THURBER ENGINEERING LTD.

FINAL
PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT
TRAIL DESIGN ON NORTH EASTERN AREA LANDS
ROUGE NATIONAL URBAN PARK
DURHAM REGION (PICKERING AND UXBRIDGE TOWNSHIPS), ONTARIO

Report

to

Dillon Consulting Limited

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1. INTRODUCTION

This report presents the results of a preliminary geotechnical investigation conducted for the trail route design for the North Eastern Area lands in Rouge National Urban Park, located in Durham Region-Pickering and Uxbridge Township, north of Concession Road 8, Ontario.

Based on the revised Terms of Reference (TOR) documents dated April 21, 2020, we understand that Dillon has been retained by Parks Canada to complete the trail route design and prepare construction documents for the North Eastern (NE) Area lands in Rouge National Urban Park (RNUP), located in Durham Region-Pickering and Uxbridge Township, north of Concession Road 8. It is understood that potential structures, including boardwalks (in wetland, or partially saturated areas), stairs, and shade structures are proposed along the proposed trail route. It is also understood that raised granular trails may be constructed in place of potential boardwalks.

The purpose of the investigation was to explore the subsurface conditions at the specific locations requested and based on the data obtained, to provide borehole logs, borehole location plans, a written description of the subsurface conditions, and geotechnical recommendations regarding foundations for the proposed structures, trail route design, the environmental quality of the soils, and other construction concerns.

Thurber Engineering Ltd. (Thurber) carried out the investigation as a sub-consultant to Dillon Consulting Limited (Dillon) who has been retained by Parks Canada to complete the trail route design.

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. BACKGROUND INFORMATION

2.1 Site Description

The NE area of the RNUP project area extends about 6 km north and 2 km east through farmland and forested areas from the intersection of Durham Regional Road 8 and Sideline 34 to the intersection of Webb Road and Concession Road 2. The northern most section of the project area is an existing trail "Coyote Trail", part of the existing RNUP system.

The farmland within the project site is mainly used for crop farming of corn and soybean. The forested area is dense mature forest with various trees and underbrush. Low-lying wetlands and swampy areas are located throughout the proposed trail alignment.

The proposed trail crosses West Duffins Creek and/or its tributaries at numerous locations along the alignment.

2.2 Geology

Based on the information in *The Physiography of Southern Ontario*[1] by Chapman and Putnam (1984), the site is located within the South Slope physiographic region. The South Slope is characterized by low-lying, fine-grained, undulating ground moraine and knolls

Based on *Surficial Geology of Southern Ontario*[2] and *Quaternary Geology Map P2204*[3], the surficial material of the South Slope in the vicinity of the site is composed of clay and silt till where the materials may have been derived from a glaciolacustrine environment or from the shale bedrock. Ice contact stratified deposits of sand and gravel with minor silt, clay and till are located on the northeast corner of the project limits. Pockets of modern alluvial deposits comprised of clay, silt, sand, gravel and may contain organic remains are noted within the vicinity of the study area near existing creeks.

According to *Paleozoic Geology of Southern Ontario*[4], the site's bedrock is comprised of the Blue Mountain Formation. The unit is composed of shale and minor limestone. The bedrock depth is variable due to the undulating topography, however, it is expected to be greater than 40 meters below ground surface.

[1] Chapman, L.J. and Putnam, D.F. 1984. The Physiography of Southern Ontario, Ontario Geological Survey Special Volume 2, Third Edition. Accompanied by Map P.2715, Scale 1:600,000.
[2] Ontario Geological Survey, 2010: Surficial geology of Southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 128-REV
[3] Sharpe, D. R., 1980: Quaternary Geology of Toronto and Surrounding Area; Ontario Geological Survey Preliminary Map P. 2204, Geological Series. Scale 1:100 000. Compiled 1980
[4] Armstrong, D.K. and Dodge, J.E.P., 2007: Paleozoic geology of southern Ontario; Ontario Geological Survey, Miscellaneous Release--Data 219.

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3. INVESTIGATION PROCEDURES

3.1 Field Investigation

The field investigation for this project was carried out on July 17 and between September 9 to 25, 2020 and comprised a total of 13 boreholes (Boreholes SC-1, SC-2A, SC-2B, SC-4A, SC-4B, BW1 to BW4, BW6, BW-7A, BW-7B and SS1) advanced to depths ranging from 1.9 to 9.5 m. Borehole details are provided in Table 3.1 and in the Record of Borehole sheets included in Appendix A. The approximate locations of the boreholes are shown on the Borehole Location Plans, Drawings 28522-1 to 28522-2, provided in Appendix B.

Table 3.1 – Borehole Details

Facility	Borehole No.	Approx. Ground Elevation (m)	Borehole Termination Depth (m)	Approx. Borehole Termination Elevation (m)
Boardwalks	BW-1	235.3	4.9	230.4
	BW-2	242.1	3.0	239.1
	BW-3	265.2	2.7	262.5
	BW-4	264.6	3.0	261.6
	BW-6	285.2	4.3	280.9
	BW-7A	262.3	1.9	260.4
	BW-7B	262.0[1]	6.7	255.3[1]
Stair Structures	SC-1	232.5	4.9	227.6
	SC-2A	268.7	2.4	266.3
	SC-2B	266.4	5.2	261.2
	SC-4A	287.4	2.7	284.7
	SC-4B	282.0[1]	2.9	279.1[1]
Shade Structure	SS-1	294.3	9.4	284.9

Note:

1. Boreholes SC-4B and BW-7B were not surveyed due to poor GPS reception caused by tree cover. The elevations and GPS coordinates for these boreholes were based on Topographic and GIS Mapping systems. The elevations should not be relied upon for design. The foundation level recommendations will be based on depths below ground surface, not on geodetic elevations.
2. Boreholes BW-5 and SC-3 were not advanced by direction of the client.

The borehole locations and ground surface elevations were established in the field by a Thurber representative using a portable GPS receiver (Trimble R10), with the exception of Boreholes BW-7B and SC-4B as noted above, and/or verified relative to existing site features.

All borehole locations were cleared of utilities prior to commencement of drilling. The boreholes were repositioned as necessary in consideration of surface features, underground utilities, and restricted site access.

Due to the limited access conditions of the borehole locations, Boreholes BW-1, BW-2, BW-3, BW-4, BW-6, BW-7A, SC-1, SC-2A SC-4A and SC-4B were advanced by driving continuous split spoons using portable tripod with a full weighted hammer supplied and operated by OGS Inc. Boreholes SC-2B, SS-1 and BW-7B were advanced using hollow stem augers powered by a Mobile B-57 rubber track drill rig supplied and operated by Landshark Drilling Inc.

Soil samples were obtained at selected intervals using a 50 mm outside diameter spit-spoon sampler driven in conjunction with the SPT.

The field investigation was carried out under the full-time supervision of Thurber technical staff. All boreholes were logged in the field. Soil sampled were identified, placed in labelled containers, and transported back to Thurber's laboratory in Oakville for further examination and testing.

Groundwater conditions were observed in the open boreholes throughout the drilling operations. Monitoring wells were installed in Boreholes BW-1, BW-2, BW-3, BW-4, BW-6 and BW-7B to permit monitoring of the groundwater levels at the site. The monitoring wells consisted of 32 mm or 50 mm diameter PVC pipe with a slotted screen sealed at a selected depth within the borehole. The installation details are summarized in Table 3.2 below.

Table 3.2 – Monitoring Well Details

Borehole/ Monitoring Well (BH/MW) No.	Ground Elevation (m)	Monitoring Well Tip		Slotted Screen Length (m)	Mid-Screen Depth (m)	Mid-Screen Elev. (m)
		Depth (m)	Elevation (m)			
BW-1	235.3	2.3	233.0	1.5	1.6	233.7
BW-2	242.1	3.0	239.1	1.5	2.3	239.8
BW-3	265.2	2.7	262.5	1.5	2.0	263.2
BW-4	264.6	1.6	263.0	0.8	1.2	263.4
BW-6	285.2	2.4	282.8	1.5	1.7	283.5
BW-7B	262.0	6.7	255.3	3.0	5.2	256.8

The boreholes in which no monitoring wells were installed were backfilled in general accordance with Ontario Regulation 903.

3.2 LABORATORY TESTING

3.2.1 Geotechnical

Geotechnical laboratory testing was carried out at Thurber's laboratory. All recovered soil samples were subjected to visual identification and to natural moisture content determination. Selected samples were also subjected to grain size distribution analysis (hydrometer and/or sieve) and Atterberg Limits testing, where appropriate. Laboratory testing results are summarized on the Record of Borehole sheets included in Appendix A and are presented on the figures included in Appendix C.

Selected soil samples were also submitted for analytical testing to assess the corrosion potential of the soil to ductile iron and the potential for sulphate attack on subsurface concrete structures. The analyses were carried out by SGS Canada Inc. (SGS) laboratories, an independent Canadian Association for Laboratory Accreditation (CALA) accredited laboratory. The results of the analytical testing are summarized in Section 5 below and are presented in Appendix D.

3.2.2 Geoenvironmental

For preliminary evaluation of the environmental quality of the on-site soils, representative samples recovered from a selected borehole were submitted to Bureau Veritas Laboratories (BV), an independent Canadian Association for Laboratory Accreditation (CALA) accredited laboratory, for analytical testing of metals and inorganic parameters and petroleum hydrocarbons (PHC) Fractions F1 to F4, including benzene, ethylbenzene, toluene and xylenes (BTEX) and volatile organic compounds (VOCs) in accordance with O. Reg. 153/04. The results of the chemical laboratory testing are presented on the laboratory certificates of analysis in Appendix E.

4. DESCRIPTION OF SUBSURFACE CONDITIONS

A generalized description of the subsurface conditions encountered in the boreholes is given in the following sections. Detailed descriptions of the soil conditions at the specific locations drilled are presented on the Record of Borehole sheets in Appendix A and take precedence over the generalized description. It should be recognized and expected that soil conditions will vary between and beyond borehole locations.

The subsurface stratigraphy encountered in the boreholes generally comprised of surficial topsoil, overlying deposits of fill and organic and alluvial deposits, underlain by native deposits of silty clay, clayey silt, sand and silt, overlying cohesive and non-cohesive till deposits. Further descriptions of the individual strata are presented below.

4.1 Topsoil

In Boreholes BW-1 to BW-4, BW-7A, BW-7B, SC-1A, SC-2A, SC-2B, SC-4A and SC-4B, a 100 to 610 mm thick surficial topsoil/topsoil fill layer was encountered. The topsoil contained varying levels of organic materials. The topsoil thickness will vary between and beyond the borehole locations, and the reported thickness is not meant to be used for estimating quantities.

A buried 100 mm thick layer of topsoil fill was contacted in Borehole SC-2B within a fill layer at a depth of 0.7 m.

4.2 Fill

Fill was encountered below the topsoil fill in Boreholes BW-7A, BW-7B, SC-2A and SC-2B, and at the ground surface of Borehole SS-1. In Boreholes BW-7B, SC-2B and SS-1 and the fill layer was 1.9 to 2.5 m thick and was penetrated at depths of 2.2 to 2.7 m (Elev. 259.8 to 292.1). Boreholes SC-2A and BW-7A were terminated within the fill at depths of 2.4 and 1.9 m (Elev. 266.3 and 260.5) upon practical refusal to advance. The fill was variable and comprised silty clay, silt, sand and gravel, and sand and contained concrete fragments and topsoil layers.

SPT ‘N’ values of 4 blows per 0.3 m of penetration to 75 blows for 25 mm of penetration were recorded in the fill, indicating a firm/loose to hard/very dense condition. Moisture contents of 2 to 25% were measured.

The results of grain size distribution analyses carried out on a selected sample of the silty clay fill is shown on Figure C1 in Appendix C. The results indicated 0% gravel, 12% sand, 35% silt and 53% clay sized particles.

4.3 Organic and Alluvial Deposits

Locally, in Borehole BW-6, an organic silt layer was contacted at the ground surface and was penetrated at a depth of 1.8 m (Elev. 283.4). SPT ‘N’ values of 1 to 25 blows per 0.3 m of penetration were recorded in the organic silt layer, indicating a very loose to compact condition. Moisture contents ranged from 148% to 233%.

A 0.5 and 0.6 m thick layer of alluvial silt was encountered below the surficial topsoil and was penetrated at 0.7 and 1.2 m (Elev. 241.5 and 286.2) in Boreholes BW-2 and SC-2A, respectively. The alluvial silt was loose with SPT ‘N’ values of 8 and 9 blows per 0.3 m of penetration. Moisture contents of 7% and 12% were measured.

4.4 Sand to Silt and Sand

In Boreholes BW-1 and BW-4, a 1.2 and 0.6 m thick sand to silt and sand layer was contacted below the topsoil and was penetrated at depths of 1.8 and 0.9 m (Elev. 233.5 and 263.7). Moisture contents of the sand to silt and sand ranged from 19% to 24%. SPT 'N' values of 2 to 46 blows per 0.3 m of penetration were recorded in the sand to silt and sand stratum, indicating a very loose to dense condition.

4.5 Silty Clay to Clayey Silt

A layer of silty clay to clayey silt was encountered below the fill, silt and sand, and alluvial silt at depths of 0.7 to 2.2 m (Elev. 233.5 to 292.1) in Boreholes BW-1, BW-2, and SS-1. The silty clay to clayey silt layer was penetrated at 2.4 and 2.3 m (Elev. 232.8 and 239.9) in Boreholes BW-1 and BW-2 and was penetrated at a depth of 7.2 m (Elev. 287.2) in Borehole SS-1. SPT 'N' values of 6 to 32 blows per 0.3 m of penetration were recorded, indicating a consistency of firm to hard. Moisture contents of 10 to 26% were measured.

The results of grain size distribution analyses carried out on selected samples of the silty clay are shown on Figure C2 in Appendix C. The results of the grain size distribution analyses are summarized below:

Soil Particle	Percentage (%)
Gravel	0
Sand	2 to 23
Silt	41 to 79
Clay	18 to 42

Atterberg limits testing carried out on samples of the silty clay measured a plastic limit, liquid limit and plasticity index of 13 to 17, 25 to 29, and 8 to 14, respectively. These results, which are plotted on Figure C5 in Appendix C, indicate that the samples tested consists of low plasticity silty clay (CL).

4.6 Silt

Locally, in Borehole SS-1, a sandy silt layer was contacted below the silty clay to clayey silt at a depth of 7.2 m (Elev. 287.2) and was penetrated at a depth of 7.8 m (Elev. 286.5). It is noted that a 0.4 m thick gravel layer was observed below the silt and was penetrated at a depth of 8.2 m (Elev. 286.1).

4.7 Till Deposits

Plastic till deposits were contacted in Boreholes SC-1, BW-2, and BW-7B and non-plastic till deposits were contacted in Boreholes SC-1, SC-2B, SC-4A, SC-4B, SS-1, BW-1, BW-3, BW-4, and BW-6 below the topsoil, fill, alluvial silt, organic silt, and clay at depths of 0.6 to 8.2 m (Elev. 231.9 to 286.1). The till deposits extended to the termination depths of 2.7 to 9.4 m (Elev. 227.6 to 284.9).

SPT 'N' values recorded in the till deposits ranged from 13 blows per 0.3 m of penetration to 75 blows for 25 mm of penetration. In general, the 'N' values indicate a compact/stiff to very dense/hard condition. Measured moisture contents ranged from 4 to 23%.

The results of grain size distribution analyses carried out on selected samples of the non-plastic and plastic till deposits are shown on Figures C3 and C4, respectively, in Appendix C. The results of the grain size distribution analyses are summarized below:

Soil Particle	Non-Plastic Till	Plastic Till
Gravel %	1 to 12	1 to 3
Sand %	43 to 87	23 to 31
Silt %	10 to 40	35 to 58
Clay %	2 to 5	18 to 31

Atterberg limits testing carried out on a sample of the silty clay till measured a plastic limit, liquid limit and plasticity index of 14, 29 and 15, respectively. These results, which are plotted on Figure C5 in Appendix C, indicate that the sample tested consists of low plasticity silty clay (CL).

Till soils frequently contain cobbles and boulders, and these should be anticipated when excavating during construction.

4.8 Groundwater Levels

During drilling, wet conditions were noted in the surficial materials in Boreholes BW-1, BW-2, BW-3, BW-4, BW-6 and BW-7, at approximate depths ranging from 0.0 to 1.9 m.

The groundwater depths and elevations measured in the monitoring wells installed in the boreholes are summarized in Table 4.1.

Table 4.1 – Summary of Groundwater Level Observations

BH/MW No.	Ground Elev. (m)	Mid-Screen Depth (m)	Mid-Screen Elev. (m)	Ground Water Elevation (metres below ground surface)
				October 30, 2020
BW-1	235.3	1.6	233.7	234.6 (0.7)
BW-2	242.1	2.3	239.8	241.9 (0.2)
BW-3	265.2	2.0	263.2	Dry
BW-4	264.6	1.2	263.4	264.6 (0.0)
BW-6	285.2	1.7	283.5	284.9 (0.3)
BW-7B	262.0	5.2	256.8	260.9 (1.1)

The above groundwater level measurements are short-term observations and seasonal fluctuations of the groundwater level are to be expected. Further, groundwater levels may be higher after prolonged periods of precipitation.

5. ANALYTICAL LABORATORY TESTING RESULTS

5.1 Geotechnical

Samples of the soils were submitted for analytical testing of corrosivity parameters and sulphate. The results of the analytical tests are shown in Table 5.1. The laboratory certificates of analysis are presented in Appendix D.

Table 5.1 – Analytical Corrosivity Test Results

Sample ID	Depth (m)	Description	Sulphide (%)	Chloride (µg/g)	Sulphate (µg/g)	pH	Resistivity (ohm.cm)	Redox Potential (mV)
SS-1 SS4	2.3-2.9	Silty Clay/Clayey Silt	<0.04	13	11	8.83	10000	307
BW-1 SS2	0.6-1.2	Silt and Sand	<0.04	6.6	33	8.75	6540	246

5.2 Geoenvironmental

Based on the conditions encountered during the investigation, it is anticipated that the soils excavated during potential trail construction works will primarily comprise existing fill materials and native overburden. In general, no visual and olfactory indications of impact were observed in the soil samples recovered during the geotechnical field investigation program, with the exception of two samples in Borehole BW-7B (BH BW-7B SS2 and SS3), which had hydrocarbon odours.

The two soil samples with olfactory indications of potential contamination were submitted for analytical laboratory testing. The sample locations and material types that were selected for analysis are summarized in Table 5.2.

Table 5.2 – Soil Samples Selected for Analytical Testing

Borehole	Sample ID	Depth (m)	Material	Analysis
BW-7B	BW7-B SS2	0.8 – 1.4	Sand and Gravel Fill	Metals & Inorganics PHCs F1 to F4, BTEX, VOCs
BW-7B	BW7-B SS3	1.5 – 2.1	Clay Fill	Metals & Inorganics PHCs F1 to F4, BTEX, VOCs

For preliminary characterization of the on-site soils, the analytical data was compared to the MECP Table 1 “Full Depth Background Site Condition Standards” for Residential/Parkland/Institutional/Industrial/Commerical/Community (RPI/ICC) Property Uses, coarse textured soils (MECP Table 1 RPI/ICC Standards) to assess the suitability of the on-site reuse of excavated soils within the subject site as part of the proposed construction works.

On December 4, 2019, Ministry of Environment, Conservation and Parks (MECP) filed Ontario Regulation (O. Reg.) 406/19 “On-Site and Excess Soil Management” that is to be phased in over a period extending from January 1, 2021 to January 1, 2026 where the Rules for Soil Management and Excess Soil Quality Standards under this regulation are to be adopted on January 1, 2021. In this regard, the analytical data was also compared to Table 1 RPI/ICC Property Uses and Table 2.1 RPI Property Uses of the Excess Soil Quality Standards (ESQS) for Residential/Parkland/Institutional and/or Industrial/Commercial/Community Property Uses, coarse textured soils provided under MECP’s Rules for Soil Management and O. Reg. 406/19 for comparison purposes only at this time.

The results of the analytical laboratory testing indicate that the concentrations of the tested parameters met MECP Table 1 RPI/ICC Standards.

Comparison to the Table 1 RPI/ICC and Table 2.1 RPI ESQS indicate the concentrations of the tested parameters met the Standards.

Laboratory Certificates of Analysis are included in Appendix E. The measured concentrations and corresponding Standards are shown on the certificates of analysis.

6. ENGINEERING DISCUSSION AND RECOMMENDATIONS

This section of the report provides preliminary geotechnical recommendations for design and construction of the trail and structure foundations. The recommendations are based on the subsurface soil and groundwater conditions encountered during the investigation. The soil conditions may vary between and beyond the borehole locations.

It is understood that potential structures, including boardwalks (in wetland, or partially saturated areas), stairs, and shade structures are proposed along the proposed trail route. It is also understood that raised granular trails may be constructed in place of boardwalks.

6.1 Preliminary Foundation Design

Foundation construction for the proposed structures using spread footings, short augered caissons, or helical piers are considered feasible for foundation support. Difficulties with construction of conventional shallow foundations should be anticipated in locations where deeper fill and organic soil deposits are present and the groundwater level is high.

At this time, it is understood that the structures will be lightly loaded for use as pedestrian walkways and no vehicle access will be permitted. If the structures are required to support heavier loads, including vehicle traffic, the foundation options will need to be re-evaluated, and additional deeper boreholes may be required.

The preferred foundation system will depend on the local soil and groundwater conditions at each structure, foundation loads, construction constraints, and structural design considerations. The foundation options are is discussed in the following sections.

6.1.1 Spread Footings

The structures may be supported on spread footings founded on the compact/stiff to very dense/hard, inorganic, native soils encountered in the boreholes. Excavation for footing

construction would need to extend through the surficial topsoil, organic and alluvial soils, and fill and into the competent native soils at the levels identified below. In areas with high groundwater levels, advance dewatering and/or sheet pile installation may be necessary to enable construction of footings in the dry. Factored geotechnical resistances of 150 kPa at ULS and 100 kPa at SLS may be employed for preliminary design of spread footings founded on the compact/stiff to very dense/hard, inorganic, native, soils at or below the levels listed as follows:

Table 6.1 – Founding Levels for Spread Footing Design

Borehole No.	Minimum Founding Level (Depth Below Existing Ground Surface, m)	Founding Soil at Minimum Founding Level	Anticipated Groundwater Level (Depth Below Ground Surface, m)
BW-1	0.9	Compact Silt and Sand	0.7
BW-2	2.4	Hard Clay Till	0.2
BW-3	0.9	Very Dense Silt Till	> 2.7
BW-4	0.9	Dense Sand Till	0.0 (Ground Surface)
BW-6	2.1	Compact Sand	0.3
BW-7A	No Suitable Bearing Material Found[1]	-	-
BW-7B	2.5	Hard Clay Till	1.1
SC-1	1.2	Hard Clay Till	4.3
SC-2A	No Suitable Bearing Material Found[1]	-	-
SC-2B	3.0	Dense Silt Till	2.3
SC-4A	1.5	Compact Silt Till	> 2.7
SC-4B	0.9	Compact Silt and Sand	> 2.9
SS-1	2.5	Stiff Clay	4.6

Note:

1. Boreholes BW-7A and SC-2A were not able to be advanced to sufficient depths to determine bearing capacity due to limitations of access, which limited the drilling equipment/methodology (continuous split spoon advanced by tripod)

6.1.2 Helical Piers

It is considered feasible to employ helical piers extended into native inorganic, soils with SPT N-values greater than 25.

For preliminary design, a Chance RS2875 helical pier may be designed with a factored bearing resistance at ULS of 155 kN and an SLS resistance of 115 kN for native soils with SPT N-values greater than 25. It is noted that these are preliminary values are suitable for preliminary design only. Detailed design services for the helical piers are available through product suppliers. If required, higher capacities can be achieved with larger helical pier units.

If helical piers are employed, the design and installation should be completed by contractors that are approved by the manufacturer. Helical piers/anchors are proprietary products design, supplied and installed by specialist contractors. It is noted that the contractor should be responsible for the design capacity of the piers and it is recommended that load tests be conducted to verify helical pier capacities prior to final design.

The provided capacities are preliminary and must be confirmed with a specialist helical pier contractor and verified with load tests.

All work should be carried out in accordance with the Occupational Health and Safety Act (Ontario Regulation 213/91) and with local regulations.

6.1.3 Short Augered Caissons

It is considered feasible to support the structures on caisson foundations. However, the installation of caissons may be particularly problematic in some structure locations due to the presence of obstructions, or cohesionless sand deposits and high groundwater levels. Construction may require use of a steel liner to maintain stability of the caisson sidewalls as well as techniques such as drilling slurry to prevent disturbance of the caisson base.

Caissons must be founded below frost depth, 1.4 m below ground surface, and extended into the compact/stiff to very dense/hard native, inorganic, soils. Founding levels, bearing capacities, and further evaluation of this option can be provided, if requested.

6.1.4 Frost Cover

The depth of frost penetration at this site is approximately 1.4 m. All spread footings, caisson caps, or pile caps should be provided with a minimum of 1.4 m of earth cover or provided with an equivalent thickness of thermal insulation as protection against frost action, in accordance with OPSD 3090.101 (Foundation Frost Penetration Depths for Southern Ontario).

6.2 Floor Slab Construction

It is understood that a floor slab will be constructed at the shade structure. The subsurface conditions encountered in Borehole SS-1 at this location comprised of fill to a depth of 2.2 m (Elev. 292.1) over stiff to hard/very dense native overburden.

The in-situ fill is not suitable for slab-on-grade support. Construction of the floor slab as a conventional slab-on-grade on engineered fill is considered feasible.

Preparation of the floor slab subgrade should include stripping of the fill and other deleterious material followed by proofrolling of the exposed subgrade with a heavy roller to ensure uniform adequate support. Any soft/wet areas identified shall be subexcavated and replaced with approved engineered fill, as described below.

All fill under the floor slab must consist of engineered fill. The engineered fill should consist of approved well graded inorganic material placed in maximum 200 mm thick lifts, within 2% of optimum moisture content, and compacted to at least 98% of SPMDD. The engineered fill must extend at least 1.0 m beyond the limits of the outer edge of the floor slab and extend downward and outward at a slope no greater than 45° to meet the subgrade.

A minimum 150 mm thick layer of well compacted free draining clear stone (or Granular A compacted to 98% SPMDD) meeting OPSS 1010 specifications is recommended directly beneath the floor slab. A polyethylene vapour barrier should be placed under the slab if a moisture sensitive finish is to be placed on the floor.

Exterior grades should be maintained at least 150 mm below the floor slab level and sloped to promote drainage away from the structure.

6.3 Granular Trail Design

It is understood that a raised granular trail is being considered in lieu of boardwalks. At the time of this report, the proposed raised granular height above existing grades was not provided. For the purposes of this report it is assumed that the granular will be raised to a maximum of 2 m above existing grades.

Preparation of the subgrade should consist of removal of the topsoil, topsoil fill, fill, and organics, where possible, and proofrolling to expose very soft/loose or unstable areas. Proof rolling in areas of a high water table is recommended in the summer months when the water levels are anticipated to be lower, however this recommendation should be reviewed at the time of construction as it

may not be feasible to perform a proof roll if the soil is wet/saturated. Any soft/wet areas identified shall be subexcavated, if possible, and replaced with approved material within 2% of optimum moisture content, and compacted to at least 98% of SPMDD. It is understood the topsoil and/or organics will not be removed in certain areas to protect the roots of the trees. In this regard, proofrolling and subexcavation would not be possible in these areas and settlement and instability of the granular trail should be anticipated. It is noted that the organic layer extended to depths of 0.6 to 0.7 m, locally up to 1.8 m.

Wet and soft soil conditions can be expected, and contractors must adopt means and equipment to suit these conditions including groundwater control and restrictions for heavy equipment on unprotected subgrade.

The subgrade should be approved by geotechnical personnel prior to placement of bulk fill.

Fill placed to raise the grades should be placed as an engineered fill in uniform 200 mm thick lifts within 2% of the optimum moisture content. The engineered fill should comprise Granular B Type II meeting OPSS and should be compacted to at least 98% SPMDD. It may not be practical to compact the granular materials placed on topsoil in a wet environment. In this regard, uncompacted granular will be susceptible to erosion and will not generally be suitable for support of any vehicles.

As the raised granular trail is to be constructed in areas that could be partly or fully saturated during high water levels, the raised granular trail should be constructed with side slope inclinations of 3H:1V, or flatter and the side slopes must be provided with erosion protection in the form of rip-rap underlain with filter cloth.

As the fill and organic/alluvial soils will not removed prior to placement of the granular, settlement of the trail should be anticipated and a maintenance program of regrading and/or addition of additional granular material would be required. The magnitude of the settlement will depend on the added volume of granular and the subexcavation level. Estimates of the anticipated settlement can be provided once more design details are known.

6.4 Excavation and Groundwater Control

Excavations for construction of the structure foundations are anticipated to extend through the surficial topsoil, fill and native organic/alluvial soils and into the competent compact/stiff to very dense/hard native overburden. Excavations to these soils are expected to extend up to 2 to 3 m below the measured groundwater levels at some of the structure locations.

All excavations should be carried out in accordance with the requirements of the Occupational Health and Safety Act (OHSA) and local regulations. Provided adequate groundwater control is achieved, the soils within the likely depth of excavation may be classed as Type 3 soils according to the Occupational Health and Safety Act criteria. Therefore, for open cut dewatered excavations, the side slopes should be cut at an inclination of 1H:1V from the bottom of the excavation. Where space restrictions preclude excavation of inclined slopes, excavation may be carried out using a trench box or temporary shoring.

Use of a hydraulic excavator should be suitable for excavation in the fill and native soils. The selection of the method of excavation is the responsibility of the contractor and must be based on their equipment, experience, and interpretation of the site conditions. The native overburden may contain cobbles and boulders and the contractor must be prepared to handle these obstructions.

It is noted that Boreholes SC-2A and BW-7A were terminated upon practical refusal to advance in the fill. Based on past aerial photographs, residential dwellings previously existed at the borehole locations. Difficulties with respect to the excavation of buried construction rubble, such as foundations and floor slabs that may be reinforced, as well as underground services left in place should be anticipated.

Seepage into excavations should be anticipated where excavations will extend below the observed water levels and measures such as heavy-duty pumping and/or perimeter wells may be required to maintain a dry excavation. Stream flow and surface water runoff must be diverted away from the excavations at all times during construction.

Effective dewatering operations rely on the Contractor's experience, construction techniques, sequencing, and work force efficiency.

It is recommended that in the tendering stage, prospective contractors conduct test pits to familiarize themselves with the on-site soil and groundwater conditions. The required dewatering should be established by the contractor in the context of a performance specification. The dewatering system should meet a performance specification to maintain and control the groundwater below the excavation base.

Groundwater control must be the responsibility of the contractor. The contractor must retain a dewatering specialist to design the dewatering system and identify effective measures for the conditions encountered. The dewatering plan should be submitted for information purposes before the start of excavation. The impact of the dewatering on local water wells or other

groundwater resources in the area would need to be assessed prior to adopting this method of construction.

A hydrogeological assessment to determine the anticipated dewatering rates, and assessment of impacts resulting from dewatering, including possible mitigations, would be recommended if the foundation design requires extending excavations below the water table (i.e. spread footing and caissons). A hydrogeological assessment is not anticipated for helical pier design. If the anticipated dewatering rates range between 50,000 and 400,000 L/day, the water taking must be registered on the Ministry of the Environment, Conservations and Parks (MECP) Environmental Activity and Sector Registry (EASR). A Permit to Take Water (PTTW) will be required if pumping rates are expected to exceed 400,000 L/day.

If possible, it is recommended that construction be carried out during the dry summer months, when groundwater levels are normally lowest to reduce the required dewatering. Groundwater levels will fluctuate subject to seasonal variations and precipitation patterns.

It is noted that groundwater sampling and chemical testing was not within the scope of this investigation. Sampling and testing of the ground water will be required to provided discharge options.

All work should be carried out in accordance with the current Occupational Health and Safety Act (Ontario Regulation 213/91) and with local regulations.

6.5 Soil Aggressiveness

Based on the results of the corrosivity testing carried out on native soil samples, the native soil is not considered to be corrosive.

The measured sulphate concentrations indicate that buried concrete structures will not be subject to sulphate attack in the overburden soils.

6.6 Geoenvironmental Considerations

The chemical sampling and testing program carried out during this investigation was completed for due diligence purposes to obtain a general understanding of the environmental quality of the soils on site. The environmental characteristics of the soils were inferred from a limited number of samples and sampling locations, and the extent of materials that may be encountered during construction was not delineated. As such, the environmental data and comments are provided as

guidance to the contractor on the requirements for reuse or disposal of materials generated during construction and should not be used to estimate quantities.

The results of the analytical laboratory testing indicate that the concentrations of the tested parameters met MECP Table 1 RPI/ICC Standards.

Comparison to the Table 1 RPI/ICC and Table 2.1 RPI ESQS indicate the concentrations of the tested parameters met the Standards.

A more comprehensive level of testing should be carried out for the off-site reuse of excess fill or native soils to verify that the environmental quality of the excess soils meets the site's analytical requirements and the requirements of O. Reg. 406/19 and the Excess Soil Quality Standards. In this regard and depending on the project design details, management strategies and receiving site requirements, the documentation and sampling and testing criteria of O. Reg. 406/19 may need to be met.

Alternatively, the excavated materials may be disposed of off-site at a licensed landfill facility with an ECA to receive this waste type. TCLP analysis will be required during construction on the actual materials to be disposed, if any, to verify the waste classification and the acceptance criteria of the waste management facility selected by the Contractor has been met.

Additional analytical testing of excavated soils will be required to further evaluate the environmental quality of the soil and confirm reuse and disposal requirements.

The "new" O. Reg. 406/19 may or may not apply to this project subject to specific design details (i.e. excavated quantities, soil management strategies involving excess soils that are to be reused off-site, receiving site analytical requirements). If the regulation applies, additional documentation, sampling and testing procedures (including prescribed leachate analysis) may be required to meet the criteria of O. Reg. 406/19. The regulation does not apply to the reuse of excavated soils on Site, and the project may be exempt from the registration, planning and sampling requirements of the regulation if excess soils are to be reused as part of another infrastructure project owned by the Project Leader (as defined by the Regulation) or public body.

No statement made herein should be construed as relieving the Contractor's responsibility to comply with all applicable federal and provincial regulations, municipal by-laws and guidelines related to the handling or disposal of excavated materials (and/or discharge of extracted groundwater).

7. CLOSURE

We trust the above provides the information you require at this time. If you have any questions regarding this report, please do not hesitate to contact us.

Yours truly,

Thurber Engineering Ltd.

Timothy Feather, B.Eng.
Geotechnical Engineer-in-Training

Karel Furbacher, P.Eng.
Geotechnical Engineer

Renato Pasqualoni, P.Eng.
Review Principal

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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.

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Appendix A

Record of Borehole Sheets

SYMBOLS, ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES

1. TEXTURAL CLASSIFICATION OF SOILS

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

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

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

3. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

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

NOTE: Hierarchy of Soil Strength Prediction

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

4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

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

5. LEGEND FOR RECORDS OF BOREHOLES

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

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

▼ Water Level

C_{pen} Shear Strength Determination by Pocket Penetrometer

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

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

RECORD OF BOREHOLE BW-1

PROJECT : Rouge Park NE Trails
LOCATION : Glasgow, Ontario
STARTED : September 10, 2020
COMPLETED : September 10, 2020

Project No. 28522
SHEET 1 OF 1
DATUM Geodetic

N 4 867 661.2 E 644 108.1

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS
		GROUND SURFACE		235.28				
	Manual SPT	**TOPSOIL** (610mm)		0.00	1	SS	7	
				234.67				
1		**SILT** and **SAND**, trace clay, compact to dense, light brown to grey, wet		0.61	2	SS	17	
					3	SS	46	
				233.45				
2		**CLAY**, silty, trace sand and gravel, hard, grey		1.83	4	SS	30	Grain Size Analysis: Gr 0%/ Sa 2%/ Si 56%/ Cl 42%
				232.84				
		SILT, some sand to sandy, trace to some clay, very dense to compact, grey, wet: (TILL)		2.44	5	SS	84	
3					6	SS	44	
4					7	SS	24	
					8	SS	26	
				230.40				
5		END OF BOREHOLE AT 4.88m UPON PRACTICAL REFUSAL TO ADVANCE. Monitoring Well installation consists of 36mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.		4.88				
6		WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) Oct 30/20 0.70 234.58						
7								
8								
9								

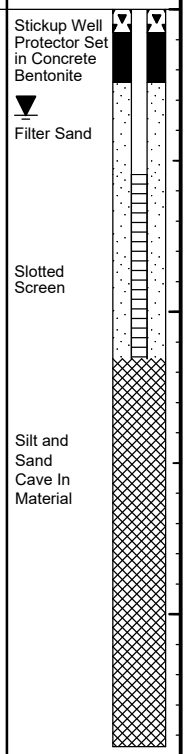
DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH: Cu, KPa
nat V - ✚ Q - ✖
rem V - ● Cpen ▲
40 80 120 160

WATER CONTENT, PERCENT
wp w wl
10 20 30 40

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION

▼ WATER LEVEL IN WELL/PIEZOMETER
October 30, 2020

LOGGED : MC
CHECKED : KF

THURBER

THURBER2S TEL-28522.GPJ 12/22/20

RECORD OF BOREHOLE BW-2

PROJECT : Rouge Park NE Trails
LOCATION : Glasgow, Ontario
STARTED : September 11, 2020
COMPLETED : September 11, 2020

Project No. 28522
SHEET 1 OF 1
DATUM Geodetic

N 4 867 940.2 E 644 188.9

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	COMMENTS
		GROUND SURFACE		242.14				
	Manual SPT	**TOPSOIL** (225mm)		0.00				
		SILT, some sand, trace clay, loose to compact, dark grey, moist (ALLUVIAL)		0.23	1	SS	8	
				241.46				
1		**CLAY**, silty, some sand to sandy, stiff to firm, grey		0.69	2	SS	10	
					3	SS	7	Grain Size Analysis: Gr 0%/ Sa 23%/ Si 41%/ Cl 36%
2					4	SS	6	
				239.86				
		CLAY, silty, trace to some sand, trace gravel, very stiff to hard, grey: (TILL)		2.29				
					5	SS	44	
3				239.10				
		END OF BOREHOLE AT 3.05m UPON PRACTICAL REFUSAL TO ADVANCE. BOREHOLE OPEN AND WATER LEVEL AT 1.37m. Monitoring Well installation consists of 36mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.		3.05				
4		WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) Oct 30/20 0.16 241.98						
5								
6								
7								
8								
9								

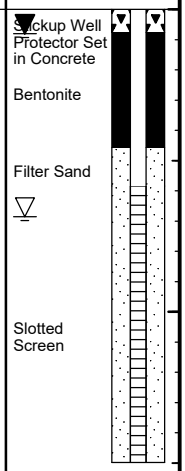
DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH: Cu, KPa
nat V - ✚ Q - ✖
rem V - ● Cpen ▲
40 80 120 160

WATER CONTENT, PERCENT
wp w wl
10 20 30 40

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION



GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION

▼ WATER LEVEL IN WELL/PIEZOMETER
October 30, 2020

LOGGED : MC
CHECKED : KF

THURBER

THURBER2S TEL-28522.GPJ 12/22/20

RECORD OF BOREHOLE BW-3

PROJECT : Rouge Park NE Trails
LOCATION : Glasgow, Ontario
STARTED : September 17, 2020
COMPLETED : September 17, 2020

Project No. 28522
SHEET 1 OF 1
N 4 869 617.8 E 644 438.8
DATUM Geodetic

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✖, Cpen ▲) (40 80 120 160) / WATER CONTENT, PERCENT (wp w wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		265.24							
0	Manual SPT	**TOPSOIL**(610mm)		0.00	1	SS	12				Stickup Well Protector Set in Concrete
				264.63							
1		**CLAY**, silty, some sand to sandy, trace gravel, hard, grey: (TILL)		0.61	2	SS	73				Bentonite
					3	SS	76	Grain Size Analysis: Gr 1%/ Sa 23%/ Si 58%/ Cl 18%			Filter Sand
2					4	SS	78				Slotted Screen
					5	SS	150/ 0.150				
				262.53	6	SS	50/ 0.025				
3		END OF BOREHOLE AT 2.72m UPON PRACTICAL REFUSAL TO ADVANCE. Monitoring Well installation consists of 50mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.		2.72							
		WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) Oct 30/20 Dry -									
4											
5											
6											
7											
8											
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : MC
CHECKED : KF

THURBER

THURBER2S TEL-28522.GPJ 12/22/20

RECORD OF BOREHOLE BW-4

PROJECT : Rouge Park NE Trails
LOCATION : Glasgow, Ontario
STARTED : September 18, 2020
COMPLETED : September 18, 2020

Project No. 28522
SHEET 1 OF 1
DATUM Geodetic

N 4 871 212.2 E 644 819.9

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS
		GROUND SURFACE		264.63				
	Manual SPT	**TOPSOIL** (300mm)		0.00				
		SAND, some silt, trace gravel, very loose to compact, brown, wet		264.32 0.30	1	SS	2	
1		**SAND** some silt to **SAND** and **SILT**, some gravel, dense to very dense, light brown, wet to saturated: (TILL)		263.71 0.91	2	SS	39	
					3	SS	57	
2					4	SS	40	
					5	SS	61	Grain Size Analysis: Gr 12%/Sa 43%/ Si 40%/ Cl 5%
3		END OF BOREHOLE AT 3.05m UPON PRACTICAL REFUSAL TO ADVANCE. Monitoring Well installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.		261.58 3.05				
4		WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) Oct 30/20 0.00 264.63						
5								
6								
7								
8								
9								

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH: Cu, KPa
nat V - ✚ Q - ✖
rem V - ● Cpen ▲
40 80 120 160

WATER CONTENT, PERCENT
wp w wl
10 20 30 40

ADDITIONAL LAB. TESTING: 328

PIEZOMETER OR STANDPIPE INSTALLATION
Stickup Well Protector Set in Concrete
Bentonite
Filter Sand
Slotted Screen

GROUNDWATER ELEVATIONS
▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : MC
CHECKED : KF

THURBER

THURBER2S TEL-28522.GPJ 12/22/20

RECORD OF BOREHOLE BW-6

PROJECT : Rouge Park NE Trails
LOCATION : Glasgow, Ontario
STARTED : September 16, 2020
COMPLETED : September 16, 2020

Project No. 28522
SHEET 1 OF 1
DATUM Geodetic

N 4 872 594.0 E 644 401.2

DEPTH SCALE (metres)	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) (40 80 120 160) / WATER CONTENT, PERCENT (wp, w, wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		285.21							
0	Manual SPT	**ORGANIC SILT** some sand and clay, trace to some gravel, very loose to compact, dark brown, wet to saturated		0.00	1	SS	1		233		Stickup Well Protector Set in Concrete Bentonite
1					2	SS	3		241		Filter Sand
					3	SS	25		148		Slotted Screen
				283.38							
2		**SAND**, some to trace gravel, some silt, trace clay, compact to dense, grey, saturated: (TILL)		1.83	4	SS	13				
					5	SS	29	Grain Size Analysis: Gr 1%/ Sa 87%/ Si 10%/ Cl 2%			
3					6	SS	49				
4					7	SS	47				
				280.94							
		END OF BOREHOLE AT 4.27m UPON PRACTICAL REFUSAL TO ADVANCE. Monitoring Well installation consists of 25mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen.		4.27							
5		WATER LEVEL READINGS: DATE / DEPTH(m) / ELEV.(m) — Oct 23/20 / 0.33 / 284.88									
6											
7											
8											
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION

▼ WATER LEVEL IN WELL/PIEZOMETER
October 23, 2020

LOGGED : MV
CHECKED : KF

THURBER

THURBER2S TEL-28522.GPJ 12/22/20

RECORD OF BOREHOLE BW-7A

PROJECT : Rouge Park NE Trails
LOCATION : Glasgow, Ontario
STARTED : September 11, 2020
COMPLETED : September 11, 2020

Project No. 28522
SHEET 1 OF 1
DATUM Geodetic

N 4 870 901.1 E 644 746.6

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	COMMENTS
		GROUND SURFACE		262.33				
		TOPSOIL(150mm)		0.00				
	Manual SPT	**CLAY**, silty, trace to some sand, trace gravel, stiff to very stiff, light brown: (FILL)		0.15	1	SS	8	
1					2	SS	23	Grain Size Analysis: Gr 0%/ Sa 12%/ Si 35%/ Cl 53%
				261.11				
		SAND and **GRAVEL**, trace silt, trace clay, compact, brown, moist: (FILL)		1.22	3	SS	15	
				260.48	4	SS	75/ 0.025	
2		END OF BOREHOLE AT 1.85m UPON PRACTICAL REFUSAL TO ADVANCE ON PROBABLE CONCRETE.		1.85				
3								
4								
5								
6								
7								
8								
9								

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH: Cu, KPa
nat V - ✚ Q - ✖
rem V - ● Cpen ▲
40 80 120 160

WATER CONTENT, PERCENT
wp w wl
10 20 30 40

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : MC
CHECKED : KF

THURBER

THURBER2S TEL-28522.GPJ 12/22/20

RECORD OF BOREHOLE BW-7B

PROJECT : Rouge Park NE Trails
LOCATION : Glasgow, Ontario
STARTED : September 25, 2020
COMPLETED : September 25, 2020

Project No. 28522
SHEET 1 OF 1
DATUM Geodetic

N 4 870 890.0 E 644 749.0

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		262.00							
		TOPSOIL FILL: (275mm)		0.00							Stickup Well Protector Set in Concrete
				261.72	1	SS	8				
		SAND and **GRAVEL**, silty, occasional organics, loose to compact, brown, dry: (FILL)		0.28							
1		Slight hydrocarbon odour			2	SS	18				Bentonite
				260.55							
		CLAY, silty, trace sand, some gravel, firm, grey, with slight hydrocarbon odour: (FILL)		1.45							
2					3	SS	7				
				259.79							
		CLAY, silty, some sand and gravel, hard, grey: (TILL)		2.21							
					4	SS	30				
3	Hollow Stem Augers										Filter Sand
					5	SS	40				
4											
					6	SS	46				
5											Slotted Screen
6											
					7	SS	70				
				255.29							
		END OF BOREHOLE AT 6.71m Monitoring Well installation consists of 50mm diameter Schedule 40 PVC pipe with a 3.05m slotted screen.		6.71							
7											
		WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) Oct 30/20 1.09 260.91									
8											
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION

▼ WATER LEVEL IN WELL/PIEZOMETER
October 30, 2020

LOGGED : MC
CHECKED : KF

THURBER

THURBER2S TEL-28522.GPJ 12/22/20

RECORD OF BOREHOLE SC-1

PROJECT : Rouge Park NE Trails
LOCATION : Glasgow, Ontario
STARTED : September 9, 2020
COMPLETED : September 9, 2020

Project No. 28522
SHEET 1 OF 1
DATUM Geodetic

N 4 866 526.1 E 644 281.1

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS
		GROUND SURFACE		232.51				
	Manual SPT	**TOPSOIL**(600mm)		0.00	1	SS	22	
				231.90				
1		**SILT**, trace to some sand and gravel, occasional organics, very dense, brown to grey, moist (TILL)		0.61	2	SS	50	
					3	SS	91	
				230.68				
2		**CLAY**, silty, some sand to sandy, trace gravel, hard, brown to grey: (TILL)		1.83	4	SS	97	Grain Size Analysis: Gr 3%/ Sa 31%/ Si 35%/ Cl 31%
					5	SS	111	
3					6	SS	90	
4					7	SS	53	
					8	SS	63	
				227.63				
5		END OF BOREHOLE AT 4.88m UPON PRACTICAL REFUSAL TO ADVANCE.		4.88				
6								
7								
8								
9								

DYNAMIC CONE PENETRATION RESISTANCE PLOT
20 40 60 80 100

SHEAR STRENGTH: Cu, KPa
nat V - ✚ Q - ✖
rem V - ● Cpen ▲
40 80 120 160

WATER CONTENT, PERCENT
wp w wl
10 20 30 40

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : MC
CHECKED : KF

THURBER

THURBER2S TEL-28522.GPJ 12/22/20

RECORD OF BOREHOLE SC-2A

PROJECT : Rouge Park NE Trails
LOCATION : Glasgow, Ontario
STARTED : September 12, 2020
COMPLETED : September 12, 2020

Project No. 28522
SHEET 1 OF 1
DATUM Geodetic

N 4 870 828.7 E 644 615.5

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✖, Cpen ▲) (40 80 120 160) / WATER CONTENT, PERCENT (wp, w ○, wl) (10 20 30 40)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		268.71							
		TOPSOIL FILL(100mm)		0.10							
		SAND and **GRAVEL**, silty, occasional concrete fragments, compact to very dense, brown, dry: (FILL)			1	SS	23		○		
1	Manual SPT				2	SS	36		○		
					3	SS	48		○		
2					4	SS	96		○		
				266.28							
		END OF BOREHOLE AT 2.44m UPON PRACTICAL REFUSAL TO ADVANCE.		2.44							
3											
4											
5											
6											
7											
8											
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : MC
CHECKED : KF

THURBER

THURBER2S TEL-28522.GPJ 12/22/20

RECORD OF BOREHOLE SC-2B

PROJECT : Rouge Park NE Trails
LOCATION : Glasgow, Ontario
STARTED : September 25, 2020
COMPLETED : September 25, 2020

Project No. 28522
SHEET 1 OF 1
DATUM Geodetic

N 4 870 829.6 E 644 628.4

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m
		GROUND SURFACE		266.38			
	Hollow Stem Augers	**TOPSOIL FILL**(250mm)		0.00			
		SILT, some gravel, compact, brown, dry: (FILL)		0.25	1	SS	13
				265.69			
		TOPSOIL FILL(100mm)		0.69			
1		**SILT**, some gravel, trace clay, compact to hard, grey, moist; with occasional concrete fragments: (FILL)		0.86	2	SS	16
					3	SS	40
2					4	SS	40
				263.63			
		SILT, trace clay and sand, dense to very dense, grey, wet; with occasional sand layers: (TILL)		2.74			
3					5	SS	54
4							
					6	SS	51
5				261.20			
		END OF BOREHOLE AT 5.18m.		5.18			
6							
7							
8							
9							

COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)

SHEAR STRENGTH: Cu, KPa (nat V - ✚ Q - ✖ rem V - ● Cpen ▲) (40 80 120 160)

WATER CONTENT, PERCENT (wp w wl) (10 20 30 40)

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : MC
CHECKED : KF

THURBER

THURBER2S TEL-28522.GPJ 12/22/20

RECORD OF BOREHOLE SC-4A

PROJECT : Rouge Park NE Trails
LOCATION : Glasgow, Ontario
STARTED : September 16, 2020
COMPLETED : September 16, 2020

Project No. 28522
SHEET 1 OF 1
DATUM Geodetic

N 4 872 863.4 E 644 444.8

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✚, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		287.37							
		TOPSOIL(610mm)		0.00	1	SS	2		○		
				286.76							
1	Manual SPT	**SILT**, sandy, trace organics, loose, brown, moist: (ALLUVIAL)		0.61	2	SS	9		○		
				286.15							
		SILT and **SAND**, some gravel, compact to dense, light brown, moist: (TILL)		1.22	3	SS	17		○		
2					4	SS	44		○		
					5	SS	150/ 0.125		○		
				284.65							
		END OF BOREHOLE AT 2.72m UPON PRACTICAL REFUSAL TO ADVANCE. BOREHOLE BACKFILLED WITH BENTONITE.		2.72							
3											
4											
5											
6											
7											
8											
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : MC
CHECKED : KF

THURBER

THURBER2S TEL-28522.GPJ 12/22/20

RECORD OF BOREHOLE SC-4B

PROJECT : Rouge Park NE Trails
LOCATION : Glasgow, Ontario
STARTED : September 16, 2020
COMPLETED : September 16, 2020

Project No. 28522
SHEET 1 OF 1
DATUM Geodetic

N 4 872 845.4 E 644 444.8

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT (wp, w, wl) 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		282.00							
	Manual SPT	**TOPSOIL** (610mm)		0.00	1	SS	8		○		
				281.39							
1		**SILT** and **SAND**, trace to some gravel, compact to very dense, brown, moist: (TILL)		0.61	2	SS	17		○		
					3	SS	36		○		
2					4	SS	17		○		
					5	SS	78/ 0.275		○		
				279.13							
3		END OF BOREHOLE AT 2.87m UPON PRACTICAL REFUSAL TO ADVANCE. BOREHOLE BACKFILLED WITH BENTONITE.		2.87							
4											
5											
6											
7											
8											
9											

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : MC
CHECKED : KF

THURBER

THURBER2S TEL-28522.GPJ 12/22/20

RECORD OF BOREHOLE SS-1

PROJECT : Rouge Park NE Trails
LOCATION : Glasgow, Ontario
STARTED : July 17, 2020
COMPLETED : July 17, 2020

Project No. 28522
SHEET 1 OF 1
DATUM Geodetic

N 4 872 498.7 E 644 079.1

DEPTH SCALE (metres)	BORING METHOD	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	COMMENTS: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)	SHEAR STRENGTH: Cu, KPa (nat V - ✤, rem V - ●, Q - ✖, Cpen ▲) 40 80 120 160 / WATER CONTENT, PERCENT wp w wl 10 20 30 40	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		GROUND SURFACE		294.32							
	Hollow Stem Augers	**SAND**, silty, some gravel, compact, beige, dry: (FILL)		0.00	1	SS	22				
				293.64							
		CLAY, silty, trace sand and gravel, firm to very stiff, brown, moist: (FILL)		0.69	2	SS	4				
					3	SS	17				
				292.11							
		CLAY, silty to **SILT**, clayey, trace sand, oxidization, laminated with silt interbeds, stiff to hard, brown to grey, moist		2.21	4	SS	12	Grain Size Analysis: Gr 0%/ Sa 3%/ Si 79%/ Cl 18%			
					5	SS	32				
					6	SS	16				
					7	SS	20				
		SILT, sandy, trace gravel, trace clay, silt lenses(<2mm), very dense, brown, moist		287.16 7.16							
		GRAVEL, sandy, trace gravel, trace clay, occasional cobbles, frequent oxidation, very dense, brown, moist		286.52 7.80	8	SS	69				
		SILT, sandy, some gravel, some clay, occasional cobbles, oxidization, very dense, brown, moist: (TILL)		286.09 8.23							
					9	SS	75/ 0.025				
		END OF BOREHOLE 9.35m. BOREHOLE CAVED TO 7.6m AND DRY UPON COMPLETION.		284.97 9.35							

GROUNDWATER ELEVATIONS

▽ WATER LEVEL UPON COMPLETION ▼ WATER LEVEL IN WELL/PIEZOMETER

LOGGED : RB
CHECKED : KF

THURBER

THURBER2S TEL-28522.GPJ 12/22/20

THURBER

Appendix B

Borehole Location Plans

LEGEND

- BOREHOLE (BH) LOCATION
- BOREHOLE (BH) LOCATION WITH MONITORING WELL (MW)
- PROP. ROUGE PARK NE TRAIL

0 metres 240

Dillon Consulting Limited

TRAIL DESIGN ON
NORTH EASTERN AREA LANDS
ROUGE NATIONAL URBAN PARK

BOREHOLE LOCATION PLAN

JOB# 28522

THURBER ENGINEERING LTD.

PREPARED :	DRAWN :	APPROVED :
KF	BH	MRA
DATE :	SCALE :	DRAWING No.
DECEMBER 2020	1:6000	28522-1

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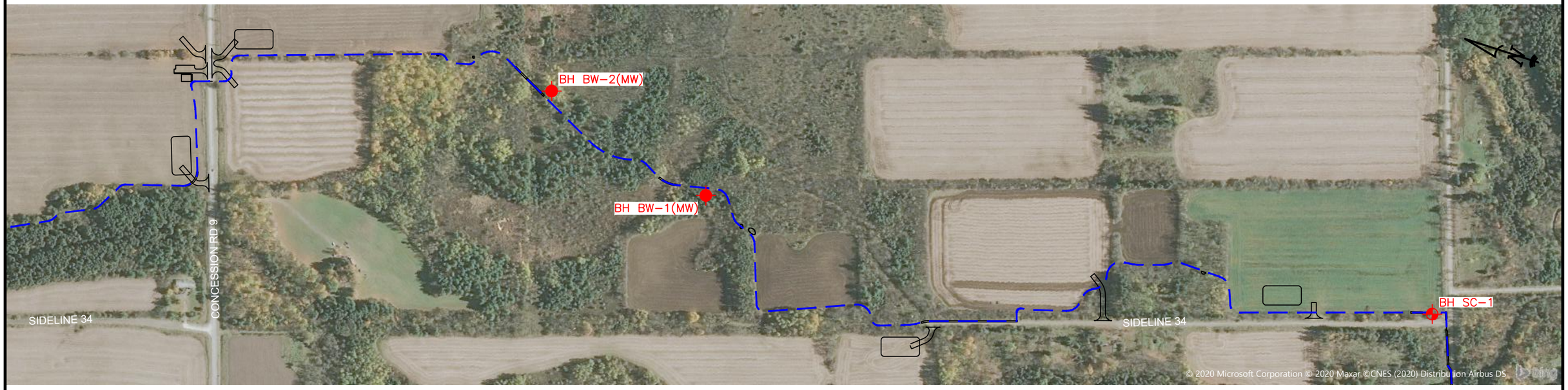
PLOTDATE: Dec 22, 2020 - 10:18 AM



LEGEND

- BOREHOLE (BH) LOCATION
- BOREHOLE (BH) LOCATION WITH MONITORING WELL (MW)
- PROP. ROUGE PARK NE TRAIL

0 metres 240

Dillon Consulting Limited

TRAIL DESIGN ON
NORTH EASTERN AREA LANDS
ROUGE NATIONAL URBAN PARK

BOREHOLE LOCATION PLAN

JOB# 28522

THURBER ENGINEERING LTD.

PREPARED :	DRAWN :	APPROVED :
KF	BH	MRA
DATE :	SCALE :	DRAWING No.
DECEMBER 2020	1:6000	28522-2

FILENAME: H:\Drafting\28000\28522\TED-28522-BHPL.dwg
PLOTDATE: Dec 22, 2020 - 10:18 AM

THURBER

Appendix C

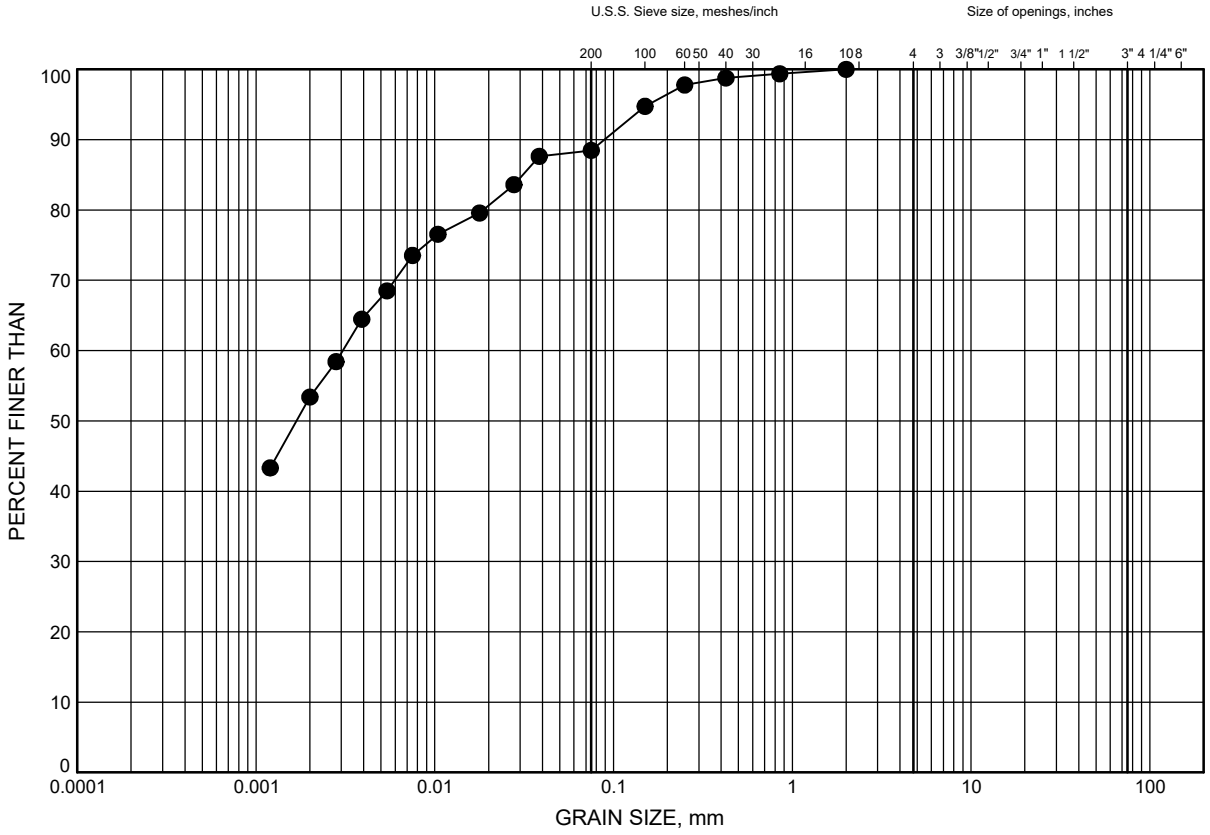
Geotechnical Laboratory Soil Test Results

Rouge Park NE Trails

GRAIN SIZE DISTRIBUTION

FIGURE C1

Silty CLAY FILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	BW-7A	0.91	261.42

Date December 2020

Project 28522

THURBER

Prep'd AN

Chkd. TF

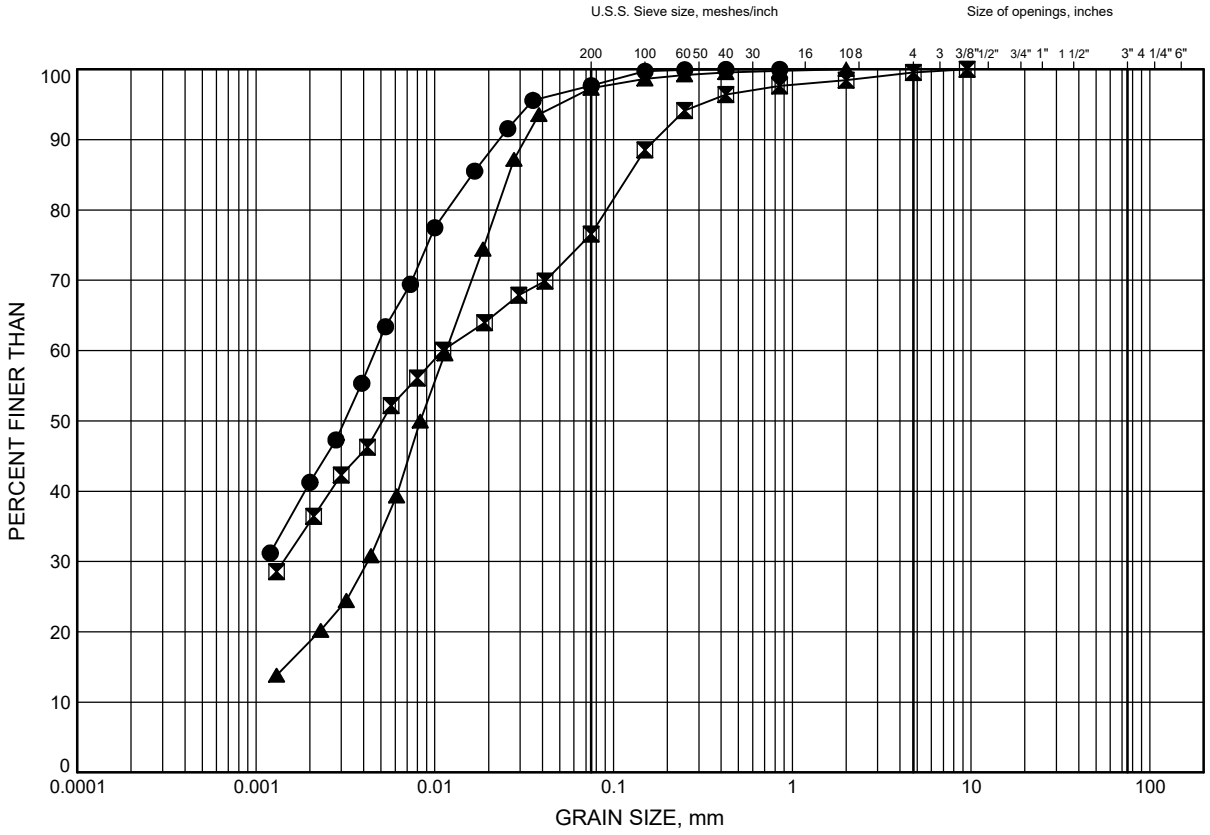
GRAIN SIZE DISTRIBUTION - THURBER TEL-28522.GPJ 12/17/20

Rouge Park NE Trails

GRAIN SIZE DISTRIBUTION

FIGURE C2

Silty CLAY



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	BW-1	1.83	233.45
⊠	BW-2	1.52	240.62
▲	SS-1	2.59	291.73

Date December 2020

Project 28522

THURBER

Prep'd AN

Chkd. TF

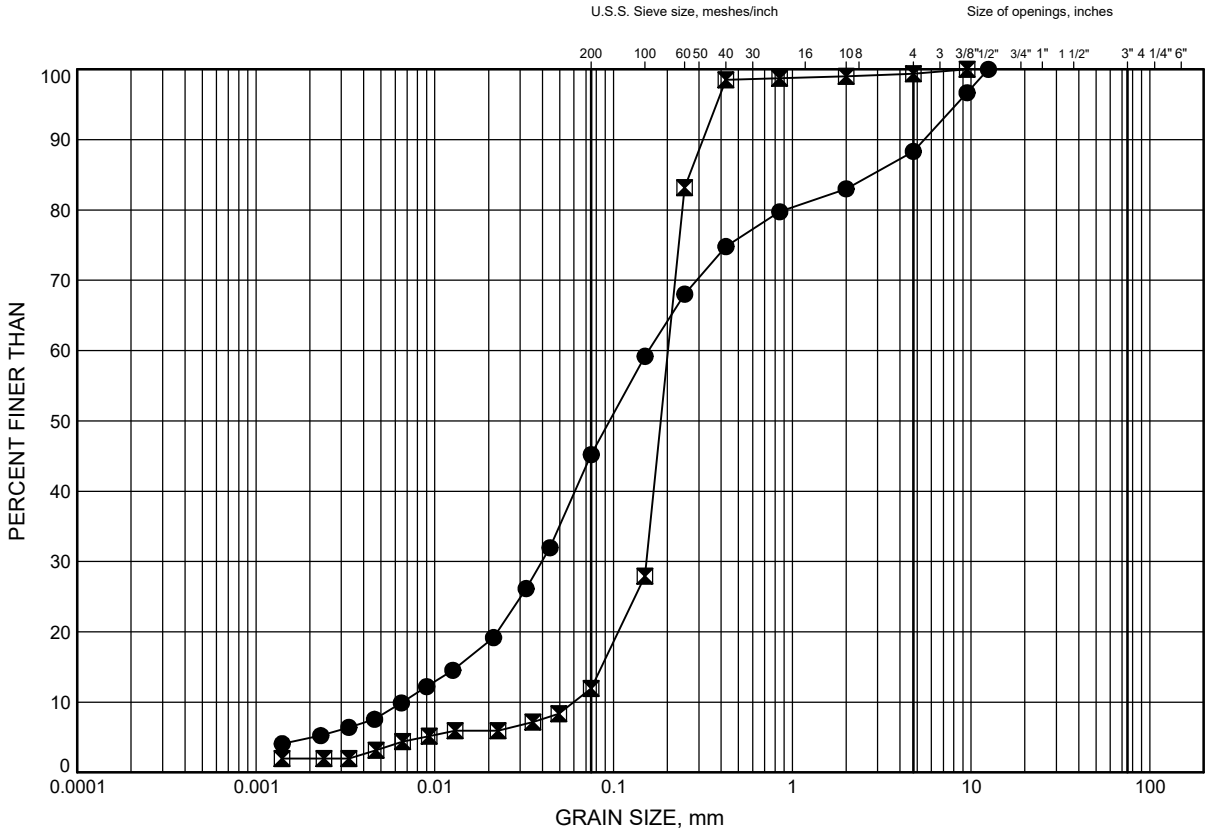
GRAIN SIZE DISTRIBUTION - THURBER TEL-28522.GPJ 12/17/20

Rouge Park NE Trails

GRAIN SIZE DISTRIBUTION

FIGURE C3

Non-Plastic TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	BW-4	2.74	261.88
⊠	BW-6	2.74	282.47

Date December 2020

Project 28522

THURBER

Prep'd AN

Chkd. TF

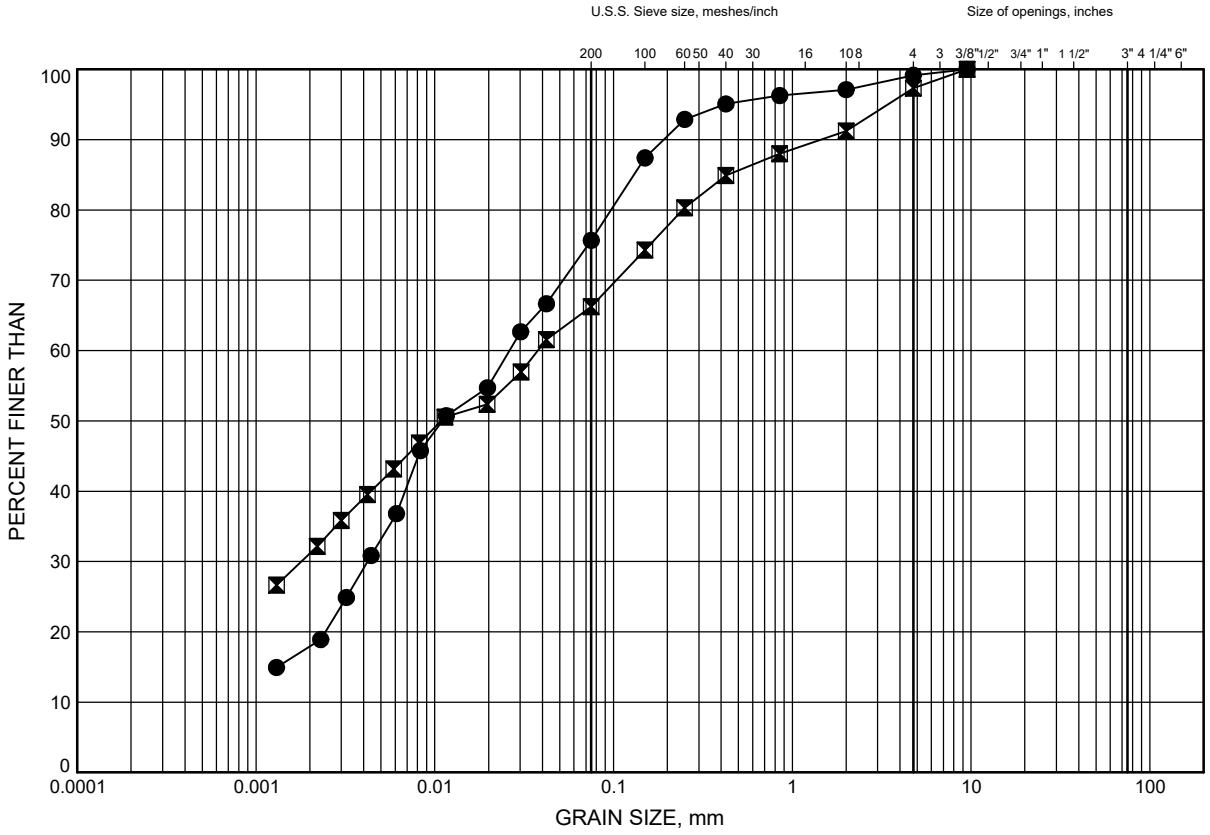
GRAIN SIZE DISTRIBUTION - THURBER TEL-28522.GPJ 12/22/20

Rouge Park NE Trails

GRAIN SIZE DISTRIBUTION

FIGURE C4

Plastic TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	BW-3	1.52	263.72
⊠	SC-1	2.13	230.38

Date December 2020

Project 28522

THURBER

Prep'd AN

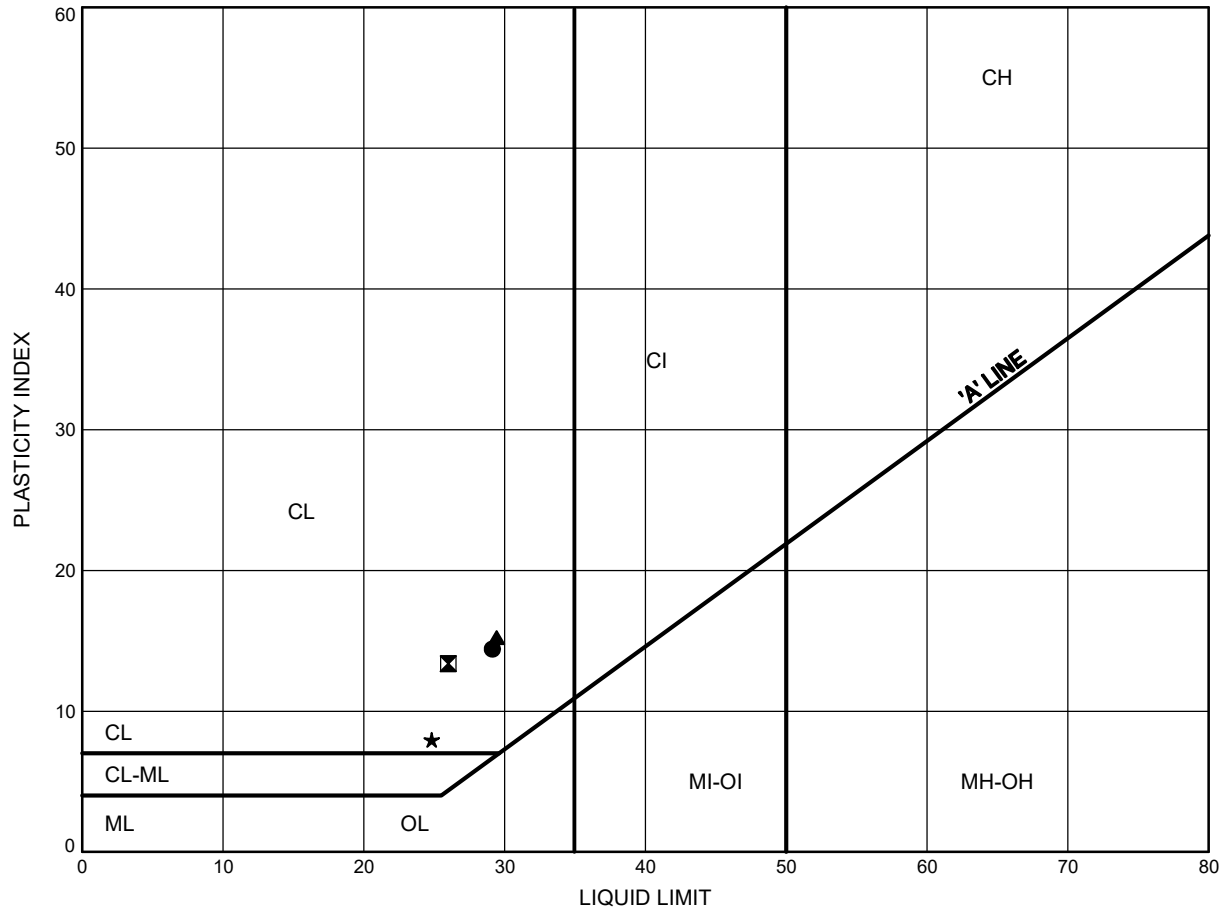
Chkd. TF

GRAIN SIZE DISTRIBUTION - THURBER TEL-28522.GPJ 12/22/20

Rouge Park NE Trails

ATTERBERG LIMITS TEST RESULTS

FIGURE C5



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	BW-1	2.13	233.15
⊠	BW-2	1.52	240.62
▲	SC-1	2.13	230.38
★	SS-1	2.59	291.73

Date December 2020

Project 28522

THURBER

Prep'd AN

Chkd. TF

THURBALT TEL-28522.GPJ 12/17/20

THURBER

Appendix D

Laboratory Certificate of Analysis
Soil Aggressiveness

FINAL REPORT

CA14474-DEC20 R1

28522

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	Tim Feather
Telephone	905-745-7377
Facsimile	
Email	tfeather@thurber.ca
Project	28522
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	CA14474-DEC20
Received	12/15/2020
Approved	12/23/2020
Report Number	CA14474-DEC20 R1
Date Reported	12/23/2020

COMMENTS

Temperature of Sample upon Receipt: 4 degrees C
Cooling Agent Present:Yes
Custody Seal Present:Yes

Chain of Custody Number:C1

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: 28522
Project Manager: Tim Feather
Samplers: Madisan Chiarotto

PACKAGE: **- Corrosivity Index** (SOIL)

			Sample Number	5	6
			Sample Name	BHSS-1 SS4	BHBW-1 SS2
			Sample Matrix	Soil	Soil
			Sample Date	17/07/2020	10/09/2020
Parameter	**Units**	**RL**		**Result**	**Result**
Corrosivity Index					
Corrosivity Index	none	1		4	4
Soil Redox Potential	mV	-		307	246
Sulphide (Na2CO3)	%	0.04		< 0.04	< 0.04
pH	pH Units	0.05		8.83	8.75
Resistivity (calculated)	ohms.cm	-9999		10000	6540

PACKAGE: **- General Chemistry** (SOIL)

			Sample Number	5	6
			Sample Name	BHSS-1 SS4	BHBW-1 SS2
			Sample Matrix	Soil	Soil
			Sample Date	17/07/2020	10/09/2020
Parameter	**Units**	**RL**		**Result**	**Result**
General Chemistry					
Conductivity	uS/cm	2		100	153

PACKAGE: **- Metals and Inorganics** (SOIL)

			Sample Number	5	6
			Sample Name	BHSS-1 SS4	BHBW-1 SS2
			Sample Matrix	Soil	Soil
			Sample Date	17/07/2020	10/09/2020
Parameter	**Units**	**RL**		**Result**	**Result**
Metals and Inorganics					
Moisture Content	%	0.1		13.4	18.4
Sulphate	µg/g	0.4		11	33

Client: Thurber Engineering Ltd.
Project: 28522
Project Manager: Tim Feather
Samplers: Madisan Chiarotto

PACKAGE: **- Other (ORP)** (SOIL)

Sample Number	5	6
Sample Name	BHSS-1 SS4	BHBW-1 SS2
Sample Matrix	Soil	Soil
Sample Date	17/07/2020	10/09/2020

Parameter	Units	RL		Result	Result
Other (ORP)					
Chloride	µg/g	0.4		13	6.6

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	DIO0295-DEC20	µg/g	0.4	<0.4	5	20	99	80	120	102	75	125
Sulphate	DIO0295-DEC20	µg/g	0.4	<0.4	20	20	98	80	120	91	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)	ECS0044-DEC20	%	0.04	< 0.04	ND	20	117	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	EWL0255-DEC20	uS/cm	2	< 2	0	20	99	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	EWL0255-DEC20	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

Samples analysed as received. 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" 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. This document is issued, on the Client's behalf, by the Company under its General Conditions of Service available on request and accessible at http://www.sgs.com/terms_and_conditions.htm. The Client's attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any other holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents.

-- End of Analytical Report --

SGS Request for Laboratory Services and CHAIN OF CUSTODY

No: C1

Page 1 of 1

Environment, Health & Safety - 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

Laboratory Information Section - Lab use only

Received By: Mayeed Ahmad Lavi
Received Date (mm/dd/yy): 12/15/2020
Received Time: 11:05
Received By (signature): Mayeed Ahmad Lavi
Custody Seal Present: ☐
Custody Seal Intact: ☐
Cooling Agent Present: ☐
Temperature Upon Receipt (°C): 4°C 4°C 4°C
CA-14474-Dec 20
LAB LIMS #:

REPORT INFORMATION	INVOICE INFORMATION	PROJECT INFORMATION
Company: Thurber Engineering Ltd.	☑ (same as Report Information)	Quotation #: P.O. #:
Contact: Tim Feather	Company:	Project #: 28522 Site Location/ID:
Address: 103-2010 Winston Park Drive, Oakville, Ontario	Contact:	**TURNAROUND TIME (TAT) REQUIRED**
Phone: 905-745-7377	Address:	☑ 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
Email: tfeather@thurber.ca	Phone:	**RUSH TAT (Additional Charges May Apply):** ☐ 1 Day ☐ 2 Days ☐ 3 Days ☐ 4 Days
Email:	Email:	**PLEASE CONFIRM RUSH FEASIBILITY WITH SGS REPRESENTATIVE PRIOR TO SUBMISSION**
		Specify Due Date: Rush Confirmation ID:

REGULATIONS

Regulation 153/04: ☐ Table 1 ☐ Table 2 ☐ Table 3 ☐ Table ____ ☐ R/P/I ☐ I/C/C ☐ A/O Soil Texture: ☐ Coarse ☐ Medium ☐ Fine

Other Regulations: ☐ Reg 347/558 (3 Day min TAT) ☐ PWQO ☐ MMER ☐ CCME ☐ Other: ☐ MISA

Sewer By-Law: ☐ Sanitary ☐ Storm Municipality:

RECORD OF SITE CONDITION (RSC) ☐ YES ☑ NO

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

	SAMPLE IDENTIFICATION	DATE SAMPLED	TIME SAMPLED	# OF BOTTLES	MATRIX	ANALYSIS REQUESTED: Field Filtered (Y/N)	Metals & Inorganics	PAH ☑ ABN ☐ SVOC(all) ☐	PCB Total ☐ Aroclor ☐	PHC F1-F4 ☑ VOC ☑ BTEX ☑ BTEX/F1 ☐ F2-F4 ☐	VOC ☐ BTEX ☐ THM ☐	Pesticides OC ☐ OP ☐	TCLP M&I ☐ VOC ☐ PCB ☐ B(a)P ☐ ABN ☐ Ignit. ☐	Water Pkg Gen. ☐ Ext. ☐	Sewer Use:	Corrosivity/Resistivity					COMMENTS:
1	BHSS-1 SS4	7/17/20	A.M.	1	SOIL		☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	
2	BHBW-1 SS2	09/10/20	A.M.	1	SOIL		☐	☐	☐	☐	☐	☐	☐	☐	☐	☑	☐	☐	☐	☐	
3							☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
4							☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
5							☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
6							☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
7							☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
8							☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
9							☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
10							☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
11							☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
12							☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

Observations/Comments/Special Instructions

Sampled By (NAME): Madisan Chiarotto	**Signature:** TF	Date: 12/15/20 (mm/dd/yy)	Pink Copy - Client
Relinquished by (NAME): Tim Feather	**Signature:** TF	Date: 12/15/20 (mm/dd/yy)	Yellow & White Copy - SGS

THURBER

Appendix E

Laboratory Certificates of Analysis
Soil Management

Your Project #: 28522
Site Location: ROUGE PARK NE TRAILS
Your C.O.C. #: N/A

Attention: Karel Furbacher

Thurber Engineering Ltd
2010 Winston Park Dr
Suite 103
Oakville, ON
CANADA L6H 5R7

Report Date: 2020/10/08
Report #: R6362376
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C0P7718
Received: 2020/10/01, 12:11

Sample Matrix: Soil
Samples Received: 2

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Hot Water Extractable Boron	2	2020/10/05	2020/10/05	CAM SOP-00408	R153 Ana. Prot. 2011
1,3-Dichloropropene Sum	2	N/A	2020/10/07		EPA 8260C m
Free (WAD) Cyanide	2	2020/10/05	2020/10/06	CAM SOP-00457	OMOE E3015 m
Conductivity	2	2020/10/06	2020/10/06	CAM SOP-00414	OMOE E3530 v1 m
Hexavalent Chromium in Soil by IC (1)	2	2020/10/06	2020/10/06	CAM SOP-00436	EPA 3060/7199 m
Petroleum Hydrocarbons F2-F4 in Soil (2)	2	2020/10/05	2020/10/05	CAM SOP-00316	CCME CWS m
Strong Acid Leachable Metals by ICPMS	2	2020/10/05	2020/10/05	CAM SOP-00447	EPA 6020B m
Moisture	1	N/A	2020/10/02	CAM SOP-00445	Carter 2nd ed 51.2 m
Moisture	1	N/A	2020/10/03	CAM SOP-00445	Carter 2nd ed 51.2 m
pH CaCl2 EXTRACT	2	2020/10/05	2020/10/05	CAM SOP-00413	EPA 9045 D m
Sodium Adsorption Ratio (SAR)	2	N/A	2020/10/07	CAM SOP-00102	EPA 6010C
Volatile Organic Compounds and F1 PHCs	2	N/A	2020/10/07	CAM SOP-00230	EPA 8260C m

Remarks:

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.

Your Project #: 28522
Site Location: ROUGE PARK NE TRAILS
Your C.O.C. #: N/A

Attention: Karel Furbacher

Thurber Engineering Ltd
2010 Winston Park Dr
Suite 103
Oakville, ON
CANADA L6H 5R7

Report Date: 2020/10/08
Report #: R6362376
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BV LABS JOB #: C0P7718

Received: 2020/10/01, 12:11

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Soils are reported on a dry weight basis unless otherwise specified.

(2) All CCME PHC results met required criteria unless otherwise stated in the report. The CWS PHC methods employed by Bureau Veritas Laboratories conform to all prescribed elements of the reference method and performance based elements have been validated. All modifications have been validated and proven equivalent following "Alberta Environment's Interpretation of the Reference Method for the Canada-Wide Standard for Petroleum Hydrocarbons in Soil Validation of Performance-Based Alternative Methods September 2003". Documentation is available upon request. Modifications from Reference Method for the Canada-wide Standard for Petroleum Hydrocarbons in Soil-Tier 1 Method: F2/F3/F4 data reported using validated cold solvent extraction instead of Soxhlet extraction.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Antonella Brasil, Senior Project Manager
Email: Antonella.Brasil@bvlabs.com
Phone# (905)817-5817

==========

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

BV Labs Job #: C0P7718
Report Date: 2020/10/08

Thurber Engineering Ltd
Client Project #: 28522
Site Location: ROUGE PARK NE TRAILS
Sampler Initials: KF

O.REG 153 METALS & INORGANICS PKG (SOIL)

BV Labs ID		NUD352	NUD353		
Sampling Date		2020/09/25 12:00	2020/09/25 12:00		
	UNITS	BW7-B SS2	BW7-B SS3	RDL	QC Batch
Calculated Parameters					
Sodium Adsorption Ratio	N/A	0.29 (1)	0.38	N/A	6978874
Inorganics					
Conductivity	mS/cm	0.13	0.20	0.002	6984469
Available (CaCl2) pH	pH	7.72	7.47	N/A	6982455
WAD Cyanide (Free)	ug/g	<0.01	0.01	0.01	6982833
Chromium (VI)	ug/g	<0.18	<0.18	0.18	6984440
Metals					
Hot Water Ext. Boron (B)	ug/g	0.073	0.65	0.050	6982670
Acid Extractable Antimony (Sb)	ug/g	<0.20	<0.20	0.20	6982344
Acid Extractable Arsenic (As)	ug/g	1.3	2.2	1.0	6982344
Acid Extractable Barium (Ba)	ug/g	34	42	0.50	6982344
Acid Extractable Beryllium (Be)	ug/g	0.25	0.22	0.20	6982344
Acid Extractable Boron (B)	ug/g	<5.0	<5.0	5.0	6982344
Acid Extractable Cadmium (Cd)	ug/g	<0.10	0.12	0.10	6982344
Acid Extractable Chromium (Cr)	ug/g	11	9.8	1.0	6982344
Acid Extractable Cobalt (Co)	ug/g	3.8	3.9	0.10	6982344
Acid Extractable Copper (Cu)	ug/g	7.5	9.0	0.50	6982344
Acid Extractable Lead (Pb)	ug/g	4.1	7.1	1.0	6982344
Acid Extractable Molybdenum (Mo)	ug/g	<0.50	<0.50	0.50	6982344
Acid Extractable Nickel (Ni)	ug/g	7.5	7.1	0.50	6982344
Acid Extractable Selenium (Se)	ug/g	<0.50	<0.50	0.50	6982344
Acid Extractable Silver (Ag)	ug/g	<0.20	<0.20	0.20	6982344
Acid Extractable Thallium (Tl)	ug/g	0.072	0.10	0.050	6982344
Acid Extractable Uranium (U)	ug/g	0.41	0.47	0.050	6982344
Acid Extractable Vanadium (V)	ug/g	21	22	5.0	6982344
Acid Extractable Zinc (Zn)	ug/g	21	41	5.0	6982344
Acid Extractable Mercury (Hg)	ug/g	<0.050	<0.050	0.050	6982344

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable
(1) Sodium was not detected. To report SAR the sodium detection limit was used in the calculation. This value represents a maximum ratio.

Bureau Veritas Laboratories 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

O.REG 153 VOCS BY HS & F1-F4 (SOIL)

BV Labs ID		NUD352		NUD353		
Sampling Date		2020/09/25 12:00		2020/09/25 12:00		
	UNITS	BW7-B SS2	QC Batch	BW7-B SS3	RDL	QC Batch
Inorganics						
Moisture	%	11	6981373	15	1.0	6980292
Calculated Parameters						
1,3-Dichloropropene (cis+trans)	ug/g	<0.050	6979025	<0.050	0.050	6979025
Volatile Organics						
Acetone (2-Propanone)	ug/g	<0.50	6981441	<0.50	0.50	6981441
Benzene	ug/g	<0.020	6981441	<0.020	0.020	6981441
Bromodichloromethane	ug/g	<0.050	6981441	<0.050	0.050	6981441
Bromoform	ug/g	<0.050	6981441	<0.050	0.050	6981441
Bromomethane	ug/g	<0.050	6981441	<0.050	0.050	6981441
Carbon Tetrachloride	ug/g	<0.050	6981441	<0.050	0.050	6981441
Chlorobenzene	ug/g	<0.050	6981441	<0.050	0.050	6981441
Chloroform	ug/g	<0.050	6981441	<0.050	0.050	6981441
Dibromochloromethane	ug/g	<0.050	6981441	<0.050	0.050	6981441
1,2-Dichlorobenzene	ug/g	<0.050	6981441	<0.050	0.050	6981441
1,3-Dichlorobenzene	ug/g	<0.050	6981441	<0.050	0.050	6981441
1,4-Dichlorobenzene	ug/g	<0.050	6981441	<0.050	0.050	6981441
Dichlorodifluoromethane (FREON 12)	ug/g	<0.050	6981441	<0.050	0.050	6981441
1,1-Dichloroethane	ug/g	<0.050	6981441	<0.050	0.050	6981441
1,2-Dichloroethane	ug/g	<0.050	6981441	<0.050	0.050	6981441
1,1-Dichloroethylene	ug/g	<0.050	6981441	<0.050	0.050	6981441
cis-1,2-Dichloroethylene	ug/g	<0.050	6981441	<0.050	0.050	6981441
trans-1,2-Dichloroethylene	ug/g	<0.050	6981441	<0.050	0.050	6981441
1,2-Dichloropropane	ug/g	<0.050	6981441	<0.050	0.050	6981441
cis-1,3-Dichloropropene	ug/g	<0.030	6981441	<0.030	0.030	6981441
trans-1,3-Dichloropropene	ug/g	<0.040	6981441	<0.040	0.040	6981441
Ethylbenzene	ug/g	<0.020	6981441	<0.020	0.020	6981441
Ethylene Dibromide	ug/g	<0.050	6981441	<0.050	0.050	6981441
Hexane	ug/g	<0.050	6981441	<0.050	0.050	6981441
Methylene Chloride(Dichloromethane)	ug/g	<0.050	6981441	<0.050	0.050	6981441
Methyl Ethyl Ketone (2-Butanone)	ug/g	<0.50	6981441	<0.50	0.50	6981441
Methyl Isobutyl Ketone	ug/g	<0.50	6981441	<0.50	0.50	6981441
Methyl t-butyl ether (MTBE)	ug/g	<0.050	6981441	<0.050	0.050	6981441
Styrene	ug/g	<0.050	6981441	<0.050	0.050	6981441
1,1,1,2-Tetrachloroethane	ug/g	<0.050	6981441	<0.050	0.050	6981441

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

BV Labs Job #: C0P7718
Report Date: 2020/10/08

Thurber Engineering Ltd
Client Project #: 28522
Site Location: ROUGE PARK NE TRAILS
Sampler Initials: KF

O.REG 153 VOCS BY HS & F1-F4 (SOIL)

BV Labs ID		NUD352		NUD353		
Sampling Date		2020/09/25 12:00		2020/09/25 12:00		
	UNITS	BW7-B SS2	QC Batch	BW7-B SS3	RDL	QC Batch
1,1,2,2-Tetrachloroethane	ug/g	<0.050	6981441	<0.050	0.050	6981441
Tetrachloroethylene	ug/g	<0.050	6981441	<0.050	0.050	6981441
Toluene	ug/g	<0.020	6981441	<0.020	0.020	6981441
1,1,1-Trichloroethane	ug/g	<0.050	6981441	<0.050	0.050	6981441
1,1,2-Trichloroethane	ug/g	<0.050	6981441	<0.050	0.050	6981441
Trichloroethylene	ug/g	<0.050	6981441	<0.050	0.050	6981441
Trichlorofluoromethane (FREON 11)	ug/g	<0.050	6981441	<0.050	0.050	6981441
Vinyl Chloride	ug/g	<0.020	6981441	<0.020	0.020	6981441
p+m-Xylene	ug/g	<0.020	6981441	<0.020	0.020	6981441
o-Xylene	ug/g	<0.020	6981441	<0.020	0.020	6981441
Total Xylenes	ug/g	<0.020	6981441	<0.020	0.020	6981441
F1 (C6-C10)	ug/g	<10	6981441	<10	10	6981441
F1 (C6-C10) - BTEX	ug/g	<10	6981441	<10	10	6981441
F2-F4 Hydrocarbons						
F2 (C10-C16 Hydrocarbons)	ug/g	<10	6982047	<10	10	6982047
F3 (C16-C34 Hydrocarbons)	ug/g	<50	6982047	<50	50	6982047
F4 (C34-C50 Hydrocarbons)	ug/g	<50	6982047	<50	50	6982047
Reached Baseline at C50	ug/g	Yes	6982047	Yes	N/A	6982047
Surrogate Recovery (%)						
o-Terphenyl	%	99	6982047	95	N/A	6982047
4-Bromofluorobenzene	%	95	6981441	97	N/A	6981441
D10-o-Xylene	%	111	6981441	113	N/A	6981441
D4-1,2-Dichloroethane	%	103	6981441	108	N/A	6981441
D8-Toluene	%	97	6981441	97	N/A	6981441

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
N/A = Not Applicable

Bureau Veritas Laboratories 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

BV Labs Job #: C0P7718
Report Date: 2020/10/08

Thurber Engineering Ltd
Client Project #: 28522
Site Location: ROUGE PARK NE TRAILS
Sampler Initials: KF

GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	8.0°C

Results relate only to the items tested.

Bureau Veritas Laboratories 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

BV Labs Job #: C0P7718
Report Date: 2020/10/08

Thurber Engineering Ltd
Client Project #: 28522
Site Location: ROUGE PARK NE TRAILS
Sampler Initials: KF

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
6980292	KJP	RPD	Moisture	2020/10/02	0		%	20
6981373	KJP	RPD	Moisture	2020/10/03	0.63		%	20
6981441	DR1	Matrix Spike	4-Bromofluorobenzene	2020/10/06		101	%	60 - 140
			D10-o-Xylene	2020/10/06		117	%	60 - 130
			D4-1,2-Dichloroethane	2020/10/06		109	%	60 - 140
			D8-Toluene	2020/10/06		102	%	60 - 140
			Acetone (2-Propanone)	2020/10/06		159 (1)	%	60 - 140
			Benzene	2020/10/06		111	%	60 - 140
			Bromodichloromethane	2020/10/06		109	%	60 - 140
			Bromoform	2020/10/06		109	%	60 - 140
			Bromomethane	2020/10/06		112	%	60 - 140
			Carbon Tetrachloride	2020/10/06		110	%	60 - 140
			Chlorobenzene	2020/10/06		106	%	60 - 140
			Chloroform	2020/10/06		109	%	60 - 140
			Dibromochloromethane	2020/10/06		110	%	60 - 140
			1,2-Dichlorobenzene	2020/10/06		106	%	60 - 140
			1,3-Dichlorobenzene	2020/10/06		107	%	60 - 140
			1,4-Dichlorobenzene	2020/10/06		108	%	60 - 140
			Dichlorodifluoromethane (FREON 12)	2020/10/06		105	%	60 - 140
			1,1-Dichloroethane	2020/10/06		116	%	60 - 140
			1,2-Dichloroethane	2020/10/06		112	%	60 - 140
			1,1-Dichloroethylene	2020/10/06		122	%	60 - 140
			cis-1,2-Dichloroethylene	2020/10/06		112	%	60 - 140
			trans-1,2-Dichloroethylene	2020/10/06		110	%	60 - 140
			1,2-Dichloropropane	2020/10/06		113	%	60 - 140
			cis-1,3-Dichloropropene	2020/10/06		111	%	60 - 140
			trans-1,3-Dichloropropene	2020/10/06		116	%	60 - 140
			Ethylbenzene	2020/10/06		111	%	60 - 140
			Ethylene Dibromide	2020/10/06		114	%	60 - 140
			Hexane	2020/10/06		126	%	60 - 140
			Methylene Chloride(Dichloromethane)	2020/10/06		108	%	60 - 140
			Methyl Ethyl Ketone (2-Butanone)	2020/10/06		156 (1)	%	60 - 140
			Methyl Isobutyl Ketone	2020/10/06		135	%	60 - 140
			Methyl t-butyl ether (MTBE)	2020/10/06		116	%	60 - 140
			Styrene	2020/10/06		113	%	60 - 140
			1,1,1,2-Tetrachloroethane	2020/10/06		109	%	60 - 140
			1,1,2,2-Tetrachloroethane	2020/10/06		112	%	60 - 140
			Tetrachloroethylene	2020/10/06		106	%	60 - 140
			Toluene	2020/10/06		104	%	60 - 140
			1,1,1-Trichloroethane	2020/10/06		111	%	60 - 140
			1,1,2-Trichloroethane	2020/10/06		111	%	60 - 140
			Trichloroethylene	2020/10/06		107	%	60 - 140
			Trichlorofluoromethane (FREON 11)	2020/10/06		117	%	60 - 140
			Vinyl Chloride	2020/10/06		114	%	60 - 140
			p+m-Xylene	2020/10/06		111	%	60 - 140
			o-Xylene	2020/10/06		113	%	60 - 140
			F1 (C6-C10)	2020/10/06		101	%	60 - 140
6981441	DR1	Spiked Blank	4-Bromofluorobenzene	2020/10/06		100	%	60 - 140
			D10-o-Xylene	2020/10/06		99	%	60 - 130
			D4-1,2-Dichloroethane	2020/10/06		110	%	60 - 140
			D8-Toluene	2020/10/06		104	%	60 - 140

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acetone (2-Propanone)	2020/10/06		154 (1)	%	60 - 140
			Benzene	2020/10/06		98	%	60 - 130
			Bromodichloromethane	2020/10/06		99	%	60 - 130
			Bromoform	2020/10/06		106	%	60 - 130
			Bromomethane	2020/10/06		100	%	60 - 140
			Carbon Tetrachloride	2020/10/06		94	%	60 - 130
			Chlorobenzene	2020/10/06		95	%	60 - 130
			Chloroform	2020/10/06		98	%	60 - 130
			Dibromochloromethane	2020/10/06		103	%	60 - 130
			1,2-Dichlorobenzene	2020/10/06		97	%	60 - 130
			1,3-Dichlorobenzene	2020/10/06		95	%	60 - 130
			1,4-Dichlorobenzene	2020/10/06		97	%	60 - 130
			Dichlorodifluoromethane (FREON 12)	2020/10/06		89	%	60 - 140
			1,1-Dichloroethane	2020/10/06		102	%	60 - 130
			1,2-Dichloroethane	2020/10/06		105	%	60 - 130
			1,1-Dichloroethylene	2020/10/06		105	%	60 - 130
			cis-1,2-Dichloroethylene	2020/10/06		101	%	60 - 130
			trans-1,2-Dichloroethylene	2020/10/06		96	%	60 - 130
			1,2-Dichloropropane	2020/10/06		102	%	60 - 130
			cis-1,3-Dichloropropene	2020/10/06		101	%	60 - 130
			trans-1,3-Dichloropropene	2020/10/06		107	%	60 - 130
			Ethylbenzene	2020/10/06		96	%	60 - 130
			Ethylene Dibromide	2020/10/06		108	%	60 - 130
			Hexane	2020/10/06		107	%	60 - 130
			Methylene Chloride(Dichloromethane)	2020/10/06		99	%	60 - 130
			Methyl Ethyl Ketone (2-Butanone)	2020/10/06		154 (1)	%	60 - 140
			Methyl Isobutyl Ketone	2020/10/06		133 (1)	%	60 - 130
			Methyl t-butyl ether (MTBE)	2020/10/06		104	%	60 - 130
			Styrene	2020/10/06		102	%	60 - 130
			1,1,1,2-Tetrachloroethane	2020/10/06		99	%	60 - 130
			1,1,2,2-Tetrachloroethane	2020/10/06		109	%	60 - 130
			Tetrachloroethylene	2020/10/06		91	%	60 - 130
			Toluene	2020/10/06		92	%	60 - 130
			1,1,1-Trichloroethane	2020/10/06		96	%	60 - 130
			1,1,2-Trichloroethane	2020/10/06		105	%	60 - 130
			Trichloroethylene	2020/10/06		94	%	60 - 130
			Trichlorofluoromethane (FREON 11)	2020/10/06		99	%	60 - 130
			Vinyl Chloride	2020/10/06		99	%	60 - 130
			p+m-Xylene	2020/10/06		97	%	60 - 130
			o-Xylene	2020/10/06		99	%	60 - 130
			F1 (C6-C10)	2020/10/06		97	%	80 - 120
6981441	DR1	Method Blank	4-Bromofluorobenzene	2020/10/06		97	%	60 - 140
			D10-o-Xylene	2020/10/06		106	%	60 - 130
			D4-1,2-Dichloroethane	2020/10/06		106	%	60 - 140
			D8-Toluene	2020/10/06		97	%	60 - 140
			Acetone (2-Propanone)	2020/10/06	<0.50		ug/g	
			Benzene	2020/10/06	<0.020		ug/g	
			Bromodichloromethane	2020/10/06	<0.050		ug/g	
			Bromoform	2020/10/06	<0.050		ug/g	
			Bromomethane	2020/10/06	<0.050		ug/g	
			Carbon Tetrachloride	2020/10/06	<0.050		ug/g	

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Chlorobenzene	2020/10/06	<0.050		ug/g	
			Chloroform	2020/10/06	<0.050		ug/g	
			Dibromochloromethane	2020/10/06	<0.050		ug/g	
			1,2-Dichlorobenzene	2020/10/06	<0.050		ug/g	
			1,3-Dichlorobenzene	2020/10/06	<0.050		ug/g	
			1,4-Dichlorobenzene	2020/10/06	<0.050		ug/g	
			Dichlorodifluoromethane (FREON 12)	2020/10/06	<0.050		ug/g	
			1,1-Dichloroethane	2020/10/06	<0.050		ug/g	
			1,2-Dichloroethane	2020/10/06	<0.050		ug/g	
			1,1-Dichloroethylene	2020/10/06	<0.050		ug/g	
			cis-1,2-Dichloroethylene	2020/10/06	<0.050		ug/g	
			trans-1,2-Dichloroethylene	2020/10/06	<0.050		ug/g	
			1,2-Dichloropropane	2020/10/06	<0.050		ug/g	
			cis-1,3-Dichloropropene	2020/10/06	<0.030		ug/g	
			trans-1,3-Dichloropropene	2020/10/06	<0.040		ug/g	
			Ethylbenzene	2020/10/06	<0.020		ug/g	
			Ethylene Dibromide	2020/10/06	<0.050		ug/g	
			Hexane	2020/10/06	<0.050		ug/g	
			Methylene Chloride(Dichloromethane)	2020/10/06	<0.050		ug/g	
			Methyl Ethyl Ketone (2-Butanone)	2020/10/06	<0.50		ug/g	
			Methyl Isobutyl Ketone	2020/10/06	<0.50		ug/g	
			Methyl t-butyl ether (MTBE)	2020/10/06	<0.050		ug/g	
			Styrene	2020/10/06	<0.050		ug/g	
			1,1,1,2-Tetrachloroethane	2020/10/06	<0.050		ug/g	
			1,1,2,2-Tetrachloroethane	2020/10/06	<0.050		ug/g	
			Tetrachloroethylene	2020/10/06	<0.050		ug/g	
			Toluene	2020/10/06	<0.020		ug/g	
			1,1,1-Trichloroethane	2020/10/06	<0.050		ug/g	
			1,1,2-Trichloroethane	2020/10/06	<0.050		ug/g	
			Trichloroethylene	2020/10/06	<0.050		ug/g	
			Trichlorofluoromethane (FREON 11)	2020/10/06	<0.050		ug/g	
			Vinyl Chloride	2020/10/06	<0.020		ug/g	
			p+m-Xylene	2020/10/06	<0.020		ug/g	
			o-Xylene	2020/10/06	<0.020		ug/g	
			Total Xylenes	2020/10/06	<0.020		ug/g	
			F1 (C6-C10)	2020/10/06	<10		ug/g	
			F1 (C6-C10) - BTEX	2020/10/06	<10		ug/g	
6981441	DR1	RPD	Acetone (2-Propanone)	2020/10/07	NC		%	50
			Benzene	2020/10/07	NC		%	50
			Bromodichloromethane	2020/10/07	NC		%	50
			Bromoform	2020/10/07	NC		%	50
			Bromomethane	2020/10/07	NC		%	50
			Carbon Tetrachloride	2020/10/07	NC		%	50
			Chlorobenzene	2020/10/07	NC		%	50
			Chloroform	2020/10/07	NC		%	50
			Dibromochloromethane	2020/10/07	NC		%	50
			1,2-Dichlorobenzene	2020/10/07	NC		%	50
			1,3-Dichlorobenzene	2020/10/07	NC		%	50
			1,4-Dichlorobenzene	2020/10/07	NC		%	50
			Dichlorodifluoromethane (FREON 12)	2020/10/07	NC		%	50
			1,1-Dichloroethane	2020/10/07	NC		%	50

QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			1,2-Dichloroethane	2020/10/07	NC		%	50
			1,1-Dichloroethylene	2020/10/07	NC		%	50
			cis-1,2-Dichloroethylene	2020/10/07	NC		%	50
			trans-1,2-Dichloroethylene	2020/10/07	NC		%	50
			1,2-Dichloropropane	2020/10/07	NC		%	50
			cis-1,3-Dichloropropene	2020/10/07	NC		%	50
			trans-1,3-Dichloropropene	2020/10/07	NC		%	50
			Ethylbenzene	2020/10/07	NC		%	50
			Ethylene Dibromide	2020/10/07	NC		%	50
			Hexane	2020/10/07	NC		%	50
			Methylene Chloride(Dichloromethane)	2020/10/07	NC		%	50
			Methyl Ethyl Ketone (2-Butanone)	2020/10/07	NC		%	50
			Methyl Isobutyl Ketone	2020/10/07	NC		%	50
			Methyl t-butyl ether (MTBE)	2020/10/07	NC		%	50
			Styrene	2020/10/07	NC		%	50
			1,1,1,2-Tetrachloroethane	2020/10/07	NC		%	50
			1,1,2,2-Tetrachloroethane	2020/10/07	NC		%	50
			Tetrachloroethylene	2020/10/07	NC		%	50
			Toluene	2020/10/07	NC		%	50
			1,1,1-Trichloroethane	2020/10/07	NC		%	50
			1,1,2-Trichloroethane	2020/10/07	NC		%	50
			Trichloroethylene	2020/10/07	NC		%	50
			Trichlorofluoromethane (FREON 11)	2020/10/07	NC		%	50
			Vinyl Chloride	2020/10/07	NC		%	50
			p+m-Xylene	2020/10/07	NC		%	50
			o-Xylene	2020/10/07	NC		%	50
			Total Xylenes	2020/10/07	NC		%	50
			F1 (C6-C10)	2020/10/07	NC		%	30
			F1 (C6-C10) - BTEX	2020/10/07	NC		%	30
6982047	AS2	Matrix Spike	o-Terphenyl	2020/10/05		104	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2020/10/05		100	%	50 - 130
			F3 (C16-C34 Hydrocarbons)	2020/10/05		110	%	50 - 130
			F4 (C34-C50 Hydrocarbons)	2020/10/05		109	%	50 - 130
6982047	AS2	Spiked Blank	o-Terphenyl	2020/10/05		97	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2020/10/05		94	%	80 - 120
			F3 (C16-C34 Hydrocarbons)	2020/10/05		103	%	80 - 120
			F4 (C34-C50 Hydrocarbons)	2020/10/05		102	%	80 - 120
6982047	AS2	Method Blank	o-Terphenyl	2020/10/05		98	%	60 - 130
			F2 (C10-C16 Hydrocarbons)	2020/10/05	<10		ug/g	
			F3 (C16-C34 Hydrocarbons)	2020/10/05	<50		ug/g	
			F4 (C34-C50 Hydrocarbons)	2020/10/05	<50		ug/g	
6982047	AS2	RPD	F2 (C10-C16 Hydrocarbons)	2020/10/05	NC		%	30
			F3 (C16-C34 Hydrocarbons)	2020/10/05	NC		%	30
			F4 (C34-C50 Hydrocarbons)	2020/10/05	NC		%	30
6982344	DT1	Matrix Spike	Acid Extractable Antimony (Sb)	2020/10/05		87	%	75 - 125
			Acid Extractable Arsenic (As)	2020/10/05		97	%	75 - 125
			Acid Extractable Barium (Ba)	2020/10/05		NC	%	75 - 125
			Acid Extractable Beryllium (Be)	2020/10/05		95	%	75 - 125
			Acid Extractable Boron (B)	2020/10/05		82	%	75 - 125
			Acid Extractable Cadmium (Cd)	2020/10/05		97	%	75 - 125
			Acid Extractable Chromium (Cr)	2020/10/05		107	%	75 - 125

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Cobalt (Co)	2020/10/05		101	%	75 - 125
			Acid Extractable Copper (Cu)	2020/10/05		97	%	75 - 125
			Acid Extractable Lead (Pb)	2020/10/05		NC	%	75 - 125
			Acid Extractable Molybdenum (Mo)	2020/10/05		97	%	75 - 125
			Acid Extractable Nickel (Ni)	2020/10/05		103	%	75 - 125
			Acid Extractable Selenium (Se)	2020/10/05		98	%	75 - 125
			Acid Extractable Silver (Ag)	2020/10/05		96	%	75 - 125
			Acid Extractable Thallium (Tl)	2020/10/05		96	%	75 - 125
			Acid Extractable Uranium (U)	2020/10/05		98	%	75 - 125
			Acid Extractable Vanadium (V)	2020/10/05		NC	%	75 - 125
			Acid Extractable Zinc (Zn)	2020/10/05		NC	%	75 - 125
			Acid Extractable Mercury (Hg)	2020/10/05		91	%	75 - 125
6982344	DT1	Spiked Blank	Acid Extractable Antimony (Sb)	2020/10/05		100	%	80 - 120
			Acid Extractable Arsenic (As)	2020/10/05		97	%	80 - 120
			Acid Extractable Barium (Ba)	2020/10/05		93	%	80 - 120
			Acid Extractable Beryllium (Be)	2020/10/05		96	%	80 - 120
			Acid Extractable Boron (B)	2020/10/05		98	%	80 - 120
			Acid Extractable Cadmium (Cd)	2020/10/05		99	%	80 - 120
			Acid Extractable Chromium (Cr)	2020/10/05		97	%	80 - 120
			Acid Extractable Cobalt (Co)	2020/10/05		99	%	80 - 120
			Acid Extractable Copper (Cu)	2020/10/05		100	%	80 - 120
			Acid Extractable Lead (Pb)	2020/10/05		98	%	80 - 120
			Acid Extractable Molybdenum (Mo)	2020/10/05		98	%	80 - 120
			Acid Extractable Nickel (Ni)	2020/10/05		98	%	80 - 120
			Acid Extractable Selenium (Se)	2020/10/05		102	%	80 - 120
			Acid Extractable Silver (Ag)	2020/10/05		101	%	80 - 120
			Acid Extractable Thallium (Tl)	2020/10/05		97	%	80 - 120
			Acid Extractable Uranium (U)	2020/10/05		97	%	80 - 120
			Acid Extractable Vanadium (V)	2020/10/05		101	%	80 - 120
			Acid Extractable Zinc (Zn)	2020/10/05		97	%	80 - 120
			Acid Extractable Mercury (Hg)	2020/10/05		97	%	80 - 120
6982344	DT1	Method Blank	Acid Extractable Antimony (Sb)	2020/10/05	<0.20		ug/g	
			Acid Extractable Arsenic (As)	2020/10/05	<1.0		ug/g	
			Acid Extractable Barium (Ba)	2020/10/05	<0.50		ug/g	
			Acid Extractable Beryllium (Be)	2020/10/05	<0.20		ug/g	
			Acid Extractable Boron (B)	2020/10/05	<5.0		ug/g	
			Acid Extractable Cadmium (Cd)	2020/10/05	<0.10		ug/g	
			Acid Extractable Chromium (Cr)	2020/10/05	<1.0		ug/g	
			Acid Extractable Cobalt (Co)	2020/10/05	<0.10		ug/g	
			Acid Extractable Copper (Cu)	2020/10/05	<0.50		ug/g	
			Acid Extractable Lead (Pb)	2020/10/05	<1.0		ug/g	
			Acid Extractable Molybdenum (Mo)	2020/10/05	<0.50		ug/g	
			Acid Extractable Nickel (Ni)	2020/10/05	<0.50		ug/g	
			Acid Extractable Selenium (Se)	2020/10/05	<0.50		ug/g	
			Acid Extractable Silver (Ag)	2020/10/05	<0.20		ug/g	
			Acid Extractable Thallium (Tl)	2020/10/05	<0.050		ug/g	
			Acid Extractable Uranium (U)	2020/10/05	<0.050		ug/g	
			Acid Extractable Vanadium (V)	2020/10/05	<5.0		ug/g	
			Acid Extractable Zinc (Zn)	2020/10/05	<5.0		ug/g	
			Acid Extractable Mercury (Hg)	2020/10/05	<0.050		ug/g	
6982344	DT1	RPD	Acid Extractable Antimony (Sb)	2020/10/05	22		%	30

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
			Acid Extractable Arsenic (As)	2020/10/05	2.9		%	30
			Acid Extractable Barium (Ba)	2020/10/05	0.14		%	30
			Acid Extractable Beryllium (Be)	2020/10/05	1.2		%	30
			Acid Extractable Boron (B)	2020/10/05	8.8		%	30
			Acid Extractable Cadmium (Cd)	2020/10/05	NC		%	30
			Acid Extractable Chromium (Cr)	2020/10/05	1.2		%	30
			Acid Extractable Cobalt (Co)	2020/10/05	1.4		%	30
			Acid Extractable Copper (Cu)	2020/10/05	1.2		%	30
			Acid Extractable Lead (Pb)	2020/10/05	0.095		%	30
			Acid Extractable Molybdenum (Mo)	2020/10/05	24		%	30
			Acid Extractable Nickel (Ni)	2020/10/05	2.7		%	30
			Acid Extractable Selenium (Se)	2020/10/05	NC		%	30
			Acid Extractable Silver (Ag)	2020/10/05	NC		%	30
			Acid Extractable Thallium (Tl)	2020/10/05	4.2		%	30
			Acid Extractable Uranium (U)	2020/10/05	3.7		%	30
			Acid Extractable Vanadium (V)	2020/10/05	3.0		%	30
			Acid Extractable Zinc (Zn)	2020/10/05	19		%	30
			Acid Extractable Mercury (Hg)	2020/10/05	11		%	30
6982455	YPA	Spiked Blank	Available (CaCl2) pH	2020/10/05		100	%	97 - 103
6982455	YPA	RPD	Available (CaCl2) pH	2020/10/05	0.15		%	N/A
6982670	JOH	Matrix Spike	Hot Water Ext. Boron (B)	2020/10/05		105	%	75 - 125
6982670	JOH	Spiked Blank	Hot Water Ext. Boron (B)	2020/10/05		93	%	75 - 125
6982670	JOH	Method Blank	Hot Water Ext. Boron (B)	2020/10/05	<0.050		ug/g	
6982670	JOH	RPD	Hot Water Ext. Boron (B)	2020/10/05	3.0		%	40
6982833	GTO	Matrix Spike	WAD Cyanide (Free)	2020/10/06		88	%	75 - 125
6982833	GTO	Spiked Blank	WAD Cyanide (Free)	2020/10/06		89	%	80 - 120
6982833	GTO	Method Blank	WAD Cyanide (Free)	2020/10/06	<0.01		ug/g	
6982833	GTO	RPD	WAD Cyanide (Free)	2020/10/06	NC		%	35
6984440	RSU	Matrix Spike	Chromium (VI)	2020/10/06		65 (2)	%	70 - 130
6984440	RSU	Spiked Blank	Chromium (VI)	2020/10/06		83	%	80 - 120
6984440	RSU	Method Blank	Chromium (VI)	2020/10/06	<0.18		ug/g	
6984440	RSU	RPD	Chromium (VI)	2020/10/06	NC		%	35
6984469	SAU	Spiked Blank	Conductivity	2020/10/06		104	%	90 - 110
6984469	SAU	Method Blank	Conductivity	2020/10/06	<0.002		mS/cm	

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QUALITY ASSURANCE REPORT(CONT'D)

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
6984469	SAU	RPD	Conductivity	2020/10/06	4.1		%	10

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

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

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) The recovery was above the upper control limit. This may represent a high bias in some results for this specific analyte. For results that were not detected (ND), this potential bias has no impact.

(2) The matrix spike recovery was below the lower control limit. This may be due in part to the reducing environment of the sample.The sample was reanalyzed with the same results

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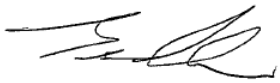
BV Labs Job #: C0P7718
Report Date: 2020/10/08

Thurber Engineering Ltd
Client Project #: 28522
Site Location: ROUGE PARK NE TRAILS
Sampler Initials: KF

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Brad Newman, B.Sc., C.Chem., Scientific Service Specialist

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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BUREAU VERITAS

6740 Campobello Road, Mississauga, Ontario L5N 2L8
Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: 800-563-6266
CAM FCD-01191/5

CHAIN OF CUSTODY RECORD

Invoice Information

Company Name: Thurber Engineering Ltd.
Contact Name: Karel Furbacher
Address: 103, 2010 Winston Park Drive
Oakville, Ontario
Phone: 2894557296 Fax:
Email: kfurbacher@thurber.ca

Report Information (if differs from invoice)

Company Name:
Contact Name:
Address:
Phone: Fax:
Email:

Project Information (where applicable)

Quotation #:
P.O. #/ AFE#:
Project #: 28522
Site Location: Rouge Park NE Trails
Site #:
Site Location Province:
Sampled By:

Turnaround Time (TAT) Required

[X] Regular TAT (5-7 days) Most analyses

PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS

Rush TAT (Surcharges will be applied)
[ ] 1 Day [ ] 2 Days [ ] 3-4 Days

Date Required:
Rush Confirmation #:

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS LABORATORIES' DRINKING WATER CHAIN OF CUSTODY

Regulation 153

[X] Table 1 [ ] Res/Park [ ] Med/ Fine
[ ] Table 2 [ ] Ind/Comm [ ] Coarse
[ ] Table 3 [ ] Agri/ Other
[X] Table 2.1 RPI
FOR RSC (PLEASE CIRCLE) Y / (N)

Other Regulations

[ ] CCME [ ] Sanitary Sewer Bylaw
[ ] MISA [ ] Storm Sewer Bylaw
[ ] PWQO Region
[ ] Other (Specify)
[ ] REG 558 (MIN. 3 DAY TAT REQUIRED)

Include Criteria on Certificate of Analysis: (Y) / N

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

LABORATORY USE ONLY

CUSTODY SEAL Y / (N)
Present / Intact

COOLER TEMPERATURES: 10/9/5

COOLING MEDIA PRESENT: (Y) / N

	SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED (CIRCLE) Metals / Hg / CrVI	BTEX/ PHC F1	PHCs F2 - F4	VOCs	REG 153 METALS & INORGANICS	REG 153 ICPMS METALS	REG 153 METALS (Hg, Cr VI, ICPMS Metals, HWS - B)	PCBs	PAHs	HOLD- DO NOT ANALYZE	COMMENTS
1	BW7-B SS2	2020-09-25	12:00	Soil	4		X	X	X	X						
2	BW7-B SS3	2020-09-25	12:00	Soil	4		X	X	X	X						
3																
4																
5																
6																
7																
8																
9																
10																

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)
Karel Furbacher	2020-10-01	1:00		01/10/20	11:00
				2020/10/01	1211

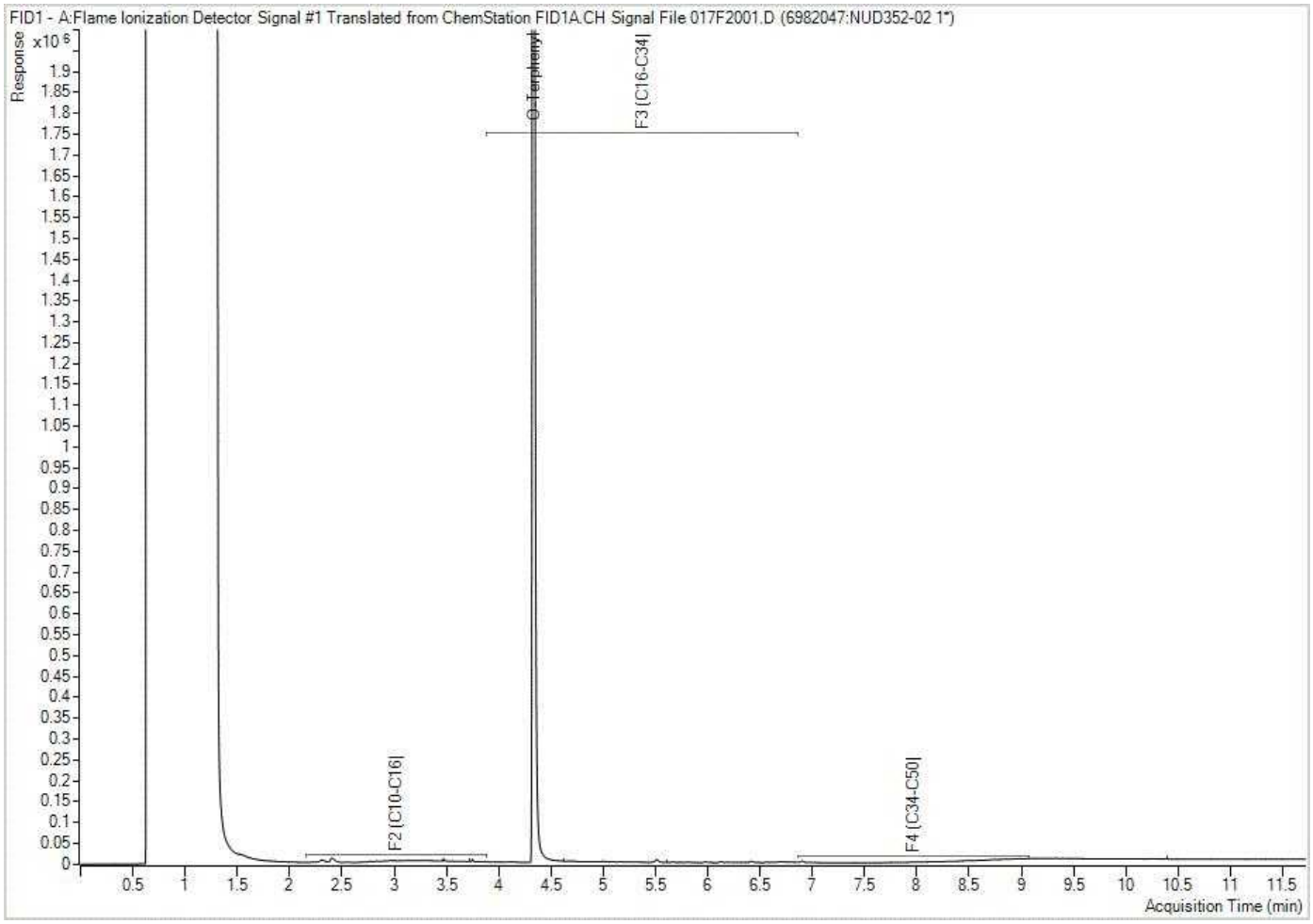
01-Oct-20 12:11
Antonella Brasil
C0P7718
KVG ENV-997

BV Privé

BV Labs Job #: C0P7718
Report Date: 2020/10/08
BV Labs Sample: NUD352

Thurber Engineering Ltd
Client Project #: 28522
Project name: ROUGE PARK NE TRAILS
Client ID: BW7-B SS2

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram

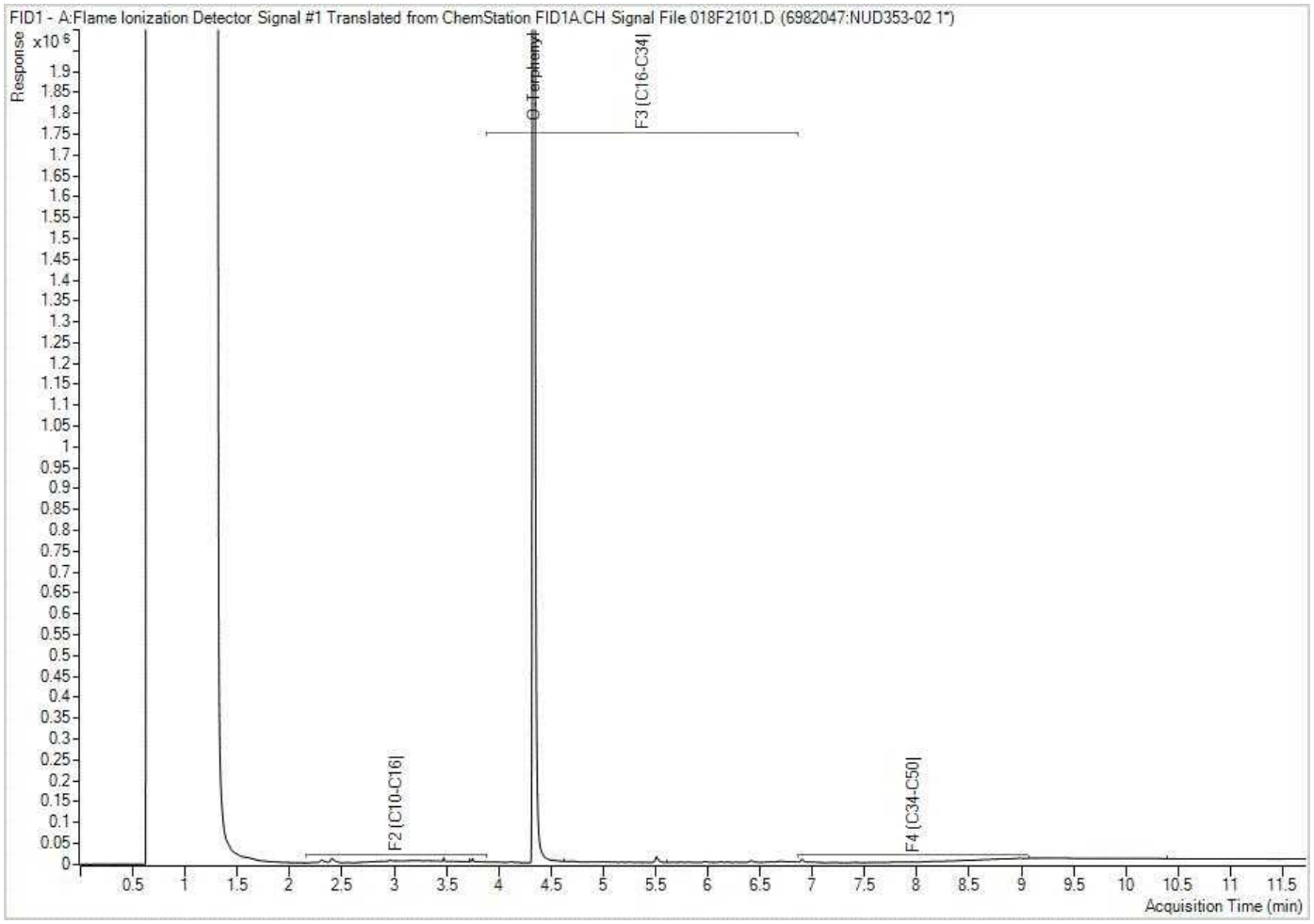


Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.

BV Labs Job #: C0P7718
Report Date: 2020/10/08
BV Labs Sample: NUD353

Thurber Engineering Ltd
Client Project #: 28522
Project name: ROUGE PARK NE TRAILS
Client ID: BW7-B SS3

Petroleum Hydrocarbons F2-F4 in Soil Chromatogram



Note: This information is provided for reference purposes only. Should detailed chemist interpretation or fingerprinting be required, please contact the laboratory.