REPORT

May 11, 2018

FOUNDATION INVESTIGATION REPORT

STORMWATER MANAGEMENT POND
QEW WIDENING FROM WEST OF MISSISSAUGA ROAD TO WEST OF HURONTARIO STREET
CITY OF MISSISSAUGA
MINISTRY OF TRANSPORTATION, ONTARIO
ASSIGNMENT NO. 2015-E-0033, G.W.P. 2002-13-00

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Report Number: 1662333

Distribution:

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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) has been retained by Morrison Hershfield Limited (MH) on behalf of the Ministry of Transportation, Ontario (MTO) to provide foundation engineering services in support of the detail design for the widening of the Queen Elizabeth Way (QEW) from west of Mississauga Road to west of Hurontario Street in the City of Mississauga, in the Regional Municipality of Peel, Ontario.

The purpose of this investigation is to establish the subsurface soil, bedrock and groundwater conditions at the location of the proposed Stormwater Management (SWM) Pond by borehole drilling and laboratory testing on selected soil samples.

The Terms of Reference (TOR) and the scope of work for the foundation investigation are outlined in MTO's Request for Proposal, dated July 2016, which forms part of the Consultant's Assignment Number (Number 2015-E-0033) for this project. The work has been carried out in accordance with Golder's Supplementary Specialty Plan for foundation engineering services for this project, dated February 3, 2017.

2.0 SITE DESCRIPTION

The existing QEW-Mississauga Road overpass is located approximately 2.0 km west of the QEW-Hurontario Street interchange, in the City of Mississauga. The QEW alignment in the project area is oriented generally in a southwest-northeast direction; for the purposes of this report, the QEW alignment is described as being in an east-west orientation.

The current ground surface in the vicinity of the interchange is grass covered with some trees and is at between about Elevations 97 m and 101 m. In the immediate area of the SWM Pond the ground surface grade is between about Elevation 99.4 m and 100.5 m, sloping down towards the southeast.

Land use to the south of the interchange is primarily residential, and a golf course is located immediately to the north of the interchange and northeast of Mississauga Road.

3.0 INVESTIGATION PROCEDURES

Field work for the foundation investigation was carried out on August 14 and 16, 2017, during which time a total of four sampled boreholes (designated as Boreholes SWMW-01 to SWMW-04) were advanced within the outline of the proposed SWM Pond. The location of the boreholes are shown on Drawing 1 and the Records of Boreholes and Drillholes are included in Appendix A.

The field borehole investigation was carried out using a track-mounted CME 55 drill rig, supplied and operated by Aardvark Drilling Inc. of Guelph, Ontario. The boreholes were advanced using 150 mm or 108 mm outside diameter solid-stem augers through the overburden, and NW casing and an NQ core barrel through the bedrock in two of the boreholes. Soil and weathered bedrock samples were obtained at 0.75 m intervals of depth, using a 50 mm outer diameter split-spoon sampler driven by an automatic hammer in accordance with Standard Penetration Test (SPT) procedures (ASTM D1586-08)[1].

[1] ASTM D1586-08a – Standard Test Method for Standard Penetration Tests and Split Barrel Sampling of the soil.

The boreholes were either advanced to auger and/or sampler refusal (i.e. on inferred bedrock) or cored into bedrock, to depths ranging from about 2.6 m to 7.7 m below existing ground surface. Samples of the bedrock were obtained using an 'NQ'-size rock core barrel and coring techniques in Boreholes SWMW-03 and SWMW-04. Photographs of the recovered bedrock core samples are provided in Appendix B.

The groundwater conditions and water levels in the open boreholes were observed during and immediately following drilling operations. A standpipe piezometer was installed in Borehole SWMW-04 to permit monitoring of the groundwater level at the borehole location. The standpipe piezometer consists of 50 mm diameter PVC pipe, with a slotted screen within a sand filter pack sealed within the bedrock. Above the sand filter pack and piezometer screen, the annulus surrounding the piezometer pipe was backfilled to the ground surface with bentonite pellets. The piezometer installation details and water level readings are shown on the borehole records contained in Appendix A. All remaining boreholes were backfilled with bentonite upon completion, in accordance with Ontario Regulation 903 (as amended).

The field work was observed by members of Golder's engineering and technical staff, who located the boreholes, arranged for the clearance of underground services, observed the drilling, sampling and in-situ testing operations, logged the boreholes and examined the soil and bedrock samples. The samples were identified in the field, placed in appropriate containers, labelled and transported to Golder's Mississauga geotechnical laboratory where the samples underwent further visual examination and laboratory testing. All of the laboratory tests were carried out to MTO and/or ASTM Standards, as appropriate. Classification testing (water content, Atterberg limits and grain size distribution) was carried out on selected soil samples. The results of the geotechnical laboratory testing are included in Appendix B.

The as-drilled borehole locations and the ground surface elevations were obtained using a GPS (Trimble XH 3.5G), having an accuracy of 0.1 m in the vertical and 0.1 m in the horizontal directions. The locations given on the Record of Borehole/Drillhole sheets and shown on Drawing 1 are positioned relative to MTM NAD 83 (Zone 10) northing and easting coordinates and the ground surface elevations are referenced to Geodetic datum. The borehole locations, ground surface elevations and drilled depths are summarized below.

Borehole No.	Location (MTM NAD 83)		Ground Surface Elevation (m)	Borehole Depth (m)
	Northing (m) (Latitude, °)	Easting (m) (Longitude, °)		
SWMW-01	4,823,494.9 (43.551320)	295,272.4 (-79.617900)	100.5	2.6
SWMW-02	4,823,554.0 (43.551850)	295,325.1 (-79.617300)	100.3	2.6
SWMW-03	4,823,513.7 (43.551490)	295,424.7 (-79.616000)	99.4	6.9*
SWMW-04	4,823,507.5 (43.551430)	295,332.3 (-79.617200)	99.8	7.7*

* includes bedrock core of 4.5 m length in Boreholes SWMW-03 and SWMW-04.

4.0 SITE GEOLOGY AND SUBSURFACE CONDITIONS

4.1 Regional Geology

The project area is located within the Iroquois Plain physiographic region, as delineated in *The Physiography of Southern Ontario* (Chapman and Putman, 1984)[2].

The glacial Iroquois Plain stretches along the northern shoreline of Lake Ontario, extending from the Niagara Escarpment in the west to the Scarborough Bluffs in the east. The Iroquois Plain soils consist of glaciolacustrine sediments deposited in Lake Iroquois, primarily sands, silts and gravels, with a shallow cover of till remaining over the bedrock.

The bedrock of the Georgian Bay Formation that underlies the study area consists mainly of blue-grey shale, containing siltstone, sandstone and limestone interbeds. Outcrops of this formation are commonly found along water courses on the west side of Toronto and in Mississauga, notably in the Humber River, Mimico Creek, Etobicoke Creek and Credit River valleys.

4.2 Subsurface Conditions

The detailed subsurface soil, bedrock and groundwater conditions as encountered in the boreholes and the results of the laboratory tests carried out on selected soil and bedrock core samples are presented on the Records of Boreholes and Drillholes provided in Appendix A. The results of the in-situ field tests (i.e. SPT “N” values) as presented on the borehole records and in sub-sections of Section 4.2 are uncorrected. The geotechnical laboratory testing results and test data are contained in Appendix B.

The stratigraphic boundaries shown on the borehole records and the stratigraphic cross-section on Drawing 1 are inferred from non-continuous sampling, observations of drilling progress and the results of Standard Penetration Tests. These boundaries, therefore, represent transitions between soil types and soil/bedrock rather than exact planes of geological change. Furthermore, subsurface conditions will vary between and beyond the borehole locations; however, the factual data presented in the borehole and drillhole records govern any interpretation of the site conditions. It should be noted that the interpreted stratigraphy shown on Drawing 1 is a simplification of the subsurface conditions.

In general, the subsurface conditions in the area of the proposed SWM Pond consist of a layer of topsoil, underlain by a deposit of sand at one borehole location, or by a deposit of silty clay to sandy silty clay, which are all in turn underlain by residual soil consisting of sandy clayey silt. The native soil deposits are underlain by shale bedrock. A more detailed description of the subsurface conditions encountered in the boreholes is provided in the following sections.

4.2.1 Topsoil

A 80 mm to 200 mm thick layer of topsoil was encountered at the ground surface in all of the boreholes.

4.2.2 Sand

Underlying the topsoil in Borehole SWMW-02 a deposit of sand was encountered. The surface of this non-cohesive deposit was encountered at a depth of about 0.2 m (about Elevation 100.1 m) below ground surface and extends to about 0.8 m (Elevation 99.5 m) below ground surface.

[2] Chapman, L.J. and Putman, D.F., 1984, The Physiography of Southern Ontario, Ontario Geological Society, Special Volume 2, Third Edition. Accompanied by Map p. 2715, Scale 1:600,000.)

The single SPT "N"-value measured within the granular deposit is 5 blows per 0.3 m of penetration, indicating a loose compactness condition.

The water content measured on a sample of the sand deposit is about 7 per cent.

4.2.3 Silty Clay to Sandy Silty Clay

Underlying the topsoil in Boreholes SWMW-01, SWMW-03 and SWMW-04 a deposit of sandy silty clay to silty clay, some sand, was encountered. The surface of the silty clay deposit was encountered at depths of between about 0.1 m and 0.2 m below ground surface (between about Elevation 100.3 and 99.3 m) and extends to between about 0.7 m and 1.4 m below ground surface (between Elevation 99.1 m and 98.7 m). The thickness of this deposit varies from about 0.5 m to 1.2 m.

SPT "N"-values measured within the silty clay deposit are between 9 blows and 64 blows per 0.3 m of penetration, suggesting a stiff to hard consistency.

The results of grain size distribution tests completed on two selected samples of the silty clay deposit are shown on Figure B1 in Appendix B.

Atterberg limits tests were carried out on two samples of the silty clay deposit and measured liquid limits of about 36 per cent and 45 per cent, plastic limits of about 20 per cent and 21 per cent, and plasticity indices of about 16 per cent and 24 per cent. These test results, which are plotted on a plasticity chart on Figure B2 in Appendix B, indicate that the deposit can be classified as a silty clay of medium plasticity.

The natural water content measured on samples of the silty clay deposit ranges between 9 per cent and 16 per cent.

4.2.4 Clayey Silt (Residual Soil)

Underlying the sand deposit in Borehole SWMW-02, and the silty clay deposit in Boreholes SWMW-01, SWMW-03 and SWMW-04, a clayey silt (residual soil) was encountered at depths between about 0.7 m and 1.4 m below ground surface (between Elevations 99.5 m and 98.7 m). The base of the residual soil was encountered at depths of between about 2.2 m and 2.5 m below ground surface (between Elevation 98.0 m and 97.2 m). This deposit is interpreted to be derived from weathering of the underlying shale bedrock, and consists of sandy clayey silt trace to some gravel, containing varying amounts of shale and limestone fragments.

SPT "N"-values measured within the residual soil are between 18 blows and 93 blows per 0.3 m of penetration, suggesting a very stiff to hard consistency.

The results of a grain size distribution test completed on a selected sample of the residual soil are shown on Figure B3 in Appendix B.

Atterberg limits tests were carried out on two samples of the residual soil and measured liquid limits of about of 32 per cent and 34 per cent, plastic limits of about 20 per cent, and plasticity indices of about 12 per cent and 14 per cent. These test results, which are plotted on a plasticity chart on Figure B4 in Appendix B, indicate that the fines portion of the residual soil can be classified as a clayey silt of low plasticity.

The natural water content measured on samples of the residual soils ranges between 7 per cent and 16 per cent.

4.2.5 Shale Bedrock

Bedrock was encountered and confirmed by split-spoon sampling in Boreholes SWMW-01 and SWMW-02, and bedrock core samples were obtained in Boreholes SWMW-03 and SWMW-04. The depths to bedrock below ground surface, and the corresponding bedrock surface elevation are summarized below.

Borehole	Depth to Bedrock Surface / Refusal (m)	Bedrock Surface / Refusal Elevation (m)	Comments
SWMW-01	2.5	98.0	Split-Spoon Sample
SWMW-02	2.5	97.8	Split-Spoon Sample
SWMW-03	2.2	97.2	Bedrock Cored 4.5 m
SWMW-04	2.2	97.6	Bedrock Cored 4.5 m

In general, the bedrock surface as encountered or inferred in the area of the proposed stormwater management pond is relatively horizontal to gently sloping towards the south.

Based on a review of the bedrock core samples, the bedrock consists of shale of the Georgian Bay Formation. In general, the bedrock samples are described as slightly weathered, thinly laminated to bedded, fine grained, slightly porous, weak, grey, with medium strong to strong limestone interbeds at varying intervals, as presented in the drillhole records in Appendix A, and shown on the photographs of the recovered core samples on Figures B5 and B6 in Appendix B. The degree of weathering of the bedrock samples (i.e. slightly weathered –W2), and the strength classification of the intact rock mass based on field identification (i.e. weak – R2) are described in accordance with the International Society for Rock Mechanics (ISRM[3]) standard classification system.

The Rock Quality Designation (RQD) measured on the core samples is between 67 per cent and 100 per cent, indicating a rock mass of generally fair to excellent quality, as per Table 3.10 of CFEM (2006)[4]. The Total Core Recovery (TCR) and Solid Core Recovery (SCR) of samples recovered are 100 per cent and between 95 per cent and 100 per cent, respectively.

4.2.6 Groundwater Conditions

The overburden samples obtained from the boreholes were generally moist. The open boreholes were observed to be dry upon completion of drilling; however, these observations are not necessarily representative of the stabilized groundwater level at the site. A standpipe piezometer was installed in Borehole SWMW-04, sealed within the shale bedrock, and the recorded water level is summarized below:

Borehole	Stratum Sealed Into	Depth to Water Level (m)	Water Level Elevation (m)	Date
SWMW-04	Bedrock	2.4	97.4	November 28, 2017

[3] International Society for Rock Mechanics Commission on Test Methods, 1985. Int. J. Rock Mech.Min. Sci. & Geomech. Abstr. Vol 22, No. 2, pp. 51-60.

[4] Canadian Geotechnical Society, 2006. Canadian Foundation Engineering Manual (CFEM), 4th Edition. The Canadian Geotechnical Society, BiTech Published Ltd., British Columbia.

It should be noted that the groundwater level in the area is subject to seasonal fluctuations and precipitation events, and should be expected to be higher during wet periods of the year.

5.0 CLOSURE

This report was prepared by Mr. Matthew Kelly, P.Eng., a Geotechnical Engineer with Golder. Ms. Sandra McGaghran, M.Eng., P.Eng., a Geotechnical Engineer and Associate with Golder, and Mr. Paul Dittrich, P.Eng., a Principal with Golder reviewed the technical aspects of the report. Mr. Jorge Costa, P.Eng., MTO Foundations Designated Contact for Golder and Senior Consultant, conducted a quality control audit of the report.

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https://golderassociates.sharepoint.com/sites/11176g/shared documents/07-reporting/foundations/swm pond wet/final/1662333 fidr - swm pond 2018may09.docx

DRAWINGS

MINISTRY OF TRANSPORTATION, ONTARIO

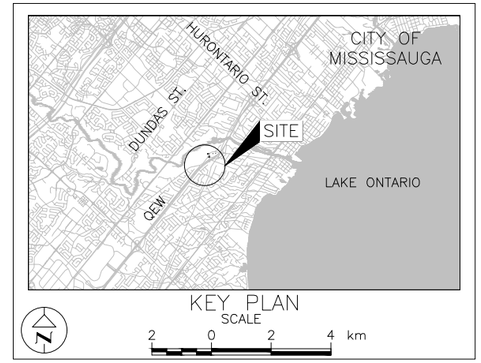
METRIC
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN.
STATIONS IN KILOMETRES + METRES.

CONT No.
GWP No.2002-13-00

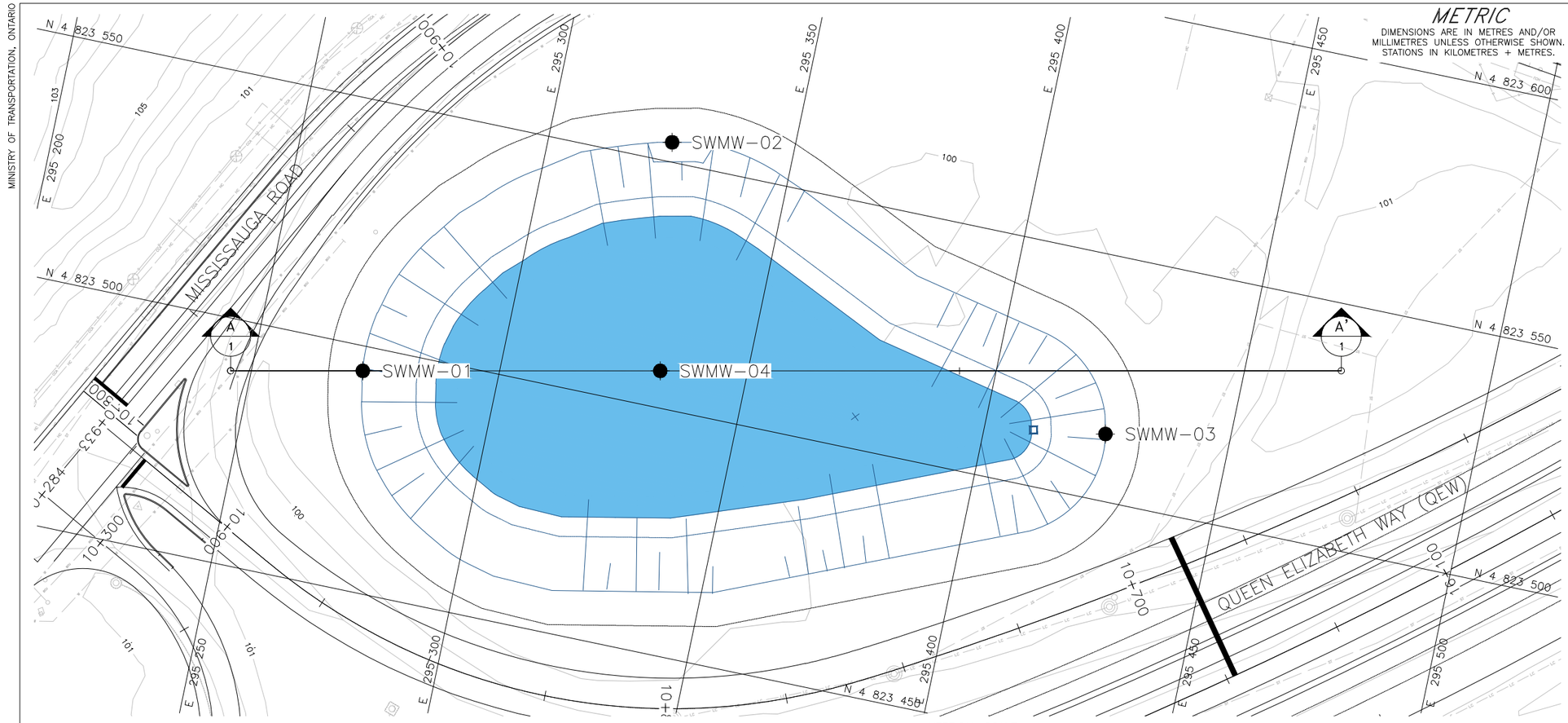
SHEET

QEW STORMWATER MANAGEMENT POND BOREHOLE LOCATIONS AND SOIL STRATA

Golder Associates



KEY PLAN
SCALE
2 0 2 4 km



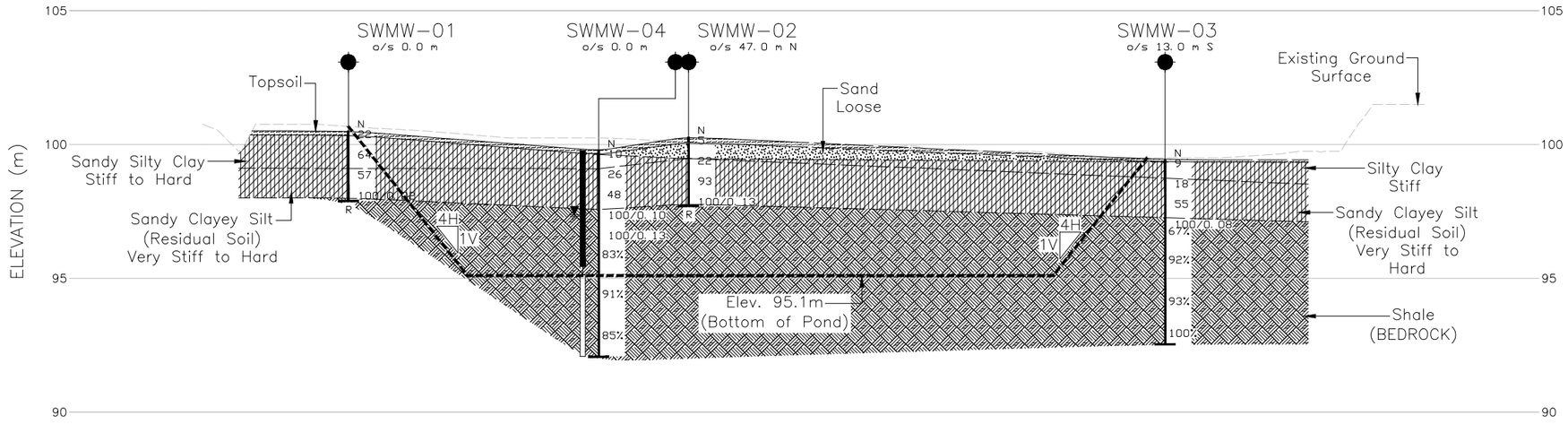
PLAN

VERTICAL SCALE
10 0 10 20 m

LEGEND

- Borehole
- Seal
- Piezometer
- N — Standard Penetration Test Value
- 16 — Blows/0.3m unless otherwise stated (Std. Pen. Test, 475 j/blow)
- 100% — Rock Quality Designation (RQD)
- R — Refusal
- WL in piezometer, measured on Nov. 14, 2017

BOREHOLE CO-ORDINATES (MTM NAD83, ZONE 10)			
No.	ELEVATION	NORTHING	EASTING
SWMW-01	100.5	4823494.9	295272.4
SWMW-02	100.3	4823554.0	295325.1
SWMW-03	99.4	4823513.7	295424.7
SWMW-04	99.8	4823507.5	295332.3



HORIZONTAL SCALE
10 0 10 20 m

HORIZ. SCALE 1:500 m
VERT. SCALE 1:100 m
A-A' CROSS-SECTION A-A'

VERTICAL SCALE
2 0 2 4 m

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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.

The boundaries between soil strata have been established only at borehole locations. Between boreholes the boundaries are assumed from geological evidence.

REFERENCE

Base plans provided in digital format by Morrison Hershfield, drawing file P7733-117404-8, dated April 27, 2017, received April 27, 2016.

NO.	DATE	BY	REVISION
.	.	.	.

Geocres No. 30M12-416

HWY. QEW		PROJECT NO. 1662333	DIST. CENTRAL
SUBM'D. DM	CHKD. MK	DATE: 5/9/2018	SITE: .
DRAWN: SMD	CHKD. SMM	APPD. JD/JMAC	DWG. 1

PLOT DATE: May 9, 2018
FILENAME: S:\Clients\MTO\QEW-Credit_River\09_PROJ\1662333_MH_P&P\40_PROD\0004_SWM_Pond_Dry\1662333-0004-BC-0001.dwg

APPENDIX A

Borehole and Drillhole Records

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
σ_1, σ_2, σ_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 $\gamma = \rho g$ (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 = $(w_l - w_p)$
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_α	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
ϕ'	effective angle of internal friction
δ	angle of interface friction
μ	coefficient of friction = tan δ
c'	effective cohesion
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	$(\sigma_1 - \sigma_3)/2$ 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

LIST OF ABBREVIATIONS

The abbreviations commonly employed on Records of Boreholes, on figures and in the text of the report are as follows:

I. SAMPLE TYPE

AS	Auger sample
BS	Block sample
CS	Chunk sample
DS	Denison type sample
FS	Foil sample
RC	Rock core
SC	Soil core
SS	Split-spoon
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

II. 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.) drive open sampler for a distance of 300 mm (12 in.)

Dynamic Cone Penetration Resistance; 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, 60º 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

Piezo-Cone Penetration Test (CPT)

A 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 (PWP) and friction along a sleeve are recorded electronically at 25 mm penetration intervals.

III. SOIL DESCRIPTION

(a) Non-Cohesive Soils

Density Index / Relative Density	N Blows/300 mm or Blows/ft
Very loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	over 50

(b) Cohesive Soils

Consistency

	c_u, s_u kPa	c_u, s_u psf
Very soft	0 to 12	0 to 250
Soft	12 to 25	250 to 500
Firm	25 to 50	500 to 1,000
Stiff	50 to 100	1,000 to 2,000
Very stiff	100 to 200	2,000 to 4,000
Hard	over 200	over 4,000

IV. SOIL TESTS

w	water content
w_p	plastic limit
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
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	field vane (LV-laboratory vane test)
γ	unit weight

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

V. MINOR SOIL CONSTITUENTS

Per cent by Weight	Modifier	Example
0 to 5	Trace	Trace sand
5 to 12	Trace to Some (or Little)	Trace to some sand
12 to 20	Some	Some sand
20 to 30	(ey) or (y)	Sandy
over 30	And (non-cohesive) or With (cohesive)	Sand and Gravel / Silty Clay with sand / Clayey Silt with sand

LITHOLOGICAL AND GEOTECHNICAL ROCK DESCRIPTION TERMINOLOGY

WEATHERINGS STATE

Fresh: no visible sign of weathering

Faintly weathered: weathering limited to the surface of major discontinuities.

Slightly weathered: penetrative weathering developed on open discontinuity surfaces but only slight weathering of rock material.

Moderately weathered: weathering extends throughout the rock mass but the rock material is not friable.

Highly weathered: weathering extends throughout rock mass and the rock material is partly friable.

Completely weathered: rock is wholly decomposed and in a friable condition but the rock and structure are preserved.

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, measured relative to the length of the total core run. RQD varied from 0% for completely broken core to 100% for core in solid sticks.

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^{o} 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

JN	Joint	PL	Planar
FLT	Fault	CU	Curved
SH	Shear	UN	Undulating
VN	Vein	IR	Irregular
FR	Fracture	K	Slickensided
SY	Stylolite	PO	Polished
BD	Bedding	SM	Smooth
FO	Foliation	SR	Slightly Rough
CO	Contact	RO	Rough
AXJ	Axial Joint	VR	Very Rough
KV	Karstic Void		
MB	Mechanical Break		

GOLDER

RECORD OF BOREHOLE No SWMW-01 SHEET 1 OF 1 METRIC

PROJECT 1662333
G.W.P. 2002-13-00
LOCATION N 4823494.9; E 295272.4 MTM NAD 83 ZONE 10 (LAT. 43.551320; LONG. -79.617900)
ORIGINATED BY FC
DIST Central HWY QEW
BOREHOLE TYPE CME 55, 152 mm O.D., Solid Stem Augers (Auto Hammer)
COMPILED BY KN
DATUM Geodetic
DATE August 16, 2017
CHECKED BY SMM

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
100.5	GROUND SURFACE										
0.0	TOPSOIL (150mm)										
0.2	Sandy SILTY CLAY, trace to some gravel, trace rootlets Very stiff to hard Brown Moist		1	SS	22		100				
			2	SS	64						8 22 55 15
99.1											
1.4	Sandy CLAYEY SILT, trace to some gravel, contains shale fragments (RESIDUAL SOIL) Hard Brown Moist		3	SS	57		99				
98.0			4A 4B	SS	100/0.02		98				
	SHALE (BEDROCK) Grey										
2.6	END OF BOREHOLE - AUGER REFUSAL										

NOTES:

1. Borehole dry upon completion of drilling.

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

PROJECT: 1662333

RECORD OF DRILLHOLE: SWMW-01

SHEET 1 OF 1

LOCATION: N 4823494.9 ;E 295272.4

DRILLING DATE: August 16, 2017

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG:

DRILLING CONTRACTOR: Aardvark Drilling

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	RECOVERY TOTAL CORE % (80 60 40 20)	RECOVERY SOLID CORE % (80 60 40 20)	R.Q.D. % (80 60 40 20)	FRACT. INDEX PER Meter (5 10 15 20)	DISCONTINUITY DATA: B Angle (0 90 180 270)	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: Jr	DISCONTINUITY DATA: Ja	ROCK STRENGTH INDEX (R4 R3 R2 R1)	WEATH-ERING INDEX (W1 W2 W3 W4 W5 W6)	FEATURES	R0/R1 ZONES	NOTES WATER LEVELS INSTRUMENTATION
0		GROUND SURFACE		100.51															
				0.00															
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			

FEATURES LEGEND

BROKEN CORE CLAY SEAM LIMESTONE LOST CORE

DEPTH SCALE

1 : 50

GOLDER

LOGGED:

CHECKED:

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GOLDER

RECORD OF BOREHOLE No SWMW-02 SHEET 1 OF 1 METRIC

PROJECT 1662333
G.W.P. 2002-13-00
DIST Central HWY QEW
DATUM Geodetic

LOCATION N 4823554.0; E 295325.1 MTM NAD 83 ZONE 10 (LAT. 43.551850; LONG. -79.617300)
BOREHOLE TYPE CME 55, 152 mm O.D., Solid Stem Augers (Auto Hammer)
DATE August 16, 2017

ORIGINATED BY FC
COMPILED BY KN
CHECKED BY MWK

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
100.3	GROUND SURFACE										
0.0	TOPSOIL (200mm)										
0.2	SAND, trace silt, trace rootlets Loose Brown		1	SS	5		100		○		
99.5	Moist										
0.8	Sandy CLAYEY SILT, trace to some gravel, contains shale fragments (RESIDUAL SOIL) Very stiff to hard Brown to brown-grey Moist		2	SS	22		99		○		
			3	SS	93				○ ——		8 30 49 13
97.8			4A	SS	100/0.13		98				
2.6	SHALE (BEDROCK) Grey		4B								
	END OF BOREHOLE - AUGER REFUSAL										

NOTES:

1. Borehole dry upon completion of drilling.

$+^3, \times^3$: Numbers refer to Sensitivity

$\bigcirc^{3\%}$ STRAIN AT FAILURE

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PROJECT: 1662333

RECORD OF DRILLHOLE: SWMW-02

SHEET 1 OF 1

LOCATION: N 4823554.0 ;E 295325.1

DRILLING DATE: August 16, 2017

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG:

DRILLING CONTRACTOR: Aardvark Drilling

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	RECOVERY TOTAL CORE % (80 60 40 20)	RECOVERY SOLID CORE % (80 60 40 20)	R.Q.D. % (80 60 40 20)	FRACT. INDEX PER Meter (5 10 15 20)	DISCONTINUITY DATA: B Angle (0 90 180 270)	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS (0 30 60 90)	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: Jr	DISCONTINUITY DATA: Ja	ROCK STRENGTH INDEX (R4 R3 R2 R1)	WEATH-ERING INDEX (W1 W2 W3 W4 W5 W6)	FEATURES	R0/R1 ZONES	NOTES WATER LEVELS INSTRUMENTATION
0		GROUND SURFACE		100.28															
				0.00															
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			

FEATURES LEGEND

BROKEN CORE | CLAY SEAM | LIMESTONE | LOST CORE

DEPTH SCALE

1 : 50

GOLDER

LOGGED:

CHECKED:

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GOLDER

RECORD OF BOREHOLE No SWMW-03 SHEET 1 OF 1 METRIC

PROJECT 1662333
G.W.P. 2002-13-00
DIST Central HWY QEW
DATUM Geodetic
LOCATION N 4823513.7; E 295424.7 MTM NAD 83 ZONE 10 (LAT. 43.551490; LONG. -79.616000)
BOREHOLE TYPE CME 55, 152 mm O.D., Solid Stem Augers (Auto Hammer)
DATE August 14, 2017
ORIGINATED BY FC
COMPILED BY KN
CHECKED BY MWK

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 + FIELD VANE ● QUICK TRIAXIAL × 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
99.4	GROUND SURFACE										
0.0 / 0.1	TOPSOIL (80mm)										
	SILTY CLAY, some sand, trace gravel, trace rootlets		1	SS	9		99		○ 45		1 14 51 34
98.7 / 0.7	Stiff Brown Moist										
	Sandy CLAYEY SILT, contains shale fragments (RESIDUAL SOIL)		2	SS	18		98		○		
	Very stiff to hard Brown		3	SS	55				○		
97.2	Moist										
2.2	SHALE (BEDROCK) Grey		4	SS	100/0.08		97				
			1	RC	REC 100%						RQD = 67%
			2	RC	REC 100%		96				RQD = 92%
	Bedrock cored from depths of 2.4 m to 6.9 m For bedrock coring details refer to Record of Drillhole SWMW-03		3	RC	REC 100%		95				RQD = 93%
			4	RC	REC 100%		94				RQD = 100%
92.5							93				
6.9	END OF BOREHOLE										

NOTES:

1. Borehole dry prior to rock coring.

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

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PROJECT: 1662333

RECORD OF DRILLHOLE: SWMW-03

SHEET 1 OF 1

LOCATION: N 4823513.7 ;E 295424.7

DRILLING DATE: August 14, 2017

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Aardvark Drilling

JN - Joint; FLT - Fault; SHR- Shear; VN - Vein; CJ - Conjugate
BD- Bedding; FO- Foliation; CO- Contact; OR- Orthogonal; CL - Cleavage
PL - Planar; CU- Curved; UN- Undulating; ST - Stepped; IR - Irregular
PO- Polished; K - Slickensided; SM- Smooth; Ro - Rough; MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER Meter	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: Jr	DISCONTINUITY DATA: Ja	ROCK STRENGTH INDEX	WEATHERING INDEX	FEATURES	R0/R1 ZONES	NOTES WATER LEVELS INSTRUMENTATION
		Continued from Borehole SWMW-03		97.07															
3	HQ Core	Slightly weathered, thinly laminated to bedded, grey, fine grained, slightly porous, weak SHALE (Georgian Bay Formation), with slightly weathered to fresh, thinly bedded, grey, fine grained, non-porous, medium strong to strong, LIMESTONE interbeds		2.36	1						90	BD,UN,SM BD,UN,SM			R4	W1			
											90	BD,PL,RO BD,UN,RO			R4	W1			
											90	BD,PL,SM			R4	W1			
					2						90	CO,UN,RO BD,UN,RO			R4	W1			
											90	BD,UN,SM BD,UN,SM			R4	W1			
											90	CO,UN,SM CO,UN,SM			R4	W1			
4											90	BD,UN,SM			R4	W1		R1	
											90	BD,UN,CO			R4	W1			
					3						90	BD,IR,RO BD,UN,SM BD,UN,SM BD,PL,SM BD,PL,SM			R4	W1			
5											90	BD,PL,SM			R4	W1			
											90	BD,PL,SM			R4	W1			
											90	BD,PL,SM			R4	W1			
6					4						90	BD,PL,SM			R4	W1			
											90	BD,PL,SM CO,PL,SM			R4	W1			
				92.54															
7		END OF DRILLHOLE		6.89															

FEATURES LEGEND

BROKEN CORE | CLAY SEAM | LIMESTONE | LOST CORE

DEPTH SCALE
1 : 50

GOLDER

LOGGED: FC
CHECKED: AC

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GOLDER

RECORD OF BOREHOLE No SWMW-04 SHEET 1 OF 1 METRIC

PROJECT 1662333
G.W.P. 2002-13-00
DIST Central HWY QEW
DATUM Geodetic

LOCATION N 4823507.5; E 295332.3 MTM NAD 83 ZONE 10 (LAT. 43.551430; LONG. -79.617200)
BOREHOLE TYPE CME 55, 203 mm O.D., 108 mm I.D. Hollow Stem Augers (Auto Hammer)
DATE August 16, 2017

ORIGINATED BY FC
COMPILED BY KN
CHECKED BY MWK

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 (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
99.8	GROUND SURFACE										
0.0	TOPSOIL (150mm)										
0.2	Sandy SILTY CLAY, trace gravel, trace rootlets		1	SS	10				○		
99.1	Stiff						99				
0.7	Brown Moist Sandy CLAYEY SILT, contains shale fragments (RESIDUAL SOIL) Very stiff to hard Brown to grey Moist		2	SS	26						
			3	SS	48		98		○		
97.6											
2.2	SHALE (BEDROCK)		4	SS	100/0.10	▼					
			5	SS	100/0.13		97				
			1	RC	REC 100%		96				RQD = 83%
			2	RC	REC 100%		95				RQD = 91%
	Bedrock cored from depths of 3.2 m to 7.7 m For bedrock coring details refer to Record of Drillhole SWMW-04						94				
			3	RC	REC 100%		93				RQD = 85%
92.1											
7.7	END OF BOREHOLE										

NOTES:

1. Borehole dry prior to rock coring.

2. Groundwater level measurements in piezometer:

Date	Depth (m)	Elev. (m)
14/11/17	2.49	7.4
21/11/17	2.49	7.4
28/11/17	2.49	7.4

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

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PROJECT: 1662333

RECORD OF DRILLHOLE: SWMW-04

SHEET 1 OF 1

LOCATION: N 4823507.5 ;E 295332.3

DRILLING DATE: August 16, 2017

DATUM: Geodetic

INCLINATION: -90° AZIMUTH: ---

DRILL RIG: CME 55

DRILLING CONTRACTOR: Aardvark Drilling

JN - Joint, FLT - Fault, SHR- Shear, VN - Vein, CJ - Conjugate
BD- Bedding, FO- Foliation, CO- Contact, OR- Orthogonal, CL - Cleavage
PL - Planar, CU- Curved, UN- Undulating, ST - Stepped, IR - Irregular
PO- Polished, K - Slickensided, SM- Smooth, Ro - Rough, MB- Mechanical Break
BR - Broken Rock
NOTE: For additional abbreviations refer to list of abbreviations & symbols.

DEPTH SCALE METRES	DRILLING RECORD	DESCRIPTION	SYMBOLIC LOG	ELEV. / DEPTH (m)	RUN No.	RECOVERY TOTAL CORE %	RECOVERY SOLID CORE %	R.Q.D. %	FRACT. INDEX PER Meter	DISCONTINUITY DATA: B Angle	DISCONTINUITY DATA: DIP w.r.t. CORE AXIS	DISCONTINUITY DATA: TYPE AND SURFACE DESCRIPTION	DISCONTINUITY DATA: Jr	DISCONTINUITY DATA: Ja	ROCK STRENGTH INDEX	WEATHERING INDEX	FEATURES	R0/R1 ZONES	NOTES WATER LEVELS INSTRUMENTATION
		Continued from Borehole SWMW-04		96.61															
4	HQ Core	Slightly weathered, thinly laminated to bedded, grey, fine grained, slightly porous, weak SHALE (Georgian Bay Formation), with slightly weathered to fresh, thinly bedded, grey, fine grained, non-porous, medium strong to strong, LIMESTONE interbeds		3.17	1							BD,UN,SM BD,UN,RO BD,IR,RO BD,UN,SM BD,PL,SM BD,UN,SM BD,PL,SM BD,UN,RO			R4 R3 R2 R1	W1 W2 W3 W4 W5 W6			
5					2							BD,PL,SM BD,UN,RO BD,UN,SM CO,PL,SM CO,PL,SM BD,UN,SM							
6												BD,PL,SM							
7					3							BD,PL,SM BD,PL,SM BD,PL,SM BD,IR,RO BD,IR,RO BD,PL,SM CO,UN,SM CO,PL,SM CO,UN,SM						R1 R1	
				92.07															
		END OF DRILLHOLE		7.71															
8																			
9																			
10																			
11																			
12																			

FEATURES LEGEND

BROKEN CORE | CLAY SEAM | LIMESTONE | LOST CORE

DEPTH SCALE

1 : 50

GOLDER

LOGGED: FC

CHECKED: AC

GTA-RCK 054 N:\COMMON\SDONOVAN\FOR MATT\20180509\QEW-CREDIT_RIVER.GPJ GAL-MISS.GDT 9/5/18

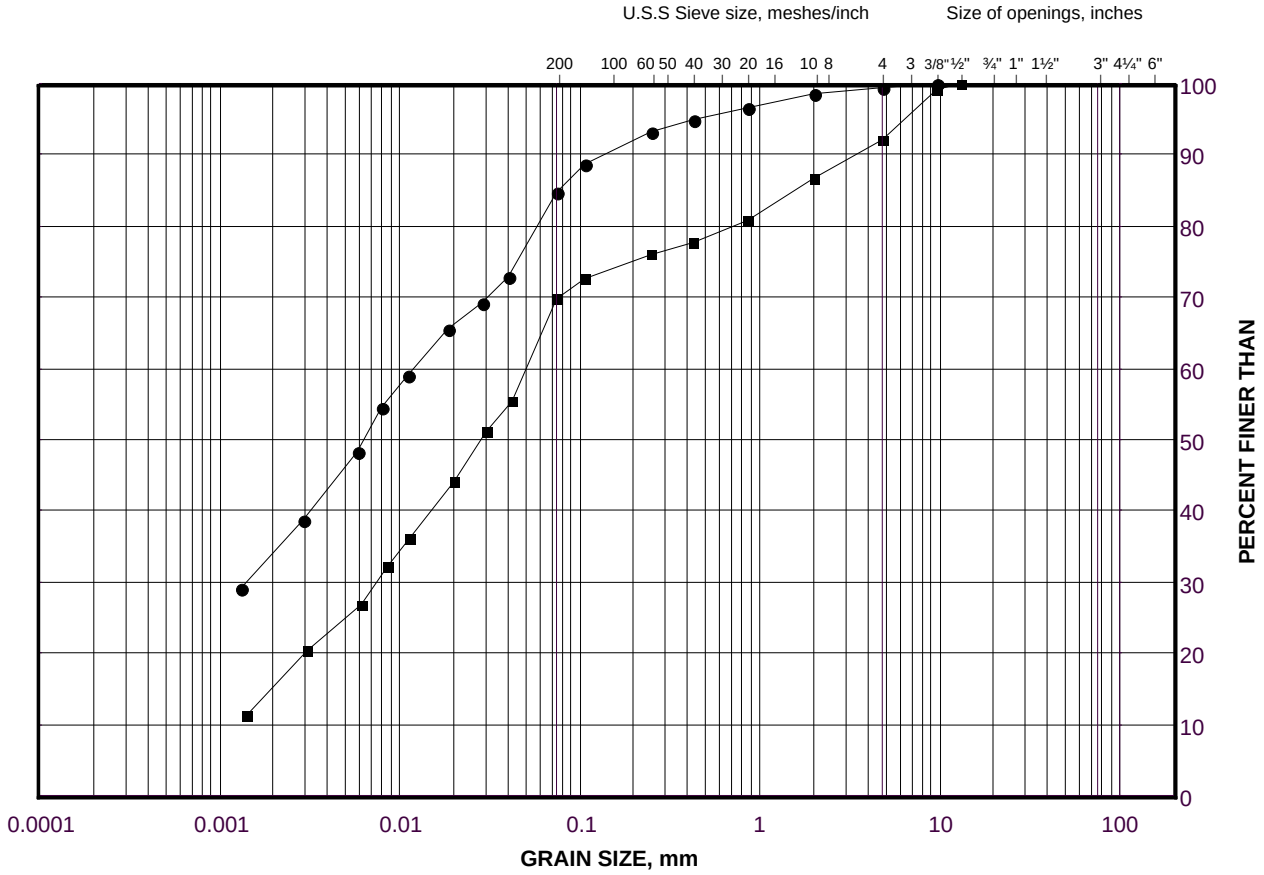
APPENDIX B

Laboratory Test Results, Bedrock Core Photographs

GRAIN SIZE DISTRIBUTION

Silty Clay to Sandy Silty Clay

FIGURE B1



LEGEND

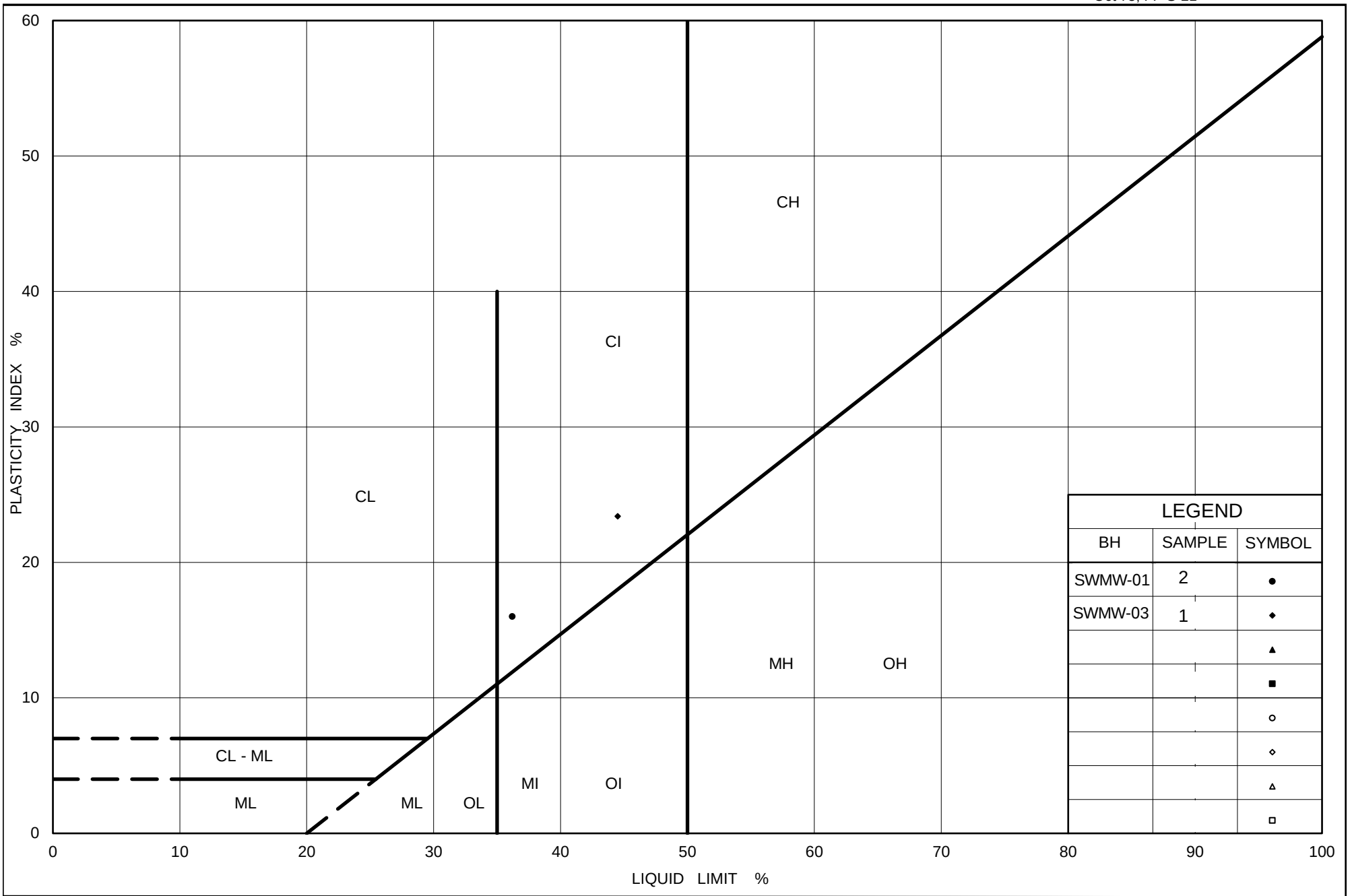
SYMBOL	Borehole	SAMPLE	ELEVATION(m)
●	SWMW-03	1	99.1
■	SWMW-01	2	99.4

Project Number: 1662333

Checked By: JPD

Golder Associates

Date: 04-Dec-17



Ministry of Transportation

Ontario

PLASTICITY CHART
Silty Clay

Figure No. B2

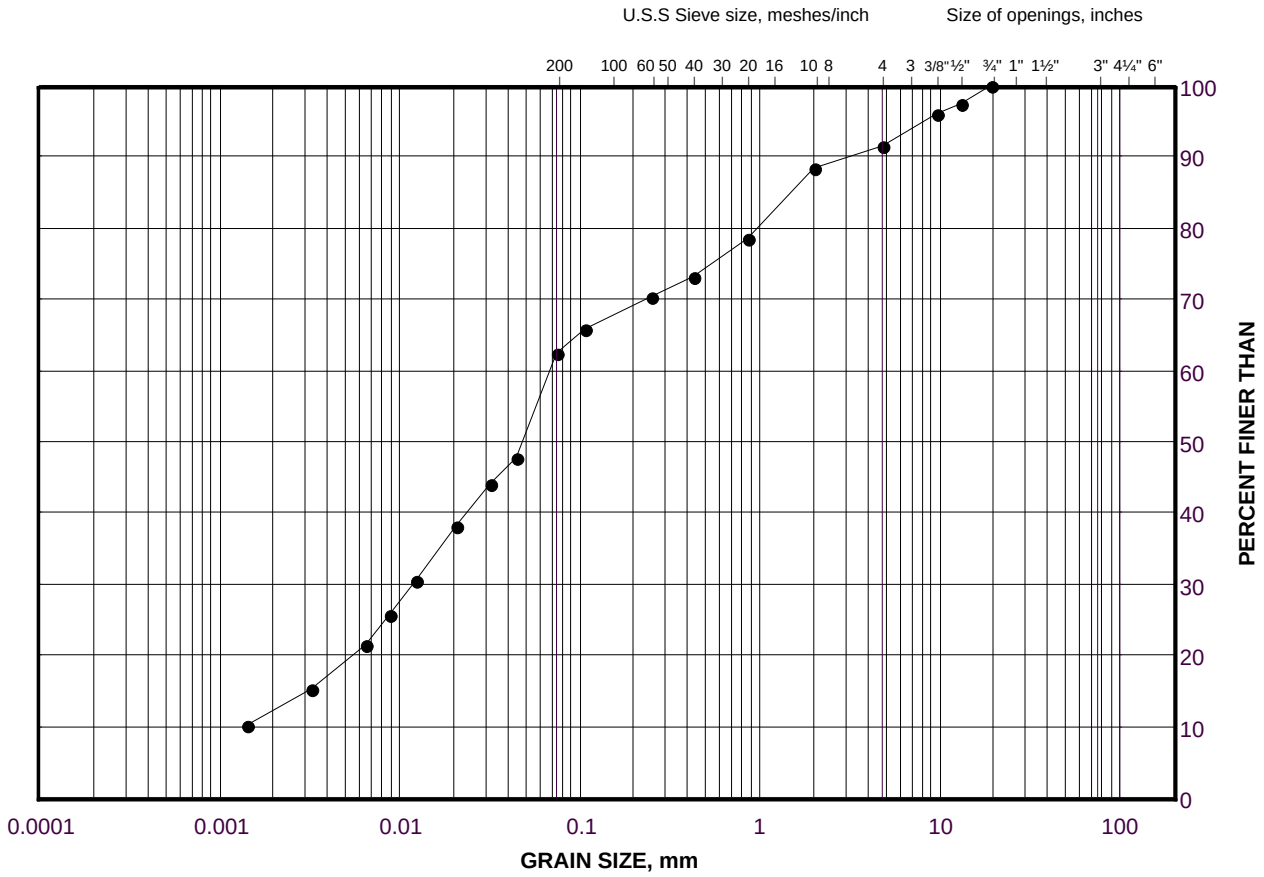
Project No. 1662333

Checked By: JPD

GRAIN SIZE DISTRIBUTION

Sandy Clayey Silt (Residual Soil)

FIGURE B3



LEGEND

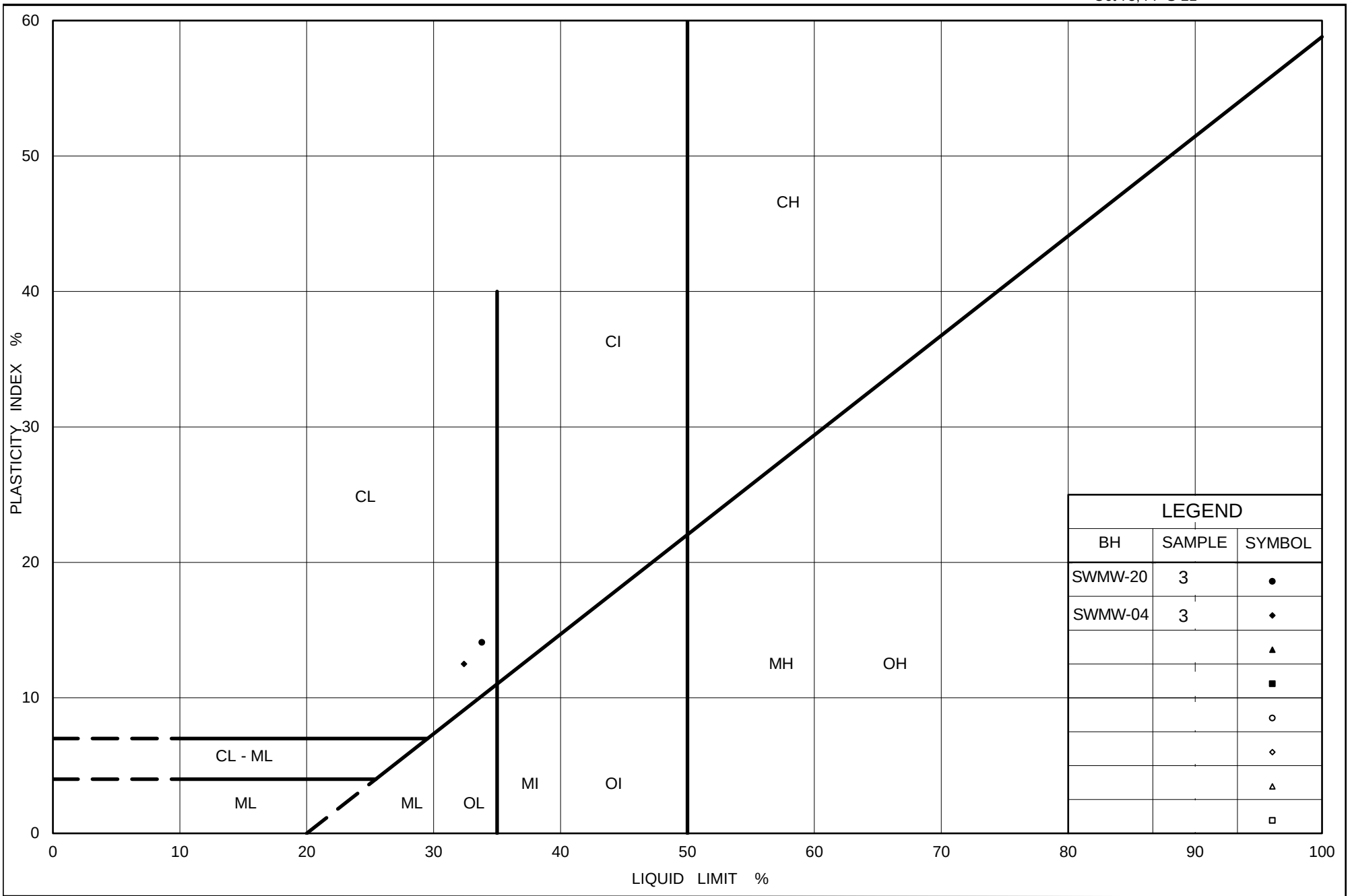
SYMBOL	Borehole	SAMPLE	ELEVATION(m)
●	SWMW-02	3	98.4

Project Number: 1662333

Checked By: JPD

Golder Associates

Date: 04-Dec-17



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Ontario

PLASTICITY CHART
Clayey Silt (Residual Soil)

Figure No. B4

Project No. 1662333

Checked By: JPD

Start of Run No. 1 (2.36 m)

Start of Run No. 2 (2.96 m)

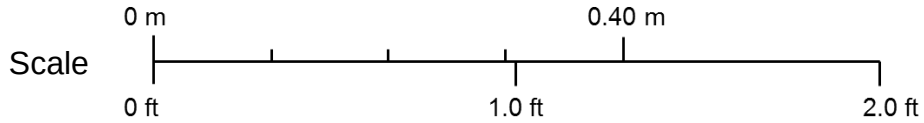
Box 1: 2.36 m to 5.43 m

Start of Run No. 3 (4.50 m)

Start of Run No. 4 (6.06 m)

Box 2: 5.43 m to 6.89 m

End of Run No. 4 (6.89 m)



REVISION DATE October 3, 2017 BY: AC Project: 1662333

PROJECT

MTO Assignment 2015-E-0033: Detail Design for the widening/rehab/realignment of QEW Between Mississauga Road and Hurontario Street

TITLE

Bedrock Core Photographs
Borehole SWMW-03 (2.36 m to 6.89 m)

Golder Associates

PROJECT No. 1662333			FILE No. ----		
DESIGN	AC	20171003	SCALE	NTS	REV.
CADD	--		**FIGURE B5**		
CHECK	MWK	20170208			
REVIEW	KJB	20170208			

Start of Run No. 1 (3.17 m)

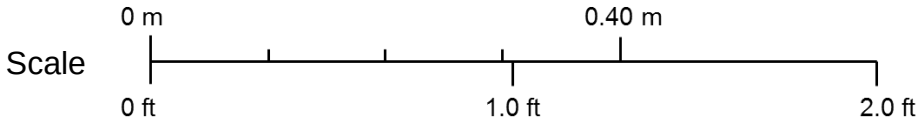
Box 1: 3.17 m to 6.12 m

Start of Run No. 2 (4.60 m)

Start of Run No. 3 (6.12 m)

End of Run No. 3 (7.71 m)

Box 2: 6.12 m to 7.71 m



REVISION DATE October 3, 2017 BY: AC Project: 1662333

PROJECT
MTO Assignment 2015-E-0033: Detail Design for the widening/rehab/realignment of QEW Between Mississauga Road and Hurontario Street

TITLE
Bedrock Core Photographs
Borehole SWMW-04 (3.17 m to 7.71 m)

Golder Associates

PROJECT No. 1662333			FILE No. ----		
DESIGN	AC	20171003	SCALE	NTS	REV.
CADD	--		**FIGURE B6**		
CHECK	MWK	20170208			
REVIEW	KJB	20170208			

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