Geotechnical Investigation
Proposed Long-Term Care Facility
980 Earl Armstrong Road
Ottawa, Ontario

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Introduction

EXP Services Inc. (EXP) is pleased to present the results of the geotechnical investigation completed as part of due diligence for the proposed new long-term care (LTC) facility to be located at 980 Earl Armstrong Road, Ottawa, Ontario (Figure 1). Authorization to proceed with this geotechnical investigation was provided by Extendicare (Canada) Inc.

A Phase One Environmental Site Assessment (ESA)/ Assessment of Past Uses, Phase Two ESA/Soil Characterization, Hydrogeological Investigation and Civil Engineering due diligence were also undertaken for this project as part of EXP's scope of work and are presented in separate reports.

Proposed Development

It is our understanding that the proposed LTC facility will consist of a five (5) storey building with a 3.4 m deep basement located in a portion of the proposed building. The proposed LTC development will have outdoor paved parking lots and access roads and will be serviced by municipal services. The location of the basement within the footprint of the proposed building was not known at the time of this geotechnical investigation. Design elevations of the ground floor and basement floor of the proposed building and final site grades were not available at the time of this geotechnical investigation.

Fieldwork

The borehole fieldwork was undertaken from June 4 to 14, 2024 and originally consisted of thirty (30) boreholes (Borehole Nos. 24-01 to 24-30) located on the site. Borehole Nos. 24-19, 24-23 and 24-24 were not drilled since access to the borehole locations could not be gained due to the presence and depth of the ponded surface water in the vicinity of the boreholes. Therefore, a total of twenty-seven (27) boreholes were completed for this geotechnical investigation. The boreholes were advanced to sampler refusal and termination depths ranging from 7.9 m to 16.8 m below existing grade. In addition to the boreholes, a total of six (6) piezocone penetration tests (CPTs) were undertaken on the site on August 6,2024.

The fieldwork also included seismic shear wave velocity sounding surveys (one seismic line) on site by Geophysics GPR International Inc. for the purpose of determining the site classification for seismic response and to assist in determining if the subsurface soils are liquefiable during a seismic event.

Subsurface Conditions

The subsurface conditions at the site consist of a surficial topsoil layer underlain by fill, buried organic silty clay and topsoil layers followed by native very soft to very stiff sandy silty clay to silty clay, loose to very dense sand and silt, very soft to stiff clayey silt, very loose to very dense glacial till and limestone bedrock contacted at 11.7 m to 14.1 m depths (Elevation 79.9 m to Elevation 77.4 m). The groundwater level ranges from 1.1 m to 1.9 m depths (Elevation 90.9 m to Elevation 89.6 m).

Geotechnical Engineering Comments and Recommendations

The seismic shear wave velocity sounding survey report is shown in Appendix A. Based on a review of the results of the seismic shear wave velocity sounding survey, the seismic shear wave velocity from existing ground surface to a 30 m depth is 376 m/s. For a seismic shear wave velocity of 376 m/s, the 2012 Ontario Building Code (as amended January 1, 2022) indicates the site classification for seismic response is Class C.

The subsurface soils at the site are not liquefiable during a seismic event.

The laboratory consolidation test results indicate the lower grey silty clay has very limited capacity to support additional loads. The site is underlain by the lower grey silty clay which is a sensitive marine silty clay deposit that is prone to consolidation settlement if overstressed by loads imposed on it by site grade raise, foundations and by the permanent lowering of the groundwater level following construction. Overstressing of the clay will result in its consolidation and subsequent settlement of foundations, which may exceed tolerable limits of the structure resulting in cracking of the structure.

A maximum permissible site grade raise of 0.5 m using soil fill may be used along with a 2.5 m permanent groundwater lowering (groundwater level at 1.1 m to 1.9 m depths; Elevation 90.9 m to Elevation 89.6 m) for the proposed 3.4 m deep basement equipped with permanent perimeter and underfloor drainage systems. If the proposed building will have no basement or the basement will be designed as a water-tight structure, the permissible site grade raise may be increased to 1.0 m using soil fill. The permissible site grade raise values are based on the proposed building supported by pile foundations as discussed in section 8 of the attached report.

Based on a review of the subsurface conditions, it is considered that the subsurface native soils do not have sufficient bearing capacity to support the proposed five (5) storey building on strip and spread footings. Therefore, it is recommended the proposed building be supported by pile foundations designed in end-bearing and driven to bedrock and the ground floor and basement floor of the proposed building may be designed as slabs-on-grade. The possibility of caisson foundations to support the proposed building was reviewed and considered to be problematic and not feasible due to the high groundwater level and soft soil.

A perimeter drainage system should be installed around the proposed new building and basement area. It is anticipated that the basement floor of the building will be located below the groundwater level and as such will require an underfloor drainage system. The need for an underfloor drainage system for non-basement areas will have to be assessed once the lowest floor slab elevation is known and compared with the groundwater level.

Excavations for the construction of the proposed building and installation of the underground services may extend to an approximate maximum depth of 4.0 below existing grade. These excavations will extend through the fill and into the native upper brown silty clay, sandy silty clay and lower grey silty clay. These excavations are anticipated to be below the groundwater level. Excavations may be undertaken by heavy equipment capable of removing debris within the fill.

Excavations should be undertaken in accordance with the Occupational Health and Safety Act (OHSA), Ontario, Reg. 213/91. Based on the definitions provided in OHSA, the subsurface soils at the site are considered to be Type 3 soil. As per OHSA, the sidewalls of open cut excavations undertaken within Type 3 soil, must be sloped back at 1H:1V from the bottom of the excavation. Within zones of seepage and below the groundwater level, the excavation side slopes are expected to slough and eventually stabilize at a gradient of 2H:1V to 3H:1V from the bottom of the excavation.

If side slopes cannot be achieved due to space restrictions on site such as the proximity of open cut excavations to the property limits or existing infrastructure, the new building construction would have to be undertaken within the confines of an engineered support system (shoring system) that may be designed to cut-off groundwater flows into the excavation (sheeting-type shoring system).

Above the groundwater level, seepage of surface and subsurface water into the excavations is anticipated. It should be possible to remove surface and subsurface water by pumping from sumps. In areas of high infiltration or in areas where more permeable soil layers may exist, a higher seepage rate should be anticipated and may require high-capacity pumps to keep the excavation dry (may need to operate 24 hours a day, seven (7) days a week).

Existing ditches may need to be relocated and drainage of surface water in the ditches may be required by draining and pumping the water from low points (sumps). Thicker organic deposits than noted in the boreholes may exist in the bottom of the existing ditches.

The excavation for the construction of the proposed building is anticipated to extend below the groundwater level into the upper brown silty clay, sandy silty clay and into the underlying grey silty clay. The sandy silty clay below the groundwater level is susceptible to instability or failure of the base of the excavation. To minimize failure of the base of the excavation, to maintain stability of the excavation side slopes and to permit the excavation and construction activities to be undertaken in relatively dry conditions, it will be necessary to lower the groundwater table at the site to below the final excavation level prior to the start of the excavation. This may be achieved by installing deep sumps, pumping with high-capacity pumps and pumping on a continuous basis (such as twenty-four (24) hours a day, seven (7) days a week). The groundwater level should be lowered and maintained to at least 1.0 m below the bottom of the excavation until construction below grade has been completed. Standpipes should also be installed to monitor the groundwater level during initial groundwater lowering and during construction. A specialized dewatering contractor should be consulted to determine the most appropriate dewatering method for the site conditions to allow for the construction to be undertaken in relatively dry conditions.

Reference is made to the EXP hydrogeological assessment report regarding anticipated groundwater quantities and Environmental Activity and Sector Registry (EASR) and Permit to Take Water (PTTW) requirements.

It is anticipated that the majority of the material required for backfilling purposes would have to be imported and should preferably conform to the specifications outlined in the attached geotechnical report.

The above and other related considerations are discussed in greater detail in the main body of the attached geotechnical report.

This executive summary is a brief synopsis of the attached geotechnical report and should not be read in lieu of reading the geotechnical report in its entirety.

1. Introduction

EXP Services Inc. (EXP) is pleased to present the results of the geotechnical investigation completed as part of due diligence for the proposed new long-term care (LTC) facility to be located at 980 Earl Armstrong Road, Ottawa, Ontario (Figure 1). Authorization to proceed with this geotechnical investigation was provided by Extendicare (Canada) Inc.

It is our understanding that the proposed LTC facility will consist of a five (5) storey building with a 3.4 m deep basement located in a portion of the proposed building. The proposed LTC development will have outdoor paved parking lots and access roads and will be serviced by municipal services. The location of the basement within the footprint of the proposed building was not known at the time of this geotechnical investigation. Design elevations of the ground floor and basement floor of the proposed building and final site grades were not available at the time of this geotechnical investigation.

A Phase One Environmental Site Assessment (ESA)/ Assessment of Past Uses, Phase Two ESA/Soil Characterization, Hydrogeological Investigation and Civil Engineering due diligence were also undertaken for this project as part of EXP's scope of work and are presented in separate reports.

The geotechnical investigation was undertaken to:

a) Establish the subsurface and groundwater conditions at twenty-seven (27) boreholes and six (6) piezocone penetration tests (CPTs) located at the site,

b) Classify the site for seismic site response in accordance with the requirements of the 2012 Ontario Building Code (as amended January 1,2022) and determine the susceptibility of the subsurface soils to liquefaction during a seismic event,

c) Comment on grade-raise restrictions,

d) Provide recommendations regarding the most suitable type of foundations, founding depth and bearing pressure at serviceability limit state (SLS) and factored geotechnical resistance at ultimate limit state (ULS) of the founding strata and comment on the anticipated total and differential settlements of the recommended foundation type,

e) Provide comments regarding slab-on-grade construction and the requirement for perimeter and underfloor drainage systems,

f) Discuss soil parameters regarding lateral earth pressure against subsurface basement walls for static and seismic conditions,

g) Comment on excavation conditions and de-watering requirements during construction,

h) Provide pipe bedding requirements for underground services,

i) Discuss backfilling requirements and suitability of on-site soils for backfilling purposes,

j) Recommend pavement structure thicknesses for access roads and parking lots,

k) Discuss subsurface concrete and steel requirements; and

l) Provide comments regarding tree planting restrictions.

The comments and recommendations given in this report are based on the assumption that the above-described design concepts will proceed into construction. If changes are made either in the design phase or during construction, this office must be retained to review these modifications. The result of this review may be a modification of our recommendations, or it may require additional field or laboratory work to check whether the changes are acceptable from a geotechnical viewpoint.

2. Site Description

The subject site is located in the southeast corner of the Portico Way and Earl Armstrong Road intersection in Ottawa, Ontario. The location of the site is shown in Figure 1.

At the time of this geotechnical investigation, the site was a vacant parcel of land that was grass covered (high grass) with mature trees along the western property line. There are several low-height small stockpiles of soil fill in the northwest portion of the site along with some debris scattered on the ground surface in the west portion of the site. The debris appears to consist of asphalt, concrete, timber (wood) and silt fencing. Several small and large areas of ponded water on the ground surface exist on the site.

Based on the topographic plan dated June 3,2024 and prepared by Annis, O'Sullivan, Vollebekk Ltd. (AOV), there are some shallow open drainage ditches on site that run in a south direction from the north property line of the site. The AOV topographic plan also indicates the existing ground surface of the site is at a similar elevation to the ground surface elevation of Earl Armstrong Road and Portico Way. Based on the ground surface elevation at the borehole locations and the spot elevations from the AOV topographic plan, the ground surface of the site is relatively flat and ranges from Elevation 91.19 m to Elevation 92.62 m.

3. Procedure

3.1 Borehole Fieldwork

The borehole fieldwork was undertaken from June 4 to 14, 2024 and originally consisted of thirty (30) boreholes (Borehole Nos. 24-01 to 24-30) to be drilled in a grid pattern throughout the site. Borehole Nos. 24-19, 24-23 and 24-24 were not drilled since access to the borehole locations could not be gained due to the presence and depth of the ponded surface water in the vicinity of these boreholes. Therefore, a total of twenty-seven (27) boreholes were completed for this geotechnical investigation. The boreholes were advanced to sampler and termination depths ranging from 7.9 m to 16.8 m below existing grade. The fieldwork was supervised on a full-time basis by a representative from EXP.

In addition to the boreholes, a total of six (6) piezocone penetration tests (CPTs) were conducted on the site on August 6,2024 next to Borehole Nos. 24-05, 24-07, 24-13, 24-15, 24-18 and 24-21.

The locations and geodetic elevations of the boreholes were established on site by EXP. The borehole location plan is shown in Figure 2.

The borehole locations were cleared of private and public underground services, prior to the start of the fieldwork.

The boreholes were advanced using a CME-55 track mounted drill rig equipped with continuous flight hollow stem augers and conventional rock coring equipment. Standard penetration tests (SPTs) were performed in all the boreholes at 0.75 m to 2.9 m depth intervals and soil samples retrieved by the split-barrel sampler. Relatively undisturbed samples (Shelby tube samples) of the clayey soil were obtained at selected depths in some of the boreholes. The undrained shear strength of the clayey soil was measured at selected depth intervals by conducting penetrometer and in-situ vanes tests. The presence of the bedrock was proven by conventional rock coring techniques using the N-size or H-size core barrel. A field record of wash water return, colour of wash water and any sudden drops of the core barrel were kept during the rock coring operation.

A 19 mm diameter standpipe and 50 mm diameter monitoring well were installed in selected boreholes for long-term monitoring of the groundwater levels and for sampling the groundwater. The standpipes and monitoring wells were installed in accordance with EXP standard practice, and the installation configurations are documented on the respective borehole logs. The boreholes were backfilled upon completion of drilling and installation of the standpipes and monitoring wells.

All soil samples were visually examined in the field for textural classification, logged, preserved in plastic bags and identified accordingly. Similarly, all the rock cores were visually examined, placed in core boxes, identified and logged. On completion of the fieldwork, all soil samples and rock cores were transported to the EXP laboratory in Ottawa.

Soil classification consisted of classifying the main constituents of the soils in accordance with the Unified Soil Classification System (USCS) using the soil group name and symbol and by the modified Burmister Soil Classification System to classify the minor constituents of the soil using modifiers and adjectives (such as trace and some). The bedrock was classified from the rock quality designation values (RQD) and from the unconfined compressive strength of the bedrock in accordance with the 2023 Fifth Edition of the Canadian Foundation Engineering Manual (CFEM).

3.2 Laboratory Testing Program

The geotechnical laboratory testing program for the soil samples and rock cores is summarized in Table I.

Table I: Summary of Laboratory Testing Program

Type of Test	Number of Tests Completed
Soil Samples	
Moisture Content Determination	237
Grain Size Analysis	9
Atterberg Limit Determination	20
Consolidation Test	2
Corrosion Analysis (pH, sulphate, chloride and resistivity)	6
Bedrock Cores	
Unit Weight Determination	3
Unconfined Compressive Strength Test	3

3.3 Seismic Shear Wave Surveys

Seismic shear wave velocity sounding surveys (one seismic line) were conducted on the site on May 15,2024 by Geophysics GPR International Inc. (GPR). The purpose of the surveys is to determine the site classification for seismic site response and to assist in determining if the subsurface soils are liquefiable or not. The seismic shear wave velocity sounding surveys were undertaken using the multi-channel analysis of surface waves (MASW), spatial auto correlation (SPAC) and seismic refraction methods. The seismic shear wave velocity sounding survey report is shown in Appendix A.

4. Subsurface Conditions and Groundwater Levels

A detailed description of the subsurface conditions and groundwater levels encountered in the boreholes drilled throughout the site is given on the borehole logs, Figures 3 to 29. The borehole logs and related information depict subsurface conditions only at the specific locations and times indicated. Subsurface conditions and water levels at other locations may differ from conditions at the locations where sampling was conducted. The passage of time also may result in changes in the conditions interpreted to exist at the locations where sampling was conducted. The results of the piezocone penetration tests (CPTs) are shown in Appendix B.

The boreholes were drilled to provide representation of subsurface conditions as part of the geotechnical exploration program and are not intended to provide evidence of environmental conditions. Reference is made to the Phase One ESA/Assessment of Past Users and the Phase Two ESA/Soil Characterization reports prepared by EXP regarding the environmental condition of the soils and groundwater.

It should be noted that the soil and bedrock boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during field operations. These boundaries are intended to reflect approximate transition zones for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. The “Notes on Sample Descriptions” preceding the borehole logs form an integral part of this report and should be read in conjunction with this report.

A review of the borehole logs indicates the following subsurface conditions with depth and groundwater level measurements.

4.1 Topsoil

A surficial topsoil layer was contacted in all of the boreholes, except in Borehole Nos. 24-08 and 24-15. The topsoil layer ranges in thickness from 25 mm to 410 mm.

4.2 Surficial Fill

The fill was surficially contacted in Borehole Nos. 24-08 and 24-15 and extends to 0.9 m and 2.2 m depths (Elevation 91.3 m and Elevation 90.5 m) respectively. The fill consists of a mixture of silty sand and crushed gravel with dark brown organic silty clay in Borehole No. 24-15. Based on the standard penetration test (SPT) N-values of 11 to 24, the fill is in a compact state. The moisture content of the fill ranges from 9 percent to 22 percent.

4.3 Fill

The surficial topsoil layer is underlain by fill in all boreholes with the exception of Borehole Nos. 24-08 and 24-15. The fill extends to depths of 0.7 m to 1.5 m (Elevation 90.6 m). The fill consists of silty clay to a mixture of silty clay and silty sand with roots, rootlets and decayed grass shoots. In Borehole Nos. 24-11, 24-12, the fill consists of a mixture of silty sand and crushed gravel. The fill in Borehole No. 24-09 contains wood fragments. Based on the SPT N-values of 4 to 18, the fill is in a loose to compact state. The moisture content of the fill ranges from 9 percent to 39 percent.

4.4 Buried Organic Silty Clay and Topsoil

Beneath the fill in Borehole Nos. 24-01 and 24-12, a 75 mm thick organic silty clay was contacted at a 1.1 m depth (Elevation 91.2 m) in Borehole No. 24-12 and a 50 mm thick topsoil layer was contacted at a 0.8 m depth (Elevation 91.0 m) in Borehole No. 24-01.

4.5 Upper Brown Silty Clay

The fill and buried organic silty clay/topsoil in Borehole Nos. 24-01, 24-04, 24-08, 24-11, 24-12, 24-16, 24-22 and 24-26 to 24-28 are underlain by silty clay that extends to depths of 1.4 m to 2.2 m (Elevation 90.9 m to Elevation 89.7 m). Based on undrained shear strength measurements ranging from 170 kPa to 200 kPa, the silty clay has a very stiff consistency. The natural moisture content of the silty clay ranges from 22 percent to 41 percent.

The results from the grain-size analysis and Atterberg limit determination conducted on one (1) selected sample of the brown silty clay are summarized in Table II. The grain-size distribution curve is shown in Figure 30.

Table II: Summary of Results from Grain-Size Analysis and Atterberg Limit Determination – Upper Brown Silty Clay Sample

Borehole No. (BH): Sample No. (SS)	Depth (m)	Grain-Size Analysis (%) and Atterberg Limits (%)								
		Gravel	Sand	Silt	Clay	Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index	Soil Classification
BH 24-26: SS2	0.8-1.4	1	16	32	51	35	44	18	26	Silty Clay of Medium Plasticity (CI) – Some Sand, Trace Gravel

Based on a review of the results of the grain-size analysis and Atterberg limits, the soil may be classified as a silty clay of medium plasticity (CI) with some sand and trace gravel.

4.6 Upper Brown to Grey Sandy Silty Clay

In all of the boreholes, the fill and upper silty clay are underlain by sandy silty clay that extends to depths ranging from 2.2m to 3.7 m (Elevation 89.5 m to Elevation 88.3). Based on the SPT N-values of 0 to 10 and undrained shear strength of 72 kPa, the sandy silty clay has a very soft to stiff consistency. The natural moisture content of the sandy silty clay ranges from 23 percent to 39 percent.

The results from the grain-size analysis and Atterberg limit determination conducted on and fifteen (15) selected soil samples of the upper sandy silty clay are summarized in Table III. The grain-size distribution curves are shown in Figure 31 to 34.

Table III: Summary of Results from Grain-Size Analysis and Atterberg Limit Determination – Upper Sandy Silty Clay Samples										
Borehole No. (BH): Sample No. (SS)	Depth (m)	Grain-Size Analysis (%) and Atterberg Limits (%)								
		Gravel	Sand	Silt	Clay	Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index	Soil Classification
BH 24-01: SS3	1.5-2.1	0	39	39	22	27	22	14	8	Sandy Silty Clay of Low Plasticity (CL)
BH 24-05: SS3	1.5-2.1	-	-	-	-	29	34	17	17	Sandy Silty Clay of Medium Plasticity (CI)
BH 24-6: SS2	0.8-1.4	0	40	37	23	42	25	15	10	Sandy Silty Clay of Low Plasticity (CL)
BH 24-07: SS2	0.8-1.4	-	-	-	-	41	40	17	23	Sandy Silty Clay of Medium Plasticity (CI)
BH 24-09: SS3	1.5-2.1	-	-	-	-	33	30	16	14	Sandy Silty Clay of Low to Medium Plasticity (CI)
BH 24-10: SS3	1.5-2.1	-	-	-	-	33	33	16	17	Sandy Silty Clay of Medium Plasticity (CI)
BH 24-11: SS4	2.3-2.9	-	-	-	-	34	28	16	12	Sandy Silty Clay of Low Plasticity (CL)
BH 24-12: SS5	3.0-3.6	1	24	46	29	31	28	15	13	Sandy Silty Clay of Low Plasticity (CL) - Trace Gravel
BH 24-13: SS3	1.5-2.1	-	-	-	-	30	31	15	16	Sandy Silty Clay of Medium Plasticity (CI)
BH 24-14: SS2	0.8-1.4	-	-	-	-	30	33	18	15	Sandy Silty Clay of Medium Plasticity (CI)
BH 24-15: SS5	3.0-3.6	-	-	-	-	29	28	16	12	Sandy Silty Clay of Low Plasticity (CL)
BH 24-17: SS3	1.5-2.1	-	-	-	-	33	38	18	20	Sandy Silty Clay of Medium Plasticity (CI)
BH 24-18: SS4	2.3-2.7	0	22	46	32	32	28	16	12	Sandy Silty Clay of Low Plasticity (CL)
BH 24-20: SS3	1.5-2.1	-	-	-	-	26	37	15	22	Sandy Silty Clay of Medium Plasticity (CI)
BH 24-21: SS2	0.8-1.4	-	-	-	-	28	29	17	12	Sandy Silty Clay of Low Plasticity (CL)

Based on a review of the results of the grain-size analysis and Atterberg limits, the soil may be classified as a sandy silty clay of low to medium plasticity (CL-CI) with trace gravel.

4.7 Lower Brown and Grey Silty Clay

In all boreholes, the upper sandy silty clay at 2.2m to 3.7 m depths (Elevation 89.5 m to Elevation 88.3 m) is underlain by grey silty clay that extends to depths of 5.6 m to 8.7 m (Elevation 86.4 m to Elevation 79.8 m). Locally, in Borehole No. 24-02, the silty clay has an upper brown desiccated crust over a weaker un-desiccated weaker grey silty clay. The upper desiccated brown clay crust extends to a 3.0 m depth (Elevation 88.7 m).

In the remaining boreholes, an upper desiccated crust was not encountered, and the silty clay consists only of the grey silty clay. The lower depths of the silty clay in some of the boreholes contain numerous silt seams. The undrained shear strength of the brown desiccated crust of the silty clay is 82 kPa indicating the brown silty clay has a stiff consistency. The undrained shear strength of the grey silty clay ranges from 38 kPa to 91 kPa indicating the grey silty clay has a firm to stiff consistency. Due to the presence of the many silt seams in the lower depths of the silty clay, the SPT N-values range increases from 0 in the upper levels of the silty clay to N-values ranging from 2 to 4 within the zone of numerous silt seams indicating a soft to firm consistency. The natural moisture content of the brown and grey silty clay ranges from 26 percent to 71 percent.

The results from the grain-size analysis and Atterberg limit determination conducted on one (1) selected sample of the lower grey silty clay are summarized in Table IV. The grain-size distribution curve is shown in Figure 35.

Table IV: Summary of Results from Grain-Size Analysis and Atterberg Limit Determination – Lower Grey Silty Clay Sample

Borehole No. (BH): Sample No. (SS)	Depth (m)	Grain-Size Analysis (%) and Atterberg Limits (%)								
		Gravel	Sand	Silt	Clay	Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index	Soil Classification
BH 24-26: SS6	3.8-4.3	0	5	46	49	63	39	19	20	Silty Clay of Medium Plasticity (CI) -Trace Sand

Based on a review of the results of the grain-size analysis and Atterberg limits, the soil may be classified as a silty clay of medium plasticity (CI) with trace of sand.

A consolidation test was conducted on one (2) samples of the grey silty clay. The soil parameters derived from the consolidation test results are summarized in Table V and the consolidation test result report is shown in Appendix C.

Table V: Consolidation Test Results – Grey Silty Clay Samples

Borehole No.	Sample No. (Sample Depth, m)	Natural Unit Weight (kN/m^3)	σ_p'	σ_{vo}'	C_c	C_r	e_o	OCR
BH 24-27	SH 5 (3.0-3.6)	17.6	80	47	0.538	0.032	1.184	1.7
BH 24-16	SH 8 (6.1-6.6)	18.4	65	74	0.305	0.020	0.959	0.88~1.0

NOTES:

σ_p'	- Apparent pre-consolidation pressure (kPa)	σ_{vo}'	- Calculated existing vertical effective pressure (kPa)
C_c	- Compression index	C_r	- Recompression index
e_o	- Initial void ratio	**OCR**	- Over consolidation ratio

4.8 Lower Grey Sand, Silt and Clayey Silt

A cohesionless sand and silt and a cohesive clayey silt were contacted below the grey silty clay in Borehole Nos. 24-02, 24-03, 24-08, 24-12, 24-16 to 24-19, 24-21, 24-22, 24-25, 24-26, 24-28 and 24-29 at 5.6 m to 8.7 m depths (Elevation 86.4 m to Elevation 82.8 m) and extends to depths of 7.2 m to 11.7 m (Elevation 84.9 m to Elevation 79.8 m). Based on the SPT N-values of 4 to 42, the cohesionless sand and silt are in a loose to very dense state. It is noteworthy to mention that the sand was heaving up into the casing in Borehole No. 24-22 to an 8.7 m depth (Elevation 82.8 m), likely as a result of disturbing the sand from augering and sampling operations. The natural moisture content of the cohesionless sand and silt is 14 percent to 32 percent. Based on the SPT N-values of 0 to 15 and the undrained shear strength value of 67 kPa, the cohesive clayey silt has a very soft to stiff consistency. The natural moisture content of the clayey silt is 24 percent to 44 percent.

4.9 Glacial Till

With the exception of Borehole Nos. 24-12, 24-15, 24-16, 24-20, 24-26 and 24-27, the grey silty clay, sand, silt and clayey silt are underlain by glacial till contacted at 5.8 m to 11.7 m (Elevation 85.6 m to Elevation 79.8 m). The glacial till extends to depths of 11.7 m to 14.1 m depths (Elevation 79.9 m to Elevation 77.4 m). Borehole Nos. 24-01, 24-02, 24-04, 24-07 to 24-18, 24-21, 24-25, and 24- 30 terminated within the glacial till at 8.1 m and 8.2 m depths (Elevation 84.2 m to Elevation 83.1 m). The glacial till consists of silty sand to sandy silt to clayey silt to silty clay with varying percentages of gravel. The glacial till contains possible cobbles and boulders. Based on the standard penetration test (SPT) N-values ranging widely from 3 to 124, the glacial till is in a very loose to very dense state. At some depths within the glacial till, the N-value is high for low sampler penetration that may result from the sampler making contact with a cobble or boulder within the glacial till. The natural moisture content of the glacial till ranges from 7 percent to 38 percent.

The results from the grain-size analysis conducted on three (3) samples of the glacial till are summarized in Table VI and the grain-size distribution curves are shown in Figures 36 to 38.

Table VI: Summary of Results from Grain-Size Analysis and Atterberg Limit Determination – Glacial Till Samples

Borehole No. (BH): Sample No. (SS)	Depth (m)	Grain-Size Analysis (%) and Atterberg Limits (%)								
		Gravel	Sand	Silt	Clay	Moisture Content	Liquid Limit	Plastic Limit	Plasticity Index	Soil Classification
BH 24-01: SS9	7.6-8.1	15	15	57	13	20	21	14	7	Silty Clay to Clayey Silt of Low Plasticity (CL-ML) - Some Gravel and Sand
BH 24-18: SS9	7.6-8.2	1	5	77	17	29	22	15	6	Silty Clay to Clayey Silt of Low Plasticity (CL-ML) – Trace Gravel and Sand
BH 24-28: SS12	12.2-12.8	3	78	15	4	15	-	-	Non-Plastic	Silty Sand (SM) – Some Gravel, Trace Clay

Based on a review of the test results, the glacial till may be classified as a silty clay to clayey silt of low plasticity (CL-ML) to silty sand (SM) with trace to some gravel, trace to some sand and trace clay. The glacial till contains possible cobbles and boulders.

4.10 Limestone Bedrock

Sampler refusal was met on inferred cobbles and boulders within the glacial till or on inferred bedrock in Borehole No. 24-06 at a 7.9 m depth (Elevation 83.4 m). Bedrock was contacted in Borehole Nos. 24-03, 24-05, 24-22, 24-28 and 24-29 at 11.7 m to 14.1 depths (Elevation 79.9 m to Elevation 77.4 m). The bedrock is limestone bedrock. Photographs of the bedrock cores are shown in Appendix D.

Based on the bedrock geology map tilted, Generalized Bedrock Geology, Ottawa-Hull, Ontario and Quebec, Map 1508A, dated 1979 and prepared by the Geological Survey of Canada, the site lies near the transition zone between dolostone and limestone bedrock of the Oxford formation and interbedded sandstone and sandy dolostone bedrock of the March formation. The majority of the site appears to be underlain by limestone bedrock of the Oxford formation.

A summary of the depth (elevation) to the bedrock surface is shown in Table VII.

Table VII: Summary of Bedrock Depths (Elevations)		
Borehole (BH) No.	Ground Surface Elevation (m)	Bedrock Depth (Elevation), m
BH 24-03	91.43	13.1 (78.3)
BH 24-05	91.61	11.7 (79.9)
BH 24-22	91.52	13.0 (78.5)
BH 24-28	91.51	14.1 (77.4)
BH 24-29	91.64	13.2 (78.4)

The total core recovery (TCR) and rock quality designation (RQD) of the bedrock cores are 55 percent to 100 percent and 33 percent to 98 percent respectively. Based on the RQD values, the bedrock maybe described as having a poor to excellent quality based on the 2023 Fifth Edition Canadian Foundation Engineering Manual (CFEM).

A summary of the unit weight and unconfined compressive strength of tested rock cores is shown in Table VIII. The classification of the rock with respect to strength is as per the 2023 CFEM (Fifth Edition). Based on the unconfined compressive strength tests, the bedrock may be classified as very strong (R5).

Table VIII: Summary of Unconfined Compressive Strength Test Results – Bedrock Cores				
Borehole No. – Run No.	Depth (m)	Unit Weight (kN/m^3)	Unconfined Compressive Strength (MPa)	Classification of Rock with respect to Strength
BH 24-03: Run 1	13.6-13.7	27.8	230.4	Very Strong (R5)
BH 24-05 – Run 1	12.2-12.3	27.6	226.2	Very Strong (R5)
BH 24-28: Run 1	15.1-15.2	27.4	131.9	Very Strong (R5)

4.11 Groundwater Level Measurements

A summary of the groundwater level measurements taken on June 19, 21 and 25,2024 in the standpipes and monitoring wells installed in selected boreholes is shown in Table IX.

Table IX: Summary of Groundwater Level Measurements			
Borehole (Monitoring Well) No. (MW)	Ground Surface Elevation (m)	Date of Measurement (Elapsed Time in Days from Date of Installation)	Groundwater Depth Below Ground Surface (Elevation), (m
BH/MW 24-01	91.77	June 19,2024 (13 days)	1.5 (90.3)
BH/MW 24-02	91.74	June 21,2024 (17 days)	1.1 (89.8)
BH/MW 24-04	91.72	June 19,2024 (14 days)	1.8 (89.9)
BH/MW 24-13	91.19	June 21,2024 (15 days)	1.1 (90.1)
BH/MW 24-16	92.62	June 21,2024 (7 days)	1.7 (90.9)
BH/MW 24-22	91.52	June 21,2024 (14 days)	1.7 (90.9)
BH/MW 24-25	91.68	June 19,2024 (8 days)	1.9 (89.8)
BH/MW 24-27	91.47	June25,2024 (15 days)	Inaccessible due to Ponded Surface Water
BH/MW 24-28	91.51	June 25,2024 (14 days)	1.9 (89.6)

The groundwater level ranges from 1.1 m to 1.9 m depths (Elevation 90.9 m to Elevation 89.6 m).

Groundwater levels were determined in the boreholes at the times and under the condition stated in this report. Note that fluctuations in the level of groundwater may occur due to a seasonal variation such as precipitation, snowmelt, rainfall activities, and other factors not evident at the time of measurement and therefore may be at a higher level during wet weather periods.

5. Site Classification for Seismic Site Response and Seismic Liquefaction of Soils

5.1 Site Classification for Seismic Site Response

The seismic shear wave velocity sounding survey report is shown in Appendix A. Based on a review of the results of the seismic shear wave velocity sounding survey, the seismic shear wave velocity from existing ground surface to a 30 m depth is 376 m/s. For a seismic shear wave velocity of 376 m/s, the 2012 Ontario Building Code (as amended January 1, 2022) indicates the site classification for seismic response is Class C.

5.2 Seismic Liquefaction of Soils

The susceptibility to liquefaction during a seismic event of the upper sandy silty clay and the lower silty clay was evaluated using the laboratory test results from the Atterberg limit determination. The plasticity index of the upper sandy silty clay ranges from 8 percent to 23 percent with an average plasticity index of 15 percent. The lower silty clay has a plasticity index of 20 percent. The 2023 Fifth Edition of the Canadian Foundation Engineering Manual indicates that if a fine-grained soil has a plasticity index greater than 12 percent, the soil can be classified as 'clay-like and considered not liquefiable during a seismic event. Therefore, based on the average plasticity index of the upper sandy silty clay and the plasticity index of the lower silty clay being greater than 12 percent, these soils are considered not liquefiable during a seismic event.

The susceptibility to liquefaction during a seismic event of the lower sand, silt, clayey silt and glacial till was assessed by examining the soil profiles of the in-situ piezocone penetration tests (CPTs) shown in Appendix B and the seismic shear wave velocity values of these soils from the seismic shear wave velocity sounding survey results shown in Appendix A. Based on high cone tip resistance values from the CPT test results and that the shear wave velocity is greater than 200 m/s within the lower sand, silt, clayey silty and glacial till, these soils are considered not liquefiable during a seismic event.

In summary, the subsurface soils at the site are not liquefiable during a seismic event.

6. Grade Raise Restrictions

The design elevation for the ground floor of the proposed building and design site grade raise were not available at the time of this geotechnical investigation.

The laboratory consolidation test results indicate the lower grey silty clay has very limited capacity to support additional loads. The site is underlain by the lower grey silty clay which is a sensitive marine silty clay deposit that is prone to consolidation settlement if overstressed by loads imposed on it by site grade raise, foundations and by the permanent lowering of the groundwater level following construction. Overstressing of the clay will result in its consolidation and subsequent settlement of foundations, which may exceed tolerable limits of the structure resulting in cracking of the structure.

A maximum permissible site grade raise of 0.5 m using soil fill may be used along with a 2.5 m permanent groundwater lowering (groundwater level ranges from 1.1 m to 1.9 m depths; (Elevation 90.9 m to Elevation 89.6 m) for the proposed 3.4 m deep basement equipped with permanent perimeter and underfloor drainage systems. If the proposed building will have no basement or the basement will be designed as a water-tight structure, the permissible site grade raise may be increased to 1.0 m using soil fill. The permissible site grade raise values are based on the proposed building supported by pile foundations as discussed in section 8 of this report.

If the maximum site grade raise will be different than noted above or the permanent groundwater lowering of 2.5 m will be different, EXP should be contacted to review the acceptability of the different site grade raise.

If the grades at the site will be lowered from existing grade, consideration should be given to the high groundwater level at the site. The lowering of the grades at the site and the lowering of design elevations for the proposed building will bring excavations, floor slabs and foundation components (such as grade beams for pile foundation) closer to or below the shallow groundwater level resulting in a higher level of effort required to dewater the site during construction and higher volumes of water for the perimeter and underfloor drainage systems and sump pumps to deal with on a permanent basis during the life of the proposed building. It is recommended that if the site grades will be lowered (cut), EXP should be contacted to review and provide geotechnical engineering comments and recommendations for lower site grades.

7. Site Grading

Site grading within the **proposed building footprint for a slab-on-grade** should consist of the removal of all surficial topsoil layer, fill buried organic layers, organic stained soils and silty clay or sandy silty clay down to the grey silty clay. The native silty clay subgrade should be examined by a geotechnician. Any loose/soft areas identified during the subgrade examination should be excavated, removed and replaced with Ontario Provincial Standard Specification (OPSS) Granular B Type II material compacted to 98 percent standard Proctor maximum dry density (SPMDD). Once the subgrade has been approved, the grades may be raised to the design underside of the floor slab elevation by the construction of an engineered fill pad consisting of Ontario Provincial Standard Specification (OPSS) Granular B Type II material compacted to 98 percent standard Proctor maximum dry density (SPMDD).

Site grading within the **proposed parking lot and access road areas** should consist of the removal of all surficial topsoil. The exposed subgrade should be proofrolled in the presence of a geotechnician. Any loose/soft areas identified during the proofrolling process should be excavated, removed and replaced with Ontario Provincial Standard Specification (OPSS) Granular B Type II or OPSS Select Subgrade Material (SSM) compacted to 95 percent standard Proctor maximum dry density (SPMDD). Once the subgrade has been approved, the grades may be raised to the design subgrade level by the placement and compaction of approved on-site material, OPSS Granular B Type II or SSM material compacted to 95 percent (SPMDD). In wet soft clayey subgrade areas, crusher-run material (100 mm minus) will be required in the lower levels of the fill (to be placed to design subgrade level) for the purpose of stabilizing the subgrade.

Within areas of ponded surface water at the ground surface and in open drainage ditches located within the footprint of the proposed building, parking lots and access roads, the organic soil (including topsoil) and organic stained soils that will require excavation and removal down to the native soils may be thicker than indicated in the borehole logs. Also, existing ditches may need to be relocated and drainage of surface water in the ditches may be required by draining and pumping the water from low points (from sumps).

The excavation for the construction of the proposed building including the construction of an engineered fill pad is anticipated to extend below the groundwater level into the upper brown silty clay, sandy silty clay and into the underlying grey silty clay. The sandy silty clay below the groundwater level is susceptible to instability or failure of the base of the excavation. To minimize failure of the base of the excavation, to maintain stability of the excavation side slopes and to permit the excavation and construction activities to be undertaken in relatively dry conditions, it will be necessary to lower the groundwater table at the site to below the final excavation level prior to the start of the excavation. This may be achieved by installing deep sumps, pumping with high-capacity pumps and pumping on a continuous basis (such as twenty-four (24) hours a day, seven (7) days a week). The groundwater level should be lowered and maintained to at least 1.0 m below the bottom of the excavation until construction below grade has been completed. Standpipes should also be installed to monitor the groundwater level during initial groundwater lowering and during construction. A specialized dewatering contractor should be consulted to determine the most appropriate dewatering method for the site conditions to allow for the construction to be undertaken in relatively dry conditions.

In place density tests should be performed on each lift of placed material to ensure that it has been compacted to the project specifications.

8. Foundation Considerations

The proposed building will be a five (5) storey long-term care building with a 3.4 m deep basement located in a portion of the proposed building. The location of the basement within the proposed building footprint, the elevation of the ground floor and the basement floor were not known at the time of this geotechnical investigation.

Based on a review of the subsurface conditions and laboratory consolidation test results, it is considered that the subsurface native soils do not have sufficient bearing capacity to support the proposed five (5) storey building on strip and spread footings. Therefore, it is recommended the proposed building be supported by pile foundations designed in end-bearing and driven to bedrock and the ground floor and basement floor of the proposed building may be designed as slabs-on-grade. The possibility of caisson foundations to support the proposed building was reviewed and considered to be problematic and not feasible due to the high groundwater level and soft soil.

The excavation for the construction of the proposed building is anticipated to extend below the groundwater level into the upper brown silty clay, sandy silty clay and into the underlying grey silty clay. The sandy silty clay below the groundwater level is susceptible to instability or failure of the base of the excavation. To minimize failure of the base of the excavation, to maintain stability of the excavation side slopes and to permit the excavation and construction activities to be undertaken in relatively dry conditions, it will be necessary to lower the groundwater table at the site to below the final excavation level prior to the start of the excavation. This may be achieved by installing deep sumps, pumping with high-capacity pumps and pumping on a continuous basis (such as twenty-four (24) hours a day, seven (7) days a week). The groundwater level should be lowered and maintained to at least 1.0 m below the bottom of the excavation until construction below grade has been completed. Standpipes should also be installed to monitor the groundwater level during initial groundwater lowering and during construction. A specialized dewatering contractor should be consulted to determine the most appropriate dewatering method for the site conditions to allow for the construction to be undertaken in relatively dry conditions.

Pile foundations are discussed in this section of the report.

8.1 Pile Foundations

8.1.1 Pile Capacity

The proposed building may be supported by steel H or concrete filled pipe piles designed in end-bearing and driven to practical refusal into the underlying limestone bedrock contacted at 11.7 m to 14.1 depths (Elevation 79.9 m to Elevation 77.4 m). Practical refusal of the pile may occur at a depth below the bedrock surface.

For pile foundations, reference is made to the previous comments regarding the need to lower the groundwater level at the site prior to start of construction.

Since the piles are expected to meet refusal in the bedrock, the factored geotechnical resistance at ultimate limit state (ULS) will govern the design. The factored geotechnical resistance values at ULS for various pile sections are shown in Table XI. The factored geotechnical resistance values at ULS are based on steel piles with a yield strength of 350 MPa and concrete compressive strength of 35 MPa and a geotechnical resistance factor of 0.4.

It is noted that the factored ULS values for the piles shown in Table X will have to be reduced by down-drag forces (negative skin friction) on the pile once the magnitude of the site grade raise, permanent groundwater lowering and depth of the basement level are known.

Table X: Factored Geotechnical Resistance at Ultimate Limit State (ULS) of Steel Pipe and H-Piles	
Pile Section	**Factored Geotechnical Resistance at ULS (kN)**
245 mm O.D. by 10 mm wall thickness	1275
245 mm O.D. by 12 mm wall thickness	1445
324 mm O.D. by 12 mm wall thickness	2120
HP 310 x 110	1775
HP 310 x 125	2000

Note:

1. It is noted that the factored ULS values for the piles shown in Table X will have to be reduced by down-drag forces (negative skin friction) on the pile once the magnitude of the site grade raise, permanent groundwater lowering and the depth of the basement level are known.

Total and differential settlement of the piles are expected to be less than 10 mm.

8.1.2 Additional Comments for Pile Foundations

To achieve the capacity given previously, the pile-driving hammer must seat the pile in the overburden without overstressing the pile material. For guidance purposes, it is estimated that a hammer with rated energy of 54 kJ to 70 kJ (40,000 to 52,000 ft. lbs.) per blow would be required to drive the piles to practical refusal. Practical refusal is considered to have been achieved at a set of 5 blows for 6 mm or less of pile penetration. However, the driving criteria for a particular hammer-pile system must be established at the beginning of the project using the Pile Driving Analyzer.

The site is underlain by glacial till with cobbles and boulders in the lower levels. It is therefore recommended that the piles should be equipped with a driving shoe to protect them from damage during driving as per Ontario Provincial Standard Drawing (OPSD) 3001.100, Type II dated November 2010.

A number of test piles should be monitored with the Pile Driving Analyzer during the initial driving and re-striking at the beginning of the project. This monitoring will allow for the evaluation of transferred energy into the pile from the hammer, determination of driving criteria and an evaluation of the ultimate bearing capacity of the piles. Depending on the results of the pile driving analysis, the pile capacity may have to be proven by at least one pile load test for each pile type before production piling begins. If necessary, the pile load test should be performed in accordance with ASTM D 1143.

Closed end pipe piles tend to displace a relatively large volume of soil. When driven in a cluster or group, they may tend to jack up the adjacent piles in the group. In addition, since the on-site silty clay is very weak, it is susceptible to liquefaction during pile driving, in which case large displacements of the piles already driven may result. Consequently, the elevation and the location of the top of each pile in a group should be monitored immediately after driving and after all the piles in the group have been driven. This is to ensure that the piles are not heaving or being displaced. Any piles found to heave more than 3 mm should be re-tapped.

Piles driven at the site may be subject to relaxation i.e. loss of set with time. It is therefore recommended that all the piles should be re-tapped at least 24 hours after initially driving and at 24-hour intervals thereafter until it can be proven that relaxation is no longer a problem.

The installation of the piles at the site should be monitored on a full-time basis by a geotechnician working under the direction and supervision of a qualified geotechnical engineer to verify that the piles are driven in accordance with the project specifications.

The concrete grade beams and pile caps for heated structures should be protected from frost action by providing the beams and caps with 1.5 m of earth cover. For non-heated structures, the pile caps and beams should be provided with 2.4 m of earth cover in areas where the snow will be removed and 2.1 m of earth cover where the snow will not be removed. Alternatively, frost protection may be provided by rigid insulation or a combination of rigid insulation and earth cover.

A 50 mm thick concrete mud slab is recommended to installed under the grade beams and pile caps immediately upon excavation and approval of the subgrade to protect the surface of the clay from disturbance from water, the effects from the weather and foot traffic from construction workers.

Temporary granular roads and mats (at least 900 mm thick) will be required to provide access to the pile driving rig. The thickness of the required granular mat will have to be established by the piling contractor, based on the type of piling rig that will be used on site and subsurface condition.

The recommended factored geotechnical resistances at ULS have been calculated by EXP from the borehole information for the design stage only. The investigation and comments are necessarily on-going as new information of underground conditions becomes available. For example, more specific information is available with respect to conditions between boreholes, when foundation construction is underway. The interpretation between boreholes and the recommendations of this report must therefore be checked through field monitoring provided by an experienced geotechnical engineer to validate the information for use during the construction stage.

9. Floor Slab and Drainage Requirements

The basement floor and the ground floor in the non-basement areas of the building may be constructed on an engineered fill pad in accordance with section 7.0 of this report. The floor slab should be set on a bed of well-packed 19 mm clear stone at least 200 mm thick placed on the engineered fill pad. The clear stone would prevent the capillary rise of moisture from the sub-soil to the floor slab. Alternatively, the clear stone layer may be replaced with a 200 mm thick OPSS Granular A compacted to 100 percent SPMDD and overlain by a vapour barrier. Adequate saw cuts should be provided in the floor slab to control cracking.

Reference is made to the previous comments dealing with dewatering of the site prior to excavation and construction.

A perimeter drainage system should be installed around the proposed new building and basement area. It is anticipated that the basement floor of the building will be located below the groundwater level and as such will require an underfloor drainage system. The need for an underfloor drainage system for non-basement areas will have to be assessed once the lowest floor slab elevation is known and compared with the groundwater level.

The perimeter and underfloor drainage system should be connected to separate sumps equipped with backup (redundant) pumps and generators in case of mechanical failure and/or power outage, so that at least one system would be operational should the other fail.

The finished ground floor slab should be set at least 150 mm higher than the finished exterior grade.

The finished exterior grade should be sloped away from the building to prevent ponding of surface water close to the exterior walls of the proposed building.

10. Lateral Earth Pressure Against Subsurface Basement Walls

The subsurface basement walls of the building should be backfilled with free draining material, such as OPSS Granular B Type II compacted to 95 percent SPMDD and equipped with a perimeter drainage system to prevent the buildup of hydrostatic pressure behind the walls. The walls will be subjected to lateral static and dynamic (seismic) earth forces. The expressions below assume free draining backfill material, a perimeter drainage system, level backfill surface behind the wall and vertical face on the back side of the wall.

For design purposes, the lateral static earth thrust against the subsurface walls may be computed from the following equation:

$$P = K_0\, h\, (½\, \gamma h + q)$$

where P = lateral earth thrust acting on the subsurface wall, kN/m

K_0 = lateral earth pressure at rest coefficient, assumed to be 0.5 for Granular B Type II backfill material

γ = unit weight of free draining granular backfill; Granular B Type II = 22 kN/m^3

h = depth of point of interest below top of backfill, m

q = surcharge load stress, kPa

The lateral dynamic thrust may be computed from the equation given below:

$$\Delta_{Pe} = \gamma H^2 \frac{a_h}{g} F_b$$

where Δ_{Pe} = dynamic thrust in kN/m of wall

H = height of wall, m

γ = unit weight of backfill material = 22 kN/m^3

$\frac{a_h}{g}$ = earth pressure coefficient = 0.353 as per Table IX of this report

F_b = thrust factor = 1.0

The dynamic thrust does not take into account the surcharge load. The resultant force of the lateral dynamic thrust acts approximately at 0.63H above the base of the wall.

All subsurface walls should be properly waterproofed.

11. Excavation and De-Watering Requirements

11.1 Excess Soil Management

Ontario Regulation 406/19 specifies protocols that are required for the management and disposal of excess soils. As set forth in the regulation, specific analytical testing protocols need to be implemented and followed based on the volume of soil to be managed. The testing protocols are specific as to whether the soil is stockpiled or in-situ. In either scenario, the testing protocols are far more onerous than have been historically carried out as part of standard industry practices. These decisions should be factored in and accounted for prior to the initiation of the project-defined scope of work. EXP would be pleased to assist with the implementation of a soil management and testing program that would satisfy the requirements of Ontario regulation 406/19.

Reference is made to the EXP Phase Two ESA/Soil Characterization report for additional information regarding excess soil management.

11.2 Excavations

Excavations for the construction of the proposed building and installation of the underground services may extend to an approximate maximum depth of 4.0 below existing grade. These excavations will extend through the fill and into the native upper brown silty clay, sandy silty clay and lower grey silty clay. These excavations are anticipated to be below the groundwater level.

Excavations may be undertaken by heavy equipment capable of removing debris within the fill.

Excavations should be completed in accordance with the Occupational Health and Safety Act (OHSA), Ontario, Reg. 213/91. Based on the definitions provided in OHSA, the subsurface soils at the site are considered to be Type 3 soil. As per OHSA, the sidewalls of open cut excavations undertaken within Type 3 soil, must be sloped back at 1H:1V from the bottom of the excavation. Within zones of seepage and below the groundwater level, the excavation side slopes are expected to slough and eventually stabilize at a gradient of 2H:1V to 3H:1V from the bottom of the excavation.

If side slopes cannot be achieved due to space restrictions on site such as the proximity of open cut excavations to the property limits or existing infrastructure, the new building construction would have to be undertaken within the confines of an engineered support system (shoring system) that may be designed to cut-off groundwater flows into the excavation (sheeting-type shoring system).

The need for a shoring system, the most appropriate type of shoring system and the design and installation of the shoring system should be determined by the contractors bidding on this project. The design of the shoring system should be undertaken by a professional engineer experienced in shoring design and the installation of the shoring system should be undertaken by a contractor experienced in the installation of shoring systems. The shoring system should be designed and installed in accordance with latest edition of Ontario Regulation 213/91 under the OHSA and the 2023 Fifth Edition of the Canadian Foundation Engineering Manual (CFEM). For tiebacks that may be required to laterally support the shoring system and will extend onto neighboring properties, permission may need to be obtained from the neighboring property owners.

Base heave type failure for excavations that extend to a 4.0 m depth below existing grade into the lower grey silty clay is not anticipated.

A pre-construction condition survey of buildings and infrastructure within the influence zone of the construction should be undertaken prior to start of construction activities.

The native upper brown silty clay, sandy silty clay and lower grey silty clay are susceptible to disturbance due to the movement of construction equipment and personnel on its surface. It is therefore recommended that the excavation

at the site should be undertaken by equipment that does not need to travel on the excavated surface, such as a gradall or mechanical shovel.

Many geologic materials deteriorate rapidly upon exposure to meteorological elements. Unless otherwise specifically indicated in this report, walls and floors of excavations must be protected from moisture, desiccation, frost action throughout the course of construction.

11.3 De-Watering Requirements

Above the groundwater level, seepage of surface and subsurface water into the excavations is anticipated. It should be possible to remove surface and subsurface water by pumping from sumps. In areas of high infiltration or in areas where more permeable soil layers may exist, a higher seepage rate should be anticipated and may require high-capacity pumps to keep the excavation dry (may need to operate 24 hours a day, seven (7) days a week).

Existing ditches may need to be relocated and drainage of surface water in the ditches may be required by draining and pumping the water from low points (sumps).

The excavation for the construction of the proposed building is anticipated to extend below the groundwater level into the upper brown silty clay, sandy silty clay and into the underlying grey silty clay. The sandy silty clay below the groundwater level is susceptible to instability or failure of the base of the excavation. To minimize failure of the base of the excavation, to maintain stability of the excavation side slopes and to permit the excavation and construction activities to be undertaken in relatively dry conditions, it will be necessary to lower the groundwater table at the site to below the final excavation level prior to the start of the excavation. This may be achieved by installing deep sumps, pumping with high-capacity pumps and pumping on a continuous basis (such as twenty-four (24) hours a day, seven (7) days a week). The groundwater level should be lowered and maintained to at least 1.0 m below the bottom of the excavation until construction below grade has been completed. Standpipes should also be installed to monitor the groundwater level during initial groundwater lowering and during construction. A specialized dewatering contractor should be consulted to determine the most appropriate dewatering method for the site conditions to allow for the construction to be undertaken in relatively dry conditions.

Alternatively, the excavation may be shored with a shoring system that is designed to support the excavation sidewalls and designed to cut-off groundwater flows into the excavation (sheeting-type shoring system). Seepage of groundwater into the shored excavation should still be anticipated but may be removed by collecting the water at low points within the excavation and pumping from sumps. In areas of high infiltration, a higher seepage rate should be anticipated and high-capacity pumps may be required to keep the shored excavation dry.

Reference is made to the EXP hydrogeological investigation report regarding anticipated groundwater quantities and Environmental Activity and Sector Registry (EASR) and Permit to Take Water (PTTW) requirements.

Although this investigation has estimated the groundwater levels at the time of the fieldwork, and commented on dewatering and general construction problems, conditions may be present which are difficult to establish from standard boring and excavating techniques and which may affect the type and nature of dewatering procedures used by the contractor in practice. These conditions include local and seasonal fluctuations in the groundwater table, erratic changes in the soil profile, thin layers of soil with large or small permeabilities compared with the soil mass, etc. Only carefully controlled tests using pumped wells and observation wells will yield the quantitative data on groundwater volumes and pressures that are necessary to adequately engineer construction dewatering systems.

12. Pipe Bedding Requirements

The depth at which municipal services will be installed is anticipated to be approximately 3.0 m to 4.0 m depths below existing grade. Therefore, the subgrade for the underground service pipes is expected to consist of sandy silty clay to silty clay and are expected to be below the groundwater level.

The bedding for the underground services including material specifications, thickness of cover material and compaction requirements conform to municipal requirements and/or Ontario Provincial Standard Specification and Drawings (OPSS and OPSD).

It is recommended that the pipe bedding be 300 mm thick and consist of OPSS Granular A. The bedding material should be placed along the sides and on top of the pipe to provide a minimum cover of 300 mm. The bedding should be compacted to at least 98 percent of the SPMDD.

The bedding thickness may be further increased in areas where the subgrade becomes disturbed. Trench base stabilization techniques, such as the removal of loose/soft material, placement of additional sub-bedding, consisting of Ontario Provincial Standard Specification (OPSS) Granular B Type II completely wrapped in a non-woven geotextile, may be used if trench base disturbance becomes a problem in wet or soft/loose areas.

To minimize settlement of the pavement structure over services trenches, the trench backfill material within the frost zone, to 1.8 m depth below final grade, should match the existing material along the trench walls to minimize differential frost heaving of the subgrade soil, provided this material is compactible. Otherwise, frost tapers may be required.

If the backfill in the service trenches will consist of granular fill, clay seals should be installed in the service trenches at select intervals (spacing) as per City of Ottawa Drawing No. S8. The seals should be 1 m wide, extend over the entire trench width and from the bottom of the trench to the underside of the pavement structure. The clay should be compacted to 95 percent SPMDD. The purpose of the clay seals is to prevent the permanent lowering of the groundwater level.

The municipal services should be installed in short open trench sections that are excavated and backfilled the same day.

13. Backfilling Requirements and Suitability of On-Site Soils for Backfilling Purposes

The materials to be excavated from the site will comprise of surficial and buried topsoil/organic soil, fill upper brown silty clay, brown to grey sandy silty clay and lower grey silty clay. From a geotechnical perspective, the excavated topsoil/organic soil and fill are not considered suitable for reuse as backfill material in the interior or exterior of the new building and should be discarded. These soils (free of debris) may be used for general grading purposes in landscaped areas. Portions of the excavated fill (free of rootlets, roots, grass shoots and debris) above the groundwater level may be re-used as fill in locations away from the proposed building as backfill in service trenches and subgrade fill in paved and landscaped areas, subject to further geotechnical examination and testing during construction. These soils are subject to moisture absorption due to precipitation and must be protected at all times from the elements. Subject to additional examination and testing during construction, portions of the upper silty clay, sandy silty clay and lower grey silty clay above the groundwater level, may be re-used as fill in locations away from the proposed building as backfill in service trenches and subgrade fill in paved and landscaped areas, but will likely require air-drying to reduce the moisture content to compact the materials to the specified degree of compaction. Air-drying may be problematic (difficult) since it is weather dependent, may take time and the soils are subject to moisture absorption from precipitation and must be protected at all times from the elements.

Therefore, it is anticipated that the majority of the material required for backfilling purposes in the interior and exterior of the proposed building and in the underground service trenches will need to be imported and should preferably conform to the following specifications:

- Fill beneath floor slabs and against basement walls inside the proposed building – OPSS Granular B Type II placed in 300 mm thick lifts and each lift compacted to 98 percent SPMDD,
- Backfill material against grade beams and foundation walls located outside the proposed building – OPSS Granular B Type II placed in 300 mm thick lifts and each lift compacted to 95 percent SPMDD,
- Trench backfill and subgrade fill should consist of OPSS Granular B Type I or OPSS Select Subgrade Material (SSM) placed in 300 mm thick lifts and each lift compacted to 95 percent SPMDD; and
- Landscaped areas - Clean fill that is free of organics and deleterious material, cobbles and boulders and is placed in 300 mm thick lifts with each lift compacted to 92 percent of the SPMDD.

14. Access Roads and Parking Lots

Pavement structures for the surface parking lots and access roads are given on Table XI below for the anticipated silty clay, sandy silty clay and prepared fill subgrades. The pavement structures are based upon the assumption that the subgrade will be properly prepared and assumes a functional design life of 15 years to 18 years. The proposed functional design life represents the number of years to the first rehabilitation, assuming regular maintenance is carried out.

Table XI: Recommended Pavement Structure Thicknesses

Pavement Layer	Compaction Requirements	Light Duty Traffic (Cars)	Heavy Duty Traffic (Fire Trucks/Garbage Trucks)
Asphaltic Concrete (PG 58-34)	92 percent to 97 percent MRD*	65 mm HL3/SP12.5 Cat C	50 mm HL3/SP12.5 Cat C 60 mm HL8 SP19.0 Cat C
OPSS 1010 Granular A Base	100 percent SPMDD**	150 mm	150 mm
OPSS 1010 Granular B Sub-Base Type II	100 percent SPMDD**	450 mm	600 mm

Notes:
*Denotes maximum relative density.
** Denotes standard Proctor maximum dry density, ASTM-D698-12e2.
-The upper 300 mm of the subgrade fil must be compacted to 98 percent SPMDD.

The foregoing design assumes that construction is carried out during dry periods and that the subgrade is stable under the load of construction equipment. If construction is carried out during wet and, heaving or rolling of the subgrade is experienced, additional thickness of granular material may be required in addition to a woven geotextile.

Additional comments on the construction of the parking lots and access roads are as follows:

1. As part of the subgrade preparation, the proposed parking areas and access roads should be stripped of topsoil and other obviously unsuitable material. The subgrade should be properly shaped, crowned, then proofrolled with a heavy vibratory roller in the full-time presence of a representative of this office. Any soft or spongy subgrade areas detected should be sub excavated and properly replaced with suitable approved backfill compacted to 95 percent SPMDD (ASTM D698-12e2).
2. The long-term performance of the 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. The need for adequate drainage cannot be over-emphasized. Subdrains should be installed on both sides of the access road(s). Subdrains must be installed in the proposed parking area at low points and should be continuous between catchbasins to intercept excess surface and subsurface moisture and to prevent subgrade softening. The subdrains may also drain into open drainage ditches located along the sides of the access roads and parking lots to provide drainage of the pavement structure. This will ensure no water collects in the granular course, which could result in pavement failure during the spring thaw. The location and extent of subdrains and open drainage ditches required within the paved areas should be reviewed by this office in conjunction with the proposed site grading.
3. To minimize the problems of differential movement between the pavement and catchbasins/manhole due to frost action, the backfill around the structures should consist of free-draining granular preferably conforming to OPSS Granular B Type II material. Weep holes should be provided in the catchbasins/manholes to facilitate drainage of any water that may accumulate in the granular fill.

4. The most severe loading conditions on light-duty pavement areas and the subgrade may occur during construction. Consequently, special provisions such as restricted lanes, half-loads during paving, temporary construction roadways, etc., may be required, especially if construction is carried out during unfavorable weather.
5. The finished pavement surface should be free of depressions and should be sloped (preferably at a minimum cross fall of 2 percent) to provide effective surface drainage towards catch basins. Surface water should not be allowed to pond adjacent to the outside edges of paved areas.
6. Relatively weaker subgrade may develop over service trenches at subgrade level. These areas may require the use of thicker/coarser sub-base material and the use of a geotextile at the subgrade level. If this is the case, it is recommended that additional 150 mm of granular sub-base, OPSS Granular B Type II or should be provided in these areas, in addition to the use of a geotextile at the subgrade level.
7. The granular materials used for pavement construction should conform to Ontario Provincial Standard Specifications (OPSS 1010) for Granular A and Granular B Type II and should be compacted to 100 percent of the SPMDD.

The asphaltic concrete used, and its placement should meet OPSS 1150 or 1151 requirements. It should be compacted from 92 percent to 97 percent of the MRD (ASTM D2041). Asphalt placement should be in accordance with OPSS 310 and OPSS 313.

It is recommended that EXP be retained to review the final pavement structure design and drainage plans prior to construction to ensure they are consistent with the recommendations of this preliminary geotechnical report.

15. Subsurface Concrete and Steel Requirements

Chemical tests limited to pH, chloride, sulphate and resistivity were performed on six (6) selected soil samples. The laboratory certificate of analysis is attached in Appendix E and the results are summarized in Table XII.

Table XII: Results of pH, Chloride, Sulphate and Resistivity Tests on Soil Samples

Borehole No. - Sample No.	Depth (m)	Soil Type	pH	Sulphate (%)	Chloride (%)	Resistivity (ohm-cm)
BH 24-02: SS3	1.5-2.1	Sandy Silty Clay	8.50	0.0059	0.0011	5155
BH 24-02: SS8	6.1-6.7	Grey Silty Clay	8.45	0.0124	0.0007	3247
BH 24-15: SS4	2.3-2.9	Sandy Silty Clay	8.11	0.0113	0.0007	6452
BH 24-15: SS8	6.1-6.7	Grey Silty Clay	8.38	0.0097	0.0006	3650
BH 24-21: SS3	1.5-2.1	Sandy Silty Clay	8.44	0.0069	0.0004	8850
BH 24-21: SS5	3.0-3.6	Grey Silty Clay	8.45	0.0069	0.0004	5319

The test results indicate the tested soil samples have a have a negligible potential of sulphate attack on subsurface concrete. The concrete should be designed in accordance with Table Nos. 3 and 6 of CSA A.23.1-19. However, the concrete should be dense, well compacted and cured.

Based on a review of the resistivity test results, the tested soil samples are considered to be mildly corrosive to bare steel as per the National Association of Corrosion Engineers (NACE). Appropriate measures should be undertaken to protect buried steel elements from corrosion.

16. Tree Planting Restrictions

The site is underlain by a shallow sensitive marine silty clay. The laboratory test results (grain size analysis and Atterberg limit determinations) of the silty clay were compared with the document titled, Tree Planting in Sensitive Marine Clay Soils – 2017 City of Ottawa Guidelines (2017 Guidelines) and indicate the silty clay has a low/medium potential for soil volume change. For soils that have a low/medium potential for soil volume change, tree planting should be in accordance with the 2017 Guidelines.

17. General Comments

The comments given in this report are intended only for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions, between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc., would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well, as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

The information contained in this report is not intended to reflect on environmental aspects of the soils. Should specific information be required, including for example, the presence of pollutants, contaminants or other hazards in the soil, additional testing may be required. Reference is made to the EXP Phase One Environmental Site Assessment (ESA)/ Assessment of Past Uses, Phase Two ESA/Soil Characterization and Hydrogeological Investigation reports regarding the environmental aspects of the subsurface soils and the groundwater.

We trust that the information contained in this geotechnical report will be satisfactory for your purposes. Should you have any questions, please do not hesitate to contact this office.

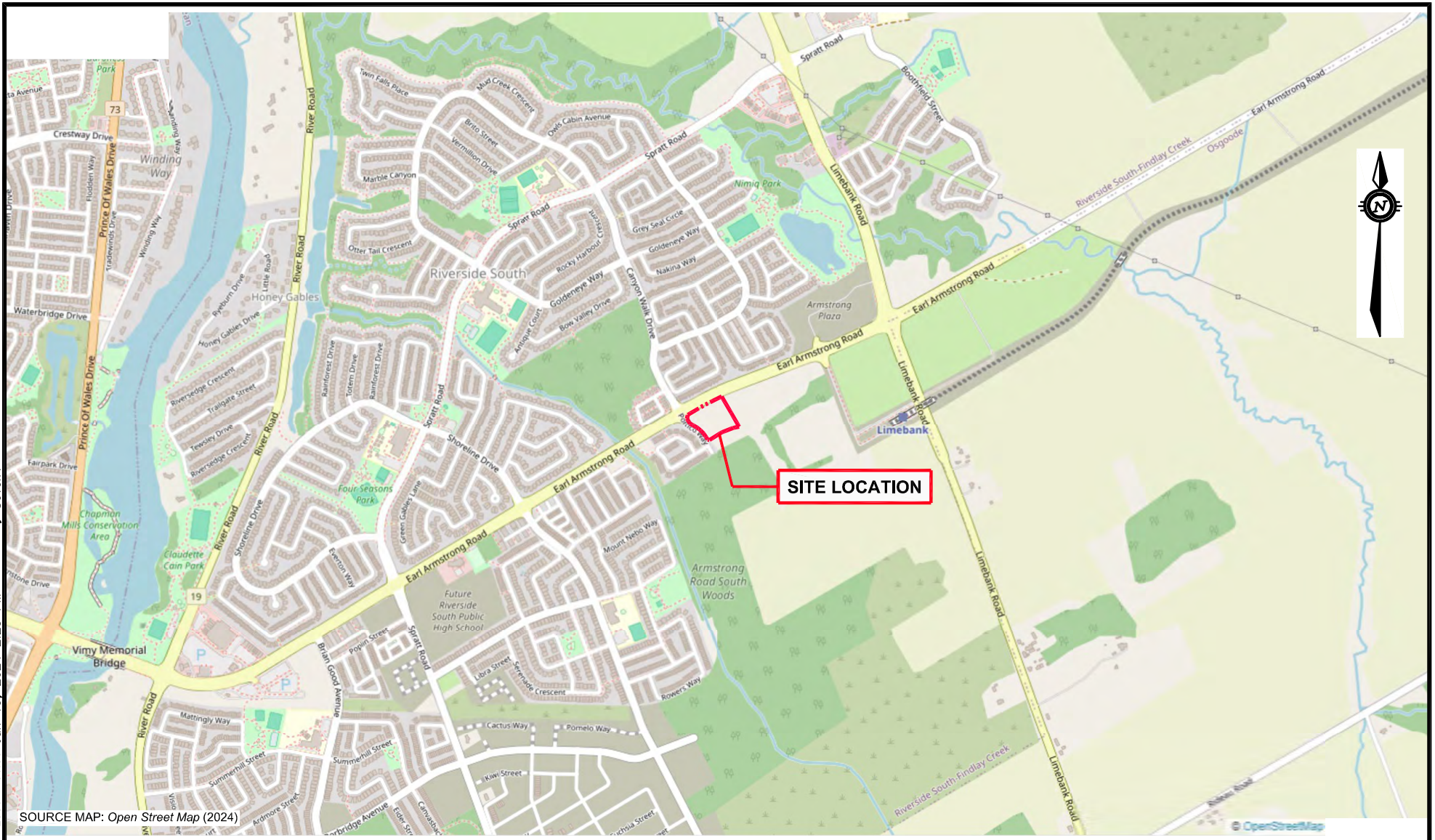
Sincerely,

EXP Services Inc.

Susan M. Potyondy, P.Eng.
Senior Geotechnical Engineer
Earth & Environment

Ismail M. Taki, M.Eng., P.Eng.
Senior Manager, Eastern Region
Earth & Environment

Figures



LEGEND

APPROXIMATE SITE BOUNDARY

0 200m 400m 800m

HORIZONTAL 1:20,000

exp Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6
www.exp.com

DESIGN	IT/SP
DRAWN	AS
DATE	JUNE 2024
FILE NO	OTT-24005069-A0

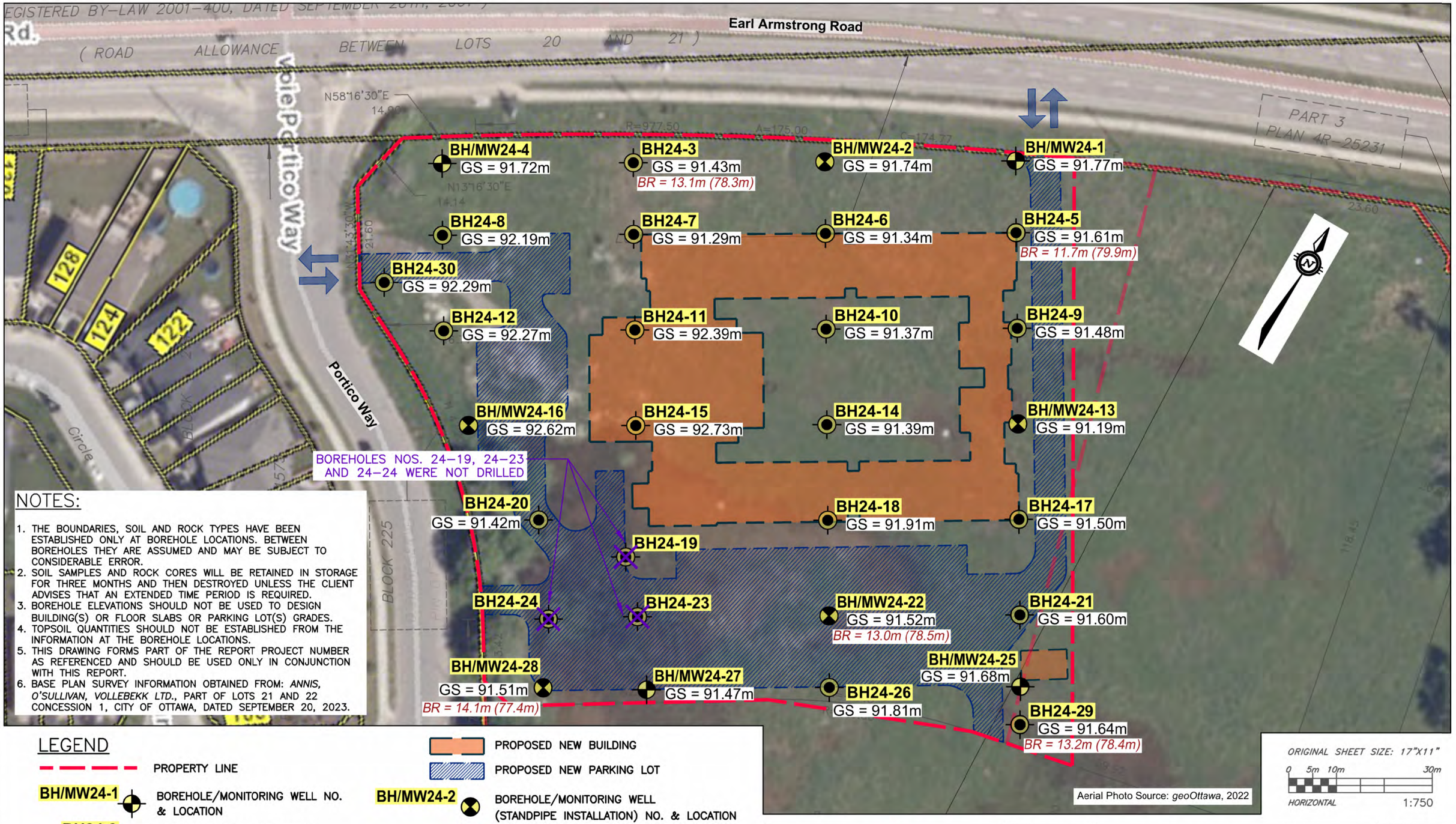
GEOTECHNICAL INVESTIGATION
980 EARL ARMSTRONG ROAD, OTTAWA, ON

SITE LOCATION PLAN

SCALE 1:20,000

SKETCH NO FIG 1

Filename: E:\OTT\OTT-24005069-A0\60 Execution\65 Drawings\Geotechnical\OTT-24005069-A0_980-Earl-Armstrong-Rd_Geo.dwg
Last Saved: Jun 19, 2024 2:23 PM Last Plotted: Jun 19, 2024 2:23 PM Plotted by: SeverA



NOTES:

1. THE BOUNDARIES, SOIL AND ROCK TYPES HAVE BEEN ESTABLISHED ONLY AT BOREHOLE LOCATIONS. BETWEEN BOREHOLES THEY ARE ASSUMED AND MAY BE SUBJECT TO CONSIDERABLE ERROR.
2. SOIL SAMPLES AND ROCK CORES WILL BE RETAINED IN STORAGE FOR THREE MONTHS AND THEN DESTROYED UNLESS THE CLIENT ADVISES THAT AN EXTENDED TIME PERIOD IS REQUIRED.
3. BOREHOLE ELEVATIONS SHOULD NOT BE USED TO DESIGN BUILDING(S) OR FLOOR SLABS OR PARKING LOT(S) GRADES.
4. TOPSOIL QUANTITIES SHOULD NOT BE ESTABLISHED FROM THE INFORMATION AT THE BOREHOLE LOCATIONS.
5. THIS DRAWING FORMS PART OF THE REPORT PROJECT NUMBER AS REFERENCED AND SHOULD BE USED ONLY IN CONJUNCTION WITH THIS REPORT.
6. BASE PLAN SURVEY INFORMATION OBTAINED FROM: *ANNIS, O'SULLIVAN, VOLLEBEKK LTD.*, PART OF LOTS 21 AND 22 CONCESSION 1, CITY OF OTTAWA, DATED SEPTEMBER 20, 2023.

LEGEND

- PROPERTY LINE
- BH/MW24-1 — BOREHOLE/MONITORING WELL NO. & LOCATION
- BH24-3 — BOREHOLE NO. & LOCATION
- GS = 91.77m — GS = GROUND SURFACE ELEVATION (m)
- BR = 13.1m (78.3m) — BR = BEDROCK DEPTH (ELEVATION) (m)
- PROPOSED NEW BUILDING
- PROPOSED NEW PARKING LOT
- BH/MW24-2 — BOREHOLE/MONITORING WELL (STANDPIPE INSTALLATION) NO. & LOCATION
- NOT DRILLED

NOTE:
BOREHOLE NOS. 24-19, 24-23 AND 24-24 WERE NOT DRILLED. BOREHOLES COULD NOT BE ACCESSED BY THE DRILL RIG DUE TO PONDED SURFACE WATER.

Aerial Photo Source: *geoOttawa*, 2022

ORIGINAL SHEET SIZE: 17"X11"
0 5m 10m 30m
HORIZONTAL 1:750

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Ottawa, ON K2B 8H6
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DRAWN	AS
DATE	JULY 2024
FILE NO	OTT-24005069-A0

GEOTECHNICAL INVESTIGATION
980 EARL ARMSTRONG ROAD, OTTAWA, ON

BOREHOLE LOCATION PLAN

SCALE 1:750
SKETCH NO FIG 2

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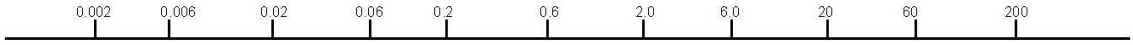
Notes On Sample Descriptions

1. All sample descriptions included in this report follow the Canadian Foundations Engineering Manual soil classification system. This system follows the standard proposed by the International Societv for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by **exp** Services Inc. also follow the same system. Different classification systems may be used by others; one such system is the Unified Soil Classification. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

Log of Borehole MW24-01

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 3

Page. 1 of 1

Date Drilled: 'June 6, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: M.Z. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits ⊢○ | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~125 mm thick	91.77	0				
		FILL Silty clay, brown, damp, no odours, no stains, (loose)	91.6		9		SS1	
		TOPSOIL ~ 50 mm thick	91.0					
		SILTY CLAY Light brown to reddish brown, moist, no odours, no stains, (stiff)	90.7	1	14		SS2	
		SANDY SILTY CLAY Low plasticity, light brown, moist, no odours, no stains, (soft to stiff)	90.27 / 90.1	2	9		SS3	
					3		SS4	
				3	72 kPa, s=6.0		V5	
		SILTY CLAY Grey, wet, no odours, no stains, (firm to stiff)	88.2		Hammer Weight		SS6	
				5	43 kPa, s=6.0			
					Hammer Weight		SS7	
				6	77 kPa, s=7.7			
				7	Hammer Weight		SS8	
		GLACIAL TILL Silty clay to clayey silt of low plasticity, some gravel and sand, possible cobbles and boulders, grey, wet, no odours, no stains, (loose)	84.2 / 83.7	8	9		SS9	

Borehole Terminated at 8.1 m Depth

Note:
1) V5 -Soil sample taken from vane.
2) SS1 & SS6 and duplicate samples of SS1&SS6 submitted for environmental laboratory analyses.

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 50 mm diameter monitoring well installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
Upon Completion	no water	no cave-in
Jun 19, 2024	1.5	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

Log of Borehole MW24-02

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 4

Page. 1 of 1

Date Drilled: 'June 4, 2024

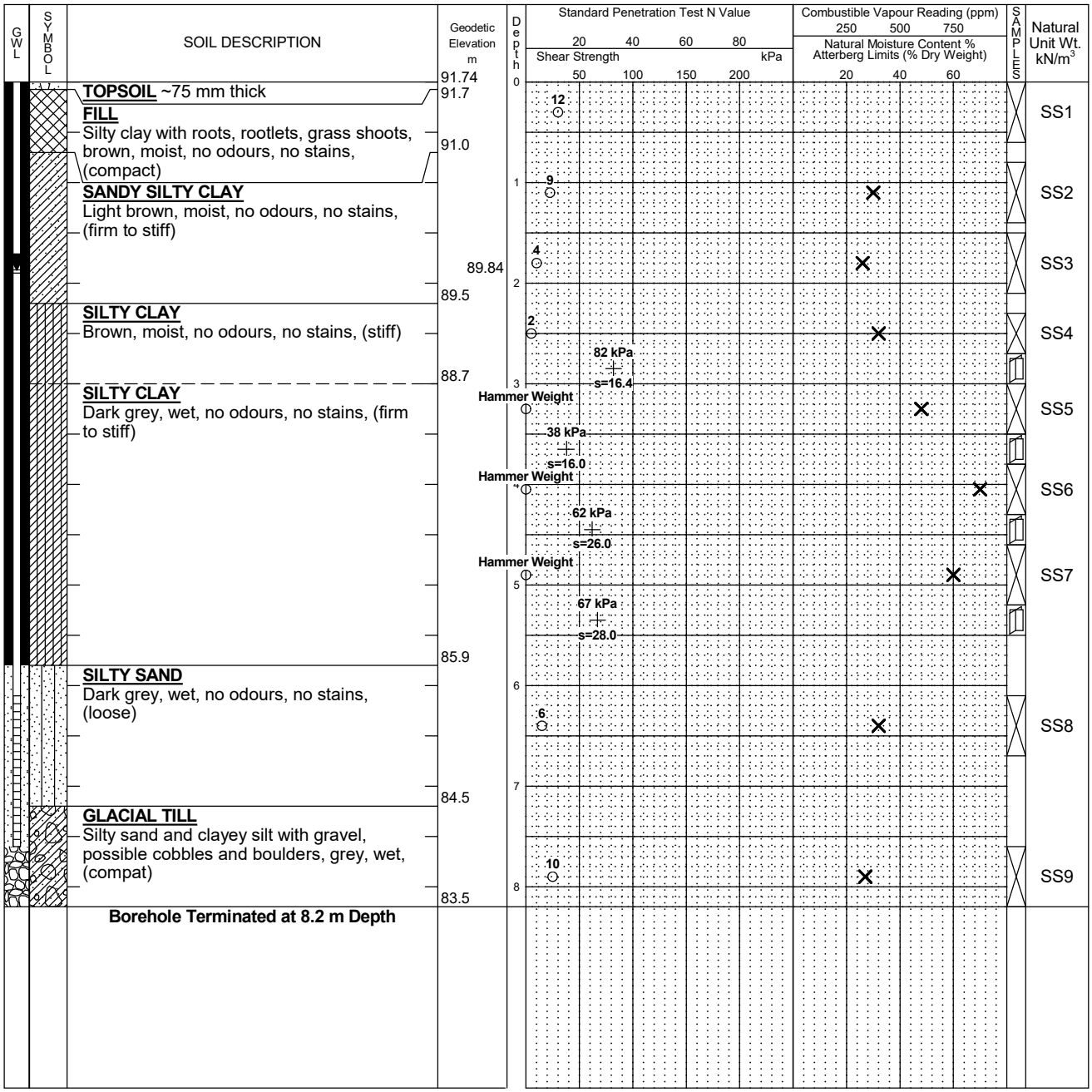
Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲



LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 19 mm diameter monitoring well installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
Upon Completion	no water	no cave-in
Jun 21, 2024	1.9	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

Log of Borehole BH 24-03

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 5

Page. 1 of 2

Date Drilled: 'June 13, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		TOPSOIL ~ 125 mm thick	91.43	0
		FILL	91.3	
		Silty clay with roots, rootlets, grass shoots, brown, moist, no odours, no stains, (loose)	90.7	
		SANDY SILTY CLAY Light brown, moist, no odours, no stains, (firm)		1
				2
			88.4	3
		SILTY CLAY Grey, wet, no odours, no stains, (firm to stiff)		
				4
				5
				6
		With frequent silt seams from 6.1 m to 6.7 m depths		
			84.7	7
		SILT Trace gravel, grey, wet, no odours, no stains, (compact)		
		Borehole advanced by casing and wash-boring method from 7.6 m to 13.0 m depths.		8
			82.3	9
		GLACIAL TILL Silty sand with gravel, possible cobbles and boulders, some clay, grey, moist, (compact)		10

Standard Penetration Test N Value (20 40 60 80) / Shear Strength (50 100 150 200 kPa)

Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)

SAMPLES	Natural Unit Wt. kN/m³	Standard Penetration Test N Value	Shear Strength	Combustible Vapour Reading (ppm)	Natural Moisture Content % Atterberg Limits (% Dry Weight)
SS1		7		×	
SS2		6		×	
SS3		4		×	
ST4					
			43 kPa, s=18.0		
SS5		Hammer Weight		×	
			77 kPa, s=16.0		
SS6		Hammer Weight		×	
			67 kPa, s=28.0		
SS7		1		×	
SS8		10		×	

Continued Next Page

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	13 - 13.9	95	34
2	13.9 - 15.4	100	95

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole BH 24-03

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Figure No. 5

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		GLACIAL TILL Silty sand with gravel, possible cobbles and boulders, some clay, grey, moist, (compact) *(continued)*	81.43	10	18		SS9	
				11				
				12				
			78.4	13			Run 1	
		LIMESTONE BEDROCK Grey		14			Run 2	
			76.0	15				
		Borehole Terminated at 15.4 m Depth						

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	13 - 13.9	95	34
2	13.9 - 15.4	100	95

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole MW24-04

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 6

Page. 1 of 1

Date Drilled: 'June 5, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits ⊢○ | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
	TOPSOIL ~50 mm thick	91.72	0				
	FILL Silty clay with roots, rootlets, grass shoots, brown, moist, no odours, no stains, (compact)	91.7		14		SS1	
		91.0	1	9, 170 kPa		SS2	
	SILTY CLAY Brown, moist, no odours, no stains, (very stiff)	90.3					
	SANDY SILTY CLAY Light brown, moist, no odours, no stains, (soft to firm)	89.92	2	4		SS3	
		89.1		2		SS4	
	SILTY CLAY Grey, wet, no odours, no stains, (firm to stiff)		3	38 kPa, s=16.0, Hammer Weight		SS5	
			4	48 kPa, s=20.0, Hammer Weight		SS6	
			5	62 kPa, s=13.0, Hammer Weight		SS7	
			6	62 kPa, s=26.0, Hammer Weight		SS8	
	With frequent silt seams from 6.1 m to 6.6 m depths		7				
	GLACIAL TILL Silty sand to silty clay with gravel, possible cobbles and boulders, grey, moist, (loose)	85.1	8	4		SS9	
		83.5					

Borehole Terminated at 8.2 m Depth

Note:

1) SS2 & SS6 samples submitted for environmental laboratory analyses.

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 50 mm diameter monitoring well installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
June 19, 2024	1.8	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole BH 24-05

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 7

Page. 1 of 2

Date Drilled: 'June 13, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		TOPSOIL ~50 mm thick	91.61	0
		FILL	91.6	
		Silty clay with roots, rootlets, grass shoots, brown, moist, no odours, no stains, (loose)	90.9	
		SANDY SILTY CLAY Medium plasticity, light brown, moist, no odours, no stains, (soft to firm)		1
				2
			88.6	3
		SILTY CLAY Grey, wet, no odours, no stains, (firm to stiff)		
				5
			85.8	6
		GLACIAL TILL Silty sand to silty clay with gravel, possible cobbles and boulders, some clay, grey, moist, (loose to very dense)		
		Borehole advanced by casing and wash-boring method from 7.6 m to 10.2 m depths.		8
				9
				10

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60

SPT values: 8 (SS1), 7 (SS2), 4 (SS3), 3 (SS4), Hammer Weight (SS5), 38 kPa, s=16.0, Hammer Weight (SS6), 67 kPa, s=28.0, Hammer Weight (SS7), 5 (SS8), 77 (SS9)

SAMPLES	Natural Unit Wt. kN/m³
SS1	
SS2	
SS3	
SS4	
SS5	
SS6	
SS7	
SS8	
SS9	

Continued Next Page

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	10.2 - 10.8	0	0
2	10.8 - 12.4	81	49
3	12.4 - 13.9	95	34
4	13.9 - 15.5	100	77

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole BH 24-05

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Figure No. 7

Page. 2 of 2

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		GLACIAL TILL Silty sand to silty clay with gravel, possible cobbles and boulders, some clay, grey, moist, (loose to very dense) *(continued)*	81.61	10	20 40 60 80 / 50 100 150 200	250 500 750 / 20 40 60	Run 1	
				11			Run 2	
			79.9	12				
		LIMESTONE BEDROCK Grey		13			Run 3	
				14				
				15			Run 4	
		Borehole Terminated at 15.5 m Depth	76.1					

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	10.2 - 10.8	0	0
2	10.8 - 12.4	81	49
3	12.4 - 13.9	95	34
4	13.9 - 15.5	100	77

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole BH 24-06

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 8

Page. 1 of 1

Date Drilled: 'June 4, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits ⊢○ | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~100 mm thick	91.34	0				
		FILL	91.2					
		Silty clay with roots, rootlets, grass shoots, brown, moist, no odours, no stains, (loose)	90.6					
		SANDY SILTY CLAY						
		Low plasticity, light brown to grey, moist, no odours, no stains, (soft)		1	6		SS1	
					3		SS2	
				2	2		SS3	
					Hammer Weight		SS4	
			88.4	3	34 kPa			
		SILTY CLAY			Hammer Ws=14.0		SS5	
		Dark grey, wet, no odours, no stains, (firm to stiff)			62 kPa			
					s=13.0			
				4	Hammer Weight		SS6	
					72 kPa			
					s=15.0			
					Hammer Weight		SS7	
				5	82 kPa			
					s=11.3			
		With frequent silt seams from 6.1 m to 6.7 m depths		6				
					4		SS8	
			84.6					
		GLACIAL TILL		7				
		Silty sand to silty clay with gravel, possible cobbles and boulders, grey, moist, (loose)			6 then 50 / 100 mm		SS9	
			83.4					
		Sampler Refusal at 7.9 m Depth						

Note:

1) SS1 & SS3 samples submitted for environmental laboratory analyses.

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

Log of Borehole BH 24-07

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 9

Page. 1 of 1

Date Drilled: 'June 5, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		TOPSOIL ~100 mm thick	91.29	0
		FILL	91.2	
		Silty clay, brown, moist, no odours, no stains, (loose)	90.6	
		SANDY SILTY CLAY		1
		Medium plasticity, light brown, moist to wet, no odours, no stains, (soft to firm)		
			89.1	2
		SILTY CLAY		
		Dark grey, wet, no odours, no stains, (firm to stiff)		3
				4
				5
		With frequent silt seams from 6.1 m to 6.7 m depths		6
			84.6	
		GLACIAL TILL		7
		Silty sand to clayey silt with gravel, possible cobbles and boulders, grey, moist, (compact)		
			83.1	8
		Borehole Terminated at 8.2 m Depth		

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60

SAMPLES	Natural Unit Wt. kN/m³	Test Data
SS1		6
SS2		6
SS3		2
SS4		Hammer Weight; 48 kPa; s=10.0
SS5		Hammer Weight; 48 kPa; s=20.0
SS6		Hammer Weight; 77 kPa; s=16.0
SS7		Hammer Weight; 86 kPa; s=18.0
SS8		2
SS9		15

Note:

1) SS1 & SS4 samples submitted for environmental laboratory analyses.

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole BH 24-08

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 10

Page. 1 of 1

Date Drilled: 'June 5, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		FILL ~900 mm thick Silty sand and crushed gravel, brown, moist, (compact)	92.19	0	24	×	SS1	
		SILTY CLAY Brown, moist, no odours, no stains, (hard)	91.3	1	17; 200 kPa	×	SS2	
		SANDY SILTY CLAY Light brown, moist to wet, no odours, no stains, (firm)	90.8	2	6	×	SS3	
					4	×	SS4	
		SILTY CLAY Dark grey, wet, no odours, no stains, (firm to stiff)	89.2	3	Hammer Weight	×	SS5	
					48 kPa; s=20.0			
				4	Hammer Weight	×	SS6	
					53 kPa; s=11.0			
				5	Hammer Weight	×	SS7	
					53 kPa; s=22.0			
		CLAYEY SILT With silt seams, some sand, grey, wet, no odours, no stains, (stiff)	86.4	6	Hammer Weight	×	SS8	
					50 kPa; s=6.0			
		GLACIAL TILL Silty sand with gravel, possible cobbles and boulders, some clay, grey, moist, (compact)	84.9	7				
				8	10	×	SS9	
		Borehole Terminated at 8.2 m Depth	84.0					

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole BH 24-09

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 11

Page. 1 of 1

Date Drilled: 'June 4, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

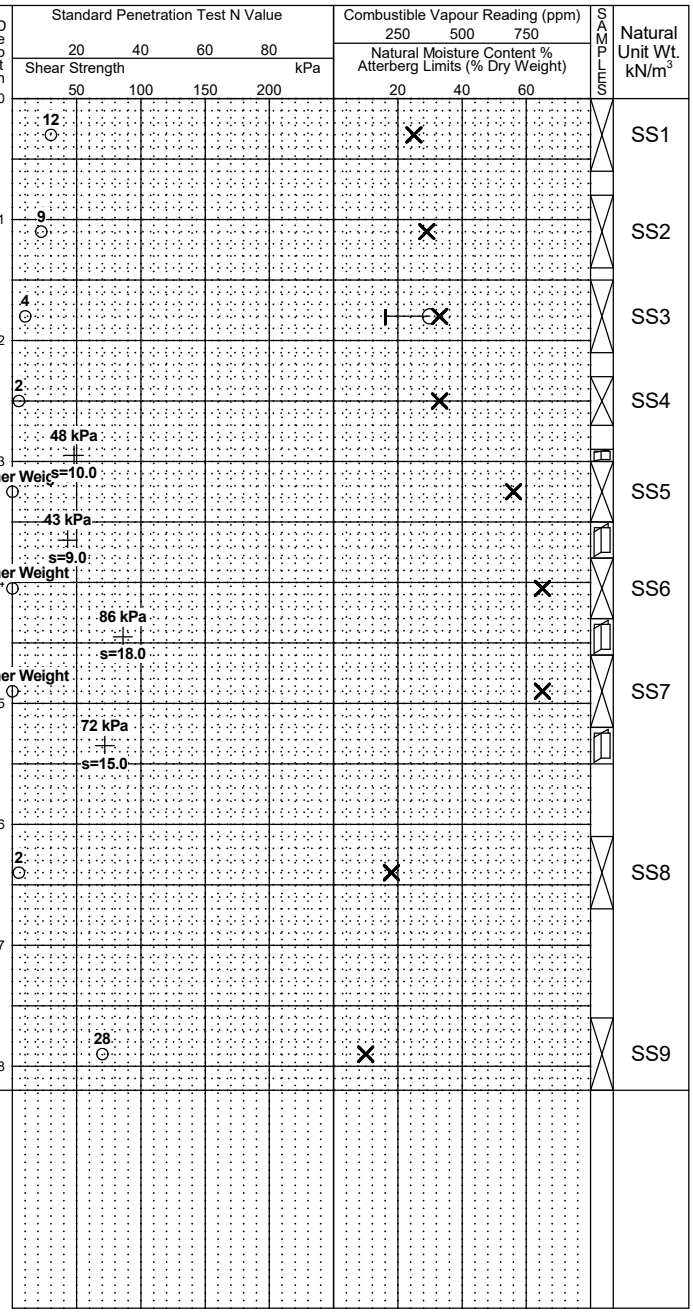
Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		TOPSOIL ~200 mm thick	91.48 / 91.3	0
		FILL Silty clay with roots, rootlets, grass shoots, and wood fragments, brown, moist, no odours, no stains, (compact)	90.8	
		SANDY SILTY CLAY Low to medium plasticity, light brown, moist to wet, no odours, no stains, (firm to stiff)		1
				2
			88.6	3
		SILTY CLAY Dark grey, wet, no odours, no stains, (firm to stiff)		
				4
				5
				6
		GLACIAL TILL Silty sand with gravel, some clay, possible cobbles and boulders, grey, moist, (compact)	85.1	
				7
				8
			83.3	
		Borehole Terminated at 8.2 m Depth		

Note:

1) SS2 & SS5 samples submitted for environmental laboratory analyses.



NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole BH 24-10

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 12

Page. 1 of 1

Date Drilled: 'June 4, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		TOPSOIL ~200 mm thick	91.37	0
		FILL Silty clay, brown, moist, no odours, no stains, (loose)	91.2	
		SANDY SILTY CLAY Medium plasticity, light brown, moist to wet, no odours, no stains, (soft to firm)	90.7	1
				2
			88.5	3
		SILTY CLAY Dark grey, wet, no odours, no stains, (firm to stiff)		4
				5
		With frequent silt seams from 6.1 m to 6.6 m depths		6
		GLACIAL TILL Silty sand with gravel, some clay, possible cobbles and boulders, grey, moist, (loose)	84.8	7
			83.2	8
		Borehole Terminated at 8.2 m Depth		

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60

SAMPLES	Natural Unit Wt. kN/m³	Test Data
SS1		6
SS2		6
SS3		2
SS4		Hammer Weight
SS5		48 kPa; s=20.0; Hammer Weight
SS6		53 kPa; s=22.0; Hammer Weight
SS7		72 kPa; s=15.0; Hammer Weight; 72 kPa; s=30.0
SS8		4
SS9		5

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
Upon Completion	3.0	no cave-in

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole BH 24-11

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 13

Page. 1 of 1

Date Drilled: 'June 6, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~50 mm thick	92.39	0				
		FILL Silty sand and crushed gravel, roots, rootlets, grass shoots, brown, moist, no odour, no stains, (compact)	92.3		14		SS1	
		SILTY CLAY Brown, moist, no odours, no stains, (very stiff)	91.3	1	14; 190 kPa		SS2	
		SANDY SILTY CLAY Low plasticity, light brown, moist to wet, no odours, no stains, (firm to stiff)	90.9	2	9		SS3	
					4		SS4	
				3	2		SS5	
		SILTY CLAY Dark grey, wet, no odours, no stains, (firm to stiff)	89.1		43 kPa; s=18.0; Hammer Weight		SS6	
				4	72 kPa; s=30.0; Hammer Weight		SS7	
				5	48 kPa; s=20.0			
				6	Hammer Weight		SS8	
				7	82 kPa; s=17.0			
		GLACIAL TILL Silty sand with gravel, some clay, possible cobbles and boulders, grey, moist, (loose)	85.2					
				8	6		SS9	
		Borehole Terminated at 8.2 m Depth	84.2					

Note:
1) SS2 & SS4 samples submitted for environmental laboratory analyses.

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole BH 24-12

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 14

Page. 1 of 1

Date Drilled: 'June 6, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits I—○ | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~50 mm thick	92.27	0	18		SS1	
		FILL Silty sand and crushed gravel, some clay, roots, rootlets, grass shoots, brown, moist, no odours, no stains, (compact)	92.2					
		ORGANIC SILTY CLAY ~75 mm thick Dark brown to black, moist, organic odour, no stains	91.4	1	17		SS2	
		SILTY CLAY With rootlets, brown, moist, no odours, no stains, (hard)	91.3	2	10		SS3	
		SANDY SILTY CLAY Low plasticity, light brown to grey, moist to wet, no odours, no stains, (firm)	90.1	3	4		SS4	
					2		SS5	
		SILTY CLAY Dark grey, wet, no odours, no stains, (firm to stiff)	88.7	4	48 kPa s=20.0 Hammer Weight		SS6	
				5	53 kPa s=22.0 Hammer Weight		SS7	
				6	48 kPa s=20.0 Hammer Weight		SS8	
				7	67 kPa s=14.0			
		CLAYEY SILT With silt seams, some sand, grey, wet, no odours, no stains, (very soft)	85.0	8	Hammer Weight		SS9	
		Borehole Terminated at 8.2 m Depth	84.1					

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 50 mm diameter monitoring well installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

Log of Borehole MW24-13

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 15

Page. 1 of 1

Date Drilled: 'June 6, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: M.Z. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~100 mm thick	91.19	0				
		FILL	91.1					
		Silty clay with roots, rootlets, grass shoots, brown, moist, no odours, no stains, (loose)	90.5					
		SANDY SILTY CLAY Medium plasticity, light brown, moist to wet, no odours, no stains, (soft)	90.09	1	4		SS1	
					3		SS2	
				2	2		SS3	
			88.6					
		SILTY CLAY Grey, wet, no odours, no stains, (firm to stiff)		3	Hammer Weight		SS4	
				4	43 kPa, s=9.0			
				5	Hammer Weight		SS5	
					91 kPa, s=5.4			
		With frequent silt seams from 6.1 m to 6.8 m depths		6	2		SS6	
			84.4					
		GLACIAL TILL Sandy silt with gravel, possible cobbles and boulders, grey, wet, (compact)		7	18		SS7	
				8	15		SS8	
			83.0					
		Borehole Terminated at 8.2 m Depth						

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 19 mm diameter monitoring well installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
June 21, 2024	1.1	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole BH 24-14

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 16

Page. 1 of 1

Date Drilled: 'June 7, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~50 mm thick	91.39	0	5		SS1	
		FILL	91.3					
		Silty clay with roots, rootlets, grass shoots, brown, moist, no odours, no stains, (loose)	90.7	1	4		SS2	
		SANDY SILTY CLAY Medium plasticity, light brown, moist to wet, no odours, no stains, (soft to firm)			2		SS3	
			89.2	2	Hammer Weight		SS4	
		SILTY CLAY Grey, wet, no odours, no stains, (firm to stiff)			77 kPa s=16.0			
				3	Hammer Weight		SS5	
					53 kPa s=22.0			
				4	Hammer Weight		SS6	
					48 kPa s=20.0			
					Hammer Weight		SS7	
				5	72 kPa s=15.0			
			85.6					
		GLACIAL TILL Silty sand to silty clay with gravel, possible cobbles and boulders, grey, wet, (very loose to compact)		6	3		SS8	
				7				
				8	10		SS9	
			83.2					
		Borehole Terminated at 8.2 m Depth						
		Note: 1) SS1 & SS9 samples submitted for environmental laboratory analyses.						

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole BH 24-15

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 17

Page. 1 of 1

Date Drilled: 'June 6, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		FILL Silty sand and crushed gravel, some clay, brown, moist, no odours, no stains, (compact)	92.73	0
		FILL Mixture of silty sand and dark brown organic silty clay, some gravel, rootlets, brown to dark brown to grey, moist, no odours, no stains, (compact)	92.0	1
		FILL Silty sand and crushed gravel, some clay, brown, damp, no odours, no stains, (compact)	91.3	2
		SANDY SILTY CLAY Low plasticity, light brown, moist to wet, no odours, no stains, (firm)	90.5	3
		SILTY CLAY Dark grey, wet, no odours, no stains, (firm to stiff)	89.0	4
		With frequent silt seams from 7.6 m to 8.2 m depths	84.5	8
		Borehole Terminated at 8.2 m Depth		

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60

SAMPLES	Natural Unit Wt. kN/m³	Standard Penetration Test N Value	Shear Strength kPa	Natural Moisture Content % / Atterberg Limits (% Dry Weight)
SS1		13		×
SS2		15		×
SS3		11		×
SS4		5		×
SS5		4		×
SS6		Hammer Weight	38 kPa, s=16.0	×
SS7		Hammer Weight	53 kPa, s=22.0	×
SS8		Hammer Weight	96 kPa, s=13.0	×
SS9		4		×

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole MW24-16

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 18

Page. 1 of 1

Date Drilled: 'June 14, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~ 150 mm thick	92.62	0				
		FILL Mixture of silty sand and silty clay, some gravel, roots, rootlets, grass shoots, brown to dark brown, moist, no odours, no stains, (loose)	92.5		8	×	SS1	
				1	7	×	SS2	
			91.1					
▽		**SILTY CLAY** Brown, moist, no odours, no stains, (very stiff)	90.92		11 ; 190 kPa ▲	×	SS3	
				2	11 ; 190 kPa ▲	×	SS4	
			89.7					
		SANDY SILTY CLAY Brown, moist to wet, no odours, no stains, (firm)		3	4	×	SS5	
			88.9					
		SILTY CLAY Dark grey, wet, no odours, no stains, (stiff)			Hammer Weight		SS6	
				4	53 kPa ; s=22.0			
					Hammer Weight	×	SS7	
				5				
				6			ST8	
				7	82 kPa ; s=17.0			
			85.4					
		CLAYEY SILT With silt seams, some sand, grey, wt, no odours, no stains, (firm)			5	×	SS9	
			84.4	8				
		Borehole Terminated at 8.2 m Depth						

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 19 mm diameter monitoring well installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
June 21, 2024	1.7	

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

Log of Borehole BH 24-17

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 19

Page. 1 of 1

Date Drilled: 'June 7, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: M.Z. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		TOPSOIL ~ 80 mm thick	91.5	0
		FILL	91.4	
		Silty clay, light brown to reddish brown, moist, no odours, no stains, (loose)	90.8	
		SANDY SILTY CLAY Medium plasticity, light brown, moist, no odours, no stains, (soft to firm)		1
				2
			88.9	
		SILTY CLAY Grey, wet, no odours, no stains, (firm to stiff)		3
				4
				5
				6
			84.9	
		CLAYEY SILT With silt seams, some sand, grey, wet, no odours, no stains, (stiff)		7
			84.1	
		GLACIAL TILL Silty sand, with gravel, possible cobbles and boulders, grey, moist, no odours, no stains, (very dense)		8
			83.3	
		Borehole Terminated at 8.2 m Depth		

Note:
2) SS1 & SS4 samples submitted for environmental laboratory analyses.

Standard Penetration Test N Value (20 40 60 80) / Shear Strength (50 100 150 200 kPa)

Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)

SAMPLES	Natural Unit Wt. kN/m³
SS1	
SS2	
SS3	
SS4	
ST5	
SS6	
SS7	

6 (SS1) | 4 (SS2) | 2 (SS3) | Hammer Weight (SS4) | 43 kPa, s = 8.6 | 53 kPa, s=7.6 | Hammer Weight (SS6) | 67 kPa, s=4.0 | 64 (SS7)

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

Log of Borehole BH 24-18

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 20

Page. 1 of 1

Date Drilled: 'June 6, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits ⊢○ | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~ 150 mm thick	91.91	0	14		SS1	
		FILL Mixture of silty sand and silty clay, some gravel, roots, rootlets and grass shoots, brown to dark brown, moist, no odours, no stains, (compact)	91.8					
		SANDY SILTY CLAY Low plasticity, light brown to grey, moist, no odours, no stains, (soft to stiff)	91.2	1	9		SS2	
				2	3		SS3	
					2		SS4	
			89.1	3	58 kPa, s=24.0, Hammer Weight		SS5	
		SILTY CLAY Dark grey, wet, no odours, no stains, (firm to stiff)		4	48 kPa, s=20.0, Hammer Weight		SS6	
				5	62 kPa, s=13.0, Hammer Weight		SS7	
					72 kPa, s=15.0			
			86.1	6	Hammer Weight		SS8	
		CLAYEY SILT With silt seams, some sand, grey, wet, no odours, no stains, (very soft)	84.7	7				
		GLACIAL TILL Silty clay to clayey silt of low plasticity, trace gravel and sand, possible cobbles and boulders, grey, moist, no odours, no stains, (compact)	83.7	8	16		SS9	
		Borehole Terminated at 8.2 m Depth						

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole BH 24-20

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 21

Page. 1 of 1

Date Drilled: 'June 14, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		TOPSOIL ~300 mm thick	91.42	0
		FILL Silty clay with roots, rootlets and grass shoots, brown, moist, no odours, no stains, (loose)	91.1	
		SANDY SILTY CLAY Medium plasticity, light brown, moist, no odours, no stains, (soft to stiff)	90.7	1
				2
		SILTY CLAY Dark grey, wet, no odours, no stains, (firm to stiff)	88.5	3
				4
				5
		CLAYEY SILT With silt seams, some sand, grey, wet, no odours, no stains, (stiff)	84.7	6
				7
			83.2	8
		Borehole Terminated at 8.2 m Depth		

Standard Penetration Test N Value (20 40 60 80) / Shear Strength (50 100 150 200 kPa)

Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)

SAMPLES	Natural Unit Wt. kN/m³	Test Data
SS1		6
SS2		8
SS3		3
SS4		2
SS5		Hammer Weight; 43 kPa; s=18.0
SS6		Hammer Weight; 62 kPa; s=26.0
SS7		Hammer Weight; 72 kPa; s=10.0
ST8		
SS9		11

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole BH 24-21

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 22

Page. 1 of 1

Date Drilled: 'June 12, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		TOPSOIL ~ 75 mm thick	91.6	0
		FILL	91.5	
		Silty clay, brown, moist, no odours, no stains, (loose)	90.9	
		SANDY SILTY CLAY Low plasticity, light brown, moist, no odours, no stains, (soft to firm)		1
				2
			88.7	3
		SILTY CLAY Grey, wet, no odours, no stain, (firm to stiff)		
				4
				5
			85.9	6
		CLAYEY SILT With silt seams, some sand, no odours, no stains, (firm)		
			84.4	7
		GLACIAL TILL Silty sand with gravel, possible cobbles and boulders, trace clay, grey, wet, (compact)		8
			83.4	
		Borehole Terminated at 8.2 m Depth		

Standard Penetration Test N Value: 20 40 60 80

Shear Strength kPa: 50 100 150 200

Combustible Vapour Reading (ppm): 250 500 750

Natural Moisture Content % Atterberg Limits (% Dry Weight): 20 40 60

SAMPLES	Natural Unit Wt. kN/m³	N	Shear Strength
SS1		7	
SS2		5	
SS3		3	
SS4		2	
SS5		Hammer Weight	48 kPa s=20.0
SS6		Hammer Weight	62 kPa s=26.0
SS7		Hammer Weight	72 kPa s=15.0
SS8		5	
SS9		18	

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole MW24-22

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 23

Page. 1 of 2

Date Drilled: 'June 7, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits ⊢○⊣ | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~25 mm thick	91.52	0				
		FILL Silty clay with roots, rootlets, grass shoots, brown, moist, no odours, no stains, (loose)	91.5		6		SS1	
		SILTY CLAY Brown, moist, no odours, no stains, (very stiff)	90.8	1	16		SS2	
▽		**SANDY SILTY CLAY** Light brown, moist, no odours, no stains, (soft)	90.1					
			89.82	2	2		SS3	
					2		SS4	
		SILTY CLAY Dark grey, wet, no odours, no stains, (firm to stiff)	88.6	3	48 kPa s=20.0 Hammer Weight		SS5	
				4	67 kPa s=28.0 Hammer Weight		SS6	
				5	72 kPa s=15.0 Hammer Weight		SS7	
					77 kPa s=16.0			
		CLAYEY SILT With silt seams, some sand, no odours, no stains, (soft to stiff)	85.7	6	3		SS8	
				7				
				8	13		SS9	
		SILTY SAND Trace gravel, grey, wet, no odours, no stains, (dense)	82.8	9	42		SS10	
		Silty sand heaving up in casing to 8.7 m depth		10				

Continued Next Page

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 19 mm diameter monitoring well installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
June 21, 2024	1.7	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	13 - 14.1	100	75
2	14.1 - 15.6	100	73

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole MW24-22

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Figure No. 23

SOIL DESCRIPTION	Geodetic Elevation m	Depth
SILTY SAND Trace gravel, grey, wet, no odours, no stains, (dense) *(continued)*	81.52	10
GLACIAL TILL Silty sand with gravel, some clay, possible cobbles and boulders, grey, wet, (very dense)	80.5	11
		12
LIMESTONE BEDROCK Grey	78.5	13
		14
		15
Borehole Terminated at 15.6 m Depth	75.9	

Note:
1) Borehole advanced from ground surface to bedrock surface at 13.0 m depth by casing and wash-boring method.
2) SS2 & SS8 samples submitted for environmental laboratory analyses.

Standard Penetration Test N Value: 20 40 60 80
Shear Strength kPa: 50 100 150 200
Combustible Vapour Reading (ppm): 250 500 750
Natural Moisture Content % / Atterberg Limits (% Dry Weight): 20 40 60

124

SAMPLES: SS11, Run 1, Run 2

Natural Unit Wt. kN/m³

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 19 mm diameter monitoring well installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
June 21, 2024	1.7	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	13 - 14.1	100	75
2	14.1 - 15.6	100	73

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole MW24-25

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 24

Page. 1 of 1

Date Drilled: 'June 11, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~410 mm thick	91.68	0	6		SS1	
			91.3					
		FILL Silty clay with roots, rootlets, and grass shoots, brown, moist, no odours, no stains, (loose)	91.0	1	10		SS2	
		SANDY SILTY CLAY Light brown, moist, no odours, no stains, (soft to stiff)	89.78	2	4		SS3	
					3		SS4	20.5
			88.8	3	Hammer Weight		SS5	
		SILTY CLAY Dark grey, wet, no odours, no stains, (firm to stiff)			43 kPa s=9.0			
				4	Hammer Weight		SS6	
					62 kPa s=13.0			
				5	Hammer Weight		SS7	
			86.1					
		CLAYEY SILT With silt seams, some sand, grey, wet, no odours, no stains, (very stiff)		6	15		SS8	
			84.5	7				
		GLACIAL TILL Silty sand with gravel, some clay, possible cobbles and boulders, grey, moist, (very dense)			90		SS9	
			83.6	8				
		Borehole Terminated at 8.1 m Depth						

Note:
1) SS1 & SS7 samples submitted for environmental laboratory analyses.

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 50 mm diameter monitoring well installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
June 19, 2024	1.9	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole BH 24-26

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 25

Page. 1 of 1

Date Drilled: 'June 10, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		TOPSOIL ~ 250 mm thick	91.81	0
		FILL Silty clay with roots, rootlets and grass shoots, moist, no odours, no stains, (loose)	91.6	
		SILTY CLAY Medium plasticity, some sand, trace gravel, brown, moist, no odours, no stains, (very stiff)	91.1	1
		SANDY SILTY CLAY Light brown, moist, no odours, no stains, (soft to firm)	90.4	2
		SILTY CLAY Medium plasticity, trace sand, dark grey, wet, no odours, no stains, (firm to stiff)	88.8	3
		With frequent silt seams from 6.1 m to 6.7 m depths		4 5 6
		CLAYEY SILT With silt seams, some sand, grey, no odours, no stains, wet, (stiff)	85.1	7
		Borehole Terminated at 8.2 m Depth	83.6	8

Standard Penetration Test N Value (20 40 60 80) / Shear Strength (50 100 150 200 kPa)

6 | 8 | 4 | 2 | 43 kPa s=18.0 | Hammer Weight | 53 kPa s=22.0 | Hammer Weight | 67 kPa s=28.0 | 72 kPa s=15.0 | 2 | 12

170 kPa

Combustible Vapour Reading (ppm) 250 500 750

Natural Moisture Content % / Atterberg Limits (% Dry Weight) 20 40 60

SAMPLES	Natural Unit Wt. kN/m³
SS1	
SS2	
SS3	
SS4	
SS5	
SS6	
ST7	
SS8	
SS9	

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole MW24-27

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 26

Page. 1 of 1

Date Drilled: 'June 10, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits ⊢○⊣ | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~ 50 mm thick	91.47	0	4		SS1	
		FILL Silty clay with roots, rootlets and grass shoots, brown, moist, no odours, no stains, (loose)	91.4					
			90.8	1	8; 190 kPa		SS2	
		SILTY CLAY Brown, moist, no odours, no stains, (very stiff)	90.1					
		SANDY SILTY CLAY Light brown, moist, no odours, no stains, (very soft to firm)		2	6		SS3	
					Hammer Weight		SS4	
			88.6	3	62 kPa; s=26.0			
		SILTY CLAY Dark grey, wet, no odours, no stains, (stiff)					ST5	
				4	67 kPa; 62 kPa); s=13.0			
					Hammer Weight		SS6	
				5	62 kPa; s=26.0			
			85.7					
		CLAYEY SILT With silt seams, some sand, grey, wet, no odours, no stains, (soft)		6	2		SS7	
				7				
				8	3		SS8	
			83.3					

Borehole Terminated at 8.2 m Depth

Note:
1) SS1 & SS6 samples submitted for environmental laboratory analyses.

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

NOTES:
1. Borehole data requires interpretation by EXP before use by others
2. A 50 mm diameter monitoring well installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)
June 25,2024	Inaccessible	

CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

Log of Borehole MW24-28

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 27

Page. 1 of 2

Date Drilled: 'June 11, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		TOPSOIL ~100 mm thick	91.51 / 91.4	0
		FILL Silty clay with roots, rootlets and grass shoots, brown, moist, no odours, no stains, (loose)	90.8	
		SILTY CLAY Brown, moist, no odours, no stains, (very stiff)	90.1	1
		SANDY SILTY CLAY Light brown, moist, no odours, no stains, (very soft to firm)	89.61	2
		SILTY CLAY Dark grey, wet, no odours, no stains, (firm to stiff)	88.6	3
		CLAYEY SILT With silt seams, some sand, grey, wet, no odours, no stains, (very soft to soft)	84.2	8

Standard Penetration Test N Value (20 40 60 80) / Shear Strength (50 100 150 200 kPa)

Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)

Depth	SPT N	Shear Strength	Moisture / Atterberg	Sample	Natural Unit Wt. kN/m³
0	6		×	SS1	
1	9	190 kPa ▲	×	SS2	
2	6		×	SS3	
2			×	SS4	
3		38 kPa +S s>30	×	SS5	
4	Hammer Weight	48 kPa +S s=20.0	×	SS6	
5	Hammer Weight	53 kPa +S s=22.0	×	SS7	
5		62 kPa +S s=26.0			
6	2		×	SS8	
7		82 kPa +S s=17.0			
8	1		×	SS9	
9	3		×	SS10	
10					

Continued Next Page

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 19 mm diameter monitoring well installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
June 25,2024	1.9	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	14.1 - 15.3	93	72
2	15.3 - 16.8	100	89

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole MW24-28

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Figure No. 27

SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
CLAYEY SILT With silt seams, some sand, grey, wet, no odours, no stains, (very soft to soft) *(continued)*	81.51	10	20 40 60 80 Shear Strength 50 100 150 200 kPa	250 500 750 Natural Moisture Content % Atterberg Limits (% Dry Weight) 20 40 60		
		11	Hammer Weight		SS11	
GLACIAL TILL Silty sand some gravel, trace clay, possible cobbles and boulders, grey, wet, (compact to very dense)	79.8	12	15		SS12	
		13				
		14		>100	SS13	
LIMESTONE BEDROCK Grey	77.4	15			Run 1	
		16			Run 2	
Borehole Terminated at 16.8 m Depth	74.7					

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. A 19 mm diameter monitoring well installed as shown.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)
June 25,2024	1.9	

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	14.1 - 15.3	93	72
2	15.3 - 16.8	100	89

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole BH 24-29

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 28

Page. 1 of 2

Date Drilled: 'June 12, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth
		TOPSOIL ~200 mm thick	91.64 / 91.4	0
		FILL Silty clay, brown, moist, no odours, no stains, (loose)	90.9	
		SANDY SILTY CLAY Trace gravel, brown, moist, no odours, no stains, (firm to stiff)		1
				2
			88.6	3
		SILTY CLAY Dark grey, wet, no odours, no stains, (firm to stiff)		4
				5
			85.8	6
		SILTY SAND Trace gravel, grey, wet, no odours, no stains, (loose)		7
			84.4	
		GLACIAL TILL Silty sand with gravel, possible cobbles and boulders, grey, wet, no odours, no stains		8
				9
				10

Standard Penetration Test N Value (20 40 60 80) / Shear Strength (50 100 150 200 kPa)

Combustible Vapour Reading (ppm) (250 500 750) / Natural Moisture Content % Atterberg Limits (% Dry Weight) (20 40 60)

Depth	SPT N	Shear Strength	Hammer Weight	SAMPLES	Natural Unit Wt. kN/m³
0	5			SS1	
1	10			SS2	
2	5			SS3	
3	5	48 kPa s=20.0	Hammer Weight	SS4	
4		38 kPa s=16.0		SS5	
5		62 kPa s=13.0	Hammer Weight	ST6	
6		77 kPa s=16.0		SS7	
7	4			SS8	
8	50 / 75 mm			SS9	
9					
10					

Continued Next Page

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	12.4 - 13.2	0	0
2	13.2 - 14	93	83
3	14 - 15.5	98	98

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

Log of Borehole BH 24-29

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Figure No. 28

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		GLACIAL TILL Silty sand with gravel, possible cobbles and boulders, grey, wet, no odours, no stains *(continued)*	81.64	10	20 40 60 80 Shear Strength kPa 50 100 150 200	250 500 750 Natural Moisture Content % Atterberg Limits (% Dry Weight) 20 40 60		
				11	20, 50 / 75 mm	×	SS10	
				12				
				13			Run 1	
		LIMESTONE BEDROCK Grey	78.4	14			Run 2	
				15			Run 3	
		Borehole Terminated at 15.5 m Depth	76.1					

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS

Date	Water Level (m)	Hole Open To (m)

CORE DRILLING RECORD

Run No.	Depth (m)	% Rec.	RQD %
1	12.4 - 13.2	0	0
2	13.2 - 14	93	83
3	14 - 15.5	98	98

Log of Borehole BH 24-30

Project No: OTT-24005069-A0

Project: Proposed Long-Term Care Facility

Location: 980 Earl Armstrong Road, Ottawa, Ontario

Figure No. 29

Page. 1 of 1

Date Drilled: 'June 5, 2024

Drill Type: CME 55 Track-Mounted Drill Rig

Datum: Geodetic Elevation

Logged by: A.N. Checked by: S.P.

Split Spoon Sample ⊠ | Auger Sample ◧ | SPT (N) Value ○ | Dynamic Cone Test —— | Shelby Tube ■ | Shear Strength by Vane Test +S

Combustible Vapour Reading □ | Natural Moisture Content × | Atterberg Limits |—○—| | Undrained Triaxial at % Strain at Failure ⊕ | Shear Strength by Penetrometer Test ▲

GWL	SYMBOL	SOIL DESCRIPTION	Geodetic Elevation m	Depth	Standard Penetration Test N Value / Shear Strength kPa	Combustible Vapour Reading (ppm) / Natural Moisture Content % / Atterberg Limits (% Dry Weight)	SAMPLES	Natural Unit Wt. kN/m³
		TOPSOIL ~50 mm thick	92.29	0	12	×	SS1	
		FILL Mixture of silty sand and silty clay, some gravel, roots, rootlets, grass shoots, brown to dark brown to grey, moist, no odours, no stains, (compact)	92.2					
				1	17	×	SS2	
			90.9					
		SANDY SILTY CLAY Brown, moist, no odours, no stains, (firm)		2	5	×	SS3	
					4	×	SS4	
			89.4	3	2	×	SS5	
		SILTY CLAY Grey, wet, no odours, no stains, (firm to stiff)			48 kPa s=10.0 Hammer Weight			
				4		×	SS6	
					53 kPa s=22.0 Hammer Weight			
				5		×	SS7	
					58 kPa s=12.0			
				6	Hammer Weight	×	SS8	
			85.1	7				
		GLACIAL TILL Silty sand with gravel, possible cobbles and boulders, grey, wet, no odours, no stains, (compact)						
				8	11	×	SS9	
			84.1					
		Borehole Terminated at 8.2 m Depth						
		Note: 1) SS1 & SS5 samples submitted for environmental laboratory analyses.						

NOTES:

1. Borehole data requires interpretation by EXP before use by others
2. Borehole backfilled upon completion of drilling.
3. Field work supervised by an EXP representative.
4. See Notes on Sample Descriptions
5. Log to be read with EXP Report OTT-24005069-A0

WATER LEVEL RECORDS		
Date	Water Level (m)	Hole Open To (m)

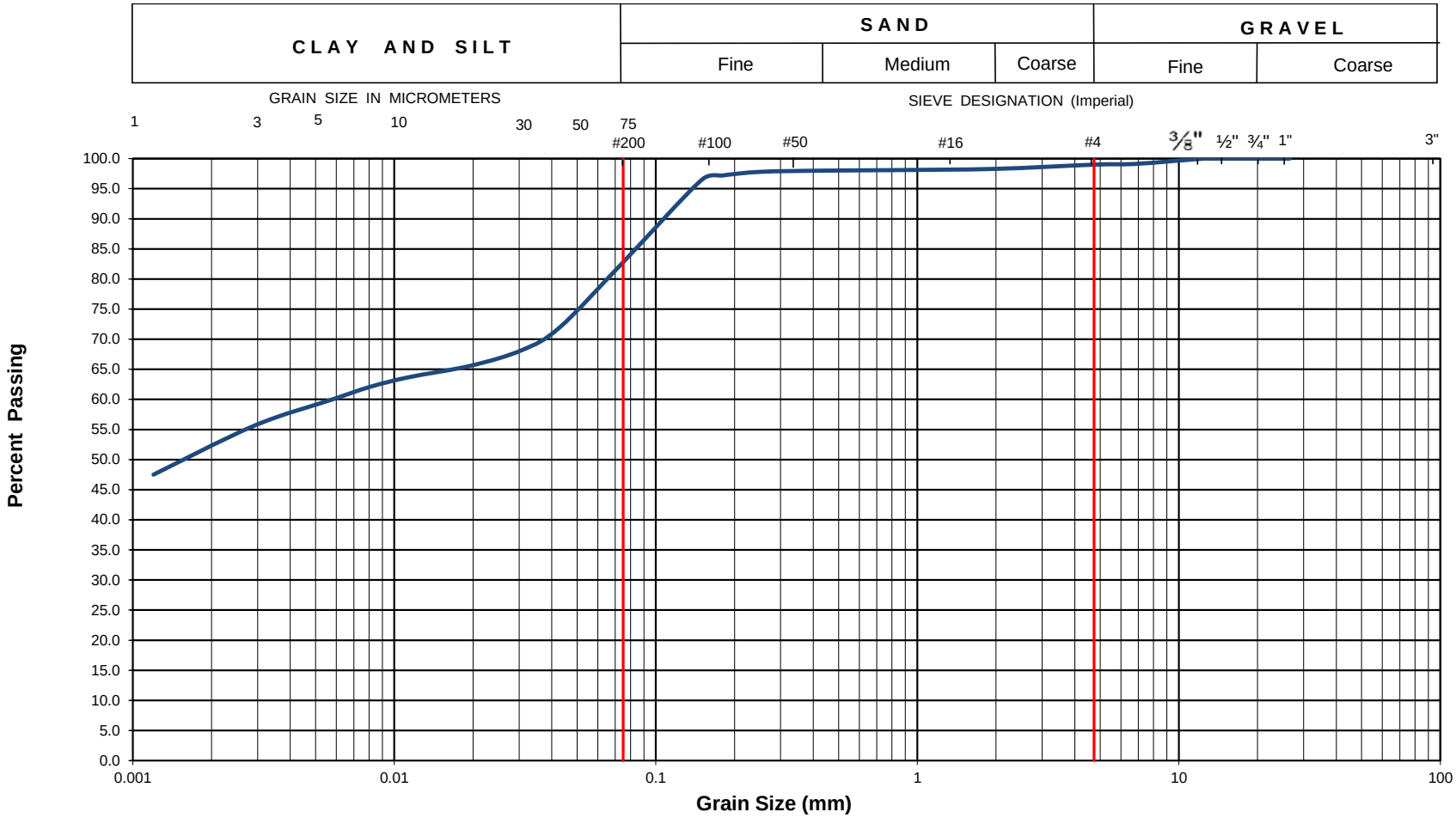
CORE DRILLING RECORD			
Run No.	Depth (m)	% Rec.	RQD %

LOG OF BOREHOLE BHS-980 EARL ARMSTRONG.GPJ TROW OTTAWA.GDT 9/3/24

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422

Unified Soil Classification System



EXP Project No.:	**OTT-24005069-A0**	**Project Name :**	**Proposed Long-Term Care Facility**						
Client :	**Extendicare (Canada) Inc.**	**Project Location :**	**980 Earl Armstrong Road, Ottawa, ON**						
Date Sampled :	**June 6, 2024**	**Borehole No:**	**BH 24-26**	**Sample No.:**	**SS2**	**Depth (m) :**	**0.8 - 1.4**		
Sample Description :		**% Silt and Clay**	**83**	**% Sand**	**16**	**% Gravel**	**1**	**Figure :**	**30**
Sample Description :	**Upper Brown Silty Clay of Medium Plasticity (CI) - Some Sand, Trace Gravel**								

EXP Services Inc.
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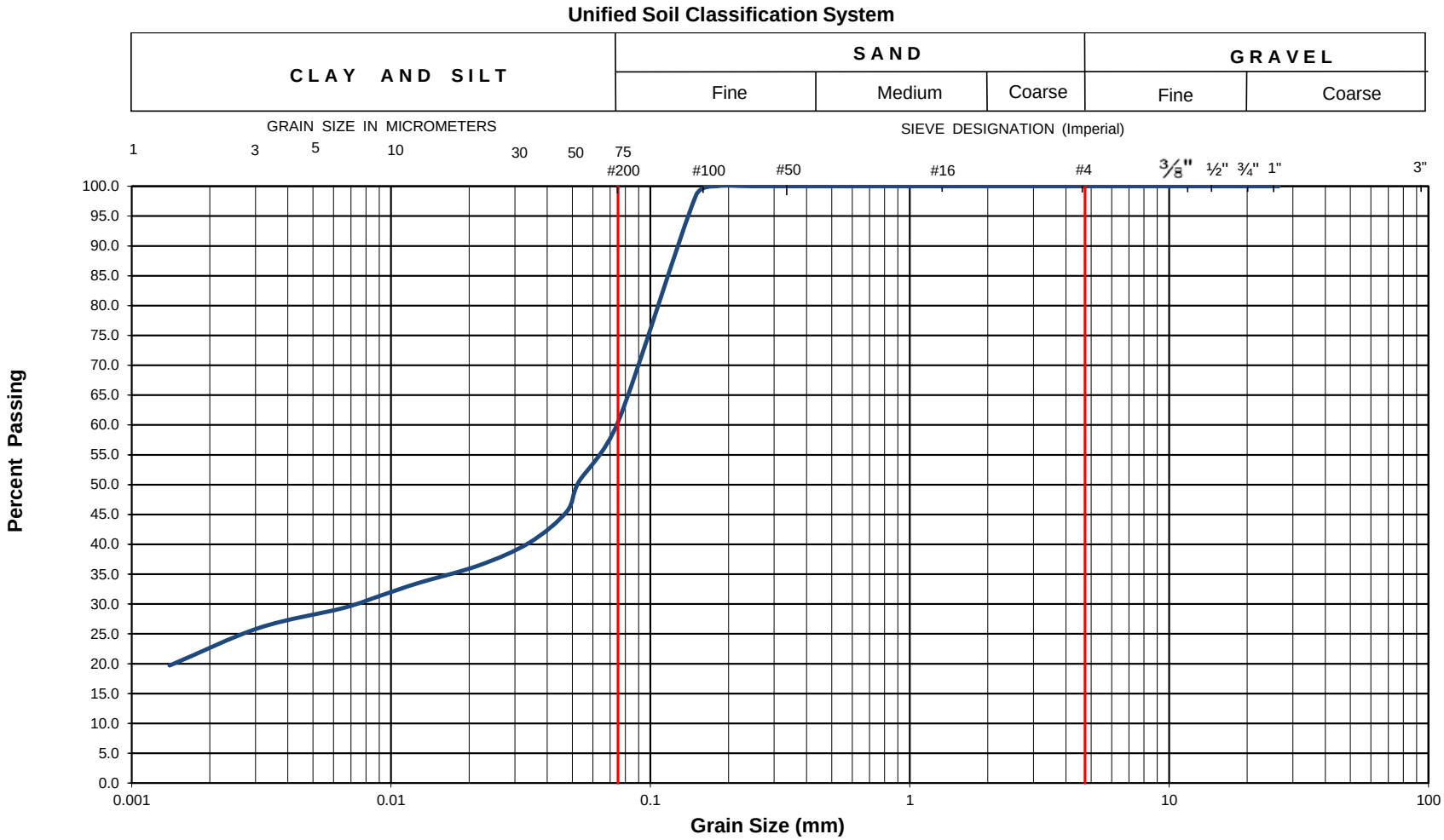
Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422



EXP Project No.:	**OTT-24005069-A0**	**Project Name :**	**Proposed Long-Term Care Facility**						
Client :	**Extendicare (Canada) Inc.**	**Project Location :**	**980 Earl Armstrong Road, Ottawa, ON**						
Date Sampled :	**June 6, 2024**	**Borehole No:**	**BH 24-01**	**Sample No.:**	**SS3**	**Depth (m) :**	**1.5-2.1**		
Sample Description :		**% Silt and Clay**	**61**	**% Sand**	**39**	**% Gravel**	**0**	**Figure :**	**31**
Sample Description :	**Upper Sandy Silty Clay of Low Plasticity (CL)**								

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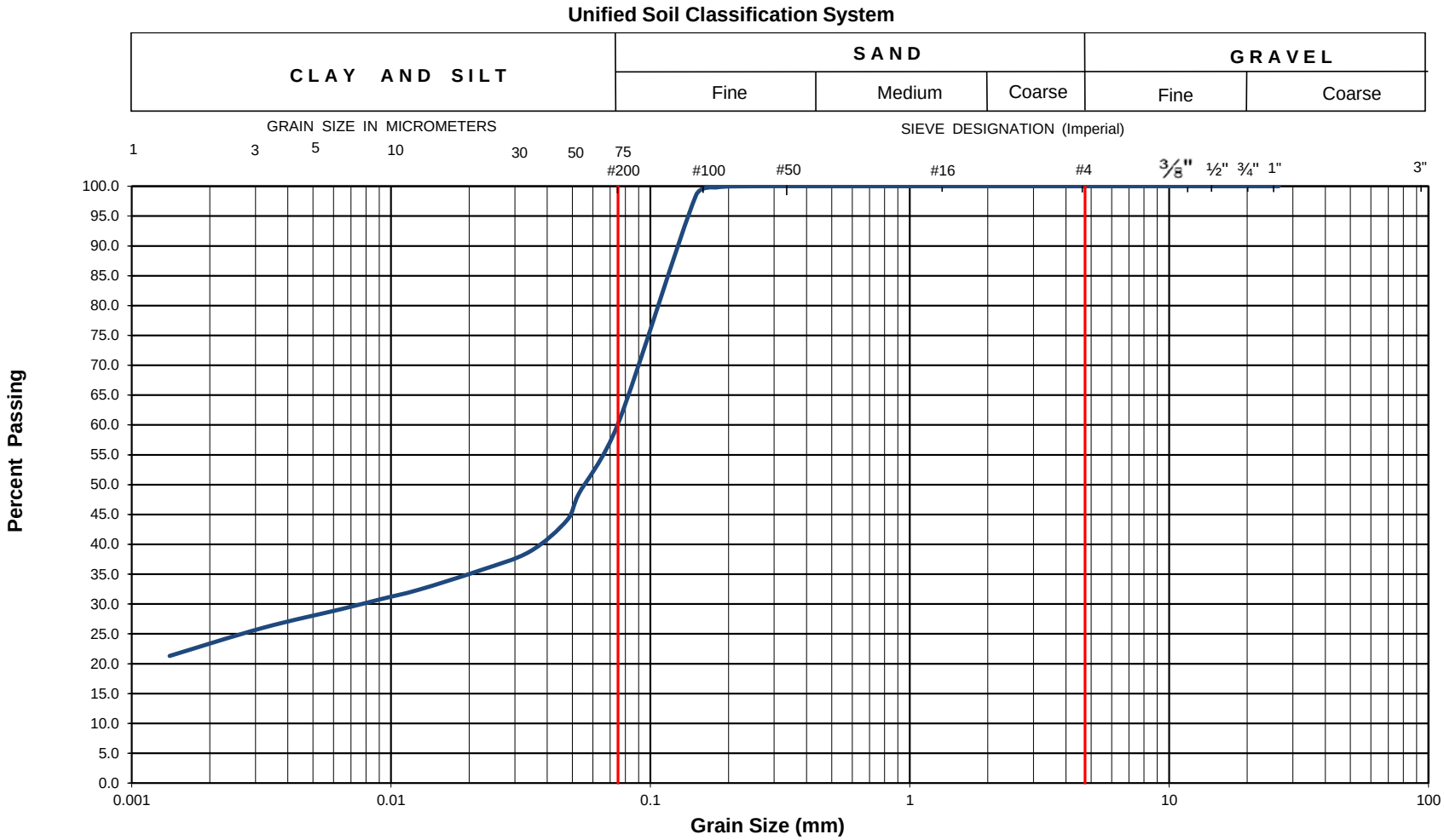
Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422

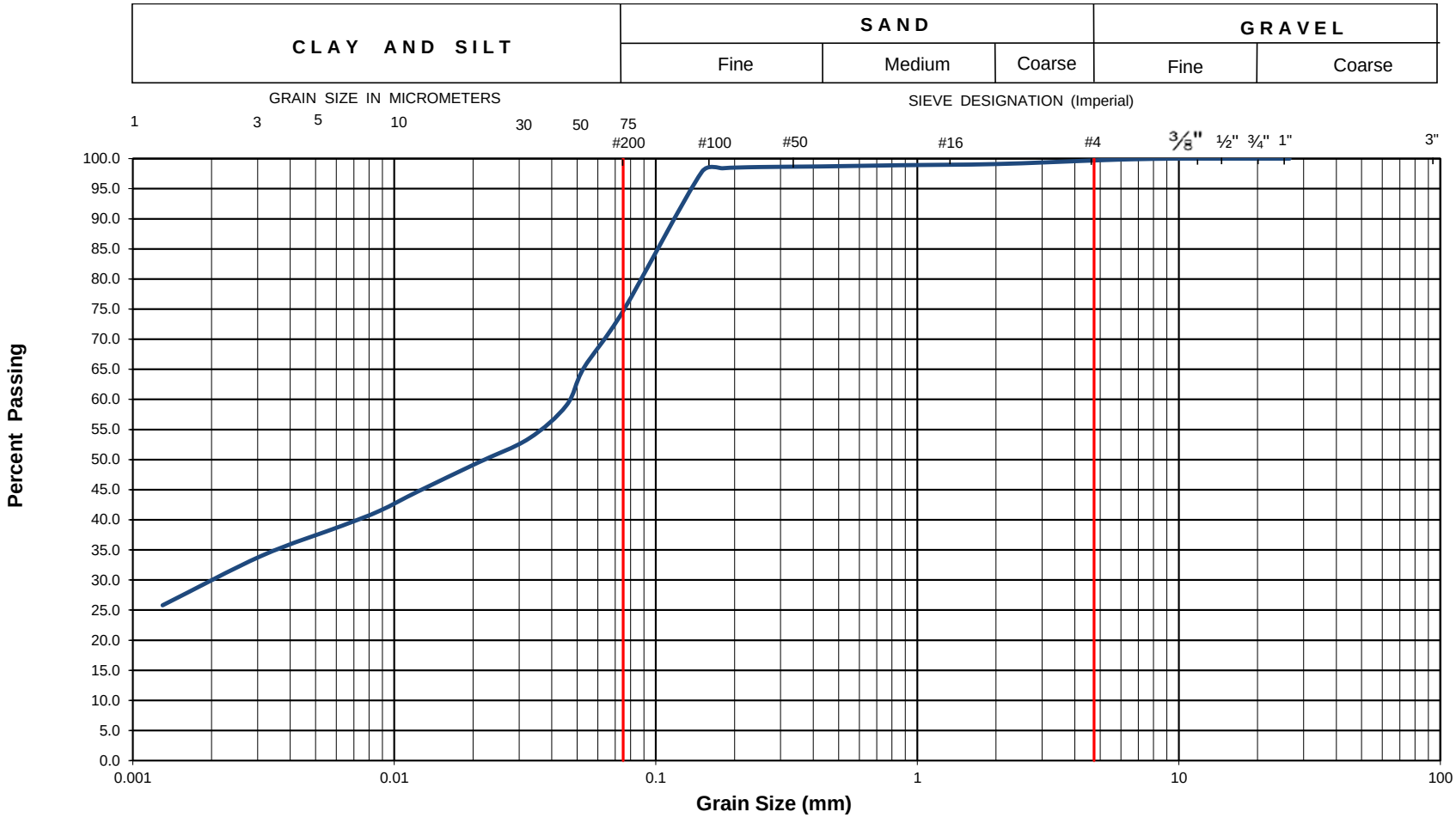


EXP Project No.:	**OTT-24005069-A0**	**Project Name :**	**Proposed Long-Term Care Facility**						
Client :	**Extendicare (Canada) Inc.**	**Project Location :**	**980 Earl Armstrong Road, Ottawa, ON**						
Date Sampled :	**June 6, 2024**	**Borehole No:**	**BH 24-06**	**Sample No.:**	**SS2**	**Depth (m) :**	**0.8 - 1.4**		
Sample Description :		**% Silt and Clay**	**60**	**% Sand**	**40**	**% Gravel**	**0**	**Figure :**	**32**
Sample Description :	**Upper Sandy Silty Clay of Low Plasticity (CL)**								

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422

Unified Soil Classification System



EXP Project No.:	**OTT-24005069-A0**	**Project Name :**	**Proposed Long-Term Care Facility**						
Client :	**Extendicare (Canada) Inc.**	**Project Location :**	**980 Earl Armstrong Road, Ottawa, ON**						
Date Sampled :	**June 6, 2024**	**Borehole No:**	**BH 24-12**	**Sample No.:**	**SS5**	**Depth (m) :**	**3.0 - 3.6**		
Sample Description :		**% Silt and Clay**	**75**	**% Sand**	**24**	**% Gravel**	**1**	**Figure :**	**33**
Sample Description :	**Upper Sandy Silty Clay of Low Plasticity (CL) - Trace Gravel**								

EXP Services Inc.
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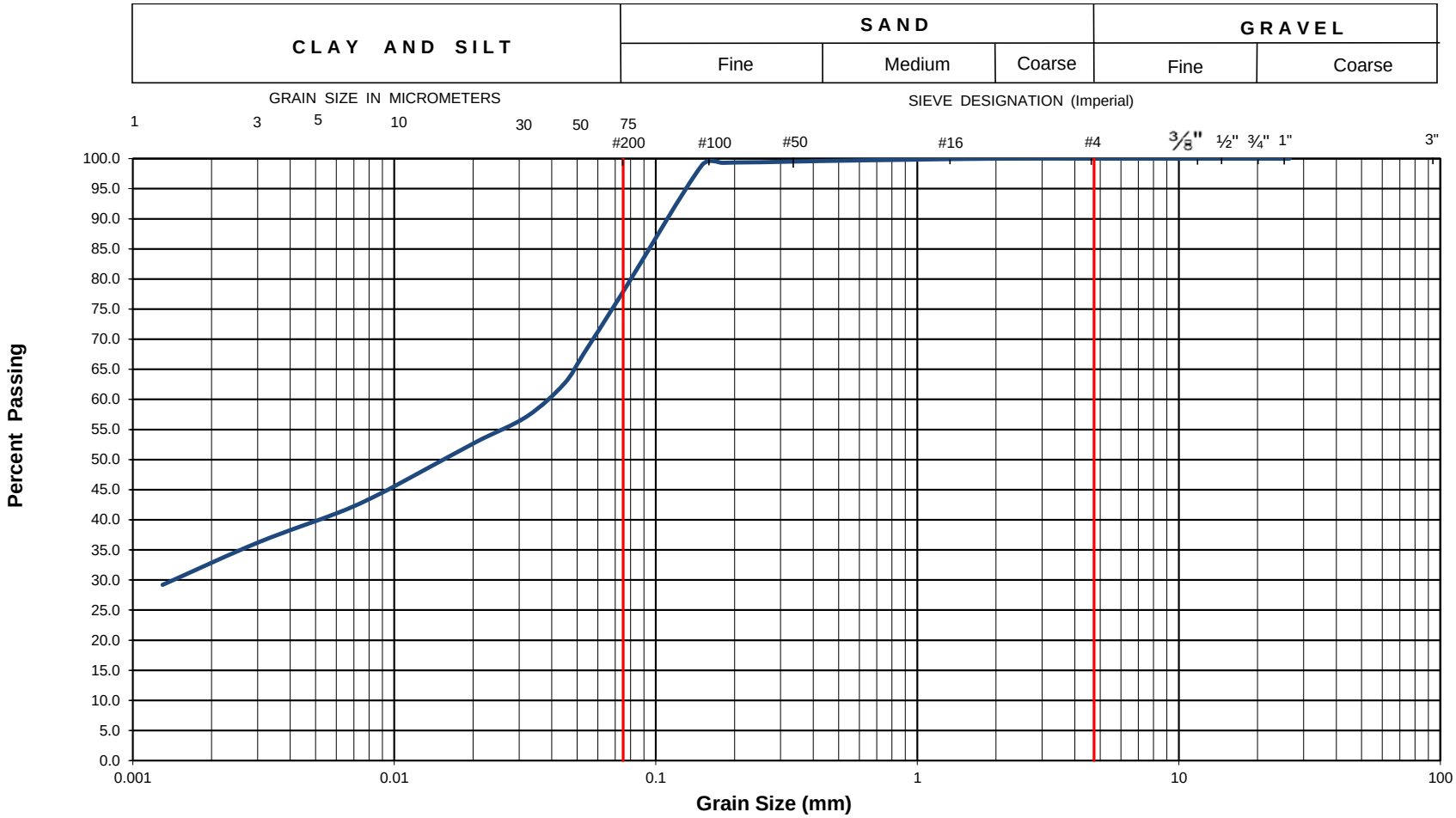
Ottawa, ON K2B 8H6

Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422

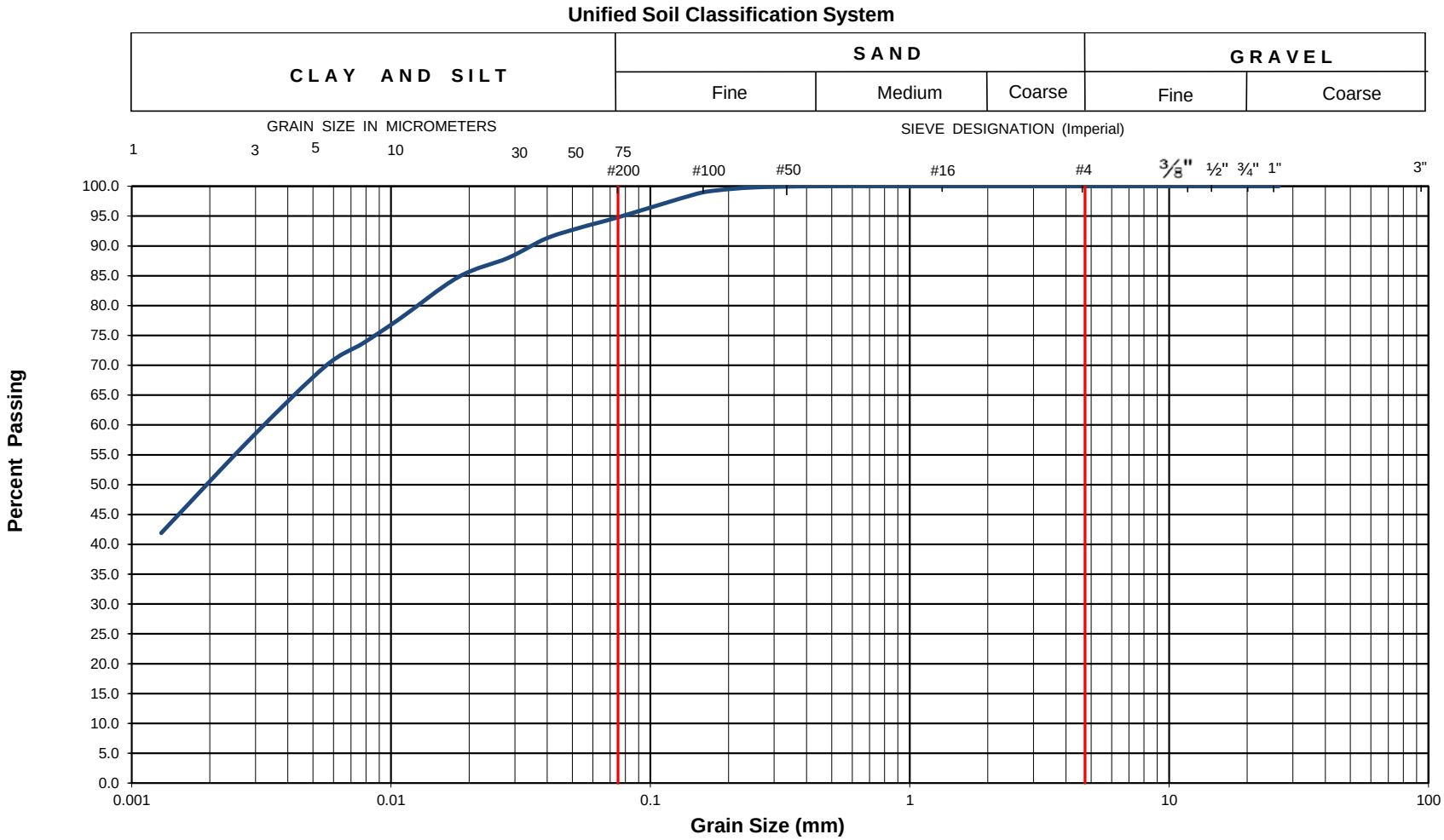
Unified Soil Classification System



EXP Project No.:	**OTT-24005069-A0**	**Project Name :**	**Proposed Long-Term Care Facility**						
Client :	**Extendicare (Canada) Inc.**	**Project Location :**	**980 Earl Armstrong Road, Ottawa, ON**						
Date Sampled :	**June 6, 2024**	**Borehole No:**	**BH 24-18**	**Sample No.:**	**SS4**	**Depth (m) :**	**2.3 -2.7**		
Sample Description :		**% Silt and Clay**	**78**	**% Sand**	**22**	**% Gravel**	**0**	**Figure :**	**34**
Sample Description :	**Upper Sandy Silty Clay of Low Plasticity (CL)**								

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

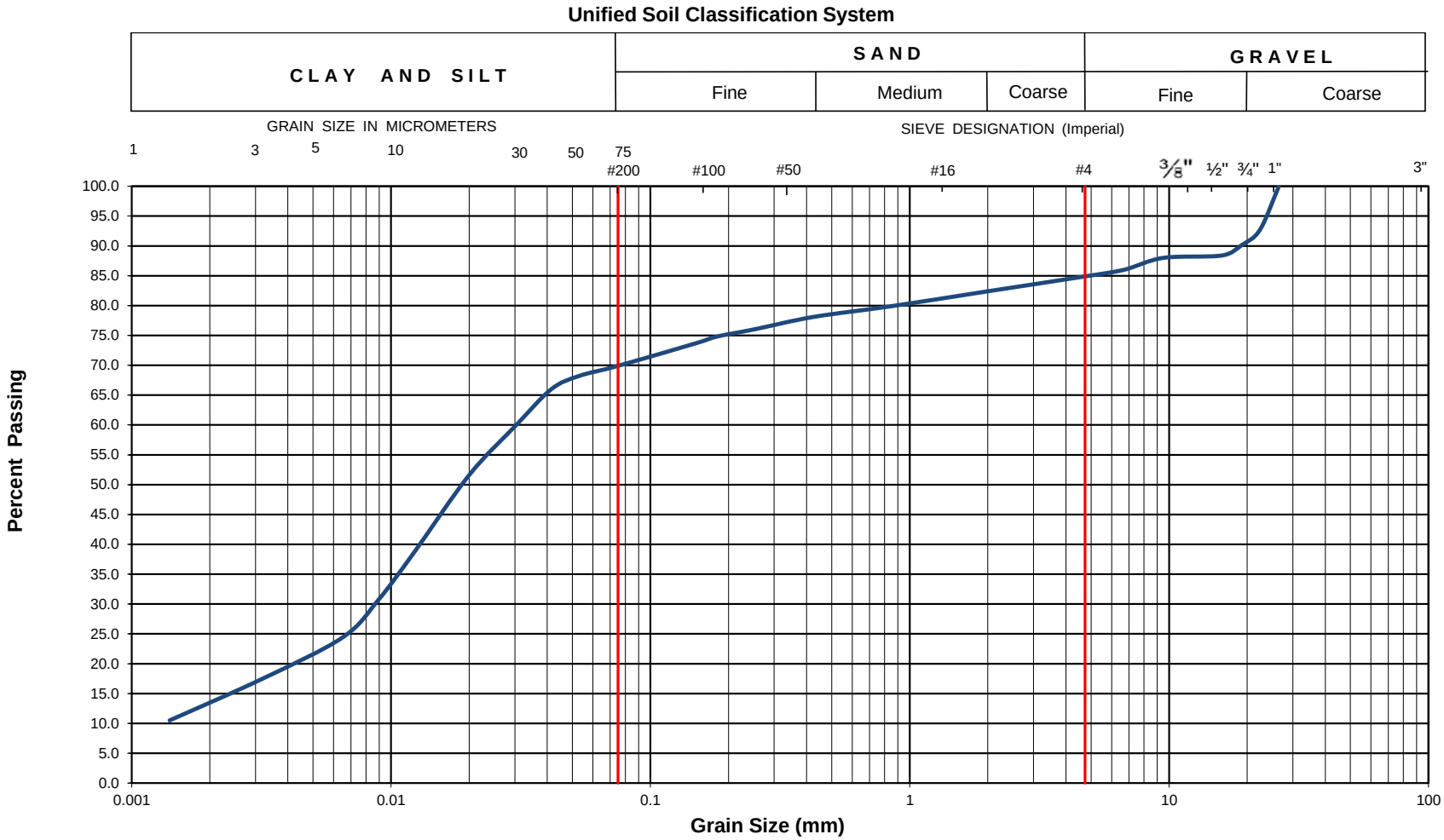
Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422



EXP Project No.:	**OTT-24005069-A0**	**Project Name :**	**Proposed Long-Term Care Facility**						
Client :	**Extendicare (Canada) Inc.**	**Project Location :**	**980 Earl Armstrong Road, Ottawa, ON**						
Date Sampled :	**June 6, 2024**	**Borehole No:**	**BH 24-26**	**Sample No.:**	**SS6**	**Depth (m) :**	**3.8 - 4.3**		
Sample Description :		**% Silt and Clay**	**95**	**% Sand**	**5**	**% Gravel**	**0**	**Figure :**	**35**
Sample Description :	**Lower Grey Silty Clay of Medium Plasticity (CI) - Trace Sand**								

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422

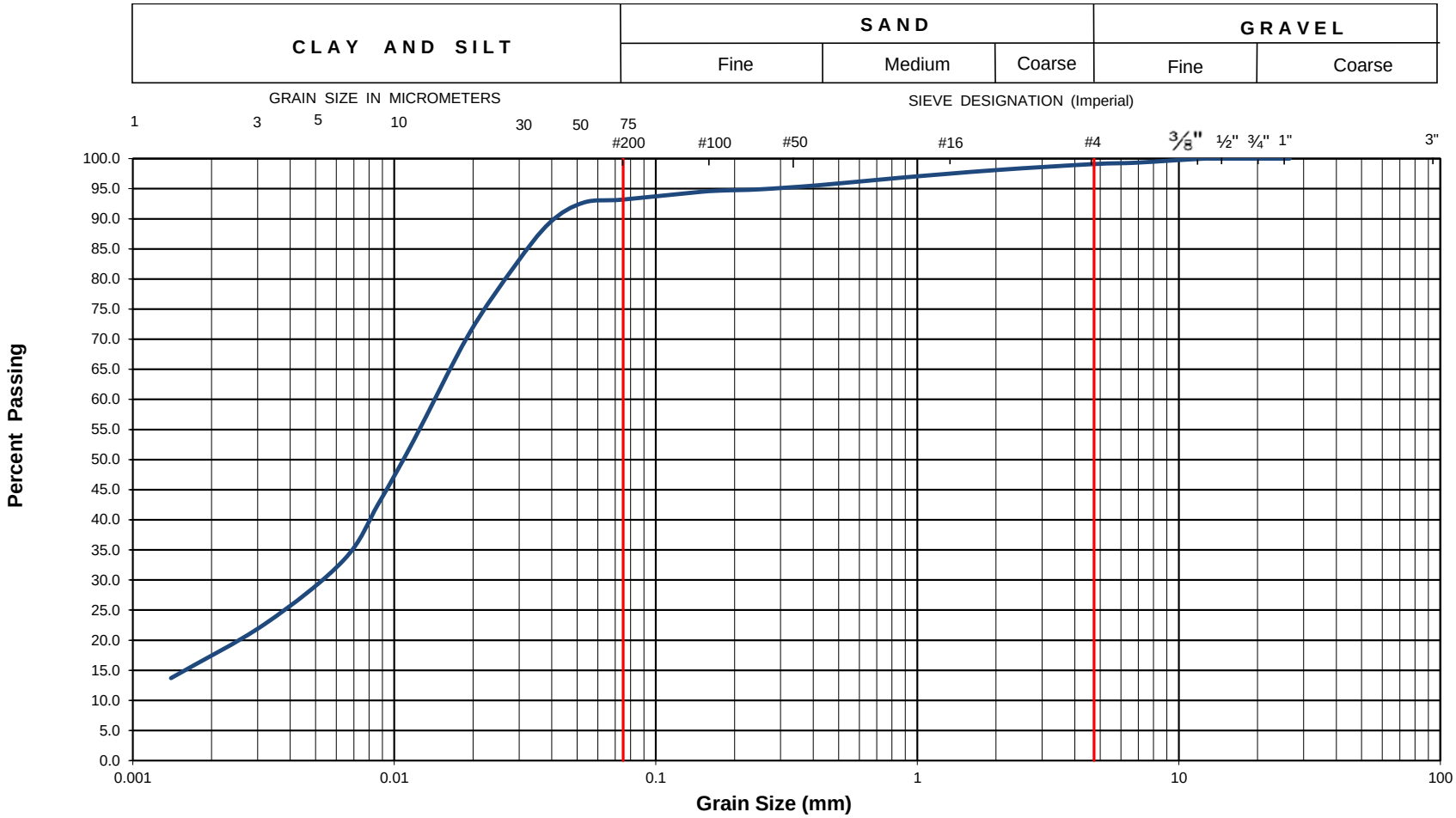


EXP Project No.:	**OTT-24005069-A0**	**Project Name :**	**Proposed Long-Term Care Facility**						
Client :	**Extendicare (Canada) Inc.**	**Project Location :**	**980 Earl Armstrong Road, Ottawa, ON**						
Date Sampled :	**June 6, 2024**	**Borehole No:**	**BH 24-01**	**Sample No.:**	**SS9**	**Depth (m) :**	**7.6-8.1**		
Sample Description :		**% Silt and Clay**	**70**	**% Sand**	**15**	**% Gravel**	**15**	**Figure :**	**36**
Sample Description :	**GLACIAL TILL: Silty Clay to Clayey Silt of Low Plasticity (CL-ML) -Some Gravel and Sand**								

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422

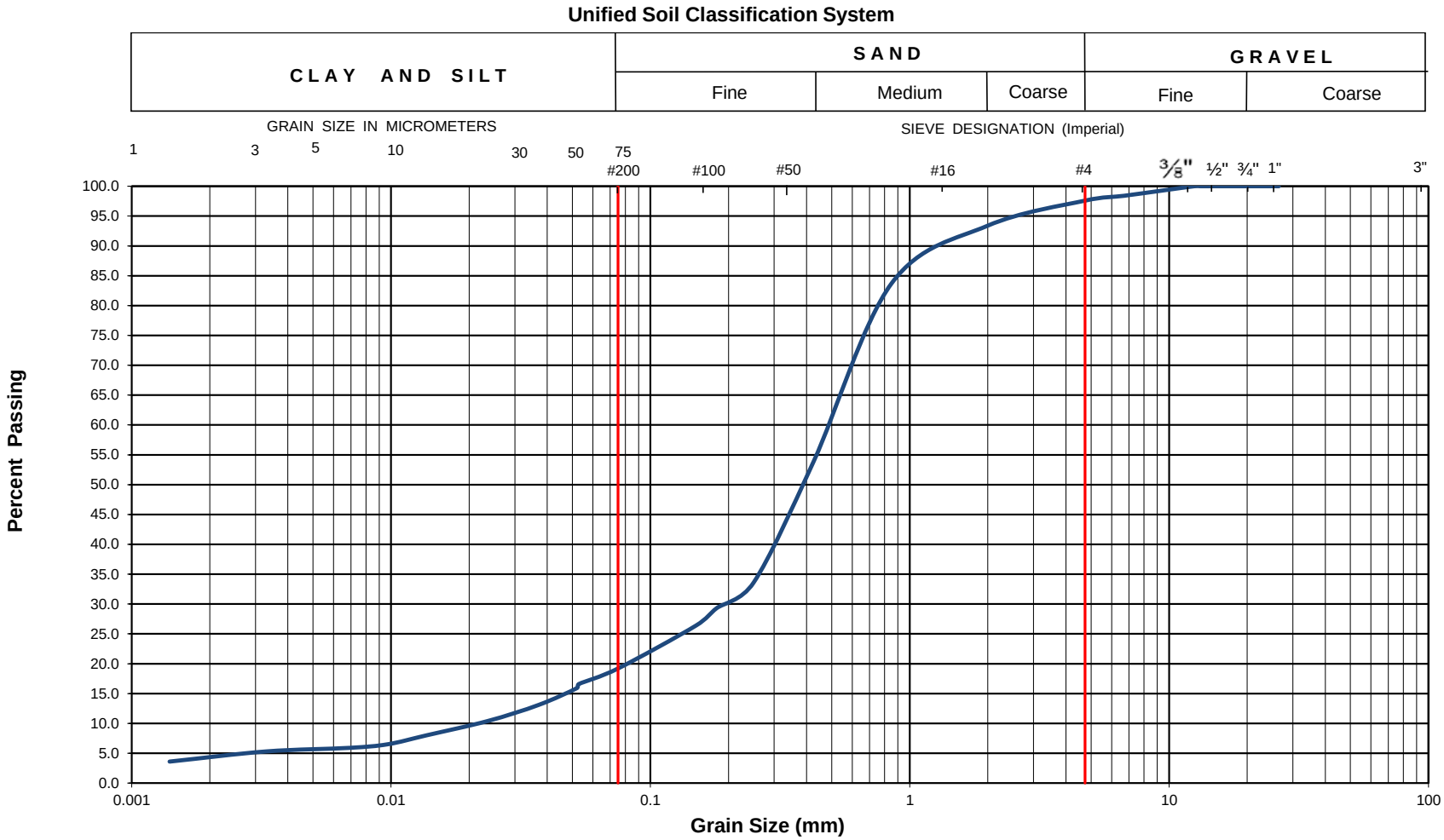
Unified Soil Classification System



EXP Project No.:	**OTT-24005069-A0**	**Project Name :**	**Proposed Long-Term Care Facility**						
Client :	**Extendicare (Canada) Inc.**	**Project Location :**	**980 Earl Armstrong Road, Ottawa, ON**						
Date Sampled :	**June 6, 2024**	**Borehole No:**	**BH 24-18**	**Sample No.:**	**SS9**	**Depth (m) :**	**7.6 - 8.2**		
Sample Description :		**% Silt and Clay**	**94**	**% Sand**	**5**	**% Gravel**	**1**	**Figure :**	**37**
Sample Description :	**GLACIAL TILL: Silty Clay to Clayey Silt of Low Plasticity (CL-ML) - Trace Gravel and Sand**								

EXP Services Inc.
100-2650 Queensview Drive
Ottawa, ON K2B 8H6

Grain-Size Distribution Curve
Method of Test For Particle Size Analysis of Soil
ASTM C-136/ASTM D422



EXP Project No.:	**OTT-24005069-A0**	**Project Name :**	**Proposed Long-Term Care Facility**						
Client :	**Extendicare (Canada) Inc.**	**Project Location :**	**980 Earl Armstrong Road, Ottawa, ON**						
Date Sampled :	**June 6, 2024**	**Borehole No:**	**BH 24-28**	**Sample No.:**	**SS12**	**Depth (m) :**	**12.2 - 12.8**		
Sample Description :		**% Silt and Clay**	**19**	**% Sand**	**78**	**% Gravel**	**3**	**Figure :**	**38**
Sample Description :	**GLACIAL TILL: Silty Sand (SM) - Some Gravel, Trace Clay**								

Appendix A – Shear Wave Velocity Soundings Survey Report by Geophysics GPR International Inc.

GEOPHYSICS GPR INTERNATIONAL INC.

June 21st, 2024

Transmitted by email : ismail.taki@exp.com
Our ref : GPR24-05486-c

Mr. Ismail Taki, M.Eng., P.Eng.
Senior Manager, Earth & Environment, Eastern Region
exp Services inc.
100 - 2650 Queensview Drive
Ottawa ON K2B 8H6

Subject: **Shear Wave Velocity Sounding for the Site Class Determination**
Earl Armstrong Road & Portico Way, Ottawa (ON)

[Project: OTT-24005069-A0]

Dear Mr. Taki,

Geophysics GPR International inc. has been mandated by **exp** Services inc. to carry out seismic surveys on a property located east of the intersection of Earl Armstrong Road and Portico Way, in Ottawa (ON). The geophysical investigation used the Multi-channel Analysis of Surface Waves (MASW), the Spatial AutoCorrelation (SPAC), and the seismic refraction method. From the subsequent results, the seismic shear wave velocity values were calculated for the soils and the rock, to determine the Site Class.

The surveys were conducted on May 15th, 2024, by Mrs. Karyne Faguy, B.Sc. geophysics and Mr. Charles Trottier, M.Sc. physics. Figure 1 shows the regional location of the site and Figure 2 illustrates the location of the seismic spread. Both figures are presented in the Appendix.

The following paragraphs briefly describe the survey design, the principles of the testing methods, and the results presented in table and graph.

MASW Principle

The *Multi-channel Analysis of Surface Waves* (MASW) and the *SPatial AutoCorrelation* (SPAC or MAM for *Microtremors Array Method*) are seismic methods used to evaluate the shear wave velocities of subsurface materials through the analysis of the dispersion properties of the Rayleigh surface wave. The MASW is considered an "active" method, as the seismic signal is induced at known location and time in the geophones' spread axis. Conversely, the SPAC is considered a "passive" method, using the low frequency "signals" produced far away. The method can also be used with "active" seismic source records. The SPAC method generally allows deeper V_S soundings. Its dispersion curve can then be merged with the one of higher frequency from the MASW to calculate a more complete inversion. The dispersion properties are expressed as a change of velocities with respect to frequencies. Surface wave energy will decay exponentially with depth. Lower frequency surface waves will travel deeper and thus be more influenced by deeper velocity layering than the shallow higher frequency waves. The inversion of the Rayleigh wave dispersion curve yields a shear wave (V_S) velocity depth profile (sounding).

Figure 3 schematically outlines the basic operating procedure for the MASW method. Figure 4 illustrates an example of one of the MASW/SPAC records, a corresponding spectrogram analysis and resulting 1D V_S model.

INTERPRETATION

The main processing sequence involved data inspection and edition when required; spectral analysis (from MASW and SPAC); picking the fundamental mode; and 1D inversion of the MASW and SPAC shot records using the SeisImagerSW™ software. The data inversions used a nonlinear least squares algorithm.

In theory, all the shot records for a given seismic spread should produce a similar shear-wave velocity profile. In practice, however, differences can arise due to energy dissipation, local surface seismic velocities variations, and/or dipping of overburden layers or rock. In general, the precision of the calculated seismic shear wave velocities (V_S) is around 15% or better.

More detailed descriptions of these methods are presented in *Shear Wave Velocity Measurement Guidelines for Canadian Seismic Site Characterization in Soil and Rock*, Hunter, J.A., Crow, H.L., et al., Geological Surveys of Canada, General Information Product 110, 2015.

SURVEY DESIGN

The seismic spreads were laid out on a vacant lot located east of the intersection of Earl Armstrong Road and Portico Way (Figure 2). The geophone spacing was 3.0 metres for the main spread, using 24 geophones, and a shorter seismic spread, with geophone spacing of 1.0 metre was dedicated to the near surface materials. The seismic records were produced with a seismograph Terraloc MK6 (from ABEM Instrument), and the geophones were 4.5 Hz.

The seismic records counted 4096 data, sampled at 1000 µs for the MASW surveys, and at 50 µs for the seismic refraction. The records included a pre-trigged portion of 10 ms. An 8 kg sledgehammer was used as the energy source, with impacts being recorded off both ends of the seismic spreads. A stacking procedure was also used to improve the Signal / Noise ratio for the seismic records.

The shear wave depth sounding can be considered as the average of the bulk area within the geophone spread, especially for its central half-length.

RESULTS

From seismic resonance (V_P) the rock was calculated between 13 and 15 metres deep (± 10%), dipping WSW. From seismic refraction the rock seismic velocity (V_S) was calculated at 2225 m/s. These parameters were used for the geophysical models prior to the MASW results inversions.

The MASW calculated V_S results are illustrated at Figure 5. Some low seismic velocities were calculated from the surface to 5 to 7 metres deep.

The $\overline{V}_{S30}$ value results from the harmonic mean of the shear wave velocities, from the surface to 30 metres deep. It is calculated by dividing the total depth of interest (30 metres) by the sum of the time spent in each velocity layer from the surface down to 30 metres, as:

$$\overline{V}_{S30} = \frac{\sum_{i=1}^{N} H_i}{\sum_{i=1}^{N} {H_i}/{V_i}} \quad | \quad \sum_{i=1}^{N} H_i = 30 \text{ m}$$

(N: number of layers; H_i: thickness of layer "i" ; V_i: V_S of layer "i")

Thus, the $\overline{V}_{S30}$ value represents the seismic shear wave velocity of an equivalent homogeneous single layer response, between the surface and 30 metres deep.

The calculated $\overline{V}_{S30}$ value of the actual site is 376.0 m/s (Table 1), corresponding to the Site Class "C".

CONCLUSION

Geophysical surveys were carried out on a property located east of the intersection of Earl Armstrong Road and Portico Way, in Ottawa (ON). The seismic surveys used the MASW and SPAC analysis, and the seismic refraction to calculate the $\overline{V}_{S30}$ value.

The $\overline{V}_{S30}$ value of the actual site is 376 m/s, corresponding to the Site Class "C" ($360 < \overline{V}_{S30} \leq 760$ m/s), as determined through the MASW and SPAC methods, Table 4.1.8.4.-A of the NBC (2015), and the Building Code, O. Reg. 332/12.

It must be noted that some low seismic velocities were calculated from the surface to 5 to 7 metres deep. A geotechnical assessment of the corresponding materials could be required for the potential of liquefaction, the clays degree of sensitivity and other critical parameters.

It must also be noted that other geotechnical information gleaned on site; including the presence of liquefiable soils, very soft clays, high moisture content etc. (cf. Table 4.1.8.4.-A of the NBC 2015) can supersede the Site classification provided in this report based on the $\overline{V}_{S30}$ value.

The V_S values calculated are representative of the in situ materials and are not corrected for the total and effective stresses.

Hoping the whole to your satisfaction, we remain yours truly,

P. Eng.

Jean-Luc Arsenault, M.A.Sc., P.Eng.
Senior Project Manager

LICENSED PROFESSIONAL ENGINEER
J.-L. ARSENAULT
100148122
PROVINCE OF ONTARIO
2024-06-21

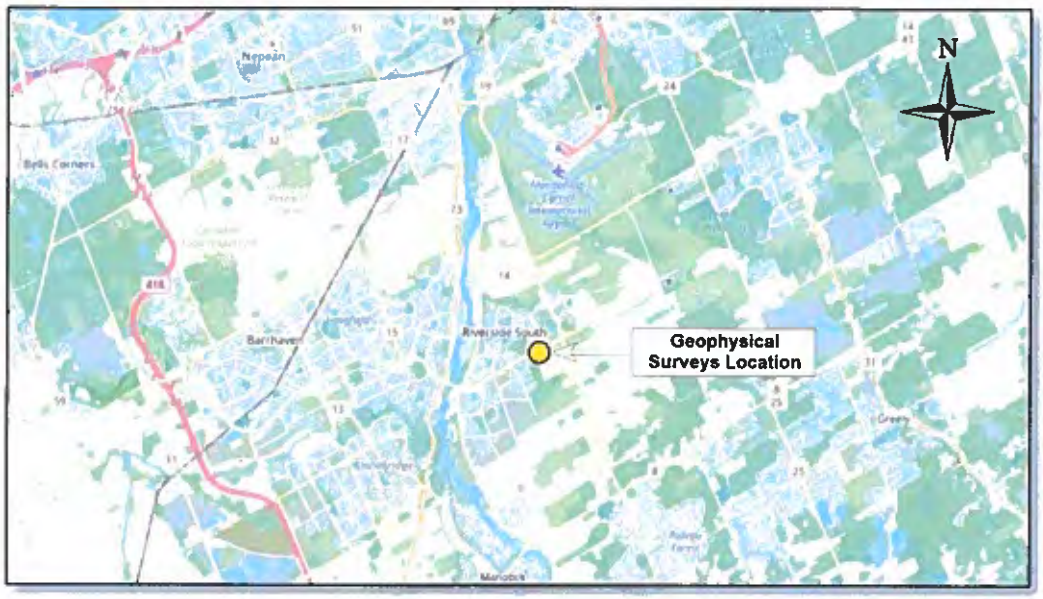


Figure 1: Regional location of the Site
(Source : OpenStreetMap©)

Figure 2: Location of the seismic spreads
(source: *Google Earth™*)

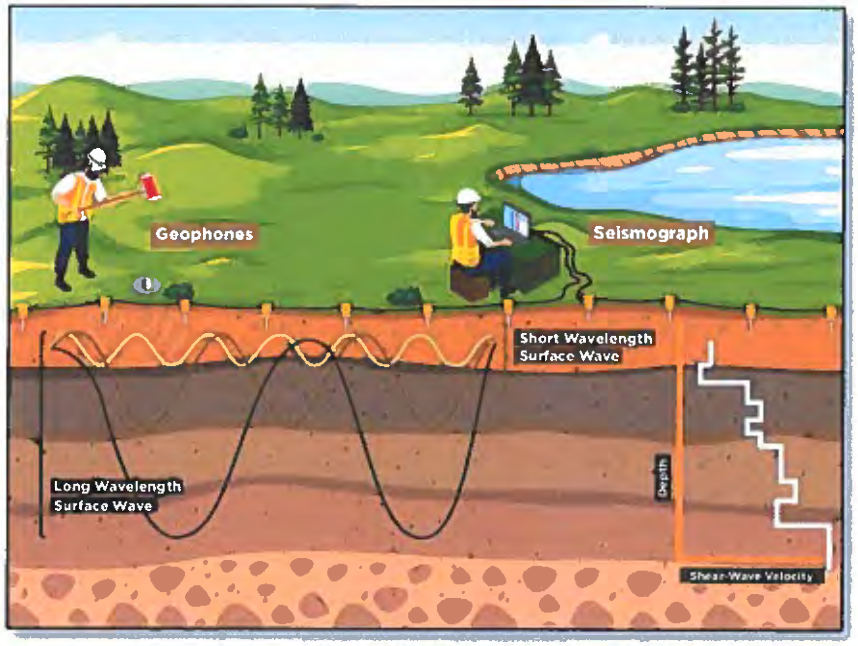


Figure 3: MASW Operating Principle

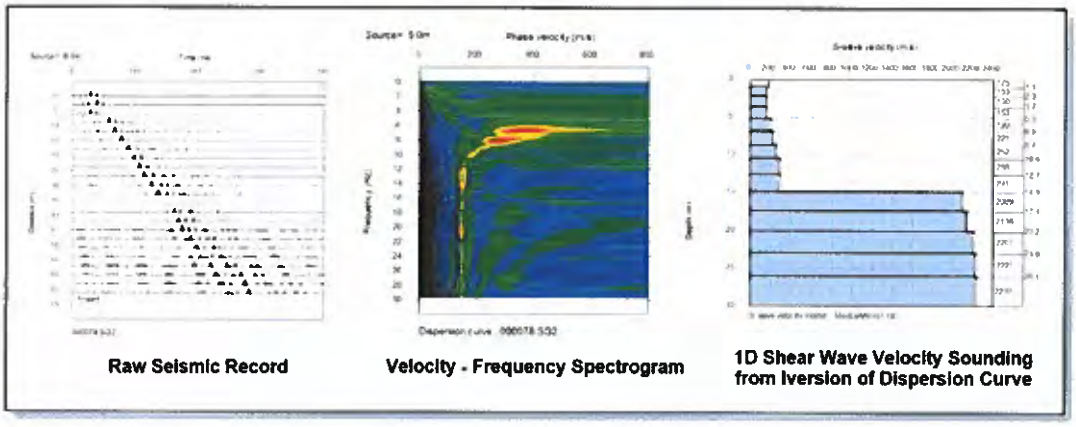


Figure 4: Example of a MASW/SPAC record, Phase Velocity - Frequency curve of the Rayleigh wave and resulting 1D Shear Wave Velocity Model

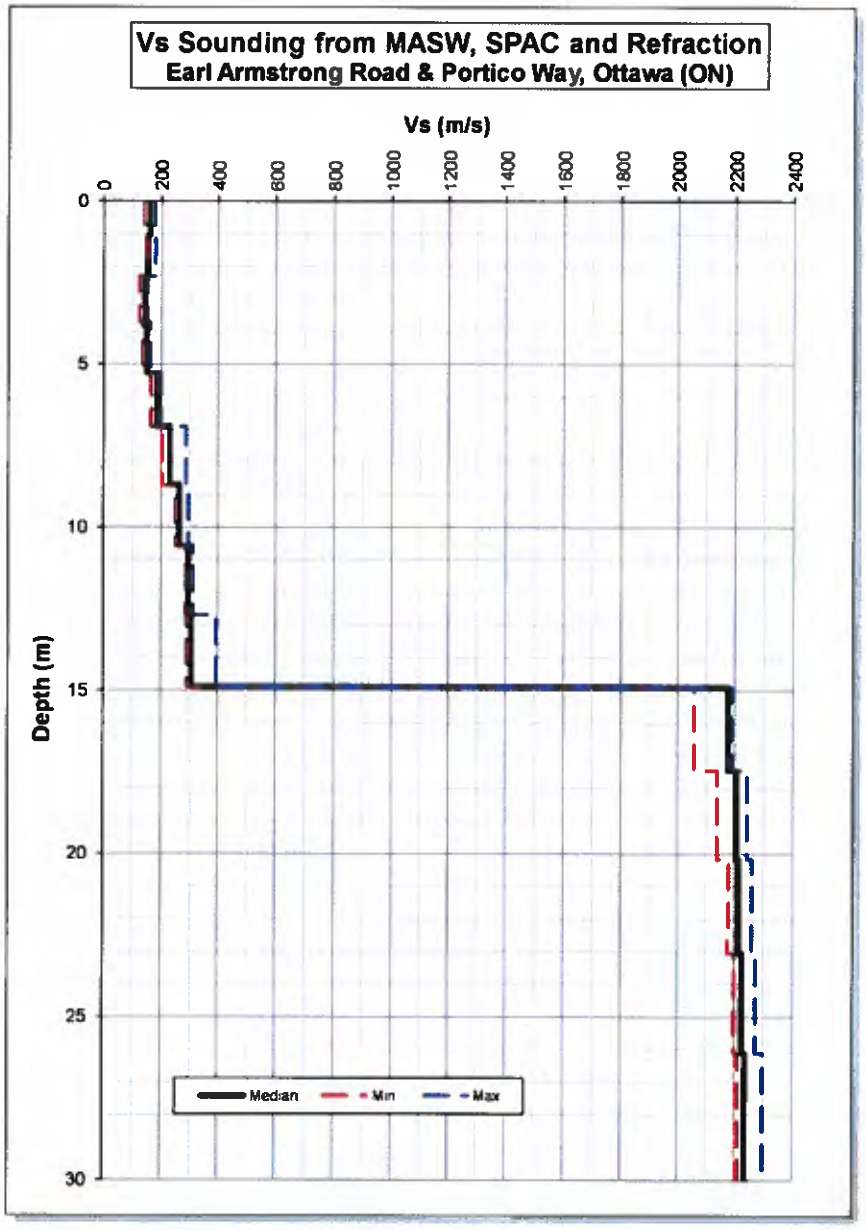


Figure 5: MASW Shear-Wave Velocity Soundings

TABLE 1

$\bar{V}_{S30}$ Calculation for the Site Class (actual site)

Depth	Vs			Thickness	Cumulative Thickness	Delay for med. Vs	Cumulative Delay	Vs at given Depth
	Min.	Median	Max.					
(m)	(m/s)	(m/s)	(m/s)	(m)	(m)	(s)	(s)	(m/s)
0	**141.4**	**159.7**	**175.9**	**Grade Level (May 15th, 2024)**				
1.07	**149.3**	**152.6**	**178.4**	1.07	1.07	0.006707	0.006707	159.7
2.31	**124.0**	**142.6**	**151.7**	1.24	2.31	0.008104	0.014811	155.8
3.71	**136.6**	**150.2**	**162.0**	1.40	3.71	0.009823	0.024634	150.6
5.27	**165.6**	185.4	199.8	1.57	5.27	0.010426	0.035060	150.4
6.91	205.2	231.9	288.1	1.63	6.91	0.008794	0.043854	157.5
8.70	252.3	263.8	296.2	1.80	8.70	0.007744	0.051598	168.6
10.56	288.2	297.1	313.6	1.86	10.56	0.007053	0.058651	180.1
12.69	291.4	307.9	394.4	2.13	12.69	0.007154	0.065805	192.8
14.89	2059.2	2177.1	2187.7	2.20	14.89	0.007146	0.072951	204.1
17.44	2136.6	2205.4	2242.6	2.55	17.44	0.001174	0.074125	235.3
20.16	2175.4	2213.8	2260.3	2.72	20.16	0.001233	0.075358	267.5
23.05	2198.3	2225.8	2272.7	2.88	23.05	0.001303	0.076661	300.6
26.10	2210.9	2235.3	2295.8	3.05	26.10	0.001370	0.078031	334.4
30				3.90	30.00	0.001747	0.079778	376.0

V_{S30} (m/s)	**376.0**
Class	**C (1)**

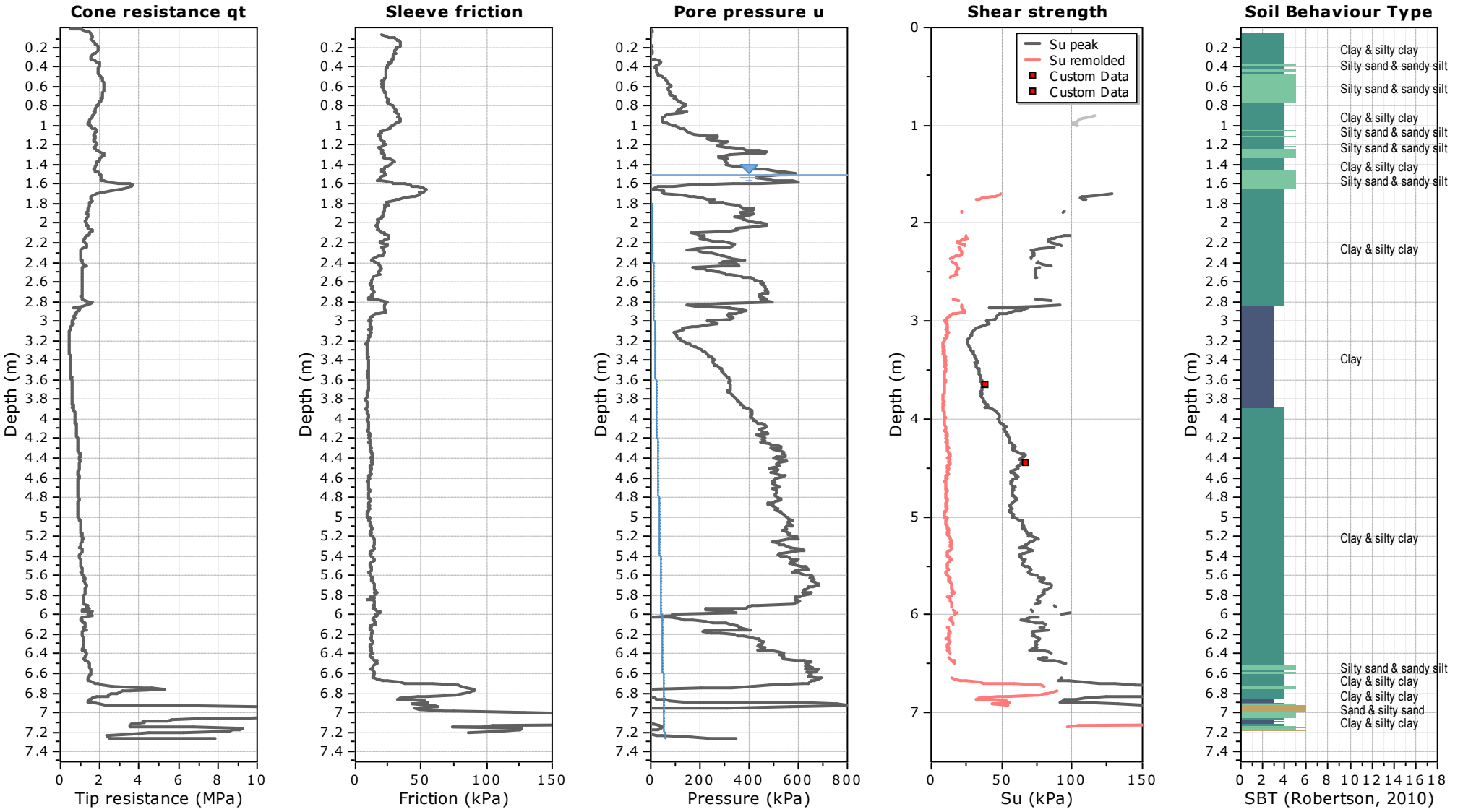
(1) Some low seismic velocities were calculated from the surface to 5 to 7 metres deep. A geotechnical assessment of the corresponding materials could be required.

Appendix B – Piezocone Penetration Test (CPT) Results

EXP
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6
http://www.exp.com

CPT-24-05r2
Total depth: 7.27 m, Date: 2024-08-06
Surface Elevation: 91.61 m
Cone Operator: MR Geotechnix

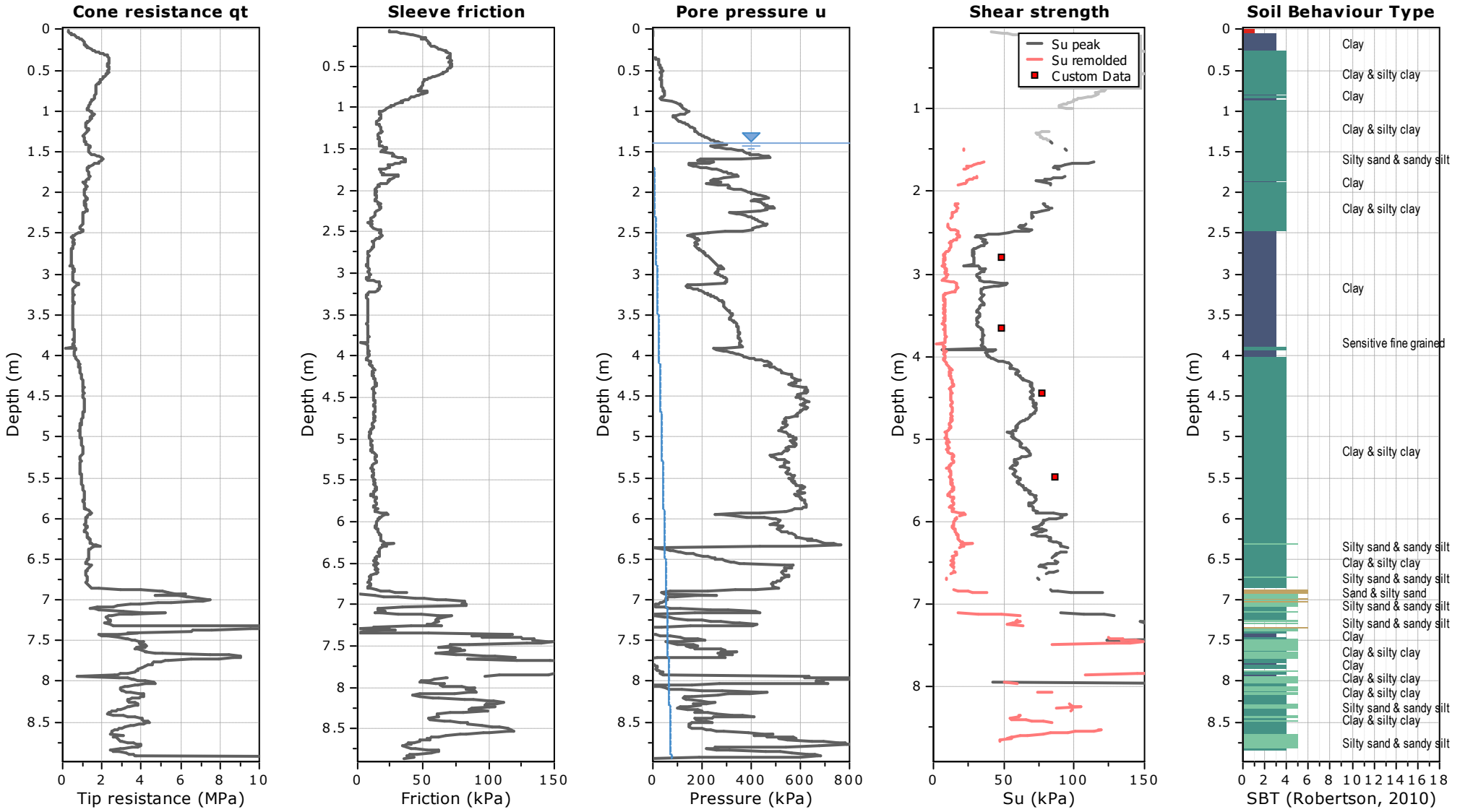
Project: Proposed Long-Term Care Facility
Location: 980 Earl Armstrong Road, Ottawa



EXP
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6
http://www.exp.com

CPT-24-07r2
Total depth: 8.95 m, Date: 2024-08-06
Surface Elevation: 91.29 m
Cone Operator: MR Geotechnix

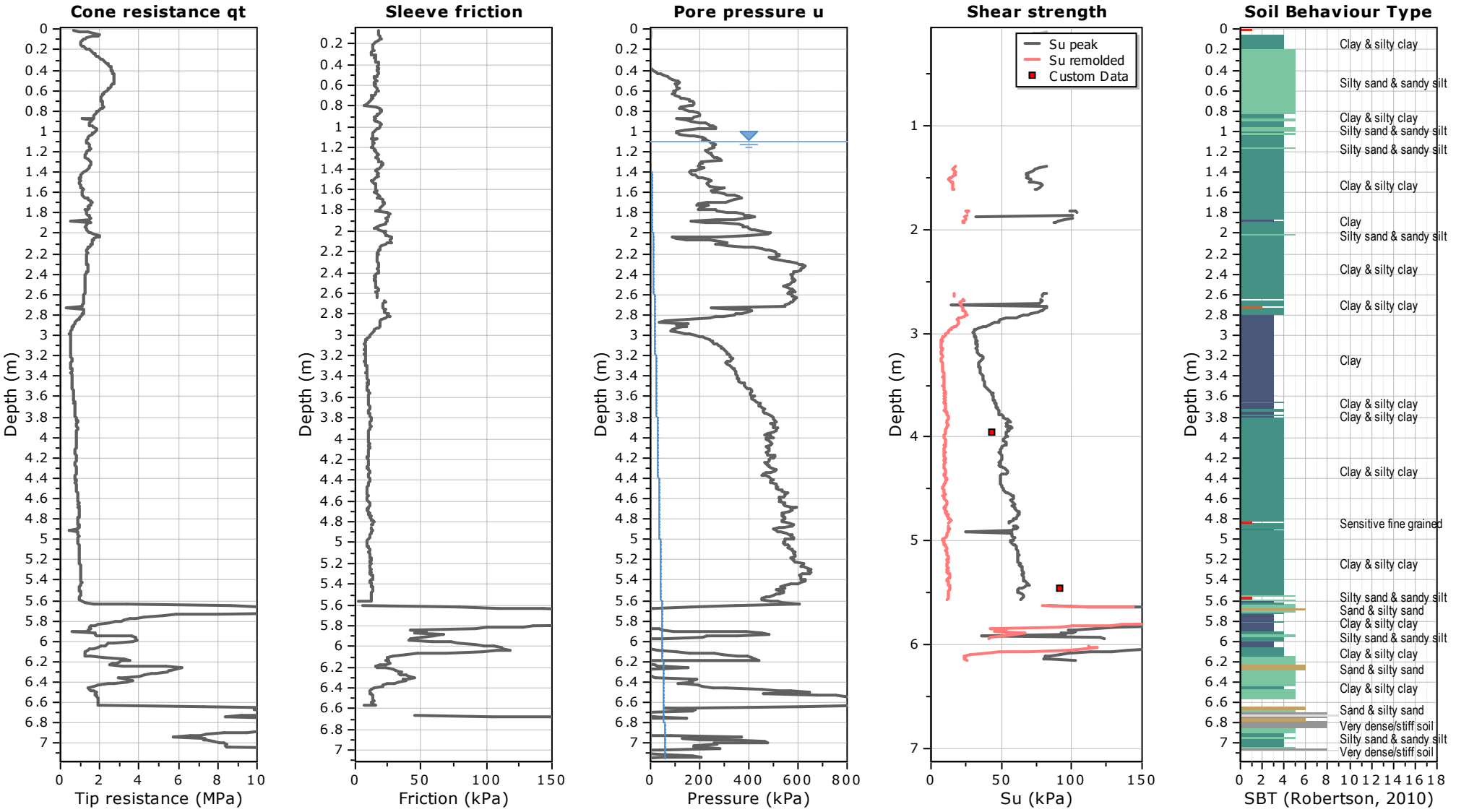
Project: Proposed Long-Term Care Facility
Location: 980 Earl Armstrong Road, Ottawa



EXP
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6
http://www.exp.com

CPT-24-13r2
Total depth: 7.15 m, Date: 2024-08-06
Surface Elevation: 91.19 m
Cone Operator: MR Geotechnix

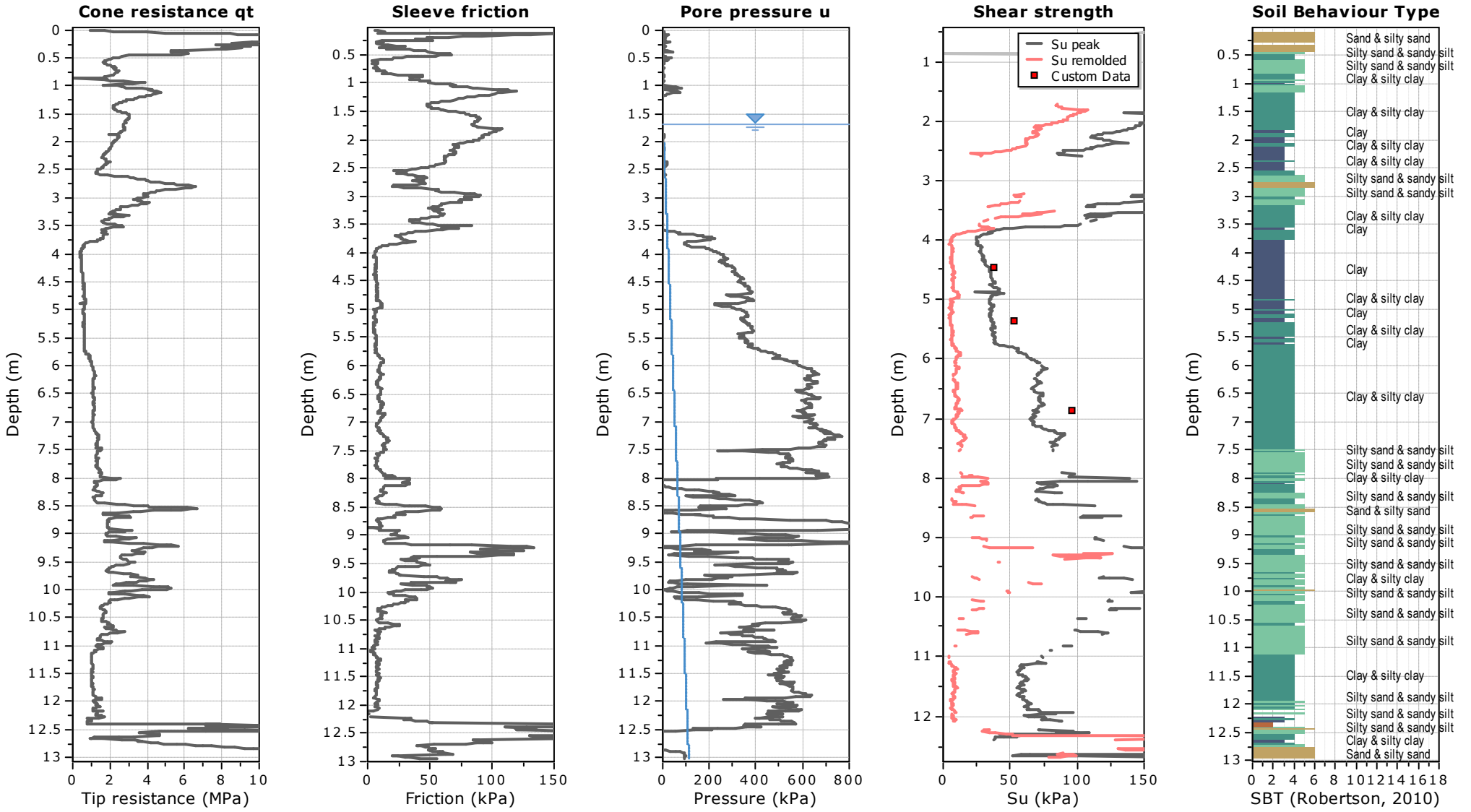
Project: Proposed Long-Term Care Facility
Location: 980 Earl Armstrong Road, Ottawa



EXP
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6
http://www.exp.com

CPT-24-15r2
Total depth: 13.02 m, Date: 2024-08-06
Surface Elevation: 92.73 m
Cone Operator: MR Geotechnix

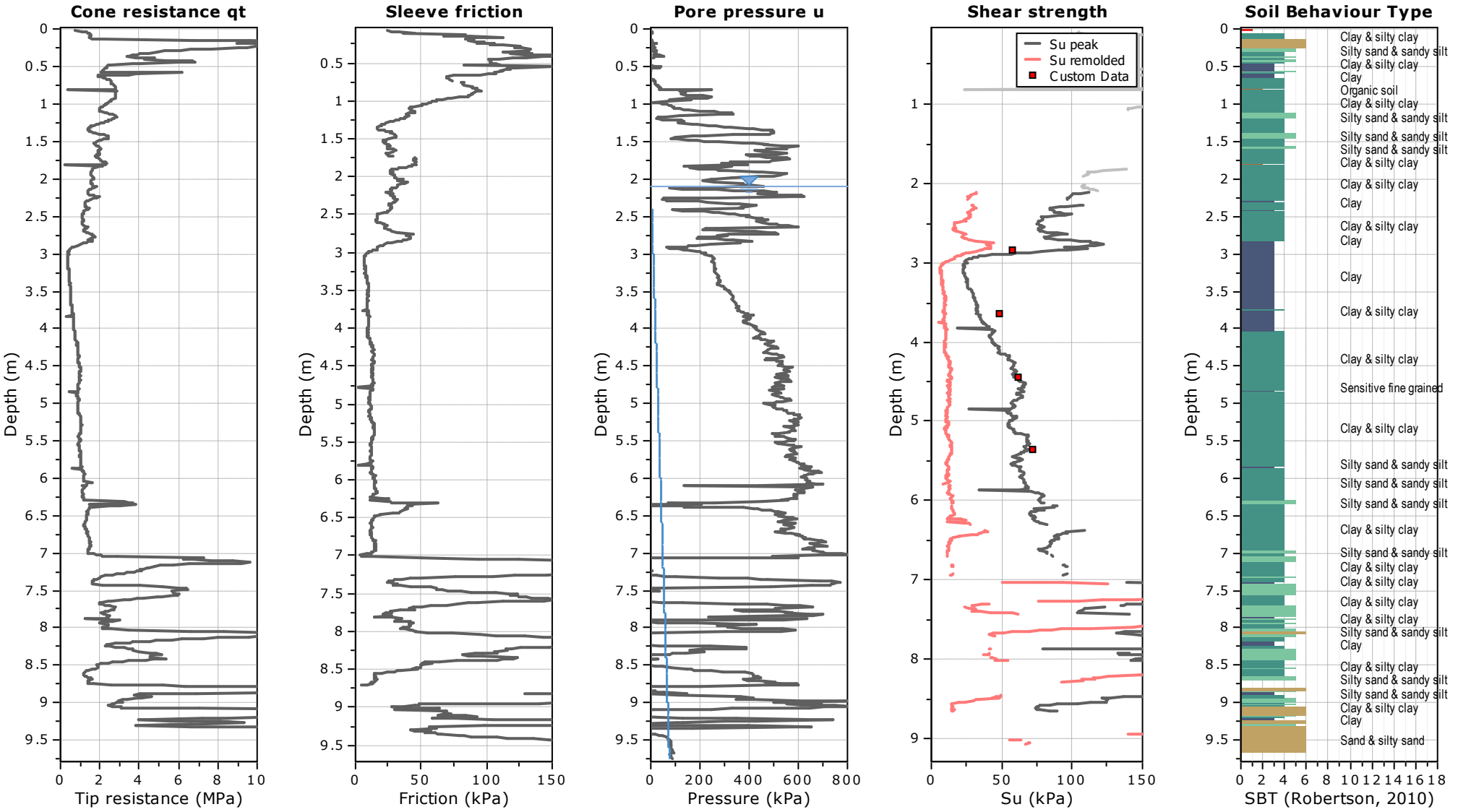
Project: Proposed Long-Term Care Facility
Location: 980 Earl Armstrong Road, Ottawa



EXP
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6
http://www.exp.com

CPT-24-18r2
Total depth: 9.75 m, Date: 2024-08-06
Surface Elevation: 91.91 m
Cone Operator: MR Geotechnix

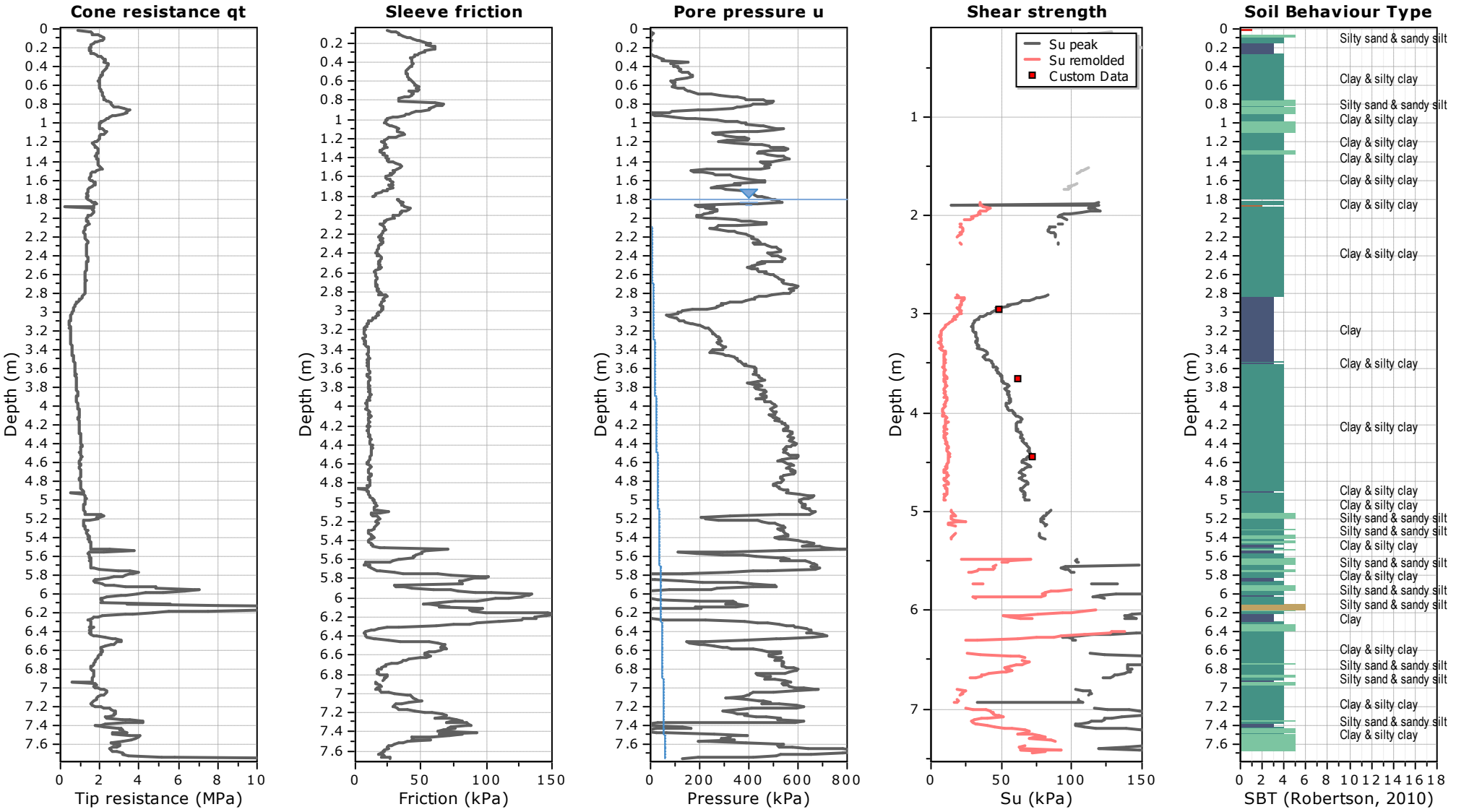
Project: Proposed Long-Term Care Facility
Location: 980 Earl Armstrong Road, Ottawa



EXP
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6
http://www.exp.com

CPT-24-21r2
Total depth: 7.75 m, Date: 2024-08-06
Surface Elevation: 91.60 m
Cone Operator: MR Geotechnix

Project: Proposed Long-Term Care Facility
Location: 980 Earl Armstrong Road, Ottawa



Appendix C – Consolidation Test Results

Stantec Consulting Ltd.
400 - 1331 Clyde Avenue, Ottawa ON K2C 3G4

July 18, 2024
File: 121624678

Attention: Ismail Taki, M.Eng., P.Eng.
Exp Services Inc
2650 Queensview Drive
Suite 100
Ottawa, Ontario, Canada, K2B 8H6
Tel: 1-613-853-1350
E-mail: ismail.taki@exp.com

Dear Mr. Taki,

Reference: Consolidation Test Results: Due Diligence-980 Earl Armstrong Rd., Gloucester, ON. Exp Services Inc., File # OTT-24005069-A

This letter presents the results of one-dimensional consolidation tests carried out on two shelby tube samples in accordance with ASTM D2435/D2435M – 11(2020). The test results are provided in the attached tables and figures.

Summary of tested samples

Sample ID	Depth (ft)	Date sampled
BH 24-27 SH 5	10-12	June 10, 2024
BH 24-16, SH8	20-22	June 14, 2024

This letter provides test results only and does not constitute any interpretation or engineering recommendations with respect to material suitability or specification compliance.

We trust the information presented herein meets your present requirements. Should you have any questions or require additional information, please do not hesitate to contact us.

Regards,

Stantec Consulting Ltd.

Ramin Ghassemi Ph.D., P.Eng.
Geotechnical Engineer
Direct: 613 722-4420
Mobile: 437 775-7625
Ramin.ghassemi@stantec.com

v:\01216\active\laboratory_standing_offers\2024 laboratory standing offers\121624678 exp services inc\2 consols & limits, exp # ott-02400569-a\consols\121624678_let_consolidation_bh24-27, sh5, bh24-16, sh8.docx

CONSOLIDATION TEST SUMMARY

SAMPLE IDENTIFICATION

Borehole No. :	BH24-27	Sample No. :	SH5
		Sample Depth (ft) :	10-12

TEST CONDITIONS

Test Type :	ASTM D2435/D2435M	Date Started :	20-Jun-19
Load Duration (hr) :	24	Date Completed :	5-Jul-24

SAMPLE DIMENSIONS AND PROPERTIES _ INITIAL

Sample Height (mm) :	20.00	Unit Weight (kN/m^3) :	17.64
Sample Diameter (mm) :	50.00	Dry Unit Weight (kN/m^3) :	12.35
Area (cm^2) :	19.63	Specific Gravity : (Assumed)	2.750
Volume (cm^3) :	39.27	Solid Height (mm) :	9.16
Water Content (%) :	42.90	Volume of Solids (cm^3) :	17.98
Wet Mass (g) :	70.65	Volume of Voids (cm^3) :	21.29
Dry Mass (g) :	49.44	Degree of Saturation (%) :	99.62

TEST COMPUTATIONS

Axial Stress (kPa)	Height (H) (mm)	Corrected Deformation (ΔH) (mm)	Axial Strain (ε_a) (%)	Void Ratio e	t_{90} (min)	C_v (cm^2/s)	m_v (m^2/kN)	k (cm/s)
0	20.0000	0.0000	0.00	1.184				
5	19.7401	0.2599	1.30	1.156	1.82	7.63E-01	2.60E-03	1.95E-08
10	19.6366	0.3634	1.82	1.145	2.94	4.66E-01	1.03E-03	4.73E-09
20	19.4841	0.5159	2.58	1.128	4.14	3.27E-01	7.63E-04	2.44E-09
40	19.2475	0.7525	3.76	1.102	2.57	5.16E-01	5.92E-04	3.00E-09
80	18.7903	1.2097	6.05	1.052	3.05	4.21E-01	5.72E-04	2.36E-09
160	17.5922	2.4078	12.04	0.921	5.96	2.00E-01	7.49E-04	1.47E-09
320	16.1037	3.8963	19.48	0.759	6.53	1.56E-01	4.65E-04	7.14E-10
480	15.4159	4.5841	22.92	0.684	8.69	1.02E-01	2.15E-04	2.15E-10
160	15.4670	4.5330	22.67	0.689				
40	15.6506	4.3494	21.75	0.709				
160	15.5304	4.4696	22.35	0.696	1.19	7.22E-01	5.01E-05	3.55E-10
480	15.2321	4.7679	23.84	0.664	1.29	6.48E-01	4.66E-05	2.96E-10
720	14.7886	5.2114	26.06	0.615	4.23	1.91E-01	9.24E-05	1.73E-10
960	14.4052	5.5948	27.97	0.573	10.99	6.91E-02	7.99E-05	5.41E-11
1920	13.5563	6.4437	32.22	0.481	2.80	2.48E-01	4.42E-05	1.08E-10

SAMPLE DIMENSIONS AND PROPERTIES _ FINAL

Sample Height (mm) :	13.56	Unit Weight (kN/m^3) :	22.15
Sample Diameter (mm) :	50.00	Dry Unit Weight (kN/m^3) :	18.13
Area (cm^2) :	19.63	Specific Gravity (Assumed) :	2.750
Volume (cm^3) :	26.62	Solid Height (mm) :	9.16
Water Content (%) :	21.60	Volume of Solids (cm^3) :	17.90
Wet Mass (g) :	60.12	Volume of Voids (cm^3) :	8.72
Dry Mass (g) :	49.22		

Project No. :	121624678	Prepared By :	DB
Date :	17-Jul-24	Checked By :	RG

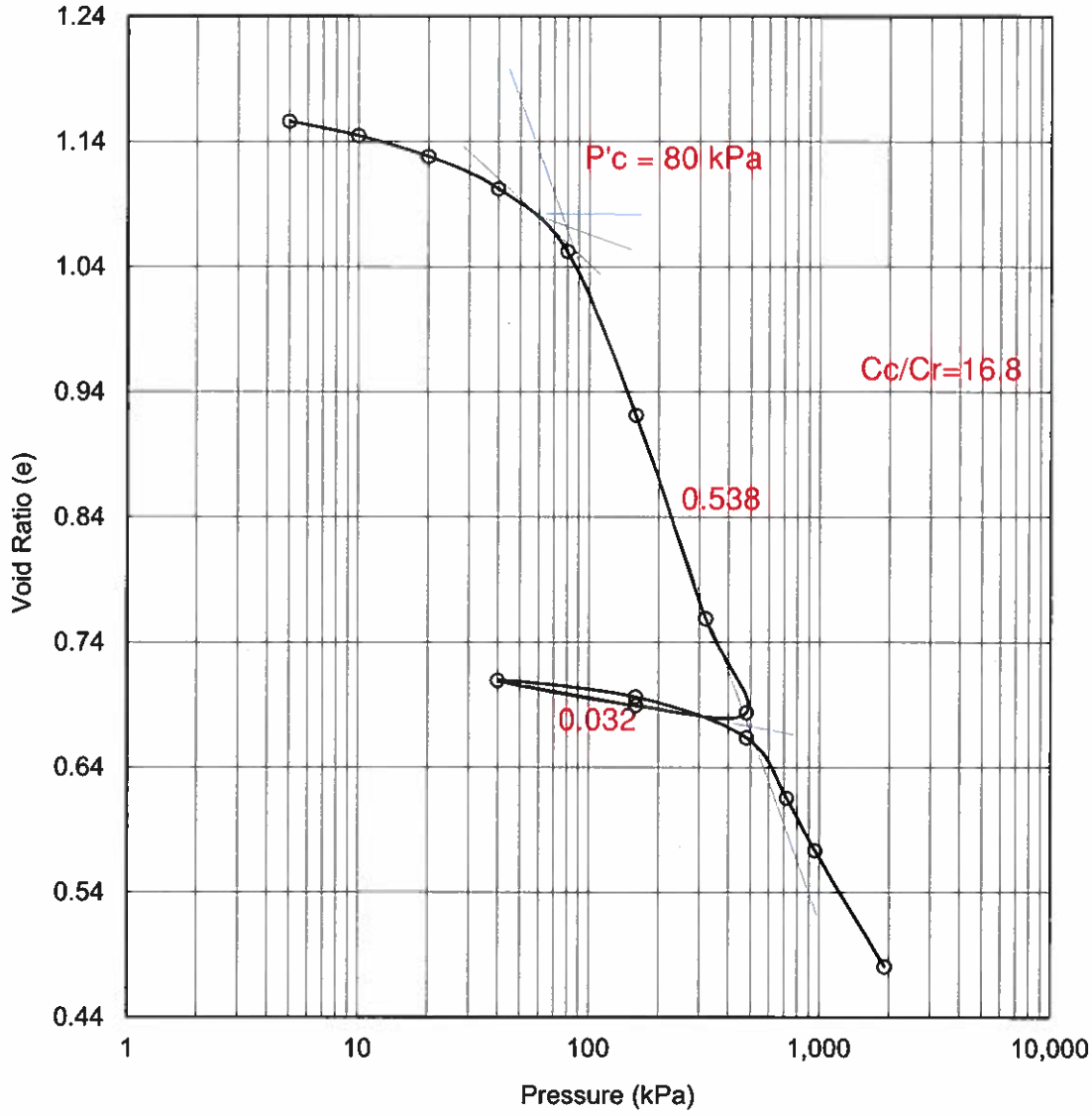
Stantec

CONSOLIDATION TEST	FIGURE 1

Due Diligence, Exp File# OTT-024005069-A

BH24-27, SH5

Void Ratio vs Pressure



Soil Type : *Silty clay of low plasticity with occasional sand partings, firm to stiff, grey, moist*

e_o =	1.184	w_L =	32%	σ_{v0}' =	kPa
w =	43%	w_P =	16%	σ_P' =	kPa
γ =	17.6 kN/m^3	PI =	16%		
Gs =	2.75				

Project No. : 121624678
Date : 17-Jul-24

Stantec

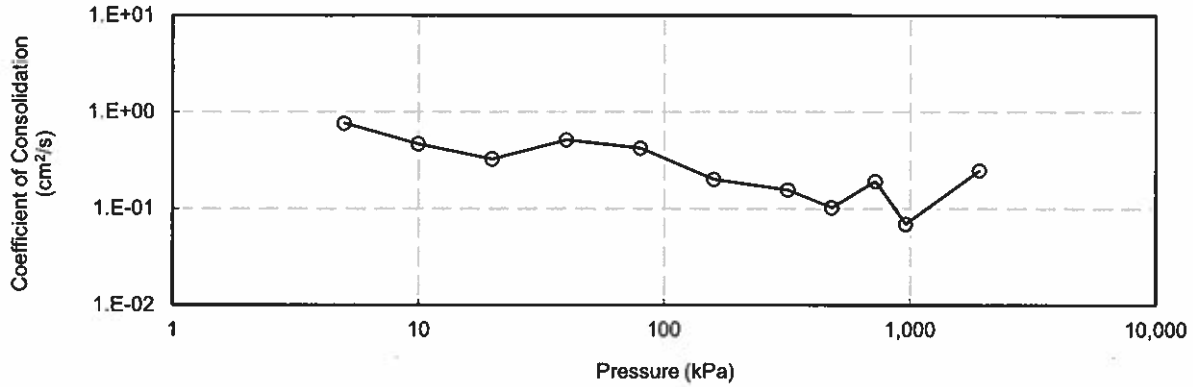
Prepared By : DB
Checked By : RG

CONSOLIDATION TEST	FIGURES 2, 3 & 4

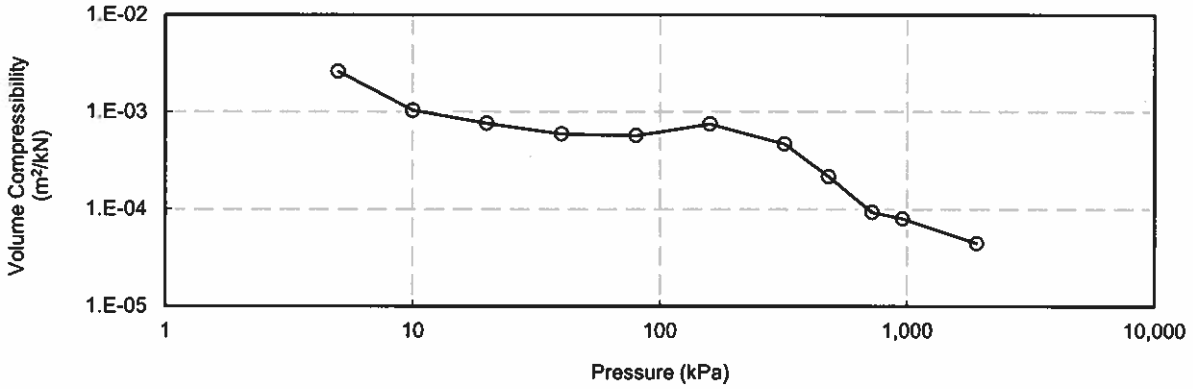
Due Diligence, Exp File# OTT-024005069-A

BH24-27, SH5

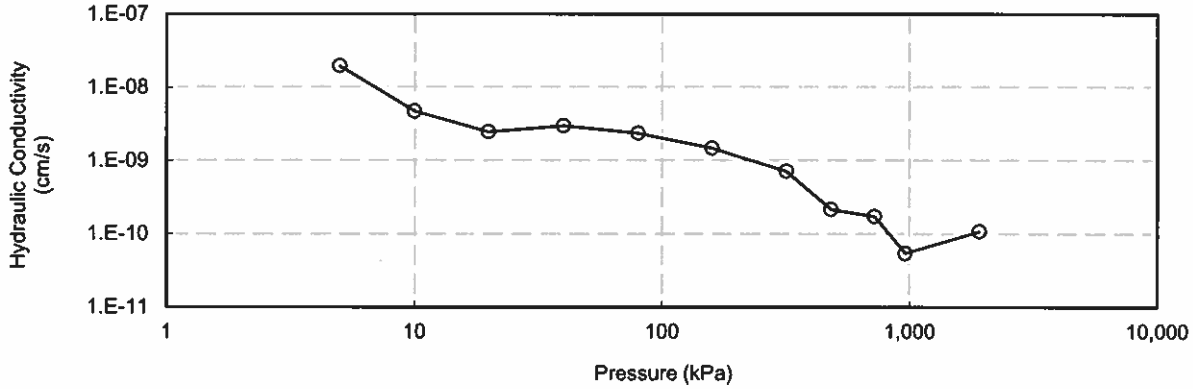
Cv vs Pressure



mv vs Pressure



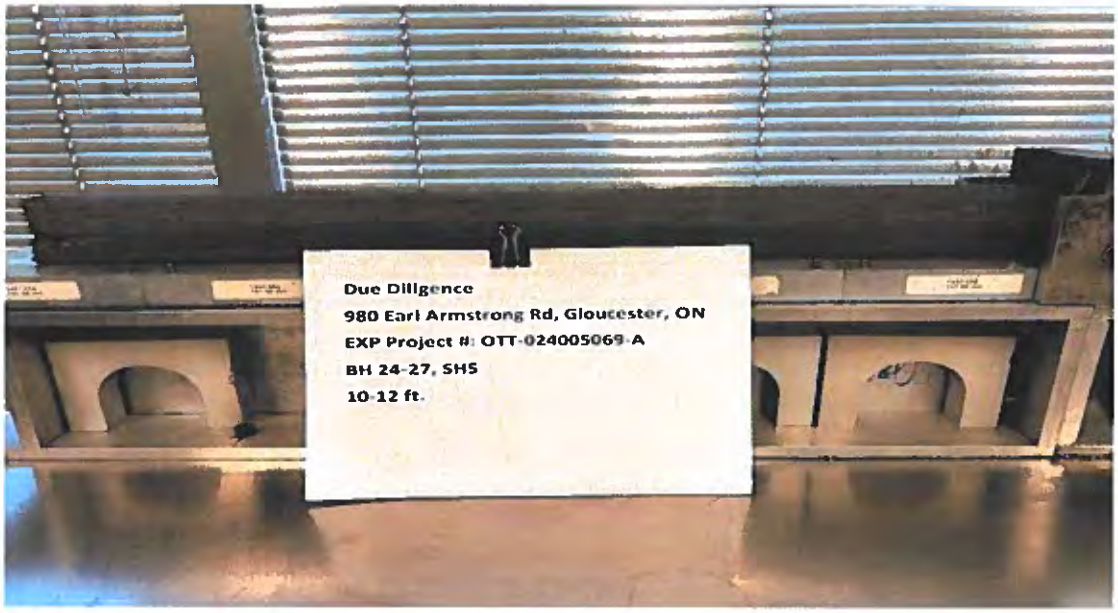
k vs Pressure



Project No. :	121624678	Stantec	Prepared By : DB
Date :	17-Jul-24		Checked By : RG

Due Diligence, Exp File# OTT-024005069-A

Silty clay of low plasticity with occasional sand partings, firm to stiff, grey, moist



BH24-27, SH5

BH24-27, SH5

CONSOLIDATION TEST SUMMARY

SAMPLE IDENTIFICATION

Borehole No. :	BH24-16	Sample No. :	SH8
		Sample Depth (ft) :	20-22

TEST CONDITIONS

Test Type :	ASTM D2435/D2435M	Date Started :	20-Jun-19
Load Duration (hr) :	24	Date Completed :	5-Jul-24

SAMPLE DIMENSIONS AND PROPERTIES _ INITIAL

Sample Height (mm) :	20.00	Unit Weight (kN/m^3) :	18.35
Sample Diameter (mm) :	50.00	Dry Unit Weight (kN/m^3) :	13.77
Area (cm^2) :	19.63	Specific Gravity : (Assumed)	2.750
Volume (cm^3) :	39.27	Solid Height (mm) :	10.21
Water Content (%) :	33.30	Volume of Solids (cm^3) :	20.05
Wet Mass (g) :	73.50	Volume of Voids (cm^3) :	19.22
Dry Mass (g) :	55.14	Degree of Saturation (%) :	95.53

TEST COMPUTATIONS

Axial Stress (kPa)	Height (H) (mm)	Corrected Deformation (ΔH) (mm)	Axial Strain (ε_a) (%)	Void Ratio e	t_{90} (min)	C_v (cm^2/s)	m_v (m^2/kN)	k (cm/s)
0	20.0000	0.0000	0.00	0.959				
5	19.5936	0.4064	2.03	0.919	1.35	1.02E+00	4.06E-03	4.08E-08
10	19.4293	0.5707	2.85	0.903	2.65	5.07E-01	1.64E-03	8.17E-09
20	19.2135	0.7865	3.93	0.881	3.17	4.16E-01	1.08E-03	4.40E-09
40	18.9133	1.0867	5.43	0.852	2.16	5.96E-01	7.51E-04	4.39E-09
80	18.4389	1.5611	7.81	0.806	2.95	4.18E-01	5.93E-04	2.43E-09
160	17.6840	2.3160	11.58	0.732	2.32	4.98E-01	4.72E-04	2.31E-09
320	16.7458	3.2542	16.27	0.640	2.65	3.99E-01	2.93E-04	1.15E-09
480	16.2709	3.7291	18.65	0.593	4.08	2.38E-01	1.48E-04	3.47E-10
160	16.3038	3.6962	18.48	0.597				
40	16.4196	3.5804	17.90	0.608				
160	16.3419	3.6581	18.29	0.600	1.02	9.31E-01	3.24E-05	2.96E-10
480	16.1254	3.8746	19.37	0.579	2.64	3.51E-01	3.38E-05	1.17E-10
720	15.7668	4.2332	21.17	0.544	4.02	2.25E-01	7.47E-05	1.65E-10
960	15.4433	4.5567	22.78	0.512	5.58	1.55E-01	6.74E-05	1.03E-10
1920	14.6486	5.3514	26.76	0.434	1.41	5.67E-01	4.14E-05	2.30E-10

SAMPLE DIMENSIONS AND PROPERTIES _ FINAL

Sample Height (mm) :	14.65	Unit Weight (kN/m^3) :	22.59
Sample Diameter (mm) :	50.00	Dry Unit Weight (kN/m^3) :	18.80
Area (cm^2) :	19.63	Specific Gravity (Assumed) :	2.750
Volume (cm^3) :	28.76	Solid Height (mm) :	10.21
Water Content (%) :	20.17	Volume of Solids (cm^3) :	20.05
Wet Mass (g) :	66.26	Volume of Voids (cm^3) :	8.71
Dry Mass (g) :	55.14		

Project No. :	121624678	Prepared By :	DB
Date :	17-Jul-24	Checked By :	RG

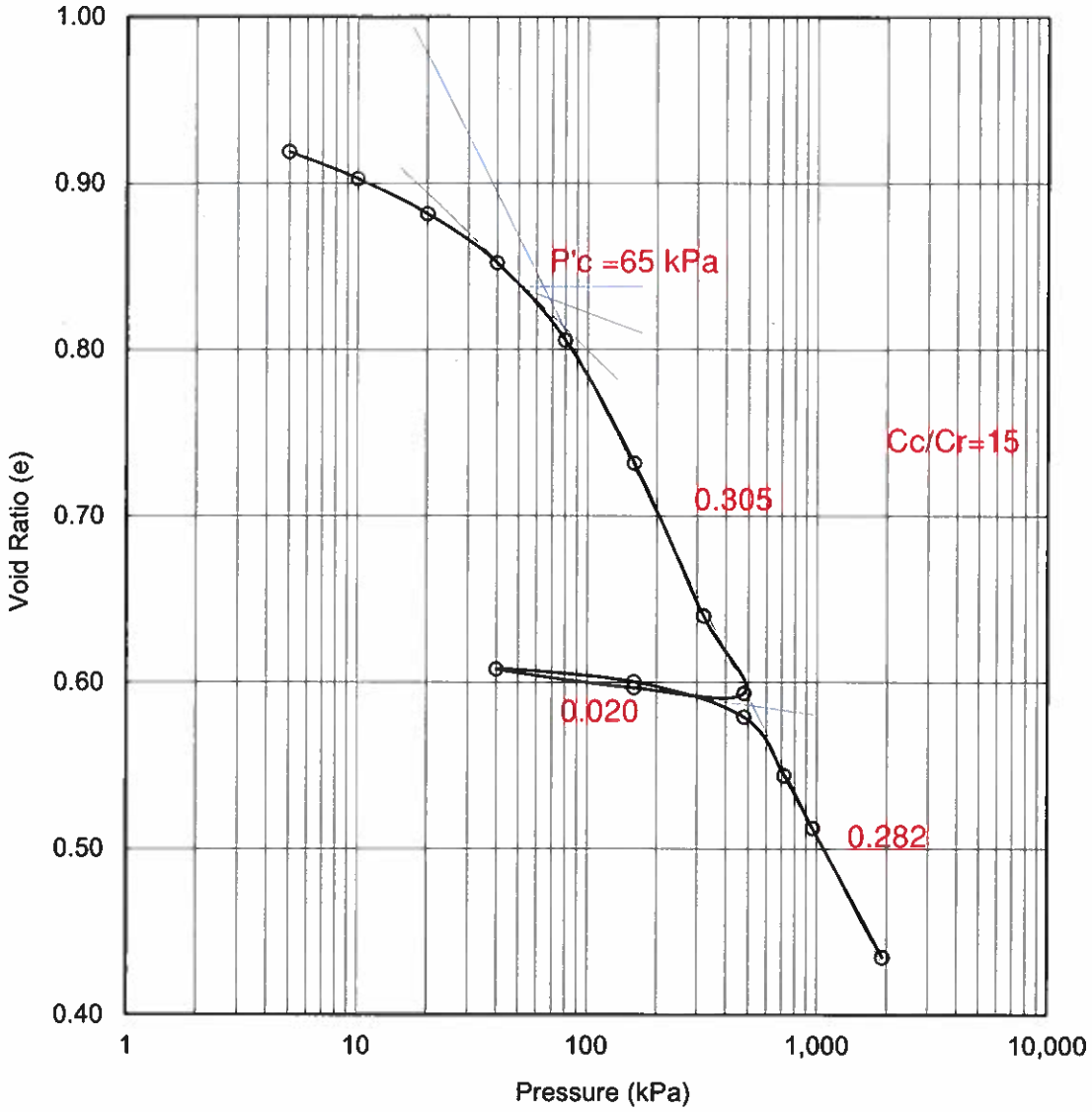
Stantec

CONSOLIDATION TEST	FIGURE 1

Due Diligence, Exp File# OTT-024005069-A

BH24-16, SH8

Void Ratio vs Pressure



Soil Type :	*Silty clay of low plasticity with occasional trace sand, firm to stiff, grey, moist*						
	e_o =	0.959		w_L =	32%	σ_{v0}' =	kPa
	w =	33%		w_P =	16%	σ_P' =	kPa
	γ =	18.4	kN/m^3	PI =	16%		
	Gs =	2.75					

Project No. : 121624678
Date : 17-Jul-24

Stantec

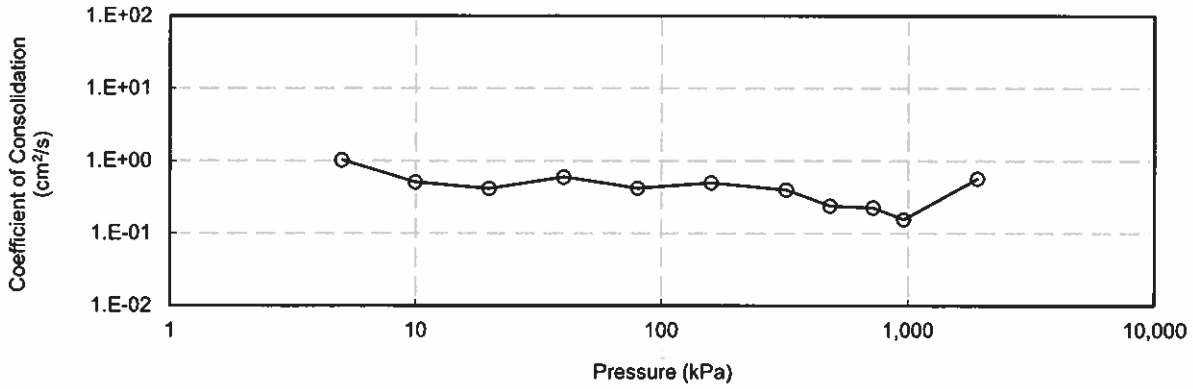
Prepared By : DB
Checked By : RG

CONSOLIDATION TEST	FIGURES 2, 3 & 4

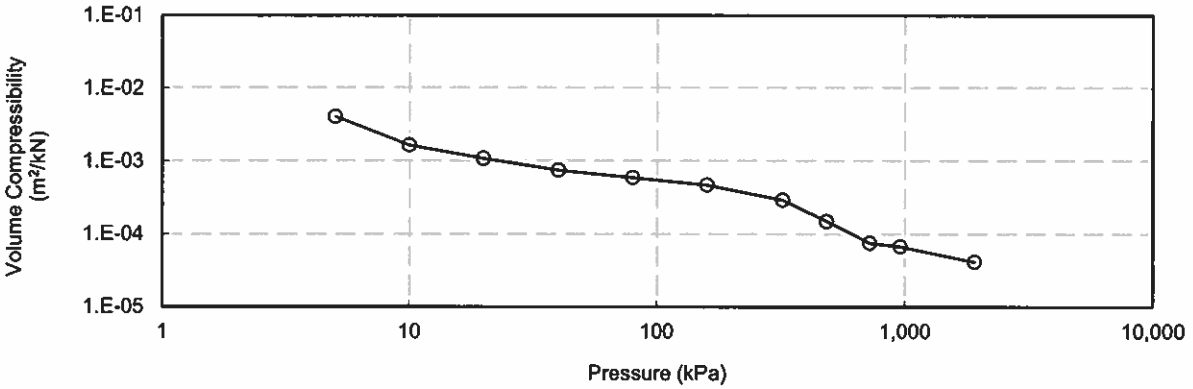
Due Diligence, Exp File# OTT-024005069-A

BH24-16, SH8

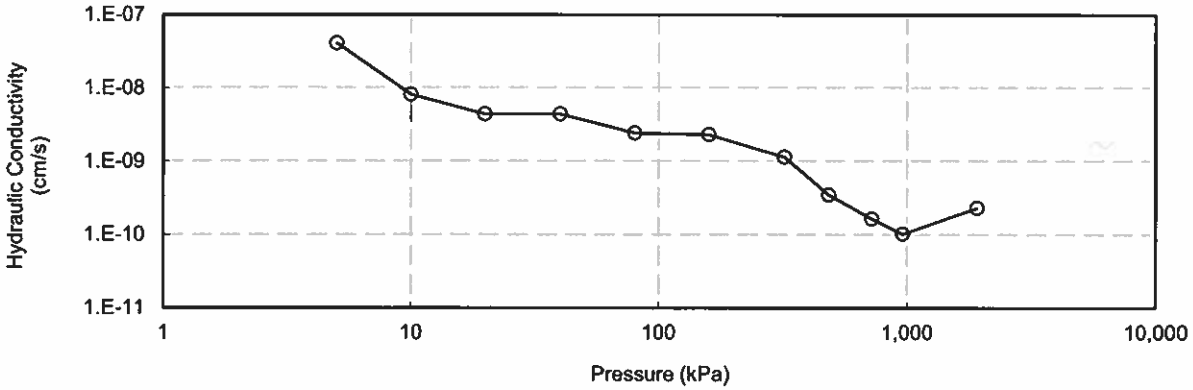
Cv vs Pressure



mv vs Pressure



k vs Pressure



Project No. :	121624678	Stantec	Prepared By : DB
Date :	17-Jul-24		Checked By : RG

Due Diligence, Exp File# OTT-024005069-A

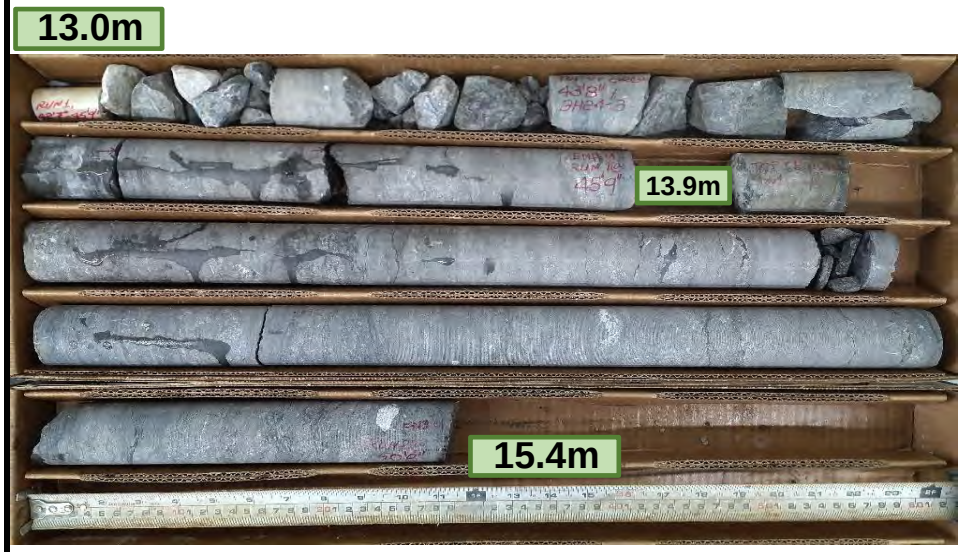
Silty clay of low plasticity with occasional trace sand, firm to stiff, grey, moist

BH24-16, SH8

BH24-16, SH8

Appendix D – Bedrock Core Photographs

DRY BEDROCK CORES



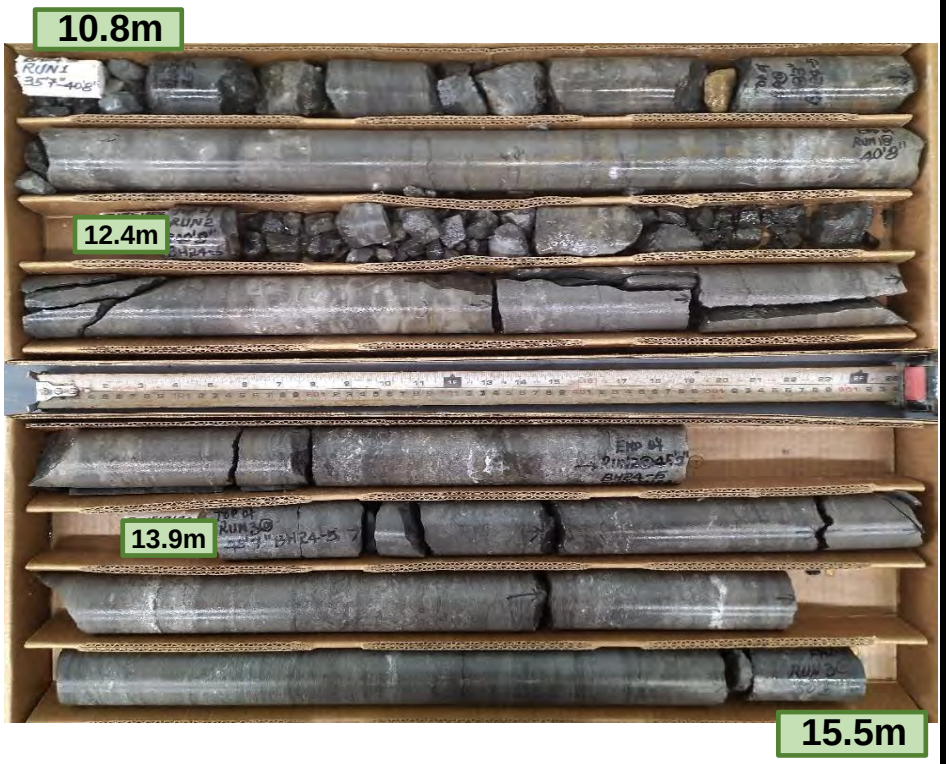
WET BEDROCK CORES

EXP Services Inc. www.exp.com
t: +1.613.688.1899 | f: +1.613.225.7337
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6, Canada

borehole no. **BH24-3**	Run 1: 13.0m - 13.9m Run 2: 13.9m - 15.4m End of Borehole	project	Proposed Long Term Care Facility 980 Earl Armstrong Road, Ottawa, ON	project no. OTT-24005069-A0
date cored Jun 13, 2024			Rock Core Photographs	FIG. D-1

DRY BEDROCK CORES

WET BEDROCK CORES



EXP Services Inc. www.exp.com
t: +1.613.688.1899 | f: +1.613.225.7337
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6, Canada

borehole no.		project	project no.
BH24-5	Run 1: 10.2m - 10.8m Run 2: 10.8m - 12.4m Run 3: 12.4m - 13.9m Run 4: 13.9m - 15.5m End of Borehole	Proposed Long Term Care Facility 980 Earl Armstrong Road, Ottawa, ON	OTT-24005069-A0
date cored Jun 13, 2024		Rock Core Photographs	FIG. D-2

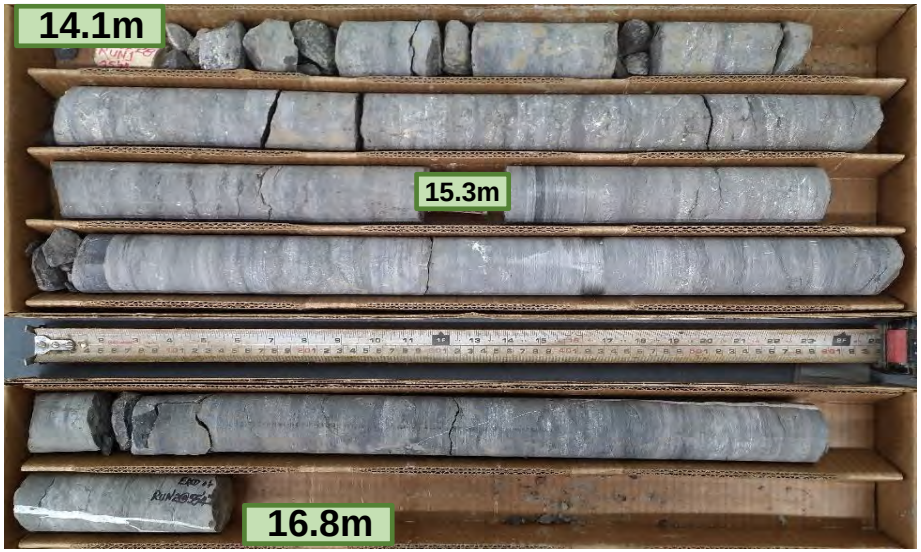
DRY BEDROCK CORES

WET BEDROCK CORES

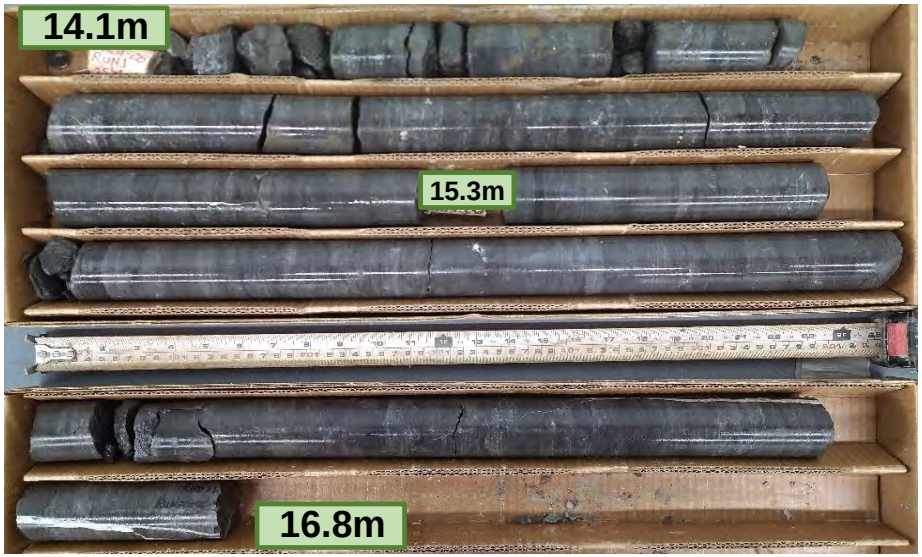
EXP Services Inc. www.exp.com
t: +1.613.688.1899 | f: +1.613.225.7337
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6, Canada

borehole no.		project		project no.
BH24-22	Run 1: 13.0m - 14.1m Run 2: 14.1m - 15.6m End of Borehole		Proposed Long Term Care Facility 980 Earl Armstrong Road, Ottawa, ON	OTT-24005069-A0
date cored				
Jun 07, 2024			Rock Core Photographs	FIG. D-3

DRY BEDROCK CORES



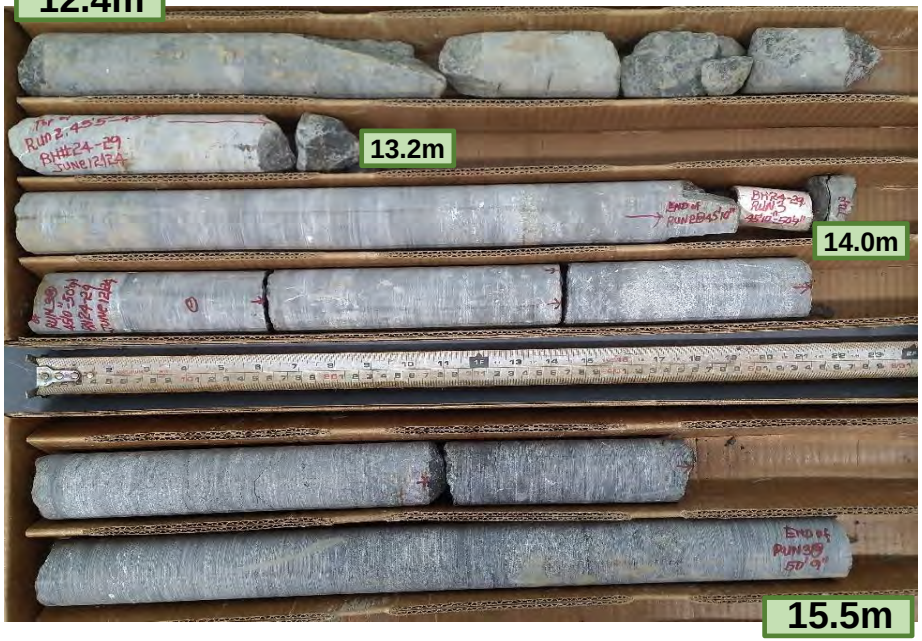
WET BEDROCK CORES



EXP Services Inc. www.exp.com
t: +1.613.688.1899 | f: +1.613.225.7337
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6, Canada

borehole no.		project	project no.
BH24-28	Run 1: 14.1m - 15.3m Run 2: 15.3m - 16.8m End of Borehole	Proposed Long Term Care Facility 980 Earl Armstrong Road, Ottawa, ON	OTT-24005069-A0
date cored Jun 11, 2024		Rock Core Photographs	FIG. D-4

DRY BEDROCK CORES



WET BEDROCK CORES

EXP Services Inc. www.exp.com
t: +1.613.688.1899 | f: +1.613.225.7337
2650 Queensview Drive, Suite 100
Ottawa, ON K2B 8H6, Canada

borehole no. **BH24-29**	Run 1: 12.4m - 13.2m Run 2: 13.2m - 14.0m Run 3: 14.0m - 15.5m End of Borehole	project	Proposed Long Term Care Facility 980 Earl Armstrong Road, Ottawa, ON	project no. OTT-24005069-A0
date cored Jun 12, 2024			Rock Core Photographs	FIG. D-5

Appendix E – Laboratory Certificate of Analysis Report by AGAT Laboratories

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: EXP SERVICES INC
2650 QUEENSVIEW DRIVE, UNIT 100
OTTAWA, ON K2B8H6
(613) 688-1899
ATTENTION TO: Ismail M. Taki
PROJECT: OTT-24005069-A0
AGAT WORK ORDER: 24Z164642
SOIL ANALYSIS REVIEWED BY: Nivine Basily, Inorganic Team Lead
DATE REPORTED: Jun 27, 2024
PAGES (INCLUDING COVER): 5
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
- *This Certificate shall not be reproduced except in full, without the written approval of the laboratory.*
- *The test results reported herewith relate only to the samples as received by the laboratory.*
- *Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.*
- *All reportable information is available on request from AGAT Laboratories, in accordance with ISO/IEC 17025:2017, ISO/IEC 17025:2005 (Quebec), DR-12-PALA and/or NELAP Standards.*
- *This document is signed by an authorized signatory who meets the requirements of the MELCCFP, CALA, CCN and NELAP.*
- *For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.*

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 24Z164642

PROJECT: OTT-24005069-A0

CLIENT NAME: EXP SERVICES INC

ATTENTION TO: Ismail M. Taki

SAMPLING SITE:980 Earl Armstrong Road

SAMPLED BY:EXP

(Soil) Inorganic Chemistry

DATE RECEIVED: 2024-06-19 **DATE REPORTED: 2024-06-27**

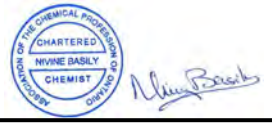
				BH24-2 SS3	BH24-2 SS8	BH24-15 SS4	BH24-15 SS8	BH24-21 SS3	BH24-21 SS5
		SAMPLE DESCRIPTION:		(5'-7')	(20'-22')	(7.5'-9.5')	(20'-22')	(5'-7')	(10'-12.5')
		SAMPLE TYPE:		Soil	Soil	Soil	Soil	Soil	Soil
		DATE SAMPLED:		2024-06-04	2024-06-04	2024-06-06	2024-06-06	2024-06-12	2024-06-12
Parameter	Unit	G / S	RDL	5952646	5952647	5952648	5952649	5952650	5952651
Chloride (2:1)	µg/g		2	11	7	7	6	4	4
Sulphate (2:1)	µg/g		2	59	124	113	97	69	39
pH (2:1)	pH Units		NA	8.50	8.45	8.11	8.38	8.44	8.45
Electrical Conductivity (2:1)	mS/cm		0.005	0.194	0.308	0.155	0.274	0.113	0.188

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

5952646-5952651 EC, pH, Chloride and Sulphate were determined on the extract obtained from the 2:1 leaching procedure (2 parts DI water: 1 part soil).

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:



AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: EXP SERVICES INC

AGAT WORK ORDER: 24Z164642

PROJECT: OTT-24005069-A0

ATTENTION TO: Ismail M. Taki

SAMPLING SITE:980 Earl Armstrong Road

SAMPLED BY:EXP

Soil Analysis

RPT Date: Jun 27, 2024			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
(Soil) Inorganic Chemistry															
Chloride (2:1)	5952646	5952646	11	11	1.7%	< 2	98%	70%	130%	99%	80%	120%	95%	70%	130%
Sulphate (2:1)	5952646	5952646	59	60	1.7%	< 2	101%	70%	130%	102%	80%	120%	99%	70%	130%
pH (2:1)	5952646	5952646	8.50	8.37	1.5%	NA	101%	80%	120%						
Electrical Conductivity (2:1)	5952646	5952646	0.194	0.207	6.4%	< 0.005	102%	80%	120%						

Comments: NA signifies Not Applicable.
pH duplicates QA acceptance criteria was met relative as stated in Table 5-15 of Analytical Protocol document.

Duplicate NA: results are under 5X the RDL and will not be calculated.

Certified By:

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: EXP SERVICES INC

AGAT WORK ORDER: 24Z164642

PROJECT: OTT-24005069-A0

ATTENTION TO: Ismail M. Taki

SAMPLING SITE:980 Earl Armstrong Road

SAMPLED BY:EXP

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Chloride (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Sulphate (2:1)	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
pH (2:1)	INOR 93-6031	modified from EPA 9045D and MCKEAGUE 3.11	PH METER
Electrical Conductivity (2:1)	INOR-93-6075	modified from MSA PART 3, CH 14 and SM 2510 B	PC TITRATE

AGAT Laboratories

Have feedback? Scan here for a quick survey!

2345 Cawthra Avenue
Mississauga, Ontario, L5C 2T7
Tel: 905.712.5100 Fax: 905.712.5122
www.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 24716464 2

Cooler Quantity: n/a - no ice packs
Arrival Temperatures: 29.3 | 29.0 | 29.2
Depot Temperatures: 6.9 | 6.8 | 7.3
Custody Seal Intact: ☐ Yes ☐ No ☐ N/A
Notes:

Report Information:

Company: EXP Services Inc.
Contact: Ismail Taki
Address: 2650 Queensview Drive, Suite 100
Ottawa, Ontario, K2B 8H6
Phone: 613-688-1899 Fax:
Reports to be sent to:
1. Email: ismail.taki@exp.com
2. Email: ryan.digiuseppe@exp.com

Regulatory Requirements:

(Please check all applicable boxes)

☐ Regulation 153/04
Table _____ (Indicate One)
☐ Ind/Com
☐ Res/Park
☐ Agriculture
Soil Texture (Check One)
☐ Coarse
☐ Fine

☐ Regulation 406
Table _____ (Indicate One)
☐ Ind/Com
☐ Res/Park
☐ Agriculture
☐ Regulation 558
☐ CCME

☐ Sewer Use
☐ Sanitary ☐ Storm
Region
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
Indicate One

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
TAT is exclusive of weekends and statutory holidays

For 'Same Day' analysis, please contact your AGAT CSR

Project Information:

Project: OTT-24005069-A0
Site Location: 980 earl armstrong road
Sampled By: EXP
AGAT Quote #: PO:
Please note: If quotation number is not provided, client will be billed full price for analysis.

Is this submission for a **Record of Site Condition (RSC)?** ☐ Yes ☐ No

Report Guideline on *Certificate of Analysis* ☐ Yes ☐ No

Legal Sample ☐

Invoice Information:

Bill To Same: Yes ☑ No ☐

Company:
Contact:
Address:
Email:

Sample Matrix Legend

GW	Ground Water	**SD**	Sediment
O	Oil	**SW**	Surface Water
P	Paint	**R**	Rock/Shale
S	Soil		

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC Y/N	O. Reg 153: Metals & Inorganics	O. Reg 153: Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	O. Reg 153: BTEX, F1-F4 PHCs	O. Reg 153: VOC	O. Reg 153: PAHs	O. Reg 153: PCBs: Aroclors ☐	O. Reg 406: Regulation 406 Characterization Package: pH, Metals, BTEX, F1-F4	O. Reg 406: EC, SAR	O. Reg 406: Regulation 406 SPLP Rainwater Leach mSPLP: ☐ Metals ☐ VOCs ☐ SVOCs ☐ DOC	O. Reg 406: Landfill Disposal Characterization TCLP: TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ BaP ☐ PCBs	O. Reg 558	Corrosivity: ☐ Moisture ☐ Sulphide	pH	Sulphate	chloride	electroConductivity			Potentially Hazardous or High Concentration (Y/N)
1. BH24-2 SS3 (5'-7')	June 4	AM PM	1																☑	☑	☑	☑			
2. BH24-2 SS8 (20'-22')	June 4	AM PM	1																☑	☑	☑	☑			
3. BH24-15 SS4 (7.5'-9.5')	June 6	AM PM	1																☑	☑	☑	☑			
4. BH24-15 SS8 (20'-22')	June 6	AM PM	1																☑	☑	☑	☑			
5. BH24-21 SS3 (5'-7')	June 12	AM PM	1																☑	☑	☑	☑			
6. BH24-21 SS5 (10-12.5')	June 12	AM PM	1																☑	☑	☑	☑			
7.		AM PM																							
8.		AM PM																							
9.		AM PM																							
10.		AM PM																							
11.		AM PM																							

Samples Relinquished By (Print Name and Sign)	Date	Time	Samples Received By (Print Name and Sign)	Date	Time
			C. Guitterez	06/19/24	16h34
CC. to Pam	06/20/24	15h00	Anmol - B3	06/21/24	8:42am

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N°:

Pink Copy - Client | Yellow Copy - AGAT | White Copy - AGAT

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