REPORT

FOUNDATION INVESTIGATION AND DESIGN REPORT

Pole-Mounted Variable Message Sign Supports
Highway 401
Essex and Oxford Counties
GWP 3008-22-00

Submitted to:
Ministry of Transportation - Central Region
159 Sir William Hearst Avenue
Toronto, ON M3M 0B7

Submitted by:
WSP Canada Inc.
309 Exeter Road, Unit #1, London, ON N6L 1C1
(519) 652-0099

CA0051716.2286-R01

December 19, 2025

Geocres No. 40J02-158

Distribution List

1 e-Copy - MTO West Region

1 e-Copy - MTO Foundations Section

1 e-Copy - WSP Canada Inc.

Table of Contents

TABLES

ATTACHMENTS

APPENDICES

PART A

FOUNDATION INVESTIGATION REPORT
POLE-MOUNTED VARIABLE MESSAGE SIGN SUPPORTS
HIGHWAY 401
ESSEX AND OXFORD COUNTIES
GWP 3008-22-00

1 INTRODUCTION

WSP Canada Inc. (WSP) has been retained by the Ministry of Transportation, Ontario (MTO) to provide Total Project Management (TPM) for the detail design of Intelligent Transportation Systems (ITS) for GWP 3008-22-00. The assignment includes the replacement of a number of signs on Highways 401, 402, and 3. This report addresses the signs on Highway 401. Signs on Highways 402 and 3 are addressed under separate cover(s).

This report addresses the geotechnical aspects of the following signs:

Table 1: List of Highway 401 Signs

Sign Name and No. (MTO Structure No.)	Site No.	Approximate Sign Location
401PM3195VWS	3195	Westbound, 3.0 km southwest of Culloden Rd
401PM3181VWS	3181	Westbound, Lakeshore Road 103
401PM3180VWS	3180	Westbound, 8th Concession Road

It is understood that each of the new signs will be a ground-mounted, Pole-Mounted Variable Message Sign (VMS), designed in accordance with the MTO's Sign Support Manual (2019).

2 SITE DESCRIPTION

2.1 General

Each of the subject signs are located on the westbound/north side of Highway 401 within Essex or Oxford Counties, Ontario. Highway 401 in these areas is a six-lane highway with paved shoulders. These areas are generally level, with slight slopes down to the adjacent ditches.

2.2 Site Geology

Sites 3181 and 3180

Sites 3181 and 3180 are located in the physiographic region of Southwestern Ontario known as the St. Clair Clay Plains. Within this region, Essex County and the southwestern part of Kent County are normally discussed as a sub-region known as the Essex Clay Plain. The clay plain was deposited during the retreat of ice sheets (late Pleistocene Era) when a series of glacial lakes inundated the area. In general, the ice sheets deposited materials with a glacial-till-like gradation in the Essex County area. Depending on the locations of the glacial ice sheets and depths of water in the ice-contact glacial lakes, the materials may have been directly deposited at the contact between the ice sheet and the bedrock or, as the lake levels rose, and the ice sheets retreated and floated, the soil and rock debris within and at the base of the ice were deposited through the lake water (glaciolacustrine depositional environment). The Essex Clay Plain exhibits grain size distributions consistent with that of a cohesive glacial till but these deposits do not have increased densities and high strengths typically associated with tills deposited under a grounded ice sheet. It is most likely that in the Windsor area, the soils were deposited at the underside, or in front of floating ice through a shallow water depth as a broadly graded mud and, therefore, carried little or no weight of the overlying ice.

The quaternary geological mapping indicates a major soil stratum, consisting primarily of silty clay and clayey silt exhibiting a "till-like" structure by a random distribution of coarser particles within the primarily fine-grained silt and clay matrix (also called a 'diamict'). Predominantly, the near-surface clayey soils are generally firm to hard and

contain weathering structures consisting of fractures and desiccation cracks. Underlying this 'crust', the soil becomes grey-brown and soft to firm to stiff in consistency, indicating a historical groundwater level.

More typically, layered glaciolacustrine silty clay, silty sand, silt, or sand overly the extensive stratum of 'till-like' silty clay, or clayey silt. This interlayering of sands and silts indicates the glacial lake and glacial ice depositional environment. Typically, a relatively thin stratum of very dense, or hard, basal glacial till containing limestone clasts (sand and gravel) exists below the extensive silty clay/clayey silt deposit. This stratum overlies the bedrock and is generally referred to as the Catfish Creek Till.

The bedrock underlying the overburden soils at the sites consists of relatively horizontally oriented sedimentary rock of the Palaeozoic era. This sedimentary rock formed in shallow marine environments within what is now geologically referred to as the Michigan Basin, a regional bowl-shaped depression permeating through Southern Ontario. The indicated geological mapping suggests bedrock surface occurring at a depth of about 25 to 40 metres (m) below the ground surface. The bedrock consists of the limestones of the Devonian Dundee Formation of the Hamilton Group Formations, and the underlying limestone of the Devonian Lucas Formation of the Detroit River Group of Formations.

Groundwater regime in the region is influenced by the presence of a pressurized brackish and H_2S and/or natural gas loaded deep, and pressurised aquifer located within the thin basal till layer and bedrock fractures covered by the more impervious silty clay deposit. The hydrostatic head within the basal till varies from slightly artesian to within typically 1 m to 3 m below the ground surface.

Site 3195

Site 3195 is located within the physiographic region of Southwestern Ontario known as the Oxford Till Plain. The surface is drumlinized, with good drumlins appearing south of Woodstock where the glacier apparently overrode an older moraine, and faint drumlins and fluting farther north. Both drumlins and flutings have a northwest alignment. Site 3195 is located immediately north of the mapped limit of the Ingersol Moraine which is within a subregion of Port Stanley Till. The surficial geology at Site 3195 is mapped as an isolated deposit of glaciofluvial ice-contact stratified drift, consisting of morainic or kame sand and gravely sand.

The bedrock in the area of the site it mapped as Middle Devonian limestone, dolostone, or shale of the Detroit River Group Onondaga Formation. The bedrock surface in the area of the site it mapped at elevations in the range of about 228 m to 236 m, or about 50 m to 60 m deep (drift thickness).

3 INVESTIGATION PROCEDURES

The field work for the current investigation was carried out on September 2, 2025 and November 14, 2025, during which time 3 boreholes were drilled at the locations shown on Drawings 1 and 2.

The table below summarizes the locations, geodetic ground surface elevations, and depths of the boreholes.

Table 2: List of Highway 401 Signs and Boreholes

Sign No. (MTO Structure No.)	Site No.	Borehole No.	Borehole Locations MTM NAD83, Zone17		Geodetic Ground Surface Elevation (m)	Borehole Depth (m)
			Northing (m)	Easting (m)		
401PM3195VWS	3195	BH-101	4760074	507762	284.5	8.2
401PM3181VWS	3181	BH-102	4678044	348404	186.0	8.2
401PM3180VWS	3180	BH-103	4678931	339416	189.3	8.2

The investigation was carried out using a track-mounted drill supplied and operated by a specialist drilling contractor, Direct Environmental Drilling. In the boreholes, samples of the overburden were obtained at generally 0.75 metre intervals of depth using 50 millimetre outside diameter split spoon sampling equipment in accordance with the standard penetration test (SPT) procedures of ASTM D1586. The recorded SPT N values are noted on the Record of Borehole sheets. According to ASTM D1586, the SPT resistance, or N value, is defined as the number of blows required by a 63.5 kilogram hammer dropped from a height of 760 millimetres to drive a split-spoon sampler a distance of 300 millimetres, after an initial 150 millimetres of penetration. In cases where it was not possible to achieve a full 450 millimetres of drive, a penetration resistance representing the number of blows to drive the sampler is recorded on the Record of Borehole. The penetration resistance obtained in the first 150 millimetres is normally neglected unless the sampler could only be driven 150 millimetres or less, in which case SPT testing was terminated after 100 blows. The results of the SPT testing as presented on the Record of Borehole sheets and in Section 4 are unmodified (not standardized for hammer efficiency, borehole diameter, rod length, etc.).

The samplers used in the investigation limit the maximum particle size that can be sampled and tested to about 40 millimetres. Therefore, particles that may exist within the soils that are larger than this dimension have not been sampled or represented in the grain size distributions. Larger particle sizes including cobbles and boulders are known to be present in the fill materials and native soils as discussed in the text of this report.

The boreholes were terminated at 8.2 m below the existing ground surface. Groundwater conditions in the boreholes were observed throughout the drilling operations. The boreholes were backfilled in general accordance with current MTO procedures and Ontario Regulation 903 (as amended).

The field work was monitored on a full-time basis by experienced WSP staff members who also located the boreholes in the field, monitored the drilling, sampling, and in situ testing operations, and logged the boreholes. The samples were identified in the field, placed in labelled containers, and transported to our London laboratory for further examination and testing. Index and classification tests, consisting of water content determinations, grain size distribution analyses, and Atterberg limits tests were carried out on selected samples. The results of the geotechnical testing are shown on the Record of Borehole sheets and in Appendix B.

Additionally, one (1) sample from each of the boreholes was submitted to Bureau Veritas in London, Ontario or ALS Canada Ltd. in Waterloo, Ontario for analytical testing. The samples were analysed for conductivity, resistivity, redox potential, pH, sulfides, sulfate, and chloride ion content. The analytical test results are provided in Appendix C.

The locations of the boreholes are shown on the Record of Borehole sheets and on Drawings 1 through 4, attached.

4 SUBSURFACE CONDITIONS

4.1 Site Stratigraphy

The detailed subsurface soil and groundwater conditions encountered in the boreholes, together with the results of the in situ testing and the laboratory testing carried out on selected samples, are provided on the attached Record of Borehole sheets following the text of this report in Appendix A. The stratigraphic boundaries shown on the Record of Borehole sheets are inferred from non-continuous samples and observations of drilling resistance and, therefore, may represent transitions between soil and rock types rather than exact planes of geological change. Further, the subsurface conditions will vary between and beyond the borehole locations.

The boreholes drilled at Sites 3181 and 3180 generally encountered surficial fill materials over native silty clay to clayey silt. The borehole drilled at Site 3195 generally encountered surficial topsoil over fill over deposits of clayey silt, silt, silty sand, and sand and gravel. Detailed descriptions of the subsurface conditions encountered in the boreholes are provided on the Record of Borehole sheets and are summarized in the following sections.

4.1.1 Fill Materials

Surficial fill was encountered in boreholes BH-102 and BH-103. The fill in borehole BH-102 was described as sandy organic clayey silt while the fill in borehole BH-103 was described as sandy clayey silt. The fill in borehole BH-101 consisted of topsoil over varying layers of non-cohesive sands and silts over a buried topsoil layer. The fill materials are summarized in the following table.

Table 3: Summary of Topsoil, Pavement, and Fill Thicknesses

Sign No. (MTO Structure No.)	Site No.	Borehole No.	Maximum Depth to Native Soils [Elevation] (m)	Material Thickness and Description (mm)	
401PM3195VWS	3195	BH-101	3.56 [280.94]	150 610 610 1,220 965	Topsoil Fill – Gravelly sand Fill – Sandy silt Fill – Silty sand Topsoil
401PM3181VWS	3181	BH-102	0.7 [185.3]	700	Fill – organic clayey silt
401PM3180VWS	3180	BH-103	0.7 [188.6]	700	Fill – sandy clayey silt

Samples of the fills from borehole BH-101 had moisture contents ranging from 4% to 26%. Measured N values in the fill in borehole BH-101 ranged from 6 blows to 18 blows per 0.3 m penetration indicating loose to compact conditions. Samples of the fill from boreholes BH-102 and BH-103 had moisture contents of 21% and 16%, respectively and measured N values from SPTs carried out in the fill were 9 blows per 0.3 m penetration indicating a stiff consistency.

The results of laboratory testing carried out on a sample of the silty sand fill from borehole BH-101 are summarized below, included on the borehole log sheets, and attached in Appendix B.

Table 4: Summary of Laboratory Test Results on Fill Materials

Borehole/ Sample No.	Sample Depth [Elevation] (m)	Grain Size Distribution (%)[1]				Atterberg Limits		
		GR	SA	SI	CL	Liquid Limit (WL)	Plastic Limit (PL)	Plasticity Index
BH-101/SS4A	2.4 [282.1]	1	45	38	16	25	13	12

1. GR: Gravel, SA: Sand, SI: Silt, CL: Clay sized particles

4.1.2 Silty Sand

A 100 mm thick layer of silty sand was encountered in borehole BH-101 beneath the buried topsoil. A single N value of 7 blows per 0.3 m penetration was obtained in the silty sand layer, indicating loose conditions.

4.1.3 Silty Clay to Clayey Silt

An extensive cohesive stratum of silty clay to clayey silt was encountered beneath the silty sand layer in borehole BH-101 and beneath the fill in boreholes BH-102 and BH-103.

In borehole BH-101 a 1.78 m thick layer of clayey silt was encountered beneath the silty sand layer. Measured N values in the clayey silt in borehole BH-101 were 12 blows and 14 blows per 0.3 m penetration indicating stiff consistency. The corresponding samples had moisture contents of 22% and 24%, respectively.

In the Essex County region this stratum is generally divided into three general zones, the 'weathered' zone, the 'crust', and the 'grey' zone. The weathered zone was observed in boreholes BH-102 and BH-103 beneath the fill materials to a depth of 0.7 m. Soils in the weathered zone are subjected to freeze-thaw cycles, and changes in moisture content caused by seasonal weather variations. This zone is characterized by fissures, with a mottled brown and grey appearance. Measured N values from SPTs carried out in the weathered silty clay to clayey silt ranged from 5 blows to 9 blows per 0.3 m of penetration, indicating a firm to stiff consistency. Samples of the weathered/mottled silty clay to clayey silt had moisture contents typically ranging from 19% to 29%.

The crust was encountered underlying the weathered zone in boreholes BH-102 and BH-103. The crust was characterized by a brown colouration and oxidized fissures. This layer extended to a depth of 3.7 m. Measured N values in the crust ranged from 20 blows to 39 blows per 0.3 m of penetration, indicating a very stiff to hard consistency. The moisture contents of samples of the crust/brown silty clay to clayey silt typically ranged from 12% to 17%.

The grey zone is generally characterized by higher moisture contents and little to no apparent soil structure or fissures. The grey zone was encountered in each of the boreholes. Each of the boreholes were terminated in the grey clayey silt. Measured N values in the grey clayey silt ranged from 8 blows to 18 blows per 0.3 m of penetration, indicating a stiff to very stiff consistency. The moisture contents of samples of the grey clayey silt ranged from 13% to 21%.

The results of laboratory testing carried out on samples of the silty clay to clayey silt are summarized below, included on the borehole log sheets, and attached in Appendix B.

Table 5: Summary of Laboratory Test Results on Silty Clay to Clayey Silt

Borehole/ Sample No.	Sample Depth [Elevation] (m)	Grain Size Distribution (%)[1]				Atterberg Limits		
		GR	SA	SI	CL	Liquid Limit (WL)	Plastic Limit (PL)	Plasticity Index
BH-101/SS6	4.1 [280.4]	0	5	50	45	34	20	14
BH-102/SS4	2.6 [183.4]	0	16	28	56	36	17	19
BH-102/SS5	3.4 [182.6]	0	16	37	47	37	16	21
BH-102/SS6	4.1 [181.9]	4	15	37	44	32	15	17
BH-103/SS2	1.1 [188.2]	1	22	35	42	40	17	23
BH-103/SS4	2.6 [186.7]	1	25	39	35	28	14	14
BH-103/SS7	4.9 [184.4]	3	27	36	34	26	13	13

1. GR: Gravel, SA: Sand, SI: Silt, CL: Clay sized particles

4.1.4 Silt

A 1.1 m thick layer of silt was encountered in borehole BH-101 beneath the clayey silt. A single N value of 14 blows per 0.3 m penetration was obtained in the silty sand layer, indicating compact conditions, and the corresponding sample had a moisture content of 18%.

The results of laboratory testing carried out on a sample of the silt are summarized below, included on the borehole log sheets, and attached in Appendix B.

Table 6: Summary of Laboratory Test Results on Silt

Borehole/ Sample No.	Sample Depth [Elevation] (m)	Grain Size Distribution (%)[1]				Atterberg Limits		
		GR	SA	SI	CL	Liquid Limit (WL)	Plastic Limit (PL)	Plasticity Index
BH-101/SS8B	5.5 [279.0]	0	4	87	9	34	20	14

1. GR: Gravel, SA: Sand, SI: Silt, CL: Clay sized particles

4.1.5 Sand and Gravel

A layer of sand and gravel was encountered in borehole BH-101 beneath the silt at a depth of 6.3 m, and extended to the termination depth of the borehole. Measured N values in the sand and gravel were 24 blows and 15 blows per 0.3 m of penetration, indicating a compact condition. Samples of the sand and gravel had moisture contents of 9% and 11%.

The results of laboratory testing carried out on a sample of the sand and gravel are summarized below, included on the borehole log sheets, and attached in Appendix B.

Table 7: Summary of Laboratory Test Results on Silty Clay to Clayey Silt

Borehole/ Sample No.	Sample Depth [Elevation] (m)	Grain Size Distribution (%)[1]				Atterberg Limits		
		GR	SA	SI	CL	Liquid Limit (WL)	Plastic Limit (PL)	Plasticity Index
BH-101/SS10	7.9 [276.6]	36	54	10		-	-	-

1. GR: Gravel, SA: Sand, SI: Silt, CL: Clay sized particles

4.2 Groundwater Conditions

Groundwater conditions were observed during and on completion of drilling and sampling of the current boreholes. Groundwater was observed in borehole BH-101 following drilling at a depth of 5.0 m. Boreholes BH-102 and BH-103 were dry during and immediately following drilling. Due to the low permeability of the clayey soil at the site, however, insufficient time had passed to allow stabilization of groundwater levels in the open boreholes, as such these conditions are not considered to be representative of the long-term, stabilized groundwater conditions.

Typically, in the Essex County region, the grey colour of the clayey soils is indicative of a permanent saturated condition, and therefore, fluctuation of the long-term groundwater should be anticipated near this depth range. However, during and after local precipitation events, groundwater that is ‘perched’ above the long-term levels may accumulate in the fissured weathered clays or any fills above the relatively more impervious grey clayey silt. In addition, significant amounts of groundwater may be present within the layers/pockets of granular soils known to occur randomly within the overburden soils and within any fill materials around existing utilities that may be present. The depth of the brown to grey transition encountered in each borehole is summarized in the following table.

Table 8: Depths of Transition from Brown to Grey Clayey Silt

Sign No. (MTO Structure No.)	Site No.	Borehole No.	Depth of Colour Change from Brown to Grey [Elevation] (m)
401PM3181VWS	3181	102	3.7 [182.3]
401PM3180VWS	3180	103	3.7 [185.6]

Perched groundwater may rise to the ground surface following precipitation and snowmelt. In the absence of an active, engineered drainage system, the design should assume possible temporary groundwater levels rising to the ground surface.

4.3 Analytical Test Results

As indicated above, one (1) sample was selected from each the boreholes and submitted to Bureau Veritas in London, Ontario for analytical testing. The test results are included in Appendix C and summarized in the following table.

Table 9: Results of Analytical Test Results

Borehole/ Sample No.	pH	Redox Potential (mV)	Sulfides (mg/kg)	Chloride (ug/g)	Sulfate (ug/g)	Conductivity	Resistivity ohm.cm
BH-101*	7.53	256	<0.22	8.7	32	796 µS/cm	1260
BH-102/SS5	7.79	170	1.13	110	110	419 umho/cm	2400
BH-103/SS3	7.65	150	<0.50	740	99	1490 umho/cm	670

* composite sample

5 CLOSURE

This investigation was carried out using equipment supplied and operated by Direct Environmental Drilling, an Ontario Ministry of Environment licensed well contractor. The field operations were supervised by Mr. Harshkumar Kevadia, P.Eng.

The laboratory testing was carried out at WSP's London laboratory under the direction of Mr. Dan Babcock, P.Eng. The laboratory is an accredited participant in the MTO Soil and Aggregate Proficiency Program and is certified by the Canadian Council of Independent Laboratories (CCIL) for testing Types C and D aggregates.

This report was prepared by Ms. Nicole A. Gould, P.Eng. and reviewed by Mr. Nazmur Rhaman, M.A.Sc., PE, P.Eng., MTO Principal Foundations Contact and Quality Control Auditor for this assignment.

WSP Canada Inc.

Nicole A. Gould, P.Eng.
Senior Geotechnical Engineer

Nazmur Rhaman, M.A.Sc., PE, P.Eng.
Senior Principal Geotechnical Engineer
MTO Foundation Designated Contact

NG/NR/ms

PART B

FOUNDATION DESIGN REPORT
POLE-MOUNTED VARIABLE MESSAGE SIGN SUPPORTS
HIGHWAY 401
ESSEX AND OXFORD COUNTIES
GWP 3008-22-00

6 ENGINEERING RECOMMENDATIONS

6.1 General

This section of the report provides recommendations on the foundation aspects for design of the proposed variable message sign supports. The recommendations are based on our interpretation of the information obtained from the boreholes advanced near the proposed sign locations. This Foundation Design Report, with its interpretation and recommendations, is intended for use of the design engineers. Where comments are made on construction, they are provided only to highlight those aspects which could affect the design of the project. Contractors must make their own interpretation of the factual information provided as it may affect equipment selection, proposed construction methods, and scheduling.

The following soil properties and long-term groundwater levels, based on the results of the borehole investigation, may be used for design of the sign support foundations.

Table 10: Summary of Soil Properties and Groundwater Levels

Site No.	Borehole Reference	Soil	Depth [Elevation] (m)	Undrained Shear Strength (kPa)	Angle of Internal Friction (deg)	Unit Weight (kN/m^3)	Long-term Groundwater Level [Elevation] (m)
3195	BH-101	Granular FILL, loose to compact	0.2 to 2.6 [284.3 to 281.5]	-	28 to 30	21.0	5.0 [279.5]
		Silty topsoil	2.6 to 3.6 [281.5 to 280.9]	25-30	20 to 25	15.0	
		Clayey silt, stiff	3.6 to 5.4 [280.9 to 279.1]	75	28 to 30	20.5	
		Silt, compact	5.4 to 6.2 [279.1 to 278.3]	-	30	21.0	
		Sand and gravel, compact	6.2 to 8.2 [278.3 to 276.3]	-	32	22.0	
3181	BH-102	Sandy Organic clayey silt FILL	0 to 0.7 [186.0 to 185.3]	-	20 to 25	15.0	3.7* [182.3]
		Clayey silt, firm	0.7 to 2.2 [185.3 to 183.8]	35	27 to 28	20.5	
		Silty Clay, very stiff	2.2 to 3.7 [183.8 to 182.3]	150	28 to 29	20.5	
		Clayey silt, stiff	3.7 to 8.2 [182.3 to 177.8]	65	28 to 29	20.5	
3180	BH-103	Clayey silt FILL, stiff	0 to 0.7 [189.3 to 188.6]	50	27 to 28	20.5	3.7* [185.6]
		Silty Clay, firm	0.7 to 2.2 [188.6 to 187.1]	45	27 to 28	20.5	
		Clayey silt, very stiff	2.2 to 3.1 [187.1 to 185.0]	150	28 to 30	20.5	
		Clayey silt, stiff	3.1 to 8.2 [185.0 to 181.1]	75	28 to 30	20.5	

* Depth of transition from brown to grey clayey silt

6.2 Variable Message Sign Foundations

It is understood that each of the new signs will be a ground-mounted, Pole-Mounted Variable Message Sign (VMS), designed in accordance with the MTO's *Sign Support Manual* (2019), which includes a "standard" drilled shaft (caisson) foundation provided that minimum geotechnical parameters are available. The following minimum geotechnical design parameters are provided in Section 8.5.4 of the *Sign Support Manual*:

- Case 1 Sand: Non-cohesive soil with an effective friction angle of 28 degrees surrounding the upper two-thirds of the caisson below the frost depth, and an effective friction angle of 30 degrees surrounding the lower one-third of the caisson below the design frost depth.
- Case 2 Soft Clay: Cohesive soil with an undrained shear strength of 25 kilopascals (kPa) surrounding the upper two thirds of the caisson below the frost depth and an undrained shear strength of 50 kPa surrounding the lower third of the caisson below the frost depth.

Where soils meet the above minimum parameters, the "standard" foundation design consisting of a 1.2 m diameter caisson with a length of 6.0 m below the frost depth can be used.

6.2.1 Standard Foundation Design

The soil conditions at each sign site meet or exceed the minimum parameters specified in Case 2. Therefore, the standard design sign foundation detailed in Standard Drawing SS118-3 of the *Sign Support Manual* is applicable provided the board sizes and eccentricities are within the specification for pole-mounted variable message signs per *Sign Support Manual* Section 8.

It is noted that if the signs will be at risk of chloride exposure from the environment consideration should be given to the use of Class C-1 concrete which specifies a higher concrete compressive strength than the standard foundation design.

The frost depth to be used in the sign support foundation is 1.2 m, based on the frost penetration isopleths for Southern Ontario per Ontario Provincial Standard Drawing (OPSD) 3090.101 (Foundation Frost Penetration Depths).

6.3 Construction Considerations

VMS foundations should be constructed in accordance with the OPSS.PROV 915 (Construction Specification for Sign Support Structures) and OPSS.PROV 903 (Construction Specification for Deep Foundations).

While not explicitly encountered in the boreholes near the proposed VMS locations, cobbles and boulders should be expected in the soils in this project area and the contractor should be prepared to address their presence, if required.

During placement of concrete a positive head of concrete must be maintained at all times to prevent the breaking of the concrete continuity by the ingress of soil or water. The concrete should be placed by tremie methods to prevent segregation, allow air to escape, and reduce the potential for entrapped air in the concrete.

At Site 3195 groundwater inflow into the excavation may be significant, especially below the groundwater level estimated to be 5.0 m below grade. Significant 'perched' groundwater may also be present within the surficial fills. This would especially be true during and after local precipitation events. As such, a temporary liner will be required during advancement of the caisson at Site 3195 to maintain the integrity of the caisson walls and to reduce groundwater ingress into the excavation during construction. The liner should extend to the full depth of

foundation. During placement of concrete and removal of the liner a positive head of concrete must be maintained at all times to prevent the breaking of the concrete continuity by the ingress of the soil or water. The concrete should be placed by tremie methods to prevent segregation, allow air to escape, and reduce the potential for entrapped air in the concrete.

At Sites 3181 and 3180 groundwater inflow into excavations in the clayey soils is expected to be low; however, significant 'perched' groundwater may be present within the surficial fills. This would especially be true during and after local precipitation events. The Contractor should be prepared to address groundwater inflow with the use of pumps, temporary liners, and/or other appropriate means at the Contractor's discretion.

Care should be taken to prevent disturbance or softening of the supporting soils at the base of the excavation. A proper inspection should be carried out during construction of the caissons to check that the conditions encountered are consistent with the information obtained from the boreholes, to confirm the base elevation of the caissons, and to confirm cleanliness after inspection. Loosened material present at the base of the caissons must be removed.

The final grade surrounding the VMS support should be shaped to promote drainage of surface water away from the sign foundation.

A notice to contractor is provided in Appendix D.

6.4 Corrosion Potential and Concrete Exposure Class

Testing of corrosion potential parameters was carried out on selected soil samples from each borehole. The results of the testing have been provided in Section 4.3, above.

The test results indicate that concrete in contact with the tested soil samples would have a negligible degree of exposure to sulphate attack based on CSA-A23; therefore, sulphate resistant concrete is not considered necessary for this site.

ANSI/AWWA C105/A21.5-05, Appendix A, Table A.1 is often used to assess the risk of corrosion of buried metallic elements, including concrete reinforcing steel. The sample from borehole BH-102 is not considered corrosive to buried metallic elements in accordance with ANSI/AWWA C105/A21.5-05, Appendix A, Table A.1. However, the samples from boreholes BH-101 and BH-103 were found to have relatively low resistivity values and therefore may be corrosive to buried metallic elements in accordance with ANSI/AWWA C105/A21.5-05, Appendix A, Table A.1.

In general, CSA-A23.1 exposure class F-1 concrete should be used for the sign support foundations; however, class C-1 should be considered where there is a risk of environmental chloride exposure or where corrosive soil conditions have been identified as discussed above. In accordance with the MTO Structural Design Manual, Premium Reinforcing shall be used in locations vulnerable to salt induced corrosion. While sign supports are not specifically referenced, the recommendations for lighting poles provided in Table 12.2.1 of the Design Manual, as amended by MTO memo SCB-SO-2024-02, are considered applicable to sign supports. These recommendations include the use of stainless steel reinforcement or Glass Fibre Reinforced Polymer (GFRP). Considering the long-term potential for reduction of cover, these recommendations should also be applied to the sites where soil-related corrosion is likely, Sites 3195 and 3180 as indicated above. It is noted that the standard foundation design assumes the use of steel reinforcement and the use of GFRP would necessitate a non-standard foundation design.

These test results and comments are provided as high-level guidance for the design team. If more in-depth recommendations are required, the above results and conclusions/inferences should be reviewed by a corrosion specialist to assess the risk to buried metallic elements including concrete reinforcing steel.

7 CLOSURE

This report was prepared by Ms. Nicole A. Gould, P.Eng. and reviewed by Mr. Nazmur Rhaman, M.A.Sc., PE, P.Eng., MTO Principal Foundations Contact and Quality Control Auditor for this assignment.

WSP Canada Inc.

Nicole A. Gould, P.Eng.
Senior Geotechnical Engineer

Nazmur Rhaman, M.A.Sc., PE, P.Eng.
Senior Principal Geotechnical Engineer
MTO Foundation Designated Contact

NG/NR/ms

https://wsponlinecan.sharepoint.com/sites/ca-ca0051716.2286/shared documents/05. technical/.07 (700) foundations/hwy 401/ca0051716.2286-r02- hwy401 geotech fidr final pvms

Attachments

METRIC

PLATE No

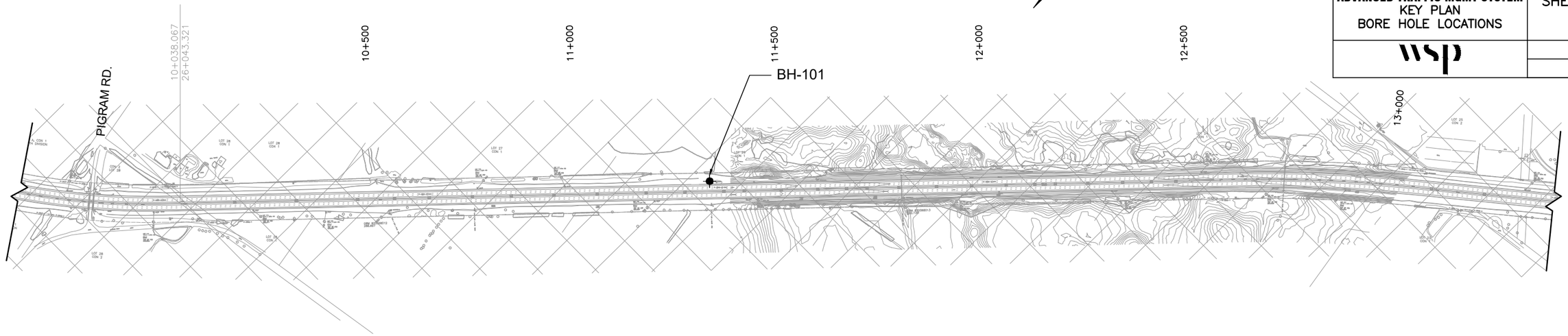
CONT No

GWP No 3008-22-00

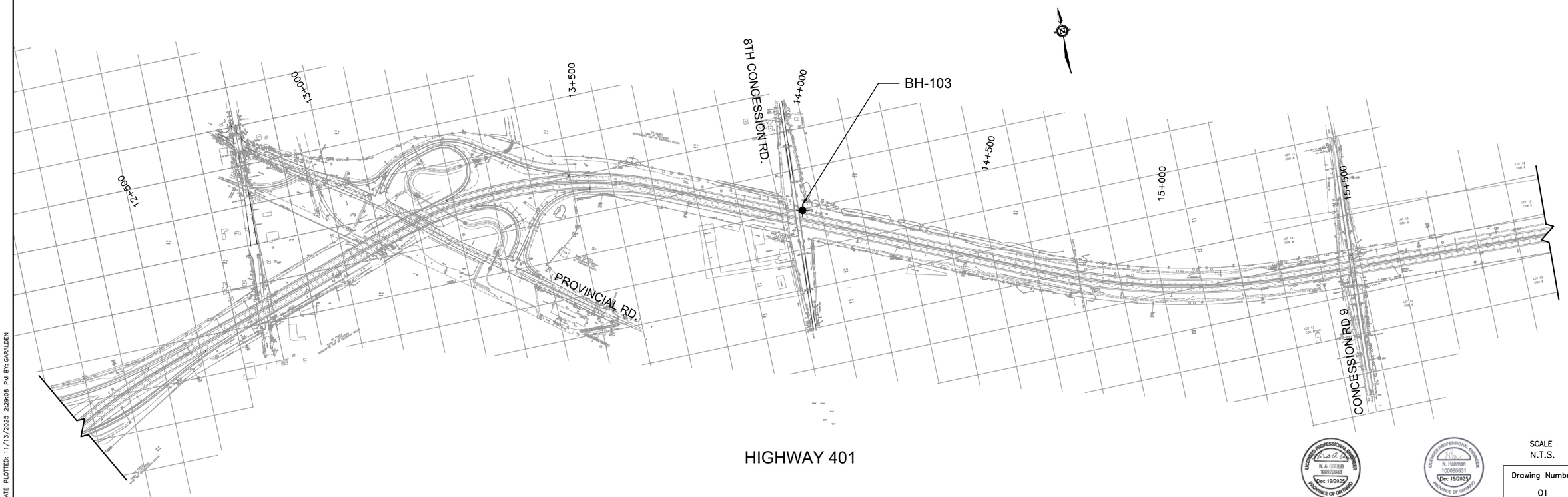
ADVANCED TRAFFIC MGMT SYSTEM
KEY PLAN
BORE HOLE LOCATIONS

wsp

SHEET



HIGHWAY 401



HIGHWAY 401

N.A. GOULD
100122043
Dec 19/2025
PROVINCE OF ONTARIO

N. Rahman
100086831
Dec 19/2025
PROVINCE OF ONTARIO

SCALE
N.T.S.

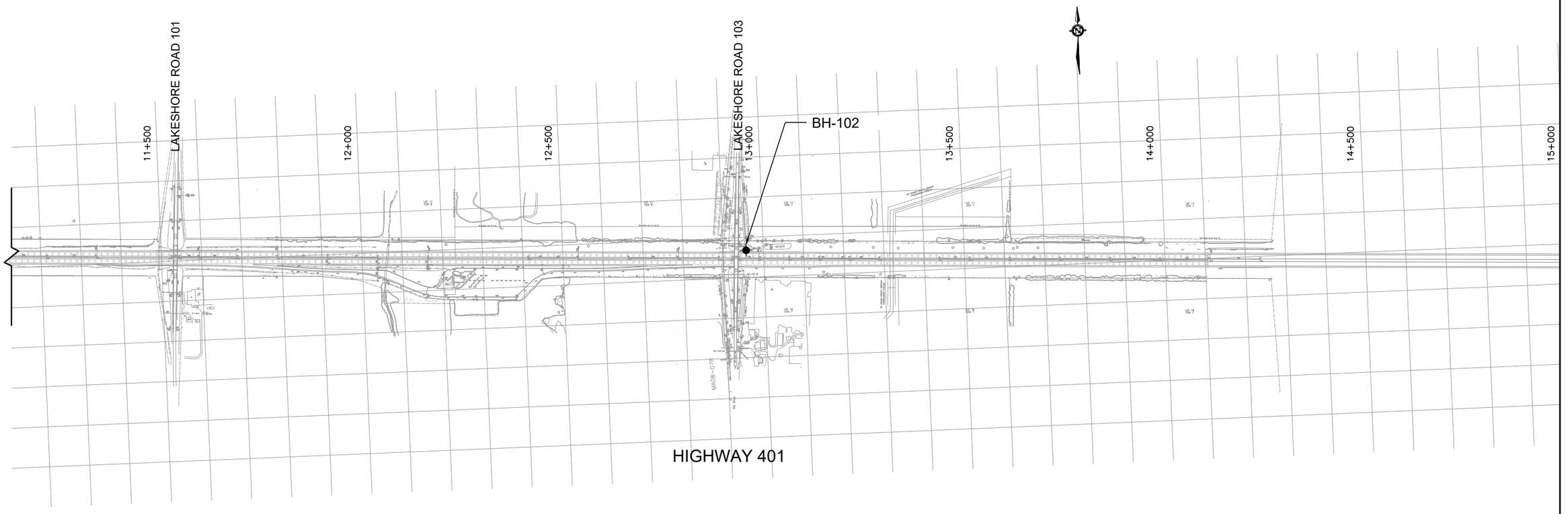
Drawing Number
01

MINISTRY OF TRANSPORTATION, ONTARIO RR-D-707 85-05

CAD FILE LOCATION AND NAME: S:\data\2025\CA00517716.2286.250 PWMS WR\CA00517716.2286 Cont-2-BH_K01.dwg
MODIFIED: 11/13/2025 2:16:05 PM BY: GARALDEN
DATE PLOTTED: 11/13/2025 2:29:08 PM BY: GARALDEN

METRIC

PLATE No CONT No GWP No 3008-22-00	
ADVANCED TRAFFIC MGMT SYSTEM KEY PLAN BORE HOLE LOCATIONS	SHEET
wsp	



MINISTRY OF TRANSPORTATION, ONTARIO RR-D-707 85-05

CAD FILE LOCATION AND NAME: S:\data\2025\CA00051716.2286.250 PM\MS WR\ACA00051716.2286 Cont-2-BH_K01.dwg
MODIFIED: 11/13/2025 2:16:05 PM BY: GARALDEN
DATE PLOTTED: 11/13/2025 2:34:18 PM BY: GARALDEN

LICENSED PROFESSIONAL ENGINEER
N.A. GOULD
100122043
Dec 19/2025
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
N. Rahman
100086831
Dec 19/2025
PROVINCE OF ONTARIO

SCALE
N.T.S.

Drawing Number
02

APPENDIX A

Record of Boreholes

ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES AND TEST PITS
MINISTRY OF TRANSPORTATION, ONTARIO

PARTICLE SIZES OF CONSTITUENTS

Soil Constituent	Particle Size Description	Millimetres	Inches (US Std. Sieve Size)
BOULDERS	Not Applicable	>200	>8
COBBLES	Not Applicable	75 to 200	3 to 8
GRAVEL	Coarse Fine	19 to 75 4.75 to 19	0.75 to 3 (4) to 0.75
SAND	Coarse Medium Fine	2.00 to 4.75 0.425 to 2.00 0.075 to 0.425	(10) to (4) (40) to (10) (200) to (40)
FINES	Classified by plasticity	<0.075	< (200)

MODIFIERS FOR SECONDARY COMPONENTS[1,2]

Percentage by Mass	Modifier
> 35	Use 'and' to combine primary and secondary component (*i.e.,* SAND and gravel)
> 20 to 35	Primary soil name prefixed with "gravelly, sandy" as applicable
> 10 to 20	some (*i.e.,* some sand)
≤ 10	trace (*i.e.,* trace fines)

1. Only applicable to components not described by Primary Group Name.
2. Classification of Primary Group Name based on Unified Soil Classification System (ASTM D2487) for coarse-grained soils; fine-grained soils described per current MTO Soil Classification System.

PENETRATION RESISTANCE

Standard Penetration Resistance (SPT), N:
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) split-spoon sampler for a distance of 300 mm (12 in.). Values reported are as recorded in the field and are uncorrected.

Cone Penetration Test (CPT)
An electronic cone penetrometer with a 60° conical tip and a project end area of 10 cm^2 pushed through ground at a penetration rate of 2 cm/s. Measurements of tip resistance (q_t), porewater pressure (u) and sleeve friction (f_s) are recorded electronically at 25 mm penetration intervals.

Dynamic Cone Penetration Resistance (DCPT); N_d:
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in.).

PH: Sampler advanced by hydraulic pressure
PM: Sampler advanced by manual pressure
WH: Sampler advanced by static weight of hammer
WR: Sampler advanced by weight of sampler and rod

SAMPLES

AS	Auger sample
BS	Block sample
CS	Chunk sample
DD	Diamond Drilling
DO or DP	Seamless open ended, driven or pushed tube sampler – note size
DS	Denison type sample
GS	Grab Sample
MC	Modified California Samples
MS	Modified Shelby (for frozen soil)
RC / SC	Rock core / Soil core
SS	Split spoon sampler – note size
ST	Slotted tube
TO	Thin-walled, open – note size (Shelby tube)
TP	Thin-walled, piston – note size (Shelby tube)
WS	Wash sample
OD / ID	Outer Diameter / Inner Diameter
HSA / SSA	Hollow-Stem Augers / Solid-Stem Augers

SOIL TESTS

w	water content
PL , w_p	plastic limit
LL , w_L	liquid limit
C	consolidation (oedometer) test
CHEM	chemical analysis (refer to text)
CID	consolidated isotropically drained triaxial test[1]
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement[1]
D_R	relative density (specific gravity, Gs)
DS	direct shear test
GS	specific gravity
M	sieve analysis for particle size
MH	combined sieve and hydrometer (H) analysis
MPC	Modified Proctor compaction test
SPC	Standard Proctor compaction test
OC	organic content test
SO_4	concentration of water-soluble sulphates
UC	unconfined compression test
UU	unconsolidated undrained triaxial test
V (FV)	field vane (LV-laboratory vane test)
γ	unit weight

1. Tests anisotropically consolidated prior to shear are shown as CAD, CAU.

COARSE-GRAINED SOILS

Compactness[1]

Term	SPT 'N' (blows/0.3m)[2]
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	> 50

1. Definition of compactness terms are based on SPT 'N' ranges as provided in Terzaghi, Peck and Mesri (1996). Many factors affect the recorded SPT 'N' value, including hammer efficiency (which may be greater than 60% in automatic trip hammers), overburden pressure, groundwater conditions, and grainsize. As such, the recorded SPT 'N' value(s) should be considered only an approximate guide to the soil compactness. These factors need to be considered when evaluating the results, and the stated compactness terms should not be relied upon for design or construction.
2. SPT 'N' in accordance with ASTM D1586, uncorrected for the effects of overburden pressure.

FINE-GRAINED SOILS

Consistency

Term	Undrained Shear Strength (kPa)	SPT 'N'[1,2] (blows/0.3m)
Very Soft	< 12	0 to 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	> 200	> 30

1. SPT 'N' in accordance with ASTM D1586, uncorrected for overburden pressure effects; approximate only.
2. SPT 'N' values should be considered ONLY an approximate guide to consistency; for sensitive clays (e.g., Champlain Sea clays), the N-value approximation for consistency terms does NOT apply. Rely on direct measurement of undrained shear strength or other manual observations.

Field Moisture Condition

Term	Description
Dry	Soil flows freely through fingers.
Moist	Soils are darker than in the dry condition and may feel cool.
Wet	As moist, but with free water forming on hands when handled.

Unless otherwise stated, the symbols employed in the report are as follows:

I. GENERAL

π	3.1416
ln x	natural logarithm of x
$\log_{10}$	x or log x, logarithm of x to base 10
g	acceleration due to gravity
t	time
FoS	factor of safety

II. STRESS AND STRAIN

γ	shear strain
Δ	change in, e.g. in stress: $\Delta\sigma$
ε	linear strain
ε_v	volumetric strain
η	coefficient of viscosity
υ	Poisson's ratio
σ	total stress
σ'	effective stress ($\sigma' = \sigma - u$)
σ'_{vo}	initial effective overburden stress
$\sigma_1, \sigma_2, \sigma_3$	principal stress (major, intermediate, minor)
σ_{oct}	mean stress or octahedral stress $= (\sigma_1 + \sigma_2 + \sigma_3)/3$
τ	shear stress
u	porewater pressure
E	modulus of deformation
G	shear modulus of deformation
K	bulk modulus of compressibility

III. SOIL PROPERTIES

(a) Index Properties

$\rho(\gamma)$	bulk density (bulk unit weight)*
$\rho_d(\gamma_d)$	dry density (dry unit weight)
$\rho_w(\gamma_w)$	density (unit weight) of water
$\rho_s(\gamma_s)$	density (unit weight) of solid particles
γ'	unit weight of submerged soil ($\gamma' = \gamma - \gamma_w$)
D_R	relative density (specific gravity) of solid particles ($D_R = \rho_s / \rho_w$) (formerly G_s)
e	void ratio
n	porosity
S	degree of saturation

* Density symbol is ρ. Unit weight symbol is γ. where $\gamma = \rho \cdot g$ (i.e., mass density multiplied by acceleration due to gravity)

(a) Index Properties (continued)

w	water content
w_L or LL	liquid limit
w_P or PL	plastic limit
I_P or PI	plasticity index = $(w_l - w_p)$
NP	non-plastic
w_s	shrinkage limit
I_L	liquidity index = $(w - w_p) / I_p$
I_C	consistency index = $(w_l - w) / I_p$
e_{max}	void ratio in loosest state
e_{min}	void ratio in densest state
I_D	density index = $(e_{max} - e) / (e_{max} - e_{min})$ (formerly relative density)

(b) Hydraulic Properties

h	hydraulic head or potential
q	rate of flow
v	velocity of flow
i	hydraulic gradient
k	hydraulic conductivity (coefficient of permeability)
j	seepage force per unit volume

(c) Consolidation (one-dimensional)

C_c	compression index (normally consolidated range)
C_r	recompression index (over-consolidated range)
C_s	swelling index
$C_{\alpha(e)}$	secondary compression index
C_α	rate of secondary compression
$C_{\alpha(\varepsilon)}$	modified secondary compression index
m_v	coefficient of volume change
c_v	coefficient of consolidation (vertical direction)
c_h	coefficient of consolidation (horizontal direction)
T_v	time factor (vertical direction)
U	degree of consolidation
σ'_p	pre-consolidation stress
OCR	over-consolidation ratio = σ'_p / σ'_{vo}

(d) Shear Strength

τ_p, τ_r	peak and residual shear strength
c′	effective cohesion
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = tan δ
c_u, s_u	undrained shear strength ($\phi = 0$ analysis)
p	mean total stress $(\sigma_1 + \sigma_3)/2$
p′	mean effective stress $(\sigma'_1 + \sigma'_3)/2$
q or q'	$(\sigma_1 - \sigma_3)/2$ or $(\sigma'_1 - \sigma'_3)/2$
q_u	compressive strength $(\sigma_1 - \sigma_3)$
S_t	sensitivity

Notes: 1 $\tau = c' + \sigma' \tan \phi'$

2 shear strength = (compressive strength)/2

LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY

WEATHERING CLASSIFICATION

Fresh (W1): no visible sign of rock material weathering.

Slightly Weathered (W2): discoloration indicates weathering of rock mass material on discontinuity surfaces. **Less than 5%** of rock mass is altered or weathered.

Moderately Weathered (W3): less than 50% of the rock mass is decomposed and/or disintegrated to a soil. Fresh or discoloured rock is present either as a discontinuous framework or as corestones.

Highly Weathered (W4): more than 50% of the rock mass is decomposed and/or disintegrated to a soil. Fresh or discoloured rock is present either as a discontinuous framework or as corestones.

Completely Weathered (W5): 100% of the rock mass is decomposed and/or disintegrated to a soil. The original mass structure is still largely intact.

Residual Soil (W6): all rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

BEDDING THICKNESS

Description	Bedding Plane Spacing
Very thickly bedded	Greater than 2 m
Thickly bedded	0.6 m to 2 m
Medium bedded	0.2 m to 0.6 m
Thinly bedded	60 mm to 0.2 m
Very thinly bedded	20 mm to 60 mm
Laminated	6 mm to 20 mm
Thinly laminated	Less than 6 mm

JOINT OR FOLIATION SPACING

Description	Spacing
Very wide	Greater than 3 m
Wide	1 m to 3 m
Moderately close	0.3 m to 1 m
Close	50 mm to 300 mm
Very close	Less than 50 mm

GRAIN SIZE

Term	Size*
Very Coarse Grained	Greater than 60 mm
Coarse Grained	2 mm to 60 mm
Medium Grained	60 microns to 2 mm
Fine Grained	2 microns to 60 microns
Very Fine Grained	Less than 2 microns

Note: * Grains greater than 60 microns diameter are visible to the naked eye

CORE CONDITION

Total Core Recovery (TCR)

The percentage of solid drill core recovered regardless of quality or length, measured relative to the length of the total core run.

Solid Core Recovery (SCR)

The percentage of solid drill core, regardless of length, recovered at full diameter, measured relative to the length of the total core run.

Rock Quality Designation (RQD)

The percentage of solid drill core, greater than 100 mm length, recovered at full diameter, as measured along the centerline axis of the core, relative to the length of the total core run. RQD varies from 0% for completely broken core to 100% for core in solid segments.

DISCONTINUITY DATA

Fracture Index

A count of the number of discontinuities (physical separations) in the rock core, including both naturally occurring fractures and mechanically induced breaks caused by drilling.

Dip with Respect to Core Axis

The angle of the discontinuity relative to the axis (length) of the core. In a vertical borehole, a discontinuity with a 90° angle is horizontal.

Description and Notes

An abbreviation description of the discontinuities, whether naturally occurring separations such as fractures, bedding planes and foliation planes or mechanically induced features caused by drilling such as ground or shattered core and mechanically separated bedding or foliation surfaces. Additional information concerning the nature of fracture surfaces and infillings are also noted.

Abbreviations

AXJ Axial Joint
BD Bedding
BC Broken Core
CC Continuous Core
CL Closed
CO Contact
CU Curved
CT Coated
FLT Fault
FOL Foliation
FR Fracture
GO Gouge
IN Infilled
IR Irregular
JN Joint
KV Karstic Void
K Slickensided
LC Lost Core
MB Mechanical Break
PL Planar
PO Polished
RO Rough
SA Slightly Altered
SH Shear
SM Smooth
SR Slightly Rough
SY Stylolite
UN Undulating
VN Vein
VR Very Rough

ISRM Intact Rock Material Strength Classification

Grade	Description	Approx. Range of Uniaxial Compressive Strength (MPa)
R0	Extremely weak rock	0.25 – 1.0
R1	Very weak rock	1.0 – 5.0
R2	Weak rock	5.0 – 25
R3	Medium strong rock	25 – 50
R4	Strong rock	50 -100
R5	Very strong rock	100 -250
R6	Extremely strong rock	>250

PROJECT CA0051716.2286

RECORD OF BOREHOLE No BH-101

SHEET 1 OF 1

METRIC

G.W.P. 3008-22-00 LOCATION N 4760073.6; E 507761.9 MTM NAD 83 ZONE 17 (LAT. 42.993286; LONG. -80.904782) ORIGINATED BY KB

DIST WEST HWY 402 BOREHOLE TYPE 209 mm, OD Hollow Stem Auger COMPILED BY NV

DATUM Geodetic DATE November 4, 2025 CHECKED BY NG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × REMOULDED) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) (25 50 75)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
284.5	GROUND SURFACE										
0.0 / 0.2	SILT - TOPSOIL (ML), some sand, trace gravel, trace rootlets (FILL) Loose Dark brown Moist		1A, 1B	SS	9		284				
283.7 / 0.8	gravelly SAND (SP), trace silt, crushed (FILL) Loose Brown		2	SS	9						
283.1 / 1.4	sandy SILT (ML), trace gravel, some clay (FILL) Loose Brown Moist		3	SS	18		283				
281.9 / 2.6	SILTY SAND with topsoil (SM), trace to some gravel (FILL) Compact Dark brown Moist		4A, 4B	SS	7		282				1 45 38 16
280.9 / 3.7	SILT - TOPSOIL (ML), trace gravel, trace rootlets (FILL) Firm Dark brown Moist		5	SS	7						
	SILTY SAND (SM) Dark brown		6	SS	12		281				0 5 50 45
279.4 / 5.1	CLAYEY SILT (CL), trace to some sand, trace gravel Stiff Brown with fissures w<PL		7	SS	14						
	SILT (ML), trace to some sand Compact Brown Wet		8A, 8B	SS	14		280				
278.3 / 6.3	SAND and GRAVEL (SW-SM/GM), trace silt, some silt Compact Brown/grey Wet		9A, 9B	SS	24		279				0 4 87 9
276.3			10	SS	15		278				36 54 (10)
8.2	END OF BOREHOLE						277				

Note(s):

1. Water level in screen measured at a depth of 4.99 m.
2. The following soil sample headspace vapour readings were obtained in the field:

Samp. No	HEX (ppm)	IBL (ppm)
1A	0	0
1B	5	0
2	5	0
3	15	0
4A	10	0
4B	0	0
6	0	0
7	5	0
8A	0	0
8B	0	0
9A	0	0
9B	0	0
10	0	0

$+^3$, $\times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

GTA-MTO 001 S:\CLIENTS\MTO\HWY_402\02_DATA\GINTH\HIGHWAY_402.GPJ GAL-GTA.GDT 12/17/25

PROJECT CA0051716.2286

RECORD OF BOREHOLE No BH-102

SHEET 1 OF 1

METRIC

G.W.P. 3008-22-00 LOCATION N 4678044.0; E 348404.0 MTM NAD 83 ZONE 17 ORIGINATED BY HK

DIST WEST HWY 401 BOREHOLE TYPE Power Auger, 80 mm I.D. Hollow Stem Auger COMPILED BY MM

DATUM Geodetic DATE September 2, 2025 CHECKED BY PG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × REMOULDED) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
186.0	GROUND SURFACE										
0.0 / 185.3	Sandy ORGANIC CLAYEY SILT (OL) (FILL), trace gravel Stiff Dark grey Moist		1	SS	9						
0.7 / 183.8	CLAYEY SILT (CL), some sand, trace gravel Firm Mottled brown and grey Moist		2	SS	6		185				
			3	SS	5		184				
2.2 / 182.3	SILTY CLAY (CI), some sand, trace gravel, some oxidized fissures Very stiff Brown Moist		4	SS	20		183				0 16 28 56
			5	SS	27						0 16 37 47
3.7	CLAYEY SILT (CL), some sand, trace gravel Stiff Grey Moist		6	SS	12		182				4 15 37 44
			7	SS	11		181				
			8	SS	10		180				
							179				
177.8			9	SS	8		178				
8.2	END OF BOREHOLE NOTE(S): 1. Borehole dry upon completion of drilling.										

$+^3$, $\times^3$: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

GTA-MTO 001 S:\CLIENTS\MTO\HWY_401_&_HWY_3102_DATA\GINT\HWY_401_&_HWY_3.GPJ GAL-GTA.GDT 10/8/25

PROJECT CA0051716.2286

RECORD OF BOREHOLE No BH-103

SHEET 1 OF 1

METRIC

G.W.P. 3008-22-00 LOCATION N 4678931.0; E 339416.0 MTM NAD 83 ZONE 17 ORIGINATED BY HK

DIST WEST HWY 401 BOREHOLE TYPE Power Auger, 80 mm I.D. Hollow Stem Auger COMPILED BY MM

DATUM Geodetic DATE September 2, 2025 CHECKED BY PG

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × REMOULDED) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
189.3	GROUND SURFACE										
0.0	Sandy CLAYEY SILT (CL) (FILL), trace gravel, contains rootlets Stiff Dark grey		1	SS	9		189				
188.6											
0.7	Moist SILTY CLAY (CI), some sand, trace gravel Stiff to firm Mottled brown and grey Moist		2	SS	9						1 22 35 42
			3	SS	5		188				
187.1							187				
2.2	CLAYEY SILT (CL), some sand, trace gravel, some oxidized fissures Very stiff to hard Brown Moist		4	SS	25						1 25 39 35
			5	SS	39		186				
185.6											
3.7	CLAYEY SILT (CL), some sand, trace gravel Very stiff to stiff Grey Moist		6	SS	18		185				
			7	SS	14						3 27 36 34
							184				
			8	SS	12		183				
							182				
181.1			9	SS	13						
8.2	END OF BOREHOLE NOTE(S): 1. Borehole dry upon completion of drilling.										

+3, ×3: Numbers refer to Sensitivity ○3% STRAIN AT FAILURE

GTA-MTO 001 S:\CLIENTS\MTO\HWY_401_&_HWY_3102_DATA\GINT\HWY_401_&_HWY_3.GPJ GAL-GTA.GDT 10/8/25

APPENDIX B

Geotechnical Laboratory Test Data

WSP Canada Inc.
309 Exeter Road, Unit 1
London, N6L 1C1
519-652-0099

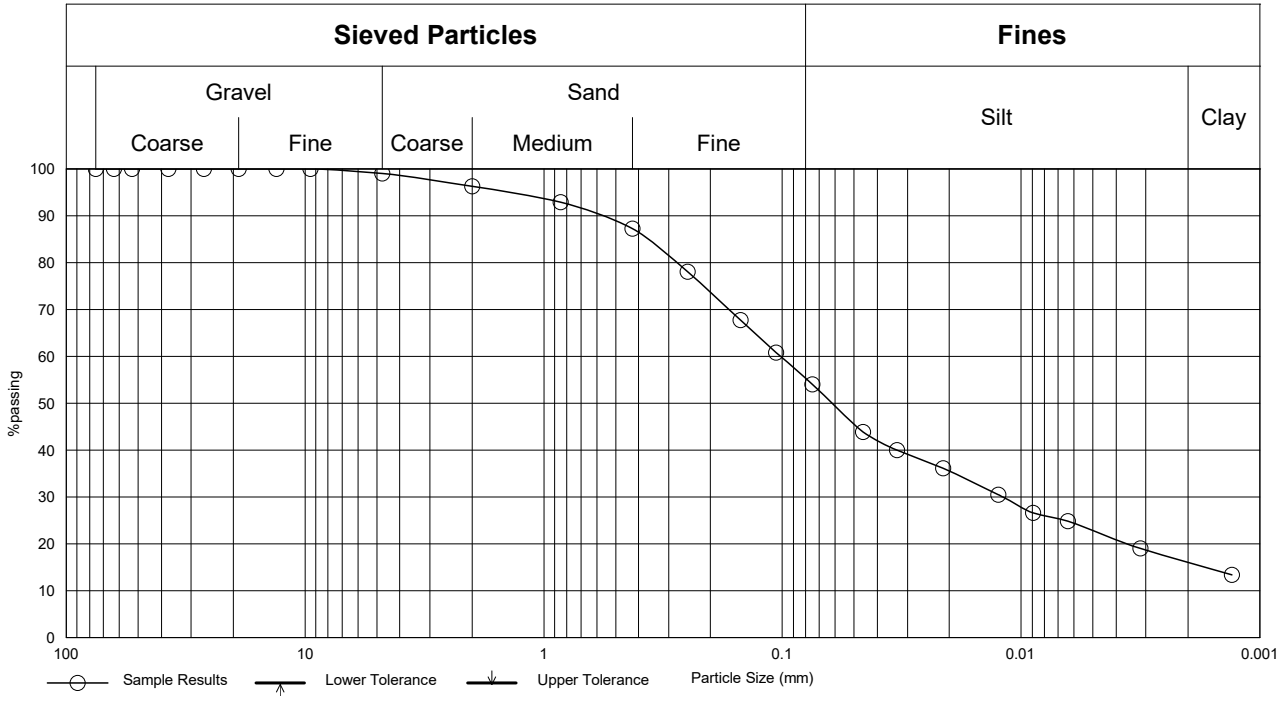
12/04/2025

Particle Size Distribution of Soils

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

Testing Program #:	054356	Project Number:	CA0051716.2286
Client:	MTO	Project Location:	
Project Name:	Hwy 3, 401, 402	Sample Location:	BH101
Source:		Borehole Type:	
Report Number:		Borehole Depth (m):	-
Sample Number:	4A	WSP Lab Number:	LON25-04152
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	11/27/2025
Specification:		Tested By:	Kothiya, Raj

Grain Size Distribution	Gravel	Sand	Silt / Clay
	1.0	45.0	54.0



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0460	43.8
		0.0331	40.0
		0.0212	36.2
		0.0125	30.5
		0.0089	26.7
		0.0063	24.8
75.0		0.0032	19.1
63.0		0.0013	13.3
53.0			
37.5			
26.5			
19.0			
13.2			
9.5	100.0		
4.75	99.0	0.005mm	22.8
2.00	96.4	0.002mm	15.7
0.850	87.3	D60	0.102
0.425	78.1	D30	0.012
0.250	67.7	D10	NA
0.106	60.8	Cu	NA
0.075	54.0	Cc	NA

Notes:

Disclaimer:

Notice: The test data given herein pertain to the sample provided and may not be applicable to other samples or to material from earlier or subsequent production. Reporting of these results constitutes a testing service only. Engineering interpretation and advice may be provided upon written request.

Reviewed By: Katie Patton Title: Laboratory Supervisor

Signature: K Patton

CERTIFIED BY CCIL

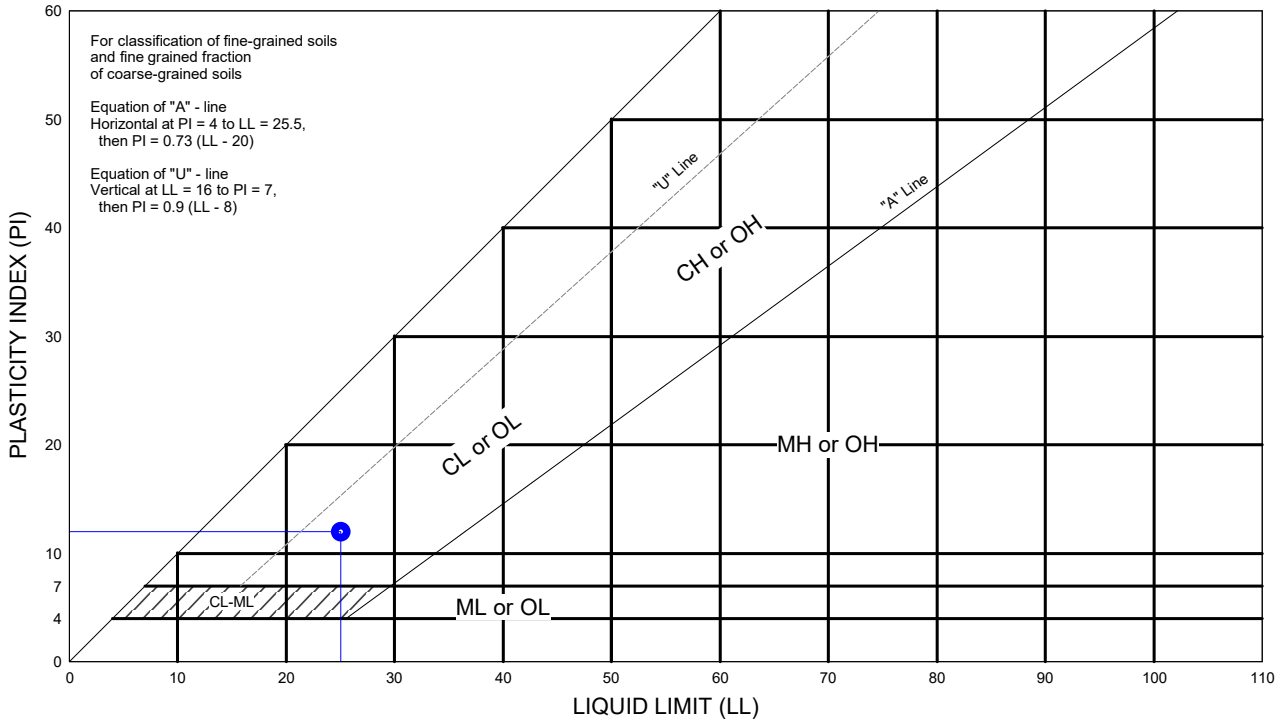
WSP Canada Inc.
309 Exeter Road, Unit 1
London, N6L 1C1
519-652-0099

12/04/2025

Liquid Limit, Plastic Limit and Plasticity Index

Testing Standard: MTO LS-703/704 (Rev. 36)

Testing Program #:	054356	Project Number:	CA0051716.2286
Client:	MTO	Project Location:	
Project Name:	Hwy 3, 401, 402	Sample Location	BH101
Source:		Borehole Type:	
Report Number:		Borehole Depth (m):	-
Sample Number:	4A	WSP Lab Number:	LON25-04152
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	12/01/2025
		Tested By:	Raj Kothiya



Sample Location	Sample Number	Top Depth (m)	Base Depth (m)	Percent Passing 425um Sieve	Natural Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index
BH101	4A			87.3	18.0	25	13	12	

NP = Non-Plastic
ND = Not Determined

Test Preparation Dry Preparation Tested After >425um Removed
Lab Testing Comments / Deviations:
General Comments:

Reviewed By: Katie Patton Title: Laboratory Supervisor

Signature: K Patton

CERTIFIED BY CCIL

WSP Canada Inc.
309 Exeter Road, Unit 1
London, N6L 1C1
519-652-0099

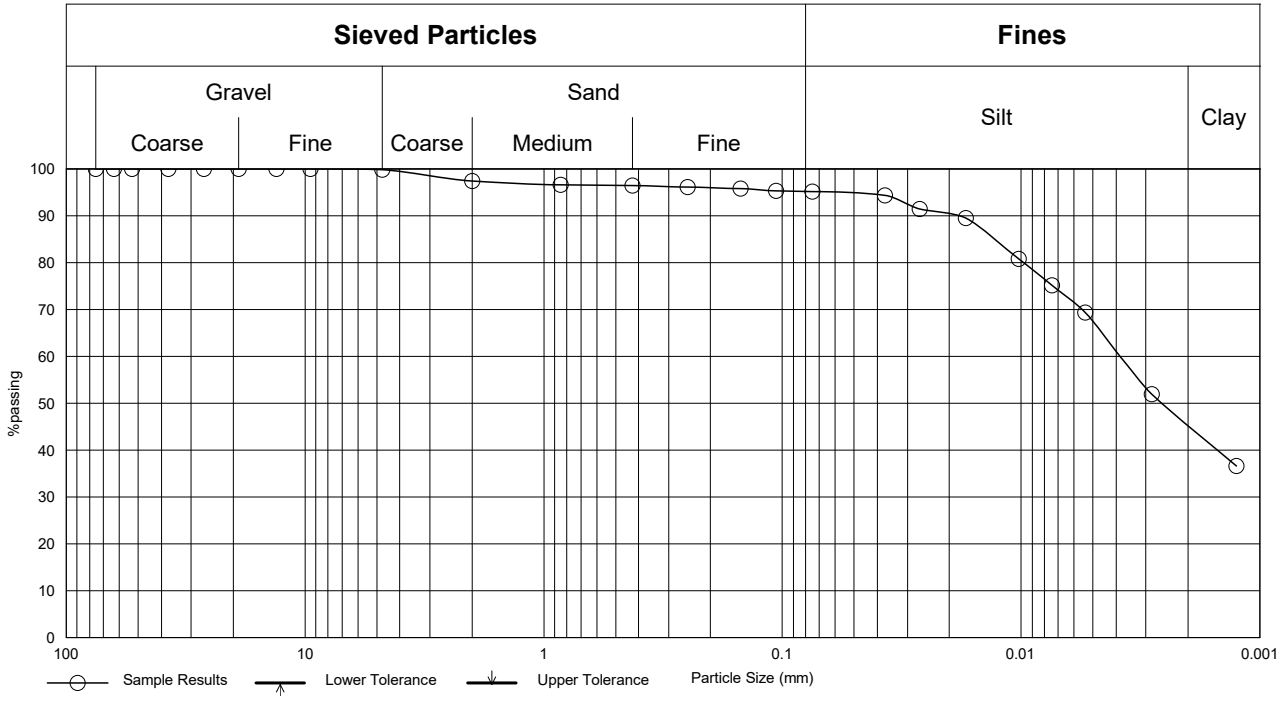
12/04/2025

Particle Size Distribution of Soils

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

Testing Program #:	054356	Project Number:	CA0051716.2286
Client:	MTO	Project Location:	
Project Name:	Hwy 3, 401, 402	Sample Location:	BH101
Source:		Borehole Type:	
Report Number:		Borehole Depth (m):	-
Sample Number:	6	WSP Lab Number:	LON25-04153
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	11/27/2025
Specification:		Tested By:	Kothiya, Raj

Grain Size Distribution	Gravel	Sand	Silt / Clay
	0.2	4.6	95.2



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0371	94.4
		0.0266	91.5
		0.0170	89.5
		0.0102	80.9
		0.0074	75.1
		0.0054	69.3
75.0		0.0028	52.0
63.0		0.0012	36.6
53.0			
37.5			
26.5			
19.0			
13.2			
9.5	100.0		
4.75	99.8	0.005mm	67.4
2.00	97.4	0.002mm	44.5
0.850	96.5	D60	0.004
0.425	96.2	D30	NA
0.250	95.8	D10	NA
0.106	95.3	Cu	NA
0.075	95.2	Cc	NA

Notes:

Disclaimer:

Notice: The test data given herein pertain to the sample provided and may not be applicable to other samples or to material from earlier or subsequent production. Reporting of these results constitutes a testing service only. Engineering interpretation and advice may be provided upon written request.

Reviewed By: Katie Patton Title: Laboratory Supervisor

Signature: K Patton

CERTIFIED BY CCIL

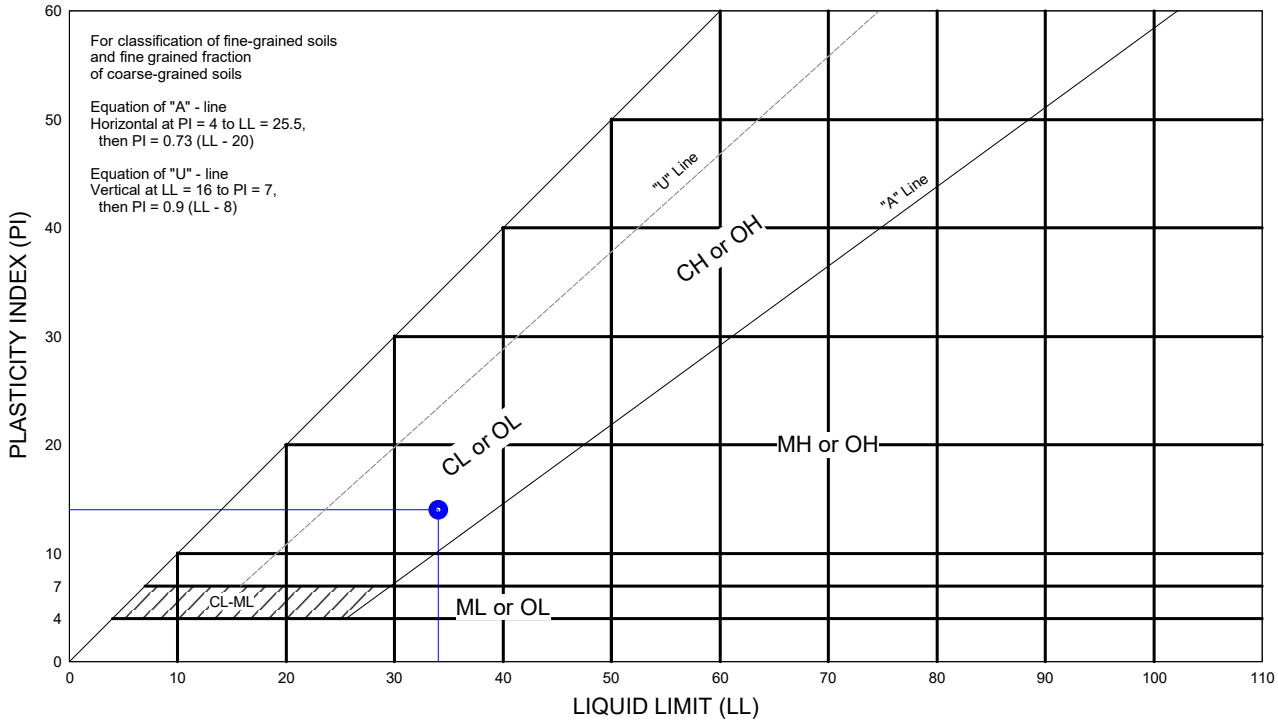
WSP Canada Inc.
309 Exeter Road, Unit 1
London, N6L 1C1
519-652-0099

12/04/2025

Liquid Limit, Plastic Limit and Plasticity Index

Testing Standard: MTO LS-703/704 (Rev. 36)

Testing Program #:	054356	Project Number:	CA0051716.2286
Client:	MTO	Project Location:	
Project Name:	Hwy 3, 401, 402	Sample Location	BH101
Source:		Borehole Type:	
Report Number:		Borehole Depth (m):	-
Sample Number:	6	WSP Lab Number:	LON25-04153
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	12/01/2025
		Tested By:	Raj Kothiya



Sample Location	Sample Number	Top Depth (m)	Base Depth (m)	Percent Passing 425um Sieve	Natural Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index
BH101	6			96.5	21.6	34	20	14	

NP = Non-Plastic
ND = Not Determined

Test Preparation
Dry Preparation Tested After >425um Removed

Lab Testing Comments / Deviations:

General Comments:

Reviewed By: Katie Patton Title: Laboratory Supervisor

Signature: K Patton

CERTIFIED BY CCIL

WSP Canada Inc.
309 Exeter Road, Unit 1
London, N6L 1C1
519-652-0099

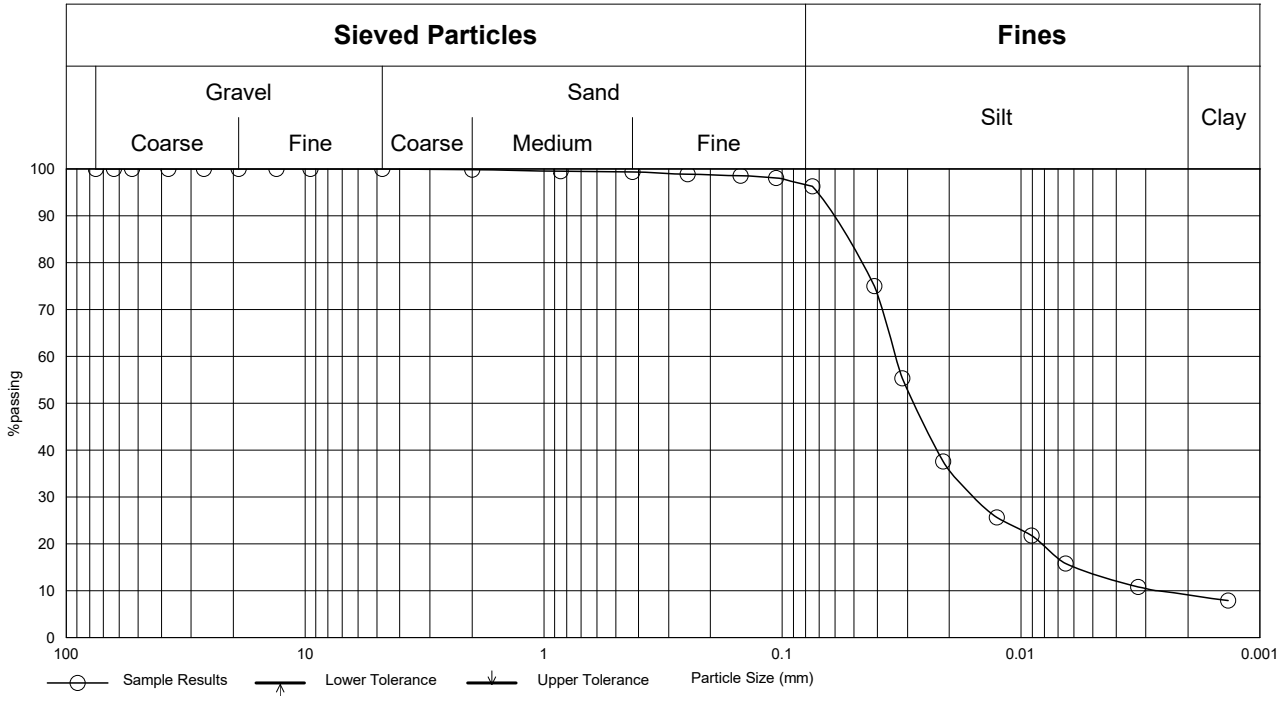
12/04/2025

Particle Size Distribution of Soils

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

Testing Program #:	054356	Project Number:	CA0051716.2286
Client:	MTO	Project Location:	
Project Name:	Hwy 3, 401, 402	Sample Location:	BH101
Source:		Borehole Type:	
Report Number:		Borehole Depth (m):	-
Sample Number:	8B	WSP Lab Number:	LON25-04154
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	11/27/2025
Specification:		Tested By:	Kothiya, Raj

Grain Size Distribution	Gravel	Sand	Silt / Clay
		3.7	96.3



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0412	75.0
		0.0314	55.3
		0.0212	37.5
		0.0127	25.7
		0.0091	21.7
		0.0065	15.8
75.0		0.0032	10.9
63.0		0.0014	7.9
53.0			
37.5			
26.5			
19.0			
13.2			
9.5			
4.75	100.0	0.005mm	13.6
2.00	99.9	0.002mm	9.0
0.850	99.4	D60	0.034
0.425	98.9	D30	0.016
0.250	98.5	D10	0.003
0.106	98.1	Cu	12.528
0.075	96.3	Cc	2.77

Notes:

Disclaimer:

Notice: The test data given herein pertain to the sample provided and may not be applicable to other samples or to material from earlier or subsequent production. Reporting of these results constitutes a testing service only. Engineering interpretation and advice may be provided upon written request.

Reviewed By: Katie Patton Title: Laboratory Supervisor

Signature: K Patton

CERTIFIED BY CCIL

WSP Canada Inc.
309 Exeter Road, Unit 1
London, N6L 1C1
519-652-0099

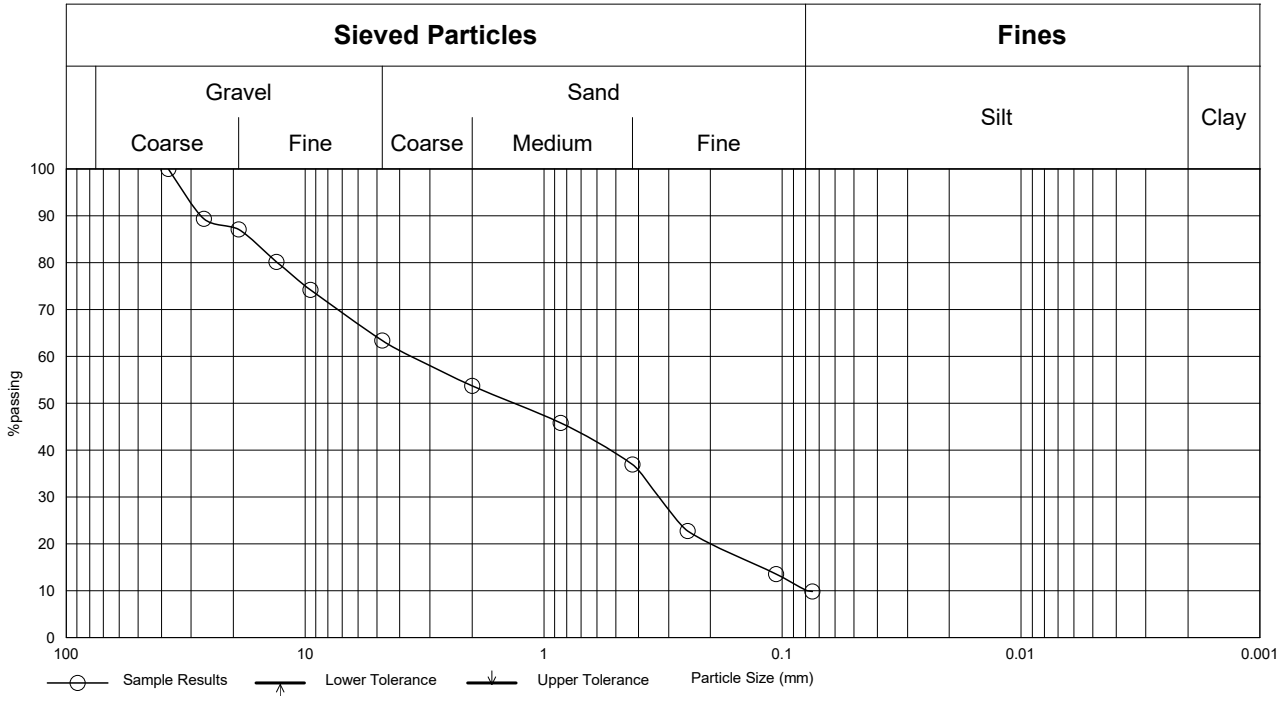
12/04/2025

Particle Size Distribution of Soils

Testing Standard: MTO LS-602 (Rev. 39)

Testing Program #:	054356	Project Number:	CA0051716.2286
Client:	MTO	Project Location:	
Project Name:	Hwy 3, 401, 402	Sample Location:	BH101
Source:		Borehole Type:	
Report Number:		Borehole Depth (m):	-
Sample Number:	10	WSP Lab Number:	LON25-04155
Soil Description:		Specimen Depth (m):	0 - 0
Soil Classification:		Date of Test:	11/27/2025
Specification:		Tested By:	Kothiya, Raj

Grain Size Distribution	Gravel	Sand	Silt / Clay
	36.6	53.6	9.8



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
37.5	100.0		
26.5	89.4		
19.0	87.1		
13.2	80.2		
9.5	74.1		
4.75	63.4		
2.00	53.7		
0.850	45.8		
0.425	37.0		
0.250	22.8		
0.106	13.6	0.005mm	
0.075	9.8	0.002mm	
		D60	3.600
		D30	0.329
		D10	0.079
		Cu	45.828
		Cc	0.38

Notes:

Disclaimer:

Notice: The test data given herein pertain to the sample provided and may not be applicable to other samples or to material from earlier or subsequent production. Reporting of these results constitutes a testing service only. Engineering interpretation and advice may be provided upon written request.

Reviewed By: Katie Patton Title: Laboratory Supervisor

Signature: K Patton

CERTIFIED BY CCIL

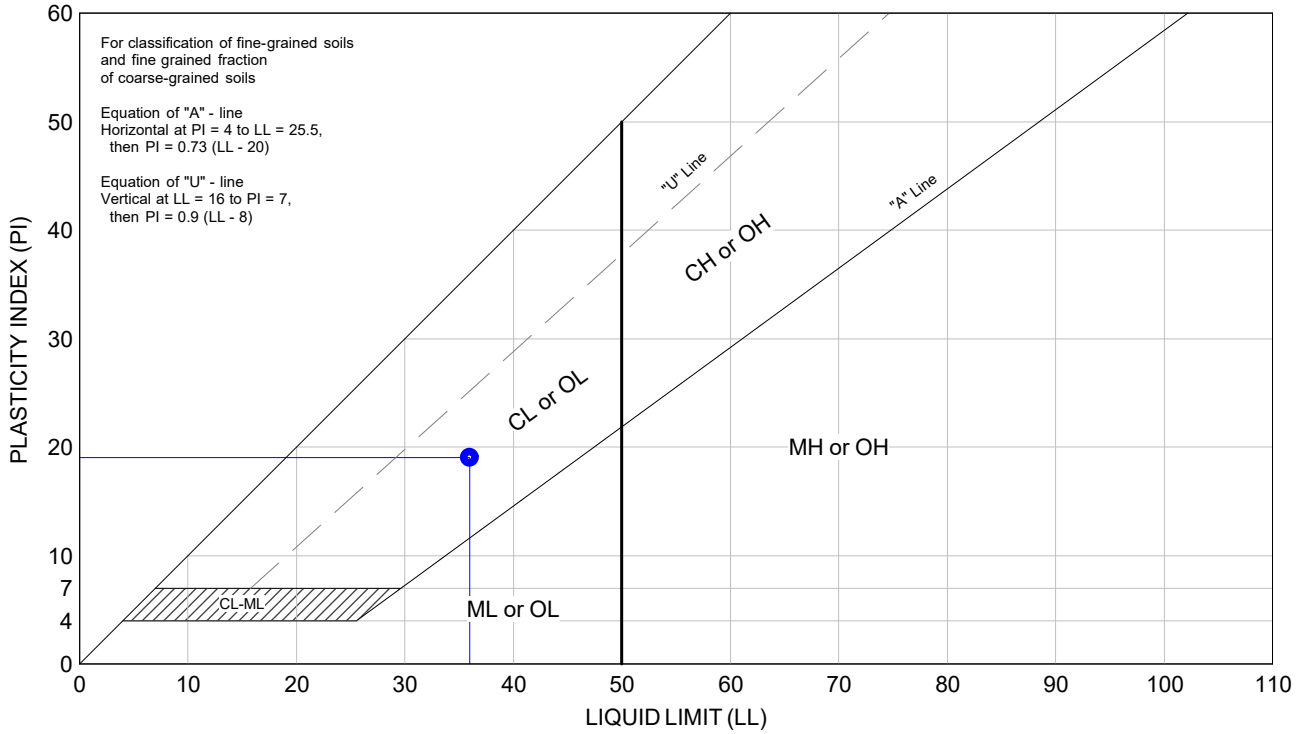
WSP Canada Inc.
1825 Provincial Road Unit 1
Windsor, N8W 5V7
519-250-3733

11/12/2025

Liquid Limit, Plastic Limit and Plasticity Index

Testing Standard: MTO LS-703/704 (Rev. 36)

Testing Program #	052696	Project Number:	CA0051716.2286
Supplier:		Contract Number:	
Source:	On site	Project Name:	Hwy 3, 401, 402
Sample Location:	Site sampled	Client:	MTO
Sample Number:	BH102 - 4	Report Number:	LON00091-25
Soil Description:		WSP Lab Number:	WIN25-01577
Soil Classification:		Date Received:	09/02/2025
Sampled By:	H. Kevadia	Date of Test:	09/25/2025
Date Sampled:	09/02/2025	Tested By:	Jack Marinigh



Sample Depth (m)	Percent Passing 425um Sieve	Natural Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index
			36	17	19	

NP = Non-Plastic
ND = Not Determined

Test Preparation
Lab Testing Comments / Deviations:
General Comments:

Reviewed By: Dave Dillabough Title: Laboratory Supervisor

Signature:

CERTIFIED BY CCIL

WSP Canada Inc.
1825 Provincial Road Unit 1
Windsor, N8W 5V7
519-250-3733

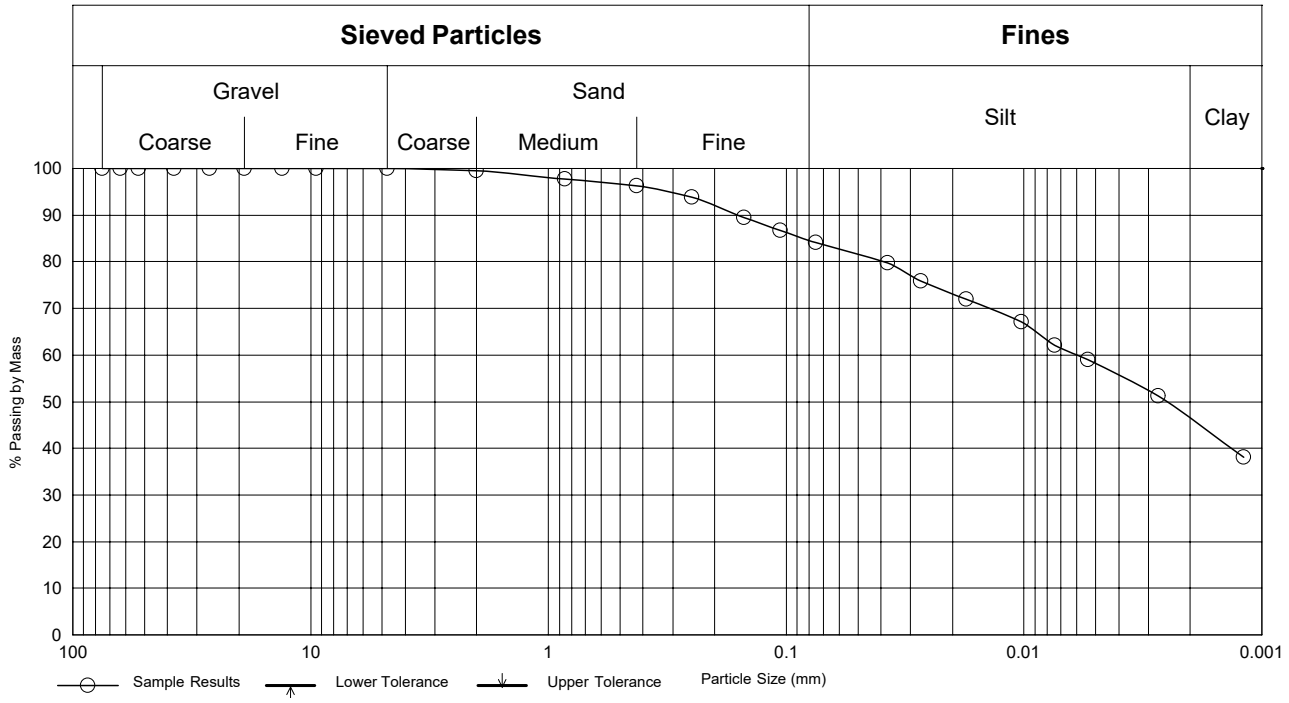
11/12/2025

Particle Size Distribution of Soils

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

Testing Program #:	052696	Project Number:	CA0051716.2286
Supplier:		Contract Number:	
Source:	On site	Client:	MTO
Sample Location:	Site sampled	Project Name:	Hwy 3, 401, 402
Sample Number:	BH102 - 4	Report Number:	LON00091-25
Soil Description:		WSP Lab Number:	WIN25-01577
Soil Classification:		Date Received:	09/02/2025
Specification:		Date of Test:	09/22/2025
Sampled By:	H. Kevadia	Tested By:	Marinigh, Jack
Date Sampled:	09/02/2025		

Grain Size Distribution	Gravel	Sand	Silt / Clay
		16.0	84.0



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0376	79.8
		0.0270	75.9
		0.0175	71.9
		0.0103	67.0
		0.0074	62.1
		0.0054	59.1
75.0		0.0027	51.2
63.0		0.0012	38.2
53.0			
37.5			
26.5			
19.0			
13.2			
9.5			
4.75	100.0	0.005mm	58.2
2.00	99.5	0.002mm	46.1
0.850	96.3	D60	0.006
0.425	93.8	D30	NA
0.250	89.5	D10	NA
0.106	86.6	Cu	NA
0.075	84.0	Cc	NA

Notes:

Silty Clay

Disclaimer:

Notice: The test data given herein pertain to the sample provided and may not be applicable to other samples or to material from earlier or subsequent production. Reporting of these results constitutes a testing service only. Engineering interpretation and advice may be provided upon written request.

Reviewed By: Dave Dillabough Title: Laboratory Supervisor

Signature:

CERTIFIED BY CCIL

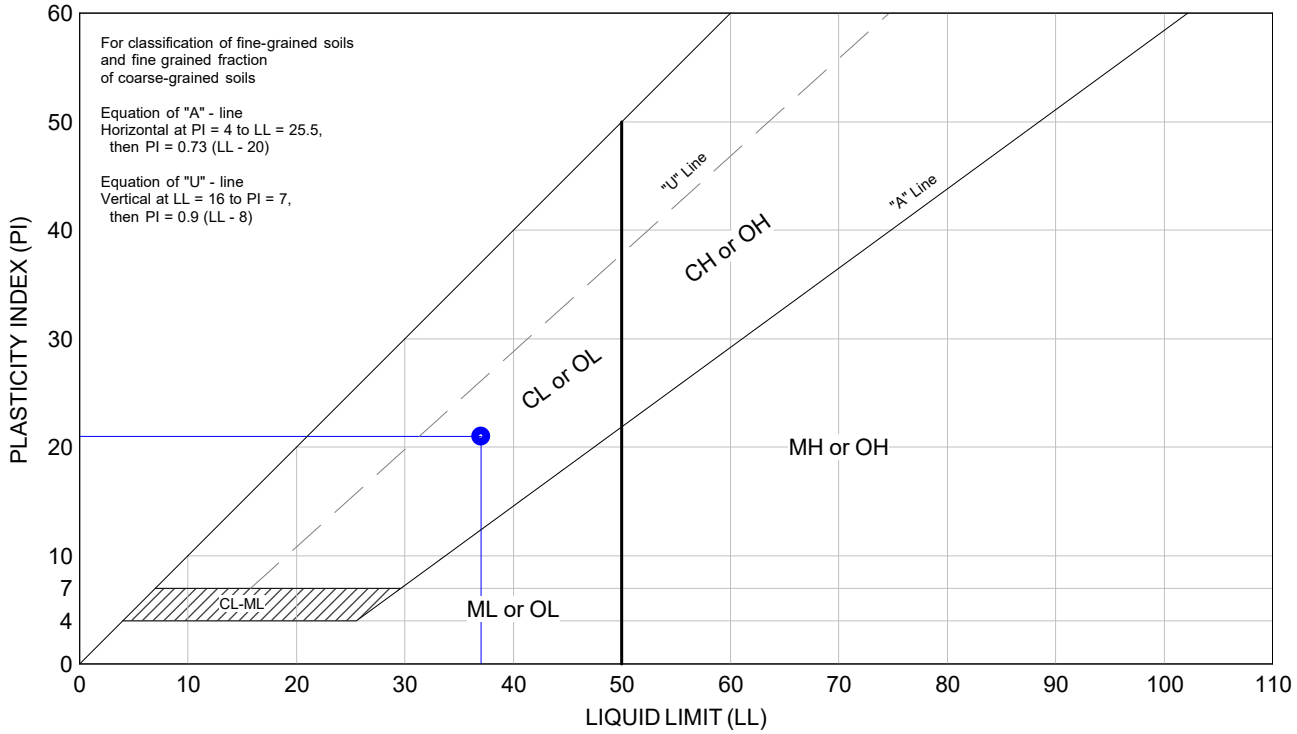
WSP Canada Inc.
1825 Provincial Road Unit 1
Windsor, N8W 5V7
519-250-3733

11/12/2025

Liquid Limit, Plastic Limit and Plasticity Index

Testing Standard: MTO LS-703/704 (Rev. 36)

Testing Program #	052700	Project Number:	CA0051716.2286
Supplier:		Contract Number:	
Source:	On site	Project Name:	Hwy 3, 401, 402
Sample Location:	Site sampled	Client:	MTO
Sample Number:	BH102 - 5	Report Number:	LON00092-25
Soil Description:		WSP Lab Number:	WIN25-01578
Soil Classification:		Date Received:	09/02/2025
Sampled By:	H. Kevadia	Date of Test:	09/22/2025
Date Sampled:	09/02/2025	Tested By:	Jack Marinigh



Sample Depth (m)	Percent Passing 425um Sieve	Natural Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index
			37	16	21	

NP = Non-Plastic
ND = Not Determined

Test Preparation
Lab Testing Comments / Deviations:
General Comments:

Reviewed By: Dave Dillabough Title: Laboratory Supervisor

Signature:

CERTIFIED BY CCIL

WSP Canada Inc.
1825 Provincial Road Unit 1
Windsor, N8W 5V7
519-250-3733

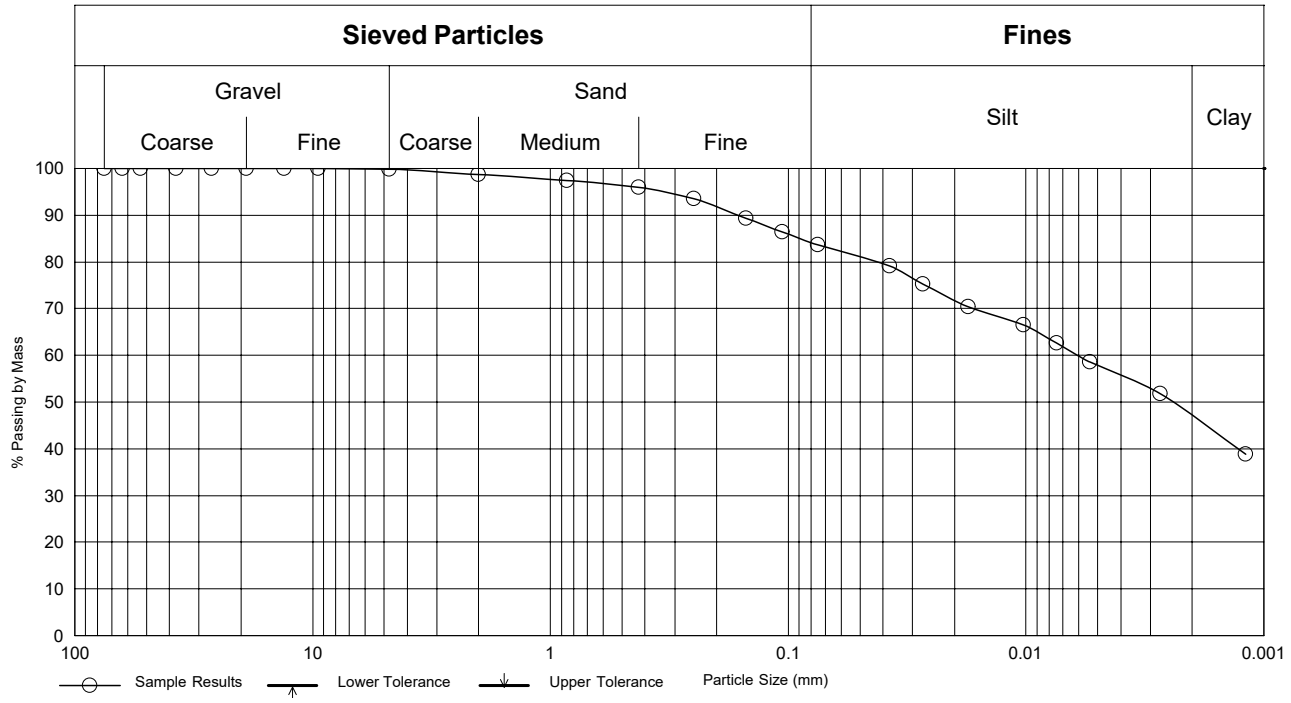
11/12/2025

Particle Size Distribution of Soils

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

Testing Program #:	052700	Project Number:	CA0051716.2286
Supplier:		Contract Number:	
Source:	On site	Client:	MTO
Sample Location:	Site sampled	Project Name:	Hwy 3, 401, 402
Sample Number:	BH102 - 5	Report Number:	LON00092-25
Soil Description:		WSP Lab Number:	WIN25-01578
Soil Classification:		Date Received:	09/02/2025
Specification:		Date of Test:	09/22/2025
Sampled By:	H. Kevadia	Tested By:	Marinigh, Jack
Date Sampled:	09/02/2025		

Grain Size Distribution	Gravel	Sand	Silt / Clay
	0.2	16.1	83.7



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0376	79.1
		0.0270	75.2
		0.0175	70.3
		0.0103	66.5
		0.0074	62.6
		0.0054	58.5
75.0		0.0027	51.7
63.0		0.0012	38.8
53.0			
37.5			
26.5			
19.0			
13.2			
9.5	100.0		
4.75	99.8	0.005mm	57.8
2.00	98.7	0.002mm	46.8
0.850	96.0	D60	0.006
0.425	93.5	D30	NA
0.250	89.3	D10	NA
0.106	86.3	Cu	NA
0.075	83.7	Cc	NA

Notes:

Silty Clay

Disclaimer:

Notice: The test data given herein pertain to the sample provided and may not be applicable to other samples or to material from earlier or subsequent production. Reporting of these results constitutes a testing service only. Engineering interpretation and advice may be provided upon written request.

Reviewed By: Dave Dillabough Title: Laboratory Supervisor

Signature:

CERTIFIED BY CCIL

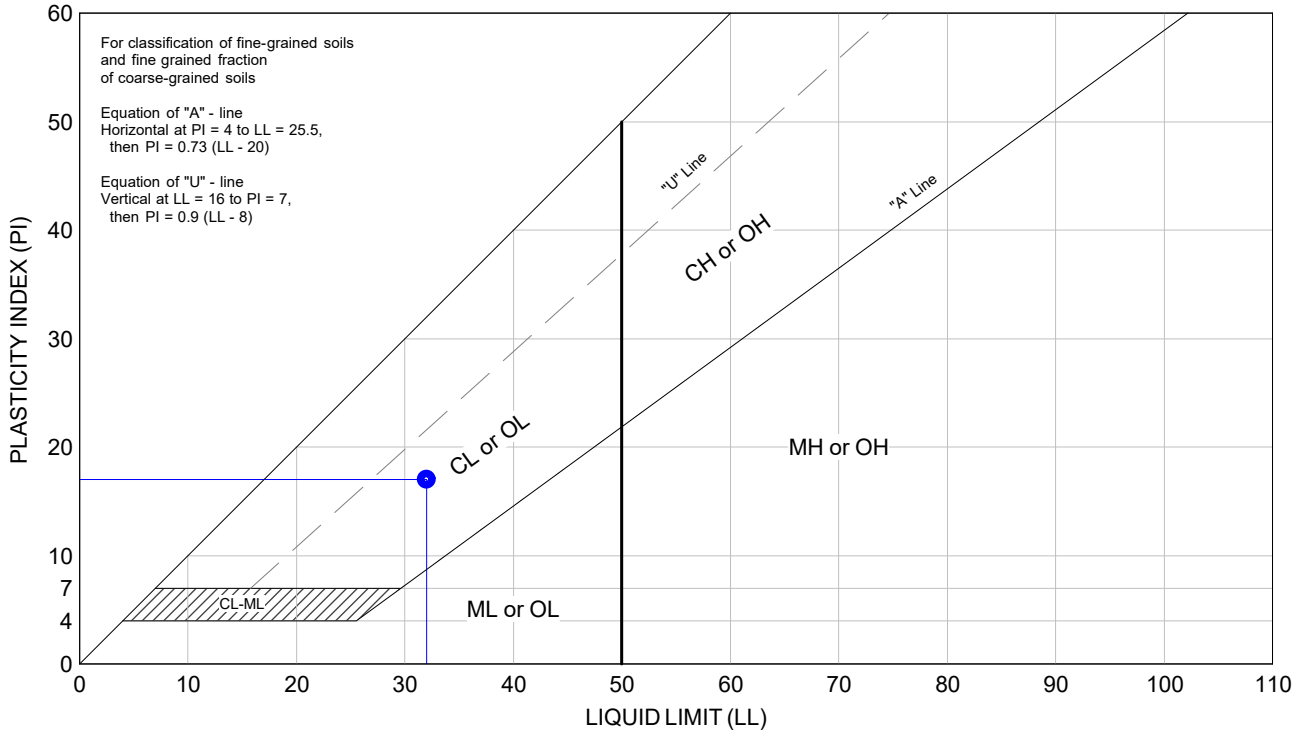
WSP Canada Inc.
1825 Provincial Road Unit 1
Windsor, N8W 5V7
519-250-3733

11/12/2025

Liquid Limit, Plastic Limit and Plasticity Index

Testing Standard: MTO LS-703/704 (Rev. 36)

Testing Program #	052701	Project Number:	CA0051716.2286
Supplier:		Contract Number:	
Source:	On site	Project Name:	Hwy 3, 401, 402
Sample Location:	Site sampled	Client:	MTO
Sample Number:	BH102 - 6	Report Number:	LON00093-25
Soil Description:		WSP Lab Number:	WIN25-01579
Soil Classification:		Date Received:	09/02/2025
Sampled By:	H. Kevadia	Date of Test:	09/26/2025
Date Sampled:	09/02/2025	Tested By:	Jack Marinigh



Sample Depth (m)	Percent Passing 425um Sieve	Natural Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index
			32	15	17	

NP = Non-Plastic
ND = Not Determined

Test Preparation
Lab Testing Comments / Deviations:
General Comments:

Reviewed By: Dave Dillabough Title: Laboratory Supervisor

Signature:

CERTIFIED BY CCIL

WSP Canada Inc.
1825 Provincial Road Unit 1
Windsor, N8W 5V7
519-250-3733

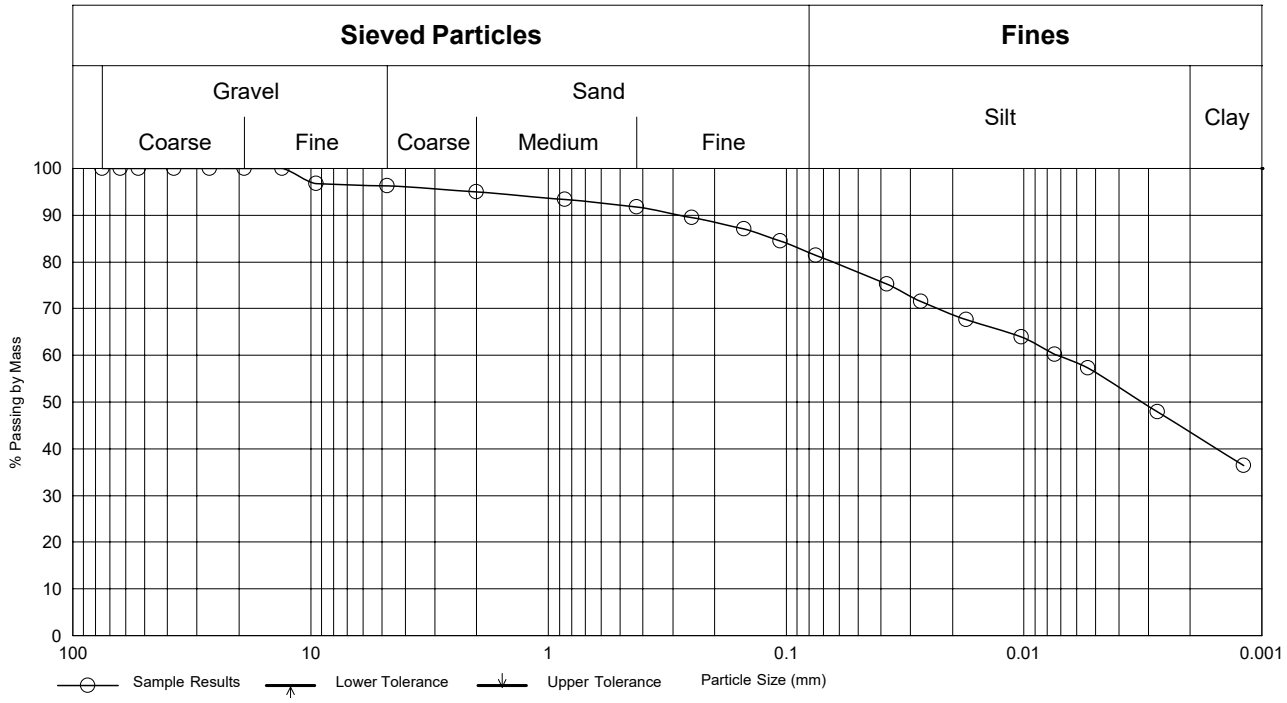
11/12/2025

Particle Size Distribution of Soils

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

Testing Program #:	052701	Project Number:	CA0051716.2286
Supplier:		Contract Number:	
Source:	On site	Client:	MTO
Sample Location:	Site sampled	Project Name:	Hwy 3, 401, 402
Sample Number:	BH102 - 6	Report Number:	LON00093-25
Soil Description:		WSP Lab Number:	WIN25-01579
Soil Classification:		Date Received:	09/02/2025
Specification:		Date of Test:	09/22/2025
Sampled By:	H. Kevadia	Tested By:	Marinigh, Jack
Date Sampled:	09/02/2025		

Grain Size Distribution	Gravel	Sand	Silt / Clay
	3.8	14.8	81.4



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0378	75.2
		0.0272	71.5
		0.0175	67.7
		0.0103	64.0
		0.0074	60.2
		0.0054	57.3
75.0		0.0027	47.9
63.0		0.0012	36.4
53.0			
37.5			
26.5			
19.0			
13.2	100.0		
9.5	96.7		
4.75	96.2	0.005mm	56.4
2.00	94.9	0.002mm	43.2
0.850	91.7	D60	0.007
0.425	89.4	D30	NA
0.250	87.1	D10	NA
0.106	84.5	Cu	NA
0.075	81.4	Cc	NA

Notes:

Disclaimer:

Notice: The test data given herein pertain to the sample provided and may not be applicable to other samples or to material from earlier or subsequent production. Reporting of these results constitutes a testing service only. Engineering interpretation and advice may be provided upon written request.

Reviewed By: Dave Dillabough Title: Laboratory Supervisor

Signature:

CERTIFIED BY CCIL

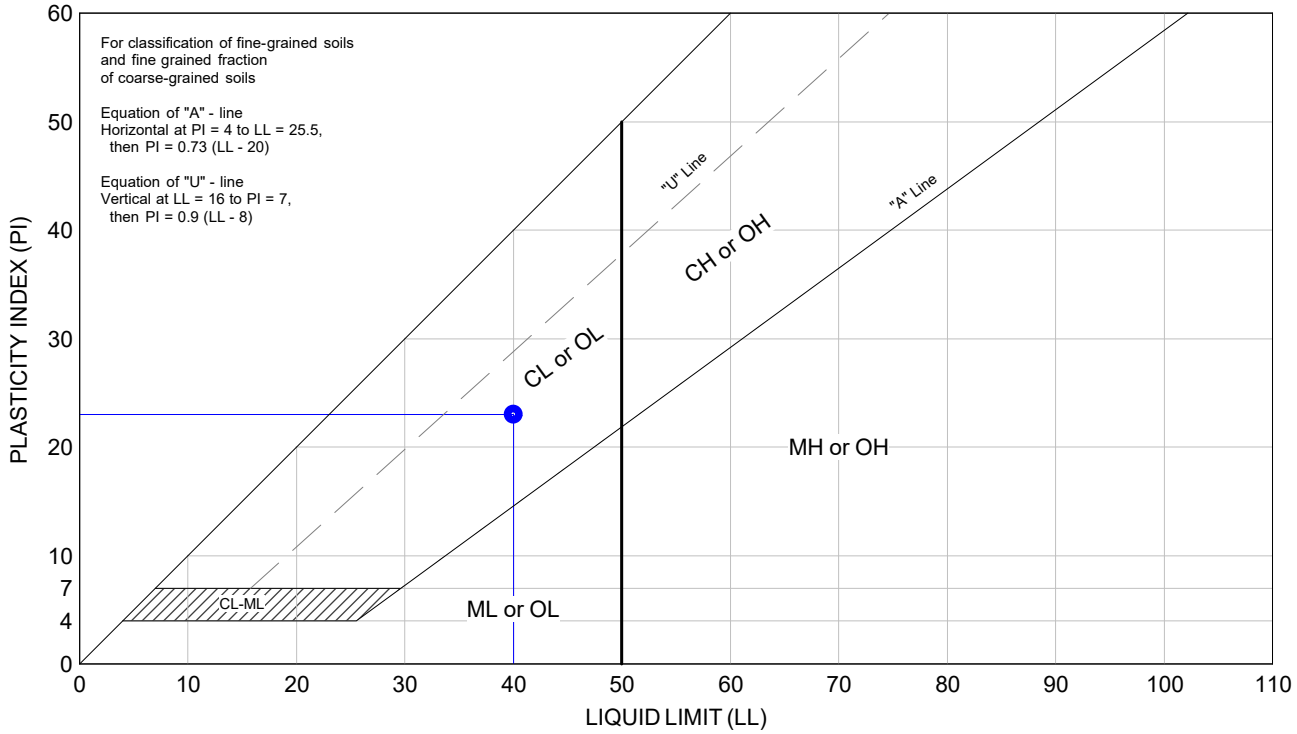
WSP Canada Inc.
1825 Provincial Road Unit 1
Windsor, N8W 5V7
519-250-3733

11/12/2025

Liquid Limit, Plastic Limit and Plasticity Index

Testing Standard: MTO LS-703/704 (Rev. 36)

Testing Program #	052702	Project Number:	CA0051716.2286
Supplier:		Contract Number:	
Source:	On site	Project Name:	Hwy 3, 401, 402
Sample Location:	Site Sampled	Client:	MTO
Sample Number:	BH103 - 2	Report Number:	LON00094-25
Soil Description:		WSP Lab Number:	WIN25-01580
Soil Classification:		Date Received:	09/02/2025
Sampled By:	H. Kevadia	Date of Test:	09/24/2025
Date Sampled:	09/02/2025	Tested By:	Jack Marinigh



Sample Depth (m)	Percent Passing 425um Sieve	Natural Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index
			40	17	23	

NP = Non-Plastic
ND = Not Determined

Test Preparation
Lab Testing Comments / Deviations:
General Comments:

Reviewed By: Dave Dillabough Title: Laboratory Supervisor

Signature:

CERTIFIED BY CCIL

WSP Canada Inc.
1825 Provincial Road Unit 1
Windsor, N8W 5V7
519-250-3733

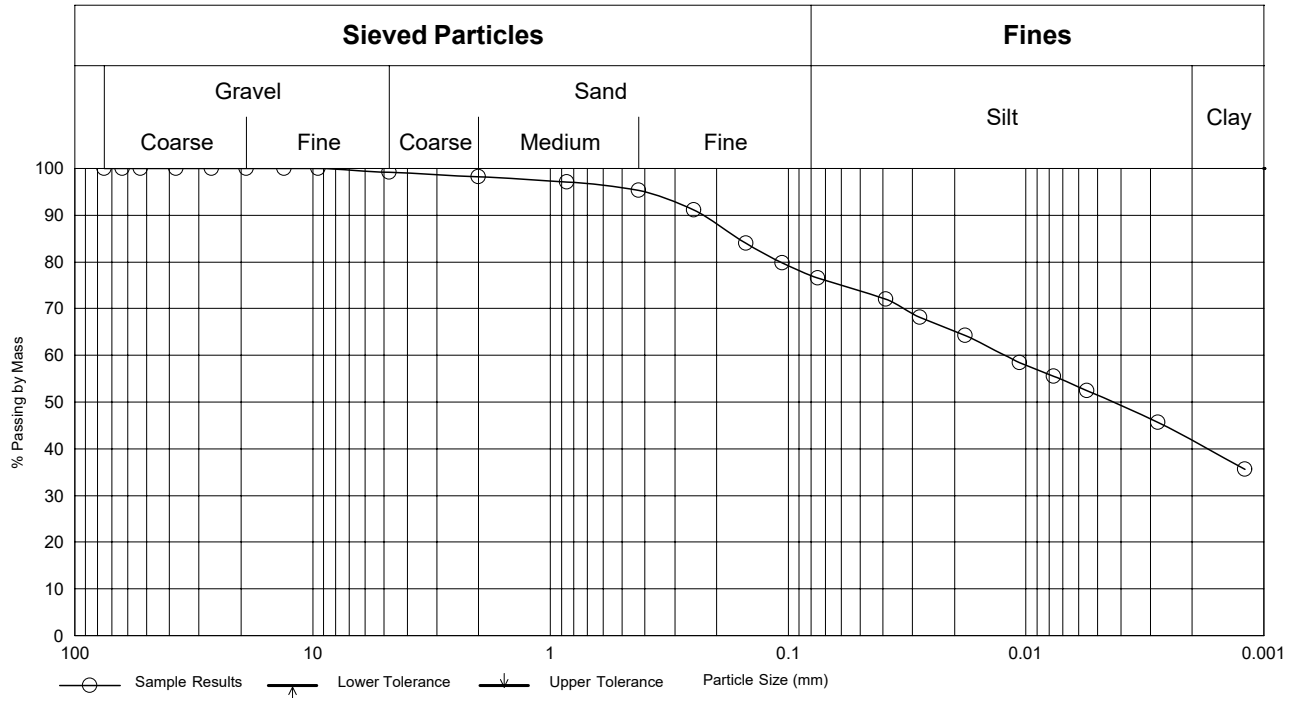
11/12/2025

Particle Size Distribution of Soils

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

Testing Program #:	052702	Project Number:	CA0051716.2286
Supplier:		Contract Number:	
Source:	On site	Client:	MTO
Sample Location:	Site sampled	Project Name:	Hwy 3, 401, 402
Sample Number:	BH103 - 2	Report Number:	LON00094-25
Soil Description:		WSP Lab Number:	WIN25-01580
Soil Classification:		Date Received:	09/02/2025
Specification:		Date of Test:	09/22/2025
Sampled By:	H. Kevadia	Tested By:	Marinigh, Jack
Date Sampled:	09/02/2025		

Grain Size Distribution	Gravel	Sand	Silt / Clay
	0.8	22.7	76.5



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0389	72.0
		0.0280	68.1
		0.0180	64.2
		0.0107	58.4
		0.0076	55.5
		0.0055	52.5
75.0		0.0028	45.7
63.0		0.0012	35.7
53.0			
37.5			
26.5			
19.0			
13.2			
9.5	100.0		
4.75	99.2	0.005mm	51.5
2.00	98.2	0.002mm	41.6
0.850	95.3	D60	0.012
0.425	91.0	D30	NA
0.250	84.0	D10	NA
0.106	79.7	Cu	NA
0.075	76.5	Cc	NA

Notes:

Disclaimer:

Notice: The test data given herein pertain to the sample provided and may not be applicable to other samples or to material from earlier or subsequent production. Reporting of these results constitutes a testing service only. Engineering interpretation and advice may be provided upon written request.

Reviewed By: Dave Dillabough Title: Laboratory Supervisor

Signature:

CERTIFIED BY CCIL

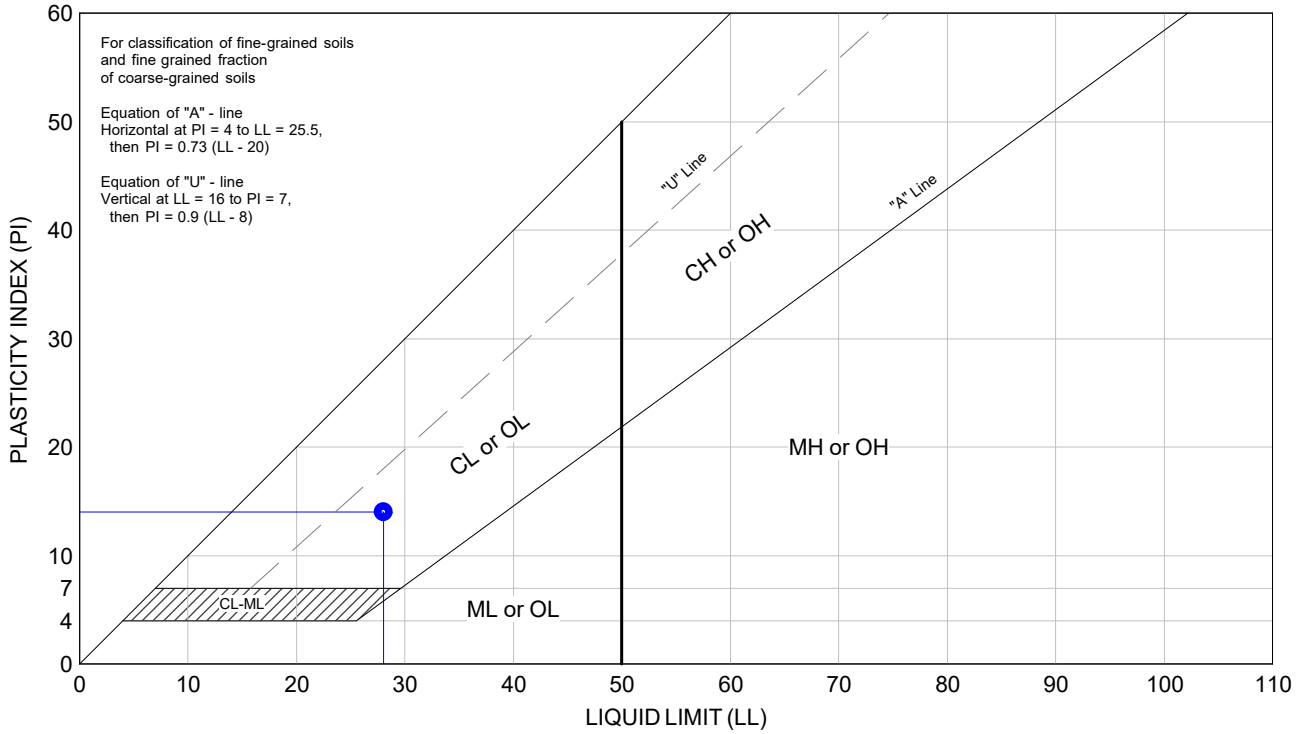
WSP Canada Inc.
1825 Provincial Road Unit 1
Windsor, N8W 5V7
519-250-3733

11/12/2025

Liquid Limit, Plastic Limit and Plasticity Index

Testing Standard: MTO LS-703/704 (Rev. 36)

Testing Program #	052704	Project Number:	CA0051716.2286
Supplier:		Contract Number:	
Source:	On site	Project Name:	Hwy 3, 401, 402
Sample Location:	Site sampled	Client:	MTO
Sample Number:	BH103 - 4	Report Number:	LON00095-25
Soil Description:		WSP Lab Number:	WIN25-01581
Soil Classification:		Date Received:	09/02/2025
Sampled By:	H. Kevadia	Date of Test:	09/24/2025
Date Sampled:	09/02/2025	Tested By:	Jack Marinigh



Sample Depth (m)	Percent Passing 425um Sieve	Natural Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index
			28	14	14	

NP = Non-Plastic
ND = Not Determined

Test Preparation
Lab Testing Comments / Deviations:
General Comments:

Reviewed By: Dave Dillabough Title: Laboratory Supervisor

Signature:

CERTIFIED BY CCIL

WSP Canada Inc.
1825 Provincial Road Unit 1
Windsor, N8W 5V7
519-250-3733

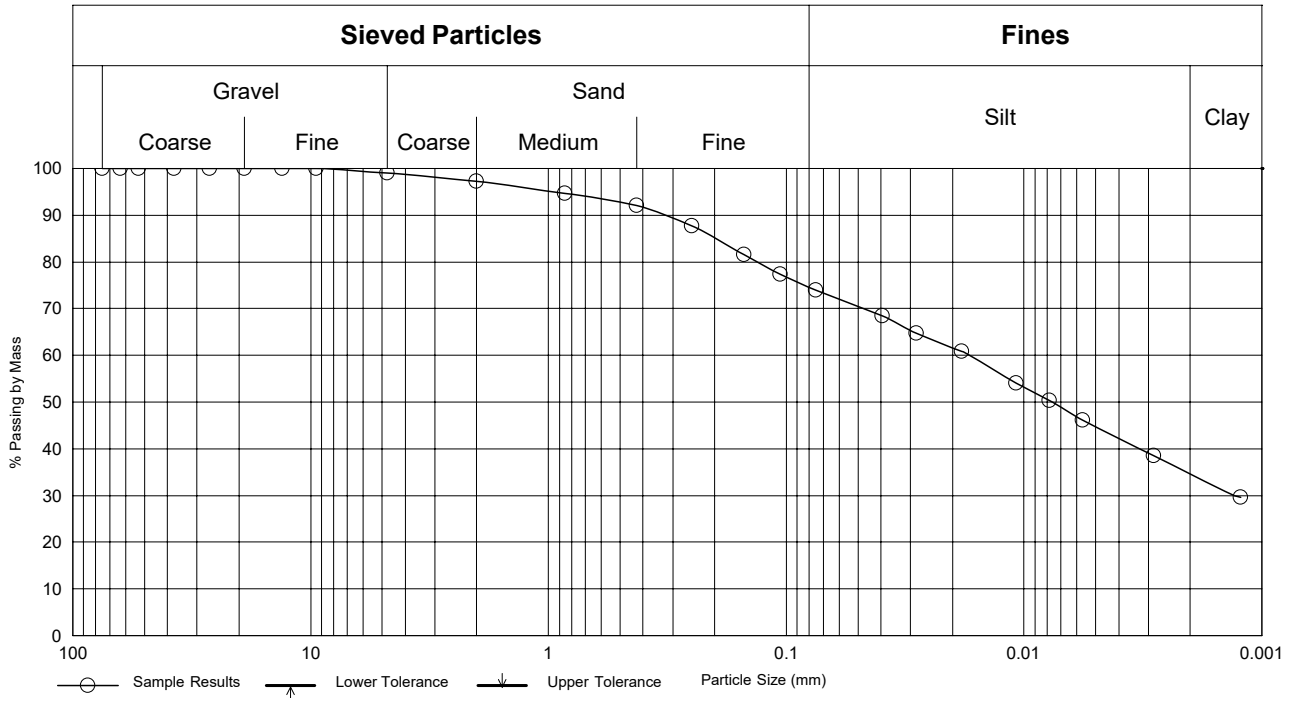
11/12/2025

Particle Size Distribution of Soils

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

Testing Program #:	052704	Project Number:	CA0051716.2286
Supplier:		Contract Number:	
Source:	On site	Client:	MTO
Sample Location:	Site sampled	Project Name:	Hwy 3, 401, 402
Sample Number:	BH103 - 4	Report Number:	LON00095-25
Soil Description:		WSP Lab Number:	WIN25-01581
Soil Classification:		Date Received:	09/02/2025
Specification:		Date of Test:	09/22/2025
Sampled By:	H. Kevadia	Tested By:	Marinigh, Jack
Date Sampled:	09/02/2025		

Grain Size Distribution	Gravel	Sand	Silt / Clay
	1.0	25.0	74.0



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0394	68.5
		0.0283	64.7
		0.0182	60.8
		0.0108	54.1
		0.0078	50.3
		0.0057	46.2
75.0		0.0028	38.5
63.0		0.0012	29.6
53.0			
37.5			
26.5			
19.0			
13.2			
9.5	100.0		
4.75	99.0	0.005mm	44.8
2.00	97.2	0.002mm	34.6
0.850	92.0	D60	0.017
0.425	87.8	D30	0.001
0.250	81.5	D10	NA
0.106	77.3	Cu	NA
0.075	74.0	Cc	NA

Notes:

Disclaimer:

Notice: The test data given herein pertain to the sample provided and may not be applicable to other samples or to material from earlier or subsequent production. Reporting of these results constitutes a testing service only. Engineering interpretation and advice may be provided upon written request.

Reviewed By: Dave Dillabough Title: Laboratory Supervisor

Signature:

CERTIFIED BY CCIL

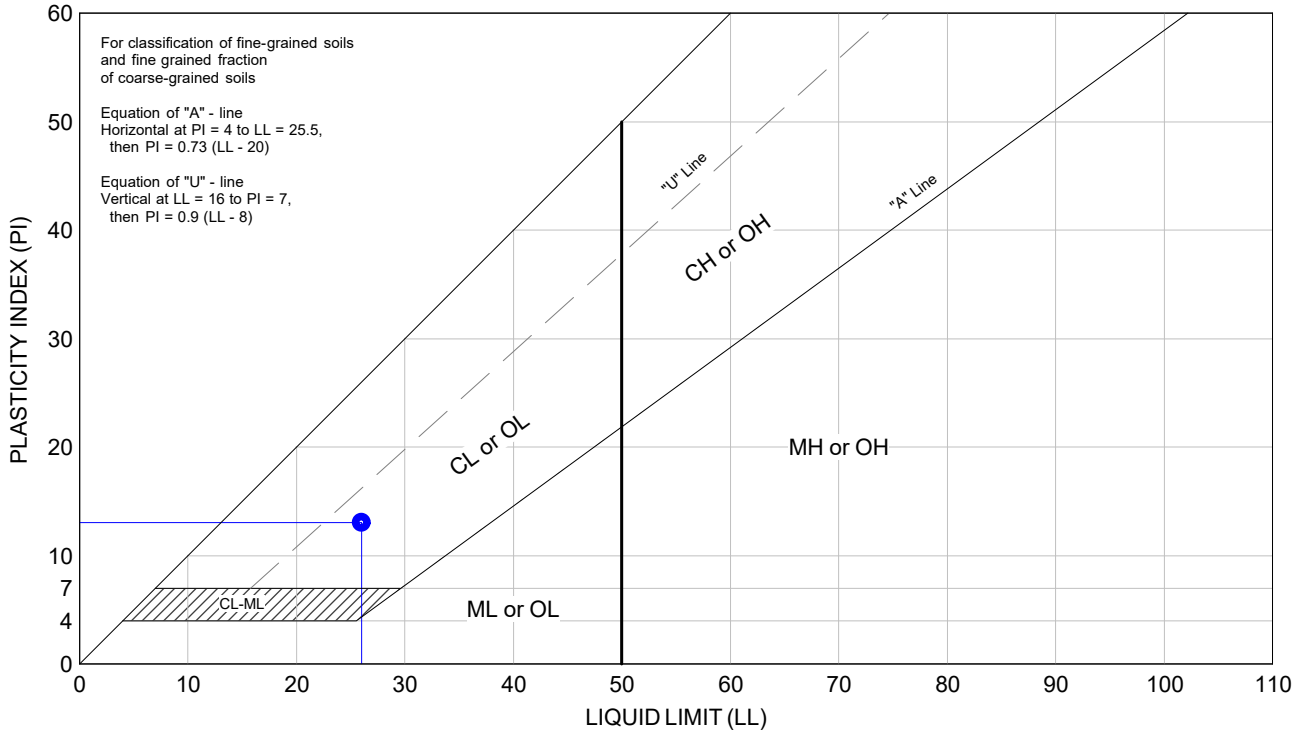
WSP Canada Inc.
1825 Provincial Road Unit 1
Windsor, N8W 5V7
519-250-3733

11/12/2025

Liquid Limit, Plastic Limit and Plasticity Index

Testing Standard: MTO LS-703/704 (Rev. 36)

Testing Program #	052713	Project Number:	CA0051716.2286
Supplier:		Contract Number:	
Source:	On site	Project Name:	Hwy 3, 401, 402
Sample Location:	Site sampled	Client:	MTO
Sample Number:	BH103 - 7	Report Number:	LON00096-25
Soil Description:		WSP Lab Number:	WIN25-01582
Soil Classification:		Date Received:	09/02/2025
Sampled By:	H. Kevadia	Date of Test:	09/23/2025
Date Sampled:	09/02/2025	Tested By:	Jack Marinigh



Sample Depth (m)	Percent Passing 425um Sieve	Natural Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index
			26	13	13	

NP = Non-Plastic
ND = Not Determined

Test Preparation
Lab Testing Comments / Deviations:
General Comments:

Reviewed By: Dave Dillabough Title: Laboratory Supervisor

Signature:

CERTIFIED BY CCIL

WSP Canada Inc.
1825 Provincial Road Unit 1
Windsor, N8W 5V7
519-250-3733

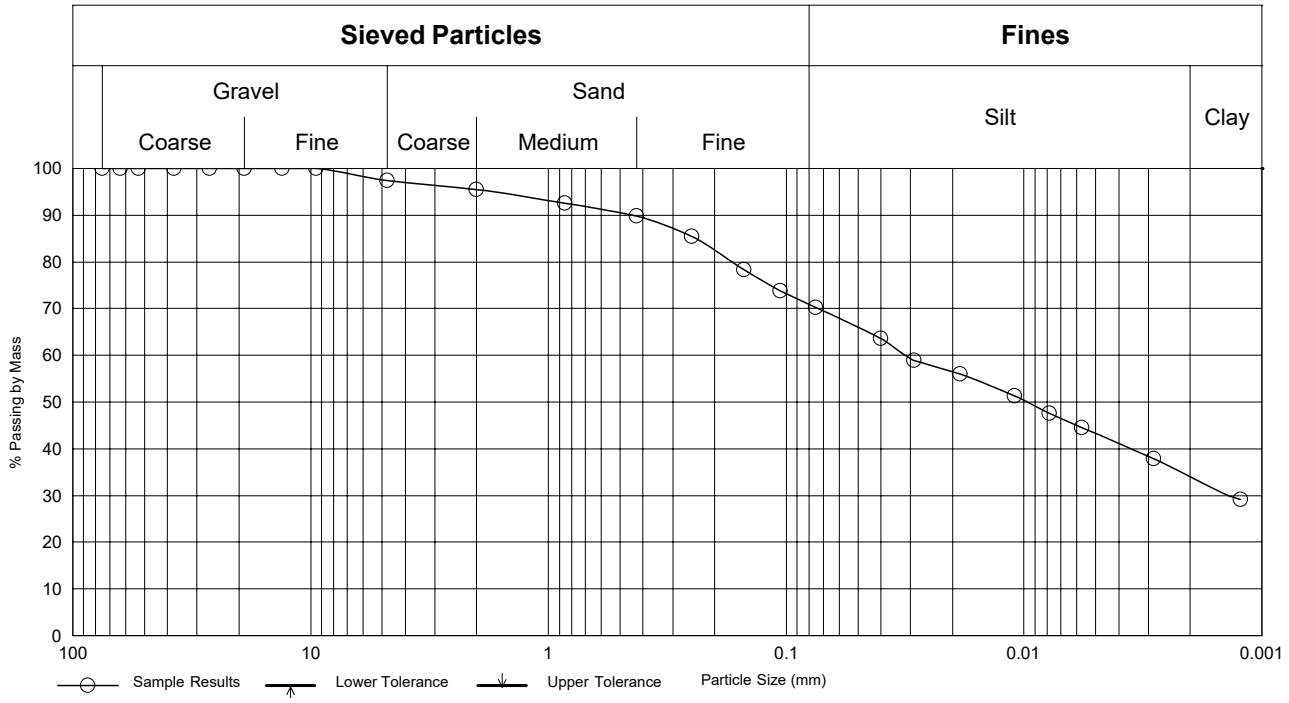
11/12/2025

Particle Size Distribution of Soils

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

Testing Program #:	052713	Project Number:	CA0051716.2286
Supplier:		Contract Number:	
Source:	On site	Client:	MTO
Sample Location:	Site sampled	Project Name:	Hwy 3, 401, 402
Sample Number:	BH103 - 7	Report Number:	LON00096-25
Soil Description:		WSP Lab Number:	WIN25-01582
Soil Classification:		Date Received:	09/02/2025
Specification:		Date of Test:	09/22/2025
Sampled By:	H. Kevadia	Tested By:	Marinigh, Jack
Date Sampled:	09/02/2025		

Grain Size Distribution	Gravel	Sand	Silt / Clay
	2.6	27.2	70.2



Sieve		Hydrometer Sedimentation	
Sieve Size (mm)	% Passing	Particle Size mm	% Passing
		0.0400	63.5
		0.0289	58.8
		0.0186	56.0
		0.0109	51.3
		0.0078	47.5
		0.0057	44.5
75.0		0.0028	37.9
63.0		0.0012	29.1
53.0			
37.5			
26.5			
19.0			
13.2			
9.5	100.0		
4.75	97.4	0.005mm	43.3
2.00	95.5	0.002mm	34.1
0.850	89.9	D60	0.032
0.425	85.4	D30	0.001
0.250	78.3	D10	NA
0.106	73.7	Cu	NA
0.075	70.2	Cc	NA

Notes:

Disclaimer:

Notice: The test data given herein pertain to the sample provided and may not be applicable to other samples or to material from earlier or subsequent production. Reporting of these results constitutes a testing service only. Engineering interpretation and advice may be provided upon written request.

Reviewed By: Dave Dillabough Title: Laboratory Supervisor

Signature:

CERTIFIED BY CCIL

APPENDIX C

Analytical Laboratory Test Data

Your Project #: CA0051716.2286, TASK 700
Your C.O.C. #: C#1057533-05-01

Attention: Harshkumar Kevadia

WSP Canada Inc.
55 King St
Suite 700
St. Catharines, ON
CANADA L2R3H5

Report Date: 2025/11/21
Report #: R8655771
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C5B0983
Received: 2025/09/08, 13:33

Sample Matrix: Soil
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Chloride (20:1 extract)	2	2025/09/11	2025/09/12	CAM SOP-00463	MOE E3013 m
Conductivity	2	2025/09/11	2025/09/11	CAM SOP-00414	OMOE E3530 v1 m
Moisture (Subcontracted) (1, 2)	2	N/A	2025/09/14	AB SOP-00002	CCME PHC-CWS m
Sulphide in Soil (1)	2	N/A	2025/09/16	AB SOP-00080	EPA9030B/SM4500S2-DF
pH CaCl2 EXTRACT	2	2025/09/11	2025/09/11	CAM SOP-00413	EPA 9045 D m
Redox Potential (3)	2	2025/09/17	2025/09/18	CAM SOP-00421	SM 24 2580 B
Resistivity of Soil	2	2025/09/09	2025/09/12	CAM SOP-00414	SM 24 2510 m
Sulphate (20:1 Extract)	2	2025/09/11	2025/09/12	CAM SOP-00464	MOE E3013 m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, EPA, APHA or the Quebec Ministry of Environment.

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

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

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) This test was performed by Bureau Veritas Calgary (19th), 4000 19th Street NE , Calgary, AB, T2E 6P8
(2) Offsite analysis requires that subcontracted moisture be reported.
(3) Oxidation-Reduction Potential (ORP) values are determined using a Ag/AgCl reference electrode. The test is therefore, not SCC accredited for this matrix.

Your Project #: CA0051716.2286, TASK 700
Your C.O.C. #: C#1057533-05-01

Attention: Harshkumar Kevadia

WSP Canada Inc.
55 King St
Suite 700
St. Catharines, ON
CANADA L2R3H5

Report Date: 2025/11/21
Report #: R8655771
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

BUREAU VERITAS JOB #: C5B0983
Received: 2025/09/08, 13:33

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Keshani Vijh, Sr. Project Manager
Email: keshani.vijh@bureauveritas.com
Phone# (905) 817-5700

==========

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

SOIL CORROSIVITY PACKAGE (SOIL)

Bureau Veritas ID		AUWU14		AUWU15		
Sampling Date		2025/09/02 10:00		2025/09/02 14:00		
COC Number		C#1057533-05-01		C#1057533-05-01		
	UNITS	BH-102-5	RDL	BH-103-3	RDL	QC Batch
Calculated Parameters						
Resistivity	ohm-cm	2400		670		A006393
CONVENTIONALS						
Redox Potential	mV	170	N/A	150	N/A	A011952
Inorganics						
Soluble (20:1) Chloride (Cl-)	ug/g	110	20	740	100	A008007
Conductivity	umho/cm	419	2	1490	2	A008151
Available (CaCl2) pH	pH	7.79		7.65		A008293
Soluble (20:1) Sulphate (SO4)	ug/g	110	20	99	20	A008192
Sulphide	mg/kg	1.13 (1)	0.50	<0.50 (1)	0.50	A011827

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Extracted past method specified hold time

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Bureau Veritas Job #: C5B0983
Report Date: 2025/11/21

WSP Canada Inc.
Client Project #: CA0051716.2286, TASK 700
Sampler Initials: HK

RESULTS OF ANALYSES OF SOIL

Bureau Veritas ID		AUWU14	AUWU15		
Sampling Date		2025/09/02 10:00	2025/09/02 14:00		
COC Number		C#1057533-05-01	C#1057533-05-01		
	UNITS	BH-102-5	BH-103-3	RDL	QC Batch
Physical Testing					
Moisture-Subcontracted	%	15	20	0.30	A010007

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

GENERAL COMMENTS

Revised Report [2025/11/21]: Split report as per client request.

Results relate only to the items tested.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Bureau Veritas Job #: C5B0983
Report Date: 2025/11/21

WSP Canada Inc.
Client Project #: CA0051716.2286, TASK 700
Sampler Initials: HK

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
A008007	ADB	Matrix Spike	Soluble (20:1) Chloride (Cl-)	2025/09/12		NC	%	70 - 130
A008007	ADB	Spiked Blank	Soluble (20:1) Chloride (Cl-)	2025/09/12		98	%	70 - 130
A008007	ADB	Method Blank	Soluble (20:1) Chloride (Cl-)	2025/09/12	<20		ug/g	
A008007	ADB	RPD	Soluble (20:1) Chloride (Cl-)	2025/09/12	4.8		%	35
A008151	GTK	Spiked Blank	Conductivity	2025/09/11		101	%	90 - 110
A008151	GTK	Method Blank	Conductivity	2025/09/11	<2		umho/cm	
A008151	GTK	RPD	Conductivity	2025/09/11	0		%	10
A008192	MJ1	Matrix Spike	Soluble (20:1) Sulphate (SO4)	2025/09/12		NC	%	70 - 130
A008192	MJ1	Spiked Blank	Soluble (20:1) Sulphate (SO4)	2025/09/12		97	%	75 - 125
A008192	MJ1	Method Blank	Soluble (20:1) Sulphate (SO4)	2025/09/12	<20		ug/g	
A008192	MJ1	RPD	Soluble (20:1) Sulphate (SO4)	2025/09/12	5.8		%	35
A008293	SRT	Spiked Blank	Available (CaCl2) pH	2025/09/11		100	%	97 - 103
A008293	SRT	RPD [AUWU15-01]	Available (CaCl2) pH	2025/09/11	0.29		%	N/A
A010007	RJF	Method Blank	Moisture-Subcontracted	2025/09/14	<0.30		%	
A010007	RJF	RPD [AUWU15-01]	Moisture-Subcontracted	2025/09/14	1.0		%	20
A011827	CT6	Matrix Spike [AUWU14-01]	Sulphide	2025/09/16		98	%	75 - 125
A011827	CT6	Spiked Blank	Sulphide	2025/09/16		97	%	75 - 125
A011827	CT6	Method Blank	Sulphide	2025/09/16	<0.50		mg/kg	
A011827	CT6	RPD [AUWU14-01]	Sulphide	2025/09/16	7.3		%	30
A011952	GTK	Spiked Blank	Redox Potential	2025/09/18		100	%	80 - 120
A011952	GTK	RPD [AUWU15-01]	Redox Potential	2025/09/18	4.1		%	35

N/A = Not Applicable

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

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

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

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

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

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Cristina Carriere, Senior Scientific Specialist

Veronica Falk, B.Sc., P.Chem., QP, Scientific Specialist, Organics

Louise Harding, Scientific Specialist

Bureau Veritas Proprietary Software
Logiciel Propriétaire de Bureau Veritas

Automated Statchk

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

C5B0983
2025/09/08 13:33

HARSHKUMAR.KEVADIA@WSP.COM

Bureau Veritas
109 & 110, 4023 Meadowbrook Drive, London, Ontario Canada N5L 1E7 Tel:(519) 652-9444 Toll-free:800-563-6266 Fax:(519) 652-8189 www.bvna.com

CHAIN OF CUSTODY RECORD

Page 1 of 1

SCD IN LONDON

INVOICE TO:	REPORT TO:	PROJECT INFORMATION:	Laboratory Use Only:
Company Name: #29908 WSP Canada Inc.	Company Name: WSP CANADA INC	Quotation #: C50182	Bureau Veritas Job #: / Bottle Order #: 1057533
Attention: Accounts Payable	Attention: ~~Quorine Alavata~~ HARSHKUMAR KEVADIA	P.O. #:	
Address: 55 King St Suite 700, St. Catharines ON L2R3H5	Address:	Project: CA0051716.2286, Task ~~400~~ 700	COC #: C#1057533-05-01 / Project Manager: Keshani Vijh
Tel: Fax:	Tel: HARSHKUMAR.~~KEVADIA~~KEVADIA@WSP.COM Fax:	Project Name:	
Email: capayablesinvoice@wsp.com	Email: ~~quorine.alavata@wsp.com~~	Site #:	
		Sampled By:	

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY

Regulation 153 (2011): ☐ Table 1 ☐ Res/Park ☐ Medium/Fine; ☐ Table 2 ☐ Ind/Comm ☐ Coarse; ☐ Table 3 ☐ Agri/Other ☐ For RSC; ☐ Table ___

Other Regulations: ☐ CCME ☐ Sanitary Sewer Bylaw; ☐ Reg 558 ☐ Storm Sewer Bylaw; ☐ MISA Municipality ___; ☐ PWQO ☐ Reg 406 Table ___; ☐ Other ___

Special Instructions

Include Criteria on Certificate of Analysis (Y/N)? ___

ANALYSIS REQUESTED (PLEASE BE SPECIFIC)

Turnaround Time (TAT) Required:
Please provide advance notice for rush projects

Regular (Standard) TAT: ☐
(will be applied if Rush TAT is not specified):
Standard TAT = 5-7 Working days for most tests..
Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.

Job Specific Rush TAT (if applies to entire submission)
Date Required: ___ Time Required: ___ ☐
Rush Confirmation Number: ___ *(call lab for #)*

	Sample Barcode Label	Sample (Location) Identification	Date Sampled	Time Sampled	Matrix	Field Filtered (please circle): Metals / Hg / Cr VI	O.Reg 153 PHCs, BTEX/F1-F4 (Soil)	Metals + Hydrides	Conductivity	Sodium Adsorption Ratio (SAR)	pH CaCl2 EXTRACT	O.Reg 406 Excess Soil SPLP Metals	O.Reg 406 Excess Soil mSPLP Prep	(Corrosivity)			# of Bottles	Comments
1	BH-101-5		Sept 2	10:00	S									X			1	
2	BH-103-3		Sept 2	14:00	S									X			1	
3	BH-301-5		Sept 2	16:00	S									X			1	
4	BH-302-2		Sept 3	9:00	S									X			1	
5																		
6																		
7																		
8																		
9																		
10																		

LON-2025-09-042

* RELINQUISHED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	RECEIVED BY: (Signature/Print)	Date: (YY/MM/DD)	Time	# jars used and not submitted	Laboratory Use Only
Harshkumar Kevadia	25/09/05	11:30	Saumyak	2025/09/08	13:33		Time Sensitive ✓ / Temperature (°C) on Recei 18/18/18 18/17/17 / Custody Seal Present ✓ Intact ✓ / Yes / No

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BUREAU VERITAS'S STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/COC-TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVNA.COM/ENVIRONMENTAL-LABORATORIES/RESOURCES/CHAIN-CUSTODY-FORMS-COCS.

SAMPLES MUST BE KEPT COOL (< 10° C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

White: Bureau Veritas Yellow: Client
Melted ice

Bureau Veritas Canada (2019) Inc.

CERTIFICATE OF ANALYSIS

Work Order	: **WT2533225**		
Amendment	: **1**		
Client	: **WSP Canada Inc.**	Laboratory	: ALS Environmental - Waterloo
Contact	: Jordan Kiss	Account Manager	: Gayle Braun
Address	: 309 Exeter Road Unit #1 London Ontario Canada N6L 1C1	Address	: 60 Northland Road, Unit 1 Waterloo ON Canada N2V 2B8
Telephone	: ----	E-mail	: Gayle.Braun@ALSGlobal.com
Project	: CA0051716.2286-700	Telephone	: +1 519 886 6910
PO	: ----	Date Samples Received	: 17-Nov-2025 12:15
C-O-C number	: ----	Date Analysis Commenced	: 24-Nov-2025
Sampler	: ----	Issue Date	: 30-Nov-2025 13:00
Site	: ----		
Quote number	: 2025 SOA Pricing ON (E)		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QC Interpretive report to assist with Quality Review and Sample Receipt Notification (SRN).

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Centralized Prep, Waterloo, Ontario
Greg Pokocky	Manager - Inorganics	Inorganics, Waterloo, Ontario

General Comments

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Refer to the ALS Quality Control Interpretive report (QCI) for applicable references and methodology summaries. Reference methods may incorporate modifications to improve performance.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Please refer to Quality Control Interpretive report (QCI) for information regarding Holding Time compliance.

Key: CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
LOR: Limit of Reporting (detection limit).

Unit	*Description*
%	percent
mg/kg	milligrams per kilogram
mV	millivolts
ohm cm	ohm centimetres (resistivity)
pH units	pH units
µS/cm	microsiemens per centimetre

<: less than.
>: greater than.
Surrogate: An analyte that is similar in behavior to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Workorder Comments

Amendment (30/11/2025): This report has been amended to alter the site details, project reference code or order number. All analysis results are as per the previous report.

Analytical Results

Sub-Matrix: Soil
(Matrix: Soil/Solid)

Analyte	CAS Number	Method/Lab	LOR	Unit	Client sample ID	BH101-COMP-1 ----	BH207-COMP-2 ----	----	----	----
					Client sampling date / time	14-Nov-2025 10:00	14-Nov-2025 13:05	----	----	----
						WT2533225-001	WT2533225-002	----	----	----
						Result	Result	----	----	----
Physical Tests										
Conductivity (1:2 leachate)	----	E100-L/WT	5.00	µS/cm		796	493	----	----	----
Moisture	----	E144/WT	0.25	%		10.3	12.0	----	----	----
Oxidation-reduction potential [ORP]	----	E125/WT	0.10	mV		256	261	----	----	----
pH (1:2 soil:CaCl2-aq)	----	E108A/WT	0.10	pH units		7.53	7.73	----	----	----
Resistivity	----	EC100R/WT	100	ohm cm		1260	2030	----	----	----
Inorganics										
Sulfides, acid volatile	----	E396-L/WT	0.20	mg/kg		<0.22	0.36	----	----	----
Leachable Anions & Nutrients										
Chloride, soluble ion content	16887-00-6	E236.Cl/WT	5.0	mg/kg		8.7	12.7	----	----	----
Sulfate, soluble ion content	14808-79-8	E236.SO4/WT	20	mg/kg		32	32	----	----	----

Please refer to the General Comments section for an explanation of any qualifiers detected.

ALS Canada Ltd.

right solutions.
right partner.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **WT2533225**	Page	: 1 of 7
Amendment	: **1**		
Client	: **WSP Canada Inc.**	Laboratory	: ALS Environmental - Waterloo
Contact	: Jordan Kiss	Account Manager	: Gayle Braun
Address	: 309 Exeter Road Unit #1 London ON Canada N6L 1C1	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: ----	Telephone	: +1 519 886 6910
Project	: CA0051716.2286-700	Date Samples Received	: 17-Nov-2025 12:15
PO	: ----	Issue Date	: 30-Nov-2025 12:59
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: 2025 SOA Pricing ON (E)		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 00:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 00:00 is used for calculation purposes.

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Inorganics : Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)										
Glass soil jar/Teflon lined cap [ON MECP] BH101-COMP-1	E396-L	14-Nov-2025	24-Nov-2025	14 days	10 days	✓	24-Nov-2025	7 days	0 days	✓
Inorganics : Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)										
Glass soil jar/Teflon lined cap [ON MECP] BH207-COMP-2	E396-L	14-Nov-2025	24-Nov-2025	14 days	10 days	✓	24-Nov-2025	7 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
Glass soil jar/Teflon lined cap [ON MECP] BH101-COMP-1	E236.Cl	14-Nov-2025	25-Nov-2025	30 days	11 days	✓	25-Nov-2025	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Chloride by IC										
Glass soil jar/Teflon lined cap [ON MECP] BH207-COMP-2	E236.Cl	14-Nov-2025	25-Nov-2025	30 days	11 days	✓	25-Nov-2025	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Sulfate by IC										
Glass soil jar/Teflon lined cap [ON MECP] BH101-COMP-1	E236.SO4	14-Nov-2025	25-Nov-2025	30 days	11 days	✓	25-Nov-2025	28 days	0 days	✓
Leachable Anions & Nutrients : Water Extractable Sulfate by IC										
Glass soil jar/Teflon lined cap [ON MECP] BH207-COMP-2	E236.SO4	14-Nov-2025	25-Nov-2025	30 days	11 days	✓	25-Nov-2025	28 days	0 days	✓
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP] BH207-COMP-2	E100-L	14-Nov-2025	26-Nov-2025	30 days	12 days	✓	27-Nov-2025	30 days	12 days	✓

Matrix: **Soil/Solid**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group : Analytical Method / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)										
Glass soil jar/Teflon lined cap [ON MECP] BH101-COMP-1	E100-L	14-Nov-2025	26-Nov-2025	30 days	13 days	✓	27-Nov-2025	30 days	13 days	✓
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP] BH101-COMP-1	E144	14-Nov-2025	----	----	----		24-Nov-2025	----	----	
Physical Tests : Moisture Content by Gravimetry										
Glass soil jar/Teflon lined cap [ON MECP] BH207-COMP-2	E144	14-Nov-2025	----	----	----		24-Nov-2025	----	----	
Physical Tests : ORP by Electrode										
Glass soil jar/Teflon lined cap [ON MECP] BH101-COMP-1	E125	14-Nov-2025	25-Nov-2025	180 days	11 days	✓	26-Nov-2025	180 days	11 days	✓
Physical Tests : ORP by Electrode										
Glass soil jar/Teflon lined cap [ON MECP] BH207-COMP-2	E125	14-Nov-2025	25-Nov-2025	180 days	11 days	✓	26-Nov-2025	180 days	11 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap [ON MECP] BH101-COMP-1	E108A	14-Nov-2025	26-Nov-2025	30 days	12 days	✓	27-Nov-2025	30 days	12 days	✓
Physical Tests : pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received										
Glass soil jar/Teflon lined cap [ON MECP] BH207-COMP-2	E108A	14-Nov-2025	26-Nov-2025	30 days	12 days	✓	27-Nov-2025	30 days	12 days	✓

Legend & Qualifier Definitions

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Soil/Solid**

Evaluation: × = *QC frequency outside specification*; ✓ = *QC frequency within specification.*

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	2352185	1	17	5.8	5.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	2355993	1	20	5.0	5.0	✓
ORP by Electrode	E125	2354874	1	16	6.2	5.0	✓
Moisture Content by Gravimetry	E144	2353819	1	19	5.2	5.0	✓
Water Extractable Chloride by IC	E236.Cl	2354855	1	3	33.3	5.0	✓
Water Extractable Sulfate by IC	E236.SO4	2354854	1	3	33.3	5.0	✓
Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)	E396-L	2353086	1	14	7.1	4.7	✓
Laboratory Control Samples (LCS)							
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	2352185	2	17	11.7	10.0	✓
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A	2355993	1	20	5.0	5.0	✓
ORP by Electrode	E125	2354874	1	16	6.2	5.0	✓
Moisture Content by Gravimetry	E144	2353819	1	19	5.2	5.0	✓
Water Extractable Chloride by IC	E236.Cl	2354855	2	3	66.6	10.0	✓
Water Extractable Sulfate by IC	E236.SO4	2354854	2	3	66.6	10.0	✓
Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)	E396-L	2353086	1	14	7.1	4.7	✓
Method Blanks (MB)							
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L	2352185	1	17	5.8	5.0	✓
Moisture Content by Gravimetry	E144	2353819	1	19	5.2	5.0	✓
Water Extractable Chloride by IC	E236.Cl	2354855	1	3	33.3	5.0	✓
Water Extractable Sulfate by IC	E236.SO4	2354854	1	3	33.3	5.0	✓
Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)	E396-L	2353086	1	14	7.1	4.7	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Soil (1:2 Soil:Water Extraction) (Low Level)	E100-L ALS Environmental - Waterloo	Soil/Solid	CSSS Ch. 15 (mod)/APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Conductance is measured in the fluid that is observed in the upper layer.
pH by Meter (1:2 Soil:0.01M CaCl2 Extraction) - As Received	E108A ALS Environmental - Waterloo	Soil/Solid	MECP E3530	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C) and is carried out in accordance with procedures described in the Analytical Protocol (prescriptive method). A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling, or decanting and then analyzed using a pH meter and electrode. This method is equivalent to ASTM D4972 and is acceptable for topsoil analysis.
ORP by Electrode	E125 ALS Environmental - Waterloo	Soil/Solid	APHA 2580 (mod)	Oxidation Redution Potential (ORP) is reported as the oxidation-reduction potential of the platinum metal-reference electrode employed in the analysis, measured in mV.
Moisture Content by Gravimetry	E144 ALS Environmental - Waterloo	Soil/Solid	CCME PHC in Soil - Tier 1	Moisture is measured gravimetrically by drying the sample at 105°C. Moisture content is calculated as the weight loss (due to water) divided by the wet weight of the sample, expressed as a percentage.
Water Extractable Chloride by IC	E236.Cl ALS Environmental - Waterloo	Soil/Solid	EPA 300.1	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection using a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Anions are measured in the fluid that is observed in the upper layer.
Water Extractable Sulfate by IC	E236.SO4 ALS Environmental - Waterloo	Soil/Solid	EPA 300.1	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection using a soil sample that has been added in a defined ratio of soil to deionized water, then shaken well and allowed to settle. Anions are measured in the fluid that is observed in the upper layer.
Acid Volatile Sulfide in Soil by Colourimetry (0.2 mg/kg)	E396-L ALS Environmental - Waterloo	Soil/Solid	APHA 4500S2J	This analysis is carried out in accordance with the method described in APHA 4500 S2-J. After extraction the Acid Volatile Sulphide is determined colourimetrically.
Resistivity Calculation for Soil Using E100-L	EC100R ALS Environmental - Waterloo	Soil/Solid	APHA 2510 B	Soil Resistivity (calculated) is determined as the inverse of the conductivity of a 2:1 water:soil leachate (dry weight). This method is intended as a rapid approximation for Soil Resistivity. Where high accuracy results are required, direct measurement of Soil Resistivity by the Wenner Four-Electrode Method (ASTM G57) is recommended.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Leach 1:2 Soil:Water for pH/EC	EP108 ALS Environmental - Waterloo	Soil/Solid	BC WLAP METHOD: PH, ELECTROMETRIC, SOIL	The procedure involves mixing the dried (at <60°C) and sieved (No. 10 / 2mm) sample with deionized/distilled water at a 1:2 ratio of sediment to water.
Leach 1:2 Soil : 0.01CaCl2 - As Received for pH	EP108A ALS Environmental - Waterloo	Soil/Solid	MOEE E3137A	A minimum 10g portion of the sample, as received, is extracted with 20mL of 0.01M calcium chloride solution by shaking for at least 30 minutes. The aqueous layer is separated from the soil by centrifuging, settling or decanting and then analyzed using a pH meter and electrode.
Preparation of ORP by Electrode	EP125 ALS Environmental - Waterloo	Soil/Solid	APHA 2580 (mod)	Field-moist sample is extracted in a 1:2 ratio with DI water and then analyzed by ORP meter.
Anions Leach 1:10 Soil:Water (Dry)	EP236 ALS Environmental - Waterloo	Soil/Solid	EPA 300.1	5 grams of dried soil is mixed with 50 grams of distilled water for a minimum of 30 minutes. The extract is filtered and analyzed by ion chromatography.
Distillation for Acid Volatile Sulfide in Soil	EP396-L ALS Environmental - Waterloo	Soil/Solid	APHA 4500S2J	Acid Volatile Sulfide is determined by colourimetric measurement on a sediment sample that has been treated with hydrochloric acid within a purge and trap system, where the evolved hydrogen sulfide gas is carried into a basic solution by argon gas for analysis.

QUALITY CONTROL REPORT

Work Order	: **WT2533225**	Page	: 1 of 5
Amendment	: **1**		
Client	: WSP Canada Inc.	Laboratory	: ALS Environmental - Waterloo
Contact	: Jordan Kiss	Account Manager	: Gayle Braun
Address	: 309 Exeter Road Unit #1 London ON Canada N6L 1C1	Address	: 60 Northland Road, Unit 1 Waterloo, Ontario Canada N2V 2B8
Telephone	: ----	Telephone	: +1 519 886 6910
Project	: CA0051716.2286-700	Date Samples Received	: 17-Nov-2025 12:15
PO	: ----	Date Analysis Commenced	: 24-Nov-2025
C-O-C number	: ----	Issue Date	: 30-Nov-2025 12:59
Sampler	: ----		
Site	: ----		
Quote number	: 2025 SOA Pricing ON (E)		
No. of samples received	: 2		
No. of samples analysed	: 2		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Reference Material (RM) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is conducted in accordance with US FDA 21 CFR Part 11.

Signatories	*Position*	*Laboratory Department*
Amanda Ganouri-Lumsden	Department Manager - Microbiology and Prep	Waterloo Centralized Prep, Waterloo, Ontario
Greg Pokocky	Manager - Inorganics	Waterloo Inorganics, Waterloo, Ontario

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Soil/Solid**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 2352185)											
WT2532693-006	Anonymous	Conductivity (1:2 leachate)	----	E100-L	5.00	µS/cm	2.38 mS/cm	2250	5.62%	20%	----
Physical Tests (QC Lot: 2353819)											
HA2505097-001	Anonymous	Moisture	----	E144	0.25	%	24.2	23.4	3.24%	20%	----
Physical Tests (QC Lot: 2354874)											
CG2516749-001	Anonymous	Oxidation-reduction potential [ORP]	----	E125	0.10	mV	323	315	2.51%	25%	----
Physical Tests (QC Lot: 2355993)											
WT2531643-035	Anonymous	pH (1:2 soil:CaCl2-aq)	----	E108A	0.10	pH units	8.11	8.15	0.492%	5%	----
Inorganics (QC Lot: 2353086)											
EO2510509-003	Anonymous	Sulfides, acid volatile	----	E396-L	0.27	mg/kg	1.25	1.88	40.6%	45%	----
Leachable Anions & Nutrients (QC Lot: 2354854)											
WT2533145-001	Anonymous	Sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	34	34	0.3	Diff <2x LOR	----
Leachable Anions & Nutrients (QC Lot: 2354855)											
WT2533145-001	Anonymous	Chloride, soluble ion content	16887-00-6	E236.Cl	5.0	mg/kg	6.6	6.0	0.7	Diff <2x LOR	----

Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: **Soil/Solid**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 2352185)						
Conductivity (1:2 leachate)	----	E100-L	5	µS/cm	<5.00	----
Physical Tests (QCLot: 2353819)						
Moisture	----	E144	0.25	%	<0.25	----
Inorganics (QCLot: 2353086)						
Sulfides, acid volatile	----	E396-L	0.2	mg/kg	<0.20	----
Leachable Anions & Nutrients (QCLot: 2354854)						
Sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	<20	----
Leachable Anions & Nutrients (QCLot: 2354855)						
Chloride, soluble ion content	16887-00-6	E236.Cl	5	mg/kg	<5.0	----

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Soil/Solid**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Target Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 2352185)									
Conductivity (1:2 leachate)	----	E100-L	5	µS/cm	1410 µS/cm	102	90.0	110	----
Physical Tests (QCLot: 2353819)									
Moisture	----	E144	0.25	%	50 %	100	90.0	110	----
Physical Tests (QCLot: 2355993)									
pH (1:2 soil:CaCl2-aq)	----	E108A	----	pH units	7 pH units	100	98.0	102	----
Inorganics (QCLot: 2353086)									
Sulfides, acid volatile	----	E396-L	0.2	mg/kg	100 mg/kg	92.0	70.0	130	----
Leachable Anions & Nutrients (QCLot: 2354854)									
Sulfate, soluble ion content	14808-79-8	E236.SO4	20	mg/kg	1000 mg/kg	101	80.0	120	----
Leachable Anions & Nutrients (QCLot: 2354855)									
Chloride, soluble ion content	16887-00-6	E236.Cl	5	mg/kg	1000 mg/kg	100	80.0	120	----

Reference Material (RM) Report

A Reference Material (RM) is a homogenous material with known and well-established analyte concentrations. RMs are processed in an identical manner to test samples, and are used to monitor and control the accuracy and precision of a test method for a typical sample matrix. RM results are expressed as percent recovery of the target analyte concentration. RM targets may be certified target concentrations provided by the RM supplier, or may be ALS long-term mean values (for empirical test methods).

Sub-Matrix:

					Reference Material (RM) Report				
					RM Target	Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Reference Material ID	Analyte	CAS Number	Method	Concentration	RM	Low	High	Qualifier
Physical Tests (QCLot: 2352185)									
QC-2352185-003	RM	Conductivity (1:2 leachate)	----	E100-L	888 µS/cm	105	70.0	130	----
Physical Tests (QCLot: 2354874)									
QC-2354874-001	RM	Oxidation-reduction potential [ORP]	----	E125	475 mV	102	90.0	110	----
Leachable Anions & Nutrients (QCLot: 2354854)									
QC-2354854-003	RM	Sulfate, soluble ion content	14808-79-8	E236.SO4	493 mg/kg	111	70.0	130	----
Leachable Anions & Nutrients (QCLot: 2354855)									
QC-2354855-003	RM	Chloride, soluble ion content	16887-00-6	E236.Cl	495 mg/kg	110	70.0	130	----

SOL-680 CP

Chain of Custody (COC) / Analytical Request Form

COC Number: 23 - 116

Page 1 of 1

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

Environmental Division Waterloo

Work Order Reference WT2533225

Telephone : +1 519 886 6910

Report To	Contact and company name below will appear on the final report
Company:	WSP CANADA
Contact:	JORDAN KISS
Phone:	519-281-9631
Company address below will appear on the final report	
Street:	309 FEDERAL UNIT 1
City/Province:	LONDON
Postal Code:	N6L-1C1
Invoice To	Same as Report To [x] YES [ ] NO
	Copy of Invoice with Report [ ] YES [ ] NO
Company:	
Contact:	

Reports / Recipients	
Select Report Format:	[x] PDF [x] EXCEL [ ] EDD (DIGITAL)
Merge QC/QCI Reports with COA	[ ] YES [ ] NO [ ] N/A
[ ] Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	[ ] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	JORDAN.KISS@WSP.COM
Email 2	
Email 3	

Invoice Recipients	
Select Invoice Distribution:	[x] EMAIL [ ] MAIL [ ] FAX
Email 1 or Fax	
Email 2	CAPayables.NVoice@WSP.com

Turnaround Time (TAT) Requested
[x] Routine [R] if received by 3pm M-F - no surcharges apply
[ ] 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum
[ ] 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum
[ ] 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum
[ ] 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum
[ ] Same day [E2] if received by 10am M-S - 200% rush surcharge.
Additional fees may apply to rush requests on weekends.
Date and Time Required for all E&P TATs:

For all tests with rush TATs requested, please contact your AM to confirm availability.

Project Information	
ALS Client Code / QUOTE #:	
Job / Project #:	
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (ALS use only): WT2533225NTB

ALS Contact: Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Soil Carbonate	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	BH101-COMP-1	14/11/25	10:00	Soil	1	R			
	BH207-COMP-2	14/11/25	13:05	Soil	1	R			

Drinking Water (DW) Samples[1] (client use)	Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)
Are samples taken from a Regulated DW System? [ ] YES [ ] NO	
Are samples for human consumption/ use? [ ] YES [ ] NO	

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: [x] NONE [ ] ICE [ ] ICE PACKS [ ] FROZEN [ ] COOLING INITIATED

Cooler Custody Seals Intact: [ ] YES [ ] N/A Sample Custody Seals Intact: [ ] YES [ ] N/A

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
15				0.2			

SHIPMENT RELEASE (client use)		
Released by: KIRK BOUDREAU	Date: NOV 17/25	Time: 1211

INITIAL SHIPMENT RECEPTION (ALS use only)		
Received by:	Date: 17 NOV 25	Time: 12:15

FINAL SHIPMENT RECEPTION (ALS use only)		
Received by: CP	Date: 11/17/25	Time: 17:30

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

JAN 2023 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

APPENDIX D

Notice to Contractor

SIGN SUPPORT FOUNDATIONS – SUBSURFACE CONDITIONS

NOTICE TO CONTRACTOR

The contractor is alerted that the native soils contain cobbles and boulders. Appropriate equipment and procedures will be required to penetrate or remove such obstructions during caisson foundation construction.

The contractor is also alerted that water-bearing non-cohesive soils at Sign No. 401PM3195VWS should be expected to run or flow into the drillholes during foundation installation. Additionally, perched groundwater conditions may be likely at Sings No. 401PM3181VWS and 401PM3180VWS. Appropriate equipment and procedure, such as use of casings and/or water/drilling fluid to maintain a positive head of pressure within the drill hole, will be required to minimize the ground loss and to control base disturbance/heave. Specifically, a temporary liner will be required during advancement of the caisson for Sign No. 401PM3195VWS. Further, the placement of concrete by tremie method will be required at each sign location.

Sign foundations will be constructed in accordance with the OPSS.PROV 915 (Construction Specification for Sign Support Structures) and OPSS.PROV 903 (Construction Specification for Deep Foundations). The contractor is to confirm cleanliness of the base of the foundation excavation. Loosened material present at the base of the foundations must be removed.

wsp.com