



THURBER ENGINEERING LTD.

FOUNDATION INVESTIGATION REPORT HIGHWAY 7 & 8 INTERCHANGE – SIGN SUPPORT STRUCTURES

HIGHWAY 8, KITCHENER, ONTARIO

Agreement No. 3021-E-0029

Work Order No. 2

G.W.P. 3061-22-00

GEOCRES NO. 40P08-303

Client Name: MTO/Parsons

Date: October 17, 2024

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**FOUNDATION INVESTIGATION REPORT
HIGHWAY 7 & 8 INTERCHANGE – SIGN SUPPORT STRUCTURES
CITY OF KITCHENER, ONTARIO
G.W.P. 3061-22-00**

GEOCRES NO.: 40P08-303

PART A: FACTUAL INFORMATION

1. INTRODUCTION

Thurber Engineering (Thurber) has been retained by Parsons on behalf of the Ministry of Transportation, Ontario (MTO) to undertake a geotechnical investigation in support of the proposed relocation of three (3) sign support structures as part of the works at the Highway 7 & 8 interchange in the City of Kitchener, Ontario. A site location map is provided on the Borehole Location Plan in Appendix A.

This work is completed as per the MTO Work Order Number 2 of the Retainer Agreement 3021-E-0029 dated March 6, 2024.

The purpose of the investigation was to explore the subsurface conditions at the site and, based on the data obtained, to provide a borehole location plan, records of boreholes, a stratigraphic profile, laboratory test results and a written description of the subsurface conditions. A model of the subsurface conditions was developed from the data obtained in the course of the investigation.

It is a condition of this report that Thurber's performance of its professional services is subject to the attached Statement of Limitations and Conditions.

2. SITE DESCRIPTION AND GEOLOGY

The proposed site is located on Highway 8 Westbound Lane between Hwy 7 & 8 interchange and approximately 520 m east of Highway 8 Underpass at Franklin St. South in the City of Kitchener, Ontario. The urban area adjacent to the highway is densely developed with commercial and residential buildings and municipal roadways.

The site is located within the Physiographic Region of Southern Ontario known as the Waterloo Sandhills. The area is characterized by a flat topography, heavy textured soil and poor drainage

(Chapman and Putnam, 1984). The overburden deposits generally consist of sands and silts underlain by sandy silt to silt till.

3. INVESTIGATION PROCEDURES

The foundation investigation was carried out between April 12 and 16, 2024, and involved the completion of a total of five (5) boreholes to an approximate depth of 8.2 m below ground surface.

Utility clearances and Permits were obtained prior to mobilization to the site. The borehole locations were marked in the field by Thurber field staff using a Trimble R10 survey unit. The coordinate system MTM NAD 83, Zone 10 was used for the borehole locations.

Boreholes BH-1, BH-3, BH-4 and BH-5 were advanced on the highway in the median or shoulder using truck mounted drill rig whereas Borehole BH-2 was advanced in the private property North of the Highway 8 travelled lane using a track mounted drill rig. The drill rigs were supplied and operated by Elements GEO of Hamilton, Ontario. Lane closure and traffic control were provided during drilling. Hollow-stem augers were used to advance the boreholes and the soil samples were obtained using a 50 mm outer diameter split-spoon sampler driven by an automatic hammer in accordance with the Standard Penetration Test (SPT) per ASTM D1586.

The as-drilled borehole locations were surveyed using Trimble R10 GPS upon completion of drilling and are shown in the Borehole Location Plan included in Appendix A.

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

All boreholes were backfilled in general accordance with MOE Regulation 903 as amended by Regulation 372. Backfilling details for each borehole are provided on the Record of Borehole sheets in Appendix B.

The borehole locations, geographic coordinates, ground surface elevations and depths of termination are summarized in the table below.

Borehole	Northing	Easting	Ground Surface Elevation (m)	Depth of Borehole (m) / Elevation
BH-1	4811087.5	227524.2	322.2	8.2 / 314.0
BH-2	4810978.5	227797.2	325.1	8.2 / 316.9

Borehole	Northing	Easting	Ground Surface Elevation (m)	Depth of Borehole (m) / Elevation
BH-3	4810956.6	227789.3	323.1	8.2 / 314.9
BH-4	4810649.9	228489.5	329.9	8.2 / 321.7
BH-5	4810636.0	228483.5	329.4	8.2 / 321.2

Groundwater conditions in the open boreholes were observed throughout the drilling operation.

3.1 Laboratory Testing

The recovered soil samples were subjected to Visual Identification (VI) and natural moisture content determination. Selected samples were also subjected to grain size distribution analysis and Atterberg Limits testing where appropriate. The results of the laboratory testing are summarized on the Record of Borehole sheets in Appendix B and are shown on figures in Appendix C.

Analytical testing was carried out on samples of the fill and native soils to assess the potential for sulphate attack on buried concrete structures, as well as the potential for corrosion associated with buried steel elements of the structures. The results of the analytical testing are summarized in this report and presented in Appendix F.

4. SUBSURFACE CONDITIONS

Details of the encountered soil stratigraphy are presented on the Record of Borehole sheets included in Appendix B and interpreted stratigraphic profile is presented in Appendix A. A general description of the stratigraphy, based on the conditions encountered in the boreholes, is given in the following sections. However, the factual data presented on the Record of Borehole sheets takes precedence over this general description for interpretation of the site conditions. Classification and descriptions of coarse-grained and fine-grained soils are made in general accordance with ASTM D2487 and MTO's Soil Classification Manual, respectively.

The boundaries between soil strata on the record of boreholes have been inferred from non-continuous sampling, observation of the progress of drilling, and the results of Standard Penetration Testing. Therefore, the boundaries represent the transitions between soil deposits rather than exact planes of geological change. Variation on the stratigraphic boundaries between and beyond boreholes will exist and is to be expected.

In general, the subsurface conditions below the pavement structure and fill materials consist of a native silty sand to sand deposit overlying sand and silt till.

A detailed description of the subsurface conditions is presented in the following sections.

4.1 Sign Relocation # 1 (Cantilever Structure)

Borehole BH-1 was drilled on the outside shoulder of SW ramp (Highway 8 westbound to Highway 7/8 westbound) near the proposed sign relocation # 1. The encountered soil conditions are discussed as follows:

4.1.1 Asphalt

Asphalt approximately 225 mm thick was encountered at the ground surface.

4.1.2 Fill

Fill material approximately 1.2 m thick and consisting of sand and gravel was encountered underlying the asphalt. The base of the fill was at elevation of 320.8 m.

The SPT 'N' values ranged from 22 to 77 blows per 0.3 m of penetration suggesting that the fill material is compact to very dense. Natural moisture contents ranged from 3 to 8 percent.

4.1.3 Sand

A 2.7 m thick native sand deposit with trace silt was encountered underlying the fill material and extended to an approximate depth of 4.1 m (elevation 318.1 m).

SPT 'N' values encountered within sand deposit ranged between 12 to 29 blows per 0.3 m of penetration indicating these deposits to be compact. Natural moisture contents ranged from 9 to 10 percent.

The results of grain size analysis testing conducted on a sample of the sand deposit are provided on the Record of Borehole Sheets in Appendix B and included on Figure 1 in Appendix C. The results are summarized as follows:

Soil Particles	(%)
Gravel	0
Sand	94
Silt + Clay	6

4.1.4 Sand and Silt (TILL)

A native sand and silt till, containing trace clay and trace to some gravel, was encountered below the sand deposit and extended to the termination depth of the borehole.

SPT 'N' values ranged between 11 to 24 blows per 0.3 m penetration indicating these soil deposits to be compact. The measured moisture contents generally ranged from 10 to 19 percent.

The results of grain size analysis testing conducted on a sample of the till is provided on the Record of Borehole Sheets in Appendix B and included on Figures 2 in Appendix C. The result is summarized as follows:

Soil Particles	(%)
Gravel	10
Sand	45
Silt	43
Clay	2

It should be noted that the glacial tills inherently contain cobbles and/or boulders.

4.2 Sign Relocation # 2 (Dual Sign Support)

Boreholes BH-2 and BH-3 were drilled at the site of proposed sign support structure #2. BH-2 was advanced near the north foundation element within the MTO property. The BH-2 location was accessed from the backyard of a private property due to the presence of a noise barrier retaining wall along the highway shoulder. BH-3 was drilled on the median of Hwy 8 westbound lane near the south foundation element location.

4.2.1 Topsoil

Topsoil approximately 75 mm thick was encountered at the ground surface in BH-2.

4.2.2 Asphalt

Approximately 330 mm thick asphalt was encountered at the ground surface in BH-3.

4.2.3 Fill

Fill material, approximately 2.9 m thick and consisting of sand and gravel and trace organics was encountered underlying the topsoil in BH-2. Occasional cobbles were also encountered at about

2.8 m. The base of the fill was at elevation of 322.1 m.

In BH-3, approximate 1.2 m thick sand and gravel fill was encountered below the pavement. The base of the fill was at elevation 321.6 m.

The SPT 'N' values ranged from 15 to 44 blows per 0.3 m of penetration suggesting that the fill material is compact to dense except at about 2.8 m depth in BH-2 where an SPT 'N' value of 55 blows for 0.225 m penetration was recorded possibly due to presence of occasional cobbles. Natural moisture content within the fill ranged from 5 to 22 percent.

4.2.4 Sand

A native sand deposit containing trace to some fines was encountered underlying the fill material and extended to approximate depths of 6.7 m (elevation 318.4 m) and 4.6 m (elevation 318.5 m) in BH-2 and BH-3, respectively. The sand deposit was 3.7 m and 3.1 m thick in BH-2 and BH-3, respectively.

SPT 'N' values encountered within the sand deposit ranged between 8 to 53 blows per 0.3 m of penetration indicating loose to very dense relative density. Natural moisture content generally ranged from 5 to 18 percent.

The results of grain size analysis testing conducted on samples of the sand deposits are provided on the Record of Borehole Sheets in Appendix B and included on Figure 1 in Appendix C. The results are summarized as follows:

Soil Particles	(%)
Gravel	0
Sand	88 to 95
Silt + Clay	5 to 12

4.2.5 Sand and Silt (TILL)

A sand and silt till deposit, containing trace gravel to gravelly and trace to some clay, was encountered underlying the sand deposit. Silty clay pockets were encountered within the sand and silt till deposit near the base of borehole in BH-3. Both BH-2 and BH-3 were terminated within the sand and silt till deposit.

SPT 'N' values in the till ranged between 22 to 57 blows per 0.3 m penetration indicating compact to very dense relative density. Natural moisture content generally ranged from 10 to 17 percent.

The results of grain size analysis testing conducted on samples of the sand and silt till deposit is provided on the Record of Borehole Sheets in Appendix B and included on Figure 2 and 3 in Appendix C. The result is summarized as follows:

Soil Particles	Sand and Silt Till (%)	Silty Clay Pockets (%)
Gravel	28	1
Sand	38	7
Silt	23	59
Clay	11	33

The results of Atterberg Limits testing conducted on the selected samples from the till are included on Figure 4 in Appendix C and summarized below.

Atterberg Limits	Sand and Silt Till (%)	Silty Clay Pockets (%)
Liquid Limit	20	34
Plastic Limit	12	17
Plasticity Index	8	17

It should be noted that the glacial tills inherently contain cobbles and/or boulders.

4.3 Sign Relocation # 3 (Dual Sign Support)

BH-4 and BH-5 were advanced at the proposed location of sign support structure # 3. BH-4 was advanced through the north shoulder of Highway 8 westbound lane and BH-5 was advanced through the highway median.

4.3.1 Asphalt

Approximately 300 mm thick asphalt was encountered at the ground surface in BH-4 whereas in BH-5, asphalt approximately 200 mm thick was encountered at the ground surface.

4.3.2 Fill

In BH-4, approximately 1.8 m thick sand and gravel fill material was encountered underlying the asphalt. The base of the fill was at elevation 327.8 m. In BH-5, sand and gravel fill was encountered underlying the asphalt in the upper 0.6 m followed by a 0.7 m thick layer of silty sand fill. The total thickness of the fill was 1.3 m. The base of the fill was at elevation 327.9 m.

The SPT 'N' values ranged from 33 to 61 blows per 0.3 m of penetration suggesting that the fill material is dense to very dense. An SPT 'N' value of 50 blows for 0.075 m penetration was encountered in BH-4 near the ground surface. Natural moisture contents within the fill ranged from 4 to 9 percent.

4.3.3 Sand to Silty Sand

Underlying the fill material in both boreholes, a native deposit consisting of sand, some silt to silty sand was encountered at an approximate depth of 2.1 m (elevation 327.8 m) in BH-4 and 1.5 m (elevation 327.9 m) in BH-5. Both boreholes were terminated within this deposit.

SPT 'N' values encountered within the sand to silty sand deposit ranged between 20 and 46 blows per 0.3 m of penetration indicating a compact to dense relative density. Natural moisture contents generally ranged from 4 to 9 percent.

The results of grain size analysis testing conducted on samples of the sand to silty sand deposit are provided on the Record of Borehole Sheets in Appendix B and included on Figure 1 in Appendix C. The results are summarized as follows:

Soil Particles	Sand (%)	Silty Sand (%)
Gravel	0	0
Sand	84 to 88	61 to 73
Silt	-	27 to 38
Clay	-	0 to 1
Silt + Clay	12 to 16	-

4.4 Groundwater Conditions

Details of the water level observed in the boreholes upon completion of drilling are presented on the Record of Borehole sheets and summarized below.

Borehole	Groundwater Level (m)		Borehole Conditions at Borehole Completion
	Depth	Elevation	
BH-01	-	-	Borehole open, wet soil conditions below 4.1 m
BH-02	6.6	318.5	Borehole caved-in to 6.7 m, wet soil conditions below 3.0 m
BH-03	-	-	Borehole caved-in to 7.0 m, wet soil conditions below 4.6 m
BH-04	-	-	Borehole open and dry
BH-05	-	-	Borehole open and dry

Seasonal fluctuations of the groundwater level are to be expected. In particular, the groundwater level may be at a higher elevation after the spring snowmelt or after periods of heavy rainfall. Perched water may be present in the fill material, old trench/infrastructure backfill and granular pavement base.

5. ANALYTICAL LABORATORY TESTING

A total of five selected samples (i.e. one sample per BH) were submitted for analytical testing for corrosivity analysis and sulphide content. The analytical test results are presented in Appendix F and are summarized below.

Borehole	BH-01	BH-02	BH-03	BH-04	BH-05
Sample	SS3	SS4 (Fill)	SS3	SS2 (Fill)	SS3
Depth (m)	1.5 – 2.1	2.3 – 2.9	1.5 – 2.1	0.8 – 1.4	1.5 – 2.1
Sulphide (Na ₂ CO ₃) %	<0.01	<0.01	<0.01	<0.01	<0.01
Chloride (µg/g)	460	27	1700	350	1300
Sulphate (µg/g)	24	37	38	31	28
pH	8.58	8.53	8.90	9.50	8.87
Conductivity (µS/cm)	1020	236	4560	873	2710
Resistivity (Ohm-cm)	980	4240	219	1150	369
Redox Potential (mV)	191	204	274	260	254

6. MISCELLANEOUS

Elements Geo of Hamilton, Ontario supplied a truck mounted drill rig and a track mounted drill rig and conducted the drilling, sampling and in-situ testing operations.

The coordinates and elevations for the boreholes were obtained by Thurber using a Trimble R10.

The drilling and sampling operations in the field for the current investigation were supervised on a full-time basis by Thurber field technicians. Geotechnical laboratory testing was carried out at Thurber's geotechnical laboratory. Analytical testing was carried out by SGS Canada Inc.

Overall supervision of the field program, interpretation of the data, and preparation of the report was conducted by Mr. Puneet Verma, P.Eng. The report was reviewed by Mr. Keli Shi, P.Eng., and Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations projects.

Thurber Engineering Ltd.



Puneet Verma, M. Eng., P. Eng.
Geotechnical Engineer



Keli Shi, M.Eng., P.Eng.
Senior Geotechnical Engineer



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

STATEMENT OF LIMITATIONS AND CONDITIONS

1. STANDARD OF CARE

This Report has been prepared in accordance with generally accepted engineering or environmental consulting practices in the applicable jurisdiction. No other warranty, expressed or implied, is intended or made.

2. COMPLETE REPORT

All documents, records, data and files, whether electronic or otherwise, generated as part of this assignment are a part of the Report, which is of a summary nature and is not intended to stand alone without reference to the instructions given to Thurber by the Client, communications between Thurber and the Client, and any other reports, proposals or documents prepared by Thurber for the Client relative to the specific site described herein, all of which together constitute the Report.

IN ORDER TO PROPERLY UNDERSTAND THE SUGGESTIONS, RECOMMENDATIONS AND OPINIONS EXPRESSED HEREIN, REFERENCE MUST BE MADE TO THE WHOLE OF THE REPORT. THURBER IS NOT RESPONSIBLE FOR USE BY ANY PARTY OF PORTIONS OF THE REPORT WITHOUT REFERENCE TO THE WHOLE REPORT.

3. BASIS OF REPORT

The Report has been prepared for the specific site, development, design objectives and purposes that were described to Thurber by the Client. The applicability and reliability of any of the findings, recommendations, suggestions, or opinions expressed in the Report, subject to the limitations provided herein, are only valid to the extent that the Report expressly addresses proposed development, design objectives and purposes, and then only to the extent that there has been no material alteration to or variation from any of the said descriptions provided to Thurber, unless Thurber is specifically requested by the Client to review and revise the Report in light of such alteration or variation.

4. USE OF THE REPORT

The information and opinions expressed in the Report, or any document forming part of the Report, are for the sole benefit of the Client. NO OTHER PARTY MAY USE OR RELY UPON THE REPORT OR ANY PORTION THEREOF WITHOUT THURBER'S WRITTEN CONSENT AND SUCH USE SHALL BE ON SUCH TERMS AND CONDITIONS AS THURBER MAY EXPRESSLY APPROVE. Ownership in and copyright for the contents of the Report belong to Thurber. Any use which a third party makes of the Report, is the sole responsibility of such third party. Thurber accepts no responsibility whatsoever for damages suffered by any third party resulting from use of the Report without Thurber's express written permission.

5. INTERPRETATION OF THE REPORT

- a) Nature and Exactness of Soil and Contaminant Description: Classification and identification of soils, rocks, geological units, contaminant materials and quantities have been based on investigations performed in accordance with the standards set out in Paragraph 1. Classification and identification of these factors are judgmental in nature. Comprehensive sampling and testing programs implemented with the appropriate equipment by experienced personnel may fail to locate some conditions. All investigations utilizing the standards of Paragraph 1 will involve an inherent risk that some conditions will not be detected and all documents or records summarizing such investigations will be based on assumptions of what exists between the actual points sampled. Actual conditions may vary significantly between the points investigated and the Client and all other persons making use of such documents or records with our express written consent should be aware of this risk and the Report is delivered subject to the express condition that such risk is accepted by the Client and such other persons. Some conditions are subject to change over time and those making use of the Report should be aware of this possibility and understand that the Report only presents the conditions at the sampled points at the time of sampling. If special concerns exist, or the Client has special considerations or requirements, the Client should disclose them so that additional or special investigations may be undertaken which would not otherwise be within the scope of investigations made for the purposes of the Report.
- b) Reliance on Provided Information: The evaluation and conclusions contained in the Report have been prepared on the basis of conditions in evidence at the time of site inspections and on the basis of information provided to Thurber. Thurber has relied in good faith upon representations, information and instructions provided by the Client and others concerning the site. Accordingly, Thurber does not accept responsibility for any deficiency, misstatement or inaccuracy contained in the Report as a result of misstatements, omissions, misrepresentations, or fraudulent acts of the Client or other persons providing information relied on by Thurber. Thurber is entitled to rely on such representations, information and instructions and is not required to carry out investigations to determine the truth or accuracy of such representations, information and instructions.
- c) Design Services: The Report may form part of design and construction documents for information purposes even though it may have been issued prior to final design being completed. Thurber should be retained to review final design, project plans and related documents prior to construction to confirm that they are consistent with the intent of the Report. Any differences that may exist between the Report's recommendations and the final design detailed in the contract documents should be reported to Thurber immediately so that Thurber can address potential conflicts.
- d) Construction Services: During construction Thurber should be retained to provide field reviews. Field reviews consist of performing sufficient and timely observations of encountered conditions in order to confirm and document that the site conditions do not materially differ from those interpreted conditions considered in the preparation of the report. Adequate field reviews are necessary for Thurber to provide letters of assurance, in accordance with the requirements of many regulatory authorities.

6. RELEASE OF POLLUTANTS OR HAZARDOUS SUBSTANCES

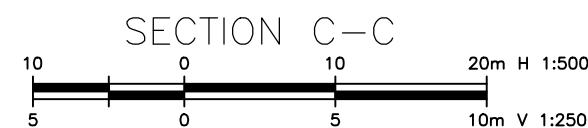
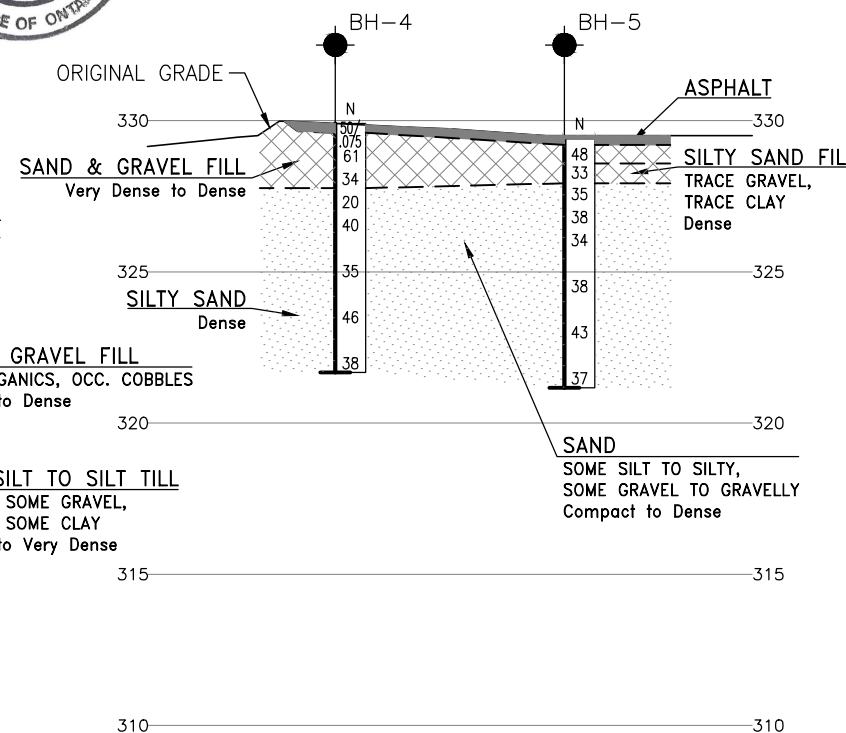
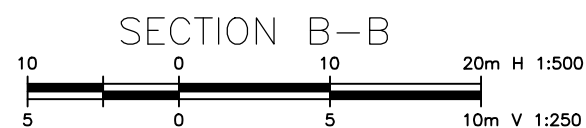
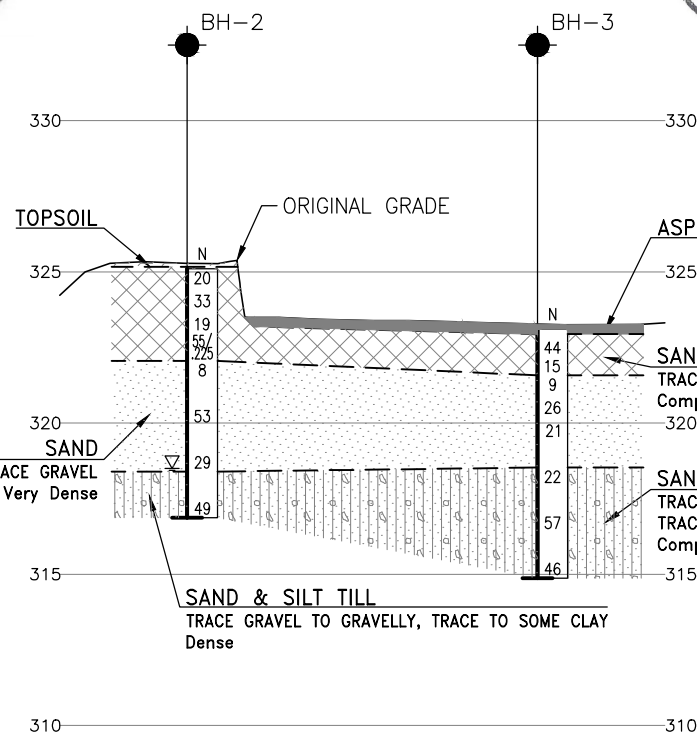
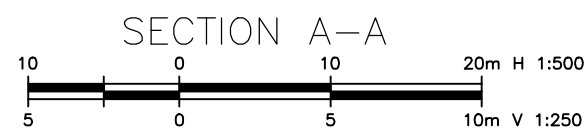
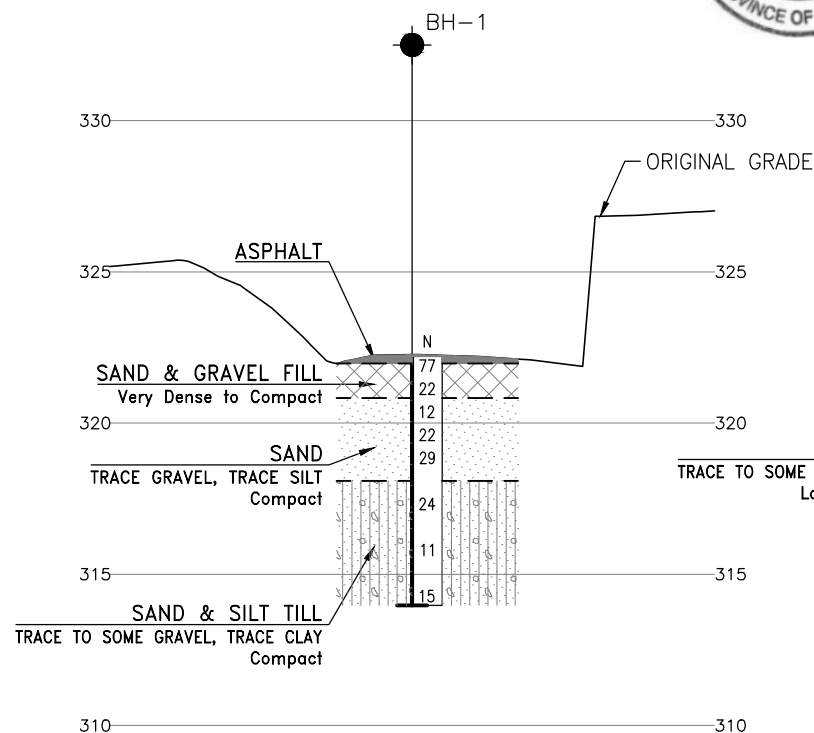
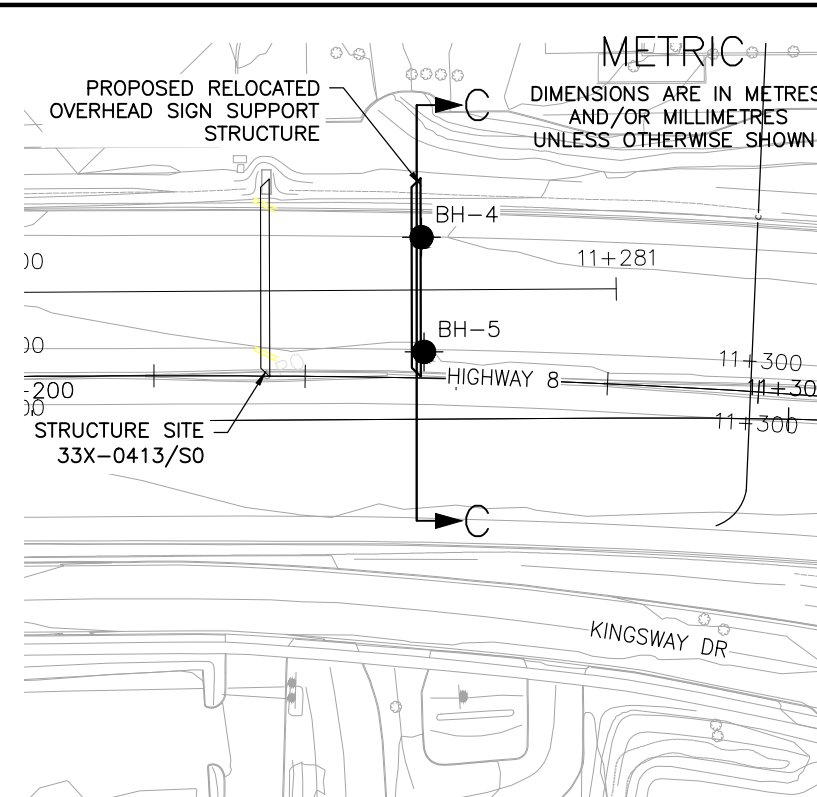
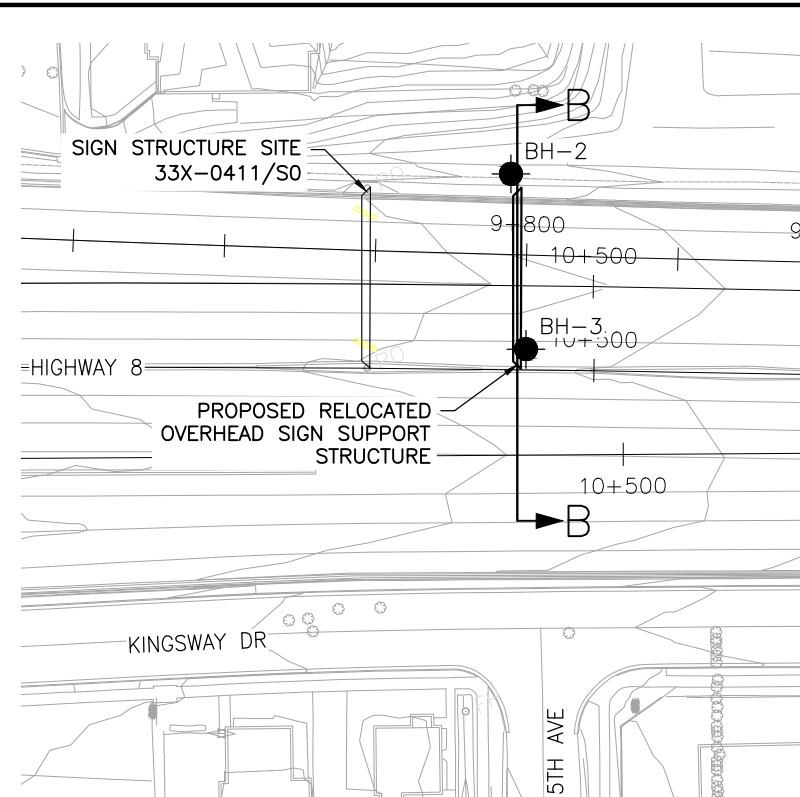
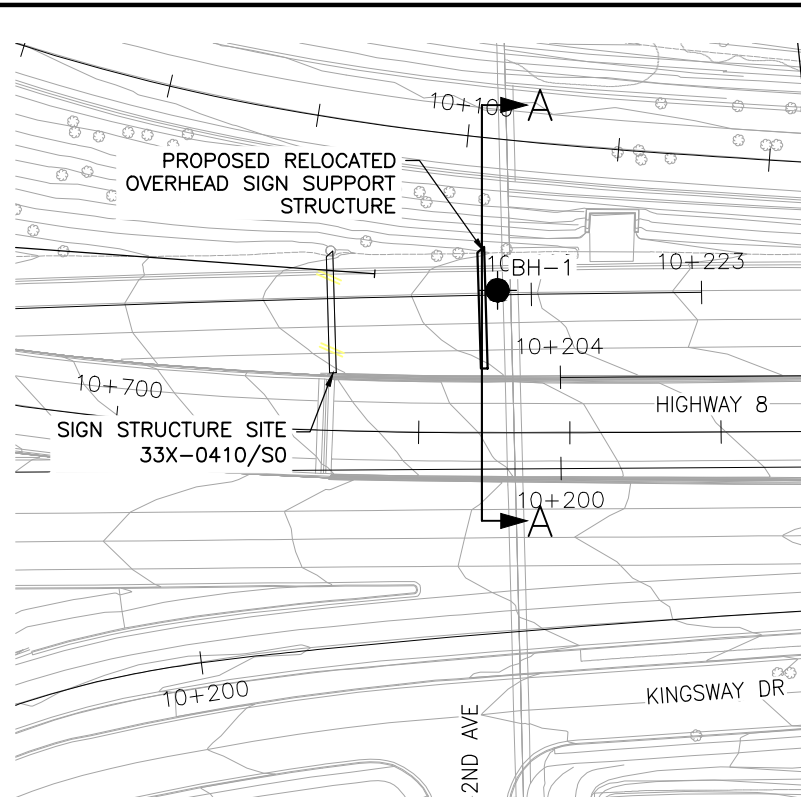
Geotechnical engineering and environmental consulting projects often have the potential to encounter pollutants or hazardous substances and the potential to cause the escape, release or dispersal of those substances. Thurber shall have no liability to the Client under any circumstances, for the escape, release or dispersal of pollutants or hazardous substances, unless such pollutants or hazardous substances have been specifically and accurately identified to Thurber by the Client prior to the commencement of Thurber's professional services.

7. INDEPENDENT JUDGEMENTS OF CLIENT

The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or decisions of the Client, or others who may come into possession of the Report, or any part thereof, which may be based on information contained in the Report. This restriction of liability includes but is not limited to decisions made to develop, purchase or sell land.

APPENDIX A

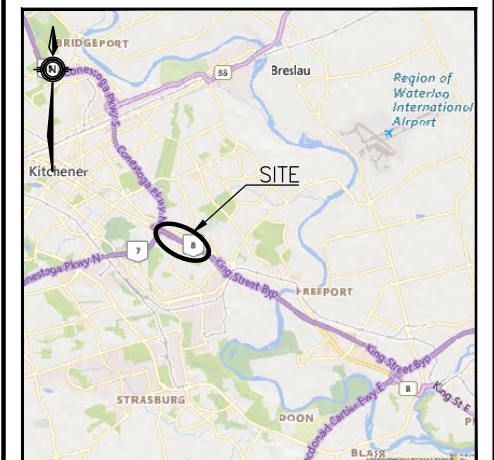
Borehole Locations and Soil Strata Drawings



CONT No
WP No 3061-22-00






HIGHWAY 8
SIGN RELOCATION
3 SITES
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET



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 Upon Completion of Drilling |
|  | Water Level in Monitoring Well/Piezometer |
|  | Monitoring Well/Piezometer Screen |
| 90% | Rock Quality Designation (RQD) |
| A/R | Auger Refusal |

[illegible]

-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. 40P08-303

0	REVISIONS											
0			DATE	BY	DESCRIPTION							
	DESIGN	PV	CHK	KS	CODE	LOAD				DATE OCTOBER 2024		
	DRAWN	MFA	CHK	PC	SITE	STRUCT				DWG 1		

APPENDIX B

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
 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			

RECORD OF BOREHOLE No BH-1

1 OF 1

METRIC

W.P. 3061-22-00 LOCATION Sign Relocation #1 (Cantilever Structure): N 4 811 087.5 E 227 524.2 ORIGINATED BY HC
DIST Western HWY 7/8 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2024.04.15 - 2024.04.15 LATITUDE 43.435710 LONGITUDE -80.454558 CHECKED BY PV

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 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE				WATER CONTENT (%) w _p w w _L					
322.2	GROUND SURFACE							20	40	60	80	100					
0.0	ASPHALT: (225mm)																
0.2	SAND and GRAVEL Very Dense to Compact Brown Dry (FILL)		1	SS	77		322							○			
			2	SS	22		321							○			
320.8																	
1.4	SAND, trace gravel, trace silt Compact Light Brown Moist		3	SS	12		320							○			
			4	SS	22		319							○			
			5	SS	29		318							○			
318.1																	
4.1	SAND and SILT, trace to some gravel, trace clay Compact Greyish Brown Wet (TILL)		6	SS	24		317							○			
							316							○			
			7	SS	11		315							○			
			8	SS	15		314							○			
314.0																	
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE OPEN WITH WET SOIL CONDITION BELOW 4.1m. BOREHOLE BACKFILLED WITH SOIL CUTTINGS TO 2.3m AND BENTONITE TO 0.8m, CONCRETE TO 0.1m, AND COLD PATCH ASPHALT TO THE SURFACE.																

+³, ×³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No BH-2

1 OF 1

METRIC

W.P. 3061-22-00 LOCATION Sign Relocation #2 (Dual Sign Supports): N 4 810 978.5 E 227 797.2 ORIGINATED BY HC
DIST Western HWY 7/8 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2024.04.12 - 2024.04.12 LATITUDE 43.434758 LONGITUDE -80.451171 CHECKED BY PV

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											
325.1	GROUND SURFACE							20	40	60	80	100							
0.0 0.1	TOPSOIL: (75mm) SAND and GRAVEL , trace organics Compact to Dense Brown Moist (FILL)		1	SS	20		325												
			2	SS	33		324												
			3	SS	19		323												
	Occasional cobbles Wet		4	SS	55/ 0.225		322												
322.1							321												
3.0	SAND , some silt, trace gravel Loose Brown Wet		5	SS	8		320												
							319												
	Very Dense		6	SS	53		318												
							317												
	Flowing sands encountered		7	SS	29		316												
318.4							315												
6.7	SAND and SILT , trace gravel to gravelly, trace to some clay Dense Brown Wet (TILL)		8	SS	49		314												
316.9							313												
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE CAVED TO A DEPTH OF 6.7m WITH WET SOIL CONDITIONS ENCOUNTERED AT 3.0m. WATER LEVEL WAS ENCOUNTERED AT 6.6m UPON COMPLETION. BOREHOLE BACKFILLED WITH MIXTURE OF BENTONITE AND SOIL CUTTINGS TO 0.4m AND WITH SOIL CUTTINGS TO THE SURFACE.						312												

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

RECORD OF BOREHOLE No BH-3

1 OF 1

METRIC

W.P. 3061-22-00 LOCATION Sign Relocation #2 (Dual Sign Supports): N 4 810 956.6 E 227 789.3 ORIGINATED BY HC
DIST Western HWY 7/8 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2024.04.15 - 2024.04.15 LATITUDE 43.434560 LONGITUDE -80.451265 CHECKED BY PV

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 ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE				WATER CONTENT (%) w _P w w _L					
323.1	GROUND SURFACE							20	40	60	80	100					
0.0	ASPHALT: (330mm)						323										
322.8																	
0.3	SAND and GRAVEL Compact to Dense Light Brown Moist (FILL)		1	SS	44		322										
			2	SS	15												
321.6																	
1.5	SAND, trace silt Loose to Compact Brown Moist		3	SS	9		321										
			4	SS	26		320										
			5	SS	21												
							319										
318.5																	
4.6	Sandy SILT to SILT, trace to some gravel, trace to some clay Compact to Very Dense Brown Wet (TILL)		6	SS	22		318										
							317										
			7	SS	57												
							316										
	Silty clay pocket		8	SS	46		315										
314.9																	
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE CAVED TO A DEPTH OF 7.0m WITH WET SOIL CONDITIONS ENCOUNTERED AT 4.6m. BOREHOLE BACKFILLED WITH SOIL CUTTINGS TO 2.3m AND BENTONITE TO 0.8m, CONCRETE TO 0.1m AND COLD PATCH ASPHALT TO THE SURFACE.																

+³, ×³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No BH-4

1 OF 1

METRIC

W.P. 3061-22-00 LOCATION Sign Relocation #3 (Dual Sign Supports): N 4 810 649.9 E 228 489.5 ORIGINATED BY HC
DIST Western HWY 7/8 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2024.04.16 - 2024.04.16 LATITUDE 43.431871 LONGITUDE -80.442574 CHECKED BY PV

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						
329.9	GROUND SURFACE													
0.0	ASPHALT: (300mm)													
329.6														
0.3	SAND and GRAVEL Very Dense to Dense Brown Dry (FILL)		1	SS	50/0.075									
			2	SS	61									
			3	SS	34									
327.8														
2.1	SAND , some silt to silty Compact to Dense Brown Moist		4	SS	20									
	Gravelly		5	SS	40									
325.8														
4.1	Silty SAND Dense Brown Moist		6	SS	35									
			7	SS	46									
			8	SS	38									
321.7														
8.2	END OF BOREHOLE AT 8.2m. BOREHOLE OPEN AND DRY UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH SOIL CUTTINGS TO 2.3m AND BENTONITE TO 0.8m, CONCRETE TO 0.1m AND COLD PATCH ASPHALT TO THE SURFACE.													

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

RECORD OF BOREHOLE No BH-5

1 OF 1

METRIC

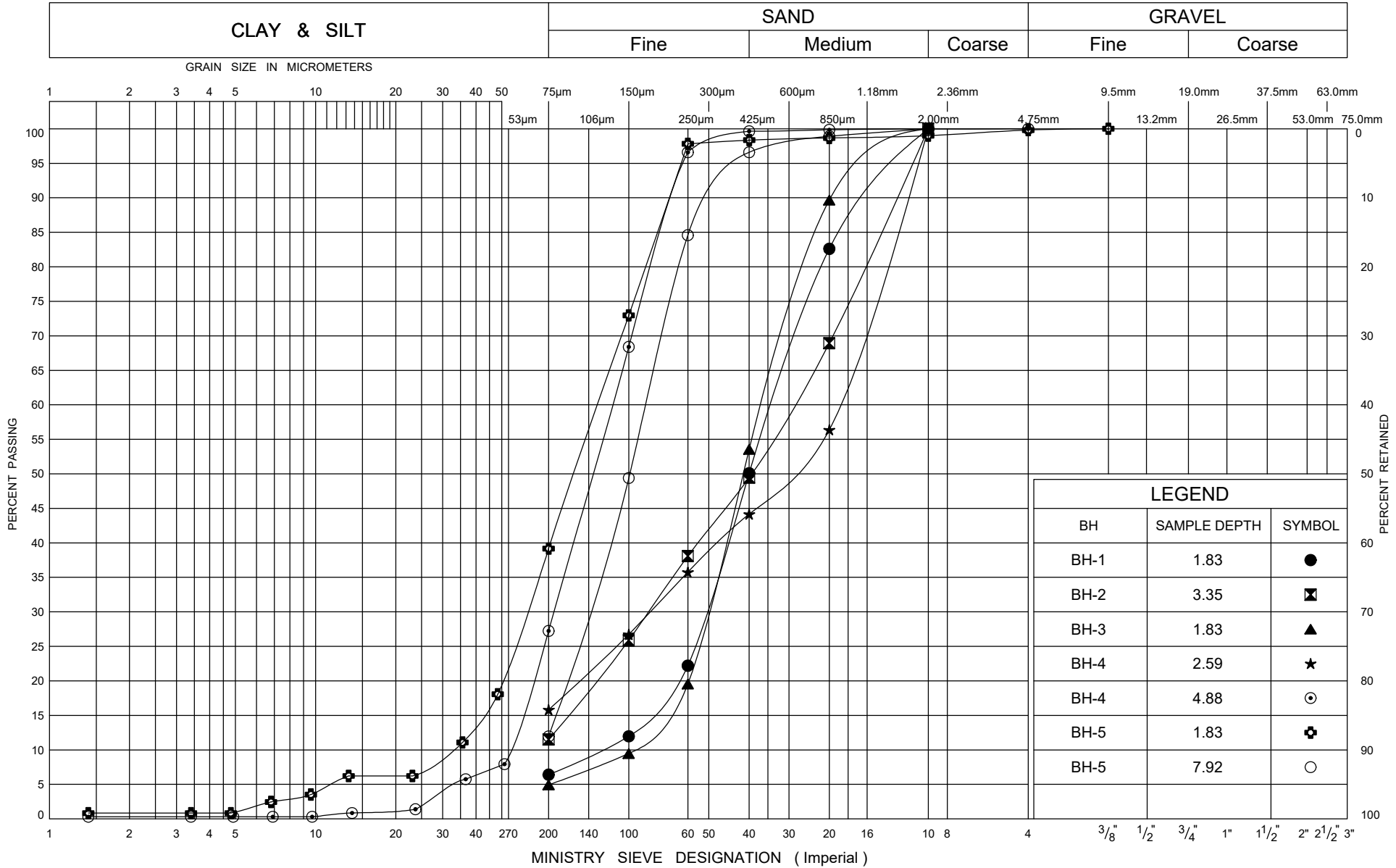
W.P. 3061-22-00 LOCATION Sign Relocation #3 (Dual Sign Supports): N 4 810 636.0 E 228 483.5 ORIGINATED BY HC
DIST Western HWY 7/8 BOREHOLE TYPE Hollow Stem Augers COMPILED BY AN
DATUM Geodetic DATE 2024.04.16 - 2024.04.16 LATITUDE 43.431745 LONGITUDE -80.442647 CHECKED BY PV

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 (%)					
329.4	GROUND SURFACE							20	40	60	80	100						
0.0	ASPHALT: (200mm)																	
0.2	SAND and GRAVEL Dense Brown Moist (FILL)		1	SS	48		329							o				
328.6																		
0.8	Silty SAND, trace gravel, trace clay Dense Brown Moist (FILL)		2	SS	33		328							o				
327.9																		
1.5	SAND, some silt to silty Dense Brown/Grey Moist		3	SS	35									o				0 61 38 1
	Some gravel		4	SS	38		327							o				
			6	SS	38		325							o				
			7	SS	43		323							o				
						</												

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

APPENDIX C

Geotechnical Laboratory Test Results



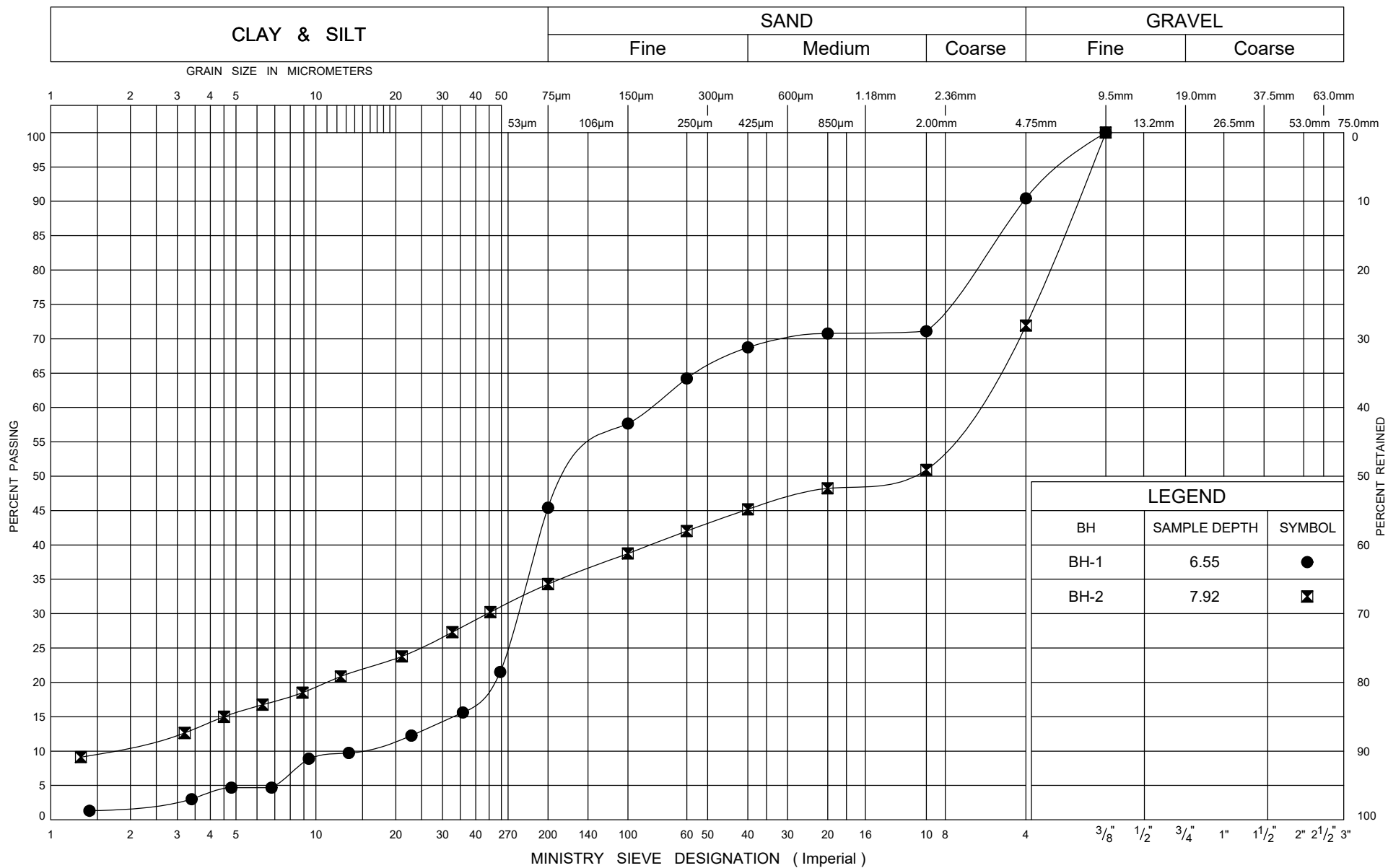
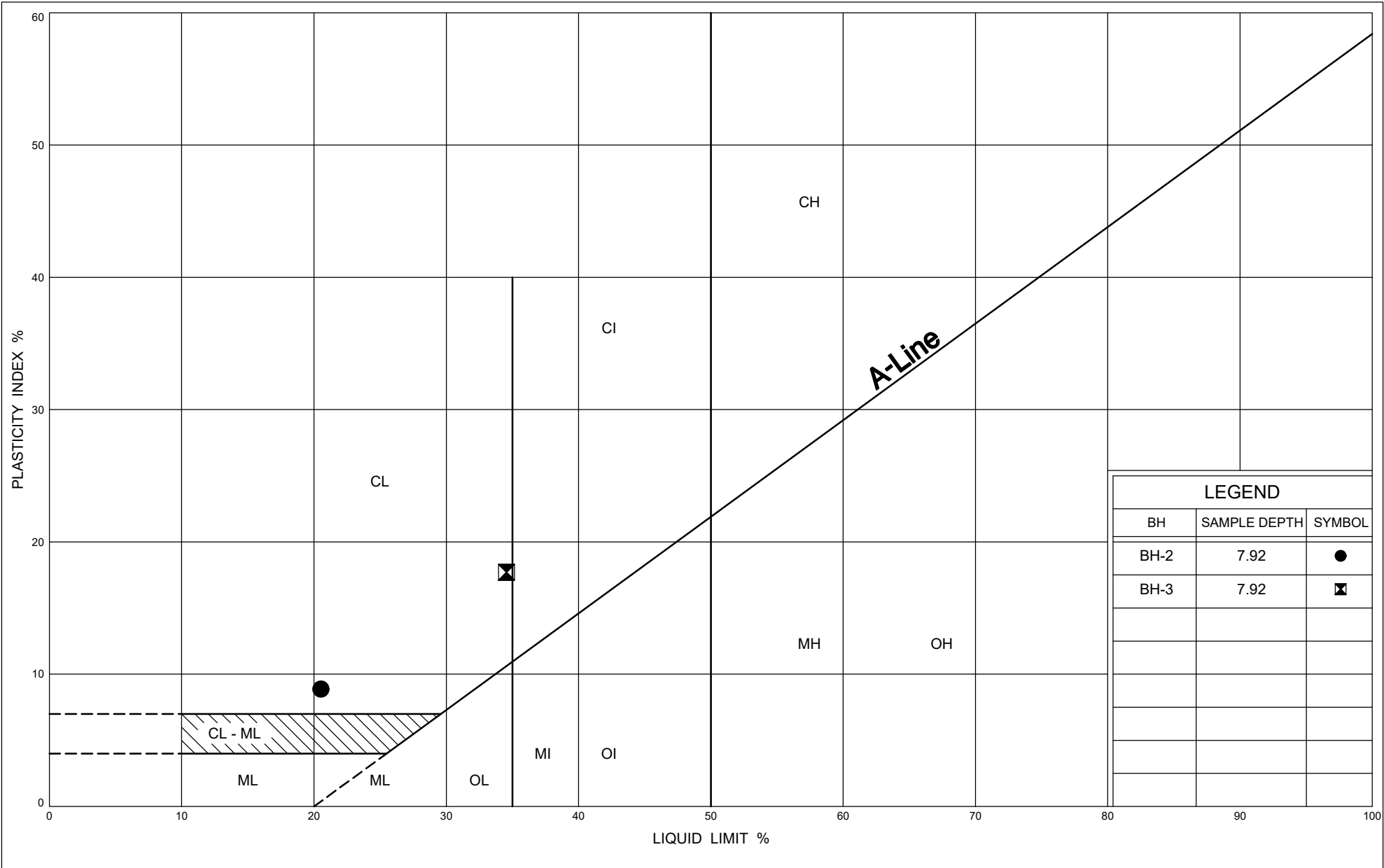




FIG No 3

W.P. 3061-22-00

ONTARIO MOT PLASTICITY CHART 2 MTO-49053.GPJ ONTARIO MOT.GDT 5/10/24



APPENDIX D

Analytical Test Results



FINAL REPORT

CA40137-APR24 R1

49053

Prepared for

Thurber Engineering Ltd.



FINAL REPORT

CA40137-APR24 R1

First Page

CLIENT DETAILS

Client Thurber Engineering Ltd.

Address 250 Thompson Drive
Cambridge, ON
N1T 2H9, Canada

Contact Puneet Verma

Telephone 905-829-8666

Facsimile

Email pverma@thurber.ca

Project 49053

Order Number

Samples Soil (5)

LABORATORY DETAILS

Project Specialist Jill Campbell, B.Sc.,GISAS

Laboratory SGS Canada Inc.

Address 185 Concession St., Lakefield ON, K0L 2H0

Telephone 2165

Facsimile 705-652-6365

Email jill.campbell@sgs.com

SGS Reference CA40137-APR24

Received 04/17/2024

Approved 04/26/2024

Report Number CA40137-APR24 R1

Date Reported 04/26/2024

COMMENTS

Temperature of Sample upon Receipt: 6 degrees C

Cooling Agent Present: Yes

Custody Seal Present: Yes

Chain of Custody Number: 036941

Corrosivity Index is based on the American Water Works Corrosivity Scale according to AWWA C-105. An index greater than 10 indicates the soil matrix may be corrosive to cast iron alloys.

SIGNATORIES

Jill Campbell, B.Sc.,GISAS



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FINAL REPORT

CA40137-APR24 R1

Client: Thurber Engineering Ltd.
Project: 49053
Project Manager: Puneet Verma
Samplers: Hayden Clarke

MATRIX: SOIL

Sample Number	5	6	7	8	9
Sample Name	BH1 SS-3	BH2 SS-4	BH3 SS3	BH4 SS-2	BH5 SS-3
Sample Matrix	Soil	Soil	Soil	Soil	Soil
Sample Date	15/04/2024	12/04/2024	15/04/2024	15/04/2024	16/04/2024

Parameter	Units	RL		Result	Result	Result	Result	Result
Corrosivity Index								
Corrosivity Index	none	1		14	4	14	13	14
Soil Redox Potential	mV	no		191	204	274	260	254
Sulphide (Na2CO3)	%	0.01		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
pH	pH Units	0.05		8.58	8.53	8.90	9.50	8.87
Resistivity (calculated)	ohms.cm	-9999		980	4240	219	1150	369

General Chemistry

Conductivity	uS/cm	2		1020	236	4560	873	2710
--------------	-------	---	--	------	-----	------	-----	------

Metals and Inorganics

Moisture Content	%	0.1		7.1	9.0	6.9	3.2	8.7
Sulphate	µg/g	0.4		24	37	38	31	28

Other (ORP)

Chloride	µg/g	0.4		460	27	1700	350	1300
----------	------	-----	--	-----	----	------	-----	------



FINAL REPORT

CA40137-APR24 R1

QC SUMMARY

Anions by IC
Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-IENVIIC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chloride	DIO0447-APR24	µg/g	0.4	<0.4	2	35	99	80	120	110	75	125
Sulphate	DIO0447-APR24	µg/g	0.4	<0.4	3	35	94	80	120	95	75	125

Carbon/Sulphur
Method: ASTM E1915-07A | Internal ref.: ME-CA-IENVIARD-LAK-AN-020

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Sulphide (Na2CO3)	ECS0068-APR24	%	0.01	< 0.01								

Conductivity
Method: SM 2510 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Conductivity	EWL0529-APR24	uS/cm	2	< 2	0	20	100	90	110	NA		



QC SUMMARY

pH
Method: SM 4500 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0529-APR24	pH Units	0.05	NA	0		101			NA		

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

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

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS Insufficient sample for analysis.

RL Reporting Limit.

↑ Reporting limit raised.

↓ Reporting limit lowered.

NA The sample was not analysed for this analyte

ND Non Detect

Results relate only to the sample tested.

Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.

"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.

Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

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The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Reproduction of this analytical report in full or in part is prohibited.

This report supersedes all previous versions.

-- End of Analytical Report --



Industries & Environment - Lakefield 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment
London: 557 Consortium Court, London, ON, N6E 2S8 Phone: 519-372-4500 Toll Free: 877-848-6860 Fax: 519-372-0361

Request for Laboratory Services and CHAIN OF CUSTODY

Received By: APR 17 2024

Received Date: 17/04/24 (mm/dd/yy)

Received Time: 14:08 (hr : min)

REPORT INFORMATION

Company: Thurber Engineering Ltd
Contact: Puneet Verma
Address: 250 Thompson Drive,
Cambridge ONT
Phone: 905-829-8666
Fax:

Received By (signature)

Custody Seal Present: Yes ☒ No ☐

Custody Seal Intact: Yes ☒ No ☐

INVOICE INFORMATION

☒ (same as Report Information)

Company:

Contact:

Address:

Phone:

Email:

Accounting@thurber.ca

REGULATIONS

☐ O.Reg 153/04 ☐ O.Reg 406/19
☐ Table 1 ☐ Res/Park ☐ Soil Texture:
☐ Table 2 ☐ Ind/Com ☐ Coarse
☐ Table 3 ☐ Agri/Other ☐ Medium/Fine
☐ Table ☐ Appx.
Soil Volume ☐ <350m3 ☐ >350m3

Other Regulations:
☐ Reg 347/558 (3 Day min TAT)
☐ PWQO ☐ MMER
☐ CCME ☐ Other:
☐ MISA
☐ ODWS Not Reportable *See note

Sewer By-Law:
☐ Sanitary
☐ Storm
☐ Municipality:

RECORD OF SITE CONDITION (RSC)

☐ YES ☐ NO

SAMPLE IDENTIFICATION

	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX
1	BH1 5-63	15/4/24 1:00PM	1	S
2	BH2 55-A	12/4/24 11:00AM	1	S
3	BH3 583	16/4/24 4:00PM	1	S
4	BH4 55-a	16/4/24 11:00AM	1	S
5	BH5 56-3	16/4/24 11:00AM	1	S
6				
7				
8				
9				
10				
11				
12				

Observations/Comments/Special Instructions

Sampled By (NAME): Hayden Clarke

Relinquished by (NAME): Nathan Curriston

Version # 1.7

Date of Issue: 07 JUNE 2023

Note: Submission of samples to SGS is acknowledgement that you have been provided direction on sample collection/handling and transportation of samples. [2] Submission of samples to SGS is considered authorization for completion of work. Signatures may appear on this form or be retained on file in the contract, or in an alternative format (e.g. shipping documents). (3) Results may be sent by email to an unlimited number of addresses for no additional cost. Fax is available upon request. This document is issued by the Company under its General Conditions of Service accessible at http://www.sgs.com/terms_and_conditions.htm. (Printed copies are available upon request.) Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Signature: Hayden Clarke

Signature: Nathan Curriston

Date: 17 / 4 / 24 (mm/dd/yy)

Date: 17 / 4 / 2024 (mm/dd/yy)

Pink Copy - Client

Yellow & White Copy - SGS

Quotation #: 49053

Project #: 49053

Site Location/ID: 49053

TURNAROUND TIME (TAT) REQUIRED

☒ Regular TAT (5-7days)

RUSH TAT (Additional Charges May Apply): ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days

PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION

Specify Due Date:

*NOTE: DRINKING (POTABLE) WATER SAMPLES FOR HUMAN CONSUMPTION MUST BE SUBMITTED WITH SGS DRINKING WATER CHAIN OF CUSTODY

ANALYSIS REQUESTED

M & I

Field Filtered (Y/N)

Metals & Inorganics

ICP Metals only

ICP Metals plus B(W/S-soil only) Hg, CrVI

ICP Metals only

ICP Metals only

ICP Metals only

ICP Metals only

ICP Metals only

ICP Metals only

ICP Metals only

ICP Metals only

ICP Metals only

ICP Metals only

ICP Metals only

ICP Metals only

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