WWW.THURBER.CA

THURBER ENGINEERING LTD.

Foundation Investigation Report
Gull River Culvert Replacement

Highway 811, District of Thunder Bay, Ontario
Agreement 6021-E-0005, Work Orders 1 & 23
G.W.P. 6104-17-00, Site No. 48W-0198/C0
Latitude: 49.404264°, Longitude: -89.590338°
GEOCRES No. 52H05-001

Client Name: HATCH
Date: August 1, 2024
File: 34812

Suite 202, 1908 Ironoak Way, Oakville, Ontario L6H 0N1 | Phone: (905) 829-8666

THURBER ENGINEERING LTD.

TABLE OF CONTENTS

IN-TEXT TABLES

THURBER ENGINEERING LTD.

APPENDICES

APPENDIX A

Borehole Locations and Soil Strata Drawings

APPENDIX B

Record of Borehole Sheets

APPENDIX C

Laboratory and Well Test Results

APPENDIX D

Site Photographs

THURBER ENGINEERING LTD.

FOUNDATION INVESTIGATION REPORT
GULL RIVER CULVERT REPLACEMENTS
HIGHWAY 811, DISTRICT OF THUNDER BAY, ONTARIO
AGREEMENT 6021-E-0005, WORK ORDERS 1 & 23
G.W.P. 6104-17-00, SITE NO. 48W-0198/C0
LATITUDE: 49.404264°, LONGITUDE: -89.590338°

GEOGRES No. 52H05-001

1. INTRODUCTION

This report presents the factual data obtained from a foundation investigation carried out by Thurber Engineering Ltd. (Thurber) for design of the proposed Gull River Culvert replacement. The Gull River Culvert is located on Highway 811, approximately 17 km west of Highway 527, in the Unsurveyed Territory, District of Thunder Bay, Ontario.

The purpose of this investigation was to explore the subsurface conditions at the culvert 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.

Thurber carried out the investigation as a sub-consultant to Hatch Corporation (Hatch), under the Ministry of Transportation Ontario (MTO) Retainer Agreement Number 6021-E-0005, Work Order 1, with additional foundation engineering services under Work Order 23.

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

The site is located on Highway 811, in the Unsurveyed Territory, District of Thunder Bay, Ontario. The existing culvert, which consists of three pipes, allows Gull River to flow in a general south to north direction under Highway 811. Highway 811 generally runs in a northwest-southeast direction at the culvert site. For the purposes of this report, Highway 811 is described as running in a west-east direction.

Photographs in Appendix D show the general nature of the site and the existing culvert.

The available base plan drawing provided by Hatch indicates that the existing structure consists of three horizontal elliptical structural plate corrugated steel pipes (SPCSP); each measuring 3.1 m wide, 2.1 m high and 16.8 m long. The culvert pipes span an overall distance of approximately 11 m. The culvert invert at each existing pipe is at approximate Elevation 447.2 m. Highway 811 is a gravel road with an existing grade level of approximate Elevation 451 m at the culvert location. The highway embankment is approximately 3 to 4 m high, with 1.7 m of fill above the culvert pipes. As seen in Photo 5 in Appendix D, the inlet of the existing culvert pipes was partially obstructed by fallen timber. The local river water level was reportedly measured at Elevation 447.6 m on July 5, 2018. The site topography within the culvert area gently slopes downward from the east and west toward the culvert site. The site is surrounded by mature trees, with marshy areas near the riverbanks.

Based on published geological mapping, the quaternary geology in the area of the culvert site consists of mainly undifferentiated igneous and metamorphic bedrock, exposed at surface or covered by a discontinuous, thin layer of drift; with nearby glaciofluvial outwash and ice-contact deposits and recent fluvial deposits including gravel and sand, minor till, and recent sand, silt, gravel and clay. The bedrock in the area is described as folded tonalite suite consisting of foliated to massive tonalite to granodiorite.

3. SITE INVESTIGATION AND FIELD TESTING

The site investigation and field-testing program for this project was carried out in two phases, from August 15 to 18, 2022 and from September 22 to October 2, 2022. The field program consisted of drilling and sampling eight (8) boreholes (22-01 to 22-08) to depths ranging from 5.6 to 14.6 m below the ground surface (Elevation 442.5 to 436.2 to m).

Boreholes 22-05 to 22-08 were drilled through the gravel Highway 811 embankment. Boreholes 22-01 to 22-04 were drilled off-road near the inlet and outlet of the existing culvert. The approximate borehole locations are shown on the attached Borehole Locations and Soil Strata Drawings in Appendix A. The Record of Borehole sheets are included in Appendix B.

Utility clearances were obtained prior to the start of drilling. The ground surface elevations for the boreholes were estimated from field measurements and the topographic drawings provided to Thurber by Hatch. The coordinate system MTM NAD 83, Zone 15 was used for the boreholes.

The boreholes through the road surface (22-05 to 22-08) were advanced using a rubber track-mounted CME55 drill rig, using hollow stem auger and/or wash boring techniques. The off-road boreholes (22-01 to 22-04) were advanced using a portable Hilti drill and tripod equipment using

wash boring techniques. In all 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). Bedrock coring used an NQ size core barrel was used to advance all boreholes into bedrock.

The drilling and sampling 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 and rock samples for transport to Thurber's laboratory for further examination and testing.

The rock cores were logged, and the Total Core Recovery (TCR), Solid Core Recovery (SCR), Rock Quality Designation (RQD) and the Fracture Indices (FI) were determined.

Monitoring wells were installed in Boreholes 22-05 and 20-06. Both wells consisted of 50 mm Schedule 40 PVC pipe with a 1.5 m long slotted screen, enclosed in a column of filter sand to permit groundwater level monitoring. Monitoring well installation details, groundwater level observations and water level readings are shown on the Record of Borehole sheets. A sample of the groundwater was obtained from the well at Borehole 22-05 and submitted to a specialist analytical laboratory under chain of custody procedures for testing for a suite of water quality parameters. Single well response tests ("slug") tests were carried out in the wells installed in both Boreholes 22-05 and 22-06. Upon collection of the final water level readings on August 18, 2022, the wells were decommissioned in accordance with MOECP O.Reg. 903.

Details of the drilling program, including drilling depths, monitoring well installation and completion details are summarized in Table 3.1 below.

Table 3.1 Borehole Completion Details

Borehole Number	Borehole Depth / Base Elevation (m)	Monitoring Well Tip Depth / Elevation (m)	Completion Details
22-01	9.4 / 438.8	None installed	Borehole caved to 7.2 m and backfilled with bentonite holeplug to ground surface.
22-02	7.7 / 441.9	None installed	Borehole caved to 5.2 m and backfilled with bentonite holeplug to ground surface.
22-03	5.6 / 442.5	None installed	Borehole caved to 2.0 m and backfilled with bentonite holeplug to ground surface.
22-04	10.0 / 439.1	None installed	Borehole caved to 7.4 m and backfilled with bentonite holeplug to ground surface.

Borehole Number	Borehole Depth / Base Elevation (m)	Monitoring Well Tip Depth / Elevation (m)	Completion Details
22-05	14.6 / 436.2	9.8 / 441.0	Bentonite holeplug to 9.9 m. Filter sand from 9.9 m to 7.9 m, bentonite holeplug from 7.9 to 7.3 m, cave in material to 2.1 m, bentonite to 0.3 m, then sand to ground surface.
22-06	13.9 / 437.1	5.9 / 445.1	Cave in material to 6.1 m. Filter sand from 6.1 to 4.3, bentonite to 3.7 m, cave in material to 2.0 m, then bentonite to ground surface.
22-07	9.8 / 441.0	None installed	Borehole caved to 0.9 m and was backfilled with bentonite holeplug and sand to ground surface.
22-08	10.1 / 441.1	None installed	Borehole caved to 3.1 m and was backfilled with bentonite holeplug and sand to ground surface.

4. LABORATORY TESTING

All recovered soil samples were subjected to visual identification and natural moisture content determination. Selected samples were subjected to grain size distribution analyses (sieve and hydrometer), where appropriate. Point load tests and Unconfined Compressive Strength (UCS) tests were also conducted on selected samples of the bedrock cores. The results of this testing program are summarized on the Record of Borehole sheets in Appendix B and are shown on the figures included in Appendix C.

In order to assess the potential for sulphate attack on concrete foundations, as well as the potential for corrosion associated with the structure, two soil samples and a sample of the river water were collected during the investigation and submitted to SGS Canada Inc., a CALA accredited analytical laboratory in Lakefield, Ontario, for analytical testing of corrosivity parameters. In order to assess the quality of the groundwater for disposal purposes, a water sample was collected from the well installed in Borehole 22-05. The results of the analytical testing are summarized in this report and presented in Appendix C.

5. DESCRIPTION OF SUBSURFACE CONDITIONS

Reference is made to the Record of Borehole sheets included in Appendix B. Details of the encountered soil stratigraphy are presented on the Record of Borehole sheets and on the Borehole Locations and Soil Strata drawings 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 in the Record of Borehole sheets governs any interpretation of the site conditions. It must be recognized that soil conditions may vary between and beyond the borehole locations.

In general, the subsurface stratigraphy on the road consists of sand fill with some silt to silty and trace to some gravel. The fill was underlain by native soils consisting of silty sand to sand, zones of sandy silt mixed with peat and organics, silt till, and sand and gravel. The overburden soils were underlain by tonalite bedrock. More detailed descriptions of the individual strata are presented below.

5.1 Embankment Fill

Sand embankment fill was encountered at the ground surface in Boreholes 22-05 to 22-08 located on Highway 811. The fill generally consisted of sand with trace silt to silty, and trace to some gravel. Occasional cobbles were also encountered in the fill.

The fill extended to depths ranging from 2.7 m to 5.2 m below ground surface (Elevation 448.2 to 445.8 m).

SPT 'N' values in the sand fill generally ranged from 4 to 32 blows per 0.3 m penetration, indicating a loose to dense relative density; typically compact. In Borehole 22-08, one SPT 'N' value of greater than 100 blows per 0.3 m penetration was recorded where cobbles were encountered.

The measured moisture contents generally ranged from 3 to 13%.

The results of grain size analyses conducted on selected samples of the sand fill are provided on the Record of Borehole sheets in Appendix B and plotted on Figure C1 in Appendix C. The results are summarized as follows:

Soil Particle	Percentage (%)
Gravel	1 to 14
Sand	59 to 88
Silt & Clay	10 to 28

5.2 Topsoil

A surficial layer of topsoil ranging in thickness from 100 to 250 mm was encountered at the ground surface in Boreholes 22-01 to 22-04.

5.3 Silt Mixed with Peat and Organics

Underlying the topsoil, a layer of silt mixed with peat and organics was encountered near the ground surface in Boreholes 22-01 to 22-04. A buried layer of sandy silt mixed was peat and organics was also encountered below the embankment fill in Borehole 22-08. The silt with peat and organics generally contained silt, trace sand to sandy, trace clay, trace gravel, occasional cobbles and boulders, and wood fragments. Coring methods were used to penetrate cobbles and boulders in Boreholes 22-01 to 22-03.

The thickness of the silt mixed with peat and organics ranged from 0.5 m to 4.2 m, with the base encountered at depths ranging from 0.6 to 4.5 m (Elevation 448.5 to 445.9 m).

SPT 'N' Values in the layer ranged from 3 to 21 blows per 0.3 m penetration, indicating a very loose to compact density; typically loose. SPT 'N' values of greater than 50 per 0.3 m penetration were also recorded where cobbles or boulders were encountered.

Measured moisture contents ranged from 23 to 163%.

The results of grain size analyses conducted on samples of the silt mixed with peat and organics are provided on the Record of Borehole sheets in Appendix B and plotted on Figure C2 in Appendix C. The results are summarized as follows:

Soil Particle	Percentage (%)
Gravel	0
Sand	14 to 40
Silt	59 to 82
Clay	1 to 4

5.4 Silty Sand to Sand

A deposit ranging in composition from silty sand to sand was encountered below either the silt mixed with peat or the embankment fill in Boreholes 22-01, 22-03, 22-04, 22-05, 22-06 and 22-07. The deposit also generally contained trace gravel, trace clay, and occasional cobbles. Occasional wood fragments were encountered in the silty sand in Borehole 22-07. Coring methods were used to penetrate cobbles in Boreholes 22-04 and 22-05.

The thickness of the silty sand to sand deposit ranged from 0.7 m to 5.3 m, with the base encountered at depths ranging from 2.4 to 8.7 m (Elevation 446.7 to 442.1 m).

SPT 'N' Values in the silty sand to sand ranged from 11 blows to greater than 100 blows per

0.3 m penetration, indicating a compact to very dense relative density.

Measured moisture contents generally ranged from 7 to 21%.

The results of grain size analyses conducted on samples of the silty sand to sand deposit are provided on the Record of Borehole sheets in Appendix B, and plotted on Figure C3 in Appendix C. The results are summarized as follows:

Soil Particle	Percentage (%)
Gravel	0 to 9
Sand	65 to 90
Silt	8 to 32
Clay	1 to 3
Silt and Clay	12 to 15

5.5 Silt Till

A silt till deposit was encountered below the silty sand to sand layer in Boreholes 22-01, 22-05 and 22-06 and beneath the silt mixed with peat and organics in Borehole 22-08. The silt till deposit contained trace to some sand, trace gravel, trace clay and occasional cobbles.

The thickness of the silt till ranged from 0.6 m to 1.7 m, with the base of the deposit encountered at depths ranging from 4.3 to 10.4 m. (Elevation 445.9 to 440.4 m).

SPT ‘N’ Values in the silt till deposit ranged from 15 to greater than 100 blows per 0.3 m penetration, indicating a compact to very dense relative density.

Recorded moisture contents in the silt till ranged from 11 to 31%.

The results of grain size analyses conducted on samples of the silt till deposit are provided on the Record of Borehole sheets in Appendix B and plotted in Figure C4 in Appendix C. The results are summarized as follows:

Soil Particle	Percentage (%)
Gravel	0 to 3
Sand	1 to 13
Silt	79 to 94
Clay	5 to 8

5.6 Sand and Gravel with Cobbles

The silty sand to sand and silt till deposits were underlain by a deposit of sand and gravel with some cobbles and occasional boulders. The sand and gravel deposit was encountered in all of the boreholes except for 22-02 and 22-03. Coring methods were frequently required to penetrate the sand and gravel layer.

The thickness of the sand and gravel deposit ranged from 0.2 m to 2.2 m, with the base encountered at depths ranging from 5.6 to 10.6 m. (Elevation 445.2 to 440.2 m).

SPT 'N' Values in the sand and gravel deposit ranged from 32 to greater than 100 blows per

0.3 m penetration, indicating a dense to very dense relative density.

Recorded moisture contents in the sand and gravel ranged from 1 to 9%

5.7 Bedrock

The overburden soils described above are underlain by bedrock. The bedrock is described as folded tonalite, is red and grey in colour and is moderately weathered to fresh. Bedrock was proven by coring 1.9 to 4.9 m in all borehole locations (3 m or greater in all boreholes except for 22-04).

Table 5.1 summarizes the depths and elevations to the top of the bedrock at the borehole locations. Photographs of the rock cores are included in Appendix C.

Table 5.1 Depths and Elevations of Top of Bedrock

Borehole	Top of Bedrock	
	Depth Below Existing Grade Level (m)	Elevation (m)
22-01	5.8	442.4
22-02	4.4	445.2
22-03	2.4	445.7
22-04	8.1	441.0
22-05	10.6	440.2
22-06	9.0	442.0
22-07	5.6	445.2
22-08	7.0	444.2

Total Core Recovery (TCR) in the bedrock ranged between 77% to 100% throughout all runs, and Solid Core Recovery (SCR) ranged between 26 to 100%. The Rock Quality Designation (RQD) determined from the recovered cores ranged between 0 and 94%, which indicates very poor to excellent rock quality. The rock quality is typically poor to fair (RQD from 26 to 75%), with the

exceptions of Borehole 22-04, which is very poor (RQD from 0 to 15%) and Borehole 22-07, which is excellent (RQD from 86 to 94%). The Fracture Index (FI) of the rock, expressed as fractures per 0.3 m of core, typically ranged from 0 to 7, with some broken zones with FI of greater than 10.

Average unconfined compressive strengths (UCS) of the rock ranged between 130 and 223 MPa, These estimated rock strength values are interpreted from point load tests that were conducted on rock cores recovered from the boreholes. Unconfined Compression Strength (UCS) tests were also conducted on 6 bedrock core sample specimens. The UCS test results ranged from 71 to 209 MPa. Based on the average point load and UCS test results, the bedrock is typically strong to very strong. The UCS and point load test results are presented in Appendix C.

5.8 Groundwater Conditions

Groundwater conditions were observed during drilling operations and groundwater levels were measured in the open boreholes upon completion of drilling, and in the monitoring wells installed in Boreholes 22-05 and 22-06. Water levels were not recorded when residual drilling water (for coring purposes) was observed in the open boreholes. The measured groundwater levels are summarized in Table 5.2 below. The monitoring wells were decommissioned on August 18, 2022 following final water level readings and slug testing.

Table 5.2 Groundwater Measurements

Borehole	Date	Water Level (m)		Remark
		Depth	Elevation	
22-05	August 17, 2022	3.4	447.4	In monitoring well
22-06	August 18, 2022	3.4	447.4	
22-08	August 16, 2022	3.3	447.7	In monitoring well
22-05	August 17, 2022	3.5	447.5	
22-06	August 18, 2022	1.8	449.4	Open Borehole

The groundwater level is likely to reflect the local river water level. The local river water level was measured at Elevation 447.6 m on July 5, 2018.

It should also be noted that groundwater levels are short term observations and seasonal fluctuations of the groundwater level are to be expected. In particular, the groundwater level may be at a higher elevation after periods of significant and/or prolonged precipitation and spring snow melts.

6. CORROSIVITY AND SULPHATE TEST RESULTS

Samples of the sand fill from Boreholes 22-05 and 22-06 and a sample of surface water collected from the river were submitted for analytical testing of corrosivity parameters and sulphate. The laboratory certificates of analysis are presented in Appendix C. The results of the analytical tests are summarized below in Table 6.1.

Table 6.1: Analytical Test Results

Parameter	Units (Soil)	Units (Water)	Test Results		
			22-05 SS3 (7'-9') (2.1 – 2.7 m)	22-06 SS6 (12.5'-14.5') (3.8 – 4.4 m)	Gull River SW
			(Sand Fill)	(Sand Fill)	(Surface Water)
Redox Potential	mV	mV	268	289	251
Sulphide	%	µg/L	<0.04	<0.04	-
pH	-	-	9.10	8.95	7.66
Chloride	µg/g	mg/L	< 10	< 10	0.57
Sulphate	µg/g	mg/L	< 10	< 10	<0.04
Conductivity	µS/cm	µS/cm	72	93	85
Resistivity*	ohm-cm	ohm-cm	13900	10800	11764*

* Calculated based on conductivity result

7. WATER QUALITY

For preliminary screening of the general groundwater quality in the project area, a sample of the groundwater from the monitoring well at Borehole 22-05 was collected on August 18, 2022. The water sample was analyzed for selected inorganic parameters included in the Ontario Provincial Water Quality Objectives (PWQO), as well as Total Suspended Solids. A filtered sub-sample was also tested for dissolved metal parameters for comparison purposes. The analytical test results are presented in Appendix C.

The analytical results of the water testing were compared to limits for the PWQO for surface water discharge. The concentrations of all parameters tested that did not meet the criteria established in the PWQO are listed below in Table 7.1. The Total Suspended Solids concentration was 81 mg/L.

Table 7.1: Water Parameters Exceeding PWQO Criteria

Sample ID	Parameter	Criteria	Parameter Limit (µg/L)	Result
22-05	Aluminum (0.2 µm)	PWQO	75	860
	Total Cobalt	PWQO	0.9	7.90
	Total Copper	PWQO	5	63.5
	Total Iron	PWQO	300	6790
	Total Phosphorus	PWQO	10	98
	Total Silver	PWQO	0.1	2.34
	Total Vanadium	PWQO	6	6.54
	Total Zinc	PWQO	20	54
22-05 Dissolved Metals (Filtered sub-sample)	Dissolved Cobalt	PWQO	0.9	6.90
	Dissolved Copper	PWQO	5	50.1
	Dissolved Iron	PWQO	300	3190
	Dissolved Phosphorus	PWQO	10	51
	Dissolved Silver	PWQO	0.1	0.22
	Dissolved Zinc	PWQO	20	39

8. SINGLE WELL RESPONSE TEST RESULTS

8.1 Test Procedure

Single well response tests (SWRT) (“slug” tests) were carried out in the 50 mm diameter wells installed in Boreholes 22-05 and 22-06. The well installed in Borehole 22-05 was screened across silty sand to silt, some sand till. The well installed in Borehole 22-06 was screened across sand, some silt to silty, trace to some gravel. The tests were completed using the following method:

- The static water level was measured and recorded, and a datalogger was inserted into the well below the water level. The datalogger was set to record water levels every 0.125 to 0.5 seconds, based on the anticipated rate of recovery of the wells.
- A slug of groundwater was removed from the well with a dedicated bailer to induce a change in hydraulic head (rising head test).

- Manual and electronic measurements were recorded until the water level in the well recovered sufficiently.
- Manual measurements were compared to electronic measurements for quality control of the data.

8.2 Hydraulic Conductivity

The slug tests were completed and analyzed using the Hvorslev method. The plots of the slug test results are included in Appendix C. The hydraulic conductivity values calculated from the in-situ slug tests are summarized in Table 8.1:

Table 8.1: Hydraulic Conductivity

Monitoring Well	Hydraulic Conductivity (m/s)	Screened Formation
22-05	2.3×10^{-5}	Sand and silt to silty sand
22-06	2.7×10^{-4}	Sand, some silt

9. MISCELLANEOUS

Thurber obtained utility clearances for the borehole locations prior to drilling. Borehole locations were selected and established in the field by Thurber Engineering Ltd.

RPM Drilling of Thunder Bay, Ontario supplied a rubber track-mounted CME55 drill rig and Ohlmann Geotechnical Services (OGS) Inc. of Almonte, Ontario supplied a portable Hilti drill with tripod, to conduct the drilling, sampling and in-situ testing operations for the boreholes. Traffic control services conforming to Ontario Book 7 were provided by Thurber.

Geotechnical laboratory testing was carried out in Thurber's geotechnical laboratory. Analytical testing was carried out by SGS Canada Inc.

The field investigation was supervised on a full-time basis by Mr. Ian Ross, E.I.T. and Mr. Greg Stanhope, E.I.T. of Thurber. Overall supervision of the field program was provided by Ms. Rachel Bourassa, E.I.T. and Mr. Mark Farrant, P. Eng. of Thurber.

Interpretation of the field data and preparation of this report was carried out by Ms. Madisan Chiarotto, P.Eng. and Mr. Mark Farrant, P.Eng., and reviewed by Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations Projects.

THURBER ENGINEERING LTD.

Madisan Chiarotto, P.Eng.
Geotechnical Engineer

Mark Farrant, P.Eng.
Associate, Senior Geotechnical Engineer

P.K. Chatterji, P.Eng.
Principal, Designated MTO Contact

Date: August 1, 2024
File: 34812

THURBER

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

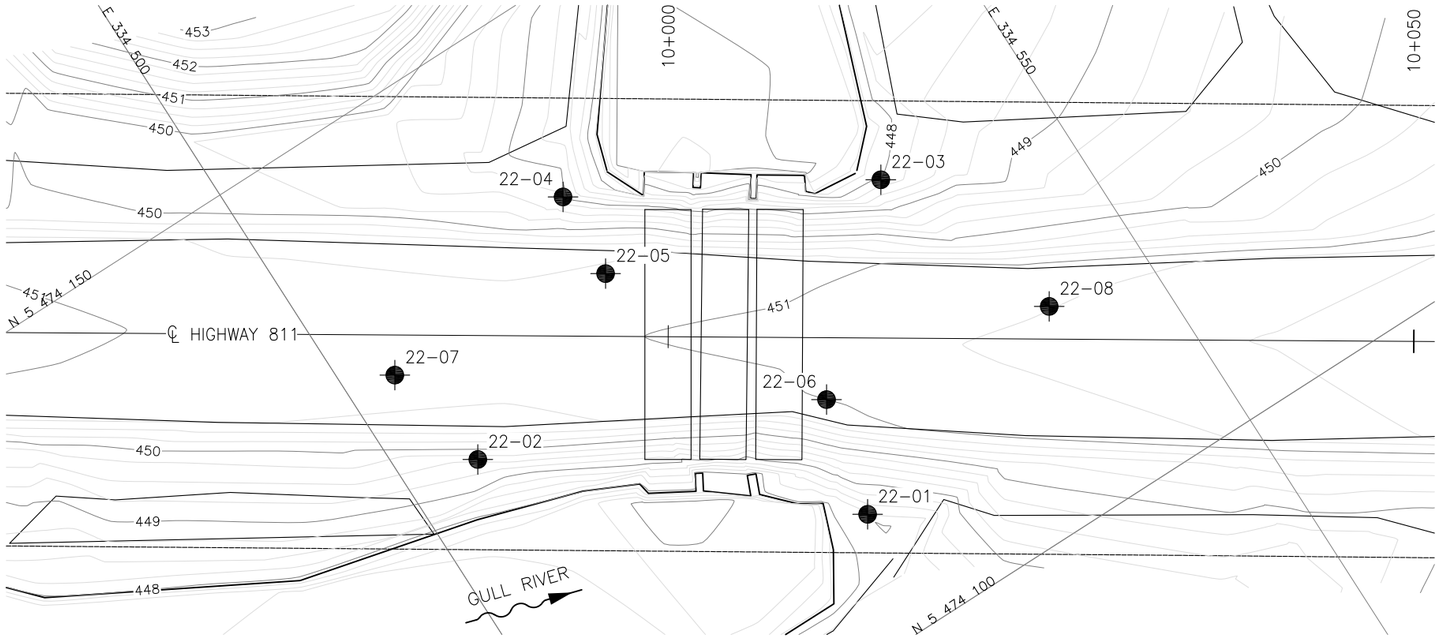
The information, interpretations and conclusions in the Report are based on Thurber's interpretation of conditions revealed through limited investigation conducted within a defined scope of services. Thurber does not accept responsibility for independent conclusions, interpretations, interpolations and/or 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.

THURBER ENGINEERING LTD.

APPENDIX A

Borehole Locations and Soil Strata Drawings

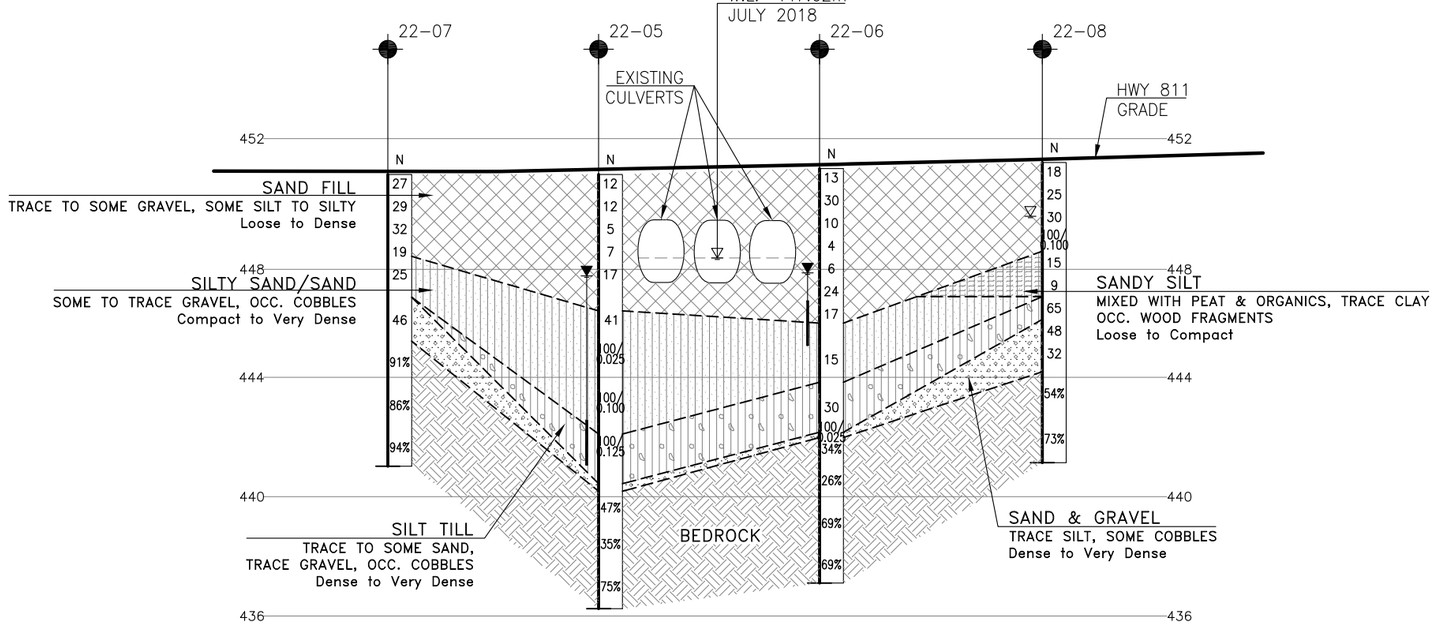
MINISTRY OF TRANSPORTATION, ONTARIO



PLAN

8 0 8 16m

SCALE 1:400



SECTION ALONG ℄ HWY 811

8 0 8 16m H 1:400

4 0 4 8m V 1:200

METRIC

DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

CONT No
GWP No 6104-17-00

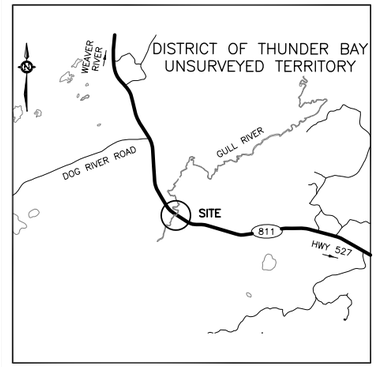
HIGHWAY 811
GULL RIVER
CULVERT REPLACEMENT
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET

THURBER ENGINEERING LTD.

LICENSED PROFESSIONAL ENGINEER
M.E. FARRANT
100053767
August 1, 2024
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
P. K. CHATTERJI
August 1, 2024
PROVINCE OF ONTARIO



KEYPLAN

L E G E N D

●	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
▼	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
22-01	448.2	5 474 108.5	334 525.0
22-02	449.6	5 474 125.7	334 505.0
22-03	448.1	5 474 126.9	334 537.9
22-04	449.1	5 474 137.5	334 519.3
22-05	450.8	5 474 131.6	334 518.9
22-06	451.0	5 474 116.5	334 526.8
22-07	450.8	5 474 133.5	334 503.3
22-08	451.2	5 474 113.7	334 542.8

-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 15.

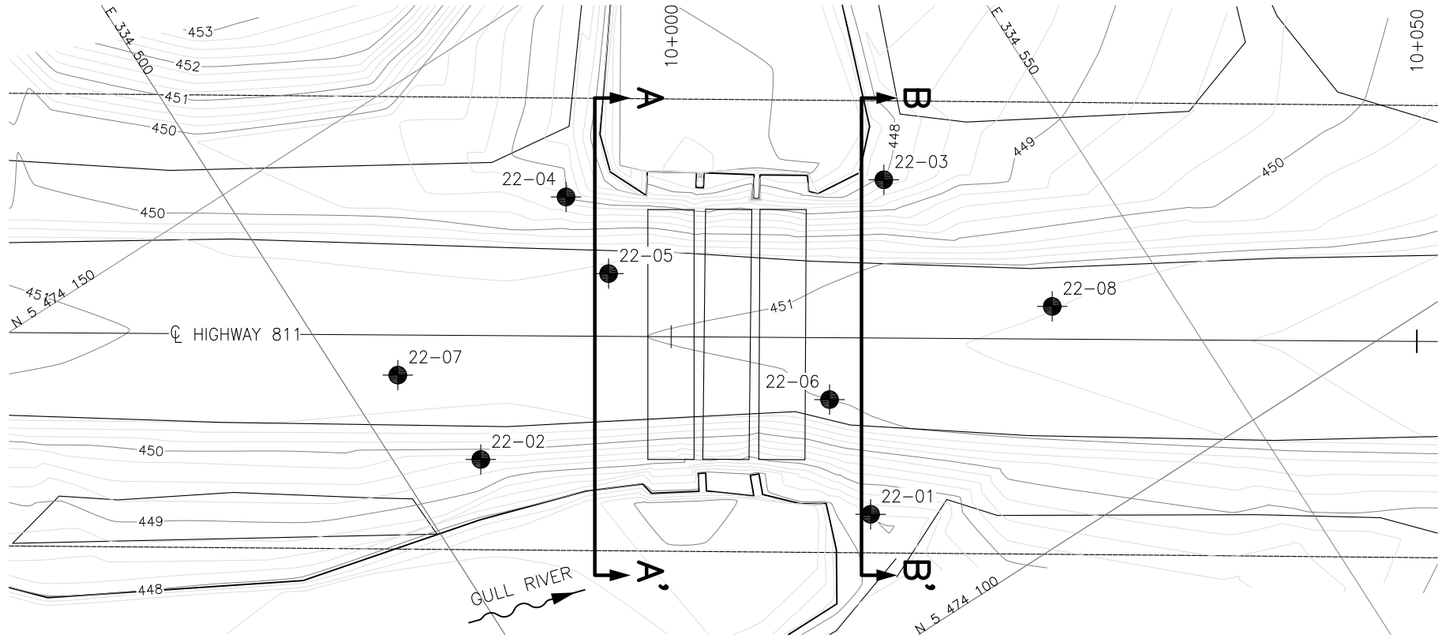
GEOCRES No. 52H05-001

REVISIONS		
DATE	BY	DESCRIPTION

DESIGN	MEF	CHK	PK	CODE		LOAD	
DRAWN	AN	CHK	MEF	SITE 48W-0198/C0		STRUCT	
DATE	AUG 2024					DWG	1

FILENAME: H:\Drafting\34000\34812\TED-34812-PLPR-GR.dwg
PLOTDATE: 8/1/2024 11:22 AM

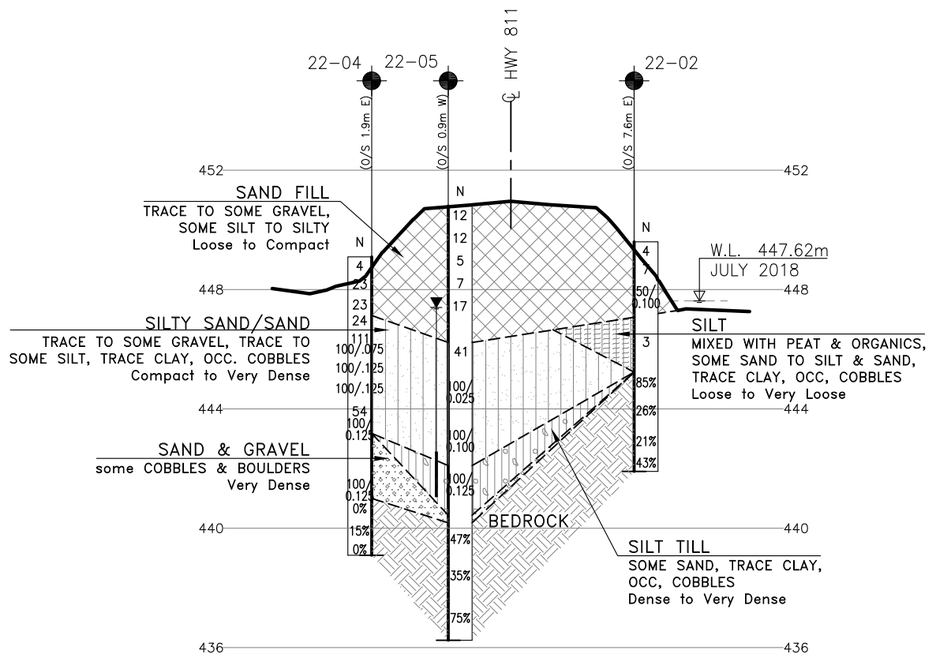
MINISTRY OF TRANSPORTATION, ONTARIO



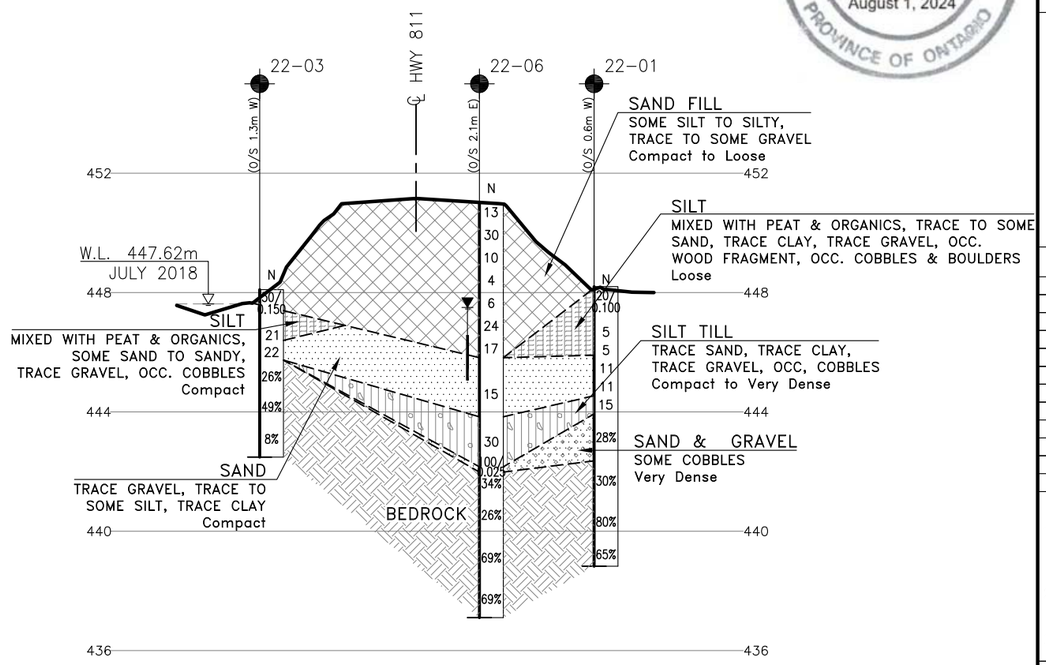
PLAN

8 0 8 16m

SCALE 1:400



SECTION A–A'



SECTION B–B'

8 0 8 16m H 1:400

4 0 4 8m V 1:200

METRIC

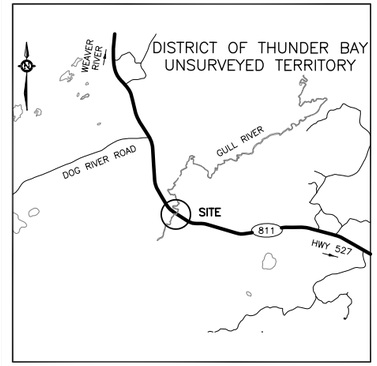
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN

CONT No
GWP No 6104-17-00

HIGHWAY 811
GULL RIVER
CULVERT REPLACEMENT
BOREHOLE LOCATIONS AND SOIL STRATA

SHEET

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
▼	Head Artesian Water
	Piezometer
90%	Rock Quality Designation (RQD)
A/R	Auger Refusal

NO	ELEVATION	NORTHING	EASTING
22-01	448.2	5 474 108.5	334 525.0
22-02	449.6	5 474 125.7	334 505.0
22-03	448.1	5 474 126.9	334 537.9
22-04	449.1	5 474 137.5	334 519.3
22-05	450.8	5 474 131.6	334 518.9
22-06	451.0	5 474 116.5	334 526.8
22-07	450.8	5 474 133.5	334 503.3
22-08	451.2	5 474 113.7	334 542.8

-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 15.

GEOCRES No. 52H05-001

REVISIONS		
DATE	BY	DESCRIPTION

DESIGN	MEF	CHK	PK	CODE	LOAD	DATE	AUG 2024
DRAWN	AN	CHK	MEF	SITE 48W-0198/C0	STRUCT	DWG	2

FILENAME: H:\Drafting\34000\34812\TED-34812-PLPR-GR.dwg
PLOTDATE: 8/1/2024 11:23 AM

THURBER ENGINEERING LTD.

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

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			

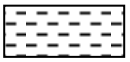
EXPLANATION OF ROCK LOGGING TERMS

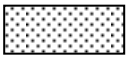
ROCK WEATHERING CLASSIFICATION

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 22-01 1 OF 1 METRIC

GWP# 6104-17-00 LOCATION Gull River Crossing; MTM 83-15: N 5 474 108.5 E 334 525.0 ORIGINATED BY IR

DIST Thunder Bay HWY 811 BOREHOLE TYPE Tripod/NQ Coring COMPILED BY AA

DATUM Geodetic DATE 2022.09.22 - 2022.09.25 LATITUDE 49.404156 LONGITUDE -89.590399 CHECKED BY MEF

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
448.2	GROUND SURFACE								
0.0	**TOPSOIL:** (100mm)		1	SS	20/		448		
0.1	**SILT**, mixed with peat and organics, trace to some sand, trace clay, trace gravel, occasional wood fragments, occasional cobbles and boulders Loose Brown to Black Wet				0.100				
	Cored through cobbles and boulders from 0.3m to 0.7m		2	SS	5		447		0 14 82 4
445.9			3	SS	5		446		
2.3	**SAND**, trace gravel, trace silt, trace clay Compact Grey Wet		4	SS	11				1 90 8 1
			5	SS	11		445		
444.5									
3.7	**SILT**, trace clay, trace sand Compact Grey Wet		6	SS	15				0 1 94 5
443.9	(TILL)						444		
4.3	**SAND** and **GRAVEL**, some cobbles (coring required to penetrate)		1	RUN					RUN #2 TCR=77% SCR=55% RQD=30% UCS=172MPa (Avg Point Load)
442.4							443	FI	
5.8	**BEDROCK (FOLDED TONALITE),** moderately to slightly weathered, very strong, grey/red		2	RUN			442	>10 2 5	
			3	RUN			441	5 1 >10 0	RUN #3 TCR=100% SCR=89% RQD=80% UCS=168MPa (Avg Point Load)
			4	RUN			440	5 4 7 10	RUN #4 TCR=100% SCR=84% RQD=65% UCS=189MPa (Avg Point Load) UCS=87MPa
438.8							439	2	
9.4	END OF BOREHOLE AT 9.4m. BOREHOLE CAVED TO 7.2m. BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.								

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

+ ³, × ³: Numbers refer to Sensitivity

15 20 10 5 (%) STRAIN AT FAILURE

ONTMT4S2 2020LIBRARY(MTO) - COPY.GLB MTO-34812.GPJ 9/7/23

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 22-02 1 OF 1 METRIC

GWP# 6104-17-00 LOCATION Gull River Crossing; MTM 83-15: N 5 474 125.7 E 334 505.0 ORIGINATED BY IR

DIST Thunder Bay HWY 811 BOREHOLE TYPE Tripod/NQ Coring COMPILED BY AA

DATUM Geodetic DATE 2022.10.01 - 2022.10.02 LATITUDE 49.404312 LONGITUDE -89.590673 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (20 40 60 80 100): ○ UNCONFINED, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE	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
449.6	GROUND SURFACE										
0.0	**TOPSOIL:** (200mm)										
0.2	**SILT**, some sand to silt and sand, mixed with peat and organics, trace clay, occasional cobbles Loose to Very Loose Dark Brown Wet		1	SS	4		449	○	○		
			2	SS	7			○	○		
			3	SS	50/ 0.100		448	○	○		
	Cored through cobbles from 1.9m to 2.2m						447				
			4	SS	3		446		163 ◇		0 40 59 1
445.2											
4.4	**BEDROCK (FOLDED TONALITE),** slightly weathered, very strong, grey/red		1	RUN			445			FI 0 0 1	RUN #1 TCR=89% SCR=85% RQD=85% UCS=145MPa (Avg Point Load)
			2	RUN			444			7 1 5 5	RUN #2 TCR=100% SCR=38% RQD=26% UCS=147MPa (Avg Point Load)
			3	RUN			443			>10 4 >10	RUN #3 TCR=97% SCR=26% RQD=21% UCS=130MPa (Avg Point Load)
			4	RUN						1 2	RUN #4 TCR=91% SCR=43% RQD=43% UCS=158MPa
441.9							442				
7.7	END OF BOREHOLE AT 7.7m. BOREHOLE CAVED TO 5.2m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO THE SURFACE.										(Avg Point Load)

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

20
15 5
10
(%) STRAIN AT FAILURE

ONTMT4S2 2020LIBRARY(MTO) - COPY.GLB MTO-34812.GPJ 9/7/23

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 22-03 1 OF 1 METRIC

GWP# 6104-17-00 LOCATION Gull River Crossing; MTM 83-15: N 5 474 126.9 E 334 537.9 ORIGINATED BY IR

DIST Thunder Bay HWY 811 BOREHOLE TYPE Tripod/NQ Coring COMPILED BY AA

DATUM Geodetic DATE 2022.09.26 - 2022.09.27 LATITUDE 49.404321 LONGITUDE -89.590220 CHECKED BY MEF

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × 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/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
448.1	GROUND SURFACE						448				
0.0	**TOPSOIL:** (250mm)		1	SS	50/ 0.150				89		
0.2	**SILT**, mixed with organics and peat, some sand to sandy, trace gravel, occasional cobbles Compact Brown to Black Wet Cored through cobbles from 0.5m to 0.6m		2	SS	21		447				
446.4											
1.7	**SAND**, some silt, trace gravel Compact Grey Wet		3	SS	22		446				4 81 15 (SI+CL)
445.7										FI	
2.4	**BEDROCK (FOLDED TONALITE),** moderately to slightly weathered, very strong, grey/red Rubble zone from 2.4m to 2.7m		1	RUN						>10	RUN #1 TCR=100% SCR=35% RQD=26% UCS=187MPa (Avg Point Load)
							445			>10 4 5	
			2	RUN						>10 4	RUN #2 TCR=100% SCR=65% RQD=49% UCS=197MPa (Avg Point Load)
							444			1	
	Rubble zone from 5.0m to 5.2m		3	RUN						4 7	RUN #3 TCR=100% SCR=41% RQD=8% UCS=164MPa (Avg Point Load)
							443			>10	
442.5										3	
5.6	END OF BOREHOLE AT 5.6m. BOREHOLE CAVED TO 2.0m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO THE SURFACE.										

+ ³, × ³: Numbers refer to Sensitivity

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

ONTMT4S2 2020LIBRARY(MTO) - COPY.GLB MTO-34812.GPJ 9/7/23

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 22-04 1 OF 2 METRIC

GWP# 6104-17-00 LOCATION Gull River Crossing; MTM 83-15: N 5 474 137.5 E 334 519.3 ORIGINATED BY IR

DIST Thunder Bay HWY 811 BOREHOLE TYPE Tripod/NQ Coring COMPILED BY AA

DATUM Geodetic DATE 2022.09.28 - 2022.09.30 LATITUDE 49.404417 LONGITUDE -89.590475 CHECKED BY MEF

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × 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/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
449.1	GROUND SURFACE						449				
0.0	**TOPSOIL:** (100mm)										
0.1	**SILT**, some sand, trace clay, mixed with peat and organics		1	SS	4				○		
448.5	Loose										
0.6	Brown		2	SS	23		448		○		
	Wet										
	Silty **SAND**, trace gravel, trace clay		3	SS					○		
	Compact										
	Brown		4	SS	23				○		6 67 25 2
	Moist to Wet										
	No recovery from 0.6m to 1.2m, occasional cobbles										
447.3											
1.8	**SAND**, trace to some gravel, trace to some silt, occasional cobbles		5	SS	24		447		○		
	Compact to Very Dense										
	Grey										
	Wet		6	SS	111				○		9 79 12 (SI+CL)
			7	SS	100/.075		446		○		
	Cored through cobbles from 3.3m to 3.7m		8	SS	100/0.125				○		
			9	SS	100/0.125		445		○		
			10	SS	54		444		○		
			11	SS	100/0.125				○		
443.2									○		
5.9	**SAND** and **GRAVEL**, some cobbles and boulders (coring required to penetrate)						443				
	Very Dense										
	Grey										
	Wet						442				
			12	SS	100/0.125					FI	RUN #1 TCR=100% SCR=73% RQD=0% UCS=206MPa (Avg Point Load)
441.0							441			3	
8.1	**BEDROCK (FOLDED TONALITE),** slightly weathered, very strong, grey/red		1	RUN						4	RUN #2 TCR=94% SCR=50% RQD=15% UCS=223MPa (Avg Point Load)
										1	
			2	RUN			440			4	UCS=209MPa
	Vertical fracture from 9.6m to 9.7m									4	RUN #3 TCR=88% SCR=50% RQD=0% UCS=213MPa (Avg Point Load)
			3	RUN						2	
439.1										1	

Continued Next Page

+ ³, × ³: Numbers refer to Sensitivity

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

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 22-04 2 OF 2 METRIC

GWP# 6104-17-00 LOCATION Gull River Crossing; MTM 83-15: N 5 474 137.5 E 334 519.3 ORIGINATED BY IR

DIST Thunder Bay HWY 811 BOREHOLE TYPE Tripod/NQ Coring COMPILED BY AA

DATUM Geodetic DATE 2022.09.28 - 2022.09.30 LATITUDE 49.404417 LONGITUDE -89.590475 CHECKED BY MEF

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT / WATER CONTENT (%)	UNIT WEIGHT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20 40 60 80 100 O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	w_P w w_L 20 40 60	γ kN/m^3	GR SA SI CL
	Continued From Previous Page										
10.0	END OF BOREHOLE AT 10.0m. BOREHOLE CAVED TO 7.4m. BOREHOLE BACKFILLED WITH BENOTNITE HOLEPLUG TO GROUND SURFACE.										

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

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

ONTMT4S2 2020LIBRARY(MTO) - COPY.GLB MTO-34812.GPJ 9/7/23

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 22-05 1 OF 2 METRIC

GWP# 6104-17-00 LOCATION Gull River Crossing; MTM 83-15: N 5 474 131.6 E 334 518.9 ORIGINATED BY GAS

DIST Thunder Bay HWY 811 BOREHOLE TYPE Hollow Stem Augers/Wash Boring COMPILED BY AA

DATUM Geodetic DATE 2022.08.16 - 2022.08.17 LATITUDE 49.404364 LONGITUDE -89.590481 CHECKED BY MEF

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
450.8	GROUND SURFACE							20 40 60 80 100	20 40 60		
0.0	**SAND**, trace to some gravel, some silt to silty Loose to Compact Brown Dry to Moist (FILL)		1	SS	12		450	○	○		
			2	SS	12			○	○		5 83 12 (SI+CL)
			3	SS	5		449	○	○		
			4	SS	7			○	○		14 64 22 (SI+CL)
			5	SS	17	▽	448	○	○		
446.2							447				
4.6	Silty **SAND**, trace gravel, trace clay, occasional cobbles Dense to Very Dense Grey Wet		6	SS	41		446	○	○		1 65 32 2
	No recovery from SS7 due to cobbles		~~7~~	~~SS~~	~~100/~~ 0.025		445				
	Cored though cobbles from 6.1m to 6.7m						444				
442.1			8	SS	100/ 0.100		443		○		
8.7	**SILT**, some sand, trace clay, trace gravel, occasional cobbles Very Dense Grey Wet (TILL)		9	SS	100/ 0.125		442		○		
							441				

Continued Next Page

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

20 15 10 5 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 22-05 2 OF 2 METRIC

GWP# 6104-17-00 LOCATION Gull River Crossing; MTM 83-15: N 5 474 131.6 E 334 518.9 ORIGINATED BY GAS

DIST Thunder Bay HWY 811 BOREHOLE TYPE Hollow Stem Augers/Wash Boring COMPILED BY AA

DATUM Geodetic DATE 2022.08.16 - 2022.08.17 LATITUDE 49.404364 LONGITUDE -89.590481 CHECKED BY MEF

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (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
	Continued From Previous Page										
440.4											
10.4 / 440.2	**SAND** and **GRAVEL**, some cobbles (coring required to penetrate)									FI	
10.6	**BEDROCK (FOLDED TONALITE),** slightly weathered, very strong, grey/red		1	RUN			440			5	RUN #1 TCR=93% SCR=86% RQD=47% UCS=186MPa (Avg Point Load) UCS=148MPa
										4	
										3	
							439			0	RUN #2 TCR=100% SCR=94% RQD=35%
	Vertical fracture from 12.2m to 12.9m		2	RUN						3	
										6	
										4	
							438			1	
										3	RUN #3 TCR=100% SCR=100% RQD=75%
			3	RUN			437			5	
										3	
436.2										2	
										1	
14.6	END OF BOREHOLE AT 14.6m. Monitoring well installation consists of 50mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.										

WATER LEVEL READINGS

DATE	DEPTH(m)	ELEV.(m)
2022.08.17	3.4	447.4
2022.08.18	3.4	447.4

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

(%) STRAIN AT FAILURE

ONTMT4S2 2020LIBRARY(MTO) - COPY.GLB MTO-34812.GPJ 9/7/23

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 22-06 1 OF 2 METRIC

GWP# 6104-17-00 LOCATION Gull River Crossing; MTM 83-15: N 5 474 116.5 E 334 526.8 ORIGINATED BY IR

DIST Thunder Bay HWY 811 BOREHOLE TYPE Wash Boring/NQ Coring COMPILED BY AA

DATUM Geodetic DATE 2022.08.15 - 2022.08.16 LATITUDE 49.404228 LONGITUDE -89.590373 CHECKED BY MEF

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 (20 40 60 80 100): ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE	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
451.0	GROUND SURFACE										
0.0	**SAND**, some silt to silty, trace to some gravel Compact to Loose Grey and Brown Moist (FILL)		1	SS	13				○		13 59 28 (SI+CL)
	No recovery		2	SS	30		450				
			3	SS	10		449		○		
			4	SS	4				○		1 88 11 (SI+CL)
	No recovery Becoming wet		5	SS	6		448				
			6	SS	24		447		○		
445.8			7	SS	17				○		
5.2	**SAND**, some silt, trace gravel Compact Grey Wet		8	SS	15		446				
443.8							445		○		
7.2	**SILT**, trace sand, trace clay, trace gravel, occasional cobbles Dense to Very Dense Grey Wet (TILL)		9	SS	30		444				
442.2							443		○		3 10 81 6
8.8	**SAND** and **GRAVEL**, some cobbles		10	SS	100/						FI
442.0	(coring required to penetrate) Very Dense Grey Wet		1	RUN	0.025		442		○		2 >10 >10
9.0	**BEDROCK (FOLDED TONALITE),** slightly weathered, very strong										RUN #1 TCR=100% SCR=42% RQD=34%

Continued Next Page

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

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

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 22-06 2 OF 2 METRIC

GWP# 6104-17-00 LOCATION Gull River Crossing; MTM 83-15: N 5 474 116.5 E 334 526.8 ORIGINATED BY IR

DIST Thunder Bay HWY 811 BOREHOLE TYPE Wash Boring/NQ Coring COMPILED BY AA

DATUM Geodetic DATE 2022.08.15 - 2022.08.16 LATITUDE 49.404228 LONGITUDE -89.590373 CHECKED BY MEF

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Continued From Previous Page										
	BEDROCK (FOLDED TONALITE), slightly weathered, very strong, grey/red		2	RUN						8	RUN #2 TCR=100% SCR=38% RQD=26%
										1	
										8	
							440			>10	
										5	
			3	RUN						2	RUN #3 TCR=100% SCR=75% RQD=69% UCS=218MPa (Avg Point Load) UCS=71MPa
							439			3	
										5	
										1	
										2	
			4	RUN			438			3	RUN #4 TCR=100% SCR=100% RQD=69%
										2	
437.1										5	
13.9	END OF BOREHOLE AT 13.9m. Monitoring well installation consists of 50mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.										

WATER LEVEL READINGS

DATE	DEPTH(m)	ELEV.(m)
2022.08.16	3.3	447.7
2022.08.17	3.5	447.5

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

(%) STRAIN AT FAILURE

ONTMT4S2 2020LIBRARY(MTO) - COPY.GLB MTO-34812.GPJ 9/7/23

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 22-07 1 OF 2 METRIC

GWP# 6104-17-00 LOCATION Gull River Crossing; MTM 83-15: N 5 474 133.5 E 334 503.3 ORIGINATED BY GAS

DIST Thunder Bay HWY 811 BOREHOLE TYPE Hollow Stem Augers/Wash Boring/NQ Coring COMPILED BY MC

DATUM Geodetic DATE 2022.08.17 - 2022.08.17 LATITUDE 49.404382 LONGITUDE -89.590695 CHECKED BY MEF

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × 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
450.8	GROUND SURFACE										
0.0	**SAND**, some silt to silty, trace to some gravel Compact to Dense Brown Moist (FILL)		1	SS	27				○		
			2	SS	29		450		○		7 81 12 (SI+CL)
			3	SS	32		449		○		
448.1			4	SS	19				○		
2.7	Silty **SAND**, trace clay Compact Grey Wet Occasional wood fragments from 2.7m to 3.3m		5	SS	25		448		○		0 66 31 3
446.7							447				
4.1	**SAND** and **GRAVEL**, some cobbles (coring required to penetrate from 4.1m to 4.6m) Dense Grey Wet		6	SS	46		446		○		
445.2										FI	RUN #1 TCR=100% SCR=94% RQD=91% UCS=218MPa (Avg Point Load) UCS=149MPa
5.6	**BEDROCK (FOLDED TONALITE),** slightly weathered to fresh, very strong, grey/red		1	RUN			445			1 2	
							444			1 1	RUN #2 TCR=94% SCR=92% RQD=86%
			2	RUN			443			0 1	
							442			1 1	RUN #3 TCR=100% SCR=100% RQD=94%
441.0			3	RUN						0 0 0	
9.8	END OF BOREHOLE AT 9.8m.										

Continued Next Page

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

$\frac{20}{15 \oplus 5}$ (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 22-07 2 OF 2 METRIC

GWP# 6104-17-00 LOCATION Gull River Crossing; MTM 83-15: N 5 474 133.5 E 334 503.3 ORIGINATED BY GAS

DIST Thunder Bay HWY 811 BOREHOLE TYPE Hollow Stem Augers/Wash Boring/NQ Coring COMPILED BY MC

DATUM Geodetic DATE 2022.08.17 - 2022.08.17 LATITUDE 49.404382 LONGITUDE -89.590695 CHECKED BY MEF

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										
	BOREHOLE CAVED TO 0.9m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND SAND TO SURFACE.										

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

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

ONTMT4S2 2020LIBRARY(MTO) - COPY.GLB MTO-34812.GPJ 9/7/23

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 22-08 1 OF 2 METRIC

GWP# 6104-17-00 LOCATION Gull River Crossing; MTM 83-15: N 5 474 113.7 E 334 542.8 ORIGINATED BY GAS

DIST Thunder Bay HWY 811 BOREHOLE TYPE Hollow Stem Augers/Wash Boring/NQ Coring COMPILED BY MC

DATUM Geodetic DATE 2022.08.18 - 2022.08.18 LATITUDE 49.404202 LONGITUDE -89.590153 CHECKED BY MEF

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × 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/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
451.2	GROUND SURFACE										
0.0	**SAND**, some silt to silty, trace to some gravel Compact to Very Dense Brown Moist (FILL)		1	SS	18		451	○			
			2	SS	25		450	○			5 85 10 (SI+CL)
			3	SS	30	▽	449	○			
	Occasional cobbles		4	SS	100/ 0.100			○			
448.2											
3.0	Sandy **SILT**, mixed with peat and organics, trace clay, occasional wood fragments Loose to Compact Black Wet		5	SS	15		448			○	
			6	SS	9		447		○ ○		
446.7											
4.5	**SILT**, some sand, trace clay Very Dense Grey Wet (TILL)		7	SS	65		446		○		0 13 79 8
445.9											
5.3	**SAND** and **GRAVEL**, some cobbles Dense Grey Wet		8	SS	48		445				
			9	SS	32			○			
444.2											FI
7.0	**BEDROCK (FOLDED TONALITE),** slightly weathered to fresh, very strong, grey/red Vertical fractures from 7.1m to 7.2m and 8.3m to 8.4m		1	RUN			444				5 0 1 3 RUN #1 TCR=100% SCR=86% RQD=54%
							443				3 1
			2	RUN			442				2 RUN #2 TCR=100% SCR=86% RQD=73% UCS=217MPa (Avg Point Load) UCS=188MPa >10 4 3

Continued Next Page

+ ³, × ³: Numbers refer to Sensitivity

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

ONTMT4S2 2020LIBRARY(MTO) - COPY.GLB MTO-34812.GPJ 9/7/23

Ministry of Transportation
Ontario

THURBER

RECORD OF BOREHOLE No 22-08 2 OF 2 METRIC

GWP# 6104-17-00 LOCATION Gull River Crossing; MTM 83-15: N 5 474 113.7 E 334 542.8 ORIGINATED BY GAS

DIST Thunder Bay HWY 811 BOREHOLE TYPE Hollow Stem Augers/Wash Boring/NQ Coring COMPILED BY MC

DATUM Geodetic DATE 2022.08.18 - 2022.08.18 LATITUDE 49.404202 LONGITUDE -89.590153 CHECKED BY MEF

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										
441.1 / 10.1	END OF BOREHOLE AT 10.1m. BOREHOLE CAVED TO 3.1m. WATER LEVEL OBSERVED AT 1.8m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND SAND TO SURFACE.										

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

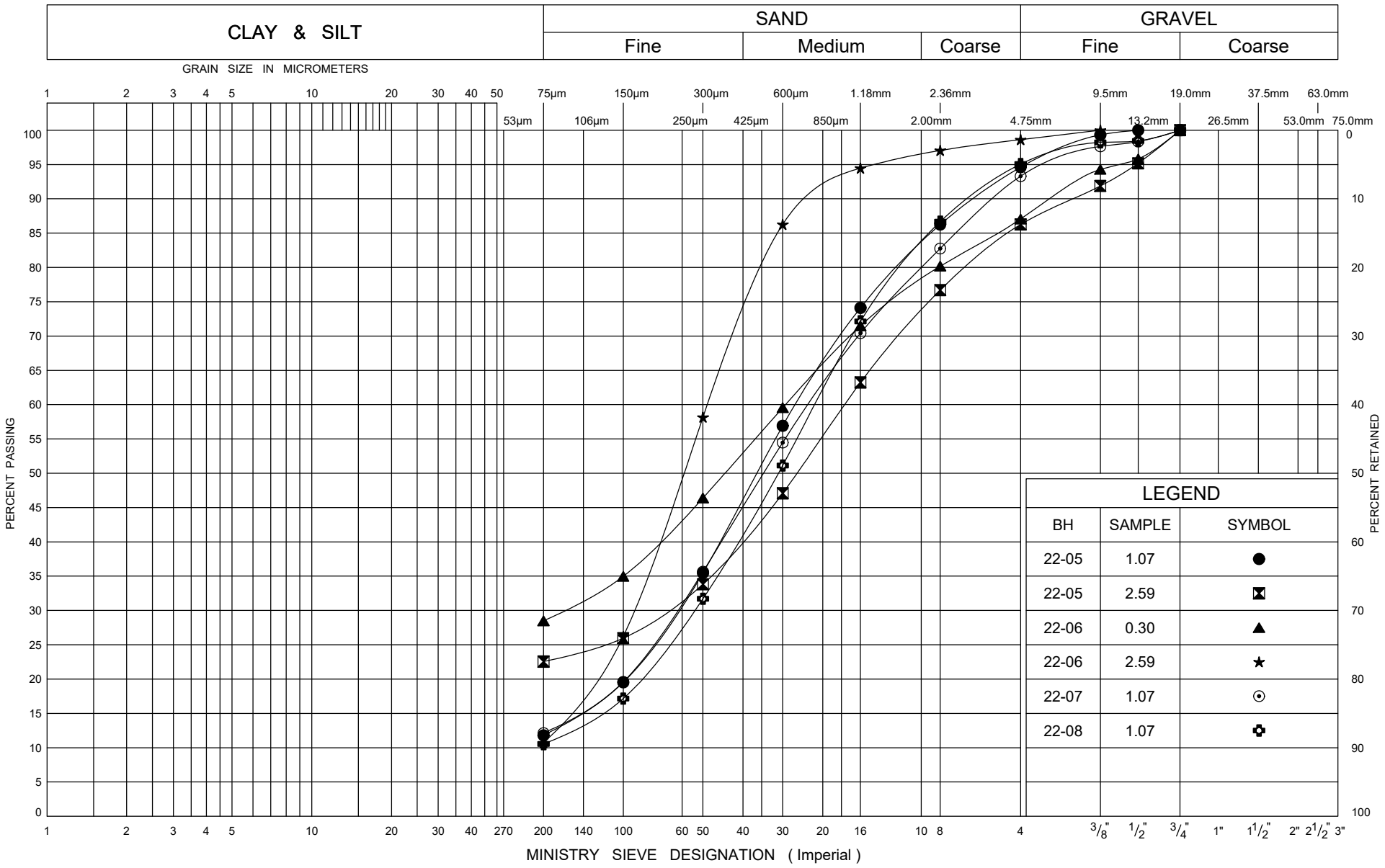
15 20 10 5 (%) STRAIN AT FAILURE

ONTMT4S2 2020LIBRARY(MTO) - COPY.GLB MTO-34812.GPJ 9/7/23

THURBER ENGINEERING LTD.

APPENDIX C

Laboratory and Well Test Results



Ministry of Transportation
Ontario

GRAIN SIZE DISTRIBUTION

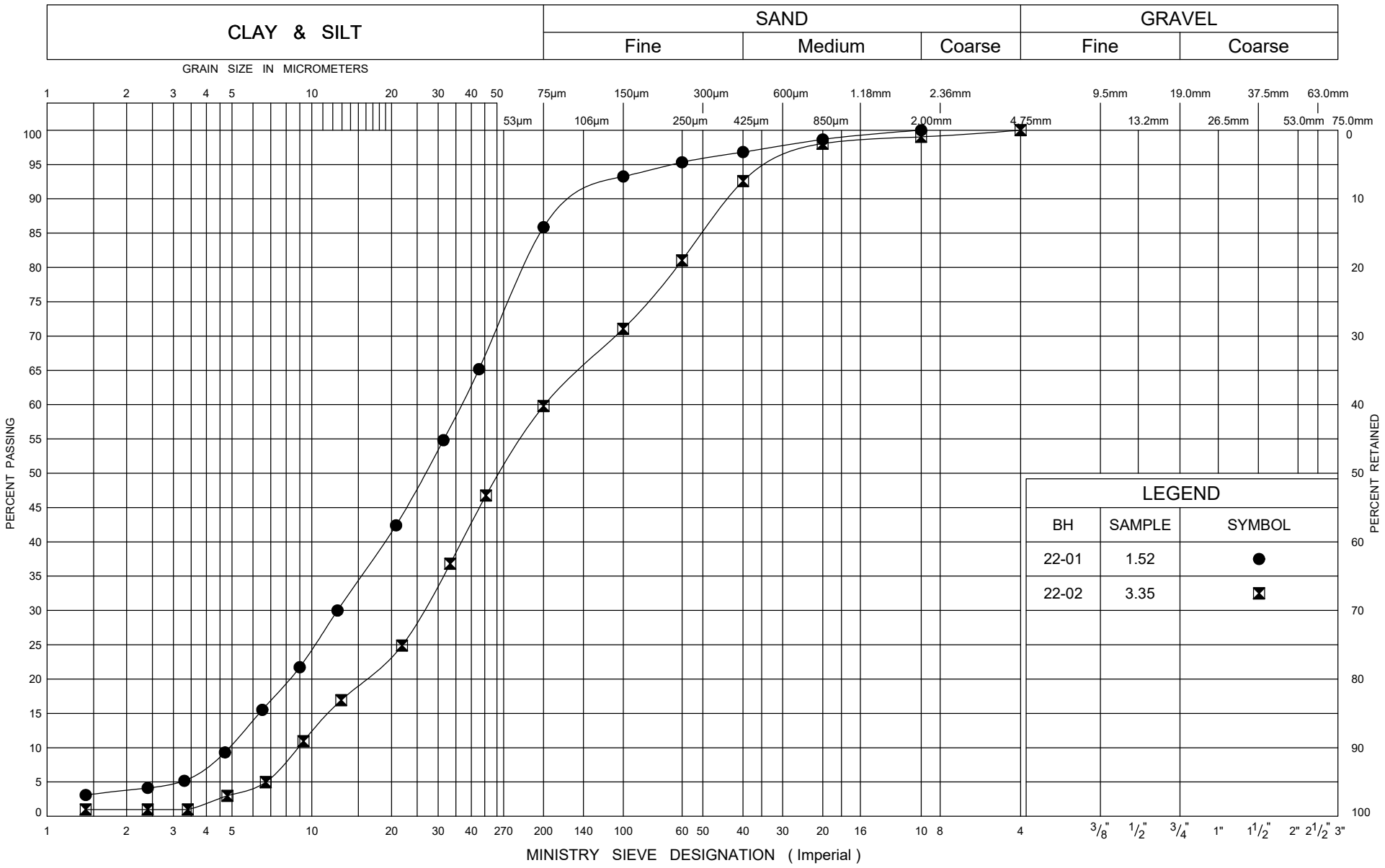
SAND FILL

FIG No C1

GWP# 6104-17-00

Gull River Crossing

ONTARIO MOT GRAIN SIZE 2 MTO-34812.GPJ ONTARIO MOT.GDT 5/15/23



Ministry of Transportation
Ontario

GRAIN SIZE DISTRIBUTION

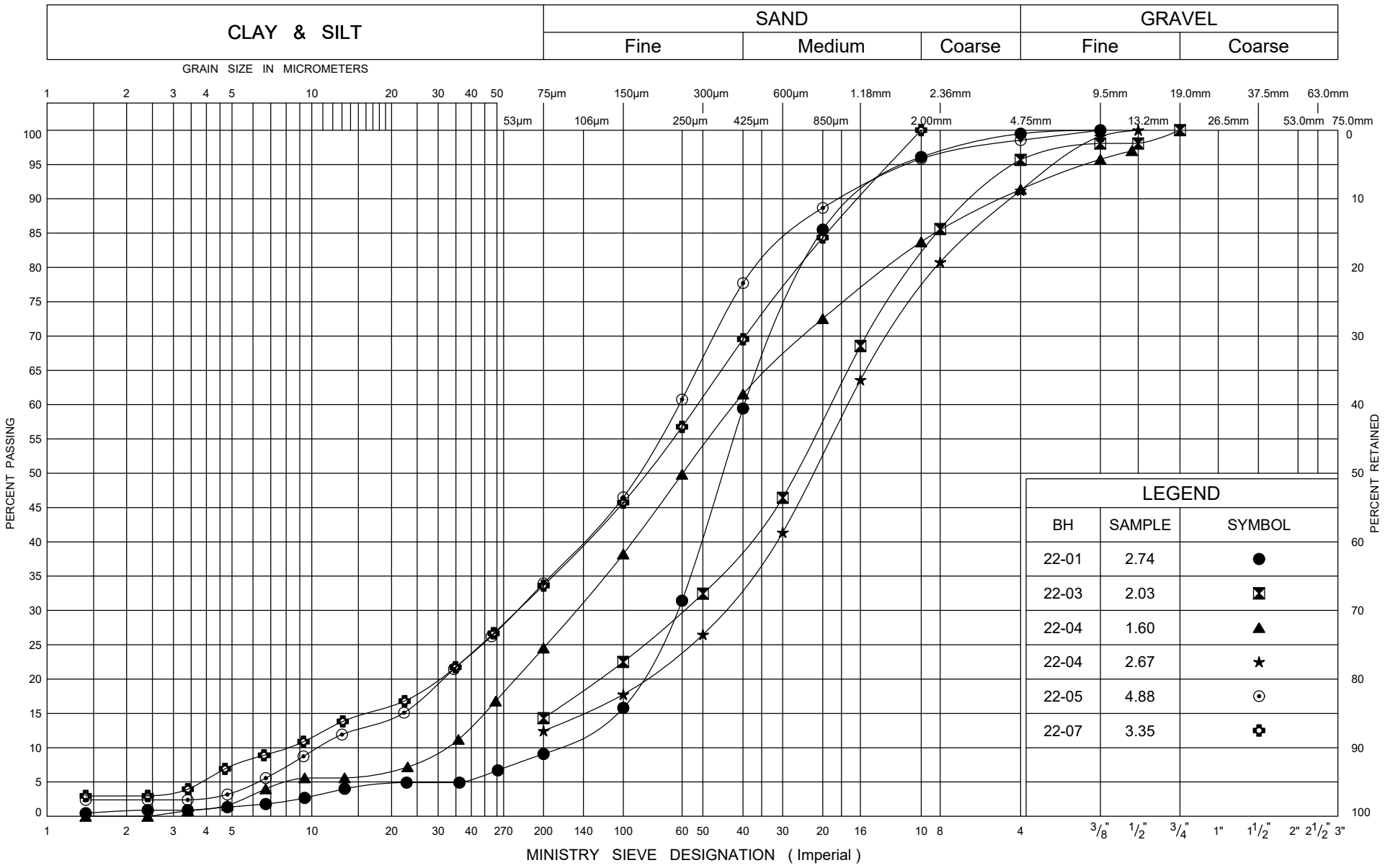
SILT Mixed With Peat and Organics

FIG No C2

GWP# 6104-17-00

Gull River Crossing

ONTARIO MOT GRAIN SIZE 2 MTO-34812.GPJ ONTARIO MOT.GDT 5/15/23



ONTARIO MOT GRAIN SIZE 2 MTO-34812.GPJ ONTARIO MOT.GDT 5/15/23

Ministry of Transportation
Ontario

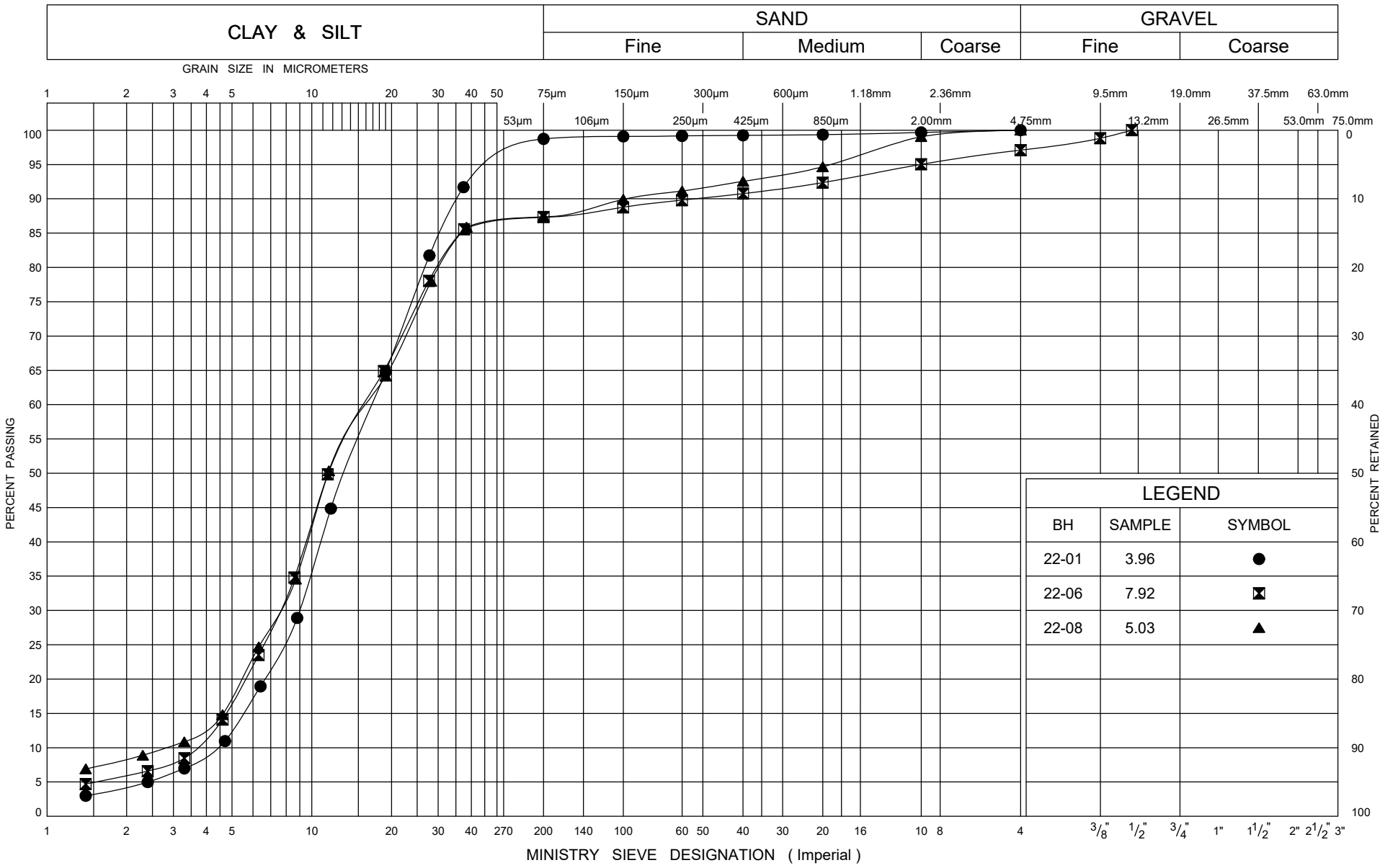
GRAIN SIZE DISTRIBUTION

SAND to Silty SAND

FIG No C3

GWP# 6104-17-00

Gull River Crossing



ONTARIO MOT GRAIN SIZE 2 MTO-34812.GPJ ONTARIO MOT.GDT 5/15/23

Ministry of Transportation
Ontario

GRAIN SIZE DISTRIBUTION

SILT TILL

FIG No C4

GWP# 6104-17-00

Gull River Crossing

THURBER ENGINEERING LTD.

POINT LOAD TEST SHEET

ASTM D5731-08

Job No:	34812	**Date Drilled:**	03-Oct-22
Client:	HATCH	**Date Tested:**	29-Oct-22
Project Name:	Gull River Culvert	**Tester:**	GA/SS
Core Size:	NQ **BH No :**	22-01	

Test No.	Run No.	Depth (m)	Axial or Diametral	Gauge (MPa)	Diameter (mm)	Length (mm)	$I_{s(50)}$ (MPa)	UCS (MPa)	Rock Type	Rock Strength (after Hoek & Brown, 1997)
2	2	6.0	A	21.1	50.3	63.4	5.5	132.2	Tonalite	Very Strong
3	2	6.4	D	25.0	50.4	108.3	9.4	224.5	Tonalite	Very Strong
4	2	6.8	A	25.0	50.7	62.1	6.6	157.8	Tonalite	Very Strong
5	3	7.3	A	25.0	49.4	57.1	7.2	171.7	Tonalite	Very Strong
6	3	7.7	D	21.6	49.0	105.0	8.4	202.8	Tonalite	Very Strong
7	3	8.0	A	13.8	49.2	68.3	3.4	82.7	Tonalite	Strong
8	3	8.2	D	25.0	49.1	105.9	9.8	234.1	Tonalite	Very Strong
9	3	8.5	A	22.7	49.1	62.2	6.1	146.6	Tonalite	Very Strong
10	4	8.8	A	25.0	48.8	73.5	5.9	142.6	Tonalite	Very Strong
11	4	8.9	D	25.0	49.0	96.0	9.8	234.9	Tonalite	Very Strong
12										
13					**RUN #2 (AVERAGE) =**			**171.5**	**MPa**	**Very Strong**
14					**RUN #3 (AVERAGE) =**			**167.6**	**MPa**	**Very Strong**
15					**RUN #4 (AVERAGE) =**			**188.7**	**MPa**	**Very Strong**
16										
17										
18										
19										
20										

THURBER ENGINEERING LTD.

POINT LOAD TEST SHEET

ASTM D5731-08

Job No:	34812	**Date Drilled:**	01-Oct-22
Client:	HATCH	**Date Tested:**	28-Oct-22
Project Name:	Gull River Culvert	**Tester:**	GA/SS
Core Size:	NQ **BH No :**	22-02	

Test No.	Run No.	Depth (m)	Axial or Diametral	Gauge (MPa)	Diameter (mm)	Length (mm)	$I_{s(50)}$ (MPa)	UCS (MPa)	Rock Type	Rock Strength (after Hoek & Brown, 1997)
1	1	4.5	A	24.2	48.2	66.0	6.3	151.8	Tonalite	Very Strong
2	1	4.9	D	14.7	49.0	110.6	5.7	137.8	Tonalite	Very Strong
3	2	5.2	D	25.0	48.4	131.4	10.0	239.0	Tonalite	Very Strong
4	2	5.4	A	10.0	48.6	68.8	2.5	60.0	Tonalite	Strong
5	2	5.5	D	17.0	48.1	160.0	6.8	163.9	Tonalite	Very Strong
6	2	5.7	A	19.8	48.2	65.1	5.2	125.4	Tonalite	Very Strong
7	3	6.5	A	18.6	48.7	77.7	4.2	101.7	Tonalite	Very Strong
8	3	6.5	D	16.8	48.8	128.9	6.6	158.5	Tonalite	Very Strong
9	4	8.3	D	23.5	48.8	119.4	9.2	221.7	Tonalite	Very Strong
10	4	8.4	A	15.7	48.9	69.3	3.9	93.7	Tonalite	Strong
11										
12					**RUN #1 (AVERAGE) =**			**144.8**	**MPa**	**Very Strong**
13					**RUN #2 (AVERAGE) =**			**147.1**	**MPa**	**Very Strong**
14					**RUN #3 (AVERAGE) =**			**130.1**	**MPa**	**Very Strong**
15					**RUN #4 (AVERAGE) =**			**157.7**	**MPa**	**Very Strong**
16										
17										
18										
19										
20										

THURBER ENGINEERING LTD.

POINT LOAD TEST SHEET

ASTM D5731-08

Job No:	34812	**Date Drilled:**	27-Sep-22
Client:	HATCH	**Date Tested:**	28-Oct-22
Project Name:	Gull River Culvert	**Tester:**	EA
Core Size:	NQ **BH No :**	22-03	

Test No.	Run No.	Depth (m)	Axial or Diametral	Gauge (MPa)	Diameter (mm)	Length (mm)	$I_{s(50)}$ (MPa)	UCS (MPa)	Rock Type	Rock Strength (after Hoek & Brown, 1997)
1	1	2.9	D	18.5	49.1	106.4	7.2	173.4	Tonalite	Very Strong
2	1	3.2	A	25.0	48.7	64.0	6.6	158.9	Tonalite	Very Strong
3	1	3.4	D	23.8	48.5	154.2	9.5	227.1	Tonalite	Very Strong
4	2	3.7	D	25.0	48.9	96.5	9.8	235.5	Tonalite	Very Strong
5	2	3.8	A	25.0	49.0	65.1	6.5	156.2	Tonalite	Very Strong
6	2	4.1	D	25.0	48.5	138.2	9.9	238.3	Tonalite	Very Strong
7	2	4.3	A	25.0	48.6	65.6	6.5	156.3	Tonalite	Very Strong
8	3	4.4	A	12.2	48.7	56.7	3.6	85.5	Tonalite	Strong
9	3	4.7	D	19.7	48.9	80.1	7.7	185.5	Tonalite	Very Strong
10	3	5.2	A	23.6	49.1	62.6	6.3	151.5	Tonalite	Very Strong
11	3	5.4	D	25.0	49.2	144.1	9.7	233.3	Tonalite	Very Strong
12										
13					**RUN #1 (AVERAGE) =**			**186.5**	**MPa**	**Very Strong**
14					**RUN #2 (AVERAGE) =**			**196.6**	**MPa**	**Very Strong**
15					**RUN #3 (AVERAGE) =**			**163.9**	**MPa**	**Very Strong**
16										
17										
18										
19										
20										

THURBER ENGINEERING LTD.

POINT LOAD TEST SHEET

ASTM D5731-08

Job No:	34812	**Date Drilled:**	30-Sep-22
Client:	HATCH	**Date Tested:**	28-Oct-22
Project Name:	Gull River Culvert	**Tester:**	EA
Core Size:	NQ **BH No :**	22-04	

Test No.	Run No.	Depth (m)	Axial or Diametral	Gauge (MPa)	Diameter (mm)	Length (mm)	$I_{s(50)}$ (MPa)	UCS (MPa)	Rock Type	Rock Strength (after Hoek & Brown, 1997)
1	1	8.2	A	25.0	47.6	48.5	8.4	200.9	Tonalite	Very Strong
2	1	8.4	A	25.0	50.3	48.6	8.0	192.0	Tonalite	Very Strong
3	1	8.7	D	25.0	50.4	48.4	9.4	224.5	Tonalite	Very Strong
4	2	9.2	D	25.0	50.7	49.2	9.3	222.5	Tonalite	Very Strong
5	3	9.7	A	25.0	49.4	49.5	8.0	191.8	Tonalite	Very Strong
6	3	9.8	D	25.0	49.0	49.4	9.8	234.5	Tonalite	Very Strong
7										
8					**RUN #1 (AVERAGE) =**			**205.8**	**MPa**	**Very Strong**
9					**RUN #1 (AVERAGE) =**			**222.5**	**MPa**	**Very Strong**
10					**RUN #1 (AVERAGE) =**			**213.2**	**MPa**	**Very Strong**
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

THURBER ENGINEERING LTD.

POINT LOAD TEST SHEET

ASTM D5731-08

Job No:	34812	**Date Drilled:**	16-Aug-22
Client:	HATCH	**Date Tested:**	01-Dec-22
Project Name:	Gull River Culvert	**Tester:**	AK
Core Size:	NQ **BH No :**	22-05	

Test No.	Run No.	Depth (m)	Axial or Diametral	Gauge (MPa)	Diameter (mm)	Length (mm)	$I_{s(50)}$ (MPa)	UCS (MPa)	Rock Type	Rock Strength (after Hoek & Brown, 1997)
1	1	10.9	D	18.6	47.6	33.3	7.6	183.1	Tonalite	Very Strong
2	1	11.3	D	19.1	47.6	38.3	7.8	188.0	Tonalite	Very Strong
3										
4						**RUN #1 AVERAGE =**		**185.5**	**MPa**	**Very Strong**
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

THURBER ENGINEERING LTD.

POINT LOAD TEST SHEET

ASTM D5731-08

Job No:	34812	**Date Drilled:**	15-Aug-22
Client:	HATCH	**Date Tested:**	01-Dec-22
Project Name:	Gull River Culvert	**Tester:**	AK
Core Size:	**BH No :** 22-06		

Test No.	Run No.	Depth (m)	Axial or Diametral	Gauge (MPa)	Diameter (mm)	Length (mm)	$I_{s(50)}$ (MPa)	UCS (MPa)	Rock Type	Rock Strength (after Hoek & Brown, 1997)
1	3	11.6	D	19.5	47.4	37.9	8.0	192.8	Tonalite	Very Strong
2	3	12.2	D	25.0	47.8	36.1	10.2	244.0	Tonalite	Very Strong
3										
4					**RUN #3 AVERAGE =**			**218.4**	**MPa**	**Very Strong**
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

THURBER ENGINEERING LTD.

POINT LOAD TEST SHEET

ASTM D5731-08

Job No:	34812	**Date Drilled:**	17-Aug-22
Client:	HATCH	**Date Tested:**	01-Dec-22
Project Name:	Gull River Culvert	**Tester:**	AK
Core Size:	**BH No :** 22-07		

Test No.	Run No.	Depth (m)	Axial or Diametral	Gauge (MPa)	Diameter (mm)	Length (mm)	$I_{s(50)}$ (MPa)	UCS (MPa)	Rock Type	Rock Strength (after Hoek & Brown, 1997)
1	1	6.0	D	23.7	47.7	39.8	9.7	232.0	Tonalite	Very Strong
2	1	6.3	D	20.8	47.8	37.9	8.5	203.0	Tonalite	Very Strong
3										
4					**RUN #1 AVERAGE =**			**217.5**	**MPa**	**Very Strong**
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

THURBER ENGINEERING LTD.

POINT LOAD TEST SHEET

ASTM D5731-08

Job No:	34812	**Date Drilled:**	18-Aug-22
Client:	HATCH	**Date Tested:**	01-Dec-22
Project Name:	Gull River Culvert	**Tester:**	AK
Core Size:	**BH No :** 22-08		

Test No.	Run No.	Depth (m)	Axial or Diametral	Gauge (MPa)	Diameter (mm)	Length (mm)	$I_{s(50)}$ (MPa)	UCS (MPa)	Rock Type	Rock Strength (after Hoek & Brown, 1997)
1	2	9.1	D	22.8	47.6	33.1	9.3	223.9	Tonalite	Very Strong
2	2	9.3	D	21.3	47.5	36.1	8.7	209.9	Tonalite	Very Strong
3										
4					**RUN #2 AVERAGE =**			**216.9**	**MPa**	**Very Strong**
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

THURBER ENGINEERING LTD.

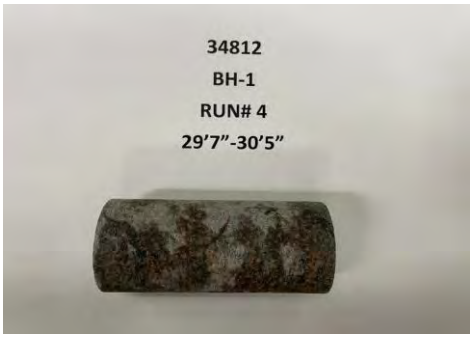
UNCONFINED COMPRESSION TEST REPORT

ASTM D7012-14

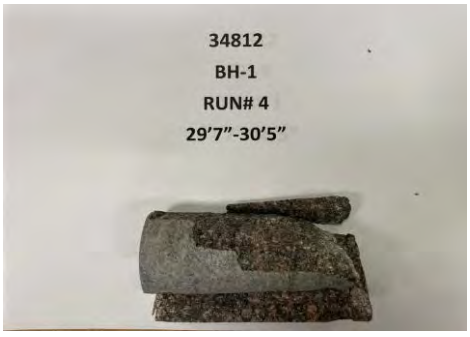
CLIENT:	HATCH	FILE NUMBER:	34812
PROJECT NAME:	Gull River Culvert	REPORT DATE:	7-Sep-23
BOREHOLE No.:	22-01	TEST DATE:	13-Dec-22
SAMPLE No.:	Run 4		
SAMPLE DEPTH:	29'7" - 30'5"		
DESCRIPTION:	Tonalite		

Avg. Height (cm):	10.8	Weight (g):	537.9
Avg. Diameter (cm):	4.9	Wet Density (kg/m^3):	2,641
H. to Dia. Ratio**:	2.2:1	Dry Density (kg/m^3):	2,641
Cross Sectional Area (cm^2):	18.86	Moisture Content* (%):	N/A
Sample Volume (cm^3):	203.66		

ORIGINAL SPECIMEN



FRACTURED SPECIMEN



AVG. RATE OF STRAIN TO FAILURE:	0.250	MPa/s
MAXIMUM COMPRESSIVE LOAD:	162.8	kN
UNCONFINED COMPRESSIVE STRENGTH:	87.1	MPa

Note: * The moisture content was obtained before the test.
** Dimensions of Specimen conform to ASTM D 4543-04.

TEST DONE BY: AK
REVIEWED BY: WM

THURBER ENGINEERING LTD.

UNCONFINED COMPRESSION TEST REPORT

ASTM D7012-14

CLIENT:	HATCH	FILE NUMBER:	34812
PROJECT NAME:	Gull River Culvert	REPORT DATE:	7-Sep-23
BOREHOLE No.:	22-04	TEST DATE:	13-Dec-22
SAMPLE No.:	Run 2		
SAMPLE DEPTH:	30'4" - 30'11"		
DESCRIPTION:	Tonalite		

Avg. Height (cm):	10.2	Weight (g):	503.0
Avg. Diameter (cm):	4.8	Wet Density (kg/m^3):	2,725
H. to Dia. Ratio**:	2.1:1	Dry Density (kg/m^3):	2,725
Cross Sectional Area (cm^2):	18.10	Moisture Content* (%):	N/A
Sample Volume (cm^3):	184.57		

ORIGINAL SPECIMEN

FRACTURED SPECIMEN

AVG. RATE OF STRAIN TO FAILURE:	0.250	MPa/s
MAXIMUM COMPRESSIVE LOAD:	382.4	kN
UNCONFINED COMPRESSIVE STRENGTH:	208.7	MPa

Note: * The moisture content was obtained before the test.
** Dimensions of Specimen conform to ASTM D 4543-04.

TEST DONE BY: AK
REVIEWED BY: WM

THURBER ENGINEERING LTD.

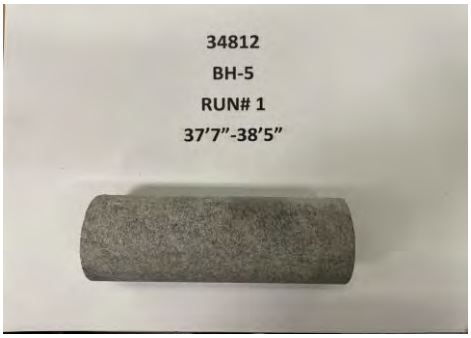
UNCONFINED COMPRESSION TEST REPORT

ASTM D7012-14

CLIENT:	HATCH	FILE NUMBER:	34812
PROJECT NAME:	Gull River Culvert	REPORT DATE:	7-Sep-23
BOREHOLE No.:	22-05	TEST DATE:	13-Dec-22
SAMPLE No.:	Run 1		
SAMPLE DEPTH:	37'7" - 38'5"		
DESCRIPTION:	Tonalite		

Avg. Height (cm):	13.2	Weight (g):	616.3
Avg. Diameter (cm):	4.7	Wet Density (kg/m^3):	2,640
H. to Dia. Ratio**:	2.8:1	Dry Density (kg/m^3):	2,640
Cross Sectional Area (cm^2):	17.68	Moisture Content* (%):	N/A
Sample Volume (cm^3):	233.42		

ORIGINAL SPECIMEN



FRACTURED SPECIMEN

AVG. RATE OF STRAIN TO FAILURE:	0.250	MPa/s
MAXIMUM COMPRESSIVE LOAD:	262.9	kN
UNCONFINED COMPRESSIVE STRENGTH:	148.4	MPa

Note: * The moisture content was obtained before the test.
** Dimensions of Specimen do not conform to ASTM D 4543-04.

TEST DONE BY: AK
REVIEWED BY: WM

THURBER ENGINEERING LTD.

UNCONFINED COMPRESSION TEST REPORT

ASTM D7012-14

CLIENT:	HATCH	FILE NUMBER:	34812
PROJECT NAME:	Gull River Culvert	REPORT DATE:	7-Sep-23
BOREHOLE No.:	22-06	TEST DATE:	13-Dec-22
SAMPLE No.:	Run 3		
SAMPLE DEPTH:	36.6-41.6		
DESCRIPTION:	Tonalite		

Avg. Height (cm):	13.2	Weight (g):	610.6
Avg. Diameter (cm):	4.7	Wet Density (kg/m^3):	2,666
H. to Dia. Ratio**:	2.8:1	Dry Density (kg/m^3):	2,666
Cross Sectional Area (cm^2):	17.35	Moisture Content* (%):	N/A
Sample Volume (cm^3):	229.01		

ORIGINAL SPECIMEN

34812
BH-6
RUN# 3
38'2" - 38'9'

FRACTURED SPECIMEN

AVG. RATE OF STRAIN TO FAILURE:	0.250	MPa/s
MAXIMUM COMPRESSIVE LOAD:	125.5	kN
UNCONFINED COMPRESSIVE STRENGTH:	71.1	MPa

Note: * The moisture content was obtained before the test.
** Dimensions of Specimen do not conform to ASTM D 4543-04.

TEST DONE BY: AK
REVIEWED BY: WM

THURBER ENGINEERING LTD.

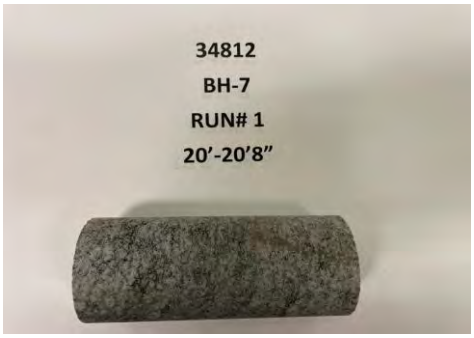
UNCONFINED COMPRESSION TEST REPORT

ASTM D7012-14

CLIENT:	HATCH	FILE NUMBER:	34812
PROJECT NAME:	Gull River Culvert	REPORT DATE:	7-Sep-23
BOREHOLE No.:	22-07	TEST DATE:	13-Dec-22
SAMPLE No.:	Run 1		
SAMPLE DEPTH:	20' - 20'8"		
DESCRIPTION:	Tonalite		

Avg. Height (cm):	11.4	Weight (g):	547.4
Avg. Diameter (cm):	4.8	Wet Density (kg/m^3):	2,654
H. to Dia. Ratio**:	2.4:1	Dry Density (kg/m^3):	2,654
Cross Sectional Area (cm^2):	18.10	Moisture Content* (%):	N/A
Sample Volume (cm^3):	206.29		

ORIGINAL SPECIMEN



FRACTURED SPECIMEN

AVG. RATE OF STRAIN TO FAILURE:	0.250	MPa/s
MAXIMUM COMPRESSIVE LOAD:	263.6	kN
UNCONFINED COMPRESSIVE STRENGTH:	148.8	MPa

Note: * The moisture content was obtained before the test.
** Dimensions of Specimen conform to ASTM D 4543-04.

TEST DONE BY: AK
REVIEWED BY: WM

THURBER ENGINEERING LTD.

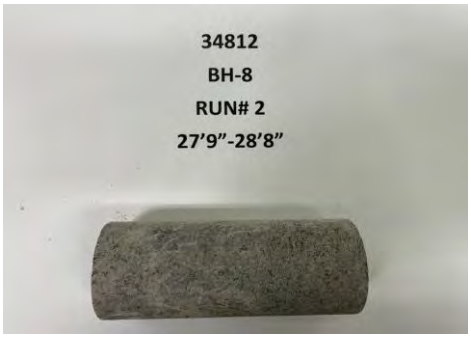
UNCONFINED COMPRESSION TEST REPORT

ASTM D7012-14

CLIENT:	HATCH	FILE NUMBER:	34812
PROJECT NAME:	Gull River Culvert	REPORT DATE:	7-Sep-23
BOREHOLE No.:	22-08	TEST DATE:	13-Dec-22
SAMPLE No.:	Run 2		
SAMPLE DEPTH:	27'9" - 28'8"		
DESCRIPTION:	Tonalite		

Avg. Height (cm):	11.9	Weight (g):	559.3
Avg. Diameter (cm):	4.8	Wet Density (kg/m^3):	2,597
H. to Dia. Ratio**:	2.5:1	Dry Density (kg/m^3):	2,597
Cross Sectional Area (cm^2):	18.10	Moisture Content* (%):	N/A
Sample Volume (cm^3):	215.34		

ORIGINAL SPECIMEN



FRACTURED SPECIMEN

AVG. RATE OF STRAIN TO FAILURE:	0.250	MPa/s
MAXIMUM COMPRESSIVE LOAD:	333.5	kN
UNCONFINED COMPRESSIVE STRENGTH:	188.2	MPa

Note: * The moisture content was obtained before the test.
** Dimensions of Specimen conform to ASTM D 4543-04.

TEST DONE BY: AK
REVIEWED BY: WM

THURBER ENGINEERING LTD.

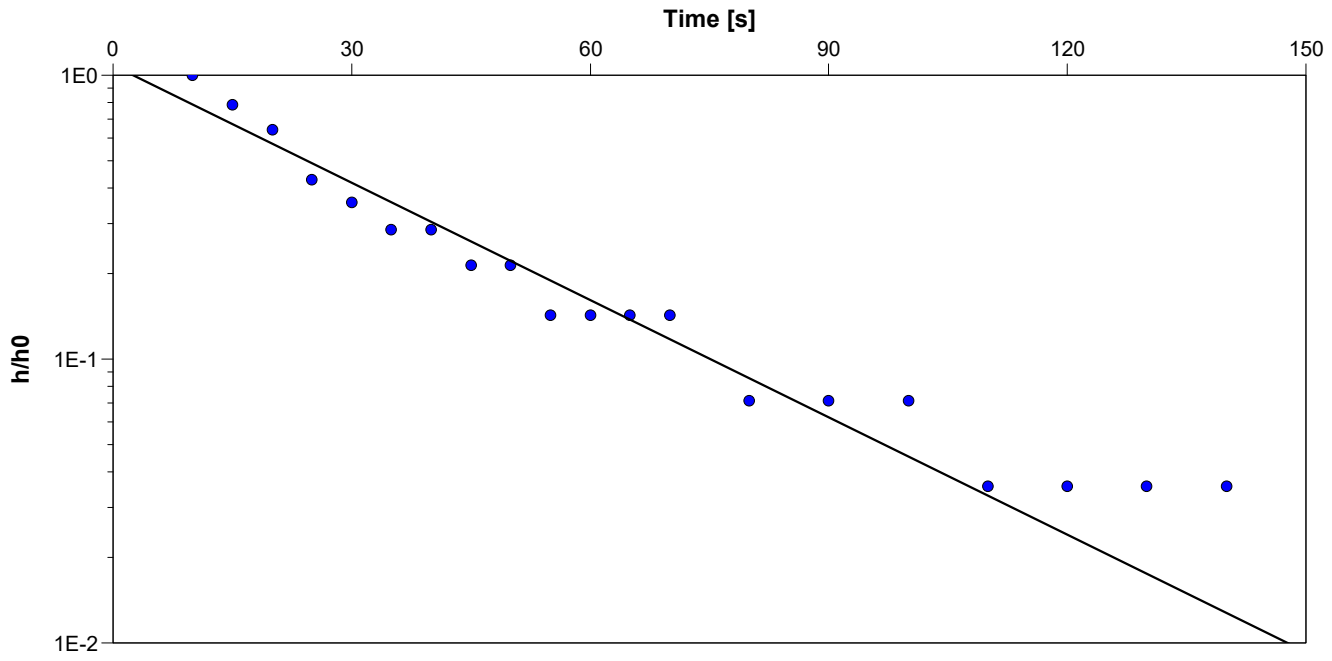
Slug Test Analysis Report

Project: Gull River Culvert Replacements

Number: 34812

Client: Hatch

Location: Highway 811	Slug Test: 22-05	Test Well: 22-05
Test Conducted by: GS		Test Date: 2022-08-18
Analysis Performed by: PC	22-05 SWRT analysis	Analysis Date: 2022-11-30
Aquifer Thickness:		
		Checked by: AH



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
22-05	2.8×10^{-5}	

THURBER ENGINEERING LTD.

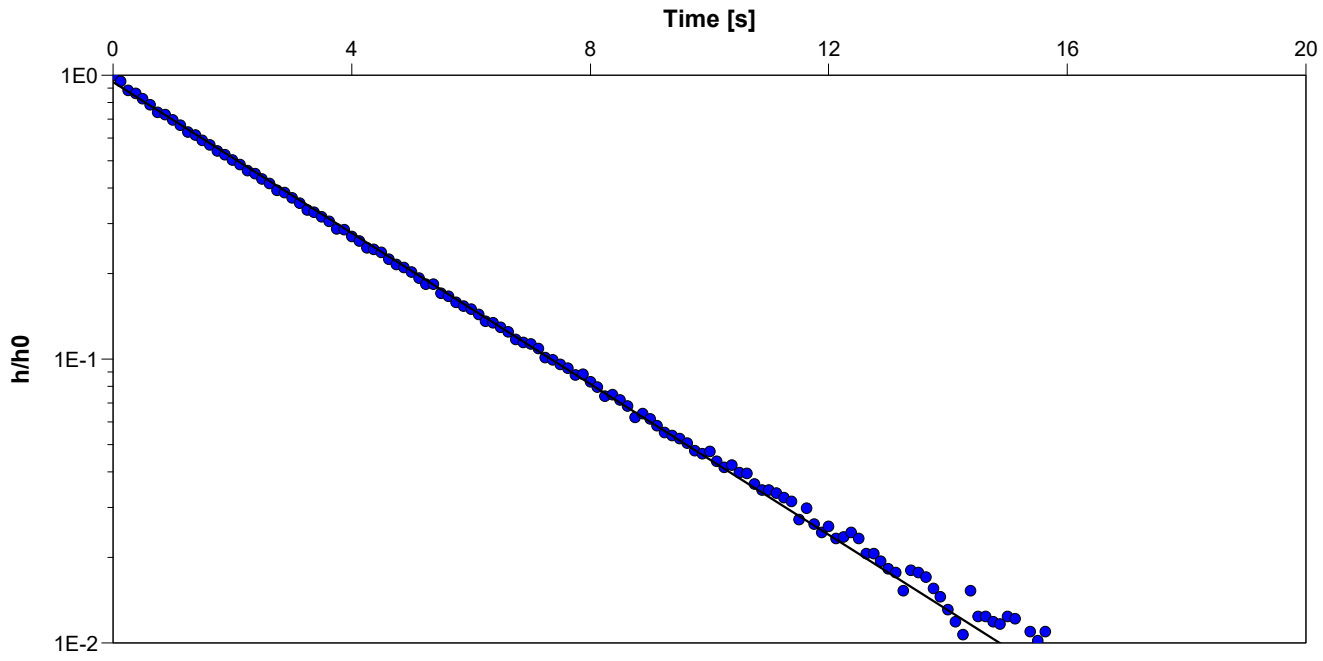
Slug Test Analysis Report

Project: Gull River Culvert Replacements

Number: 34812

Client: Hatch

Location: Highway 811	Slug Test: 22-06	Test Well: 22-06
Test Conducted by: GS		Test Date: 2022-08-17
Analysis Performed by: PC	22-06 SWRT Analysis	Analysis Date: 2022-11-30
Aquifer Thickness:		
		Checked by: AH



Calculation using Hvorslev

Observation Well	Hydraulic Conductivity [m/s]	
22-06	2.7×10^{-4}	

FINAL REPORT

CA40070-OCT22 R1

34812, Gull River, ON

Prepared for

Thurber Engineering Ltd.

FINAL REPORT

First Page

CLIENT DETAILS

Client	Thurber Engineering Ltd.
Address	103, 2010 Winston Park Drive Oakville, ON L6H 5R7. Canada
Contact	Rachel Bourassa
Telephone	905-829-8666 x 263
Facsimile	
Email	rbourassa@thurber.ca
Project	34812, Gull River, ON
Order Number	
Samples	Soil (2)

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	CA40070-OCT22
Received	10/12/2022
Approved	10/28/2022
Report Number	CA40070-OCT22 R1
Date Reported	10/28/2022

COMMENTS

Temperature of Sample upon Receipt: 9 degrees C
Cooling Agent Present: Yes
Custody Seal Present: Yes

Chain of Custody Number: 033414

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

TABLE OF CONTENTS

Client: Thurber Engineering Ltd.
Project: 34812, Gull River, ON
Project Manager: Rachel Bourassa
Samplers: GS

MATRIX: SOIL

Sample Number	5	6
Sample Name	22-05 SS3 (7'-9')	22-06 SS6 (12.5'-14.5')
Sample Matrix	Soil	Soil
Sample Date	16/08/2022	15/08/2022

Parameter	Units	RL		Result	Result
Corrosivity Index					
Corrosivity Index	none	1		3	4
Soil Redox Potential	mV	no		268	289
Sulphide (Na2CO3)	%	0.04		< 0.04	< 0.04
pH	pH Units	0.05		9.10	8.95
Resistivity (calculated)	ohms.cm	-9999		13900	10800
General Chemistry					
Conductivity	uS/cm	2		72	93
Metals and Inorganics					
Moisture Content	%	0.1		4.2	15.2
Sulphate	µg/g	10		< 10	< 10
Other (ORP)					
Chloride	µg/g	10		< 10	< 10

QC SUMMARY

Anions by IC

Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-[ENV]IC-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	DIO0244-OCT22	µg/g	10	<0.4	23	35	102	80	120	109	75	125
Sulphate	DIO0244-OCT22	µg/g	10	<0.4	10	35	96	80	120	95	75	125

Carbon/Sulphur

Method: ASTM E1915-07A | Internal ref.: ME-CA-[ENV]ARD-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)	ECS0036-OCT22	%	0.04	< 0.04	ND	20	120	80	120			

Conductivity

Method: SM 2510 | Internal ref.: ME-CA-[ENV]EWL-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	EWL0306-OCT22	uS/cm	2	< 2	0	20	100	90	110	NA		

QC SUMMARY

pH

Method: SM 4500 I Internal ref.: ME-CA-[ENV]EWL-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	EWL0306-OCT22	pH Units	0.05	NA	0		100			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.

This report supersedes all previous versions.

-- End of Analytical Report --

Request for Laboratory Services and CHAIN OF CUSTODY

SGS Industries & Environment - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

No: 033414
Page 1 of 1

Laboratory Information Section - Lab use only

Received By: Scott L
Received Date: 08/17/2022 (mm/dd/yy)
Received Time: 08:00 (hr : min)
Received By (signature): S
Custody Seal Present: Yes ☑ No ☐
Custody Seal Intact: Yes ☑ No ☐
Cooling Agent Present: Yes ☑ No ☐ Type: Ice
Temperature Upon Receipt (°C): 9.2 x 2
LAB LIMS #: Oct 12th CA 40070

REPORT INFORMATION
Company: Thurber Engineering LTD
Contact: Rachel Bourassa
Address: 2010 Winston Park Dr. #103, Oakville, ON L6H5R7
Phone: 416-523-1015
Fax:
Email: rbourassa@thurber.ca

INVOICE INFORMATION
☑ (same as Report Information)
Company:
Contact:
Address:
Phone:
Email:

Quotation #:
P.O. #:
Project #: 34812
Site Location/ID: Gull River, ON

TURNAROUND TIME (TAT) REQUIRED
☑ Regular TAT (5-7days)
TAT's are quoted in business days (exclude statutory holidays & weekends).
Samples received after 6pm or on weekends: TAT begins next business day
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

REGULATIONS
☐ O.Reg 153/04 ☑ O.Reg 406/19
☐ Table 1 ☐ Res/Park Soil Texture: ☐ Coarse
☐ Table 2 ☐ Ind/Com ☐ Medium/Fine
☐ Table 3 ☐ Agri/Other
☐ 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

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX
1	22-05 SS3 (7'-9')	Aug 16/2022	-	1	Soil
2	22-06 SS6 (12.5'-14.5')	Aug 15/2022	-	1	Soil
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

	M & I				SVOC		PCB	PHC		VOC		Pest	Other (please specify)							SPLP	TCLP	
	Field Filtered (Y/N)	Metals & Inorganics incl CrVI, CN, Hg pH,(B(HWS),EC,SAR–soil) (Cl, Na–water)	Full Metals Suite (CP metals plus B(HWS-soil only) Hg, CrVI	ICP Metals only Sb,As,Ba,Be,B,Cd, Cr,Co,Cu,Pb,Mo,Ni,Se,Ag,Tl,U,V,Zn	PAHs only	SVOCs all incl PAHs, ABNs, CPs	PCBs Total ☐ Aroclor ☐	F1-F4 + BTEX	F1-F4 only no BTEX	VOCs all incl BTEX	BTEX only	Pesticides Organochlorine or specify other	* Note below				Sewer Use: Specify pkg:	Water Characterization Pkg General ☐ Extended ☐	Specify tests	Specify tests	COMMENTS:
													* Corrosivity							☐ Metals ☐ VOC ☐ 1,4-Dioxane ☐ OCP ☐ ABN	☐ M&I ☐ VOC ☐ PCB ☐ B(a)P ☐ ABN ☐ Ignit.	
1													✓									
2													✓									

Observations/Comments/Special Instructions
*Include For Corrosivity: PH, Solvable Sulphates, Chloride, resistivity, and electrical conductivity

Sampled By (NAME): GS
Signature: GS
Date: 08 / 16 / 2022 (mm/dd/yy)

Relinquished by (NAME): Rachel Bourassa
Signature: Rachel Bourassa
Date: 10 / 11 / 2022 (mm/dd/yy)

Pink Copy - Client
Yellow & White Copy - SGS

Revision #: 1.6
Date of Issue: 02 May 2022

FINAL REPORT

CA40224-AUG22 R

34812, Gull River Cuvert

Prepared for

Thurber Engineering Ltd.

FINAL REPORT

CA40224-AUG22 R

First Page

CLIENT DETAILS		LABORATORY DETAILS	
Client	Thurber Engineering Ltd.	Project Specialist	Jill Campbell, B.Sc.,GISAS
		Laboratory	SGS Canada Inc.
Address	103, 2010 Winston Park Drive Oakville, ON L6H 5R7. Canada	Address	185 Concession St., Lakefield ON, K0L 2H0
Contact	Rachel Bourassa	Telephone	2165
Telephone	905-829-8666 x 263	Facsimile	705-652-6365
Facsimile		Email	jill.campbell@sgs.com
Email	rbourassa@thurber.ca	SGS Reference	CA40224-AUG22
Project	34812, Gull River Cuvert	Received	08/23/2022
Order Number		Approved	08/30/2022
Samples	Surface Water (1)	Report Number	CA40224-AUG22 R
		Date Reported	08/30/2022

COMMENTS

Temperature of Sample upon Receipt: 9 degrees C
Cooling Agent Present: Yes
Custody Seal Present: Yes

Chain of Custody Number: 033177

SIGNATORIES

Jill Campbell, B.Sc.,GISAS

TABLE OF CONTENTS

FINAL REPORT

CA40224-AUG22 R

Client: Thurber Engineering Ltd.
Project: 34812, Gull River Cuvert
Project Manager: Rachel Bourassa
Samplers: Greg Stanhope

MATRIX: WATER

Sample Number	6
Sample Name	Gull River SW
Sample Matrix	Surface Water
Sample Date	18/08/2022

Parameter	Units	RL		Result
General Chemistry				
Conductivity	uS/cm	2		85
Redox Potential	mV	no		251
Metals and Inorganics				
Sulphate	mg/L	0.04		<0.04
Other (ORP)				
pH	No unit	0.05		7.66
Chloride	mg/L	0.04		0.57

QC SUMMARY

Anions by IC

Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-[ENV]IC-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	DIO0664-AUG22	mg/L	0.04	<0.04	5	20	96	90	110	101	75	125
Sulphate	DIO0664-AUG22	mg/L	0.04	<0.04	12	20	93	90	110	90	75	125

Conductivity

Method: SM 2510 | Internal ref.: ME-CA-[ENV]EWL-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	EWL0463-AUG22	uS/cm	2	2	0	20	99	90	110	NA		

pH

Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-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
pH	EWL0463-AUG22	No unit	0.05	NA	0		100			NA		

QC SUMMARY

Redox Potential

Method: SM 2580 I

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
Redox Potential	EWL0452-AUG22	mV	no	NA	0	20	100	80	120	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.

This report supersedes all previous versions.

-- End of Analytical Report --

Request for Laboratory Services and CHAIN OF CUSTODY

SGS Industries & Environment - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

No: 033177 Page ____ of ____

Laboratory Information Section - Lab use only

Received By: Scott Ker
Received Date: 08/23/2022 (mm/dd/yy)
Received Time: 09:15 (hr : min)
Received By (signature): S
Custody Seal Present: Yes ☑ No ☐
Custody Seal Intact: Yes ☑ No ☐
Cooling Agent Present: Yes ☑ No ☐ Type: ice
Temperature Upon Receipt (°C): 9C K 3
LAB LIMS #: CA70224-AUG22

REPORT INFORMATION	INVOICE INFORMATION
Company: Thurber Engineering Ltd.	☑ (same as Report Information)
Contact: Rachel Bourassa	Company:
Address: 2010 winston Park Dr. #103 Oakville, ON, L6H 5R7	Contact:
Phone: 905 829 8666	Address:
Fax:	Phone:
Email: RBourassa@thurber.ca	Email:

Quotation #: P.O. #:
Project #: 34812 Site Location/ID: Gull River Culvert

TURNAROUND TIME (TAT) REQUIRED

☑ Regular TAT (5-7days) — TAT's are quoted in business days (exclude statutory holidays & weekends). Samples received after 6pm or on weekends: TAT begins next business day

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

REGULATIONS

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

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	M&I: Field Filtered (Y/N)	M&I: Metals & Inorganics (incl CrVI, CN, Hg pH,(B(HWS),EC,SAR–soil) (Cl, Na-water)	M&I: Full Metals Suite (ICP metals plus B(HWS-soil only) Hg, CrVI	M&I: ICP Metals only Sb,As,Ba,Be,B,Cd, Cr,Co,Cu,Pb,Mo,Ni,Se,Ag,Tl,U,V,Zn	SVOC: PAHs only	SVOC: SVOCs all incl PAHs; ABNs, CPs	PCB: PCBs Total ☐ Aroclor ☐	PHC: F1-F4 + BTEX	PHC: F1-F4 only no BTEX	VOC: VOCs all incl BTEX	VOC: BTEX only	Pest: Pesticides Organochlorine or specify other	Other: Corrosivity package	Other: Sewer Use: Specify pkg:	Other: Water Characterization Pkg General ☐ Extended ☐	SPLP: Specify tests ☐ Metals ☐ VOC ☐ 1,4-Dioxane ☐ OCP ☐ ABN	TCLP: Specify tests ☐ M&I ☐ VOC ☐ PCB ☐ B(a)P ☐ ABN ☐ Ignit.	COMMENTS:
1	Gull River SW	Aug. 18/22	3:00pm	3	water	N												X					
2																							
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							
11																							
12																							

Observations/Comments/Special Instructions: Analysis Requested - Corrosivity package (pH, soluble Sulphates, Chloride, resisivity, ec.)

Sampled By (NAME): Greg Stanhope Signature: Date: Aug. / 18 / 2022 (mm/dd/yy)
Relinquished by (NAME): Greg Stanhope Signature: Date: Aug. / 19 / 2022 (mm/dd/yy)

Pink Copy - Client
Yellow & White Copy - SGS

Revision #: 1.6
Date of Issue: 02 May 2022

FINAL REPORT

CA40225-AUG22 R1

34812, Gull River Culvert

Prepared for

Thurber Engineering Ltd.

FINAL REPORT

CA40225-AUG22 R1

First Page

CLIENT DETAILS

Client	Thurber Engineering Ltd.
Address	103, 2010 Winston Park Drive Oakville, ON L6H 5R7. Canada
Contact	Rachel Bourassa
Telephone	905-829-8666 x 263
Facsimile	
Email	rbourassa@thurber.ca
Project	34812, Gull River Culvert
Order Number	
Samples	Solution (2)

LABORATORY DETAILS

Project Specialist	Maarit Wolfe, Hon.B.Sc
Laboratory	SGS Canada Inc.
Address	185 Concession St., Lakefield ON, K0L 2H0
Telephone	705-652-2000
Facsimile	705-652-6365
Email	Maarit.Wolfe@sgs.com
SGS Reference	CA40225-AUG22
Received	08/23/2022
Approved	09/07/2022
Report Number	CA40225-AUG22 R1
Date Reported	06/14/2023

COMMENTS

MAC - Maximum Acceptable Concentration
AO/OG - Aesthetic Objective / Operational Guideline
NR - Not reportable under applicable Provincial drinking water regulations as per client.

Temperature of Sample upon Receipt: 9 degrees C
Cooling Agent Present: Yes
Custody Seal Present: Yes

Chain of Custody Number: 033178

Turb recv'd UAL

SIGNATORIES

Maarit Wolfe, Hon.B.Sc

TABLE OF CONTENTS

Client: Thurber Engineering Ltd.
Project: 34812, Gull River Culvert
Project Manager: Rachel Bourassa
Samplers: Greg Stanhope

MATRIX: WATER

L1 = PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number	7	8
Sample Name	22-05	22-05 Dissolved Metals
Sample Matrix	Solution	Solution
Sample Date	18/08/2022	18/08/2022

Parameter	Units	RL	L1	Result	Result
General Chemistry					
Alkalinity	mg/L as CaCO3	2		52	---
Bicarbonate	mg/L as CaCO3	2		52	---
Carbonate	mg/L as CaCO3	2		< 2	---
OH	mg/L as CaCO3	2		< 2	---
Colour	TCU	3		129	---
Conductivity	uS/cm	2		107	---
Turbidity	NTU	0.10		100	---
Ammonia+Ammonium (N)	as N mg/L	0.1		< 0.1	---
Phosphorus (total reactive)	mg/L	0.03		0.04	---
Total Organic Carbon	mg/L	1		19	---
Total Suspended Solids	mg/L	2		81	---
Metals and Inorganics					
Fluoride	mg/L	0.06		< 0.06	---
Bromide	mg/L	0.3		< 0.3	---
Nitrite (as N)	as N mg/L	0.03		< 0.03	---
Nitrate (as N)	as N mg/L	0.06		< 0.06	---
Sulphate	mg/L	0.2		1.2	---
Aluminum (0.2µm)	mg/L	0.001	0.075	0.86	---
Hardness	mg/L as CaCO3	0.05		65.6	---
Hardness (dissolved)	mg/L as CaCO3	0.05		---	56.47
Aluminum (total)	mg/L	0.001		3.63	---

Client: Thurber Engineering Ltd.
Project: 34812, Gull River Culvert
Project Manager: Rachel Bourassa
Samplers: Greg Stanhope

MATRIX: WATER

L1 = PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number	7	8
Sample Name	22-05	22-05 Dissolved Metals
Sample Matrix	Solution	Solution
Sample Date	18/08/2022	18/08/2022

Parameter	Units	RL	L1	Result	Result
Metals and Inorganics (continued)					
Arsenic (total)	mg/L	0.0002	0.005	0.0018	---
Arsenic (dissolved)	mg/L	0.0002		---	0.0017
Boron (total)	mg/L	0.002	0.2	0.009	---
Boron (dissolved)	mg/L	0.002		---	0.190
Barium (total)	mg/L	0.00008		0.0606	---
Barium (dissolved)	mg/L	0.00008		---	0.03646
Beryllium (total)	mg/L	0.000007	0.011	0.000150	---
Beryllium (dissolved)	mg/L	0.000007		---	0.000094
Cobalt (total)	mg/L	0.000004	0.0009	0.00790	---
Cobalt (dissolved)	mg/L	0.000004		---	0.00690
Calcium (total)	mg/L	0.01		16.8	---
Calcium (dissolved)	mg/L	0.01		---	15.7
Cadmium (total)	mg/L	0.000003	0.0001	0.000098	---
Cadmium (dissolved)	mg/L	0.000003		---	0.000079
Copper (total)	mg/L	0.0002	0.005	0.0635	---
Copper (dissolved)	mg/L	0.0002		---	0.0501
Chromium (total)	mg/L	0.00008	0.1	0.00883	---
Chromium (dissolved)	mg/L	0.00008		---	0.01131
Iron (total)	mg/L	0.007	0.3	6.79	---
Iron (dissolved)	mg/L	0.007		---	3.19
Potassium (total)	mg/L	0.009		1.14	---

Client: Thurber Engineering Ltd.
Project: 34812, Gull River Culvert
Project Manager: Rachel Bourassa
Samplers: Greg Stanhope

MATRIX: WATER

L1 = PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number	7	8
Sample Name	22-05	22-05 Dissolved Metals
Sample Matrix	Solution	Solution
Sample Date	18/08/2022	18/08/2022

Parameter	Units	RL	L1	Result	Result
Metals and Inorganics (continued)					
Potassium (dissolved)	mg/L	0.009		---	1.11
Magnesium (total)	mg/L	0.001		5.73	---
Magnesium (dissolved)	mg/L	0.001		---	4.21
Manganese (total)	mg/L	0.00001		0.106	---
Manganese (dissolved)	mg/L	0.00001		---	0.0629
Molybdenum (total)	mg/L	0.00004	0.04	0.00358	---
Molybdenum (dissolved)	mg/L	0.00004		---	0.00295
Nickel (total)	mg/L	0.0001	0.025	0.0118	---
Nickel (dissolved)	mg/L	0.0001		---	0.0082
Sodium (total)	mg/L	0.01		4.62	---
Sodium (dissolved)	mg/L	0.01		---	85.2
Phosphorus (total)	mg/L	0.003	0.01	0.098	---
Phosphorus (dissolved)	mg/L	0.003		---	0.051
Lead (total)	mg/L	0.00009	0.02	0.00700	---
Lead (dissolved)	mg/L	0.00009		---	0.00236
Silicon (total)	mg/L	0.02		10.7	---
Silicon (dissolved)	mg/L	0.02		---	5.49
Silver (total)	mg/L	0.00005	0.0001	0.00234	---
Silver (dissolved)	mg/L	0.00005		---	0.00022
Strontium (total)	mg/L	0.00008		0.0426	---
Strontium (dissolved)	mg/L	0.00008		---	0.0326

Client: Thurber Engineering Ltd.
Project: 34812, Gull River Culvert
Project Manager: Rachel Bourassa
Samplers: Greg Stanhope

MATRIX: WATER

L1 = PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number	7	8
Sample Name	22-05	22-05 Dissolved Metals
Sample Matrix	Solution	Solution
Sample Date	18/08/2022	18/08/2022

Parameter	Units	RL	L1	Result	Result
Metals and Inorganics (continued)					
Thallium (total)	mg/L	0.000005	0.0003	0.000023	---
Thallium (dissolved)	mg/L	0.000005		---	0.000013
Tin (total)	mg/L	0.00006		0.00694	---
Tin (dissolved)	mg/L	0.00006		---	0.00382
Titanium (total)	mg/L	0.00005		0.0658	---
Titanium (dissolved)	mg/L	0.00005		---	0.0236
Antimony (total)	mg/L	0.0009	0.02	< 0.0009	---
Antimony (dissolved)	mg/L	0.0009		---	< 0.0009
Selenium (total)	mg/L	0.00004	0.1	0.00017	---
Selenium (dissolved)	mg/L	0.00004		---	0.00014
Uranium (total)	mg/L	0.000002	0.005	0.000455	---
Uranium (dissolved)	mg/L	0.000002		---	0.000328
Vanadium (total)	mg/L	0.00001	0.006	0.00654	---
Vanadium (dissolved)	mg/L	0.00001		---	0.00449
Zinc (total)	mg/L	0.002	0.02	0.054	---
Zinc (dissolved)	mg/L	0.002		---	0.039

Client: Thurber Engineering Ltd.
Project: 34812, Gull River Culvert
Project Manager: Rachel Bourassa
Samplers: Greg Stanhope

MATRIX: WATER

L1 = PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E

			Sample Number	7	8
			Sample Name	22-05	22-05 Dissolved Metals
			Sample Matrix	Solution	Solution
			Sample Date	18/08/2022	18/08/2022
Parameter	**Units**	**RL**	**L1**	**Result**	**Result**
Other (ORP)					
pH	No unit	0.05	8.6	7.84	---
Chloride	mg/L	0.2		1.5	---
Mercury (total)	mg/L	0.00001	0.0002	0.00002	---
Mercury (dissolved)	mg/L	0.00001	0.0002	---	< 0.00001

EXCEEDANCE SUMMARY

Parameter	Method	Units	Result	PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E L1
22-05				
Aluminum (dissolved)	SM 3030/EPA 200.8	mg/L	0.86	0.075
Cobalt	SM 3030/EPA 200.8	mg/L	0.00790	0.0009
Copper	SM 3030/EPA 200.8	mg/L	0.0635	0.005
Iron	SM 3030/EPA 200.8	mg/L	6.79	0.3
Phosphorus	SM 3030/EPA 200.8	mg/L	0.098	0.01
Silver	SM 3030/EPA 200.8	mg/L	0.00234	0.0001
Vanadium	SM 3030/EPA 200.8	mg/L	0.00654	0.006
Zinc	SM 3030/EPA 200.8	mg/L	0.054	0.02

QC SUMMARY

Alkalinity

Method: SM 2320 I Internal ref.: ME-CA-[ENV]EWL-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
Alkalinity	EWL0463-AUG22	mg/L as CaCO3	2	< 2	3	20	106	80	120	NA		

Ammonia by SFA

Method: SM 4500 I Internal ref.: ME-CA-[ENV]SFA-LAK-AN-007

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
Ammonia+Ammonium (N)	SKA0258-AUG22	as N mg/L	0.1	<0.1	3	10	97	90	110	102	75	125

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
Bromide	DIO0557-AUG22	mg/L	0.3	<0.3	ND	20	93	90	110	80	75	125
Nitrite (as N)	DIO0557-AUG22	mg/L	0.03	<0.03	ND	20	94	90	110	99	75	125
Nitrate (as N)	DIO0557-AUG22	mg/L	0.06	<0.06	1	20	97	90	110	100	75	125
Chloride	DIO0643-AUG22	mg/L	0.2	<0.2	0	20	102	90	110	101	75	125
Sulphate	DIO0643-AUG22	mg/L	0.2	<0.2	1	20	98	90	110	94	75	125

Carbon by SFA

Method: SM 5310 | Internal ref.: ME-CA-IENVISFA-LAK-AN-009

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
Total Organic Carbon	SKA0269-AUG22	mg/L	1	<1	ND	20	95	90	110	91	75	125

QC SUMMARY

Carbonate/Bicarbonate

Method: SM 2320 | Internal ref.: ME-CA-[ENV]EWL-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
Carbonate	EWL0463-AUG22	mg/L as CaCO3	2	< 2	ND	10	NA	90	110	NA		
Bicarbonate	EWL0463-AUG22	mg/L as CaCO3	2	< 2	3	10	NA	90	110	NA		
OH	EWL0463-AUG22	mg/L as CaCO3	2	< 2	ND	10	NA	90	110	NA		

Colour

Method: SM 2120 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-002

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
Colour	EWL0468-AUG22	TCU	3	< 3	0	10	105	80	120	NA		

QC SUMMARY

Conductivity

Method: SM 2510 | Internal ref.: ME-CA-[ENVIEWL-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	EWL0463-AUG22	uS/cm	2	2	0	20	99	90	110	NA		

Fluoride by Specific Ion Electrode

Method: SM 4500 | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-014

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
Fluoride	EWL0464-AUG22	mg/L	0.06	<0.06	1	10	100	90	110	100	75	125

Mercury by CVAAS

Method: EPA 7471A/SM 3112B | Internal ref.: ME-CA-[ENVISPE-LAK-AN-004

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
Mercury (total)	EHG0048-AUG22	mg/L	0.00001	< 0.00001	0	20	116	80	120	115	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-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
Silver (total)	EMS0189-AUG22	mg/L	0.00005	<0.00005	ND	20	99	90	110	95	70	130
Aluminum (total)	EMS0189-AUG22	mg/L	0.001	<0.001	14	20	98	90	110	110	70	130
Aluminum (0.2µm)	EMS0189-AUG22	mg/L	0.001	<0.001	14	20	98	90	110	110	70	130
Arsenic (total)	EMS0189-AUG22	mg/L	0.0002	<0.0002	16	20	99	90	110	108	70	130
Barium (total)	EMS0189-AUG22	mg/L	0.00008	<0.00002	7	20	98	90	110	99	70	130
Beryllium (total)	EMS0189-AUG22	mg/L	0.000007	<0.000007	ND	20	99	90	110	103	70	130
Boron (total)	EMS0189-AUG22	mg/L	0.002	<0.002	4	20	96	90	110	NV	70	130
Calcium (total)	EMS0189-AUG22	mg/L	0.01	<0.01	4	20	98	90	110	97	70	130
Cadmium (total)	EMS0189-AUG22	mg/L	0.000003	<0.000003	ND	20	99	90	110	91	70	130
Cobalt (total)	EMS0189-AUG22	mg/L	0.000004	<0.000004	11	20	100	90	110	103	70	130
Chromium (total)	EMS0189-AUG22	mg/L	0.00008	<0.00008	1	20	102	90	110	103	70	130
Copper (total)	EMS0189-AUG22	mg/L	0.0002	<0.0002	5	20	97	90	110	97	70	130
Iron (total)	EMS0189-AUG22	mg/L	0.007	<0.007	10	20	92	90	110	125	70	130
Potassium (total)	EMS0189-AUG22	mg/L	0.009	<0.009	5	20	98	90	110	90	70	130
Magnesium (total)	EMS0189-AUG22	mg/L	0.001	<0.001	3	20	96	90	110	94	70	130
Manganese (total)	EMS0189-AUG22	mg/L	0.00001	<0.00001	7	20	104	90	110	94	70	130
Molybdenum (total)	EMS0189-AUG22	mg/L	0.00004	<0.00004	7	20	96	90	110	102	70	130
Sodium (total)	EMS0189-AUG22	mg/L	0.01	<0.01	3	20	96	90	110	85	70	130
Nickel (total)	EMS0189-AUG22	mg/L	0.0001	<0.0001	1	20	99	90	110	98	70	130
Lead (total)	EMS0189-AUG22	mg/L	0.00009	<0.00001	13	20	101	90	110	105	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS (continued)

Method: SM 3030/EPA 200.8 I Internal ref.: ME-CA-IENVISPE-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
Phosphorus (total)	EMS0189-AUG22	mg/L	0.003	<0.003	0	20	100	90	110	NV	70	130
Antimony (total)	EMS0189-AUG22	mg/L	0.0009	<0.0009	ND	20	106	90	110	110	70	130
Selenium (total)	EMS0189-AUG22	mg/L	0.00004	<0.00004	16	20	105	90	110	104	70	130
Silicon (total)	EMS0189-AUG22	mg/L	0.02	<0.02	0	20	104	90	110	NV	70	130
Tin (total)	EMS0189-AUG22	mg/L	0.00006	<0.00006	ND	20	99	90	110	NV	70	130
Strontium (total)	EMS0189-AUG22	mg/L	0.00008	<0.00002	3	20	103	90	110	100	70	130
Titanium (total)	EMS0189-AUG22	mg/L	0.00005	<0.00005	1	20	93	90	110	NV	70	130
Thallium (total)	EMS0189-AUG22	mg/L	0.000005	<0.000005	ND	20	101	90	110	105	70	130
Uranium (total)	EMS0189-AUG22	mg/L	0.000002	<0.000002	12	20	102	90	110	122	70	130
Vanadium (total)	EMS0189-AUG22	mg/L	0.00001	<0.00001	1	20	101	90	110	107	70	130
Zinc (total)	EMS0189-AUG22	mg/L	0.002	<0.002	9	20	96	90	110	114	70	130

pH

Method: SM 4500 I 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
pH	EWL0463-AUG22	No unit	0.05	NA	0		100			NA		

QC SUMMARY

Reactive Phosphorus by SFA

Method: SM 4500-P F | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-004

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
Phosphorus (total reactive)	SKA0265-AUG22	mg/L	0.03	<0.03	ND	10	96	90	110	86	75	125

Suspended Solids

Method: SM 2540D | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-004

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
Total Suspended Solids	EWL0462-AUG22	mg/L	2	< 2	0	10	94	90	110	NA		

Turbidity

Method: SM 2130 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-003

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
Turbidity	EWL0451-AUG22	NTU	0.10	< 0.10	0	10	99	90	110	NA		

QC SUMMARY

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.

This report supersedes all previous versions.

-- End of Analytical Report --

Request for Laboratory Services and CHAIN OF CUSTODY

SGS Industries & Environment - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Fax: 705-652-6365 Web: www.sgs.com/environment
- London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361

No: 033178 Page ____ of ____

Laboratory Information Section - Lab use only

Received By: Scott Ron
Received Date: 08/23/2022 (mm/dd/yy)
Received Time: 08:15 (hh:min)
Received By (signature):
Custody Seal Present: Yes ☐ No ☐
Custody Seal Intact: Yes ☐ No ☐
Cooling Agent Present: Yes ☑ No ☐ Type: Ice
Temperature Upon Receipt (°C): 9C x 3
LAB LIMS #: CA40225-AUG22

REPORT INFORMATION

Company: Thurber Engineering Ltd.
Contact: Rachel Bowassa
Address: 2010 winston park Dr. #103
Oakville, ON, L6H 5R7
Phone: 905 829 8666
Fax:
Email: rbowassa@thurber.ca

INVOICE INFORMATION

☑ (same as Report Information)
Company:
Contact:
Address:
Phone:
Email:

Quotation #:
P.O. #:
Project #: 34812
Site Location/ID: Gull River Culvert

TURNAROUND TIME (TAT) REQUIRED

☑ Regular TAT (5-7days)
TAT's are quoted in business days (exclude statutory holidays & weekends). Samples received after 6pm or on weekends: TAT begins next business day

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

REGULATIONS

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

ANALYSIS REQUESTED

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	M&I: Field Filtered (Y/N)	M&I: Metals & Inorganics (incl CrVI, CN, Hg pH,(B(HWS),EC,SAR-soil) (Cl, Na-water)	M&I: Full Metals Suite (ICP metals plus B(HWS-soil only) Hg, CrVI	M&I: ICP Metals only Sb,As,Ba,Be,B,Cd, Cr,Co,Cu,Pb,Mo,Ni,Se,Ag,Tl,U,V,Zn	SVOC: PAHs only	SVOC: SVOCs all incl PAHs, ABNs, CPs	PCB: PCBs Total ☐ Aroclor ☐	PHC: F1-F4 + BTEX	PHC: F1-F4 only no BTEX	VOC: VOCs all incl BTEX	VOC: BTEX only	Pest: Pesticides Organochlorine or specify other	Other: TSS	Other: lab filtered metals	Other	Other	Other	Sewer Use: Specify pkg:	Water Characterization Pkg ☐ Extended ☒ General	SPLP: Specify tests ☐ Metals ☐ VOC ☐ 1,4-Dioxane ☐ OCP ☐ ABN	TCLP: Specify tests ☐ M&I ☐ VOC ☐ PCB ☐ B(a)P ☐ ABN ☐ Ignit.	COMMENTS:
1	22-05	Aug 18/22	1:00pm	12	water	N												X	X				X			
2																										
3																										
4																										
5																										
6																										
7																										
8																										
9																										
10																										
11																										
12																										

Observations/Comments/Special Instructions

Sampled By (NAME): Greg Stanhope Signature: Date: Aug / 18 / 2022 (mm/dd/yy) Pink Copy - Client
Relinquished by (NAME): Greg Stanhope Signature: Date: Aug / 19 / 2022 (mm/dd/yy) Yellow & White Copy - SGS

Revision #: 1.6
Date of Issue: 02 May 2022

THURBER ENGINEERING LTD.

APPENDIX D

Site Photographs

Photo 1: Looking west at west approach on Highway 811 (August 2022)

Photo 2: Looking east at east approach on Highway 811 (August 2022)

Photo 3: Looking south towards culvert inlet (August 2022)

Photo 4: Looking north towards culvert outlet (August 2022)

Photo 5: Looking west at culvert inlet (August 2022)

Photo 6: Looking west at culvert outlet (August 2022)