

**GEOTECHNICAL INVESTIGATION REPORT
PROPOSED MIXED-USE DEVELOPMENT
PHASE 2A & 2B
WATERIDGE VILLAGE
OTTAWA, ONTARIO**

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Prepared For:

Canada Lands Company CLC Limited
100 Queen Street , Unit 1050
Ottawa, ON
K1P 1J9

Prepared By:

Alston Associates
A division of Terrapex Environmental Ltd.

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1 INTRODUCTION

Alston Associates (AA), the geotechnical division of Terrapex Environmental Ltd. (**Terrapex**) has been retained by Canada Lands Company CLC Limited (CLC) to carry out a geotechnical investigation for the proposed mixed-use development of Wateridge Village (Phase 2A and 2B) located at the property of the former Canadian Forces Base (CFB) Rockcliffe in the City of Ottawa, Ontario. Authorization to proceed with this study was given by Mr. Jean Lachance of CLC.

We understand that CLC is seeking approval to develop the land at Wateridge Village referred to as Phase 2A and 2B Lands and construct Parks 1 and 7 including road improvements to existing infrastructure along Hemlock Road.

The Phase 2 (A and B) area is located north of Registered Plans of Subdivisions 4M-1559 and 4M-1581 in Wateridge Village, as shown on Drawing 2 attached in Appendix B of this report. Drawing 2 also shows the proposed land use of the property sub-divided into blocks according to the type of development. According to the proposed development plan, the site is scheduled for a mixed use residential development which would include the following:

- Phase 2A will contain three low to mid-rise mixed use Blocks (8, 10 and 11), one low to mid-rise residential Block (13), one low-rise residential Block (12), Park 1 (Block 9), and Hemlock Road west of Codd's Road.
- Phase 2B will contain two mid-rise mixed use Blocks (6 and 7), four low to mid-rise residential Blocks (1, 2, 4 and 5), and Park 9 (Block 3).

A grading plan dated December 2018 was prepared by IBI Group; attached in Appendix B as Drawings 7, 8, and 9. Drawings 7 and 8 shows the building locations and finish floor and foundation elevations on Blocks 2, 4, and 5. Details regarding building locations and design and municipal infrastructure on the remaining blocks were not available at the time of the investigation, and accordingly the recommendations provided in this report are considered to be preliminary in nature, subject for review and revision upon completion of proposed plans.

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

The investigation included evaluation of the pavement of the old Hemlock Road to assess the condition of the pavement structure and to provide recommendations for improvements/repairs prior to use for construction traffic, transit vehicles and public access.

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

2 BACKGROUND

A number of geotechnical and hydrogeological investigations were completed at the former CFB Rockcliffe property for CLC and documented in the following reports; copies of which were provided to us by CLC:

- *“Geotechnical Investigation Phase 1B Development – Site Servicing, Wateridge Village at Rockcliffe, Ottawa, Ontario”, dated November 2016 (DST File No: IN-SO-026755);*
- *“Geotechnical Investigation Phase 1A Development – Site Servicing, Former CFB Rockcliffe Development, Ottawa, Ontario”, dated November 2015 (DST File No: OE-OT- 015358);*
- *“Final Geotechnical Investigation for Subdivision Approval, Former CFB Rockcliffe Development, Ottawa, Ontario”, dated September 2015 (DST File No: OE-OT-015358);*
- *“Preliminary Geotechnical and Hydrogeological Investigation Proposed Stormwater Management Pond, CLC Rockcliff Lands Hemlock Road and Aviation Parkway, Ottawa, Ontario”, dated May 2015 (Golder Associates File No: 1521309);*
- *“Geotechnical Investigation Report for Preliminary Assessment for Building Foundation, Services Installation and Grade Raise Analysis Mapping – Phase 1 Development, Former CFB Rockcliffe, Ottawa, Ontario”, dated April 2014 (DST File No: GS-OT-015358);*
- *“Hydrogeological Report - Stormwater Management Support Studies, Former CFB Rockcliffe, Ottawa, Ontario, dated October 2013” (DST File No: OE-OT- 017184);*
- *“Preliminary Geotechnical Investigation, Rockcliffe Redevelopment Program”, dated March 2006 (DST File No.: OGO6562).*

The previous borehole and test pit locations in the Phase 2 development area were extracted from the above referenced reports; shown on Drawing 4 attached in Appendix B of this report. The logs of the previous boreholes and test pits are also attached in Appendix D.

According to the previous borehole and test pit findings, topsoil up to about 200 mm in depth is present across the site. Asphaltic concrete, with a thickness of about 100 mm, is present on existing roads and driveways. Fill material consisting of various silty sand, sand and gravel or clay is present in various areas of the site, with thickness ranging from approximately 0.5 to 4.3 m.

Grey silty clay is the dominant native overburden type in the central and southern portion of the site. The clay layer extends from near surface to a depth of more than 6 m in the south and thins out to the northeast and north where it overlies silty till deposits at depths of 1 to 2 m. The northern and eastern portions of the site are generally underlain by till material consisting of grey compact silt, sand and minor gravel. Where encountered during previous drilling, the till is 1 to 3 m thick.

Boreholes drilled into the bedrock typically encountered horizontally bedded, grey limestone with minor narrow shale bedding, interpreted to be of the Ottawa Group. The bedrock surface is generally unweathered or has a narrow weathering zone, less than one metre thick.

The applicable information from the previous geotechnical investigations are discussed and applied to the comments and recommendations presented in this report.

3 FIELDWORK

The fieldwork for this investigation was carried out during the period between November 13 and 20, and December 14, 2018. It consisted of sixty seven (67) boreholes and twenty four (24) exploratory test pits, advanced by drilling and excavation contractors commissioned by **AA**. The number and location of the boreholes were chosen by **AA** and reviewed by IBI Group and CLC to provide general coverage of the site for the proposed development. The locations of the test pits were chosen by **AA** to provide general coverage between the boreholes to confirm the depth of bedrock. The locations of the boreholes and test pits are shown on Drawing 3; enclosed in Appendix B of this report.

The boreholes; designated as BH101 through BH129, BH131, BH133 through BH150, BH152 through BH167, and BH173 through BH175, were advanced to depths ranging from 0.6 to 4.58 m below ground surface (mbgs). Eight (8) of the boreholes; MW111, MW124, MW125, MW142, MW142, MW152, MW158, and MNW166, were instrumented with monitoring wells to determine the long term groundwater table at the site.

The exploratory test pits (designated as TP201 through TP224) were extended to depths ranging from 0.4 to 4.4 mbgs to confirm the existence and depth of the bedrock.

The ground surface elevations at the locations of the boreholes and test pits were established by **AA** using Topcon Hiper V GNSS Receiver and Trimble R10 GNSS Receiver respectively.

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

Groundwater level observations were made in the boreholes and test pits upon completion of each of their advancement, and in the monitoring wells on December 17, 2018. The results of the groundwater measurements are discussed in Section 4.5 of this report.

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

4 LABORATORY TESTS

The soil samples retained from the split spoon sampler were properly sealed, labelled and brought to our laboratory. They were visually classified and water content tests were conducted on all soil samples retained from Boreholes BH101, BH102, BH107, BH 114, BH118, MW124, MW125, BH140, NW142, MW147, MW152, BH154, BH157, BH164, and BH167. The results of the classification, water contents, and Standard Penetration Tests are presented on the borehole logs sheets attached in Appendix C of this report.

Grain-size analyses were carried out on twelve (12) soil samples; Atterberg Limits test was performed on two. The results of these tests are presented as Figures E-1 through E-14 in Appendix E.

In addition, four (4) soil samples were submitted to an analytical laboratory for chemical analyses for pH and soluble sulphate tests. The results of these tests are enclosed in Appendix F; discussed in Section 6.13 of this report.

5 SITE AND SUBSURFACE CONDITIONS

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

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

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

5.1 Site Description

The subject site is located at the former CFB Rockcliffe property in the City of Ottawa. The former CFB Rockcliffe property is approximately 310 acres; bounded by Aviation Parkway to the west, Sir George Etienne Cartier Parkway to the North, the National Research Council of Canada campus to the east, and existing residential communities and Montfort Hospital to the south. It is bounded by two bedrock escarpments at the south and north boundaries. The Rockcliffe Airport is also located in the vicinity of the site, just north of Sir George Etienne Cartier Parkway.

Our investigation was limited to Phase 2A and 2B including Hemlock Road (west of Codd's Road). The former CFB Rockcliffe property and Phase 2 development area are shown in Drawing 1, attached in Appendix B.

Phase 2A is situated north of Hemlock Road, west of Codd's Road, east of vacant NCC lands, and south of Sir George Etienne Cartier Parkway. It has been divided into Blocks 8 through 13 including Street No. 3, Street No.4, and Hemlock Road. The north escarpment is located along the north boundary of Phase 2A. The slope of the escarpment is almost vertical with exposed bedrock. There is a storm management pond at the bottom of the escarpment.

There are several old pathways, roadways and driveways traversing throughout Phase 2A from past land use, and new storm and sewer lines have been installed along the alignment of the proposed Street No. 4 and east towards the storm sewer outfall. Stockpiles of fill material from previous phases and ongoing construction activities are located in and around Block 12, within the northern half of Block 8, and scattered throughout the north area of Block 9. The remainder of Phase 2A is covered with light to moderate vegetation with mature trees predominately outlining the perimeters of the blocks, and scattered throughout Block 9 (Proposed Park1). The ground surface topography of phase 2A slopes down from south to north and from east to west, the ground surface elevations at the borehole and test pit locations ranged between 77.25 at Test Pit TP208 to 89.57 m at Borehole BH120.

Phase 2B is situated north of Hemlock Road, east of Codd's Road, west of National Research Council of Canada campus, and south of Wanaki Road. It has been divided into Blocks 1 through 7 including Wanaki Road, Street No. 1, Street No. 2, Moses Tennisco Street, Michael Stoqua Street, Bareille-Snow Street, and Codd's Road.

There are several old pathways, roadways and driveways traversing through Phase 2B from past land use. Stockpiles of fill, topsoil and blast rock material from previous phases and ongoing construction activities are located in and around Block 4, northern half of Block 1, northern half of Block 6 and northeast portion of Block 7. Blast rock and fill material are also present along the north edge of Hemlock Road. The remainder of Phase 2B is covered with light vegetation and mature trees predominately outlining the perimeters of the blocks. The ground surface topography is relatively flat with a gradual slope down from east to west and south to north. The ground surface elevations at the borehole and test pit locations ranged between 88.14 m at Borehole BH140 to 93.99 m at Test Pit TP221.

5.2 Asphaltic Concrete Pavement

Boreholes BH101, BH102, BH103, BH104, BH105, BH107, BH108, BH115, BH121, BH138, BH141, BH144, BH 155, BH162, and BH167 were advanced through the asphaltic concrete pavement. They revealed that the thickness of the asphaltic concrete ranges from approximately 40 to 140 mm.

5.3 Granular Base Course

The base course supporting the asphaltic concrete consists of sandy gravel to gravelly sand. The thickness of this granular soil ranges from approximately 200 to 250 mm.

Penetration resistance of the base course material measured N-values ranging from 19 to 25, indicating its compactness condition is compact. The water content of the tested samples of the granular base from Boreholes BH107 and BH167 was about 5% by weight; being damp in appearance.

Sieve grain size analysis was carried out on one (1) sample of granular base course obtained from Borehole BH102 at 0.2 mbgs (Sample 1A). The test revealed that the soil has 70% sand, 28% gravel, and 2% silt and clay. The result of the grain size analysis is shown as Figure E-1 in Appendix E.

5.4 Topsoil

Topsoil was encountered in Boreholes BH114, BH118, BH131, BH134, BH143, BH145, BH146, BH147, BH150, BH153, BH158, BH159, BH155, BH160, BH164, BH165, BH166 and BH167. The thickness of the topsoil at the boreholes varies between approximately 50 and 250 mm.

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

5.5 Fill Material

Fill material is present in all boreholes below the pavement granular base, the topsoil, or surficial

vegetation with the exception of Boreholes BH118, BH127, BH131, BH146, BH147, and BH150. The fill consists of various gravelly sand to sandy gravel, silty sand to sandy silt with trace of gravel, and clayey silt soils; extending to approximate depths ranging from 0.3 to 2.7 mbgs. The fill contains traces of organic, rootlet, and rock fragment. At the location of Boreholes BH114, BH116, BH118, BH120, BH153, and BH154, the fill material contains trace cinder. At the location of Boreholes BH137, BH139, BH142, BH143, BH148, BH153, BH161, and BH174, the fill contains trace to some brick pieces.

SPT carried out in the silty, sandy, and gravelly fill material measured N-values ranging from 3 to 50/25 mm penetration; indicating very loose to very dense compactness condition; generally being compact. The higher N-values are likely due to the split spoon sampler striking boulders or construction rubble. SPT carried out in the clayey silt fill material measured N-values ranging from 3 to 36; indicating soft to hard consistency; generally being firm.

The fill material is generally brown to dark brown in color and damp to moist in appearance. The water content of the tested fill samples from Boreholes BH101, BH102, BH107, BH114, BH118, MW124, MW125, BH140, NW142, MW147, MW152, BH154, BH157, BH164, and BH167 ranges from 5 to 37% by weight.

5.6 Native Soils

5.6.1 Silty Sand to Sand with trace silt

Silty sand to sand with trace silt soils are present below the fill material in Boreholes BH127, BH131, BH140, BH149, BH152, BH153, BH156, BH157, BH160, BH162, BH163, BH164, BH166 and underneath a clayey silt deposit in Borehole MW147. The sandy soils contain variable proportions of silt classifying the soil as sand with trace to some silt and silty sand.

The silty sand to sand unit is generally brown in colour. The water content of the tested sand samples from Boreholes BH140, BH147, BH154, BH157, and BH164 ranges from approximately 7 to 22% by weight; generally being moist in appearance.

Penetration resistance in the silty sand to sand units provided N-values ranging from 4 to 50/75 mm penetration, indicating loose to very dense compactness condition.

Sieve grain size analysis was carried out on five (5) representative samples of the sandy soils. The results of the grain size analysis are enclosed in Appendix E as Figures E-2 to E-6 and summarized below.

Borehole Number	Sample Depth (mbgs) and No.	Sample Description	Gravel %	Sand %	Silt %	Clay %
BH104	1.5 (Sample 3)	Silty Sand, some gravel	13	66	21	
BH140	1.5 (Sample 3)	Sand, trace silt, trace gravel	3	51	2	
BH149	0.76 (Sample 2A)	Silty Sand, trace gravel	7	63	30	
BH158	1.5 (Sample 3)	Sand, some gravel, trace silt	15	81	4	
BH163	2.28 (Sample 4)	Sand, some silt, trace gravel	5	76	19	

Based on the results of the grain size analysis, the coefficient of permeability (K) of the sand soils range from 10^{-2} cm/sec to 10^{-4} cm/sec; medium to high permeability.

5.6.2 Silt with trace sand to sandy silt

Silt with trace sand to sandy silt soils are present below the fill material in Boreholes BH101 through BH105, BH112, BH113, BH116, BH118, BH120, BH124, BH126, BH134, BH136, BH137, BH145, BH146, BH150, BH151, BH154, BH155, BH164, and BH173. This unit contains variable proportions of sand classifying the soil as silt with trace sand to sandy silt.

The sandy silt to silt unit is generally brown in colour. The water content of the tested silt samples from Boreholes BH101, BH124, BH152, and BH164 ranges from approximately 4 to 20% by weight; generally being damp to moist in appearance.

Penetration resistance in the silt unit provided N-values ranging from 11 to 50/25 mm penetration, indicating compact to very dense compactness condition.

Sieve and hydrometer grain size analyses were carried out on three (3) samples of silt soil obtained from Boreholes BH112, BH120, and BH152. The test results are enclosed in Appendix E as Figures E-7 to E-9, and summarized below.

Borehole Number	Sample Depth (mbgs) and No.	Sample Description	Gravel %	Sand %	Silt %	Clay %
BH112	0.76 (Sample 2)	Silt, some clay, trace sand, trace gravel	3	8	73	16
BH120	0.76 (Sample 2)	Silt, some sand, trace clay	0	20	71	9
BH152	2.28 (Sample 4)	Silt, some sand, some clay	0	18	65	14

Based on the results of the grain size analysis, the K values of the silt soils range from 10^{-5} cm/sec to less than 10^{-6} cm/sec; low permeability.

5.6.3 Clay and Silt

A deposit of silt and clay to clayey silt ranging in thickness from 0.5 to 2 m is present below the fill material in Boreholes BH104, BH106, BH125, BH133, BH134, BH138, BH141, BH147, BH150, BH151, BH163, and BH173.

The clay and silt unit is generally brown in colour. The water content of the tested clay and silt samples ranges from approximately 11 to 36% by weight; generally being moist to wet in appearance.

Penetration resistance in the clay and silt soil measured N-values ranging from 5 to 28, indicating firm to very stiff consistencies.

Sieve and hydrometer grain size analyses were carried out on three (3) samples of clay and silt soils; Atterberg Limits test on two (2). The test results are enclosed in Appendix E as Figures E-10 through E-14, and summarized below.

Borehole No.	Sample Depth (mbgs) and No.	Sample Description	Gravel %	Sand %	Silt %	Clay %	Liquid Limit	Plasticity Index	Soil Classification
BH104	0.76 (Sample 2)	Clay and Silt, trace sand	0	2	42	56	-	-	-
BH125	1.5 (Sample 3)	Clay and Silt, trace sand	0	1	45	54	58	34	Inorganic clays of high plasticity
BH134	0.8 (Sample 2)	Clay and Silt, trace sand	0	4	37	59	53	28	Inorganic clays of high plasticity

The soil classification was based on the plasticity chart as shown on Figure 3.1 of the CFEM, 4th Edition.

Based on the results of the grain size analysis, the K values of the clay and silt soil is less than 10^{-7} cm/sec; very low relative permeability.

5.6.4 Gravelly Sand

A gravelly sand deposit is present in Borehole BH107; positioned at an approximate depth of 1.8 mbgs and extending to the bedrock at 2.2 mbgs.

SPT in the gravelly sand unit had N-value of 75/254 mm penetration, indicating very dense compactness condition. It is greyish brown in colour and has a moist appearance.

5.7 Bedrock

Bedrock was encountered in all boreholes and test pits with the exception of Boreholes BH101, BH102, and BH103 at approximate depths ranging from 0.6 to 4.58 mbgs, corresponding to approximate elevations of 79.51 m to 91.57 m. The bedrock was proven by auger refusal and test pits and was not cored. The test pits confirmed that refusal to further advancement of the boreholes was due to bedrock and not large boulders or buried concrete slabs. The depth and elevation of the bedrock encountered in the test pits is tabulated in the table below.

Test Pit No.	Ground Elevation (m)	Depth of Bedrock (mbgs)	Elevation of Bedrock (m)
TP201	74.35	1.42	72.93
TP202	76.71	1.15	75.56
TP203	85.48	1.64	83.84
TP204	86.64	1.84	84.80
TP205	85.81	1.64	84.17
TP206	84.13	1.60	82.53
TP207	82.29	0.64	81.65
TP208	77.25	0.98	76.27
TP209	83.71	1.70	82.01
TP210	88.84	1.60	87.24
TP211	89.64	1.35	88.29
TP212	89.04	1.07	87.97
TP213	88.05	0.78	87.27

TP214	88.28	1.30	86.98
TP215	88.88	0.76	88.12
TP216	89.75	1.60	88.15
TP217	8.84	2.13	86.71
TP218	90.64	1.41	89.23
TP219	91.02	1.12	89.90
TP220	93.92	0.92	93.00
TP221	93.99	0.38	93.61
TP222	93.61	0.90	92.71
TP223	93.58	4.40	89.18
TP224	93.56	4.12	89.44

Based on the ground surface elevations, the surface of the rock dips down from the east to the west and from the central section of the site toward the north and south.

The bedrock at the base of all test pits with the exceptions of Test Pits TP221 and TP222 consists of grey limestone. The bedrock at the base of Test Pits TP221 and TP222 consists of shale.

Review of available geological mapping and previous geotechnical investigations indicates that the bedrock is of the Ottawa Formation, consisting of limestone with some shale bedding and some sandstone in the basal part. According to the previous investigations at the site, the rock is classified to be strong to very strong.

5.8 Groundwater

Groundwater level and cave-in of the unlined side walls of the boreholes were measured during the course of the borehole drilling and upon completion of the boreholes; shown on the individual borehole logs. All boreholes were open and dry upon completion with the exception of the ones listed in the following table:

Borehole No.	Groundwater Depth (m)	Cave-in Level (mbgs)
BH107	Dry	1.8
BH108	Dry	1.5
BH110	Dry	0.9
BH133	Dry	1.8
BH134	0.9	Open
BH139	Dry	1.1
BH140	Dry	2.8
BH148	Dry	1.9
BH154	3.0	Open
BH157	1.96	Open
BH174	Dry	0.6

Groundwater conditions exposed in the test pit excavations were also observed. All test pits remained dry upon completion of excavation.

Groundwater levels in the monitoring wells were measured on December 17, 2018. The results of the groundwater measurement are shown in the following table.

Borehole No.	Ground Elevation (m)	Bottom of the Monitoring Well Depth (m)	Bottom of the Monitoring Well Elevation (m)	Groundwater Depth (mbgs)	Groundwater Elevation (mbgs)
MW111	86.96	2.6	84.36	Dry	-
MW124	90.15	1.7	88.45	Dry	-
MW125	82.65	2.4	80.25	0.25	82.40
MW142	89.85	1.8	88.05	Dry	-
MW147	90.91	2.2	88.71	Dry	-
MW152	92.98	3.0	89.98	Dry	-
MW158	92.86	3.0	89.86	2.25	90.61
MW166	93.54	4.1	89.44	2.55	90.99

It should be noted that groundwater levels are subject to seasonal fluctuations. A higher groundwater level condition will likely develop in the spring and following significant rainfall events.

6 DISCUSSION AND RECOMMENDATIONS

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

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

On the basis of our fieldwork, laboratory tests and other pertinent information supplied by the client, the following comments and recommendations are made.

6.1 Site Grading

The proposed grading plan prepared and provided for our use by IBI Group and dated December 2018 is included in Appendix B as Drawings 7, 8, and 9.

Based on the proposed grading plan, there will be some modifications to the site grading. The grade will be raised/cut by a maximum of 1m. Given the subsurface conditions at the site; i.e. shallow bedrock, and the absence of thick layers of soft clay, grade raise will not cause any settlement of the subsoil.

6.2 Engineered Fill

The following recommendations regarding construction of engineered fill should be adhered to during the construction stage:

- All surface vegetation, organic materials, softened and disturbed soils must be removed, and the exposed subgrade soils proof-rolled with an inspection by the Geotechnical Engineer prior to any fill placement.
- In the event that the fill will be used to support structures, the existing fill must be removed in its

entirety prior to placement of new fill.

- Soils used as engineered fill should be free of organics and/or other unsuitable material. The engineered fill must be placed in lifts not exceeding 200 mm in thickness and compacted to at least 98% Standard Proctor maximum Dry Density (SPMDD).
- Engineered fill operations should be monitored and compaction tests should be performed on a full-time basis by a qualified engineering technician supervised by the project engineer.
- The boundaries of the engineered fill must be clearly and accurately laid out in the field by qualified surveyors prior to the commencement of engineered fill construction. The top of the engineered fill should extend a minimum of 2.5 m beyond the envelope of the proposed structures. Where the depth of engineered fill exceeds 1.5 m, this horizontal distance of 2.5 m beyond the perimeter of the structure should be increased by at least 1 m for each 1.5 m depth of fill. The edges of the engineered fill should be sloped at a maximum of 3 horizontal to 1 vertical in order to avoid weakening of the engineered fill edges due to slope movement.
- Due to the potential detrimental effects of differential settlement between the engineered fill and the native soils, any buildings where footings are to be placed engineered fill or partly on engineered fill and partly on native soils should include steel reinforcement. The foundation walls of house foundations supported on engineered fill should be reinforced to bridge localized soft spots and zones of non-uniform compaction, and to minimize structural distress due to differential settlement of the engineered fill.
- The engineered fill operation should take place in favorable climatic conditions. If the work is carried out in months where freezing temperatures may occur, all frost affected material must be removed prior to the placement of frost-free fill.
- If unusual soil conditions become apparent during construction, due to subsurface groundwater influences, our office should be contacted in order to assess the conditions and recommend appropriate remedial measures.

6.3 Excavation

Based on the borehole findings, excavation for foundations, potential basements, sewer trenches and utilities will be carried out through fill material, sandy, silty, and clayey native soils, and bedrock. Excavation of the soil strata is not expected to pose any difficulty and can be carried out with heavy hydraulic excavators.

Significant bedrock excavation is anticipated across the site. According to the rock core data from the previous investigations, the bedrock generally consists of strong to very strong limestone with interbedded shale of variable bed thicknesses and depth across the site.

Bedrock excavation is expected to be carried out using line drilling and blasting, hoe ramming or both. Provision should be made in the excavation contract to include the use of these techniques for excavation in bedrock.

Any blasting should be carried out in accordance with City of Ottawa Special Provision S.P. No: F-1201 and under the supervision of a blasting specialist engineer. Vibration monitoring of the blasting operation should be carried out to ensure that the blasting meets the limiting vibration criteria at all times.

The contractor should submit a complete and detailed blasting design and monitoring proposal

prepared by a blasting/vibrations specialist prior to commencing blasting. This would have to be reviewed and accepted in relation to the requirements of the blasting specifications. Vibration monitoring of the blasting should be carried out to ensure that the blasting meets the limiting vibration criteria at all times. A pre-blast condition survey should be carried out of surrounding structures and utilities located within 100 m of the excavation site. The condition survey should also include the National Research Council's Montreal Road Campus located east of the subject site.

All excavations must be carried out in accordance with Occupational Health and Safety Act (OHSA). With respect to OHSA, the near surface fill, compact sandy silt to silt and sand to silty sand, and firm clay and silt soils are expected to conform to Type 3 soils. The dense to very dense sandy silt to silt and sand to silty sand, and stiff to very stiff clay and silt soils can be classified as Type 2 soils. The bedrock is classified as Type 1 soil.

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

For excavations through multiple soil types, the side slope geometry is governed by the soil with the highest number designation. Excavation side-slopes should not be unduly left exposed to inclement weather. Excavation slopes consisting of sandy soils will be prone to gullyng in periods of wet weather, unless the slopes are properly sheeted with tarpaulins.

It should be noted that the on-site fill material may contain boulders, cobbles and remnants of former buildings in the form of buried concrete. Provisions must be made in the excavation and foundation installation contracts for the removal of possible boulders and concrete.

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

It is anticipated that sufficient space will be available to slope the sidewalls of the basement excavation; as such it will not be necessary to shore the basement excavation walls.

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

On-site excavated inorganic native soils are considered suitable for reuse as backfill material within the roadways and pipeline trench excavations, provided their water content is within 2% of their optimum water contents (OWC) as determined by Standard Proctor test, and the materials are effectively compacted with heavy compaction rollers.

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

Measured water content ranges from approximately 4 to 36% within the native soils and from 5 to 37% within the fill material; generally being close to the wet side of the material's OWC. On-site native soils that are wetter than their OWC should be dried sufficiently prior to use as backfill in order to achieve the specified degree of compaction. Spreading the material in a wide area and air drying will be required to achieve the specified compaction of the native material. Thorough vertical mixing of the excavated soils will be required to provide a material that can be adequately compacted.

The spoil resulting from excavation through the bedrock will contain a large amount of hard rock slabs which will be virtually impossible to compact. Bedrock crushed on-site can be used as granular material provided that it conforms to OPSS gradation requirements and physical properties.

6.5 Groundwater Control

Based on observations made during drilling of the boreholes and excavation of the test pits, close examination of the soil samples extracted from the boreholes, and groundwater measurements made in the monitoring wells, significant groundwater problems are not anticipated within the presumed excavation depths throughout majority of the site with the exception of the area encompassing Blocks 1 and 2 in the easternmost section of the site. Groundwater is present in sand soil in this section of the site. Active dewatering of the sand layers will be required in the event that the excavation is extended below the water table; it is anticipated that dewatering will be possible using a series of filter sump pumps in the base of the excavation.

In the remainder of the site, some seepage of groundwater from localized permeable layers may occur during construction. It will be possible to remove any such seepage using submersible pumps.

Dewatering can be carried out using existing Permit to Take Water (PTTW) obtained by CLC from the MOECP.

Surface water should be directed away from open excavations.

6.6 Residential and Mixed-Use Buildings

6.6.1 Foundation Design

According to the proposed grading plan; shown on Drawing 7 attached in Appendix B, the proposed buildings on Blocks 2, 4, and 5 will be constructed over a single level basement. Details regarding the remaining blocks were not available at the time of the investigation, and accordingly the recommendations provided in this report are considered to be preliminary in nature, subject for review and revision upon completion of proposed plans. Additional boreholes may have to be advanced by the builders at the site once the details of the proposed buildings are finalized.

Conventionally, footing foundations of heated and unheated buildings are positioned at depths of 1.5 m and 1.8 m respectively below exterior grade in the Ottawa area, in order to provide protection to the foundation soil from freezing temperatures.

The foundations for the mid-rise buildings should be installed on the bedrock.

It is not recommended to install the foundations of the proposed low-rise buildings on the fill material. Based on the borehole findings, the bearing stratum should consist of the bedrock or native soil. The native soil throughout the site is considered suitable for the support of low rise building foundations. Locally, it will be necessary to deepen the foundations where the native soil is less competent in strength.

It should also be noted that intact bedrock will not be subjected to frost heave, and provided that footings are extended to non-fractured intact rock, the minimum founding depth of 1.8 m would not apply, and the footings may be placed at shallower depths.

Foundations may be constructed on engineered fill provided that the existing fill is removed in its entirety and the engineered fill is constructed in accordance with recommendations provided in Section 6.2 of this report.

Conventional spread and strip footings may be used to support the proposed buildings.

Foundations installed on the native soil or certified engineered fill may be designed based on bearing resistance of 100 KPa at Serviceability Limit States (SLS), and factored geotechnical bearing resistances at Ultimate Limit States (ULS) of 150 kPa.

The geotechnical bearing resistances recommended above are for vertical loads (no inclination) and no eccentricity. The total and differential settlements of spread footing foundations founded on the native soil designed in accordance with the recommendations provided in this report should not exceed the conventional limits of 25 mm and 19 mm respectively.

Foundations installed on the bedrock may be designed for a factored bearing resistance at Ultimate Limit States of 1 MPa (ULS). The serviceability limit state is not applicable as bedrock will not undergo settlement.

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

In the event necessary, the stepping of the footings at different elevations should be carried out at an angle no steeper than 2 horizontal (clear horizontal distance between footings) to 1 vertical (difference in elevation) on the native soil and 1 horizontal to 1 vertical on the bedrock. No individual footing step should be greater than 0.6 m.

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

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

protect a bearing surface where footing construction is to be delayed.

In the absence of a significant clay soil at this site, a tree planting restriction does not apply for the development.

6.6.2 Concrete Slab-on-Grade

For building(s) without basement construction, the subgrade supporting the ground floor slab will in general consist of engineered fill or native soil which is adequate to support a slab-on-grade construction. Subgrade preparation should include the removal of surface vegetation, organic materials, weak and softened soils. After removal of all unsuitable materials, the subgrade should then be proof-rolled with heavy rubber tired equipment and adjudged as satisfactory before preparing the granular base course. The proof-rolling operation should be witnessed by the Geotechnical Engineer. Any soft or unsuitable subgrade areas which deflect significantly should be sub-excavated and replaced with suitable engineered fill material compacted to at least 98% of SPMDD.

For building(s) that include a single level basement, the basement floor slabs will rest on the native soil or bedrock; suitable for slab-on-grade construction. Subgrade preparation should include the removal of any disturbed soils, followed by proof-rolling to confirm the subgrade conditions. Any unsuitable subgrade areas which deflect significantly should be sub-excavated and replaced with suitable engineered fill material compacted to at least 98% of its SPMDD.

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

Provided the subgrade, under-floor fill and granular base are prepared in accordance with the above recommendations, the Modulus of Subgrade Reaction (k_s) for floor slab design will be 25,000 kPa/m.

It is recommended that a combined moisture barrier and a leveling course, having a minimum thickness of 150 mm and comprised of free draining material be provided as a base for the slab-on-grade. For building(s) without basement construction, either Granular "A" or 20 mm crusher run limestone may be used. For building(s) with basement construction, 20 mm clear crushed limestone is recommended as the base course. The Granular "A" should be compacted to 100% of its SPMDD; the 20 mm clear stone must be compacted by vibration to a dense state.

For building(s) containing a basement level, an exterior perimeter drainage system, consisting of 100 mm diameter weeping tile wrapped in filter fabric and covered with a minimum 150 mm clear crushed stone should be placed along the exterior foundation walls, below the level of the granular base of the floor slab. The weeping tiles must be connected to a positive frost free outlet from which the water can be removed, or connected to a sump located in the basement. The water from the sump must be pumped out to a suitable discharge point. The installation of the perimeter drains as well as the outlet

must conform to the applicable plumbing code requirements.

For building(s) without basement construction, perimeter drainage at the foundation level is not required provided the finished floor surface is at least 150 mm above the prevailing grade and the surrounding surfaces slope away from the buildings.

For building(s) with basement construction, the basement wall backfill for a minimum lateral distance of 0.6 m out from the wall should consist of free-draining granular material such as OPSS Granular "B" Type I. The native soil may be used to backfill excavations along foundation walls provided that prefabricated drainage sheets must be placed continuously against the walls. Damp-proofing must be applied to the exterior basement walls.

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

6.7 Park 1: North Community Park

It is understood that the north Community Park will be located on Block 9 along the northern border of the site and occupy an area of 10.34 hectares. It will partially front onto Codd's Road on the east and local roads on the west and south sides. It will overlook the Ottawa River on the north side.

The topography of the park area is not level; generally sloping down from south to north. It contains steep ridges and some significant tree and vegetation groupings along the northern and southern boundaries.

The park will serve as the primary passive-recreational space for the community and contain a multi-use pathway system, a community building, look-out area with water feature, outdoor amphitheatre, shade structure, playground, splash pad, open space free play area, toboggan hill, and community gathering area. The approximate locations of the proposed features are shown on the Parks Master Plan drawing prepared by MMM Group Limited and provided for our use by CLC; shown on Drawing 5 attached in Appendix B.

According to the proposed grading plan, there will be some minor modifications to the park grades.

6.7.1 Community Building

It is anticipated that the proposed community building will be a 3,000 ft², single storey above grade structure: constructed on the west side of the park.

The subsurface conditions for the proposed building are represented by Borehole BH127. The borehole reveals that bedrock is situated at an approximate depth of 1.5 mbgs.

Conventional spread and wall footings may be used to support the proposed building. Footing foundations which rest on the bedrock may be designed to apply a factored bearing resistance at Ultimate Limit States of 1 MPa (ULS). The serviceability limit state is not applicable as bedrock will not

undergo settlement.

The subgrade supporting the floor slab of the community building will consist of native silty sand soil.

Subgrade preparation should include the removal of surface vegetation, organic materials, weak and softened soils. After removal of all unsuitable materials, the subgrade should then be proof-rolled with heavy rubber tired equipment and adjudged as satisfactory before preparing the granular base course. The proof-rolling operation should be witnessed by geotechnical staff. Any soft or unsuitable subgrade areas should be sub-excavated and replaced with suitable approved compacted backfill; placed in maximum lifts of 200 mm and compacted to at least 98% of SPMDD.

Where new fill is required to raise the grade, the excavated earth fill and native sand and silt material from the site or similar clean imported fill material free from topsoil, organic or deleterious matter, may be used, provided the material is placed in large areas where it can be compacted with a heavy vibratory roller. The fill material should not be frozen and should not be too dry or too wet for efficient compaction (moisture content at optimum or 2% greater than optimum). The fill placement should not be performed during winter months when freezing temperatures occur persistently or intermittently. All fill placed below the slab on grade areas of the buildings must be placed in thin lifts of 150 mm thickness or less, and compacted to a minimum of 98% of SPMDD.

It is recommended that a combined moisture barrier and a levelling course, with a minimum thickness of 150 mm and comprised of free draining material be provided as a base for the slab-on-grade, either Granular "A" or 20 mm crusher run limestone may be used and compacted to 100% of its SPMDD.

Perimeter drainage at the foundation level is not required provided the finished floor surface is at least 150 mm above the prevailing grade and the surrounding surfaces slope away from the building at a gradient of at least 2 percent.

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

6.7.2 Look-Out Area

We understand that it is proposed to construct a look-out area with a prominent water feature along the northern boundary to optimize the views to the Ottawa River.

Test Pit (TP208) was advanced in the proposed look-out area and revealed that the stratigraphy in this area consists of fill material extending to an approximate depth of 1.7 mbgs, followed by the bedrock.

Conventional spread and strip footings founded on the bedrock may be used to support the proposed structure. It is recommended that the foundation is designed and prepared in accordance with the recommendations provided in section 6.7.1 of this report.

Due to the proximity of the proposed lookout structure to the crest of the escarpment at the northern

boundary of the park, a slope stability analysis must be carried out based on the profile of the existing slope and subsurface soil and groundwater data collected from the current and previous investigations. The proposed structure must be set a safe distance from the crest of the escarpment.

6.7.3 Shade Structure

Borehole BH128 which was advanced in the proposed shade structure area revealed that the soil stratigraphy consists of fill; extending to an approximate depth of 1 mbgs, followed by bedrock.

Conventional spread and strip footings founded on the bedrock may be used to support the proposed structure. It is recommended that the foundation is designed and prepared in accordance with the recommendations provided in section 6.7.1 of this report.

The subgrade supporting the floor slab of the shade structure will consist of fill soil. It is recommended that the subgrade is prepared in accordance with the recommendations provided in section 6.7.1 of this report.

It is recommended that a combined moisture barrier and a levelling course, with a minimum thickness of 150 mm and comprised of free draining material be provided as a base for the slab-on-grade, either Granular "A" or 20 mm crusher run limestone may be used and compacted to 100% of its SPMDD. The granular material must be adequately drained to minimize frost heave or be provided with insulation.

Uplift resistance should be considered for the design of the canopy structure which is subject to wind uplift forces. The uplift resistance should be provided using the dead weight of the foundation as well the soil weight above the footing of the canopy structures. For design purposes, the unit weight of concrete may be taken as 24 kN/m³ and the backfill placed above the footings is 20 kN/m³. If increased uplift capacities are required, this may be achieved by increasing the weight (size) of the foundation, or alternatively, with the use of rock anchors.

6.7.4 Playground

It is expected that the playground structures will be lightly loaded frame structures, which will probably be supported on a set of foundations.

Borehole BH129 which was advanced in vicinity of the proposed playground and revealed that the soil stratigraphy consists of fill extending to an approximate depth of 1.5 mbgs, followed by bedrock.

Conventional spread and strip footings founded on the bedrock may be used to support the proposed structure. It is recommended that the foundation is designed and prepared in accordance with the recommendations provided in section 6.7.1 of this report.

The site preparation should consist of removing the existing topsoil layer and profiling the subgrade to the design grades to provide efficient drainage. The fill should provide a satisfactory subgrade to support the playing field.

If any unsuitable fill is contacted at subgrade elevation, this should be removed to contact the underlying competent native sand and silt (till) soil. The sub-excavation should be upfilled with suitable selected fill material (reuse of site excavated soil) and compacted to a dry density of not less than 95% of the materials SPMDD. Construction of turf and the site subgrade systems should be carried out to

meet the design requirements of the artificial turf supplier.

6.7.5 Splash Pad

It is anticipated that the splash pad will consist of concrete slab on grade. It is recommended that the subgrade is prepared in accordance with the recommendations provided for in section 6.7.1 of this report.

Once the subgrade soils have been improved, it is recommended that a minimum 300 mm thick levelling granular base course (Granular A or 20 mm crusher run limestone) is constructed to provide uniform support to the concrete slab.

Sub-drains are recommended to prevent accumulation of water within the granular material, to intercept excess subsurface moisture and minimize subgrade softening. The invert of sub-drains should be maintained at least 0.3 m below subgrade level.

The foundation soils should be insulated from freezing conditions in order to mitigate movement of the foundation soils as a result of the freeze-thaw cycle.

A styrofoam insulating layer (about 150 mm thick) may be placed to rest on the granular base layer under the concrete slab extending a minimum of 1.8 m beyond the outside limit of the floor slab and is placed at a slight slope grading away from the structure to encourage drainage.

The insulation should be protected against degradation by sunlight and damage from surface traffic (with about 200 mm thick overlay layer consisting of granular material, topsoil or sod).

6.8 Park 7: East Parkette

It is understood that the East Parkette will be located on Block 3 and occupy 0.40 hectares. The park will front onto Hemlock Road on the south, residential block on the north, and local roads on the east and west sides. The topography of the park area is relatively flat and contains little vegetation.

The park will serve as the primary passive-recreational space for the local residents and contain a shade structure, splash pad, and playground in the southern portion, a community gathering area in the central portion, and a free play area in the north end of the park. The approximate locations of the proposed features are shown on the Parks Master Plan drawing prepared by MMM Group Limited and provided for use by CLC; shown on Drawing 6 attached in Appendix B.

According to the proposed grading plan, there will be some minor modifications to the park grade.

Boreholes BH153 and BH154 and Test Pit TP219 were advanced in the park area. They revealed that fill is present in this area; extending to approximate depths ranging from 1.1 to 1.6 mbgs, followed by compact silty sand, and underlain by bedrock at approximate depths ranging from 1.1 to 3.2 mbgs.

The recommendations provided for construction of the shade structure, splash pad, and playground in sections 6.7.3 through 6.7.5 of this report apply to the proposed features in this park.

6.9 Service Trenches

Based on the proposed site grades, sewer pipes and water mains will be supported on the bedrock or undisturbed native sandy and silty soils which are considered suitable for supporting water mains, sewer pipes, manholes, catch basins and other related structures

The type of bedding depends mainly on the strength of the subgrade immediately below the invert levels.

Normal Class 'B' bedding is recommended for underground utilities. Granular 'A' or 19 mm crusher-run limestone can be used as bedding material; all granular materials should meet OPS 1010 specifications. The bedding material should be compacted to a minimum of 95% SPMD. Bedding details should follow the applicable governing design detail (i.e. City of Ottawa, OPSD). Trenches dug for these purposes should not be unduly left exposed to inclement weather.

Pipe bedding and backfill for flexible pipes should be undertaken in accordance with OPSD 802.010. Pipe embedment and cover for rigid pipes should be undertaken in accordance with OPSD 802.030.

If unsuitable bedding conditions occur, careful preparation and strengthening of the trench bases prior to sewer installation will be required. The subgrade may be strengthened by placing a thick mat consisting of 50 mm crusher-run limestone. Field conditions will determine the depth of stone required. Geotextiles and/or geogrids may be helpful and these options should be reviewed by **AA** on a case by case basis.

Sand cover material should be placed as backfill to at least 300 mm above the top of pipes. Placement of additional granular material (thickness dictated by the type of compaction equipment) as required or use of smaller compaction equipment for the first few lifts of native material above the pipe will probably be necessary to prevent damage to the pipe during the trench backfill compaction.

It is recommended that service trenches be backfilled with on-site native materials such that at least 95% of SPMD is obtained in the lower zone of the trench and 98% of SPMD for the upper 1000 mm.

Impermeable clay should be provided across the entire width of the service trenches. It is recommended that the seals be at least 1.0 m in length along the trench (in accordance with the city of Ottawa Standard S8). The seals should be constructed at intervals no greater than 100 m along all sewer installations.

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

6.10 Pavement Design

6.10.1 On-Grade Construction

Based on the existing topography of the site and the proposed grades, re-grading of the subgrade will be required. It is anticipated that the sub-grade material for the pavement will generally comprise of engineered fill.

The subgrade should be thoroughly proof-rolled and re-compacted to ensure uniformity in subgrade strength and support. Lift thicknesses should not exceed 200 mm in a loose state and the excavated site material should be compacted using heavy vibratory rollers. As an alternative, if suitable on-site native material is not available, the upper part of the subgrade could be improved by placing imported granular material.

If construction is carried out in inclement weather, there is a likelihood that some amount of road sub-base supplement will be required (i.e. some sub-excavation followed by granular replacement).

Given the frost susceptibility and drainage characteristics of the subgrade soils, the pavement design presented below is recommended.

**Recommended Asphaltic Concrete Pavement Structure Design
(Minimum Component Thicknesses)**

Pavement Layer	Compaction Requirements	Light Duty Pavement Local Residential Routes	Heavy Duty Pavement Transit Routes
Surface Course	as per OPSS 310	40 mm Superpave 12.5 Level B Asphalt (PG58-34)	40 mm Superpave 12.5 Level D Asphalt (PG64-34)
Binder Course	as per OPSS 310	50 mm Superpave 19 mm Level B Asphalt (PG58-34)	100 mm Superpave 19 mm Level D Asphalt (PG64-34)
Granular Base	100% SPMDD	150 mm Granular 'A' (OPSS 1010) Pit Run or 19 mm Crusher Run Limestone	150 mm Granular 'A' (OPSS 1010) Pit Run or 19 mm Crusher Run Limestone
Granular Sub-Base	100% SPMDD	450 mm Granular 'B' Type II (OPSS 1010)	600 mm Granular 'B' Type II (OPSS 1010)

The subgrade must be compacted to at least 98% of SPMDD for at least the upper 600 mm and 95% below this level. The granular base and sub-base materials should be compacted to a minimum of 100% SPMDD.

The long-term performance of the proposed pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure that uniform subgrade moisture and density conditions are achieved as much as practically possible when fill is placed and that the subgrade is not disturbed and weakened after it is exposed.

Control of surface water is a significant factor in achieving good pavement life. Grading adjacent to the pavement areas must be designed so that water is not allowed to pond adjacent to the outside edges of the pavement or curb. In addition, the need for adequate drainage cannot be over-emphasized. The subgrade must be free of depressions and sloped (preferably at a minimum gradient of three percent) to provide effective drainage toward subgrade drains. Continuous sub-drains are recommended to intercept excess subsurface moisture at the curb lines and catch basins. The invert of sub-drains should be maintained at least 0.3 m below subgrade level.

Additional comments on the construction of pavement areas are as follows:

- As part of the subgrade preparation, the proposed pavement areas should be stripped of vegetation, topsoil, unsuitable earth fill and other obvious objectionable material. The subgrade should be properly shaped and sloped as required, and then proof-rolled. Loose/soft or spongy subgrade areas should be sub-excavated and replaced with suitable approved material compacted to at least 98% of SPMDD.
- Where new fill is needed to increase the grade or replace disturbed portions of the subgrade, excavated inorganic soils or similar clean imported fill materials may be used, provided their moisture content is maintained within 2 % of the soil's optimum moisture content. All fill must be placed and compacted to not less than 98% of SPMDD.
- For fine-grained soils, as encountered at the site, the degree of compaction specification alone cannot ensure distress free subgrade. Proof-rolling must be carried out and witnessed by **AA** personnel for final recommendations of sub-base thicknesses.
- In the event that pavement construction takes place in the spring thaw, the late fall, or following periods of significant rainfall, it should be anticipated that an increase in thickness of the granular sub-base layer will be required to compensate for reduced subgrade strength.

6.10.2 Above Parking Garage Roof

The pavement above the parking garage roof slab may be comprised of a minimum of 75 mm thick layer of granular 'A' topped with asphaltic concrete having a minimum thickness of 80 mm (40 mm HL8 and 40 mm HL3). The asphaltic concrete materials should be rolled and compacted in accordance with OPSS 310 requirements.

The gradation and physical properties of HL-3 and HL-8 asphaltic concrete, and Granular 'A' shall conform to the OPSS standards.

The critical section of pavement will be at the transition between the pavement on grade and the pavement above the garage roof slab. In order to alleviate the detrimental effects of dynamic loading / settlement / pavement depression in the backfill to the rigid garage roof structure, it is recommended that an approach type slab be constructed at the entrance/exit points, by extending the granular sub-base to greater depths along the exterior garage wall.

The granular courses of the pavement should be placed in lifts not exceeding 150 mm thick and be compacted to a minimum of 100% SPMDD.

6.11 Pavement Assessment: Old Hemlock Road

Evaluation of the existing pavement along old Hemlock Road was undertaken to assess the condition of the pavement structure and to provide recommendations for improvements/repairs prior to its use for construction traffic, transit vehicles and public access.

At the time of this investigation the road surface was covered with snow. As such, our visual examination of the pavement was limited to the visible sections of the road. It revealed that the pavement is generally in poor to fair condition with few areas of settlement and localized cracking.

Boreholes BH101, BH102, BH103, and BH167 were advanced along old Hemlock Road and extended to

depths ranging from 0.8 to 1.8 mbgs to determine the thickness and composition of the pavement structures as well as the compactness condition/ consistency of the underlying subgrade.

The boreholes revealed that the thickness of the asphaltic concrete is about 140 mm. The base course supporting the asphaltic concrete consists of gravelly sand to sandy gravel. The thickness of this granular soil ranges from approximately 200 to 250 mm. Based on SPT results, it is inferred that the granular materials have been moderately to well compacted. The underlying subgrade soil consist of compact sandy silt to silty sand fill materials.

Test Pits TP201 and TP202 which were advanced immediately adjacent to Hemlock Road, revealed that the bedrock is situated at approximate depths of 1.4 and 1.1 mbgs respectively.

Sieve grain size analysis was carried out on one (1) sample of granular base course obtained from Borehole BH102 at 0.2 mbgs (Sample 1A). The test revealed that the soil has 70% sand, 28% gravel, and 2% silt and clay. The result of the grain size analysis is shown as Figure E-1 in Appendix D.

The condition of the existing pavement along old Hemlock Road is satisfactory for its temporary use for construction traffic. However, the thickness of the existing base course is not sufficient for long term use as a permanent public road. The proposed grading plan provided for our use by IBI Group does not include the Hemlock Road extension. However, we understand that it is not planned to change the grade of the current roadway. The provided recommendations are considered to be preliminary in nature, subject for review and revision upon completion of proposed grading plans.

The following recommendations are provided for preparation of the subgrade soils.

- *Remove existing granular materials and stockpile selected materials which may be reused as granular sub-base;*
- *Lower the subgrade to design elevation and shape to promote drainage.*
- *In the event that soft and/or organic fill materials are contacted at subgrade elevation, these should be removed and replaced with a suitable native or imported soil which is compacted to 98% of the material's SPMDD.*
- *Densely compact the subgrade to improve the condition of the disturbed layers and fill materials and to ensure uniformity in subgrade strength and support.*
- *If construction is carried out in inclement weather, there is a likelihood that some amount of pavement sub-base supplement will be required (i.e. some sub-excavation followed by granular replacement). In such instances, it will be necessary to ensure that granular materials are properly drained by lowering the subdrains.*

6.12 Lateral Earth Pressure

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

Soil Parameters

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

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

Soil Parameter Values

Soil	Parameter				
	Φ'	γ	K_a	K_p	K_o
Fill Material	28°	18	0.36	2.77	0.53
Silty Sand to Sand	compact - 32°	19.0	0.31	3.25	0.47
Silt to Sandy Silt	dense to very dense - 36°	19.0	0.26	3.85	0.41
Clay and Silt	30°	20	0.33	3.00	0.5
Bedrock	36°	25	0.26	3.85	0.41

Walls or bracings subject to unbalanced earth pressures must be designed to resist a pressure that can be calculated based on the following formula:

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

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

K = applicable lateral earth pressure coefficient

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

q = the complete surcharge loading (kPa)

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

The coefficient of earth pressure at rest (K_o) should be used in the calculation of the earth pressure on the basement walls.

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

6.13 Earthquake Design Parameters

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

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

Based on the current and previous borehole and test pit information, the subsurface stratigraphy generally comprises surficial topsoil and asphaltic concrete pavement, underlain by fill material, followed by various native soils consisting of silty sand to sand, sandy silt to silt, and clay and silt soils, underlain by limestone bedrock at shallow depths. Based on the above, the site designation for seismic analysis is estimated to be Class B according to Table 4.1.8.4.A from the quoted code.

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

6.14 Chemical Characterization of Subsurface Soil

Four (4) soil samples obtained from Boreholes BH108, BH127, BH153, and BH156 were submitted to Maxxam Analytics Inc. for pH index test, water-soluble sulphate, and chloride content to determine the potential of attacking the subsurface concrete and corrosion of steel pipelines. The test results are summarized below:

Soil Parameter	BH108: 0.76 mbgs (Sample 2)	BH127: 0.76 mbgs (Sample 2)	BH153: 1.5 mbgs (Sample 3)	BH156: mbgs (Sample)
pH	7.58	7.54	7.66	7.77
Water-soluble Sulphate (%)	0.0098	0.0026	ND	ND
Chloride (%)	ND*	ND	ND	ND

*ND: Not Detected

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

The Certificate of Analysis provided by the analytical chemical testing laboratory is contained in Appendix G of this report.

7 LIMITATIONS OF REPORT

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

Yours respectfully

alston associates

A division of Terrapex Environmental Ltd.



Rachel Herzog, CET
Geotechnical Technician



Shabnam Aziznejad, M.A.Sc.
Geotechnical Engineering Trainee



Vic Nersesian, P. Eng.
Vice President, Geotechnical Services

APPENDIX A

LIMITATIONS OF REPORT



limitations of report

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

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

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

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

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

APPENDIX B

DRAWING 1: SITE LOCATION

DRAWING 2: PROPOSED DEVELOPMENT PLAN

DRAWING 3: BOREHOLE AND TEST PIT LOCATION PLAN

DRAWING 4: PREVIOUS BOREHOLE AND TEST PIT LOCATION PLAN

DRAWING 5: PROPOSED PARK 1

DRAWING 6: PROPOSED PARK 7

DRAWING 7: PROPOSED GRADING PLAN – PART OF PHASE 2B

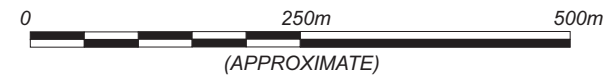
DRAWING 8: PROPOSED GRADING PLAN – PARTS OF PHASE 2A&2B

DRAWING 9: PROPOSED GRADING PLAN – PART OF PHASE 2A



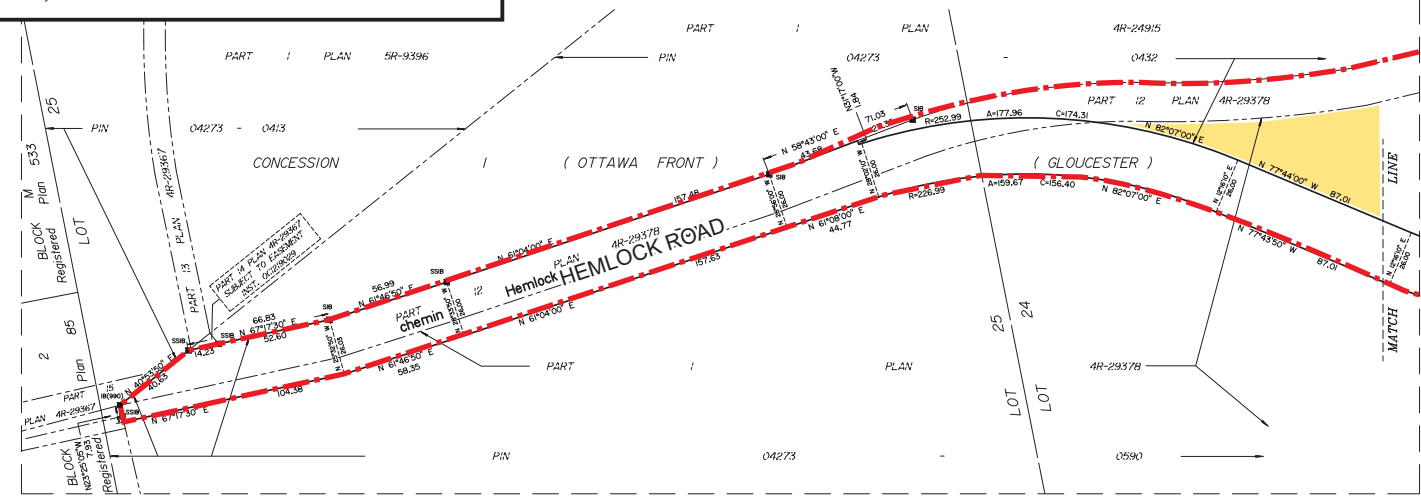
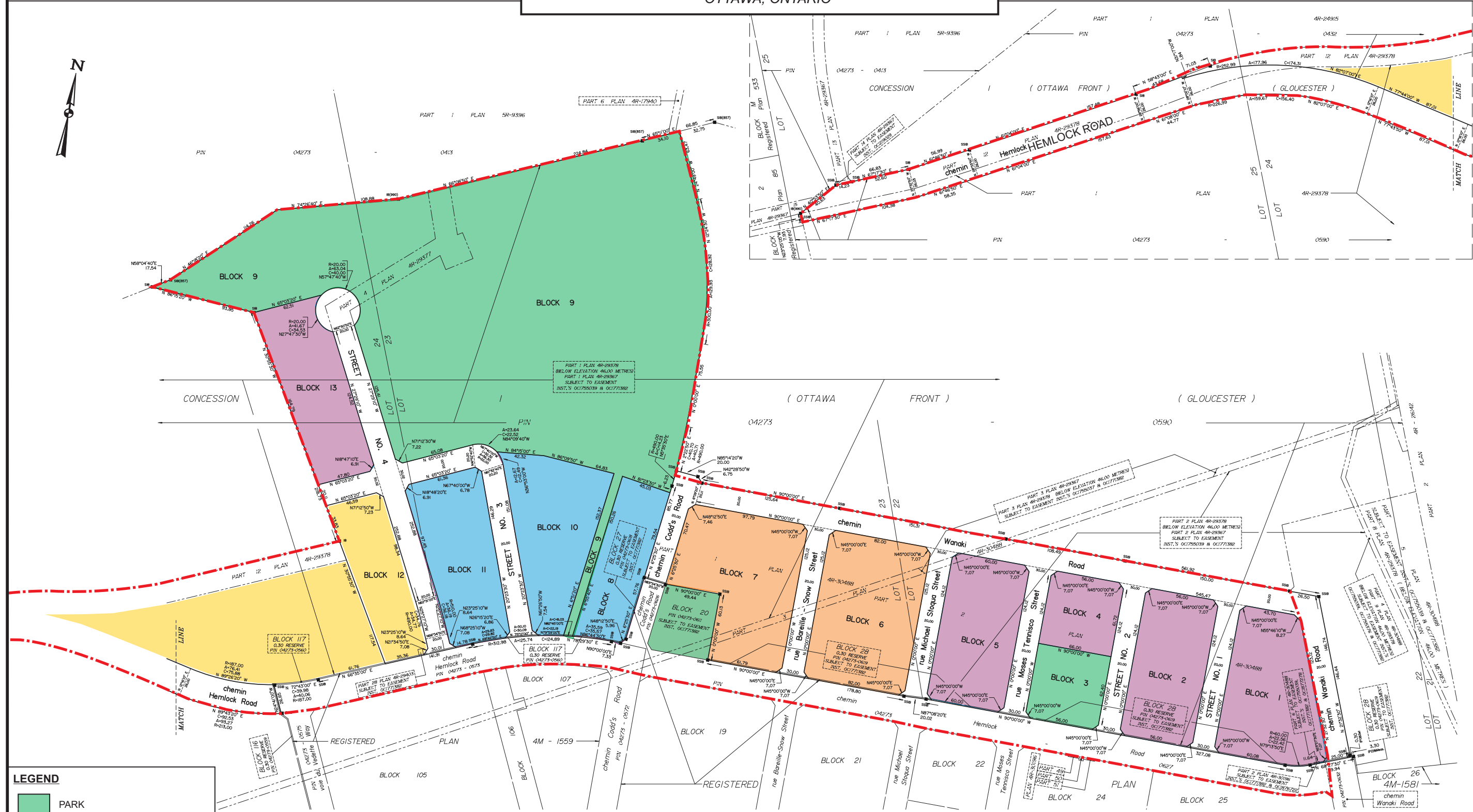
LEGEND

- - -	FORMER CFB ROCKCLIFFE
- . - . -	PHASE 2A AND 2B DEVELOPMENT



SOURCE: VUMAP FIRST BASE SOLUTIONS, 2017 IMAGERY AND PREFERRED PLAN - LAND USE BY MMM GROUP AND MELOSHE & ASSOCIATES, OCTOBER 2015.

PROJECT #	CO682.00
SCALE	AS SHOWN
DATE	DECEMBER 2018
DRAWN	SK/SF
CHECKED	
DRAWING #	DRAWING 1



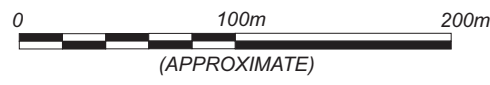
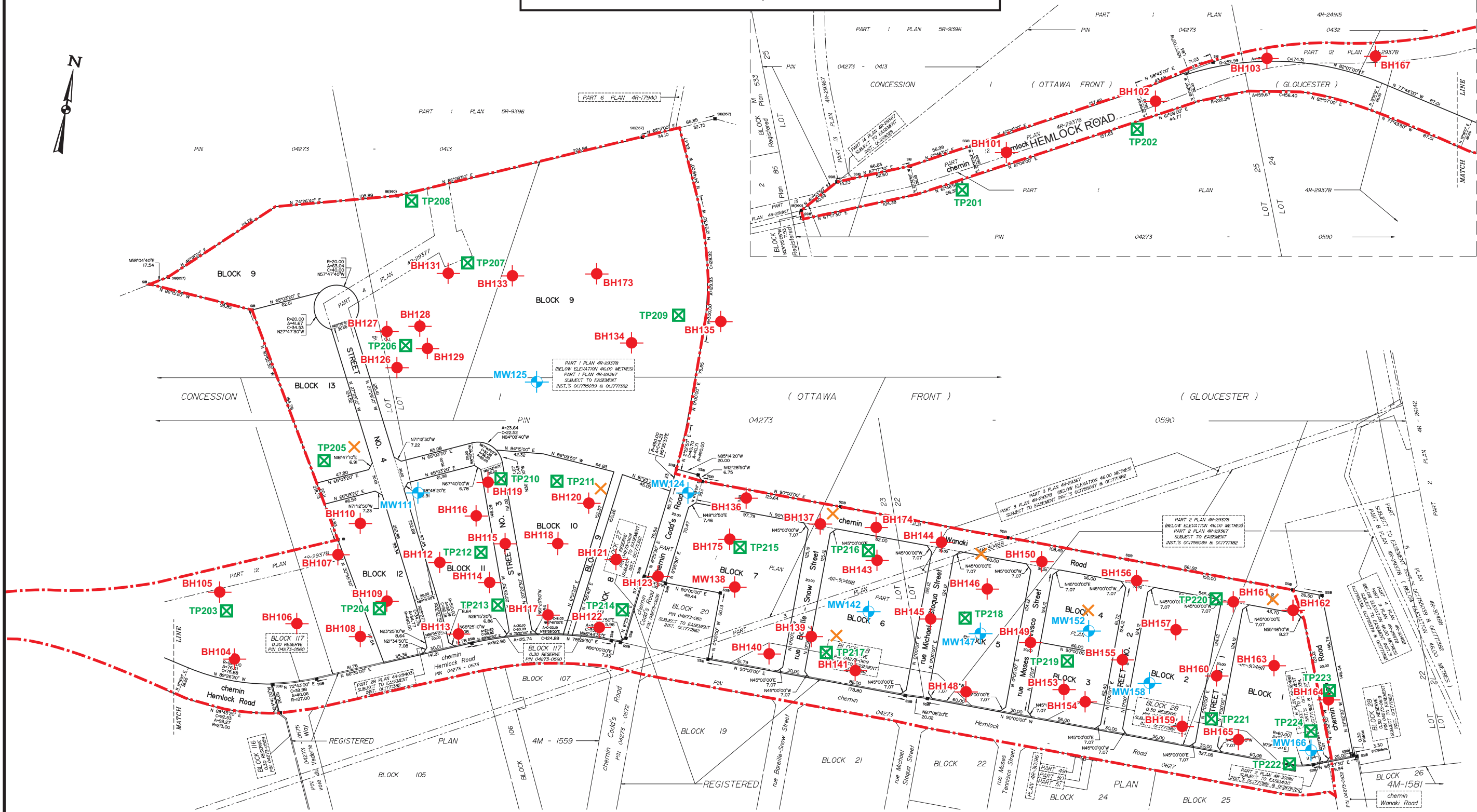
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	PARK
	LOW RISE RESIDENTIAL
	LOW TO MID RISE RESIDENTIAL
	LOW TO MID RISE MIXED USE
	MID RISE MIXED USE
	APPROXIMATE LOCATION OF INVESTIGATIONS



SOURCE: VUMAP FIRST BASE SOLUTIONS, 2017 IMAGERY AND DRAFT PLAN OF SUBDIVISION PREPARED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD., JANUARY 11, 2016.

PROJECT #	CO682.00
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DATE	DECEMBER 2018
DRAWN	SK/SF
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DRAWING #	DRAWING 2

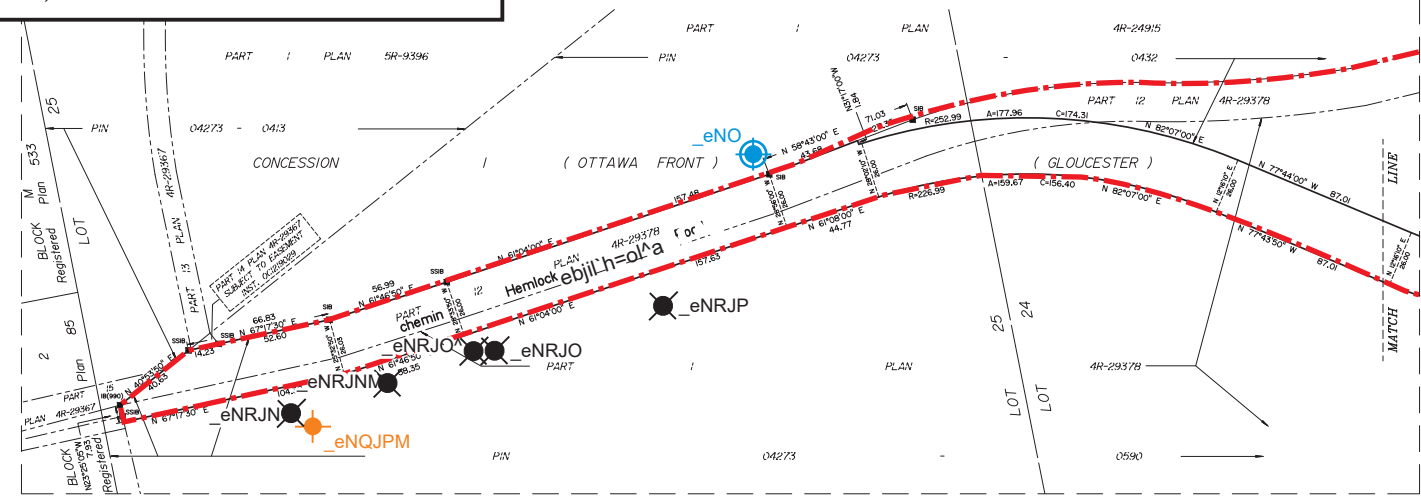
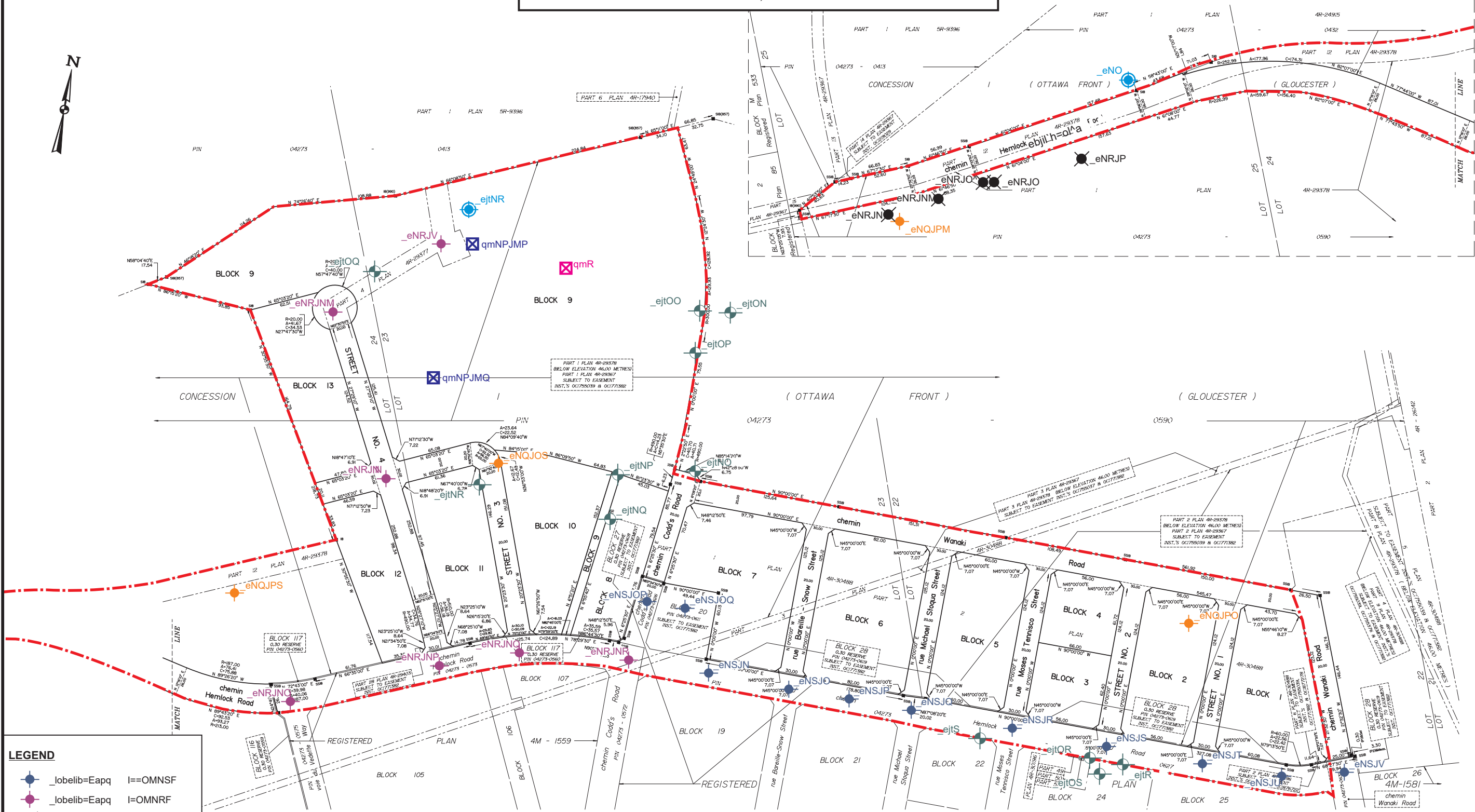


LEGEND

- STOCKPILE LOCATION (APPROXIMATE)
- TEST PIT LOCATION
- BOREHOLE WITH MONITORING WELL
- BOREHOLE LOCATION
- APPROXIMATE LOCATION OF INVESTIGATIONS

SOURCE: VUMAP FIRST BASE SOLUTIONS, 2017 IMAGERY AND DRAFT PLAN OF SUBDIVISION PREPARED BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD., JANUARY 11, 2016.

PROJECT #	CO682.00
SCALE	AS SHOWN
DATE	DECEMBER 2018
DRAWN	SK/SF
CHECKED	
DRAWING #	DRAWING 3



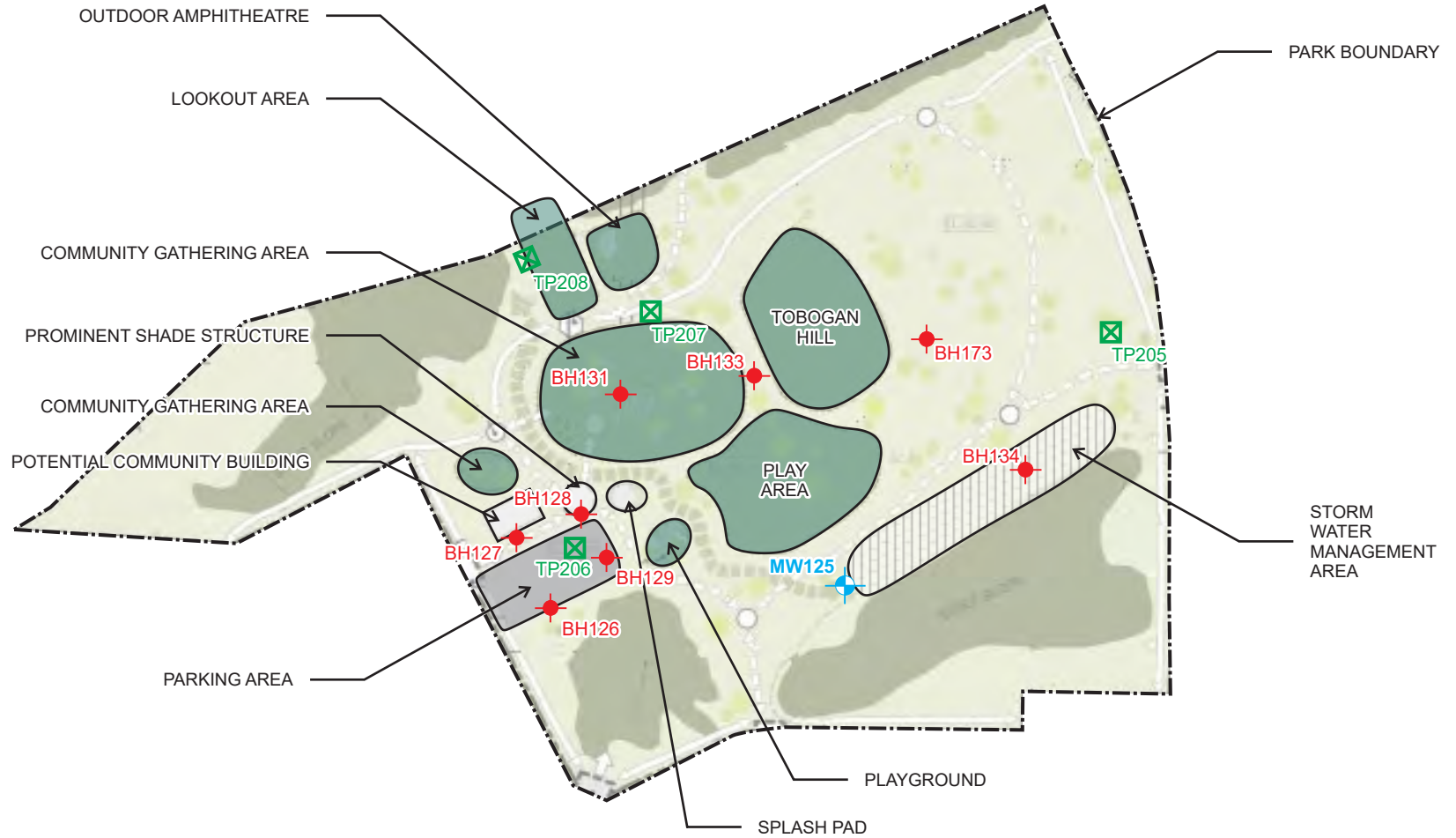
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- _lobelib=Eapq I=OMMSF
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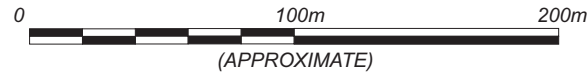
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p^hb AS SHOWN	
a^qb DECEMBER 2018	
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DRAWING 4	



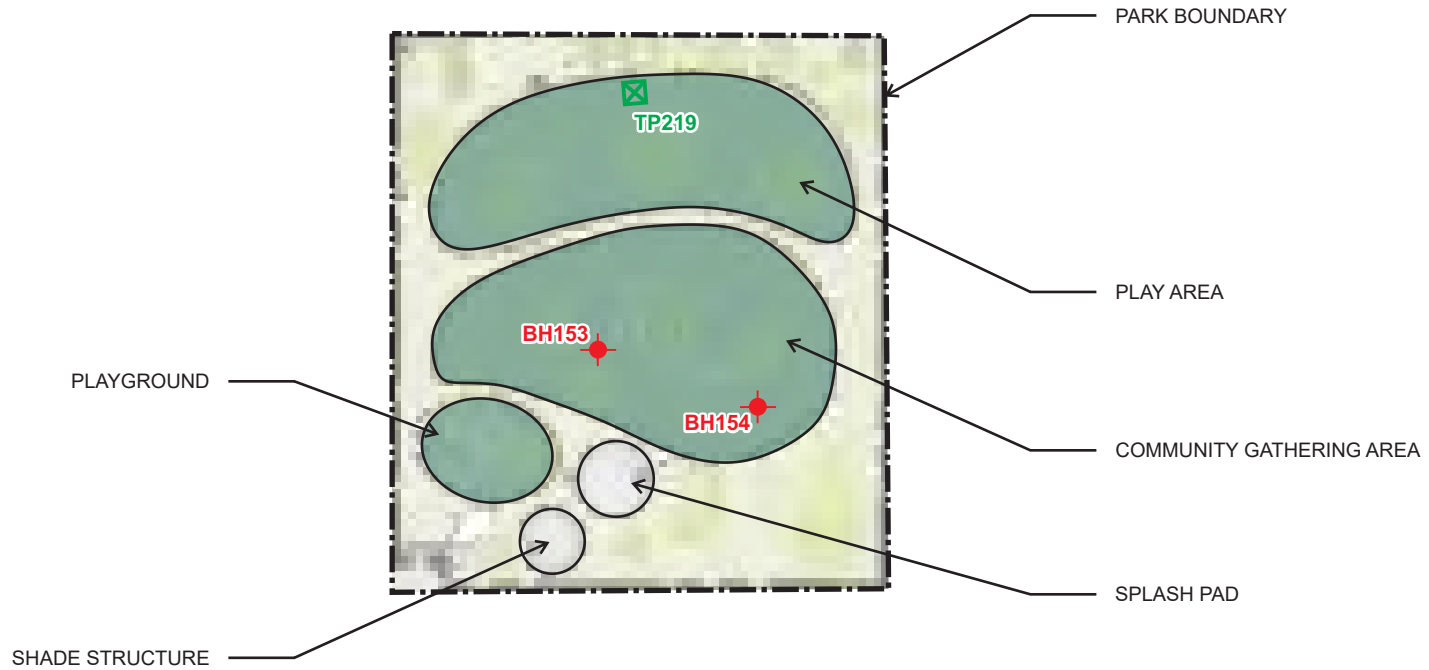
LEGEND

-  BOREHOLE WITH MONITORING WELL
-  BOREHOLE LOCATION
-  TEST PIT LOCATION



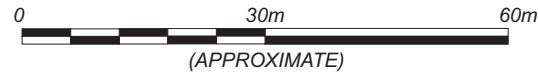
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PROJECT #	CO682.00
SCALE	AS SHOWN
DATE	DECEMBER 2018
DRAWN	SF/SK
CHECKED	
DRAWING #	DRAWING 5



LEGEND

- BOREHOLE LOCATION
- TEST PIT LOCATION



SOURCE: PARKS MASTER PLAN, FORMER CFB ROCKCLIFFE REDEVELOPMENT, PREPARED BY MMM GROUP LIMITED.

PROJECT #	CO682.00
SCALE	AS SHOWN
DATE	DECEMBER 2018
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CHECKED	
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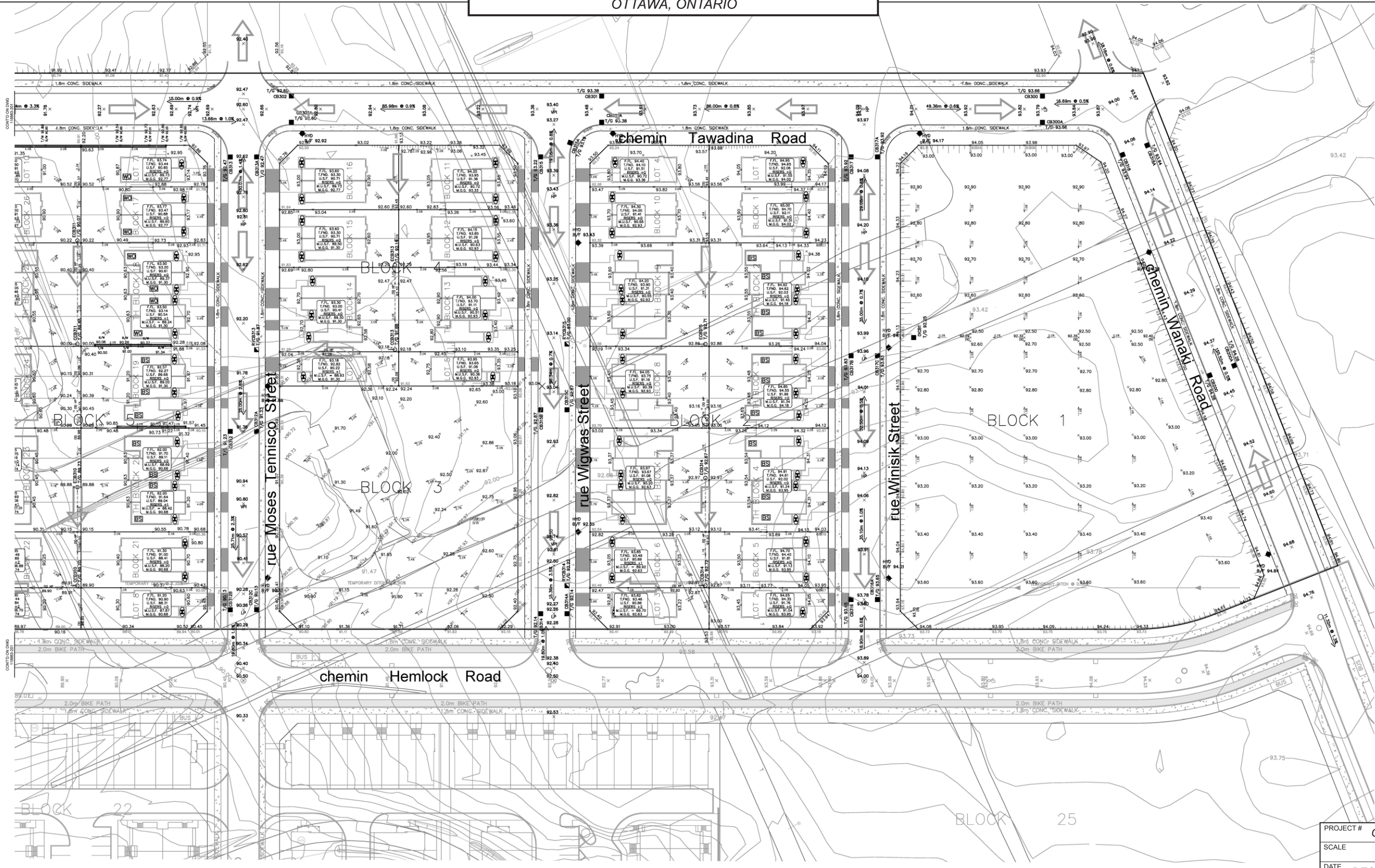


**PROPOSED GRADING PLAN
PART OF PHASE 2B
WATERIDGE VILLAGE
OTTAWA, ONTARIO**

CLIENT



Canada Lands Company
Société immobilière du Canada



SOURCE: IBI GROUP, GRADING PLAN, DRAWING #200, DECEMBER 2018.

PROJECT #	CO682.00
SCALE	N.T.S
DATE	DECEMBER 2018
DRAWN	SK
CHECKED	
DRAWING #	DRAWING 7

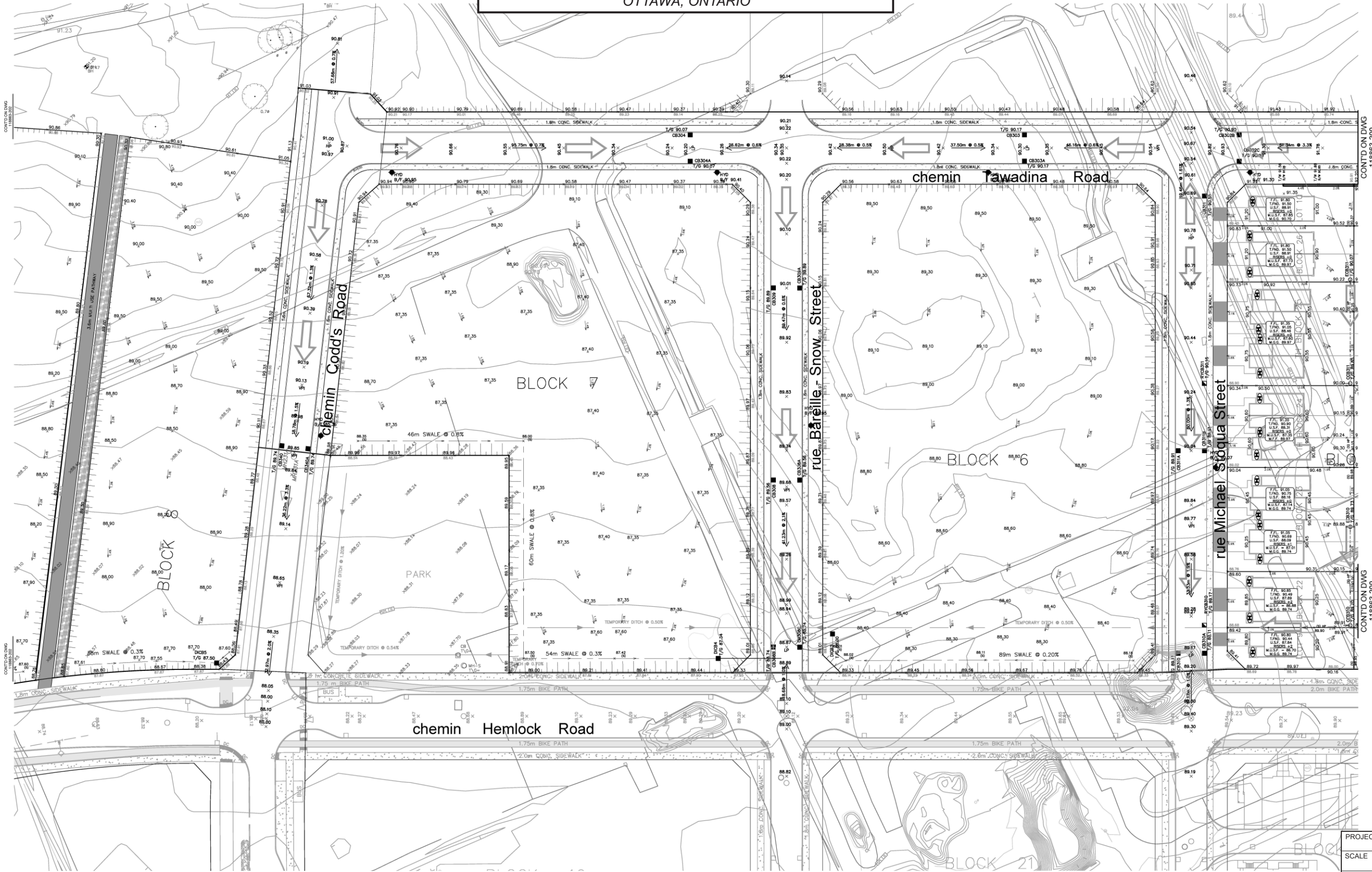


**PROPOSED GRADING PLAN
PART OF PHASE 2A AND 2B
WATERIDGE VILLAGE
OTTAWA, ONTARIO**

CLIENT



Canada Lands Company
Société immobilière du Canada



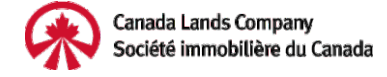
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SCALE	N.T.S
DATE	DECEMBER 2018
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CHECKED	
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SOURCE: IBI GROUP, GRADING PLAN-PHASE 2A & 2B, DRAWING #201, DECEMBER 2018.



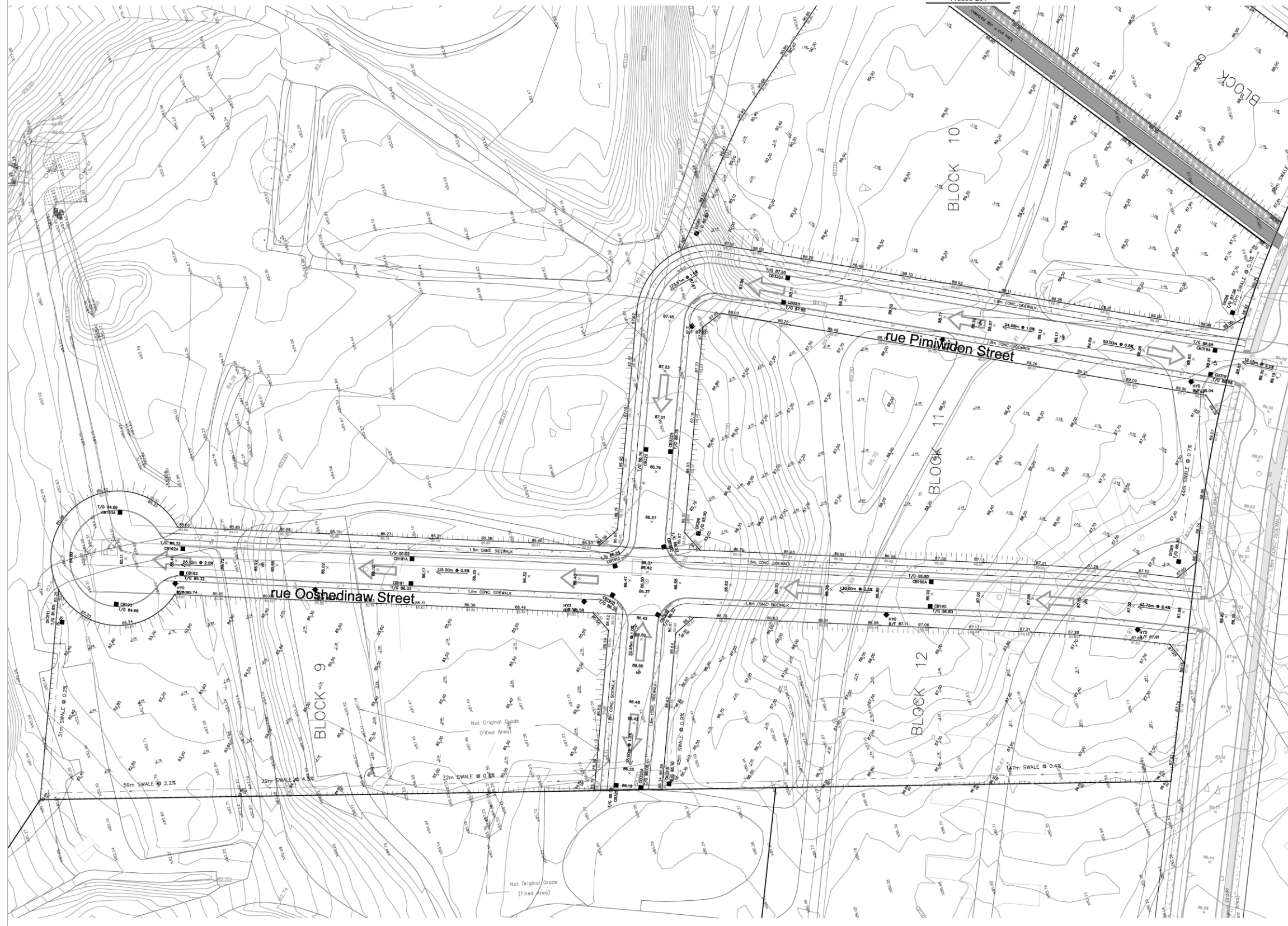
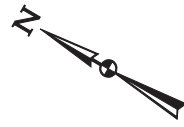
**PROPOSED GRADING PLAN
PART OF PHASE 2A
WATERIDGE VILLAGE
OTTAWA, ONTARIO**

CLIENT



Canada Lands Company
Société immobilière du Canada

CONT'D ON DWG
118863-201



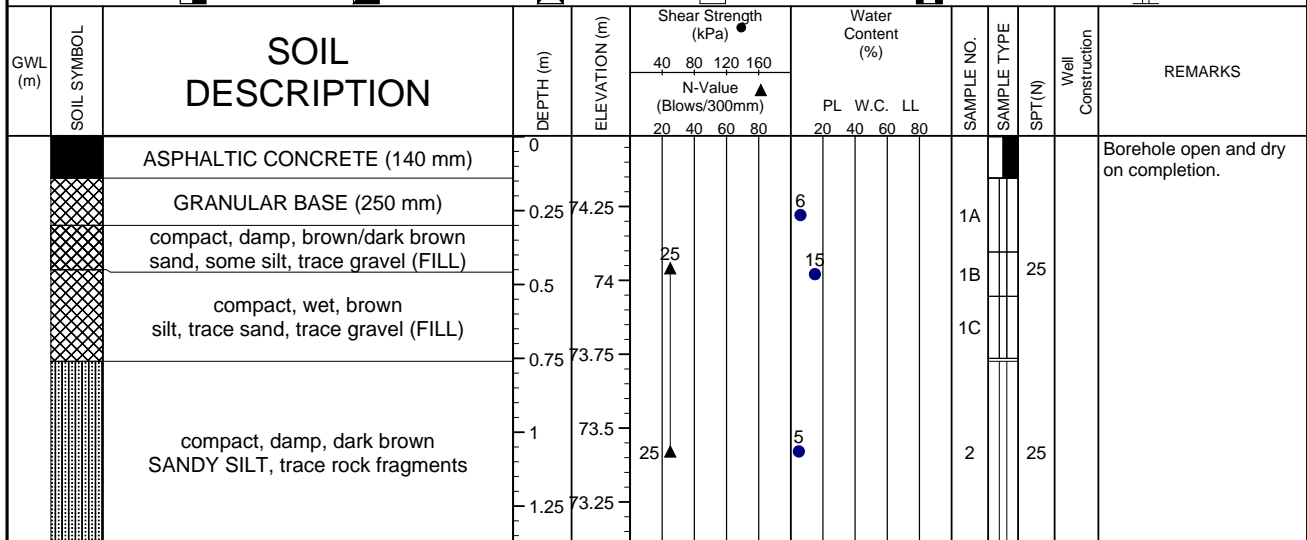
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PROJECT #	C0682.00	
SCALE	N.T.S	
DATE	DECEMBER 2018	
DRAWN	SK	CHECKED
DRAWING #	DRAWING 9	

APPENDIX C

BOREHOLE AND TEST PIT LOG SHEETS

CLIENT: Canada Lands Company CLC Limited	METHOD: Hollow Stem Auger & Split Spoon		BH No.: 101
PROJECT: Wateridge Village	PROJECT ENGINEER: VN	ELEV. (m) 74.486	
LOCATION: Rockcliffe, Ottawa	NORTHING: 5033319	EASTING: 449635	PROJECT NO.: CO682.00
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON			



CLIENT: Canada Lands Company CLC Limited	METHOD: Hollow Stem Auger & Split Spoon		BH No.: 102
PROJECT: Wateridge Village	PROJECT ENGINEER: VN	ELEV. (m) 77.596	
LOCATION: Rockcliffe, Ottawa	NORTHING: 5033372	EASTING: 449737	PROJECT NO.: CO682.00
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GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		ASPHALTIC CONCRETE (140 mm)	0	77.5									Borehole open and dry on completion.
		GRANULAR BASE (250 mm)	0.25	77.25					1A				
		compact, damp, brown/dark brown silty sand, some gravel (FILL)	0.5	77	20				1B	20			
		loose, moist, brown silt, some sand, traces of gravel and organics (FILL)	0.75	76.75					2A				
		compact, damp, brown SANDY SILT, trace rock fragments	1.0	76.5					2B	13			
		END OF BOREHOLE	1.25	76.25									

--	--	--	--	--	--	--	--	--	--	--	--	--

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 103									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 83.885										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033431	EASTING: 449858	PROJECT NO.: CO682.00									
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON													
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
					N-Value (Blows/300mm)								
					20 40 60 80	20 40 60 80							
		ASPHALTIC CONCRETE (130 mm)	0	83.75									Borehole open and dry on completion.
		GRANULAR BASE (200 mm)	0.25					1A					
		compact, damp, brown, sandy silt, traces of gravel and clay (FILL)	0.5	83.5	19			1B		19			
		compact, damp, light brown layered SANDY SILT trace gravel, occasional oxidized layers.	1.0	83				2		23			
		END OF BOREHOLE	1.25	82.75	23								

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 104											
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 84.343												
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033420	EASTING: 450076	PROJECT NO.: CO682.00											
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON								
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		ASPHALTIC CONCRETE (50 mm)	0	84.25											Borehole open and dry on completion.
		compact, damp, brown/grey silt, traces of clay, sand and gravel (FILL)	0.25	84		12					1		12		
		compact, damp, grey CLAYEY SILT	0.75	83.75		14					2		14		
		very dense, damp, brown SANDY SILT, trace gravel	1.5	83.25		50/127					3		50/127		Auger refusal at 1.85 m bgs.
		END OF BOREHOLE	1.75	82.75											
			1.75	82.5											

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 105											
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 85.658												
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033479	EASTING: 450064	PROJECT NO.: CO682.00											
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON								
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
			0	85.5											Borehole open and dry on completion.
		loose, moist, brown silty sand, traces of gravel, clay, and topsoil (FILL)	0.25	85.25	5						1		5		
			0.5	85											
			0.75	84.75											
			1	84.5	10						2		10		
			1.25	84.25											
		hard, damp, light brown/brown SANDY SILT some clay, trace rock fragments	1.5	84	50/100						3		50/100		Auger refusal at 1.80 m bgs.
		END OF BOREHOLE	1.75												

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 106											
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 85.125		PROJECT NO.: CO682.00									
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033459		EASTING: 450127		PROJECT NO.: CO682.00									
SAMPLE TYPE		AUGER		DRIVEN		CORING		DYNAMIC CONE		SHELBY		SPLIT SPOON			
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
		compact, moist, grey gravelly sand (FILL)	0	85							1A				Borehole open and dry on completion.
		very stiff, moist, brown CLAYEY SILT trace gravel, sand, and organics, occasional oxidized pockets	0.25	84.75	16						1B		16		Difficult to auger from 0.61 m bgs to refusal.
		rock fragments	0.75	84.5											
			1	84.25	50/75						2		50/75		Auger refusal at 1 m bgs.
		END OF BOREHOLE													

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 107									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 86.700										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033520	EASTING: 450148	PROJECT NO.: CO682.00									
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GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		ASPHALTIC CONCRETE (100 mm)	0	86.5									Borehole caved-in at 1.8 m bgs and dry on completion. Auger refusal at 2.20 m bgs.
		dense, damp, grey/brown gravelly sand, some silt (FILL)	0.25	86.25	33				1	33			
		soft, wet, dark brown/black clayey silt (FILL)	0.75	86					2A				
		soft, moist, greyish blue clayey silt, trace sand (FILL)	1.0	85.75	4				2B	4			
		dense, moist, greyish blue sandy silt, trace gravel (FILL)	1.75	85.25					3A				
		very dense, greyish brown, moist GRAVELLY SAND, trace rock fragments	2.0	84.75	75/254				3B	75/254			
		END OF BOREHOLE											
					LOGGED BY: RH		DRILLING DATE: November 19, 2018						
					REVIEWED BY: VN		Page 1 of 1						

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 108									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 86.302										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033465	EASTING: 450175	PROJECT NO.: CO682.00									
SAMPLE TYPE		<input type="checkbox"/> AUGER	<input checked="" type="checkbox"/> DRIVEN	<input checked="" type="checkbox"/> CORING	<input type="checkbox"/> DYNAMIC CONE	<input type="checkbox"/> SHELBY	<input type="checkbox"/> SPLIT SPOON						
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		ASPHALTIC CONCRETE (40 mm)	0	86.25									
		compact, damp, brown gravelly sand (FILL)	0.25	86					1		10		
		firm, moist, dark brown clayey silt, trace sand, trace to some gravel, trace organics (FILL)	0.75	85.5									
		compact to very dense, moist, brown sandy silt, some gravel (FILL)	1.0	85.25					2		8		
			1.25	85									
			1.5	84.75									
			1.75	84.5					3		62/203		Auger refusal at 1.90 m bgs.
		END OF BOREHOLE											

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon				BH No.: 109									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 87.338		PROJECT NO.: CO682.00									
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033491		EASTING: 450202		PROJECT NO.: CO682.00									
SAMPLE TYPE		AUGER		DRIVEN		CORING		DYNAMIC CONE		SHELBY		SPLIT SPOON			
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
			0	87.25		50/125					1	50/125			Borehole open and dry on completion.
		soft, moist, dark brown, clayey silt traces of sand, gravel, and organics (FILL)	0.25	87											
			0.5	86.75											Rock in spoon tip at 0.3 m bgs
			0.75	86.5											
			1	86.25		40					2A	40			Difficult augering from 1.0 m bgs to refusal.
			1.25	86							2B				
			1.5	85.75											Relocated drill 1 m S to avoid rocks.
			1.75	85.5		23					3	23			
		dense to compact, damp, light brown silty sand, some clay, trace gravel (FILL)	2	85.25											
			2.25	85											
		rock fragments	2.5	84.75		64					4	64			Auger refusal at 2.9 m bgs.
			2.75	84.5											
		END OF BOREHOLE													

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 110								
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 86.374									
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033554	EASTING: 450130	PROJECT NO.: CO682.00								
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON					
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) 40 80 120 160	N-Value (Blows/300mm) 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
		FROZEN GROUND	0	86.25								Borehole caved-in at 0.91 m bgs and dry on completion.
		very dense, damp, grey gravel, some sand (FILL)	0.25	86				1A		80		
		compact, damp to wet, brown sandy silt, some gravel, trace organics trace oxidization (FILL)	0.75	85.75				1B				
		compact to very dense, moist to wet, dark brown, silty gravel, trace sand, trace organics and rock fragments (FILL)	1.0	85.5				2A				
		END OF BOREHOLE	1.25	85.25				2B		31		Auger refusal at 1.40 m bgs.

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: MW111									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 86.960										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033607	EASTING: 450217		PROJECT NO.: CO682.00								
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON													
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
					N-Value (Blows/300mm)								
					20 40 60 80	20 40 60 80							
			0										Monitoring well was dry on December 17, 2018.
		soft, moist, grey clayey silt, organic layers (FILL)	0.25	86.75	3				1	3			Bentonite
		some sand trace asphalt	1.25	85.75	4				2	4			sand
		limestone fragments, trace sand (FILL)	1.75	85.25	26				3	26			sand and screen
			2.5	84.5	61/228				4	61/228			Auger refusal at 2.7 m bgs.
		END OF BOREHOLE											

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon				BH No.: 112									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 88.479		PROJECT NO.: CO682.00									
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033534		EASTING: 450242		PROJECT NO.: CO682.00									
SAMPLE TYPE		AUGER		DRIVEN		CORING		DYNAMIC CONE		SHELBY		SPLIT SPOON			
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
		FROZEN GROUND	0												borehole open and dry on completion.
		dense, moist, brown sand and gravel, trace organics (FILL)	0.25	88.25							1A				
		very dense, damp, light brown SANDY SILT trace organics	0.5	88	36						1B		36		
		rock fragments occasional oxidized pockets	0.75	87.75											
			1	87.5	58/228						2		58/228		Auger refusal at 1.2 m bgs.
		END OF BOREHOLE													

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon				BH No.: 113							
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 87.861									
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033488		EASTING: 450267		PROJECT NO.: CO682.00							
SAMPLE TYPE		<input type="checkbox"/> AUGER	<input checked="" type="checkbox"/> DRIVEN	<input checked="" type="checkbox"/> CORING	<input type="checkbox"/> DYNAMIC CONE	<input type="checkbox"/> SHELBY	<input type="checkbox"/> SPLIT SPOON						
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		compact, damp, dark brown sandy gravel mixed with organics (FILL)	0 0.25 0.5 0.75 1	87.75 87.5 87.25 87	▲ 10				1	10		Borehole open and dry on completion.	
		very dense, damp, brown silty sand, large gravel (FILL)			▲ 50/75				2	50/75		Difficult augering to 0.76 m to refusal at 1.0 m bgs	
		END OF BOREHOLE											




CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 114											
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 88.305												
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033521	EASTING: 450284	PROJECT NO.: CO682.00											
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON								
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
		TOPSOIL (250 mm)	0	88.25							1A				Borehole open and dry on completion.
		compact, damp to dry, brown/dark brown sand some silt, trace rootlets, trace gravel, trace cinder (FILL)	0.25	88	12						1B		12		
			0.5	87.75											
			0.75	87.5											
		dense to compact damp light brown mixed dark brown SANDY SILT trace gravel, trace organics	1	87.25	46						2		46		
			1.25	87											
			1.5	86.75											
			1.75	86.5	13						3		13		Auger refusal at 2.1 m bgs.
			2	86.25											
		END OF BOREHOLE													


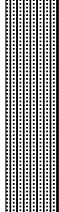
CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon				BH No.: 115							
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 89.154		PROJECT NO.: CO682.00							
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033555		EASTING: 450293		PROJECT NO.: CO682.00							
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON													
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
					N-Value (Blows/300mm)								
					20 40 60 80	20	40	60	80				
		ASPHALTIC CONCRETE (40 mm)	0	89									Borehole open and dry on completion. Relocated drill 1 m N, confirmed bedrock depth of 1.0 m bgs.
		dense, damp, brown gravelly sand, trace asphalt (FILL)	0.25	88.75	44				1		44		Auger refusal at 1.0 m bgs.
		very dense, damp, brown sandy silt, traces of gravel and rock fragments (FILL)	0.75	88.5	50/100				2		50/100		
		END OF BOREHOLE	1	88.25									
					LOGGED BY: RH		DRILLING DATE: November 19, 2018						
					REVIEWED BY: VN		Page 1 of 1						



CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon				BH No.: 116									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 89.153		PROJECT NO.: CO682.00									
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033580		EASTING: 450267		PROJECT NO.: CO682.00									
SAMPLE TYPE		AUGER		DRIVEN		CORING		DYNAMIC CONE		SHELBY		SPLIT SPOON			
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
		stiff, moist-wet, grey clayey silt (FILL)	0	89							1A		9		Borehole open and dry on completion.
		loose, moist, brown/dark brown sandy silt, traces of organics and cinder (FILL)	0.25	88.75							1B				
		very dense, damp, light brown SANDY SILT occasional oxidized pockets	0.5	88.5							2		75/228		Auger refusal at 1.44 m bgs.
		END OF BOREHOLE	1	88											
			1.25	87.75											

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 117											
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 88.021			PROJECT NO.: CO682.00									
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033498	EASTING: 450350		PROJECT NO.: CO682.00										
SAMPLE TYPE		<input type="checkbox"/> AUGER	<input checked="" type="checkbox"/> DRIVEN	<input checked="" type="checkbox"/> CORING	<input type="checkbox"/> DYNAMIC CONE	<input type="checkbox"/> SHELBY	<input type="checkbox"/> SPLIT SPOON								
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
		compact, moist, brown mixed grey sandy silt, traces of clay and gravel (FILL)	0	88											Borehole open and dry on completion.
		loose, moist, dark brown/black sandy silt, some organics (FILL)	0.25	87.75		12					1A		12		
		firm, moist, brownish grey clayey silt, trace sand (FILL)	0.75	87.25							1B				
			1	87		10					2		10		Auger refusal at 1.23 m bgs.
		END OF BOREHOLE													


CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon				BH No.: 118							
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 88.079									
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033567		EASTING: 450340		PROJECT NO.: CO682.00							
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON													
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		TOPSOIL (200 mm)	0	88					1A				Borehole open and dry on completion.
		loose, moist, dark brown sandy silt, traces of cinder and rootlet (FILL)	0.25	87.75	5				1B		5		
		dense, moist brown with grey mottling SANDY SILT, some clay, trace gravel occasional oxidized pockets	0.5	87.5									
			0.75	87.25	50/50				2		50/50		Auger refusal at 0.96 m bgs.
		END OF BOREHOLE											
					LOGGED BY: RH		DRILLING DATE: November 16, 2018						
					REVIEWED BY: VN		Page 1 of 1						

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon				BH No.: 119										
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 88.530												
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033613		EASTING: 450267		PROJECT NO.: CO682.00										
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON																
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)				Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40	80	120	160	PL	W.C.	LL					
		very dense, moist, dark brown sand and gravel, large rock in spoon (FILL)	0 0.25 0.5	88.5 88.25 88								1		90		Borehole open and dry on completion. Auger refusal at 0.65 m bgs.
		END OF BOREHOLE														
 geotechnical division of 					LOGGED BY: RH			DRILLING DATE: November 19, 2018								
					REVIEWED BY: VN			Page 1 of 1								

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 120									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 89.574										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033596	EASTING: 450340	PROJECT NO.: CO682.00									
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON													
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		compact, moist, dark brown/brown gravelly sand, traces of cinder and rootlets (FILL)	0 0.25	89.5 89.25	▲ 13				1A		13		Borehole open and dry on completion.
		very dense, damp, light brown SILT some sand, trace clay	0.5 0.75 1	89 88.75 88.5					1B 2		100/280		Auger refusal at 1.20 m bgs.
		END OF BOREHOLE											



CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon				BH No.: 121											
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 88.554		PROJECT NO.: CO682.00											
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033556		EASTING: 450408		PROJECT NO.: CO682.00											
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON																	
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)				Water Content (%)				SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40	80	120	160	PL	W.C.	LL	LL					
		ASPHALTIC CONCRETE (75 mm) compact, moist to wet, dark brown sandy gravel, trace asphalt (FILL)	0 0.25 0.5 0.75	88.5 88.25 88										1	14		Borehole open and dry on completion. Auger refusal at 0.80 m bgs.
		END OF BOREHOLE															
					LOGGED BY: RH		DRILLING DATE: November 16, 2018			REVIEWED BY: VN			Page 1 of 1				


CLIENT: Canada Lands Company CLC Limited		METHOD: Split Spoon Sampling				BH No.: 122											
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 88.020													
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033509		EASTING: 450395		PROJECT NO.: CO682.00											
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON																	
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)				Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS	
					40	80	120	160	PL	W.C.	LL						
					N-Value (Blows/300mm) ▲												
					20	40	60	80	20	40	60	80					
			0	88													Borehole open and dry on completion.
		moist, dark brown/black silt, some sand, some gravel (FILL)	0.25	87.75													
			0.5	87.5													
			0.75	87.25													
		greyish blue, moist, hard clayey silt, trace sand, trace gravel (FILL)	1	87								1		36			
			1.25	86.75													Auger refusal at 1.52 m bgs.
			1.5	86.5													
		END OF BOREHOLE															
				LOGGED BY: RH		DRILLING DATE: November 16, 2018											
				REVIEWED BY: VN		Page 1 of 1											



CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon				BH No.: 123										
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 88.589												
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033559		EASTING: 450433		PROJECT NO.: CO682.00										
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON																
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)				Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40	80	120	160	PL	W.C.	LL					
					N-Value (Blows/300mm)											
					20	40	60	80	20	40	60	80				
		loose, moist, brown sandy silt, some gravel, trace clay (FILL)	0 0.25 0.5 0.75	88.5 88.25 88 87.75								1 2	8 50/25		Borehole open and dry on completion. Auger refusal at 0.94 m bgs.	
		END OF BOREHOLE														

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: MW124									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 90.147										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033631	EASTING: 450454	PROJECT NO.: CO682.00									
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON						
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
					N-Value (Blows/300mm)								
					20 40 60 80	20	40	60	80				
		compact, damp to moist, dark brown silty sand, some gravel, trace organics (FILL)	0 to 0.25	90 to 89.75	24					1	24	Bentonite	Monitoring well was dry on Decemebr 17, 2018.
		compact to dense light brown SANDY SILT	0.25 to 1.70	89.75 to 88.5	20	8	27			2A	20	sand	
			1.70 to 1.70	88.5	50/25					2B	50/25	sand and screen	Auger refusal at 1.70 m bgs.
		END OF BOREHOLE								3			

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: MW125											
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 82.655												
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033720	EASTING: 450286		PROJECT NO.: CO682.00										
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON								
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
		stiff, moist, dark brown/grey clayey silt, traces of topsoil, gravel and rootlets (FILL)	0 to 0.25	82.5 to 82.25	12	33					1	12			Groundwater was measured at 0.25 mbgs on December 17, 2018. Bentonite
		firm, moist, grey layered CLAY and SILT trace sand occasional oxidized layers	0.25 to 2.25	82.25 to 80.25	9	34					2	9			sand
			2.25 to 2.46	80.25 to 80.14	9	36					3	9			sand and screen
		coarse sand seam	2.46 to 2.46	80.14 to 80.14	50/50	11					4	50/50			Auger refusal at 2.46 m bgs.
		END OF BOREHOLE													

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 126									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 84.434										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033711	EASTING: 450163	PROJECT NO.: CO682.00									
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON													
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		compact, moist, brown gravelly sand, trace rock fragments (FILL)	0 0.25 0.5	84.25 84	12				1	12		Borehole open and dry on completion.	
		compact, dry, brown SANDY SILT occasional oxidized layers trace rock fragments	0.75 1 1.25 1.5	83.75 83.5 83.25 83	25				2	25			
					50/125				3	50/125		Auger refusal at 1.65 m bgs.	
		END OF BOREHOLE											


CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon				BH No.: 127							
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 84.156									
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033735		EASTING: 450159		PROJECT NO.: CO682.00							
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON													
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		brown, moist compact to dense SILTY SAND some rock fragments	0	84									Borehole open and dry on completion.
			0.25	83.75	19				1		19		
			0.5	83.5									
			0.75	83.25	74/50				2		74/50		Auger refusal at 1.52 m bgs.
			1	83									
			1.25	82.75									
			1.5										
END OF BOREHOLE													
					LOGGED BY: RH			DRILLING DATE: November 20, 2018					
					REVIEWED BY: VN			Page 1 of 1					

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon				BH No.: 128							
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 84.086									
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033735		EASTING: 450193		PROJECT NO.: CO682.00							
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON													
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		FROZEN GROUND	0	84									Borehole open and dry on completion.
		compact, moist, brown silty sand, trace gravel (FILL)	0.25	83.75	15				1		15		Auger refusal at 1.0 m bgs.
		rock fragments	0.5	83.5	50/75				2		50/75		
		END OF BOREHOLE	1	83.25									

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon				BH No.: 131									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 83.039		PROJECT NO.: CO682.00									
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033795		EASTING: 450201		PROJECT NO.: CO682.00									
SAMPLE TYPE		AUGER		DRIVEN		CORING		DYNAMIC CONE		SHELBY		SPLIT SPOON			
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		TOPSOIL (50 mm)	0	83											Borehole open and dry on completion.
		compact dense moist SILTY SAND	0.25 0.5 0.75	82.75 82.5 82.25	12 50/75						1 2		12 50/75		
		END OF BOREHOLE	1.5	81.75											Auger refusal at 1.52 m bgs.

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 133									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 81.775										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033799	EASTING: 450270		PROJECT NO.: CO682.00								
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON													
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		FROZEN GROUND	0	81.75									Borehole caved-in at 1.83 m bgs and dry on completion.
		compact, moist, brown gravel, trace sand (FILL)	0.25	81.5					1		25		
		firm, moist, dark brown clayey silt, traces of sand, gravel, and organics (FILL)	0.75	81					2A				
		stiff, moist greyish brown CLAYEY SILT trace gravel trace sand	1.0	80.75	8				2B		8		
			1.25	80.5									
			1.5	80.25									
			1.75	80	17				3		17		
			2.0	79.75									Auger refusal at 2.28 m bgs.
		END OF BOREHOLE	2.25	79.5	50/25				4		50/25		

CLIENT: Canada Lands Company CLC Limited		METHOD: Split Spoon Sampling		BH No.: 134											
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 82.819												
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033758	EASTING: 450381	PROJECT NO.: CO682.00											
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON								
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		TOPSOIL (150 mm)	0	82.75							1A				On completion of the borehole water was at 0.91 m bgs.
		brownish orange, moist, loose sand some silt trace organics (FILL)	0.25	82.5		6					1B		6		
		light brown	0.5	82.25							2C				
		stiff, moist CLAY and SILT trace sand	1.0	81.75		13					2		13		
		greyish brown	1.25	81.5											
			1.5	81.25							3A			Difficult augering between the depths of 1.8 m to refusal.	
			1.75	81		11							11	Auger refusal at 2.13 m bgs.	
		brown, wet, loose SILT, some sand, some gravel	2.0	80.75							3B				
		END OF BOREHOLE													

CLIENT: Canada Lands Company CLC Limited		METHOD: Hologram Auger & Split Spoon				BH No.: 135										
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 84.928												
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033790		EASTING: 450447		PROJECT NO.: CO682.00										
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON																
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)				Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40	80	120	160	PL	W.C.	LL					
					N-Value (Blows/300mm) ▲											
		very dense, moist, brown gravelly sand, some silt (FILL)	0 0.25 0.5 84.25	84.75 84.5								1		50		Borehole open and dry on completion. Auger refusal at 0.70 m bgs.
		END OF BOREHOLE														

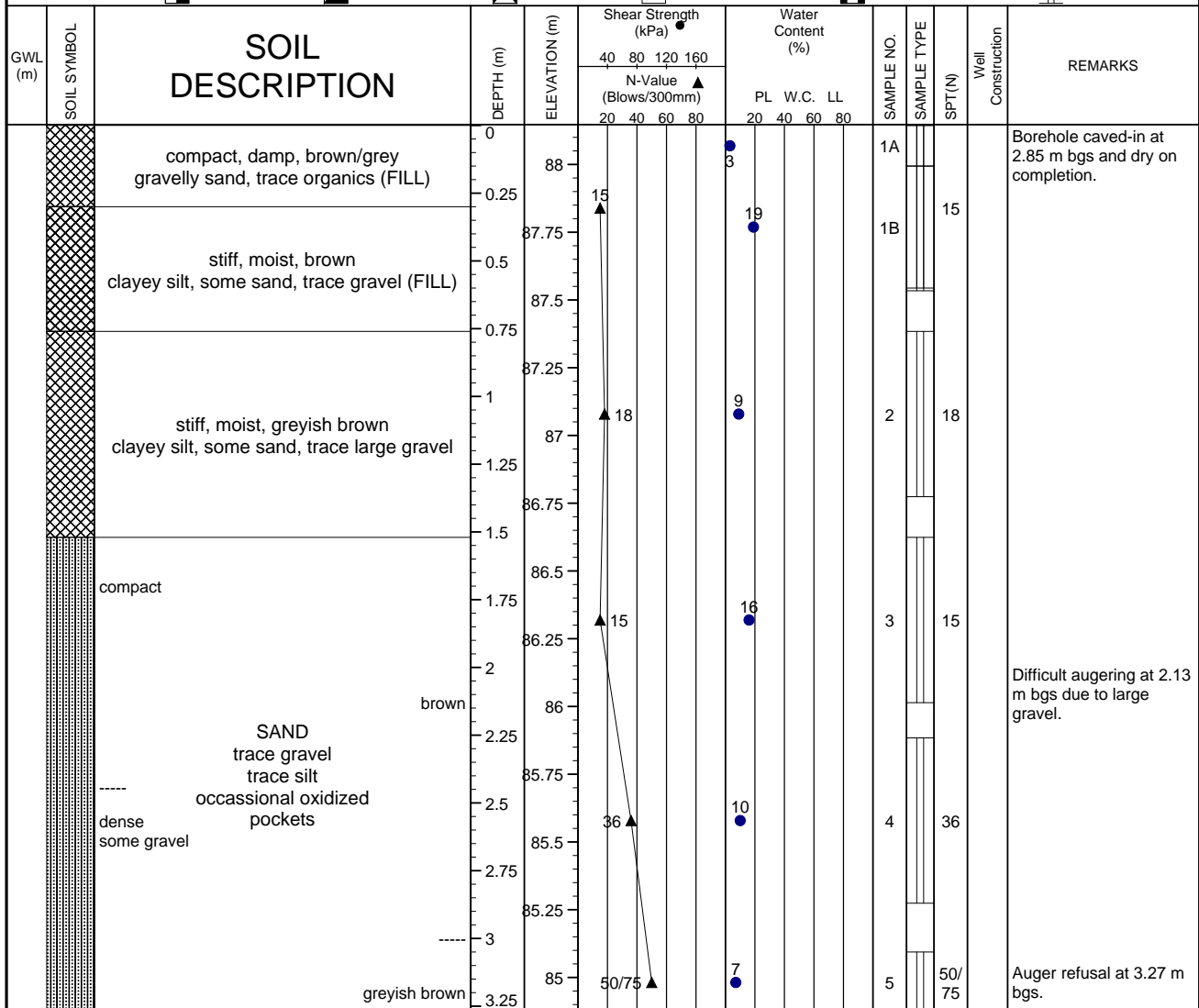
CLIENT: Canada Lands Company CLC Limited		METHOD: Split Spoon Sampling		BH No.: 136									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 89.202										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033634	EASTING: 450509	PROJECT NO.: CO682.00									
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON													
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		very dense, moist, dark brown and black, gravelly sand, trace asphalt pieces (FILL)	0	89					1A				Borehole open and dry on completion.
		very stiff, damp, dark brown clayey silt, some gravel (FILL)	0.25	88.75	29				1B	29			
		very dense, damp, light brown SANDY SILT	0.5	88.5	50/75				1C	50/75			
		END OF BOREHOLE	1	88.25					2				Auger refusal at 1.37 m bgs.
			1.25	88									

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 137											
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 89.668												
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033622	EASTING: 450581	PROJECT NO.: CO682.00											
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON								
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		compact, moist-wet, light brown/brown/grey silty sand to sand, some gravel, trace brick, trace concrete, black organics (FILL)	0 0.25 0.5 0.75 1 1.25 1.5 1.75	89.5 89.25 89 88.75 88.5 88.25 88	40 80 120 160	▲ 17					1		17		Borehole open and dry on completion.
		compact, damp, light brown SANDY SILT				▲ 7					2A		7		
		rock fragments				▲ 62/203					2B				Auger refusal at 1.87 m bgs.
		END OF BOREHOLE									3		62/203		

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon				BH No.: 138											
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 88.510													
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033554		EASTING: 450509		PROJECT NO.: CO682.00											
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON																	
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)				Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS	
					40	80	120	160	PL	W.C.	LL						
		ASPHALTIC CONCRETE (75 mm)	0	88.5													
		damp, brown gravelly sand (FILL)	0.25	88.25								1		50			
			0.5	88													
		hard, moist, brown CLAYEY SILT, some sand, some gravel	0.75	87.75								2		53/254			
			1	87.5													
			1.25	87.25													Auger refusal at 1.37 m bgs.
		END OF BOREHOLE															
					LOGGED BY: RH			DRILLING DATE: November 16, 2018									
					REVIEWED BY: VN			Page 1 of 1									

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon				BH No.: 139									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 89.520		PROJECT NO.: CO682.00									
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033537		EASTING: 450577		PROJECT NO.: CO682.00									
SAMPLE TYPE		AUGER		DRIVEN		CORING		DYNAMIC CONE		SHELBY		SPLIT SPOON			
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		compact to dense, damp, brown/grey gravelly sand, traces of brick and concrete (FILL) ----- metal fragments	0 0.25 0.5 0.75 1 1.25 1.5	89.5 89.25 89 88.75 88.5 88.25 88	40 80 120 160	▲ ▲ ▲									
						30 15 50/25					1 2 3		30 15 50/25		Borehole caved-in at 1.10 m bgs and dry on completion. Auger refusal at 1.70 m bgs.
		no recovery													
		END OF BOREHOLE													

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 140
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 88.144	
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033503	EASTING: 450549	PROJECT NO.: CO682.00
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON				



END OF BOREHOLE

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 141									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 88.613										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033512	EASTING: 450627	PROJECT NO.: CO682.00									
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON													
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		ASPHALTIC CONCRETE (75 mm)	0	88.5									Borehole open and dry on completion.
		stiff, damp, dark brown/grey/black clayey silt, some sand, some gravel, trace construction debris, trace rock fragments (FILL)	0.25	88.25	▲ 14				1		14		
			0.5	88									
		very stiff, moist, greyish brown CLAYEY SILT some sand, trace gravel	0.75	87.75									
			1	87.5	▲ 13				2		13		
		no recovery	1.25	87.25									
			1.5	87									
		no recovery	1.75	86.75	▲ 28				3		28		
			2	86.5									
		no recovery	2.25	86.25	▲ 50/50				4		50/50		Auger refusal at 2.46 m bgs.
			END OF BOREHOLE										

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: MW142											
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 89.848		PROJECT NO.: CO682.00									
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033561		EASTING: 450629		PROJECT NO.: CO682.00									
SAMPLE TYPE		CORING		DYNAMIC CONE		SHELBY									
AUGER		DRIVEN		DYNAMIC CONE		SHELBY									
SPLIT SPOON		CORING		DYNAMIC CONE		SHELBY									
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
		TOPSOIL (100 mm)	0	89.75							1A				Borehole open and dry on completion. Monitoring well was dry on December 17, 2018.
		brownish grey some black	0.25	89.5	30						1B		30		bentonite
		compact	0.5	89.25											
		grey	0.75	89											
		moist gravelly sand trace brick, trace concrete (FILL)	1	88.75	9						2		9		sand
		loose	1.25	88.5											Sand and screen
		compact rock fragments	1.5	88.25	50/25						3		50/25		Auger refusal at 1.82 m bgs.
		END OF BOREHOLE	1.75												

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 143													
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 89.890														
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033592	EASTING: 450632	PROJECT NO.: CO682.00													
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON										
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)				Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS	
					40	80	120	160	PL	W.C.	LL						
					N-Value (Blows/300mm)												
					20	40	60	80	20	40	60	80					
			0														Borehole open and dry on completion.
			0.25	89.75									1		30		
		compact, damp, brown sandy silt trace clay trace brick trace concrete (FILL)	0.5	89.5													
		some brick trace limestone fragments	0.75	89.25													
			1	89									2		19		
			1.25	88.75													
			1.5	88.5													
			1.75	88.25									3		50/75		Auger refusal at 1.75 m bgs.
		END OF BOREHOLE															

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 144									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 88.929										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033618	EASTING: 450674	PROJECT NO.: CO682.00									
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON													
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		ASPHALTIC CONCRETE (75 mm) compact, moist, brown gravelly sand (FILL)	0	88.75									Borehole open and dry on completion.
		stiff, moist, brown/grey/black clayey silt, some sand, trace gravel	0.25	88.5	20					1A	20		Difficult augering between 0.91 to refusal.
		very dense, damp, light brown sandy silt, trace rock fragments (FILL)	0.5	88.25	50/50					1B			
			0.75	88						1C			
			1	87.75						2	50/50		Auger refusal at 1.22 m bgs.
		END OF BOREHOLE											

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 145									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 89.052										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033556	EASTING: 450688		PROJECT NO.: CO682.00								
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON													
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		TOPSOIL (75 mm)	0	89					1A				Borehole open and dry on completion.
		compact, damp, brown gravelly sand (FILL)	0.25	88.75	15				1B		15		
		compact, moist, brown sand, some silt, trace gravel (FILL)	0.5	88.5									
		very dense, damp, light brown SANDY SILT, trace rock fragments	0.75	88.25					2A				Auger refusal at 1.20 m bgs.
		END OF BOREHOLE	1	88	62				2B		62		

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 146											
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 91.105												
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033589	EASTING: 450737	PROJECT NO.: CO682.00											
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON								
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		TOPSOIL (220 mm)	0	91							1A		5		Borehole open and dry on completion.
		compact, damp, light brown SANDY SILT trace gravel trace sand trace rock fragments	0.25	90.75	5						1B				
			0.5	90.5											
			0.75	90.25											
			1	90	19						2		19		
			1.25	89.75											
			1.5	89.5	50/125						3		50/125		Auger refusal at 1.83 m bgs.
		END OF BOREHOLE	1.75												

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: MW147									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 90.903										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033552	EASTING: 450735	PROJECT NO.: CO682.00									
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON													
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
					N-Value (Blows/300mm)	20	40	60	80				
		TOPSOIL (100 mm)	0	90.75									Monitoring well was dry on December 17, 2018.
		stiff, damp, dark brown CLAYEY SILT some organics	0.25	90.5	10					1	10		bentonite
		some sand	0.75	90.25									
		compact, damp to moist, light brown SILTY SAND	1	90						2A			
			1.25	89.75	21					2B	21		sand
		compact, moist, light brown SAND, some gravel trace rock fragments	1.5	89.5									
			1.75	89.25	65/228					3	65/228		sand and screen
			2	89									Auger refusal at 2.26 m bgs.
		END OF BOREHOLE	2.25	88.75									

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 148											
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 90.484												
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033518	EASTING: 450732		PROJECT NO.: CO682.00										
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON								
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
			0	90.484											Borehole caved-in at 1.92 m bgs and dry on completion.
	trace organics		0.25	89.90	20						1		20		
			0.5	89.5											
		compact, moist, brown gravelly sand (FILL)	0.75	89.75											
			1	89.5		11					2		11		
			1.25	89.25											
			1.5	89											
	brick fragments		1.75	88.75		6					3		6		
			2	88.5											
	rock fragments		2.25	88.25		50/50					4		50/50		Auger refusal at 2.44 m bgs.
		END OF BOREHOLE													

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon				BH No.: 149									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 90.842		PROJECT NO.: CO682.00									
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033548		EASTING: 450777		PROJECT NO.: CO682.00									
SAMPLE TYPE		AUGER		DRIVEN		CORING		DYNAMIC CONE		SHELBY		SPLIT SPOON			
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
			0	90.75											Borehole open and dry on completion.
		compact, damp, dark brown/brown gravelly sand (FILL)	0.25	90.5	28						1		28		
		compact, wet, brown/light grey SILTY SAND trace gravel occasional oxidization	0.75	90.25											
		rock fragments	1.0	90							2		27		
		END OF BOREHOLE	1.52	89.5											Auger refusal at 1.52 m bgs.

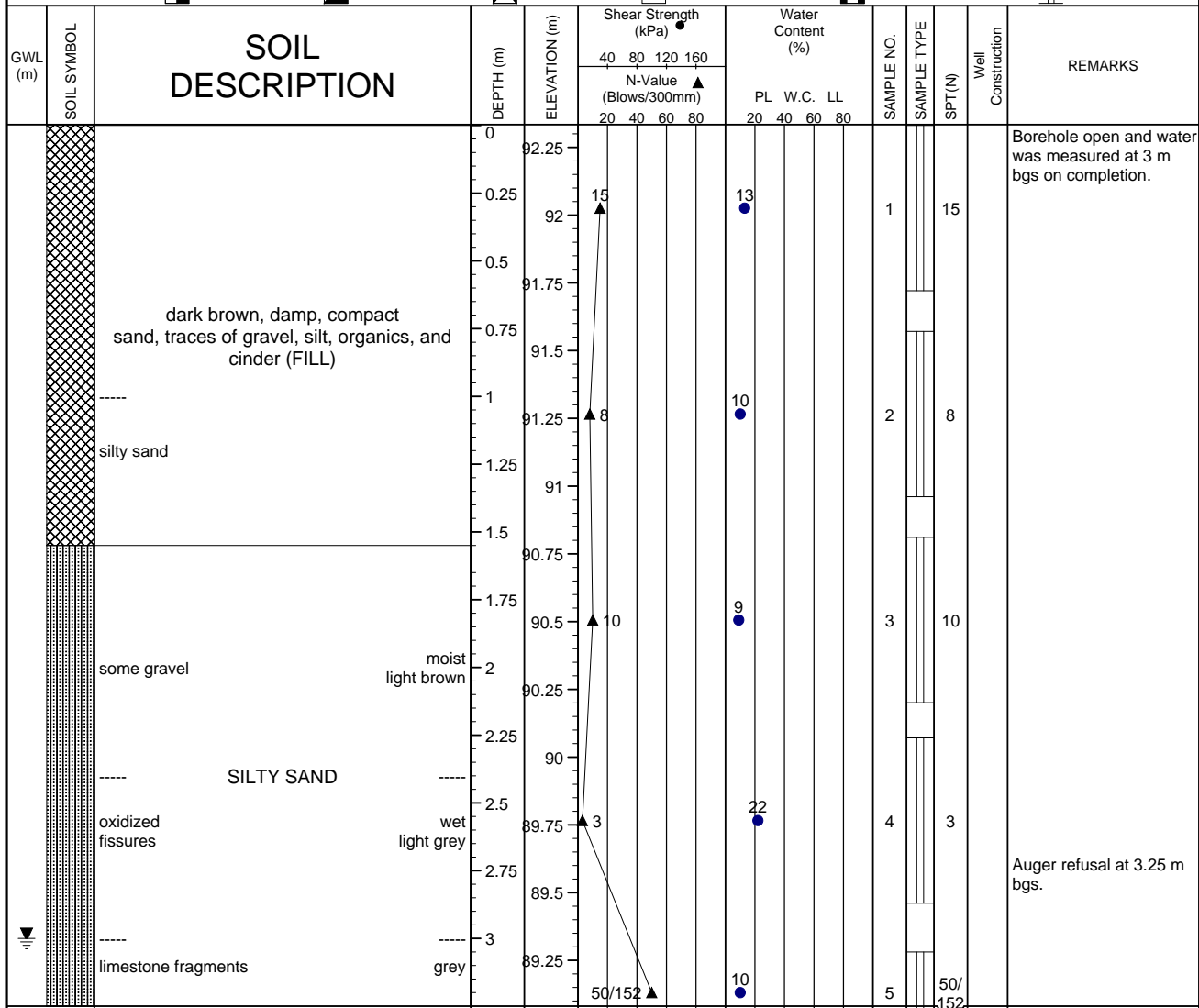
CLIENT: Canada Lands Company CLC Limited	METHOD: Hollow Stem Auger & Split Spoon		BH No.: 150
PROJECT: Wateridge Village	PROJECT ENGINEER: VN	ELEV. (m) 91.981	
LOCATION: Rockcliffe, Ottawa	NORTHING: 5033616	EASTING: 450777	PROJECT NO.: CO682.00
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON			

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		TOPSOIL (100 mm)	0						1A				Borehole open and dry on completion.
		firm, damp to moist, dark brown mottled light brown and grey CLAYEY SILT, some sand, trace gravel	0.25	91.75	5				1B	5			
		damp compact light brown SANDY SILT trace gravel occasional oxidized layers	1.0	91.0	21				2	21			
		moist	1.75	90.25	75/228				3A	75/228			
			2.0	90.0					3B				Auger refusal at 2.13 m bgs.
		END OF BOREHOLE											

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: MW152										
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 92.984											
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033581	EASTING: 450800	PROJECT NO.: CO682.00										
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON														
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS	
					40 80 120 160	PL	W.C.	LL						
					N-Value (Blows/300mm)	20	40	60	80	20	40	60	80	
			0	92.75	5					1	5		Monitoring well was dry on December 17, 2018.	
		soft, moist, grey/brown clayey silt (FILL)	0.25	92.5									bentonite	
			0.75	92.25										
			1	92	4					2	4			
		compact, damp, light brown silty sand to sand, some silt, trace organics (FILL)	1.25	91.75									sand	
			1.5	91.5										
			1.75	91.25	15					3	15			
			2	91										
			2.25	90.75										
		hard, damp, light brown SILT, some clay some sand	2.5	90.5	8					4	58		sand and screen	
			2.75	90.25	58								Auger refusal at 3.05 m bgs.	
			3	90										
		END OF BOREHOLE												



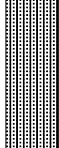

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 153											
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 91.642												
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033530	EASTING: 450814	PROJECT NO.: CO682.00											
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON								
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		TOPSOIL (130 mm)	0	91.5							1A		9		Borehole open and dry on completion.
		loose to compact, damp to moist, light brown to black silty sand to sandy silt traces of clay, gravel cinder, and brick (FILL)	0.25	91.25		9					1B				
			0.5	91								2A		23	
		compact, damp, dark brownish purple sand, trace silt (FILL)	0.75	90.75											
		compact, wet, light brown SILTY SAND, some gravel	1	90.5		23					2B				
			1.25	90.25								3		58/228	
		END OF BOREHOLE	1.5	90		58/228									
			1.75												

CLIENT: Canada Lands Company CLC Limited	METHOD: Hollow Stem Auger & Split Spoon		BH No.: 154
PROJECT: Wateridge Village	PROJECT ENGINEER: VN	ELEV. (m) 92.331	
LOCATION: Rockcliffe, Ottawa	NORTHING: 5033510	EASTING: 450847	PROJECT NO.: CO682.00
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON			



END OF BOREHOLE

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 155											
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 92.475												
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033574	EASTING: 450848	PROJECT NO.: CO682.00											
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON								
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
		ASPHATLIC CONCRETE (50 mm)	0	92.475							1A				Borehole open and dry on completion.
		dense, damp, grey/brown silty sand, some gravel (FILL)	0.25	92.25		48					1B		48		
		loose, dark brown sandy silt, trace gravel (FILL)	1.0	91.5		4					2		4		
		very dense, damp, light brown SANDY SILT	1.75	90.75		54/203					3A		54/203		Auger refusal at 1.83 m bs.
		END OF BOREHOLE									3B				

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon				BH No.: 156							
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 92.393									
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033617		EASTING: 450865		PROJECT NO.: CO682.00							
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON													
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		ASPHALTIC CONCRETE (50 mm)	0										
		compact, damp, grey gravelly sand (FILL)	0.25	92.25	26				1		26		Borehole open and dry on completion.
		very dense, moist to damp, light brown SANDY SILT	1.0	91.5	50				2		50		
			1.5	91	63/228						63/228		
		END OF BOREHOLE											
					LOGGED BY: RH		DRILLING DATE: November 14, 2018						
					REVIEWED BY: VN		Page 1 of 1						

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 157												
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 92.883													
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033575	EASTING: 450903	PROJECT NO.: CO682.00												
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON									
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS	
			0	92.75												
			0.25	92.5												
			0.5	92.25												
		moist dark brown	0.75	92												
			1	91.75												
		loose silty sand some organics (FILL)	1.25	91.5												
			1.5	91.25												
			1.75	91												
		wet greyish black	2	90.75												
			2.25	90.5												
		dense, wet, dark grey SAND, some gravel, trace silt	2.49	90.25												
		END OF BOREHOLE														

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: MW158									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 92.863										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033524	EASTING: 450883		PROJECT NO.: CO682.00								
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON													
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		TOPSOIL (120 mm)	0	92.75					1A				Groundwater was measured at 2.25 mbgs on December 17, 2018.
		loose, damp to moist, brown silty sand, trace gravel, trace organics (FILL)	0.25	92.5	9				1B	9		bentonite	
			0.75	92.25									
			1	92									
			1.25	91.75	8				2	8		sand	
		compact moist to wet light brown SAND, some gravel trace silt	1.5	91.5									
			1.75	91.25									
			2	91	17					3	17		sand and screen
			2.25	90.75									
			2.5	90.5									
			2.75	90.25	20				4	20			
			3	90									
					50/50				5	50/50			Auger refusal at 3.0 m bgs.
		END OF BOREHOLE											

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 159											
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 93.789												
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033511	EASTING: 450926		PROJECT NO.: CO682.00										
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON								
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		TOPSOIL (120 mm)	0	93.75							1A				Borehole open and dry on completion.
		compact, moist, brown sandy silt, trace to some gravel, trace organics (FILL)	0.25	93.5	17						1B		17		
			0.5	93.25											
			0.75	93											
		compact, damp, light brown gravelly sand, some silt, occasional topsoil pockets (FILL)	1	92.75	11						2		11		
			1.25	92.5											
			1.5	92.25											
			1.75	92	9						3		9		
			2	91.75											
			2.25	91.5											
		compact, damp, light grey rock fragments, trace to some sand	2.5	91.25	27						4		27		Auger refusal at 2.75 m bgs.
		END OF BOREHOLE													

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 160											
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 92.688												
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033545	EASTING: 450952	PROJECT NO.: CO682.00											
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON								
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
		TOPSOIL (110 mm)	0	92.5							1A				Borehole open and dry on completion.
		loose, moist, light brown silty sand, trace organics	0.25	92.25		3					1B		3		
		compact moist layered SILTY SAND trace gravel occasional oxidization	0.75	92											
		light brown	1	91.75		19					2		19		Difficult augering from 1.22 m bgs to refusal.
		light grey	1.25	91.5											
		trace rootlets	1.5	91.25											
			1.75	91		24					3		24		Auger refusal at 2.26 m bgs.
			2	90.75											
			2.25	90.5											
		END OF BOREHOLE													

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 161									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 93.073										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033617	EASTING: 450956	PROJECT NO.: CO682.00									
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON													
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
					N-Value (Blows/300mm)								
					20 40 60 80	20 40 60 80							
		compact, moist, brown/dark brown/grey sandy silt, some clay, trace topsoil (FILL)	0	93						1A			Borehole open and dry on completion.
			0.25	92.75	13					1B	13		
		moist	0.5	92.5									Relocated drill 3.0 m E, encountered refusal at 0.76 m bgs.
			0.75	92.25		50/25mm				2	50/25mm		
		very dense brown trace black gravelly sand trace brick (FILL)	1	92									
			1.25	91.75									Auger refusal at 1.52 m bgs.
			1.5										
		END OF BOREHOLE											

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 162									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 93.146										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033612	EASTING: 451005		PROJECT NO.: CO682.00								
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON													
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		ASPHALTIC CONCRETE (45 mm)	0	93					1A				Borehole open and dry on completion.
		compact, moist, light brown silty sand (FILL)	0.25	92.75	13				1B		13		
			0.5	92.5					1C				
			1	92.25					2		17		
		compact, light grey SILTY SAND occasional oxidization	1.25	92	17								Auger refusal at 2.44 m bgs.
			1.5	91.75									
			1.75	91.5									
			2	91.25	16				3		16		
		trace rock fragments	2.25	91									
		END OF BOREHOLE	2.44	90.75									

CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 163									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 93.488										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033562	EASTING: 451001		PROJECT NO.: CO682.00								
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON						
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
			0										Borehole open and dry on completion.
		loose, moist, grey mixed dark brown clayey silt, trace topsoil, trace gravel (FILL)	0.25	93.25	3				1		3		
			0.5	93									
			0.75	92.75					2A				
			1	92.5	11				2B		11		
			1.25	92.25									
		moist	1.5	92									
		trace large gravel	1.75	91.75	37				3		37		
		compact light brown/light grey SAND some silt trace gravel occasional oxidized pockets	2	91.5									
			2.25	91.25									
			2.5	91	16				4		16		
		wet	2.75	90.75									
			3	90.5									
			3.25	90.25	66/165				5A		66/165		
			3.5	90					5B				
		very dense, moist, grey CLAYEY SILT, with SILTY SAND trace rock fragments	3.75	89.75									Auger refusal at 3.83.
		END OF BOREHOLE			50/12				6/		50/12		




CLIENT: Canada Lands Company CLC Limited		METHOD: Split Spoon Sampling		BH No.: 164									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 93.710										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033541	EASTING: 451053	PROJECT NO.: CO682.00									
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON						
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40 80 120 160	PL	W.C.	LL					
		TOPSOIL (180 mm)	0	93.5					21	1A			Borehole open and dry on completion.
		moist	0.25	93.25	6				14	1B	6		Difficult augering due to large gravel from 0.76 m bgs to 3 m bgs.
		loose, brown some dark brown silty sand, trace clay, trace gravel trace organics, trace concrete (FILL)	0.5	93									
		damp	1	92.75	11				22	2	11		
		compact	1.25	92.5									
		damp light brown	1.5	92.25									Spoon was wet on retrieval at 3.0 m bgs.
		compact	1.75	92	27				5	3	27		
		moist light grey	2	91.75									
		dense	2.25	91.5									
		SILTY SAND trace gravel occasional oxidization	2.5	91.25	49				10	4	49		
		compact	2.75	91									Auger refusal at 4.58 m bgs.
		wet grey	3	90.75									
		compact	3.25	90.5	10				9	5	10		
			3.5	90.25									
		loose to very dense, wet, grey SILT, some sand, trace clay trace rock fragments	3.75	90									Auger refusal at 4.58 m bgs.
			4	89.75	5				10	6	5		
			4.25	89.5									
			4.5	89.25									
		END OF BOREHOLE			50/42				8	7	50/12		


CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: 165									
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 93.845										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033495	EASTING: 450981	PROJECT NO.: CO682.00									
SAMPLE TYPE		<input type="checkbox"/> AUGER	<input checked="" type="checkbox"/> DRIVEN	<input checked="" type="checkbox"/> CORING	<input type="checkbox"/> DYNAMIC CONE	<input type="checkbox"/> SHELBY	<input type="checkbox"/> SPLIT SPOON						
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) 40 80 120 160	N-Value (Blows/300mm) 20 40 60 80	Water Content (%) PL W.C. LL 20 40 60 80	SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS	
		TOPSOIL (240 mm)	0	93.75				1A				Borehole open and dry on completion.	
		loose to compact moist light brown mixed dark brown silty sand some rock fragments trace organics (FILL)	0.25	93.5		6		1B		6			
			0.5	93.25									
			0.75	93									
			1	92.75			7		2		7		
			1.25	92.5									
			1.5	92.25									
			1.75	92				3		12			
			2	91.75								Auger refusal at 2.27 m bgs.	
		END OF BOREHOLE	2.25	91.5		50/12		4		50/12			


CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: MW166										
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 93.540											
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033505	EASTING: 451043	PROJECT NO.: CO682.00										
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON							
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)		Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40	80	120	160	PL					
					N-Value (Blows/300mm)									
					20	40	60	80	20	40	60	80		
		TOPSOIL (125 mm)	0	93.5										Groundwater was measured at 2.55 mbgs on December 17, 2018.
			0.25	93.25	7									
			0.5	93										
		loose, moist, brown/dark brown silty sand, trace clay, trace gravel trace organics (FILL)	0.75	92.75										Bentonite
			1	92.5	14									sand
			1.25	92.25										sand and screen
			1.5	92										
		loose, moist, light brown SILTY SAND trace gravel, trace oxidized pockets with sand seams	1.75	91.75	5									
			2	91.5										
			2.25	91.25										
			2.5	91	4									Spoon wet on retrieval at 2.26 m bgs.
		light brown	2.75	90.75										
			3	90.5										
		loose wet SILTY SAND	3.25	90.25	6									
		light grey	3.5	90										
			3.75	89.75										
		trace rock fragments	4	89.5	56/165									Auger refusal at 4.13 m bgs.
		END OF BOREHOLE												


CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon		BH No.: BH167											
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 85.033												
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033449	EASTING: 449942	PROJECT NO.: CO682.00											
SAMPLE TYPE		AUGER	DRIVEN	CORING	DYNAMIC CONE	SHELBY	SPLIT SPOON								
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)	N-Value (Blows/300mm)	Water Content (%)	PL	W.C.	LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		ASPHALTIC CONCRETE (140 mm)	0	85							1A				Borehole open and dry on completion.
		GRANULAR BASE (200 mm)	0.25	84.75		21					1B		21		
		compact, damp, dark brown/brown silty sandy clay, trace gravel (FILL)	0.5	84.5							1C				
		dense, damp, light brown sandy silt, trace clay occasional oxidized pockets (FILL)	1	84		35					2		35		
		very dense, damp, greyish black, rock fragments, trace silty sand	1.5	83.5		50/50					3		50/50		
		END OF BOREHOLE													Auger refusal at 1.72 m bgs.



CLIENT: Canada Lands Company CLC Limited		METHOD: Hollow Stem Auger & Split Spoon				BH No.: BH173										
PROJECT: Wateridge Village		PROJECT ENGINEER: VN		ELEV. (m) 82.718		PROJECT NO.: CO682.00										
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033814		EASTING: 450338		PROJECT NO.: CO682.00										
SAMPLE TYPE		CORING		DYNAMIC CONE		SHELBY										
AUGER		DRIVEN		DYNAMIC CONE		SHELBY										
SPLIT SPOON		CORING		DYNAMIC CONE		SHELBY										
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)				Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40	80	120	160	PL	W.C.	LL					
		loose, moist, brown gravelly sand (FILL)	0	82.5									1A			Borehole open and dry on completion.
			0.25	82.25	6								1B	6		
		loose, moist, brown silty sand, trace gravel (FILL)	0.5	82									2A			
			0.75	81.75	6								2B	6		
		firm, moist, grey CLAYEY SILT	1	81.5									3	6		
			1.25	81.25											Auger refusal at 2.72 m bgs.	
			1.5	81												
			1.75	80.75												
		loose to compact, wet, brown SANDY SILT, trace gravel occasional oxidized pockets	2	80.5												
			2.25	80.25	18								4	18		
			2.5	80												
		END OF BOREHOLE														

CLIENT: Canada Lands Company CLC Limited			METHOD: Hollow Stem Auger & Split Spoon				BH No.: BH175									
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 88.961											
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033593		EASTING: 450502		PROJECT NO.: CO682.00									
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON																
GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa)				Water Content (%)			SAMPLE NO.	SAMPLE TYPE	SPT (N)	Well Construction	REMARKS
					40	80	120	160	PL	W.C.	LL					
		compact, moist, brown/grey sandy gravel (FILL)	0 0.25 0.5	88.75 88.5	20							1		20		Borehole open and dry on completion. Auger refusal at 0.61 m bgs.
		END OF BOREHOLE														
 geotechnical division of 					LOGGED BY: RH			DRILLING DATE: November 16, 2018								
					REVIEWED BY: VN			Page 1 of 1								



CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 201						
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 74.347							
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033269		EASTING: 449596		PROJECT NO.: CO682.00					
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON												
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT (N)	ELEVATION (m)
			Tip Resistance (kg/cm ²)									
0		On completion the test pit was dry and open.	40	80	120	160						74.25
0.25												74
0.5												73.75
0.75												73.5
1												73.25
1.25		Refusal @ 1.42 m bgs on Limestone Bedrock (weathered at surfac)										73
END OF TEST PIT												
alston associates geotechnical division of  TERRAPEX						LOGGED BY: RH REVIEWED BY: VN		DRILLING DATE: December 14, Page 1 of 1				


CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 202						
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 76.706							
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033347		EASTING: 449742		PROJECT NO.: CO682.00					
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON												
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT (N)	ELEVATION (m)
			Tip Resistance (kg/cm ²)									
0		On completion the test pit was dry and open.	40	80	120	160		damp, dark brown TOPSOIL				76.5
0.25								moist, brownish orange, sand some silt trace gravel (FILL)				76.25
0.5												76
0.75								damp, brown SANDY SILT				75.75
1		Refusal @ 1.15 m bgs on Limestone Bedrock (weathered at surfac)						trace clay, trace gravel, trace limestone and shale fragments				
END OF TEST PIT												
alston associates geotechnical division of 						LOGGED BY: RH			DRILLING DATE: December 14,			
						REVIEWED BY: VN			Page 1 of 1			


CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 203									
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 85.485										
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033460		EASTING: 450060		PROJECT NO.: CO682.00								
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON															
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				PL	W.C.	LL	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT (N)	ELEVATION (m)
			Tip Resistance (kg/cm ²)												
0		On completion the test pit was dry and open.	40	80	120	160								85.25	
0.25										damp, dark brown TOPSOIL trace rootlets				85	
0.5															
0.75										damp, brown SANDY SILT some rootlets				84.75	
1														84.5	
1.25														84.25	
1.5		Refusal @ 1.64 m bgs on Limestone Bedrock												84	
END OF TEST PIT															
											LOGGED BY: RH		DRILLING DATE: December 14,		
											REVIEWED BY: VN		Page 1 of 1		


CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 204						
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 86.640							
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033484		EASTING: 450194		PROJECT NO.: CO682.00					
SAMPLE TYPE			<input type="checkbox"/> AUGER	<input checked="" type="checkbox"/> DRIVEN	<input checked="" type="checkbox"/> CORING	<input type="checkbox"/> DYNAMIC CONE	<input type="checkbox"/> SHELBY	<input type="checkbox"/> SPLIT SPOON				
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT(N)	ELEVATION (m)
			Tip Resistance (kg/cm ²)									
0		On completion the test pit was dry and open.	40	80	120	160						86.5
0.25												86.25
0.5												86
0.75												85.75
1												85.5
1.25												85.25
1.5												85
1.75		Refusal @ 1.84 m bgs on Limestone Bedrock										
END OF TEST PIT												
 geotechnical division of 						LOGGED BY: RH			DRILLING DATE: December 14,			
						REVIEWED BY: VN			Page 1 of 1			

CLIENT: Canada Lands Company CLC Limited		METHOD: Excavator		TP No.: 205								
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 85.810									
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033606	EASTING: 450123	PROJECT NO.: CO682.00								
SAMPLE TYPE		<input type="checkbox"/> AUGER	<input checked="" type="checkbox"/> DRIVEN	<input checked="" type="checkbox"/> CORING	<input type="checkbox"/> DYNAMIC CONE	<input type="checkbox"/> SHELBY	SPLIT SPOON					
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)		Tip Resistance (kg/cm 2)		SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT(N)	ELEVATION (m)
			40	80	120	160						
0		On completion the test pit was dry and open.										85.75
0.25								moist, grey gravel some to trace sand (FILL)				85.5
0.5								damp, dark brown topsoil, trace rootlets (FILL)				85.25
0.75												85
1												84.75
1.25								damp, brown SANDY SILT trace clay, trace gravel				84.5
1.5		Refusal @ 1.64 m bgs on Limestone Bedrock										84.25
END OF TEST PIT												


CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 206						
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 84.13							
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033719		EASTING: 450179		PROJECT NO.: CO682.00					
SAMPLE TYPE			<input type="checkbox"/> AUGER	<input checked="" type="checkbox"/> DRIVEN	<input checked="" type="checkbox"/> CORING	<input type="checkbox"/> DYNAMIC CONE	<input type="checkbox"/> SHELBY	<input type="checkbox"/> SPLIT SPOON				
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT (N)	ELEVATION (m)
			Tip Resistance (kg/cm ²)									
0		On completion the test pit was dry and open.	40	80	120	160		moist, dark brown TOPSOIL some gravel				84
0.25								moist, brown SILTY SAND trace organics				83.75
0.5												83.5
0.75												83.25
1								damp, greyish brown SANDY SILT trace gravel				83
1.25												82.75
1.5		Refusal @ 1.60 m bgs on Limestone bedrock with thinly bedded shale layers										
END OF TEST PIT												
 geotechnical division of 						LOGGED BY: RH			DRILLING DATE: December 14,			
						REVIEWED BY: VN			Page 1 of 1			


CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 207											
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 82.29												
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033801		EASTING: 450221		PROJECT NO.: CO682.00										
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON																	
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				Tip Resistance (kg/cm ²)				SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT (N)	ELEVATION (m)	
			40	80	120	160	50	100	150	200							PL
0		On completion the test pit was dry and open.															82.25
0.25																	82
0.5		Refusal @ 0.64 m bgs on Limestone Bedrock (weathered at surface)															81.75
END OF TEST PIT																	
alston associates geotechnical division of 											LOGGED BY: RH			DRILLING DATE: December 14,			
											REVIEWED BY: VN			Page 1 of 1			


CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 208									
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 77.25										
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033847		EASTING: 450162		PROJECT NO.: CO682.00								
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON															
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				PL W.C. LL			SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT (N)	ELEVATION (m)
			40	80	120	160	20	40	60						
0		On completion the test pit was dry and open.												77.25	
0.25														77	
0.5														76.75	
0.75		Refusal @ 0.98 m bgs on Limestone bedrock with thinly bedded shale layers												76.5	
END OF TEST PIT															
alston associates geotechnical division of 									LOGGED BY: RH REVIEWED BY: VN			DRILLING DATE: December 14, Page 1 of 1			


CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 209									
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 83.71										
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033788		EASTING: 450415		PROJECT NO.: CO682.00								
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON															
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				PL W.C. LL			SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT (N)	ELEVATION (m)
			Tip Resistance (kg/cm ²)												
0		On completion water was entering the test pit from an old subdrain at 1.5 m bgs.	40	80	120	160									83.5
0.25															83.25
0.5															83
0.75															82.75
1															82.5
1.25															82.25
1.5		Refusal @ 1.70 m bgs on Limestone Bedrock													
END OF TEST PIT															
alston associates geotechnical division of 									LOGGED BY: RH			DRILLING DATE: December 14,			
									REVIEWED BY: VN			Page 1 of 1			


CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 210									
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 88.84										
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033616		EASTING: 450282		PROJECT NO.: CO682.00								
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON															
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				PL W.C. LL			SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT(N)	ELEVATION (m)
			40	80	120	160	20	40	60						
0		On completion the test pit was dry and open.													88.75
0.25															88.5
0.5															88.25
0.75															88
1														87.75	
1.25														87.5	
1.5		Refusal @ 1.60 m bgs on Limestone Bedrock												87.25	
END OF TEST PIT															
											LOGGED BY: RH		DRILLING DATE: December 14,		
											REVIEWED BY: VN		Page 1 of 1		


CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 211								
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 89.64									
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033621		EASTING: 450332		PROJECT NO.: CO682.00							
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON														
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				Tip Resistance (kg/cm ²)		SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT (N)	ELEVATION (m)
			40	80	120	160	50	100						
0		On completion the test pit was caving in between 0.8- 1.35 m bgs.												89.5
0.25														89.25
0.5														89
0.75														88.75
1														88.5
1.25		Refusal @ 1.35 m bgs on Limestone Bedrock												
END OF TEST PIT														
alston associates geotechnical division of 									LOGGED BY: RH			DRILLING DATE: December 14,		
									REVIEWED BY: VN			Page 1 of 1		

CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 212									
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 89.04										
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033549		EASTING: 450275		PROJECT NO.: CO682.00								
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON															
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				PL	W.C.	LL	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT (N)	ELEVATION (m)
			40	80	120	160									
0		On completion the test pit was caving in between 0.18- 0.4 m bgs.									asphaltic concrete				89
0.25											damp, grey sand and gravel (FILL)				88.75
0.5															88.5
0.75											damp, brown GRAVELLY SAND trace cobbles trace shale fragments				88.25
1		Refusal @ 1.07 m bgs on Limestone Bedrock													88
											END OF TEST PIT				
alston associates geotechnical division of 										LOGGED BY: RH		DRILLING DATE: December 14,			
										REVIEWED BY: VN		Page 1 of 1			

CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 213									
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 88.05										
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033505		EASTING: 450298		PROJECT NO.: CO682.00								
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON															
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				PL W.C. LL			SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT (N)	ELEVATION (m)
			40	80	120	160	20	40	60						
0		On completion the test pit remained open and dry.													88
0.25															87.75
0.5		Refusal @ 0.78 m bgs on Limestone Bedrock (fractured at surface)													87.5
0.75															
END OF TEST PIT															
alston associates geotechnical division of 									LOGGED BY: RH			DRILLING DATE: December 14,			
									REVIEWED BY: VN			Page 1 of 1			




CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 214						
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 88.26							
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033519		EASTING: 450408		PROJECT NO.: CO682.00					
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON												
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT (N)	ELEVATION (m)
			Tip Resistance (kg/cm ²)									
0		On completion the test pit was open and dry.	40	80	120	160						88.25
0.25												88
0.5												87.75
0.75												87.5
1												87.25
1.25		Refusal @ 1.30 m bgs on Limestone Bedrock										87
END OF TEST PIT												
alston associates geotechnical division of 						LOGGED BY: RH			DRILLING DATE: December 14,			
						REVIEWED BY: VN			Page 1 of 1			

CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator				TP No.: 215									
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 88.88											
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033591		EASTING: 450502		PROJECT NO.: CO682.00									
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON																
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				Tip Resistance (kg/cm ²)				SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT (N)	ELEVATION (m)
			40	80	120	160	50	100	150	200						
0		On completion the test pit was caving in at 0.224-0.52 m bgs.										asphaltic concrete damp, grey crusher run limestone (FILL)				88.75
0.25												moist, brown SANDY SILT some organics				88.5
0.5												light brown SANDY SILT trace gravel				88.25
0.75												Limestone Bedrock (fractured at surface)				88
1		Refusal @ 1.03 m bgs on Limestone Bedrock														
END OF TEST PIT																
alston associates geotechnical division of 										LOGGED BY: RH			DRILLING DATE: December 14,			
										REVIEWED BY: VN			Page 1 of 1			

CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 216						
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 89.75							
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033608		EASTING: 450616		PROJECT NO.: CO682.00					
SAMPLE TYPE			<input type="checkbox"/> AUGER	<input checked="" type="checkbox"/> DRIVEN	<input checked="" type="checkbox"/> CORING	<input type="checkbox"/> DYNAMIC CONE	<input type="checkbox"/> SHELBY	<input type="checkbox"/> SPLIT SPOON				
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT(N)	ELEVATION (m)
			Tip Resistance (kg/cm ²)									
0		On completion the test pit was caving in between 0.0 and 1.60 m bgs.	40	80	120	160						89.75
0.25												89.5
0.5												89.25
0.75												89
1												88.75
1.25												88.5
1.5		Refusal @ 1.60 m bgs on Limestone Bedrock										88.25
END OF TEST PIT												
alston associates geotechnical division of 						LOGGED BY: RH		DRILLING DATE: December 14,				
						REVIEWED BY: VN		Page 1 of 1				


CLIENT: Canada Lands Company CLC Limited		METHOD: Excavator		TP No.: 217							
PROJECT: Wateridge Village		PROJECT ENGINEER: VN	ELEV. (m) 88.84								
LOCATION: Rockcliffe, Ottawa		NORTHING: 5033511	EASTING: 450595		PROJECT NO.: CO682.00						
SAMPLE TYPE		<input type="checkbox"/> AUGER	<input checked="" type="checkbox"/> DRIVEN	<input checked="" type="checkbox"/> CORING	<input type="checkbox"/> DYNAMIC CONE	<input type="checkbox"/> SHELBY	SPLIT SPOON				
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)		SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT (N)	ELEVATION (m)	
			40	80							120
			Tip Resistance (kg/cm ²)		PL	W.C.	LL				
			50	100	150	200	20	40	60	80	
0		On completion the test pit was open and dry.									88.75
0.25											88.5
0.5											88.25
0.75											88
1											87.75
1.25											87.5
1.5											87.25
1.75											87
2											86.75
2.25		Refusal @ 2.31 m bgs on Limestone Bedrock									
END OF TEST PIT											

CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 218									
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 90.64										
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033539		EASTING: 450711		PROJECT NO.: CO682.00								
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON															
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				Tip Resistance (kg/cm ²)			SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT(N)	ELEVATION (m)
			40	80	120	160	50	100	150						
0		On completion the test pit was open and dry.													90.5
0.25															90.25
0.5															90
0.75															89.75
1															89.5
1.25		Refusal @ 1.41 m bgs on Limestone Bedrock (fractured at surface)													89.25
END OF TEST PIT															
											LOGGED BY: RH		DRILLING DATE: December 14,		
											REVIEWED BY: VN		Page 1 of 1		

CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 219										
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 91.02											
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033540		EASTING: 450809		PROJECT NO.: CO682.00									
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON																
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				PL	W.C.	LL	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT (N)	ELEVATION (m)	
			Tip Resistance (kg/cm ²)													
0		On completion the test pit was open and dry.	40	80	120	160					moist, dark brown sand, some silt trace gravel trace brick trace shale fragments trace metal (FILL)				91	
0.25																
0.5																90.5
0.75																90.25
1		Refusal @ 1.12 m bgs on Limestone Bedrock (fractured at surface)									damp, orange brown SAND, some to trace gravel trace limestone fragments					90
END OF TEST PIT																
alston associates geotechnical division of 									LOGGED BY: RH			DRILLING DATE: December 14,				
									REVIEWED BY: VN			Page 1 of 1				

CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 220								
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 92.92									
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033616		EASTING: 450929		PROJECT NO.: CO682.00							
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON														
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				PL W.C. LL		SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT (N)	ELEVATION (m)
			40	80	120	160	20	40						
0		On completion the test pit was open and dry.											92.75	
0.25													92.5	
0.5													92.25	
0.75		Refusal @ 0.92 m bgs on Limestone Bedrock with thinly bedded shale layers											92	
END OF TEST PIT														
									LOGGED BY: RH		DRILLING DATE: December 14,			
									REVIEWED BY: VN		Page 1 of 1			

CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator				TP No.: 221							
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 93.99									
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033510		EASTING: 450942		PROJECT NO.: CO682.00							
SAMPLE TYPE <input type="checkbox"/> AUGER <input checked="" type="checkbox"/> DRIVEN <input checked="" type="checkbox"/> CORING <input type="checkbox"/> DYNAMIC CONE <input type="checkbox"/> SHELBY <input type="checkbox"/> SPLIT SPOON														
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				Tip Resistance (kg/cm ²)		SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT (N)	ELEVATION (m)
			40	80	120	160	50	100						
0		On completion the test pit was open and dry.								moist, dark brown TOPSOIL				
0.25		Refusal @ 0.38 m bgs on Shale Bedrock								moist, greyish brown clayey silt (FILL)				93.75
										END OF TEST PIT				
alston associates geotechnical division of										LOGGED BY: RH			DRILLING DATE: December 14,	
										REVIEWED BY: VN			Page 1 of 1	

CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 222						
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 93.61							
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033482		EASTING: 451019		PROJECT NO.: CO682.00					
SAMPLE TYPE			<input type="checkbox"/> AUGER	<input checked="" type="checkbox"/> DRIVEN	<input checked="" type="checkbox"/> CORING	<input type="checkbox"/> DYNAMIC CONE	<input type="checkbox"/> SHELBY	SPLIT SPOON				
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT (N)	ELEVATION (m)
			Tip Resistance (kg/cm ²)									
0		On completion the test pit was open and dry.	40	80	120	160						93.5
0.25												93.25
0.5												93
0.75		Refusal @ 0.90 m bgs on Shale Bedrock										92.75
END OF TEST PIT												
alston associates geotechnical division of 						LOGGED BY: RH			DRILLING DATE: December 14,			
						REVIEWED BY: VN			Page 1 of 1			

CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 223				
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 93.58					
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033541		EASTING: 451053		PROJECT NO.: CO682.00			
SAMPLE TYPE			CORING			SPLIT SPOON				
INSTRUMENTATION DATA			REMARKS			SOIL DESCRIPTION				
DEPTH (m)			Shear Strength (kPa)	Tip Resistance (kg/cm ²)	PL W.C. LL	SOIL SYMBOL	SAMPLE TYPE	SAMPLE NO.	SPT(N)	ELEVATION (m)
			40 80 120 160	50 100 150 200	20 40 60 80					
0	On completion the test pit was open and water was filtering in at base of excavation.									93.5
0.25										93.25
0.5										93
0.75										92.75
1										92.5
1.25										92.25
1.5										92
1.75										91.75
2										91.5
2.25										91.25
2.5										91
2.75										90.75
3										90.5
3.25										90.25
3.5										90
3.75										89.75
4										89.5
4.25	Refusal @ 4.40 m bgs on Limestone Bedrock									89.25
						END OF TEST PIT				

CLIENT: Canada Lands Company CLC Limited			METHOD: Excavator			TP No.: 224						
PROJECT: Wateridge Village			PROJECT ENGINEER: VN		ELEV. (m) 93.56							
LOCATION: Rockcliffe, Ottawa			NORTHING: 5033508		EASTING: 451041		PROJECT NO.: CO682.00					
SAMPLE TYPE			<input type="checkbox"/> AUGER	<input checked="" type="checkbox"/> DRIVEN	<input checked="" type="checkbox"/> CORING	<input type="checkbox"/> DYNAMIC CONE	<input type="checkbox"/> SHELBY	<input type="checkbox"/> SPLIT SPOON				
DEPTH (m)	INSTRUMENTATION DATA	REMARKS	Shear Strength (kPa)				SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO.	SPT (N)	ELEVATION (m)
			Tip Resistance (kg/cm ²)									
			40	80	120	160						
			50	100	150	200						
0		On completion the test pit was open and dry.						Asphaltic concrete				93.5
0.25								damp, grey, sand and gravel (FILL)				93.25
0.5												93
0.75												92.75
1												92.5
1.25								moist brown sand, some silt some gravel trace shale and limestone fragments (FILL)				92.25
1.5												92
1.75												91.75
2												91.5
2.25												91.25
2.5								moist, blackish brown organic layer (FILL)				91
2.75								moist, light brown SILTY SAND trace gravel				90.75
3												90.5
3.25												90.25
3.5								moist greyish brown SANDY SILT trace clay trace gravel				90
3.75												89.75
4		Refusal @ 4.12 m bgs on Limestone Bedrock										89.5
								END OF TEST PIT				

APPENDIX D

PREVIOUS BOREHOLE AND TEST PIT LOG SHEETS

LOG OF BOREHOLE BH16-02

DST REF. No.: **IN-SO-026755**
 CLIENT: **Canada Lands Company**
 PROJECT: **Site Servicing Phase 1B**
 LOCATION: **Wateridge Village, Ottawa, Ontario**
 SURFACE ELEV.: **88.05 metres**

Drilling Data
 METHOD: **Hollow Stem Auger**
 DIAMETER: **200 mm**
 DATE: **August 26, 2016**
 COORDINATES: **5035157.52 m N, 372671.86 m E**

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE			Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	N' VALUE	VANE (kPa) ✕				REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
			W _p	W	W _i						SPT (N) □		DCPT ◆		
			20	40	60						20	40	60	80	
88						ASPHALT - 250 mm thick									
						FILL - SAND AND GRAVEL - trace clay and silt, brown, compact	SS1	28							37 57 (6)
1.0	87	●					SS2	18							
						FILL - GRAVELLY SAND - trace clay and silt, brown, compact to dense	SS3	10							22 65 (13)
2.0	86	●					SS4	37							29 60 (11)
							SS5	16							
3.0	85	●					SS6	50+							
4.0	84					End of Borehole at 4.0 m Split Spoon Sampler and Auger Refusal on Inferred Bedrock									
5.0	83														
6.0	82														
7.0	81														

BOREHOLE (STANDARD) PHASE 1B BOREHOLES V1.3.GPJ DST_MIN.GDT 10-24-16



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 Email: thunderbay@dstgroup.com
 Web: www.dstgroup.com

SAMPLE TYPE LEGEND

- | | | |
|--------------------|----------------------|-----------|
| Auger Sample | Rock Core | Bentonite |
| Split Spoon Sample | Hiller Peat Sampler | Sand |
| Bulk Sample | 70mm Thick Wall Tube | |

LOG OF BOREHOLE BH16-03

DST REF. No.: **IN-SO-026755**
 CLIENT: **Canada Lands Company**
 PROJECT: **Site Servicing Phase 1B**
 LOCATION: **Wateridge Village, Ottawa, Ontario**
 SURFACE ELEV.: **88.25 metres**

Drilling Data
 METHOD: **Hollow Stem Auger / NQ Size Core Barrel**
 DIAMETER: **200 mm**
 DATE: **September 16, 2016**
 COORDINATES: **5035157.56 m N, 372725.95 m E**

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE			Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	N' VALUE	VANE (kPa) ✕				REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
			W _p	W	W _i						SPT (N) □ DCPT ◆				
			20	40	60						20	40	60	80	
88						ASPHALT - 75 mm thick FILL - SAND AND GRAVEL - trace of clay, brown, compact	SS1	29							
1.0							SS2	10							
2.0							SS3	26							
3.0							SS4	16							
3.5						TILL - Clay, some sand, trace of gravel, grey, hard	SS5	50+							
4.0						LIMESTONE BEDROCK - Light grey RC1 = 0.61 m TCR = 87% RQD = 56%	RC1								
5.0						RC2 = 1.55 m TCR = 95% RQD = 95%	RC2								
6.0						RC3 = 0.46 m TCR = 100% RQD = 47%	RC3								
6.1						End of Borehole at 6.1 m									
7.0															
81															

BOREHOLE (STANDARD) PHASE 1B BOREHOLES V1.3.GPJ DST_MIN.GDT 10-24-16

Possible 50 mm thick clay seam at 4.4 m



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SAMPLE TYPE LEGEND

- | | | |
|--------------------|----------------------|-----------|
| Auger Sample | Rock Core | Bentonite |
| Split Spoon Sample | Hiller Peat Sampler | Sand |
| Bulk Sample | 70mm Thick Wall Tube | |

LOG OF BOREHOLE BH16-04

DST REF. No.: **IN-SO-026755**
 CLIENT: **Canada Lands Company**
 PROJECT: **Site Servicing Phase 1B**
 LOCATION: **Wateridge Village, Ottawa, Ontario**
 SURFACE ELEV.: **88.52 metres**

Drilling Data
 METHOD: **Hollow Stem Auger**
 DIAMETER: **200 mm**
 DATE: **September 2, 2016**
 COORDINATES: **5035156.93 m N, 372783.61 m E**

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE			Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	N' VALUE	VANE (kPa) ✕				REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
			W _p	W	W _i						SPT (N) □		DCPT ◆		
			20	40	60						20	40	60	80	
						ASPHALT - 75 mm thick									
						FILL - SAND AND GRAVEL - brown, compact	SS1	13							
1.0			●			CLAY - silty, trace of sand and gravel, brown (possible fill), stiff to very stiff	SS2	14							
2.0			●				SS3	20							
2.6			●			TILL - sand, gravelly, trace clay, brown, compact	SS4	25							
2.7						End of Borehole at 2.7 m Split Spoon Sampler and Auger Refusal on Inferred Bedrock									
3.0															
4.0															
5.0															
6.0															
7.0															

BOREHOLE (STANDARD) PHASE 1B BOREHOLES V1.3.GPJ DST_MIN.GDT 10-24-16



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SAMPLE TYPE LEGEND

- | | | |
|--------------------|----------------------|-----------|
| Auger Sample | Rock Core | Bentonite |
| Split Spoon Sample | Hiller Peat Sampler | Sand |
| Bulk Sample | 70mm Thick Wall Tube | |

LOG OF BOREHOLE BH16-05

DST REF. No.: **IN-SO-026755**
 CLIENT: **Canada Lands Company**
 PROJECT: **Site Servicing Phase 1B**
 LOCATION: **Wateridge Village, Ottawa, Ontario**
 SURFACE ELEV.: **90.01 metres**

Drilling Data
 METHOD: **Hollow Stem Auger**
 DIAMETER: **200 mm**
 DATE: **August 29, 2016**
 COORDINATES: **5035156.92 m N, 372873.6 m E**

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE			Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	N' VALUE	VANE (kPa) ✕				REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
			W _p	W	W _i						SPT (N) □		DCPT ◆		
			20	40	60						20	40	60	80	
						TOPSOIL - 230 mm thick									
1.0	89					FILL - SAND - some gravel, trace silt, possible cobbles and boulders, brown, very loose to dense	SS1	5							
2.0	88														
						End of Borehole at 2.1 m Split Spoon Sampler and Auger Refusal on Inferred Bedrock									
3.0	87														
4.0	86														
5.0	85														
6.0	84														
7.0	83														

BOREHOLE (STANDARD) PHASE 1B BOREHOLES V1.3.GPJ DST_MIN.GDT 10-24-16



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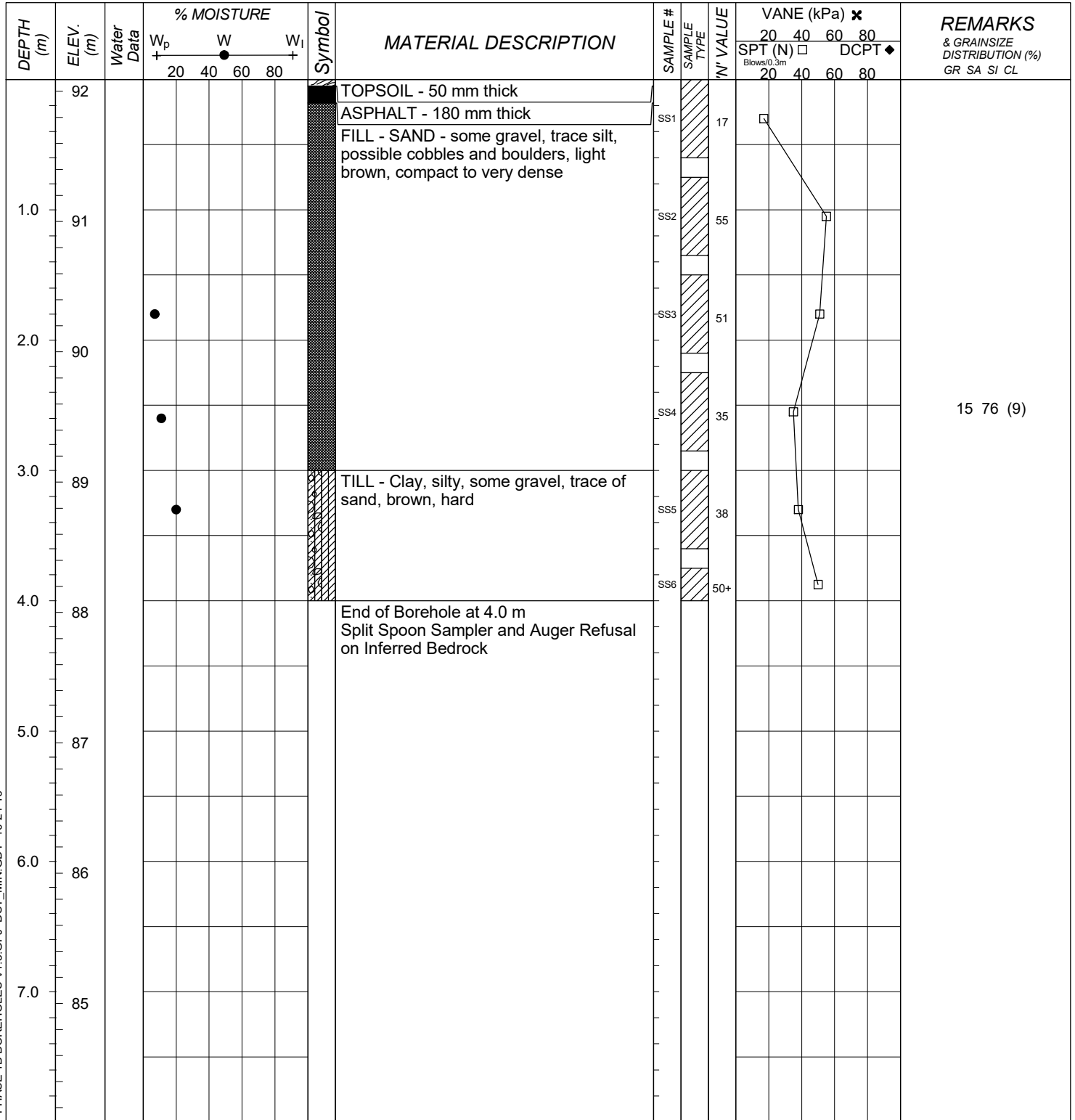
SAMPLE TYPE LEGEND

- | | | |
|--|---|---|
| <ul style="list-style-type: none"> Auger Sample Split Spoon Sample Bulk Sample | <ul style="list-style-type: none"> Rock Core Hiller Peat Sampler 70mm Thick Wall Tube | <ul style="list-style-type: none"> Bentonite Sand |
|--|---|---|

LOG OF BOREHOLE BH16-06

DST REF. No.: **IN-SO-026755**
 CLIENT: **Canada Lands Company**
 PROJECT: **Site Servicing Phase 1B**
 LOCATION: **Wateridge Village, Ottawa, Ontario**
 SURFACE ELEV.: **92.09 metres**

Drilling Data
 METHOD: **Hollow Stem Auger**
 DIAMETER: **200 mm**
 DATE: **September 2, 2016**
 COORDINATES: **5035156.35 m N, 372959.35 m E**



BOREHOLE (STANDARD) PHASE 1B BOREHOLES V1.3.GPJ DST_MIN.GDT 10-24-16



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 Web: www.dstgroup.com

SAMPLE TYPE LEGEND

- | | | |
|--------------------|----------------------|-----------|
| Auger Sample | Rock Core | Bentonite |
| Split Spoon Sample | Hiller Peat Sampler | Sand |
| Bulk Sample | 70mm Thick Wall Tube | |

LOG OF BOREHOLE BH16-07

DST REF. No.: **IN-SO-026755**
 CLIENT: **Canada Lands Company**
 PROJECT: **Site Servicing Phase 1B**
 LOCATION: **Wateridge Village, Ottawa, Ontario**
 SURFACE ELEV.: **93.45 metres**

Drilling Data
 METHOD: **Hollow Stem Auger**
 DIAMETER: **200 mm**
 DATE: **September 1, 2016**
 COORDINATES: **5035156.4 m N, 373046.35 m E**

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE			Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	N' VALUE	VANE (kPa) ✕				REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
			W _p	W	W _i						SPT (N) □		DCPT ◆		
			20	40	60						20	40	60	80	
						TOPSOIL - 25 mm thick									
93			●			FILL - SAND - gravelly, trace clay and silt, possible cobbles and boulders, light brown to grey, compact to very dense	SS1	24						32 62 (6)	
1.0					SS2		75								
92			●		SS3		28								
2.0					SS4		98								
91			●		SS5		50+								
3.0						End of Borehole at 3.1 m Split Spoon Sampler and Auger Refusal on Inferred Bedrock									
90															
4.0															
89															
5.0															
88															
6.0															
87															
7.0															
86															

BOREHOLE (STANDARD) PHASE 1B BOREHOLES V1.3.GPJ DST_MIN.GDT 10-24-16



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 Email: thunderbay@dstgroup.com
 Web: www.dstgroup.com

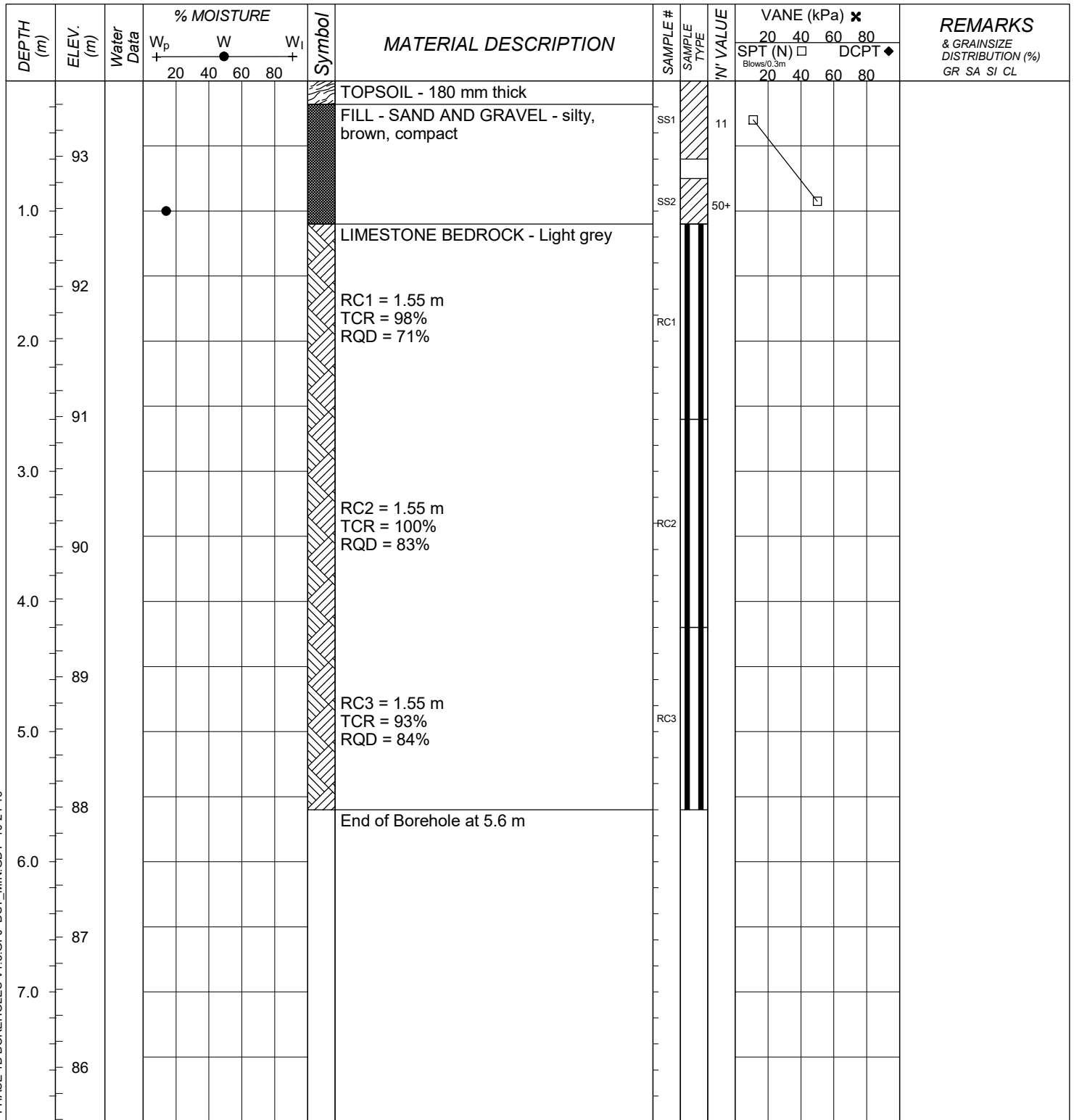
SAMPLE TYPE LEGEND

- | | | |
|--|---|---|
| <ul style="list-style-type: none"> Auger Sample Split Spoon Sample Bulk Sample | <ul style="list-style-type: none"> Rock Core Hiller Peat Sampler 70mm Thick Wall Tube | <ul style="list-style-type: none"> Bentonite Sand |
|--|---|---|

LOG OF BOREHOLE BH16-08

DST REF. No.: **IN-SO-026755**
 CLIENT: **Canada Lands Company**
 PROJECT: **Site Servicing Phase 1B**
 LOCATION: **Wateridge Village, Ottawa, Ontario**
 SURFACE ELEV.: **93.58 metres**

Drilling Data
 METHOD: **Hollow Stem Auger / NQ Size Core Barrel**
 DIAMETER: **200 mm**
 DATE: **August 29, 2016**
 COORDINATES: **5035156.34 m N, 373117.37 m E**



BOREHOLE (STANDARD) PHASE 1B BOREHOLES V1.3.GPJ DST_MIN.GDT 10-24-16



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 Web: www.dstgroup.com

SAMPLE TYPE LEGEND

- | | | |
|--------------------|----------------------|-----------|
| Auger Sample | Rock Core | Bentonite |
| Split Spoon Sample | Hiller Peat Sampler | Sand |
| Bulk Sample | 70mm Thick Wall Tube | |

LOG OF BOREHOLE BH16-09

DST REF. No.: **IN-SO-026755**
 CLIENT: **Canada Lands Company**
 PROJECT: **Site Servicing Phase 1B**
 LOCATION: **Wateridge Village, Ottawa, Ontario**
 SURFACE ELEV.: **93.39 metres**

Drilling Data
 METHOD: **Hollow Stem Auger**
 DIAMETER: **200 mm**
 DATE: **August 29, 2016**
 COORDINATES: **5035170.89 m N, 373171.56 m E**

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE			Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	N' VALUE	VANE (kPa) ✕				REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
			W _p	W	W _i						SPT (N) □		DCPT ◆		
			20	40	60	80				20	40	60	80		
							TOPSOIL - 150 mm thick								
93							FILL - SAND - gravelly, some clay and silt, brown, compact to very dense	SS1	10						
1.0								SS2	31					32 38 (30)	
92								SS3	50+						
2.0							End of Borehole at 1.8 m Split Spoon Sampler and Auger Refusal on Inferred Bedrock								
91															
3.0															
90															
4.0															
89															
5.0															
88															
6.0															
87															
7.0															
86															

BOREHOLE (STANDARD) PHASE 1B BOREHOLES V1.3.GPJ DST_MIN.GDT 10-24-16



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

SAMPLE TYPE LEGEND

- | | | |
|--------------------|----------------------|-----------|
| Auger Sample | Rock Core | Bentonite |
| Split Spoon Sample | Hiller Peat Sampler | Sand |
| Bulk Sample | 70mm Thick Wall Tube | |

LOG OF BOREHOLE BH16-23

DST REF. No.: **IN-SO-026755**
 CLIENT: **Canada Lands Company**
 PROJECT: **Site Servicing Phase 1B**
 LOCATION: **Wateridge Village, Ottawa, Ontario**
 SURFACE ELEV.: **88.26 metres**

Drilling Data
 METHOD: **Hollow Stem Auger**
 DIAMETER: **200 mm**
 DATE:
 COORDINATES: **5035209.85 m N, 372533.31 m E**

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE			Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	N' VALUE	VANE (kPa) ✕				REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
			W _p	W	W _i						SPT (N) □		DCPT ◆		
			20	40	60						20	40	60	80	
88						ASPHALT - 75 mm thick									
1.0						FILL - SAND AND GRAVEL - some clay, trace organics, possible cobbles and boulders, brown, compact to very dense	SS1	10							
87															
2.0															
86															
3.0						End of Borehole at 2.9 m Split Spoon Sampler and Auger Refusal on Inferred Bedrock	SS2	59							
85															
4.0															
84															
5.0															
83															
6.0															
82															
7.0															
81															

BOREHOLE (STANDARD) PHASE 1B BOREHOLES V1.3.GPJ DST_MIN.GDT 10-24-16



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 Web: www.dstgroup.com

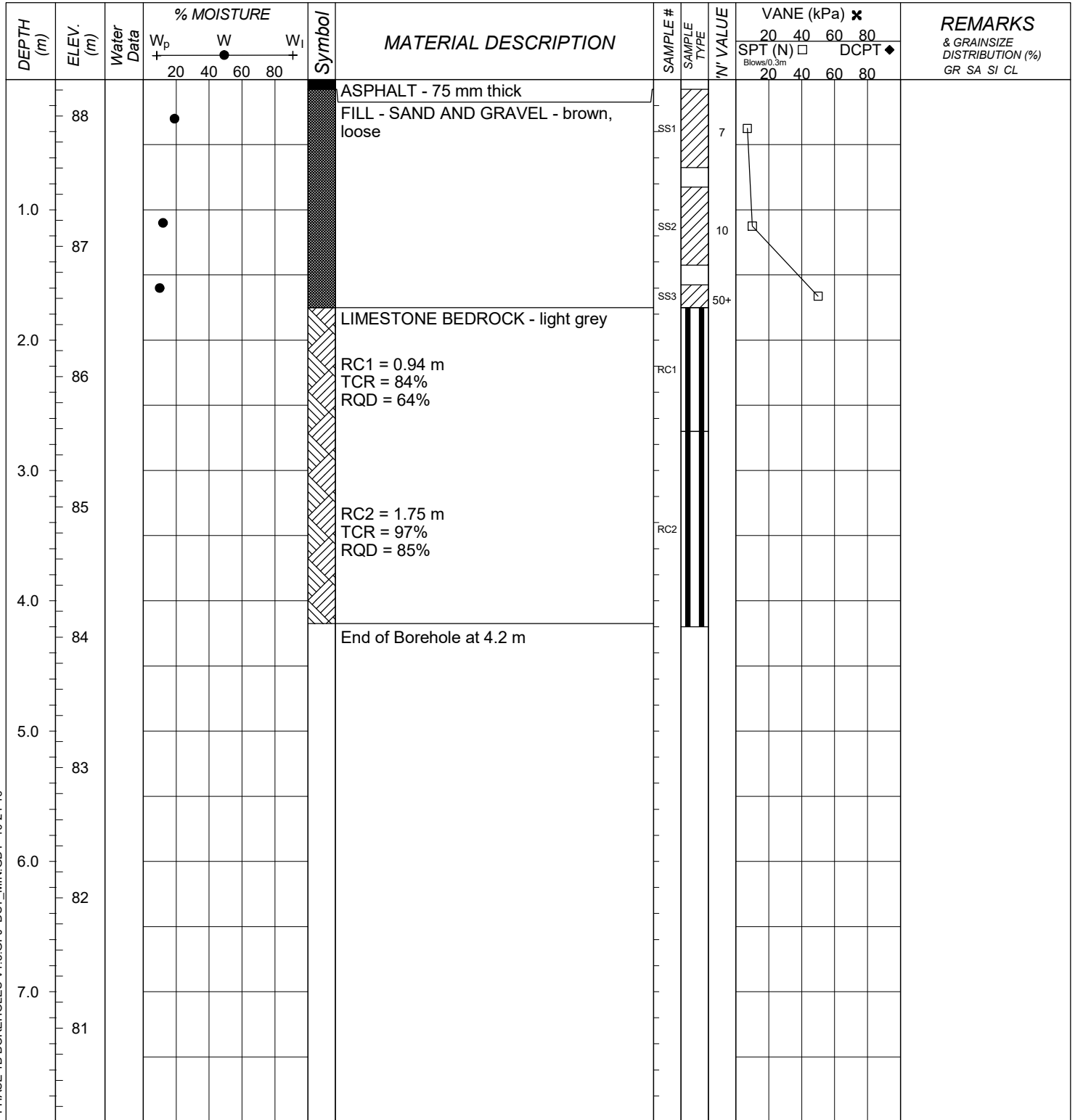
SAMPLE TYPE LEGEND

- | | | |
|--|---|---|
| <ul style="list-style-type: none"> Auger Sample Split Spoon Sample Bulk Sample | <ul style="list-style-type: none"> Rock Core Hiller Peat Sampler 70mm Thick Wall Tube | <ul style="list-style-type: none"> Bentonite Sand |
|--|---|---|

LOG OF BOREHOLE BH16-24

DST REF. No.: IN-SO-026755
 CLIENT: Canada Lands Company
 PROJECT: Site Servicing Phase 1B
 LOCATION: Wateridge Village, Ottawa, Ontario
 SURFACE ELEV.: 88.28 metres

Drilling Data
 METHOD: Hollow Stem Auger / NQ Size Core Barrel
 DIAMETER: 200 mm
 DATE: August 26, 2016
 COORDINATES: 5035209.64 m N, 372567.49 m E



BOREHOLE (STANDARD) PHASE 1B BOREHOLES V1.3.GPJ DST_MIN.GDT 10-24-16



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SAMPLE TYPE LEGEND

- | | | |
|--|---|---|
| <ul style="list-style-type: none"> Auger Sample Split Spoon Sample Bulk Sample | <ul style="list-style-type: none"> Rock Core Hiller Peat Sampler 70mm Thick Wall Tube | <ul style="list-style-type: none"> Bentonite Sand |
|--|---|---|

LOG OF BOREHOLE BH15-09

DST REF. No.: OE-OT-015358
 CLIENT: Canada Lands Company (CLC)
 PROJECT: Phase 1A Development - Site Servicing
 LOCATION: Former CFB Rockcliffe, Ottawa, Ontario,
 SURFACE ELEVATION: 81.20 metres

Drilling Data
 METHOD: Hollow Stem Auger/Core Barrel/NQ
 DIAMETER: 200 mm
 DATE: 26 August 2015
 COORDINATES: 5033823.631 m N, 450194.353 m E

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE			Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	VANE (kPa) ×	REMARKS & GRAINSIZE DISTRIBUTION (%)	
			W _p	W	W _i							SPT (N) □ DCPT ◆
			Blows/0.3m									
81						CRUSHED GRAVEL.						
1.0	80					SAND, topsoil, dry, brown.	SS1					
2.0	79					Limestone, grey, highly fractured and weathered from top to 2.2 m deep. Sub vertical fracture from top to 1.60 m, oxydized	RC1	41		TCR = 83%		
3.0	78					Shale, black with thin limestone partings, become grey at 4.14 m. Highly fractured from 3.22 to 4.16 m	RC2	49		TCR = 92%		
4.0	77					Limestone, dark grey, biomicrite with black shale partings from 4.49 m to 5.38 m and from 5.38 to 5.63 m	RC3	82		TCR = 100%		
5.0	76						RC4	100		TCR = 100%		
6.0	75					Black shale, highly fractured	RC5	43		TCR = 100%		
7.0	74					Limestone, dark grey, biomicrite	RC6	92		TCR = 96%		
8.0	73					Limestone grey, cristaline with sub-vertical joint 15 degree with core axis from 8.96 to 9.32 m	RC7	100		TCR = 100%		
9.0	72					Shale, black	RC8	100		TCR = 100%		
10.0	71					Limestone, green/grey, cristaline, highly fractured from 14.1 to 14.5 m	RC9	100		TCR = 100%		
11.0	70						RC10	75		TCR = 100%		
12.0	69					Shale, black with calcite inclusions from 16.5 to 17.4 m. Sub-vertical joint 20 degree with core axis from 16.8 to 17.0 m with thin < 1mm calcite filling. LIMSTONE interbeds from 19.3 to 20.7 m and from 21.8 to 22.1 m. Horizontal joints @ 22.4, 23.0 and 23.3 m. Highly fractured from 23.3 to 23.5 m.	RC11	90		TCR = 100%		
13.0	68						RC12	66		TCR = 93%		
14.0	67						RC13	78		TCR = 100%		
15.0	66						RC14	100		TCR = 100%		
16.0	65						RC15	93		TCR = 100%		
17.0	64							75		TCR = 98%		
18.0	63											
19.0	62											
20.0	61											
21.0	60											
22.0	59											
23.0	58											

BOREHOLE (STANDARD) - OTTAWA PROJECT.GPJ DST_MIN.GDT 29/9/15



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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 11

LOG OF BOREHOLE BH15-09

DST REF. No.: **OE-OT-015358**
 CLIENT: **Canada Lands Company (CLC)**
 PROJECT: **Phase 1A Development - Site Servicing**
 LOCATION: **Former CFB Rockcliffe, Ottawa, Ontario,**
 SURFACE ELEVATION: **81.20 metres**

Drilling Data
 METHOD: **Hollow Stem Auger/Core Barrel/NQ**
 DIAMETER: **200 mm**
 DATE: **26 August 2015**
 COORDINATES: **5033823.631 m N, 450194.353 m E**

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE			Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	W VALUE / ROD	VANE (kPa) ×				REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL	
			W _p	W	W _i						SPT (N) □ DCPT ◆					
			20	40	60						20	40	60	80		
25.0	57					Sandstone/dolomite, grey. Sub-vertical joint 30 degree with core axis from 26.1 to 26.33 m with calcite filling < 1 mm. Horizontal joint at 26.42, 26.57, 26.62, 26.64. Shale interbeds, black from 26.9 to 27.0 and from 27.8 to 28.3 m. Sub-vertical joint 20 degree with core axis from 29.7 to 29.9 and from 31.3 to 31.5 m with thin < 1 mm calcite filling. Horizontal joints @ 31.7, 31.8, 31.9, 31.2, 32.1, 32.4, 32.7 and 32.9 m.	RC16		33						TCR = 100%	
26.0	56						RC17		86							TCR = 100%
27.0	55							RC18		95						TCR = 100%
28.0	54							RC19		84						TCR = 100%
29.0	53							RC20		79						TCR = 100%
30.0	52							RC21		73						TCR = 100%
31.0	51							RC22		56						TCR = 100%
32.0	50							RC23		100						TCR = 100%
33.0	49															
34.0	48						Sandstone interbedded with black shale. Sub-vertical joints 20 degree with core axis from 33.3 to 33.4 and from 33.6 to 33.8 m no filling.									
35.0	47						End of Borehole at 35.1 m.									
36.0	46															
37.0	45															
38.0	44															
39.0	43															
40.0	42															
41.0	41															
42.0	40															
43.0	39															
44.0	38															
45.0	37															
46.0	36															
47.0	35															

BOREHOLE (STANDARD) - OTTAWA PROJECT.GPJ DST_MIN.GDT 29/9/15



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

SAMPLE TYPE LEGEND

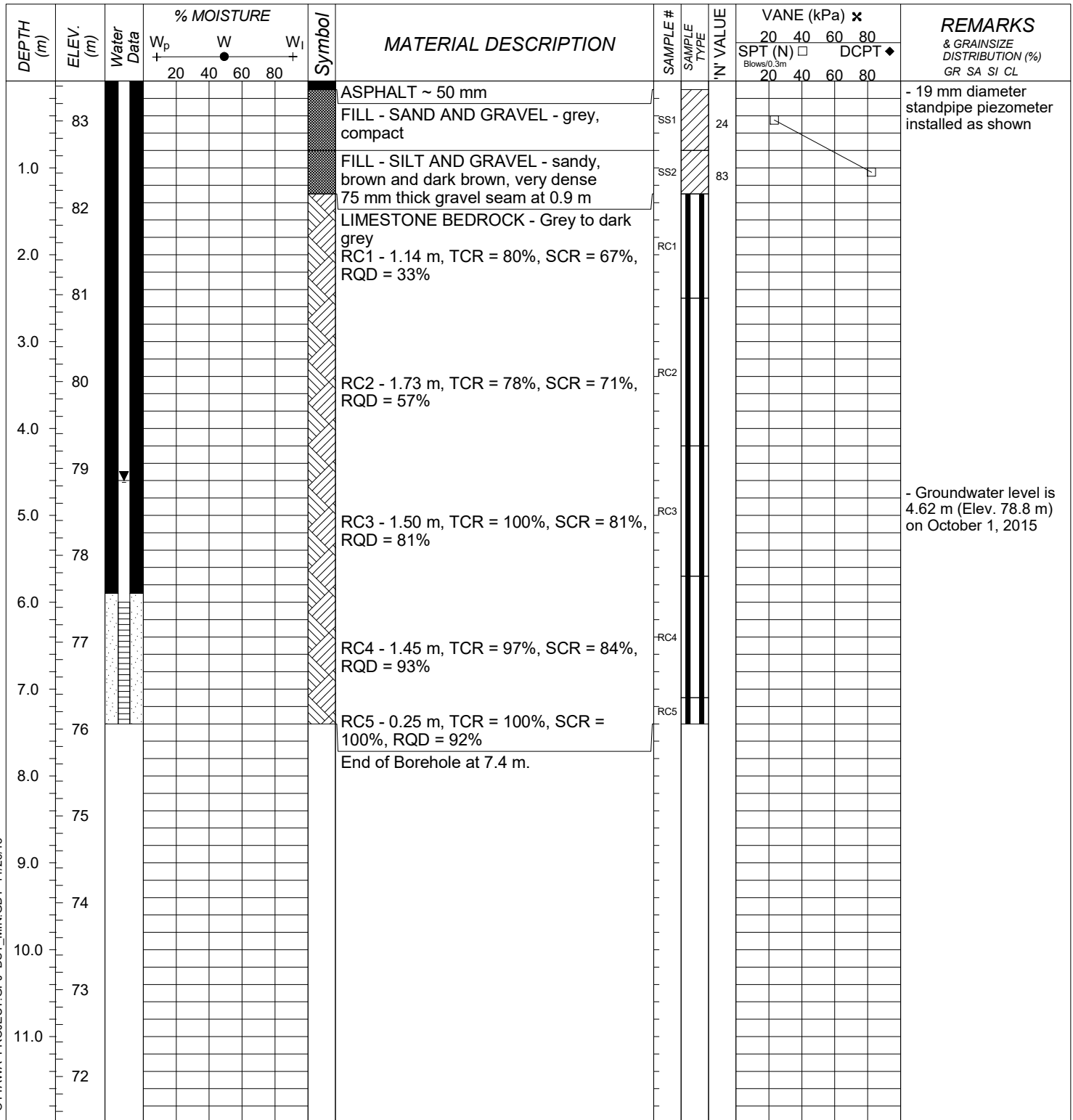
- | | | |
|--------------------|---------------------|-----------|
| Auger Sample | Rock Core | Bentonite |
| Split Spoon Sample | Hiller Peat Sampler | Sand |
| Bulk Sample | 70mm Thin Wall Tube | Slough |

ENCLOSURE 12

LOG OF BOREHOLE BH15-10

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: **83.46 metres**

Drilling Data
 METHOD: **Hollow Stem Auger/ NQ Size Core Barrel**
 DIAMETER: **200 mm**
 DATE: **August 21, 2015**
 COORDINATES: **5033743.938 m N, 450109.419 m E**



BOREHOLE (STANDARD) - OTTAWA PROJECT.GPJ DST_MIN.GDT 11/26/15



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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 | |

ENCLOSURE 13

LOG OF BOREHOLE BH15-11

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: 85.34 metres

Drilling Data
 METHOD: **Hollow Stem Auger/ NQ Size Core Barrel**
 DIAMETER: **200 mm**
 DATE: **August 21, 2015**
 COORDINATES: **5033606.53 m N, 450180.104 m E**

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE			Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	'N' VALUE	VANE (kPa) ×				REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
			W _p	W	W _i						SPT (N) □ DCPT ◆				
			20	40	60						20	40	60	80	
85						TOPSOIL ~ 150 mm									
						FILL - SAND AND GRAVEL - silty, grey, compact									
1.0															
84						TOPSOIL ~ 50 mm									
						SAND AND GRAVEL - Silty, grey									
2.0						LIMESTONE BEDROCK - Grey to dark grey									
						RC1 - 1.21 m, TCR = 93%, SCR = 90%, RQD = 65%	RC1								
3.0															
82						RC2 - 1.53 m, TCR = 99%, SCR = 90%, RQD = 86%	RC2								
4.0						SHALE BEDROCK - Black									
5.0						LIMESTONE BEDROCK - Grey to dark grey									
						RC3 - 1.50 m, TCR = 95%, SCR = 93%, RQD = 87%	RC3								
6.0															
7.0						SHALE BEDROCK - Black									
						RC4 - 1.55 m, TCR = 100%, SCR = 100%, RQD = 97%	RC4								
8.0						LIMESTONE BEDROCK - Grey to dark grey									
						RC5 - 1.12 m, TCR = 97%, SCR = 97%, RQD = 97%	RC5								
77						End of Borehole at 8.3 m.									
9.0															
76															
10.0															
75															
11.0															
74															

BOREHOLE (STANDARD) - OTTAWA PROJECT.GPJ DST_MIN.GDT 11/26/15



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SAMPLE TYPE LEGEND

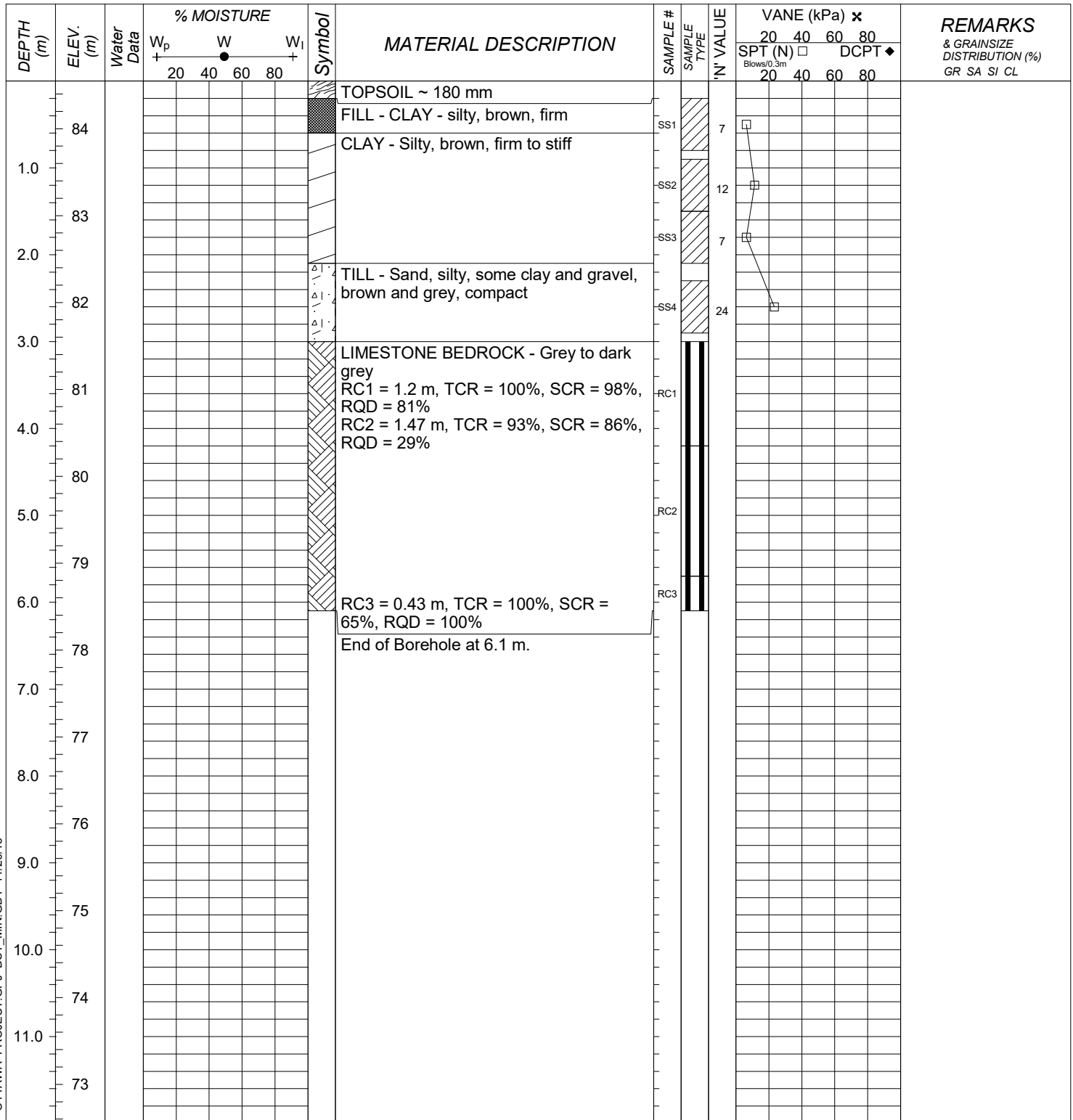
- | | | |
|--------------------|---------------------|-----------|
| Auger Sample | Rock Core | Bentonite |
| Split Spoon Sample | Hiller Peat Sampler | Sand |
| Bulk Sample | 70mm Thin Wall Tube | |

ENCLOSURE 14

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 metres**

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**



BOREHOLE (STANDARD) - OTTAWA PROJECT.GPJ DST_MIN.GDT 11/26/15



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SAMPLE TYPE LEGEND

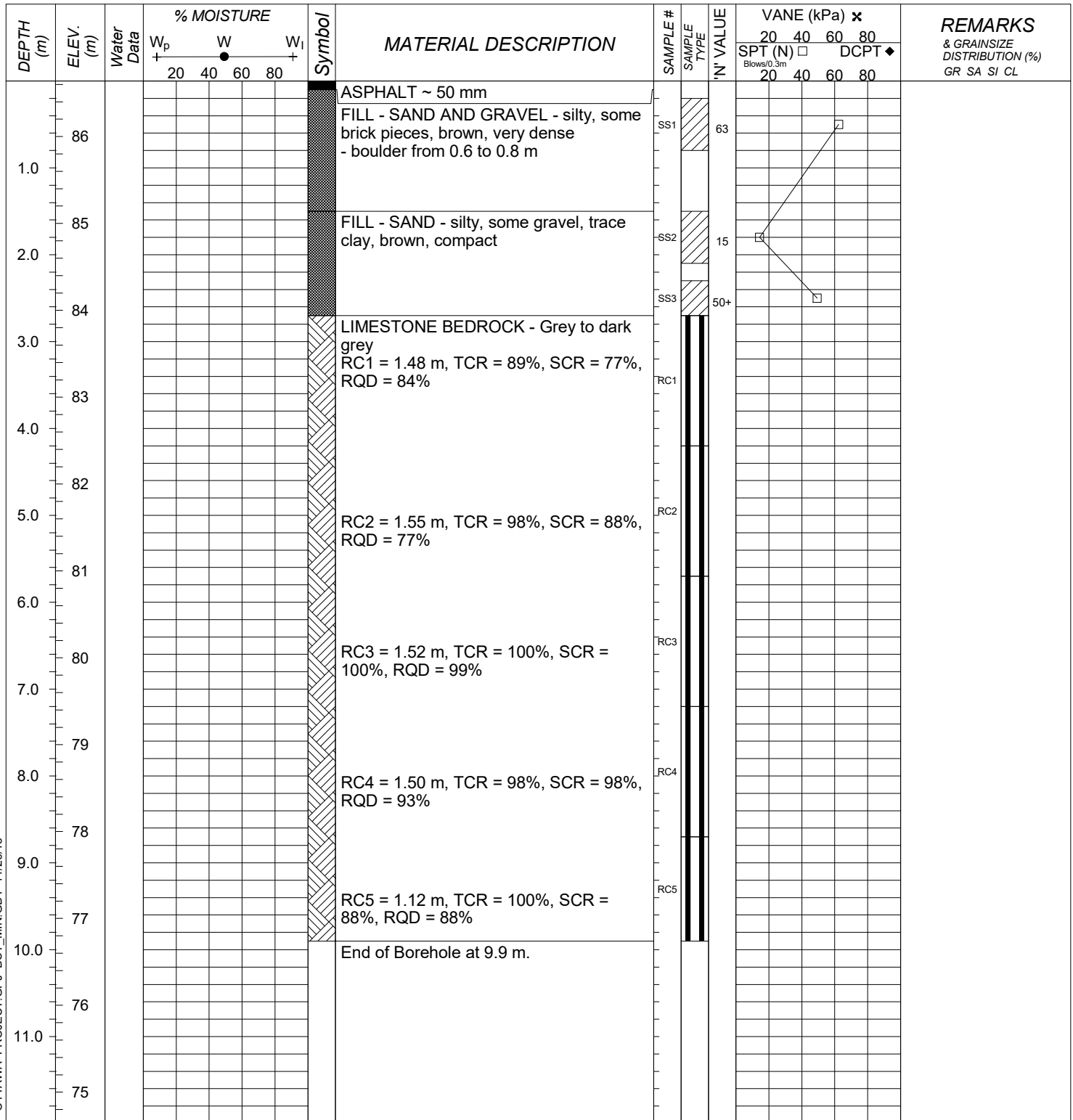
- | | | |
|--------------------|---------------------|-----------|
| Auger Sample | Rock Core | Bentonite |
| Split Spoon Sample | Hiller Peat Sampler | Sand |
| Bulk Sample | 70mm Thin Wall Tube | |

ENCLOSURE 15

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 Rockcliffe, Ottawa Ontario**
 SURFACE ELEVATION: **86.64 metres**

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**



BOREHOLE (STANDARD) - OTTAWA PROJECT.GPJ DST_MIN.GDT 11/26/15



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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 | |

ENCLOSURE 16

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 Rockcliffe, Ottawa Ontario**
 SURFACE ELEVATION: **87.77 metres**

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			Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	N' VALUE	VANE (kPa) ×				REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
			W _p	W	W _i						SPT (N) □ DCPT ◆		Blows/0.3m		
			20	40	60	80				20	40	60	80		
							TOPSOIL ~ 75 mm								
							FILL - SAND AND GRAVEL - silty, brown ~ 100 mm	SS1		6					
0.87							ORGANIC SAND - Silty, some roots and rootlets, black								
1.0							CLAY - Silty, some sand and gravel, brown	SS2		50+					
2.0							End of Borehole at 1.1 m. Auger Refusal								
2.86															
3.0															
3.85															
4.0															
5.0															
6.0															
7.0															
8.0															
9.0															
10.0															
11.0															
11.76															

BOREHOLE (STANDARD) - OTTAWA PROJECT.GPJ DST_MIN.GDT 11/26/15



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SAMPLE TYPE LEGEND

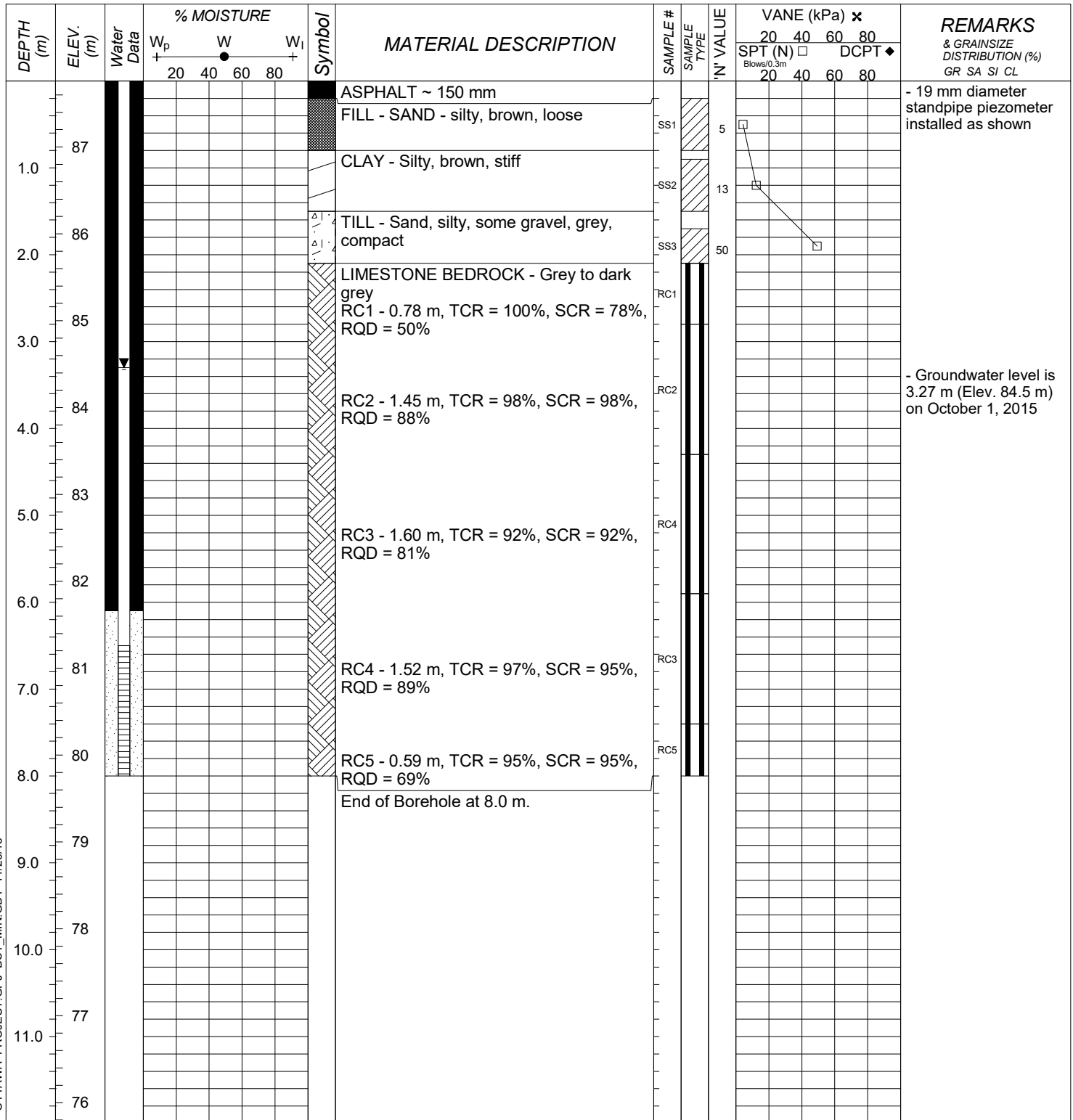
- | | | |
|--------------------|---------------------|-----------|
| Auger Sample | Rock Core | Bentonite |
| Split Spoon Sample | Hiller Peat Sampler | Sand |
| Bulk Sample | 70mm Thin Wall Tube | |

ENCLOSURE 17

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 metres**

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**



BOREHOLE (STANDARD) - OTTAWA PROJECT.GPJ DST_MIN.GDT 11/26/15



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 PH: (613)748-1415
 FX: (613)748-1356
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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 | |

ENCLOSURE 18

PROJECT: 1521309

RECORD OF BOREHOLE: 15-1

SHEET 1 OF 1

LOCATION: N 5034902.3 ; E 371648.9

BORING DATE: January 26, 2015

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		STRATA PLOT	SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	ELEV. DEPTH (m)		NUMBER	TYPE	SHEAR STRENGTH				WATER CONTENT PERCENT					
							Cu, kPa		rem V.		Wp		WI			
0		GROUND SURFACE	71.35				20	40	60	80	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴	10 ⁻³		
		TOPSOIL - (SM) SILTY SAND; dark brown; moist	0.00													
		(Cl/Ch) SILTY CLAY to CLAY; grey brown (WEATHERED CRUST); cohesive, very stiff to stiff, w>PL	71.10	1	SS	14										
1			0.25													
				2	SS	9										
2				3	SS	6										
				4	SS	4										
3	Power Auger 200 mm Diam. (Hollow Stem)															
		(Cl/Ch) SILTY CLAY to CLAY; grey; cohesive, w>PL, firm to stiff	68.00	5	SS	2										
			3.35													
4																
				6	SS	WH										
5																
6		End of Borehole	65.56													
			5.79													
7																
8																
9																
10																

MIS-BHS 001_1521309.GPJ CAL-MIS.GDT_04/16/15 JM

DEPTH SCALE
1 : 50



LOGGED: PAH
CHECKED: SD

PROJECT: 1521309

RECORD OF BOREHOLE: 15-2

SHEET 1 OF 1

LOCATION: N 5034949.1:E 371734.0

BORING DATE: January 26, 2015

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.30m	SHEAR STRENGTH				WATER CONTENT PERCENT					
								Cu, kPa		nat V. + rem V. \oplus \ominus		Q - U				Wp	
0	PA (HS)	GROUND SURFACE		73.05			20	40	60	80							
		TOPSOIL		0.00	1	SS	>50										
		End of Borehole Auger Refusal		72.75 0.30													
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

MIS-BHS 001 1521309.GPJ GAL-MIS.GDT 04/18/15 JM

DEPTH SCALE
1 : 50



LOGGED: PAH
CHECKED: SD

PROJECT: 1521309

RECORD OF BOREHOLE: 15-3

SHEET 1 OF 2

LOCATION: N 5034983.6; E 371807.7

BORING DATE: January 28, 2015

DATUM: Geodetic

SAMPLER HAMMER, 64kg; DROP, 760mm

PENETRATION TEST HAMMER, 64kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		STRA TA PLOT	ELEV. DEPTH (m)	SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k. cmvs				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	NUMBER			TYPE	BLOWS/0.30m	SHEAR STRENGTH Cu, kPa				WATER CONTENT PERCENT					
								20	40	60	80	nat V. + rem V.	Q - U	Wp	Wl		
0		GROUND SURFACE			76.24												
	Power Auger 200 mm Diam. (Hollow Stem)	FILL/TOPSOIL - (SM) SILTY SAND, some gravel, dark brown; moist			0.00												
		(SM/GM) SILTY SAND and GRAVEL; brown; non-cohesive, moist, compact to dense	1	SS	19	75.94 0.30											
1						2	SS	31									
	Rotary Drill NO Core	Fresh, thinly to medium bedded, grey to dark grey DOLOSTONE BEDROCK, with shale and sandstone interbeds			74.89 1.35												
2						C1	NO RC	DD									
3							C2	NO RC	DD								
4																	
5							C3	NO RC	DD								
6																	
7						C4	NO RC	DD									
8																	
9						C5	NO RC	DD									
10		End of Borehole			66.46 9.78												

MIS-BHS 001 1521309.GPJ GAL-MIS.GDT 04/16/15 JM

DEPTH SCALE
1 : 50



LOGGED: PAH
CHECKED: SD

PROJECT: 1521309

RECORD OF PROBEHOLE: 15-10

SHEET 1 OF 1

LOCATION: N 5034922.7 :E 371689.0

BORING DATE: January 29, 2015

DATUM: Geodetic

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLER	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k. cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT		NUMBER	20	40	60	80	10 ⁻⁵	10 ⁻³	10 ⁻²			10 ⁻¹
0		GROUND SURFACE													
		Unsampled Overburden													
1															
2															
3															
4	DCPT														
5															
6															
7															
8		End of Borehole Dynamic Cone Penetration Test Refusal													
9															
10															

MIS-BHS 001 1521309.GPJ GAL-MIS.GDT 04/16/15 JM

DEPTH SCALE
1 : 50



LOGGED: PAH
CHECKED: SD

LOG OF BOREHOLE BH14-26

DST REF. No.: **OE-OT-015358**
 CLIENT: **Canada Lands Company**
 PROJECT: **Former CFB Rockcliffe**
 LOCATION: **Ottawa, Ontario**
 SURFACE ELEV.: **86.27 metres**

Drilling Data
 METHOD: **Hollow Stem Auger**
 DIAMETER: **80 mm ID**
 DATE: **March 3, 2014**
 COORDINATES: **5033642.48 m N, 450271.46 m E**

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE			Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	N' VALUE	VANE (kPa) ✕		REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
			W _p	W	W _i						SPT (N) □	DCPT ◆	
	86												
1.0	85		●	●		TOPSOIL - with grass and roots							
						ASPHALT - 50 mm	AS1						
						SAND & GRAVEL	SS2	7					
2.0	84		●			SAND - some silt to silty, some gravel, trace clay and roots, occasional cobbles, brown, loose	SS3	100+					
						End of Borehole at 1.7 m Auger Refusal							
3.0	83												
4.0	82												
5.0	81												
6.0	80												
7.0	79												
8.0	78												
9.0	77												
10.0	76												
11.0	75												
12.0	74												
13.0	73												
14.0	72												
15.0	71												
16.0	70												
17.0	69												
18.0	68												
19.0	67												

BOREHOLE (STANDARD) - OTTAWA GS-OT-015358 ROCKCLIFFE PHASE I.G.P.J. DST_MIN.GDT 4/11/14



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 Web: www.dstgroup.com

SAMPLE TYPE LEGEND

- | | | |
|--|--|---|
| <ul style="list-style-type: none"> Auger Sample Split Spoon Sample Bulk Sample | <ul style="list-style-type: none"> Rock Core Hiller Peat Sampler 70mm Thin Wall Tube | <ul style="list-style-type: none"> Bentonite Sand |
|--|--|---|

ENCLOSURE 1

LOG OF BOREHOLE BH14-32

DST REF. No.: **OE-OT-015358**
 CLIENT: **Canada Lands Company**
 PROJECT: **Former CFB Rockcliffe**
 LOCATION: **Ottawa, Ontario**
 SURFACE ELEV.: **92.85 metres**

Drilling Data
 METHOD: **Hollow Stem Auger**
 DIAMETER: **80 mm ID**
 DATE: **March 5, 2014**
 COORDINATES: **5033592.04 m N, 450910.85 m E**

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE			Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	N' VALUE	VANE (kPa) ✕		REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
			W _p	W	W _i						20 40 60 80	SPT (N) □	
1.0	92		20	40	60	80	TOPSOIL - with grass and roots	AS1					29 66 (5)
1.5	91.5					SAND - Gravelly, trace silt, clay and roots, occasional cobbles, grey, loose to compact	SS2	14					
2.0	91						SS3	6					
2.1	90.75					End of Borehole at 2.1 m Auger Refusal							
3.0	90												
4.0	89												
5.0	88												
6.0	87												
7.0	86												
8.0	85												
9.0	84												
10.0	83												
11.0	82												
12.0	81												
13.0	80												
14.0	79												
15.0	78												
16.0	77												
17.0	76												
18.0	75												
19.0	74												
20.0	73												

BOREHOLE (STANDARD) - OTTAWA GS-OT-015358 ROCKCLIFFE PHASE I.G.P.J. DST_MIN.GDT 4/11/14



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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 | |

ENCLOSURE 7

LOG OF BOREHOLE BH14-36

DST REF. No.: **OE-OT-015358**
 CLIENT: **Canada Lands Company**
 PROJECT: **Former CFB Rockcliffe**
 LOCATION: **Ottawa, Ontario**
 SURFACE ELEV.: **85.57 metres**

Drilling Data
 METHOD: **Hollow Stem Auger**
 DIAMETER: **80 mm ID**
 DATE: **February 26, 2014**
 COORDINATES: **5033475.8 m N, 450066.74 m E**

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE W _p W W _i +-----+-----+ 20 40 60 80	Symbol	MATERIAL DESCRIPTION	SAMPLE #	SAMPLE TYPE	VANE (kPa) ✕ 20 40 60 80 SPT (N) □ DCPT ◆ Blows/0.3m 20 40 60 80	REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL
85					TOPSOIL - with grass and roots	AS1			
84.5					SAND & GRAVEL - with clay, some silt,	SS2			
84					SAND - with clay, some gravel, trace silt and roots, loose to compact	SS3			
1.8					End of Borehole at 1.8 m Auger Refusal	SS4			25 71 (4)
83									
82									
81									
80									
79									
78									
77									
76									
75									
74									
73									
72									
71									
70									
69									
68									
67									
66									

BOREHOLE (STANDARD) - OTTAWA GS-OT-0153588 ROCKCLIFFE PHASE I.G.P.J. DST_MIN.GDT 4/11/14



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SAMPLE TYPE LEGEND

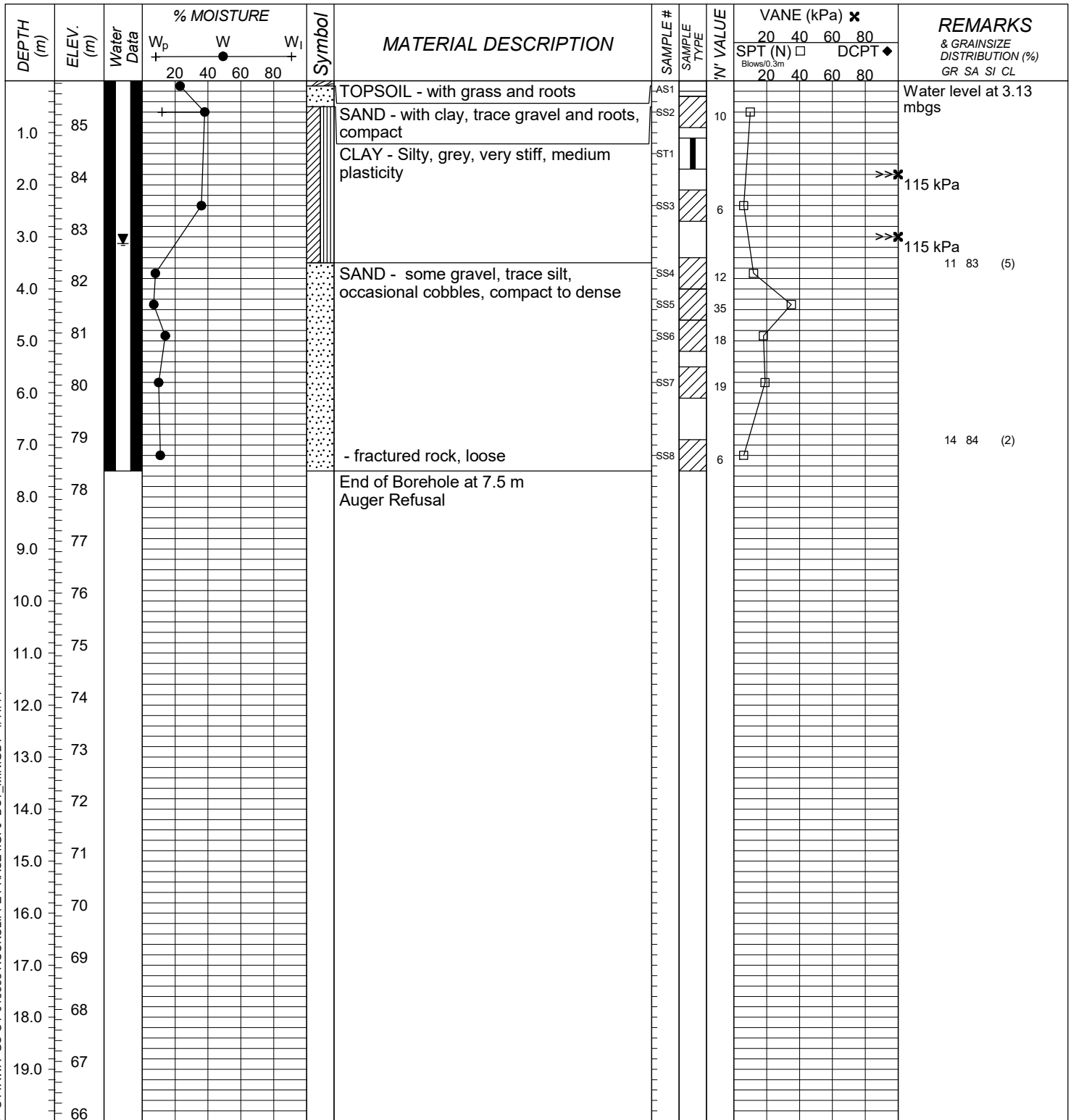
Auger Sample	Rock Core	Bentonite
Split Spoon Sample	Hiller Peat Sampler	Sand
Bulk Sample	70mm Thin Wall Tube	

ENCLOSURE 11

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**



BOREHOLE (STANDARD) - OTTAWA GS-OT-015358 ROCKCLIFFE PHASE I.G.P.J. DST_MIN.GDT 4/11/14



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SAMPLE TYPE LEGEND

- | | | |
|--|--|---|
| <ul style="list-style-type: none"> Auger Sample Split Spoon Sample Bulk Sample | <ul style="list-style-type: none"> Rock Core Hiller Peat Sampler 70mm Thin Wall Tube | <ul style="list-style-type: none"> Bentonite Sand |
|--|--|---|

ENCLOSURE 5

LOG OF TESTPIT TP13-03

DST REF. No.: **OE-OT-017184**
 CLIENT: **Canada Lands Company (CLC)**
 PROJECT: **Stormwater Management Plan**
 LOCATION: **Former CFB Rockcliffe, Ottawa, Ontario**
 SURFACE ELEV.: **77.73 metres**

Testpit Data
 METHOD: **Excavator**
 DATE: **9/6/2013**
 COORDINATES: **5033845.5 m N, 450226 m E**

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE			Symbol	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE	N' VALUE	VANE (kPa) ✕				REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL		
			W _p	W	W _l						20	40	60	80		300	600
0.2						[Symbol]	FILL - SAND & GRAVEL - some roots, cobbles and boulders, dark brown										
0.4						[Symbol]	FILL - SAND - trace gravel and silt, light brown										
0.6						[Symbol]	FILL - SAND - Gravelly, light brown										
0.8	77					[Symbol]											
1.0						[Symbol]	CLAY - Silty, stiff	1									
1.2						[Symbol]											
1.4						[Symbol]											
1.6						[Symbol]											
1.8	76					[Symbol]											
2.0						[Symbol]											
2.2						[Symbol]	End of Testpit at 2.1 m Refusal	2									
2.4						[Symbol]											
2.6						[Symbol]											
2.8	75					[Symbol]											
3.0						[Symbol]											
3.2						[Symbol]											
3.4						[Symbol]											
3.6						[Symbol]											
3.8	74					[Symbol]											
4.0						[Symbol]											
4.2						[Symbol]											
4.4						[Symbol]											
4.6						[Symbol]											
4.8	73					[Symbol]											

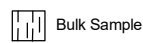
>> ✕ 130+ kPa

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SAMPLE TYPE LEGEND



ENCLOSURE 3

LOG OF TESTPIT TP13-04

DST REF. No.: **OE-OT-017184**
 CLIENT: **Canada Lands Company (CLC)**
 PROJECT: **Stormwater Management Plan**
 LOCATION: **Former CFB Rockcliffe, Ottawa, Ontario**
 SURFACE ELEV.: **84.31 metres**

Testpit Data
 METHOD: **Excavator**
 DATE: **9/6/2013**
 COORDINATES: **5033718.5 m N, 450202.2 m E**

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE			Symbol	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE	N' VALUE	VANE (kPa) ✕				REMARKS & GRAINSIZE DISTRIBUTION (%) GR SA SI CL	
			W _p	W	W _l						20	40	60	80		
0.2	84						FILL - SAND & GRAVEL - trace roots and silt, some cobbles, dark brown									
0.4																
0.6										FILL - SAND - some silt, boulders and cobbles, grey						
0.8																
1.0																
1.2	83						SILT - Sandy, trace gravel									
1.4																
1.6																
1.8							End of Testpit at 1.8 m Refusal									
2.0	82															
2.2																
2.4																
2.6	81															
2.8																
3.0																
3.2	80															
3.4																
3.6																
3.8																
4.0																
4.2																
4.4																
4.6																
4.8																

TESTPIT (STANDARD) - OTTAWA OE-OT-017184 CFB ROCKCLIFFE.GPJ DST_MIN.GDT 10/17/13



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SAMPLE TYPE LEGEND



Bulk Sample

ENCLOSURE 4


LOG OF BOREHOLE BH12

DST REF. No.: **OG06562**
 CLIENT: **Canada Lands Company**
 PROJECT: **Preliminary Geotechnical Investigation**
 LOCATION: **CFB Rockcliffe, Ottawa, Ontario**
 SURFACE ELEV.: **76.39 m (Geodetic)**

Drilling Data
 METHOD: **CME 75 Drill Rig**
 DIAMETER: **200 mm**
 DATE: **August 15 2006**

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE			Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	'N' VALUE	VANE DATA (KPA)*				REMARKS
			W _p	W	W _i						100	200	300	400	
											SPT (N) □	DCPT ♦			
			+-----+ 20 40 60 80			GRASS COVER					10	20	30	40	Standpipe installed to 3.1 m depth.
76						SAND - silty, some gravel, trace boulders, very dense, brown to reddish orange (till)									
1		•					SS1		100						Groundwater level recorded at 1.8 m depth on August 24, 2006.
75						BEDROCK - grey fossiliferous limestone bedrock with narrow horizons of black shale noted at ~ 90 degrees to core axis									Auger refusal at 1.5 m depth.
2							CR2								
74															Recovery 98% RQD 87%
3						End of borehole at 3.1 m depth.									
73															
4															
72															

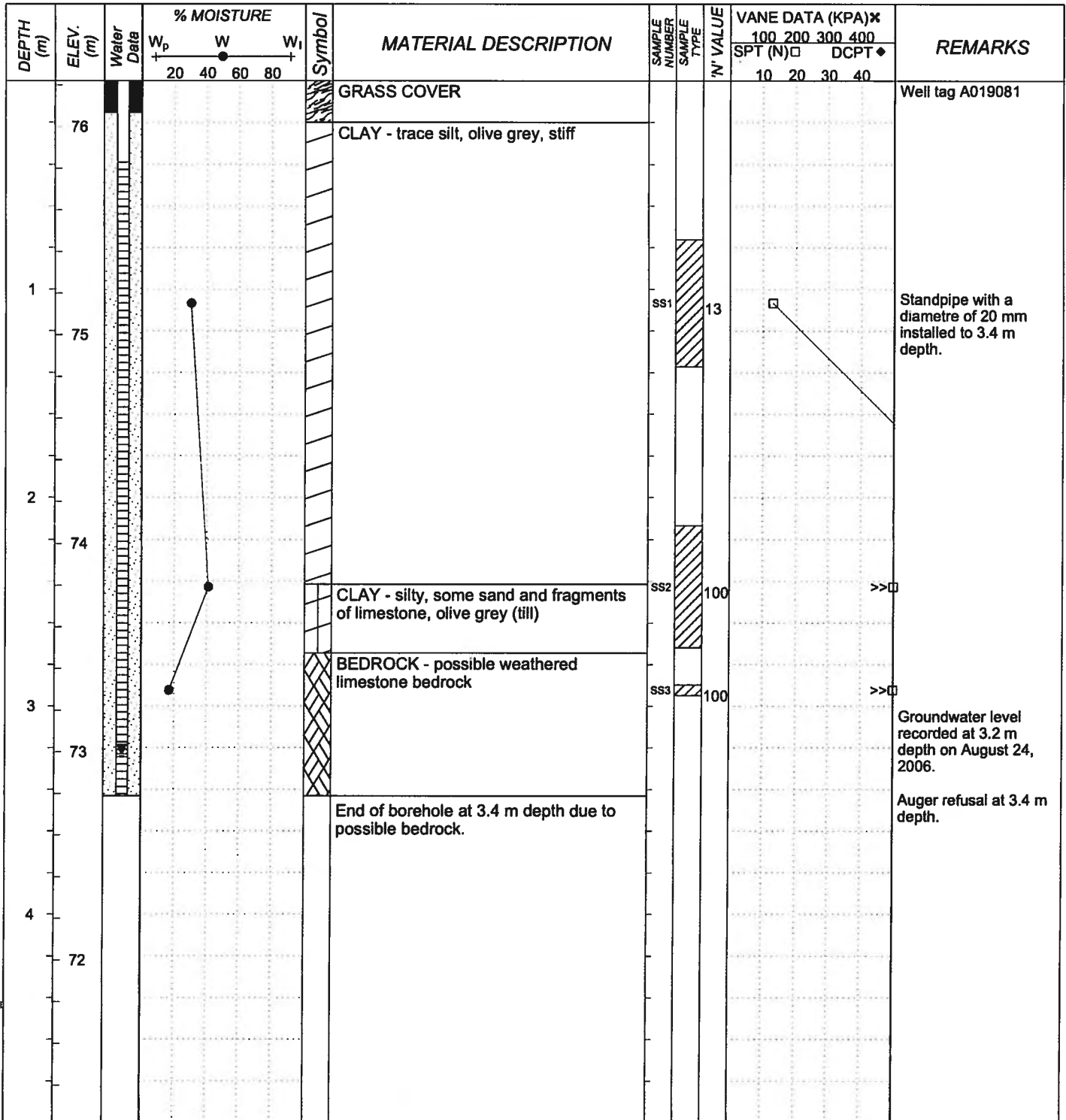
BOREHOLE (STANDARD) OG06562.GPJ DST_MIN.GDT 10/3/06

	<p>DST Consulting Engineers Inc. 2150 Thurston Drive, Suite 203 Ottawa, Ontario, K1G 5T9 PH: (613)748-1415 FX: (613)748-1356 Email: ottawa@dstgroup.com Web: www.dstgroup.com</p>	<p>SAMPLE TYPE LEGEND</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;"> Auger Sample</td> <td style="width: 33%;"> Rock Core</td> <td style="width: 33%;"> Ponar Sample</td> </tr> <tr> <td> Split Spoon Sample</td> <td> Side Sampler</td> <td> Grab Sample</td> </tr> <tr> <td> Thin Wall Tube</td> <td></td> <td></td> </tr> </table>	Auger Sample	Rock Core	Ponar Sample	Split Spoon Sample	Side Sampler	Grab Sample	Thin Wall Tube			<p>APPENDIX D</p>
Auger Sample	Rock Core	Ponar Sample										
Split Spoon Sample	Side Sampler	Grab Sample										
Thin Wall Tube												

LOG OF BOREHOLE / MONITORING WELL BHMW15 OB

DST REF. No.: OG06562
 CLIENT: Canada Lands Company
 PROJECT: Preliminary Geotechnical Investigation
 LOCATION: CFB Rockcliffe, Ottawa, Ontario
 SURFACE ELEV.: 76.22 m (Geodetic)

Drilling Data
 METHOD: CME 75 Drill Rig
 DIAMETER: 200 mm
 DATE: August 08 2006



BOREHOLE (STANDARD) OG06562.GPJ DST_MIN.GDT 10/3/06



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SAMPLE TYPE LEGEND

- | | | |
|--------------------|--------------|--------------|
| Auger Sample | Rock Core | Ponar Sample |
| Split Spoon Sample | Side Sampler | |
| Thin Wall Tube | Grab Sample | |

APPENDIX D

LOG OF BOREHOLE / MONITORING WELL BHMW15 BR

DST REF. No.: OG06562
 CLIENT: Canada Lands Company
 PROJECT: Preliminary Geotechnical Investigation
 LOCATION: CFB Rockcliffe, Ottawa, Ontario
 SURFACE ELEV.: 76.22 m (Geodetic)

Drilling Data
 METHOD: CME 75 Drill Rig
 DIAMETER: 200 mm
 DATE: August 09 2006

DEPTH (m)	ELEV. (m)	Water Data	% MOISTURE			Symbol	MATERIAL DESCRIPTION	SAMPLE NUMBER	SAMPLE TYPE	N VALUE	VANE DATA (KPA)*				REMARKS
			W _p	W	W _i						100	200	300	400	
											SPT (N) □	DCPT ♦			
76														Auger advanced to 3.5 m depth.	
75														Standpipe with a diameter of 20 mm installed to 15.8 m depth.	
74															
73															
72														Auger refusal at 3.5 m depth.	
71														Recovery 93% RQD 80%	
70														Recovery 97% RQD 80%	
69														Recovery 98% RQD 92%	
68															
67														Recovery 98% RQD 85%	
66															
65														Recovery 98% RQD 92%	
64														Recovery 97% RQD 87%	
63															
62														Recovery 95% RQD 92%	
61														Recovery 97% RQD 95%	
60														End of borehole at 15.8 m depth.	
59															
58														Groundwater level recorded at 5.5 m depth on August 24, 2006.	
57															

BOREHOLE (STANDARD) OG06562.GPJ DST_MIN.GDT 10/3/08



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SAMPLE TYPE LEGEND

Auger Sample	Rock Core	Ponar Sample
Split Spoon Sample	Side Sampler	Grab Sample
Thin Wall Tube		

APPENDIX D

LOG OF BOREHOLE / MONITORING WELL BHMW5

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 45 Trailer Mounted Drill Rig
 DIAMETER: 200 mm
 DATE: October 27 2004

CCGD *		SAMPLES				SUBSURFACE PROFILE				REMARKS
PPM		No.	Type	SPT Value	SYMBOL	MATERIAL DESCRIPTION	DPTH m	ELEV m	WATER DATA	
○ RKI EAGLE (PPM) 20 40 60 80 □ MINIRAE (PPM) 5 10 15 20										
SURFACE										
			SS1	27		FILL - sand and gravel, compact to very dense, light brown	0.5			
			SS2	100			1.0			
			SS3	100		- sand, silty, trace brick cinders, very dense, brownish grey	1.5			
			SS4	100		TILL - sand, silty, trace clay and gravel, very dense to compact with depth, light brown	2.0			
			SS5	78			2.5			
			SS6	33			3.5			
			SS7	27			4.0			
						End of borehole at 4.3 m depth.				

36 mm concrete slab
 Groundwater level observed 2.7 m below grade on November 25, 2004.

GASTECBH (OTTAWA) OE04940.GPJ DST_MIN.GDT 10/30/08



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* - Catalytic Combustible Gas Detector

SAMPLE TYPE LEGEND

Auger Sample	Rock Core	Ponar Sample
Split Spoon Sample	Side Sampler	Grab Sample
Thin Wall Tube		

APPENDIX H

LOG OF BOREHOLE / MONITORING WELL BHMW6

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 11 2004

CCGD *		SAMPLES				SUBSURFACE PROFILE				REMARKS
○ RKI EAGLE (PPM) 20 40 60 80 □ MINIRAE (PPM) 5 10 15 20		No.	Type	SPT Value	SYMBOL	MATERIAL DESCRIPTION	DPTH m	ELEV m	WATER DATA	
SURFACE										
			SS1	9		GRASS COVER FILL - sand, silty, some gravel, trace clay, loose to compact, dark brown	0.5			Groundwater level observed 3.2 m below grade on November 25, 2004. SS6: Insufficient sample recovery to collect duplicate fraction for CCGD
		0	SS2	21		- sand, some gravel, compact, orange brown	1.0			
		0	SS3	16		CLAY - silty, trace sand, very stiff to hard, brownish grey with limonite staining	1.5			
		0	SS4	48		- olive grey	2.0			
		0	SS5	22		- boulders	2.5			
		0	SS6	89		SAND - silty, some clay, compact to very dense, light brown	3.0			
						End of borehole at 3.7 m depth.	3.5			

GASTEGBH (OTTAWA) OE04940.GPJ DST_MIN.GDT 10/3/08



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* - Catalytic Combustible Gas Detector
SAMPLE TYPE LEGEND

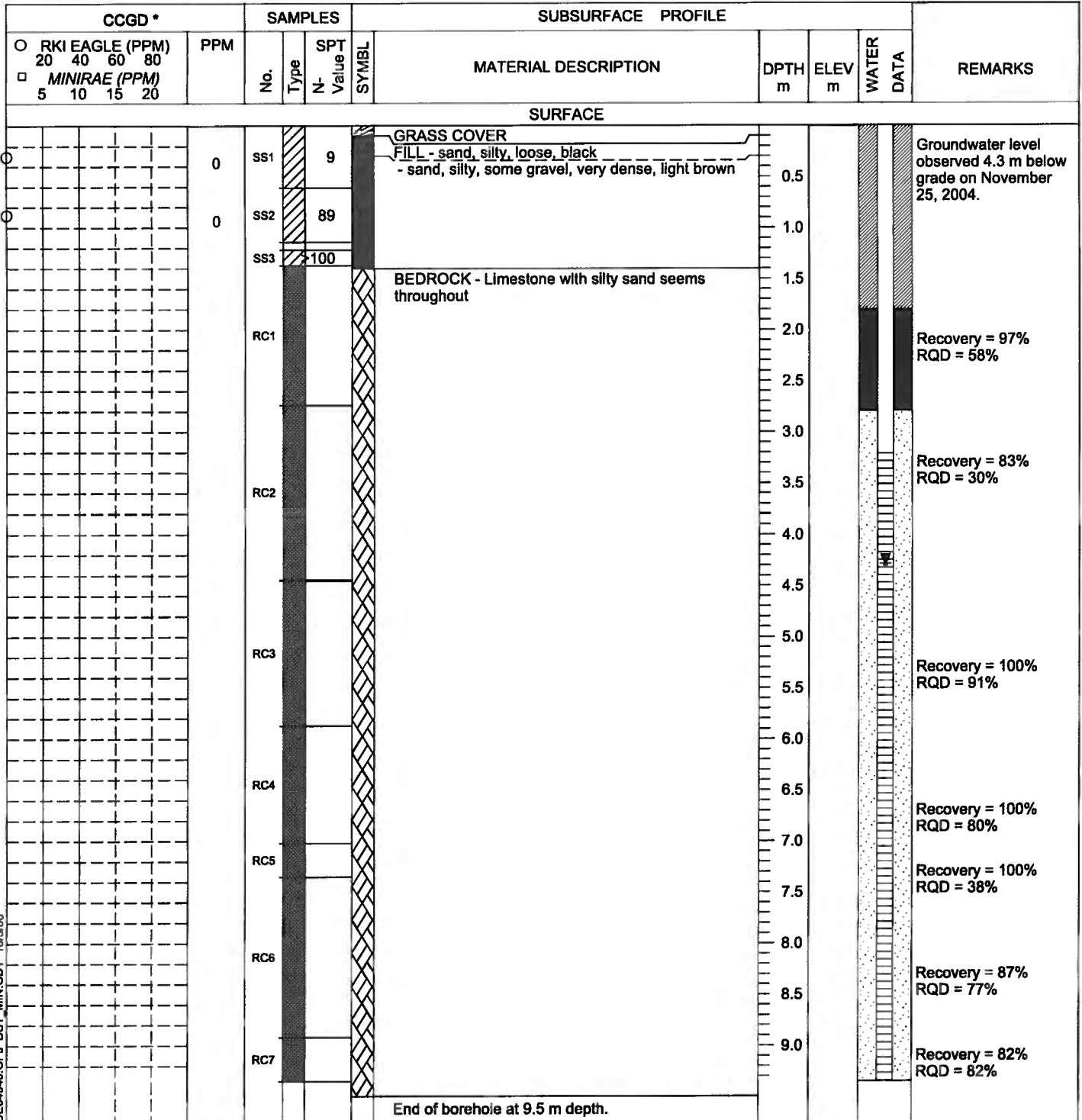
- Auger Sample
- Split Spoon Sample
- Thin Well Tube
- Rock Core
- Side Sampler
- Grab Sample
- Ponar Sample

APPENDIX H

LOG OF BOREHOLE / MONITORING WELL BHMW12

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 15 2004



GASTEGBH (OTTAWA) OE04940.GPJ DST_MIN.GDT 10/23/06



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* - Catalytic Combustible Gas Detector

SAMPLE TYPE LEGEND

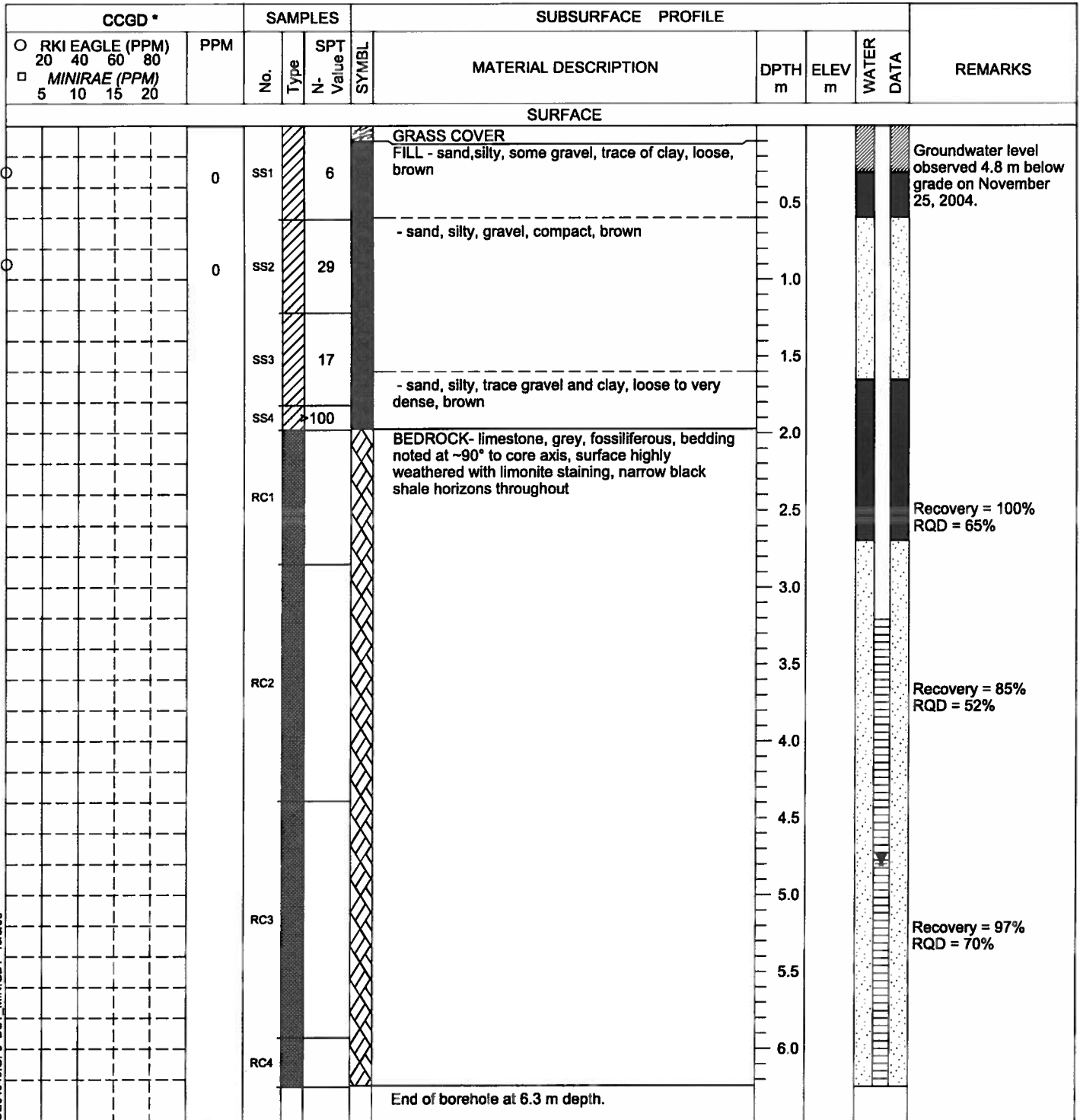
- | | | |
|--------------------|--------------|--------------|
| Auger Sample | Rock Core | Ponar Sample |
| Split Spoon Sample | Side Sampler | Grab Sample |
| Thin Wall Tube | | |

APPENDIX H

LOG OF BOREHOLE / MONITORING WELL BHMW13

DST REF. No.: OE04940
 CLIENT: Canada Lands Company
 PROJECT: Steam Line Decommissioning
 LOCATION: Canadian Forces Base, Rockcliffe, Ottawa, Ontario
 SURFACE ELEV.: -1--

Drilling Data
 METHOD: CME 55 Track Mounted Drill Rig
 DIAMETER: 200 mm
 DATE: November 15 2004



GASTEGBH (OTTAWA) OE04940.GPJ DST_MIN.GDT 10/3/08



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* - Catalytic Combustible Gas Detector

SAMPLE TYPE LEGEND

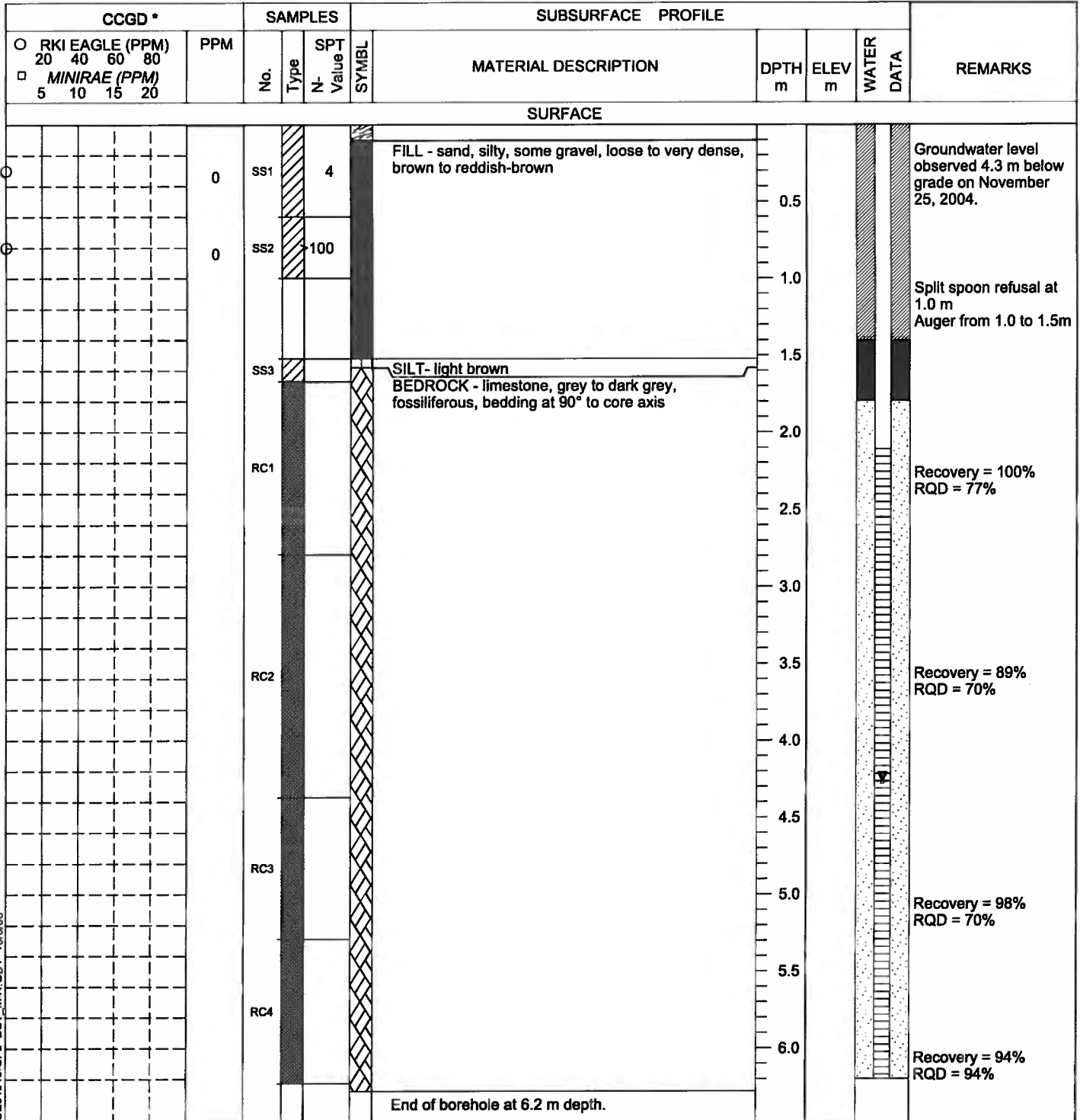
- | | | |
|--------------------|--------------|--------------|
| Auger Sample | Rock Core | Ponar Sample |
| Split Spoon Sample | Side Sampler | Grab Sample |
| Thin Well Tube | | |

APPENDIX H

LOG OF BOREHOLE / MONITORING WELL BHMW14

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 16 2004



GASTECBH (OTTAWA) OE04940.GPJ DST_MIN.GDT 10/3/06



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* - Catalytic Combustible Gas Detector

SAMPLE TYPE LEGEND

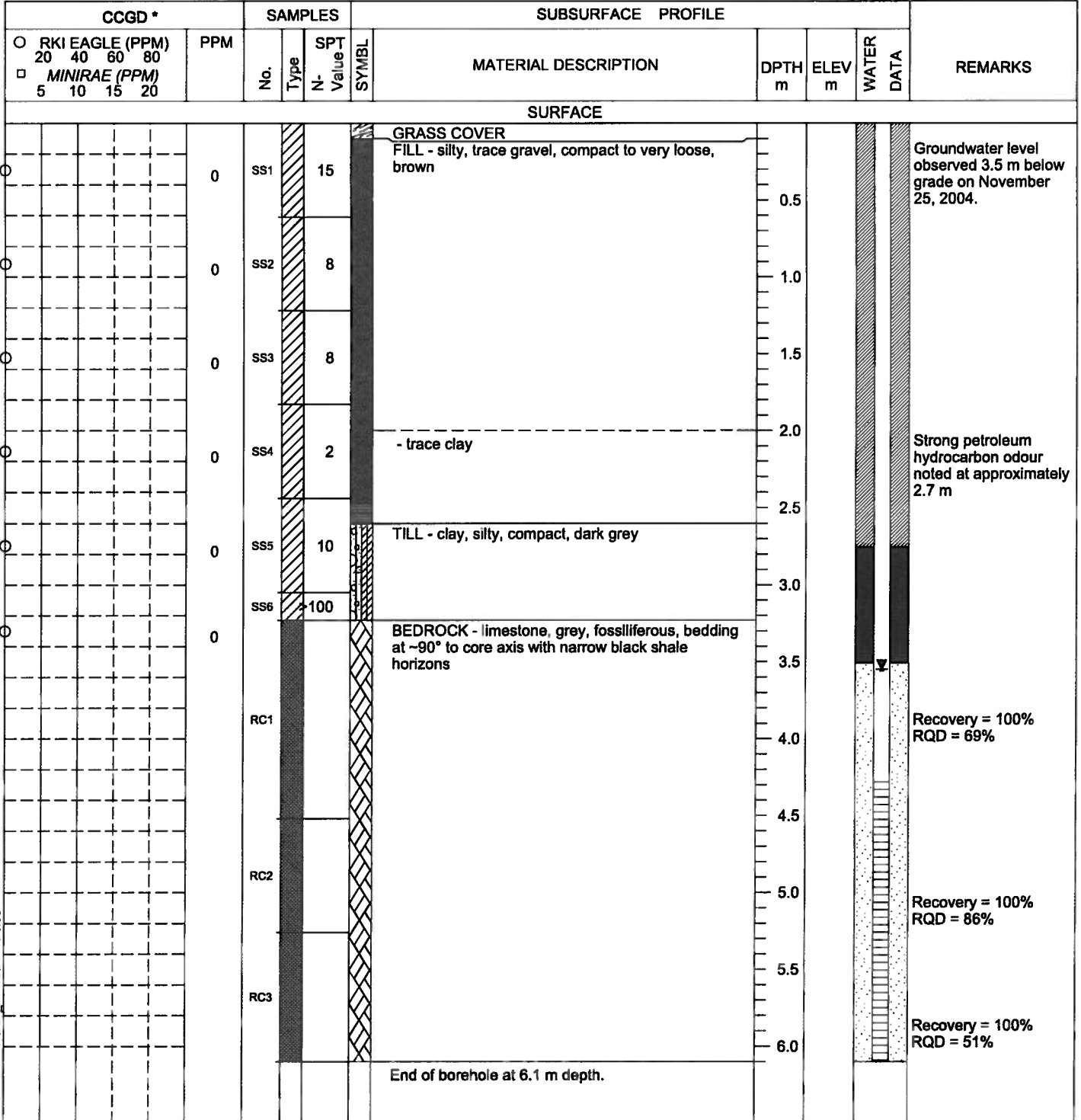
- | | | |
|--------------------|--------------|--------------|
| Auger Sample | Rock Core | Ponar Sample |
| Split Spoon Sample | Side Sampler | Grab Sample |
| Thin Wall Tube | | |

APPENDIX H

LOG OF BOREHOLE / MONITORING WELL BHMW15

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 16 2004



GASTECBH (OTTAWA) OE04940.GPJ DST_MIN.GDT 10/3/08



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

* - Catalytic Combustible Gas Detector

SAMPLE TYPE LEGEND

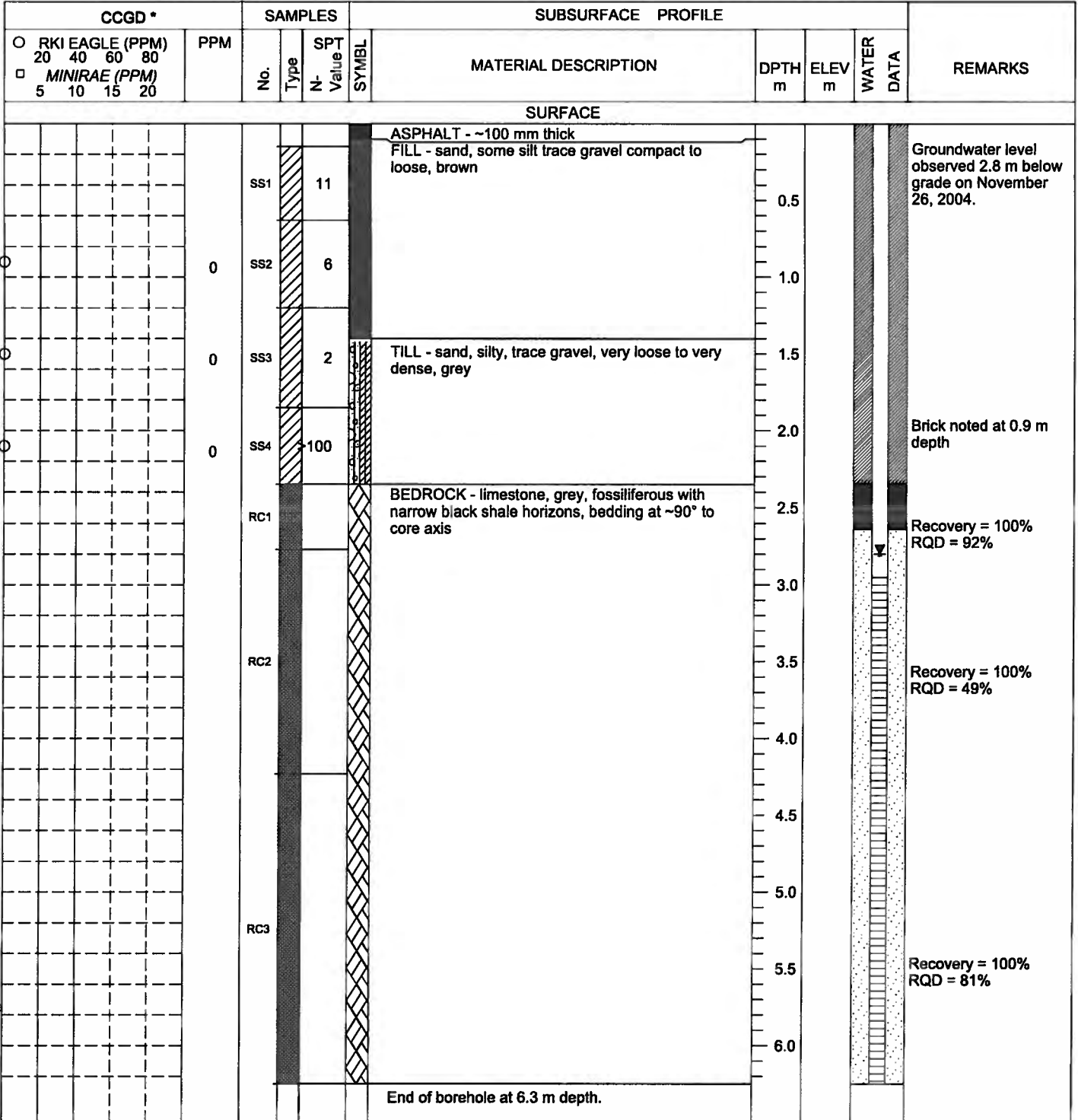
- | | | |
|--------------------|--------------|--------------|
| Auger Sample | Rock Core | Ponar Sample |
| Split Spoon Sample | Side Sampler | |
| Thin Wall Tube | Grab Sample | |

APPENDIX H

LOG OF BOREHOLE / MONITORING WELL BHMW21

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 18 2004



GASTECBH (OTTAWA) OE04940.GPJ DST_MIN.GDT 10/3/08



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

* - Catalytic Combustible Gas Detector

SAMPLE TYPE LEGEND

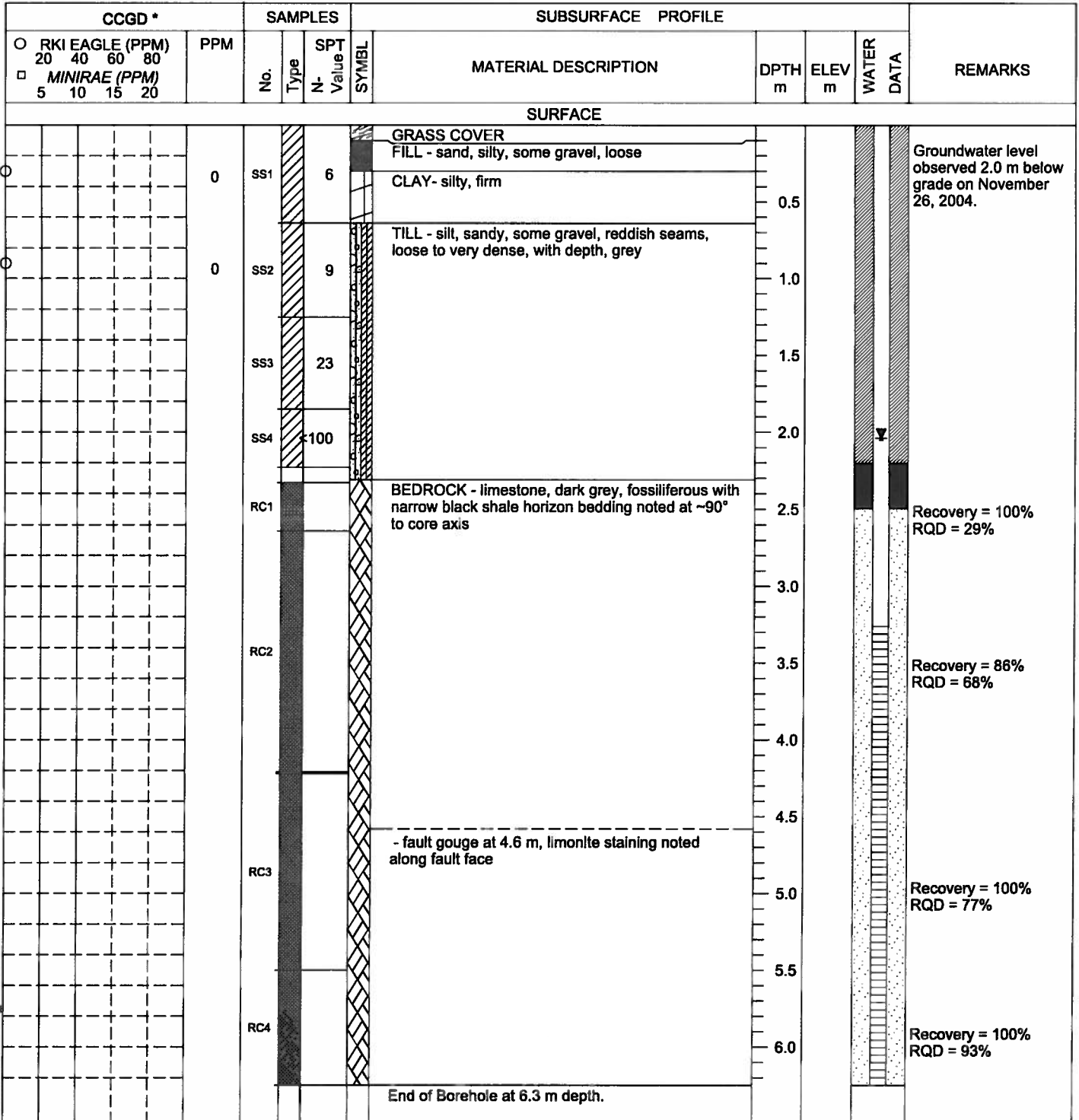
- | | | |
|--------------------|--------------|--------------|
| Auger Sample | Rock Core | Ponar Sample |
| Split Spoon Sample | Side Sampler | |
| Thin Wall Tube | Grab Sample | |

APPENDIX H

LOG OF BOREHOLE / MONITORING WELL BHMW22

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 18 2004



GASTECBH (OTTAWA) OE04940.GPJ DST_MIN.GDT 10/3/06



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

* - Catalytic Combustible Gas Detector

SAMPLE TYPE LEGEND

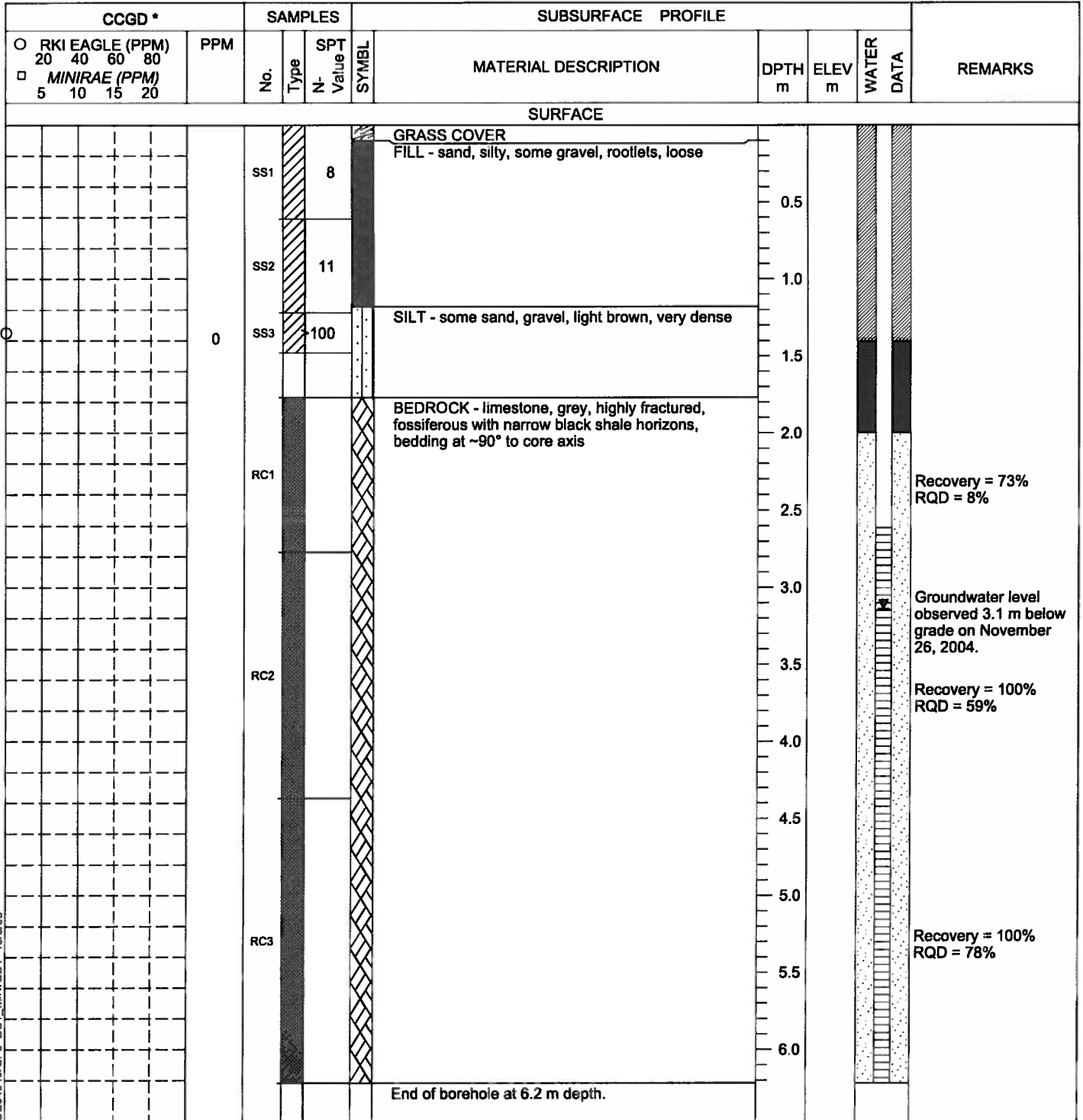
Auger Sample	Rock Core	Ponar Sample
Split Spoon Sample	Side Sampler	Grab Sample
Thin Wall Tube		

APPENDIX H

LOG OF BOREHOLE / MONITORING WELL BHMW24

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 23 2004



GASTECBH (OTTAWA) OE04940.GPJ DST_MIN.GDT 10/3/08



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

* - 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

LOG OF BOREHOLE / MONITORING WELL BHMW25

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 45c Track Mounted Drill Rig
 DIAMETER: 200 mm
 DATE: February 01 2005

CCGD *		SAMPLES				SUBSURFACE PROFILE			REMARKS	
○ RKI EAGLE (PPM) 20 40 60 80 □ MINIRAE (PPM) 5 10 15 20		No.	Type	SPT Value	SYMBL	MATERIAL DESCRIPTION	DPTH m	ELEV m		WATER DATA
SURFACE										
						FILL - sand, some gravel, trace silt and brick, compact, yellowish orange	0.5			
						- sand, silty, trace gravel, loose	1.0			
						- sand, silty, loose to compact with depth	1.5			
							2.0			
							2.5			
						- redish brown	3.0			
						TILL - sand, some gravel, compact, grey	3.5			
						- silt, trace gravel, grey, dense	4.0			
						End of borehole at 4.2 m depth on possible bedrock.				

Groundwater level observed 2.7 m below grade on February 2, 2005.

GASTEGBH (OTTAWA) OE04940.GPJ DST_MIN.GDT 10/3/08



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

* - 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

LOG OF BOREHOLE / MONITORING WELL BHMW26

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 45c Track Mounted Drill Rig
 DIAMETER: 200 mm

DATE: February 01 2005

CCGD *		SAMPLES				SUBSURFACE PROFILE			REMARKS
○ RKI EAGLE (PPM) 20 40 60 80 □ MINIRAE (PPM) 5 10 15 20		No.	Type	SPT Value	SYMBL	MATERIAL DESCRIPTION	DEPTH m	ELEV m	
SURFACE									
						FILL - sand, some silt, compact, brown	0.0 - 0.5		
						- silt, sandy, compact, brown	0.5 - 1.0		
						- sand, silty, compact, dark brown	1.0 - 1.5		
							1.5 - 2.0		
						- gravel, trace sand, loose, grey	2.0 - 2.5		
							2.5 - 3.0		
							3.0 - 3.5		
							3.5 - 4.0		
						TILL - silt, some gravel, trace clay, very dense, grey	4.0 - 4.5		
						End of borehole at 4.6 m depth on possible bedrock.	4.5 - 4.6		

Groundwater level observed 2.6 m below grade on February 2, 2005.

GASTECBH (OTTAWA) OE04940.GPJ DST_MIN.GDT 10/3/06



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

* - Catalytic Combustible Gas Detector
SAMPLE TYPE LEGEND

Auger Sample	Rock Core	Ponar Sample
Split Spoon Sample	Side Sampler	Grab Sample
Thin Wall Tube		

APPENDIX H

APPENDIX E

LABORATORY TEST RESULTS



Grain Size Distribution Report



%	% Gravel		% Sand			% Fines		
	+3"	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	28	19	31	20	2	

LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
○		7.4037	2.9542	1.6966	0.6562	0.2470	0.1674	0.87	17.64

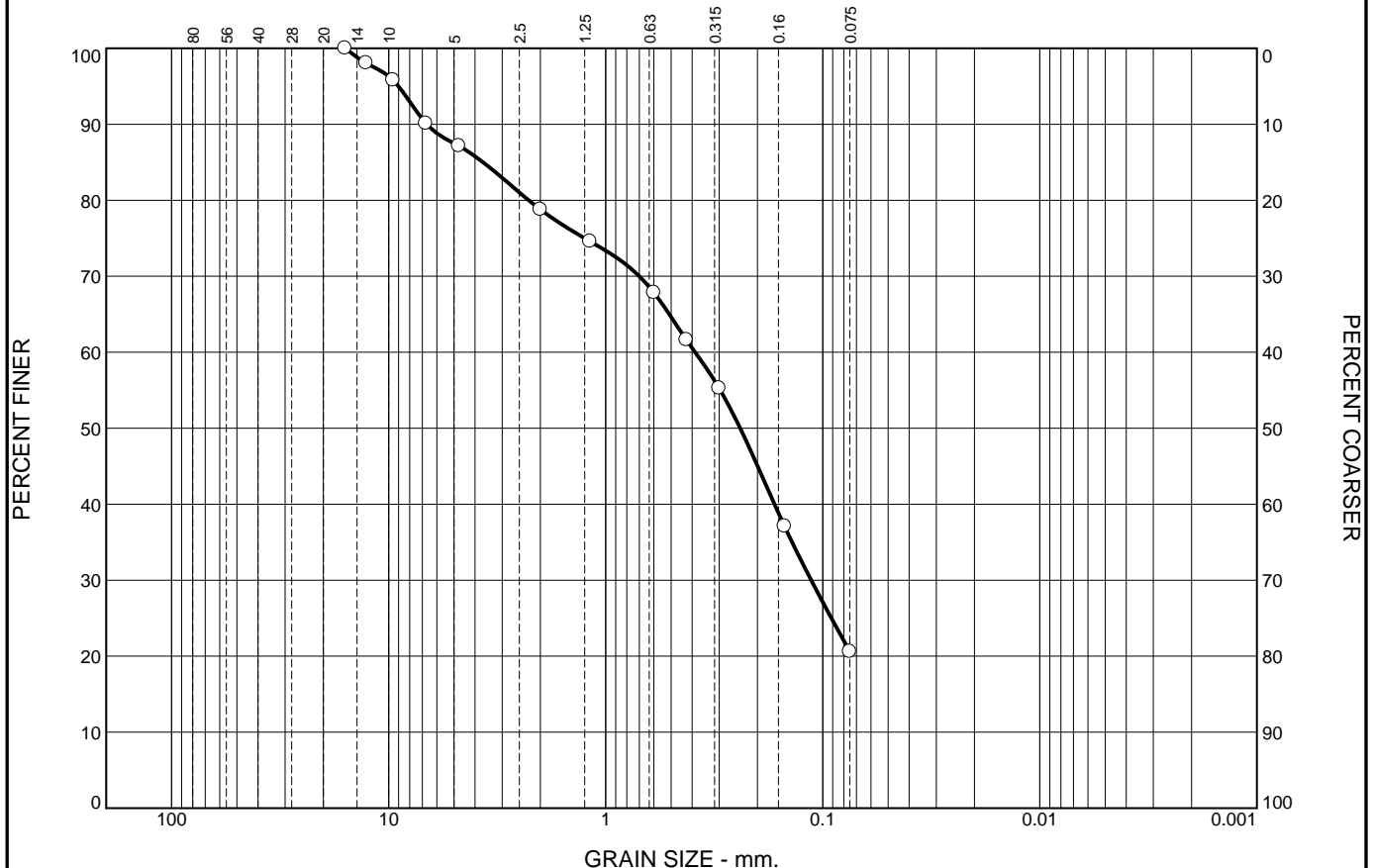
Material Description	USCS	AASHTO
○ GRAVELLY SAND, trace silt	SP	

<p>Project No. CO682.00 Client: Canada Lands Company CLC Limited</p> <p>Project: Wateridge Village</p> <p>○ Sample Number: BH102/S1A</p>	<p>Remarks:</p> <p>○ Tested on November 28, 2018</p>
<p>Alston Associates</p> <p>Geotechnical Division of Terrapex</p>	

Figure E-1

Tested By: RH

Grain Size Distribution Report



GRAIN SIZE - mm.										
%	+3"	% Gravel		% Sand			% Fines			
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
○	0	0	13	8	17	41	21			
⊗	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
○			3.6756	0.3876	0.2403	0.1131				

Material Description	USCS	AASHTO
○ SILTY SAND, some gravel		

<p>Project No. CO682.00 Client: Canada Lands Company CLC Limited</p> <p>Project: Wateridge Village</p> <p>○ Sample Number: BH104/S3</p>	<p>Remarks: ○ Tested on Nov 28, 2018</p>
<p>Alston Associates</p> <p>Geotechnical Division of Terrapex</p>	

Figure E-2

Tested By: RH

Grain Size Distribution Report



%	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	5	6	20	66	3	

LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
○		1.1403	0.3184	0.2444	0.1486	0.1014	0.0890	0.78	3.58

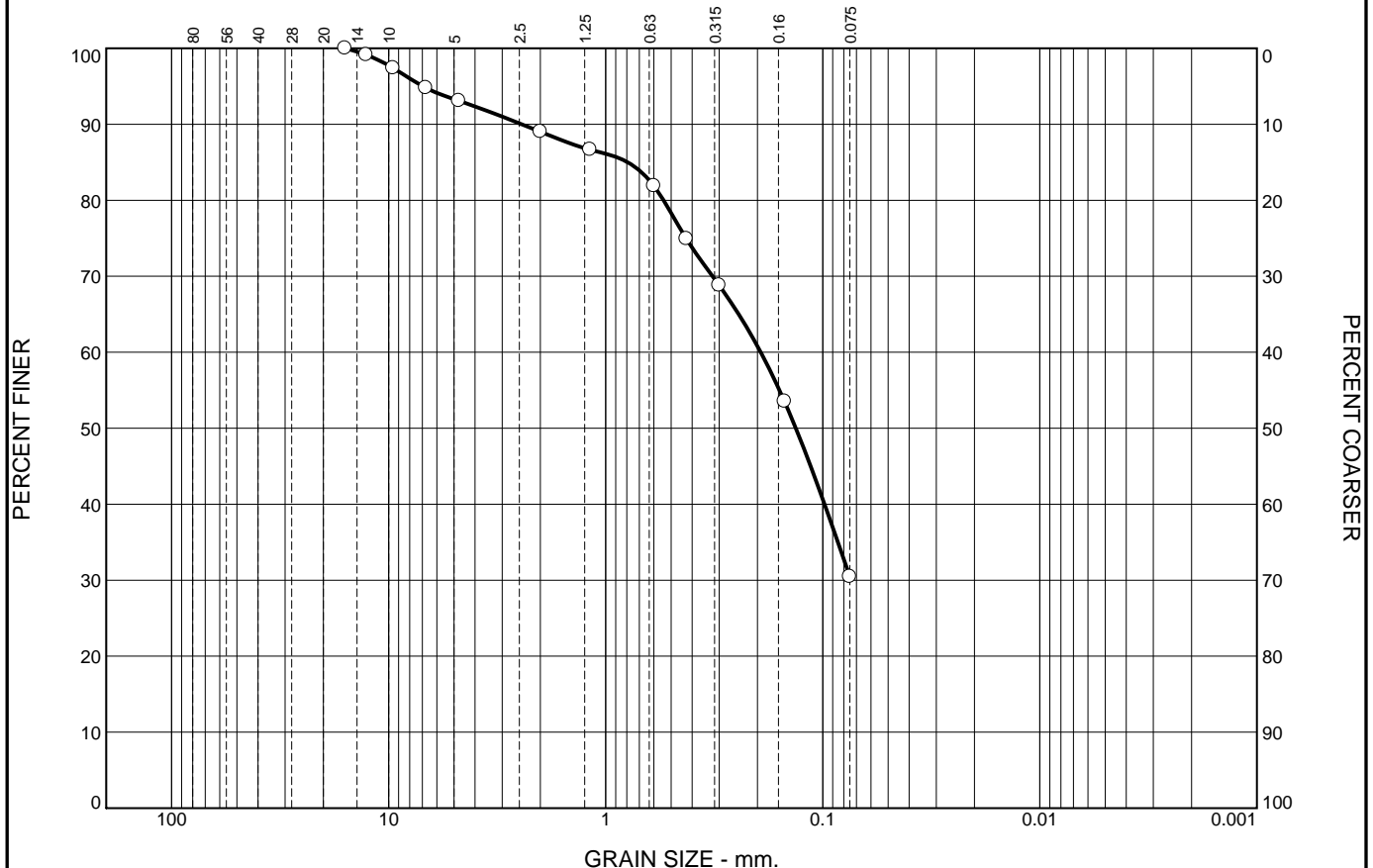
Material Description	USCS	AASHTO
○ SAND, trace gravel, trace silt	SP	

Project No. CO682.00 Client: Canada Lands Company CLC Limited Project: Wateridge Village ○ Sample Number: BH140/S3	Remarks: ○ Tested on November 28, 2018
--	--

Alston Associates Geotechnical Division of Terrapex	Figure E-3
--	-------------------

Tested By: RH

Grain Size Distribution Report



%	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	7	4	14	45	30	

LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
		0.7926	0.1932	0.1331					

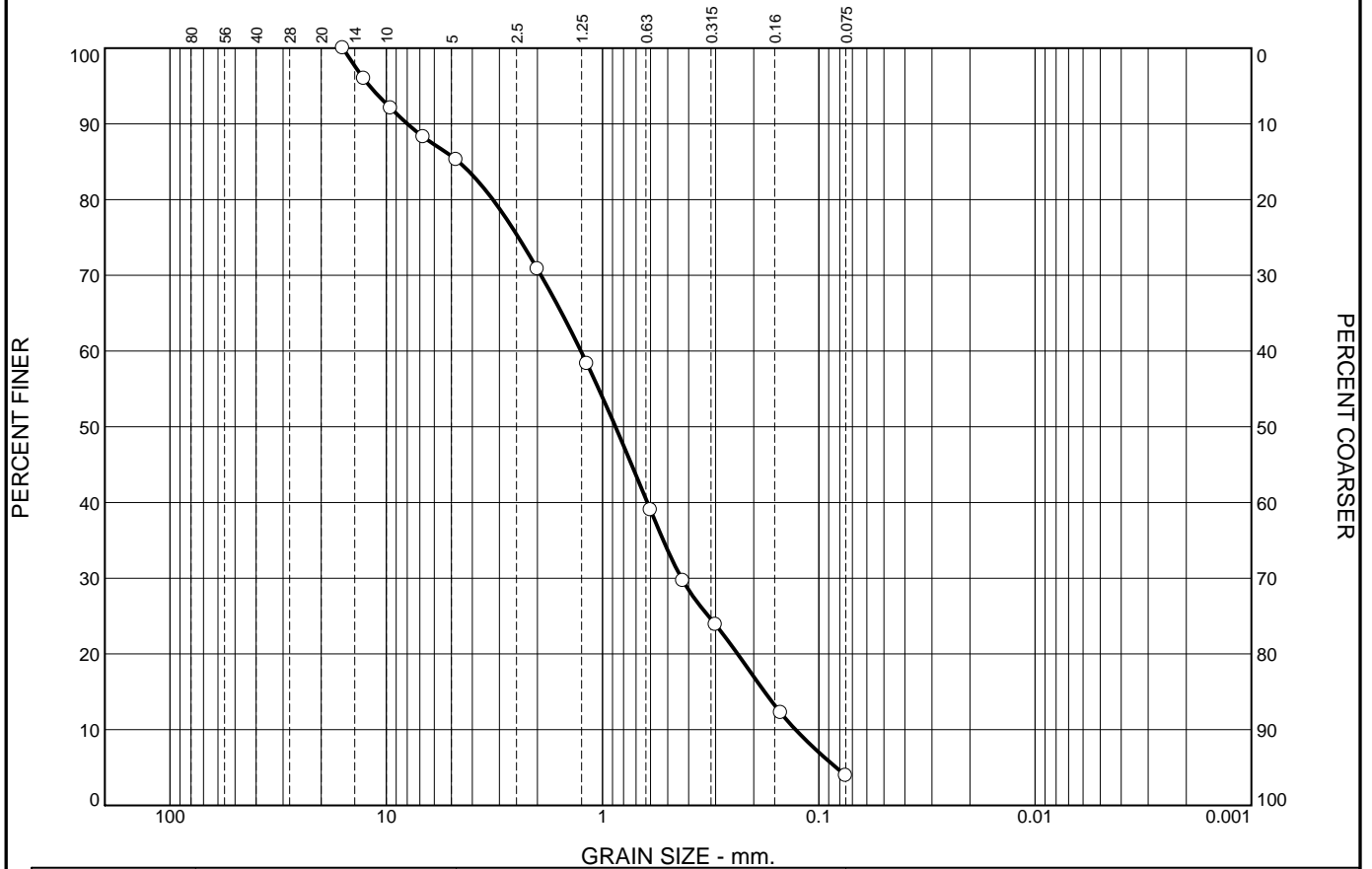
Material Description	USCS	AASHTO
○ SILTY SAND, trace gravel		

<p>Project No. CO682.00 Client: Canada Lands Company CLC Limited</p> <p>Project: Wateridge Village</p> <p>○ Sample Number: BH149/S2A</p>	<p>Remarks:</p> <p>○ Tested on November 28, 2018</p>
<p>Alston Associates</p> <p>Geotechnical Division of Terrapex</p>	

Figure E-4

Tested By: RH

Grain Size Distribution Report



%	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	15	14	41	26	4	

LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
○		4.6338	1.2589	0.8719	0.4315	0.1782	0.1281	1.15	9.83

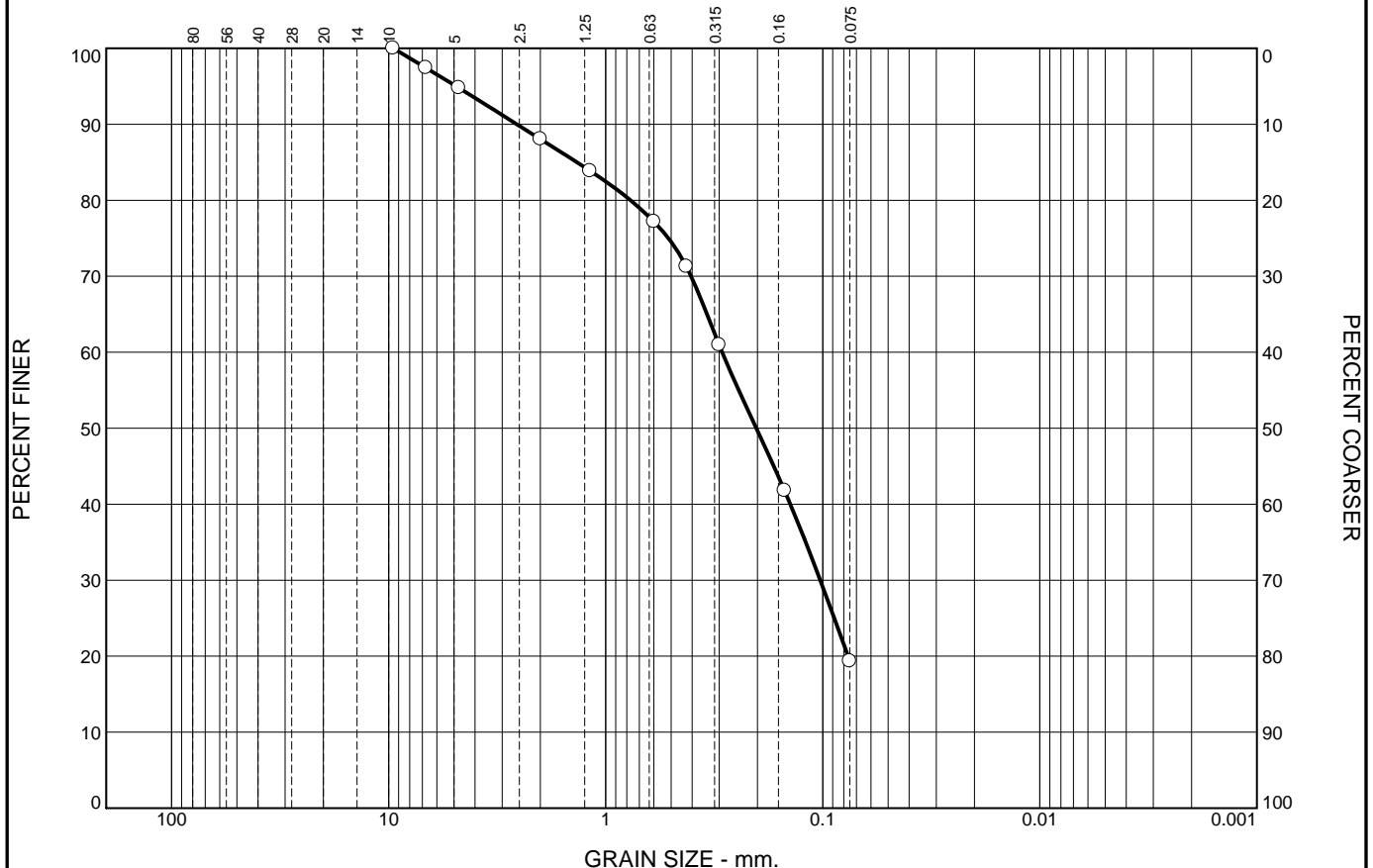
Material Description	USCS	AASHTO
○ SAND, some gravel, trace silt	SW	

<p>Project No. CO682.00 Client: Canada Lands Company CLC Limited</p> <p>Project: Wateridge Village</p> <p>○ Sample Number: BH158/S3</p>	<p>Remarks:</p> <p>○ Tested on November 28, 2018</p>
<p>Alston Associates</p> <p>Geotechnical Division of Terrapex</p>	

Figure E-5

Tested By: RH

Grain Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	5	7	17	52	19	

LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
		1.3583	0.2907	0.2026	0.1028				

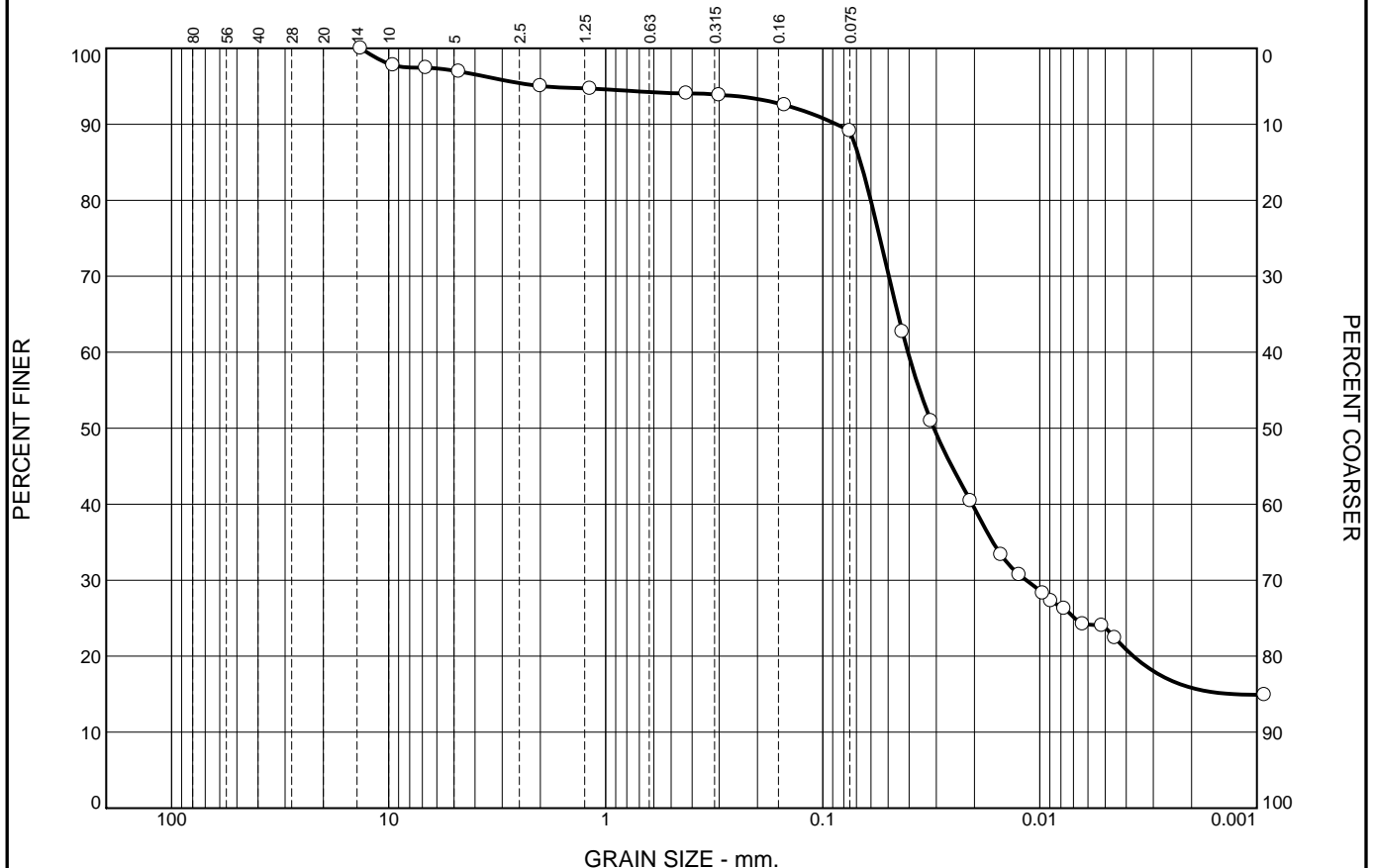
Material Description	USCS	AASHTO
○ SAND, some silt, trace gravel		

Project No. CO682.00 Client: Canada Lands Company CLC Limited Project: Wateridge Village ○ Sample Number: BH163/S4	Remarks: ○ Tested on November 28, 2018
--	--

Alston Associates Geotechnical Division of Terrapex	Figure E-6
--	-------------------

Tested By: RH

Grain Size Distribution Report



%	+3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	3	2	1	5	73	16

×	LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
○			0.0670	0.0405	0.0308	0.0116	0.0013			

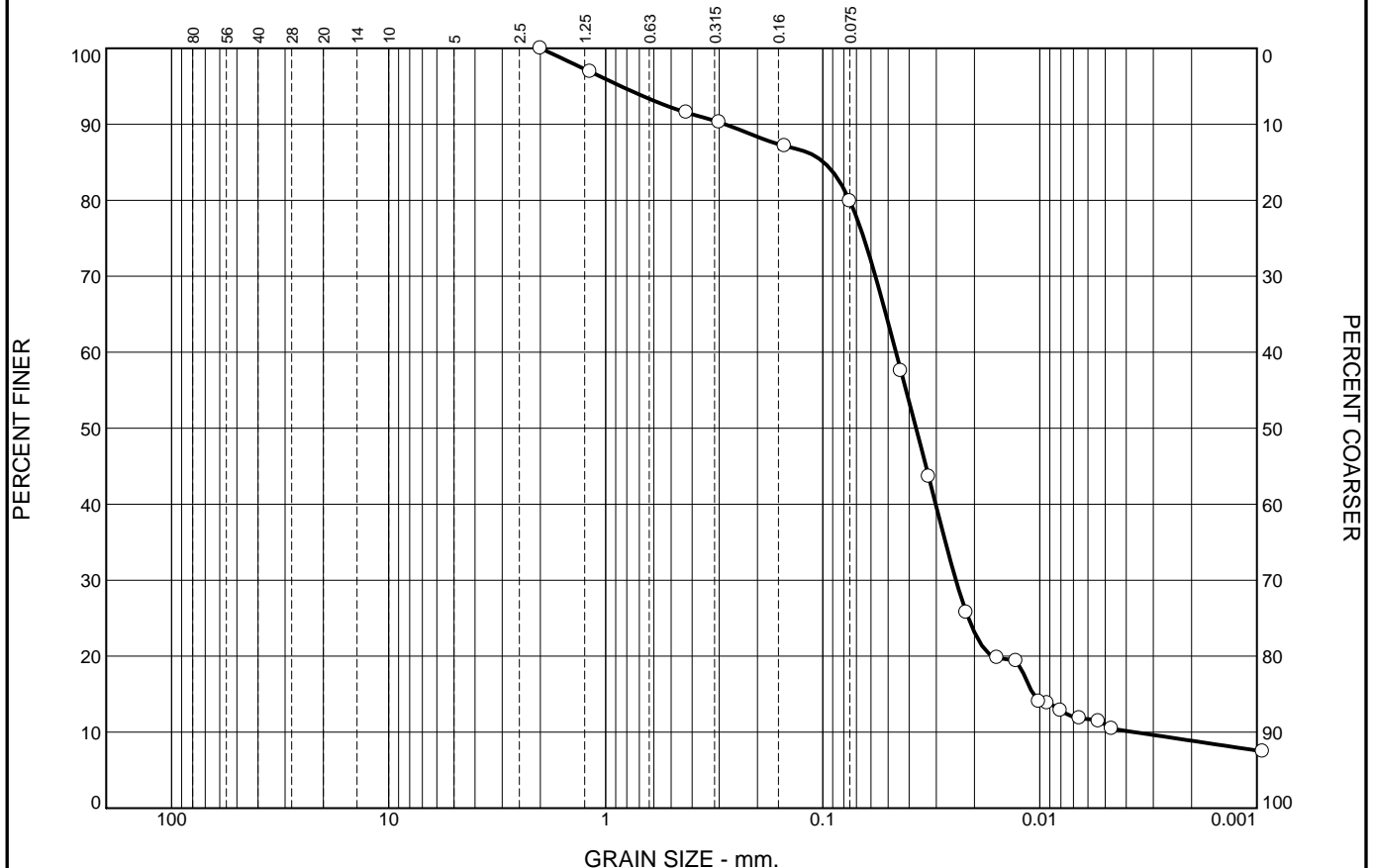
Material Description	USCS	AASHTO
○ SILT, some clay, trace sand, trace gravel		

<p>Project No. CO682.00 Client: Canada Lands Company CLC Limited</p> <p>Project: Wateridge Village</p> <p>○ Sample Number: BH112/S2</p>	<p>Remarks:</p> <p>○ Tested on November 28, 2018</p>
<p>Alston Associates</p> <p>Geotechnical Division of Terrapex</p>	

Figure E-7

Tested By: RH

Grain Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	0	8	12	71	9

LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
		0.0990	0.0460	0.0372	0.0244	0.0107	0.0037	3.53	12.58

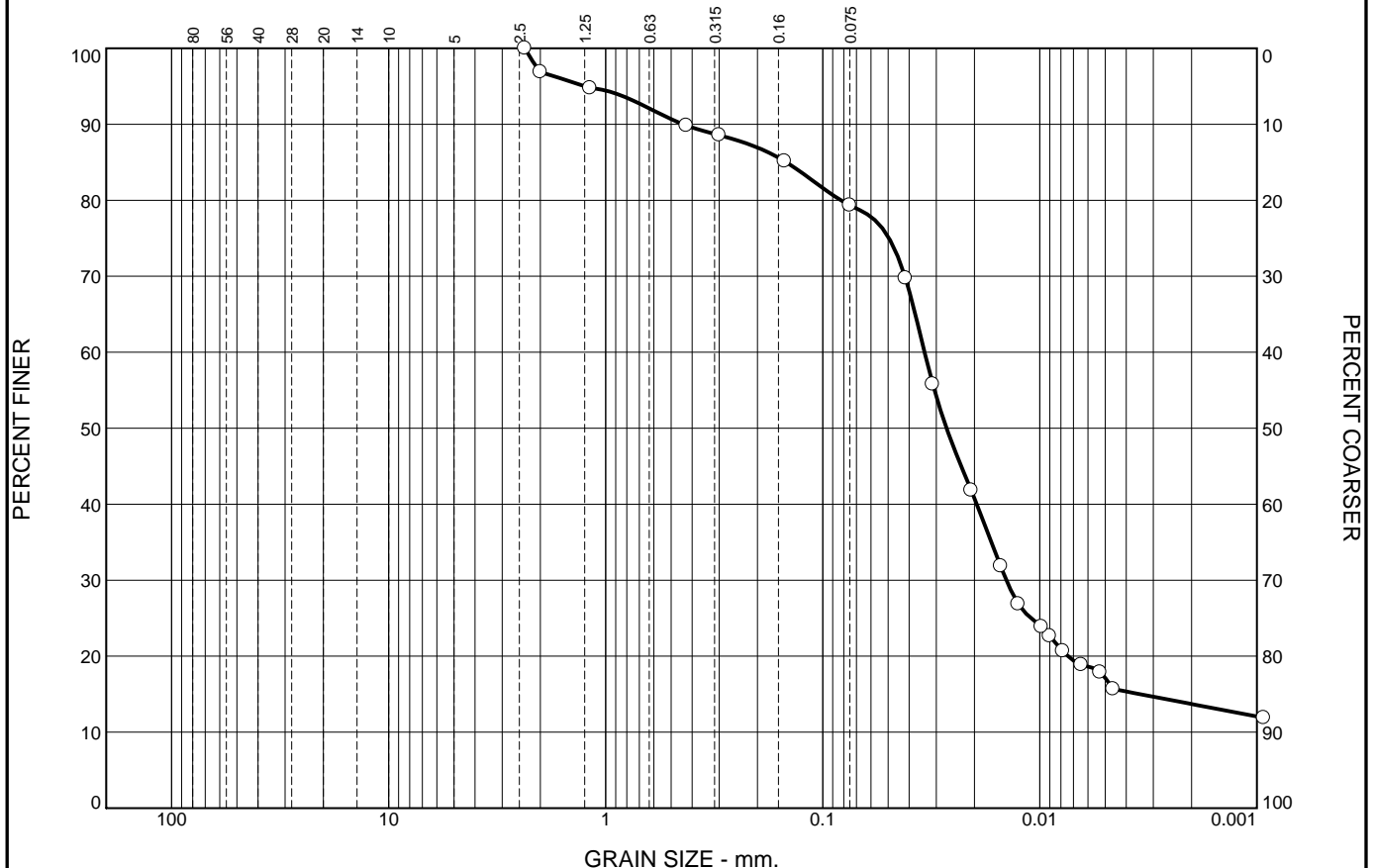
Material Description	USCS	AASHTO
○ SILT, some sand, trace clay		

<p>Project No. CO682.00 Client: Canada Lands Company CLC Limited</p> <p>Project: Wateridge Village</p> <p>○ Sample Number: BH120/S2</p>	<p>Remarks:</p> <p>○ Tested on November 28, 2018</p>
<p>Alston Associates</p> <p>Geotechnical Division of Terrapex</p>	

Figure E-8

Tested By: RH

Grain Size Distribution Report



%	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	3	7	11	65	14

LL	PL	D ₈₅	D ₆₀	D ₅₀	D ₃₀	D ₁₅	D ₁₀	C _c	C _u
○		0.1472	0.0340	0.0269	0.0143	0.0035			

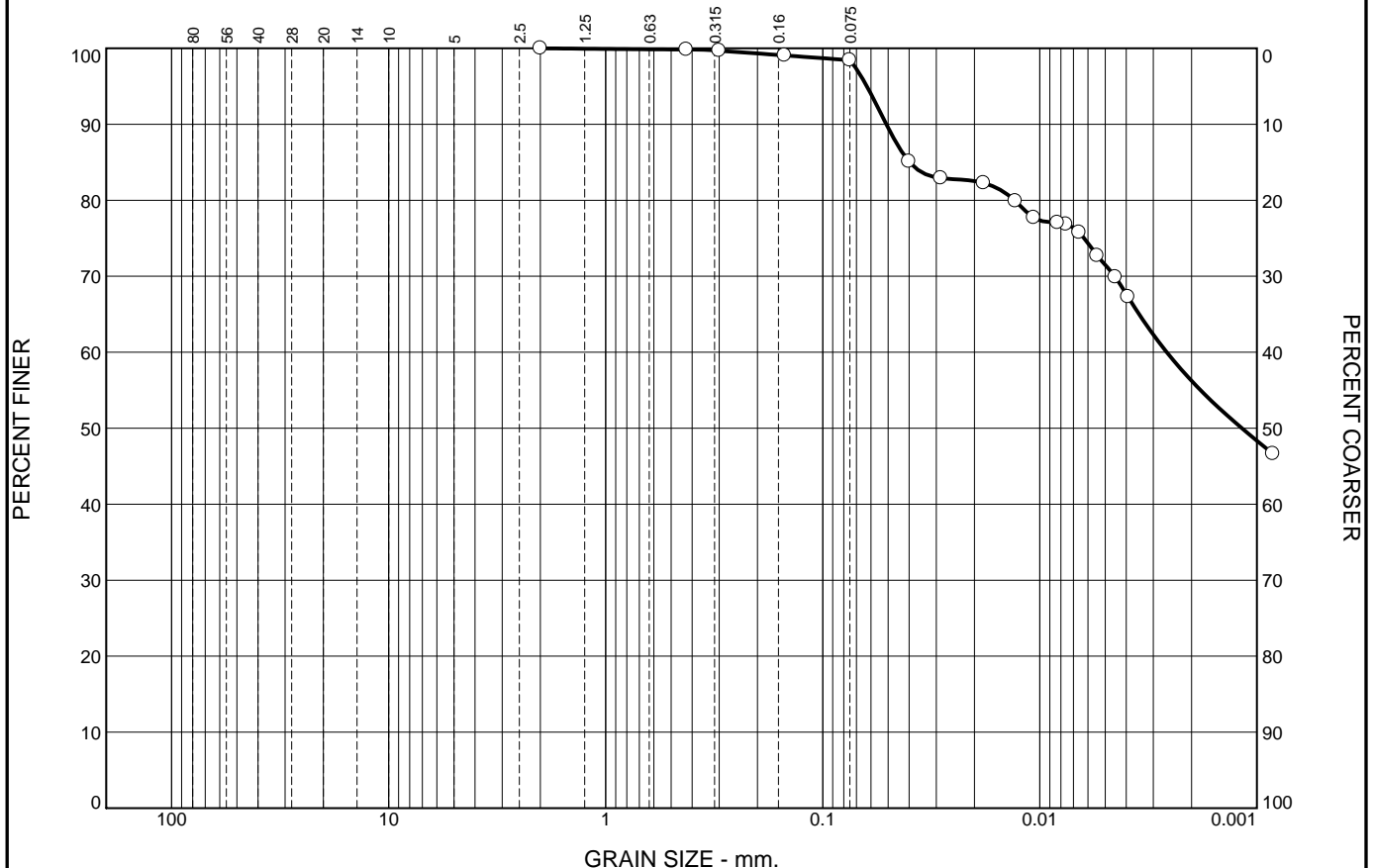
Material Description	USCS	AASHTO
○ SILT, some sand, some clay		

<p>Project No. CO682.00 Client: Canada Lands Company CLC Limited</p> <p>Project: Wateridge Village</p> <p>○ Sample Number: BH152/S4</p>	<p>Remarks:</p> <p>○ Tested on November 28, 2018</p>
<p>Alston Associates</p> <p>Geotechnical Division of Terrapex</p>	

Figure E-9

Tested By: RH

Grain Size Distribution Report



GRAIN SIZE - mm.																													
% +3"	% Gravel		% Sand			% Fines																							
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay																						
0	0	0	0	0	2	42	56																						
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>LL</th> <th>PL</th> <th>D85</th> <th>D60</th> <th>D50</th> <th>D30</th> <th>D15</th> <th>D10</th> <th>Cc</th> <th>Cu</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td style="text-align: center;">0.0398</td> <td style="text-align: center;">0.0026</td> <td style="text-align: center;">0.0012</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>										LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu			0.0398	0.0026	0.0012					
LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu																				
		0.0398	0.0026	0.0012																									

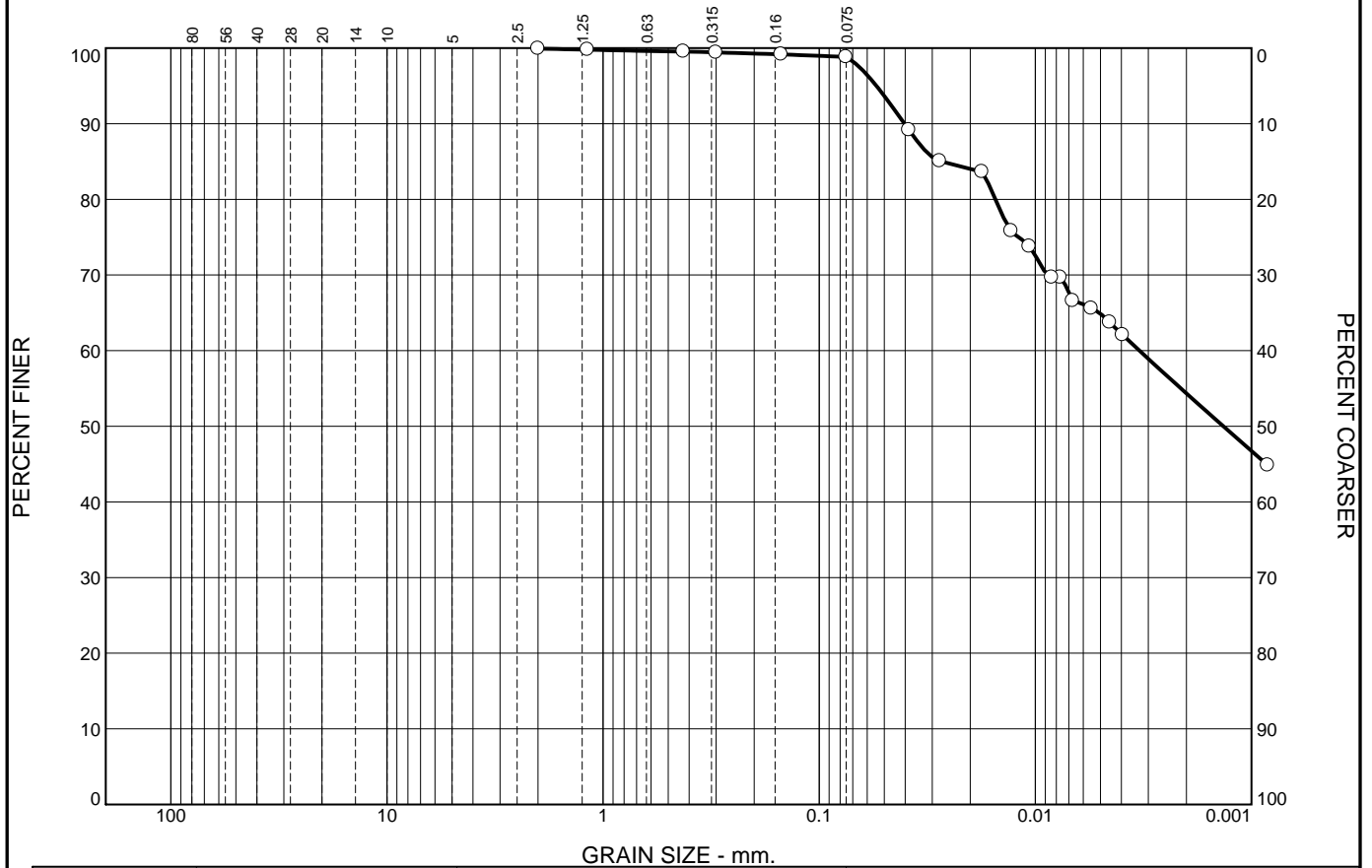
Material Description	USCS	AASHTO
○ CLAY and SILT, trace sand		

<p>Project No. CO682.00 Client: Canada Lands Company CLC Limited</p> <p>Project: Wateridge Village</p> <p>○ Sample Number: BH104/S2</p>	<p>Remarks:</p> <p>○ Tested on November 28, 2018</p>
<p>Alston Associates</p> <p>Geotechnical Division of Terrapex</p>	

Figure E-10

Tested By: RH

Grain Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○				0	1	45	54

LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
○	58	24	0.0272	0.0033	0.0013				

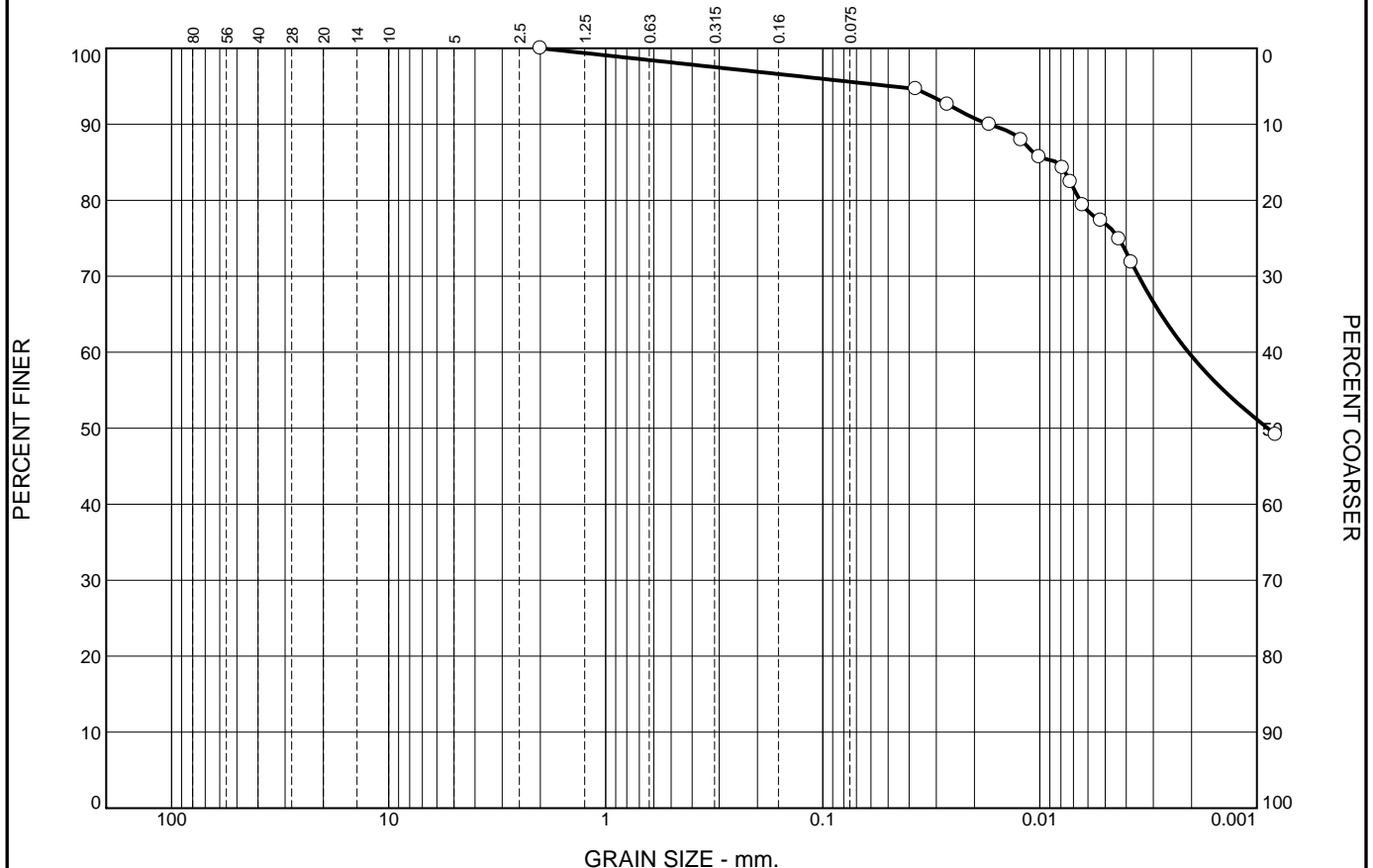
Material Description	USCS	AASHTO
○ CLAY and SILT, trace sand		A-7-6(39)

<p>Project No. CO682.00 Client: Canada Lands Company CLC Limited</p> <p>Project: Wateridge Village</p> <p>○ Sample Number: BH125/S3</p>	<p>Remarks:</p> <p>○ Tested on November 30, 2018</p>
<p>Alston Associates</p> <p>Geotechnical Division of Terrapex</p>	

Figure E-11

Tested By: RH

Grain Size Distribution Report



GRAIN SIZE - mm.									
% +3"	% Gravel		% Sand			% Fines			
	Coarse	Fine	Coarse	Medium	Fine	Silt		Clay	
0	0	0	0	2	2	37		59	
LL	PL	D85	D60	D50	D30	D15	D10	Cc	Cu
		0.0084	0.0021	0.0009					

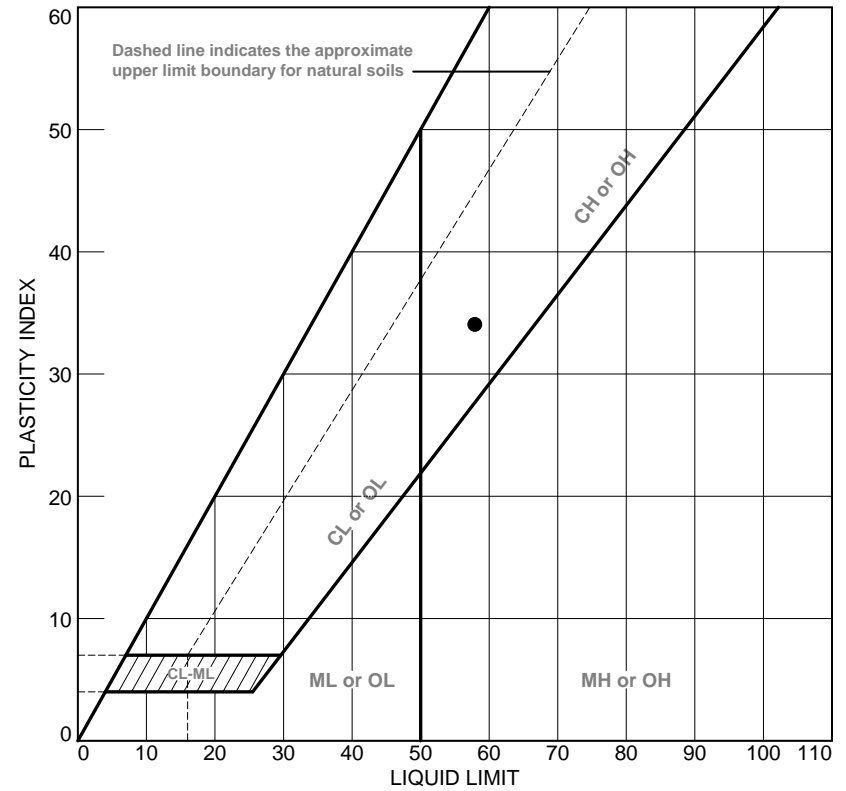
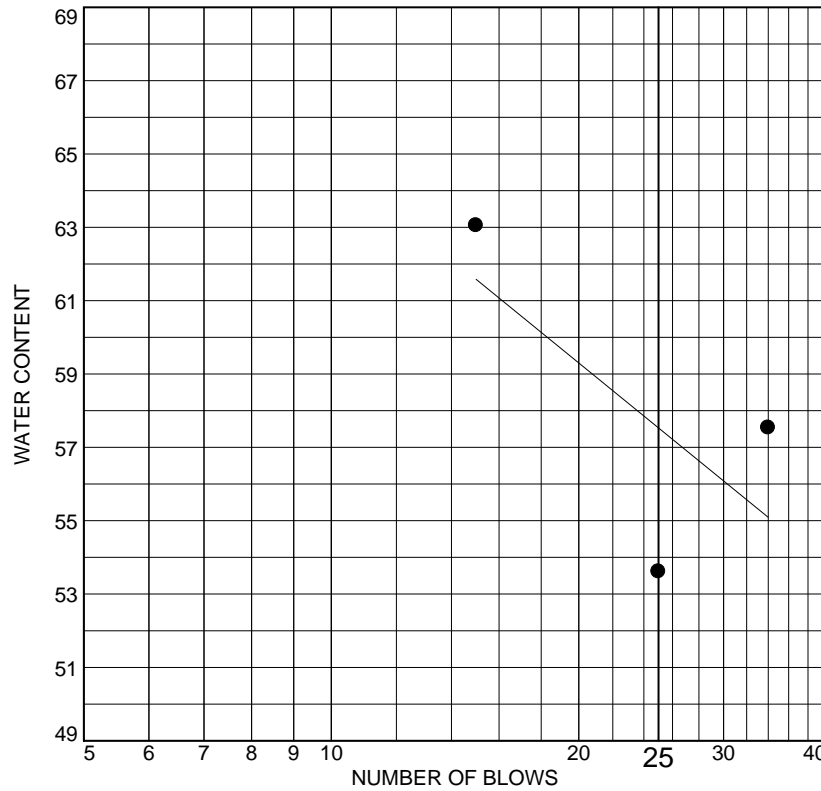
Material Description	USCS	AASHTO
○ CLAY and SILT, trace sand		

<p>Project No. CO682.00 Client: Canada Lands Company CLC Limited</p> <p>Project: Wateridge Village</p> <p>○ Sample Number: BH134/S2</p>	<p>Remarks:</p> <p>○ Tested on November 30, 2018</p>
<p>Alston Associates</p> <p>Geotechnical Division of Terrapex</p>	

Figure E-12

Tested By: RH

LIQUID AND PLASTIC LIMITS TEST REPORT

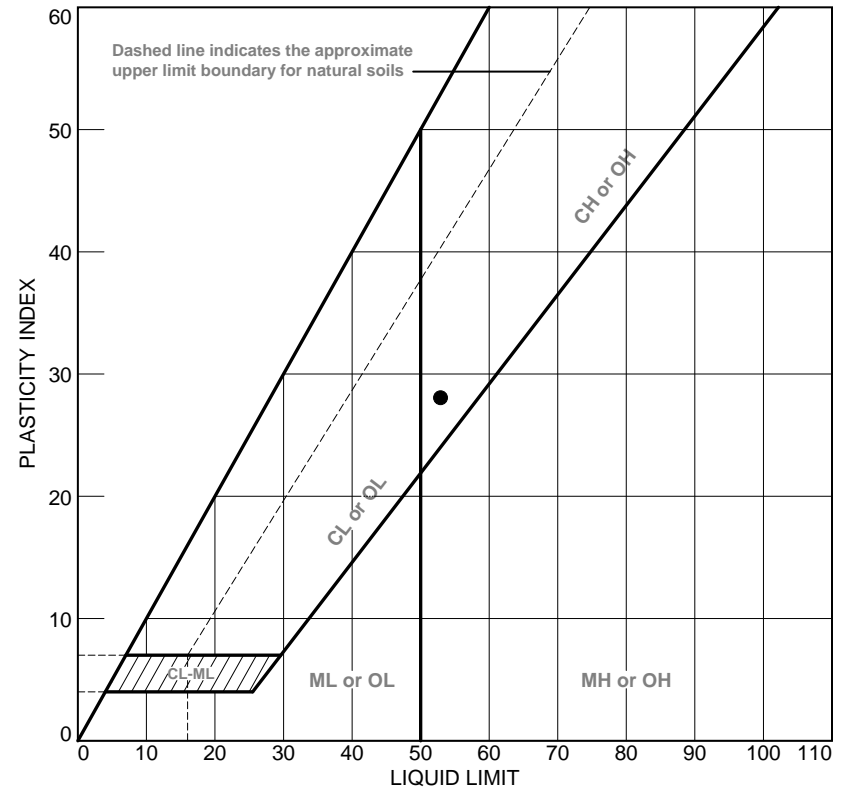
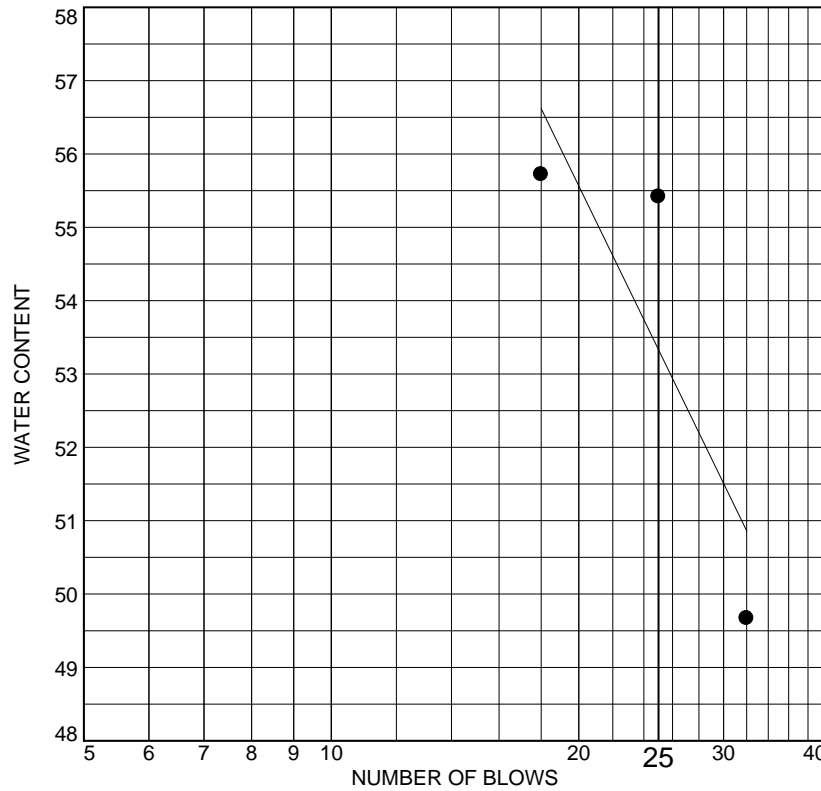


SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	BH125-3				CLAY and SILT, trace sand		58	34

Client Canada Lands Company CLC Limited	Alston Associates	
Project Wateridge Village		
Project No. CO682.00		

Tested By: RH

LIQUID AND PLASTIC LIMITS TEST REPORT



SOURCE	SAMPLE #	DEPTH/ELEV.	DATE SAMPLED	USCS	MATERIAL DESCRIPTION	NM %	LL	PI
●	BH134-2				CLAY and SILT		53	28

Client Canada Lands Company CLC Limited	Alston Associates	
Project Wateridge Village		
Project No. CO682.00		
Figure E-14	Geotechnical Division of Terrapex	

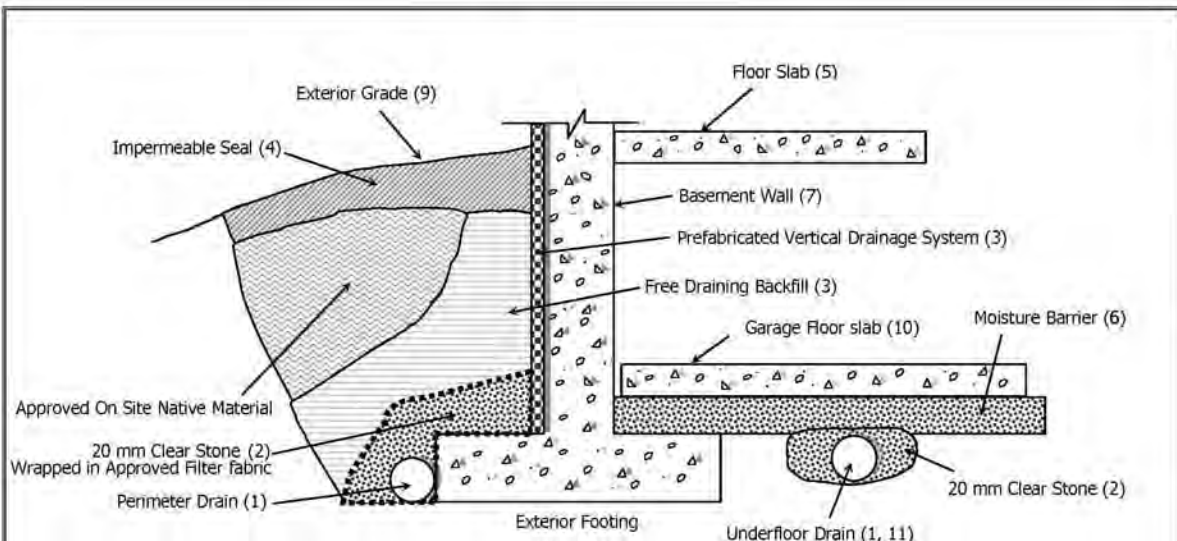
Tested By: RH

APPENDIX F

TYPICAL DRAINAGE SYSTEM



Drainage and Backfill Details



Notes

1. Perimeter and underfloor drains shall consist of 100 mm diameter weeping tile with fabric sock or equivalent perforated pipe leading to a positive sump or outlet. Invert to be a minimum of 300 mm below underside of garage floor slab. Perimeter drain is required for sections of garage wall installed below exterior grade.
2. 20 mm Clear Stone – 150 mm top and side of drain, surrounded by approved filter fabric (Terrafox 270R or equivalent).
3. Free Draining backfill – OPSS Granular B or equivalent compacted to the specified density. Do not use heavy compaction equipment within 450 mm of the wall. Use hand controlled light compaction equipment within 1.8 m of wall. Free draining backfill is not required if a prefabricated vertical drainage system (such as Miradrain 6000) is installed on the exterior of the basement wall.
4. Impermeable backfill seal (min. 600 mm) – relatively impervious compacted silty clay, clayey silt or equivalent. If on-site native backfill is impermeable, seal may be omitted.
5. Do not backfill until wall is supported by garage and floor slabs or adequate bracing.
6. Moisture barrier to be at least 200 mm of compacted 20 mm clear stone or equivalent free draining material.
7. Basement wall to be damp-proofed.
9. Exterior grade to slope away from building at minimum gradient of 2%.
10. Garage floor slab should not be structurally connected to the wall or footing.
11. Underfloor drain invert to be at least 300 mm below underside of floor slab. Drainage tile placed in parallel rows at 10 m centre to centre. Place drain on 100 mm of 20 mm clear stone with 150 mm of clear stone on top and sides. Do not connect the underfloor drains to perimeter drains.

DRAINAGE AND BACKFILL RECOMMENDATIONS

(Not to Scale)

APPENDIX G

CERTIFICATE OF CHEMICAL ANALYSES

Your Project #: CO682.00
 Site Location: WATERIDGE VILLAGE
 Your C.O.C. #: 117522

Attention: Rachel Herzog

Terrapex Environmental Ltd
 1-20 Gurdwara Rd.
 Ottawa, ON
 CANADA K2E 8B3

Report Date: 2018/12/20
 Report #: R5534330
 Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B8X8071
Received: 2018/12/18, 11:30

Sample Matrix: Soil
 # Samples Received: 4

Analyses	Quantity	Date	Date	Laboratory Method	Reference
		Extracted	Analyzed		
Anions (1)	4	2018/12/20	2018/12/20	CAM SOP-00435	SM 23 4110 B m
Moisture (1)	4	N/A	2018/12/19	CAM SOP-00445	Carter 2nd ed 51.2 m
pH CaCl2 EXTRACT (1)	4	2018/12/20	2018/12/20	CAM SOP-00413	EPA 9045 D m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing. Maxxam is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Maxxam, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) This test was performed by Maxxam Analytics Mississauga

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.

Alisha Williamson, Project Manager
 Email: AWilliamson@maxxam.ca
 Phone# (613) 274-0573

Your Project #: CO682.00
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RESULTS OF ANALYSES OF SOIL

Maxxam ID		IOS514	IOS515	IOS516	IOS517			IOS517		
Sampling Date		2018/12/11 14:15	2018/12/11 14:00	2018/12/11 13:30	2018/12/11 13:45			2018/12/11 13:45		
COC Number		117522	117522	117522	117522			117522		
	UNITS	BH108-2	BH127-2	BH153-3	BH156-2	RDL	QC Batch	BH156-2 Lab-Dup	RDL	QC Batch
Inorganics										
Moisture	%	20	15	11	10	1.0	5896681			
Available (CaCl2) pH	pH	7.58	7.54	7.66	7.77		5898613			
Chloride (Cl-)	ug/g	ND	ND	ND	ND	10	5898620	ND	10	5898620
Sulphate (SO4)	ug/g	98	26	ND	ND	20	5898620	24	20	5898620
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate ND = Not detected										

TEST SUMMARY

Maxxam ID: IOS514
Sample ID: BH108-2
Matrix: Soil

Collected: 2018/12/11
Shipped:
Received: 2018/12/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Anions	IC	5898620	2018/12/20	2018/12/20	Fari Dehdezi
Moisture	BAL	5896681	N/A	2018/12/19	Prgya Panchal
pH CaCl2 EXTRACT	AT	5898613	2018/12/20	2018/12/20	Gnana Thomas

Maxxam ID: IOS515
Sample ID: BH127-2
Matrix: Soil

Collected: 2018/12/11
Shipped:
Received: 2018/12/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Anions	IC	5898620	2018/12/20	2018/12/20	Fari Dehdezi
Moisture	BAL	5896681	N/A	2018/12/19	Prgya Panchal
pH CaCl2 EXTRACT	AT	5898613	2018/12/20	2018/12/20	Gnana Thomas

Maxxam ID: IOS516
Sample ID: BH153-3
Matrix: Soil

Collected: 2018/12/11
Shipped:
Received: 2018/12/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Anions	IC	5898620	2018/12/20	2018/12/20	Fari Dehdezi
Moisture	BAL	5896681	N/A	2018/12/19	Prgya Panchal
pH CaCl2 EXTRACT	AT	5898613	2018/12/20	2018/12/20	Gnana Thomas

Maxxam ID: IOS517
Sample ID: BH156-2
Matrix: Soil

Collected: 2018/12/11
Shipped:
Received: 2018/12/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Anions	IC	5898620	2018/12/20	2018/12/20	Fari Dehdezi
Moisture	BAL	5896681	N/A	2018/12/19	Prgya Panchal
pH CaCl2 EXTRACT	AT	5898613	2018/12/20	2018/12/20	Gnana Thomas

Maxxam ID: IOS517 Dup
Sample ID: BH156-2
Matrix: Soil

Collected: 2018/12/11
Shipped:
Received: 2018/12/18

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Anions	IC	5898620	2018/12/20	2018/12/20	Fari Dehdezi

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	1.0°C
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Results relate only to the items tested.

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5896681	JS9	RPD	Moisture	2018/12/19	2.4		%	20
5898613	GTO	Spiked Blank	Available (CaCl2) pH	2018/12/20		100	%	97 - 103
5898613	GTO	RPD	Available (CaCl2) pH	2018/12/20	0.40		%	N/A
5898620	FD	Matrix Spike [IOS517-01]	Chloride (Cl-)	2018/12/20		NC	%	70 - 130
			Sulphate (SO4)	2018/12/20		NC	%	75 - 125
5898620	FD	Spiked Blank	Chloride (Cl-)	2018/12/20		98	%	70 - 130
			Sulphate (SO4)	2018/12/20		99	%	75 - 125
5898620	FD	Method Blank	Chloride (Cl-)	2018/12/20	ND, RDL=10		ug/g	
			Sulphate (SO4)	2018/12/20	ND, RDL=20		ug/g	
5898620	FD	RPD [IOS517-01]	Chloride (Cl-)	2018/12/20	NC		%	35
			Sulphate (SO4)	2018/12/20	19		%	35

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

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

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

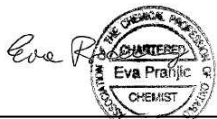
Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Ewa Pranjić, M.Sc., C.Chem, Scientific Specialist

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