THURBER ENGINEERING LTD.

FOUNDATION INVESTIGATION REPORT
ORILLIA TOWNSHIP CONCESSION 12 UNDERPASS REHABILITATION
HIGHWAY 11
SIMCOE COUNTY, ONTARIO
LATITUDE: 44.722963, LONGITUDE: -79.375792

G.W.P. 2315-16-00, W.P. 2312-16-01, SITE No. 30-486

GEOCRES Number: 31D-780

Report

to

CONSOR Engineers

Date: August 20, 2021
File: 23473

103, 2010 Winston Park Drive, Oakville, ON L6H 5R7 T: 905 829 8666 F: 905 829 1166
thurber.ca

THURBER

TABLE OF CONTENTS

PART 1: FACTUAL INFORMATION

APPENDICES

THURBER

FOUNDATION INVESTIGATION REPORT
ORILLIA TOWNSHIP CONCESSION 12 ROAD UNDERPASS REHABILITATION
HIGHWAY 11
SIMCOE COUNTY, ONTARIO
LATITUDE: 44.722963, LONGITUDE: -79.375792

G.W.P. 2315-16-00, W.P. 2312-16-01, SITE No. 30-486

GEOCRES Number: 31D-780

PART 1: FACTUAL INFORMATION

1. INTRODUCTION

This report presents the factual data obtained from a foundation investigation carried out by Thurber Engineering Ltd. (Thurber) for the proposed rehabilitation of the Orillia Township Concession 12 (Goldstein Road) Underpass bridge over Highway 11 in Simcoe County, Ontario. Thurber carried out the investigation as a sub-consultant to CONSOR Engineering (formerly AIA Engineers) under the Ministry of Transportation Ontario (MTO) Agreement Number 2018-E-0009.

The purpose of this investigation was to explore the subsurface conditions at the bridge location and, based on the data obtained, to provide a borehole location plan, stratigraphic profile, records of boreholes, laboratory test results, and a written description of the subsurface conditions.

2. SITE DESCRIPTION

The existing Concession 12 Underpass structure is located in the Township of Severn, Simcoe County, and crosses over Highway 11 approximately 10 km north of the City of Orillia, Ontario (Latitude: 44.722963, Longitude: -79.375792). The structure consists of a two-lane single span flyover with a span length of 45.5 m and a width of 11.3 m.

Road grade on the Concession 12 structure is at approximate Elevation 243.3 to 243.5. Road grade on Highway 11 below the underpass is near Elevation 236.5. The approach embankments rise above the adjacent lands.

The site lies within the physiographic region known as the Simcoe Lowlands based on Chapman and D.F. Putnam's 1984 edition of The Physiography of Southern Ontario. The area is characterized as being in a sand plain overlaying the Shadow Lake bedrock formation.

THURBER

3. INVESTIGATION PROCEDURES

The field investigation for this project was carried out on May 8, 2019, during which time two boreholes denoted as Boreholes 12A and 12B were drilled at either end of the existing Concession 12 Underpass. The approximate locations of the boreholes are shown on the Borehole Locations and Soil Strata Drawing provided in Appendix C.

A truck-mounted D-25 drill rig was used to drill Boreholes 12A and 12B. The boreholes were advanced using solid stem augers to a depth of 9.8 m. In both boreholes, soil samples were obtained at selected intervals with a 50 mm outside diameter split spoon sampler driven in conjunction with the Standard Penetration Test (SPT). The results of the boreholes are presented on the Record of Borehole sheets in Appendix A.

The field investigation was supervised on a full-time basis by a member of Thurber's technical staff who directed the drilling, sampling and in-situ testing operations, logged the boreholes and processed the recovered soil samples for transport to Thurber's laboratory for further examination and testing.

Groundwater conditions were observed in the open boreholes throughout the drilling operations. The boreholes were backfilled in general accordance with Ontario Regulation 903, as amended by Regulation 128/03.

Details of the borehole completion are summarized as follows:

Borehole Number	Borehole Depth / Base Elevation (m)	Piezometer Tip Depth / Elevation (m)	Completion Details
12A	9.8/233.8	None Installed	Bentonite holeplug and cuttings to surface and covered with cold patch asphalt
12B	9.8/233.2	None Installed	Bentonite holeplug and cuttings to surface and covered with cold patch asphalt

4. LABORATORY TESTING

The recovered soil samples were subjected to Visual Identification (VI) and to natural moisture content determination. Selected samples were also subjected to grain size distribution analyses (hydrometer and/or sieve) and Atterberg Limits testing, where appropriate. Laboratory testing

results are summarized on the Record of Borehole sheets included in Appendix A and are presented on the figures included in Appendix B.

5. DESCRIPTION OF SUBSURFACE CONDITIONS

Details of the encountered soil stratigraphy are presented on the Record of Borehole sheets included in Appendix A. A general description of the stratigraphy, based on the conditions encountered in the boreholes, is given in the following paragraphs. However, the factual data presented on the Record of Borehole sheets takes precedence over this general description and must be used for interpretation of the site conditions. It should be recognized and expected that soil conditions may vary between and beyond borehole locations.

In general, the subsurface conditions encountered in the boreholes consisted of a pavement structure overlying sand fill underlain by native sand and silt. Descriptions of the individual strata are presented below.

5.1 Pavement Structure

Boreholes 12A and 12B were drilled through the eastbound and westbound lanes approaching the Concession 12 Underpass structure, and encountered 80 mm of asphalt overlying sandy gravel to gravelly sand fill extending to depths of 0.3 m and 1.4 m (Elevation 243.3 and 241.6).

An SPT ‘N’ value of 62 blows per 0.3 m of penetration was obtained within the lower part of the granular fill, indicating a very dense relative density. Moisture contents between 2 percent and 4 percent were measured in the granular fill.

5.2 Sand Fill

Sand embankment fill was encountered below the pavement structure in Boreholes 12A and 12B. The sand fill contained some silt, trace clay, and trace to some gravel. The fill layer was 6.9 m and 7.3 m thick and extended to depths of 7.2 m and 8.7 m (Elevation 236.4 to 234.4) in Boreholes 12A and 12B, respectively.

SPT ‘N’ values within the sand fill ranged from 7 to 30 blows per 0.3 m of penetration, indicating a loose to dense relative density. Moisture contents between 2 percent and 12 percent were measured in the sand fill.

The results of grain size distribution analyses carried out on selected samples of the sand fill are presented on the Record of Borehole sheets included in Appendix A and on Figure B1 of Appendix B. The results of the grain size distribution analyses are summarized below:

Soil Particle	Percentage (%)
Gravel	2 to 17
Sand	70 to 73
Silt and Clay	10 to 28

5.3 Sand and Silt

Native brown sand and silt with trace clay was encountered below the sand fill in both boreholes. Both boreholes were terminated in the sand and silt at a depth of 9.8 m (Elevation 233.8 and 233.2).

SPT 'N' values ranging from 13 to 45 blows per 0.3 m penetration were recorded, indicating a compact to dense relative density. The sand and silt had a measured moisture content ranging from 18 percent to 21 percent.

The results of a grain size distribution analysis carried out on a selected sample of the sand and silt are presented on the Record of Borehole sheets included in Appendix A and on Figure B2 of Appendix B. The results of the grain size distribution analyses are summarized below:

Soil Particle	Percentage (%)
Gravel	0
Sand	55
Silt	44
Clay	1

5.4 Groundwater Conditions

Groundwater conditions were observed during drilling operations, and the groundwater level was measured in the open boreholes upon completion of drilling. The groundwater levels measured in the open boreholes are summarized below.

Borehole	Date	Water Level (m)		Remark
		Depth	Elevation	
12A	May 8, 2019	8.5	235.1	Open Borehole
12B	May 8, 2019	8.8	234.2	Open borehole

The groundwater levels above are short-term readings, and seasonal fluctuations of the groundwater levels are to be expected. In particular, the groundwater levels may be at a higher elevation after periods of significant or prolonged precipitation.

6. MISCELLANEOUS

Thurber marked the borehole locations in the field and obtained subsurface utility clearances prior to drilling. Callon Dietz Incorporated determined the northing and easting coordinates and ground surface elevations at the boreholes from the base plan and digital terrain model, based on site measurements by Thurber. The borehole co-ordinates are considered to have a horizontal accuracy of 0.15 m and a vertical accuracy of 20 mm.

Walker Drilling of Utopia, Ontario supplied and operated the drilling, sampling and in-situ testing equipment to complete the boreholes. The field investigation was supervised on a full-time basis by Mr. Randy Pomerleau of Thurber. Overall supervision of the field program was provided by Dr. Nancy Berg, P.Eng of Thurber.

Routine laboratory testing was carried out at Thurber's geotechnical laboratory. Interpretation of the field data and preparation of this report was carried out by Ms. Judy Mei, E.I.T. The report was reviewed by Mr. Murray Anderson, P.Eng. and Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations Projects.

Thurber Engineering Ltd.

Judy Mei, M.A.Sc., E.I.T.
Geotechnical Engineer-in-Training

Murray Anderson, M.Eng., P.Eng.
Associate / Senior Geotechnical Engineer

P.K. Chatterji, P.Eng., Ph.D.
Review Principal, Designated MTO Contact

THURBER

Appendix A

Record of Borehole Sheets

SYMBOLS, ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES

1. TEXTURAL CLASSIFICATION OF SOILS

CLASSIFICATION	PARTICLE SIZE	VISUAL IDENTIFICATION
Boulders	Greater than 200mm	same
Cobbles	75 to 200mm	same
Gravel	4.75 to 75mm	5 to 75mm
Sand	0.075 to 4.75mm	Not visible particles to 5mm
Silt	0.002 to 0.075mm	Non-plastic particles, not visible to the naked eye
Clay	Less than 0.002mm	Plastic particles, not visible to the naked eye

2. COARSE GRAIN SOIL DESCRIPTION (50% greater than 0.075mm)

TERMINOLOGY	PROPORTION
Trace or Occasional	Less than 10%
Some	10 to 20%
Adjective (e.g. silty or sandy)	20 to 35%
And (e.g. sand and gravel)	35 to 50%

3. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

DESCRIPTIVE TERM	UNDRAINED SHEAR STRENGTH (kPa)	APPROXIMATE SPT[(1)] 'N' VALUE
Very Soft	12 or less	Less than 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	Greater than 200	Greater than 30

NOTE: Hierarchy of Soil Strength Prediction

1) Laboratory Triaxial Testing
2) Field Insitu Vane Testing
3) Laboratory Vane Testing
4) SPT value
5) Pocket Penetrometer

4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

DESCRIPTIVE TERM	SPT "N" VALUE
Very Loose	Less than 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	Greater than 50

5. LEGEND FOR RECORDS OF BOREHOLES

SYMBOLS AND ABBREVIATIONS FOR SAMPLE TYPE	SS Split Spoon Sample	WS Wash Sample	AS Auger (Grab) Sample
	TW Thin Wall Shelby Tube Sample		TP Thin Wall Piston Sample
	PH Sampler Advanced by Hydraulic Pressure		PM Sampler Advanced by Manual Pressure
	WH Sampler Advanced by Self Static Weight	RC Rock Core	SC Soil Core

$$\text{Sensitivity} = \frac{\text{Undisturbed Shear Strength}}{\text{Remoulded Shear Strength}}$$

▼ Water Level

C_{pen} Shear Strength Determination by Pocket Penetrometer

(1) SPT 'N' Value Standard Penetration Test 'N' Value – refers to the number of blows from a 63.5kg hammer free falling a height of 0.76m to advance a standard 50 mm outside diameter split spoon sampler for 0.3 m depth into undisturbed ground.

(2) DCPT Dynamic Cone Penetration Test – Continuous penetration of a 50 mm outside diameter, 60° conical steel point attached to "A" size rods driven by a 63.5 kg hammer free falling a height of 0.76 m. The resistance to cone penetration is the number of hammer blows required for each 0.3 m advance of the conical point into undisturbed ground.

UNIFIED SOILS CLASSIFICATION

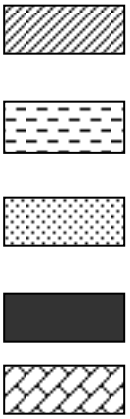
MAJOR DIVISIONS		GROUP SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well-graded gravels or gravel-sand mixtures, little or no fines.
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines.
		GM	Silty gravels, gravel-sand-silt mixtures.
		GC	Clayey gravels, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS	SW	Well-graded sands or gravelly sands, little or no fines.
		SP	Poorly-graded sands or gravelly sands, little or no fines.
		SM	Silty sands, sand-silt mixtures.
		SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS	SILTS AND CLAYS $W_L < 50\%$	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. ($W_L < 30\%$).
		CI	Inorganic clays of medium plasticity, silty clays. ($30\% < W_L < 50\%$).
		OL	Organic silts and organic silty-clays of low plasticity.
	SILTS AND CLAYS $W_L > 50\%$	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils.
CLAY SHALE			
SANDSTONE			
SILTSTONE			
CLAYSTONE			
COAL			

EXPLANATION OF ROCK LOGGING TERMS

ROCK WEATHERING CLASSIFICATION

Fresh (FR)	No visible signs of weathering.
Fresh Jointed (FJ)	Weathering limited to the surface of major discontinuities.
Slightly Weathered (SW)	Penetrative weathering developed on open discontinuity surfaces, but only slight weathering of rock material.
Moderately Weathered (MW)	Weathering extends throughout the rock mass, but the rock material is not friable.
Highly Weathered (HW)	Weathering extends throughout the rock mass and the rock is partly friable.
Completely Weathered (CW)	Rock is wholly decomposed and in a friable condition, but the rock texture and structure are preserved.

SYMBOLS



CLAYSTONE

SILTSTONE

SANDSTONE

COAL

Bedrock (general)

DISCONTINUITY SPACING

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

TERMS

Total Core Recovery: (TCR)	Core recovered as a percentage of total core run length.
Solid Core Recovery: (SCR)	Percent Ratio of solid core of full cylindrical shape recovered. Expressed with respect to the total length of core run.
Rock Quality Designation: (RQD)	Total length of sound core recovered in pieces 0.1m in length or larger as a percentage of total core run length.
Uniaxial Compressive Strength (UCS)	Axial stress required to break the specimen
Fracture Index: (FI)	Frequency of natural fractures per 0.3m of core run.

STRENGTH CLASSIFICATION

Rock Strength	Approximate Uniaxial Compressive Strength (MPa)	(psi)	Field Estimation of Hardness*
Extremely Strong	Greater than 250	Greater than 36,000	Specimen can only be chipped with a geological hammer
Very Strong	100-250	15,000 to 36,000	Requires many blows of geological hammer to break
Strong	50-100	7,500 to 15,000	Requires more than one blow of geological hammer to break
Medium Strong	25.0 to 50.0	3,500 to 7,500	Breaks under single blow of geological hammer.
Weak	5.0 to 25.0	750 to 3,500	Can be peeled by a pocket knife with difficulty
Very Weak	1.0 to 5.0	150 to 750	Can be peeled by a pocket knife, crumbles under firm blows of geological pick.
Extremely Weak (Rock)	0.25 to 1.0	35 to 150	Indented by thumbnail

THURBER

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 12A 1 OF 2 METRIC

W.P. 2308-16-01 LOCATION Concession 12 Underpass N 4 953 692.6 E 314 614.8 ORIGINATED BY RP

DIST Central HWY 11 BOREHOLE TYPE Solid Stem Auger COMPILED BY BH

DATUM Geodetic DATE 2019.05.08 - 2019.05.08 LATITUDE 44.723170 LONGITUDE -79.376103 CHECKED BY NB

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
243.6	GROUND SURFACE										
0.0	**ASPHALT:** (80mm)										
243.3											
0.3	Sandy **GRAVEL**, trace silt Brown Moist (FILL)										
	SAND, trace to some gravel, some silt Loose to Dense Brown Moist (FILL)		1	SS	30		243				11 73 16 (SI+CL)
			2	SS	7		242				
			3	SS	11		241				
			4	SS	16		240				
			5	SS	20		239				
			6	SS	30		238				
236.4							237				
7.2	**SAND** and **SILT**, trace clay Dense to Compact Brown Moist to Wet		7	SS	45	▽	236				
							235				
233.8			8	SS	13		234				0 55 44 1
9.8	END OF BOREHOLE AT 9.75m.										

Continued Next Page

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

20 / 15 ⊕ 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S2 MTO-23473.GPJ 2017TEMPLATE(MTO).GDT 7/24/20

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 12A 2 OF 2 METRIC

W.P. 2308-16-01 LOCATION Concession 12 Underpass N 4 953 692.6 E 314 614.8 ORIGINATED BY RP

DIST Central HWY 11 BOREHOLE TYPE Solid Stem Auger COMPILED BY BH

DATUM Geodetic DATE 2019.05.08 - 2019.05.08 LATITUDE 44.723170 LONGITUDE -79.376103 CHECKED BY NB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
	Continued From Previous Page										
	WATER LEVEL AT 8.5m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE, CUTTINGS, AND COLD PATCH ASPHALT AND COMPACTED WITH HYDRAULIC HAMMER.										

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

20 / 15 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S2 MTO-23473.GPJ 2017TEMPLATE(MTO).GDT 7/24/20

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 12B 1 OF 2 METRIC

W.P. 2308-16-01 LOCATION Concession 12 Underpass N 4 953 647.5 E 314 665.1 ORIGINATED BY RP

DIST Central HWY 11 BOREHOLE TYPE Solid Stem Auger COMPILED BY BH

DATUM Geodetic DATE 2019.05.08 - 2019.05.08 LATITUDE 44.722764 LONGITUDE -79.375470 CHECKED BY NB

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
243.0	GROUND SURFACE										
0.0 / 0.1	**ASPHALT:** (80mm)										
	Sandy **GRAVEL**, trace to some silt Brown Moist (FILL)										
242.1											
1.0	Gravelly **SAND**, some silt, occasional cobbles Very Dense Brown Moist (FILL)		1	SS	62		242				
241.6 / 1.4			2	SS	26		241				
	SAND, some silt, trace clay, trace gravel Compact to Loose Brown Moist (FILL)		3	SS	9						
			4	SS	14		240				2 70 28 (SI+CL)
			5	SS	19		239				
			6	SS	22		238				
			7	SS	17		237				17 73 10 0
234.4							236				
8.7	**SAND** and **SILT**, trace clay Compact Brown Wet		8	SS	19	▽	235				
233.2							234				
9.8	END OF BOREHOLE AT 9.8m.										

Continued Next Page

+ ^{3}, × ^{3}: Numbers refer to Sensitivity

20 / 15 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S2 MTO-23473.GPJ 2017TEMPLATE(MTO).GDT 7/24/20

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 12B 2 OF 2 METRIC

W.P. 2308-16-01 LOCATION Concession 12 Underpass N 4 953 647.5 E 314 665.1 ORIGINATED BY RP

DIST Central HWY 11 BOREHOLE TYPE Solid Stem Auger COMPILED BY BH

DATUM Geodetic DATE 2019.05.08 - 2019.05.08 LATITUDE 44.722764 LONGITUDE -79.375470 CHECKED BY NB

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						GR SA SI CL
	Continued From Previous Page										
	WATER LEVEL AT 8.8m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE, CUTTINGS, AND COLD PATCH ASPHALT AND COMPACTED WITH HYDRAULIC HAMMER.										

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

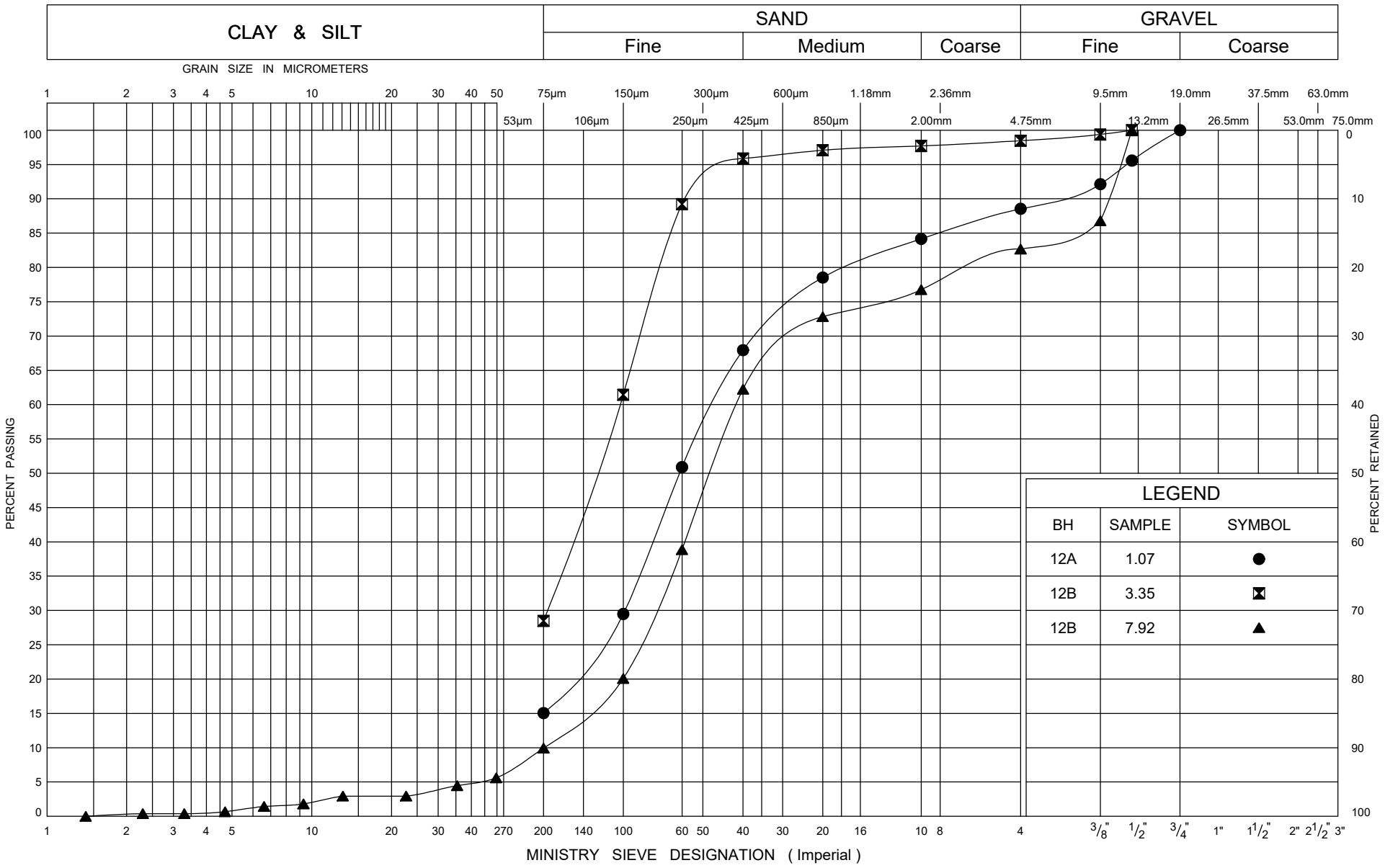
20 / 15 5 / 10 (%) STRAIN AT FAILURE

ONTMT4S2 MTO-23473.GPJ 2017TEMPLATE(MTO).GDT 7/24/20

THURBER

Appendix B

Laboratory Test Results



Ministry of Transportation
Ontario

GRAIN SIZE DISTRIBUTION

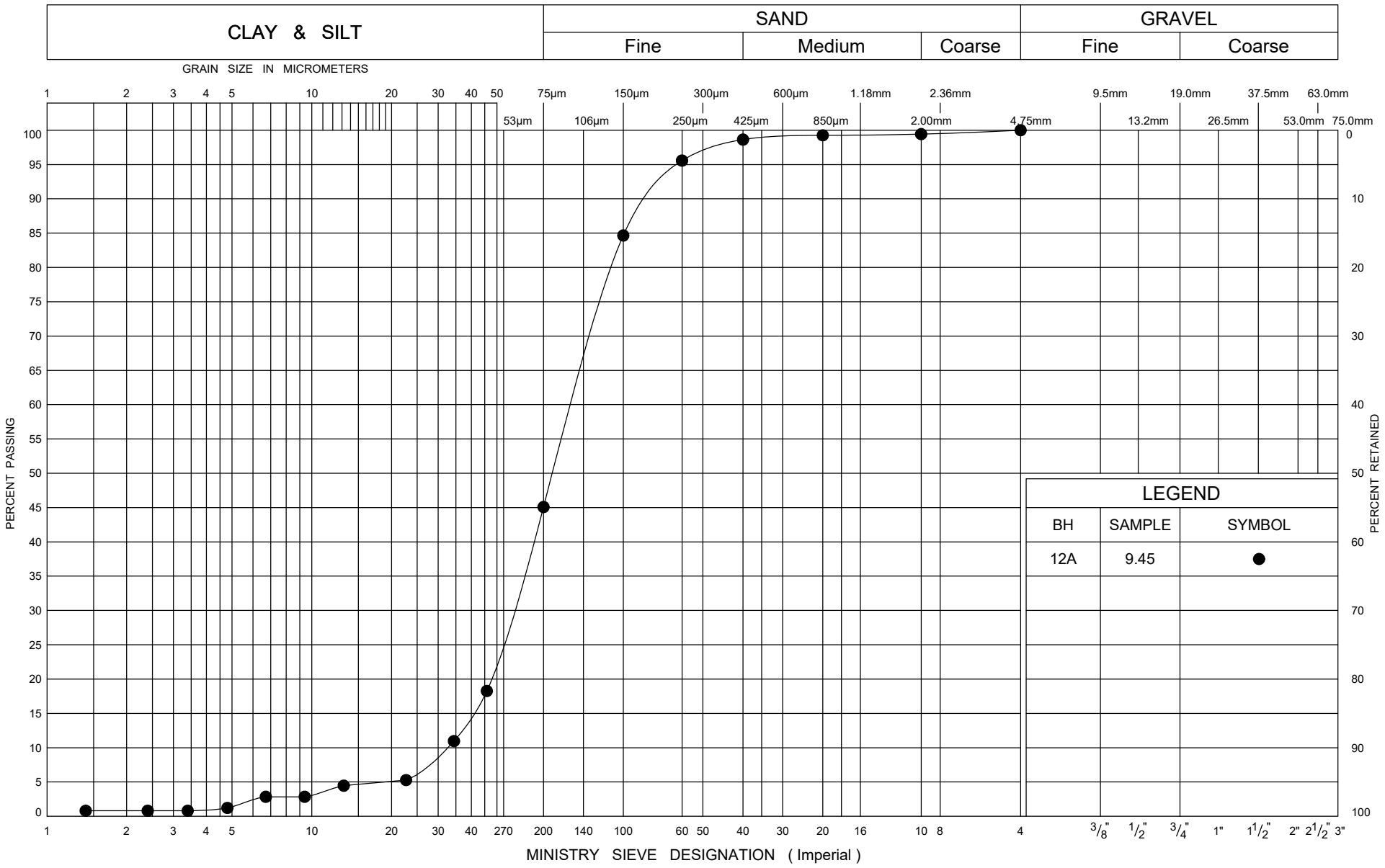
SAND FILL

FIG No B1

W P 2308-16-01

Concession 12 Underpass

ONTARIO MOT GRAIN SIZE 2 MTO-23473.GPJ ONTARIO MOT.GDT 3/5/20



ONTARIO MOT GRAIN SIZE 2 MTO-23473.GPJ ONTARIO MOT.GDT 3/5/20

Ministry of Transportation
Ontario

GRAIN SIZE DISTRIBUTION

SAND and SILT

FIG No B2

W P 2308-16-01

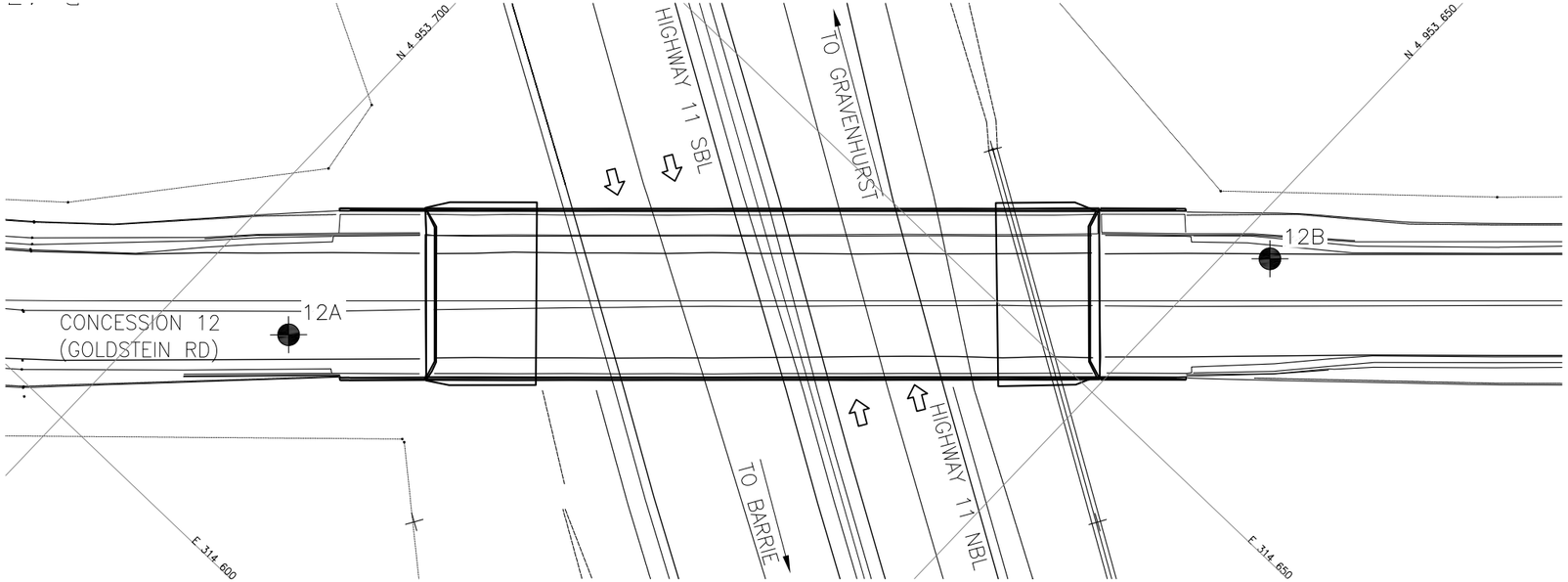
Concession 12 Underpass

THURBER

Appendix C

Borehole Locations and Soil Strata Drawing

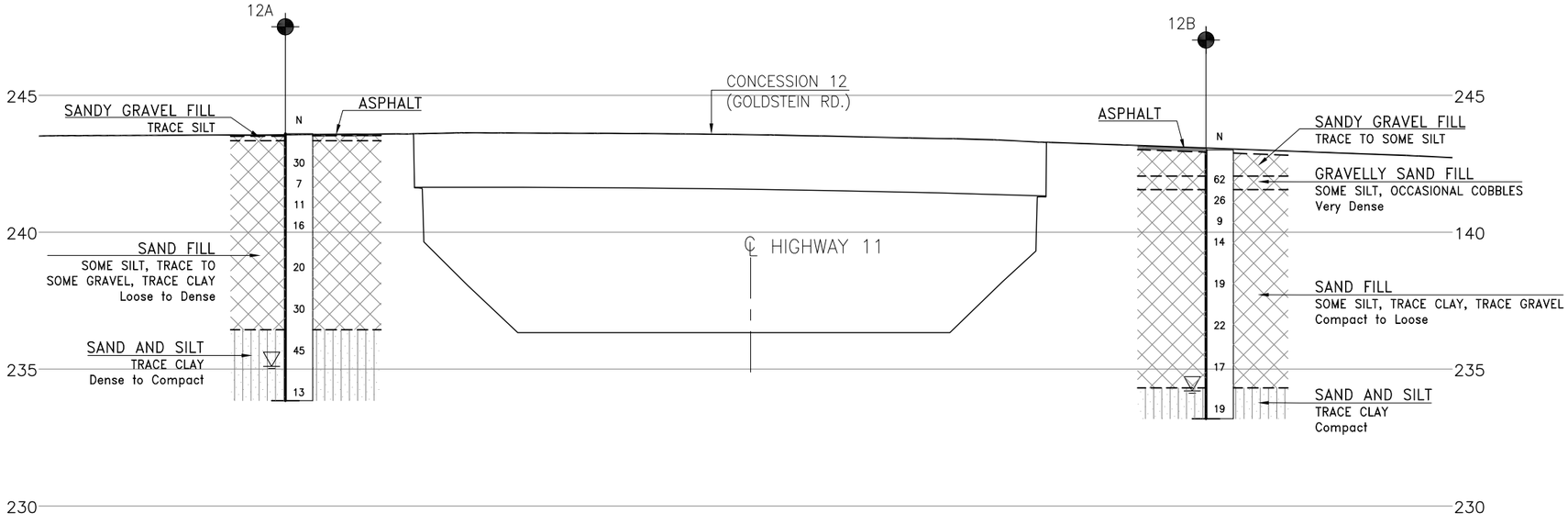
MINISTRY OF TRANSPORTATION, ONTARIO



PLAN

10 0 10 20m

SCALE 1:500



PROFILE ALONG CONCESSION 12 (GOLDSTEIN ROAD)

10 0 10 20m H 1:500

5 0 5 10m V 1:250

METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

LICENSED PROFESSIONAL ENGINEER
M. R. ANDERSON
90267360
Aug 20, 2021
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
Aug 20/2021
PROVINCE OF ONTARIO

CONT No
WP No 2308-16-01

SHEET

HIGHWAY 11
CONCESSION 12
UNDERPASS
BOREHOLE LOCATIONS AND SOIL STRATA

THURBER ENGINEERING LTD.

KEYPLAN

LEGEND

⊕	Borehole
⊕	Borehole and Cone
N	Blows /0.3m (Std Pen Test, 475J/blow)
CONE	Blows /0.3m (60° Cone, 475J/blow)
PH	Pressure, Hydraulic
▽	Water Level During Drilling
▼	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
12A	243.6	4 953 692.6	314 614.8
12B	243.0	4 953 647.5	314 665.1

-NOTES-

1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.
3) Coordinate system is MTM NAD 83 Zone 10.

GEOCRES No. 31D-780

REVISIONS		
DATE	BY	DESCRIPTION

DESIGN	JM	CHK	NB	CODE	LOAD	DATE	AUG 2021
DRAWN	BH	CHK	JM	SITE 30-486	STRUCT	DWG	1

FILENAME: H:\Drafting\23000\23473\TES-23473-PLPR-CR12.dwg
PLOTDATE: 8/20/2021 2:52 PM