



REPORT

Foundation Investigation Report

QEW Burlington Skyway Southbound Lane

Overhead Sign Relocation

City of Burlington, Halton Region

Ministry of Transportation, Ontario

GWP 2385-15-00

Submitted to:

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GEOCRES No. 30M5-353

Lat: 43.311382°

Long: -79.804780°



Distribution List

1 PDF copy - MTO - Central Region

1 PDF copy - MTO - Foundations Section

1 PDF copy - WSP Canada Inc.

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1.0 INTRODUCTION

WSP Golder (formerly Golder Associates Ltd., now a member of WSP Canada Inc.) has been retained by WSP Canada Inc. on behalf of the Ministry of Transportation, Ontario (MTO) to provide detail design foundation engineering services for the relocation of one overhead sign structure as part of the QEW Burlington Skyway Southbound Lane (SBL) rehabilitation.

The QEW Burlington Skyway SBL rehabilitation includes widening of QEW by one lane between the North Shore Boulevard and the Burlington Skyway Bridge including re-alignment of the QEW Niagara bound collector lane. To support the collector lane re-alignment, the existing overhead sign spanning across both the QEW Niagara bound collector lane and Eastport Drive will need to be re-located.

The purpose of this investigation is to assess the subsurface conditions near the location of the new sign through borehole drilling, in-situ testing, and laboratory testing on selected soil samples.

This report summarizes the factual results of field and laboratory work (including field investigation procedures, borehole stratigraphy, and geotechnical and analytical laboratory test results) and provides a description of the interpreted soil and groundwater conditions at the proposed sign location.

2.0 SITE DESCRIPTION

The orientation (i.e., north, south, east, and west) stated in the text of this report is referenced to project north and therefore may differ from magnetic north shown on Drawing 1. For the purpose of this report, QEW is considered to be oriented in a north-south direction with the proposed overhead sign perpendicular to the highway in a generally west-east direction.

The existing sign OHS is located on the QEW Niagara Bound Collector at about Station 10+060 (approximately 600 m south of North Shore Boulevard) and the new sign location is to be located about 130 m to the north at Station 9+932. The ground surface conditions at the proposed sign location are shown in Photographs 1 to 3.

3.0 INVESTIGATION PROCEDURE

The fieldwork for this subsurface exploration program was carried out on December 11 and 12, 2022 at which time a total of two boreholes (designated OHS-1 and OHS-2) were advanced near the proposed foundation elements of the overhead sign support structure. The approximate locations of the boreholes are shown in Drawing 1.

The boreholes were advanced using a CME 75 truck-mounted drilling rig, supplied and operated by Geo-Environmental Drilling Inc. (GEDI) of Acton, Ontario. Traffic control was performed in accordance with the Ontario Traffic Manual Book 7 – Temporary Conditions by Direct Traffic Management Inc. of Hamilton, Ontario.

Boreholes OHS-1 and OHS-2 were advanced using 108 mm and 57 mm hollow stem augers, respectively. Soil samples were generally obtained at 0.75 metre (m) and 1.5 m intervals of depth, using 50 mm outside diameter split-spoon samplers driven by an automatic hammer in accordance with Standard Penetration Test (SPT) procedures (ASTM D1586)¹. The split-spoon samplers used in the investigation limit the maximum particle size that can be sampled and tested to about 35 mm. Therefore, particles or objects that may exist within the soils that are larger than this dimension would not be sampled or represented in the grain size distributions.

¹ ASTM D1586/D1586M-18 Standard Test Method for Standard Penetration Test (SPT) and Split Barrel Sampling of Soils.

The groundwater conditions were noted in the boreholes during and upon completion of drilling and were backfilled in accordance with Ontario Regulation 903 Wells (as amended), and the ground surface restored to near original condition as practicable.

The field work was observed by members of WSP Golder's engineering and technical staff, who located the boreholes in the field, arranged for the clearance of underground utilities, supervised the drilling and sampling operations, logged the boreholes, and examined the soil samples. The soil samples were identified in the field, placed in individually labelled containers, and transported to WSP Golder's geotechnical laboratory in Mississauga for further examination and laboratory testing. Index and classification testing consisting of water contents, grain size distributions, and Atterberg limits determinations were carried out on selected soil samples. The geotechnical laboratory testing was completed according to MTO LS standards, as applicable. Further, two soil samples were obtained using appropriate protocols and submitted to a specialist analytical laboratory under chain of custody procedures for testing a suite of parameters including pH, resistivity, conductivity, chlorides, sulphates, and sulphides.

The as-drilled borehole locations and corresponding ground surface elevations were surveyed on-site by WSP personnel using a Trimble Geo7 GPS unit and the measurements are accurate to within 0.5 m horizontally and 0.1 m vertically. The NAD83 Canadian Spatial Reference System (CSRS) V6:2010 MTM Zone 10 northing and easting coordinates, World Geodetic System 1984 (WGS 84) geographic coordinates, ground surface elevations referenced to the Canadian Geodetic Vertical Datum (CGVD 1928), and borehole depths at each location are presented on the borehole records in Appendix A and are summarized below.

Borehole No.	Location (NAD 83 MTO Zone 10)		Location (WGS 84)		Ground Surface Elevation (m)	Borehole Depth (m)
	Northing	Easting	Latitude (°)	Longitude (°)		
OHS-1	4796877.3	280071.4	43.311372	-79.804844	77.6	9.8
OHS-2	4796877.8	280081.8	43.311376	79.804712	78.0	8.2

4.0 SITE GEOLOGY AND SUBSURFACE CONDITIONS

4.1 Regional Geology

Based on the Surficial Geology of Southern Ontario² mapping, the Burlington Skyway site is located within a coarse-textured lacustrine deposit, primarily consisting of sand and gravel with minor silt and clay and littoral deposits. This section of the QEW is located on a baymouth sand bar that crosses the west end of Lake Ontario, extending from Burlington to Hamilton, as delineated in the Urban Geology of Canadian Cities (Karrow and White, 1998)³

Based on geological mapping by the Ministry of Northern Development and Mines (MNDM)⁴, the site is underlain by bedrock belonging to the Queenston formation consisting of shale, limestone, dolostone and siltstone.

² Ministry of Natural Resources, Surficial Geology of Southern Ontario. Ontario Geological Society Electronic Mapping.

³ Geological Association of Canada, 1998. *Urban Geology of Canadian Cities*. GAC Special Paper 42, Editors P.F. Karrow and O.L. White.

⁴ Ministry of Northern Development of Mines. Bedrock Geology of Ontario – Southern Sheet, Ontario Geological Survey – Map 2544.

4.2 Subsurface Conditions

The detailed subsurface soil and groundwater conditions encountered in the boreholes and the results of the in situ and laboratory testing are given on the Record of Borehole sheets contained in Appendix A. The detailed results of the geotechnical laboratory testing are contained in Appendix B. The results of the in-situ field tests (i.e., SPT 'N' values), as presented in the Record of Borehole sheets and in the subsections below, are uncorrected. The stratigraphic boundaries shown in the Record of Borehole sheets are inferred from non-continuous sampling and therefore, represent transitions between soil types rather than exact planes of geological change. The subsurface conditions will vary between and beyond the borehole locations.

In summary, the subsurface conditions consist of the existing pavement structure (i.e., asphalt, sand fill and clayey sand fill) underlain by deposits of sand to silty sand, organic silt, and gravel.

4.2.1 Asphalt

A 100 mm and 130 mm thick layer of asphalt was encountered at the ground surface (i.e., Elevations 77.6 m and 78.0 m) in Boreholes OHS-1 and OHS-2, respectively.

4.2.2 SAND (SP) FILL

A layer of brown, moist, gravelly sand fill, trace silt was encountered below the asphalt in Boreholes OHS-1 and OHS-2. The granular fill was encountered at Elevations 77.5 m and 77.9 m and was 0.7 m and 0.6 m thick, extending to Elevations 76.8 m to 77.3 m, in Boreholes OHS-1 and OHS-2, respectively.

SPT 'N'-values measured within the gravelly sand fill were 22 blows and 40 blows per 0.3 m of penetration, indicating a compact to dense state of compactness.

4.2.3 CLAYEY SAND (SC) FILL

A layer of reddish brown, moist, clayey sand fill, trace to some gravel was encountered below the gravelly sand fill in Boreholes OHS-1 and OHS-2. The clayey sand fill was encountered at Elevations 76.8 m and 77.3 m and was 0.7 and 0.6 m thick, extending to Elevations 76.2 m to 76.6 m in Boreholes OHS-1 and OHS-2, respectively.

SPT 'N'-values measured within the clayey sand fill were 12 blows and 16 blows per 0.3 m of penetration, indicating a compact state of compactness.

The water contents measured on two samples of the clayey silt fill was 13% and 14%.

Grain size distribution testing was carried out on a sample of the clayey sand fill and the results are presented on Figure B-1 in Appendix B. Atterberg limits testing was carried out on two samples of the fill and the results are presented on Figure B-2. The Atterberg limits tests measured liquid limits of 26% and 27%, plastic limits of 17% and 21%, and corresponding plasticity indices of 6% and 9%, indicating the fines portion of the clayey sand fill has a borderline to low plasticity.

4.2.4 SAND (SP-SM) to SILTY SAND (SM)

A deposit of reddish brown to grey, moist to wet, sand, trace silt to silty sand was encountered below the clayey sand fill in Boreholes OHS-1 and OHS-2. The sand to silty sand deposit was encountered at Elevations 76.2 m and 76.6 m and was approximately 4.2 m and 3.1 m thick, extending to Elevations 73.5 m and 72.0 m.

SPT 'N'-values measured with the sand to silty sand deposit ranged from 1 blow to 14 blows per 0.3 m of penetration, indicating very loose to compact state of compactness.

The water contents measured on five samples of the sand to silty sand deposit range from 6% to 35%.

Grain size distribution testing was carried out on three samples of the sand to silty sand deposit and the results are presented on Figure B-3 in Appendix B.

Atterberg limits testing was carried out on the fines portion of a sample of the silty sand, which returned a non-plastic test result.

4.2.5 ORGANIC SILT (OL)

A deposit of brown, wet, sandy organic silt to organic silt and sand was encountered below the sand to silty sand deposit in Boreholes OHS-1 and OHS-2. The organic silt was encountered at Elevations 72.0 m and 73.5 m in Boreholes OHS-1 and OHS-2, respectively. In Borehole OHS-1, the organic silt was 3.1 m thick, extending to Elevation 68.9 m. Borehole OHS-2 was terminated at Elevation 69.8 m after penetrating 2.6 m into the deposit and encountering a methane gas pocket.

The SPT 'N'-values measured within the organic silt deposit ranged from 3 blows to 9 blows per 0.3 m of penetration, indicating a very loose to loose state of compactness.

The water contents measured on three samples of the organic silt range from 63% to 118%.

Grain size distribution testing was carried out on a sample of the organic silt deposit and the results are presented on Figure B-4 in Appendix B.

Organic content testing on two samples of the organic silt yielded organic contents of 14% and 19%.

4.2.6 GRAVEL (GW-GM)

A deposit of reddish brown, wet, gravel and sand was encountered below the organic silt in Borehole OHS-1. The gravel deposit was encountered at Elevation 68.9 m and Borehole OHS-1 was terminated at Elevation 67.8 m after penetrating 1.1 m into the deposit.

An SPT 'N'-value measured within the gravel deposit was 25 blows per 0.3 m of penetration, indicating a compact state of compactness.

The water content measured on a sample of the gravel deposit was 11%.

Grain size distribution testing was carried out on a sample of the gravel deposit and the results are presented on Figure B-5 in Appendix B.

4.3 Groundwater Conditions

The unstabilized groundwater level was measured in Borehole OHS-1 at a depth of 3.4 m below the existing ground surface (i.e., Elevation 74.2 m) upon completion; however, wet samples were observed below Elevation 75.3 m during drilling, which could be indicative of a slightly higher groundwater level. The unstabilized groundwater level was not measured in Borehole OHS-2, as the borehole was terminated and abandoned after encountering a methane gas pocket; however, wet samples were observed in Borehole OHS-2 below Elevation 75.7 m.

Groundwater levels are subject to seasonal fluctuations and precipitation events and should be expected to be higher during wet periods of the year.

4.4 Analytical Testing

The results of analytical testing of four soil samples, which were submitted to Bureau Veritas (an accredited analytical testing laboratory), are detailed in the laboratory test report (Certificate of Analysis) included in Appendix C and are summarized below.

Borehole and Sample No.	Depth / Elevation (m)	Resistivity (ohm-cm)	Conductivity (µmho/cm)	pH	Chloride (µg/g)	Sulphate (µg/g)	Sulphide (mg/kg)
OHS-1 Sample No. 4	2.6 / 75.0	700	1430	7.41	830	<20 ¹	13.1
OHS-2 Sample No. 4	2.6 / 75.4	1200	817	7.44	470	<20 ¹	3.3

Note 1: Sulphate concentrations are less than the reportable detection limit (RDL) of 20 µg/g.

5.0 CLOSURE

The field drilling program was carried out under the supervision of Mr. Ankaren Maheswaran, EIT under the overall direction of Mr. Mark Henderson, P.Eng. This Foundation Investigation Report was prepared by Mr. Ankaren Maheswaran, E.I.T. and Mr. Mark Henderson, P.Eng., provided a technical review of the report. Mr. David Muldowney, P.Eng., an MTO Foundations Designated Contact and Principal Geotechnical Engineer of WSP Golder, conducted an independent technical and quality control review of the report.

Signature Page

WSP Golder



Ankaren Maheswaran, EIT
Junior Geotechnical Analyst



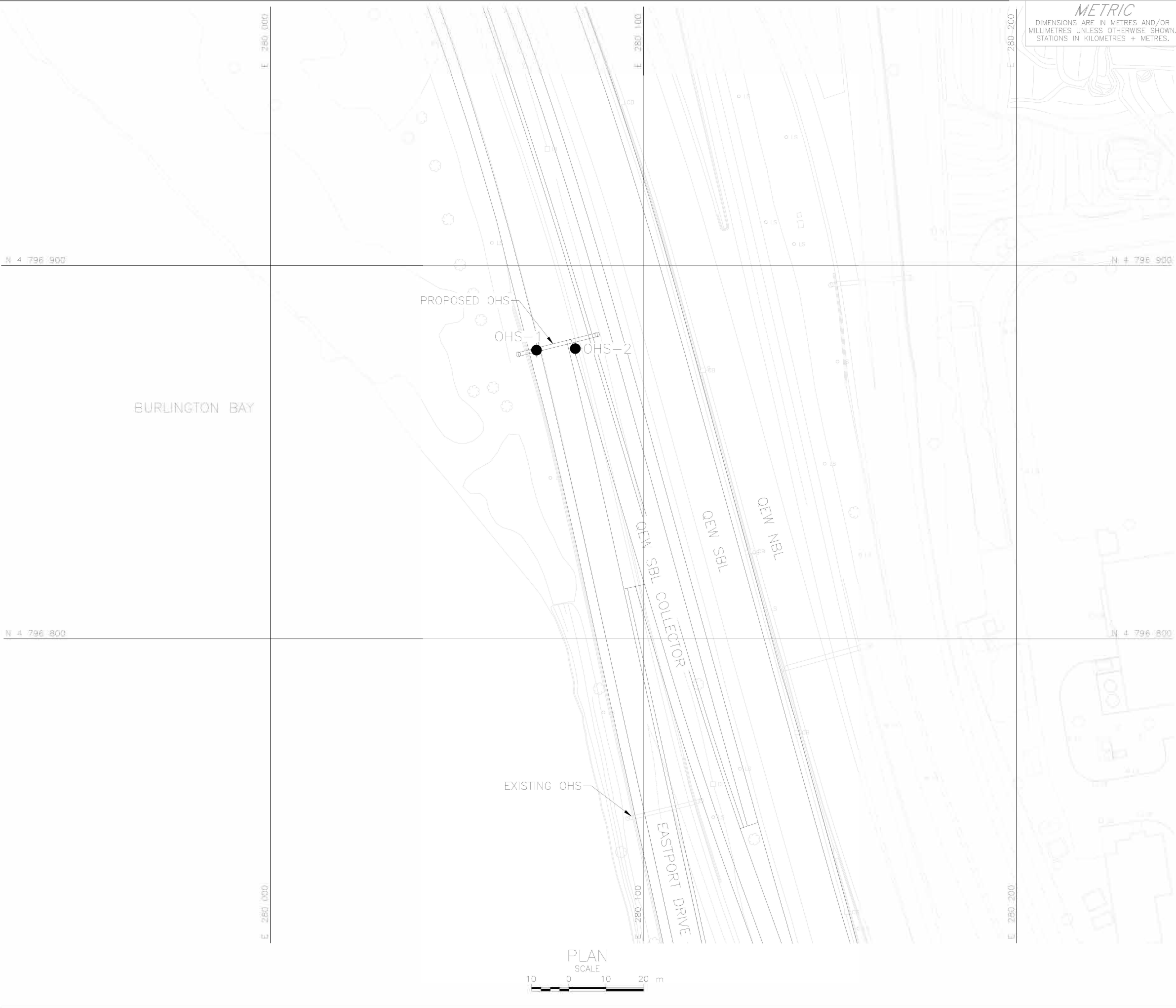
Mark Henderson, P.Eng.
Geotechnical Engineer



David Muldowney, P.Eng.
MTO Designated Foundations Contact

AM/MH/DAM/cr/ljv

[https://golderassociates.sharepoint.com/sites/140379/project files/6 deliverables/2. reports/3. final/fir/21451904-fir-rev0_final ohs qew burlington_2023'05'31.docx](https://golderassociates.sharepoint.com/sites/140379/project%20files/6%20deliverables/2.%20reports/3.%20final/fir/21451904-fir-rev0_final%20ohs%20qew%20burlington_2023%2005%2031.docx)

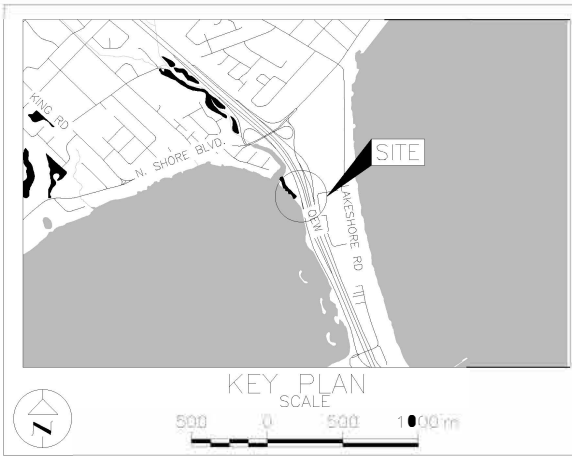


METRIC
DIMENSIONS ARE IN METRES AND/OR
MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.

CONT No.
GWP No.2385-15-00

QEW – BURLINGTON SKYWAY
REHABILITATION
OVERHEAD SIGN RELOCATION
BOREHOLE LOCATION PLAN

SHEET



LEGEND

Borehole – Current Investigation

BOREHOLE CO-ORDINATES (MTM NAD83 ZONE 10)			
No.	ELEVATION	NORTHING	EASTING
OHS-1	77.6	4796877.3	280071.4
OHS-2	78.0	4796877.8	280081.8



NOTES

This drawing is for subsurface information only. The proposed structure details/works are shown for illustration purposes only and may not be consistent with the final design configuration as shown elsewhere in the Contracts Documents.

REFERENCE

Base plan provided in digital format by WSP, drawing file no. XB01.dwg, received January 25, 2023.
Design plan provided in digital format by WSP, drawing file no. 211-09860-00_XN01.dwg.

NO.	DATE	BY	REVISION
Geocres No. 30M5-353			
HWY. QEW	PROJECT NO. 21451904		DIST.
SUBM'D. AM	CHKD. AM	DATE: 05/31/2023	SITE:
DRAWN: DD/SA	CHKD. MH	APPD. DAM	DWG. 1



Photograph 1: Existing Overhead Sign Location, facing south



Photograph 2: Proposed Overhead Sign Location, facing south



Photograph 3: Proposed Overhead Sign Location, facing north

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>i.e.</i> , SAND and gravel)
> 20 to 35	Primary soil name prefixed with "gravelly, sandy" as applicable
> 10 to 20	some (<i>i.e.</i> , some sand)
≤ 10	trace (<i>i.e.</i> , 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 cm² 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, G_s)
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

Compactness¹

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 grain size. 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.

LIST OF SYMBOLS

MINISTRY OF TRANSPORTATION, ONTARIO

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
ν	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

(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
$C_{a(e)}$	secondary compression index
C_a	rate of secondary compression
$C_{a(e)}$	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 = $\tan \delta$
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

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

Notes: 1
2

$\tau = c' + \sigma' \tan \phi'$
shear strength = (compressive strength)/2




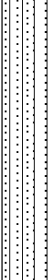
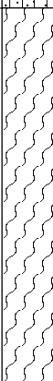
PROJECT	21451904	LOCATION	N 4796877.3; E 280071.4 NAD83 / MTM Zone 10 (LAT. 43.311372; LONG. -79.804840)	RECORD OF BOREHOLE No. OHS 1	Sheet 1 of 1	METRIC
G.W.P.	2385-15-00	BOREHOLE TYPE	108 mm ID Hollow Stem Augers	ORIGINATED BY	AM	
DIST	Central HWY QEW	DATE	Dec 11, 2022	COMPILED BY	AM	
DATUM	Geodetic			CHECKED BY	MH	

SOIL PROFILE			SAMPLES			GROUNDWATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					WATER CONTENT (%)			UNIT WEIGHT Y	GR	SA	SI	CL	REMARKS
ELEV. ----- DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH (kPa)					PL W _p	NMC W	LL W _L						
77.6								20	40	60	80	100	20	40	60						
0.0	ASPHALT (100 mm)																				
77.5	Gravelly SAND (SP), trace silt (FILL)		1	SS	22		77														
0.1	Compact																				
76.8	Brown																				
0.8	Moist																				
76.2	CLAYEY SAND (SC), trace gravel (FILL)		2	SS	12																
1.4	Compact																				
	Reddish brown																				
	Moist																				
	SAND (SP-SM) to SILTY SAND (SM)		3	SS	7		76														
	Very loose to loose																				
	Reddish brown																				
	Moist																				
	- 2.3 m: Becoming grey and wet		4	SS	7		75														
			5	SS	4		74														
			6	SS	1		73														
			7	SS	2																
72.0							72														
5.6	Sandy ORGANIC SILT (OL) to ORGANIC SILT (OL)																				
	and sand, trace clay																				
	Very loose to loose																				
	Brown		8	SS	3		71														
	Wet																				
			9	SS	9		70														
68.9							69														
8.7	GRAVEL (GW-GM) and sand, trace silt																				
	Compact																				
	Reddish brown																				
	Wet		10	SS	25		68														
67.8																					
9.8	End of Borehole																				
	Note: 1. Borehole caved to a depth of 3.4 m below ground surface (Elev. 74.2 m) upon completion of drilling. 2. Water level measured at a depth of 3.4 m below ground surface (Elev. 74.2 m) upon completion of drilling.																				

+³, x³ : Numbers refer to Sensitivity o³% STRAIN AT FAILURE

PROJECT	21451904		RECORD OF BOREHOLE		No. OHS 2	Sheet 1 of 1	METRIC
G.W.P.	2385-15-00		LOCATION	N 4796877.8; E 280081.8 NAD83 / MTM Zone 10 (LAT. 43.311376; LONG. -79.804712)			ORIGINATED BY AM
DIST	Central	HWY	QEW	BOREHOLE TYPE	57 mm ID Hollow Stem Augers		COMPILED BY AM
DATUM	Geodetic		DATE	Dec 12, 2022		CHECKED BY	MH

SOIL PROFILE			SAMPLES			GROUNDWATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT						WATER CONTENT (%)			UNIT WEIGHT Y kN/m³	GR	SA	SI	CL	REMARKS
ELEV. ----- DEPTH 78.0	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH (kPa)						PL	NMC	LL						
								Field Vane	Remoulded	Pocket Pen	Quick Triaxial	Unconfined	W _p	W	W _i	NP Nonplastic						

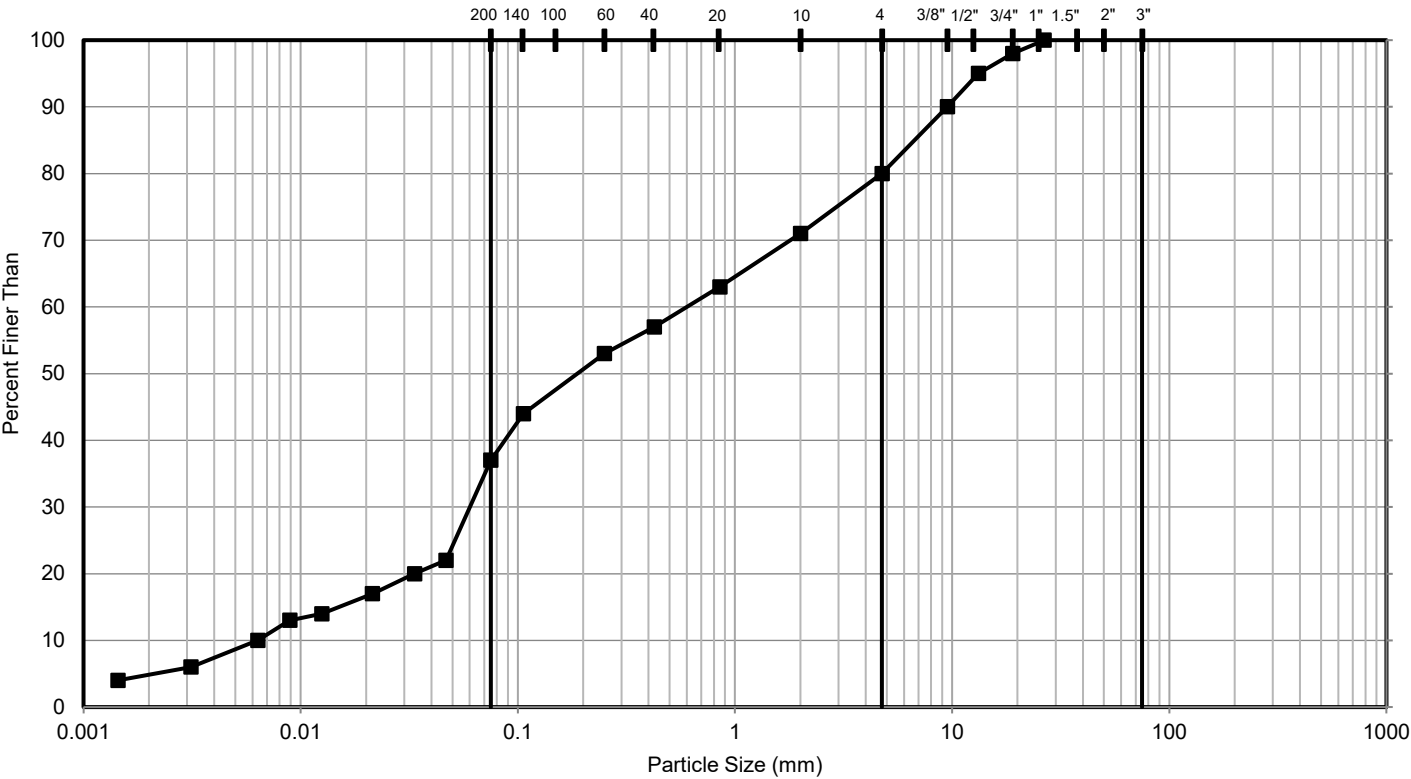
0.0	ASPHALT (130 mm)																			
77.9	Gravelly SAND (SP), trace silt (FILL)		1	SS	40															
0.1	Dense																			
77.3	Brown																			
0.7	Moist		2	SS	16															
	CLAYEY SAND (SC), some gravel (FILL)																			
	Compact																			
76.6	Reddish Brown																			
1.4	Moist		3	SS	14															
	SAND (SP-SM) to SILTY SAND (SM)																			
	Very loose to compact																			
	Reddish brown																			
	Moist																			
	- 2.0 m: Becoming wet		4	SS	4															
	- 3.0 m: Becoming grey		5	SS	4															
			6	SS	2															
73.5																				
4.5	Sandy ORGANIC SILT (OL) to ORGANIC SILT (OL) and sand		7	SS	4															
	Very loose to loose																			
	Brown																			
	Wet			8	SS	4														
	- 7.6 m: Encountered gas pocket; groundwater flowing out of borehole		9	SS	4															
69.8																				
8.2	End of Borehole																			
	Note: 1. Borehole terminated and backfilled after encountering methane pocket. 2. Groundwater not recorded.																			

APPENDIX B

Geotechnical Laboratory Test Results


PATH: https://goldeassociates.sharpoint.com/sites/140379/Project Files/6 Deliverables/2. PreDraft/Appendix B - Geotech Lab/Working Files | FILE NAME: 21451904_Laboratory Particle Size Distribution MTO.xlsm

GRAIN SIZE DISTRIBUTION - CLAYEY SAND (SC) (FILL)

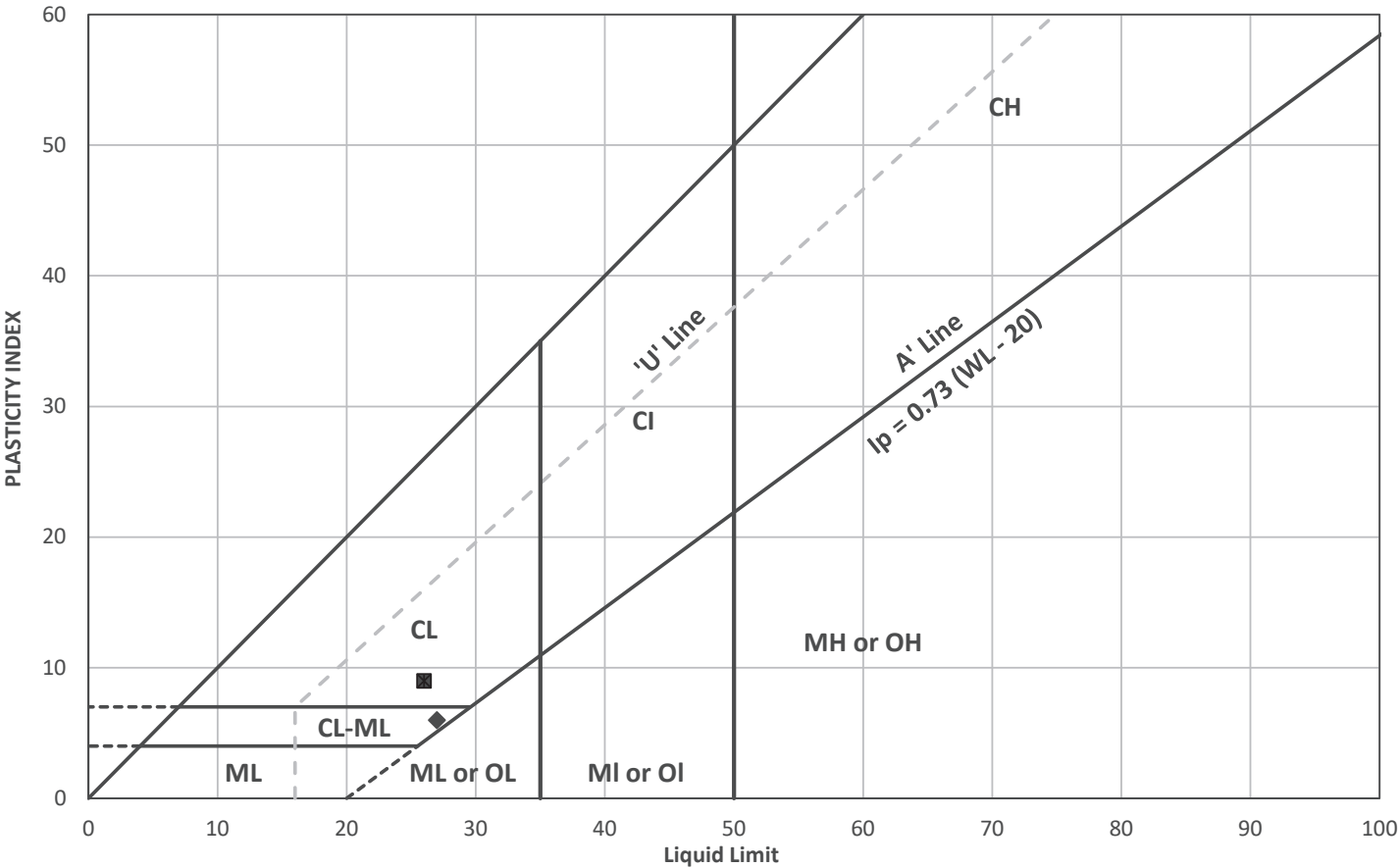


FINES (Silt, Clay)	SAND			GRAVEL		COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Coarse		


Symbol	Sample Location	Sample Number	Depth (m)	Elevation (m)
■	OHS 2	2	0.8 - 1.4	77.6 to 77.0

CLIENT		PROJECT	
WSP Canada Inc. / MTO		QEW BURLINGTON SKYWAY SOUTHBOUND LANE OVERHEAD SIGN RELOCATION	
CONSULTANT	YYYY-MM-DD	2023-02-23	
	DESIGNED	AM	
	PREPARED	AM	
	REVIEWED	MH	
	APPROVED	DAM	
		TITLE	
		GRAIN SIZE DISTRIBUTION CLAYEY SAND (SC) (FILL)	
PROJECT NO.		CONTROL	REV.
21451904		0	0
		FIGURE	
		B-1	

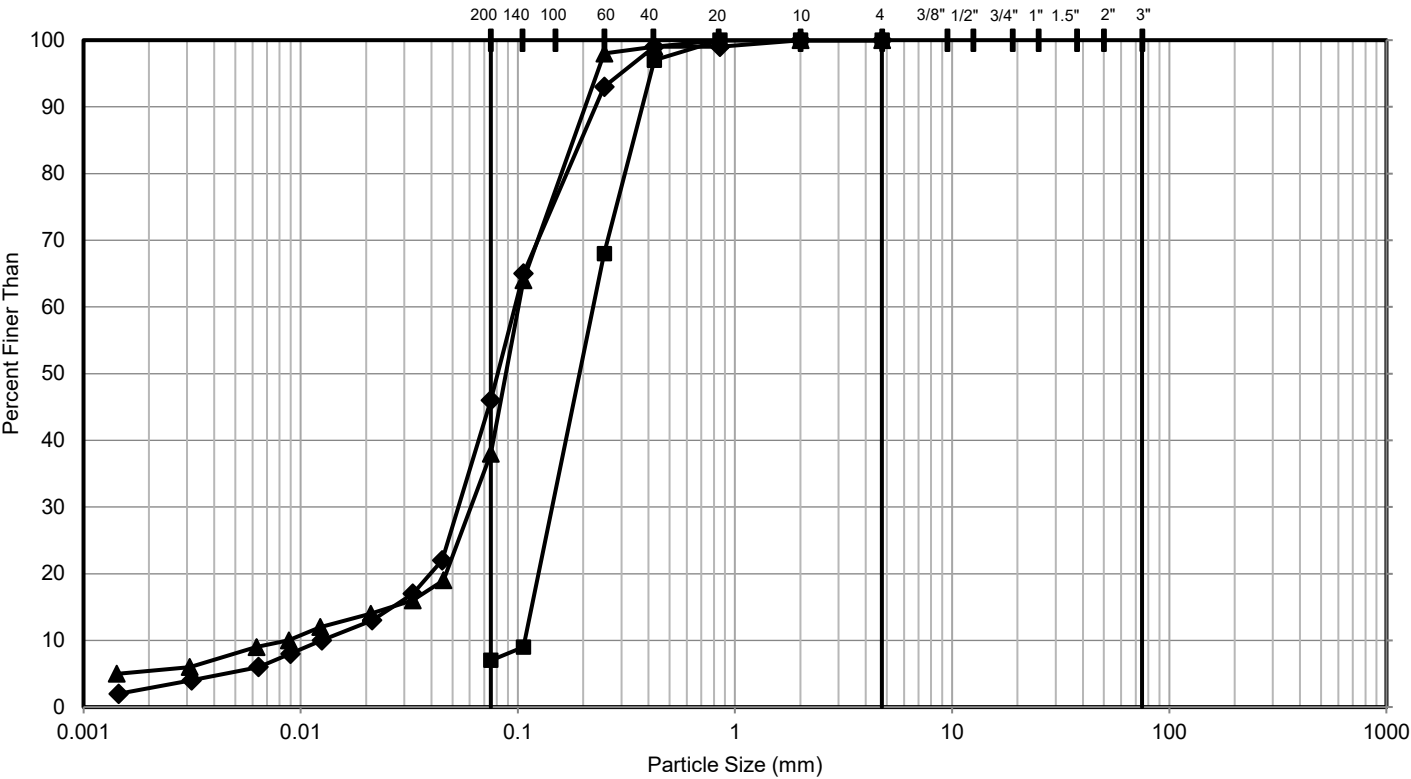
PLASTICITY CHART - CLAYEY SAND (SC) (FILL)



	Sample Location	Sample / Specimen Number	Elevation (m)	Natural Water Content (%)	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index
■	OHS 1	2	77.26 to 76.65	13.9	26	17	9	-0.34
◆	OHS 2	2	77.63 to 77.02	13.1	27	21	6	-1.32

CLIENT			PROJECT			
WSP Canada Inc. / MTO			QEW BURLINGTON SKYWAY SOUTHBOUND LANED OVERHEAD SIGN RELOCATION			
	CONSULTANT	YYYY-MM-DD	2022-11-10	TITLE		
		DESIGNED	AM	PLASTICITY CHART		
		PREPARED	AM	CLAYEY SAND (SC) (FILL)		
		REVIEWED	MH	PROJECT NO.	CONTROL	REV.
		APPROVED	DAM	21451904	0	0
					FIGURE	
					B-2	

GRAIN SIZE DISTRIBUTION - SAND (SP-SM) to SILTY SAND (SM)



FINES (Silt, Clay)	SAND			GRAVEL		COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Coarse		

Symbol	Sample Location	Sample Number	Depth (m)	Elevation (m)
■	OHS 1	3	1.5 - 2.1	76.5 to 75.9
◆	OHS 1	5	3.0 - 3.7	75.0 to 74.4
▲	OHS 2	4	2.3 - 2.9	76.1 to 75.5

CLIENT

WSP Canada Inc. / MTO

CONSULTANT



YYYY-MM-DD 2023-02-23

DESIGNED AM

PREPARED AM

REVIEWED MH

APPROVED DAM

PROJECT

QEW BURLINGTON SKYWAY SOUTHBOUND LANE
OVERHEAD SIGN RELOCATION

TITLE

GRAIN SIZE DISTRIBUTION
SAND (SP-SM) to SILTY SAND (SM)

PROJECT NO.
21451904

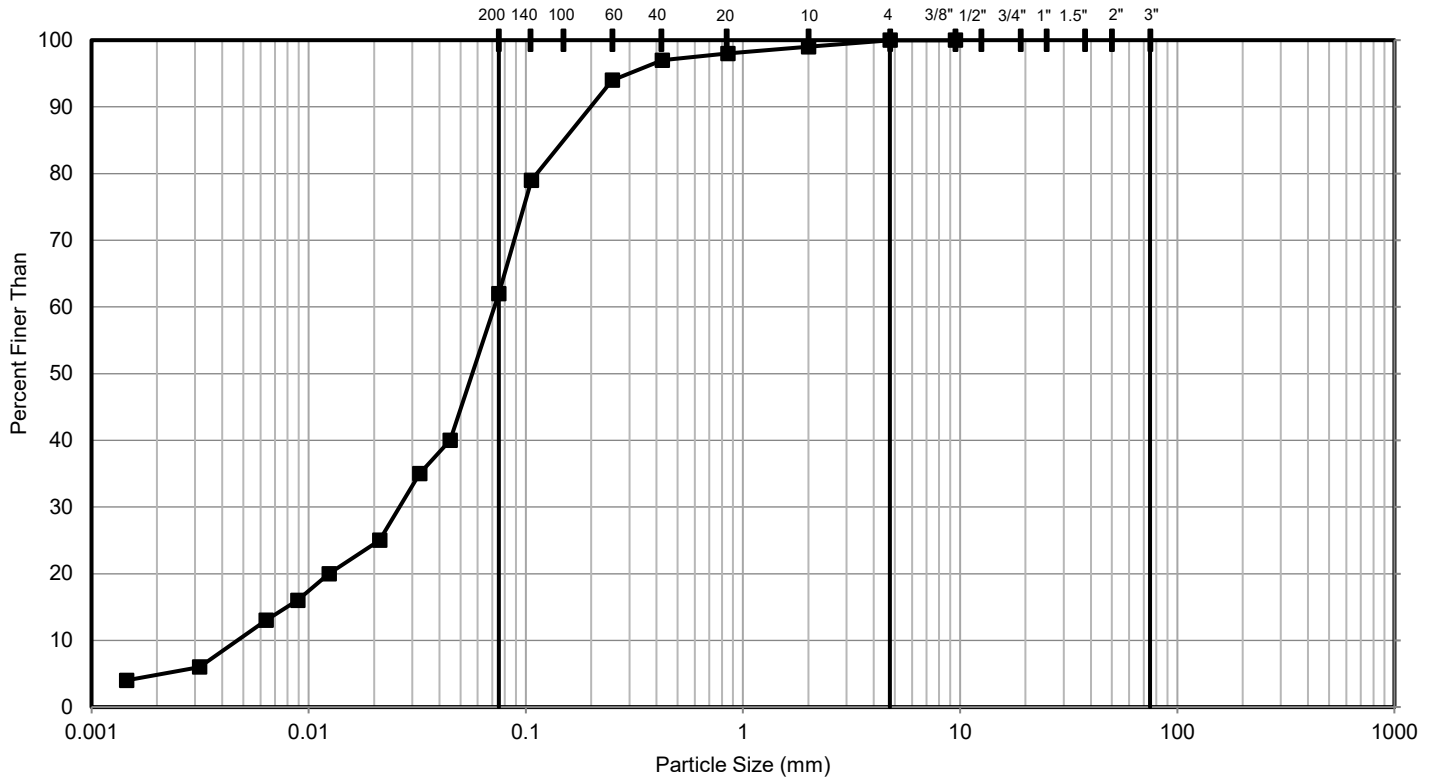
CONTROL
0

REV.
0

FIGURE
B-3

PATH: https://goldrassociates.sharepoint.com/sites/140379/Project Files/6 Deliverables/2. PreDraft/Appendix B - Geotech Lab/Working Files | FILE NAME: 21451904_Laboratory Particle Size Distribution MTO.xlsm

GRAIN SIZE DISTRIBUTION - ORGANIC SILT (OL)



FINES (Silt, Clay)	SAND			GRAVEL		COBBLES	BOULDERS
	Fine	Medium	Coarse	Fine	Coarse		

Symbol	Sample Location	Sample Number	Depth (m)	Elevation (m)
■	OHS 2	7	4.6 - 5.2	73.8 to 73.2

CLIENT

WSP Canada Inc. / MTO

CONSULTANT



YYYY-MM-DD 2023-02-23

DESIGNED AM

PREPARED AM

REVIEWED MH

APPROVED DAM

PROJECT

QEW BURLINGTON SKYWAY SOUTHBOUND LANE
OVERHEAD SIGN RELOCATION

TITLE

GRAIN SIZE DISTRIBUTION
ORGANIC SILT (OL)

PROJECT NO.

21451904

CONTROL

0

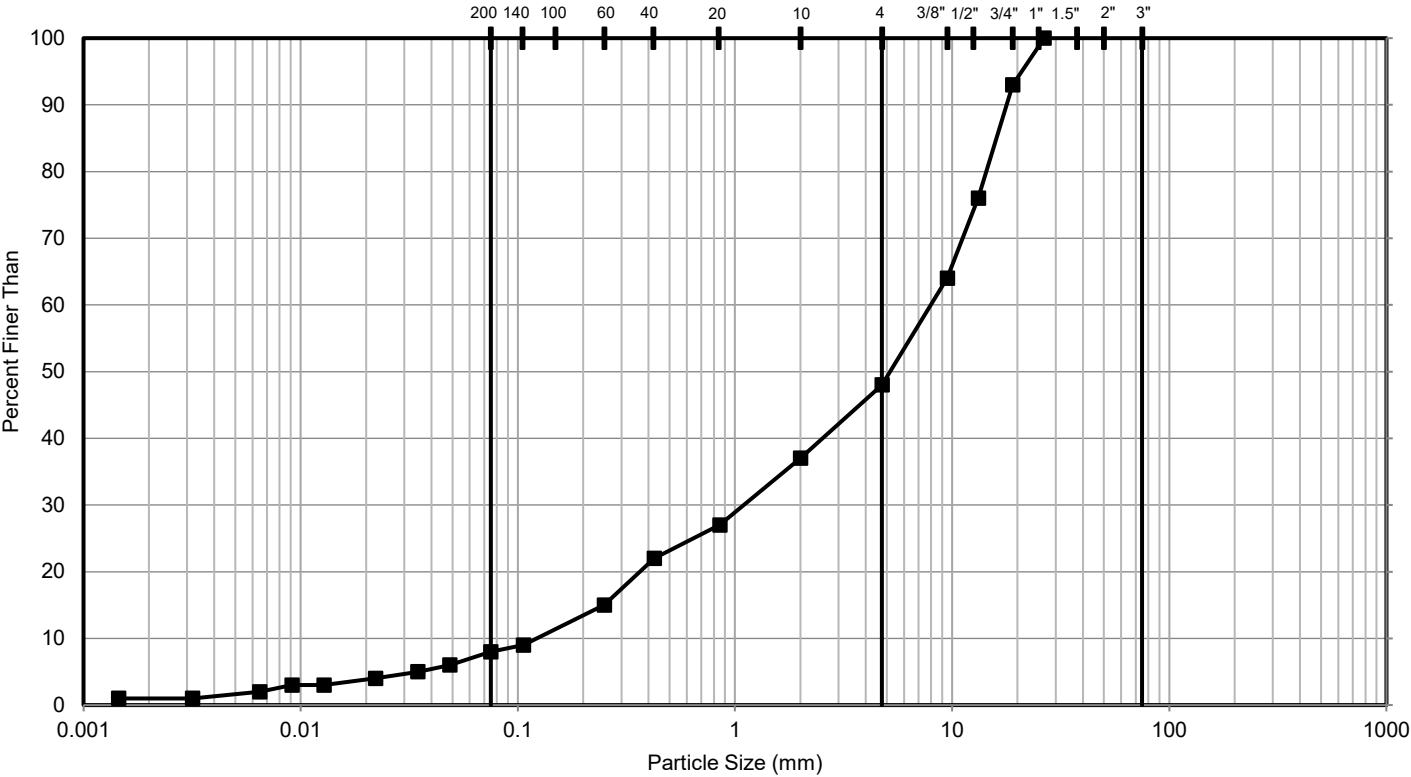
REV.

0

FIGURE

B-4

GRAIN SIZE DISTRIBUTION - GRAVEL (GW-GM)



APPENDIX C

Analytical Laboratory Test Results



Your Project #: 21451904
Site Location: BURLINGTON SKYWAY (QEW), BURLINGTON,
ON
Your C.O.C. #: n/a

Attention: Mark Henderson

Golder Associates Ltd
6925 Century Ave
Suite 100
Mississauga, ON
CANADA L5N 7K2

Report Date: 2022/12/21
Report #: R7440179
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C2AF587

Received: 2022/12/13, 14:12

Sample Matrix: Soil
Samples Received: 2

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Chloride (20:1 extract)	2	2022/12/19	2022/12/19	CAM SOP-00463	SM 23 4500-Cl E m
Conductivity	2	2022/12/19	2022/12/19	CAM SOP-00414	OMOE E3530 v1 m
Moisture (Subcontracted) (1, 2)	2	N/A	2022/12/21	AB SOP-00002	CCME PHC-CWS m
Sulphide in Soil (1)	2	N/A	2022/12/19	AB SOP-00080	EPA9030B/SM4500S2-DF
pH CaCl2 EXTRACT	2	2022/12/20	2022/12/20	CAM SOP-00413	EPA 9045 D m
Resistivity of Soil	2	2022/12/13	2022/12/19	CAM SOP-00414	SM 23 2510 m
Sulphate (20:1 Extract)	2	2022/12/19	2022/12/19	CAM SOP-00464	EPA 375.4 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, MELCC, EPA, APHA.

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.

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

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

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

(1) This test was performed by Bureau Veritas Calgary (19th), 4000 19th Street NE, Calgary, AB, T2E 6P8

(2) Offsite analysis requires that subcontracted moisture be reported.



Your Project #: 21451904
Site Location: BURLINGTON SKYWAY (QEW), BURLINGTON,
ON
Your C.O.C. #: n/a

Attention: Mark Henderson

Golder Associates Ltd
6925 Century Ave
Suite 100
Mississauga, ON
CANADA L5N 7K2

Report Date: 2022/12/21
Report #: R7440179
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C2AF587

Received: 2022/12/13, 14:12

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:

Ankita Bhalla, Project Manager

Email: Ankita.Bhalla@bureauveritas.com

Phone# (905) 817-5700

=====

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BUREAU
VERITAS

Bureau Veritas Job #: C2AF587

Report Date: 2022/12/21

Golder Associates Ltd

Client Project #: 21451904

Site Location: BURLINGTON SKYWAY (QEW), BURLINGTON,
ON

Sampler Initials: AM

SOIL CORROSIVITY PACKAGE (SOIL)

Bureau Veritas ID		U00529			U00529		
Sampling Date		2022/12/11			2022/12/11		
COC Number		n/a			n/a		
	UNITS	OHS-1 SA04 7'6"-9'6"	RDL	QC Batch	OHS-1 SA04 7'6"-9'6" Lab-Dup	RDL	QC Batch

Calculated Parameters							
Resistivity	ohm-cm	700		8400535			
Inorganics							
Soluble (20:1) Chloride (Cl-)	ug/g	830	20	8411202			
Conductivity	umho/cm	1430	2	8411083			
Available (CaCl2) pH	pH	7.41		8413343			
Soluble (20:1) Sulphate (SO4)	ug/g	<20	20	8411217	<20	20	8411217
Sulphide	mg/kg	13.1 (1)	0.5	8417625			
Physical Testing							
Moisture-Subcontracted	%	27	0.30	8417599			
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate (1) Sample contained greater than 10% headspace at time of extraction.							

Bureau Veritas ID		U00530			U00530		
Sampling Date		2022/12/12			2022/12/12		
COC Number		n/a			n/a		
	UNITS	OHS-2 SA04 7'6"-9'6"	RDL	QC Batch	OHS-2 SA04 7'6"-9'6" Lab-Dup	RDL	QC Batch

Calculated Parameters							
Resistivity	ohm-cm	1200		8400535			
Inorganics							
Soluble (20:1) Chloride (Cl-)	ug/g	470	20	8411202	430	20	8411202
Conductivity	umho/cm	817	2	8411083			
Available (CaCl2) pH	pH	7.44		8413339			
Soluble (20:1) Sulphate (SO4)	ug/g	<20	20	8411217			
Sulphide	mg/kg	3.3 (1)	0.5	8417625			
Physical Testing							
Moisture-Subcontracted	%	22	0.30	8417599			
RDL = Reportable Detection Limit QC Batch = Quality Control Batch Lab-Dup = Laboratory Initiated Duplicate (1) Sample contained greater than 10% headspace at time of extraction.							



TEST SUMMARY

Bureau Veritas ID: U00529
Sample ID: OHS-1 SA04 7'6"-9'6"
Matrix: Soil

Collected: 2022/12/11
Shipped:
Received: 2022/12/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	8411202	2022/12/19	2022/12/19	Samuel Law
Conductivity	AT	8411083	2022/12/19	2022/12/19	Gurpartee K AUR
Moisture (Subcontracted)	BAL	8417599	N/A	2022/12/21	Richard Ly
Sulphide in Soil	SPEC	8417625	N/A	2022/12/19	Bailey Morrison
pH CaCl2 EXTRACT	AT	8413343	2022/12/20	2022/12/20	Taslina Aktar
Resistivity of Soil		8400535	2022/12/19	2022/12/19	Automated Statchk
Sulphate (20:1 Extract)	KONE/EC	8411217	2022/12/19	2022/12/19	Samuel Law

Bureau Veritas ID: U00529 Dup
Sample ID: OHS-1 SA04 7'6"-9'6"
Matrix: Soil

Collected: 2022/12/11
Shipped:
Received: 2022/12/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Sulphate (20:1 Extract)	KONE/EC	8411217	2022/12/19	2022/12/19	Samuel Law

Bureau Veritas ID: U00530
Sample ID: OHS-2 SA04 7'6"-9'6"
Matrix: Soil

Collected: 2022/12/12
Shipped:
Received: 2022/12/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	8411202	2022/12/19	2022/12/19	Samuel Law
Conductivity	AT	8411083	2022/12/19	2022/12/19	Gurpartee K AUR
Moisture (Subcontracted)	BAL	8417599	N/A	2022/12/21	Richard Ly
Sulphide in Soil	SPEC	8417625	N/A	2022/12/19	Bailey Morrison
pH CaCl2 EXTRACT	AT	8413339	2022/12/20	2022/12/20	Taslina Aktar
Resistivity of Soil		8400535	2022/12/19	2022/12/19	Automated Statchk
Sulphate (20:1 Extract)	KONE/EC	8411217	2022/12/19	2022/12/19	Samuel Law

Bureau Veritas ID: U00530 Dup
Sample ID: OHS-2 SA04 7'6"-9'6"
Matrix: Soil

Collected: 2022/12/12
Shipped:
Received: 2022/12/13

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Chloride (20:1 extract)	KONE/EC	8411202	2022/12/19	2022/12/19	Samuel Law



BUREAU
VERITAS

Bureau Veritas Job #: C2AF587

Report Date: 2022/12/21

Golder Associates Ltd

Client Project #: 21451904

Site Location: BURLINGTON SKYWAY (QEW), BURLINGTON,
ON

Sampler Initials: AM

GENERAL COMMENTS

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

Package 1	6.3°C
-----------	-------

Results relate only to the items tested.



BUREAU
VERITAS

Bureau Veritas Job #: C2AF587

Report Date: 2022/12/21

QUALITY ASSURANCE REPORT

Golder Associates Ltd

Client Project #: 21451904

BURLINGTON SKYWAY (QEW), BURLINGTON,

Site Location: ON

Sampler Initials: AM

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8411083	Conductivity	2022/12/19			104	90 - 110	<2	umho/cm	1.6	10
8411202	Soluble (20:1) Chloride (Cl ⁻)	2022/12/19	NC	70 - 130	104	70 - 130	<20	ug/g	10	35
8411217	Soluble (20:1) Sulphate (SO ₄)	2022/12/19	134 (1)	70 - 130	108	70 - 130	<20	ug/g	NC	35
8413339	Available (CaCl ₂) pH	2022/12/20			100	97 - 103			0.80	N/A
8413343	Available (CaCl ₂) pH	2022/12/20			100	97 - 103			0.56	N/A
8417599	Moisture-Subcontracted	2022/12/21					<0.30	%	2.4	20
8417625	Sulphide	2022/12/19	118	75 - 125	118	75 - 125	<0.5	mg/kg	16	30

N/A = Not Applicable

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

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

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

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

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

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

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.



BUREAU
VERITAS

Bureau Veritas Job #: C2AF587

Report Date: 2022/12/21

Golder Associates Ltd

Client Project #: 21451904

Site Location: BURLINGTON SKYWAY (QEW), BURLINGTON,
ON

Sampler Initials: AM

VALIDATION SIGNATURE PAGE

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

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

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

Sandy Yuan, M.Sc., QP, Scientific Specialist

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6740 Campobello Road, Mississauga, Ontario L5N 2L8
 Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: 800-563-6266
 CAM FCD-01191/6

WORK ORDER CHAIN OF CUSTODY RECORD

Page 1 of 1

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required																							
Company Name: Golder Associates Ltd.	Company Name: Golder Associates Ltd.	Quotation #:	<input checked="" type="checkbox"/> Regular TAT (5-7 days) Most analyses		<input type="checkbox"/> PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS																								
Contact Name: Canada Accounts Payable	Contact Name: Mark Henderson	P.O. #/ AFE#:			<input type="checkbox"/> Rush TAT (Surcharges will be applied)																								
Address: 6925 Century Ave. Suite 100	Address: 6925 Century Ave. Suite 100	Project #:	21451904		<input type="checkbox"/> 1 Day <input type="checkbox"/> 2 Days <input type="checkbox"/> 3-4 Days																								
Address: Mississauga, ON	Address: Mississauga, ON L5N 7K2	Site Location:	Burlington Skyway (QEW), Burlington, ON																										
Phone: 905-567-4444 Fax: 905-567-6561	Phone: (647) 233-7791 Fax:	Site #:			Date Required:																								
Email: canadaaccounts payableinvoices@golder.com	Email: mark.henderson@wsp.com	Site Location Province: Burlington Ontario			Rush Confirmation #:																								
MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS CHAIN OF CUSTODY				Sampled By: _____ AM																									
Regulation 153 <input checked="" type="checkbox"/> Table 1 <input type="checkbox"/> Res/Park <input type="checkbox"/> Med/ Fine <input type="checkbox"/> Table 2 <input type="checkbox"/> Ind/Comm <input type="checkbox"/> Coarse <input type="checkbox"/> Table 3 <input type="checkbox"/> Agri/ Other <input type="checkbox"/> Table _____ FOR RSC (PLEASE CIRCLE) Y / N		Other Regulations <input type="checkbox"/> CCME <input type="checkbox"/> Sanitary Sewer Bylaw <input type="checkbox"/> MISA <input type="checkbox"/> Storm Sewer Bylaw <input type="checkbox"/> PWLU <input type="checkbox"/> Region _____ <input type="checkbox"/> Other (Specify) _____ <input type="checkbox"/> REG 558 (MIN. 3 DAY TAT REQUIRED) <input type="checkbox"/> REG 406 Table _____		Analysis Requested <div style="display: flex; justify-content: space-between;"> <div> # OF CONTAINERS SUBMITTED FIELD FILTERED (CIRCLE) Metals / Hg / Cr VI BTX/ PHC F1 PHC F2 - F4 VOCs REG 153 METALS & INORGANICS REG 153 ICNMS METALS REG 153 METALS (Hg, Cr VI, ICNMS Metals, HWS - B) Corrosivity Package (+ Sulphide) </div> <div> HOLD- DO NOT ANALYZE </div> </div>				LABORATORY USE ONLY <table border="1"> <tr> <th colspan="2">CUSTODY SEAL Y / N</th> <th rowspan="2">COOLER TEMPERATURES</th> </tr> <tr> <th>Present</th> <th>Intact</th> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> <td>61617</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="3">COOLING MEDIA PRESENT: Y / N</td> </tr> <tr> <td colspan="3">COMMENTS</td> </tr> </table>		CUSTODY SEAL Y / N		COOLER TEMPERATURES	Present	Intact	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	61617							COOLING MEDIA PRESENT: Y / N			COMMENTS		
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COMMENTS																													
Include Criteria on Certificate of Analysis: Y / N SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS																													
SAMPLE IDENTIFICATION		DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED (CIRCLE) Metals / Hg / Cr VI	BTX/ PHC F1	PHC F2 - F4	VOCs	REG 153 METALS & INORGANICS	REG 153 ICNMS METALS	REG 153 METALS (Hg, Cr VI, ICNMS Metals, HWS - B)	Corrosivity Package (+ Sulphide)	HOLD- DO NOT ANALYZE	COMMENTS														
1	OHS-1 SA04 7'6"-9'6"	2022-12-11	PM	SOIL	2								X		2 Jars, no redox.														
2	OHS-2 SA04 7'6"-9'6"	2022-12-12	AM	SOIL	2								X		2 Jars, no redox.														
3																													
4																													
5																													
6																													
7																													
8																													
9																													
10																													

MSA with BV Signed May 18, 2020.
 Golder standing offer rates in email from Julie Clement dated Sept 20, 2021.
 Corrosivity package including chloride, conductivity, resistivity, pH, sulphate, sulphide is \$98.60/sample.

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Ankaren Mahes	2022-12-13	15:00	<i>[Signature]</i>	2022-12-13	15:12

13-Dec-22 14:12
 Ankita Bhalla

C2AF587



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