



February 4, 2016

FOUNDATION INVESTIGATION REPORT

HIGH FILL EMBANKMENTS AND RETAINING WALLS HIGHWAY 400 FROM ESSA ROAD TO DUNLOP STREET WEST, BARRIE, ONTARIO G.W.P. 2159-11-00

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GEOCRES No.: 31D-635

REPORT

Report Number: 1532543-4

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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 to support the detail design of the proposed widening of high fill embankments and permanent retaining walls along the east side of the Highway 400 northbound lanes, as well as temporary roadway protection/retaining walls required to facilitate construction of the widening of Highway 400, between Dunlop Street and Essa Road interchanges.

The purpose of this investigation is to establish the subsurface conditions at the location of the proposed widening of high fill embankments and permanent and temporary retaining walls, by means of a limited borehole investigation and geotechnical laboratory testing on selected samples. Separate reports address the foundation investigations for the Tiffin Street Overpass, Barrie Collingwood Rail (BCR) Overpass and for culvert structures associated with this project.

Golder has completed the foundation engineering services in accordance with Proposal No. GEOTETOB22161AA, dated March 13, 2015, originally provided to MH by Coffey Geotechnics Inc. (Coffey).

2.0 SITE DESCRIPTION

The existing Highway 400 is oriented generally in a north-south direction in the Townships of Innisfil and Vespra within the City of Barrie, Ontario. The existing Highway 400 is comprised of a 6 lane embankment (three northbound and three southbound lane) separated by a steel guide rail barrier system. The existing embankment within the project limits is up to about 9 m high, with generally 2 horizontal to 1 vertical (2H:1V) side slopes. The areas on the east and west sides of Highway 400 have been developed for residential and mixed commercial and industrial land uses throughout. The general location of the Highway 400 widening and associated structure works is shown on the Key Plan on the Borehole Location and Soil Strata drawings contained in the Contract Documents.

3.0 INVESTIGATION PROCEDURES

3.1 Previous Investigation by Others

Coffey completed a preliminary foundation investigation for the Highway 400 / Tiffin Street Overpass structures, Barrie Collingwood Rail Overpass structure and the proposed retaining wall structures comprised of a total of nineteen boreholes (C1, C2, RW1 to RW14, F1, F4 and F5) in October 2014; the records for these boreholes are provided in Appendix A. The locations of these boreholes are shown on the Borehole Location and Soil Strata drawings contained in the Contract Documents.

The results of the investigation are presented in Coffey's Preliminary Foundation Investigation and Design Report (GEOCRE No. 31D-587), dated February 2015.



3.2 Current Investigation

The field work for the current subsurface investigation for the high fill embankments and permanent and temporary retaining wall structures was carried out between June 24 and July 16, 2015, during which time a total of twenty-eight (28) boreholes (P-RW1 to P-RW6, HF1 to HF5, TRW1 to TRW9, 15-2 to 15-5, 15-7 to 15-10) were advanced using track-mounted drill rigs, supplied and operated by specialist drilling subcontractors. The locations of the boreholes are shown on the Borehole Location and Soil Strata drawings contained in the Contract Documents.

The boreholes were advanced to depths ranging from 9.4 m to 19.8 m below existing ground surface using hollow stem auger drilling methods. Soil samples were obtained in the boreholes at 0.75 m and 1.5 m intervals of depth using 50 mm outer diameter split-spoon samplers driven by an automatic hammer, in accordance with the Standard Penetration Test (SPT) procedure. Each of the boreholes was terminated at pre-determined depths as provided in the Coffey proposal, to avoid penetrating into a trichloroethylene (TCE) plume that is present in the vicinity of the site.

The groundwater conditions were observed in the open boreholes during and immediately following the drilling operations, and piezometers were installed in six (6) boreholes (Boreholes P-RW5, HF2, HF4, 15-2, 15-4 and 15-10) to permit monitoring of the groundwater levels at these locations. The piezometers consist of 50 mm diameter PVC pipe, with a slotted screen sealed within a sand filter pack at a selected depth interval within the borehole. The piezometer installation details and water level readings are indicated on the borehole records contained in Appendix A. All remaining boreholes were backfilled to ground surface with bentonite upon completion, in accordance with Ontario Regulation 903 (as amended).

The field work was supervised on a full-time basis by a member of Golder's staff who observed the drilling, sampling and in situ testing operations, and logged the subsurface conditions encountered in the boreholes. The soil samples were identified in the field, placed in labelled containers and transported to Golder's laboratory in Mississauga for further examination and laboratory testing. Index and classification tests consisting of water contents, Atterberg limits and grain size distributions were carried out on selected soil samples.

The borehole locations and ground surface elevations were obtained from the digital terrain model provided by MH. The borehole locations, including MTM NAD83 northing and easting coordinates and ground surface elevations referenced to Geodetic datum, are presented in the individual borehole records, and are summarized below and shown on are shown on the Borehole Location and Soil Strata drawings contained in the Contract Documents.

Borehole No.	NAD83 MTM Zone 10 Coordinates		Ground Surface Elevation (m)	Borehole Depth (m)
	Northing (m)	Easting (m)		
P-RW1	4914166.1	288635.1	232.4	10.1
P-RW2	4914319.8	288507.2	233.7	10.1
P-RW3	4914460.1	288390.7	234.3	10.1
P-RW4	4914537.8	288325.6	234.4	10.1
P-RW5	4914702.6	288189.5	233.8	10.1
P-RW6	4914804.3	288106.4	235.0	10.1



HF1	4914216.0	288583.2	233.2	10.1
HF2	4914305.5	288501.2	236.6	10.1
HF3	4914383.3	288436.2	238.6	10.1
HF4	4914537.7	288309.6	236.5	10.1
HF5	4914646.9	288223.9	233.7	9.4
TRW-1	4914430.8	288380.2	243.0	12.8
TRW-2	4914522.0	288304.2	241.4	12.8
TRW-3	4914663.2	288187.6	237.8	12.8
TRW-4	4914766.2	288104.8	236.6	12.8
TRW-5	4914858.2	288040.6	235.6	12.8
TRW-6	4914475.3	288322.9	242.2	12.8
TRW-7	4914599.2	288219.3	238.8	12.8
TRW-8	4914699.6	288135.3	237.2	12.8
TRW-9	4914804.3	288054.9	236.2	12.8
15-2	4914565.9	288247.2	239.8	19.8
15-3	4914544.2	288286.9	240.7	19.8
15-4	4914580.1	288286.1	233.6	14.0
15-5	4914575.3	288233.7	239.5	13.7
15-7	4914422.5	288388.8	243.1	17.2
15-8	4914416.4	288424.7	234.2	10.1
15-9	4914402.9	288423.0	237.3	14.0
15-10	4914439.4	288392.5	237.8	14.0

4.0 SITE GEOLOGY AND SUBSURFACE CONDITIONS

4.1 Regional Geology

This section of Highway 400 lies within the Simcoe Lowlands, as delineated in *The Physiography of Southern Ontario* (Chapman and Putnam, Third Edition, 1984)¹. The soil deposits are typically interlayered, non-cohesive sand and silt deposits, with occasional cohesive clayey silt to silty clay layers.

4.2 Subsurface Conditions

The detailed soil and groundwater conditions encountered in the boreholes, and the results of in situ and geotechnical laboratory testing, are summarized on the borehole records in Appendix A. The results of the laboratory tested samples from Golder's current borehole investigation are shown on Figures B1 to B7 in Appendix B. The stratigraphic boundaries shown on the borehole records and on the interpreted stratigraphic profile and cross sections on the Borehole Location and Soil Strata drawings contained in the Contract Documents are inferred from non-continuous sampling and, therefore, represent transitions between soil types

¹ Chapman, L.J., and Putnam, D.F., 1984. *The Physiography of Southern Ontario*, 3rd Edition. Ontario Geological Survey, Special Volume 2. Ontario Ministry of Natural Resources.



rather than exact planes of geological change. The subsoil conditions will vary between and beyond the borehole location.

In summary, the subsoils encountered in the boreholes consist of fill underlain by interlayered native strata comprised of silt to sand and clayey silt to silty clay. A more detailed description of the subsurface conditions encountered in the boreholes is provided in the following sections.

4.2.1 Fill

An approximately 100 mm to 400 mm thick layer of asphalt was encountered at the ground surface in Boreholes 15-2, 15-3, 15-5, 15-7 and TRW-1 to TRW-9. Underlying the asphalt, the fill material varies in composition from silt to silt and sand to silty sand to sand to gravelly sand, including a pocket of clayey silt in one borehole. The surface of the fill deposit, below the asphalt, ranges from Elevations 242.9 m to 232.4 m and the thickness of the stratum ranges from 2.2 m to 9.9 m. It should be noted that some of the boreholes were advanced through the Highway 400 roadway platform while others were advanced from the toe of slope resulting in a large variation in the surface elevations and thickness of the stratum.

The measured SPT “N”-values within the non-cohesive fill materials range from 3 blows to 61 blows per 0.3 m of penetration, indicating that the fill materials have a very loose to very dense relative density, however, the majority of the results indicate the fill stratum is compact. The measured SPT “N”-value within the clayey silt fill pocket in Borehole 15-5 is 14 blows per 0.3 m of penetration, suggesting a stiff consistency.

The natural water content measured on selected samples of the fill deposit range from about 2 per cent to 31 per cent.

The results of grain size distribution tests completed on twenty-two selected samples of the fill are shown on Figure B1-A to B1-C.

An Atterberg Limits test was carried out on one sample of the cohesive fill pocket and measured a plastic limit of about 11 per cent, a liquid limit of about 26 per cent and a plasticity index of about 14 per cent. This result, which is plotted on the plasticity chart on Figure B2 in Appendix B, indicates that the cohesive fill pocket consists of clayey silt of low plasticity.

Coffey Boreholes

An approximately 200 mm to 400 mm thick layer of asphalt was encountered at the ground surface during the preliminary investigation in Boreholes RW6 to RW14, F1, F4 and F5. Where asphalt is not present, a 0.1 m to 0.2 m thick layer of topsoil was encountered from ground surface. Underlying the asphalt or topsoil, the fill material composition varies from gravelly sand to sandy gravel below the asphalt, to silt and sand to silty sand to sand with silt and silty clay interlayers in places. The surface of the fill deposit ranges from Elevations 242.7 m to 232.0 m and the thickness of the deposit ranges from 1.5 m to 8.9 m.

The measured SPT “N”-values within the fill deposit range from 0 blows to 87 blows per 0.3 m, indicating a very loose to very dense relative density, however the majority of the results indicate that the fill deposit is compact.



4.2.2 Peat

Coffey Boreholes

In Borehole C1, a 1.1 m thick layer of peat was encountered underlying the fill deposit. The surface of the peat was encountered at Elevation 230.3 m, at 1.7 m below ground surface.

The measured SPT “N”-values within the peat are 1 blow and 5 blows per 0.3 m of penetration, suggesting a very soft to firm consistency.

4.2.3 Silt to Sand

A deposit of silt to sand, was encountered below the fill in all boreholes varying in composition from silt to sandy silt to silty sand to sand, trace to some silt, to trace to some clay. The surface of the deposit ranges from Elevations 235.9 m to 229.2 m and the thickness of the deposit ranges from 4.4 m to 10.1 m where fully penetrated. Boreholes 15-5, 15-7, HF1 to HF6, P-RW1, P-RW3, P-RW4, P-RW6, TRW-1 to TRW-7 and TRW-9 were terminated within this deposit after exploring for up to 10 m.

The measured SPT “N”-values in the silt to sand deposit range from 2 blows to 72 blows per 0.3 m of penetration, indicating a loose to very dense relative density, however most of the SPT “N” values are within the compact to dense range.

The natural water content measured on selected samples of this deposit range from about 4 per cent to 27 per cent.

The results of grain size distribution tests carried out on eight selected samples of the silty sand to sand portions of the deposit are shown on Figures B3-A and B3-B; and the results of grain size distribution tests carried out on twenty-five selected samples of the silt to silt and sand portions of the deposit are shown on Figures B4-A to B4-D in Appendix B.

Atterberg limits tests were carried out on three selected samples of the silt portion of this deposit and measured plastic limits ranging from about 18 per cent to 20 per cent, liquid limits ranging from about 19 per cent to 21 per cent and plasticity indices ranging from about 1 per cent to 4 per cent. These results, which are plotted on the plasticity chart on Figure B5 in Appendix B, confirm that the tested samples of the deposit consist of silt of slight plasticity. Three additional Atterberg limits tests yielded non-plastic results.

Coffey Boreholes

A deposit of silt to sand was encountered below the fill deposit in all boreholes except C1 where this deposit was encountered below the peat deposit. The deposit varies in composition from silt to sandy silt to silt and sand to silty sand to sand. The surface of the deposit ranges from Elevations 235.0 m to 229.2 m and the deposit was explored up to 9.8 m without being fully penetrated.

The measured SPT “N”-values in the silt to sand deposit range from 1 blow to 50 blows per 0.3 m of penetration, indicating a very loose to dense relative density, however most of the SPT “N”-values are within the compact range.



4.2.4 Clayey Silt to Silty Clay

An upper layer of clayey silt was encountered underlying the fill or silt deposit in Boreholes P-RW2, 15-5 and 15-8 and a lower layer of clayey silt to silty clay was encountered below the silt to sand deposit in Boreholes P-RW2, P-RW5, TRW-8, 15-2 to 15-4, 15-9 and 15-10. All of these boreholes were terminated in the lower clayey silt to silty clay deposit. The elevation of the surface of the upper layer of clayey silt ranges from Elevations 230.0 m to 229.2 m, while the surface of the lower layer of clayey silt to silty clay ranges from Elevations 227.1 m to 221.7 m.

The measured SPT "N"-values within the clayey silt to silty clay deposit range from 8 blows to 37 blows per 0.3 meters of penetration, suggesting a stiff to hard consistency.

The results of grain size distribution tests completed on four samples of the clayey silt to silty clay deposit are shown on Figure B6 in Appendix B.

Atterberg limits testing was carried out on five selected samples of the upper and lower layers of cohesive soils measured plastic limits ranging from about 12 per cent to 17 per cent, liquid limits ranging from about 17 per cent to 39 per cent and plasticity indices ranging from about 4 per cent to 23 per cent. These results, which are plotted on the plasticity chart on Figure B7 in Appendix B, confirms that the tested samples of the deposit consist of clayey silt to silt of slight plasticity to clayey silt of low plasticity to silty clay of intermediate plasticity.

4.3 Groundwater Conditions

In general, the overburden samples taken in the boreholes were moist to wet. The unstabilized groundwater level observed in the boreholes during drilling or upon completion of drilling for the current investigation varies between about Elevations 236.0 m and 225.0 m, measured at depths ranging from 3.1 m to 12.2 m below ground surface.

Standpipe piezometers were installed in several boreholes in the previous investigation by Coffey and the current investigation by Golder to allow for monitoring of the groundwater levels at the site. Details of the piezometer installations are shown on the Record of Borehole sheets in Appendix A. The groundwater level measured in the piezometer installations are summarized below:

Investigation	Borehole No.	Ground Surface Elevation (m)	Groundwater Elevation (m)	Date of Measurement	Notes
Golder (Current Investigation)	P-RW5	233.8	231.0	November 6, 2015	Piezometer
	HF2	236.6	233.4	November 6, 2015	Piezometer
	HF4	236.5	231.6	November 6, 2015	Piezometer
	15-2	239.8	230.7 230.2	June 25, 2015 November 8, 2015	Open Borehole Piezometer
	15-4	233.6	229.5	November 6, 2015	Piezometer
	15-10	237.8	233.0 232.9	October 7, 2015 November 6, 2015	Piezometer



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Investigation	Borehole No.	Ground Surface Elevation (m)	Groundwater Elevation (m)	Date of Measurement	Notes
Coffey (Preliminary Investigation)	RW2	234.0	231.6 231.1*	October 31, 2014 November 6, 2015*	Piezometer
	RW3	234.5	230.5 230.2 229.8*	October 4, 2014 October 31, 2014 November 6, 2015*	Piezometer
	RW4	233.2	229.2 229.6 230.4*	October 6, 2014 October 31, 2014 November 6, 2015*	Piezometer
	C1	232.0	230.2 230.1*	October 31, 2014 November 6, 2015*	Piezometer
	C2	233.3	229.7 229.4*	October 31, 2014 November 6, 2015*	Piezometer

Note: * Water level reading taken by Golder during current investigation.

The stabilized groundwater level as measured in the piezometers ranges between Elevations 233.4 m and 229.2 m. The groundwater level at the site is expected to fluctuate seasonally in response to changes in precipitation and snow melt, and is expected to be higher during the spring and other wet periods of the year.

5.0 CLOSURE

This Foundation Investigation Report was prepared by Mr. Adam Core, P.Eng., and reviewed by Ms. Sarah E.M. Poot, P.Eng., a senior geotechnical engineer and Associate of Golder. Mr. Jorge M.A. Costa, P.Eng., a Principal of Golder and Designated MTO Foundations Contact for Golder, conducted an independent quality control review of this report.



Report Signature Page

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APPENDIX A

Borehole Records



LIST OF SYMBOLS

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 = $(w_l - w_p)$
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 = $\tan \delta$
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

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

Notes: 1
2

$$\tau = c' + \sigma' \tan \phi'$$

$$\text{shear strength} = (\text{compressive strength})/2$$



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, 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

Piezo-Cone Penetration Test (CPT)

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

III. SOIL DESCRIPTION

(a) Non-Cohesive (Cohesionless) Soils

Density Index	N
Relative Density	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	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 (cohesionless)) or With (cohesive)	Sand and Gravel Silty Clay with sand / Clayey Silt with sand

PROJECT 1532543		RECORD OF BOREHOLE No P-RW1				1 OF 1 METRIC											
G.W.P. 2159-11-00		LOCATION N 4914166.1; E 288635.1				ORIGINATED BY AK											
DIST Central HWY 400		BOREHOLE TYPE 200 mm Diameter Hollow Stem Augers				COMPILED BY AC											
DATUM GEODETIC		DATE July 14, 2015				CHECKED BY SEMP											
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
								20	40	60	80	100					
232.4	GROUND SURFACE																
0.0	Silt and sand, trace clay, organic staining (FILL) Compact Brown Moist		1	SS	15												
			2	SS	16												
			3	SS	12												
230.2	SILTY SAND to SAND Loose to compact Brown to grey Moist to wet		4	SS	21												
2.2			5	SS	16												
			6	SS	17												
			7	SS	13												
			8	SS	15												
			9	SS	18												
			10	SS	7												
			11	SS	26												
222.3	END OF BOREHOLE																
10.1	NOTES: 1. Water level encountered at 4.6 m (Elev. 227.8 m) during drilling. 2. Borehole caved to a depth of 7.6 m (Elev. 224.8 m) upon removal of augers.																

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT		1532543		RECORD OF BOREHOLE No P-RW2				1 OF 1 METRIC									
G.W.P.		2159-11-00		LOCATION		N 4914319.8; E 288507.2		ORIGINATED BY		AK							
DIST		Central HWY 400		BOREHOLE TYPE		200 mm Diameter Hollow Stem Augers		COMPILED BY		AC							
DATUM		GEODETIC		DATE		July 15, 2015		CHECKED BY		SEMP							
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
233.7	GROUND SURFACE																
0.0	Silty sand, trace gravel, trace clay, organic staining, rootlets (FILL) Loose to compact Dark brown to brown Moist to wet		1	SS	7												
			2	SS	5												0 73 25 2
			3	SS	12												
			4	SS	17												
	- Grey at 2.8 m depth.		5	SS	21												
230.0	CLAYEY SILT to SILT, trace sand Firm to stiff Brown Moist		6	SS	8												0 3 80 17
3.7			7	SS	14												
228.2	SANDY SILT, trace to some clay Compact Grey Wet		8	SS	11												
5.5			9	SS	12												
225.2	CLAYEY SILT, trace sand Grey Stiff Wet		10	SS	14												
8.5			11	SS	14												
223.6	END OF BOREHOLE																
10.1	NOTE: 1. Water level encountered at 7.6 m (Elev. 226.1 m) during drilling.																

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT		1532543		RECORD OF BOREHOLE No P-RW3				1 OF 1 METRIC					
G.W.P.		2159-11-00		LOCATION		N 4914460.1; E 288390.7		ORIGINATED BY		AK			
DIST		Central HWY 400		BOREHOLE TYPE		200 mm Diameter Hollow Stem Augers		COMPILED BY		NLP			
DATUM		GEODETIC		DATE		July 6, 2015		CHECKED BY		LCC			
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)			
234.3	GROUND SURFACE												
0.0	Sand, trace gravel, trace silt (FILL) Loose to compact Dark brown to brown Moist		1	SS	6								
			2	SS	10								
			3	SS	5								
232.1	Silt and sand to silt, trace clay (FILL) Very loose to compact Grey Moist		4	SS	13								
2.2			5	SS	2								
			6A	SS	10								
230.2	SAND, trace to some silt Loose to compact Brown to grey Moist to wet		6B	SS	10								
4.1			7	SS	15								
			8	SS	7								
227.1	SILT, some sand, trace clay Very loose to compact Grey Wet		9	SS	3								
7.2			10	SS	13								
			11	SS	9								
224.2	END OF BOREHOLE												
10.1	NOTE: 1. Water level encountered at 9.3 m (Elev. 225.0 m) during drilling.												

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT 1532543		RECORD OF BOREHOLE No P-RW4				1 OF 1 METRIC											
G.W.P. 2159-11-00		LOCATION N 4914537.8; E 288325.6				ORIGINATED BY AK											
DIST Central HWY 400		BOREHOLE TYPE 200 mm Diameter Hollow Stem Augers				COMPILED BY AC											
DATUM GEODETIC		DATE July 6, 2015				CHECKED BY SEMP											
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
234.4	GROUND SURFACE							20	40	60	80	100					
0.0	Sand, some silt to silty sand, trace gravel (FILL) Loose to compact Dark brown to brown Moist		1	SS	9		234										
			2	SS	8												
			3	SS	12		233										
232.2	SILTY SAND Very dense to compact Grey Moist to wet 75 mm sand seam at 3.2 m depth.		4	SS	55		232										
			5	SS	24		231										
			6	SS	14												
229.9	SILT to SANDY SILT, trace clay Compact Grey Moist		7	SS	20		230										
4.5			8	SS	23		229										
			9	SS	18		228										
			10	SS	21		227										
227.2	SILTY SAND to SAND Compact Grey Wet		11	SS	24		226										
7.2							225										
224.3	END OF BOREHOLE																
10.1	NOTES: 1. Water level encountered at 7.3 m (Elev. 227.1 m) during drilling. 2. Borehole caved to a depth of 4.9 m (Elev. 229.5 m) upon removal of augers.																



SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT 1532543		RECORD OF BOREHOLE No P-RW5				1 OF 1 METRIC						
G.W.P. 2159-11-00		LOCATION N 4914702.6; E 288189.5				ORIGINATED BY AK						
DIST Central HWY 400		BOREHOLE TYPE 200 mm Diameter Hollow Stem Augers				COMPILED BY AC						
DATUM GEODETIC		DATE July 9, 2015				CHECKED BY SEMP						
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	20 40 60 80 100	W _p W W _L			
233.8	GROUND SURFACE											
0.0	Sand to silty sand, trace gravel (FILL) Loose to compact Brown Moist		1	SS	6		233					
			2	SS	5							
			3	SS	5		232					
231.1			4	SS	14		231					
2.8	SANDY SILT, trace clay Compact Grey Wet		5	SS	15							
230.1							230					
3.7	SAND, trace to some silt, trace gravel Compact to dense Grey Wet		6	SS	18							
			7	SS	24		229					
							228					
			8	SS	34		227					
226.6							226					
7.2	CLAYEY SILT, trace sand Stiff to very stiff Grey Wet		9	SS	11							
							225					
			10	SS	10							
223.7			11	SS	12		224					
10.1	END OF BOREHOLE											
NOTE: 1. Water level encountered at 8.8 m (Elev. 225.0 m) during drilling. 2. Water level measured at 2.8 m (Elev. 231.0 m) on November 6, 2014 in piezometer.												

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT 1532543		RECORD OF BOREHOLE No P-RW6				1 OF 1 METRIC								
G.W.P. 2159-11-00		LOCATION N 4914804.3; E 288106.4				ORIGINATED BY AK								
DIST Central HWY 400		BOREHOLE TYPE 200 mm Diameter Hollow Stem Augers				COMPILED BY AC								
DATUM GEODETIC		DATE July 9, 2015				CHECKED BY SEMP								
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
235.0	GROUND SURFACE							20 40 60 80 100	20 40 60 80 100					
0.0	Sand to gravelly sand, trace silt (FILL) Loose to dense Dark brown to brown Moist	X	1	SS	5									
			2	SS	25									
			3	SS	39									
			4	SS	28									
232.0	SILT to SANDY SILT, trace to some gravel Loose to compact Brown to grey Wet		5	SS	7									
			6	SS	6									
			7	SS	16									
	- 50 mm sand seam encountered at 4.7 m depth.													
			8	SS	20									
			9	SS	25									
	- 0.6 m thick clayey silt layer encountered at 8.8 m depth.		10	SS	11									
			11	SS	24									
224.9	END OF BOREHOLE													
10.1	NOTES: 1. Water level encountered at 5.2 m (Elev. 229.8 m) during drilling. 2. Borehole caved to a depth of 5.5 m (Elev. 229.5 m) upon removal of augers.													



SUD-MTO 001 1532543.GPJ GAL-MASS.GDT 04/02/16 DATA INPUT:

PROJECT		1532543				RECORD OF BOREHOLE No HF1				1 OF 1 METRIC									
G.W.P.		2159-11-00		LOCATION		N 4914216.0; E 288583.2				ORIGINATED BY				AK					
DIST		Central		HWY		400		BOREHOLE TYPE		200 mm Diameter Hollow Stem Augers				COMPILED BY		AC			
DATUM		GEODETIC		DATE		July 15, 2015				CHECKED BY				SEMP					
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)						
233.2	GROUND SURFACE							20	40	60	80	100							
0.0	Silty sand, trace gravel, trace organic staining, rootlets, some cobbles (FILL)		1	SS	9		233												
232.5	Loose Dark brown Moist		2	SS	6		232												
0.7	Silt and sand, trace gravel, trace clay, trace organics (FILL)		3	SS	4		231												
	Loose Brown to black Moist		4	SS	4		230												
230.2	Silty sand, trace clay (FILL)	5	SS	6	229														
3.0	Loose Brown Wet	6	SS	14	228														
229.5	SILT, some sand, trace clay Compact Grey Wet	7	SS	22	227														
3.7	- Trace clay seams from 4.3 m to 4.9 m depth.	8	SS	32	226														
227.6	SILTY SAND Loose to dense Grey Wet	9	SS	16	225														
5.6		10	SS	14	224														
223.1		11	SS	8															
10.1	END OF BOREHOLE																		
NOTES:																			
1. Water level encountered at 3.1 m below ground surface (Elev. 230.1 m) upon completion of drilling.																			
2. Borehole caved to a depth of 3.1 m (Elev. 230.1 m) upon removal of augers.																			

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT 1532543		RECORD OF BOREHOLE No HF2				1 OF 1 METRIC							
G.W.P. 2159-11-00		LOCATION N 4914305.5; E 288501.2				ORIGINATED BY AK							
DIST Central HWY 400		BOREHOLE TYPE 200 mm Diameter Hollow Stem Augers				COMPILED BY AC							
DATUM GEODETIC		DATE July 15, 2015				CHECKED BY SEMP							
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa		W _p	W		
236.6	GROUND SURFACE						20 40 60 80 100						
0.0	Sand, trace to some silt, trace gravel, organic staining, rootlets (FILL)		1	SS	11								
235.9	Moist Dark brown Compact		2	SS	9								
0.7	Silty sand, trace gravel, organic staining (FILL)		3	SS	15								
	Loose to compact		4	SS	15								
	Dark brown to brown Moist to wet		5	SS	22								
232.9													
3.7	SILT, trace to some sand, trace to some clay		6	SS	17								
	Loose to compact		7	SS	6								
	Grey Wet												
	- Slight plasticity above 5.6 m depth.												
			8	SS	19								
			9	SS	23								
			10	SS	14								
			11	SS	12								
226.5													
10.1	END OF BOREHOLE												
	NOTE: 1. Water level encountered at 6.4 m (Elev. 230.2 m) during drilling. 2. Water level measured at 3.2 m (Elev. 233.4 m) on November 6, 2015 in piezometer.												

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT 1532543		RECORD OF BOREHOLE No HF3				1 OF 1 METRIC												
G.W.P. 2159-11-00		LOCATION N 4914383.3; E 288436.2				ORIGINATED BY AK												
DIST Central HWY 400		BOREHOLE TYPE 200 mm Diameter Hollow Stem Augers				COMPILED BY AC												
DATUM GEODETIC		DATE July 16, 2015				CHECKED BY SEMP												
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)					
								20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100				
238.6	GROUND SURFACE																	
0.0	Silty sand, trace gravel, organic staining, rootlets (FILL)		1	SS	5													
237.9	Loose Dark brown Moist		2	SS	9													
0.7	Silt and sand, trace clay (FILL)		3	SS	9													
236.5	Sandy silt (FILL)	4	SS	13														
2.1	Compact Brown Moist	5	SS	12														
235.6	SILT of slight plasticity, trace to some clay, trace gravel	6	SS	16														
3.0	Compact Light brown Moist	7	SS	13														
232.8	SAND, trace clay	8	SS	22														
5.8	Compact Grey Wet	9	SS	19														
230.1	SAND and SILT	10	SS	12														
8.5	Compact Grey Wet	11	SS	14														
228.5	END OF BOREHOLE																	
10.1	NOTES: 1. Water level encountered at 3.5 m (Elev. 235.1 m) during drilling. 2. Borehole caved to a depth of 7.6 m (Elev. 231.0 m) upon removal of augers.																	

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT		1532543				RECORD OF BOREHOLE No HF4				1 OF 1 METRIC											
G.W.P.		2159-11-00		LOCATION		N 4914537.7; E 288309.6				ORIGINATED BY											
DIST		Central		HWY		400		BOREHOLE TYPE		200 mm Diameter Hollow Stem Augers											
DATUM		GEODETIC		DATE		July 7, 2015				COMPILED BY											
										NLP											
										CHECKED BY											
										LCC											
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)								
236.5	GROUND SURFACE						20	40	60	80	100	20	40	60	80	100	10	20	30		
0.0	Sand, trace gravel, trace silt (FILL) Compact Dark brown to brown Moist		1	SS	22																
			2	SS	21																
235.1																					
1.4	Silty sand to sandy silt, trace gravel (FILL) Compact to dense Light brown to brown Moist		3	SS	23																
			4	SS	28																
			5	SS	35																
232.6																					
3.9	SILT, trace sand, trace clay Compact Grey Moist to wet		6	SS	25																
			7	SS	12																
230.9																					
5.6	SANDY SILT to SILTY SAND Compact Grey Moist		8	SS	16																
			9	SS	19																
			10	SS	18																
			11	SS	16																
226.4																					
10.1	END OF BOREHOLE																				
NOTES:																					
1. Water level encountered at 8.5 m (Elev. 228.0 m) during drilling.																					
2. Water level measured at 4.9 m (Elev. 231.6 m) on November 6, 2015 in piezometer.																					

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:


PROJECT 1532543		RECORD OF BOREHOLE No HF5				1 OF 1 METRIC											
G.W.P. 2159-11-00		LOCATION N 4914646.9; E 288223.9				ORIGINATED BY AK											
DIST Central HWY 400		BOREHOLE TYPE 200 mm Diameter Hollow Stem Augers				COMPILED BY NLP											
DATUM GEODETIC		DATE July 13, 2015				CHECKED BY LCC											
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
233.7	GROUND SURFACE							20	40	60	80	100					
0.0	Sand, some gravel, some silt, trace clay (FILL) Compact Dark brown Moist		1	SS	17												
			2	SS	14												
			3	SS	25												
231.5	SILTY SAND to SAND, trace clay Compact to dense Grey Moist to wet		4	SS	30												17 69 12 2
2.2			5	SS	32												
			6	SS	23												
	- Silt seam at 4.6 m depth.		7	SS	20												0 9 86 5
			8	SS	25												
			9	SS	39												
			10	SS	11												
224.3	END OF BOREHOLE																
9.4	NOTES: 1. Borehole caved at a depth of 6.1 m (Elev. 227.6 m) upon removal of augers.																

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT 1532543		RECORD OF BOREHOLE No TRW-1				1 OF 1 METRIC											
G.W.P. 2159-11-00		LOCATION N 4914430.8; E 288380.2				ORIGINATED BY DM											
DIST Central HWY 400		BOREHOLE TYPE 200 mm Diameter. Hollow Stem Augers				COMPILED BY NLP											
DATUM GEODETIC		DATE June 24-25, 2015				CHECKED BY LCC											
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
243.0	GROUND SURFACE																
0.0	ASPHALT (250 mm)																
0.3	Sand, some gravel, trace silt (FILL) Brown Moist																
242.1																	
0.9	Silty sand, trace trace to some clay, trace to some gravel (FILL) Compact to dense Brown Moist - Minor organic staining at 1.5 m		1	AS	-												
			2	SS	26												
			3	SS	25												
			4	SS	24												
			5	SS	21												
			6	SS	35												
			7A	SS	40												
			7B	SS	40												
236.4	- Trace organics at depth of 6.6 m																
6.6	Sand, trace to some silt, trace gravel (FILL) Dense Light brown Moist																
			8	SS	31												
234.3																	
8.7	SAND, trace silt Compact Brown Moist																
			9	SS	25												
232.8																	
10.2	SILTY SAND Compact Light brown Moist Becoming wet below a depth of 10.8 m																
			10	SS	18												
231.3																	
11.7	SILT, trace clay Loose Brown Wet																
			11	SS	9												
230.2																	
12.8	END OF BOREHOLE																
	NOTES: 1. Borehole dry upon completion of drilling. 2. Borehole caved to a depth of 11.6 m (Elev. 231.4 m) upon removal of augers.																

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

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

PROJECT		1532543		RECORD OF BOREHOLE No TRW-2				1 OF 1 METRIC									
G.W.P.		2159-11-00		LOCATION		N 4914522.0; E 288304.2		ORIGINATED BY		DM							
DIST		Central HWY 400		BOREHOLE TYPE		200 mm Diameter. Hollow Stem Augers		COMPILED BY		AC							
DATUM		GEODETIC		DATE		June 24, 2015		CHECKED BY		SEMP							
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
241.4	GROUND SURFACE																
0.0	ASPHALT (210 mm)																
240.9	Gravelly sand, trace silt (FILL)					241											
0.5	Brown Moist Sand, trace to some gravel, trace to some silt (FILL)					240											
	Compact to dense		1	SS	38												
	Brown Moist		2	SS	35												
			3	SS	16												
			4	SS	26												
			5	SS	25												
			6	SS	30												
234.2	- A 25 mm silty clay seam encountered at 6.8 m depth.					239											
7.2	SILTY SAND, trace to some gravel, trace clay					238											
	Compact to dense																
	Brown Moist to wet	7	SS	27		237											
	Trace organics encountered at 7.6 m depth.					236											
						235											
		8	SS	43		234											
						233											
						232											
		9	SS	34		231											
						230											
229.7	SILT, trace clay, trace sand					229											
11.7	Compact Brown Wet	10	SS	10													
228.6	END OF BOREHOLE																
12.8	NOTES: 1. Borehole dry upon completion of drilling. 2. Borehole caved to a depth of 11.6 m (Elev. 229.8 m) upon removal of augers.																

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT 1532543		RECORD OF BOREHOLE No TRW-3				1 OF 1 METRIC										
G.W.P. 2159-11-00		LOCATION N 4914663.2; E 288187.6				ORIGINATED BY AK										
DIST Central HWY 400		BOREHOLE TYPE 200 mm Diameter, Hollow Stem Augers				COMPILED BY AC										
DATUM GEODETIC		DATE June 23, 2015				CHECKED BY SEMP										
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								
237.8	GROUND SURFACE															
0.0	ASPHALT (350 mm)															
237.4																
0.4	Sand to silty sand, trace to some gravel (FILL) Dense Brown Moist		1	AS	-											
			2	AS	-											
			3	SS	42											
			4	SS	35											
			5	SS	37											
234.1	- Silt seams below 3.4 m depth															
3.7	SILTY SAND to SAND Compact to dense Brown Moist to wet - Trace organics encountered at 3.8 m depth.		6	SS	13											
			7	SS	29											
			8	SS	21											
			9	SS	36											
			10	SS	21											
227.6																
10.2	SILT, trace sand Compact Grey Wet		11	SS	20											
226.1																
11.7	SILTY SAND Dense Grey Wet		12	SS	37											
225.0																
12.8	END OF BOREHOLE															
	NOTES: 1. Water level at a depth of 10.4 m (Elev. 227.4 m) upon completion of drilling. 2. Borehole caved to a depth of 7.8 m (Elev. 230.0 m) upon removal of augers.															

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

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

PROJECT 1532543		RECORD OF BOREHOLE No TRW-4				1 OF 1 METRIC											
G.W.P. 2159-11-00		LOCATION N 4914766.2; E 288104.8				ORIGINATED BY AK											
DIST Central HWY 400		BOREHOLE TYPE 200 mm Diameter, Hollow Stem Augers				COMPILED BY AC											
DATUM GEODETIC		DATE June 25, 2015				CHECKED BY SEMP											
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
236.6	GROUND SURFACE																
0.0	ASPHALT (325 mm)																
0.3	Sand to silty sand, trace to some gravel, trace to some silt, trace clay (FILL) Compact to dense Brown Moist		1	AS	-												
			2	AS	-												
			3	SS	38												
			4	SS	24												
			5	SS	31												
			6	SS	23												
232.1																	
4.5	SILTY SAND to SAND Compact Brown to grey Moist to wet		7	SS	24												
			8	SS	17												
			9A	SS	28												
			9B														
228.7																	
7.9	SILT, trace to some sand Compact Grey		10	SS	21												
226.4																	
10.2	SAND, trace to some silt Compact Grey Moist		11	SS	22												
224.9																	
11.7	SILT, trace to some sand Compact Grey Moist		12	SS	23												
223.8																	
12.8	END OF BOREHOLE																
	NOTE: 1. Water level encountered at 5.8 m (Elev. 230.8 m) during drilling.																

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT 1532543		RECORD OF BOREHOLE No TRW-5				1 OF 1 METRIC							
G.W.P. 2159-11-00		LOCATION N 4914858.2; E 288040.6				ORIGINATED BY AK							
DIST Central HWY 400		BOREHOLE TYPE 200 mm Diameter, Hollow Stem Augers				COMPILED BY AC							
DATUM GEODETIC		DATE June 28, 2015				CHECKED BY SEMP							
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT		REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa		WATER CONTENT (%)		γ	
235.6	GROUND SURFACE							20 40 60 80 100	20 40 60 80 100	10 20 30			
0.0	ASPHALT (225 mm)												
235.1	Gravelly sand, trace silt (FILL) Brown Moist Sand, trace to some gravel, trace silt (FILL) Compact to dense Brown to dark brown Moist						235						
0.5			1	SS	38		234						
			2	SS	19		233						
232.4			3A				232						
3.2	SAND, trace silt Compact to very loose Brown Moist		3B	SS	26								
231.5			4	SS	4		231						
4.1	SANDY SILT, trace clay Loose to dense Grey Wet - Silt seams below 4.6 m		5	SS	9								
230.0							230						
5.6	SAND, trace silt, trace gravel Compact to dense Grey Wet - Silt seam encountered at a depth of 7.9 m.		6	SS	32		229						
							228						
			7	SS	39		227						
226.1			8A				226						
9.5	SILT, trace to some sand Loose to compact Grey Moist to wet		8B	SS	28								
							225						
			9	SS	25		224						
							223						
222.8			10	SS	7								
12.8	END OF BOREHOLE												
NOTES:													
1. Water level encountered at 5.2 m (Elev. 230.4 m) during drilling.													
2. Borehole caved to a depth of 6.2 m (Elev. 229.4 m) upon removal of augers.													

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT		1532543		RECORD OF BOREHOLE No TRW-6				1 OF 1 METRIC									
G.W.P.		2159-11-00		LOCATION		N 4914475.3; E 288322.9		ORIGINATED BY DM									
DIST		Central HWY 400		BOREHOLE TYPE		200 mm Diameter. Hollow Stem Augers		COMPILED BY AC									
DATUM		GEODETIC		DATE		June 29, 2015		CHECKED BY SEMP									
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
242.2	GROUND SURFACE																
0.0	ASPHALT (190 mm)																
241.7	Gravelly sand, trace silt, crushed (FILL) Brown Moist Sand to silty sand, trace gravel, trace clay (FILL) Dense Brown Moist																
0.5			1	SS	35												
			2	SS	36												
			3	SS	36												
			4	SS	43												
			5	SS	42												
236.6	Silty sand, some gravel, trace clay (FILL) Very dense Brown with oxidation staining Moist - Trace organics and rootlets below 7.6 m depth.																
5.6			6	SS	61												
			7A	SS	12												
234.2	SAND to Silty SAND, trace clay Compact to dense Brown Moist		7B														
8.0			8	SS	41												
232.0	SILT to SANDY SILT, trace clay Compact to dense Brown Wet - A 76 mm thick clayey silt seam observed at 12.5 m depth. - A 25.4 mm thick seam observed at 12.7 m depth.																
10.2			9	SS	37												
			10	SS	11												
229.4	END OF BOREHOLE																
12.8	NOTES: 1. Borehole dry upon completion of drilling. 2. Borehole caved to a depth of 9.9 m (Elev. 232.3 m) upon removal of auger.																

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT		1532543		RECORD OF BOREHOLE No TRW-7				1 OF 1 METRIC					
G.W.P.		2159-11-00		LOCATION		N 4914599.2; E 288219.3		ORIGINATED BY		DM			
DIST		Central HWY 400		BOREHOLE TYPE		200 mm Diameter. Hollow Stem Augers		COMPILED BY		AC			
DATUM		GEODETIC		DATE		June 25, 2015		CHECKED BY		SEMP			
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)			
238.8	GROUND SURFACE												
0.0	ASPHALT (100 mm)												
238.4	Gravelly sand, trace silt (FILL)												
0.4	Brown Moist												
	Sand to silty sand, trace clay, trace gravel (FILL)												
	Loose to dense												
	Brown Moist												
	A 0.3 m thick clayey silt layer was encountered at 1.1 m depth.												
			1	AS	-								
			2	SS	13								
			3	SS	47								
			4	SS	35								
			5	SS	9								
234.3	Sand, some silt, trace gravel, trace clay (FILL)												
4.5	Compact Brown Moist												
	Trace organics encountered at 4.6 m depth.												
			6	SS	26								3 82 12 3
			7	SS	15								
			8	SS	18								
230.1	SILT, trace clay												
8.7	Compact Grey Wet												
			9	SS	25								0 0 95 5
			10	SS	24								
227.1	SILTY SAND, trace clay												
11.7	Dense Grey Moist												
226.0	END OF BOREHOLE												
12.8	NOTES:												
	1. Water level encountered at 11.0 m (Elev. 227.8 m) upon completion of drilling.												
	2. Borehole caved to a depth of 7.8 m (Elev. 231.0 m) upon removal of augers.												

PROJECT 1532543		RECORD OF BOREHOLE No TRW-8				1 OF 1 METRIC								
G.W.P. 2159-11-00		LOCATION N 4914699.6; E 288135.3				ORIGINATED BY DM								
DIST Central HWY 400		BOREHOLE TYPE 200 mm Diameter. Hollow Stem Augers				COMPILED BY AC								
DATUM GEODETIC		DATE June 25, 2015				CHECKED BY SEMP								
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
237.2	GROUND SURFACE													
0.0	ASPHALT (200 mm)													
236.7	Gravelly sand, trace silt (FILL)													
0.5	Brown Moist													
	Sand to silty sand, trace to some gravel, trace clay (FILL)													
	Compact to dense													
	Brown Moist													
233.9			1	AS	-									
			2	SS	48									
			3	SS	36									
			4A											
			4B	SS	18									
231.6	SAND, trace to some silt													
3.3	Compact													
	Brown Moist													
			5	SS	29									
			6	SS	26									
231.6														
5.6	SILT, trace to some sand, some clay													
	Very loose													
	Grey													
	Wet													
			7	SS	2									
230.0														
7.2	SILT and SAND, trace clay, trace gravel													
	Compact to dense													
	Grey													
	Wet													
			8	SS	22									
			9	SS	39									
227.0														
10.2	SILTY CLAY, trace sand													
	Very stiff													
	Grey													
	Wet													
			10	SS	24									
			11	SS	17									
224.4														
12.8	END OF BOREHOLE													
NOTES:														
1. Water level encountered at 9.2 m (Elev. 228.0 m) during drilling.														
2. Borehole caved to a depth of 7.0 m (Elev. 230.2 m) upon removal of augers.														

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT 1532543			RECORD OF BOREHOLE No TRW-9			1 OF 1 METRIC																
G.W.P. 2159-11-00			LOCATION N 4914804.3; E 288054.9			ORIGINATED BY DM																
DIST Central HWY 400			BOREHOLE TYPE 200 mm Diameter. Hollow Stem Augers			COMPILED BY AC																
DATUM GEODETIC			DATE June 25, 2015			CHECKED BY SEMP																
SOIL PROFILE			SAMPLES			DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT			REMARKS & GRAIN SIZE DISTRIBUTION (%)							
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED					WATER CONTENT (%) W _p W W _L			γ			GR SA SI CL			
236.2	GROUND SURFACE							20 40 60 80 100														
0.0	ASPHALT (100 mm)						236															
235.7	Sand, some gravel, trace silt (FILL) Brown Moist						235															
0.5	Silty sand, trace clay, trace gravel (FILL) Compact to dense Grey to light brown Moist		1	AS	-																	
			2A	SS	20																	
234.1	Gravelly sand, trace silt (FILL) Dense Brown Moist		2B				234															
2.1			3	SS	42																	
233.2	SILTY SAND to SAND, trace gravel Loose to compact Brown Moist to wet		4	SS	19		233															
3.0			5	SS	27		232															
			6	SS	5		231															
230.6	SANDY SILT, trace to some clay Compact to loose Grey Wet		7	SS	14		230															
5.6			8	SS	13		229															
							228															
227.5	SILTY SAND, trace to some gravel, trace clay Loose to compact Brown Wet		9	SS	29		227															
8.7			10	SS	8		226															
							225															
			11	SS	12		224															
223.4	END OF BOREHOLE																					
12.8	NOTES: 1. Water level encountered at a depth of 6.4 m (Elev. 229.8 m) during drilling. 2. Borehole caved to a depth of 6.4 m (Elev. 229.8 m) upon removal of augers.																					

PROJECT <u>1532543</u>		RECORD OF BOREHOLE No 15-2		1 OF 2 METRIC	
G.W.P. <u>2159-11-00</u>		LOCATION <u>N 4914565.9; E 288247.2</u>		ORIGINATED BY <u>AK</u>	
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>200 mm O.D. Hollow Stem Augers</u>		COMPILED BY <u>NLP</u>	
DATUM <u>GEODETIC</u>		DATE <u>June 25, 2015</u>		CHECKED BY <u>LCC</u>	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							WATER CONTENT (%)		
								20	40	60	80	100			W _P	W	W _L
239.8	GROUND SURFACE																
0.0 239.5	ASPHALT																
239.2	Gravelly sand, trace silt (FILL) Brown Moist		1	AS	-												
0.6	Silty sand, some gravel (FILL) Brown Moist		2	AS	-												
238.2	Silty sand to sand, trace to some gravel, trace to some silt, trace to some clay (FILL) Compact to dense Light brown to brown Moist		3	SS	12												
1.5			4	SS	27												
			5	SS	34												
			6	SS	10												
			7	SS	25												
			8	SS	35												
	- Organic layer at a depth of 6.7 m		9	SS	33												
231.1	SILT, trace to some clay Compact to dense Grey Wet		10	SS	41												
8.7			11	SS	24												
228.0	SILTY SAND, trace clay Compact Grey Moist to wet		12	SS	16												
11.7			13	SS	10												

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

PROJECT 1532543		RECORD OF BOREHOLE No 15-2				2 OF 2 METRIC									
G.W.P. 2159-11-00		LOCATION N 4914565.9; E 288247.2				ORIGINATED BY AK									
DIST Central HWY 400		BOREHOLE TYPE 200 mm O.D. Hollow Stem Augers				COMPILED BY NLP									
DATUM GEODETIC		DATE June 25, 2015				CHECKED BY LCC									
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa				WATER CONTENT (%)			
	--- CONTINUED FROM PREVIOUS PAGE ---						20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED				W _p W W _L 10 20 30				GR SA SI CL
223.4	SILTY SAND, trace clay Compact Grey Moist to wet		14	SS	19										
16.3	CLAYEY SILT, trace sand Stiff to very stiff Grey		15	SS	16										
			16	SS	13										
219.9			17	SS	9										
19.8	END OF BOREHOLE														
	NOTE: 1. Groundwater measured at a depth of 9.1 m (Elev. 230.7 m) during drilling operations. 2. Water level measured at 9.6 m (Elev. 230.2 m) on November 8, 2015 in piezometer.														

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT 1532543		RECORD OF BOREHOLE No 15-3		1 OF 2 METRIC	
G.W.P. 2159-11-00		LOCATION N 4914544.2; E 288286.9		ORIGINATED BY D.M	
DIST Central HWY 400		BOREHOLE TYPE 200 mm O.D. Hollow Stem Augers		COMPILED BY NLP	
DATUM GEODETIC		DATE June 28, 2015		CHECKED BY LCC	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				
240.7	GROUND SURFACE																
0.0	ASPHALT																
240.4																	
240.1	Gravelly sand, trace silt (FILL) Brown Moist																
0.6	Sand, trace to some silt, trace gravel to silty sand (FILL) Loose to compact Light brown to brown Moist		1	SS	9												
	- Wet below a depth of 2.3 m		2	SS	3												
			3A	SS	5												
			3B	SS	5												
	- 51 mm thick silty clay layer observed at a depth of 4.0 m		4	SS	15										0 69 28 3		
			5	SS	18												
			6	SS	19												
			7	SS	18												
			8	SS	61												
230.5																	
10.2	SILT, trace to some sand, trace clay Dense Brown Moist		9	SS	39										0 19 76 5		
228.9																	
11.8	SILTY SAND, trace clay Compact Brown becoming grey below a depth of 13.7 m Wet		10	SS	21												
			11	SS	17												
													</				

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

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT 1532543			RECORD OF BOREHOLE No 15-3			2 OF 2 METRIC												
G.W.P. 2159-11-00			LOCATION N 4914544.2; E 288286.9			ORIGINATED BY D.M												
DIST Central HWY 400			BOREHOLE TYPE 200 mm O.D. Hollow Stem Augers			COMPILED BY NLP												
DATUM GEODETIC			DATE June 28, 2015			CHECKED BY LCC												
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa										
	--- CONTINUED FROM PREVIOUS PAGE ---						20 40 60 80 100 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED					WATER CONTENT (%) 10 20 30						
221.7	SILTY SAND, trace clay Compact Brown becoming grey below a depth of 13.7 m Wet		12	SS	15		225											
							224											
			13	SS	18		223											
			14	SS	16		222											
19.1	CLAYEY SILT, trace fine sand Stiff Grey		15	SS	10		221										0 1 86 13	
220.9																		
19.8	END OF BOREHOLE NOTES: 1. Groundwater encountered at 10.7 m (Elev. 230.0 m) during drilling. 2. Groundwater measured in augers at 7.8 m (Elev. 232.9 m) upon completion. 3. Borehole sloughed to 11.6 m (Elev. 229.1 m) upon removal of augers.																	

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT 1532543				RECORD OF BOREHOLE No 15-4				1 OF 2 METRIC					
G.W.P. 2159-11-00				LOCATION N 4914580.1; E 288286.1				ORIGINATED BY AK					
DIST Central HWY 400				BOREHOLE TYPE 200 mm O.D. Hollow Stem Augers				COMPILED BY NLP					
DATUM GEODETIC				DATE July 13, 2015				CHECKED BY LCC					
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT		UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		W _p W W _L			
233.6	GROUND SURFACE						20 40 60 80 100						
0.0	Sand to silty sand, trace gravel (FILL) Loose to very dense Brown Moist		1	SS	8								
			2	SS	74								
			3	SS	11								
231.4	SILT, trace to some sand, trace clay Compact Light brown Moist to wet		4	SS	23								
2.2			5	SS	29								
			6	SS	15								
			7	SS	26								
227.9	SILTY SAND Compact Grey Moist to wet		8A	SS	25								
5.6			8B										
227.0	SILT, trace to some sand to sandy, trace clay Compact to dense Grey Wet		9	SS	16								
6.6			10	SS	29								
			11A	SS	43								
			11B										
221.9	SILTY CLAY, trace sand Very stiff to hard Grey		12	SS	17								
11.7			13	SS	37								
219.5													
14.0													

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

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

PROJECT <u>1532543</u>		RECORD OF BOREHOLE No 15-4		2 OF 2 METRIC	
G.W.P. <u>2159-11-00</u>		LOCATION <u>N 4914580.1; E 288286.1</u>		ORIGINATED BY <u>AK</u>	
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>200 mm O.D. Hollow Stem Augers</u>		COMPILED BY <u>NLP</u>	
DATUM <u>GEODETIC</u>		DATE <u>July 13, 2015</u>		CHECKED BY <u>LCC</u>	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					WATER CONTENT (%)				GR	SA	SI	CL	
								○ UNCONFINED	+	FIELD VANE	● QUICK TRIAXIAL	×	REMOULDED	W _p	W		W _L				
	--- CONTINUED FROM PREVIOUS PAGE --- END OF BOREHOLE NOTE: 1. Groundwater measured at a depth of 6.6 m (Elev. 227.0 m) during drilling. 2. Water level measured at 4.1 m (Elev. 229.5 m) on November 6, 2015 in piezometer.																				

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT 1532543		RECORD OF BOREHOLE No 15-5				1 OF 1 METRIC								
G.W.P. 2159-11-00		LOCATION N 4914575.3; E 288233.7		ORIGINATED BY D.M										
DIST Central HWY 400		BOREHOLE TYPE 200 mm O.D. Hollow Stem Augers		COMPILED BY NLP										
DATUM GEODETIC		DATE June 29, 2015		CHECKED BY LCC										
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				
239.5	GROUND SURFACE													
0.0	ASPHALT													
239.1														
238.8	Gravelly sand, trace silt (FILL) Brown Moist						239							
0.6														
237.9	Sand, some gravel, trace silt (FILL) Brown Moist						238							
1.5	Clayey silt, trace to some sand, trace gravel (FILL) Stiff Brown Moist		1	SS	14									
237.2														
2.2	Silty sand, trace clay, trace gravel (FILL) Compact to dense Brown to greyish brown Moist		2	SS	33		237							
			3	SS	19		236							3 71 21 5
	- 25 mm sand seam at 4.2 m Compact to loose Moist		4	SS	14		235							
234.4	- Asphalt pieces at 4.9 m		5A	SS	10									
5.1			5B											
	Sand and silt, trace to some clay (FILL) Compact Brown, oxidation staining Moist						234							
233.1			6A				233							0 51 39 10
6.4	Silty sand, trace clay, containing silty clay pockets (FILL) Compact to dense Brown Moist		6B	SS	22									
							232							
	- Wet below 7.6 m													
			7	SS	42		231							
			8	SS	33		230							
229.2							229							
10.2	CLAYEY SILT, trace sand Very stiff Grey Moist		9	SS	20		228							
227.7	SILTY SAND, trace clay Loose to compact Grey Wet		10	SS	8		227							
			11	SS	29		226							
225.7														
13.7	END OF BOREHOLE													
	NOTE: 1. Groundwater measured at 3.5 m (Elev. 236.0 m) during drilling.													

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

[illegible]

PROJECT 1532543				RECORD OF BOREHOLE No 15-7				2 OF 2 METRIC										
G.W.P. 2159-11-00				LOCATION N 4914422.5; E 288388.8				ORIGINATED BY AK										
DIST Central HWY 400				BOREHOLE TYPE 200 mm O.D. Hollow Stem Augers				COMPILED BY NLP										
DATUM GEODETIC				DATE June 24, 2015				CHECKED BY LCC										
SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			"N" VALUES	SHEAR STRENGTH kPa					WATER CONTENT (%)					
	--- CONTINUED FROM PREVIOUS PAGE ---						<div style="display: flex; justify-content: space-between;"> 20 40 60 80 100 20 40 60 80 100 </div> <div style="display: flex; justify-content: space-between;"> ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × REMOULDED </div>					<div style="display: flex; justify-content: space-between;"> W_p W W_L </div>						
	Silty SAND Compact to very dense Grey Moist	[Strat Plot]	13	SS	16													
			14	SS	22													
225.9 17.2	END OF BOREHOLE NOTE: 1. Water level in open borehole at a depth of 12.2 m (Elev. 230.9 m) during drilling operations.																	

PROJECT 1532543		RECORD OF BOREHOLE No 15-8				1 OF 1 METRIC								
G.W.P. 2159-11-00		LOCATION N 4914416.4; E 288424.7		ORIGINATED BY AK										
DIST Central HWY 400		BOREHOLE TYPE 200 mm O.D. Hollow Stem Augers		COMPILED BY NLP										
DATUM GEODETIC		DATE July 16, 2015		CHECKED BY LCC										
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	20 40 60 80 100	W _p W W _L	WATER CONTENT (%)	10 20 30		
234.2	GROUND SURFACE													
0.0	Silty sand, trace gravel, organic staining, rootlets and organic inclusions (FILL) Loose to compact Dark brown to brown Moist		1	SS	5									
233.0			2	SS	10									
1.2	Silty sand (FILL) Compact Light brown Moist to wet		3	SS	23									
			4	SS	16									
			5	SS	17									
230.4														
3.8	SILT, trace sand, trace clay Loose Light brown Wet		6	SS	8									0 1 96 3
229.7														
4.5	CLAYEY SILT, trace sand Stiff Light brown Moist		7	SS	12									
228.4														
5.8	SAND, some silt, trace clay Dense to compact Grey Wet		8	SS	42									0 84 15 1
			9	SS	17									
225.7														
8.5	SANDY SILT, trace clay Loose Grey Wet		10	SS	6									
224.1			11	SS	7									
10.1	END OF BOREHOLE													
	NOTE: 1. Water level in open borehole at a depth of 3.4 m (Elev. 230.8 m) during drilling operations.													

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT 1532543		RECORD OF BOREHOLE No 15-9		1 OF 2		METRIC	
G.W.P. 2159-11-00		LOCATION N 4914402.9; E 288423.0		ORIGINATED BY AK			
DIST Central HWY 400		BOREHOLE TYPE 200 mm O.D. Hollow Stem Augers		COMPILED BY NLP			
DATUM GEODETIC		DATE July 16, 2015		CHECKED BY LCC			

[illegible]

Continued Next Page

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

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT <u>1532543</u>		RECORD OF BOREHOLE No 15-9		2 OF 2 METRIC	
G.W.P. <u>2159-11-00</u>		LOCATION <u>N 4914402.9; E 288423.0</u>		ORIGINATED BY <u>AK</u>	
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>200 mm O.D. Hollow Stem Augers</u>		COMPILED BY <u>NLP</u>	
DATUM <u>GEODETIC</u>		DATE <u>July 16, 2015</u>		CHECKED BY <u>LCC</u>	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					W _p	W	W _L		GR	SA	SI	CL
								20	40	60	80	100								
	--- CONTINUED FROM PREVIOUS PAGE --- END OF BOREHOLE NOTE: 1. Water level in open borehole at a depth of 3.8 m (Elev. 233.5 m) during drilling operations.																			

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT 1532543				RECORD OF BOREHOLE No 15-10				1 OF 2 METRIC						
G.W.P. 2159-11-00				LOCATION N 4914439.4; E 288392.5				ORIGINATED BY AK						
DIST Central HWY 400				BOREHOLE TYPE 200 mm O.D. Hollow Stem Augers				COMPILED BY NLP						
DATUM GEODETIC				DATE July 8, 2015				CHECKED BY LCC						
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT W _p W W _L			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa		WATER CONTENT (%)				
237.8	GROUND SURFACE													
0.0	Silty sand, trace gravel (FILL) Loose to compact Dark brown to brown, organic staining Moist		1	SS	9									
			2	SS	17									
236.3														
1.5	Sand and silt, trace clay, organic inclusions (FILL) Compact Brown to grey Moist		3	SS	10									
			4	SS	13									
234.8														
3.0	SILT Loose Grey Moist to wet		5	SS	6									
			6	SS	9									
233.3														
4.5	SAND and SILT, trace clay Compact to loose Grey Moist to wet		7	SS	27									
			8	SS	17									
			9	SS	12									
			10	SS	8									
226.7			11	SS	6									
11.1	SILT, trace clay, trace sand Compact Grey Wet													
			12	SS	14									
224.7														
13.1	CLAYEY SILT, some sand Very stiff Grey Moist		13	SS	17									
223.8														
14.0														

Continued Next Page

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

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

PROJECT <u>1532543</u>		RECORD OF BOREHOLE No 15-10		2 OF 2 METRIC	
G.W.P. <u>2159-11-00</u>		LOCATION <u>N 4914439.4; E 288392.5</u>		ORIGINATED BY <u>AK</u>	
DIST <u>Central</u> HWY <u>400</u>		BOREHOLE TYPE <u>200 mm O.D. Hollow Stem Augers</u>		COMPILED BY <u>NLP</u>	
DATUM <u>GEODETIC</u>		DATE <u>July 8, 2015</u>		CHECKED BY <u>LCC</u>	

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa					W _p	W	W _L		GR	SA	SI	CL
								20	40	60	80	100								
	--- CONTINUED FROM PREVIOUS PAGE --- END OF BOREHOLE NOTE: 1. Water level in piezometer measured a depth of 4.8 m (Elev. 233.0 m) on October 7, 2015.																			

SUD-MTO 001 1532543.GPJ GAL-MISS.GDT 04/02/16 DATA INPUT:

GEOTETO22161AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH C1

1 OF 1

METRIC

GWP 2074-11-00 LOCATION 29+288, 42.4 m R/L C/L (N 4914237.9, E 288578.9) ORIGINATED BY JD
 DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
 DATUM Geodetic DATE 08/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH (kPa) ○ UNCONFINED + FIELD VANE ● POCKET PENETR. X LAB VANE						
232.0 0.0	GROUND SURFACE						20 40 60 80 100							
	0.1 m TOPSOIL FILL: Silty Sand trace gravel, trace rootlets brown, very loose, moist to wet		1	SS	1									
			2	SS	3									
230.3 1.7	PEAT dark grey to dark brown, very soft to soft, moist		3	SS	1									0 56 38 6 wet spoon
229.2 2.8			4	SS	5									
228.9 3.1	SAND AND SILT dilatant, trace clay grey, firm, wet													
End of Borehole Piezometer installed to 3.1 m. Piezometer water level records : Oct. 31, 2014 1.8 m (El. 230.2 m)														

+³, X³: Numbers refer to
Sensitivity

20
15 10 5
(%) STRAIN AT FAILURE

GEOTETO22181AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH C2

1 OF 1

METRIC

GWP 2074-11-00 LOCATION 10+123, 37.8 RI C/L (N 4914872.0, E 288212.1) ORIGINATED BY JD
DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
DATUM Geodetic DATE 08/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH (kPa) ○ UNCONFINED + FIELD VANE ● POCKET PENETR. x LAB VANE					WATER CONTENT (%) W _p — W — W _L
233.3 0.0	GROUND SURFACE							20 40 60 80 100					
	0.1 m TOPSOIL FILL: Silty Sand trace gravel, trace rootlets brown, loose, moist		1	SS	6		233						
			2	SS	9		232						
231.8 1.5	SILTY SAND grey, compact, moist to wet		3	SS	12		231						
			4	SS	14		230						
			5	SS	13		229						
228.6 3.7	SILT with occasional silty clay layers, trace sand moist, loose to compact		6	SS	13		228						
			7	SS	20		227						
			8	SS	10		226						
			9	SS	8		225						
226.1 7.2	SILTY SAND TO SANDY SILT grey, compact, wet						224						
225.1 8.2			10	SS	10		223						
	End of Borehole Piezometer installed to 8.2 m. Piezometer water level records : Oct. 31, 2014 3.6 m (El. 229.7 m)												

GEOTETO22161AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH RW1

1 OF 1

METRIC

GWP 2074-11-00 LOCATION 29+359, 39.3 m Rt C/L (N 4914286.9, E 288534.4) ORIGINATED BY JD
 DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
 DATUM Geodetic DATE 08/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
233.8 0.0	GROUND SURFACE																
	0.1 m TOPSOIL		1	SS	3		233										
	FILL: Silty Sand trace rootlets brown, very loose to loose, moist		2	SS	3		232										
231.6 1.8	SILTY SAND TO SILT brown to grey, loose to compact wet		3	SS	8		231										0 43 53 4 wet spoon
			4	SS	11		230										
			5	SS	10		229										0 2 88 10
			6	SS	14												
			7	SS	17												
228.1 5.2	End of Borehole Water level @ 5.0 m (not stabilized)* upon completion before cave-in cave-in @ 2.1 m upon completion.																

+³, x³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

GEOTETO22161AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH RW2

1 OF 1

METRIC

GWP 2074-11-00 LOCATION 29+474, 39.3 m R/L (N 4814375.2, E 288480.9) ORIGINATED BY JD
DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
DATUM Geodetic DATE 08/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N ^o VALUES			SHEAR STRENGTH (kPa)								WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE	● POCKET PENETR. × LAB VANE						
234.0	GROUND SURFACE						20	40	60	80	100	10	20	30		
0.0	0.1 m TOPSOIL FILL: Sand and Silt trace gravel, trace rootlets, trace organic dark grey, very loose to compact, moist		1	SS	3											
			2	SS	10											
232.3			3	SS	15										0 40 55 5	
1.7	SANDY SILT trace clay brown, compact, wet		4	SS	17											
			5	SS	14											
			6	SS	16										wet spoon	
			7	SS	13											
			8	SS	13											
228.1																
5.9	End of Borehole Piezometer installed to 5.9 m. Piezometer water level records : Oct. 31, 2014 2.4 m															

+³, X³: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

GEOTETOB22161AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH RW3

1 OF 1

METRIC

GWP 2074-11-00 LOCATION 29+630, 38.7 Rt C/L (N 4914494.8, E 288360.6) ORIGINATED BY LG
DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
DATUM Geodetic DATE 02/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
234.5 0.0	GROUND SURFACE																
	0.2 m TOPSOIL		1	SS	6		234							o			
	FILL: Silty Sand trace gravel, trace rootlet dark gray, loose to very loose, moist		2	SS	0									o			
233.0 1.5	SANDY SILT TO SILT trace of clay brown, compact, moist		3	SS	11		233							o			
	loose		4	SS	7		232							o			0 19 72 9 wet spoon
			5	SS	19		231							o			
			6	SS	5		230							o			0 0 92 8
	silt trace clay loose		7	SS	5									o			
228.7 5.8	End of Borehole Piezometer installed to 5.8 m. Piezometer water level records : Oct. 02, 2014 4.0 m Oct. 31, 2014 4.3 m		8	SS	22		229							o			

GEOTETO22161AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH RW4

1 OF 1

METRIC

GWP 2074-11-00 LOCATION 10+082, 38.5 m Rt C/L (N 4914825.5, E 288251.6) ORIGINATED BY JD
DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
DATUM Geodetic DATE 08/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N ^o VALUES			SHEAR STRENGTH (kPa)								WATER CONTENT (%)		
								○ UNCONFINED	+ FIELD VANE	● POCKET PENETR.						× LAB VANE	20	40
233.2	GROUND SURFACE																	
0.0	0.1 m TOPSOIL FILL: Silty Sand some gravel, trace rootlet brown, loose, moist		1	SS	10		233											
			2	SS	8		232											
231.7	SAND silty to some silt, trace gravel brown, compact, moist		3	SS	11		231											
1.5			4	SS	20		230								1 83 (6)			
230.0	SILTY SAND TO SANDY SILT brown to grey, compact, wet		5	SS	19		230											
3.2			6	SS	16		229								0 3 88 9 wet spoon			
	silt, trace clay		7	SS	10		228											
			8	SS	10		227											
			9	SS	8		226											
	loose		10	SS	15		225											
225.0	End of Borehole Piezometer installed to 8.2 m. Piezometer water level records : Oct. 06, 2014 4.0 m Oct. 31, 2014 3.6 m																	
8.2																		

+³, ×³: Numbers refer to
Sensitivity

20
15 10 5
10 (%) STRAIN AT FAILURE

GEOTETOB22181AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH RW5

1 OF 1

METRIC

GWP 2074-11-00 LOCATION 10+199, 37.8 m Rt C/L (N 4914730.5, E288163.2) ORIGINATED BY LG
 DIST HWY 400 BOREHOLE TYPE Solid Stem Auger COMPILED BY MP
 DATUM Geodetic DATE 02/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH (kPa)					WATER CONTENT (%)		
								20 40 60 80 100							
234.1 0.0	GROUND SURFACE														
	0.2 m TOPSOIL		1	SS	6		234								
	FILL: Silty Sand to Sand trace gravel, trace wood, trace rootlet dark brown, loose, moist		2	SS	4		233								
232.6 1.5	SILTY SAND TO SANDY SILT brown to grey, loose to compact, moist to wet		3	SS	5		232								
			4	SS	5		231								
			5	SS	3		230								
			6	SS	14		229								
			7	SS	20										
228.3 5.8			8	SS	26										
	End of Borehole Cave-in @ 3.7 m upon completion.														

GEOTETO22181AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH RW6

1 OF 1

METRIC

GWP 2074-11-00 LOCATION 29+631, 11.7 m Rt C/L (N 4814478.8, E 288338.8) ORIGINATED BY LG
DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
DATUM Geodetic DATE 22/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH (kPa)				
								20 40 60 80 100				
								20 40 60 80 100				
							WATER CONTENT (%)					
							W P W W L					
							PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT					
							W P W W L					
							W P W W L					
							W P W W L					
							W P W W L					
							W P W W L					
							W P W W L					
							W P W W L					
							W P W W L					
							W P W W L					
							W P W W L					
							W P W W L					
							W P W W L					
							W P W W L					
							W P W W L					
							W P W W L					
							W P W W L					
							W P W W L					
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+³, ×³: Numbers refer to Sensitivity 20 15 10 (% STRAIN AT FAILURE

GEOTETO22161AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH RW7

1 OF 1

METRIC

GWP 2074-11-00 LOCATION 10+080, 11.2 m Rt C/L (N 4914806.4, E286232) ORIGINATED BY JD
 DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
 DATUM Geodetic DATE 21/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH (kPa)								WATER CONTENT (%)
								○ UNCONFINED	+ FIELD VANE	● POCKET PENETR.						
238.8	GROUND SURFACE						20	40	60	80	100	10	20	30		
0.0	400 mm ASPHALT															
238.4																
0.4	PAVEMENT GRANULAR FILL: 0.2 m Sandy Gravel EMBANKMENT FILL: Silty Sand trace gravel		1	SS	87											
			2	SS	18											
			3	SS	26											
			4	SS	27											
			5	SS	25											
			6	SS	14											
			7	SS	38											
233.5			8	SS	33											
5.3	SILTY SAND TO SAND AND SILT trace gravel brown to grey, dense, moist to wet		9	SS	41											
			10	SS	45											
			11	SS	35											
			12	SS	30											
227.5																
11.3	End of Borehole Water level @ 8.8 m (not stabilized)* upon completion.															

GEOTETOB22181AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH RW8

1 OF 1

METRIC

GWP 2074-11-00 LOCATION 10+200, 15.9 m Rt C/L (N 4914717.6, E 288145.7) ORIGINATED BY JD
DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
DATUM Geodetic DATE 20/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	TN VALUES			SHEAR STRENGTH (kPa)					WATER CONTENT (%)			
								○ UNCONFINED ● POCKET PENETR.	+ FIELD VANE × LAB VANE				W _P	W	W _L	
237.1	GROUND SURFACE						20	40	60	80	100					
236.8	250 mm ASPHALT															
0.3	PAVEMENT GRANULAR FILL: 0.4 m Sandy Gravel EMBANKMENT FILL: Silty Sand trace gravel		1	SS	59											
			2	SS	31											
			3	SS	25											
234.7	SILTY SAND TO SAND AND SILT trace gravel brown to grey, compact moist to wet		4	SS	20											
5			SS	23												
6			SS	16												
7			SS	17												
8			SS	7												
9			SS	4												
10			SS	26												
11			SS	26												
227.4	End of Borehole Water level @ 5.2 m (not stabilized)* upon completion.															

GEOTETO22181AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH RW9

1 OF 1

METRIC

GWP 2074-11-00 LOCATION 10+326, 13.9 Rt C/L (N 4914814.5, E 288067.8) ORIGINATED BY JD
 DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
 DATUM Geodetic DATE 21/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100		
238.1	GROUND SURFACE													
0.0	400 mm ASPHALT													
235.7														
0.4	PAVEMENT GRANULAR FILL: 0.2 m Sandy Gravel EMBANKMENT FILL: Silty Sand trace gravel		1	SS	62									
			2	SS	42									
			3	SS	28									
233.7														
2.4	SANDY SILT TO SILTY SAND brown to grey, compact to loose wet		4	SS	37									
			5	SS	36									
			6	SS	25									
			7	SS	4									
			8	SS	16									
			9	SS	14									
			10	SS	30									
227.9														
8.2	End of Borehole Water level @ 4.6 m (not stabilized)* upon completion.													

+³, X³: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

GEOTETO22181AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH RW10

1 OF 2

METRIC

GWP 2074-11-00 LOCATION 29+578, 3.0 m L1 C/L (N 4914428.2, E286381.8) ORIGINATED BY JD
 DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
 DATUM Geodetic DATE 14/10/2014 15/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
FLEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100	PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT		
242.9	GROUND SURFACE												
240.0	225 mm ASPHALT												
0.2	0.4 m gravelly sand to sand some gravel		1	SS	38		242						
			2	SS	35								
			3	SS	24		241						
	FILL: Silty Sand trace to some gravel brown, dense to compact, moist		4	SS	20		240						
			5	SS	24								
			6	SS	17		239						
			7	SS	36		238						
			8	SS	24		237						
			9	SS	22		236						
234.8			10	SS	43		235						
8.1	SILTY SAND trace to some gravel brown, loose to dense, moist		11	SS	8		234						
			12	SS	50		233						
231.2							232						
11.7	SILT TO SAND AND SILT brown to grey, compact, moist to wet		13	SS	19		231						
			14	SS	20		230						
			15	SS	23		229						
							228						

Continued Next Page

+³, x³: Numbers refer to
Sensitivity

20
15-0.5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No BH RW10

2 OF 2

METRIC

SOIL PROFILE

SAMPLES

DESCRIPTION

STRAT PLOT

NUMBER

“N” VALUES

GROUND WATER CONDITIONS

**DYNAMIC CONE PENETRATION
RESISTANCE PLOT**

SHEAR STRENGTH (kPa)
 ○ UNCONFINED + FIELD VANE
 ● POCKET PENETR. x LAB VANE

PLASTIC
LIMIT
w p

NATURAL
MOISTURE
CONTENT
W

LIQUID
LIMIT
 w_L

UNIT	WEIGHT	Y
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**REMARKS
&
GRAIN SIZE
DISTRIBUTION
(%)**

GR SA SI CL

227.9
227.8

15.1 End of Borehole
Water level @ 11.6 m (not stabilized)* upon completion.

+³, ×³: Numbers refer to Sensitivity

(%) STRAIN AT FAILURE

GEOTETO22181AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH RW11

1 OF 1

METRIC

GWP 2074-11-00 LOCATION 29+700, 2.2 m LI C/L (N 4914522.5, E 288284.4) ORIGINATED BY JD
DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
DATUM Geodetic DATE 14/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH (kPa) ○ UNCONFINED + FIELD VANE ● POCKET PENETR. x LAB VANE							
241.0	GROUND SURFACE						20	40	60	80	100				
240.8	200 mm ASPHALT						20	40	60	80	100				
0.2	0.4 m gravelly sand		1	SS	25										
	FILL: Silty Sand trace to some gravel brown, compact to dense, moist		2	SS	34										
	sandy gravel		3	SS	20										
			4	SS	35										
	sand		5	SS	22										
			6	SS	32										
			7	SS	36										
			8	SS	22										
			9	SS	23										
233.1	SILTY SAND TO SANDY SILT trace gravel brown to grey, compact to dense moist to wet		10	SS	22										
7.9			11	SS	36										
	silty sand		12	SS	47										
	sandy silt		13	SS	17										
			14	SS	21										
226.7	End of Borehole Water level @ 10.7 m (not stabilized)* upon completion.														
14.3															

+³, ×³: Numbers refer to
Sensitivity

20
15-5
10 (%) STRAIN AT FAILURE

GEOTETO22181AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH RW12

1 OF 1

METRIC

GWP 2074-11-00 LOCATION 10+129, 4.5 m Li CL (N 4914649.3, E 288175.8) ORIGINATED BY LG
 DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
 DATUM Geodetic DATE 14/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH (kPa)							WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE ● POCKET PENETR. x LAB VANE							PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L
							20 40 60 80 100						10 20 30				
237.7	GROUND SURFACE																
239.6	220 mm ASPHALT																
0.2	PAVEMENT GRANULAR FILL: 0.3 m Gravelly Sand 0.3 m Sandy, some gravel		1	SS	18		237										
	EMBANKMENT FILL: Silty Sand trace gravel brown, compact to dense, moist		2	SS	10												
			3	SS	19		236										
			4	SS	32		235										
			5	SS	32												
234.0			6	SS	44		234										
3.7	SILTY SAND trace gravel brown to grey, dense to compact moist to wet		7	SS	19		233										
			8	SS	13		232										
			9	SS	8		231										
			11	SS	18		230										
			12	SS	17		229										
228.0							228										
9.8	End of Borehole Water level @ 6.7 m (not stabilized)* upon completion.																

+³, x³: Numbers refer to Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE



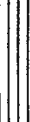
GEOTETO22161AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH RW13

1 OF 1

METRIC

GWP 2074-11-00 LOCATION 10+267, 4.8 L/C/L (N 4914755.6, E288087.8) ORIGINATED BY LG
DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
DATUM Geodetic DATE 14/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	T _N VALUES			SHEAR STRENGTH (kPa)									WATER CONTENT (%)		
								20 40 60 80 100									10 20 30		
236.7	GROUND SURFACE																		
236.8	240 mm ASPHALT																		
0.2	PAVEMENT GRANULAR FILL: 0.3 m Gravelly Sand 0.3 m Sandy, some gravel EMBANKMENT FILL: Silty Sand trace gravel brown, compact to loose, moist		1	SS	19														
			2	SS	7														
			3	SS	17														
234.4	SILTY SAND trace gravel brown, compact, moist		4	SS	18														
5			SS	28															
6			SS	20															
7			SS	21															
231.5			8	SS	3														
5.2	SILT some sand, trace gravel brown to grey, very loose to compact, wet		9	SS	2														
			10	SS	26														
228.5	End of Borehole Water level @ 4.9 m (not stabilized)* upon completion. Cave-in @ 5.5 m upon completion.																		
8.2																			

+³, x³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

GEOTETO22161AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH RW14

1 OF 1

METRIC

GWP 2074-11-00 LOCATION 10+390, 5.1 mLI C/L (N 4914858.3, E288016.2) ORIGINATED BY LG
DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
DATUM Geodetic DATE 09/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
235.8	GROUND SURFACE																
0.0	320 mm ASPHALT																
235.8																	
0.3	0.3 m Gravelly Sand		1	SS	28												
235.0	FILL: Silty Sand, trace gravel brown, compact, moist		2	SS	9												
0.8																	
	SILTY SAND trace gravel, trace clay brown, loose to compact, moist		3	SS	22												
			4	SS	33												
			5	SS	22												
			6	SS	15												
231.3			7	SS	1												
4.5	SILT some sand, trace gravel brown, very loose, wet		8	SS	2												
			9	SS	16												
229.4																	
6.4	SILTY SAND TO SAND trace gravel grey, compact, wet		10	SS	21												
227.6																	
8.2	End of Borehole Water level @ 4.6 m (not stabilized)* upon completion. Cave-in @ 6.1 m upon completion.																

GEOTETOB22181AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH F1

1 OF 2

METRIC

GWP 2074-11-00 LOCATION 29+721, 2.6 m Li C/L (N 4914538.6, E286270.5) ORIGINATED BY LG
 DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
 DATUM Geodetic DATE 15/10/2014 CHECKED BY SH

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	γ _v VALUES		20	40	60	80	100					
240.8	GROUND SURFACE															
240.6	220 mm ASPHALT															
239.8	PAVEMENT GRANULAR FILL: 0.2 m Sand and Gravel 0.4 m Sand, some gravel		1	SS	24	240										
239.6			2	SS	22											
239.4	FILL: Silty Sand trace to some gravel trace silty clay lenses grey to brown, compact to loose moist		3	SS	8	239										
239.2			4	SS	3	238										
239.0	very loose		5	SS	5											
238.8			6	SS	8	237										
238.6	silty clay lenses		7	SS	13	236										
238.4			8	SS	20	235										
238.2			9	SS	10	234										
238.0	silty clay lenses					233										
233.4	SILTY SAND brown, compact, moist		10	SS	14	232										0 66 (34)
233.2			11	SS	29	231										
230.4						230										
230.2	SILT trace sand, trace clay brown, compact, moist		12	SS	19	229										0 1 91 8
228.8						228										wet spoon
228.6	SANDY SILT grey, compact, wet		13	SS	18	227										
228.4			14	SS	15	226										
225.6																

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+³, X³: Numbers refer to Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE


GEOTETO22181AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH F1

2 OF 2

METRIC

GWP 2074-11-00 LOCATION 29+721, 2.6 m Lt C/L (N 4914538.5, E288270.5) ORIGINATED BY LG
 DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
 DATUM Geodetic DATE 15/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT Y kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH (kPa)							WATER CONTENT (%)				
								20 40 60 80 100											
225.6 15.0	SANDY SILT grey, compact, wet		15	SS	10		225												
224.8 15.9																			
	End of Borehole wet cave- in @10.7 m																		

+³, x³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

GEOTETOB22161AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH F4

1 OF 2

METRIC

GWP 2074-11-00 LOCATION 10+012, 11.9 m Rt C/L (N 4814570.4, E 288282.9) ORIGINATED BY LG
 DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
 DATUM Geodetic DATE 02/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH (kPa)					WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE					w _p w w _L		
								● POCKET PENETR. × LAB VANE							
239.9	GROUND SURFACE						20 40 60 80 100								
239.9	230 mm ASPHALT														
0.2	PAVEMENT GRANULAR FILL: 0.4 m Sand and Gravel 0.3 m Sand, some gravel		1	SS	40				○						
239.0			2	SS	13		239		○						
0.9	FILL: Silty Sand trace to some gravel brown to grey, very loose to dense, moist		3	SS	7		238		○						
		sand loose	4	SS	8		237		○						
			5	SS	10		236		○						
			6	SS	14		235		○						
			7	SS	3		234		○						
		very loose to loose	8	SS	6		233		○						
			9	SS	11		232		○						
232.7							231		○						
7.2	SILTY SAND trace gravel, trace clay brown to grey, compact, moist to wet		10	SS	19		230		○						
			11	SS	32		229		○						
		silt	12	SS	26		228		○						
			13	SS	22		227		○						
		some clay	14	SS	16		226		○						
224.9							225								

Continued Next Page

+³, x³: Numbers refer to Sensitivity 20 15 10 5 0 (%) STRAIN AT FAILURE

GEOTETOB22161AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH F4

2 OF 2

METRIC

GWP 2074-11-00 LOCATION 10+012, 11.9 m Rt C/L (N 4814570.4, E 288262.9) ORIGINATED BY LG
 DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
 DATUM Geodetic DATE 02/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)						
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100						20	40	60	80	100	10
224.8 16.0	SILTY SAND trace gravel brown to grey, compact, moist to wet		15	SS	20																		
224.1 15.9																							
15.8	End of Borehole cave-in @ 11.6 m Water level upon completion @ 9.8 m																						

GEOTETO22181AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH F5

1 OF 2

METRIC

GWP 2074-11-00 LOCATION 29+533, 11.9 m Rt C/L (N 4814403.1, E288402) ORIGINATED BY LG
DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
DATUM Geodetic DATE 21/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH (kPa)				
							20 40 60 80 100	○ UNCONFINED + FIELD VANE	WATER CONTENT (%)			
							20 40 60 80 100	● POCKET PENETR. x LAB VANE				
									PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
243.0	GROUND SURFACE						240					
242.9	280 mm ASPHALT											
0.3	PAVEMENT GRANULAR FILL: 0.2 m thick Sand and Gravel 0.4 m thick Sand, some gravel		1	SS	35				○			
242.1			2	SS	17		242		○			
0.6	FILL: Silty Sand trace to some gravel brown to grey, loose to dense, moist to wet		3	SS	9		241		○			
			4	SS	8		240		○			
			5	SS	3		239		○			
			6	SS	6		238		○			
			7	SS	15		237		○			
			8	SS	13		236		○			
			9	SS	15		235		○			
			10	SS	18		234		○			
233.9			11	SS	12		233		○			
9.1			12	SS	27		232		○			
			13	SS	9		231		○			
			14	SS	17		230		○			
228.0							229		○			

Continued Next Page

+³, X³: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

wet spoon

0 81 15 4

GEOTETO22181AA: Hwy 400/ Tiffin Street

RECORD OF BOREHOLE No BH F5

2 OF 2

METRIC

GWP 2074-11-00 LOCATION 29+533, 11.9 m R/L (N 4914403.1, E288402) ORIGINATED BY LG
 DIST HWY 400 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MP
 DATUM Geodetic DATE 21/10/2014 CHECKED BY SH

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
228.0 15.0	SILTY SAND TO SANDY SILT brown to grey, loose to compact moist to wet		15	SS	23		228										GR SA SI CL added bentonite (quick gel) for further drilling
							227										
			16	SS	17		226										
							225										
224.1 18.9			17	SS	8												
	End of Borehole Cave-in @ 13.7 m																

+³, X³: Numbers refer to
Sensitivity

20
15-5
10 (%) STRAIN AT FAILURE



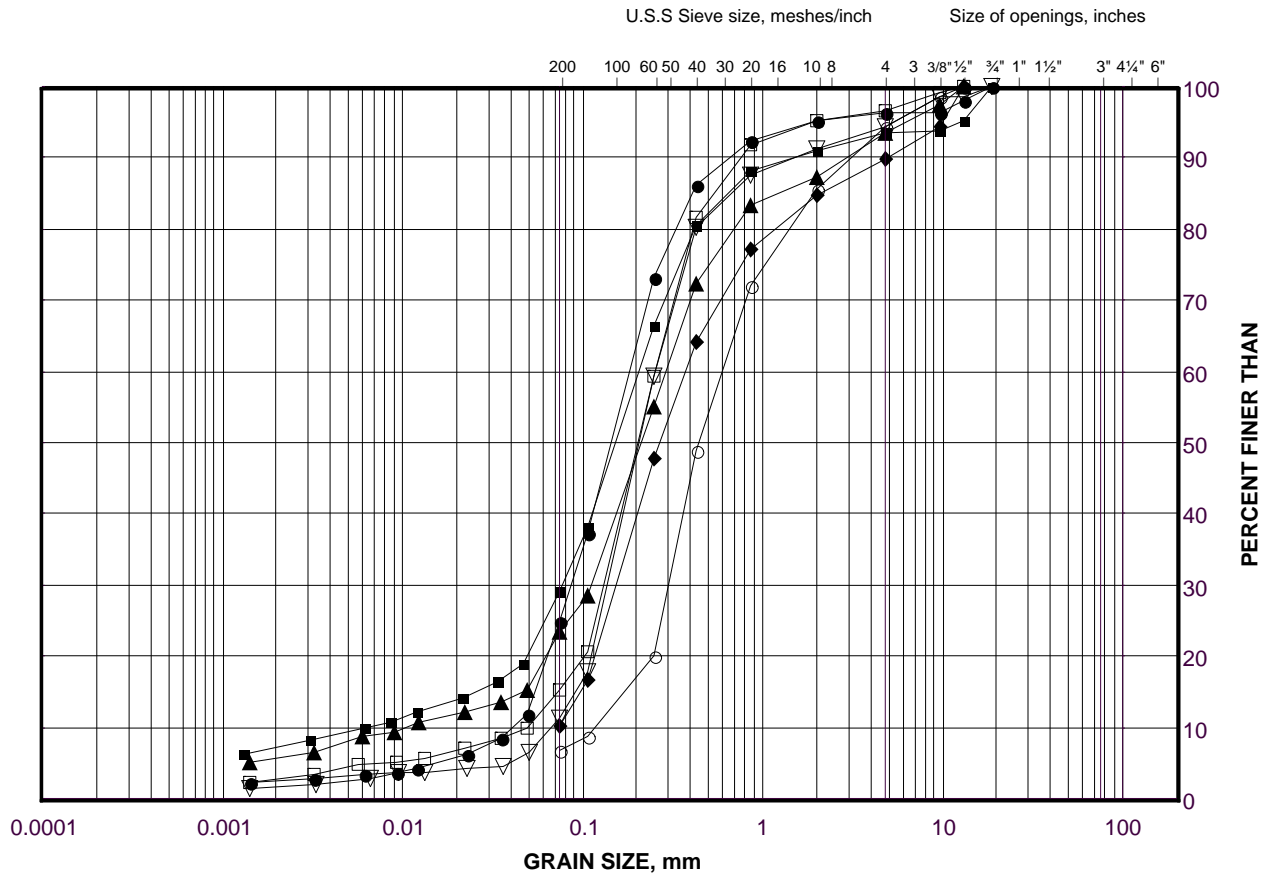
APPENDIX B

Geotechnical Laboratory Test Results

GRAIN SIZE DISTRIBUTION

Silty Sand to Sand (FILL)
RSS Wall and Temporary Retaining Walls - Hwy 400

FIGURE B1-A



SILT AND CLAY SIZES	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE
FINE GRAINED	SAND SIZE			GRAVEL SIZE		SIZE

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	TRW-6	2	239.6
■	TRW-1	2	241.2
◆	TRW-3	2	236.7
▲	TRW-9	2A	234.5
▽	TRW-8	3	234.4
○	TRW-2	3	238.0
□	TRW-7	6	233.9

Project Number: 1532543

Checked By: JMAC

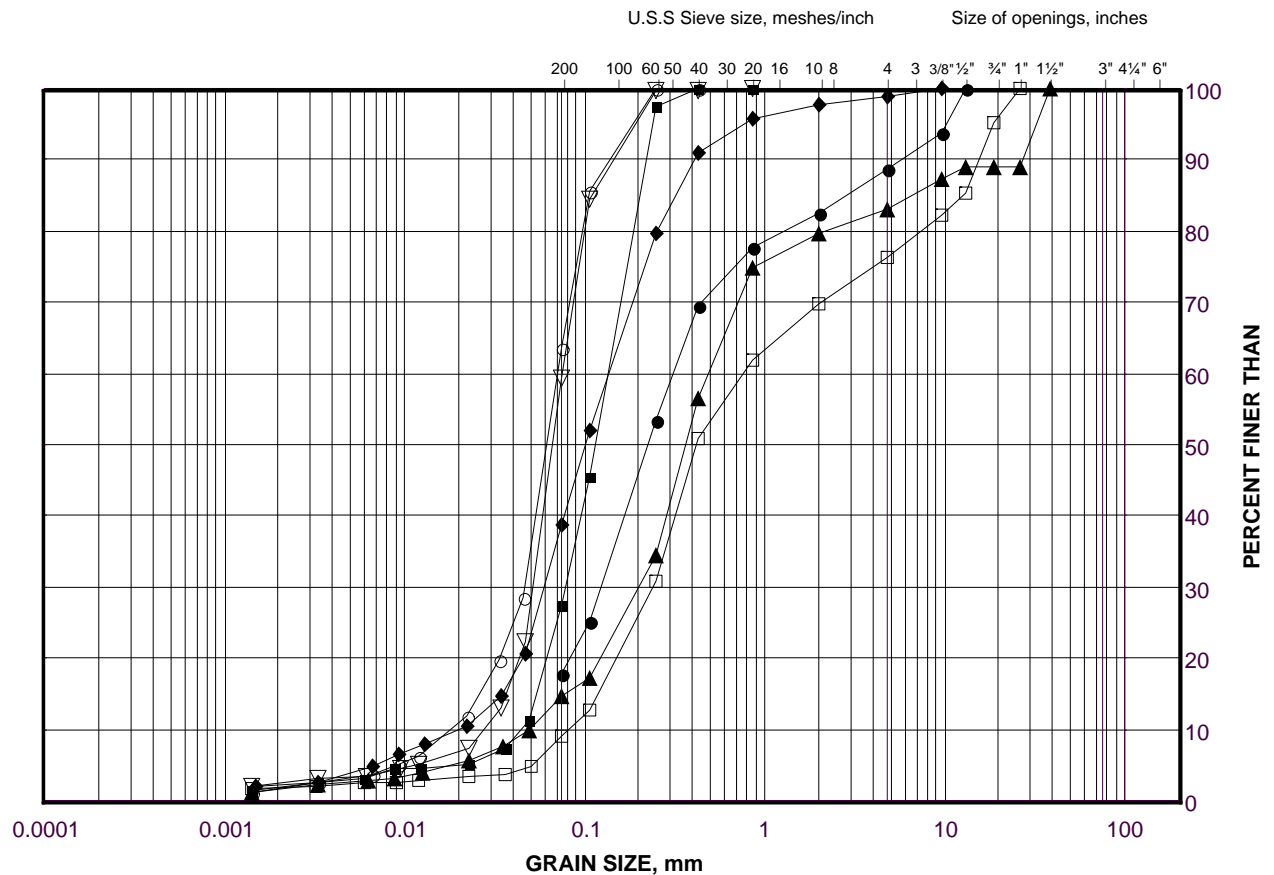
Golder Associates

Date: 23-Nov-15

GRAIN SIZE DISTRIBUTION

Silt and Sand to Gravelly Sand (FILL)
RSS Wall and Temporary Retaining Walls - Hwy 400

FIGURE B1-B



LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	15-7	1	242.6
■	P-RW2	2	232.6
◆	HF-1	3	231.4
▲	HF5	3	231.9
▽	HF3	3	236.8
○	P-RW1	3	230.6
□	15-7	4	239.8

Project Number: 1532543

Checked By: JMAC

Golder Associates

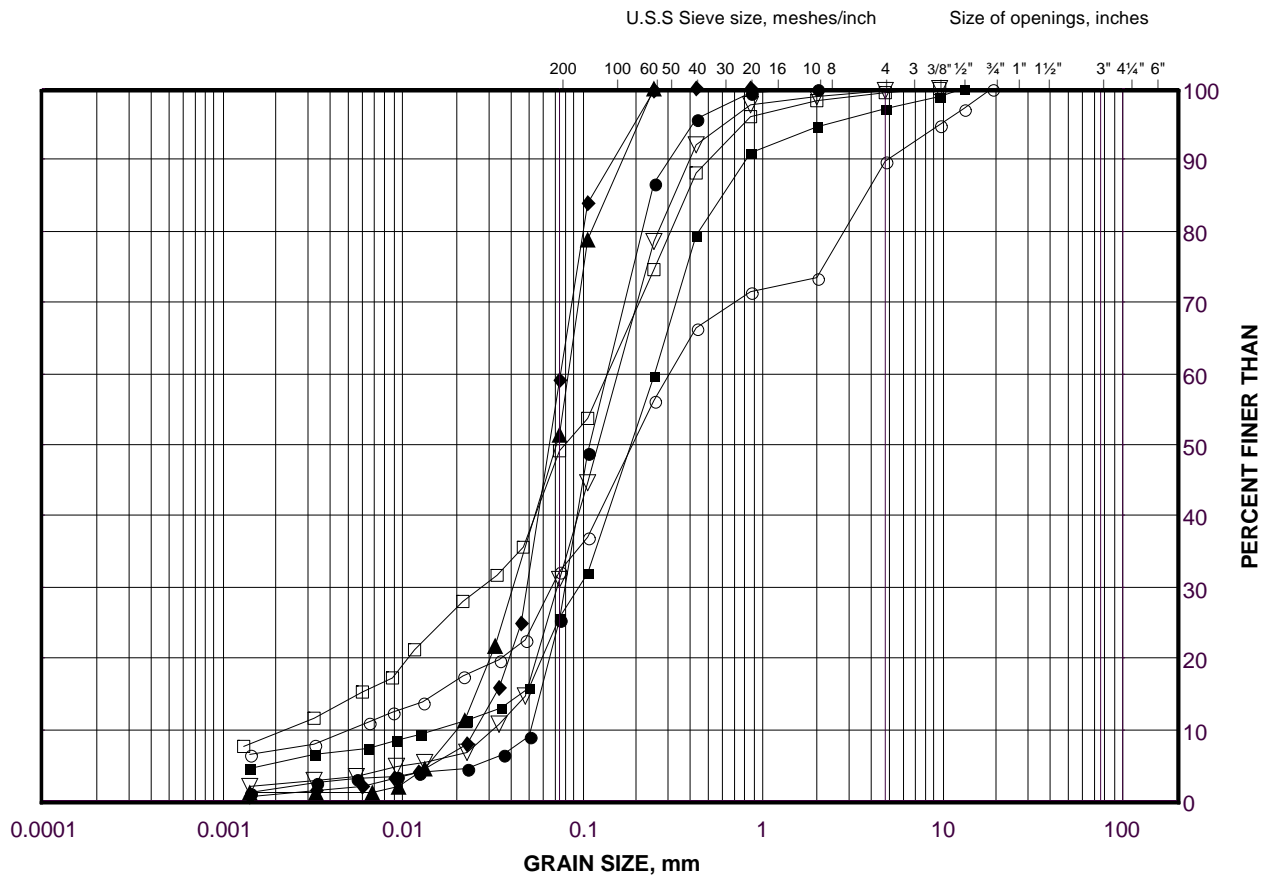
Date: 23-Nov-15

GRAIN SIZE DISTRIBUTION

Silt and Sand to Sand (FILL)

RSS Wall and Temporary Retaining Walls - Hwy 400

FIGURE B1-C



SILT AND CLAY SIZES	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE
FINE GRAINED	SAND SIZE			GRAVEL SIZE		SIZE

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	P-RW4	3	232.6
■	15-5	3	236.1
◆	P-RW3	4	231.8
▲	15-10	4	235.3
▽	15-3	4	229.7
○	15-2	6	235.6
□	15-5	6A	233.2

Project Number: 1532543

Checked By: JMAC

Golder Associates

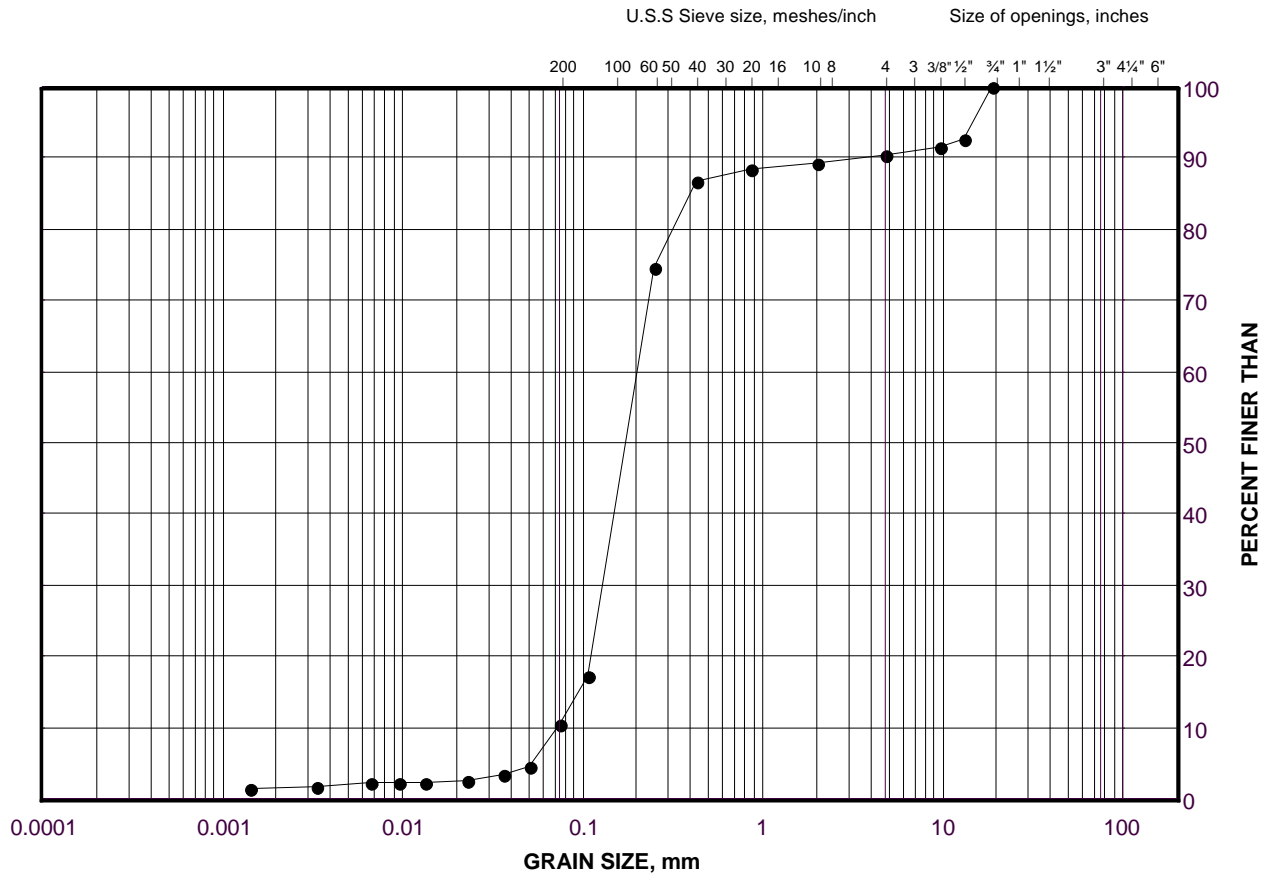
Date: 04-Jan-16

GRAIN SIZE DISTRIBUTION

Silt and Sand to Sand (FILL)

RSS Wall and Temporary Retaining Walls - Hwy 400

FIGURE B1-D



SILT AND CLAY SIZES	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE
FINE GRAINED	SAND SIZE			GRAVEL SIZE		SIZE

LEGEND

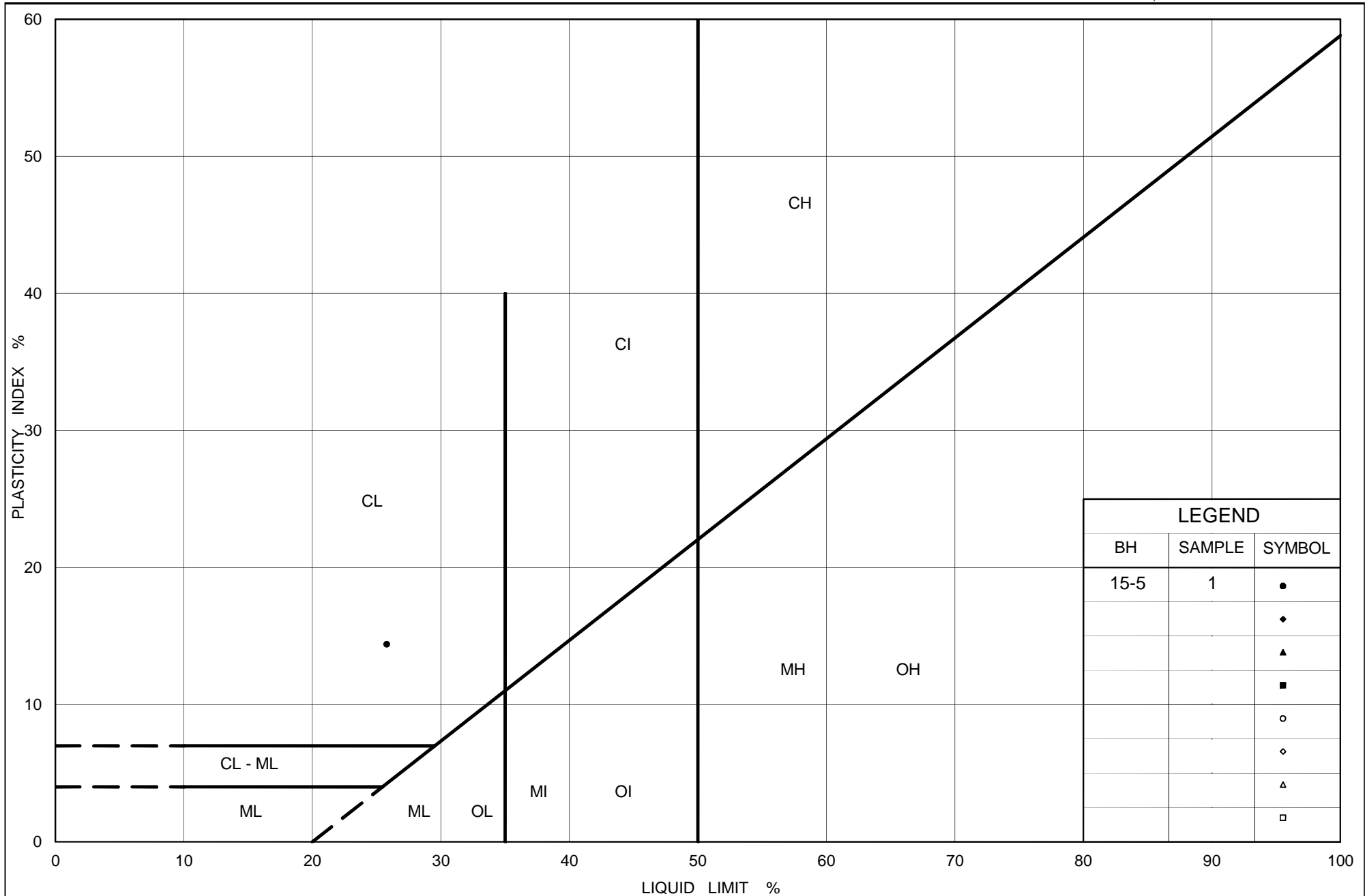
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
•	TRW-4	4	234.0

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Date: 04-Jan-16



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PLASTICITY CHART Clayey Silt (FILL)

RSS Wall and Temporary Retaining Walls - Hwy 400

Figure No. B2

Project No. 1532543

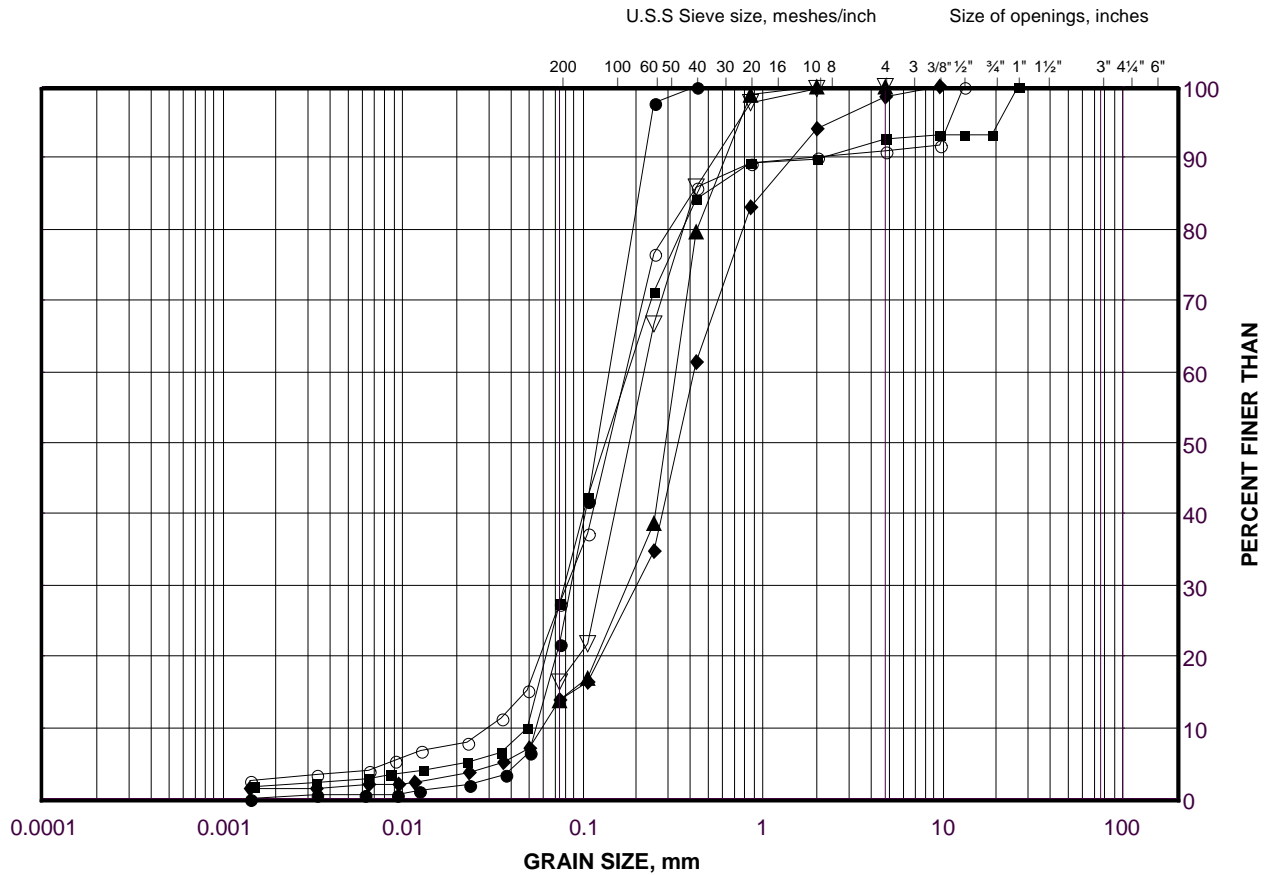
Checked By: JMAC

GRAIN SIZE DISTRIBUTION

SILTY SAND to SAND

RSS Wall and Temporary Retaining Walls - Hwy 400

FIGURE B3-A



SILT AND CLAY SIZES	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE
FINE GRAINED	SAND SIZE			GRAVEL SIZE		SIZE

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	P-RW1	7	227.6
■	TRW-2	7	233.4
◆	TRW-5	7	227.5
▲	TRW-4	7	231.8
▽	TRW-3	8	231.3
○	TRW-9	9	226.7

Project Number: 1532543

Checked By: JMAC

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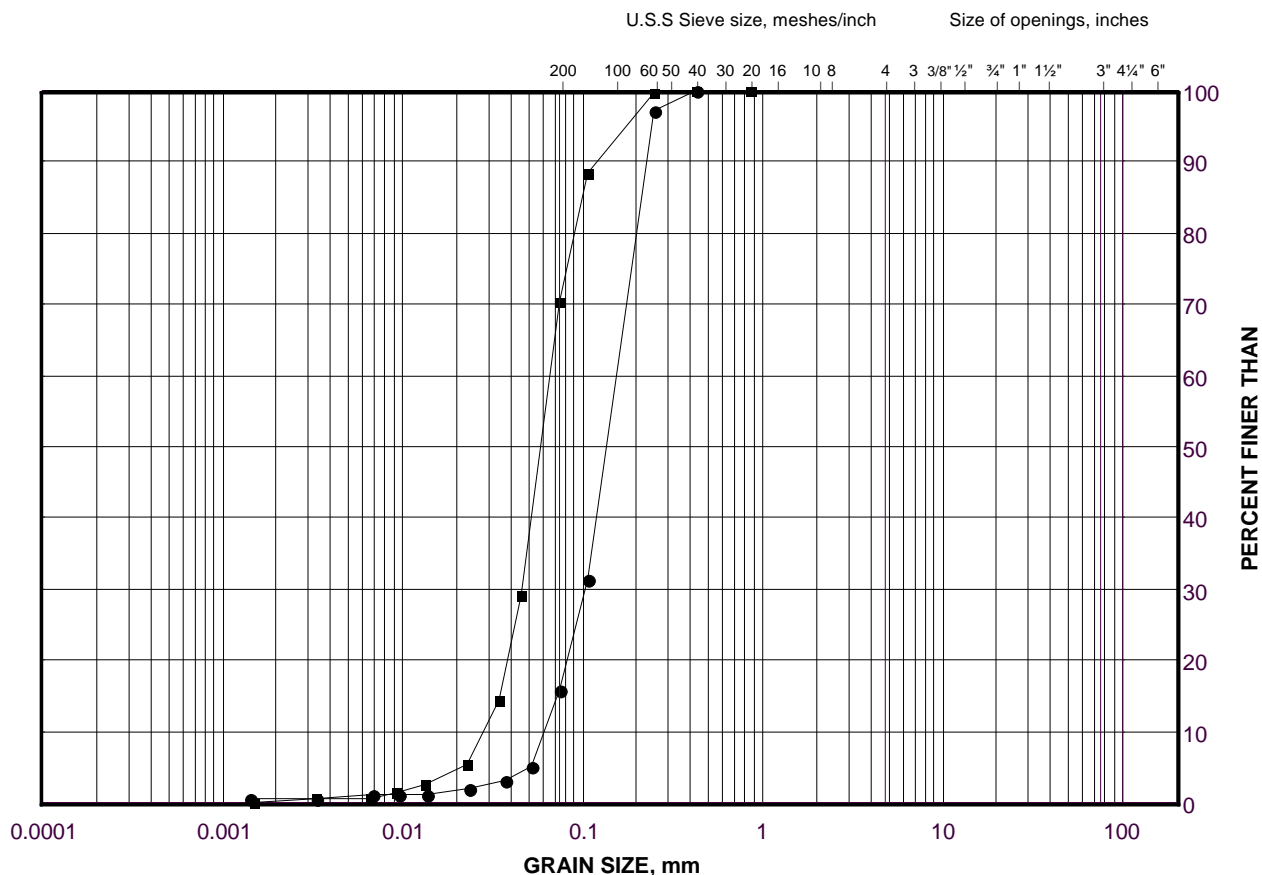
Date: 04-Jan-16

GRAIN SIZE DISTRIBUTION

SILT and SAND to SAND

RSS Wall and Temporary Retaining Walls - Hwy 400

FIGURE B3-B



SILT AND CLAY SIZES	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE
FINE GRAINED	SAND SIZE			GRAVEL SIZE		SIZE

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	15-8	8	227.8
■	HF4	9	228.6

Project Number: 1532543

Checked By: JMAC

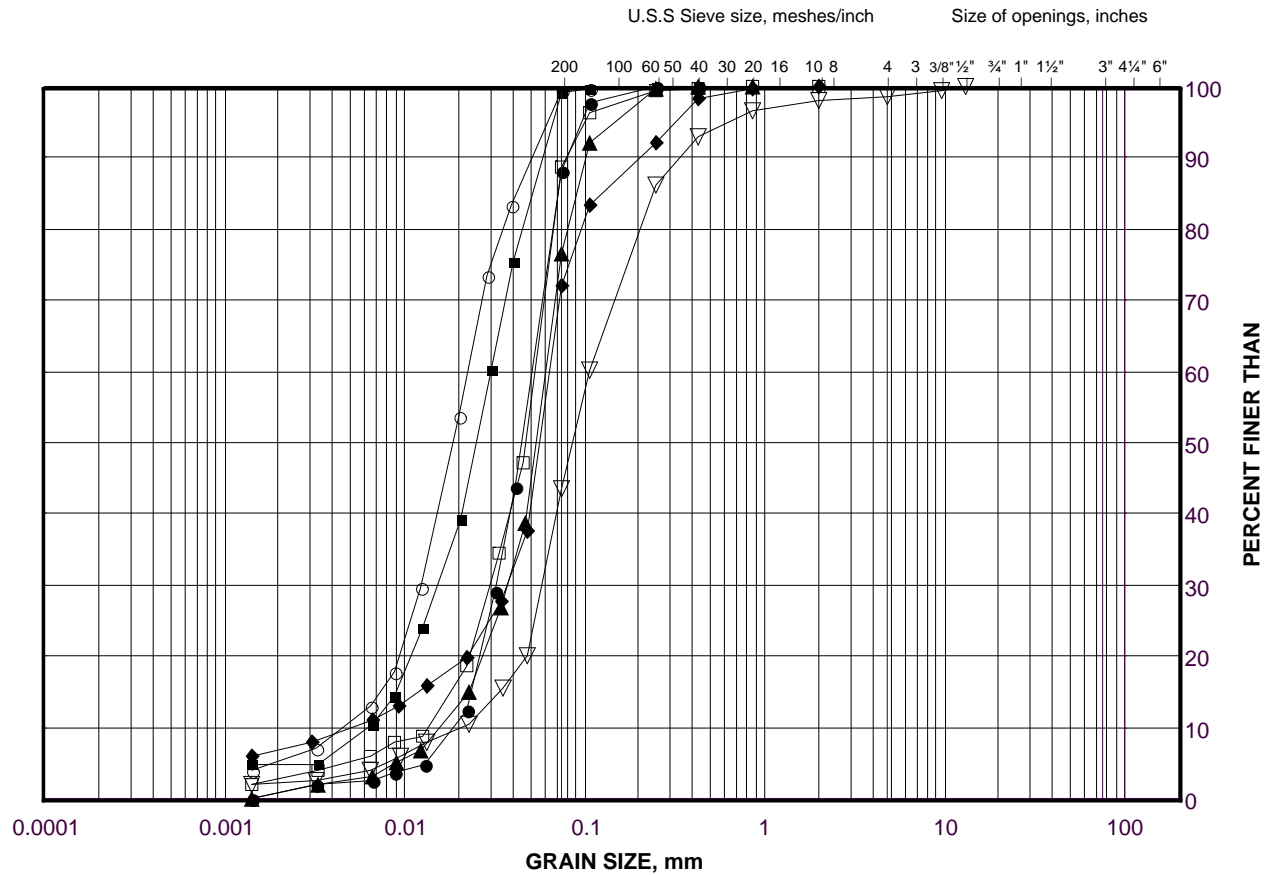
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Date: 04-Jan-16

GRAIN SIZE DISTRIBUTION

SILT to SILT and SAND
RSS Wall and Temporary Retaining Walls - Hwy 400

FIGURE B4-A



SILT AND CLAY SIZES	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE
FINE GRAINED	SAND SIZE			GRAVEL SIZE		SIZE

LEGEND

SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●	P-RW3	10	225.2
■	TRW-1	11	230.5
◆	TRW-5	5	230.8
▲	P-RW4	7	229.5
▽	TRW-8	8	229.3
○	TRW-7	9	229.3
□	TRW-6	9	231.2

Project Number: 1532543

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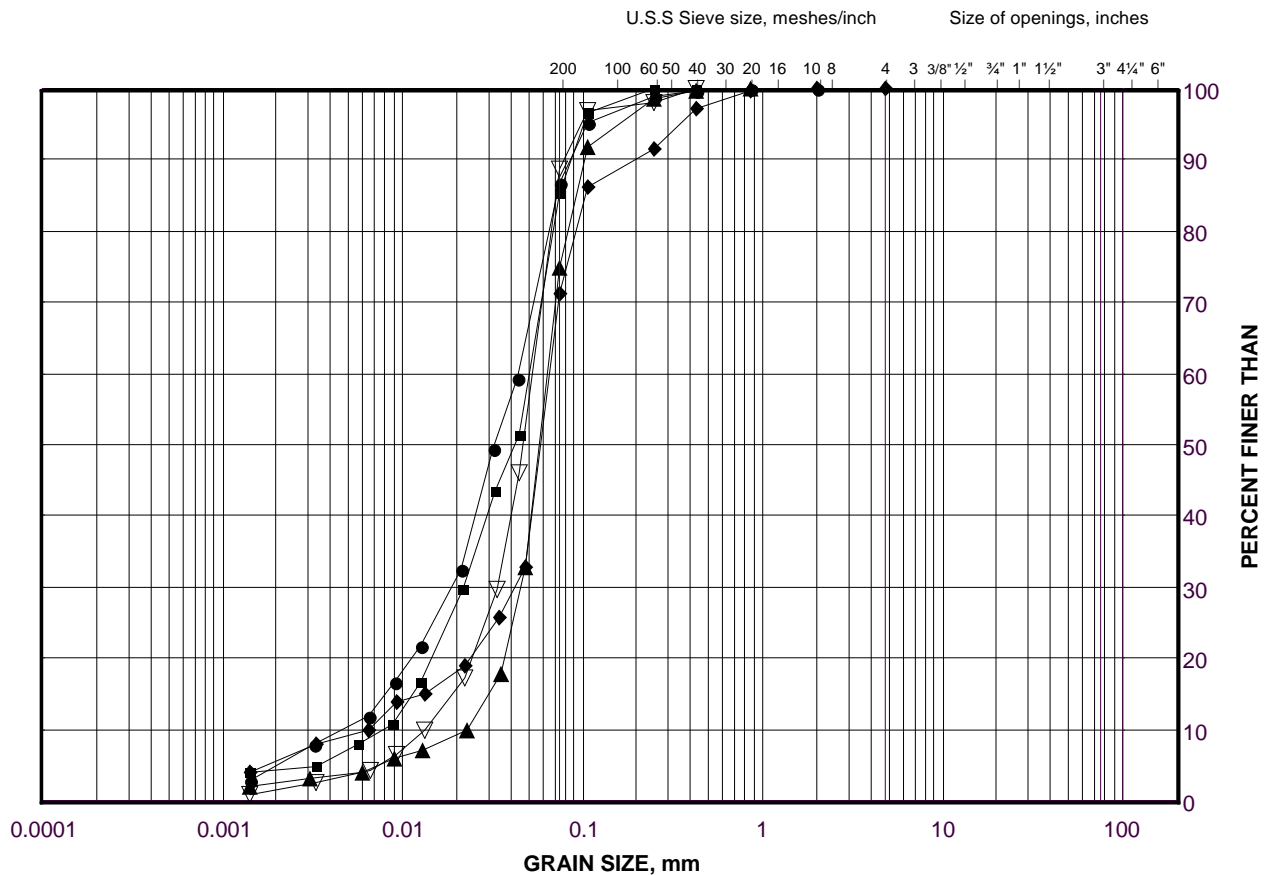
Date: 23-Nov-15

GRAIN SIZE DISTRIBUTION

SILT to SILT and SAND

RSS Wall and Temporary Retaining Walls - Hwy 400

FIGURE B4-B



SILT AND CLAY SIZES		FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE
FINE GRAINED		SAND SIZE			GRAVEL SIZE		SIZE

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	HF2	10	227.5
■	P-RW6	11	225.3
◆	P-RW6	5	231.7
▲	P-RW5	5	230.4
▽	HF1	7	228.3

Project Number: 1532543

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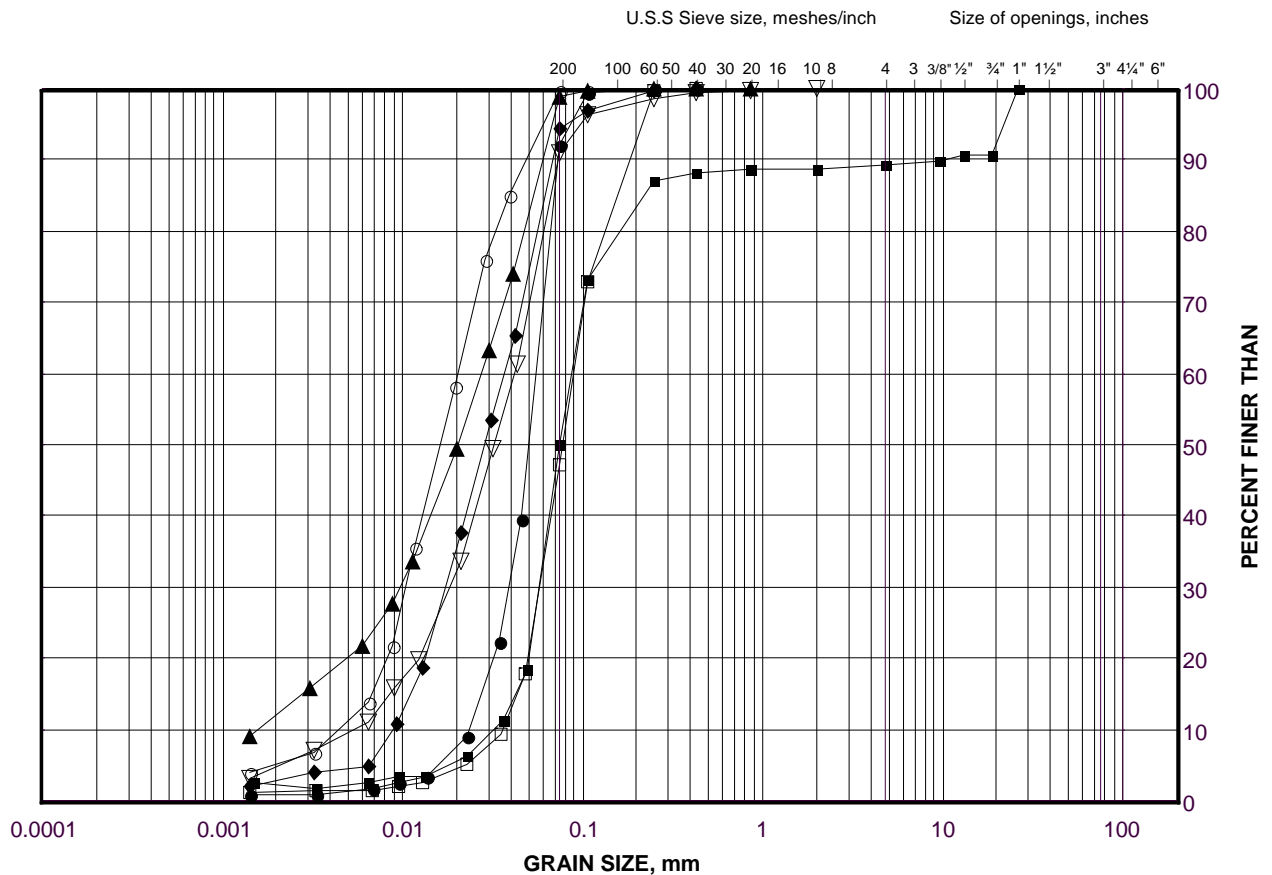
Date: 04-Jan-16

GRAIN SIZE DISTRIBUTION

SILT to SILT and SAND

RSS Wall and Temporary Retaining Walls - Hwy 400

FIGURE B4-C



SILT AND CLAY SIZES	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE
FINE GRAINED	SAND SIZE			GRAVEL SIZE		SIZE

LEGEND

SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	15-4	10	224.1
■	15-7	10	232.2
◆	15-9	10B	227.7
▲	HF2	6	232.4
▽	HF5	7	228.8
○	HF4	7	231.7
□	15-10	8	231.4

Project Number: 1532543

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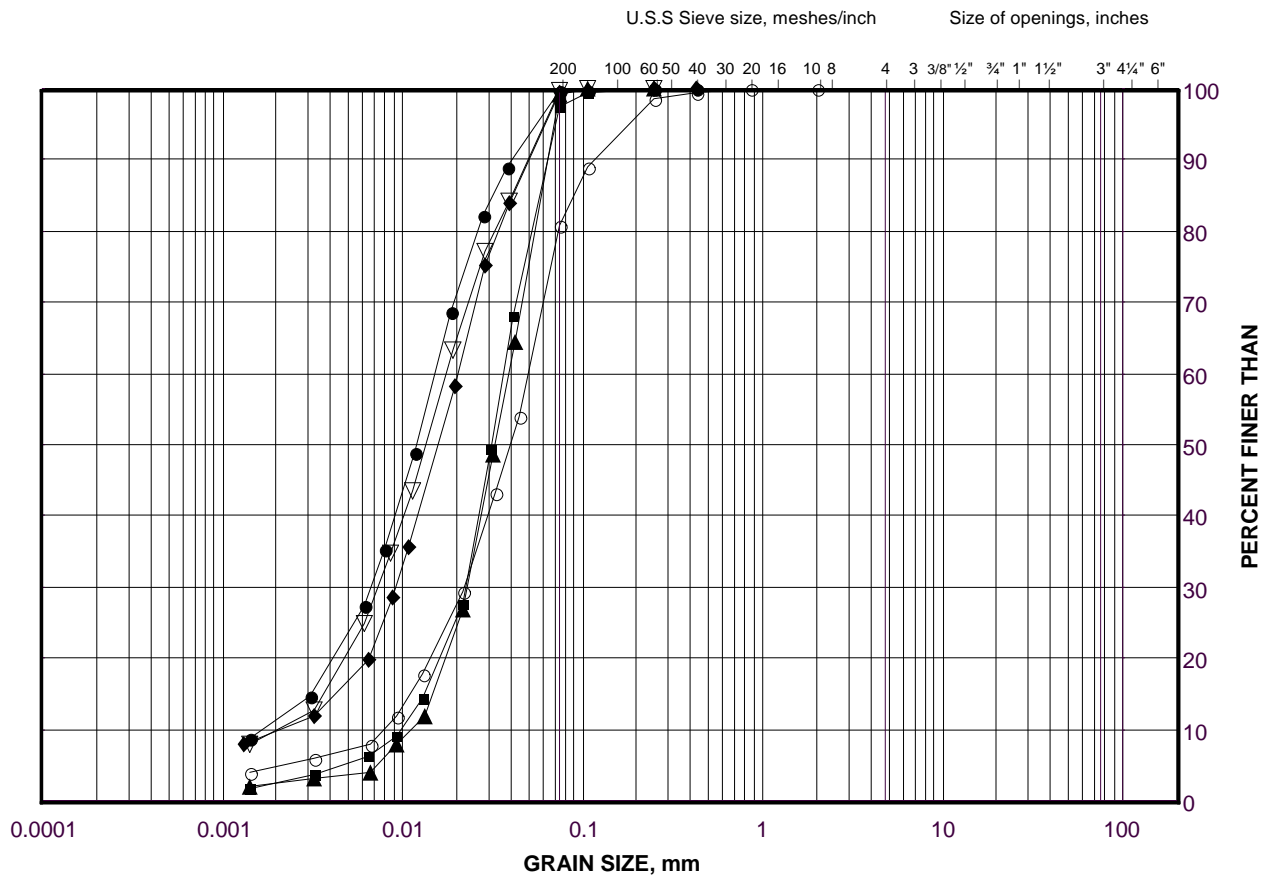
Date: 12-Jan-16

GRAIN SIZE DISTRIBUTION

SILT

RSS Wall and Temporary Retaining Walls - Hwy 400

FIGURE B4-D



SILT AND CLAY SIZES	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE
FINE GRAINED	SAND SIZE			GRAVEL SIZE		SIZE

LEGEND

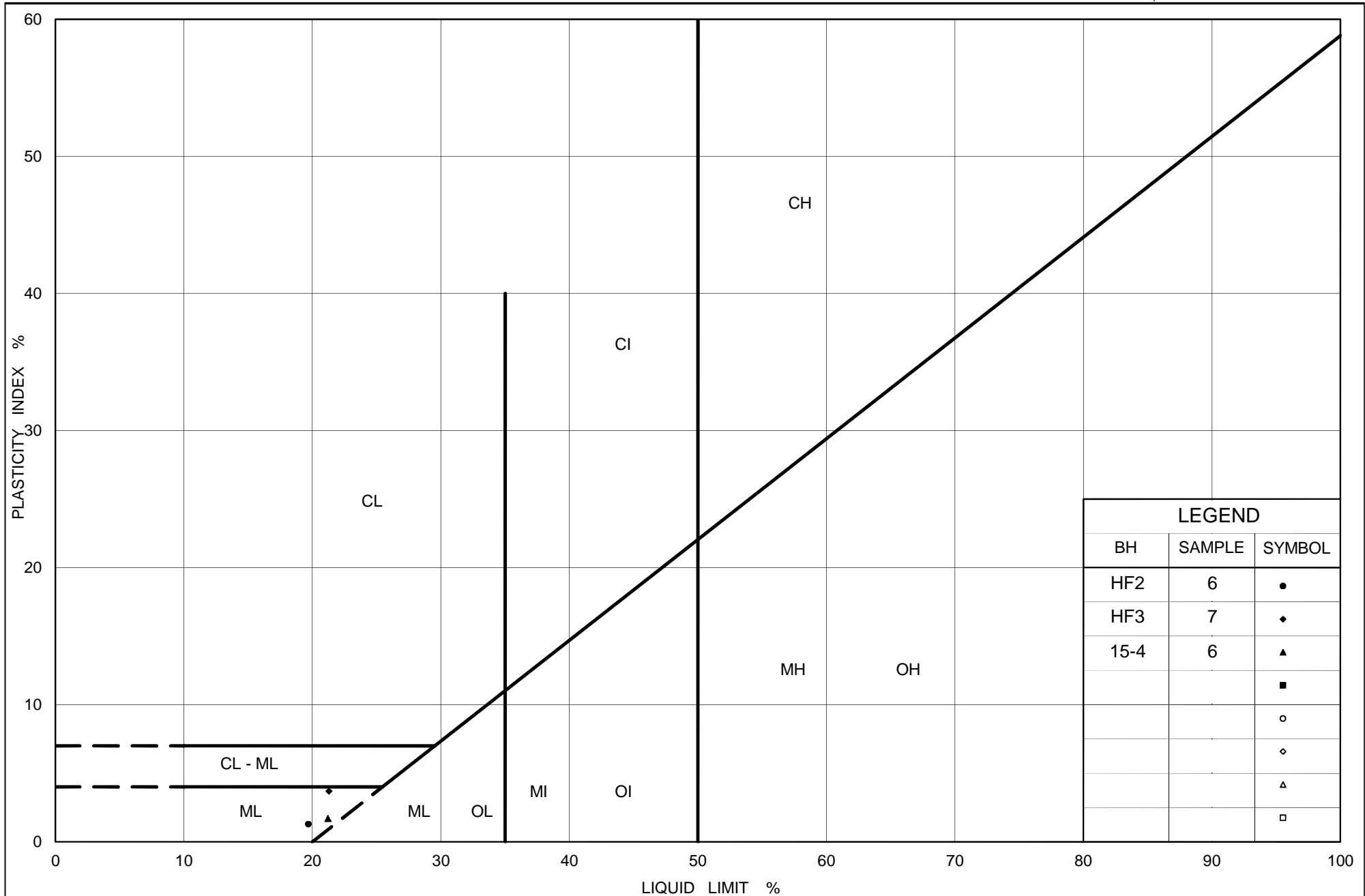
SYMBOL	BOREHOLE	SAMPLE	ELEVATION(m)
●	15-2	11	228.8
■	15-10	12	225.3
◆	15-4	6	229.4
▲	15-8	6	230.1
▽	HF3	7	233.7
○	15-3	9	229.8

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Date: 12-Jan-16



Ministry of Transportation

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PLASTICITY CHART

Silt

RSS Wall and Temporary Retaining Walls - Hwy 400

Figure No. B5

Project No. 1532543

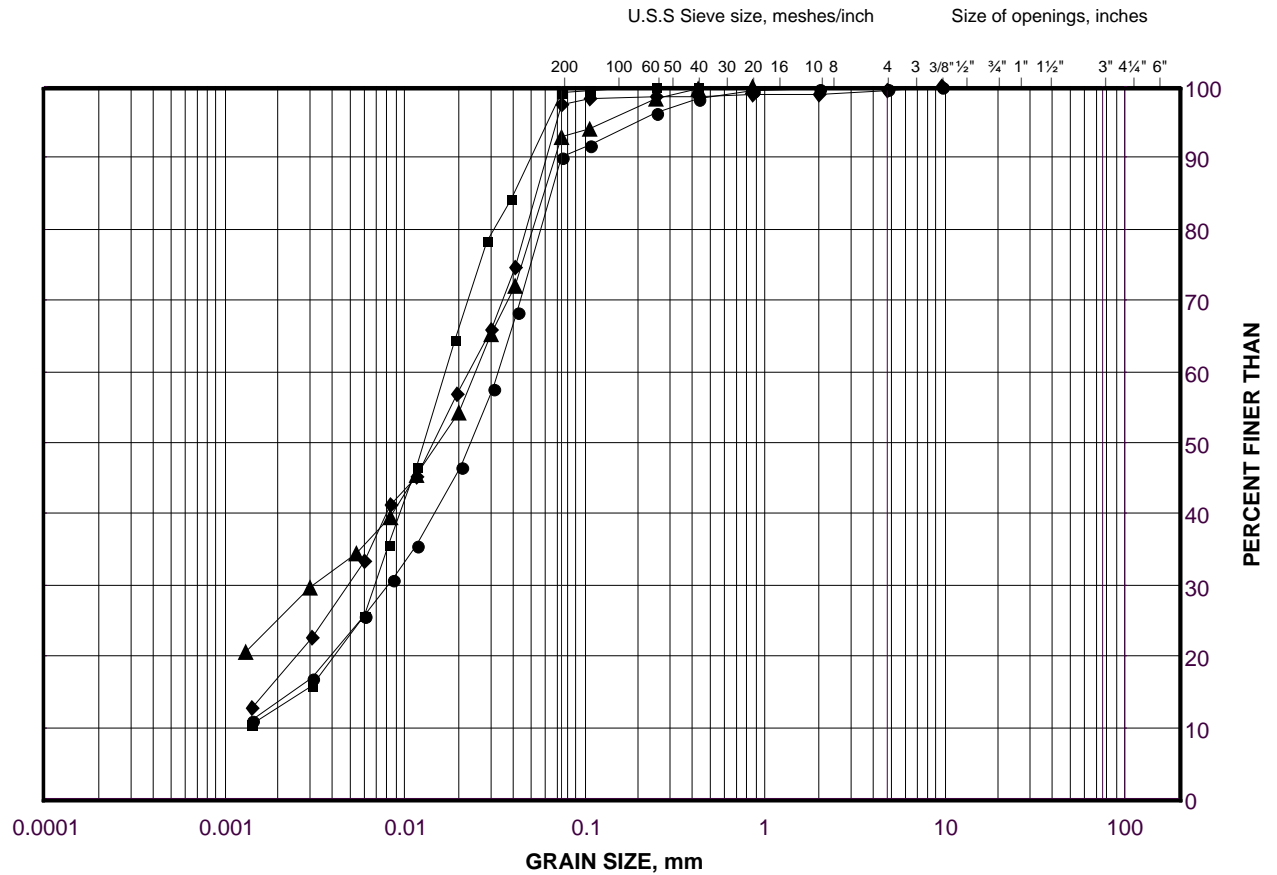
Checked By: JMAC

GRAIN SIZE DISTRIBUTION

CLAYEY SILT to SILTY CLAY

RSS Wall and Temporary Retaining Walls - Hwy 400

FIGURE B6



SILT AND CLAY SIZES	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE
FINE GRAINED	SAND SIZE			GRAVEL SIZE		SIZE

LEGEND

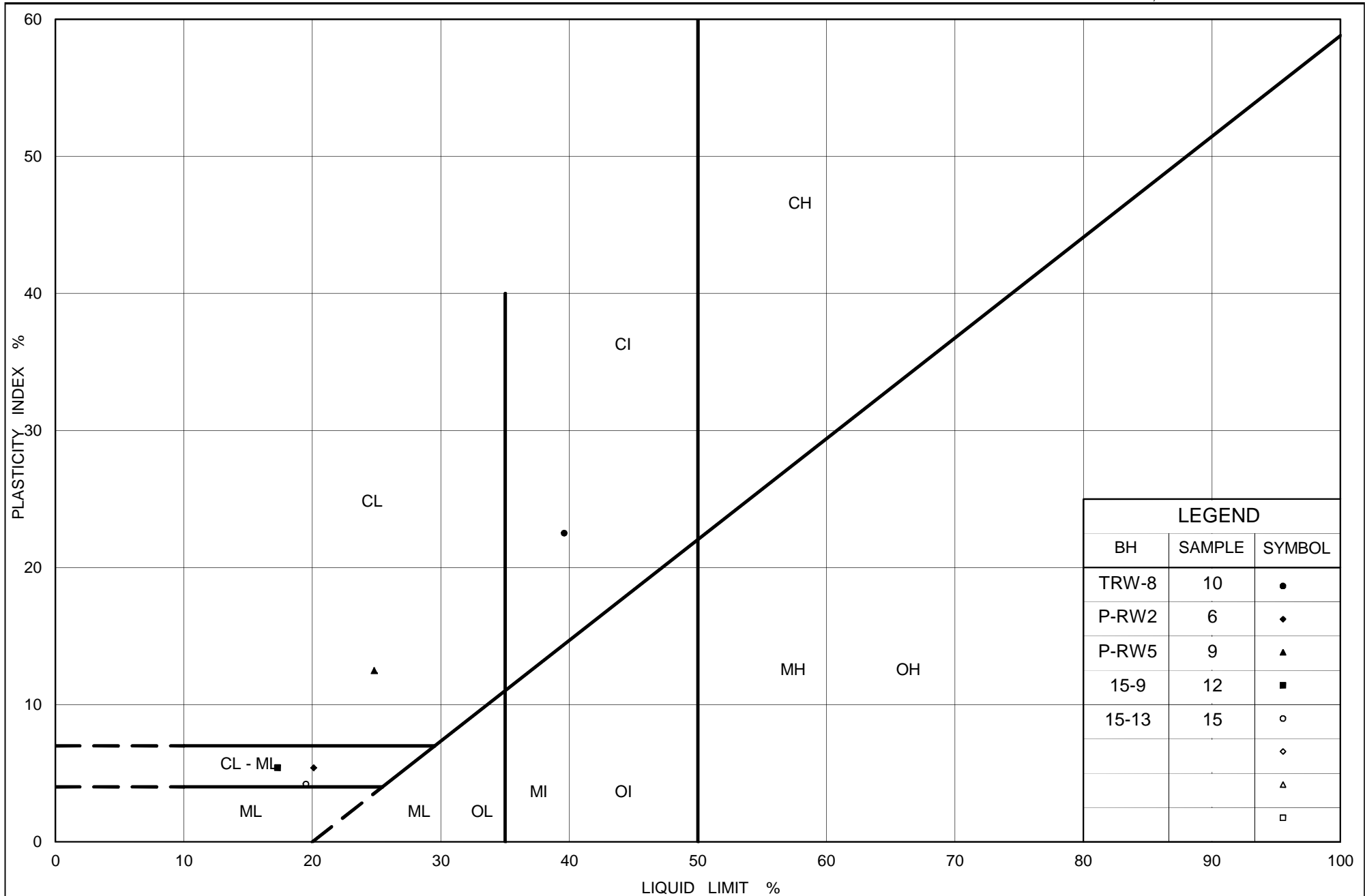
SYMBOL	BOREHOLE	SAMPLE	DEPTH(m)
●	15-9	12	224.8
■	15-3	15	221.2
◆	P-RW2	6	229.6
▲	P-RW5	9	225.8

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PLASTICITY CHART
CLAYEY SILT to SILTY CLAY
RSS Wall and Temporary Retaining Walls - Hwy 400

Figure No. B7

Project No. 1532543

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At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

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