REPORT

GEOTECHNICAL INVESTIGATION
WEST CARLETON ENVIRONMENTAL CENTRE - MAINTENANCE BUILDING

2413 Carp Road, Ottawa, Ontario

Submitted to:

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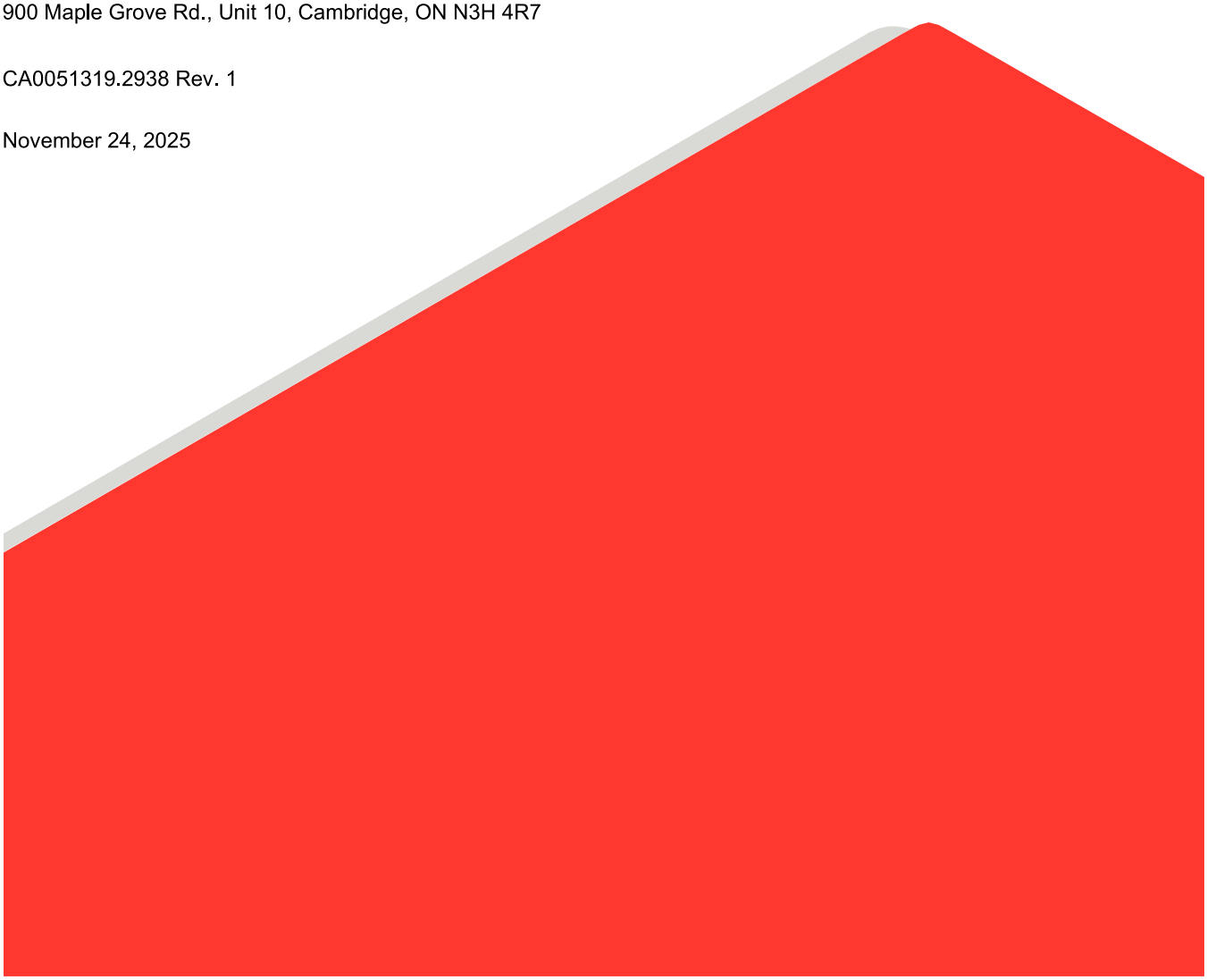

Distribution List

1 pdf copy - Waste Management of Canada Corporation

1 pdf copy - WSP Canada Inc.

Table of Contents

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

WSP Canada Inc. (“WSP”) was retained by Waste Management of Canada Corporation. (“the Client”) to undertake a geotechnical investigation in support of the proposed maintenance building at the West Carleton Environmental Centre (WCEC) (“the Project”) located at 2413 Carp Road in Ottawa, Ontario.

WSP has prepared a geotechnical investigation report titled “Proposed Access Road ad Scale House Geotechnical Investigation” with project No. 211-10332-00, dated March 2022 for other portions of the WCEC project and therefore, the previous boreholes’ information has been used to gain a more comprehensive understanding of the subsurface conditions within the Project area.

The purpose of this investigation was to obtain information on sub-surface conditions at the proposed building location by means of a limited number of boreholes, in-situ tests and laboratory tests on selected soil samples. Based on WSP’s interpretation of the data obtained, recommendations are provided on the geotechnical aspects of the project with respect to the proposed building construction.

This report contains the findings of WSP’s geotechnical investigation, together with recommendations and comments. The recommendations and comments are based on factual information at the test locations and intended primarily for use by design engineers. Environmental and hydrogeological recommendations will be reported under separate covers.

The number of boreholes may not be sufficient to determine all of the factors that may affect construction methods and costs. Subsurface and groundwater conditions between and beyond the boreholes may differ from those encountered at the borehole locations, and conditions may become apparent during construction that could not be detected or anticipated at the time of the site investigation.

The anticipated construction conditions are also discussed, but only to the extent that they may influence the design decisions. The feasible construction methods, however, express our opinion and are not intended to direct contractors on how they carry out construction.

Contractors should also be aware that the data and their interpretation presented in this report may not be sufficient to assess all factors that may have effect upon construction.

This report has been prepared with the assumption that the design will be in accordance with good engineering practices, applicable regulations of jurisdictional authorities, and applicable standards and regulations. Further, the recommendations and opinions in this report are applicable only to the proposed project. The important information and limitations of this report, provided in Appendix A, following the text of this report, constitute an integral part of this report.

There should be an ongoing liaison with WSP during both the design and construction phases of this project to ensure that the recommendations in this report have been adequately interpreted and implemented. Also, any further clarification and/or elaboration are needed concerning the geotechnical aspects of this project, WSP should be contacted immediately.

2.0 SITE DESCRIPTION AND GEOLOGICAL BACKGROUND

2.1 Site & Project Description

The project site is located at 2413 Carp Road, northwest of the Carp Road interchange with Highway 417, near Stittsville, in Ottawa, Ontario. Access to the project site is from Carp Road. The general location of the project site is shown on the Key Plan provided on Figure 1.

The proposed maintenance building is positioned to the west of the existing Laurysen building, about 70 meters from the landfill boundary, with a gas detector system installed inside. Ground surface elevation within the proposed maintenance building area varies between approximately 126.3 to 127.3 metres above sea level (masl). A total of four (4) boreholes were drilled across the footprint of the proposed construction. The construction layout and boreholes are shown in Figure 2.

2.2 Geological Background and Historical Information

Based on Chapman, L. J., and Putnam, D. F. (1984), The Physiography of Southern Ontario, the Site is located at Ottawa Valley Clay Plains. Published surficial geology maps indicate that the project area is underlain by Sand Plains, consisting of predominantly sand with some glacial till. The Ontario Geological Survey (Surficial Geology of Southern Ontario MRD 128 KML) indicates that the native deposits in the vicinity of the Site primarily consist of sand, gravelly sand, gravel from glaciomarine and marine deposits.

The study area is underlain by limestone, dolostone, shale, arkose, and sandstone of the Shadow Lake Formation, according to the Bedrock Geology of Ontario Map 2544 (Southern Sheet).

A hydrogeological assessment report, No. CB8831-13-00, prepared by WESA and dated June 2014, presented two stratigraphic sections, A-A and B-B. The project site is near monitoring well W64. At this location, the bedrock surface was encountered at about an elevation of 120 m.

3.0 INVESTIGATION PROGRAMS

3.1 2022 Investigation Program

WSP completed the geotechnical investigation for the proposed access road and scale house in March 2002 including drilling of ten (10) boreholes (BH1-21 to BH10-21). The boreholes were advanced through the overburden materials using hollow stem augers to depths ranging from approximately 1.5 m to 6.9 m below ground surface (mbgs). The boreholes were advanced with a track mounted CME75 hydraulic drilling machine. No survey data exists for the as-drilled borehole locations based on the logs. The borehole location plan is included in Figure 3.

Soil samples retrieved were logged and visually classified in the field, and in-situ tests including Standard Penetration Testing (SPT) were carried out at regular intervals, where possible and applicable. A laboratory testing program was carried out on selected representative soil samples, which included the determination of natural water content and grain size distribution (sieve analysis). Summary of in-situ and laboratory test results are shown in Record of Borehole Sheets presented in Appendix B.

In summary, the boreholes advanced at the project site encountered topsoil and/or fill underlain by native sand or sand and silt, underlain by native silt till with sand and gravel. Groundwater was encountered in open boreholes BH7-21, BH8-21 and BH10-21 at depths ranging from 1.4 to 2.3 mbgs. Weathered bedrock was encountered in BH1-21 and BH3-21 between 1.1 m and 2.1 mbgs.

3.2 2025 Investigation Program

The borehole depths selected for the 2025 investigation were based on information obtained from the 2022 subsurface exploration and published geological data, which identified a glacial till deposit of gravelly sand and sand underlain by shallow bedrock within the project area. Accordingly, the 2025 boreholes were advanced to depths that extend below the local design frost depth, beneath groundwater levels previously observed, and sufficiently below anticipated foundation bearing elevations to adequately characterize the founding conditions.

The 2025 investigation program was carried on May 12, 2025, during which time, a total of four (4) boreholes designated as BH-1 to BH-4 were advanced to depths ranging 3.0 mbgs to 3.4 mbgs.

Boreholes were drilled with 150 mm diameter hollow-stem augers using a track-mounted CME55 drilling machine at the corners of the proposed maintenance building, as shown in Figure 2.

WSP surveyed the borehole locations and ground elevations. Table 1 lists the coordinates of the boreholes drilled for the 2025 investigation.

Table 1: Summary of the 2025 Investigation Boreholes

Boreholes					
ID.	Coordinates (UTM 18)		Depth below ground surface (mbgs)	Ground Elevation (masl)	Bottom Elevation (masl)
	Northing	Easting			
BH-1	5015293.93	423918.22	3.4	127.3	123.9
BH-2	5015319.28	423895.61	3.4	126.7	123.3
BH-3	5015336.59	423912.19	3.4	126.6	123.2
BH-4	5015309.46	423935.74	3.0	126.9	123.9

Soil samples in boreholes were collected at 0.76 m intervals while performing Standard Penetration Test (SPT) in accordance with ASTM D1586 (Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils). The SPT sampling consisted of freely dropping a 65 kg (140 lb) hammer for a vertical distance of 0.76 m (30 inches) to drive a 51 mm (2 inch) diameter (O.D.) split barrel (split spoon) sampler into the ground. The number of blows of the hammer required to drive the sampler into the relatively undisturbed ground by a vertical distance of 0.30 m (12 inches) were recorded as the SPT-N values of the soil which indicated the relative density of non-cohesive soils or indirectly indicated the consistency of cohesive soils. SPT-N values are shown on Record of Borehole Sheets presented in Appendix B.

After completion of each borehole, the augers were extracted, the borehole was inspected for groundwater and caving, then backfilled using bentonite grout.

The subsurface field investigation program was conducted under the full-time supervision of WSP's engineering staff, who directed the drilling and sampling operation and logged the boreholes. The soil stratigraphy within each borehole was visually examined and classified at the time of drilling in accordance with the modified Unified Soil Classification System (USCS) and/or the 2023 Canadian Foundation Engineering Manual (CFEM 2023). Soil samples were collected from each borehole at selected depths and retained in sealed plastic bags.

The soil samples obtained in the field were transported to WSP's geotechnical materials testing Laboratory in Ottawa for further examination and laboratory testing (i.e., water content determination, gradation analysis) on selected soil samples. Natural moisture content tests were carried out in accordance with ASTM D2216 on all of

the recovered soil samples. Grain size distribution test was completed on selected soil samples in accordance with ASTM D422 as per the terms of reference requirements. Geotechnical laboratory test results conducted on select soil samples are included in Appendix C, and summarized on the Record of Borehole Sheets in Appendix B.

4.0 SUBSURFACE CONDITIONS

The subsurface soil descriptions presented here are based on visual and tactile examinations augmented with field tests and select laboratory tests. Details of the subsurface soil conditions at the borehole locations are presented on the Record of Borehole sheets attached in Appendix B. The results of laboratory testing carried out on recovered soil samples are also shown on the borehole log sheets. The stratigraphic boundaries shown on the borehole logs are inferred from non-continuous samples and observations during drilling and therefore should be considered as approximate and not as precise planes of geologic change. The subsurface conditions may vary between and beyond the boreholes.

The subsurface conditions at the project site feature non-cohesive fill at the surface. Beneath the fill are native granular deposits like gravelly sand, sand, silty sand, and sand and silt. Boreholes BH5-21 and BH6-21 from the 2022 investigation in proximity to the proposed construction layout, indicate that a glacial till layer of gravelly sand to sand with traces of silt is expected under these deposits.

The following summary is intended to assist the project designers with an understanding of the anticipated soil, and groundwater conditions at the project site.

4.1 Non-Cohesive Fill

Non-Cohesive fill material was encountered in all four borehole locations which comprised predominantly of gravelly sand, sand, silty sand, and sand and silt with cobble fractions in some locations. The non-cohesive fill extended between 0.6 mbgs and 1.4 mbgs. The non-cohesive fill was interpreted to be compact as indicated by the SPT-N values ranging between 11 to 28 blows per 300 mm penetration.

The moisture content of the only selected sample within this stratum was 8.3 %.

The results of the grain size analysis carried out on selected samples of non-cohesive fill are summarized below and presented in Appendix C.

Table 2: Summary of Grain Size Analyses Results – Non-Cohesive Fill

Borehole No.	Sample No.	Depth (mbgs)	Grain Size Distribution		
			Gravel	Sand	Silt / Clay
			(%)	(%)	(%)
BH-1	SS1	0 – 0.6	19	61	20
BH-2	SS1	0 – 0.6	35	50	15
BH-2	SS2	0.6 – 1.2	42	46	12
BH-4	SS1	0 – 0.6	13	75	12

4.2 Native Granular Deposits

A native granular deposit consisting of gravelly sand, sand, silty sand, and a mixture of sand and silt with cobble to boulder fragments was identified in all boreholes below the fill layer at depths ranging from 0.6 mbgs to 3.4 mbgs. This deposit exhibited colors from brown to grey and was interpreted as compact to very dense based on SPT-N values ranging from 11 blows to 90 blows per 300 mm penetration.

The moisture content of selected samples within this stratum ranged between 10% and 22%.

The results of the grain size distribution analyses carried out on selected samples of native granular deposits are summarized below and presented in Appendix C.

Table 3: Summary of Grain Size Analysis Results – Native Granular Deposits

Borehole No.	Sample No.	Depth (mbgs)	Grain Size Distribution			U.S.C.S Soil Classification
			Gravel (%)	Sand (%)	Silt / Clay (%)	
BH-1	SS2	0.6 – 1.2	4	63	33	SM
BH-1	SS3	1.2 – 1.8	3	60	37	SM
BH-1	SS4	2.1 – 2.7	2	90	8	SP-SM
BH-1	SS5	2.7 – 3.3	1	86	13	SM
BH-2	SS3	1.5 – 2.1	14	77	9	SP-SM
BH-2	SS4	2.1 – 2.7	22	60	18	SM
BH-2	SS5	2.7 – 3.3	3	79	18	SM
BH-4	SS2	0.6 – 1.2	6	70	24	SM
BH-4	SS3	1.2 – 1.8	1	78	21	SM
BH-4	SS4	1.8 – 2.4	3	76	21	SM
BH-4	SS5	2.4 – 3.0	1	69	30	SM

Data from boreholes BH5-21 and BH6-21, from the 2022 investigation, near the proposed building site indicate that beneath this layer lies a compact to dense glacial till stratum or weathered bedrock.

4.3 Groundwater Conditions

Groundwater levels were measured in open boreholes upon completion of drilling. Groundwater was observed in all boreholes at a depth of 2.1 mbgs. It should be noted that groundwater levels can vary and are subject to seasonal fluctuations and major weather conditions. The groundwater level measurements are summarised in the following table and presented in the Record of Borehole Sheets in Appendix B.

Table 4: Summary of Groundwater Level Measurements in Boreholes upon Completion of Drilling

Borehole No.	Ground Elevation (masl)	Ground Water Depth (mbgs)	Ground Water Elevation (masl)
BH-1	127.3	2.1	125.2
BH-2	126.7	2.1	124.6
BH-3	126.6	2.1	124.5
BH-4	126.9	2.1	124.8

5.0 GEOTECHNICAL DISCUSSION AND RECOMMENDATIONS

The objective of the geotechnical investigation is to assess the existing soil and groundwater conditions and to provide geotechnical recommendations for the design of the proposed maintenance building at Waste Management Centre located at 2413 Carp Rd., Ottawa, Ontario.

The following discussions and recommendations are based on the subsoil and groundwater conditions encountered during the investigations. The nature and extent of subsurface variations that may exist at the proposed project site will not become evident until construction. If variations appear evident, then the

recommendations presented in this report should be evaluated. If any changes in the nature, design, location or elevation of the proposed building are planned, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed, and our recommendations modified in writing.

5.1 General Design Considerations

5.1.1 Seismic Site Class

The site class for seismic response should be assigned as Class D for foundations placed on the existing native granular deposits, in accordance with Table 4.1.8.4.A of the National Building Code of Canada (NBCC) 2020.

In accordance with NBCC 2020 Seismic Hazard Maps, the following Site Class D seismic hazard values may be used for preliminary design:

Table 5: Seismic Hazard Values (Site Class D)

Seismic Hazard Parameter	PGA (g)	PGV (m/s)	S_a (0.2) (g)	S_a (0.5) (g)	S_a (1.0) (g)	S_a (2.0) (g)	S_a (5.0) (g)	S_a (10.0) (g)
2% Exceedance in 50 Years (2,475 years return period)	0.338	0.341	0.573	0.490	0.293	0.141	0.0392	0.0123

5.1.2 Liquefaction

An SPT-based liquefaction screening has been completed in accordance with CFEM 2023 and the simplified Seed–Idriss/NBCC procedure, using the NBCC 2020 Site Class D seismic hazard values for the site (PGA = 0.338 g) and the measured SPT N-values and fines contents in the saturated sand layer below the groundwater table at approximately 2.1 m depth. For the lowest recorded N-value in this zone ($N \approx 18$ at $z \approx 2.4$ m), the corrected $(N1)60_{,cs}$ is about 27, which yields a cyclic resistance ratio $CRR \approx 0.35$.

The corresponding cyclic stress ratio CSR is about 0.23, giving a factor of safety against liquefaction of approximately 1.5. Higher N-values at similar depths result in larger factors of safety. This confirms that the native granular soils at the site may be considered not susceptible to seismic liquefaction for the NBCC 2020 design earthquake.

5.2 Site Preparation and Grading

Currently, preliminary design details of the proposed maintenance building are not available. However, it has been assumed that the desired finished grade elevation will be within approximately 1.0 m of the existing ground surface. Therefore, it is anticipated that limited or no engineered fill will be required to be placed and compacted within the building areas. WSP should be contacted if larger grade changes are planned to assess settlement, stability and constructability factors.

Topsoil, fill materials and any soils containing excessive amounts of organic matter, soft, loose, or otherwise deleterious materials should be stripped from below footprints of any building, structure or paved area.

At the completion of the topsoil/ fill stripping and prior to any new fill placement, the exposed subgrade should be reviewed and proof-rolled under supervision of qualified geotechnical personnel. Any loose, disturbed, or unsuitable areas should be removed and replaced with compacted engineered fill meeting the requirements described later in this report, and to the satisfaction of geotechnical personnel.

In addition, all stripping and earthwork activities should be performed in a manner consistent with good erosion and sediment control practices.

5.3 Material Re-use

Based on the results of the laboratory grain size distribution testing, the soils at this site generally meet the specifications for OPSS 1010 Granular B Type I. Therefore, the existing site soils could be used as structural engineered fill, provided that any particles larger than 50 mm in diameter are removed, as well as any soft, loose, organic or otherwise deleterious materials. The site soils should be placed and compacted in accordance with recommendations provided in Section 5.4 of this report.

Site materials could also be re-used as general earth borrow in non-structural areas (i.e., landscaping) depending on environmental suitability. Reference should be made to the environmental investigation report for further information and recommendations.

5.4 Engineered Fill

Imported materials to be used for engineered/structural fill should be approved by geotechnical personnel. In this regard, the imported materials, which meet the requirements for OPSS 1010 Granular A or Granular B Type I or II, would be suitable for use as engineered fill under footing or other foundation elements.

Existing site materials to be used for engineered/structural fill should also be reviewed and approved by geotechnical personnel. The existing site materials should meet the requirements for OPSS 1010 Granular B Type I at minimum to be considered suitable for use under footings other foundation elements.

The approved materials for engineered fill should be placed in maximum 300 mm thick loose lifts and be uniformly compacted to at least 98 percent of its Standard Proctor Maximum Dry Density (SPMDD) using suitable vibratory compaction equipment. The placement of engineered fill must be monitored by qualified geotechnical personnel on a full-time basis. The top surface of the engineered fill should be protected as necessary from construction traffic and should be sloped to provide positive drainage for surface water during the construction period.

The upper surface of the engineered fill should extend to a minimum of 1 m outside of the outer edge of any structural footprint areas (in all directions) and should be sloped downward and outward at no steeper than 1 horizontal to I vertical (1H:1V). Engineered fill slopes that will become permanently exposed fill slopes at the development, if any, should be constructed at 3H:1V or flatter, and should be covered with topsoil and sodded or otherwise treated to reduce erosion. Maintenance will be required over the first several years until the vegetable mat has taken root.

Imported materials, which meet the requirements for OPSS earth borrow, would be suitable for use as general fill. This fill should be compacted to at least 95 percent of its SPMDD. The placement of the fill should be monitored by geotechnical personnel on a regular basis. Placement of the upper 450 mm should be monitored on a full-time basis.

5.5 Foundations

5.5.1 Frost Protection

In accordance with the Ontario Provisional Standard Drawing (OPSD 3090.101) the design frost depth below the ground surface for the general area is estimated to be 1.8 mbgs. All footings, pile or caisson caps should be provided with a minimum of 1.8 m of soil cover for frost protection (in accordance with Ontario Building Code (OBC)). In addition, the bearing soil and fresh concrete should be protected from freezing during cold weather construction. If adequate soil cover cannot be provided for a footing or pile cap, rigid Styrofoam insulation could be installed to compensate for the lack of soil cover and provide protection from frost penetration.

In the event that foundations are to be constructed during the winter months, foundation soils are required to be protected from freezing temperatures using suitable construction techniques. Therefore, the base of all excavations should be insulated from freezing temperatures immediately upon exposure, until the time that heat can be supplied to the building interior and/or the foundations have sufficient earth cover to prevent freezing of the subgrade soils.

5.5.2 Bearing Resistances

It is assumed that the proposed maintenance building will be single-storey structure. Based on the results of the subsurface exploration program, the proposed building could be supported on shallow spread footing foundations with sufficient earth cover placed below frost level, which is established at 1.8 m below ground surface. At this depth, it is anticipated that the footings will be constructed either within native granular deposits or glacial till.

For footing widths between 0.6 m and 1.5 m, the following bearing resistances may be assumed:

- The unfactored ultimate geotechnical bearing resistance can be taken as 600 kilopascals (kPa). A resistance factor of 0.5 should be applied to this value, yielding a factored bearing resistance of 300 kPa at Ultimate Limit States (ULS).
- The geotechnical resistance at the Serviceability Limit State (SLS) can be taken as 200 kPa.

Provided that the foundation subgrade is properly prepared, and not unduly disturbed by construction activities, the total and differential settlements associated with the above SLS resistance value are expected to be less than 25 mm and 20 mm, respectively.

All bearing surfaces should be reviewed and approved at the time of construction by a geotechnical engineer, who is familiar with the findings of this investigation and the design and construction of similar projects prior to placement of any concrete, backfill, etc.

The unfactored ultimate bearing resistance of 600 kPa and corresponding factored ULS resistance of 300 kPa were derived using classical bearing capacity theory for shallow foundations in compact granular soils, assuming footing widths between 0.6 m and 1.5 m and a founding depth of 1.8 m. These parameters are consistent with the compact to very dense native sand and sand and silt deposits encountered at the proposed footing level, where SPT N-values generally range from about 18 to 30 and increase with depth, underlain by compact to dense glacial till. At the SLS geotechnical resistance of 200 kPa, settlements were estimated using CFEM-based correlations between SPT N-values and constrained modulus, which indicate total settlements on the order of 10 mm or less and differential settlements well within the 25 mm and 20 mm criteria adopted in the report. The localized reduction in N around 2 m bgs coincides with the groundwater table but remains within the compact range and is underlain by stiffer deposits, thus not controlling settlement.

City of Ottawa karst mapping has been reviewed in conjunction with the 2022 and 2025 borehole data. Weathered bedrock was identified at BH1-21; however, no solution voids, significant loss of drilling resistance, or anomalously low N-values were encountered beneath the proposed maintenance building footprint. Given that the building will be founded in overburden at approximately 1.8 m depth, karst features within the deeper bedrock are not expected to govern foundation performance. Should future development require foundations to bear at or near bedrock, a focused karst assessment can be undertaken at that time.

5.6 Slab-On-Grade

For predictable performance of the building floor slab, the underslab subgrade and engineered fill should be prepared as previously described in Section 5.4 of this report. The subgrade of the slab-on-grade should be reviewed by qualified geotechnical personnel prior to placement of granular fill or concrete.

Provision should be made for at least 200 mm of OPSS 1010 Granular A to form the base for the floor slab.

A modulus of subgrade reaction value for the slab subgrade may be required by the structural engineer. A value of 30,000 kN/m^3 may be used provided at least 200 mm of OPSS 1010 Granular A compacted to 100 % SPMDD is placed beneath the floor slab.

5.7 Foundation Wall Backfill

The native soils at this site are considered mildly to highly frost susceptible. However, excavated existing site soil that is reviewed, tested and approved by qualified geotechnical personnel may be used as backfill against exterior or unheated foundation elements.

To avoid problems with frost adhesion and heaving, these foundation elements should be backfilled with one or more of the following:

- Non-frost-susceptible sand and/or gravel, which meets the gradation requirements for OPSS 1010 Granular A or Granular B Type I or II; and,
- 19 mm clear crushed stone, which is separated from other soils with a Class II non-woven geotextile having an FOS not exceeding 100 microns (µm) to prevent loss of adjacent sand or silty soils into the clear stone. It should be noted that the use of clear stone as foundation backfill may lead to unfavorable growing conditions for plant matter placed in overlying topsoil.

Backfill should be placed in shallow lifts, not exceeding 200 mm loose thickness, and compacted to at least 98% of its SPMDD, where it is supporting any structures or services, or at least of 95% of its SPMDD in other areas using suitable vibratory compaction equipment.

To avoid damaging or laterally displacing the structures, care should be exercised when compacting fill adjacent to new structures. Heavy equipment should be kept a minimum of 1 m away from the structure during backfilling. The 1 m width adjacent to the wall should be compacted using hand-operated equipment unless otherwise authorized.

Drainage of the wall backfill can be provided by means of a perforated pipe subdrain in a surround of 19 mm clear stone, fully wrapped in geotextile, which leads by gravity drainage to an adjacent storm sewer or sump pit.

In areas where pavement or other hard surfacing will be in contact with the building, differential frost heaving could occur between the granular fill (if sand or crushed stone is used) and other areas. To reduce this differential heaving, the backfill adjacent to the wall should be placed to form a frost taper. The frost taper should be brought up to pavement subgrade level from 1.5 m below finished exterior grade at a slope of 3H:1V or flatter, away from the wall. The backfill should be placed in maximum 200 mm thick lifts and should be compacted to at least 95% of the material's SPMDD using suitable vibratory compaction equipment.

5.8 Site Services

Construction of new site services and/or relocation of existing site services are expected to be within the existing fill or native granular deposits or glacial till. Details of the proposed site services are not available at this time; however, it is assumed that they will include localized trenches throughout the site. Trenches can be temporarily supported using sloped excavations or trench boxes as outlined in section 5.9 of this report.

Bedding for site services should be in accordance with the relevant OPSD standard drawing and would typically consist of OPSS 1010 Granular A compacted to at least 95% of its SPMDD. Where wet or disturbed conditions are encountered in the base of the trench, it may be necessary to over-excavate and replace unsuitable soils with compacted granular fill to provide a stable subgrade for bedding. The use of clear stone as a bedding and cover material is not recommended as the finer particles of the native soils and backfill may migrate into the voids of the clear stone, resulting in loss of pipe support.

Cover material above the spring line should consist of OPSS 1010 Granular A or Granular B Type I material with a maximum particle size of 25 mm. cover material should be compacted to a minimum of at least 95% of the material's SPMDD.

Backfill may consist of additional granular fill, or properly moisture conditioned native granular deposits, and should be compacted to at least 95% of its SPMDD (98% if below structures). Where backfill is within the frost depth, the backfill profile (above the minimum cover required to 1.8 m depth) in the trench should be made to match the native soils on either side as much as is practical in order to minimize the potential for differential frost heave. As a result, portions of the silty clay above the water table may be retained, moisture conditioned (if necessary) and re-used.

Any service trenches which extend below the water table should have clay cut-offs installed across the trench at regular intervals (typically 100 m) to prevent the trench acting as a drain and lowering the groundwater table in the general area. These cut-offs should extend the full width of the trench and must completely penetrate the bedding, cover and any other granular materials in the trench.

The above are general guidelines for typical site services. All services installations should be completed in accordance with the relevant OPSS's and OPSD's for the particular application and size. WSP can provide additional review during detailed design based on the actual services proposed if required.

5.9 Uplift Resistance

If buried firefighting water storage tanks are used at the site, a buoyancy check can be carried out considering the measured groundwater table at approximately 2.1 m below existing grade and a conservative loading condition with the tanks empty and groundwater at or above tank crown elevation.

The potential uplift force acting on a foundation or buried service due to groundwater pressure is estimated at the level of the underside of the foundation or at the invert elevation. Safety against buoyancy is estimated by computing the ratio between the self-weight of the structure and overburden fill material (downward weight) versus the upward hydrostatic force. A minimum safety factor of 1.5 is acceptable (Table 8.3, CFEM). Hydrostatic pressure (p_w) is computed according to:

$$p_w = \gamma_w z_{w\,max}$$

where:

γ_w: unit weight of water (9.81 kN/m^3),

$z_{w\ max}$: maximum height of groundwater above the foundation level (i.e., the highest measured groundwater level) and

p_w: hydrostatic pressure at the foundation level, at a depth of $z_{w\ max}$ below the groundwater table.

Additional dead load to ensure that structures have adequate resistance against uplift may be provided as ballast via the following (but not limited to):

- supplemental mass concrete below the target foundation level,
- a thickness of granular material at the base of the structure below the target foundation level,
- a flared base beyond the walls of a structure to mobilize overlying soil.

5.10 Excavation and Temporary Protection Systems

All excavations must be carried out in accordance with the latest version of O. Reg. 213/91 (i.e. the Occupational Health and Safety Act and Regulations for Construction Projects). The soils found at the Site are classified as follows:

Table 6: Soil Classification for Excavations

Soil	Soil Classification
Surficial cover of fill and topsoil	Type 3
Compact / Stiff native soils above groundwater table	Type 3
Compact / Stiff native soils below groundwater table	Type 4

Positive dewatering of the Type 4 soil would alter the soil classification to that of the same soil above the groundwater table, i.e. Type 3. Also, excavations intersecting more than one soil type should be advanced following the requirements of the least optimum soil type.

When workers must enter excavations advanced deeper than 1.2 m, the trench walls must be suitably sloped and/or braced in accordance with O. Reg. 213/91 of the Occupational Health and Safety Act. The regulations stipulate maximum slopes of excavation by soil types as follows:

Table 7: Maximum Slopes of Excavations

Soil Type	Base of Slope	Maximum Slope Inclination
3	from bottom of trench	1 horizontal to 1 vertical
4	from bottom of trench	3 horizontal to 1 vertical

If required to limit excavation impacts on the adjacent structure, the excavation support system should be designed to resist lateral earth pressures of the soils, hydrostatic pressures and any surcharges while limiting ground movements to tolerable levels. To restrict horizontal displacement of the shoring system, the proposed excavation support system may require horizontal restraint such as internal bracing and/or tiebacks.

The shoring system must be designed to resist the lateral earth surcharge and hydrostatic pressures which could occur during construction. In addition, the shoring should be designed to account for lateral earth pressures resulting from the weight of the retained soil and other dead and live surcharge loads. The earth pressure distribution used for shoring design depends on the specific wall design and on the nature of the lateral support provided.

The buoyant unit weight and associated hydrostatic pressure should be used below the groundwater table. It is anticipated that active dewatering will occur during the installation of temporary shoring and pit excavation as such the groundwater must be lowered to below the base of the excavation.

The minimum horizontal earth pressure acting on the walls at a depth "z" below the top of the backfill may be calculated on the basis of the following equation:

$$\sigma_z = [d\gamma+\gamma' (z - d) + q] * K$$

Where:

σ_z = effective lateral earth pressure acting at depth z

K = earth pressure coefficient, provided below

γ' = buoyant / submerged unit weight of retained soil, provided below

γ = total unit weight of retained soil, provided below

d = depth to water table below ground surface

q = uniform surcharge at ground surface behind the wall (including the loads incurred from existing structure and traffic loading)

Full hydrostatic groundwater pressure should be included in the design ($P_w = g_w h_w$, where g_w = 9.8 kN/m3) if applicable.

Table 8: Recommended Design Lateral Earth Pressure Parameters

SOIL TYPE	COEFFICIENT OF EARTH PRESSURE AT ACTIVE CASE	COEFFICIENT OF EARTH PRESSURE AT PASSIVE CASE	COEFFICIENT OF EARTH PRESSURE AT REST CASE	DESIGN BULK UNIT WEIGHT (KN/M^3)	FRICTION ANGLE (DEGREES)
New Granular Fill	0.31	3.2	0.47	21.0	32
Non-Cohesive Fills (sand and gravel)	0.39	2.5	0.39	19.0	26
Cohesive Glacial Till (gravelly clay, sandy clay)	0.32	3.1	0.48	20.0	30
Weathered Bedrock	N/A	N/A	N/A	26	35

6.0 CLOSURE

The limitations of this report, as indicated and appended following the text of this report, constitute an integral part of this report. We recommend that a Geotechnical Consultant be retained to review drawings and the intended methods of construction prior to implementation in order to assure conformance with the geotechnical restrictions and assumptions.

We trust this report is complete within the terms of our reference. However, should questions arise concerning this report, do not hesitate to contact this office.

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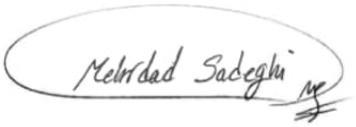
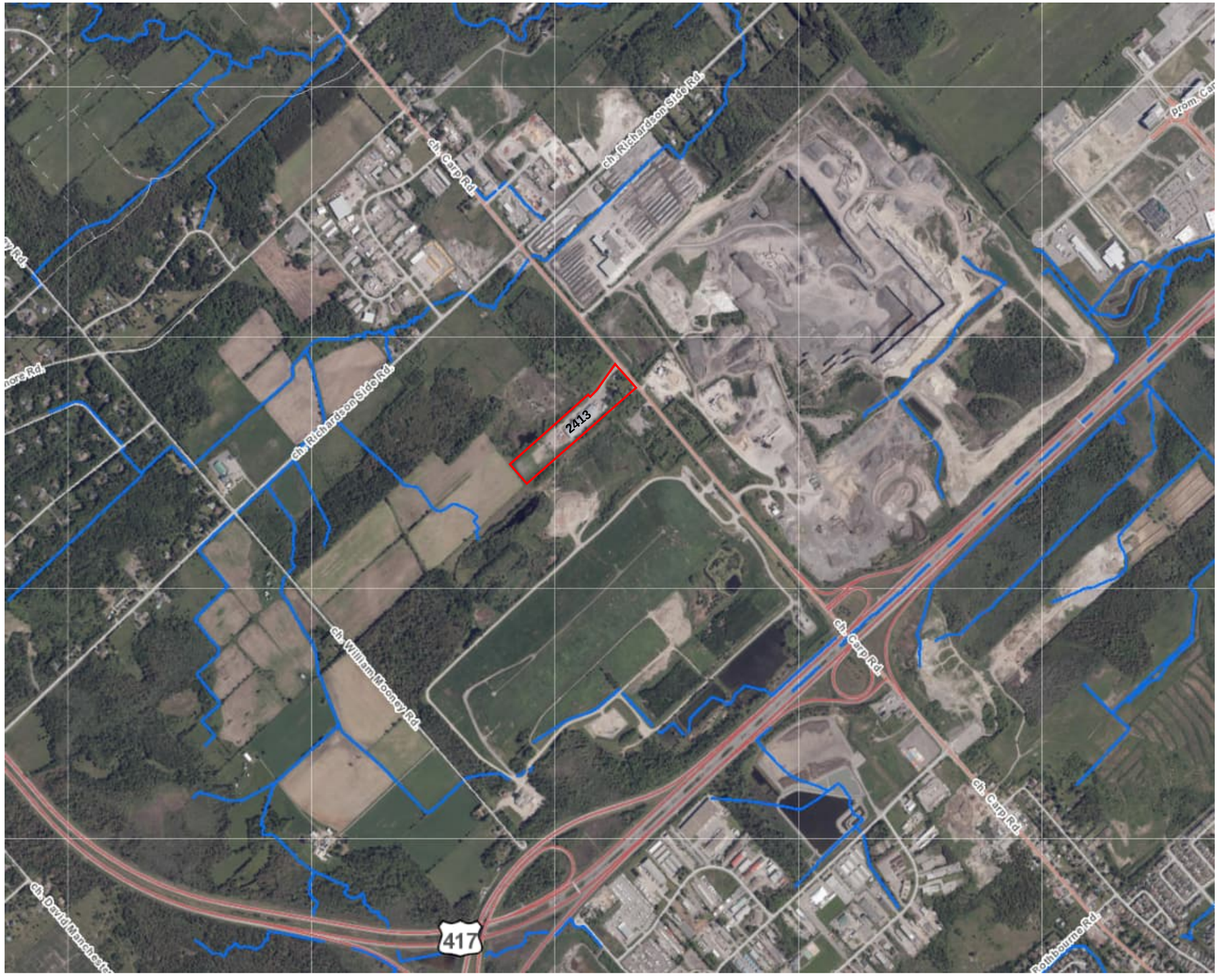


Mehrdad Sadeghi, M.Eng., M.Sc.
Geotechnical Specialist

Mauro Cortes, P.Eng., PMP, ENV SP
Principal Geotechnical Engineer

Figures



LEGEND

- SITE LOCATION
- WATERCOURSE
- SITE BOUNDARY

Sources :
World topographic Map, ESRI, 2020
GHD 2018 AutoCAD data

CLIENT
WASTE MANAGEMENT OF CANADA CORPORATION

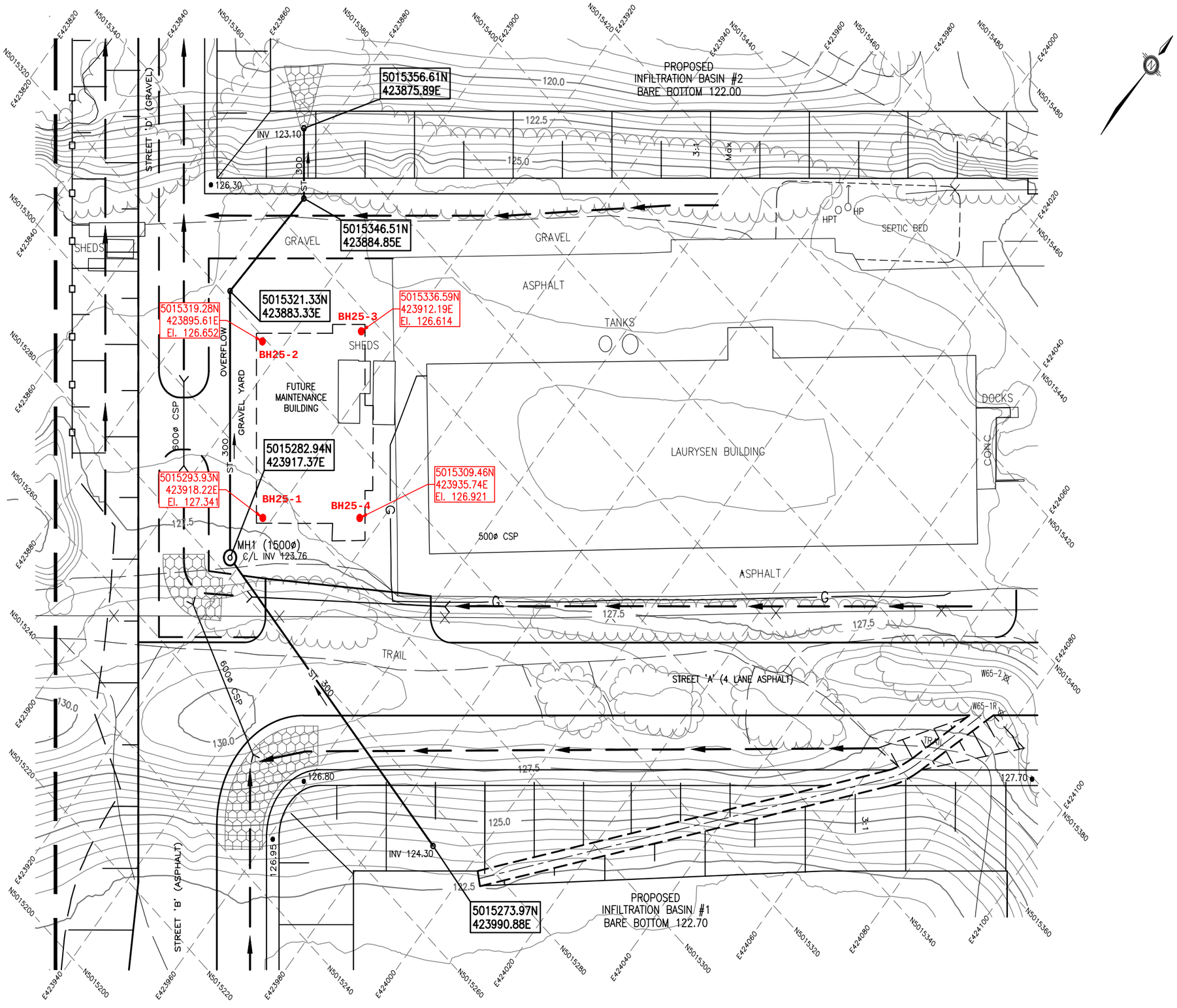
PROJECT
PROPOSED MAINTENANCE BUILDING - WEST CARLTON ENVIRONMENTAL CENTRE - 2301 CARP ROAD
OTTAWA, ONTARIO

TITLE
SITE LOCATION PLAN

CONSULTANT

YYYY-MM-DD	2025-06-06
DESIGNED	NR
PREPARED	NR
REVIEWED	NR
APPROVED	MC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0051319.2938	0001	A	1



LEGEND

BOREHOLE LOCATION (WSP REPORT, 2025)

NOTE(S)

1. ORIGINAL PAPER SIZE : 11 x 17.
2. COORDINATE SYSTEM : UTM 18 North NAD 83 (CSRS).

REFERENCE(S)

1. BING IMAGERY: © 2025 MICROSOFT CORPORATION © 2025 MAXAR © CNES (2025) DISTRIBUTION AIRBUS DS.

CLIENT
WASTE MANAGEMENT OF CANADA CORPORATION

PROJECT
PROPOSED MAINTENANCE BUILDING - WEST CARLTON
ENVIRONMENTAL CENTRE - 2413 CARP ROAD
OTTAWA, ONTARIO

TITLE
BOREHOLE LOCATION PLAN

CONSULTANT

YYYY-MM-DD	2025-06-06
DESIGNED	NR
PREPARED	NR
REVIEWED	NR
APPROVED	MC

PROJECT NO.	CONTROL	REV.	FIGURE
CA0051319.2938	0002	A	2

Prepared By: INSP03670

\\corp.pbwan.net\calgary_gis\PROJECTS\ON\2021\211-10332-00 - West Carleton\MXD\BH_TP_LOCATION_PLAN.mxd

LEGEND

- TEST PIT
- BOREHOLE
- SITE BOUNDARY

SCALE:

0 50 100 Mètres

Sources :
World topographic Map, ESRI, 2020
GHD 2018 AutoCAD data

UTM ZONE 17, NAD83
1:13,500

TITLE:

BOREHOLE LOCATION PLAN

PROJET:

WEST CARLETON ENVIRONMENTAL CENTRE, ONTARIO

CLIENT:

WASTE MANAGEMENT

NUMÉRO DE PROJET:	RÉVISION:
211-10332-00	SW
DATE:	FIG.:
JANUARY, 2022	3

APPENDIX A

Important Information and Limitations

LIMITATIONS TO GEOTECHNICAL REPORTS

1. The work performed in the preparation of this report and the conclusions presented herein are subject to the following:

   a) The contract between WSP and the Client, including any subsequent written amendment or Change Order dully signed by the parties (hereinafter together referred as the "Contract");

   b) Any and all time, budgetary, access and/or site disturbance, risk management preferences, constraints or restrictions as described in the contract, in this report, or in any subsequent communication sent by WSP to the Client in connection to the Contract; and

   c) The limitations stated herein.

2. **Standard of care:** WSP has prepared this report in a manner consistent with the level of skill and are ordinarily exercised by reputable members of WSP's profession, practicing in the same or similar locality at the time of performance, and subject to the time limits and physical constraints applicable to the scope of work, and terms and conditions for this assignment. No other warranty, guaranty, or representation, expressed or implied, is made or intended in this report, or in any other communication (oral or written) related to this project. The same are specifically disclaimed, including the implied warranties of merchantability and fitness for a particular purpose.

3. **Limited locations:** The information contained in this report is restricted to the site and structures evaluated by WSP and to the topics specifically discussed in it, and is not applicable to any other aspects, areas or locations.

4. **Information utilized:** The information, conclusions and estimates contained in this report are based exclusively on: i) information available at the time of preparation, ii) the accuracy and completeness of data supplied by the Client or by third parties as instructed by the Client, and iii) the assumptions, conditions and qualifications/limitations set forth in this report.

5. **Accuracy of information:** No attempt has been made to verify the accuracy of any information provided by the Client or third parties, except as specifically stated in this report (hereinafter "Supplied Data"). WSP cannot be held responsible for any loss or damage, of either contractual or extra-contractual nature, resulting from conclusions that are based upon reliance on the Supplied Data.

6. **Report interpretation:** This report must be read and interpreted in its entirety, as some sections could be inaccurately interpreted when taken individually or out-of-context. The contents of this report are based upon the conditions known and information provided as of the date of preparation. The text of the final version of this report supersedes any other previous versions produced by WSP.

7. **No legal representations:** WSP makes no representations whatsoever concerning the legal significance of its findings, or as to other legal matters touched on in this report, including but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

8. **Decrease in property value:** WSP shall not be responsible for any decrease, real or perceived, of the property or site's value or failure to complete a transaction, as a consequence of the information contained in this report.

9. **No third party reliance:** This report is for the sole use of the party to whom it is addressed unless expressly stated otherwise in the report or Contract. Any use or reproduction which any third party makes of the report, in whole or in part, or any reliance thereon or decisions made based on any information or conclusions in the report is the sole responsibility of such third party. WSP does not represent or warrant the accuracy, completeness, merchantability, fitness for purpose or usefulness of this document, or any information contained in this

document, for use or consideration by any third party. WSP accepts no responsibility whatsoever for damages or loss of any nature or kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on this report or anything set out therein. including without limitation, any indirect, special, incidental, punitive or consequential loss, liability or damage of any kind.

10. **Assumptions**: Where design recommendations are given in this report, they apply only if the project contemplated by the Client is constructed substantially in accordance with the details stated in this report. It is the sole responsibility of the Client to provide to WSP changes made in the project, including but not limited to, details in the design, conditions, engineering or construction that could in any manner whatsoever impact the validity of the recommendations made in the report. WSP shall be entitled to additional compensation from Client to review and assess the effect of such changes to the project.

11. **Time dependence**: If the project contemplated by the Client is not undertaken within a period of 18 months following the submission of this report, or within the time frame understood by WSP to be contemplated by the Client at the commencement of WSP's assignment, and/or, if any changes are made, for example, to the elevation, design or nature of any development on the site, its size and configuration, the location of any development on the site and its orientation, the use of the site, performance criteria and the location of any physical infrastructure, the conclusions and recommendations presented herein should not be considered valid unless the impact of the said changes is evaluated by WSP, and the conclusions of the report are amended or are validated in writing accordingly.
    Advancements in the practice of geotechnical engineering, engineering geology and hydrogeology and changes in applicable regulations, standards, codes or criteria could impact the contents of the report, in which case, a supplementary report may be required. The requirements for such a review remain the sole responsibility of the Client or their agents.
    WSP will not be liable to update or revise the report to take into account any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

12. **Limitations of visual inspections:** Where conclusions and recommendations are given based on a visual inspection conducted by WSP, they relate only to the natural or man-made structures, slopes, etc. inspected at the time the site visit was performed. These conclusions cannot and are not extended to include those portions of the site or structures, which were not reasonably available, in WSP's opinion, for direct observation.

13. **Limitations of site investigations**: Site exploration identifies specific subsurface conditions only at those points from which samples have been taken and only at the time of the site investigation. Site investigation programs are a professional estimate of the scope of investigation required to provide a general profile of subsurface conditions. The data derived from the site investigation program and subsequent laboratory testing are interpreted by trained personnel and extrapolated across the site to form an inferred geological representation and an engineering opinion is rendered about overall subsurface conditions and their likely behaviour with regard to the proposed development. Despite this investigation, conditions between and beyond the borehole/test hole locations may differ from those encountered at the borehole/test hole locations and the actual conditions at the site might differ from those inferred to exist, since no subsurface exploration program, no matter how comprehensive, can reveal all subsurface details and anomalies.
    Final sub-surface/bore/profile logs are developed by geotechnical engineers based upon their interpretation of field logs and laboratory evaluation of field samples. Customarily, only the final bore/profile logs are included in geotechnical engineering reports.
    Bedrock, soil properties and groundwater conditions can be significantly altered by environmental remediation and/or construction activities such as the use of heavy equipment or machinery, excavation, blasting, pile-driving

or draining or other activities conducted either directly on site or on adjacent terrain. These properties can also be indirectly affected by exposure to unfavorable natural events or weather conditions, including freezing, drought, precipitation and snowmelt.

During construction, excavation is frequently undertaken which exposes the actual subsurface and groundwater conditions between and beyond the test locations, which may differ from those encountered at the test locations. It is recommended practice that WSP be retained during construction to confirm that the subsurface conditions throughout the site do not deviate materially from those encountered at the test locations, that construction work has no negative impact on the geotechnical aspects of the design, to adjust recommendations in accordance with conditions as additional site information is gained and to deal quickly with geotechnical considerations if they arise.

Interpretations and recommendations presented herein may not be valid if an adequate level of review or inspection by WSP is not provided during construction.

14. **Factors that may affect construction methods, costs and scheduling**: The performance of rock and soil materials during construction is greatly influenced by the means and methods of construction. Where comments are made relating to possible methods of construction, construction costs, construction techniques, sequencing, equipment or scheduling, they are intended only for the guidance of the project design professionals, and those responsible for construction monitoring. The number of test holes may not be sufficient to determine the local underground conditions between test locations that may affect construction costs, construction techniques, sequencing, equipment, scheduling, operational planning, etc.

    Any contractors bidding on or undertaking the works should draw their own conclusions as to how the subsurface and groundwater conditions may affect their work, based on their own investigations and interpretations of the factual soil data, groundwater observations, and other factual information.

15. **Groundwater and Dewatering**: WSP will accept no responsibility for the effects of drainage and/or dewatering measures if WSP has not been specifically consulted and involved in the design and monitoring of the drainage and/or dewatering system.

16. **Environmental and Hazardous Materials Aspects**: Unless otherwise stated, the information contained in this report in no way reflects on the environmental aspects of this project, since this aspect is beyond the Scope of Work and the Contract. Unless expressly included in the Scope of Work, this report specifically excludes the identification or interpretation of environmental conditions such as contamination, hazardous materials, wild life conditions, rare plants or archeology conditions that may affect use or design at the site. This report specifically excludes the investigation, detection, prevention or assessment of conditions that can contribute to moisture, mould or other microbial contaminant growth and/or other moisture related deterioration, such as corrosion, decay, rot in buildings or their surroundings. Any statements in this report or on the boring logs regarding odours, colours, and unusual or suspicious items or conditions are strictly for informational purposes

17. **Sample Disposal**: WSP will dispose of all uncontaminated soil and rock samples after 30 days following the release of the final geotechnical report. Should the Client request that the samples be retained for a longer time, the Client will be billed for such storage at an agreed upon rate. Contaminated samples of soil, rock or groundwater are the property of the Client, and the Client will be responsible for the proper disposal of these samples, unless previously arranged for with WSP or a third party.

APPENDIX B

Record of Borehole Sheets

EXPLANATION OF BOREHOLE LOG

This form describes some of the information provided on the borehole logs, which is based primarily on examination of the recovered samples, and the results of the field and laboratory tests. Additional description of the soil/rock encountered is given in the accompanying geotechnical report.

GENERAL INFORMATION

Project details, borehole number, location coordinates and type of drilling equipment used are given at the top of the borehole log.

SOIL LITHOLOGY

Elevation and Depth

This column gives the elevation and depth of inferred geologic layers. The elevation is referred to the datum shown in the Description column.

Lithology Plot

This column presents a graphic depiction of the soil and rock stratigraphy encountered within the borehole.

Description

This column gives a description of the soil stratums, based on visual and tactile examination of the samples augmented with field and laboratory test results. Each stratum is described according to the *Modified Unified Soil Classification System* (modified slightly so that an inorganic clay of "medium plasticity" is recognized).

The compactness condition of cohesionless soils based on standard penetration testing (SPT) and the consistency of cohesive soils (undrained shear strength) are defined as follows *(Ref. Canadian Foundation Engineering Manual, 4th Edition, 2006)*:

Compactness of Cohesionless Soils	SPT N-Value
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	> 50

Consistency of Cohesive Soils	Unconfined Compressive Strength	
	kPa	psf
Very Soft	0 to 12	0 to 250
Soft	12 to 25	250 to 500
Firm	25 to 50	500 to 1000
Stiff	50 to 100	1000 to 2000
Very Stiff	100 to 200	2000 to 4000
Hard	> 200	> 4000

SOIL SAMPLING

Sample types are abbreviated as follows:

SS	Split Spoon	TW	Thin Walled Open (Pushed)	RC	Rock Core	GS	Grab Sample
AS	Auger Sample	TP	Thin Walled Piston (Pushed)	WS	Washed Sample	AR	Air Return Sample

Additional information provided in this section includes sample numbering, sample recovery (%) and numerical testing results (SPT).

FIELD AND LABORATORY SAMPLING

Results of field testing (e.g., SPT, pocket penetrometer, and vane testing) and laboratory testing (e.g., natural moisture content, and limits) executed on the recovered samples are plotted in this section.

Definitions of Penetration Resistance

Standard penetration resistance 'N' – The number of blows required to advance a standard split spoon sampler 30 cm into the subsoil, driven by means of a 63.5 kg hammer falling freely a distance of 76 cm.

Dynamic penetration resistance – The number of blows required to advance a 50 mm, 60 degree cone, fitted to the end of drill rods, 30 cm into the subsoil, the driving energy being 474.5 Joules per blow.

INSTRUMENTATION INSTALLATION

Instrumentation installations (monitoring wells, piezometers, inclinometers, etc.) are plotted in this section.

WATER LEVEL

Water levels, if measured during fieldwork, are plotted in the depth/elevation column. These water levels may or may not be representative of the static groundwater level depending on the nature of soil stratum where the piezometer tips are located, the time elapsed from installation to reading and other applicable factors. Other information includes the depth of borehole cave-in, if any. This information is also included in the borehole log footer.

COMMENTS

This column is used to describe non-standard situations or notes of interest.

MODIFIED* UNIFIED SOIL CLASSIFICATION SYSTEM

*The soil of each stratum is described using the Unified Soil Classification System (Technical Memorandum 36-357 prepared by Waterways Experiment Station, Vicksburg, Mississippi, Corps of Engineers, U.S Army. Vol. 1, March 1953) modified slightly so that an inorganic clay of "medium plasticity" is recognized.

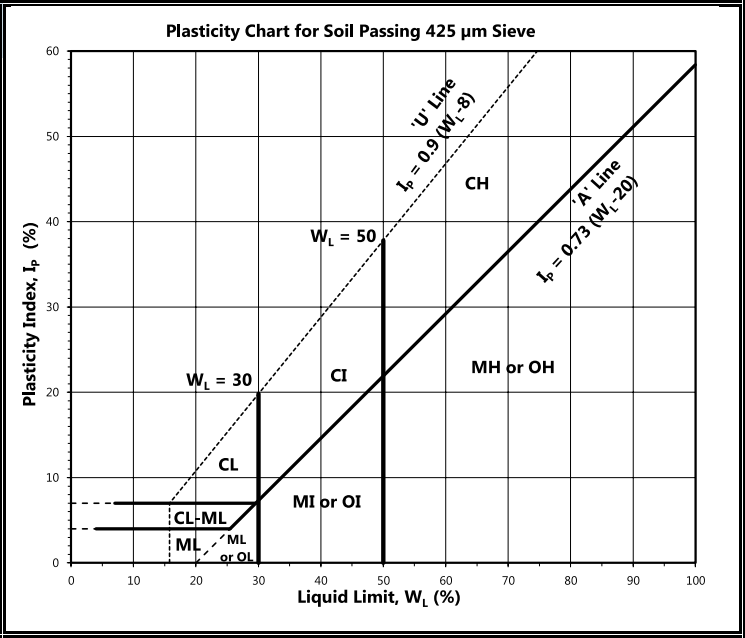
MAJOR DIVISION			GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA
COARSE GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN 75µm)	GRAVELS MORE THAN HALF THE COARSE FRACTION LARGER THAN 4.75mm	CLEAN GRAVELS (TRACE OR NO FINES)	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 4$; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ to 3
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS
		DIRTY GRAVELS (WITH SOME OR MORE FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR I_P LESS THAN 4
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	ATTERBERG LIMITS ABOVE "A" LINE OR I_P MORE THAN 7
	SANDS MORE THAN HALF THE COARSE FRACTION SMALLER THAN 4.75mm	CLEAN SANDS (TRACE OR NO FINES)	SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 6$; $C_C = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1$ to 3
			SP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS
		DIRTY SANDS (WITH SOME OR MORE FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR I_P LESS THAN 4
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES	ATTERBERG LIMITS ABOVE "A" LINE OR I_P MORE THAN 7
FINE-GRAINED SOILS (MORE THAN HALF BY WEIGHT SMALLER THAN 75µm)	SILTS BELOW "A" LINE NEGLIGIBLE ORGANIC CONTENT	W_L < 50%	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	CLASSIFICATION IS BASED UPON PLASTICITY CHART (SEE BELOW)
		W_L > 50%	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS	
	CLAYS ABOVE "A" LINE NEGLIGIBLE ORGANIC CONTENT	W_L < 30%	CL	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY OR SILTY CLAYS, LEAN CLAYS	
		30% < W_L < 50%	CI	INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS	
		W_L > 50%	CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
	ORGANIC SLTS & CLAYS BELOW "A" LINE	W_L < 50%	OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	WHENEVER THE NATURE OF THE FINES CONTENT HAS NOT BEEN DETERMINED, IT IS DESIGNATED BY THE LETTER "F", e.g. SF IS A MIXTURE OF SAND WITH SILT OR CLAY
		W_L > 50%	OH	ORGANIC CLAYS OF HIGH PLASTICITY	
HIGH ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOUR OR ODOUR, AND OFTEN FIBROUS TEXTURE

SOIL COMPONENTS

FRACTION	U.S STANDARD SIEVE SIZE			DEFINING RANGES OF PERCENTAGE BY WEIGHT OF MINOR COMPONENTS	
		PASSING	RETAINED	PERCENT	DESCRIPTOR
GRAVEL	COARSE	75 mm	19 mm	35 - 50	AND
	FINE	19 mm	4.75 mm	20 - 35	Y/EY
SAND	COARSE	4.75 mm	2.00 mm	10 - 20	SOME
	MEDIUM	2.00 mm	425 µm	1 - 10	TRACE
	FINE	425 µm	75 µm		
FINES (SILT AND CLAY BASED ON PLASTICITY)		75 µm			

OVERSIZED MATERIAL

ROUNDED OR SUBROUNDED:	NOT ROUNDED:
COBBLES 75 mm to 300 mm	ROCK FRAGMENTS > 75 mm
BOULDERS > 300 mm	ROCKS > 0.76 CUBIC METRE IN VOLUME



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Geotechnical Discipline - Ontario Region
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MODIFIED USCS

Note 1: Soils are classified and described according to their engineering properties and behaviour.
Note 2: The modifying adjectives used to define the actual or estimated percentage range by weight of minor components are consistent with the Canadian Foundation Engineering Manual (4th Edition, Canadian Geotechnical Society, 2006.)

Rev Date: September 22, 2022

RECORD OF BOREHOLE No. BH-1

Project Number: CA0051319.2938
Project Client: City of Ottawa
Project Name: Waste Management Supplemental Invesigation
Project Location: 2301 Carp Road, Ottawa, Ontario
Drilling Location: UTM 18 N 5015282.9 E 423917.4

Drilling Method: 150 mm O.D. Hollow Stem Augers
Drilling Machine: Track Mounted Drill
Date Started: 12 May 2025 Date Completed: 12 May 2025
Logged by: SG Compiled by: SG
Reviewed by: SM Revision No.: 1

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	PenetrationTesting: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; ■ Undrained Shear Strength (kPa) (from P. Penetrometer tests) 20 40 60 80	Atterberg Limits: W_P W W_L; Plastic Liquid; ✳ Passing 75 um (%); ○ Moisture Content (%); ★ Unit Weight (KN/m3); 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	Fill - Silty Sand grey, some gravel, compact, moist	SS	1	67	23			○ 23			**Grainsize on SS1** Gr: 19%, Sa: 61%, Si/Cl: 20%
	SILTY SAND/ SAND AND SILT 0.6 grey, trace gravel, compact to dense, moist	SS	2	67	20	1		○ 20	○ 5		**Grainsize on SS2** Gr: 4%, Sa: 63%, Si/Cl: 33%
		SS	3	92	31			○ 31	○ 4		**Grainsize on SS3** Gr: 3%, Sa: 60%, Si/Cl: 37%
	SAND 2.0 grey, trace to some silt, trace gravel, compact, moist					2	▽				
		SS	4	84	18			○ 18	○ 4		**Grainsize on SS4** Gr: 2%, Sa: 90%, Si/Cl: 8%
		SS	5	92	25	3		○ 25	○ 5		**Grainsize on SS5** Gr: 1%, Sa: 86%, Si/Cl: 13%
	END OF THE BOREHOLE 3.4										

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Cambridge, Ontario, Canada N3H 4R7
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Fax: (519) 653-6554
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▽ Groundwater measured at a depth of 2.1 m upon completion of drilling.

RECORD OF BOREHOLE No. BH-2

Project Number: CA0051319.2938
Project Client: City of Ottawa
Project Name: Waste Management Supplemental Invesigation
Project Location: 2301 Carp Road, Ottawa, Ontario
Drilling Location: UTM 18 N 5015321.3 E 423883.3

Drilling Method: 150 mm O.D. Hollow Stem Augers
Drilling Machine: Track Mounted Drill
Date Started: 12 May 2025 Date Completed: 12 May 2025
Logged by: SG Compiled by: SG
Reviewed by: SM Revision No.: 1

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould ■Undrained Shear Strength (kPa) (from P. Penetrometer tests) 20 40 60 80	Atterberg Limits W_P W W_L Plastic Liquid ✱ Passing 75 um (%) ○ Moisture Content (%) ★ Unit Weight (KN/m3) 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Fill - Sand and Gravel brown to grey, some silt, compact, moist	SS	1	51	20			○			**Grainsize on SS1** Gr: 35%, Sa: 50%, Si/Cl: 15%
		SS	2	51	24	1		○			**Grainsize on SS2** Gr: 42%, Sa: 46%, Si/Cl: 12%
	SAND 1.4 brown, some gravel, trace silt, compact, moist										
		SS	3	84	18	2		○	○4		**Grainsize on SS3** Gr: 14%, Sa: 77%, Si/Cl: 9%
	Gravelly Sand 2.1 brown, some silt, compact, moist	SS	4	84	18		▽	○			**Grainsize on SS4** Gr: 22%, Sa: 60%, Si/Cl: 18%
	SAND 2.7 brown, some silt, trace gravel, compact, moist	SS	5	75	30	3		○	○4		**Grainsize on SS5** Gr: 3%, Sa: 79%, Si/Cl: 18%
	END OF THE BOREHOLE 3.4										

▽ Groundwater measured at a depth of 2.1 m upon completion of drilling.

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RECORD OF BOREHOLE No. BH-3

Project Number: CA0051319.2938
Project Client: City of Ottawa
Project Name: Waste Management Supplemental Invesigation
Project Location: 2301 Carp Road, Ottawa, Ontario
Drilling Location: UTM 18 N 5015346.5 E 423884.9

Drilling Method: 150 mm O.D. Hollow Stem Augers
Drilling Machine: Track Mounted Drill
Date Started: 12 May 2025 Date Completed: 12 May 2025
Logged by: SG Compiled by: SG
Reviewed by: SM Revision No.: 1

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ● DCPT MTO Vane* Nilcon Vane* △ Intact ◇ Intact ▲ Remould ◆ Remould ■Undrained Shear Strength (kPa) (from P. Penetrometer tests) 20 40 60 80	Atterberg Limits W_P W W_L Plastic Liquid ✱ Passing 75 um (%) ○ Moisture Content (%) ★ Unit Weight (KN/m3) 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	FILL - Gravelly Sand brown to grey, trace silt, compact, moist	SS	1	59	28			○			
	- grey and cobble fragments below 0.6 m	SS	2	51	22	1		○			
	GRAVELLY SAND 1.0 grey, trace silt, compact to very dense, moist	SS	3	51	40			○			Cobble/ boulder fragments at 1.1 m Cobble/ boulder fragments at 1.7 m
		SS	4	51	11	2	▽	○			
		SS	5	133	90	3		○			
	END OF THE BOREHOLE 3.4										Auger Refusal at 3.4 m depth

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▽ Groundwater measured at a depth of 2.1 m upon completion of drilling.

RECORD OF BOREHOLE No. BH-4

Project Number: CA0051319.2938
Project Client: City of Ottawa
Project Name: Waste Management Supplemental Invesigation
Project Location: 2301 Carp Road, Ottawa, Ontario
Drilling Location: UTM 18 N 5015308.2 E 423936.7

Drilling Method: 150 mm O.D. Hollow Stem Augers
Drilling Machine: Track Mounted Drill
Date Started: 12 May 2025 Date Completed: 12 May 2025
Logged by: SG Compiled by: SG
Reviewed by: SM Revision No.: 1

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS & GRAIN SIZE DISTRIBUTION (%)
Lithology Plot	DESCRIPTION Geodetic Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	PenetrationTesting: ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; ■ Undrained Shear Strength (kPa) (from P. Penetrometer tests) 20 40 60 80	Atterberg Limits: W_P W W_L; Plastic Liquid; ✳ Passing 75 um (%); ○ Moisture Content (%); ★ Unit Weight (KN/m3); 20 40 60 80	INSTRUMENTATION INSTALLATION	GR SA SI CL
	Fill - Sand grey, some gravel and silt, compact, moist	SS	1	67	11			○			**Grainsize on SS1** Gr: 13%, Sa: 75%, Si/Cl: 12%
	SILTY SAND 0.6 grey, trace gravel, compact, moist	SS	2	75	17	1		○	○5		**Grainsize on SS2** Gr: 6%, Sa: 70%, Si/Cl: 24%
		SS	3	84	15			○	○4		**Grainsize on SS3** Gr: 1%, Sa: 78%, Si/Cl: 21%
		SS	4	84	24	2	▽	○	○4		**Grainsize on SS4** Gr: 3%, Sa: 76%, Si/Cl: 21%
		SS	5	100	23			○	○5		**Grainsize on SS5** Gr: 1%, Sa: 69%, Si/Cl: 30%
	END OF THE BOREHOLE 3.0					3					

▽ Groundwater measured at a depth of 2.1 m upon completion of drilling.

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LOG OF BOREHOLE BH1-21

PROJECT: West Carleton Environmental Centre
REF. NO.: 211-10332-00
CLIENT: Waste Management
Method: SS
ENCL NO.:
PROJECT LOCATION: Carp, Ontario
Diameter: 8"
ORIGINATED BY SD
DATUM:
Date: Dec-17-2021 to Dec-17-2021
COMPILED BY SW
BH LOCATION: 2301 Carp Rd
Eqipment: Downing Track Mount CME 75
CHECKED BY NC

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS/0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface											
0.0	**TOPSOIL**		1	SS	6							
0.3	**GLACIAL TILL-**Gravel some sand, dense, brown, moist		2	SS	32							
1.5	becoming Glacial Till-Sand trace gravel and silt, compact to dense, light brown, moist		3	SS	26							
2.1	**WEATHERED ROCK**		4	SS	R							
2.7	END OF BOREHOLE Notes: 1. Auger refusal at approximately 2.7 meters below exisitng ground surface on assumed bedrock.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH2-21

PROJECT: West Carleton Environmental Centre
REF. NO.: 211-10332-00
CLIENT: Waste Management
Method: SS
ENCL NO.:
PROJECT LOCATION: Carp, Ontario
Diameter: 8"
ORIGINATED BY SD
DATUM:
Date: Dec-17-2021 to Dec-17-2021
COMPILED BY SW
BH LOCATION: 2301 Carp Rd
Eqipment: Downing Track Mount CME 75
CHECKED BY NC

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
Ground Surface											
0.0	**TOPSOIL**										
0.1	**GLACIAL TILL-**Gravel some Sand, trace Silt, compact to dense, brown, moist rock fragments encountered at approximately 0.3 meters below existing ground surface		1	SS	25						
			2	SS	27						
1.4	END OF BOREHOLE Notes: 1. Auger refusal at approximately 1.4 meters below exisitng ground surface on assumed bedrock										

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH3-21

PROJECT: West Carleton Environmental Centre
REF. NO.: 211-10332-00
CLIENT: Waste Management
Method: SS
ENCL NO.:
PROJECT LOCATION: Carp, Ontario
Diameter: 8"
ORIGINATED BY SD
DATUM:
Date: Dec-17-2021 to Dec-17-2021
COMPILED BY SW
BH LOCATION: 2301 Carp Rd
Eqipment: Downing Track Mount CME 75
CHECKED BY NC

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" BLOWS/0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface											
0.0	**TOPSOIL**											
0.2	**GLACIAL TILL-**Gravel, trace sand, compact to dense, brown-grey, moist Rock fragments recovered at 0.45 meters below ground		1	SS	14							
			2	SS	52							
1.1	**WEATHERED ROCK**											
1.5	END OF BOREHOLE		3	SS	R							

Note:

1. Auger refusal at approximately 1.5 meters below exisitng ground surface on assumed bedrock.

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH4-21

PROJECT: West Carleton Environmental Centre
REF. NO.: 211-10332-00
CLIENT: Waste Management
Method: SS
ENCL NO.:
PROJECT LOCATION: Carp, Ontario
Diameter: 8"
ORIGINATED BY SD
DATUM:
Date: Dec-17-2021 to Dec-17-2021
COMPILED BY SW
BH LOCATION: 2301 Carp Rd
Eqipment: Downing Track Mount CME 75
CHECKED BY NC

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
Ground Surface												
0.0	**TOPSOIL**		1	SS	20							
0.1	**GLACIAL TILL-**Gravel, some Sand, trace silt, compact, brown, moist Rock fragments and wood debris encountered at approximately 0.3 meters below existing ground surface											
1	Rock fragments encountered at approximately 1.2 meters below existing ground surface *Becoming glacial till , sand trace gravel and silt, light brown		2	SS	47							
2			3	SS	13							
	*Becoming dense at 2.2 meters below existing ground surface		4	SS	42							
3			5	SS	30							
3.7	END OF BOREHOLE Note: 1. Borehole terminated at approximately 3.7 meters below existing ground surface in glacial till overburden.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH5-21

PROJECT: West Carleton Environmental Centre
REF. NO.: 211-10332-00
CLIENT: Waste Management
Method: SS
ENCL NO.:
PROJECT LOCATION: Carp, Ontario
Diameter: 8"
ORIGINATED BY SD
DATUM:
Date: Dec-16-2021 to Dec-16-2021
COMPILED BY SW
BH LOCATION: 2301 Carp Rd
Eqipment: Downing Track Mount CME 75
CHECKED BY NC

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface											
0.0	**TOPSOIL-**Organic Silty Sand, loose, dark brown, damp		1	SS	10							
0.6	**FILL-** Gravelly Sand, some silt, loose, dark brown, damp		2	SS	6							
1.1	**GLACIAL TILL-**Sand, trace silt, loose, brown, damp		3	SS	15							
	*Becoming glacial till, gravelly sand, trace silt, dense, brown, damp		4	SS	26							
			5	SS	32							
3.7	END OF BOREHOLE											

Notes:

1. Borehole terminated at approximately 3.7 meters below surface in glacial till overburden

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH6-21

PROJECT: West Carleton Environmental Centre
REF. NO.: 211-10332-00
CLIENT: Waste Management
Method: SS
ENCL NO.:
PROJECT LOCATION: Carp, Ontario
Diameter: 8"
ORIGINATED BY SD
DATUM:
Date: Dec-13-2021 to Dec-13-2021
COMPILED BY SW
BH LOCATION: 2301 Carp Rd
Eqipment: Downing Track Mount CME 75
CHECKED BY NC

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface											
0.0	**TOPSOIL-**Organics and Sand, trace gravel, black, damp Spoon refusal at approximately 0.2 meters below existing ground.		1	SS	50							
0.8	**ORGANIC SILTY SAND-**Loose, dark brown to black, damp		2	SS	6							
1.5	**SAND-** Trace silt, some rootlets, loose, brown, damp		3	SS	6							
2.1	**GLACIAL TILL-**Gravelly Sand, some Silt, dense, brownish grey, damp		4	SS	33							
	*Becoming glacial till, sand some silt and gravel, compact, grey, damp		5	SS	18							
3.7	END OF BOREHOLE											

Notes:

1. Borehole terminated at approximately 3.7 meters below exisitng ground surface in glacial till overburden

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH7-21

PROJECT: West Carleton Environmental Centre
REF. NO.: 211-10332-00
CLIENT: Waste Management
Method: SS
ENCL NO.:
PROJECT LOCATION: Carp, Ontario
Diameter: 8"
ORIGINATED BY SD
DATUM:
Date: Dec-16-2021 to Dec-16-2021
COMPILED BY SW
BH LOCATION: 2301 Carp Rd
Eqipment: Downing Track Mount CME 75
CHECKED BY NC

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	Ground Surface **FILL -**Silty Sand , trace gravel, some organic matter, loose, dark brown, damp		1	SS	9			
			2	SS	11			
1.5	**SAND-** Trace silt, compact, dark brown, damp		3	SS	21			0 92 8
	*Rootlets recovered at approximately 2.59 meters below existing ground surface		4	SS	13			
	*Sand begins to heave at approximately 3.1 meters below existing ground surface		5	SS	5			
	*Becoming sand and silt, grey, compact, wet		6	SS	8			
			7	SS	12			
			8	SS	5			
6.1	**GLACIAL TILL-**Sand and Gravel, trace silt, compact, grey, wet		9	SS	18			
6.7	END OF BOREHOLE							

Notes:

1. Auger refusal at approximately 6.7 meters below exisitng ground surface in glacial till overburden
2. Water level measured at 1.5 meters below existing ground surface in an open borehole

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH (kPa)
○ UNCONFINED + FIELD VANE & Sensitivity
● QUICK TRIAXIAL × LAB VANE
20 40 60 80 100

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+3, ×3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH8-21

PROJECT: West Carleton Environmental Centre
REF. NO.: 211-10332-00
CLIENT: Waste Management
Method: SS
ENCL NO.:
PROJECT LOCATION: Carp, Ontario
Diameter: 8"
ORIGINATED BY SD
DATUM:
Date: Dec-16-2021 to Dec-16-2021
COMPILED BY SW
BH LOCATION: 2301 Carp Rd
Eqipment: Downing Track Mount CME 75
CHECKED BY NC

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
Ground Surface												
0.0	**GLACIAL TILL-** Sand some Gravel, trace silt, compact, brown, damp		1	SS	17				○			
	*Refusal on cobbles at 0.54 meters below existing ground surface											
	*Becoming dark grey		2	SS	25				○			
	*Becoming glacial till, gravelly sand, trace silt, very dense, brownish grey, damp		3	SS	63				○			
	*Becoming glacial till, sand and gravel, trace silt, dense, brown, wet (possible weathered bedrock)		4	SS	43				○			
	*Spoon refusal at approximately 3.1 meters below ground (mbgs).		5	SS	R					○		
4.0	END OF BOREHOLE											

Notes:

1. Auger refusal at 3.9 meters below existing ground surface on assumed bedrock.
2. Water level was measured at 1.4 meters below existing ground surface.

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH9-21

PROJECT: West Carleton Environmental Centre
REF. NO.: 211-10332-00
CLIENT: Waste Management
Method: SS
ENCL NO.:
PROJECT LOCATION: Carp, Ontario
Diameter: 8"
ORIGINATED BY SD
DATUM:
Date: Dec-16-2021 to Dec-16-2021
COMPILED BY SW
BH LOCATION: 2301 Carp Rd
Eqipment: Downing Track Mount CME 75
CHECKED BY NC

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
Ground Surface												
0.0	**FILL-** Sand, trace silt and gravel, loose, brown, damp		1	SS	4							
			2	SS	6							
			3	SS	3							1 23 76
2.6	**GLAICIAL TILL-**Gravelly Sand some Silt, compact, greyish brown, damp		4	SS	10							
	becoming sand some silt, dense, brown, damp		5	SS	35							
3.7	END OF BOREHOLE											

Notes:

1. Borehole terminated at 3.6 meters below existing ground surface in glacial till overburden.

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH10-21

PROJECT: West Carleton Environmental Centre
REF. NO.: 211-10332-00
CLIENT: Waste Management
Method: SS
ENCL NO.:
PROJECT LOCATION: Carp, Ontario
Diameter: 8"
ORIGINATED BY SD
DATUM:
Date: Dec-16-2021 to Dec-16-2021
COMPILED BY SW
BH LOCATION: 2301 Carp Rd
Eqipment: Downing Track Mount CME 75
CHECKED BY NC

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	Ground Surface **TOPSOIL-**Organic Silt and Sand, black, moist, very loose		1	SS	7				○			
0.7 0.8	**FILL-**Sand, some Gravel, compact, brown, damp **GLACIAL TILL-**Sand and Gravel, trace silt, compact, brownish grey, moist		2	SS	18				○			
2	*Becoming glacial till, sand some gravel, silt and organic matter, compact, moist		3	SS	18				○			19 64 17
	*Rootlets encountered at approximately 2.1 meters below ground surface											
3	*Becoming glacial till sand some gravel, trace silt and organic matter, rootlets at 2.9 meters below existing ground surface, dense, brownish grey, moist		4	SS	50				○			
	*Becoming glacial till gravelly sand, trace silt, dense, brownish grey, damp, moist		5	SS	40				○			
4			6	SS	52				○			
			7	SS	R				○			
4.7	END OF BOREHOLE											

Notes:

1. Auger refusal at approximately 4.7 meters below exisitng ground surface on assumed bedrock.
2. Water level was measured at 2.3 meters below existing ground surface.

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES + 3, × 3: Numbers refer to Sensitivity ○ ε=3% Strain at Failure

LOG OF TEST PIT TP1-21

PROJECT: West Carleton Environmental Centre
REF. NO.: 211-10332-00
CLIENT: Waste Management
Method: Test Pit
ENCL NO.:
PROJECT LOCATION: Carp, Ontario
Diameter: 8"
ORIGINATED BY SD
DATUM:
Date: Dec-13-2021 to Dec-13-2021
COMPILED BY SW
BH LOCATION: 2301 Carp Rd
Eqipment: Waste Management Backhoe
CHECKED BY NC

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" BLOWS/0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface											
0.0	**FILL-** Silty Clay, trace gravel, cobbles and debris (styrofoam), brown, moist		1	GS					I ○			
			2	GS					I ○			
2.6	END OF TEST PIT											

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF TEST PIT TP2-21

PROJECT: West Carleton Environmental Centre
REF. NO.: 211-10332-00
CLIENT: Waste Management
Method: Test Pit
ENCL NO.:
PROJECT LOCATION: Carp, Ontario
Diameter: 8"
ORIGINATED BY SD
DATUM:
Date: Dec-13-2021 to Dec-13-2021
COMPILED BY SW
BH LOCATION: 2301 Carp Rd
Eqipment: Waste Management Backhoe
CHECKED BY NC

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT (w_P w w_L) WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%)
(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS / 0.3 m "N"							GR SA SI CL
0.0	Ground Surface											
	FILL- Silty Sand, some Cobbles and Boulders, trace clay and debris (wood, plastic), brown, moist											
1			1	GS					○			20 59 21
2			2	GS					○			
2.8	END OF TEST PIT											

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

LOG OF TEST PIT TP3-21

PROJECT: West Carleton Environmental Centre
REF. NO.: 211-10332-00
CLIENT: Waste Management
Method: Test Pit
ENCL NO.:
PROJECT LOCATION: Carp, Ontario
Diameter: 8"
ORIGINATED BY SD
DATUM:
Date: Dec-13-2021 to Dec-13-2021
COMPILED BY SW
BH LOCATION: 2301 Carp Rd
Eqipment: Waste Management Backhoe
CHECKED BY NC

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" BLOWS/0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface											
0.0	**FILL-** Silt and Sand, some Gravel, trace debris(concrete, brick), dark brown, moist											
			1	GS					○			24 59 17
			2	GS					○			
2.2	END OF TEST PIT											

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; ● =3% Strain at Failure

APPENDIX C

Geotechnical Laboratory Testing Results

WSP Canada Inc.
1931 Robertson Road
Bells Corners, ON K2H 5B7
613-592-9600

05/26/2025

Water (Moisture) Content of Soils

Testing Standard: ASTM D2216-19 Method B

Testing Program #:	039931	Project Number:	CA0051319.2938
Client:	WSP Canada Inc.	Project Location:	
Project Name:	CA-West Carleton 2025 Engineering	Report Number:	BLC00322-25

Sample Location	Sample				Soil Description	Water Content (%)	WSP Lab Number	Tested By	Remarks
	Sample Number	Top (m)	Base (m)	Type					
1	1	0.00	0.00	GS		8.3	BLC25-00567	Melanie Ireland	
1	2	0.00	0.00	GS		7.5	BLC25-00568		
1	3	0.00	0.00	GS		5.9	BLC25-00569		
1	4	0.00	0.00	GS		4.4	BLC25-00570		
1	5	0.00	0.00	GS		4.6	BLC25-00571		

Reviewed By: Chelsea Ward Title: Laboratory Technician

Signature: Chelsea Ward

CERTIFIED BY CCIL

WSP Canada Inc.
1931 Robertson Road
Bells Corners, ON K2H 5B7
613-592-9600

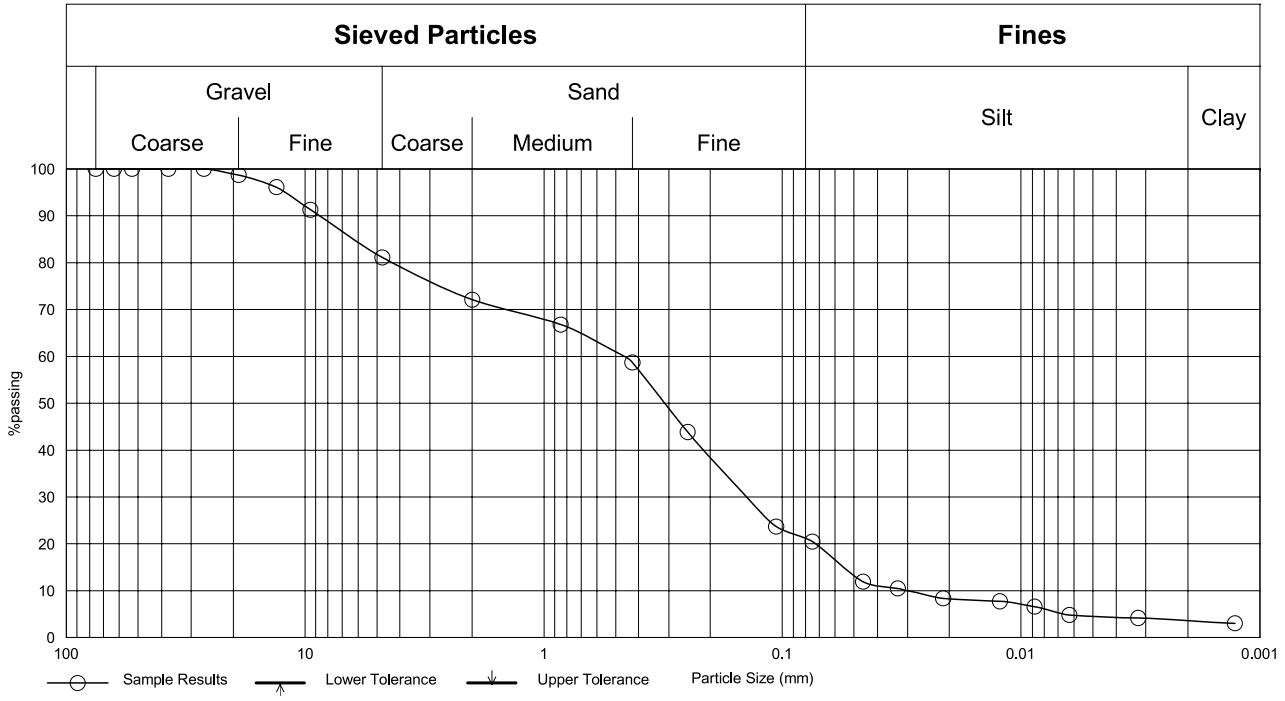
05/20/2025

Particle Size Distribution of Soils

Testing Standard: MTO LS-702 (Rev. 37)

Testing Program #:	039931	Project Number:	CA0051319.2938
Client:	WSP Canada Inc.	Project Location:	
Project Name:	CA-West Carleton 2025 Engineering	Sample Location:	1
Source:		Borehole Type:	GS
Report Number:	BLC00322-25	Borehole Depth (m):	-
Sample Number:	1	WSP Lab Number:	BLC25-00567
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	05/16/2025
Specification:		Tested By:	Ireland, Melanie

Grain Size Distribution	Gravel	Sand	Silt / Clay
	18.9	60.6	20.5



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0459	11.9
		0.0329	10.5
		0.0212	8.4
		0.0123	7.7
		0.0088	6.6
		0.0063	4.9
75.0		0.0032	4.1
63.0		0.0013	3.1
53.0			
37.5			
26.5	100.0		
19.0	98.8		
13.2	96.2		
9.5	91.2		
4.75	81.1	0.005mm	4.5
2.00	72.0	0.002mm	3.6
0.850	66.9	D60	0.458
0.425	58.7	D30	0.141
0.250	43.9	D10	0.030
0.106	23.8	Cu	15.294
0.075	20.5	Cc	1.46

Notes:

Disclaimer:

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Reviewed By: Chelsea Ward Title: Laboratory Technician

Signature: Chelsea Ward

CERTIFIED BY CCIL

WSP Canada Inc.
1931 Robertson Road
Bells Corners, ON K2H 5B7
613-592-9600

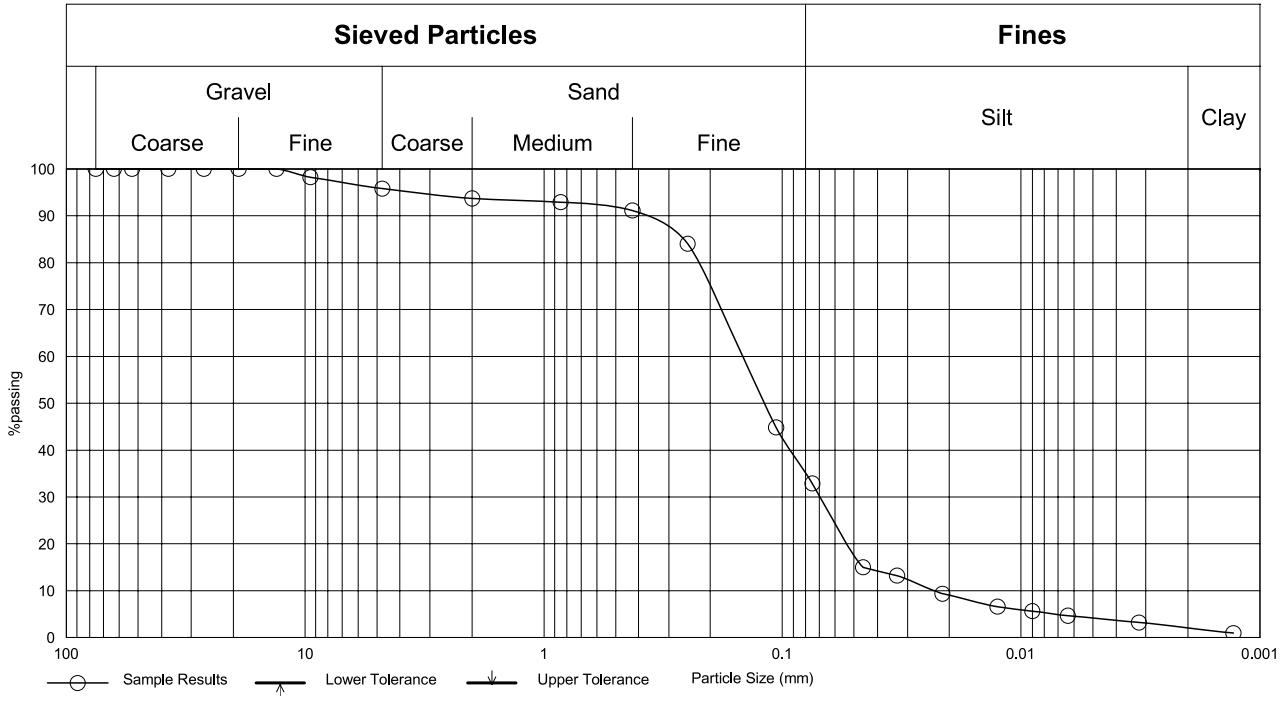
05/20/2025

Particle Size Distribution of Soils

Testing Standard: MTO LS-702 (Rev. 37)

Testing Program #:	039931	Project Number:	CA0051319.2938
Client:	WSP Canada Inc.	Project Location:	
Project Name:	CA-West Carleton 2025 Engineering	Sample Location:	1
Source:		Borehole Type:	GS
Report Number:	BLC00322-25	Borehole Depth (m):	-
Sample Number:	2	WSP Lab Number:	BLC25-00568
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	05/16/2025
Specification:		Tested By:	Ireland, Melanie

Grain Size Distribution	Gravel	Sand	Silt / Clay
	4.2	62.9	32.9



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0461	15.1
		0.0330	13.2
		0.0214	9.4
		0.0126	6.6
		0.0090	5.6
		0.0064	4.7
75.0		0.0032	3.3
63.0		0.0013	0.9
53.0			
37.5			
26.5			
19.0			
13.2	100.0		
9.5	98.2		
4.75	95.8	0.005mm	4.2
2.00	93.8	0.002mm	1.9
0.850	92.9	D60	0.146
0.425	91.1	D30	0.069
0.250	84.0	D10	0.023
0.106	44.8	Cu	6.314
0.075	32.9	Cc	1.42

Notes:

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Reviewed By: Chelsea Ward Title: Laboratory Technician

Signature: Chelsea Ward

CERTIFIED BY CCIL

WSP Canada Inc.
1931 Robertson Road
Bells Corners, ON K2H 5B7
613-592-9600

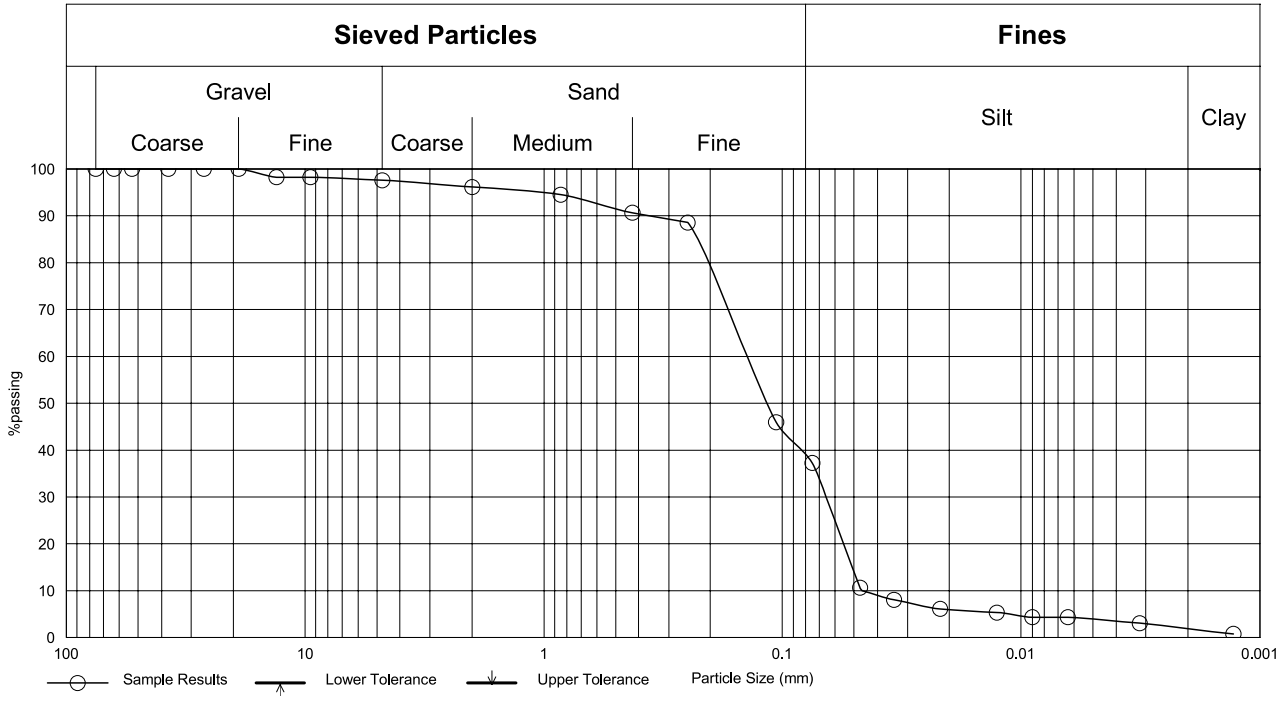
05/20/2025

Particle Size Distribution of Soils

Testing Standard: MTO LS-702 (Rev. 37)

Testing Program #:	039931	Project Number:	CA0051319.2938
Client:	WSP Canada Inc.	Project Location:	
Project Name:	CA-West Carleton 2025 Engineering	Sample Location:	1
Source:		Borehole Type:	GS
Report Number:	BLC00322-25	Borehole Depth (m):	-
Sample Number:	3	WSP Lab Number:	BLC25-00569
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	05/16/2025
Specification:		Tested By:	Ireland, Melanie

Grain Size Distribution	Gravel	Sand	Silt / Clay
	2.4	60.3	37.3



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0473	10.7
		0.0341	8.0
		0.0218	6.2
		0.0127	5.3
		0.0090	4.4
		0.0064	4.4
75.0		0.0032	3.1
63.0		0.0013	0.9
53.0			
37.5			
26.5			
19.0	100.0		
13.2	98.2		
9.5	98.2		
4.75	97.6	0.005mm	4.0
2.00	96.1	0.002mm	1.8
0.850	94.5	D60	0.140
0.425	90.7	D30	0.066
0.250	88.5	D10	0.046
0.106	45.9	Cu	3.029
0.075	37.3	Cc	0.67

Notes:

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Reviewed By: Chelsea Ward Title: Laboratory Technician

Signature: Chelsea Ward

CERTIFIED BY CCIL

WSP Canada Inc.
1931 Robertson Road
Bells Corners, ON K2H 5B7
613-592-9600

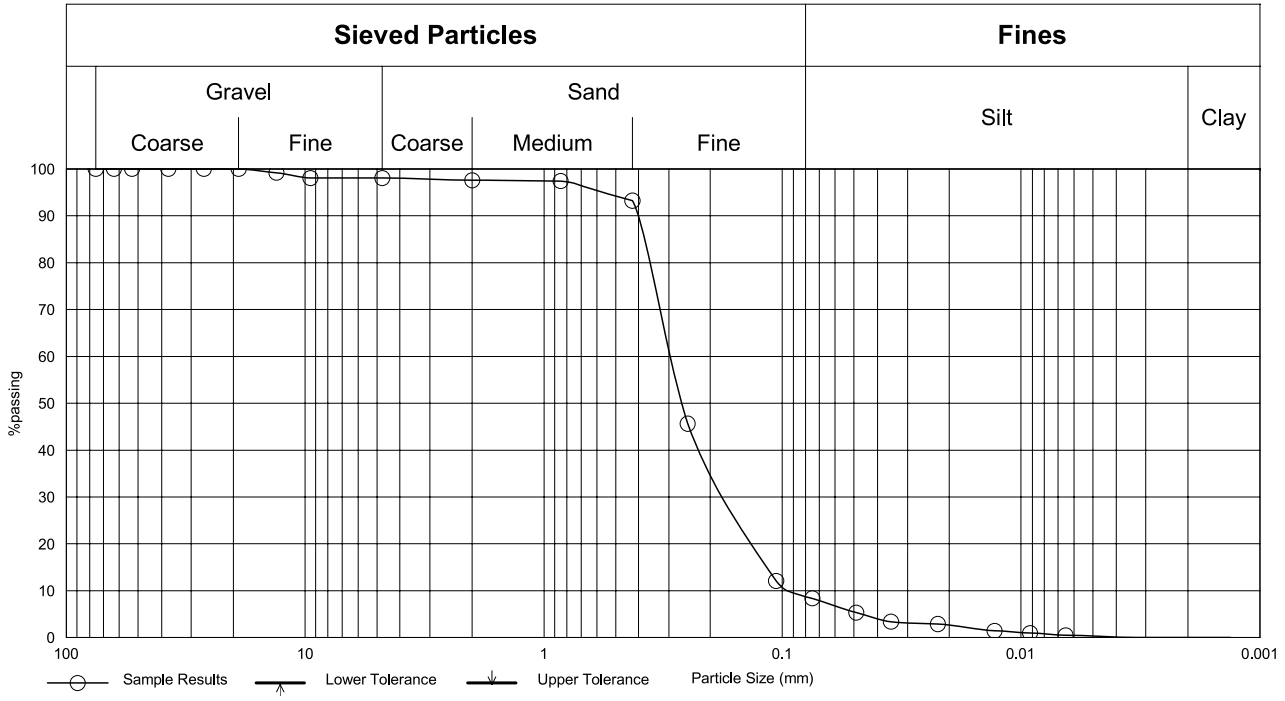
05/20/2025

Particle Size Distribution of Soils

Testing Standard: MTO LS-702 (Rev. 37)

Testing Program #:	039931	Project Number:	CA0051319.2938
Client:	WSP Canada Inc.	Project Location:	
Project Name:	CA-West Carleton 2025 Engineering	Sample Location:	1
Source:		Borehole Type:	GS
Report Number:	BLC00322-25	Borehole Depth (m):	-
Sample Number:	4	WSP Lab Number:	BLC25-00570
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	05/16/2025
Specification:		Tested By:	Ireland, Melanie

Grain Size Distribution	Gravel	Sand	Silt / Clay
	2.0	89.6	8.4



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0491	5.3
		0.0351	3.4
		0.0223	2.9
		0.0130	1.4
		0.0092	1.0
		0.0065	0.5
75.0		0.0033	
63.0		0.0013	
53.0			
37.5			
26.5			
19.0	100.0		
13.2	99.2		
9.5	98.1		
4.75	98.0	0.005mm	0.3
2.00	97.6	0.002mm	
0.850	97.4	D60	0.295
0.425	93.2	D30	0.180
0.250	45.7	D10	0.095
0.106	12.1	Cu	3.096
0.075	8.4	Cc	1.15

Notes:

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Reviewed By: Chelsea Ward Title: Laboratory Technician

Signature: Chelsea Ward

CERTIFIED BY CCIL

WSP Canada Inc.
1931 Robertson Road
Bells Corners, ON K2H 5B7
613-592-9600

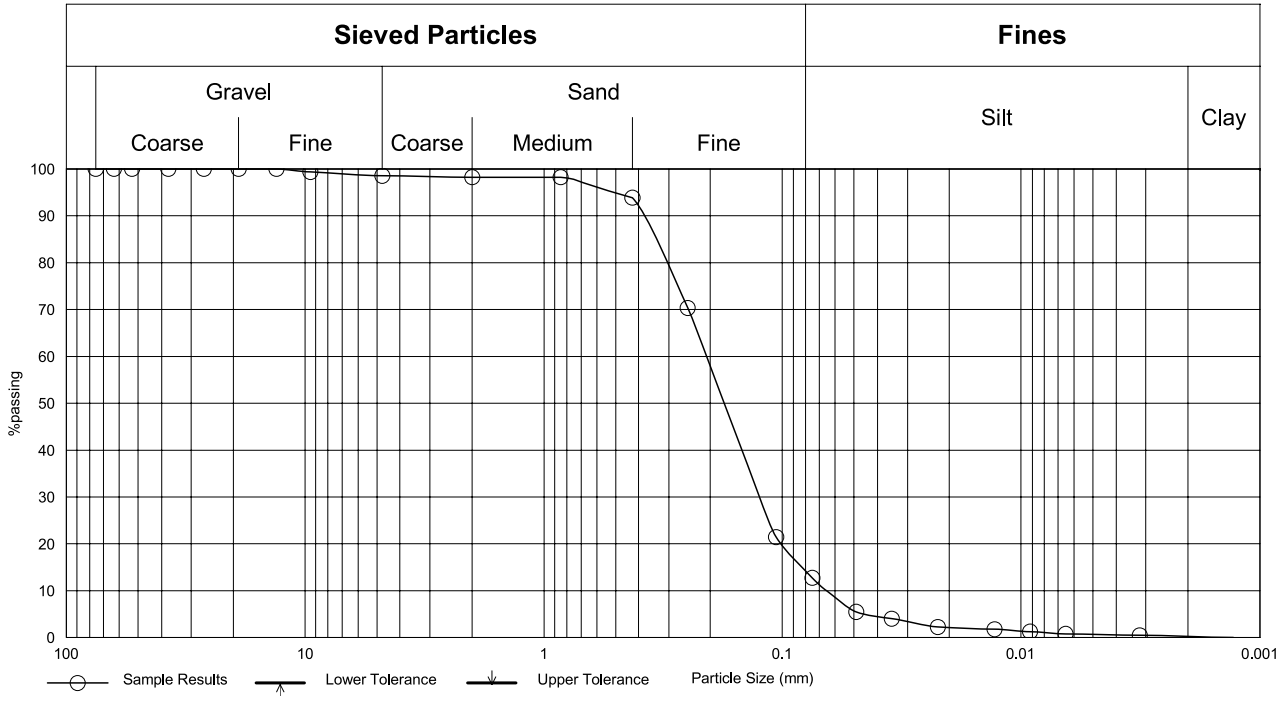
05/20/2025

Particle Size Distribution of Soils

Testing Standard: MTO LS-702 (Rev. 37)

Testing Program #:	039931	Project Number:	CA0051319.2938
Client:	WSP Canada Inc.	Project Location:	
Project Name:	CA-West Carleton 2025 Engineering	Sample Location:	1
Source:		Borehole Type:	GS
Report Number:	BLC00322-25	Borehole Depth (m):	-
Sample Number:	5	WSP Lab Number:	BLC25-00571
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	05/16/2025
Specification:		Tested By:	Ireland, Melanie

Grain Size Distribution	Gravel	Sand	Silt / Clay
	1.4	85.8	12.8



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0490	5.5
		0.0349	4.1
		0.0223	2.3
		0.0129	1.8
		0.0092	1.3
		0.0065	0.9
75.0		0.0032	0.4
63.0		0.0013	
53.0			
37.5			
26.5			
19.0			
13.2	100.0		
9.5	99.4		
4.75	98.6	0.005mm	0.7
2.00	98.2	0.002mm	0.2
0.850	98.2	D60	0.207
0.425	93.9	D30	0.125
0.250	70.4	D10	0.065
0.106	21.5	Cu	3.180
0.075	12.8	Cc	1.15

Notes:

Disclaimer:

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Reviewed By: Chelsea Ward Title: Laboratory Technician

Signature: Chelsea Ward

CERTIFIED BY CCIL

WSP Canada Inc.
1931 Robertson Road
Bells Corners, ON K2H 5B7
613-592-9600

05/26/2025

Water (Moisture) Content of Soils

Testing Standard: ASTM D2216-19 Method B

Testing Program #:	040158	Project Number:	CA0051319.2938
Client:	WSP Canada Inc.	Project Location:	
Project Name:	CA-West Carleton 2025 Engineering	Report Number:	BLC00357-25

Sample Location	Sample				Soil Description	Water Content (%)	WSP Lab Number	Tested By	Remarks
	Sample Number	Top (m)	Base (m)	Type					
2	3	0.00	0.00	SS		4.0	BLC25-00584	Melanie Ireland	
2	5	0.00	0.00	SS		4.3	BLC25-00586		

Reviewed By: Chelsea Ward Title: Laboratory Technician

Signature: Chelsea Ward

CERTIFIED BY CCIL

WSP Canada Inc.
1931 Robertson Road
Bells Corners, ON K2H 5B7
613-592-9600

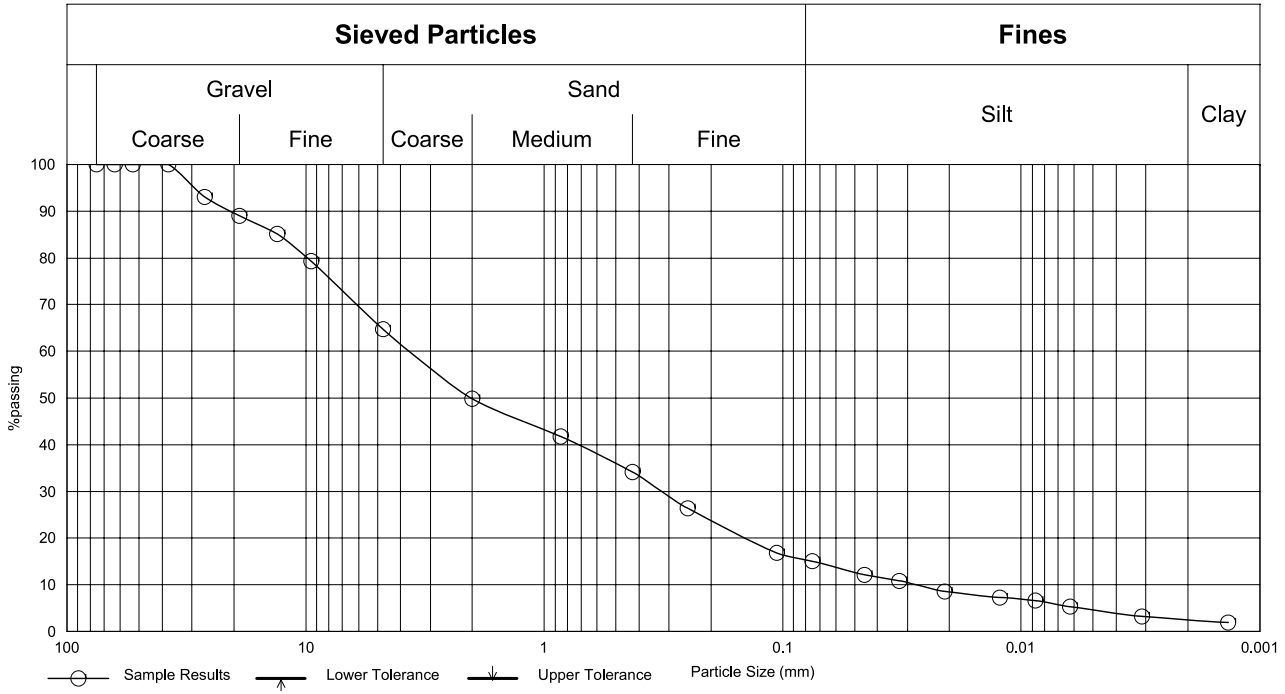
05/22/2025

Particle Size Distribution of Soils

Testing Standard: MTO LS-702 (Rev. 37)

Testing Program #:	040158	Project Number:	CA0051319.2938
Client:	WSP Canada Inc.	Project Location:	
Project Name:	CA-West Carleton 2025 Engineering	Sample Location:	2
Source:		Borehole Type:	SS
Report Number:	BLC00357-25	Borehole Depth (m):	-
Sample Number:	1	WSP Lab Number:	BLC25-00582
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	05/21/2025
Specification:		Tested By:	Ward, Chelsea

Grain Size Distribution	Gravel	Sand	Silt / Clay
	35.3	49.7	15.0



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0454	12.2
		0.0325	10.9
		0.0210	8.6
		0.0123	7.3
		0.0087	6.6
		0.0062	5.3
75.0		0.0031	3.3
63.0		0.0014	1.9
53.0			
37.5	100.0		
26.5	93.1		
19.0	89.0		
13.2	85.1		
9.5	79.3		
4.75	64.7	0.005mm	4.6
2.00	49.8	0.002mm	2.4
0.850	41.8	D60	3.698
0.425	34.1	D30	0.321
0.250	26.4	D10	0.028
0.106	16.9	Cu	133.741
0.075	15.0	Cc	1.01

Notes:

Disclaimer:

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Reviewed By: Melanie Ireland Title: Laboratory Supervisor

Signature: Melanie Ireland

CERTIFIED BY CCIL

WSP Canada Inc.
1931 Robertson Road
Bells Corners, ON K2H 5B7
613-592-9600

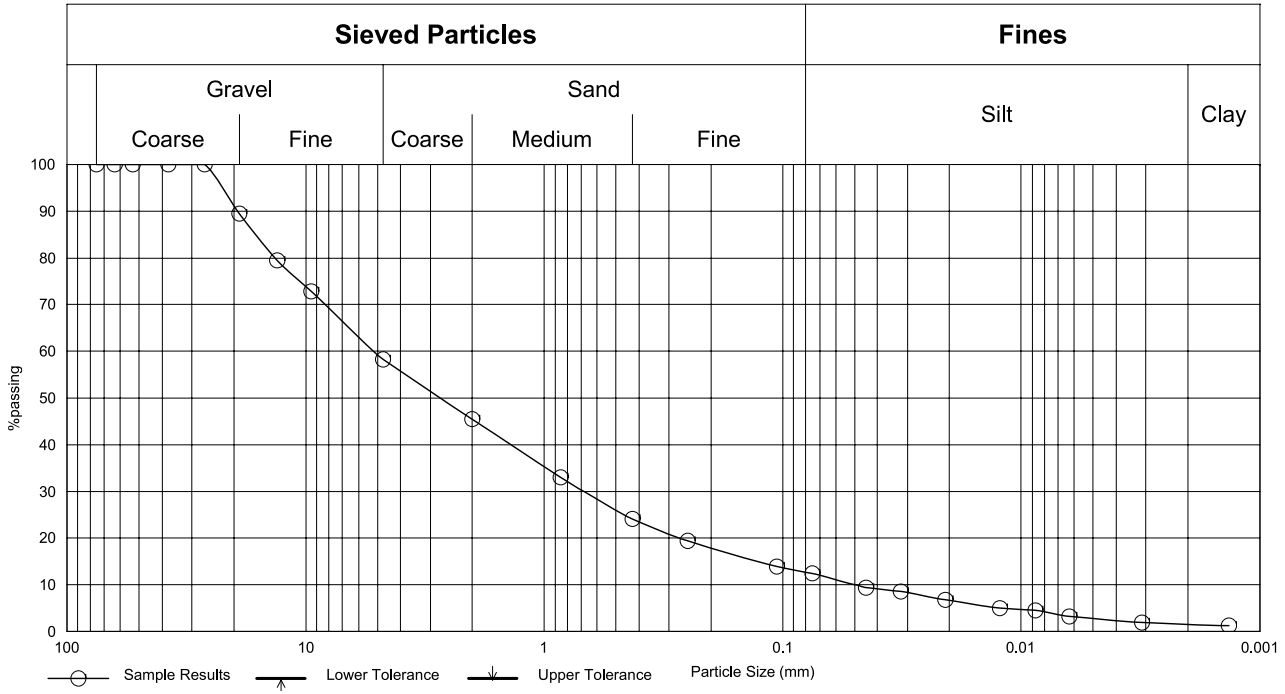
05/22/2025

Particle Size Distribution of Soils

Testing Standard: MTO LS-702 (Rev. 37)

Testing Program #:	040158	Project Number:	CA0051319.2938
Client:	WSP Canada Inc.	Project Location:	
Project Name:	CA-West Carleton 2025 Engineering	Sample Location:	2
Source:		Borehole Type:	SS
Report Number:	BLC00357-25	Borehole Depth (m):	-
Sample Number:	2	WSP Lab Number:	BLC25-00583
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	05/21/2025
Specification:		Tested By:	Ward, Chelsea

Grain Size Distribution	Gravel	Sand	Silt / Clay
	41.8	45.7	12.5



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0447	9.4
		0.0320	8.5
		0.0208	6.7
		0.0123	5.0
		0.0087	4.5
		0.0063	3.2
75.0		0.0031	2.0
63.0		0.0014	1.3
53.0			
37.5			
26.5	100.0		
19.0	89.5		
13.2	79.4		
9.5	72.7		
4.75	58.2	0.005mm	2.7
2.00	45.5	0.002mm	1.6
0.850	33.1	D60	5.223
0.425	24.2	D30	0.678
0.250	19.5	D10	0.050
0.106	13.9	Cu	104.675
0.075	12.5	Cc	1.76

Notes:

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Reviewed By: Melanie Ireland Title: Laboratory Supervisor

Signature: Melanie Ireland

CERTIFIED BY CCIL

WSP Canada Inc.
1931 Robertson Road
Bells Corners, ON K2H 5B7
613-592-9600

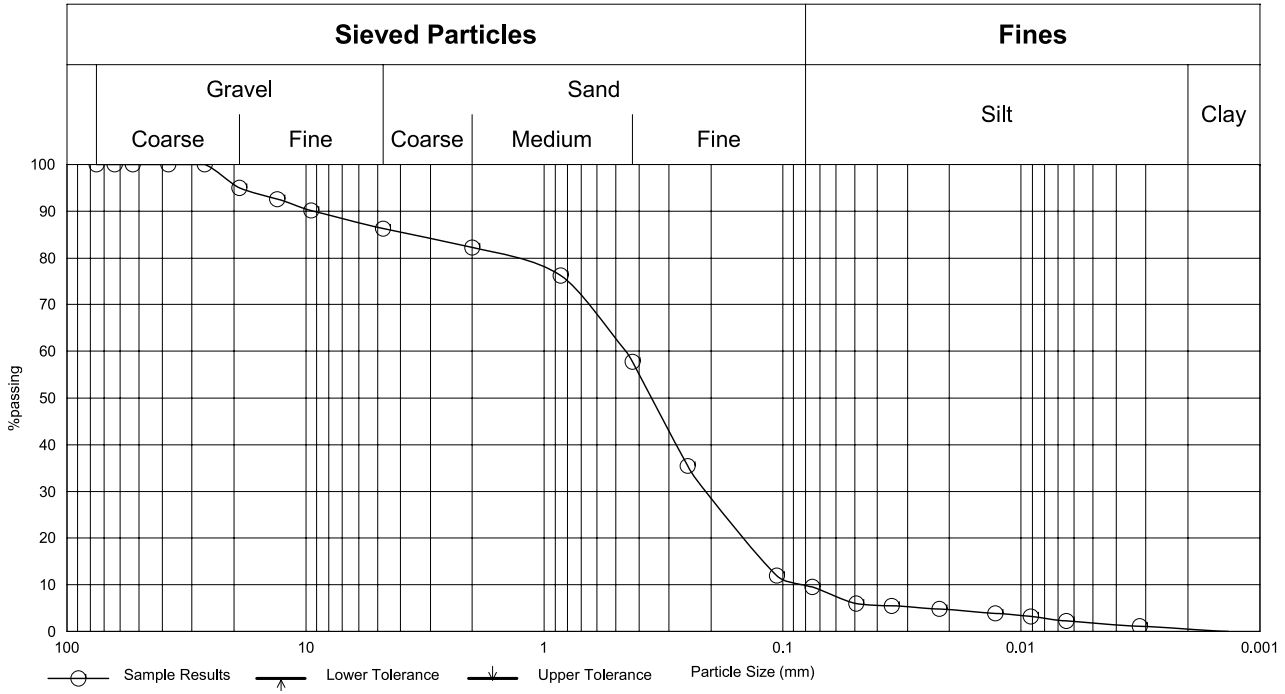
05/22/2025

Particle Size Distribution of Soils

Testing Standard: MTO LS-702 (Rev. 37)

Testing Program #:	040158	Project Number:	CA0051319.2938
Client:	WSP Canada Inc.	Project Location:	
Project Name:	CA-West Carleton 2025 Engineering	Sample Location:	2
Source:		Borehole Type:	SS
Report Number:	BLC00357-25	Borehole Depth (m):	-
Sample Number:	3	WSP Lab Number:	BLC25-00584
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	05/21/2025
Specification:		Tested By:	Ward, Chelsea

Grain Size Distribution	Gravel	Sand	Silt / Clay
	13.8	76.7	9.5



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0491	6.0
		0.0348	5.4
		0.0221	4.9
		0.0128	3.8
		0.0091	3.3
		0.0065	2.2
75.0		0.0032	1.1
63.0		0.0014	
53.0			
37.5			
26.5	100.0		
19.0	95.0		
13.2	92.5		
9.5	90.1		
4.75	86.2	0.005mm	1.7
2.00	82.1	0.002mm	0.4
0.850	76.2	D60	0.455
0.425	57.7	D30	0.210
0.250	35.5	D10	0.083
0.106	12.0	Cu	5.477
0.075	9.5	Cc	1.17

Notes:

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Reviewed By: Melanie Ireland Title: Laboratory Supervisor

Signature: Melanie Ireland

CERTIFIED BY CCIL

WSP Canada Inc.
1931 Robertson Road
Bells Corners, ON K2H 5B7
613-592-9600

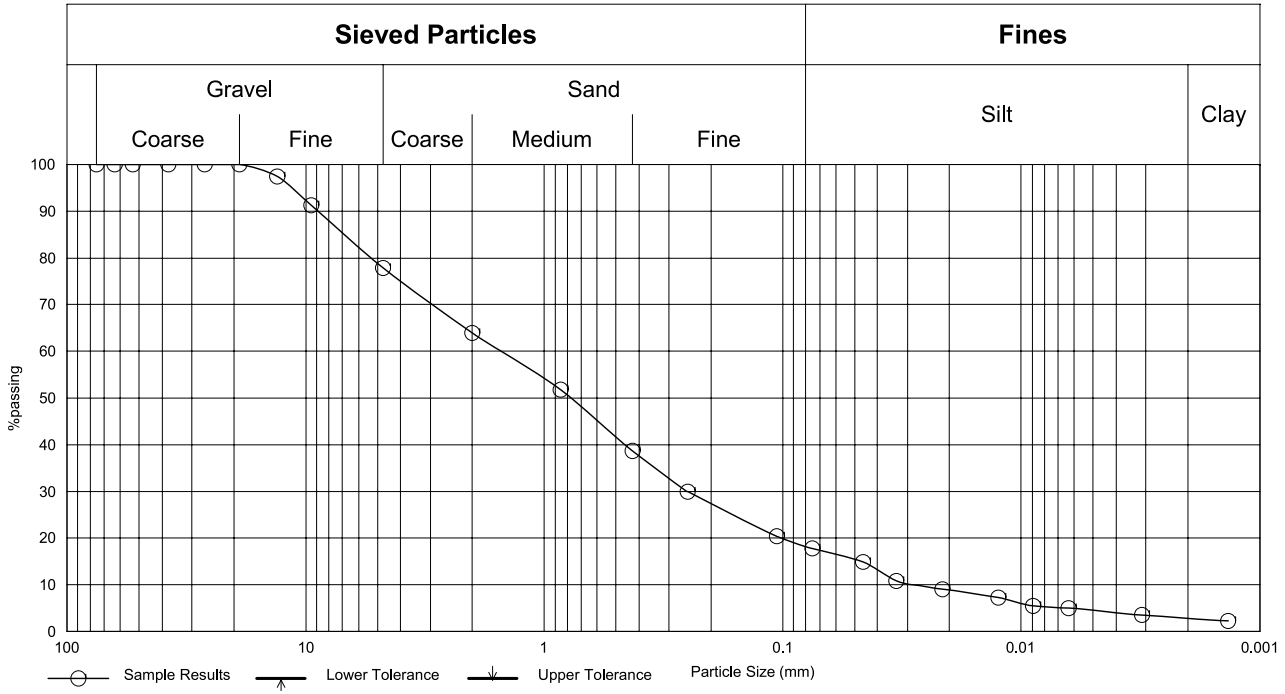
05/22/2025

Particle Size Distribution of Soils

Testing Standard: MTO LS-702 (Rev. 37)

Testing Program #:	040158	Project Number:	CA0051319.2938
Client:	WSP Canada Inc.	Project Location:	
Project Name:	CA-West Carleton 2025 Engineering	Sample Location:	2
Source:		Borehole Type:	SS
Report Number:	BLC00357-25	Borehole Depth (m):	-
Sample Number:	4	WSP Lab Number:	BLC25-00585
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	05/21/2025
Specification:		Tested By:	Ward, Chelsea

Grain Size Distribution	Gravel	Sand	Silt / Clay
	22.1	60.1	17.8



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0460	14.8
		0.0335	10.8
		0.0214	9.1
		0.0125	7.3
		0.0090	5.5
		0.0063	5.0
75.0		0.0031	3.6
63.0		0.0014	2.2
53.0			
37.5			
26.5			
19.0	100.0		
13.2	97.4		
9.5	91.3		
4.75	77.9	0.005mm	4.6
2.00	63.9	0.002mm	2.7
0.850	51.8	D60	1.520
0.425	38.6	D30	0.252
0.250	29.9	D10	0.029
0.106	20.3	Cu	52.925
0.075	17.8	Cc	1.45

Notes:

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Reviewed By: Melanie Ireland Title: Laboratory Supervisor

Signature: Melanie Ireland

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WSP Canada Inc.
1931 Robertson Road
Bells Corners, ON K2H 5B7
613-592-9600

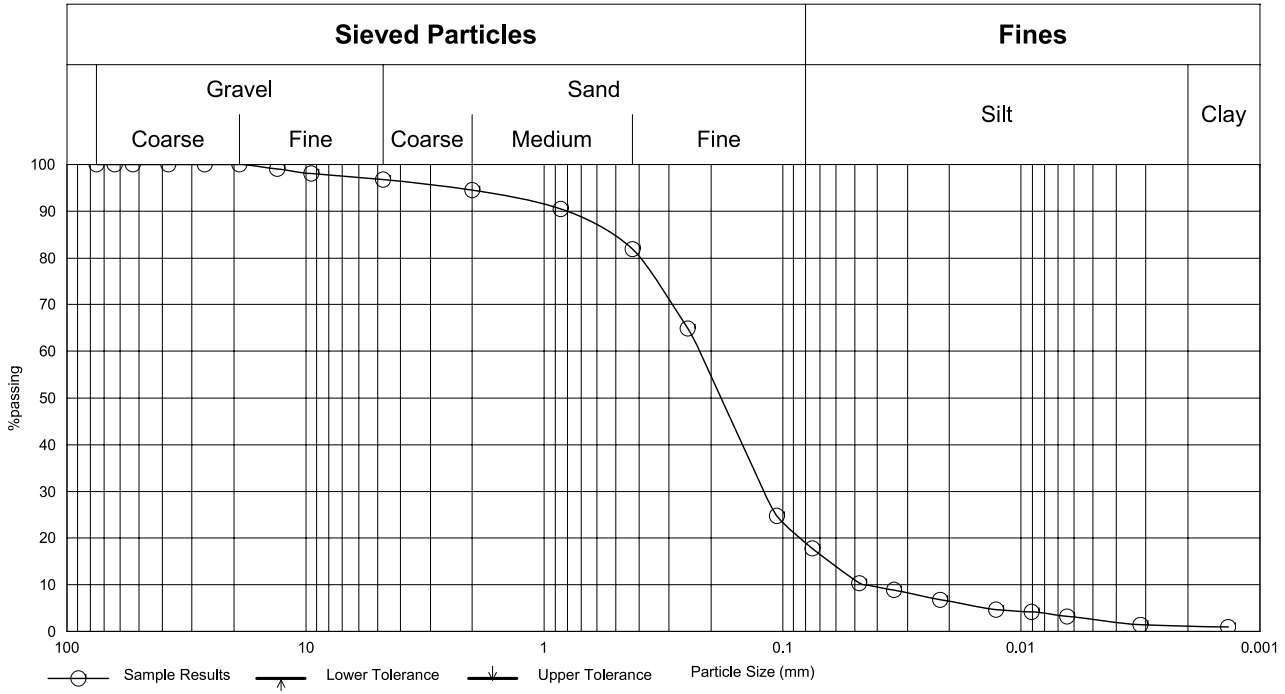
05/22/2025

Particle Size Distribution of Soils

Testing Standard: MTO LS-702 (Rev. 37)

Testing Program #:	040158	Project Number:	CA0051319.2938
Client:	WSP Canada Inc.	Project Location:	
Project Name:	CA-West Carleton 2025 Engineering	Sample Location:	2
Source:		Borehole Type:	SS
Report Number:	BLC00357-25	Borehole Depth (m):	-
Sample Number:	5	WSP Lab Number:	BLC25-00586
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	05/21/2025
Specification:		Tested By:	Ward, Chelsea

Grain Size Distribution	Gravel	Sand	Silt / Clay
	3.2	78.9	17.9



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0479	10.4
		0.0341	8.8
		0.0219	6.8
		0.0127	4.7
		0.0090	4.2
		0.0064	3.2
75.0		0.0032	1.5
63.0		0.0014	1.0
53.0			
37.5			
26.5			
19.0	100.0		
13.2	99.0		
9.5	98.1		
4.75	96.8	0.005mm	2.5
2.00	94.6	0.002mm	1.1
0.850	90.4	D60	0.223
0.425	81.9	D30	0.120
0.250	65.0	D10	0.046
0.106	24.7	Cu	4.842
0.075	17.9	Cc	1.40

Notes:

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Reviewed By: Melanie Ireland Title: Laboratory Supervisor

Signature: Melanie Ireland

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1931 Robertson Road
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05/26/2025

Water (Moisture) Content of Soils

Testing Standard: ASTM D2216-19 Method B

Testing Program #:	040176	Project Number:	CA0051319.2938
Client:	WSP Canada Inc.	Project Location:	
Project Name:	CA-West Carleton 2025 Engineering	Report Number:	BLC00358-25

Sample Location	Sample				Soil Description	Water Content (%)	WSP Lab Number	Tested By	Remarks
	Sample Number	Top (m)	Base (m)	Type					
4	2	0.00	0.00	SS		5.1	BLC25-00588	Melanie Ireland	
4	3	0.00	0.00	SS		4.2	BLC25-00589		
4	4	0.00	0.00	SS		4.2	BLC25-00590		
4	5	0.00	0.00	SS		5.2	BLC25-00591		

Reviewed By: Chelsea Ward Title: Laboratory Technician

Signature: Chelsea Ward

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1931 Robertson Road
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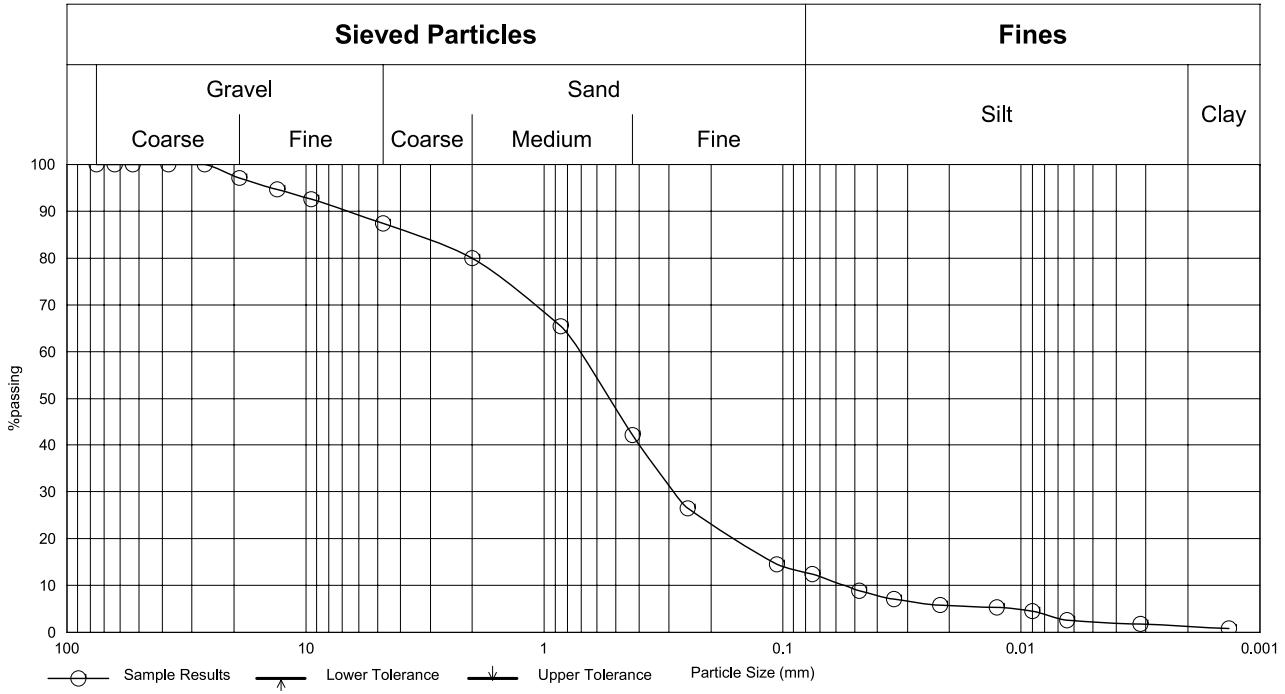
05/23/2025

Particle Size Distribution of Soils

Testing Standard: MTO LS-702 (Rev. 37)

Testing Program #:	040176	Project Number:	CA0051319.2938
Client:	WSP Canada Inc.	Project Location:	
Project Name:	CA-West Carleton 2025 Engineering	Sample Location:	4
Source:		Borehole Type:	SS
Report Number:	BLC00358-25	Borehole Depth (m):	-
Sample Number:	1	WSP Lab Number:	BLC25-00587
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	05/21/2025
Specification:		Tested By:	Ward, Chelsea

Grain Size Distribution	Gravel	Sand	Silt / Clay
	12.6	74.9	12.5



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0479	8.9
		0.0342	7.1
		0.0219	5.8
		0.0127	5.3
		0.0090	4.5
		0.0064	2.7
75.0		0.0032	1.8
63.0		0.0013	0.8
53.0			
37.5			
26.5	100.0		
19.0	97.1		
13.2	94.7		
9.5	92.5		
4.75	87.4	0.005mm	2.2
2.00	79.9	0.002mm	1.2
0.850	65.4	D60	0.708
0.425	42.2	D30	0.288
0.250	26.5	D10	0.055
0.106	14.5	Cu	12.820
0.075	12.5	Cc	2.13

Notes:

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Reviewed By: Melanie Ireland Title: Laboratory Supervisor

Signature: Melanie Ireland

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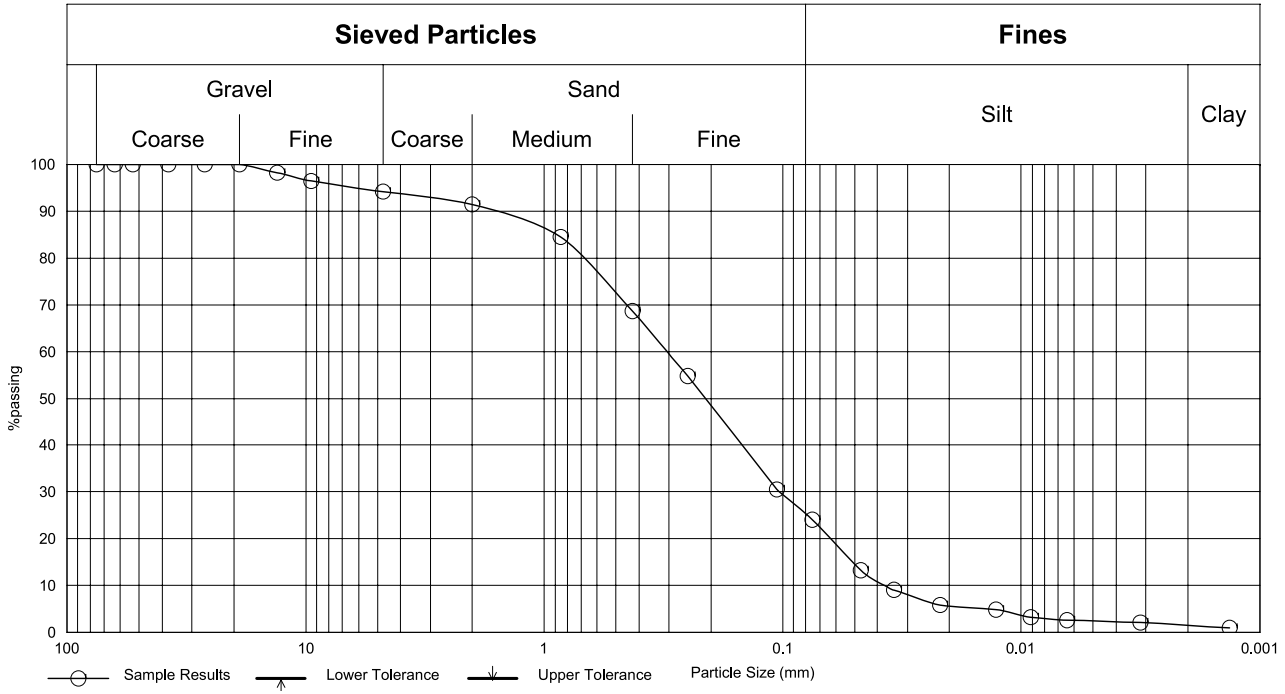
05/23/2025

Particle Size Distribution of Soils

Testing Standard: MTO LS-702 (Rev. 37)

Testing Program #:	040176	Project Number:	CA0051319.2938
Client:	WSP Canada Inc.	Project Location:	
Project Name:	CA-West Carleton 2025 Engineering	Sample Location:	4
Source:		Borehole Type:	SS
Report Number:	BLC00358-25	Borehole Depth (m):	-
Sample Number:	2	WSP Lab Number:	BLC25-00588
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	05/21/2025
Specification:		Tested By:	Ward, Chelsea

Grain Size Distribution	Gravel	Sand	Silt / Clay
	5.8	70.1	24.1



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0472	13.3
		0.0341	9.0
		0.0220	5.8
		0.0127	4.8
		0.0091	3.2
		0.0064	2.6
75.0		0.0032	2.1
63.0		0.0013	1.0
53.0			
37.5			
26.5			
19.0	100.0		
13.2	98.2		
9.5	96.4		
4.75	94.2	0.005mm	2.4
2.00	91.5	0.002mm	1.4
0.850	84.5	D60	0.304
0.425	68.6	D30	0.104
0.250	54.7	D10	0.037
0.106	30.6	Cu	8.115
0.075	24.1	Cc	0.94

Notes:

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Signature: Melanie Ireland

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613-592-9600

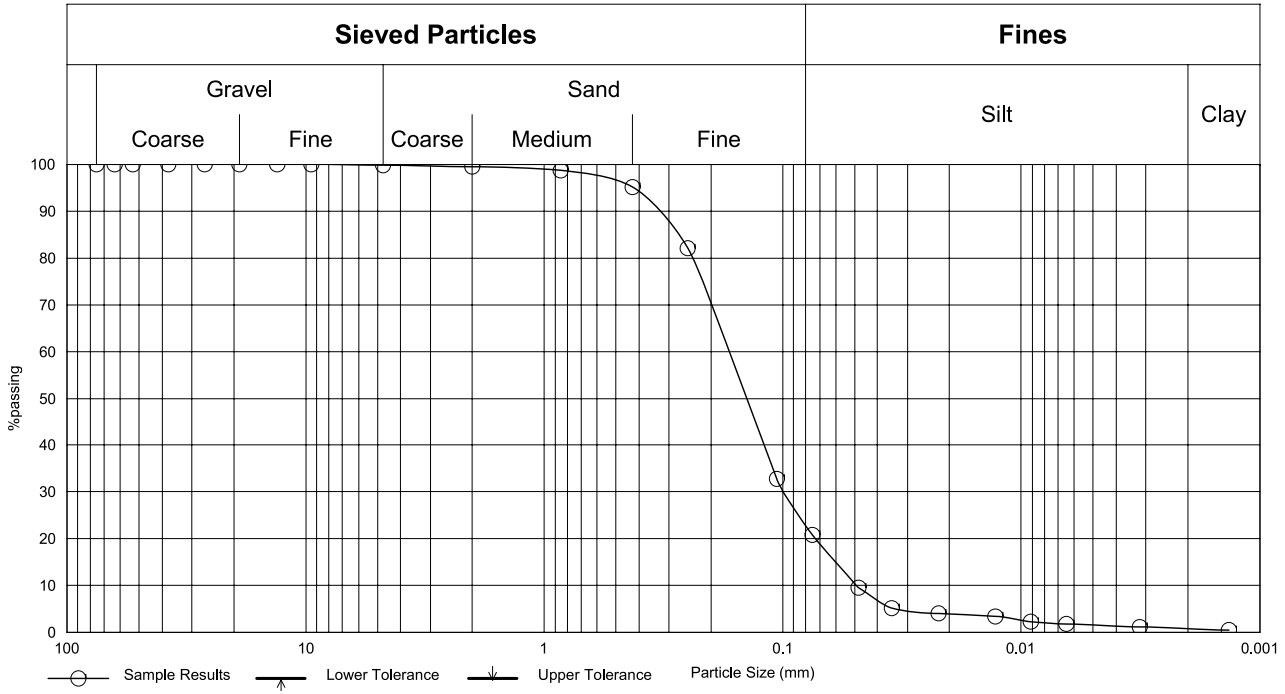
05/23/2025

Particle Size Distribution of Soils

Testing Standard: MTO LS-702 (Rev. 37)

Testing Program #:	040176	Project Number:	CA0051319.2938
Client:	WSP Canada Inc.	Project Location:	
Project Name:	CA-West Carleton 2025 Engineering	Sample Location:	4
Source:		Borehole Type:	SS
Report Number:	BLC00358-25	Borehole Depth (m):	-
Sample Number:	3	WSP Lab Number:	BLC25-00589
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	05/21/2025
Specification:		Tested By:	Ward, Chelsea

Grain Size Distribution	Gravel	Sand	Silt / Clay
	0.2	78.9	20.9



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0483	9.6
		0.0349	5.1
		0.0222	4.0
		0.0129	3.4
		0.0091	2.3
		0.0065	1.7
75.0		0.0032	1.1
63.0		0.0014	0.5
53.0			
37.5			
26.5			
19.0			
13.2			
9.5	100.0		
4.75	99.8	0.005mm	1.5
2.00	99.6	0.002mm	0.7
0.850	98.8	D60	0.168
0.425	95.2	D30	0.100
0.250	82.0	D10	0.049
0.106	32.9	Cu	3.416
0.075	20.9	Cc	1.20

Notes:

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Signature: Melanie Ireland

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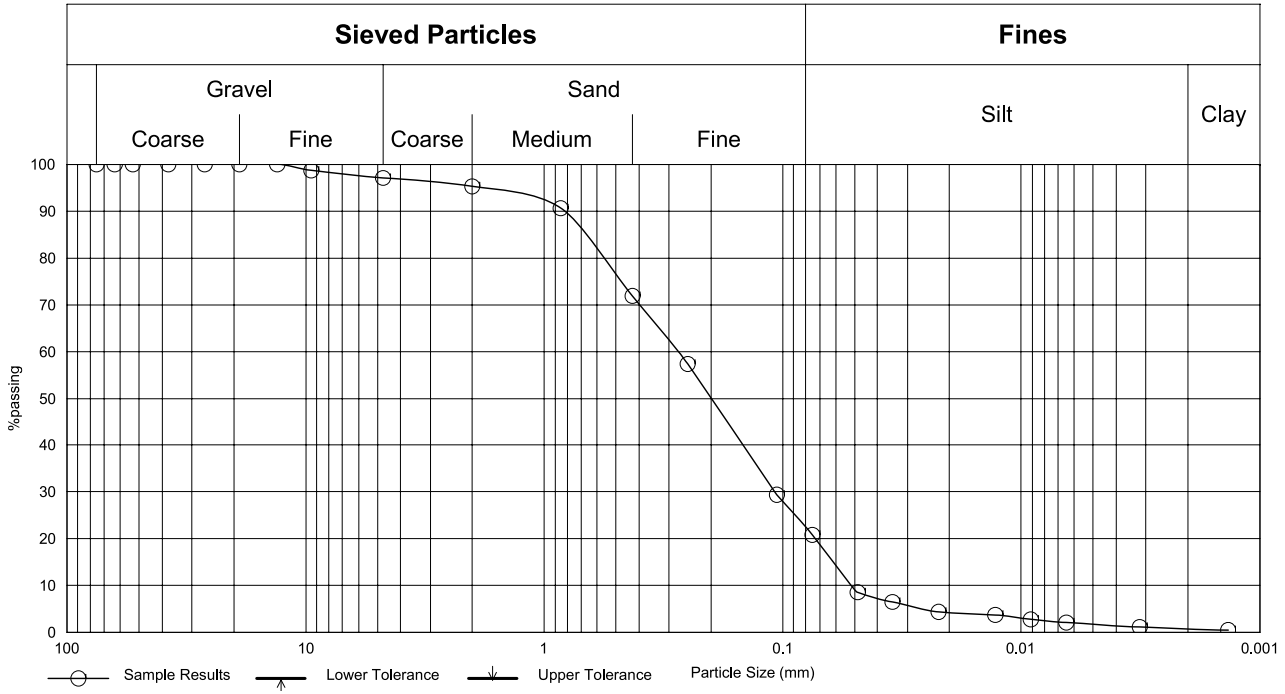
05/23/2025

Particle Size Distribution of Soils

Testing Standard: MTO LS-702 (Rev. 37)

Testing Program #:	040176	Project Number:	CA0051319.2938
Client:	WSP Canada Inc.	Project Location:	
Project Name:	CA-West Carleton 2025 Engineering	Sample Location:	4
Source:		Borehole Type:	SS
Report Number:	BLC00358-25	Borehole Depth (m):	-
Sample Number:	4	WSP Lab Number:	BLC25-00590
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	05/21/2025
Specification:		Tested By:	Ward, Chelsea

Grain Size Distribution	Gravel	Sand	Silt / Clay
	2.9	76.3	20.8



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0484	8.5
		0.0347	6.4
		0.0222	4.3
		0.0128	3.8
		0.0091	2.7
		0.0065	2.2
75.0		0.0032	1.1
63.0		0.0014	0.5
53.0			
37.5			
26.5			
19.0			
13.2	100.0		
9.5	98.8		
4.75	97.1	0.005mm	1.8
2.00	95.3	0.002mm	0.7
0.850	90.6	D60	0.273
0.425	71.9	D30	0.108
0.250	57.4	D10	0.052
0.106	29.4	Cu	5.273
0.075	20.8	Cc	0.83

Notes:

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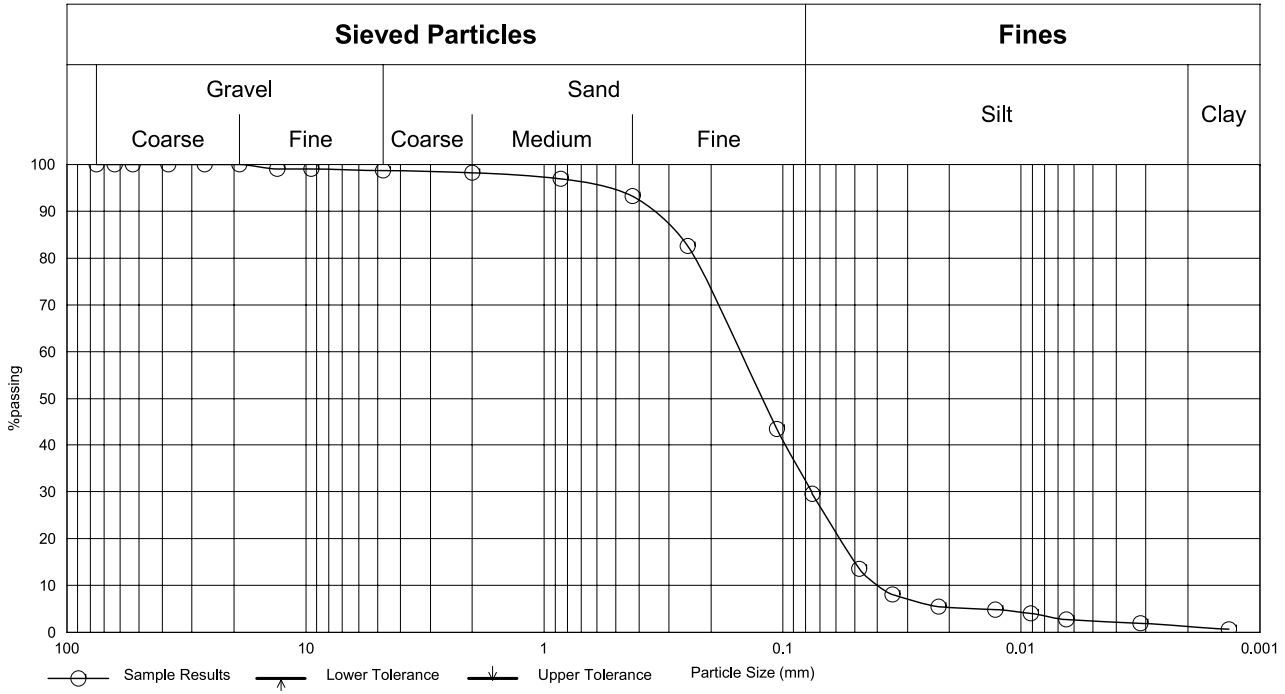
05/23/2025

Particle Size Distribution of Soils

Testing Standard: MTO LS-702 (Rev. 37)

Testing Program #:	040176	Project Number:	CA0051319.2938
Client:	WSP Canada Inc.	Project Location:	
Project Name:	CA-West Carleton 2025 Engineering	Sample Location:	4
Source:		Borehole Type:	SS
Report Number:	BLC00358-25	Borehole Depth (m):	-
Sample Number:	5	WSP Lab Number:	BLC25-00591
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	05/21/2025
Specification:		Tested By:	Ward, Chelsea

Grain Size Distribution	Gravel	Sand	Silt / Clay
	1.3	69.1	29.6



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0479	13.6
		0.0347	8.2
		0.0222	5.5
		0.0128	4.8
		0.0091	4.1
		0.0065	2.7
75.0		0.0032	2.0
63.0		0.0014	0.6
53.0			
37.5			
26.5			
19.0	100.0		
13.2	99.1		
9.5	99.1		
4.75	98.7	0.005mm	2.4
2.00	98.3	0.002mm	1.1
0.850	96.9	D60	0.150
0.425	93.2	D30	0.076
0.250	82.5	D10	0.040
0.106	43.5	Cu	3.748
0.075	29.6	Cc	0.95

Notes:

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