**
Linear Shrinkage	**22.209**

REVIEWED BY:	**Curtis Beadow**	**Joe Forsyth, P. Eng.**

patersongroup
consulting engineers

Linear Shrinkage
ASTM D4943-02

CLIENT:	Mattamy Homes	DEPTH	2.3 to 2.9m	FILE NO.:	PG5756
PROJECT:	Block 13 Wateridge Wikinak	BH OR TP No:	BH4-21 SS4	DATE SAMPLED	26-Mar
LAB No:	23746	TESTED BY:	DJ / DB / CS	DATE RECEIVED	29-Mar
SAMPLED BY:	ZM	DATE REPORTED:		DATE TESTED	06-Apr

LABORATORY INFORMATION & TEST RESULTS

Moisture	No. of Blows(8)	Calibration (Two Trials)	Tin NO.(x15)	
Tare	4.88	Tin	4.77	4.76
Soil Pat Wet + Tare	67.13	Tin + Grease	4.89	4.89
Soil Pat Wet	62.25	Glass	48.97	48.97
Soil Pat Dry + Tare	44.25	Tin + Glass + Water	91.31	91.3
Soil Pat Dry	39.37	Volume	37.45	37.44
Moisture	**58.12**	**Average Volume**	**37.45**	

Soil Pat + String	39.47
Soil Pat + Wax + String in Air	40.09
Soil Pat + Wax + String in Water	17.88
Volume Of Pat (Vdx)	22.21

RESULTS:

Shrinkage Limit	**17.65**
Shrinkage Ratio	**1.830**
Volumetric Shrinkage	**74.055**
Linear Shrinkage	**16.866**

REVIEWED BY:	**Curtis Beadow**	**Joe Forsyth, P. Eng.**

Certificate of Analysis

Report Date: 21-Mar-2025

Client: **Paterson Group Consulting Engineers (Ottawa)**

Order Date: 17-Mar-2025

Client PO: 62621

Project Description: PG7353

	Client ID:	BH2-25 SS5 (10'-12')	-	-	-		
	Sample Date:	17-Mar-25 09:00	-	-	-	-	-
	Sample ID:	2512076-01	-	-	-		
	Matrix:	Soil	-	-	-		
	MDL/Units						
Physical Characteristics							
% Solids	0.1 % by Wt.	73.9	-	-	-	-	-
General Inorganics							
pH	0.05 pH Units	7.09	-	-	-	-	-
Resistivity	0.1 Ohm.m	55.5	-	-	-	-	-
Anions							
Chloride	10 ug/g	<10	-	-	-	-	-
Sulphate	10 ug/g	95	-	-	-	-	-

APPENDIX 2

FIGURE 1 – KEY PLAN

FIGURE 2 – AERIAL PHOTOGRAPH 2014

FIGURE 3 – AERIAL PHOTOGRAPH 2008

FIGURE 4 – AERIAL PHOTOGRAPH 1965

DRAWING PG7353-1 – TEST HOLE LOCATION PLAN

FIGURE 1

KEY PLAN

PATERSON GROUP

FIGURE 2

AERIAL PHOTOGRAPH - 2014

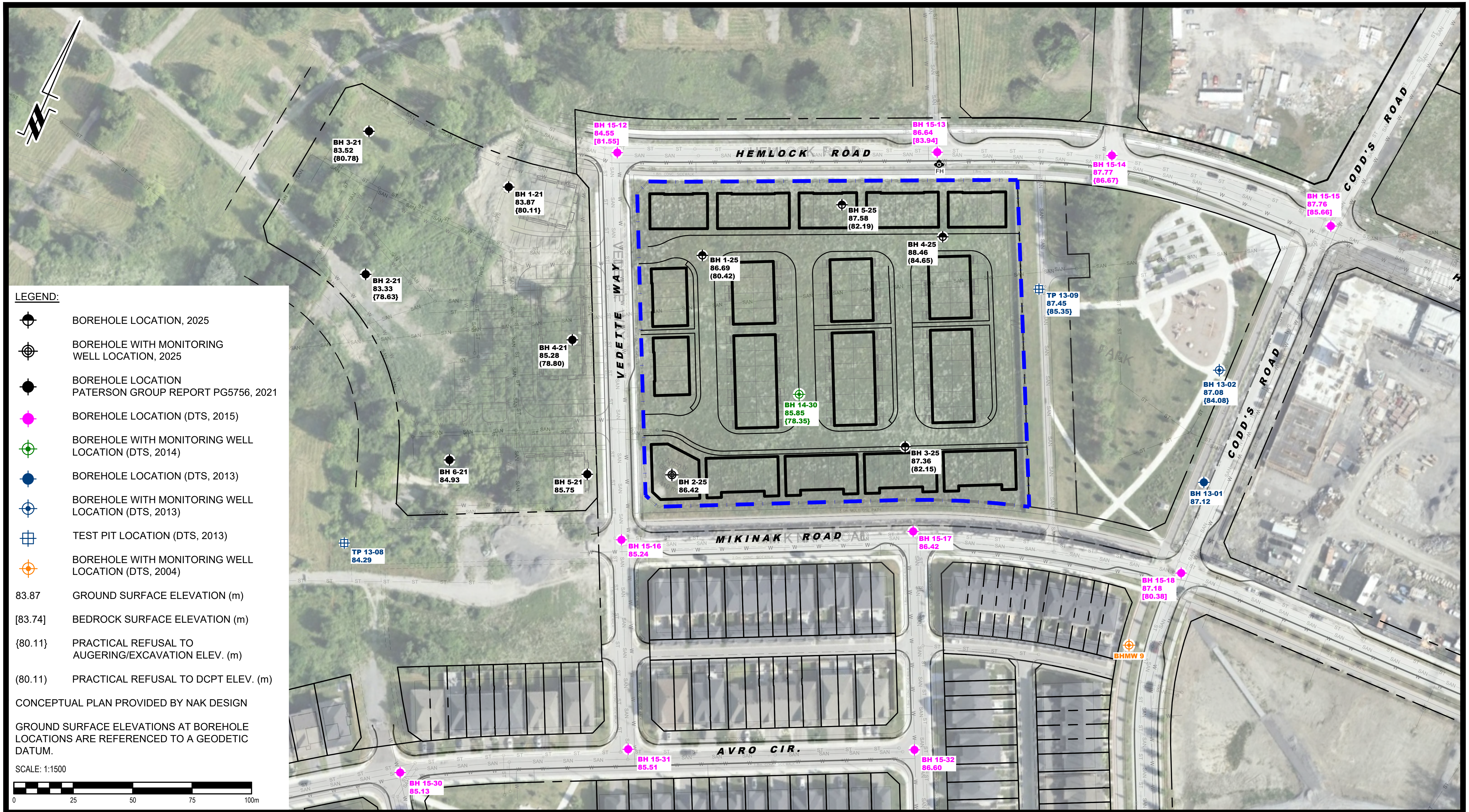
FIGURE 3

AERIAL PHOTOGRAPH - 2008

FIGURE 4

AERIAL PHOTOGRAPH - 1965

PATERSON
GROUP



LEGEND:

⊕	BOREHOLE LOCATION, 2025
⊚	BOREHOLE WITH MONITORING WELL LOCATION, 2025
●	BOREHOLE LOCATION PATERSON GROUP REPORT PG5756, 2021
●	BOREHOLE LOCATION (DTS, 2015)
⊕	BOREHOLE WITH MONITORING WELL LOCATION (DTS, 2014)
●	BOREHOLE LOCATION (DTS, 2013)
⊕	BOREHOLE WITH MONITORING WELL LOCATION (DTS, 2013)
⊞	TEST PIT LOCATION (DTS, 2013)
⊕	BOREHOLE WITH MONITORING WELL LOCATION (DTS, 2004)
83.87	GROUND SURFACE ELEVATION (m)
[83.74]	BEDROCK SURFACE ELEVATION (m)
{80.11}	PRACTICAL REFUSAL TO AUGERING/EXCAVATION ELEV. (m)
(80.11)	PRACTICAL REFUSAL TO DCPT ELEV. (m)

CONCEPTUAL PLAN PROVIDED BY NAK DESIGN

GROUND SURFACE ELEVATIONS AT BOREHOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

SCALE: 1:1500

0 25 50 75 100m

PATERSON GROUP

9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DD/MM/YYYY	INITIAL
1	2025 BOREHOLES ADDED TO PLAN UPDATED TO NEW CONCEPTUAL PLAN	25/03/2025	KP

MATTAMY HOMES
GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
WATERIDGE BLOCK 15 - MIKINAK ROAD & VEDETTE WAY

OTTAWA, ONTARIO

Title:

TEST HOLE LOCATION PLAN

Scale:	1:1500	Date:	11/2024
Drawn by:	GK	Report No.:	PG7353-1
Checked by:	MA	Dwg. No.:	PG7353-1
Approved by:	KP	Revision No.:	1

p:\autocad drawings\geotechnical\pg73xx\pg7353\pg7353-1-test hole location plan (rev.01).dwg

11x17